Amur Cork tree
invasive species
phellodendron amurense

Nancy Schofield
LCIP: Lower Chippewa
Invasives Partnership
June 22, 2017

Amur Cork tree

Amur for birthplace Amur River
Boundary between China and Siberia
(am-MOOR)

Cork for its resemblance to the bark from a true cork tree, an evergreen oak


Amur River
Boundary between
China and Siberia
RUSSIA
Sea of
Okhotsk
Shilka
Onon
Amur
MONGOLIA
CHINA
Ussuri
Amur river 3rd
largest free-flowing
river in the world
Sea of
Japan

Amur Cork tree

*phellodendron amurense

(fell-oh-DEN-drawn am-moor-EN-see)

from Greek: phellos means cork

dendron means tree

family: Rutaceae

Citrus family

***NOT philodendron**

philo = Greek word for love


Karren Wcisel © 2004

Amur Cork tree - history

- **Native Eastern Asia:** N. China, Korea, Japan
- In 1862 Smithsonian Institution, National Museum of Natural History, cataloged a specimen from Japan
- Believed brought to US by Chinese immigrants in 1850's (labor in gold mines, later on the railroads) (their native flora, medicinal properties)
- Harvard University Arnold Arboretum 1906. New York Botanical Garden 1933 – today
- Within 50 years of planting as ornamental
  ➔ dominant tree in New York City parks

What gives tree competitive advantage?

Habitat:

- Adaptable to various environmental conditions and to many soil types
- Found in forested areas or along rivers
- Heat-loving, cold and drought tolerant
- Thrives in forests and wooded areas exposed by human disturbance

What gives tree competitive advantage?

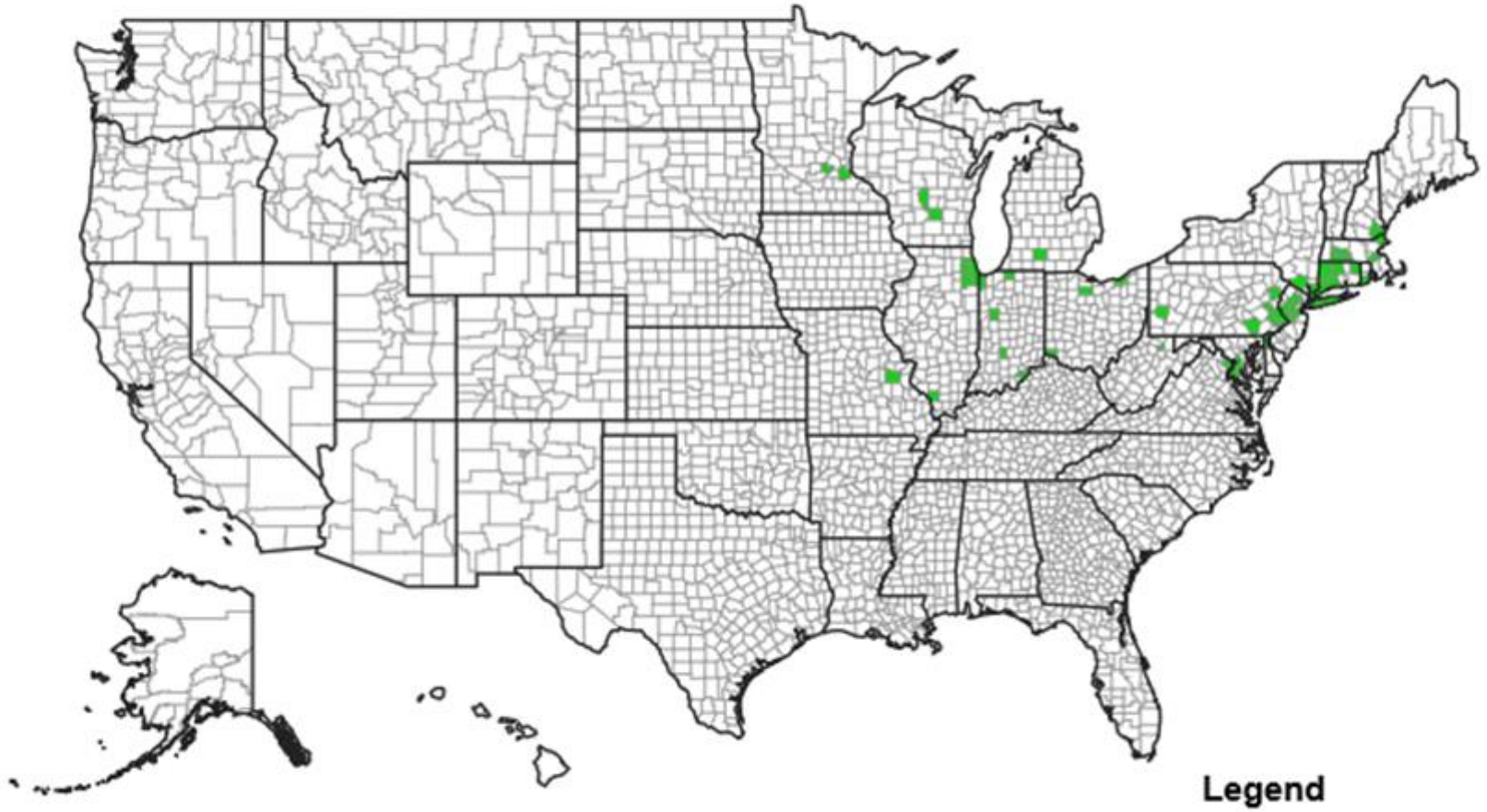
- once established, displaces native plants, outcompetes native tree and shrub species
- trees cluster around the original specimen and colonize the area. Forms a dense stand and crowds out native species. Produces great number of small trees
- no serious pest problems
- in areas with ample moisture and good soil, produces large amounts of seed to be disbursed by birds

