Minnesota Noxious Weed Risk Assessment

Developed by the Minnesota Noxious Weed Advisory Committee

Assessment information

Common name: Poison hemlock

Scientific name: *Conium maculatum* L.

Family name: Apiaceae – carrot/parsley

Current reviewer name and organizational affiliation: Christina Basch – Minnesota Department of Transportation
Date of current review: 6/22/2022
Previous reviewer name and organizational affiliation: Dave Hanson – Minnesota Department of Transportation
Date of previous review: 7/11/2017

Species description

Photos

Photo caption: Infestation of poison hemlock along railroad track in Southern MN. Photo credit: Christina Basch, Minnesota Department of Agriculture

Photo caption: Poison hemlock stem and leaves. Photo credit: Christina Basch, Minnesota Department of Agriculture

Photo caption: Poison hemlock flowers and umbel. Photo credit: Christina Basch, Minnesota Department of Agriculture

Why the plant is being assessed

- Poison hemlock was emergency listed in 2018 when limited populations were recorded. The listing subcommittee's original recommendation was for poison hemlock to be listed as Prohibited - Control. The entire Noxious Weed Advisory Committee approved for it to be a Prohibited – Eradicate species. Since then, extensive mapping efforts have uncovered populations in most counties in southern Minnesota.
- With current funding and staffing levels, it is unknown if eradication is possible.

Identification, biology, and life cycle

- Biennial that grows 6-10 feet tall.
- Member of the carrot family with purple-spotted, hairless, and hollow stem.
- Leaves are fern-like and triple pinnately compound.
- Slightly curved white flowered umbel (A flat-topped or convex inflorescence with the pedicles arising more or less from a common point (Harris 2001)), consisting of 3-16 umbellets (an ultimate cluster of a compound umbel (Harris 2001)) with 12-25 flowers each.
- Common look-a-likes: wild carrot (Queen Anne's lace) - *Daucus carota*, Japanese hedge parsley - *Torilis japonica,* wild chervil - *Anthriscus sylvestris*, caraway - *Carum carvi*, burnet saxifrage - *Pimpinella saxifraga*.
- Highly toxic

Current distribution

Photo caption: National level map from EDDMapS. Accessed 12/21/2021.
Description of where the plant is found in the United States: Poison hemlock is found in U.S. states but Hawaii.

