

## TAB 8

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# SERVICES

# District Services & Tree Planting

## District Services

The Soil Conservation Districts are financed through the charges they make for supplying special equipment or services to cooperators. All districts own and operate specialized types of machinery needed to carry out soil conservation practices such as tree planters and maintenance equipment, no-till drills, undercutters and shredders, pipeline installation machines, and grass seeders. Charges should be calculated at a minimum to pay for materials, operating costs, equipment, and overhead.

Charges for district services should pay all the above costs and provide the necessary funds for the district to carry out its conservation program. Also, it includes education, promotion, and/or other related services as deemed by the Board of Supervisors to complete the work.

### Tree Planting:

Tree planting is usually the District's main service. The District Clerk/Manager and District Technician are involved in the tree program. A tree program involves the following responsibilities:

- Providing technical assistance to producers
- Advertising your tree program
- Developing tree plans
- Checking into cost-share options
- Ordering tree stock
- Equipment maintenance
- Follow NRCS Tech Guide Specs
- Sending producer maintenance forms, deposit letters, & tree planting agreements
- Tree cooler preparation
- Overseeing tree planting crew
- Staking tree planting sites
- Tree planting
- Handplant orders

To ensure a successful tree planting program you will need to develop some of the following items: ***(these items can be found under Tab 8 Templates)***

- Tree Planting Report Form
- Tree Planting Report (Site Conditions)
- Tree Planting Crew Guidelines
- Tree Planting Agreement
- Handplant Order Form
- Tree Plan Checklist
- Assignment Forms
- Tree Ledgers

Safety precautions need to be followed when staking and planting trees and fabric application. This includes hard hats, goggles, proper footwear, and gloves.

An example timeline to follow for your tree planting program are as follows:

### **January**

- Send a letter to your tree planting producer along with a tree planting agreement, down payment amount, windbreak/shelterbelt operation & maintenance form, and assignment form.
- Plan your tree planting activities for the year
- Publish a new article promoting tree plantings for snow management
- Take photos of snow management problems or success for use in news articles or future tree promotional activities
- Develop a brochure promoting tree planting
- Continue to work with nurseries and supplies on tree stock availability and ordering
- Develop newsletter articles

### **February**

- Order fabric from your supplier and schedule it to be delivered in April
- Make farm visits to promote tree planting
- Visit City Commission, Township, and County meetings to promote tree plantings
- Contact absentee landowners to encourage tree planting, especially wildlife plantings
- Contact local sportsman's clubs and ask for help to provide cost share for wildlife plantings.
- Get tree planting customers to sign up for cost share programs
- Follow up on down payments and agreement forms
- Develop newsletter articles

### **March**

- Check to make sure cultural resources are completed and tree agreement, assignment form, maintenance form, and deposit have been returned.
- Publish news article promoting tree planting for livestock protection
- Continue to make one on one farm site visits
- Hire tree planting crew
- Check on tree planting cost share approvals
- Prepare tree planting equipment
- Inventory tree planting plans and adjust nursery tree orders
- Contact school or community groups to plan an Arbor Day Program
- Consider opportunities to sell trees to non-traditional customers
- Develop newsletter articles
- Attend Tree Promotional Meeting for new ideas and training

## **April**

- Schedule pick-up and delivery of trees. Contact producer on site conditions and schedule a planting date.
- Inspect all tree planting site. Encourage site preparation as needed.
- Make final contacts to see tree plantings
- Identify an enclosed vehicle or trailer to transport trees from the nursery (AVOID ANY USE OF OPEN PICKUPS AND TARPS)
- Complete final repairs and servicing of tree planting equipment
- Prepare a scheduling listing the order tree plantings will be completed  
Contact customers and give an estimated planting date. (Discuss site preparation at this time)
- Schedule a day to train tree planting crew and review safety regulations
- Stake tree planting sites
- Develop a form to record weather, field conditions, and tree stock information at each planting site.
- Start you tree planting if weather permits
- Develop newsletter articles

## **May**

- Plant Trees. Record weather, field conditions, and stock information at each site
- Follow proper tree storage procedures
- Invite TV or newspapers to do a story on your tree planting program
- Make final contacts to sell additional trees
- Order extra trees from the nurseries
- Put on a local Arbor Day Program
- Begin installing weed barrier fabric
- Organize a tree planting event in a park or other public site to plant excess trees
- Take pictures of tree planting operations for future news articles
- Develop newsletter articles

