2016 Project Abstract
For the Period Ending June 30, 2020

PROJECT TITLE: Elimination of Target Invasive Plant Species – Phase II

PROJECT MANAGER: Monika Chandler, MDA, and Angela Gupta, UMN Extension
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2016, Chp. 186, Sec. 2, Subd. 06e

APPROPRIATION AMOUNT: $511,000 to MDA and $239,000 to UMN
AMOUNT SPENT: $ 511,000 (depended on rebudget) and $237,061
AMOUNT REMAINING: $ 0 and $1,939

Sound bite of Project Outcomes and Results
We educated about, found, documented and managed highly damaging invasive plant populations before they spread statewide. We also initiated a response to Palmer amaranth in conservation plantings that was continued by the project Palmer Amaranth Detection and Control. Mitigating these invasive plant threats protected Minnesota forests, grasslands and riparian areas.

Overall Project Outcome and Results
The goal was to eliminate highly damaging target invasive plants before they became widespread by 1) training people to identify and report invasive plants, 2) survey, coordinate control and monitor target plants, 3) control target plants and 4) implement the invasive species management database system from Phase 1. Targeted plants that cause severe ecological harm include black swallow-wort, dalmatian toadflax, cutleaf and common teasels, Grecian foxglove, Japanese hops, brown and meadow knapweeds, Oriental bittersweet and Palmer amaranth.

University of Minnesota Extension led the education and outreach efforts outlined in the dissemination section. The drone team transitioned from research to survey work by testing several different types of drones, cameras, weather conditions and self-produced and commercial post-processing software. We determined that surveying for Oriental bittersweet is best done with sturdy quadcopter drones and a high quality camera on mild winter days after leaf drop but with snow on the ground so the red fruit is most visible. High quality, stitched-together and geo-coded maps can now be produced in post processing and inform accurate eradication efforts.

The Minnesota Department of Agriculture (MDA) and Conservation Corps Minnesota (CCM) led invasive plant management. MDA led survey, invasive plant report follow up, monitoring and coordinated control with landowners and partners. CCM led the control effort with 157 unique crew members working on this project.

Plant Name	New Infestation Reports*	New Infestation Acres Reported	Acres Treated**
Black swallow-wort	5	5	9
Dalmatian toadflax	no new reports	0	828
Common teasel	6	1	302
Cutleaf teasel	99	65	1,832
Grecian foxglove	119	47	1,368
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Oriental bittersweet	203	2,937	1,462
Total	**977**	**3,490**	**14,070**

*New infestation reports were recorded during the project period. We continued control work on infestations identified during our Phase 1 project (2013-2016).

**Acres were spot treated because the invasive plants were scattered within some large areas. Many infestations were treated in multiple years and the acreage of each treatment was recorded and included in the total.

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Project Results Use and Dissemination

University of Minnesota Extension led the education and outreach funded specifically by this project. Reaching 1,108 people via 11 workshops, field tours and public and professional presentations. Developed two national award winning videos: Planning invasive species events: Tips for working with volunteers and Planning invasive species events: Working with a natural resources professional. Created 14 innovative educational materials including: 3D-printed models of Palmer amaranth, Japanese hops and Grecian foxglove; pull-up banners for Palmer amaranth and giant hogweed; and identification kits available at the public library for Palmer amaranth, wild parsnip and Oriental bittersweet. Produced two new educational handouts and printed and distributed about 10,875 educational materials.

In addition, the University of Minnesota and Minnesota Department of Agriculture (MDA) team members won numerous national, regional and state awards for effort including this project, from across an impressively wide spectrum of content areas. There were 13 media pieces about project activities; 13 presentations or booths reaching 5,137 gardeners, tribal youth, Extension volunteers and others; and 30 presentations or posters at 14 different professional conferences representing a broad spectrum of expertise reaching almost 1,000 natural resource or invasive species professionals. Two professional, peer reviewed articles were published that reference this work. MDA organized and led 6 field tours, gave 43 presentations, provided project updates at 32 meetings, authored 14 articles, sent an annual report to stakeholders and trained Conservation Corps Minnesota crew members at multiple workshops each year.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2016 Work Plan Final Report

Date of Report: **October 1, 2020**

Final report

Date of Work Plan Approval: **June 7, 2016**

Project Completion Date: **June 30, 2020**

Does this submission include an amendment request? Yes

PROJECT TITLE: Elimination of Target Invasive Plant Species – Phase II

Project Manager: Monika Chandler

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Location: Statewide

Total ENRTF Project Budget:		
	ENRTF Appropriation:	**$ 511,000**
	Amount Spent:	**$ 506,466**
	Balance:	**$ 4,534**

Legal Citation: M.L. 2016, Chp. 186, Sec. 2, Subd. 06e1 as extended by M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 19

Appropriation Language:

$750,000 the second year is from the trust fund. Of this amount, $511,000 is to the commissioner of agriculture and $239,000 is to the Board of Regents of the University of Minnesota to train volunteers and professionals to find, control, and monitor targeted newly emergent invasive plant species. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

Carryforward; Extension (a) The availability of the appropriations for the following projects is extended to June 30, 2020: (10) Laws 2016, chapter 186, section 2, subdivision 6, paragraph (e), Elimination of Target Invasive Plant Species - Phase II;

I. PROJECT TITLE: Elimination of Target Invasive Plant Species - Phase 2

II. PROJECT STATEMENT: Eliminating highly damaging target invasive plant species before they become widespread prevents ecological and economic damage. Currently, these species have limited distributions in Minnesota. It is feasible to control them before they proliferate by continuing the strategic effort initiated in Phase 1. To date, we trained 521 people to identify target invasives, surveyed over 10,000 acres, initiated control on 450 acres and are developing an invasive species management database system with broad applicability for terrestrial and aquatic invasives. We will continue these activities in Phase 2. In addition, we will expand our training capacity by developing online training, test whether a drone will increase survey efficiency and add to the target species list.

Target Invasive Plant List: Species include but are not limited to the following. They are listed in order of feasibility to eradicate based upon their abundance and distribution. All target species are prohibited noxious and invasive weeds on the eradicate list (Minnesota Statutes, Section 18.78) providing a legal backing.

1. **Black swallow-wort** is a milkweed vine that overgrows other vegetation. Small infestations have been reported in Hennepin and Ramsey Counties and are being controlled. (New in Phase 2)
2. **Dalmatian toadflax** forms dense stands in grasslands and reduces biodiversity, wildlife habitat, and livestock production. Infestations in the Halma and Lutsen areas are reduced but not eliminated yet.
3. **Cutleaf and common teasels** overtakes grasslands and riparian areas reducing species diversity and wildlife habitat. There are scattered infestations in southeastern Minnesota. (Common teasel is new in Phase 2)
4. **Grecian foxglove** is highly toxic to humans, wildlife, and livestock. It also displaces native plants. As of spring 2015, most infestations are in Washington County.
5. **Japanese hops** are annual vines that grow so rapidly that they smother other plants. There is an extensive infestation along the Root River and a small infestation on the Mississippi.
6. **Brown and meadow knapweeds** are spreading across meadows in northern Minnesota. (New in Phase 2)
7. **Oriental bittersweet** is a woody vine that is destroying swaths of forest in Red Wing and Winona by girdling and breaking the trees then covering and shading the remains so that little else grows.
8. **Palmer amaranth** is an annual plant native to the arid southwestern United States and northwestern Mexico. It has spread to the southeastern and Midwestern US and become problematic. It grows very quickly to heights reaching 10 feet. It also produces massive amount of seed. These qualities give it a competitive advantage against row crops and native vegetation plantings. During the battle against Palmer amaranth, this plant developed resistance to multiple classes of herbicides. Palmer amaranth now causes extensive losses where it is abundant including in corn and soybeans.

Our long-term goal is to eradicate these problematic species from Minnesota to protect forest and grassland habitats. All of the invasive plants listed harm natural areas and degrade wildlife habitat.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of November 30, 2016:
We hit the ground running in Phase 2 of this project. We monitored treatments done in Phase 1 of this project and were pleased with outcomes. We followed up on numerous new reports of target species. It is clear that educational efforts made in Phase 1 of this project have paid off. A wide variety of partners are able to identify and report target species. We are beginning to plan 2017 survey and control work.

Our rapid response to the discovery of Palmer amaranth in Minnesota in September 2016 demonstrated the importance of the infrastructure developed during Phase 1 of this project. We were able to survey sites and initiate treatments this fall. This fast action greatly increased the odds of averting an agricultural disaster. MDA's emergency funds were used for this work. MDA amended our contract with CCM by a $15,000 increase to contain and control Palmer amaranth infestations. These funds are MDA emergency funds. It is feasible that there will be additional future amendments of MDA funds. There is no budget amendment for ENRTF dollars for Palmer amaranth. Use of MDA funds are reported in section VI. Project Budget Summary under Other Funds.

Amendment Approved by LCCMR January 17, 2017
As part of this project, Extension received ENRTF dollars to purchase tablets for CCM so that CCM will field test ISMTrack. Extension also received ENRTF dollars to purchase tablets for training. Extension will use other funds to pay for the data that will be used for training.

In order to utilize ISMTrack in Activity 4, CCM needs data plans with their tablets. We tried using mobile hotspots but they were cumbersome and did not work as readily as a device with a data plan. We request that CCM include data costs for their project tablets with their regular invoices to MDA. The cost will be $20 per month per tablet for 10 tablets which would be $2,400 per year. The total data cost for this project would be $5,800. This would be using ENRTF dollars for data. There would be no change in the budget amount. Use of $5,800 for data would result in one week less fieldwork by a five person crew. We consider the investment in advancing ISMTrack technology worthwhile. Use of this technology will increase efficiency for MDA in mapping and keeping track of work done.

Amendment Approved by LCCMR March 17, 2017
We request utilizing project funds to hire a Plant Health Specialist to monitor Palmer amaranth infestations and survey conservation plantings. This would be a new position at MDA. This work would be within Activity 2 Part A. Hiring this position this spring will enable us to begin work at the start of the 2017 growing season. We will submit a proposal for ENRTF emerging issues funding to expand this work.

Most of the funds for this position's salary and fringe of $30,000 were shifted from other project positions. Funding for the Research Scientist 1 position was reduced from $224,000 to $212,000 because insurance costs were less than budgeted. Single rather than dependent care coverage that was budgeted has been used. Additionally, funds were shifted from a part-time Plant Health Specialist position from $67,000 to $50,000 and the position was reduced from a 3 year to a 2 year part-time position. As a result, we will not be able to manage meadow and brown knapweed infestations in 2017 and they will continue to spread in northern Minnesota.

Project Status as of May 31, 2017:
Delimiting bittersweet infestations was a focus during this project period. This information will enable us to determine best management strategies for each infestation. It also enabled us to create better geodatabases to help coordinate work involving over 50 people in an area. Details of these databases are reported in Activity 3.

Weed 'Em Out trainings (Activity 1) directly resulted in a report of the largest black swallow-wort infestation in Minnesota. This infestation is scheduled for control next month (Activity 3). Many have raised concerns about the expansion of poison hemlock, a highly toxic invasive plant. U of M, CCM and MDA have all been mapping locations. This will inform the poison hemlock risk assessment that MDA's Noxious Weed Advisory Committee is conducting.

There has been significant outreach on Palmer amaranth. MDA posted a position to work on Palmer amaranth detection and management. Update 07/31/17 – MDA hired Shane Blair to work on Palmer amaranth and he started on 07/26/17.

Project Status as of November 30, 2017:
We accomplished much during this period. CCM crews from northern stations rotating into southeastern Minnesota to control Oriental bittersweet, Japanese hops and teasels. In addition to increasing crew members available for this work, the crew members learned to identify these species. They will be trained eyes on the lookout for these species. We have made excellent progress with Dalmatian toadflax control in all locations and are now just managing the seedbank. In contrast, Japanese hops control proved to be challenging. High water levels in 2016 prevented treatment so the hops population exploded. We are planning ways to get a better handle on it. A survey with many partners on St. Croix documented that there is very little Oriental bittersweet on the river and the scattered vines will be controlled. Poison hemlock outreach was big with 61 media outlets covering the story. The public responded well and we learned about many, mostly small, infestations.

Amendment Request November 30, 2017, Amendment Approved by LCCR 12/13/2017
MDA requests combining part time work on this project with part time work on our Tactical Plan Invasive Plant Management Plan Development project for full time positions in Duluth and Rochester. There would be no position on both projects in St. Paul. The rational for decentralizing these positions is housing them in the northern and southern regions where they will be working. This will enable the positions to develop essential local partnerships. Once housing for these positions is secured, MDA will post the positions. Fortunately, DNR agreed to house the southern position at their office in Rochester at no charge to MDA. We are in the process of working out a no charge lease agreement for the space. Extension was asked to house the position in the interim and we await a response. The city of Duluth is considering housing the northern position at City Hall. If approved, we would no longer have a full-time Research Scientist 1 position. We would have two approximately 75% time Plant Health Specialist positions instead.

Our Palmer Amaranth Detection and Eradication project was funded. As a result, we were able to charge costs to that project so would like to eliminate the position on this project. Having the funds available on this project enabled us to go through the hiring process before Palmer specific project funds were available. This saved us months in the hiring process.