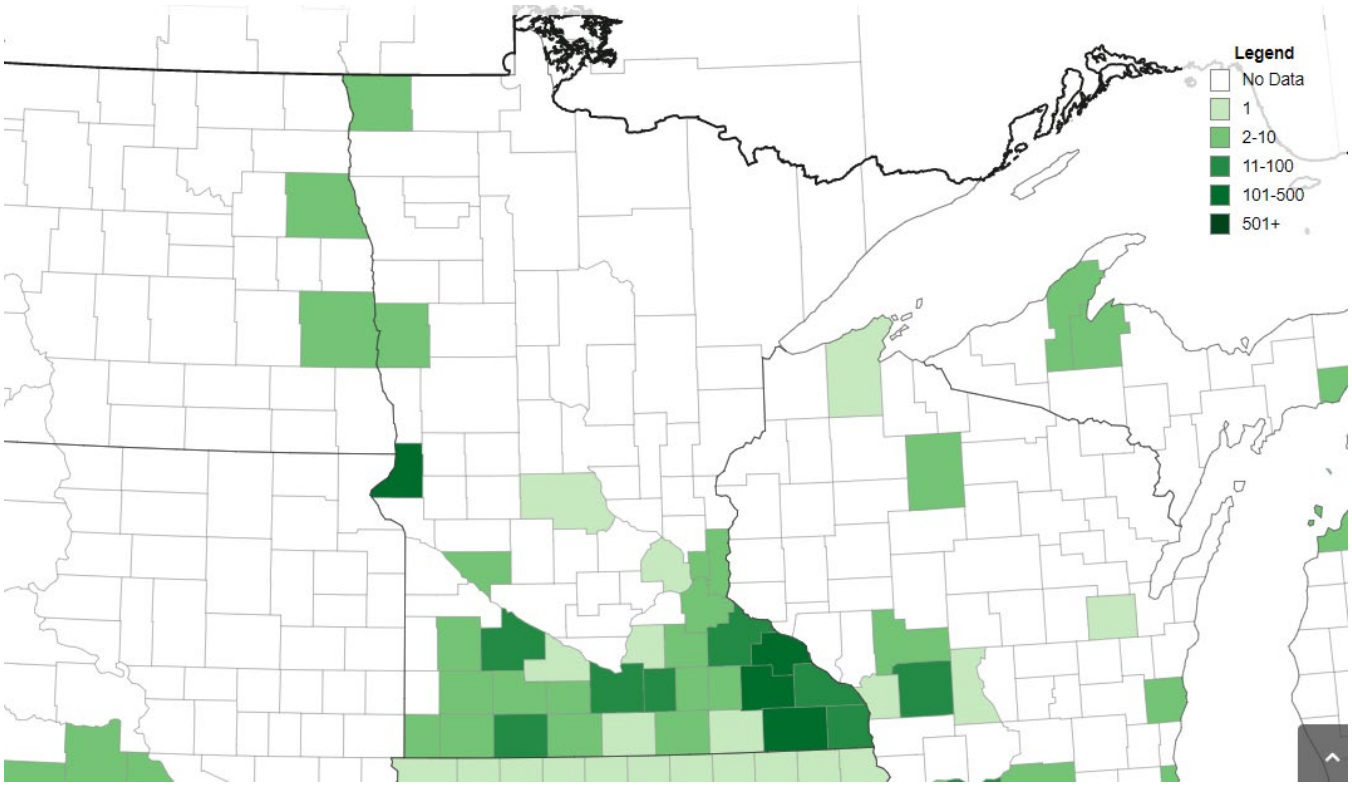

Photo caption: State level map from EDDMapS. Accessed 12/21/2021.

Description of where the plant is found in Minnesota: Most reports of poison hemlock are found in southern Minnesota. Large infestations have also been recorded in Traverse County on the North Dakota border. Table 1 (Appendix A) outlines reports and acreage reports per year.

Current regulation

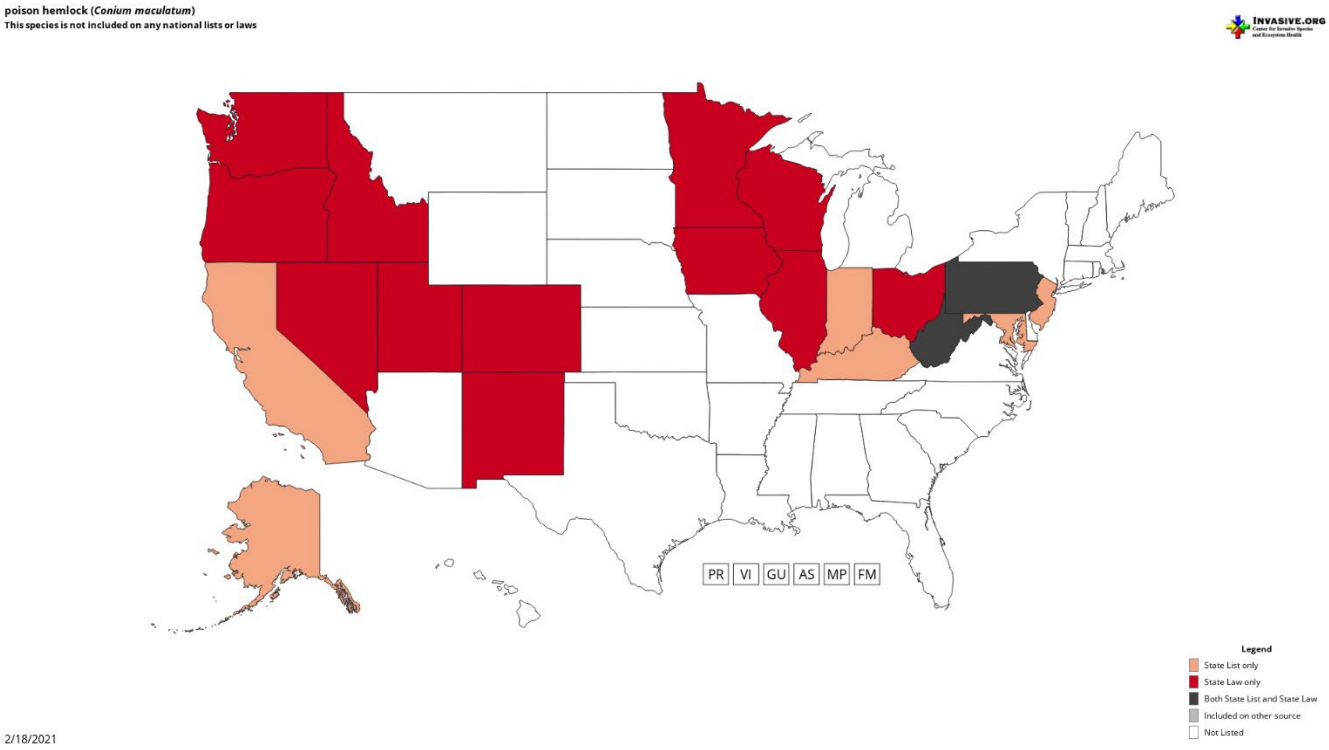

Photo caption: Map where poison hemlock is regulated in the United States. Accessed 12/21/21. (EDDMapS 2021)