Reports made by experts

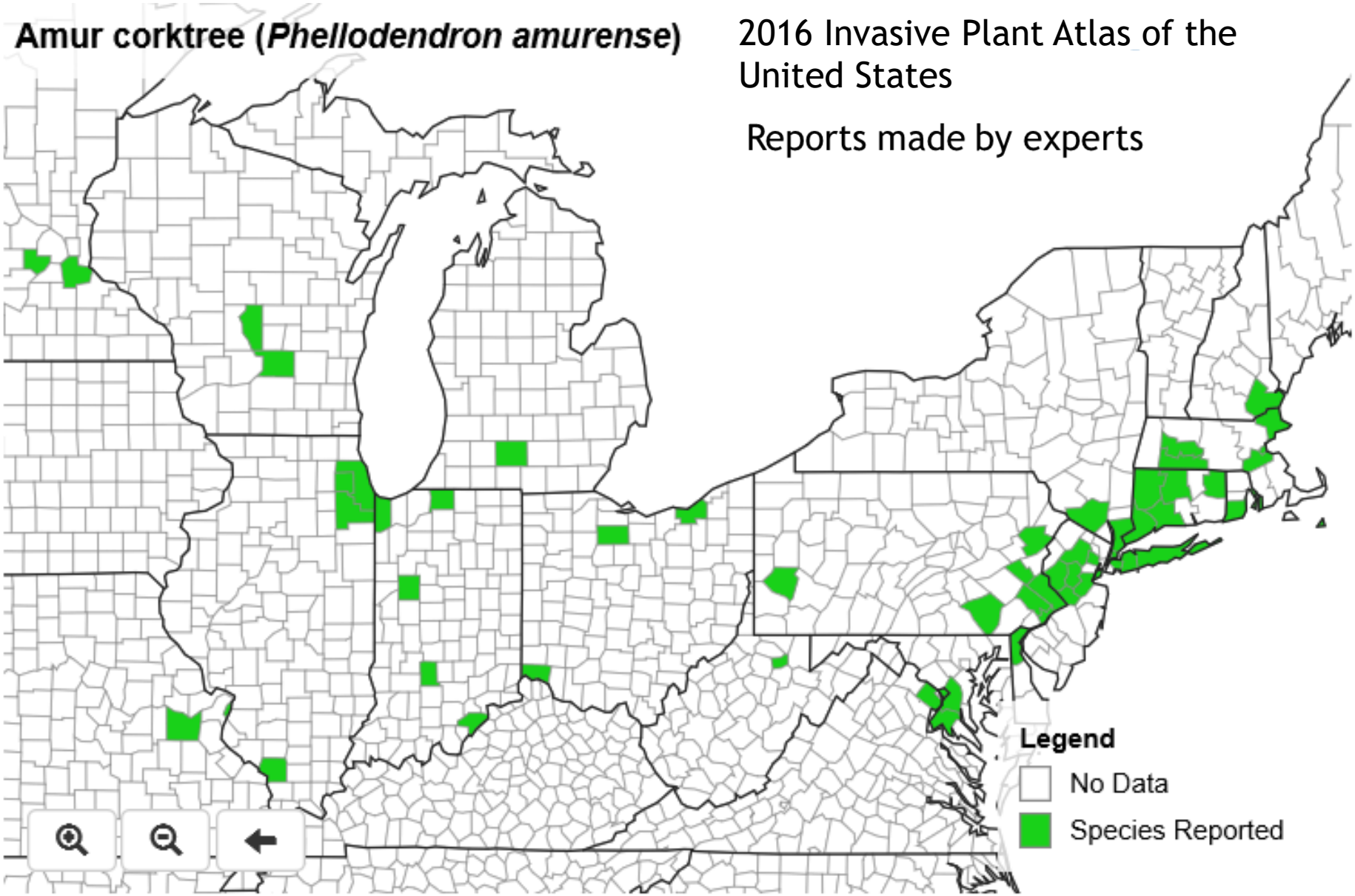
EDDMapS Distribution:

This map is incomplete and is based only on current site and county level reports made by experts and records obtained from USDA Plants Database. For more information, visit www.eddmaps.org

Amur corktree (*Phellodendron amurense*)



Swearingen, J., C. Bargeron. 2016 Invasive Plant Atlas of the United States. University of Georgia Center for Invasive Species and Ecosystem Health.


Amur corktree (*Phellodendron amurense*)
2016 Invasive Plant Atlas of the United States
Reports made by experts
Legend
No Data
Species Reported

UF | IFAS Extension
UNIVERSITY of FLORIDA

Reports ~~made by experts~~

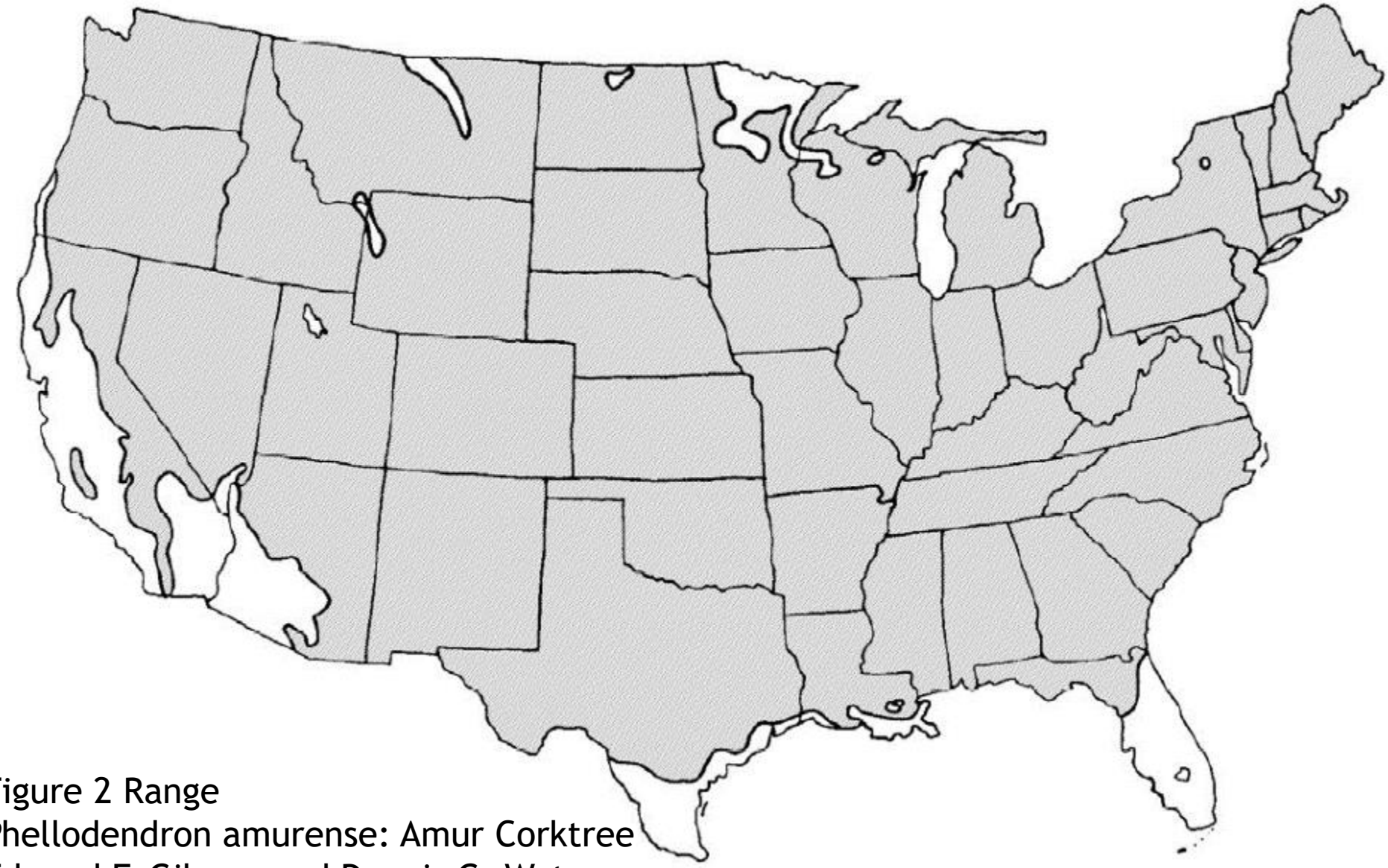


Figure 2 Range
Phellodendron amurense: Amur Corktree
Edward F. Gilman and Dennis G. Watson
February 2014