## **June**

- Sell excess trees for conservation plantings
- Finish installing weed barrier
- Finish tree planting records, bills, and cost share forms
- Encourage customers to water new planted trees if weather is hot and dry
- Service tree planting equipment and put in storage
- Clean out tree cooler. Wash inside with bleach to control mold
- Do first tree row cultivation
- Arrange for booth at County Fair to promote tree planting
- Status tree plantings and encourage weed control if needed
- Develop newsletter articles

## **July**

- Contact landowners interested in planting trees next year. Encourage starting site preparation now.
- Promote tree plantings at tour, meetings, fairs, and Ag Shows
- Visit spring planting sites and talk to landowners. Note problems and suggest corrections
- Select a good tree planting and take photos of the landowner with their trees for a future news article

## **August**

- Select a producer to be your tree maintenance award winner. Take pictures for news articles
- Visit landowners that have indicated survival problems. Attempt to identify causes. If problems are identified, develop a plan to prevent similar problems in the future
- Visit landowners needing windbreak renovation
- Send follow up letters to all customers that planted trees in the last three years and encourage them to check for survival and encourage hand plant ordering.
- Develop newsletter articles

## **September**

- Demonstrate or display tree planting equipment and weed barrier fabric at a conservation program or public event
- Promote non-traditional tree plantings such a riparian, forest block and fruit orchard.
- Plan fall conservation tours with schools
- Put tree plantings articles in SCD newsletters
- Check and record survival for each tree species at all spring planting sites. Compare survival with spring planting records and note impact of weather, site conditions and stock dates
- Prepare a tree planting article for the local newspaper. Include a picture of the landowner and their tree planting. Interview the landowner for a human interest story related to tree planting on their farm or ranch
- Check tree plantings to be sure weed barrier fabric is not girdling trees. Remind landowners that periodic maintenance of fabric is essential to long term health of the tree

## **October**

- Send a letter and order form to all customers that planted trees in the past – Encourage hand plant replacement.
- Send a letter and tree order form to all potential conservation tree planters in your District
- Place an ad in the local newspaper for replacement trees
- Field visits to producers a must
- Start developing and working on next year's tree plantings and cost share programs, review ground preparation needed

## **November**

- Prepare plans for next spring tree plantings
- Contact customers that have planted trees in the past and review new cost share programs to generate interest in a new planting
- Farm field visits for potential tree planting customers
- Make final counts for replacement trees and notify nurseries of tentative order
- Attend the ND Association of SCD Districts Annual Meeting

## **December**

- Review cost share and grant opportunities for ways to promote tree plantings
- Develop newsletter articles
- Set a tree planting goal for the coming year and review this with the supervisors and record in District Annual Work Plan
- Visit neighboring SCD's to exchange tree planting sites
- Make farm visits to sell trees
- Work on Annual Report and show accomplishments

## **Breaking Dormancy (Sweating Nursery Stock)**

If you are planting hackberry, oak, and hawthorn, these seem to be the ones I'm having trouble with, I'm sure there are others.

When these come off the truck I keep them out of the cooler, putting them through the sweating process. Using the waxed boxes I get plants shipped by UPS. I have good luck by first of all on the hackberry cutting off the first inch or two of the branch tips. This part of the plant is usually very thin and dried up.

Tie the flaps up on the boxes, place shredded paper on the bottom of the box. Stand the plants upright in the box adding a good handful of shredded paper between each 4-5 bundles.

Give the plants and paper a good misting, cover with clear plastic from the tops of the seedlings to the bottom of the outside of the box.

Try to keep this as air tight as possible, keeping the moisture and heat in. They will need some direct sunlight. Do not let them dry out!

When 80 – 90% of a bundle has noticeable green buds it is time to place that bundle into the cooler until needed for planting.

# Refrigerated Storage of Tree Stock

## Deciduous Trees

**Before storage**.....treat inside of cooler with fungicide to control mold.

**Root dips**.....dip plants in fungicide prior to storage.

**Storage temperature** .....34 to 38 degrees F.

**Air circulation**..... is essential for adequate cooling. Use shelves or spacers to allow good air circulation around trees.

