

# Wild parsnip in Minnesota

How to use phenology data to  
inform management decisions

May 2024



**This document describes:**

- 1) How recent research on the life cycle of wild parsnip in Minnesota can be used to make management decisions, and
- 2) Where to access the research results.

The same [research project](#) also involved Japanese knotweed.

## What is wild parsnip?

Wild parsnip, *Pastinaca sativa*, is a perennial plant brought to North America to be grown as a root vegetable. It has escaped cultivation and can dominate some environments. The sap can cause severe blistering to human skin and is toxic to livestock.

Wild parsnip is regulated as a [Prohibited-Control Noxious Weed](#) in Minnesota. This means that no transportation, propagation, or sale of this plant is allowed in the state. For plants already present on the landscape, effort must be made to prevent their spread into new areas. This regulation excludes non-wild cultivated parsnip varieties.



## More information

- [Wild parsnip story map](#) (Minnesota Dept. of Agriculture)
- [Wild parsnip](#) (Minnesota Dept. of Natural Resources)
- [Wild parsnip identification video](#) (Univ. of Wisconsin)

## What is plant phenology?

Plant phenology is the study of cyclical (e.g., seasonal) events in a plant's life and how the events interact with factors like climate and weather. The word *phenophase* is often used to describe particular states or phases in the annual life cycle of a plant that can be observed and defined by a start and end point, such as flowering.<sup>1</sup>



Plants require a certain amount of heat to develop from one phenophase to another. The amount of accumulated heat needed for development is measured in units called *degree-days*. Scientists can calculate the average degree-days needed for different phenophases by building a degree-day model from observations of the plant's development in relation to the surrounding temperature.

<sup>1</sup> Source: USA National Phenology Network, <https://www.usanpn.org>

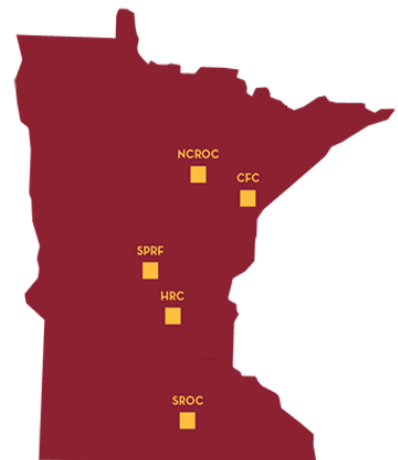
## More information

- [USA National Phenology Network](#)
- [Degree-days](#) (Univ. of California)

## Wild parsnip phenology in Minnesota

Beginning in 2020, researchers at the University of Minnesota tracked the phenology of wild parsnip plants for multiple years at five different locations in Minnesota: the UMN Research and Outreach Centers in Becker, Cloquet, Grand Rapids, St. Paul, and Waseca. Many plants were observed at each site, and for each individual plant, researchers collected data on the duration of the phenophases described below.

In addition, volunteers collected similar data through a participatory science program called [Pesky Plant Trackers](#).



### Leaves

One or more live, fully unfolded leaves are visible. Though parsnip can maintain green leaf tissue throughout winter, leaves must be fully unfolded to count for the “leaves” phenophase. Fully dried or dead leaves do not count for this phenophase.



### Flower buds and open flowers

One or more fresh, unopened flowers or flower buds are visible on the plant (*flower buds*). One or more fresh, opened flowers are visible on the plant (*open flowers*). Flowers are "open" when the reproductive parts (male stamens or female pistils) are visible within unfolded or open flower parts (petals, floral tubes, or sepals). The flowering phenophases will overlap and end at the same time (once wilted or dried). Wilted or dried flowers do not count for these phenophases.



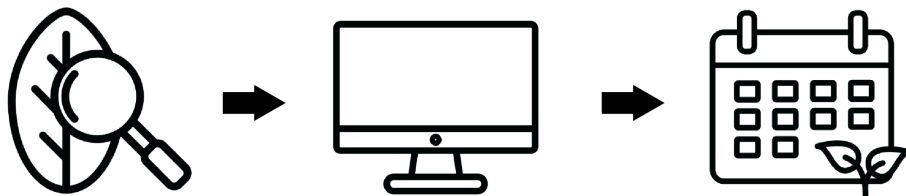
## Fruits (seeds)

One or more fruits are visible on the plant. For wild parsnip, the fruit is flattened and seed-like, with two tiny fruits joined tightly together. The fruit color changes from green to yellowish to tan or light brown as it ripens and splits into two, one-seeded segments.