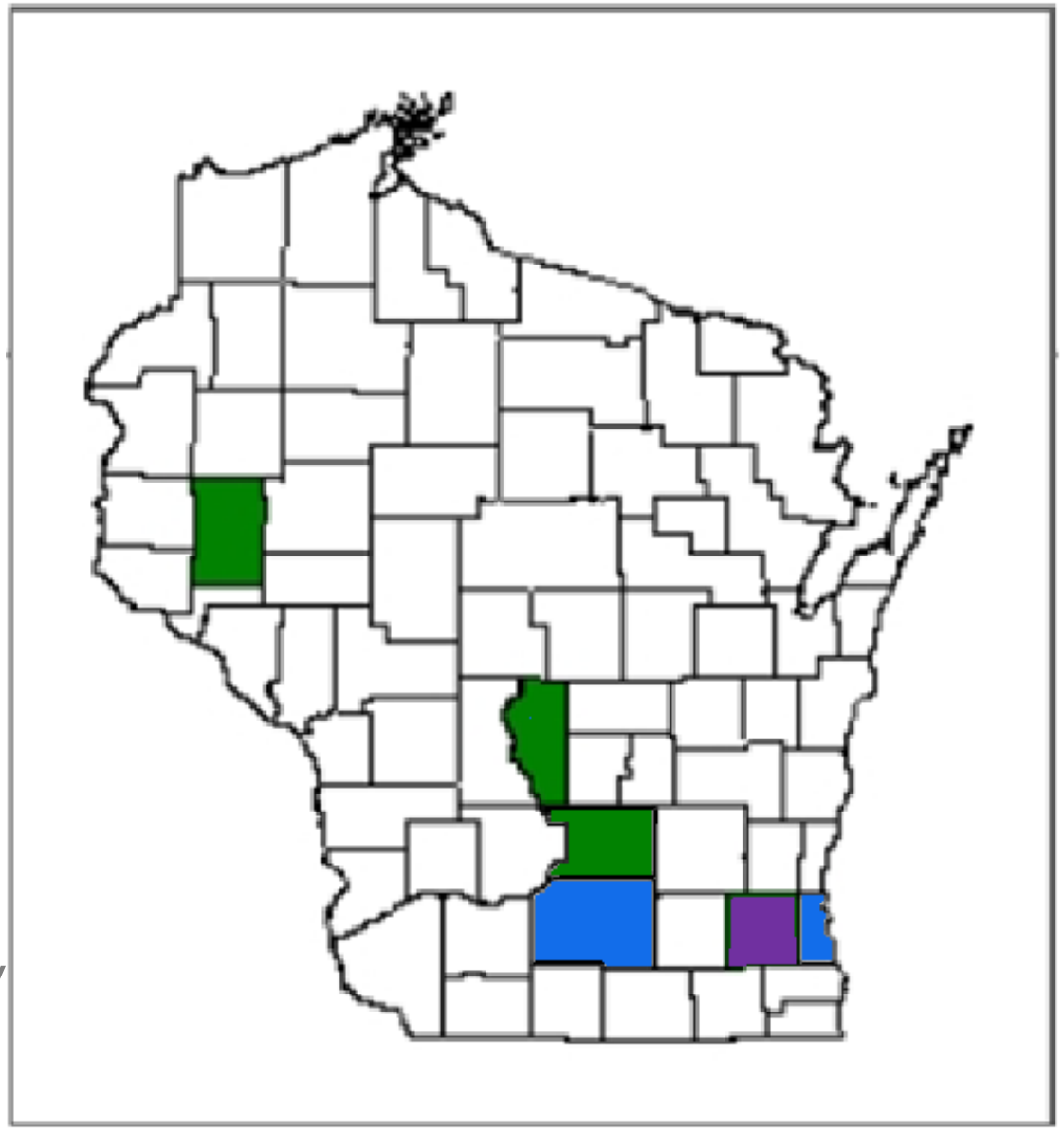
Amur cork tree emerging threat to WI forests

Counties:
- Adams
- Columbia
- Dunn

Single female trees:
-Dane
-Milwaukee

? Waukesha ?

Map adapted to show
current list from: dnr.wi.gov



Amur cork tree emerging threat to WI forests

This species Prohibited (Red Counties)

dnr.wi.gov

Figure 1. Middle-aged *Phellodendron amurense*: Amur Corktree
Credits: Ed Gilman

Amur Cork tree – positive

- In ancient China, inner yellow bark used to make:
  - Special dye for paper for religious and governmental documents ← now can verify and date w/chemical tests
  - Used to dye silk fabric ← now research to duplicate
- Amur Cork Wood is strong, rot resistant, useful for creating railings and erosion control
- Favored as U.S. ornamental and street trees and is widely planted on college campuses… ?

Amur Cork tree bark – health claims

- The bark of Amur Cork tree prized for use in traditional medicine in China, Japan and India
- Chemical components / alkaloids give it strong antimicrobial and antibiotic properties. Many health claims and uses.
- Best known as diuretic and cooling herb that stimulates the liver and gall bladder.
- Used traditionally to lower fever and reduce blood pressure and blood sugar levels.
- Amur cork tree bark has strong bitter taste

WebMD

PHELLODENDRON Overview Information

Phellodendron is a plant… whose bark is used to make medicine…

Used for osteoarthritis, weight loss and obesity, diarrhea, ulcers in stomach or upper part of the small intestine (peptic ulcers), diabetes, meningitis, pneumonia, eye infections, tuberculosis, and cirrhosis of liver.

Some people apply to skin for psoriasis, to kill germs, and to reduce redness and swelling.

How does it work? Some chemicals in phellodendron might reduce redness and swelling (inflammation). Another chemical, berberine, might be able to lower blood sugar and “bad” LDL cholesterol as well as protect the liver against toxic materials. Berberine might also be active against tumors.

However, berberine can be harmful as well.

RxList
The Internet Drug Index

Found Insufficient Evidence to Rate Effectiveness

Amur Cork tree fruit oil

- The oil has insecticidal properties similar to pyrethrum
- The oil contains a variety of biologically active substances, including flavonoids (diosmin), alkaloids (berberine, yatroriccin, palmatine), saponins and coumarins.
- Medicinal applications of the oil include treatment of pancreatitis, reduction of cholesterol and sugar in blood and the treatment of various skin diseases

Essential oils:

- Fruit oil contains myrcene (62.3-70.3%) and ß-caryophyllene (6.8-10.5%)
- Leaf oil contains ß-elemol (18.5%) and (Z)-ß-ocimene (12.6%)
- Flower oil contains (Z)-ß-ocimene (9.5%), ß-elemol (9.4%), myrcene (7.8%) and nonacosane (7.7%)
- Amurensin, a tert-amyl alcohol derivative of kaempferol 7-O-glucoside, can be found in P. amurense.

Amur Cork – examples of Chinese Sources

Price per kilogram		Price per lb		Product
$20	$50	$9	$23	factory High quality natural Amur cork tree Bark Extract 20:1
$20	$40	$9	$18	Top Quality Amur cork tree Bark Extract, Bark Powder
$500	$1,000	$227	$455	Natural Amur cork tree bark extract
$10	$20	$5	$9	100% natural Amur Corktree fruit oil

Description: deciduous tree shape:

- Grows 30 to 40 feet tall, reaches 50 feet
- Similar width
- Short trunk
- Branches usually low on trunk, droop and grow horizontally forming an open, rounded, spreading canopy*
- Root system:
  - Shallow
  - Spreads widely

* *"ideal as a durable shade tree…"*NOT

IDENTIFICATION

- Young specimen
- How did I know?

Young specimens

definitely a lighter tan (golden brown) color than other local tree species

“Much easier to identify in winter” *

*Chris Gaetzke

Amur Cork Bark : Compare

- Older: Light gray color

Mature specimens have short dark gray trunks with deeply ridged and corky bark

- Younger lighter tan (golden brown)