**Humidity** .....above 85 percent. Avoid standing water in cooler.

**Cover Roots**..... cover roots with shingletow or other moisture holding material. Mist when necessary. Avoid covering tops to reduce mold problems.

**Mold on stock**.....white mold is usually not harmful and can be easily washed off. Stock with extensive slime like mold should be discarded. Treat remaining plants with a fungicide dip or spray to prevent further infection.

## **Conifers**

**Before storage**.....treat inside of cooler with fungicide to control mold.

**Root dips**.....**Do not dip** conifer roots before storage. Doing so will reduce survival.

**Storage temperature** .....34 to 38 degrees F.

**Air circulation**..... is essential for adequate cooling. Use shelves or spacers to allow good air circulation around tree packages.

**Humidity** .....above 85 percent. Avoid standing water in cooler.

**Cover roots**.....store conifers in the nursery packages. These packages will retain moisture For up to two weeks. After that date, check packages and add water as needed to keep packaging materials moist.

**Mold on stock**..... white mold is usually not harmful and can be easily washed off. Stock with slime like mold should be discarded. Treat remaining plants with a fungicide dip or spray to prevent further infection.



# Checklist for Poor Survival

A tree dies after planting because it is unable to establish itself on a new site. The roots must absorb water and nutrients from the soil in order to survive. So what is the most important part of the tree when it comes to initial survive? **The roots**. We look at the foliage and wonder why the tree has died, when it is the roots that have failed. The dead top is a symptom caused by the inability of the roots to support the tree.

## Reasons trees die:

- **Tree does not match the site**
  - Species or seed source cannot withstand the climate
  - Soil type or condition is wrong
- **Low vitality of planting stock**
  - Improper handling
  - Lengthy or improper storage
  - Poor nursery stock
- **Improper planting**
  - Site not properly prepared
  - Planted too deep or too shallow
  - Poor root to soil contact
- **After planting care**
  - Poor weed control
  - Herbicide or cultivation damage
  - Insect or disease problems
- **Weather conditions after planting**
  - Hot, windy weather within two weeks of planting
  - Prolonged drought
  - Floods

# Synthetic Weed Control Fabric Advantages and Disadvantages

Craig Stange, Forester, Natural Resources Conservation Service, Bismarck, ND, December 2003

Thousands of miles of polypropylene woven fabric have been applied to conservation tree plantings for weed control throughout the Great Plains, resulting in improved survival and growth. Fabric both eases and complicates subsequent management of conservation plantings, even when properly applied.



***"Ideal" fabric***

## Fabric Advantages

- Applied only once.
- Greatly increased tree and shrub establishment and survival. (Increases survival from 20% to 80%+).
- Increased growth rates immediately following planting.
- Easier and more timely weed control.
- Long lasting weed control.
- Comparable cost to other weed control methods averaged over 5 to 10 years.

## Fabric Disadvantages

- Initially expensive.
- Requires specialized machinery and trained crew to install properly.
- Proper installation is critical to prevent pulling loose in high winds.
- Does not break down, especially within the shade of trees and shrubs.
- Stems may be girdled by fabric as trees and shrubs grow.
- Suckering of some shrub species is greatly restricted within first 10 years.
- Dense sod can become established on top of fabric, negating benefits and complicating future maintenance.



***Sod growing on top***

## Fabric Management

- Inspect annually or more often if needed.
- Ensure edges are firmly anchored.
- Ensure openings are not parallel to the grain of the fabric to avoid



***Reduced suckering outside fabric. Chokecherry roots on top of soil immediately under, and parallel to fabric edge. Fabric has been removed.***

stem damage. (X, C, J, or L shaped)

- Keep soil and organic matter off fabric.
- Control aggressive weeds that may establish in fabric openings.
- Enlarge openings as needed to prevent stem girdling.
- Consider alternative weed control where dense shrub thickets are desired.

## Conclusion

Fabric has greatly increased tree planting success and vigor in conservation plantings. However, it requires regular maintenance to prevent future damage to the planting. Since fabric can inhibit suckering of some shrub species, another weed control method may be more appropriate for certain types of plantings and/or landowners. Researchers continue to develop weed control materials that will provide effective initial control with minimal long-term negative aspects. New fabric types with varying amounts of photo degradation

have been released to address potential girdling problems. Conclusions as to the success of these new fabric types are not expected for several years.