## Lab testing and computer modeling

The researchers also tested plants in the laboratory to determine the lowest temperature at which wild parsnip development will occur. With this information and the field observations, researchers built a simple degree-day model. The model can estimate when phenophases like flowering or fruiting will occur based on the accumulated degree-days at a given Minnesota location.



## More information

- [Nature's Notebook wild parsnip phenophase guide](#) (USA National Phenology Network)
- [Minnesota Invasive Terrestrial Plants and Pest Center research project](#) (Univ. of Minnesota)
- [Pesky Plant Trackers](#) (Univ. of Minnesota)

## Access to wild parsnip phenology model

The wild parsnip degree-day model from the University of Minnesota research has been made available for free as an application on the [USPEST](https://uspest.org) website. This site is connected to a large network of weather stations around the country, including dozens within Minnesota.

Using the research-based models and some user-specified information, the application allows anyone to access a summary of wild parsnip phenology during a given year.

The following screenshot shows an example of what the website can provide.

**Online Phenology and Degree-day Models**  
for agricultural and pest management decision making in the US

Intro | Station | Model | Output | Graph

wild parsnip at HPN30, Falcon Heights MN, 2024

**Model Inputs**  
 show model inputs table

**Date Comparison**  
 show Date Comparison table  
Accumulation for HPN30 from 1-1-2024 through 4-15: 622 DDs(F)  
data quality is ok.

This year is about	versus	QA
20 days ahead	2023	ok
22 days ahead	2022	ok
NA	30-yr normal	ok

**Model Output**  
 show full table

Temperatures (and degree-days) are in F; rain in inches.

date	max	min	rain	DDs today	DDs cumu	QA	events
1-1	27	22	0.00	0.0	0		* START
4-5	57	31	0.00	12.1	420		First leaves
4-13	84	39	0.00	29.5	570		50% leaves
5-17	71	50	0.14	28.7	1336	Nm	First flower buds
5-22	73	53	0.15	30.8	1485	Nm	50% flower buds
5-30	76	56	0.14	33.6	1745	Nm	First open flowers
6-2	77	57	0.13	35.3	1849	Nm	50% open flowers
6-6	79	58	0.12	36.6	1994	Nm	First fruits (unripe)
6-9	80	60	0.14	37.5	2105	Nm	50% fruits

- To get this information by email, log in to or sign up for [USPEST.org](https://uspest.org) email notifications.
- To see the model output together with relevant weather inputs, go to [MyPest Page](#).
- To use this information in your a spreadsheet, download it in [CSV format](#).

In this example, the user has selected a particular Minnesota location (Falcon Heights) and time (2024) of interest. The **events** column lists different wild parsnip phenophases. The **date** column corresponds to when the phenophase is estimated to occur (“first”) and when ~50% of plants in the area would reach that phenophase (“50%”). The user has also toggled a table that shows how the degree-day accumulation for wild parsnip on the date of access compares to the two previous years.

The dates and corresponding degree-days displayed will update as time goes on. Meaning, if the above model is accessed on 4-1 (April 1, 2024) and then again on 8-15 (Aug 15, 2024), the dates and degree-day calculations that appear in the table may change. Estimates prior