Amur Cork Mature Tree Bark

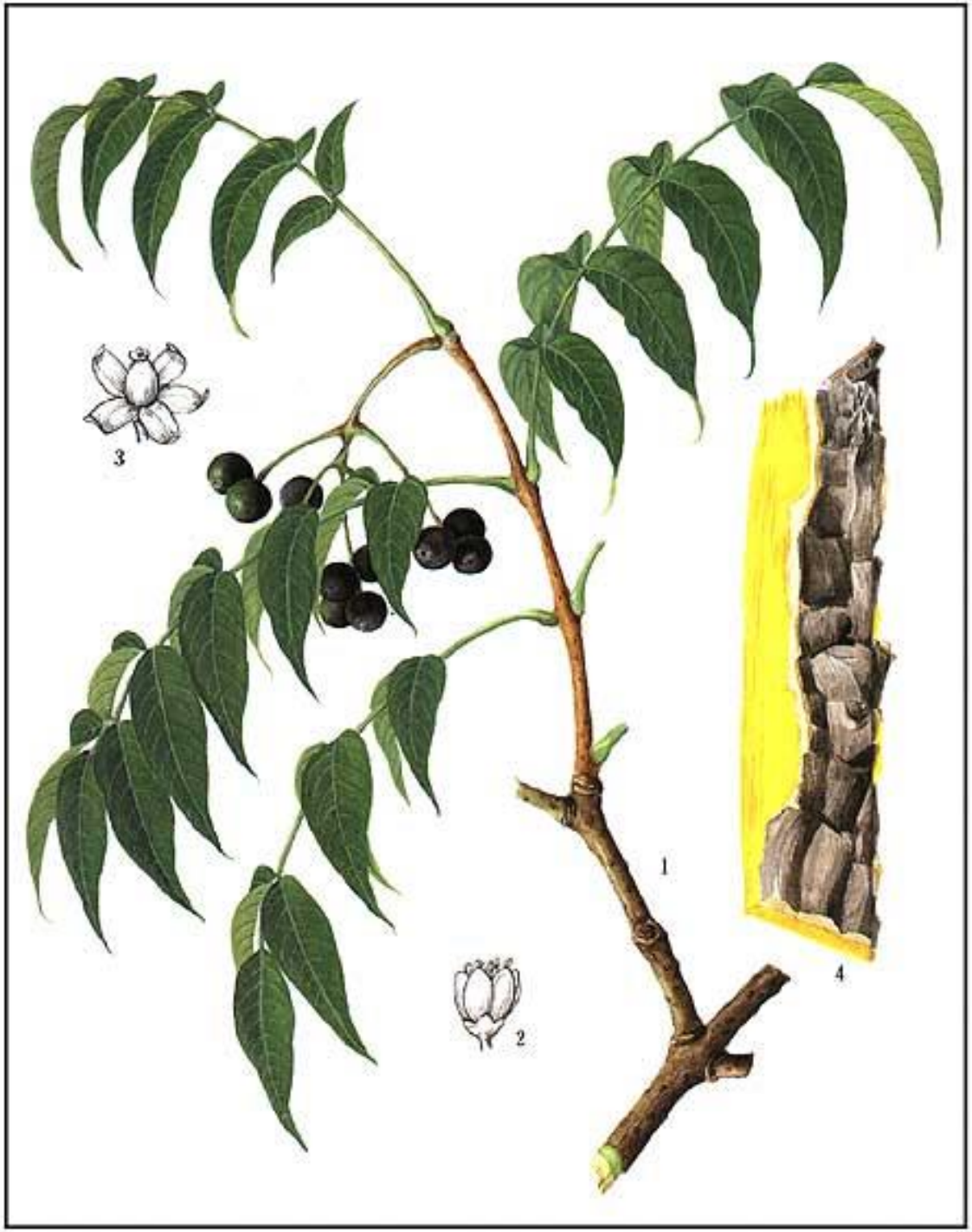
- Distinctive bark - almost diamond pattern on larger trees
- Conspicuously ridged and furrowed
- Soft and cork-like to the touch; can pierce w fingernail


Mature trees take on a
corky texture

Amur Cork ID

- Leaves:

1. Pinnately = arranged pairs on opposite sides of stem
2. Compound = 5-13 leaflets per 1-14 inches long ‘leaf’
3. Dark green, change to bronze and bright yellow in fall, before drop
4. Deciduous



http://www.itmonline.org

Amur Cork Identification:
male and female trees

- Dioecious plant: distinct male and female separate plants
- Produce either all male (staminate: stamin = anther, filament) or all female (pistillate: pistil ovary, style, stigma – often in center of flower) flowers on separate trees
- Biparental reproduction – takes two parents - produces fruit only on female

Encyclopedia of Life

Amur Cork Identification:

Female	**Male**
Flowers	Flowers
Fruits = seeds	---
Only Female trees are Prohibited under NR40	Not Prohibited

“Female trees can be marked in fall when fruit present. So visible in forest after leaves have fallen” *

*Chris Gaekzke

Amur Cork Flowers

Blooming period: late spring to early summer ~ two weeks

Regardless of gender:
>flowers 1/8" (3 mm) across
>calyx: short green or maroon
>5 teeth
>corolla: yellowish green or maroon with 5 lobes

Male tree - The Toledo Botanical Garden in Toledo, Ohio

Amur Cork Fruit

small globoid fruits 3/8" (1 cm)
replace female flowers
fleshy, bright green =>
off-white =>
blue-black or black
mature in autumn
Each fruit - 5 seeds

drupes (fleshy fruit with a single stone) ¼ - ½" (0.6 - 1.3 cm)

Berries are dispersed long distances by birds – seeds remain intact!

small black drupes with seed

Amur Cork smell of leaves

Published:

"faintly smell of citrus when crushed"

Experience:

Strong odor when crushed. They stink!!!
More like: skunk! disinfectant! turpentine!

Smell varies by season

The odor of fruits is similar
to odor of crushed foliage

Amur Cork leaves in fall - golden

Amur Cork

Bright yellow cambium layer (inner bark)

Most reliable distinguishing trait

photo by Chris Gaekzke

- Peeling outer bark reveals bright yellow cambium

IDENTIFICATION

- Young specimen
- How did I know?

Pinnately leaves

Slight gold tan of bark

AND???

IDENTIFICATION

- Bright yellow cambium layer (inner bark)

Amur cork trees grow:

F A S T !

- Mother tree - stump on Mary Gale's land
- "Chris also noted that a large stump from a cut Amur cork tree was 30" in diameter, and according to the tree rings was only 30 years old! That's some rapid growth!" *

* dnr.wi.gov


Extreme Growth!!!
6 rings = 4 inches
Ø grew 8 inches in 6 years!
KOMELON
P.R. APP'D
PTA-01-115

immature Amur Cork Tree = thin but so TALL!!!

Note: ineffective branch collar
→ a branch can be easily broken off

Tree's goal:

Great Size!

Amur Cork is Allelopathic

Plant allelopathy = means of survival in nature

- Plant exudes chemicals to alter soil microorganisms and surrounding vegetation
- Reduces competition from nearby plants

- Most allelopathic plants store 'protective' chemicals within leaves. In fall leaves drop to ground and decompose
- Some plants also release toxins through their roots into soil
- These toxins can affect nearby plants

- Documented: Presence of Amur Cork kills surrounding buckthorn!

- The active constituents of Amur Cork are: berberine, jatrorrhizine, magnoflorine, candicin, palmatin, obacunone, 7-dehydrostigmasterol, beta-sitosterol and campesterol
- Berberine and palmatine are identified as active allelochemicals