***Stem girdling after 8 years.***

# Forest and Shade Tree Pests in North Dakota

## Rural Plantings

North Dakota is largely a rural state with an economy that is deeply rooted in agriculture. Rural tree plantings are an important component of many agricultural systems and can improve rural life in the northern plains. Rural tree plantings generally refer to farmstead plantings, shelterbelts, living snow fences, wildlife plantings, and others that are designed to achieve conservation, economic, and societal goals. For example, field windbreaks reduce soil erosion during years of drought, reduce water evaporation from adjacent cropland, and increase crop yields. Similarly, some plantings are designed to stabilize streambanks, filter water runoff from adjacent agricultural lands, provide wildlife habitat, protect stretches of highways prone to severe snow accumulation, provide wind protection for livestock, or protect farmsteads and rural homes from snow and wind. Although many rural tree plantings occur in areas where the historical vegetation type was prairie, these resources are critical for the present needs of rural residents that live in the *current agricultural landscape*.

Tree plantings of the northern plains are exposed to numerous pests and environmental conditions that hinder planting success, reduce their effectiveness, and limit long-term survival. Deterioration of tree plantings are often incited by drought, flooding, frosts, inadequate spacing, weed competition, herbicide exposure, defoliating insects, and foliar diseases. As trees become weakened, canker diseases and wood-boring insects may cause further damage to these plantings. Lack of species diversity is an underlying factor in the decline of many rural plantings. Plantings composed of one or few species often experience episodes of abrupt decline simply because all trees are vulnerable to the same damaging factors. Similarly, these plantings are more susceptible to pest outbreaks in comparison to those that consist of several different (or non-host) species. Some examples include: Decline of single-row Siberian elm field windbreaks due to herbicide exposure, marginal cold hardiness, and canker diseases and decline of Colorado blue spruce plantings due to Yellowheaded spruce sawfly, *Rhizosphaera* needlecast, and *Cytospora* canker. The impacts of these damaging factors could have been greatly reduced had additional species been incorporated into these plantings. The damage to rural plantings caused by these interacting factors are more effectively prevented rather than treated. Incorporating various weed control techniques, manipulating planting density and arrangement, or selecting species most suitable for the site have been effective approaches to prevent the decline of tree plantings. In recent years, state, federal, and university forestry/tree care professionals have promoted species diversification in an attempt to avoid past experiences in tree planting decline. In practice, these techniques greatly enhanced the effectiveness of rural plantings.

Despite this, identification of species and seed sources that perform well in the northern plains is still a critical need for conservation tree planting. The number of suitable native species for the northern plains is relatively limited in comparison to more forested regions. Therefore the loss of a single species (due to the introduction of invasive pests or other factors) is magnified and further limits tree planting options and diversification efforts.



The following sections provide information about specific causes of decline in North Dakota. The following narratives are not inclusive to all damaging agents, but rather highlight the most significant insect and disease trends in 2003 and 2004.

## Insects

### Yellow-headed Spruce Sawfly (*Pikonema alaskensis*)

The Yellowheaded spruce sawfly is a damaging defoliating insect of spruce plantings in North Dakota. The insect is found throughout the northern half of the state and is most damaging in the northern tier counties and counties of the north central region. Infrequently the insect is found in the southern half of the state however severe damage is rarely observed. There are no native spruce stands in North Dakota however spruce is commonly used in rural and landscape plantings. Open growing conditions associated with these plantings provide favorable egg-laying sites for the sawfly. Female sawflies lay eggs in needles during shoot expansion in the spring. Larvae emerge within 5 to 10 days and feed on the new spruce needles for 4 to 5 weeks. Once the new foliage has been consumed, the larvae migrate to older foliage and continue feeding. Under severe infestations, entire trees can be defoliated and killed. Even moderate defoliation can significantly reduce the efficiency of windbreaks and predispose spruce trees to other damaging agents. All species of spruce planted in North Dakota are susceptible to the Yellowheaded spruce sawfly, however Colorado blue spruce appears to be preferred by the insect and sustains the greatest amount of damage. Additionally, the insect is most damaging to young spruce trees (less than 15 years old) whereas older trees appear to be avoided by the insect. Yellowheaded spruce sawfly damage is observed annually in nearly all counties of the northern half of the state and outbreaks, characterized by moderate to severe defoliation, occur periodically.



