

BITTERSWEET COLD HARDINESS RESEARCH

Research Question:

How cold hardy is Oriental bittersweet? Which areas of Minnesota are likely to be too cold for this plant to survive?

Determining Cold Hardiness:

After gathering bittersweet plant material, scientists at the University of MN, applied a range of temperature treatments to the tissue in the lab. For those temperatures that would be too low for plant survival, the tissue showed browning in the cambial cells.



Results

One-year stem material was killed at -21°F and two-year stem material at -22.5°F indicating that low winter temperatures can reduce winter survival of young, exposed tissue; therefore, Oriental bittersweet's survival will most likely be limited in Minnesota's USDA Plant Hardiness Zones 4a, 3b, and 3a.

OTHER INVASIVES

There are several new invasive plants in the Midwest that may be kept at bay by Minnesota's cold temperatures. Here are a few that may survive in Zone 5 but not in Zone 4:

- Kudzu (*Pueraria Montana var. lobata*)
- Tree of Heaven (*Ailanthus altissima*)
- Chinese Yam (*Dioscorea oppositifolia*)
- Pale-swallow-wort (*Cynanchum rossicum*)

WILL CLIMATE CHANGE INCREASE THE RISK OF PLANT INVASION?

Minnesota has already warmed $+2^{\circ}\text{F}$ to $+4^{\circ}\text{F}$ in the last 30 years but some estimates show that temperatures could increase another 4 to 5°F by 2050. This change implies that there will be an increase in Zone 5 species that will survive in Minnesota. However, even if temperatures increase, invasive species may still be limited if we have occasional winter cold snaps. So when it gets bitterly cold, just remember an old Minnesota saying "25 below keeps the riff-raff out".

HELPFUL LINKS

Oriental Bittersweet Factsheet:

<http://www.mda.state.mn.us/plants/badplants/orientalbittersweet.aspx>

Plant Hardiness Zones:

<http://planthardiness.ars.usda.gov/PHZMWeb>

Global Climate Change Impacts:

<http://nca2009.globalchange.gov/observed-and-projected-changes-plant-hardiness-zones>

Cold Tolerance of Insects:

<http://www.vegedge.umn.edu/vegpest/Cira%20et%20al%202012%20MN%20Cold%20Hardiness.pdf>

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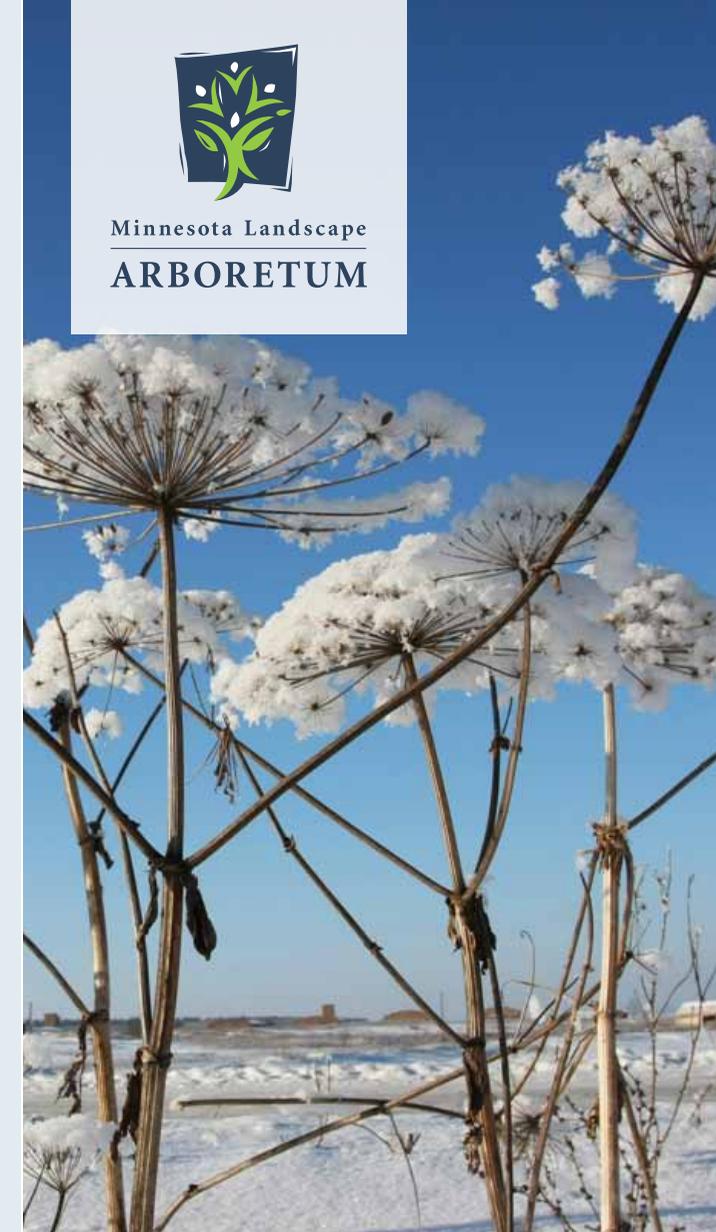
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Cold Tolerance of Invasive Plants

Could 25 below be a benefit?