Project Status as of May 31, 2018:
We continued to add capacity to this project with the hiring of Mari Hardel in Duluth and Christina Basch in Rochester as Noxious Weed Specialists at MDA. They both work half time on Activity 2 of this project. In addition to our continued progress on survey, coordination and control of target species with ENRTF support, MDA received pass through funds to local units of government for control of eradicate list species. This funding is much appreciated and is very helpful but adds to MDA's administrative and coordination roles.

Our project is low on funding for CCM to do control work. We would like to improve this situation with budget amendments. Extension's budget amendment report requested contracting with CCM for $25,000 and up to $45,000 should the full funds be available. MDA is submitting a budget amendment request to move $35,000 from salary to contract with CCM.

Amendment Request June 11, 2018, Amendment Approved by LCCMR 06/14/2018
MDA requests to amend our budget by moving $35,000 from MDA's salary and fringe (Activity 2) to amend our contract with CCM for additional control work (Activity 3). We have the salary savings because it took months to fill our new positions and because there has been an ongoing difference between insurance dependent care coverage budgeted and single care coverage utilized.

Project Status as of November 30, 2018:
Adding capacity with staff and related funding resulted in an accelerated control effort. Control work was done on over 1,000 acres more than previous years of this project. Assessing infestations and coordinating work with landowners and crews has been very involved, almost overwhelming, but we are pleased with results. The Minnesota Invasive Species Advisory Council recognized efforts of the project partners and collaborators with the Carol Mortensen team award. It was presented at the Upper Midwest Invasive Species Conference.

For the first time, MDA's grant assistance account was funded and funds were awarded to grant recipients in 2018. The appropriation language of this funding gave preference to local units of government responding to Palmer amaranth or other weeds on the eradicate list. This funding has been important for target species control. We have coordinated with grant recipients to best utilize MDA pass through and ENRTF funds. In several cases, the local governments didn't have the knowledge and/or capacity to complete the projects without coordination by the noxious weed specialists on this project. A list of grant awards is in the Activity 3 update.

Amendment Request December 14, 2018 – Amendment signed into law 05/31/19
We request to extend this project deadline one year to June 30, 2020. There is a need to continue target plant species control. Extending the project would enable us to continue this control work another field season for survey, monitoring and management on at least 500 acres. U of M Extension has a staffing issue due to a medical situation where the person hired on this project can't work full-time as budgeted. As a result, MDA assumed Activity 4 of this project and would hold at least 2 additional ISMTrack training workshops if the project is extended. U of M's staffing issue may result in additional unspent funds but the exact amount can't be determined until near the current project end of June 30, 2019. Subject to approval, these funds could be reallocated to accomplish more.

Amendment Approved by LCCMR 12/17/2018
MDA requests to amend our budget by moving $10,000 from MDA's salary and fringe (Activity 2) to amend our contract with CCM for additional control work (Activity 3). We have the salary savings because there has been an ongoing difference between insurance dependent care coverage budgeted and single care coverage utilized. This will enable us to do additional target species control.

Project Status as of May 31, 2019
We continued to make good progress with oriental bittersweet management and outreach despite challenging winter conditions. Extreme cold and snow slowed efforts but there were 22 days of bittersweet control work and extensive travel for outreach and connecting with partners. Extensive fieldwork planning with partners, including MDA grant recipients has us prepared for the upcoming summer season.

Amendment Request May 31, 2019, Amendment Approved by LCCMR 06/20/19
MDA requests to amend our budget by moving $102 from MDA's salary and fringe (Activity 2) to the Supplies category. We do not anticipate any additional supply purchases for this project. We also request to amend our budget by moving $23,000 from MDA's salary and fringe (Activity 2) to the Travel category. With two people on the project, travel has doubled. The original travel budget was for one person's travel.

Project Status as of November 30, 2019
Much went well during the growing season with survey, monitoring and treatments. Infestations are now better delimited. Treatments were done on 5,107 acres. These were spot treatments within the acreage. We continue to see a decrease in Dalmatian toadflax, common teasel, cutleaf teasel and Grecian foxglove infestations. Unfortunately, there were new finds of black swallow-wort, poison hemlock and meadow knapweed. It will take a lot of outreach, coordination and crew time to control them. On land Japanese hops treatments went well but

on river treatments continued to be challenging. We will maintain our momentum as we continue this work in the Noxious Weed Detection and Eradication project.

Amendment Request October 1, 2020

We request to move $152.00 from travel to supplies. We could not travel during COVID 19 restrictions this spring so didn't spend all travel funds. We needed a small amount of supplies. The budget for travel would decrease from $43,000 to $42,848. The budget for supplies would increase from $1,602 to $1,754.

Amendment Approved by LCCMR 10/19/2020

Overall Project Outcomes and Results:

The goal was to eliminate highly damaging target invasive plants before they became widespread by 1) training people to identify and report invasive plants, 2) survey, coordinate control and monitor target plants, 3) control target plants and 4) implement the invasive species management database system from Phase 1. Targeted plants that cause severe ecological harm include black swallow-wort, dalmatian toadflax, cutleaf and common teasels, Grecian foxglove, Japanese hops, brown and meadow knapweeds, Oriental bittersweet and Palmer amaranth.

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IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Train People to Identify and Report Target Invasive Species
Description: University of Minnesota (U of M) will train professionals, volunteers and impacted landowners to prevent, identify, report, monitor and manage target species. The U of M Extension will deliver educational trainings to:

A. Natural resource professionals to identify terrestrial invasive species of special concern and native plant species that could be confused with these invasives (2 workshops per year),
B. Natural resource professionals and volunteers will conduct target invasive species surveys (2 surveys/workshops),
C. Minnesota Master Naturalist Instructor Training - a weekend-long training and field tour dedicated specifically to terrestrial invasive species of special concern, their prevention, identification, reporting, monitoring and management to incorporate this information into Master Naturalist volunteer trainings across the state. (1 event),
D. Develop supportive, online training and outreach materials for Invasive Blitz volunteers (Master Naturalist and other master volunteers that lead invasive species removal activities in their community). This will include a video with volunteer management considerations like training volunteers, risk assessments and recruiting and maintaining active volunteers.

We will create 5 high quality traveling learning material kits about target invasive species that can be checked-out by natural resource professionals and volunteers.

This work will be done across the state. An effort will be made to find free workshop locations. It may be necessary to charge workshop participants a registration fee to cover room rental (if free room is not available) and food costs for all day and weekend workshops. Registration fees would go to Extension. In the event that workshop registration received exceeds workshop costs, Extension will use these funds for outreach for Environmental and Natural Resources Trust Fund projects. Training partners include the University of Minnesota, Extension, Minnesota Departments of Agriculture, Natural Resources and Transportations, and various local partners.

Summary Budget Information for Activity 1:	**ENRTF Budget:**	**$ 0**
	Amount Spent:	**$ 0**
	Balance:	**$ 0**

Outcome	Completion Date
1. 9 Statewide training sessions/workshops/field trainings conducted and evaluated	06/10/2019
2. Develop online training and outreach materials that are publicly available	06/10/2019

3. Create high quality display materials and 5 invasive plant learning kits for check out by educators (schools, nature centers, master gardeners, etc.) and agency staff for outreach	06/10/2019

Activity Status: See U of M report for activity status.

ACTIVITY 2: Survey, Coordinate Control and Monitor
Description:
Part A (MDA)
Minnesota Department of Agriculture (MDA) will verify reports, survey potentially infested areas and delineate infestations. Conservation Corps Minnesota (CCM) will participate in large area surveys. Presence/absence data for all target species will be collected along assigned survey routes. Surveys will be done in collaboration with agency partners when practical.

MDA will contract with the St. Croix River Association (SCRA) for survey along the St. Croix River main stream and Brown's Creek, a designated trout stream. The St. Croix watershed is a high priority conservation area where Oriental bittersweet and Grecian foxglove have been found. SCRA will monitor approximately 130 river miles by boat. Highest risk areas will be surveyed multiple times and seasons to have the best chance of seeing each target species at its most visible stage. For example, Grecian foxglove is most visible in the summer and Oriental bittersweet in the fall. We will engage SCRA staff, National Park Service partners and volunteers in survey and outreach efforts.

All survey data will be entered into EDDMapS (www.eddmaps.org). MDA will contract and coordinate with CCM and landowners for target species control. This will include writing agreements with landowners where CCM will do control work. Agreements will specify that landowners will monitor the site to prevent reinfestation for at least three years after the control work is completed. The coordinator will train the landowners how to identify and monitor for the species and report any reinfestation issues that arise.

Part B (U of M)
The U of M Unmanned Aerial Vehicle Lab will test its drone fleet with the goal of increasing survey efficiency. Tests will determine best available sensor, concept of operations, and post processing requirements outlined below. We are working with the Federal Aviation Administration on regulatory requirements before we can legally fly outside of our permitted area (currently only covers Umore park in Rosemount, MN.)

Sensor
Every sensor has trade offs in terms of cost, size, weight, resolution, speed, type of data sensed, etc. Often the required sensor drives the choice of aerial platform. We will select the sensors with the best chance of producing useful data for detecting invasive species from the air. The best sensor might not be a camera. If it is a camera we need to determine if our objective is the highest resolution possible, or is it more important to capture a certain band(s) of the visible spectrum.

Concept of Operations
Depending on the aircraft and the sensor choices the time of day and lighting may be an important consideration. We may need to consider sunny vs. overcast conditions and the best season(s) for detecting specific invasive species. We need to think through optimal routes and patterns for data collection. The type of sensor chose may drive the choice of altitude and limit the amount of area that can be covered. If significant terrain is involved, that could complicate flight planning. Is the best vantage point straight down from above (nadir view) or is an oblique view better, or even a side view from below the tree tops?

Post Processing Requirements

Will the data be reviewed manually? Are there computer algorithms that could be leveraged to highlight areas of concern in the data (i.e. some sort of threshold or blob detection?) What characteristics in the data would indicate a target invasive species is detected? For the longer term, we will evaluate economic factors including the cost to image an area vs. the likelihood or reliability of spotting invasive plants.

Summary Budget Information for Activity 2 Part A:	**ENRTF Budget:**	**$ 307,800**
	Amount Spent:	**$ 303,289**
	Balance:	**$ 4,511**

Outcome	Completion Date
1. Drones will be tested for survey capability. Testing will determine the appropriate sensor, calculate the impact of variable light conditions and chart the optimal flying pattern.	03/01/2018
2. Surveys are conducted and infestations are documented	05/30/2020
3. Treated sites are monitored to determine whether additional control is needed	06/10/2020

Activity 2 Status as of November 30, 2016:
Part A (MDA) – see U of M report for Part B
For coordinating control with landowners and CCM, it was necessary to renew agreements to continue work. Agreements were sent to 166 landowners and 132 signed agreements were returned. We will follow up on remaining agreements.

Black swallow-wort: Infestations of black swallow-wort in Hennepin and Ramsey counties were monitored. Landowners have been controlling swallow-wort to kept populations from spreading. Ramsey County Cooperative Weed Management Area involvement with monitoring infestations has been much appreciated.

Dalmatian toadflax: We did not have funds in place for early summer Dalmatian toadflax treatments. Fortunately, Kittson County and MnDOT stepped up to spot treat Dalmatian toadflax on their lands. County, state and private lands will be surveyed in Kittson County in early summer 2017. Both the Kittson County and north shore infestations are contained.

Cutleaf and common teasels: Reports of cutleaf teasel in southeastern Minnesota were verified and infestations treated in 2015 were monitored. Infestations were greatly reduced in large part thanks to efforts by our DNR and MnDOT partners. There were no new county finds. Two new county finds of common teasel were verified in Nobles and Wright counties. In both cases, the County Agricultural Inspector found the infestations and are working with the landowners to eradicate the populations.

Grecian foxglove: Grecian foxglove infestations treated in 2015 were monitored. Many sites showed distinct improvement. Landowners continue to manage infestations and report progress to MDA. MDA is working closely with the Washington Conservation District (WCD) to continue survey, outreach and treatment efforts. Additional reports resulting from a WCD mailing will be ground truthed. Correct reports will be entered into EDDMapS and considered for treatment.

Japanese hops: Infestations of Japanese hops along a 30 mile stretch of the Root River that were treated in 2015 were monitored by MDA and project partners. Treatments were very effective. Due to high water levels all summer, 2016 treatments only took place at boat landings.

Brown and meadow knapweeds: A relatively large brown knapweed infestation was reported by the Hubbard County Agricultural Inspector. There are a number of small patches on roadsides and one infested pasture.

MDA confirmed and mapped the infestation. MDA will reach out to the landowner and the Natural Resource Conservation Service for help with the pasture.

A small infestation of meadow knapweed near the Mississippi headwaters was found and reported by the Clearwater County Agricultural Inspector. MDA confirmed and mapped the infestation. It was treated by the county. A small infestation of meadow knapweed was also confirmed at Tettegouche State Park. It was reported by a Superior National Forest botanist. An area DNR resource specialist assessed the infestation. A course of action will be planned over the winter.

Oriental bittersweet: There was a new county find of Oriental bittersweet in Wright County. It was a small infestation and has been controlled and will be monitored for several years for resprouting. New reports in Dakota, Hennepin, Houston, Ramsey, and Washington Counties were verified. Infestations on private land were monitored for treatment activity and regrowth. DNR found and treated bittersweet infestations at the Whitewater Wildlife Management Area and in the Richard J. Dorer Memorial Hardwood State Forest in Houston County.