### Giant Bark Aphid (*Longistigma caryae*)

Decline of Flame willow (*Salix alba* 'Flame') were observed in 2004 throughout Cass County, North Dakota. Symptoms of this decline include progressive stem dieback and eventual mortality. This decline is apparently due to extensive stem feeding by the giant bark aphid. In addition, cankers are often found in association with the gregarious feeding habit of the aphid. Canker symptoms were similar to those reported for the genus *Cryptodiaporthe* (Sinclair et al. 1987) however the causal pathogen of the cankers has not been identified to this date. It remains unclear whether the aphid serves as a vector of the pathogen or if extensive feeding increases the stems susceptibility to colonization by the pathogen.

## Infectious Diseases

### Diplodia Shoot Blight (*Diplodia pinea*)

Recently, shoot blight, caused by *Diplodia pinea* (syn. *Sphaeropsis sapinea*) has been confirmed in many Ponderosa pine plantings throughout the state. Symptoms include shoot blight and twig dieback. Severely infected trees may be deformed and killed.

Trees of all ages are susceptible, however older, cone-bearing trees appear to sustain the greatest amount of damage. *Diplodia* shoot blight has been found periodically throughout North Dakota in past years, however the incidence and severity of this disease has increased recently. This trend may be attributed to moist conditions in





recent years that favor infection and cone production associated with aging Ponderosa pine windbreaks.

### **Dutch Elm Disease (*Ophiostoma ulmi*)**

Dutch elm disease (DED) is one of the most damaging infectious tree diseases in North Dakota. This disease has significantly altered the native forests and rural tree plantings of the state over the past 35 years. DED continues to impact community forests (including boulevard trees, city park trees, and residential home landscapes). Every year community forestry departments, utilities, and tree boards spend considerable time, effort, and money to minimize the impacts of DED.

### **Foliar Diseases of Deciduous Trees**



Cool wet conditions in 2004 were favorable for infection and disease development of several foliar diseases. Some of the commonly observed foliar diseases of deciduous species included: Ash anthracnose (*Gnomoniella fraxini*), Oak anthracnose (*Discula umbrinella*), Oak leaf blister (*Taphrina caerulescens*), and Septoria leaf spot (*Septoria musiva*) of *Populus* spp. These foliar diseases occur throughout North Dakota however disease incidence is generally sporadic and associated with localized site characteristics during years of normal early summer moisture. Moisture conditions from

late-May through July were well above average in 2004. As a result, the incidence and severity of these diseases was greater throughout the state. Generally the impact of these diseases depends on the interaction of host condition, disease severity, and the outbreak duration. Healthy, vigorous trees may suffer little damage from foliar diseases. In contrast newly planted trees or older trees in a state of poor vigor, may be severely damaged.

### **Rhizosphaera Needle Cast of Spruce (*Rhizosphaera kalkhoffii*)**

Rhizosphaera needle cast is a common foliar disease of spruce (*Picea* spp) in North Dakota. All planted spruce species are hosts to this pathogen however Colorado blue spruce (*P. pungens*) appears to be most susceptible. The incidence and severity of this disease is influenced by moist, humid conditions during the period of shoot expansion and improper spacing of host trees in tree plantings that restricts airflow and creates suitable conditions for infection. This disease causes premature needle loss that reduces the trees photosynthetic capability, predisposes infected trees to other damaging agents, and reduces the longevity and function of spruce windbreaks. Rhizosphaera needle cast has been most prevalent in the northeast portion of the state where greater moisture conditions are persistent and favor infection.



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### **Cytospora Canker of Spruce (*Valsa kunzei*)**

Cytospora canker of spruce is common throughout the state. Desiccation and death of branches distal to cankered tissue are the most obvious symptoms of this disease. Often initial infections occur in the lower crown and may spread laterally and vertically in subsequent years. Spruce species are commonly used for conservation tree plantings and as ornamental landscape trees. Severe Cytospora canker infections reduce the function of spruce windbreaks, lead to premature mortality, and degrade the appearance of ornamental trees.