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UNIVERSITY OF MINNESOTA

BRR!

Minnesota's winters can be brutally cold and long. However, there may be a silver lining to the extreme low temperatures. Some non-native, invasive insect and plant species are susceptible to cold climates. If the temperature drops low enough, they will not survive the winter and thrive as successful invaders.



HOW COLD DOES IT GET?

MINNESOTA FAST FACTS:

Record state low was -61°F , in Tower, MN, on February 2, 1966

Average Minimum Lows:

- o Twin Cities = -19.41°F (1976 – 2011)
- o Winona = -20.90°F (1893 – 2009)
- o Brainerd = -33.78°F (1955 – 2013)

COLD ACCLIMATION

Cold hardiness refers to a plant's ability to withstand winter conditions and is indicated by the lowest minimum temperature at which the plant will tolerate cold conditions without resulting injury or death to its tissue.

As winter approaches, plants undergo a period of **acclimation** to prepare them for cold conditions. As day length (photoperiod) shortens and temperatures start to decline, these environmental cues trigger physiological and biochemical changes in plants that enables them to be more cold tolerant.

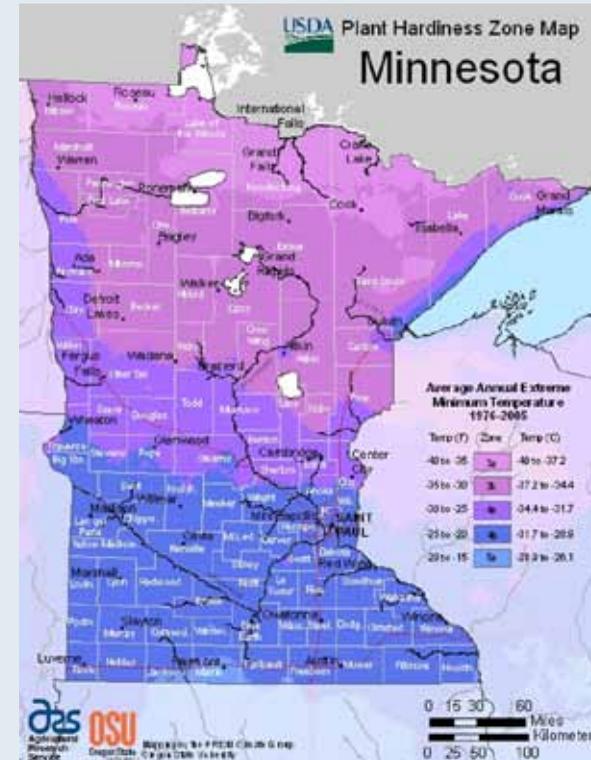


Plants that are native to Minnesota avoid cold stress through this acclimation, whereas some introduced invasive plants from other climate zones may acclimate too early in the fall, or be incapable of acclimating sufficiently to allow them to survive the winter.

IN THE ZONE

The USDA has created plant hardiness zone maps based on average annual extreme temperatures to visually describe where plants with various cold hardiness levels will be able to survive.

Not only is this map a useful tool for gardeners to determine which landscape plants are suitable to their climate, but it is also a good indicator of which invasive plants will be able to thrive in a certain area.



KEEPING OUT INVASIVES Oriental Bittersweet

The distribution of the invasive woody vine, Oriental Bittersweet (*Celastrus orbiculatus*) may be limited in regions of Minnesota that are too cold for it to survive. Currently it is found only in the southern part of the state (Zone 4b).

Origin – Native to China, Japan, and Korea. Originally thought to be hardy to USDA Plant Zone 5 (-10 to -20°F)



Ecology – Vine reaches lengths of 66'; large root systems send up new shoots; flowers and fruit found on entire length of vine; can grow up to 3 meters per year.



Damage – Vines twine around trees, girdling trunks and breaking limbs; they shade out other low-lying foliage and compete with native, non-invasive American Bittersweet (*Celastrus scandens*)