State Regulations: not regulated by federal government

State	Common Name	Listing Category
Colorado	Poison Hemlock	C list (noxious weeds)
Idaho	Poison Hemlock	Noxious weed
Illinois	Poison Hemlock	Designated exotic weed
Iowa	Poison Hemlock	Secondary noxious weed
Minnesota	Poison Hemlock	Prohibited noxious weed - Eradicate
Nevada	Poison Hemlock	Noxious weed
New Mexico	Poison Hemlock	Class B noxious weed
Pennsylvania	Poison Hemlock	Class B noxious weed
Ohio	Poison Hemlock	Prohibited noxious weed
Oregon	Poison Hemlock	“B” designated weed - Quarantine
Utah	Poison Hemlock	Class 3 noxious weed - containment
Washington	Poison Hemlock	Class C noxious weed
West Virginia	Poison Hemlock	Noxious weed
Wisconsin	Poison Hemlock	Prohibited/Restricted noxious weed

Risk assessment

Box 1:

Is the plant species or genotype non-native?

Answer: Yes
Outcome: Go to Box 3
Native to Europe, Western Asia, and North Africa. (NatureServe 2017)
Europe (USDA Forest Service 2006)

Box 2:

Does the species pose significant human or livestock concerns or have the potential to significantly harm agricultural production?

Question 2A: Does the plant have toxic qualities that pose a significant risk to livestock, wildlife, or people?

Outcome: Decision tree does not direct to this question.

Question 2B: Does the plant cause significant financial losses associated with decreased yields, reduced quality, or increased production costs?

Outcome: Decision tree does not direct to this question.

Box 3:

Is the species, or a related species, documented as being a problem elsewhere?

Answer: Yes
Outcome: Go to Box 6
See regulation table above where poison hemlock has been viewed as problematic. The plant is also reported as a problem in portions of Africa, Australia, China, and New Zealand (CABI 2017).

Box 4:

Are the species' life history and growth requirements understood?

Outcome: Decision tree does not direct to this question.

Box 5:

Gather and evaluate further information

Outcome: Decision tree does not direct to this question.

Box 6:

Does the species have the capacity to establish and survive in Minnesota?

Question 6A: Is the plant, or a close relative, currently established in Minnesota?

Answer: Yes
Outcome: Go to Box 7
Poison hemlock is well documented establishing in Minnesota. Reported to perform well in USDA hardiness zones 4-8 (CABI 2017).

Question 6B: Has the plant become established in areas having a climate and growing conditions similar to those found in Minnesota?

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.***
Reported to perform well in USDA hardiness zones 4-8 (CABI 2017).

Question 6C: Has the plant become established in areas having a climate and growing conditions similar to those projected to be present in Minnesota under future climate projections?

Outcome: Decision tree does not direct to this question.

Box 7:

Does the species have the potential to reproduce and spread in Minnesota?

Question 7A: Are there cultivars of the plant that are known to differ in reproductive properties from the species?

Answer: No
Outcome: Go to Question 7B
Poison hemlock is not a cultivated plant used in the nursery industry.

Question 7B: Does the plant reproduce by asexual/vegetative means?

Answer: No
Outcome: Go to Question 7D
Produces exclusively by seed (USDA-Forest Service 2015)

Question 7C: Are the asexual propagules - vegetative parts having the capacity to develop into new plants - effectively dispersed to new areas?

Outcome: Decision tree does not direct to this question.

Question 7D: Does the plant produce large amounts of viable, cold hardy seeds? For woody species, document the average age the species produces viable seed.

Answer: Yes
Outcome: Go to Question 7G
One plant has the ability to produce 30,000 seeds that can remain viable in the soil for 3-6 years (USDA-Forest Service 2015).

Question 7E: For species that produce low numbers of viable seeds, do they have a high level of seed/seedling vigor or remain viable for an extended period (seed bank)?

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.***
Soil bank viability potentially to 6 years (NatureServe 2017). Viability from 3 to 6 years (USDA- Forest Service 2015).

Question 7F: Is the plant self-fertile?

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.***
Yes, hermaphroditic, insect pollinated (CABI 2017).

Question 7G: Are sexual propagules – viable seeds – effectively dispersed to new areas? List and consider all vectors.