### **X disease of Chokecherry**

X disease is an economically important pathogen of *Prunus* species that causes reduced growth, shortened internodes, and reduced the longevity of plantings. Chokecherry (*Prunus virginiana*) and Wild plum (*P. americana*) are native to the state and are propagated for use in rural tree plantings. X disease symptoms have been observed on chokecherry throughout the state in recent years. The disease is systemic and causes a slow gradual decline of chokecherry. Symptoms include: early-season reddening of leaves, stunting of leaves and shoots, deformity and discoloration of fruit, reduced winter hardiness, and mortality of branches and whole plants. These symptoms may be confused with other damaging agents. In addition, weakened, declining chokecherry plants may be attacked by secondary pests that may further complicate diagnosis. Currently, research is being conducted to identify chokecherry varieties that are less susceptible to this disease.

### **Abiotic Factors Associated with Forest and Shade Tree Decline**

Abiotic factors have a great impact on the health of trees and woody plants within North Dakota. Climate extremes are limiting factors for the longterm health and survival of woody plant species used for plantings in the northern plains. Environmental factors such as drought, flooding, late spring frosts, early fall frosts, and severe winter conditions can damage forest resources directly and often exacerbate the damage caused by insects and pathogens. In addition, human-caused (anthropogenic) disturbances also contribute to declines in forest health.

### **Weather Related Effects on Tree and Woody Plant Health**

The 2003 growing season was characterized by below average moisture throughout the mid to late growing season. The southwestern portion of North Dakota was exposed to the most severe drought conditions. These conditions degrade tree defenses over time, make trees less resilient to damage caused by pests, and may allow secondary pest populations to increase. Many trees exhibited drought stress symptoms in mid-July and several species began to drop leaves by mid-August. Trees most severely damaged included recently planted trees, trees growing on sandier soils, drought-intolerant species, and deciduous trees defoliated by insects in the early growing season. Additionally, inadequate fall moisture has resulted in greater incidence of winter drying to many conifer species within the state. The 2004 growing season was characterized by moist cool conditions. Below average temperatures delayed the leaf emergence of many tree species. Many species exhibited frost damage. The cool moist conditions were also favorable for infection and development of many foliar diseases. Although the combined effects of cool temperatures and foliar disease resulted in less than optimal growth, these same conditions also delayed the emergence of many defoliating insects. Similarly, many defoliating insects that emerged early were killed by early summer frost.



### **Floods**

Flooding is a common occurrence in North Dakota. Many watercourses within the state are prone to overland spread of spring water flows that breach banks. In addition, flooding may occur near lakes and wetlands as water tables rise and inundate trees throughout the growing

season. Depending on the length of inundation and the particular tree species, growing season floods may cause root mortality, tree decline or death.

## Herbicides

Although any number of chemicals can kill or injure trees, herbicides are the most common chemicals associated with tree disorders in North Dakota. Herbicides are formulated to kill weeds and when applied inappropriately, they can be very damaging to trees. Growth regulator herbicides such as 2,4-D and Dicamba are the two most common herbicides associated with tree injury in the state. These products are systemic and move throughout the tree. Exposure to these herbicides is often the result of drift, accidental spraying, or movement of the product through the soil. Herbicide injury is most commonly observed in rural plantings adjacent to cropland. Symptoms of herbicide exposure often appear as cupping of leaves, wilting, and twisting of shoot tips. Often this damage may predispose tree to secondary pests.

## Summary

Despite limited forest acreage, forest and tree resources are extremely important to the residents of North Dakota. Native forests, rural tree plantings, and community forests provide unique benefits that in turn define which factors restrict their intended function or threaten their sustainability. Although North Dakota's forested resources are generally resilient to pest damage, sustainability concerns have arisen for some in recent years. Some of these concerns reflect successional changes within forestlands, decline of plantings due to prolonged pest outbreaks coupled with neglect, or losses of valuable boulevard species due to non-native pest introductions. Although many forest pests are natural components of the environment, some (especially pests introduced from other regions or countries) may cause substantial damage. Direct management of such pests (whether native or not) is difficult to implement on broad scales and is therefore best dealt with through indirect means.

