

# A Guide for Installing Vegetative Environmental Buffers







# The Partner Organizations

The Green Farmstead Partner program concept was developed by the Coalition to Support Iowa's Farmers as an extension of its efforts to provide farm families resources and support to raise livestock responsibly and successfully. The Coalition is partnering with Trees Forever for expertise in the technical issues of planting trees and vegetative buffers as well as their extensive network of field staff and resources across the state. The Iowa Nursery and Landscape Association brings its statewide membership of landscape and nursery professionals to the program partnership as resources for design expertise and installation and a source for quality plant materials.



### Coalition to Support Iowa's Farmers (800-932-2436)

The Coalition to Support Iowa's Farmers (CSIF) was launched in May 2004. The organization provides farm families throughout Iowa with specialized assistance in growing their livestock farms responsibly and successfully.

Seven organizations support and help direct the Coalition; Iowa Cattlemen's Association, Iowa Corn Growers Association, Iowa Farm Bureau Federation, Iowa Pork Producers Association, Iowa Poultry Association, Iowa

Soybean Association, Iowa Turkey Federation and Midwest Dairy Association. CSIF's primary purpose is to assist farmers in making responsible changes to their farms to remain economically viable and active in their communities. Since its inception, the Coalition has provided a helping hand to hundreds of farm families as they work to meet and exceed regulations, identify the best location for their new farms and enhance relations with neighbors.

#### Trees Forever (800-369-1269)



Trees Forever is a non-profit organization founded in 1989 that connects people to the environment through the planting and care of trees, prairie and other natural areas. Trees Forever has developed cutting-edge programs and innovative processes, assisting urban and rural community leaders with over 4,000 planting projects. More than 160,000 Trees Forever volunteers have contributed over one million hours of their time helping to plant more than 2.8 million trees and shrubs throughout Iowa and Illinois.

Since 1997, Trees Forever has been working with farmers and landowners on improving water quality, air quality and erosion control through its *Working Watersheds: Buffers & Beyond* program. Trees Forever field staff have assisted with the design and installation of buffers and other conservation practices on hundreds of sites throughout Iowa and the Midwest



#### Iowa Nursery and Landscape Association (800-383-1682)

The Iowa Nursery and Landscape Association (INLA) was founded in 1921 to promote and encourage interest in every phase of horticulture, and especially in the use of plants for ornamental purposes. Over the years INLA has developed close relationships of mutual helpfulness among our member firms through networking, conference education and the exchange of products, while also promoting research of new and better plants, planting practices, methods of growing, caring for and using plants.

In 1995 the INLA developed a certification program for its membership, the Iowa Certified Nursery Professional (ICNP), to promote certified garden center and landscaping professionals and the growth of horticulture in Iowa. This program has helped raise the level of professionalism among our members in the state of Iowa.

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# Introduction

owa's livestock farmers have and will continue to make environmental quality a top priority. The Green Farmstead Partner program was developed to assist in those efforts.

According to Iowa State University research, vegetative environmental buffers (VEBs) improve air quality around hog barns by a conservative 10 to 15 percent. ISU researchers also say that in addition to acting as a natural filtration system for odors, landscaping has the additional benefits of being aesthetically pleasing to the eye and of restricting the view of the operation.

The Green Farmstead Partner program creates a turn-key way for livestock farmers to research the benefits of tree plantings for their farms, identify and contact trained nursery and landscape professionals to assist in the planning process, identify, locate and purchase appropriate plant materials, secure funding sources for plant materials, and make plans for the ongoing maintenance of their vegetative buffers. The program also offers opportunities for farmers to network with other families to learn how vegetative buffers work for livestock farmers.

The program is a cooperative effort of the Coalition to Support Iowa's Farmers, Trees Forever and the Iowa Nursery and Landscape Association. Through this collaborative effort, farmers will have the opportunity to access professionals trained on the special considerations of planting trees around livestock and poultry barns and feedlots. For the latest list of nursery professionals who are participating in the Green Farmstead Partner program, visit the Coalition's website at <u>www.supportfarmers.com</u>.

The Green Farmstead Partner Program is a long-term effort that will continue to evolve as farmers and nursery professionals implement vegetative environmental buffers and provide feedback. Field days will be held throughout the state promoting this innovative, on-farm environmental program. Check the Coalition's website often for additional information!

The Green Farmstead Partner program training sessions and manual were designed and written by Roger Hunt, Trees Forever Field Coordinator and Design Specialist. Roger has over 42 years of experience as a Landscape Architect. He has been a field coordinator with Trees Forever since 1991. In addition, Roger operates his family's livestock and crop farm. He has been recognized for his farm conservation practices, and was named the Louisa County Soil Conservation Farmer of the Year in 2008.