DNR reports Amur Cork trees in Dunn County

INVASIVE tree threatens ecosystem Volunteers begin to root out

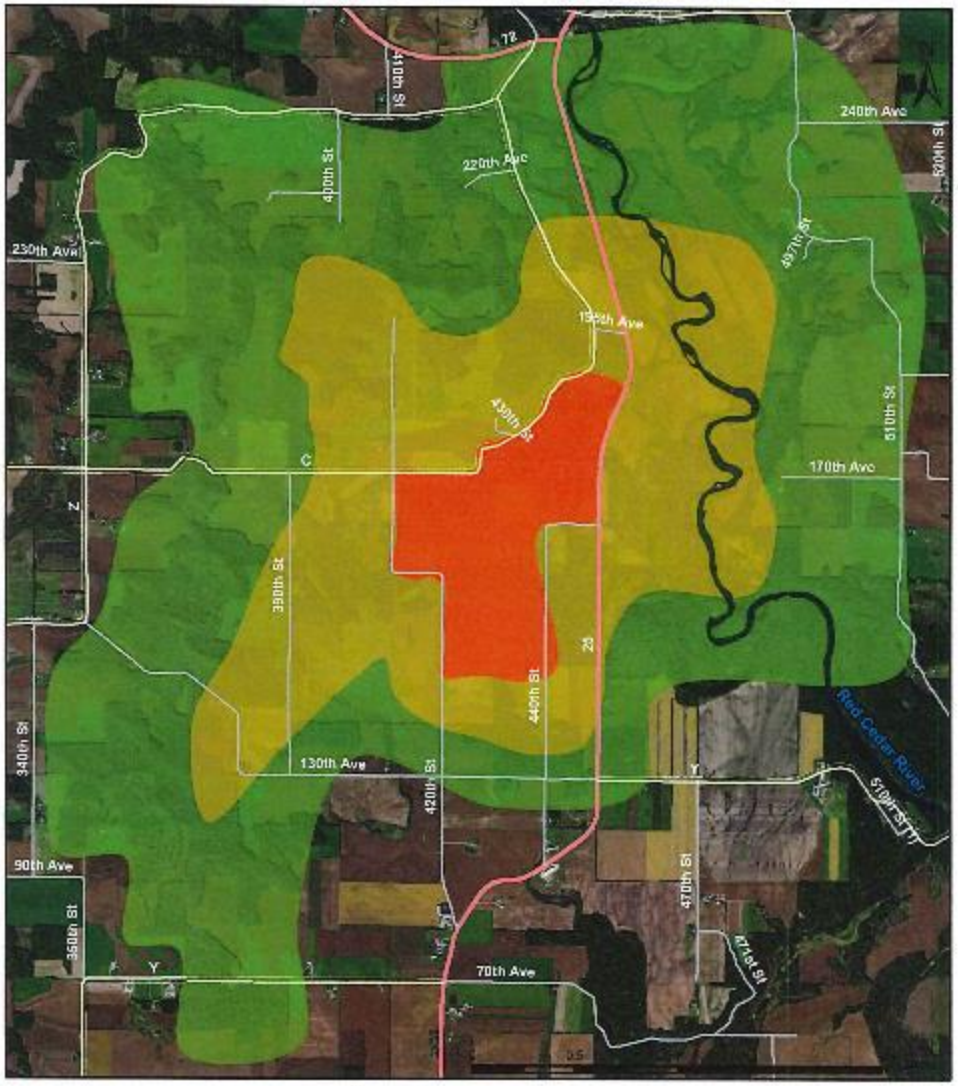
posted August 19, 2016
Dunn County News
Eau Claire Leader Telegram

NEWS 18 abc EAU CLAIRE'S OWN WQOW.COM

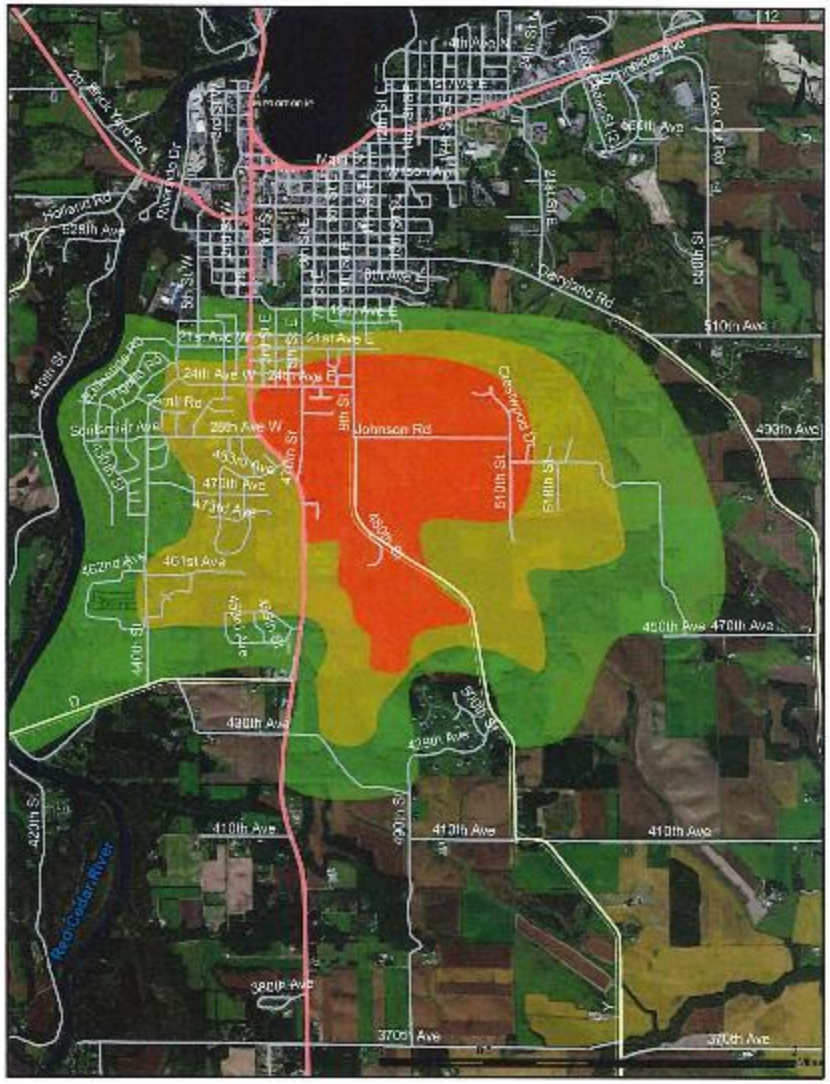
Staff photo by Pamela Powers - Property owner Mary Gale cuts away the bark of a immature Amur cork tree to show the bright yellow inner bark. Volunteers are trying to eradicate the invasive species.

Amur Cork Tree (Phellodendron amurense) in Dunn County

South of Downsville



Menomonie



Legend

Areas of potential spread

- High risk
- Low risk
- Medium risk

Road Type

- State Highway
- County Road

Amur Cork Tree is a newly listed prohibited invasive species that is quickly being discovered to have already spread into public and private land. Because the species is prohibited, it is required to be removed from all land affected. There have been several sites already identified both near the south end of Menomonie and south of Downsville. This map shows the areas at immediate risk of the spread of this highly invasive tree so that LCIP can help fund the removal.