Answer: Yes

Outcome: Go to Question 7I

Most seed germinates wherever it falls near the parent plant, thereby contributing to stand density. Seed is easily dispersed by water, humans, birds, and rodents; it is also spread over long distances by adhering to surfaces and undercarriages of road vehicles and road maintenance equipment. (USDA-Forest Service 2015)

Question 7H: Can the species hybridize with native species (or other introduced species) and produce viable seed and fertile offspring in the absence of human intervention?

Outcome: Decision tree does not direct to this question.

Question 7I: Do natural controls, species native to Minnesota, which have been documented to effectively prevent the spread of the species in question?

Answer: No

Outcome: Go to Box 8

Nothing significant at this time. Black swallowtail *(Papillio polyxenes)* larvae will utilize the plant (Hall 2017).

Agonopterix alstroemeriana – A moth that is said to be a biological control was introduced to the United States from Europe. The larvae are defoliators of poison hemlock, but ineffective as a biocontrol. Larval feeding defoliates plants which can lead to reduced reproduction and sometimes plant death. Many plants recover and produce more foliage after larvae have pupated. (USDA- Forest Service 2017).

Agonopterix alstroemeriana is not known to be present in Minnesota at this time (Chandler 2022).

Question 7J: Was the answer to Question 7A (Are there cultivars that differ in reproductive properties from the original species) "Yes"?

Outcome: Decision tree does not direct to this question.

Box 8:

Does the species pose significant human or livestock concerns or have the potential to significantly harm agricultural production, native ecosystems, or managed landscapes?

Question 8A: Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?

Answer: Yes

Outcome: Go to Box 9

Several piperidine alkaloid toxins (namely coniine) cause the poisoning of humans, livestock and wildlife (Brooks 2021).

Injurious to livestock – birth defects (crooked calf disease), potentially fatal after ingestion (Canadian Poisonous Plants, Cornell University 2017). Animals generally do not consider poison hemlock plants to be palatable but may eat them accidentally (Martinson 2021). No human deaths from accidental ingestion have been reported between 2011 and 2021. An intentional injection which resulted in death was reported in 2017 (Brooks 2021).

Hemlock alkaloids are also found a few species of native *Sarracenia* and non-native aloes (Hotti and Reicher 2017).

Although livestock poisonings from poison hemlock may be severe, they seem to be rare. Nationally, 2.2% of cattle and 6.3% of calves died prematurely in 2010. Of these losses, 94% were not caused by predators. Of the non-predator losses, 1.4% were attributable to poisoning of all types (noxious weeds, nitrate poisoning, noxious feeds, etc). These losses rank above theft (0.4%) and below metabolic problems (2.6%) as causes of death. Respiratory problems were the single greatest nonpredator cause of death (26.5%). (USDA Animal Plant Health Inspection Service 2011)

Question 8B: Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?
Outcome: Decision tree does not direct to this question.

Question 8C: Can the plant aggressively displace native species through competition (including allelopathic effects)?
Outcome: Decision tree does not direct to this question.

Question 8D: Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?
Outcome: Decision tree does not direct to this question.

Question 8E: Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?
Outcome: Decision tree does not direct to this question.

Question 8F: Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?
Outcome: Decision tree does not direct to this question.

Box 9:

Does the species have clearly defined benefits that outweigh associated negative impacts?

Question 9A: Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?
Answer: No
Outcome: Go to Box 10
No. Prohibited – Eradicate listed species since 2018 and transportation/sale is prohibited currently. Historically components of the plant were used as homeopathic medicine. However, those have been for the most part abandoned as the piperidine alkaloid toxins (namely coniine) and the danger to humans has become better understood (Hanson 2017).

Question 9B: Is the plant an introduced species and can its spread be effectively and easily prevented or controlled, or its negative impacts minimized, through carefully designed and executed management practices?
Outcome: *Decision tree does not direct to this question.*

Question 9C: Is the plant native to Minnesota?
Outcome: Decision tree does not direct to this question.

Question 9D: Is a non-invasive, alternative plant material or cultivar commercially available that could serve the same purpose as the plant of concern?
Outcome: Decision tree does not direct to this question.

Question 9E: Does the plant benefit Minnesota to a greater extent than the negative impacts identified at Box #8?
Outcome: Decision tree does not direct to this question.

Box 10:

Should the species be regulated as Prohibited/Eradicate, Prohibited/Control, or Restricted Noxious Weed?

Question 10A: Is the plant currently established in Minnesota?
Answer: Yes
Outcome: Go to Question 10D
As of 12/21/2021 there are 970 positive reports in Minnesota located in 34 of the 87 counties (EDDMapS 2021). See Appendix A. Poison hemlock readily spreads and outcompetes native vegetation and should be controlled.

Question 10B: Would prohibiting this species in trade prevent the likelihood of introduction and/or establishment?
Outcome: Decision tree does not direct to this question.