Palmer amaranth: Palmer amaranth infestations found in Lyon and Yellow Medicine counties were mapped by MDA. To date, there are 13 sites of first year conservation plantings that have been documented as potentially infested or confirmed infested. Some sites have multiple plantings within the site for a total of 30 plantings. Labor, travel and other costs for this effort were not charged to this project.

Activity 2 Status as of May 31, 2017:
Delimiting infestations with polygons is significantly more informative than collecting a point for each infestation. The data enabled tablets from Activity 4 make it possible for CCM crews to collect polygon rather than point data while surveying. We are now collecting polygon data for all sizeable infestations.

The contract with St. Croix River Association was executed. Survey work will begin in summer 2017. A large survey event involving project partners and volunteers is being planned for early fall 2017.

Black swallow-wort: One day was spent surveying for black swallow-wort. An infestation was reported through EDDMapS in Ramsey County and confirmed on May 10, 2017. The report was a direct result of a "Weed 'Em Out" training which is Activity 1 of this project. The infestation is approximately 1.5 acres and is on county land near a yard waste compost area. The infestation will be treated next month. MDA will work with Ramsey County Cooperative Weed Management area to monitor treatments.

Dalmatian toadflax: Infestations will be monitored and mapped during the summer 2017. Project partners from Kittson County and MnDOT will contribute to mapping and treatment efforts.

Cutleaf and common teasels: Two days were spent mapping cutleaf teasel. A new county find of cutleaf teasel was confirmed in January in Hennepin County. On May 9th the County Agricultural Inspector, in cooperation with MDA, visited the site to map rosettes. Only a dozen were found, and the landowner was cooperative and planning to treat the rosettes. Follow-up monitoring will be conducted by Hennepin County and the MDA in 2018.

Grecian foxglove: New agreements were set up with 14 landowners. Two days were spent mapping infestations in Washington County. MDA is working with the Washington Conservation District to work with landowners and map previously unreported infestations.

Japanese hops: Sites treated in 2015 will be monitored in 2017. On March 9th, MDA, DNR, CCM, Fish and Wildlife Service (FWS), and Army Corps of Engineers (ACOE) strategized mapping and treatments plans for 2017. A survey of the north branch of the Root River is planned for 2017, and infestations east of Hwy 26 will be documented. The FWS and ACOE will survey areas of the Mississippi River and document infestations.

Brown and meadow knapweeds: Due to the impact of adding Palmer amaranth to the project, the part time Plant Health Specialist position funds were diverted to fund a position to work on Palmer. The result of this was that work on brown and meadow knapweeds has been delayed.

Oriental bittersweet: Red Wing and Winona area were surveyed to determine the extent of infestations on the bluffs. The terrain was difficult but CCM crews and MDA staff managed to delimit all infestations with polygons and document the density of each infestations. Total hours spent on survey was 337 in Red Wing and 270 in Winona.

Poison hemlock: Infestations of poison hemlock are increasing in Minnesota. Project partners spent 4 days surveying and mapping poison hemlock in Rochester and SE Minnesota.

Activity 2 Status as of November 30, 2017:
Multi-species survey events

- Teams of CCM, Extension, DNR and MDA surveyed assigned sections of the Root River for Japanese hops and knotweeds on September 14th. We confirmed that hops treatments were effective and observed dense hops in many areas that the crew could not treat due to time constraints. We observed the difficulty for a CCM crew to treat hops vines on riverbanks with swiftly moving water and steep banks. Knotweed locations were marked and later treated using DNR funds.
- St. Croix River Association organized a Partner's Day Survey on October 20th. The day started off at the Scenic Overlook North of the Boomsite Landing in Stillwater at 9:30. Emilie Justen led a short I.D. course and passed out handouts to the group. Oriental Bittersweet was also found at the Scenic Overlook which allowed the group to see it up close and get a good idea of what was being looked for. There were three boats volunteered by the National Park Service and another boat from St. Croix County's Land and Water Resources. A total of 22 people participated representing the St. Croix River Association, National Park Service, Minnesota Department of Agriculture, St. Croix County Land and Water Resources, Minnesota Department of Natural Resources, Conservation Corps of Minnesota, and a few community volunteers. A stretch of about 18 miles was covered with 8 confirmed sightings of Oriental Bittersweet and nine more unconfirmed or possible sightings. Unconfirmed/possible sightings are defined as a bittersweet species without fruit on it and there wasn't a great distinction of the leaves using the Leicht-Young et al.'s key to distinguish native from invasive bittersweets. Another possibility for an unknown label was not being able to get a close enough look at the species from the boat. All sightings occurred North of Bayport. The day concluded around 3:00 when the last group returned.

Black swallow-wort: One day was spent monitoring the new site in Ramsey County after it had been treated on June 6, 2017. Approximately 80% of the infestation showed effects of herbicide treatments and very few seedpods were observed.

Dalmatian toadflax: Project partners monitored and treated infestations in Cook County and observed only a handful of plants remaining. MDA staff monitored the Kittson County site in July and observed many dead plants from the June treatment. MDA staff monitored the Kittson County site again in October and spend a day pulling and bagging plants. Only a handful of plants formed seeds, but many plants that appeared to have dead tops still had live crowns and rhizomes. Infestations are greatly reduced and limited to sandy edges of inactive gravel pits.

Cutleaf and common teasels: Three days were spent mapping cutleaf teasel. New infestations were recorded in Fillmore and Hennepin Counties and new landowner agreements were set up with three landowners. One day was spent cutting and bagging seedheads in Hennepin County.

Grecian foxglove: Two days were spent monitoring Grecian foxglove sites in Washington County. June treatments were very effective with approximately 85% of plants showing signs of stress or death. Follow up communications with landowners were positive, and landowners continue to monitor and treat infestations on their own properties.

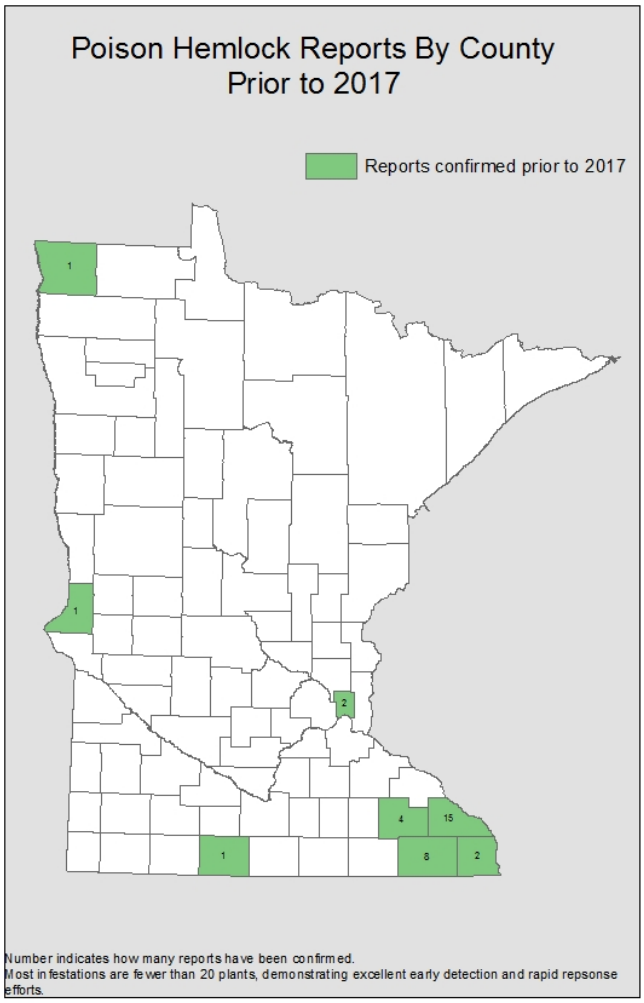
Japanese hops: In addition to the Root River survey event mentioned previously, one day was spent assessing infestations on the Root River and at boat landings and on roadsides. We observed that Japanese hops had spread extensively between 2016 and 2017. High water levels in summer 2016 prevented treatments on the river. As a result, hops spread in many locations along the river, at landings and along some roadsides. The MDA is working collaboratively with DNR, CCM, and Root River Watershed District partners to devise management and treatment plans for Japanese hops.

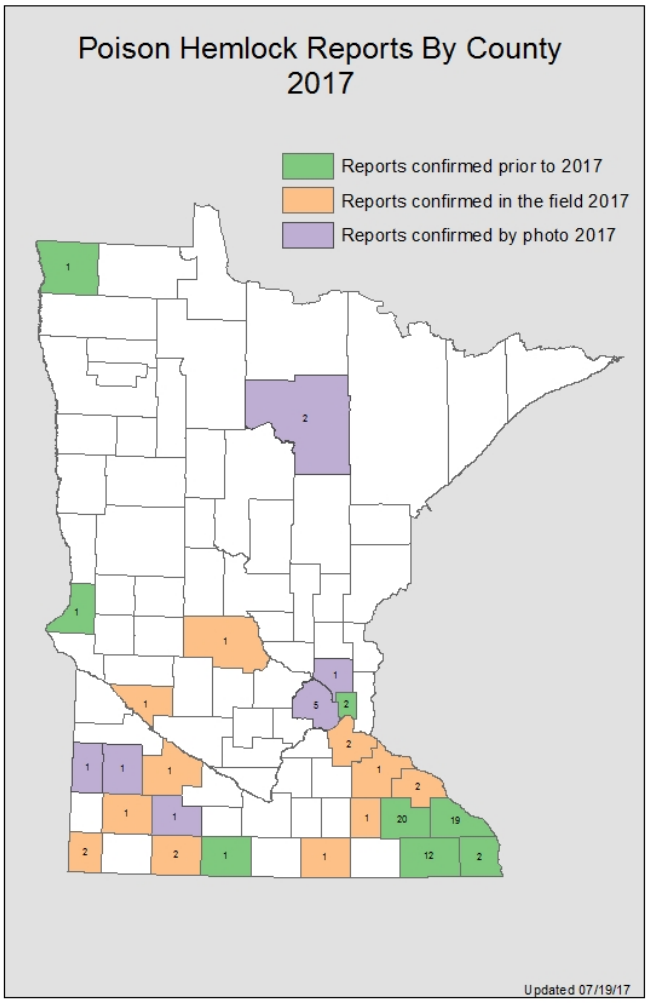
Brown and meadow knapweeds: An intern with Pine County spent multiple days mapping meadow knapweed at Audubon Center of the North Woods.

Oriental bittersweet: MDA staff assisted DNR with a one day survey of the Zumbro River Bottoms State Forest. No additional infestations were recorded. MDA also conducted a road survey near known Oriental bittersweet infestations in Wright County and did not record any new infestations. In Washington County, two new landowner agreements were set up ahead of November treatments. The Washington County infestations are less than two acres.

Palmer amaranth: Palmer amaranth survey activities will be reported in the Palmer Amaranth Detection and Eradication status report due January 31, 2018.

Poison hemlock: Four days were spent mapping and collecting voucher specimen of poison hemlock infestations. A press release in late June resulted in over 400 reports of poison hemlock, of which only 48 have been positively identified as poison hemlock to date. Prior to the media release, we were aware of poison hemlock in eight counties. After the media release, we learned that it is in 25 counties. With a few sizeable exceptions, most infestations were less than 20 plants and landowners controlled them.





Activity 2 Status as of May 31, 2018:

Black swallow-wort: We assessed the Ramsey County infestation in late May. Additional treatment is necessary. The Ramsey Cooperative Weed Management Area has MDA pass through funding for controlling target species within the county. They plan to contract with a private applicator to treat this infestation in 2018.

Dalmatian toadflax: We plan to assess infestations in the northeast in June or July. Kittson County has MDA pass through funding for controlling target species within the county. The county plans to contract with either CCM or a private applicator to treat this infestation in 2018.

Cutleaf and common teasels: DNR has some remaining grant funds on their contract with CCM that will be used for controlling teasel and other target species in the southeast. MDA will coordinate June teasel treatments on private land and has reached out to MnDOT about teasel on ROW.

Grecian foxglove: Washington Conservation District (WCD) has MDA pass through funds for summer 2018 treatments. Because no CCM crews are available during the treatment period, WCD plans to contract with a private applicator for these treatments. MDA will coordinate treatments with landowners. One difficulty is that MDA's agreements with landowners are for CCM to treat, not for a private applicator. Therefore, WCD will need to write new agreements with landowners.

Japanese hops: Hops infestations on the Root River are in Fillmore and Houston counties. Fillmore Soil Water Conservation District (Fillmore SWCD) applied for MDA pass through funds for hops treatments. Fillmore SWCD also applied for and received BWSR funds for CCM to control hops accessible by land. No entity in Houston County applied for funds so there is a funding gap. Fillmore SWCD issued a request for proposals for hops treatments accessible by boat. Potential contractors were already committed to other projects, there were no bids. The group will try to work with a contractor on a more limited scope of control if that can be arranged. MDA will coordinate control efforts with the organizations and landowners involved.