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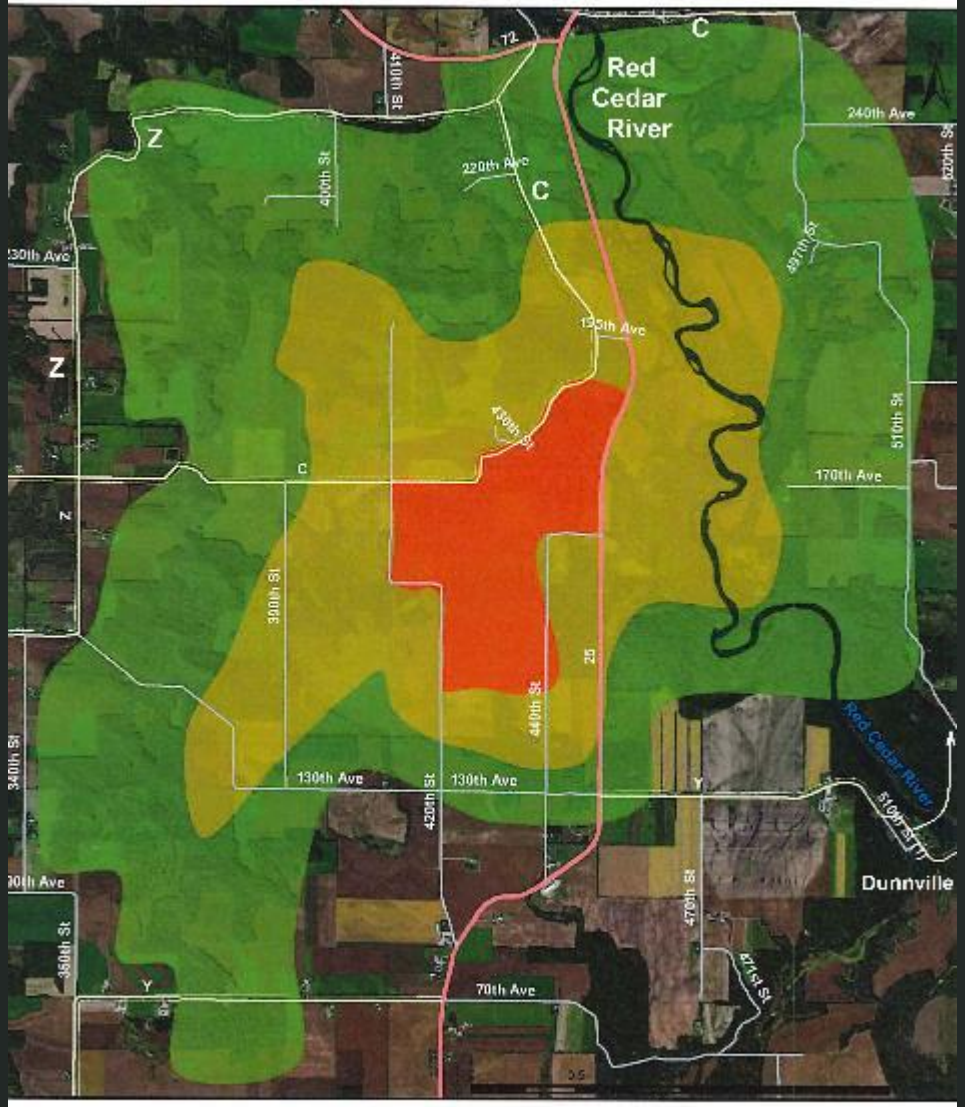
Amur Cork Tree (Phellodendron amurense) in Dunn County