Additional input, editing and review were provided by the various partner organizations. Special thanks to the Coalition to Support Iowa's Farmers and the Iowa Nursery and Landscape Association for their assistance in developing this handbook.

# Section 1— Case studies of design

The following case studies represent vegetative buffer opportunities for different kinds of livestock farms. They include a farmstead (hog barns on the owner's home site), pig nursery, hog finishing barns, cattle barns/feedlots, cattle grazing systems and dairy.

Case study pictures are shown as existing (before planting) and as ok proposed design (how plantings would look on that same site). Although each site is unique, an experienced professional designer can adapt concepts shown on the case studies to your site. It is hoped that you will use these case studies to inspire, motivate and guide your planning efforts.

# Design for farmstead with hog enterprise on site



Solution

Trees for windbreak

Trees to shade the buildings
Trees to soften the building mass
Flowering trees to personalize and beautify the home landscape

Current condition Open landscape with minimum number of trees to provide relief from wind and summer heat.



# Hog enterprises isolated from home farmstead

#### Existing



#### **Current condition**

Totally open landscapes with no trees, shrubs or visual buffers. Reasonably flat sites.

#### Solution

- Provide windbreaks to soften harsh winter winds and provide habitat for songbirds and small mammals
- Shade trees to cool buildings
- Native grasses and wildflowers to minimize maintenance, provide seasonal color and texture, and habitat for pollinating insects
- · Flowering trees to make a more desirable site for workers and visitors
- Mowed turf around buildings for well-maintained appearance.



## **Case Studies**

# Cattle grazing on permanent and/or improved pasture

#### Existing



#### Solution

- Riparian buffer with trees and shrubs keeps creek cooler
- Grazing paddocks to maximize efficiency of grazing
- Nose pump to provide clean water for cattle
- Stone riffle cattle crossing allows cattle to cross without impeding water flow

# Large cattle feedlot

### **Current condition**

Open pasture with creek site filter strip. Cattle have access to creek which is a cold-water stream with trout habitat.





#### **Current condition**

Feedlot sits on top of a hill exposing cattle to harsh winter winds and hot summer sun. The hilltop location can create runoff concerns. Site is near a developing urban area.

#### Solution



#### Solutions

- Windbreak and shade around the feedlots
- Native grass and wildflower filter strips
- Constructed wetland settlement basins
- Native plants in ditches for aesthetics and filtration

### Case Studies

# Small dairy — less than 100 cows



#### **Current condition** No windbreaks or shade for the cows or homestead.



#### Solution

- Windbreaks for cattle and homestead
- Organize spaces and functions
- Provide shade
- Filter strips to filter runoff
- Screen views and flowering trees to dress up entrance to the dairy and homestead
- Grassed waterways are included to reduce erosion and control surface water flow

# Section 2 — Goals and site inventory

# Determine your goals

Get the most out of your vegetative buffers. Your goals can address a number of issues that will not only enhance neighborhood relations but also make your site more functional, efficient, a better place to raise your livestock and a better place to work. See page 31 for a worksheet to help you list your goals and site inventory. Some goals that vegetative buffers can address are:

### Animal health

A well-designed landscape will contribute to the overall health of the livestock by keeping them cooler in summer and warmer in winter.

### **Odor reduction**

Vegetative buffers can help change wind patterns to redirect odors higher in the air for better dilution and can create dead air pockets so the particles can drop to the ground or onto the plant material.

# **Energy efficiency**

Often livestock barns are located on an open landscape away from residences. Because of this, harsh winter winds can have a huge impact on the comfort for the people who work there and the livestock they are caring for. Windbreaks will block those harsh winds. In an ideal situation well-designed windbreaks can reduce energy costs by as much as 25 percent.





From NRCS: Windbreak/Shelterbelt Establishment

### Goals & Assessment

Strategically placed shade (large deciduous) trees can shade the buildings and reduce heat build up. Trees act as nature's air conditioners. A mature shade tree can block up to 90 percent of solar radiation, which could translate to a significant reduction in cooling costs. Air temperatures under a shaded condition are typically 15 to 20 degrees cooler than non-shaded areas. In the summer this means more comfort for both people and livestock.

Planting native grasses and wildflowers can minimize the time spent mowing and reduce fuel costs.

#### Snow management

Properly designed windbreaks and native grass and wildflower plantings can help farmers control snow drifting around buildings and driveways.