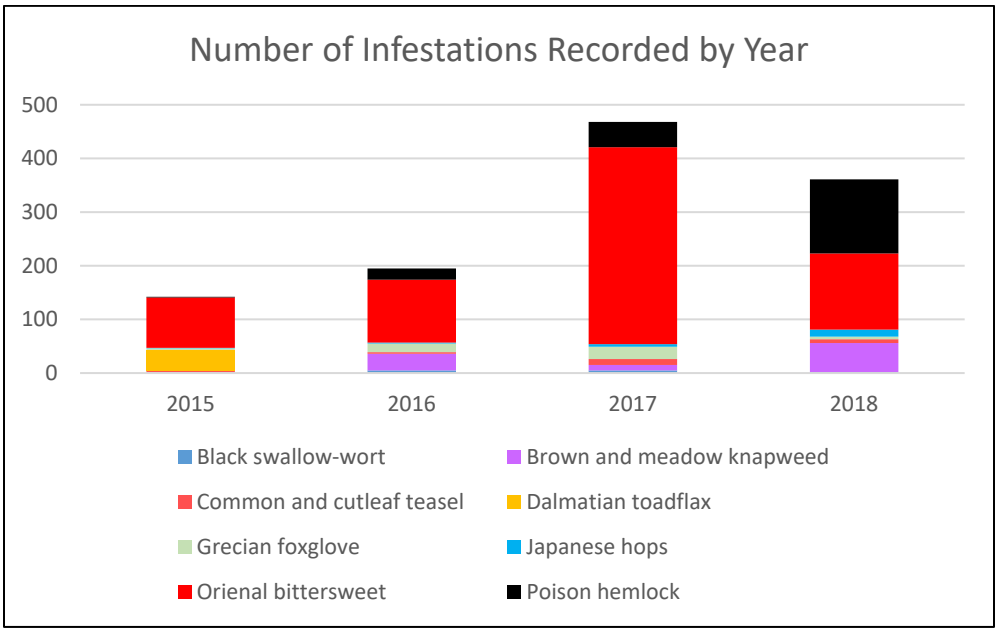
Brown and meadow knapweeds: We assessed these knapweeds at Audubon Center of the North Woods in Pine County on 05/30/18. We will prepare a detailed plan with priorities and treatment methods for infested areas. Becker, Hubbard and Koochiching counties received MDA pass through funds to treat these knapweeds and other target species in summer 2018. We learned that Koochiching plans to control infestations only on public land. We will look into coordinating control of infestations on private land.

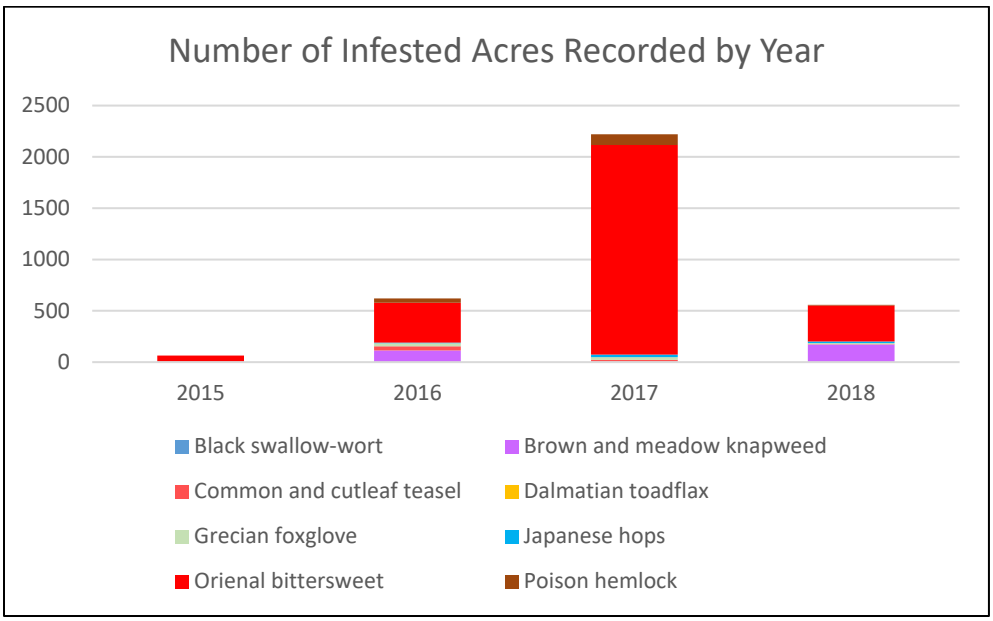
Oriental bittersweet: We verified and documented infestations in Douglas and Sherburne counties on 12/06/17 and 12/19/17 respectively. These were new county finds. The infestation in Sherburne is very small and will be controlled by the landowner. We plan to continue treatments in the fall of 2018. Douglas County received MDA pass through funds to treat the one known infestation in the county in 2018. Winona County received MDA pass through funds to hire an intern to assess infestations and work with volunteers to control small infestations. This is very helpful for our project and we are coordinating with the county.

The St. Croix River Assoc. plans to conduct late summer and early fall monitoring on reports of vines that could not be definitely identified previously. They will also monitor the following stretches of the St. Croix: Afton Marina to the Confluence of the Mississippi, County Road O Landing to Never's Dam Landing and Riverside Landing to Norway Point Landing. They will also continue outreach efforts.

Poison Hemlock: DNR has some remaining grant funds on their contract with CCM that will be used for controlling poison hemlock and other target species in the southeast. MDA will coordinate June teasel treatments in the Lanesboro area. Ramsey, Chippewa and Kittson counties received MDA pass through funds to control poison hemlock and other target invasives. Ramsey will hire a private applicator. We have not heard yet how the other counties will control the poison hemlock.

Activity 2 Status as of November 30, 2018:
We pushed to delimited infested areas in 2017 and 2018 to have good handle on the size and distribution of infestations. This push is visible in the charts below for recording new infestations and delimiting infested areas. We think we have recorded most of the target species infestations throughout the state. We anticipate that there will be fewer new reports in the future.





Black swallow-wort: There was a new find at the U of M Arboretum in Carver County that was controlled by Arboretum staff. There was a new find in Chisago County, a first for this county. The landowner tried to control the infestation then requested help. We aim to have a crew help the landowner in spring 2019.

Dalmatian toadflax: There have been no new infestations found for several years. Although we need to stay the course of controlling plants at infested areas for many more years, eradication is very feasible. This is a big accomplishment. Dalmatian toadflax is the number one reported weed in EDDMapS because it is so abundant and troublesome in the west.

Cutleaf and common teasels: New infestations were found in Fillmore, Houston and Winona counties. We think we have a good handle now on teasel infestation locations. Christina revisited the Nobles County site and found that control efforts were not occurring. MDA staff changes and a new County Agriculture Inspector for

Nobles County made previous follow-up difficult. A landowner agreement was signed, seed heads were clipped and rosettes were sprayed on 10/1/2018.

Grecian foxglove: Grecian foxglove had been reported at Weaver Dunes SNA on 06/15/09. There were only a few plants in 2009 and they were controlled. We followed up in June 2018 and did not find any Grecian foxglove at this location. This infestation was eradicated. There have been no new finds at other locations. Some landowners no longer request assistance because the foxglove levels are low enough for them to control.

Japanese hops: There have been new finds of small infestations within the city of Winona. We are not sure yet how the hops are moving. Hops infestations along the Root River are extensive and on river treatments are challenging. There is a need to better engage landowners. With our Fillmore and Houston Soil Water Conservation District and Extension partners, we are reaching out to impacted landowners and communities. MDA sent a letter to 200 private landowners along the Root River where there are hops infestations. The letter explained the hops issue and included a fact sheet about identification and control. There will be two informal outreach events for people to learn about Japanese hops and poison hemlock identification and management. Information about these meeting was included in the mailing and Extension did a media release to get the word out.

November 29th	
3:00 – 5:00 pm	MiEnergy, 31110 Cooperative Way, City of Rushford Village
6:00 – 8:00 pm	Houston County Nature Center, 215 W. Plum St., Houston
April 4th	
3:00 – 5:00 pm	Houston Community Center, 109 W. Maple St., Houston
6:00 – 8:00 pm	MiEnergy, 31110 Cooperative Way, City of Rushford Village

Brown and meadow knapweeds: Met with Koochiching Land Commissioners about knapweeds on 06/04/18. County Agricultural Inspectors/Land Commissioners found and mapped brown and/or meadow knapweed at new locations in Becker, Hubbard and Koochiching counties. All three counties were able to utilize their MDA grant funds for treatments. MnDOT found and treated in infestation in Itasca County. On 07/03/18, MDA monitored areas where these knapweeds had previously been found in St. Louis County and either pulled plants (if only a few present) or notified MnDOT about the locations where these knapweeds are present. The largest infestations are at Audubon Center of the North Woods in Pine County. Additional infestations at this location were mapped by MDA this summer and fall. We are concerned that knapweeds appear to be hybridizing into unrecognizable species.


Bracts (on flower head) are an identifying characteristic but were highly variable indicating high genetic variability. The species on the left is not readily identifiable.

Oriental bittersweet:
MDA followed up on five bittersweet reports on 07/02/18 in Duluth. Most reports were of other species but we confirmed one backyard infestation in Duluth. An agreement for treatment has been signed with this landowner. MnDOT has been managing some small infestations on I35 in Duluth. Mari Hardel monitored the treatments and notified MnDOT about the need to control some vines that were missed.

The St. Croix River Assoc. conducted late summer and early fall monitoring on reports of vines that could not be definitely identified previously. They also monitored the following stretches of the St. Croix: Afton Marina to the Confluence of the Mississippi, County Road O Landing to Never's Dam Landing and Riverside Landing to Norway Point Landing. Additionally, oriental bittersweet was confirmed and controlled at Interstate Park. There is a synergy between the efforts of Winona County, Winona SWCD, city of Winona, MnDOT, MDA and CCM. We collaborate to share resources for the best outcomes. Winona County and MDA have conducted initial assessments of new reports. If the infestations are small, interns working with the county have worked alongside landowners to control them. Vines in the most heavily infested areas will be downed with a forestry mower if the slope is not too steep for the mower. Funding for this mowing is from a BWSR Cooperative Weed Management Area grant to the SWCD. CCM and MDA are focused on large or dense infestations that are unsuitable for forestry mowing. Additionally, Anne Morse, the Sustainability Coordinator and Assistant County Agricultural Inspector, organized workshops in each impacted neighborhood and hosted by a resident. Workshop participants learned how to identify and manage oriental bittersweet. There has been good media coverage of these efforts. Building this community involvement is essential for long-term success.

Poison Hemlock: There were some new reports of small infestations. New infestations were reported in Chippewa and Blue Earth counties. Both infestations were immediately treated and no rosettes were found in the fall. Poison hemlock appears to be moving downriver in Fillmore and Houston on the Root River. A survey was conducted along West Indian Creek in Wabasha County. This stream flows direction into the Zumbro River. A total of 125 new hemlock locations were found. Wabasha County will utilize MDA grant funds for treatments.

Project Status as of May 31, 2019
Factsheets were developed for poison hemlock, black swallow-wort, Grecian foxglove, common and cutleaf teasels, and Dalmatian toadflax.

Common and cutleaf teasels

- A previously treated infestation at Pine Creek was scouted and only a few teasel rosettes were present. This is very promising.
- Populations along the Canadian Pacific Railway in Rochester have been reduced. Flowering and seed production have been prevented for 3 years.
- Treatments will continue through June on 43 different sites.

Grecian foxglove
Washington Conservation District has MDA grant funds and is lining up treatments. They will contract with CCM for a few days then finish the work with one of their crews.

Japanese hops and poison hemlock

- Open house meetings about Japanese hops and poison hemlock were held back to back on 11/29/19 in Rushford and Houston. Participation was low but included some township officials so the meetings were a good first step.
- Christina and Monika presented Japanese hops, poison hemlock and knotweeds to the Water Resources Advisory Committee in Rochester. They were interested and said that they would pass along information about these species to their staff.
- Flooding may have impacted hops spread. There was obvious riverbank erosion on the Root River.
- We held a detailed planning meeting for hops treatments with Fillmore and Houston SWCDs, Stantec (contractor) and city of Winona. Both Fillmore and Houston SWCDs have MDA grant funds to contract control treatments. Outfitting a boat to handle the upper stretch has proved difficult so they will start treatments from Peterson to Rushford the week of June 3rd then try the upper stretch afterward. City of Winona also participated in the meeting and will assess whether they need help with any of the hops infestations in the city.
- Wabasha SWCD has MDA grant funds for poison hemlock treatments along W. Indian Creek. The SWCD, DNR and MDA have been jointly planning the treatments.

Brown, meadow and diffuse knapweeds

- Pine County has MDA grant funds for and will prioritize treating brown and meadow knapweeds in two gravel pits. This will reduce spread via gravel. They will also ask the contractor to treat the relatively flat areas of Audubon Center of the North Woods. CCM will smaller and less accessible infestations at Audubon.
- Hubbard County has MDA grant funds for treating all known infestations this year. Mari is in contact with the county on surveying along with documenting infestations and treatments.
- Koochiching County has MDA grant funds for treating meadow knapweed and has been in contact with Mari about entering management data into ISMTrack.
- The only known diffuse knapweed infestation was monitored and remaining plants will be pulled or sprayed this summer.

Oriental bittersweet

- Christina assessed bittersweet at the Great River Bluffs State Park bike camp then lined up treatment.