Consequently, educational efforts directed at prevention of pest outbreaks, management of native woodlands to mimic natural disturbances, pest identification training and guidelines for local tree planting entities, and species diversity will be important to improve the condition of the susceptible forested resources within the state. In addition to the current conditions, several non-native (invasive) pests have raised concerns within the Plains States. Recently, detections of the Emerald ash borer (*Agrilus planipennis*), Asian longhorn beetle (*Anoplophora glabripennis*), and the expansion of the Gypsy moth (*Lymantria dispar*) within the Lake States region has generated great concern among natural resource professionals in North Dakota. The greatest of these new threats is the Emerald Ash Borer, an exotic wood-boring beetle responsible for ash decline in Southeastern Michigan. As a result, much time and effort has focused on early detection of invasive pests, educational outreach, coordination of agencies, and preparation for such invasive tree pests.

Prepared by: Mike Kangas, North Dakota Forest Service, Forest Health Specialist. All photos courtesy of Mike Kangas.



## About the Emerald Ash Borer

The Emerald Ash Borer (*Agrilus planipennis* [Fairmaire]) is responsible for the death or decline of tens of millions of ash trees in 14 states in the Midwest and Northeast. Native to Asia, it has been found in China, Korea, Japan, Mongolia, Taiwan and eastern Russia. It likely arrived in the United States hidden in wood packing materials commonly used to ship consumer goods, auto parts and other products. The first official U.S. identification of Emerald Ash Borer was in southeastern Michigan in 2002. It is especially dangerous because there is no known treatment for Emerald Ash Borer infestations – trees must be felled and the wood disposed of through approved means.

### What Does the Emerald Ash Borer Look Like?



Adult beetles are slender and 1/2-inch long. Males are smaller than females. Color varies but adults are usually bronze or golden green overall, with metallic, emerald green wing covers. The top of the abdomen under the wings is metallic purplish red and can be seen when the wings are spread.

Larvae reach a length of approximately 1 inch and are white or cream colored. The body is flattened and bell-shaped; the brown head is mostly retracted into the body and only the mouth parts are visible externally. The 10-segmented abdomen has a pair of brown, pincer-like appendages on the last segment.

### What is the Emerald Ash Borer's Life Cycle?

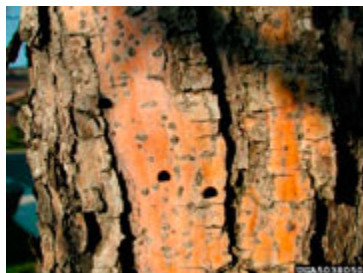


The Emerald Ash Borer generally has a one-year life cycle but it could take two years to complete its life cycle in colder climates. Adult beetles are active during the day, from mid-June to mid-August. Females can mate multiple times and lay 60 to 90 eggs during their lifetime. Eggs are deposited individually in bark crevices on a trunk or branches and hatch in seven to 10 days. After hatching, larvae chew through the bark and feed on phloem and outer sapwood for several weeks. Feeding is complete in autumn and pre-pupal larvae overwinter in shallow chambers in the outer sapwood or in bark. Pupation begins in late April or May. Adults emerge head-first through a D-shaped exit hole that is 3 to 4 mm in diameter.



## **What Kind of Damage Can the Emerald Ash Borer Cause?**

Larval feeding in the tissue between the bark and sapwood disrupts transmission of nutrients and water in a tree, eventually causing branches and the entire tree to die. Foliage may yellow, thin and wilt, and the tree canopy becomes increasingly thin and sparse as branches die. Many trees lose 30 to 50 percent of the canopy after two years of infestation and die within three to four years.



It can be difficult to detect Emerald Ash Borer infestations. The presence of woodpeckers and the holes they dig to get to the pests may be one of the first signs of infestation. When a tree has been infested for one year, the D-shaped holes left when adults emerge will be present on the branches and trunk. Another sign of infestation is the growth of epicormic shoots, which grow from roots and the trunk of the tree and often have larger-than-normal leaves. Stress is believed to be a contributing factor to tree decline and death but Emerald Ash Borer has also killed otherwise healthy trees.

Emerald Ash Borer primarily damages and kills green, white, blue and black ash trees. There is no known treatment for Emerald Ash Borer infestations – trees must be felled and the wood disposed of through approved means.

## **Where is the Emerald Ash Borer Currently Found in the United States?**

The Emerald Ash Borer is currently found in Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Virginia, West Virginia and Wisconsin. For a map showing high risk areas, visit the [Pest Tracker](#). For a current map of infested areas, visit [http://www.emeraldashborer.info/files/MultiState\\_EABpos.pdf](http://www.emeraldashborer.info/files/MultiState_EABpos.pdf).