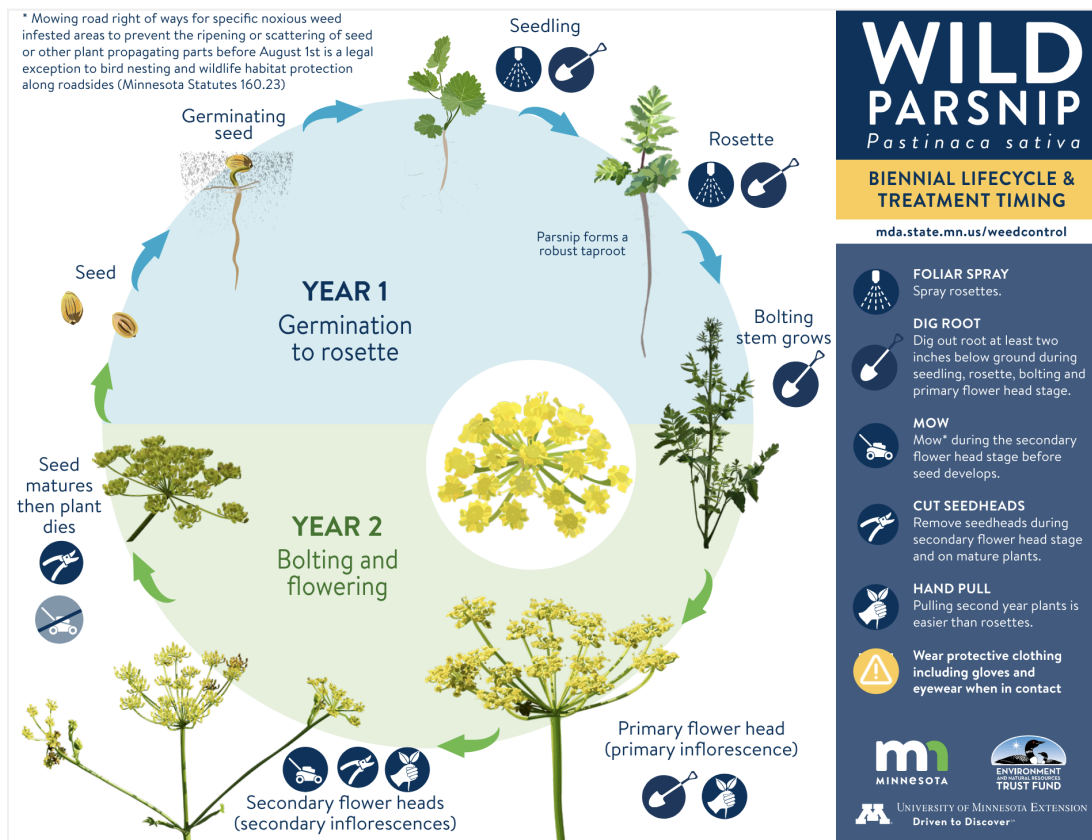
to the date of access will reflect the actual weather that occurred, whereas estimates on future dates will reflect the most recent weather forecasts.

## More information

- [USPEST wild parsnip model app](#)
- [Guide for accessing USPEST model for wild parsnip](#) (Univ. of Minnesota)

## How does phenology connect to management?

Specific recommendations for wild parsnip management can vary and depend on multiple factors, like size and age of the population, location, management goals, etc. Importantly, selecting the right tactic will depend on where the plant is in its life cycle. For example, the [diagram](#) below shows that herbicide application is only recommended during the early stages of plant growth (i.e., the leaves phenophase).



Wild parsnip phenology will follow the same pattern each year. However, the exact calendar dates over which these events occur can differ due to variations in environmental conditions each year, especially temperature. **Managers would benefit from the ability to track plant growth and plan activities based on local conditions. This is what the models on the [USPEST](#) website can provide.**

## Example scenario

Manager Doe wants to send out a seasonal crew to mow when wild parsnip is flowering but before seeds appear. They need to plan the crew's summer work schedule many months in advance. In the winter, they consult the USPEST phenology model to see when wild parsnip is forecasted to flower in the area they are managing. Manager Doe tentatively plans for the crew to mow near the forecasted date of "50% open flowers," though they also use the model application to compare the timing of 50% open flowers in previous years to see possible variation. As the year progresses, Manager Doe periodically checks the phenology model's updated forecasts. If it is a very cold or warm year, the exact time of open flowers may change and adjustments to the mowing schedule may be needed.

## More information

- [Wild parsnip identification and reporting](#) (Univ. of Minnesota)
- [Wild parsnip management recommendations](#) (Midwest Invasive Plant Network)

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- Page 5: Model screenshot from USPEST.org website
- Page 6: [Wild parsnip life cycle and treatment](#), Bugwoodcloud.org