- Previously, DNR found bittersweet at Beaver Valley Creek State Park and controlled it. CCM surveyed the surrounding area this winter and found additional infestations. These infestations are a high priority for control.
- SCRA plans to inventory the last stretch of the river which is from Afton to the confluence, monitor known infestations, follow up with identification of young vines to determine if they are American or oriental bittersweet.
- SCRA held their annual forestry conference in March. Christina gave a presentation on bittersweets, barberries and burning bush at the conference.

Dalmatian toadflax

- Mari and Christina assessed the Dalmatian toadflax sites in northeastern Minnesota near Lutsen and Tofte. They found very few plants. Mari has been in contact with MnDOT about 2019 treatments.

Project Status as of November 30, 2019

MnDOT Metro District did extensive invasive plant surveys during the summer and fall. The two people surveying recorded 864 priority infestations including 12 Grecian foxglove and 28 oriental bittersweet infestations. If an infestation was very small, it was hand pulled immediately. Oriental bittersweet treatments began in fall 2019. This MnDOT effort was much appreciated.

There were 3 reports of dodder, a parasitic vine. Two reports were confirmed to be swamp dodder, a native species. We have not received confirmation about the final dodder species. The concern is that it may be a non-native dodder species.

Mari assessed populations of red bartsia (*Odontites vernus*) and small-leaf bramble (*Rubus parvifolius*), both newly reported in Minnesota.

Common and cutleaf teasels

- Christina followed up on reports and surveyed for teasels. She documented 7 new infestations.
- She also monitored previously treated teasel sites and saw a large decrease in infestations size.

Grecian foxglove

- Christina surveyed and documented 2 additional infestations.

Black swallow-wort

- There were 2 new black swallow-wort finds reported by citizens in Minneapolis and Oakdale in Hennepin and Washington counties respectively.
- An assessment of a previously treated infestation in Ramsey County led to a plan to control buckthorn at the site as people treating the swallow-wort couldn't access the vines in dense buckthorn stands.
- Master Gardeners have been very helpful about getting out the word on black swallow-wort. We provided them a presentation and outreach materials.
- A letter was sent to 54 landowners in an infested area of the Longfellow neighborhood in Minneapolis.

Japanese hops and poison hemlock

- Hops survey resulted in an additional 5 infestations found. Infestations in the city of Winona appear to be associated with new fill brought to the site.
- Hops leaf and seed samples were provided to a U of M researcher.
- There were many new poison hemlock finds. These 43 new finds were startling because they were in many different areas of the state. Most infestations were very small, just a few plants, with no apparent

seed source nearby. We don't know how poison hemlock is moving but there appears to be an association with rail right of way.

Brown, meadow and diffuse knapweeds

- Populations were better mapped. We had previously documented general locations for most of these infestations, but additional delimiting was needed to guide treatments and identify where additional survey is needed.
    - Mari and the Pine County Ag Inspector surveyed for meadow knapweed and documented an additional 52 infestations.
    - Mari surveyed for brown knapweed in Hubbard County and documented 4 new infestations.
    - Mari did additional survey for brown and meadow knapweeds in St. Louis and Koochiching counties and 9 new infestations were documented in Koochiching. Additional survey work is planned for July 2020 on the LCCMR project titled Noxious Weed Detection and Eradication.
- The one known diffuse knapweed infestation was monitored and is decreasing.
- A report of diffuse knapweed turned out to be spotted knapweed.

Oriental bittersweet

- St. Croix River Assoc. surveyed from Afton to Prescott and didn't find any oriental bittersweet. They surveyed in St. Croix State Park but the only bittersweet found was native. They will check status at Brown's Creek.
- Christina and Monika detected 13 new infestations. There was a new county find in Northfield in Rice County.
- A letter was sent to 53 landowners in Nicollet County to notify them about a new find in their area.
- Monika visited areas with reports of possible oriental bittersweet. Fortunately, many were American bittersweet, a native species.

Dalmatian toadflax

- Mari monitored populations in Cook county and found few toadflax seedlings. She pulled the plants. This greatly reduced infestation is very encouraging.

Final Report Summary:

Survey and follow up on reports from the public was very productive. A total of 977 new infestations with a total acreage of 3,490 were documented during this project period. Many of the infestations were small or low density scattered over a large area. It was ideal to find and control these small infestations before they proliferated. The outreach and education offered in Activity 1 led to many successful finds of new infestations.

The work of communicating with landowners and coordinating control has been essential to the success of this project. Much of the work of invasive plant control is in careful planning and communicating with landowners and partners. Emilie Justen, Christina Basch and Mari Hardel did an excellent job of this and persuaded private landowners to work with us. Their careful planning also increased the efficiency of control efforts by designing efficient travel routes for crews.

ACTIVITY 3: Control Target Species

Description: MDA will contract with CCM for trained and equipped field crews to control target invasive species on an estimated 660 acres (75 ac. Dalmatian toadflax, 5 ac teasels, 130 ac Grecian foxglove, 50 ac Japanese hops, 150 ac meadow and brown knapweeds, and 250 ac Oriental bittersweet). CCM crews trained in identification and control of target species will conduct control work starting with known infestations of Oriental

bittersweet and continuing with control of other target species. Large infestations of Oriental bittersweet will be controlled using basal bark and/or cut-stump treatment with a systemic triclopyr based herbicide in basal oil which is specific to broadleaf plants and will reduce potential impact on non-target species. Smaller infestations of young plants or infestations in sensitive areas that prohibit use of herbicides will be controlled by hand or mechanical pulling with a focus on removing and properly disposing of all plant parts including all roots and fruit to prevent re-sprouting and/or seeding. Timing of control will focus on late fall and winter when non-target species are dormant to reduce impacts on desirable species. Control of additional target species will involve mechanical and chemical control methods following established best management practices for each species based on size and location of infestations.

Summary Budget Information for Activity 3:	**ENRTF Budget:**	**$ 203,200**
	Amount Spent:	**$ 203,177**
	Balance:	**$ 23**

Outcome	**Completion Date**
1. Acres treated are documented	06/30/2020

Activity 3 Status as of November 30, 2016:
Japanese hops: Due to high water levels on the Root River, crews were unable to access infestations boat. Hops were treated at boat landings. We did not have funding in place for these treatments. DNR used grant funds to cover the treatment costs.

Oriental bittersweet: Treatments are planned for winter 2016/17 and spring 2017 in Red Wing, Winona, and Washington Counties.

Palmer amaranth: MDA's contract with CCM was amended by an additional $15,000 to cover Palmer amaranth treatments. MDA emergency funds were used for this purpose. In order to reduce seed, Palmer plants including seedheads were incinerated at 4 sites with an approximate total of 60 acres. Propane torches were used to burn the plants. An additional 6 small plantings within one site were checked and no Palmer was found. One final flame weeding treatment is planned for 12/07/16, weather permitting, on a 51 acre site. Some sites had been mowed too closely to flame weed. Use of prescribed fire on at least 4 sites is planned for spring 2017. Other management methods may be used as well. Treatment costs to date were $6,570 and were reported in section VI. Project Budget Summary under other funds used.

Activity 3 Status as of May 31, 2017:
Black Swallow-wort: One day is scheduled to treat the infestation in Ramsey County. MDA is working closely with Ramsey CWMA to monitor small infestations in other parts of the county that are being treated by the landowners.

Dalmatian toadflax: A total of nine days are scheduled for treatments for June, July, and September in Kittson County.

Cutleaf and common teasels: Treatments are planned with our MnDOT and DNR partners for infestations in Southeastern Minnesota. Coordination between the Departments of Natural Resources, Transportation, and Agriculture have resulted in reduced infestations.

Grecian foxglove: Twelve days are scheduled for treatments in June and 12 days are scheduled in September, in cooperation with the Washington Conservation District.

Japanese hops: Treatments are planned for summer 2017. MDA will work closely with DNR to utilize funds and CCM crew time.

Brown and meadow knapweeds: Due to the impact of adding Palmer amaranth to the project, funds were diverted to work on Palmer treatments and work on brown and meadow knapweeds has been delayed.

Oriental bittersweet: CCM treated 69 acres of Oriental bittersweet in December, March, and April. In Winona, 34.5 acres were treated; in Red Wing 31.5 acres were treated; in Bloomington 1.5 acres were treated; and in Grant 1.5 acres were treated.

Palmer amaranth: We torched Palmer amaranth plants on December 7th at site Yellow Medicine 11. MDA emergency fund amount of $4,155 was used for this activity.

On April 21st, we used prescribed fire at six infested plantings. Insufficient vegetation made it impossible to burn all sites. We focused on areas of infestation where burning the entire sites was not possible. MDA emergency fund amount of $2,700 was used for this activity.

CCM burning a Palmer amaranth infested conservation planting on 04/21/17. Photo by MDA.

Poison Hemlock: Due to increased reports of poison hemlock infestations, the project partners agreed to add the species to the project. Infestations in Rochester and SE Minnesota will be treated in summer 2017.

Mapping Invasive Plant Management: Project partners, including MDA and city of Red Wing GIS experts, are creating user-friendly interactive maps that aggregate data from EDDMapS, ISMTrack, municipalities and counties and related projects. We can better understand what was done, where it was done and priority areas for future work. A rough draft of a Red Wing invasive plant management map is at http://arcg.is/2pgHIw4. A geodatabase for Palmer amaranth management is in development. We used MDA general fund amounts of $2,000 for Red Wing mapping and $5,000 for Palmer geodatabase development. In order to automatically feed ISMTrack data into these geodatabases, an application program interface (API) needed to be created. MDA contracted with EDDMapS for this API and improvements to ISMTrack with $5,000 general funds. We are working with a very basic API now and will receive an API with more capability by the end of June.

Activity 3 Status as of November 30, 2017:
There were 51 crew members involved with target plant control during this period. Crews from Bemidji, Brainerd, Duluth, Gooseberry Falls State Park and Moose Lake rotated into the southeast. These rotations occurred from July 17th to August 14th. These additional crew members were much needed for controlling our target species. Also, crew members became familiar with the target species. They are now on the lookout for target species in their areas. To keep costs down, crews camped in Rochester. Crews also worked eight 10 hour days in a row to reduce travel time and costs. CCM managers and coordinators went above and beyond to handle the complex logistics involved with the rotations seven days a week.

Black Swallow-wort: A large infestation in Ramsey County was treated and treatment was very effective. MDA continues to work closely with Ramsey CWMA to monitor small infestations in other parts of the county that are being treated by the landowners.

Dalmatian toadflax: Treatments in June and July were very effective at reducing the population in Kittson County. MDA evaluated these treatments and hand pulled all remaining plants in October. MnDOT surveyed for toadflax in Cook County and found only a handful of seedlings that were destroyed.

Cutleaf and common teasels: There were new and some sizeable teasel finds in the southeast. That said, all teasel infestations in the state were treated and seedheads were removed then incinerated. Some of this achievement was due to our DNR partners coordinating and paying for some treatments.

Grecian foxglove: Treatments were done in cooperation with the Washington Conservation District and DNR. This collaboration maximized efficiency of working across property lines and helped with treatment costs. Grecian foxglove populations have been greatly reduced over the years.

Japanese hops: Japanese hops treatments on the Root River were challenging. Since 2016 high water levels prevented treatments, the hops population exploded. The crew faced a daunting amount of hops and it was technically difficult to control hops with swift moving water and steep banks. The crew on the river diligently controlled hops from Preston to an area between Lanesboro and Whalen. Rotating crews from the north controlled hops along the Root River Trail. CCM, DNR, MDA and other partners in the Root River Watershed District will attempt to secure additional funds and plan for hops management.

Brown and meadow knapweeds: Some of the meadow knapweed was treated at the Audubon Center of the North Woods. There was far more meadow knapweed this year than previous years. Audubon has been managing the knapweed but asked for help this year. We scheduled an additional treatment this fall that was canceled because crews deployed to Texas, Florida and Puerto Rico for hurricane relief. We plan to treat this site in the spring.

Oriental bittersweet: Follow up treatments were done at all selected sites in Winona and Red Wing. A foliar treatment was applied to regrowth. Crews continue to cut and treat vines this fall in Washington County and Red Wing.

Palmer amaranth: Activities will be recorded in the Palmer Amaranth Detection and Eradication report due on January 31, 2018.

Poison Hemlock: Poison hemlock infestations in the Lanesboro area were treated. As a result of outreach, there were numerous new poison hemlock infestations found. Small infestations were controlled by landowners.

Moth Mullein
Moth mullein is an early detection species that DNR manages. Crews working with MDA helped for a couple of days to prevent moth mullein from going to seed and setting back the eradication effort.

Activity 3 Status as of May 31, 2018:
Black Swallow-wort: Ramsey Co. treated.

Dalmatian toadflax: MDA will follow up regarding treatments by Kittson County, MnDOT and Cook County Highway Department.

Cutleaf and common teasels: Treatments begin in June utilizing DNR funding (see Activity 2).

Grecian foxglove: Washington Conservation District will fund summer 2018 treatments by a private applicator coordinated by MDA. The aim is for MDA to have an amended contract with CCM for fall 2018 treatments.

Japanese hops: CCM will treat hops accessible by land beginning in July. A group is working to line up a private applicator for on river treatments but that may not come together in 2018.

Brown and meadow knapweeds: Infestations at the Audubon Center of the North Woods will be treated in summer 2018. Becker, Hubbard, and Koochiching counties are handling treatments (see Activity 2).