## **What's the Emerald Ash Borer Quarantine and Eradication Process?**

When an Emerald Ash Borer infestation is found, quarantine is put in place to limit the spread of the pest through human behavior (moving firewood, purchasing infested plants, etc.). Ground and aerial surveys of forested areas and sites of possible infestations, such as nurseries, may be conducted to determine the extent of the infestation. The discovery of Emerald Ash Borer triggers quarantine procedures for wood products including firewood of all hardwood species, such as ash, oak, maple and hickory; nursery stock and green lumber of ash; any other ash material, living, dead, cut or fallen including logs, stumps, roots, branches and composted or uncomposted chips.

Research is being conducted to determine possible options for the future, including improved pesticide treatments and biological control using parasitoids for live trees, and heat or pesticide treatment of firewood.

## What Can We Do?

Cooperation among Federal and State government agencies, municipalities, universities, the green industry and the public is essential to minimize the impact of the Emerald Ash Borer because human behavior is a significant factor in its spread. Things you can do to prevent the spread include:

1. Don't move firewood. Emerald Ash Borer larvae can survive hidden in the bark of firewood. A good rule of thumb is buy local, burn local.
2. Visually inspect your trees. Early detection is important, so if you see any sign or symptom of an Emerald Ash Borer infestation, contact your [State agriculture agency](#).
3. Spread the word. Talk to friends, neighbors and co-workers about Emerald Ash Borer and what they should be aware of on their trees.
4. Ask questions. If you receive ash nursery stock or firewood, know its point of origin and your supplier, as larvae could be hiding under the bark.
5. Know State and Federal regulations. Make sure you understand regulations that govern your state and those you may visit.

## Resource List [not a comprehensive list]

- Emerald Ash Borer: The Green Menace  
United States Department of Agriculture, Animal and Plant Health Inspection Service  
[http://www.aphis.usda.gov/publications/plant\\_health/content/printable\\_version/EAB-GreenMenace-reprint-June09.pdf](http://www.aphis.usda.gov/publications/plant_health/content/printable_version/EAB-GreenMenace-reprint-June09.pdf)
- Pest Alert: Emerald Ash Borer  
United States Department of Agriculture, Forest Service  
[http://na.fs.fed.us/spfo/pubs/pest\\_al/eab/eab.pdf](http://na.fs.fed.us/spfo/pubs/pest_al/eab/eab.pdf)
- Stop the Ash Borer Beetle  
The Cooperative Emerald Ash Borer Program  
<http://www.stopthebeetle.info/>
- Emerald Ash Borer  
U.S. Forest Service, Northeastern Area  
<http://www.na.fs.fed.us/fhp/eab/>
- Emerald Ash Borer  
<http://www.emeraldashborer.info/index.cfm>
- Signs and Symptoms of the Emerald Ash Borer  
Michigan State University Extension  
<http://www.emeraldashborer.info/files/E-2938.pdf>
- Wisconsin's Emerald Ash Borer Information Source  
University of Wisconsin – Madison; Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade and Consumer Protection; USDA APHIS; University of Wisconsin Extension; U.S. Forest Service  
<http://www.emeraldashborer.wi.gov/>

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## Other District Services

Each district is unique in the services they provide in there county. A best business practice to follow is when performing a service there is a working agreement signed by the producer and a district representative. This will eliminate any unforeseen problems and provide clarification on the services they are receiving. Many of times your insurance company (NDIRF) will ask for these working agreements to make sure the districts liability is covered. When developing a new service it is best to look at your client base and the feasibility of the project. A good filing habit to get into is to develop individual folders for each service your district provides. If your district charges mileage for these services it is best to outline this in the agreements as well. Any services your district wishes to offer it is a good practice to have them clearly defined in your District Policies and review pricing on an annual basis. Always make sure you are advertising your service to its full potential. Work with outside partners that are both traditional and nontraditional. Make sure to note these accomplishments in your Annual Report for the general public to see what WE can offer. ***(See Template in Tab 8 for examples of agreements.)***

Some services your district may want to consider:

- Pipelines
- Hand plant replacement
- Haybuster Drill
- No-Till Drill
- Mower
- Land Preparation
- Tree Cleaning Services
- Irrigation
- Manure Spreaders
- Tree Removal
- Tree Spades