Question 10C: Does this risk assessment support this species being a top priority for statewide eradication if found in the state?
Outcome: Decision tree does not direct to this question.

Question 10D: Does the plant pose a serious human health threat?
Answer: Yes
Outcome: Go to Question 10E
Potential confusion for foragers of native plant food materials. Often confused with other edible family members like wild carrot (*Daucus carota* L.), wild chervil (*Anthriscus sylvestris* (L.) Hoffm.) and wild parsnip (*Pastinaca sativa* L.). If foragers ate poison hemlock it could be fatal.

Question 10E: Is the health threat posed by the plant serious enough, and is the plant distribution sufficiently small enough to be manageable, and are management tools available and effective enough to justify listing as Prohibited / Eradicate species?
Answer: No
Outcome: LIST THE PLANT AS A PROHIBITED / CONTROL NOXIOUS WEED

Toxicity

Although poison hemlock is acutely toxic, no human deaths from accidental ingestion have been reported between 2011 and 2021. An intentional injection which resulted in death was reported in 2017 (Brooks 2021). Livestock mortality is rare, and animals tend to avoid poison hemlock in pastures (Martinson 2021).

Management

Preventing seed bank establishment is key for poison hemlock control. Since poison hemlock reproduces only by seed, removing plants from the ground is effective for small populations. With complete removal of seed production, it can take 3-6 years to exhaust the seed bank. Mowing in larger populations can reduce overall seed production, but plants must be mowed repeatedly. Mechanical control along with an herbicide application is most effective (USDA- Forest Service 2015).

Distribution

Distribution is much more extensive that originally known during the 2017 risk assessment. The Minnesota Department of Agriculture (MDA) posted a press release in 2017 to get a better idea of distribution in the state. At the end of 2017, there were 88 records covering 140 acres. Since the press release in 2017, mapping efforts have taken place to understand current distribution. The MDA conducted targeted surveys in 2019, 2020 and 2021 along rail corridors. In instances where waterways crossed rail lines, spread was evident along those waterways, such as Plum Creek in Redwood County (Minnesota Department of Agriculture 2022).

The surveys were mostly contained to pre-planned rail corridor routes, and areas outside of that range have not been mapped. More infestations may still exist that have not been discovered/mapped yet. Since 2018, there have been an additional 880 locations reported. Many of the reports are point data, and total infested acreage estimates are low compared to actual. See Appendix A.

Given current capacity towards terrestrial invasive species management in Minnesota, and continued discovery of new infestations, eradication may not be feasible. Future certainty and range expansion models show poison hemlock may have more suitable habitat in Minnesota in the future (EDDMapS 2021). See Appendix B.

Question 10F: Is the plant known to cause significant ecological or economic harm and can the plant be reliably eradicated (entire plant) on a statewide basis using existing practices and available resources considering the distribution, reproductive biology and potential for spread?

- *For distribution, note if the distribution is well documented, the number and acreage of known infestations and how widespread they are in the state. Note if there are infestations in border areas.*
- *For reproductive biology, note if there are reproductive biology factor that make the plant easier to control and eradication more likely (for example, long pre-reproductive period, self-incompatible pollination, short-lived seed bank).*
- *For potential for spread and re-invasion of controlled areas, note its potential to spread beyond places where it is being controlled such as deliberate planting by people, wildlife vectors, re-infestation from border states, or other factors that facilitate spread.*
- *For known management tools, note what management tools are available, potential non-target impacts, and the reasonableness of state management or mandating that landowners throughout the state use the management tools to eradicate or control existing plants.*

- *For available resources, consider the capacity of state and local personnel and availability of funding to respond to new and existing infestations.*

Outcome: Decision tree does not direct to this question.

Question 10G: Is the plant known to cause significant ecological or economic harm and can the plant be reliably controlled to limit spread on a statewide basis using existing practices and available resources? Would the economic impacts or other hardships incurred in implementing control measures be reasonable considering any ongoing or potential future increase of ecological or economic harm?

- *Also consider all bullet points listed under 10F when evaluating 10G*

Outcome: Decision tree does not direct to this question.

Question 10H: Would prohibiting this species in trade have any significant or measurable impact to limit or reduce the existing populations or future spread of the species in Minnesota?
Outcome: Decision tree does not direct to this question.

Question 10I: Are there any other measures that could be put in place as Special Regulations which could mitigate the impact of the species within Minnesota?
Outcome: Decision tree does not direct to this question.

Box 11:

The species is being proposed to be designated as a Specially Regulated Plant. What are the specific regulations proposed?

Outcome: Decision tree does not direct to this question.