Oriental bittersweet: We aim to continue control work in fall 2018.

Poison Hemlock: Treatment of poison hemlock in the Lanesboro area will continue utilizing DNR funding. Some counties will work on poison hemlock control utilizing MDA pass through funds (see Activity 2).

Activity 3 Status as of November 30, 2018:
In collaboration with numerous state and local partners, we are containing and controlling target infestations. Now that known infested areas have been mapped, we are accelerating the control effort as evidenced by the comparatively large number of acres controlled to date in 2018 (see table below). Oriental bittersweet control done in late November and early December 2018 is not included in the table.

Year	Acres
2016	1,673
2017	1,476
2018	2,679
Total	**5,827**

Black Swallow-wort: Ramsey Cooperative Weed Management Area (CWMA) in 2018 treated the largest infested areas in summer 2018 using MDA pass-through grant funds. Christina Basch, noxious weed specialist on this project assessed swallow-wort development and advised Ramsey CWMA about treatment timing.

Dalmatian toadflax: On the North Shore, the Forest Service and MnDOT treated infestations. There are few flowering plants remaining so the control effort is focused on young plants. This is excellent progress. The other area of infestation is in Kittson County near Halma. The Kittson SWCD had MDA pass-through grant funds to address the toadflax. The county sprayed in the summer. However, Monika Chandler visited the sites afterward and found many toadflax plants were missed and the treated plants were re-sprouting. It is difficult to kill toadflax with herbicides along due to their extensive rhizome system. A CCM crew was brought in to hand pull remaining plants on 11/08/18. This treatment and weed material disposal were overseen by Monika Chandler and Mari Hardel, noxious weed specialist on this project. Kittson SWCD paid for the crew time with MDA grant funds.

Herbicides top-killed this Dalmatian toadflax plant but hand-pulling the plant revealed a healthy root and rhizome (underground stem) system that is sending up new shoots. Because it is so difficult to kill toadflax by herbicide treatment alone, hand-pulling is an important control measure.

Cutleaf and common teasels: DNR funded CCM to control common teasel on 5 sites and cutleaf teasel on 22 sites. The work began in May and progressed throughout the summer (weeks of 06/04, 06/11 and 08/06).

Coordination with landowners in addition to overseeing, evaluating and documenting treatments was done by Christina Basch. In Nobles County, seedheads were clipped and rosettes were sprayed on 10/1/2018

Grecian foxglove: Washington Conservation District will fund summer 2018 treatments by a private applicator using MDA pass through grant funds (06/27, 06/28, 07/02 and 07/05). Landowner agreements and treatments were coordinated, evaluated and documented by Christina Basch. CCM did a follow up treatment 11/06 to 11/08 using our ENRTF funds. The crew had to hand pull plants when it rained and sprayed plants when it was not raining. Control work was done on 4 of 5 sites. The site that was not treated will be a high priority for spring 2019.

Japanese hops: On water treatments were very challenging. Fillmore SWCD used MDA grant funds to hire a contractor to treat hops growing on the riverbanks. The combination of moving water, river rocks and a boat weighted down with two people and a herbicide tank made the application unsafe. We decided to try again in the late spring with a more maneuverable boat. Treatments along or near the Root River Trail were successful. Fillmore SWCD used a BWSR grant for CCM crew time to control hops along the trail and at boat landings in Fillmore County. These efforts, including writing agreements with landowners on the Root, were coordinated by MDA. Hops treatments occurred the weeks of 07/06, 07/23, 07/30 and on the following dates 08/09 and 08/13. DNR Parks and Trails controlled hops along the trail in Houston County. We observed an approximately 90% kill rate.

Brown and meadow knapweeds: Audubon Center of the North Woods was treated twice by CCM crews. The first treatment was the week of 06/25 with follow up on 09/02 and 09/14. Becker, Hubbard, and Koochiching counties handled their treatments, including all coordination, with MDA grant funds. MnDOT treated meadow knapweeds in Itasca and St. Louis counties.

Oriental bittersweet: Treatments started in the early fall and will continue through winter. Treatments were in Red Wing, Winona and the Stillwater areas. Bittersweet treatment dates are the weeks of 09/24, 10/01, 10/08, 10/15, 10/22, 10/29, 10/12 and 11/26. There will be three crews working on bittersweet in Winona the week of 12/03.

National Park Service and St. Croix River Association controlled bittersweet in the Fairy Falls area of Washington County in Stillwater.

Poison Hemlock: Fillmore SWCD used their BWSR funding for CCM crew time for treatments the week of 06/25. MDA coordinated these treatments near the Root River. DNR treated poison hemlock at a wildlife management area near Slayton in June. It is good news that Canadian Pacific Railroad treatments done in 2017 were very effective at almost eliminating poison hemlock along the railroad in the Rochester area.

MDA pass through grant funds were very helpful for target species control. Recipients listed below received the following amounts to work on the same target species as this project. Funds awarded to work on other species were not included with this list.

Local Government Unit	Target Species	Amount Received
Becker SWCD	Meadow knapweed, poison hemlock	$9,273.00
Chippewa County	Wild parsnip, poison hemlock	$5,000.00
Clearwater County Environmental Services	Meadow knapweed	$3,000.00
Douglas County	Oriental bittersweet	$10,750.00
Fillmore SWCD	Japanese hops	$25,300.00
Hubbard County	Brown knapweed	$5,883.00
Kittson SWCD	Dalmatian toadflax	$5,000.00
Koochiching County	Meadow knapweed	$12,000.00
Ramsey Conservation District/CWMA	Black swallow-wort, cutleaf teasel, oriental bittersweet	$20,000.00
Traverse SWCD	Wild parsnip, poison hemlock	$6,000.00
Washington Conservation District	Grecian foxglove, cutleaf teasel, oriental bittersweet	$12,500.00
Winona County	Oriental bittersweet	$22,607.00
Wright County	Oriental bittersweet, cutleaf teasel	$15,600.00
	Total	**$152,913.00**

Project Status as of May 31, 2019

Teasels

Teasel treatments began this year at Pine Creek. A parsnip predator shovel was used to dig taproots of scattered teasel rosettes over 178 acres in the Pine Creek area. DNR funding covered the crew time.

Japanese hops

- Fillmore and Houston SWCDs have BWSR funding for CCM crew time to control hops along the Root River Trail.
- Last year, CCM tested torching a small area of hops seedlings. Christina monitored these sites and no additional seedlings emerged. This year, DNR has funding for torching seedlings at 10 sites along the Root River. Burn permits are in place. The torching will be done on a rainy day.

Oriental bittersweet

- Good progress was made with bittersweet control in Mazeppa, Stillwater, Red Wing and Winona but significant populations remain in Red Wing and Winona. Christina worked with 6 CCM crew members

for 22 days to achieve this progress. Most of the bittersweet in Mazeppa is under control but follow up monitoring is needed. Work was done at 14 sites on 244 acres.
- Oriental bittersweet on private property in downtown Duluth was treated on December 17, 2018 by CCM. This was a single vine so there is no significant acreage to report.

Poison hemlock
- An outfitter treated poison hemlock at the Whalen canoe access on the Root River.
- A parsnip predator shovel was used to dig taproots of scattered hemlock rosettes over 316 acres in the West Indian Creek area.

Treatment priorities for remaining project funds include the following.
- Black swallow-wort in Chisago County.
- Common teasel infestation in Nobles County.
- Oriental bittersweet in Scandia in Washington County.
- Oriental bittersweet near Beaver Valley Creek State Park in Houston County.

Project Status as of November 30, 2019
Dalmatian toadflax: Dalmatian toadflax plants in Schroeder were hand pulled on 06/27/19.

Cutleaf and common teasels
- Common teasel was treated at 2 sites on 06/24/19 and 06/22/19. The infestations were 0.68 and 0.53 acres.
- A total of 264 acres of cutleaf teasel was treated at 18 sites from 06/13/19 to 09/18/19.

Grecian foxglove: Washington Conservation District received MDA grant funds and coordinated 2019 treatments.

Japanese hops
- A total of 4,219 acres were treated at 40 locations between 06/05/19 and 10/15/19. Early and late season treatments included burning with propane torches to kill seedlings and seed.
- All on land treatments (Root River Trail, boat landings, adjacent pastures, and city of Winona) went well. On river treatments continue to be challenging for a boat with 2 people and a 50 gallon tank to access upper stretches of the Root River.

Brown, meadow and diffuse knapweeds
- Diffuse knapweed plants were hand pulled on 07/10/19.
- MnDOT treated a new find on Hwy 71 near International Fall.
- Becker, Hubbard and Pine counties used MDA grant funds to treat infestations. Mari coordinated treatments in Pine County.

Oriental bittersweet:
- A total of 74 acres were treated at 16 locations between 06/20/19 and 11/21/19. Treatments will continue throughout the winter.
- National Park Service treated vines in the Ferry Falls area of Stillwater.
- Using MDA grant funds, Ramsey County treated bittersweet at all locations where treatment was needed.
- Also using MDA grant funds, Winona County hired 2 interns to assess infestations and train landowners to control the vines on their property.

Poison Hemlock:

- A total of 549 acres were treated at 35 locations between 06/05/19 and 10/24/19.
- The city of St. Charles in Winona County actively manages poison hemlock. An infestation popped up again. It was mowed then treated.
- New finds in Chippewa County were treated by the county and the city of Watson.
- A new find in Clay County was treated using MDA grant funds.
- USDA NRCS is managing an infestation in Freeborn County after Christina confirmed the infestation.

MDA pass through grant funds were very helpful for target species control. A list of recipients and amounts spent will be included in the final report.

Final Report Summary:
A total of 14,070 acres were treated. Many were small infestations or were spot treatments of invasive plants scatted over large areas. Many infestations were treated in multiple years and the acreage of each treatment was recorded and included in the total. We made significant progress at finding, containing and controlling target infestations. This important work is continued in the Noxious Weed Detection and Eradication project.

ACTIVITY 4: Implement Invasive Species Management Database System from Phase 1
Description: In the field, CCM will use tablets with a database system developed in Phase 1 to collect data on target invasive species control treatments and monitor infestation changes. This platform will enable us to communicate across organizations and efficiently summarize activities and outcomes. Extension will train agencies and other organizations to utilize this system.

A. Purchase 20 tablet computers; 10 for Extension trainings for database system users and 10 for CCM crews to use while managing and monitoring on target invasive species,
B. Natural resource manager database system trainings (using the tablets, 2 per year).

Summary Budget Information for Activity 4:	**ENRTF Budget:**	**$ 0**
	Amount Spent:	**$ 0**
	Balance:	**$ 0**

Outcome	**Completion Date**
1. 6 training workshops will be conducted for vegetation managers	05/30/2020
2. Tablets and software will be utilized for data collection in the field	06/10/2020
3. Summary reports of activities and outcomes will be run	06/10/2020

Activity 4 Status as of November 30, 2016:
See U of M report for activity status.

Activity 4 Status as of May 31, 2018:
MDA has assumed responsibility for training people to utilize ISMTrack.

Activity 4 Status as of November 30, 2018:
Winona and Stearns County Agricultural Inspectors were trained to use ISMTrack. The Steans Co Ag Insp was added to the development team and will facilitate implementation. A multi-county training was held on Nov 27th. Additional trainings will be conducted over the winter. MDA is requiring that MDA grant fund recipients report management activities in ISMTrack.

Project Status as of May 31, 2019
There were 5 EDDMapS and ISMTrack workshops held. One workshop scheduled in Redwood Falls was canceled due to poor travel conditions and has not been rescheduled yet.

Participants	Date and Location
County Agricultural Inspectors, Southeastern MN	Jan 9, Owatonna
County Agricultural Inspectors, Northeastern MN	Jan 16, Mora
Duluth Stream Corps	Jan. 31, Duluth
County Agricultural Inspectors, Northwestern MN	Feb. 20, Detroit Lakes
Invasive species managers with multiple affiliations	Mar. 13, Duluth

Project Status as of November 30, 2019
A training workshop was held for District 4 County Ag Inspectors in Redwood Falls on 11/06/19 with 19 participants. With this, we met our commitment of 6 workshops. Additionally, Beltrami and Mille Lacs county individuals were trained then successfully used ISMTrack.

Final Report Summary:
CCM consistently utilized ISMTrack for this project. We were pleased with how well this tool facilitated revisiting sites for follow up treatments. At the Upper Midwest Invasive Species Conference this fall, Christina Basch will present ISMTrack's role in facilitating management using data from this and related projects.

There are currently 147 ISMTrack users. That number will continue to increase. The workshops helped us to get the word out about this tool. Outreach about ISMTrack will be ongoing.

V. DISSEMINATION:
Description: We will communicate about target invasive plant species with the public, natural resource professionals, County Agricultural Inspectors, highway and road crew employees and Cooperative Weed Management Areas. The web will be used for communication with at www.mda.state.mn.us/en/plants/pestmanagement/weedcontrol/targetplants.aspx and www.myminnesotawoods.umn.edu/ (this location may shift as we develop additional online training and outreach materials and target specific audiences). Communication with the public will be via workshops, news media (print, television, and radio), online and via social media such as YouTube, Facebook, Twitter and Pinterest. We will communicate updates at County Agricultural Inspector meetings and in trade publications such as "The Scoop" published by the Minnesota Nursery Landscape Association. We expect to present this project during at least one peer-reviewed professional conference such as the Association of Natural Resource Extension Professionals Conference or the Upper Midwest Invasive Species Conference (both biannual conferences).