South of Downsville



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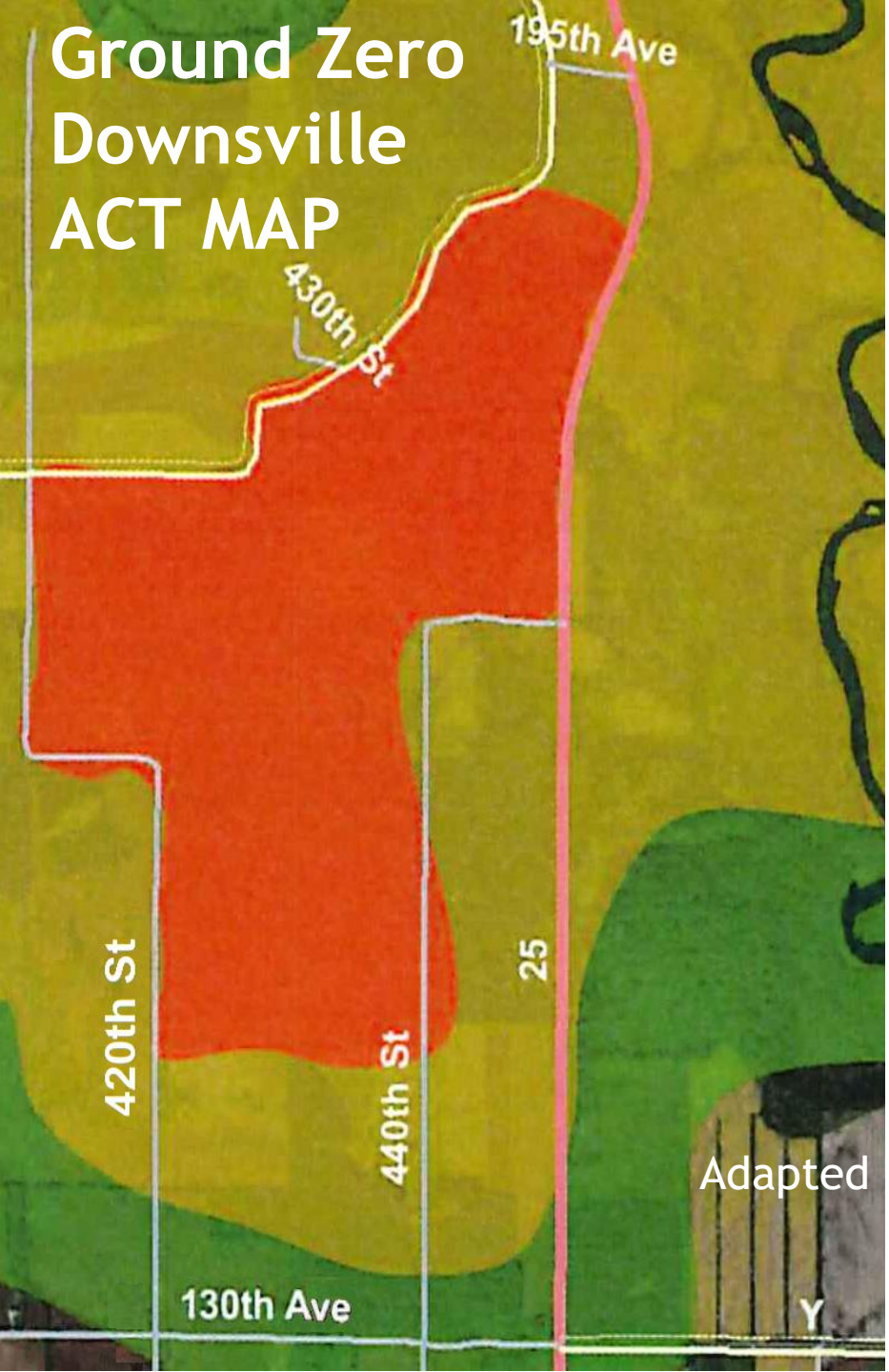
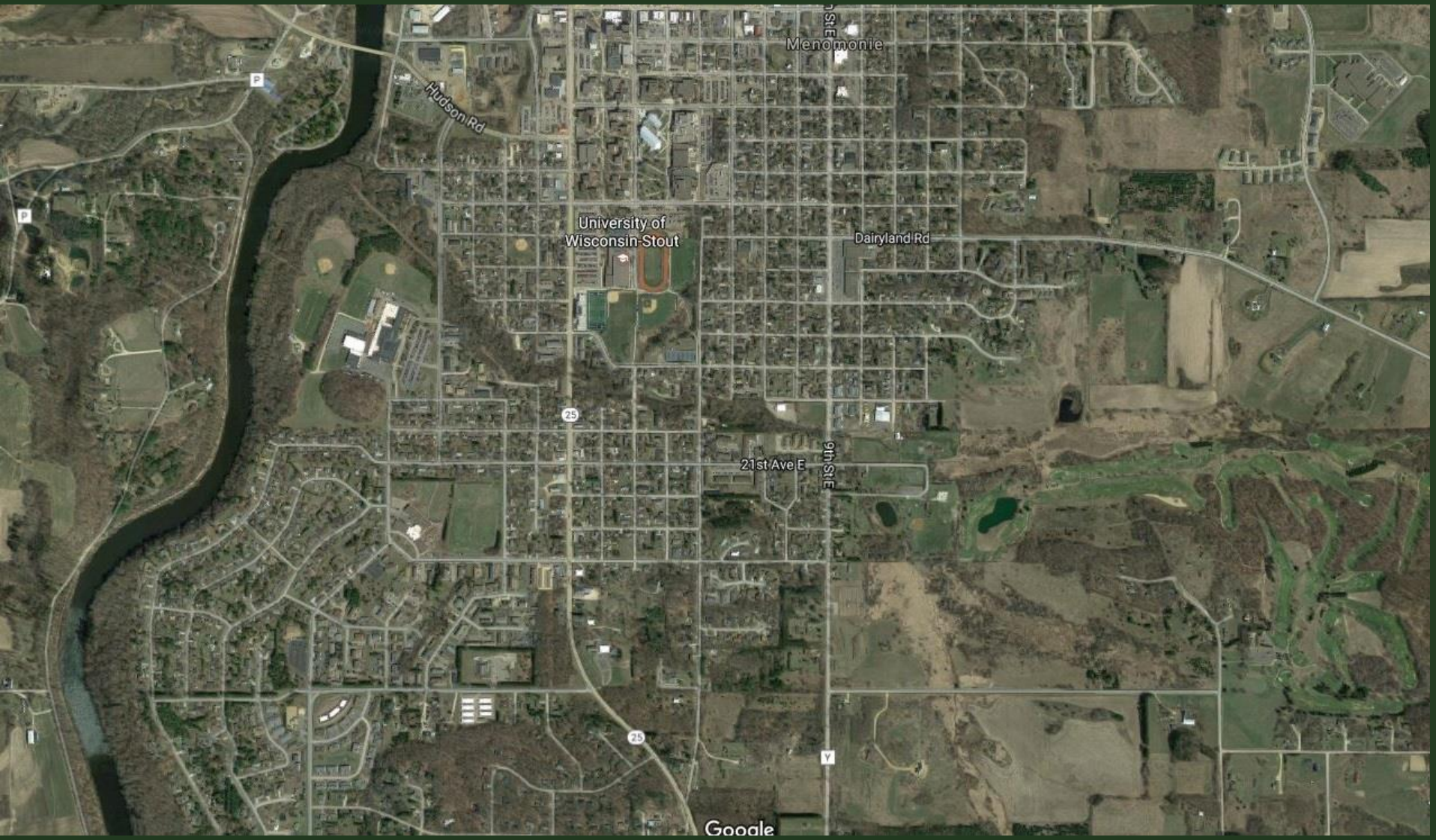
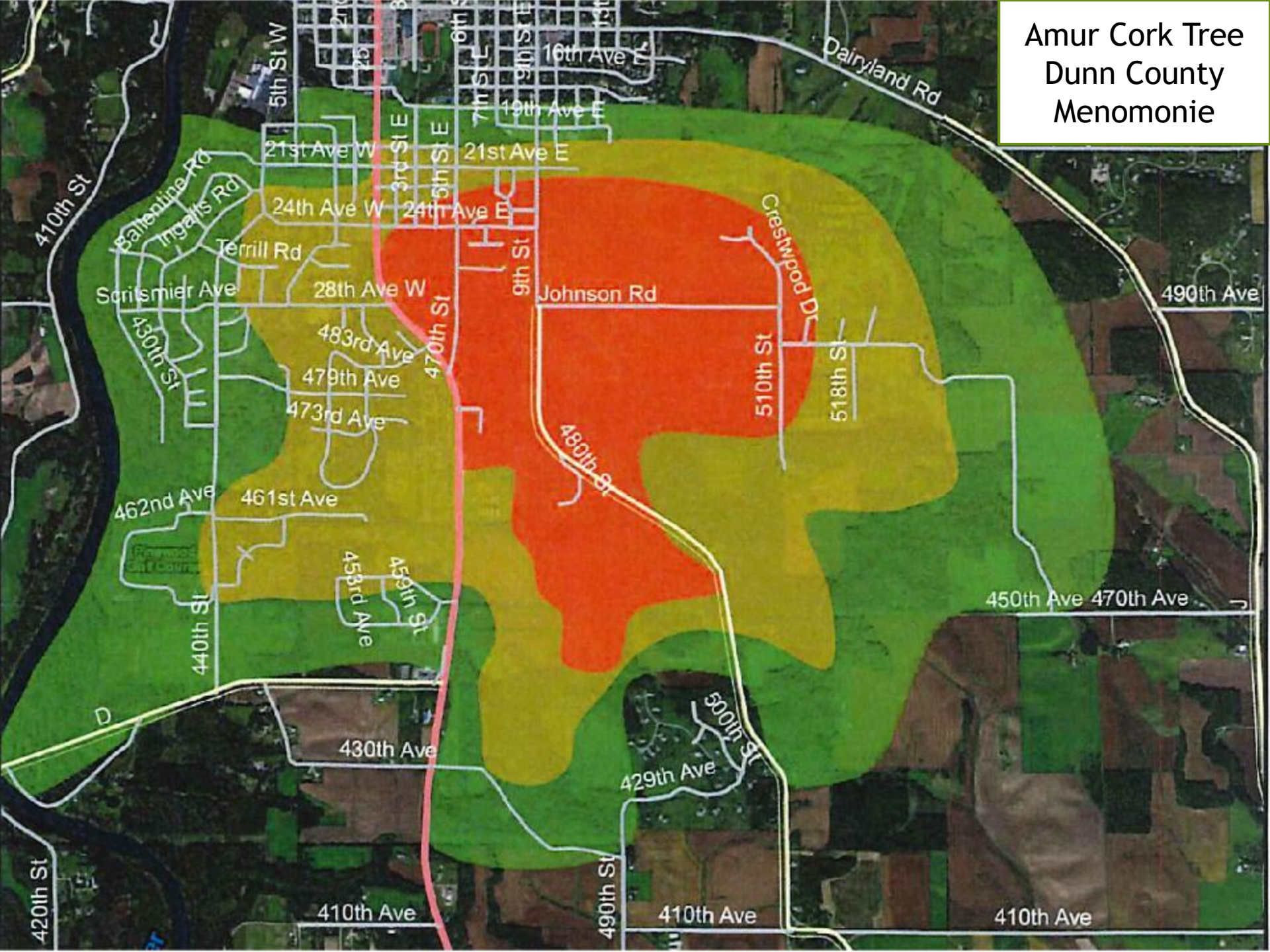

Ground Zero
Downsville
ACT MAP
195th Ave
430th St
420th St
440th St
25
130th Ave
Y
Adapted by NAS


Ground Zero
Downsville
Google map
195th Ave
C
C
25
440th St
420th St
25
25
130th Ave
Y

Ground Zero Menomonie:

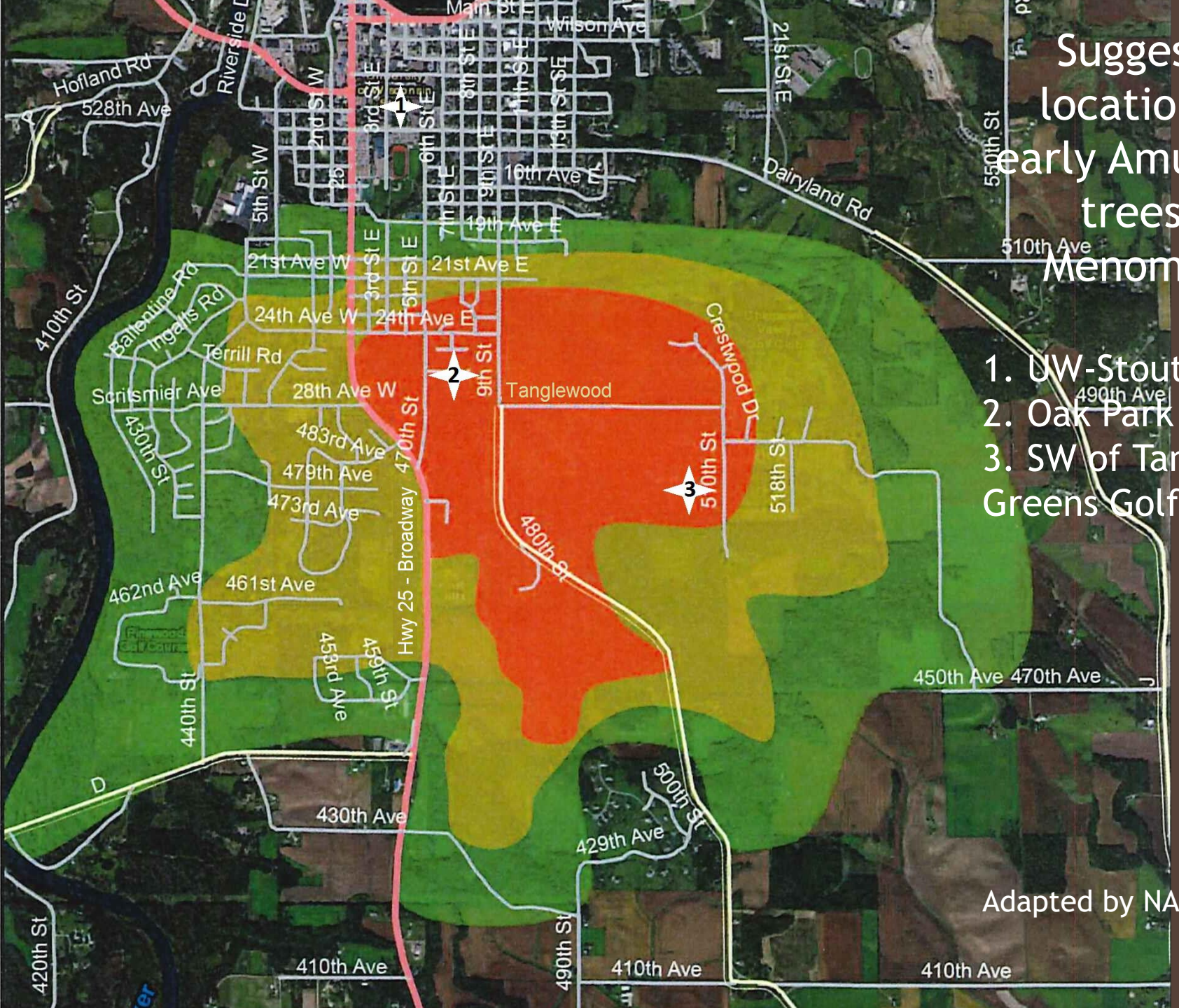



Amur Cork Tree
Dunn County
Menomonie
5th St W
16th Ave E
Dairyland Rd
19th Ave E
21st Ave W
21st Ave E
410th St
Ballentine Rd
Ingalls Rd
24th Ave W
24th Ave E
Terrill Rd
Scritsmier Ave
28th Ave W
9th St
Johnson Rd
Crestwood Dr
490th Ave
430th St
483rd Ave
470th St
479th Ave
473rd Ave
510th St
518th St
480th St
462nd Ave
461st Ave
458th Ave
459th St
440th St
450th Ave
470th Ave
500th St
430th Ave
429th Ave
420th St
410th Ave
490th St
410th Ave
410th Ave

Mike Smith
Grounds UW-
Stout

Only mention in
Stout record
1986 listed
existing Amur
Cork tree on
grounds. Single,
Female tree.
No male.
Not invasive.
Removed 2015

UNIVERSITY OF WISCONSIN
STOUT
WISCONSIN'S POLYTECHNIC UNIVERSITY


Suggested locations of early Amur Cork trees in Menomonie
1. UW-Stout campus
2. Oak Park Circle
3. SW of Tanglewood Greens Golf Course
Adapted by NAS
Tanglewood
Hofland Rd
528th Ave
Riverside Dr
Main St
Wilson Ave
21st St E
550th St
Dairyland Rd
510th Ave
5th St W
2nd St W
3rd St E
6th St E
7th St E
8th St E
9th St E
10th Ave E
19th Ave E
21st Ave W
21st Ave E
24th Ave W
24th Ave E
410th St
Ballentine Rd
Ingalls Rd
Terrill Rd
Scritsmier Ave
28th Ave W
430th St
483rd Ave
479th Ave
473rd Ave
470th St
9th St
Crestwood Dr
490th Ave
510th St
518th St
480th St
462nd Ave
461st Ave
Hwy 25 - Broadway
453rd Ave
459th St
440th St
450th Ave
470th Ave
500th St
430th Ave
429th Ave
420th St
490th St
410th Ave
410th Ave
410th Ave

Classification in Wisconsin: Prohibited - Ecological threat

Adaptable to:

- different soil types (clays to sands), acidic to alkaline
- both full sun and under dense shade
- tolerant of urban areas

Threatens nearby plants:

- Grows incredibly rapidly: shoots straight up
- New trees planted from berries - by birds
- Shades other plants, changes available light
- “Harms” soil so other plants can’t grow

Solution: Only plant male trees?

- Therefore: “a solution may be to ensure that only male trees are sold or planted” *
- Not reliable: “It has been observed that these trees often have the ability to alter their sex (it’s not uncommon in woody plants)” *
- Difficult to tell whether a tree is male or female
- Documented problems: mislabeled in the nursery

NOTE: Instead of waiting til tree is large enough to determine its sex, be advised to remove all trees when they sprout. **

*Sonia Uyterhoeven NYBG’s Gardener for Public Education
**Chris Gaetzke

Similar Species: Comparison

Native **Ash** trees to **Amur Cork**

fruit: Fraxinus spp

- narrow, winged, samara

compound leaves resemble:

- 5-9 leaflets per leaf

mature bark:

- mature, large white and green ash may be furrowed, somewhat similar BUT only very old ashes **- much taller -** have such prominent ridges

fruit:

- pea-like

compound leaves resemble:

- often 9-13 or leaflets per leaf (however, they sometimes have fewer than 9 leaflets)

mature bark:

- MORE prominent and irregular ridges

Amur Cork – Chemical Removal most effective method:

1. Cut down or girdle tree
2. Then apply systemic herbicide like **triclopyr** or **glyphosate**

- Temperature above 60 degrees F for 24 to 48 hours
- No rain expected for at least 24 hours
- Fall or winter herbicide applications will avoid impacts to other vegetation
- Repeated treatments likely necessary
- (Watch for sprouts and treat)

Land & Water Conservation Division

- **“LCIP has found that Garlon 4, ester formula product works great on ACT in both basal bark and cut stump treatments.**
- **We have found success in using this herbicide, mixed with horticultural oil, in all seasons except in spring when sap flow is up.” ***

*Chris Gaetzke

LCIP Lower Chippewa Invasives Partnership

MANAGEMENT OPTIONS

Best control: Do NOT plant this tree!

- Compare to hundreds of hours of labor and thousands of dollars spent to remove it once established
- Long-term strategy of monitoring and follow-up, re-treating:
  - Seeds remain dormant in the soil for a few to several years
  - Tends to resprout vigorously after being cut back or incompletely girdled
  - Sprouts can produce large amounts of seed
- Female trees should be prioritized for control, to remove the primary seed source. They can be marked in the fall when the fruits are present and highly visible in the forest after the leaves have fallen
- Cleared sites should be replanted with appropriate native species to prevent reestablishment of corktree

Amur Cork Invasion

Prevention

- Limit habitat disturbance because these trees easily invade disturbed habitats
- Learn to identify tree
- (Plant only MALE trees)
- Do NOT plant this tree ! ! !

NOTE: Instead of waiting til tree is large enough to determine sex, be advised to remove all trees when they sprout. *

**Chris Gaetzke

Thanks to my sources:

Chris Gaetzke,
Dunn County LWCD
Land & Water Conservation Division
cgaetzke@co.dunn.wi.us

Mary (Mame) Gale
Landowner – of early pair of trees

Susan King
Gardener ~ invasive species removal


The End