Final outcomes of risk assessment (2022)

NWAC Listing Subcommittee

Outcome: Change from Prohibited Eradicate to Prohibited Control Noxious Weed. (06/17/2022)
Comments: With better understanding of distribution and future range certainty, poison hemlock is better suited on the Prohibited Control list as it may be too widespread for eradication. Even though the plant is highly toxic, cases of accidental ingestion and livestock poisoning are low.

NWAC Full Committee

Outcome: Change from Prohibited Eradicate to Prohibited Control Noxious Weed. (12/13/2022)
Comments: The vote was 16 in favor, 1 against and 1 abstained.

MDA Commissioner

Outcome: Change from Prohibited Eradicate to Prohibited Control Noxious Weed.
Comments: No comments

Risk Assessment Current Summary (06-22-2022)

- Mapping efforts have increased since original assessment in 2017, showing a much larger distribution that previously known.
- Significant distribution observed along transportation rights of way, such as rail lines in southern Minnesota.
- Populations spreading along water corridors in southeastern Minnesota, such as along the Root River.
- Most of southern Minnesota is highly suitable habitat for poison hemlock (Appendix B), and future models show an increase in habitat suitability for the rest of the state.
- Poison hemlock is a potential human health threat and should continue to be regulated as a noxious weed, but due to the better understanding of its distribution, it should be regulated as Prohibited-Control Noxious Weed and not a Prohibited-Eradicate Noxious Weed.

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Appendix A – Poison hemlock reports before and after 2017 publicity

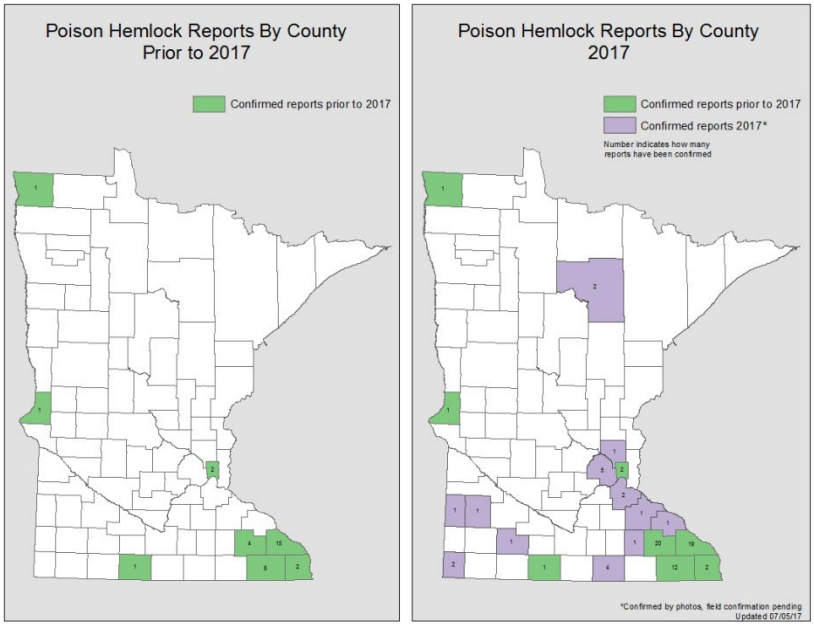

Figure caption: Poison hemlock reports by county prior to 2017, and after a press release in 2017.

Table 1: Reports of poison hemlock in Minnesota by year (EDDMapS 2021).

	Before 2017	2017	2018	2019	2020	2021
Total reports	33	105	253	325	771	968
New reports		72	148	72	446	197
Infested Acres	41	99	6	23	135	97

Data queried from EDDMapS on 12/21/2021.

Results summary from EDDMapS 12/21/2021:

- Your query returned 970 locations with records.
- 953 locations have the exact coordinates shared publicly.
- Based on most recent information this includes 401 infested acres.
- 970 new locations were added in the time period for this query.
- 1,398 records have been made at these locations.
- 428 records are revisits updating the status of 293 locations.

Table 2: Eradicate Species Occurrences in Minnesota as of May 5, 2022 (EDDMapS 2021)

Species	Positive occurrences	Treated occurrences	Eradicated occurrences
Black swallow-wort	17	11	0
Brown knapweed	61	3	0
Common teasel	25	12	0
Cutleaf teasel	123	39	38
Dalmatian toadflax	37	185	0
Diffuse knapweed	2	0	0
*Giant hogweed	0	0	0
Grecian foxglove	174	214	6
*Japanese honeysuckle	0	0	0
Japanese hops	148	483	4
Meadow knapweed	230	173	0
Oriental bittersweet	1339	503	69
Palmer amaranth	Data private on EDDMapS	Data private on EDDMapS	Data private on EDDMapS
Poison hemlock	351	575	29
Tree of heaven	0	1	2
*Yellow starthistle	0	0	0