Status as of November 30, 2016:
The following field trips and presentations were given at the Upper Midwest Invasive Species Conference in La Crosse, WI, October 16-18.

- Chandler, M., K. Kearns and B. Johnston. "Kick" Around Riparian Invasives. Field trip showcased Japanese hops.
- Gentry, A., T. Wolbers and E. Justen. Invasives by Land, Lake and Stream. Field trip toured an Oriental bittersweet infestation.
- Dahlberg, A. and J. Osthus. Hatch a Plan in Genoa. Field trip included identification and management of cutleaf teasel.

- Justen, E. Successful Japanese Hops (*Humulus japonicus*) Early Detection and Management in Southeastern Minnesota.
- Justen, E. and L. Anderson. Grecian Foxglove (*Digitalis lanata*) Management Success: A Collaborative Effort.

Status as of May 31, 2017:

Presentations

- Emilie Justen and Monika Chandler were trainers at the Weed 'Em Out workshops in Virginia, Morris and Baxter that are on the U of M report.
- Justen, E. Early Detection and Rapid Response of Invasive Plants in Minnesota. Western Weed Coordinating Committee, Las Vegas, NV. November 30, 2016. MDA general funds ($735) were used for this travel.
- Chandler, M. Knotweed, Barberries and Bittersweets. Duluth Invaders (volunteer organization), Duluth, MN. December 14, 2016.
- Chandler, M. Weed Biocontrol and Invasive Plant Early Detection. New County Agricultural Inspector Training, St. Cloud, MN. February 7, 2017.
- Justen, E. Invasive Plant Management. Wabasha Forestry Day, Millville, MN. February 10, 2017.
- Chandler, M. Noxious Weed Update. Clay County/Township Meeting, Dilworth, MN. March 20, 2017.
- The *Elimination of Target Invasive Plant Species* project webpages have been updated and include summaries from Phase 1 and the 2017 ETIPS stakeholder report: www.mda.state.mn.us/plants/pestmanagement/weedcontrol/targetplants.aspx
- MDA's Noxious Weed Advisory Committee received updates at the December 20th March 1st and May 24th 2017 meetings.
- MDA seed and weed staff provided updates on Palmer amaranth at all county and regional meetings with County Agricultural Inspectors.

Articles and Media Coverage

- There was too extensive of media coverage about Palmer amaranth in Minnesota to track.
- Chandler, M., A. Cortilet, E. Justen and C. Watrin. **Palmer amaranth management in Minnesota** in Plant Pest Insider newsletter, Fall 2016.
- **Superweed introduced to Minnesota with conservation seed mix** (www.startribune.com/superweed-introduced-in-minnesota-with-conservation-seed-mix/408439906/). *Star Tribune.* December 28, 2016
- Cortilet, A. and M. Chandler. **Palmer amaranth in Minnesota** in *Soybean Business* Vol X, Issue 2, March-April 2017.
- Chandler, M. and T. Cortilet. **Palmer amaranth in Minnesota** in *Minnesota Township Insider*, Pages 9-11, 2017 Spring Issue.
- **Beware of garden thugs – invasive plants** www.startribune.com/beware-garden-thugs-invasive-plants/420746273/?platform=hootsuite *Star Tribune* April 28, 2017.

Status as of November 30, 2017:

Presentations

- Emilie Justen and Monika Chandler were trainers at the Weed 'Em Out workshop for 82 CCM members in Red Wing on June 12, 2017 that is included with the U of M report.
- Grecian foxglove and other invasive plant species were featured on the Wetland Professionals Association field trip on June 23, 2017 at Lake Elmo Park and Belwin Conservancy. Monika and partners with Washington County Parks, Washington Conservation District and Belwin Conservancy organized the trip.
- MDA's Noxious Weed Advisory Committee received an update on September 7, 2017 in Arden Hills.

- Emilie gave a talk on woody invasive plants at the Tree Inspector Training in Brainerd on October 9, 2017.
- Emilie gave a talk on the Noxious Weed List to District 1 MnDOT employees on October 19, 2017 in Duluth.
- Emilie co-presented with Tara Kline of Washington Conservation District at the Board of Water and Soil Resources (BWSR) training academy on November 2, 2017. They talked about managing multiple grants with multiple landowners to avoid duplicating treatment and mapping efforts.
- Shane Blair taught a workshop about Oriental bittersweet and knotweeds identification and management in Winona on October 30, 2017.

Articles and Media Coverage

- Poison hemlock press release on June 22nd. Emilie interviewed with KAAL in Rochester on June 26th, KARE 11 on July 5th. 61 media outlets across the state and North Dakota, South Dakota, and Wisconsin picked up the story.
- Oriental bittersweet was featured as MDA's Weed of the Month series that is run in multiple media outlets in rural Minnesota.

Status as of May 31, 2018:

- A project update was given to MDA's Noxious Weed Advisory Committee on February 18th and May 24th 2018 in Arden Hills.
- Chandler, M. presented biological control and invasive plant early detection at the new County Agricultural Inspector training on February 20, 2018 in St. Cloud.
- MDA and Three Rivers Parks District taught an invasive plant session at CCM training on February 22, 2018 in Annandale.
- Updates were given at Ramsey and Anoka CWMA meetings on February 21 and April 10, 2018 respectively.
- A stakeholder report on project progress was sent to participating landowners, County Agricultural Inspectors, members of the Noxious Weed Advisory Committee and LCCMR commissioners.

Status as of November 30, 2018:

- Chandler, M. presented "Invasive Species Data Management" about EDDMapS including ISMTrack at the annual Minnesota Association of County Agricultural Inspectors Short Course in Waite Park on July 18, 2018.
- Justen, E. presented about weed law, Japanese hops and wild parsnip at a Fillmore County roadside vegetation workshop in Preston on August 28, 2018.
- Justen, E. presented about oriental bittersweet at a buckthorn and bittersweet management workshop at Big Marine Park Reserve on September 18, 2018.
- Chandler, M. gave a project update to MDA's Noxious Weed Advisory Committee on September 25, 2018.
- Mari Hardel presented on noxious weeds at a University of Minnesota Master Woodland Owner course on September 29, 2018 and spoke specifically about meadow knapweed and related species.
- Basch, C., M. Chandler, E. Justen, A. Gupta, D. Littleton, D. Looman and Z. Dieterman authored and Christina Basch presented the talk "The Progression of Oriental Bittersweet (*Celastrus orbiculatus*) Eradication in Minnesota" at the Upper Midwest Invasive Species Conference in Rochester from October 15-18, 2018.
- Basch, C. spoke at Saint Cloud State University about eradication and coordinating efforts for eradicate list species in Minnesota on November 29th, 2018.
- An Extension/MDA/CCM video about oriental bittersweet identification and management created in Phase 1 of this project with Farm Bill funds continues to educate people and now has 15,580 views. Defeating a killer vine: Oriental bittersweet management https://www.youtube.com/watch?v=7wmZ1Zuho1c

Articles and Media Coverage

- Oriental bittersweet was featured as MDA's Weed of the Month series in November that is run in multiple media outlets in rural Minnesota.
- Due to increased treatment efforts in Winona County, the Post Bulletin in Winona ran an article in the paper and online about efforts to kill Oriental bittersweet: https://www.postbulletin.com/news/local/winona-county-s-fight-against-oriental-bittersweet-a-notorious-woodland/article_7ac5a9ac-e819-11e8-8361-8f15cd6668c1.html
- Christina was interviewed by MPR and featured in the following article: https://www.mprnews.org/story/2018/11/19/winona-county-vine
- Poison hemlock was featured as MDA's Weed of the Month series in June.
- Oriental bittersweet was featured as MDA's Weed of the Month series in November that is run in multiple media outlets in rural Minnesota.

Project Status as of May 31, 2019

- Chandler, M. provided an update to the Minnesota Association of County Agricultural Inspectors Board on December 12, 2018 in St. Paul (14 participants).
- Chandler, M. gave project updates to MDA's Noxious Weed Advisory Committee on December 19, 2018 in Arden Hills and on February 27, 2019 in Roseville (23 and 25 participants respectively).
- Hardel M. presented about the Noxious Weed Law and target species in the Northeast Minnesota region at the Duluth Cooperative Invasive Species Management Area meeting on January 8, 2019 (15 participants) and discussed target species at meetings on March 26 and May 14, 2019 (14 and 12 participants, respectively).
- Basch, C., M. Chandler and S. Blair gave updates at the southeastern region County Agricultural Inspectors meeting on January 9, 2019 (15 participants).
- Basch, C. and E. Justen attended the Washington County CWMA Meeting. Christina talked about plans for bittersweet, Grecian foxglove and teasel eradication work on January 10, 2019 in Oakdale.
- Hardel, M. gave updates at the County Agricultural Inspector northeastern region meetings on January 10, 2019 and March 14, 2019 in Ogilvie.
- Chandler, M. presented early detection and rapid response to target species at new county agricultural inspector training on February 12, 2019 (14 participants).
- Justen, E. provided noxious weed training to new CCM members on February 21, 2019 in Annandale (38 participants).
- Basch, C., M. Chandler and S. Blair trained new CCM in southern Minnesota to identify target species followed by Extension training on safe herbicide use on February 28, 2019 at Whitewater State Park (17 participants).
- Hardel, M. trained new CCM in northeastern Minnesota to identify target species on March 1, 2019 in Duluth (20 participants).
- Gupta, A. and M. Hardel trained workshop participants to identify target plants at a joint Society of American Foresters and Wildlife Society conference on February 21, 2019 in Duluth (20 participants).
- Basch, C. presented target plant identification and reporting at the Dakota County/Township meeting on March 5, 2019 in Farmington (25 afternoon session and 7 evening session participants).
- Basch, C. and M. Chandler presented about Japanese hops, poison hemlock and knotweeds to the Water Resources Advisory Committee on March 6, 2019 in Rochester (13 participants).
- Hardel, M. discussed target species status and management at the Cook County Invasive Team meeting in Grand Marais on March 6, 2019 (10 participants)
- Hardel, M. and M. Chandler provided an update at a northeastern region invasive species meeting on March 13, 2019 in Duluth (14 participants).

- Chandler, M. gave a presentation titled "Woody Invasive Plant Detection and Management Update" at the Shade Tree Short Course on March 19 and 20, 2019 in Roseville (12 and 23 participants respectively).
- Basch, C. presented on bittersweet, barberry and burning bush at the St. Croix River Association Forestry Conference March 28-29, 2019 in Siren, WI (35 participants).
- Basch, C. presented about target species at the Houston County/Township meeting on April 2, 2019 in Caledonia (22 participants).
- Basch, C. presented about Japanese hops and poison hemlock to landowners within infestation areas in Houston and Rushford on April 4, 2019 (5 and 15 participants respectively).
- Chandler, M. presented a webinar titled "An update on invasive plants in Minnesota forests" as part of the Sustainable Forests Education Cooperative and UMN Extension Forestry Webinar Series on April 16, 2019 (45 participants). A recording is available at https://www.youtube.com/watch?v=yVamE7cefuY
- Hardel, M. discussed knapweeds and wild parsnip at the Koochiching Cooperative Weed Management Area meeting on April 17, 2019 in International Falls (17 participants).
- Chandler, M. discussed target species status and future management at the Ramsey County Cooperative Weed Management Area meeting on April 17, 2019 in Shoreview (9 participants).
- Basch, C. discussed target species management with the Wright Cooperative Weed Management Area meeting on April 17, 2019 (26 participants).
- Basch, C. discussed target species management at the Wabasha Cooperative Weed Management Area meeting on April 23, 2019 (27 participants).
- Hardel, M. presented about hybridizing target species at the Gathering Partners of Natural Resources conference on May 19, 2019 in Willmar (14 participants).
- We participated in spring 2019 MnDOT district meetings including weed identification training and weed management discussions at the following locations: Bemidji (4/24), Detroit Lakes (4/25), Arden Hills (5/10), Mankato (5/13), Rochester (5/15) and Duluth (5/30).

Articles and media coverage

Weed of the Month articles ran in multiple media outlets in outstate Minnesota. Articles related to this project include *Managing Invasive Plants in a Forest* (December 2018), *Grecian Foxglove – Not for the Faint of Heart* (February 2019), and *Japanese Hops* (April 2019).

Project Status as of November 30, 2019

- Basch, C. trained a Winona County bittersweet volunteer group on June 11, 2019. (12 participants)
- Basch, C. provided updates at a Dakota County CWMA (Cooperative Weed Management Area) Steering Committee meeting on July 16, 2019. (20 participants)
- Hardel, M. and Chandler, M. participated in and presented on meadow and brown knapweeds at a Pine County workshop with a field tour on August 8, 2019. (20 participants)
- Hardel, M. presented identification information and control recommendations to the Itasca County Local Weed Inspectors on August 1, 2019. (30 participants)
- Chandler, M. provided updates at a Ramsey CWMA meeting on August 21, 2019. (10 participants)
- Hardel, M. and Chandler, M. assisted in planning and presented on target species at the MISAC field tour for land managers, natural resource professionals, and master naturalists on September 5, 2019. (33 participants)
- Hardel, M. gave project updates at the District 2 County Ag Inspector meeting on September 12, 2019 in Ogilvie.
- Chandler, M. provided project updates at MDA's Noxious Weed Advisory Committee on September 17, 2019 and November 21, 2019 in Arden Hills. (20 and 21 participants respectively)
- Basch, C. presented oriental bittersweet to the Dellwood Garden Club on September 18, 2019 in Dellwood. (18 participants)

- Hardel, M. attended the Duluth CISMA partner meetings on September 24, and October 12, 2019 in Duluth.
- Chandler, M. gave a project update at the Anoka CWMA meeting on September 24, 2019 in Andover. (24 participants)
- Chandler, M. was a panelist at the Drones vs. Invasive Species symposium hosted by the Minnesota Invasive Terrestrial Plants and Pests Center on September 25, 2019 in St. Paul. She discussed our use of aerial survey for bittersweet detection.
- Basch, C. provided updates at a District 3 County Ag Inspector meeting on September 25, 2019.
- Hardel, M. participated in the Minnesota Department of Transportation district 1 vegetation team meeting in Virginia on October 10, 2019.
- Chandler, M. presented oriental bittersweet at a workshop organized by Washington Conservation District on October 10, 2019 in Oakdale. (9 participants)
- Basch, C. and M. Chandler provided updates and strategized with Winona County CWMA partners on October 23, 2019 in Winona. (15 participants)
- Hardel, M. participated in a District 1 County Ag Inspector meeting on October 24, 2019 in Mahnomen.
- Hardel, M. gave a presentation on target species identification, reporting and management to environmentally focused local units of government at the 2019 BWSR Academy at Breezy Point Resort on October 29, 2019. (55 participants).
- Basch, C. provided updates at a District 4 County Ag Inspector meeting on November 6, 2019. (19 participants)
- Basch, C. guest lectured about invasive plants at St. Cloud State University on 11/26/19. (3 participants)
- Basch, C. presented about teasels species and potential hybrids at MDA's Noxious Weed Advisory Committee on 11/21/19. (21 participants)

Articles and media coverage

Weed of the Month articles ran in multiple media outlets in outstate Minnesota. Articles related to this project include *Cutleaf Teasel* (July 2019), *Black Swallow-wort* (August 2019), *Dalmatian Toadflax* (September 2019), *Invasive Plants Escape from Cemeteries* (October 2019) and *Weeds that Impact Hunters* (November 2019).

- Invasive vine infesting southeastern Minnesota https://www.kimt.com/content/news/Invasive-vine-infesting-southeastern-Minnesota-528153221.html (08/08/19)
- Invasive vine found in Southeast Minnesota, public asked for help to control the weed https://www.news8000.com/news/invasive-vine-found-in-southeast-minnesota-public-asked-to-help-control-the-weed/1107212160 (08/08/19)
- Invasive vine found in Southeast Minnesota, public asked for help to control the weed https://www.austindailyherald.com/2019/08/invasive-vine-is-spreading-through-southeast-minnesota-mda-officials-ask-for-the-publics-help-in-controlling-the-weed/
- Noxious plant taking root in Oakdale, Washington County https://www.lillienews.com/articles/2019/09/27/noxious-plant-taking-root-oakdale-washington-county (09/27/19)

Final Report Summary:

MDA organized and led 6 field tours, gave 43 presentations, provided project updates at 32 meetings, authored 14 articles, sent an annual report to stakeholders and trained Conservation Corps Minnesota crew members at multiple workshops each year. Tour participants included public land managers, tribal resource managers, researchers, Extension volunteers and County Agricultural Inspectors. The formality of presentations ranged from moderated presentations at the Upper Midwest Invasive Species Conference to garden clubs. Updates at meetings were provided to Cooperative Weed Management Areas, County Agricultural Inspectors, and MDA's

Noxious Weed Advisory Committee. Dissemination about target species was consistent throughout the project with the exception of poison hemlock. There was a media flurry resulting in hundreds of potential infestations that needed follow up.

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	$ Amount	Overview Explanation
Personnel:	$ 292,000	Research Scientist 1 and Plant Health Specialist
Professional/Technical/Service Contracts:	$ 197,500	Contracts with Conservation Corps Minnesota for $175,000 and the St. Croix River Association for $22,500
Equipment/Tools/Supplies:	$ 1,500	Flagging, tags and herbarium supplies
Travel Expenses in MN:	$ 20,000	Mileage $11,200, lodging $4,500 and meals $4,300
TOTAL ENRTF BUDGET:	**$ 511,000**	

Explanation of Use of Classified Staff: NA

Explanation of Capital Expenditures Greater Than $5,000: NA

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:
One 1.2 year full time Research Scientist 1 = 1.25 FTE
Two 2.0 year part time Plant Health Specialist = 3.0 FTE
Total FTEs = 4.25

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:
MDA will contract with CCM for target invasive plant control. Crews will work an estimated 8,775 hours.
FTEs = 8,775/2080 = 4.2 FTE
MDA will contract with St. Croix River Association for survey for an estimated 750 hours
FTE = 750 hrs/2080 = 0.36 FTE
Total FTEs = 4.56

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
St. Croix River Association will have 1:1 match funds ($22,500) from WI DNR to survey on the WI side of the St. Croix.	$ 22,500	$ 22,500	
State			
In-kind Services During Project Period: MDA: Field equipment, computing/software, GIS and data management, and project management for 3 years ($30,000) and CCM: Approximately $2.50/hr difference between actual cost per member ($23.50/hr) and billing rate ($21.00/hr) = $20,830.	$ 50,830	$ 59,830	
MDA general funds for salary ($7,138) and in-state travel ($73) and travel to out-state meeting ($735). These funds			

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
were also used for IT expenses for geodatabase development ($7,000) and contract for ISMTrack API ($5,000)			
Palmer amaranth emergency funds contract with CCM		$ 13,425	
MDA pass through grant funds for local governments		$ 152,913	
TOTAL OTHER FUNDS:	**$ 73,330**	**$ 248,668**	

VII. PROJECT STRATEGY:

A. Project Partners:

Receiving funds: Angela Gupta (U of M) will lead the educational components. Curtis Olson (U of M) will lead the survey drone test. Monika Chandler (MDA) will lead survey, coordination of target species control with CCM and follow up monitoring. Dorian Hasselmann (CCM) will lead target species control activities. All organizations will provide in-kind equipment, facilities, and GIS/technical support.

Not receiving funds: We will draw from Extension's existing statewide base of volunteers which totals over 102,000 active, trained volunteers. We will collaborate with DNR and MnDOT, other federal and state agencies, counties, municipalities, and private landowners.

B. Project Impact and Long-term Strategy:

Preventing highly destructive invasive plant species from spreading throughout the state has an enormous impact. All of the selected species would become widespread without intervention. They would overtake habitats and be prohibitively costly to control on a large scale. Controlling these target species across property lines protects the investment by agencies such as MnDOT on their lands. Eradication is defined as target species absence for six years after the last seed was produced. Therefore, eradication must be achieved in a long-term effort and ongoing monitoring is critical. ENRTF funds will be leveraged for (1) Extension funding for online training development cost not included in this proposal and (2) federal funding for volunteer training.

Project partners are working closely with other agencies and land management organizations to optimize and integrate the use of the invasive species management software into invasive species work across the state in a variety of landscape. A comprehensive management inventory should help optimize management impacts while reducing costs.

Continued engagement and empowerment of trained volunteers to identify, detect, survey, monitor and manage invasive species as both immediate and long-term impacts. These volunteers are actively training others and management invasive species while also influencing local policies and action. Sustain engagement and additional outreach should continue to grow citizen understanding and action.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	$ Amount
LCCMR Elimination of Target Invasive Plant Species (Phase 1) project $350,000 from ENRTF of which $135,000 was for MDA, $65,000 was for U of M and $150,000 was for CCM. In-kind was $85,000 of which $20,000 was from MDA and $30, 000 from CCM.	07/01/2013-06/30/2015 LCCMR In-kind Total	 $ 350,000 $ 50,000 $ 335,000
DNR received $60,000 for early detection and rapid response invasive plant management. These funds were used for CCM crews to survey for and control some of our joint target plant species such as Japanese hops, cutleaf teasel and Oriental bittersweet.	2014 - 2015	$ 60,000
Winona Soil Water Conservation District received $15,000 from the Board of Water and Soil Resources to work on target invasive plant control and site restoration in Winona County	2014 - 2016	$ 15,000

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS: NA

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2016 Work Plan Final Report

IX. VISUAL COMPONENT or MAP(S):

Conservation Corps controlling Oriental bittersweet in Red Wing

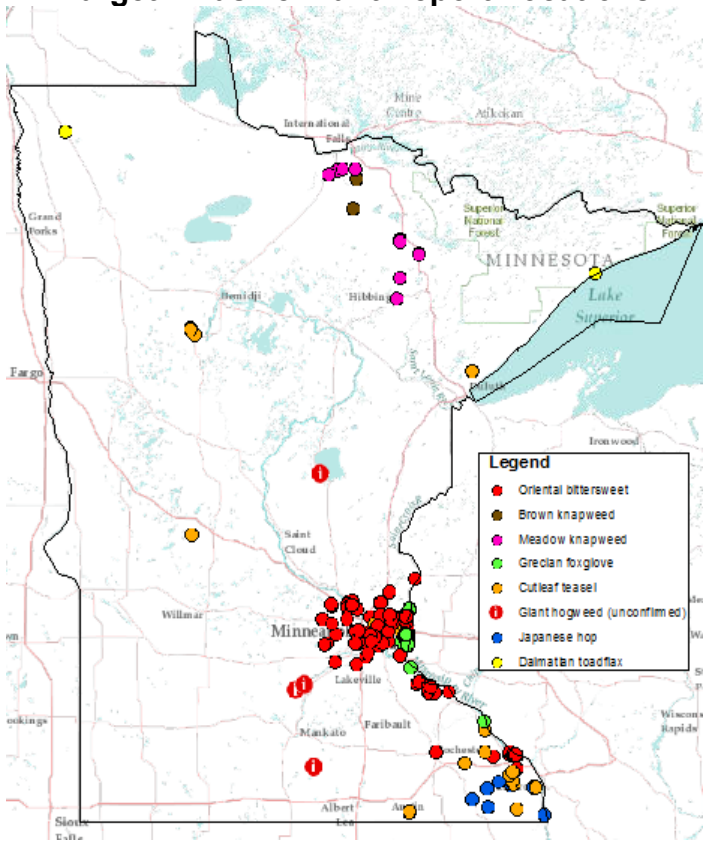
Oriental bittersweet vines overwhelming and killing trees in Red Wing

Unmanned Aerial Vehicle Lab students will test a drone for survey

Training people to identify and report target species.

To prevent environmental and economic damage, we will detect, contain and control target species before they become widespread.

Target Invasive Plant Report Locations



Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2016 Work Plan Final Report

X. RESEARCH ADDENDUM: NA

XI. REPORTING REQUIREMENTS:
Periodic work plan status update reports will be submitted no later than November 30, 2016, May 31, 2017, November 30, 2017, May 31, 2018, November 30, 2018, May 31, 2019 and November 30, 2019. A final report and associated products will be submitted between June 30 and August 15, 2020.

Environment and Natural Resources Trust Fund
M.L. 2016 Project Budget

Project Title: Elimination of Target Invasive Plant Species – Phase II
Legal Citation: M.L. 2016, Chp. 186, Sec.2, Subd. 06e1
Project Manager: Monika Chandler
Organization: Minnesota Department of Agriculture
M.L. 2016 ENRTF Appropriation: $ 511,200
Project Length and Completion Date: 4 Years, June 30, 2020
Date of Final Report: October 1, 2020

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Revised Budget	Amount Spent	Activity 2 Balance	Revised Budget 12/17/18	Amount Spent	Activity 3 Balance	Activity 4 Budget	Amount Spent	Activity 4 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	***Train People to Identify and Report Target Invasive Species***						***Control Target Species***			***Implement Invasive Species Management Database System***				
Personnel (Wages and Benefits)				$223,898	$219,769	$4,129							$223,898	$4,129
Research Scientist 1: $85,000 (62% salary, 38% fringe); 100% FTE for approximately 1.2 years														
Two Plant Health Specialists: $207,000 (67% salary, 33% fringe); approximately 75% FTE for 1.5 years														
Professional/Technical/Service Contracts														
Conservation Corps Minnesota for survey for and initial control of target species ($21/hr per crew member includes equipment, training and travel costs) and for $5,800 for data plans for tablets so that CCM can utilize ISMTrack.				$16,800	$16,800	$0	$203,200	$203,177	$23				$220,000	$23
Contract with St. Croix River Association for survey along the St. Croix River main stream and Brown's Creek (personnel $19,000, equipment & supplies $2,500 and mileage $1,000)				$22,500	$22,500	$0							$22,500	$0
Equipment/Tools/Supplies														
Supplies: Includes tags, flags, herbarium supplies, etc. for Activity 2				$1,754	$1,754	$0							$1,754	$0
Travel expenses in Minnesota														
Travel for Activity 2 project coordination for Research Scientist 1 and project manager. Milage $11,200, lodging $4,500; meals $4,300				$42,848	$42,466	$382							$42,848	$382
COLUMN TOTAL	**$0**		**$0**	**$307,800**	**$303,289**	**$4,511**	**$203,200**	**$203,177**	**$23**	**$0**		**$0**	**$511,000**	**$4,534**