*Not known to be in Minnesota

Appendix B – Poison hemlock habitat suitability models

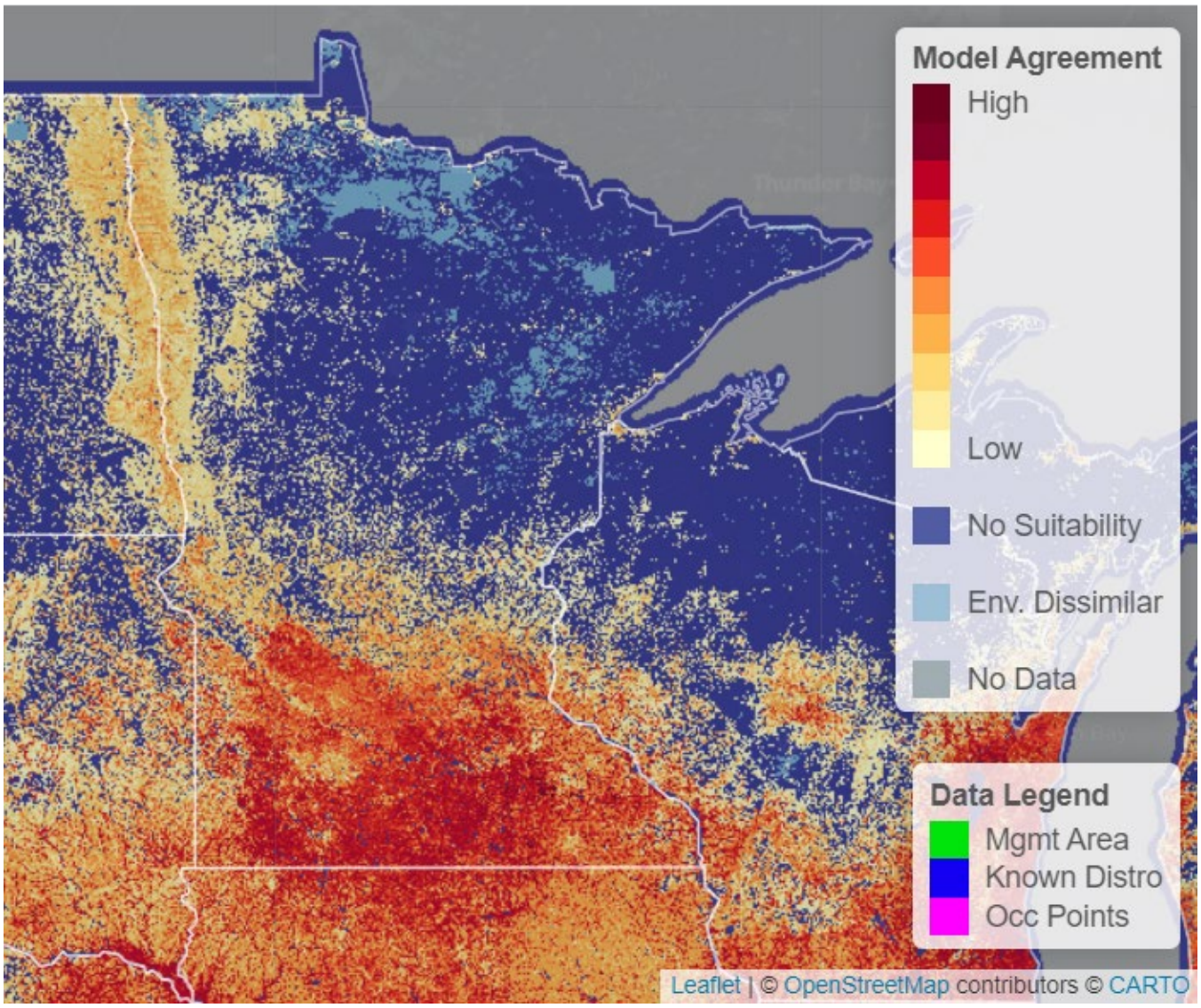

Figure caption: USGS Habitat suitability model showing suitable habitat for poison hemlock in Minnesota. The southern half and western border of the state show moderate to high suitability, while the northeast has mostly low suitability (USGS 2022).

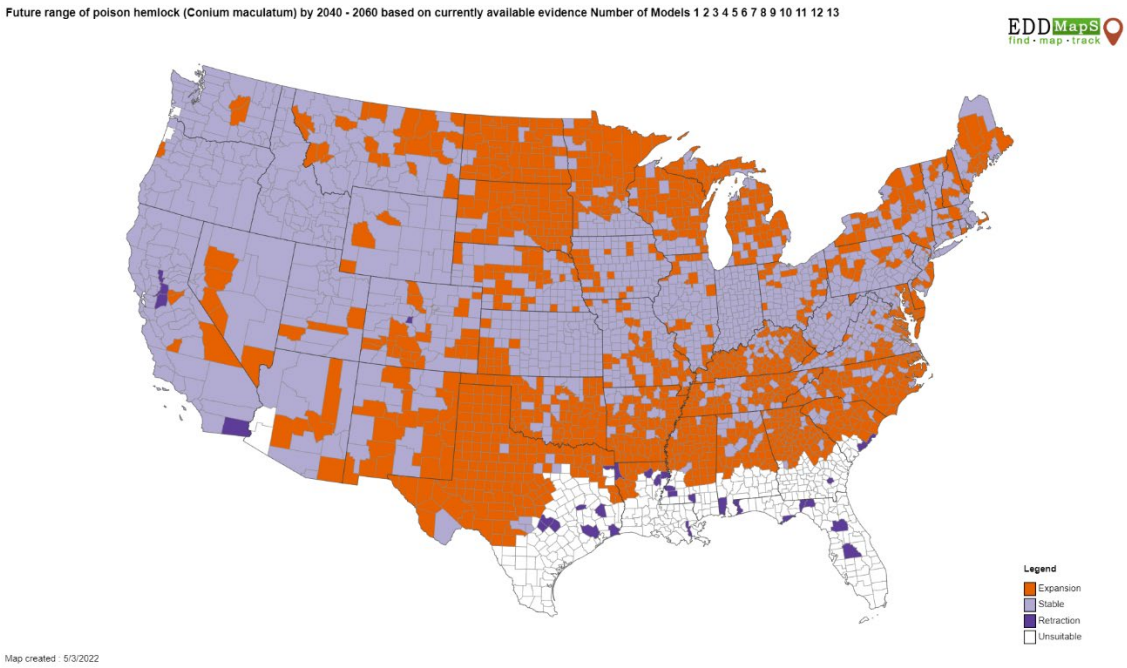

Figure caption: Future range of Poison hemlock by 2040-2060 based on currently available evidence (EDDMapS 2021).

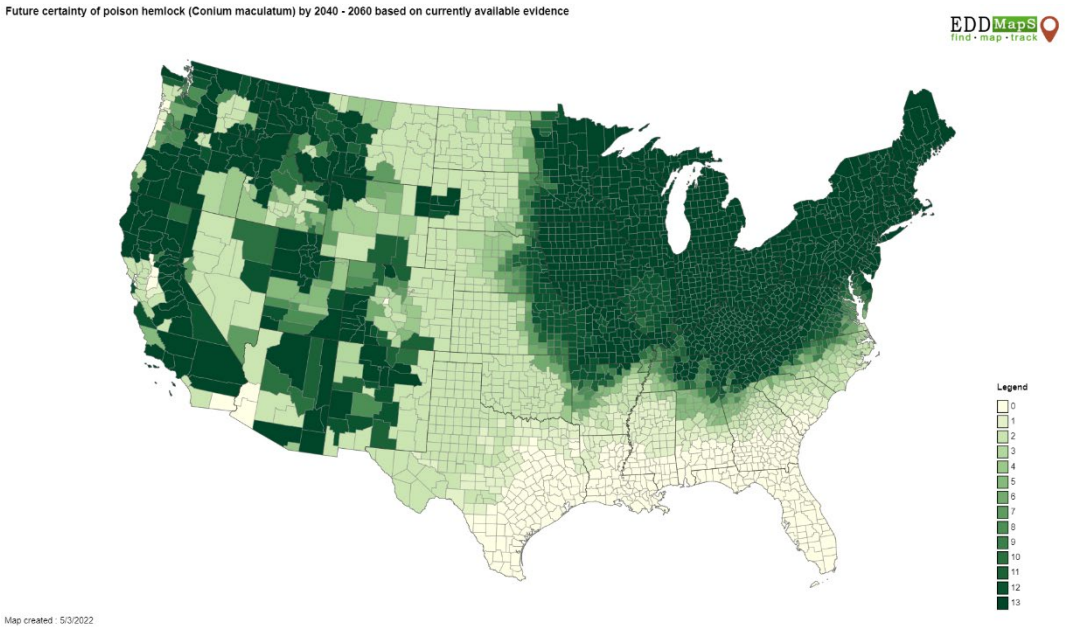

Figure caption: Future certainty of poison hemlock by 2040-2060 based on currently available evidence (EDDMapS 2021).