#### Wildlife

Wildlife habitat is increasingly scarce as we farm bigger fields with fewer fence rows. Evergreen trees, shade and flowering trees, shrubs, native grasses and wildflowers provide habitat for game and song birds, small animals, and pollinating bees and insects that perform valuable functions in any landscape, not to mention their contribution to our emotional well-being.

### Aesthetics

Having a good-looking, well-maintained farmstead and/or livestock operation contributes positively to good neighborhood relations and the total rural landscape scene. Using a combination of evergreens, deciduous shade and flower trees and shrubs, native grasses and wildflowers can contribute seasonal color throughout the year.

#### Water quality and storm water management

Planting trees and shrubs and using filter strips of fibrous, deep-rooted vegetation will filter out nutrients from surface water and allow infiltration into underground aquifers.



# Inventory your site

Regardless of whether you do a plan for your own site or have professional assistance, it is necessary to gather the following information:

## **Operational information**

Plan the landscape ahead of time so these can be strategically located and not limit desired plantings.

- Location of utilities (overhead and underground), including waterlines, wells, electrical, cables, etc.
- Determine if existing utilities present an obstacle
- Ventilating system requirements for your barn(s)
- How livestock is moved
- Feed handling (incoming)
- Manure removal and transport
- Equipment needed to maintain the site
- If your building(s) are already in place, determine where the snow drifts and how it is handled
- · Amount available to invest per pig to install and maintain vegetative buffers
- Views or activities that need to be screened (compost bins, dead animal pick-up sites, others)

### Natural resource information

- Soil types for your site
- Drainage capabilities/characteristics for your site
- Prevailing wind directions (during the winter and summer)
- How your operation affects water and air quality (ventilating systems and application of manure nutrients)

### **Cultural information**

- How the operation affects your lifestyle
- · Location of neighbors who would be most affected by your operation
- Neighbors who have voiced concern or disapproval of your operation

# Section 3 — Designing the site

Once you set your goals and know what you have to work with, the next step is to develop a plan that will reflect that information. Doing it yourself or getting the help of a professional is the choice you need to make. We recommend professional help as there is a lot to think about from a technical and visual standpoint. Professionals can put it all together so that the design is both functional and beautiful. See <u>www.supportfarmers.com/GFPFullSite/participating\_nurseries.html</u> for an up-to-date listing of professional designers and nurseries. No matter who plans the site, remember to use a diversity of plant species to promote sustainability and minimize loss due to insects or disease.

# Elements of the plan

### Windbreak/odor buffer

Properly designed windbreaks can serve not only as a windbreak, but also as a tool to reduce odor.

In Iowa, plant windbreaks on the west, northwest and north to protect from harsh winter winds. This windbreak location will also block odors carried by summer breezes. The east, south and southwest sides should be more open at ground level if summer breezes are needed to cool curtain wall ventilated buildings. To do this, use large maturing shade trees in these areas and prune them up to a height of 10 to 14 feet as the tree grows and the crown develops.

Although a single-row windbreak can help reduce winter winds, to be most effective, windbreaks should have a minimum of three rows. In a three-row design, the outside row should be shrubs, the next two rows evergreens. Add a row of shrubs as an inside row to enhance odor reduction.

An alternative to the aforementioned strategy is to use a row or two of fast-growing trees (for example Austrees) as the outside row(s) for the windbreak. This approach will give the slower growing windbreak trees some establishment protection while also providing some immediate visual and buffering benefits.

#### A word of caution about fast-growing trees.

We all want our trees to be full size right now or at least by tomorrow, but nature doesn't work that way. A fast-growing tree is one that grows more than 2 or 3 feet per year under average conditions. Usually fast-growing trees are weaker and break more easily under ice and wind conditions and their life expectancy is usually much shorter. When planning it is a good idea to use a combination of fast-growing and more moderate-growing species.

### Designing the Site

### Shade (deciduous overstory) trees — mature height greater than 35 feet

Shade trees can be used in windbreaks but their primary value is in shading and cooling the area and buildings. In Iowa, shade trees provide the most benefit when planted on the east and southeast, west and southwest sides of buildings. Since the sun is high in the sky during the summer months, the shadow cast during midday is short, therefore, trees planted on the south would have to be close to buildings to provide the needed relief. If your barns are oriented east and west, to be effective it would be necessary to plant shade trees 15 to 25 feet from the building on the south and north sides.

Leave east, south and southwest directions more open at ground level if summer breezes are needed to cool curtain wall ventilated buildings. To do this, use large shade trees in these areas and prune them up to a height of 10 to 14 feet as the tree grows and the crown develops.

Choose trees that also provide some variety in fall color. It will make your place more pleasing to you and the neighbors.

### Flowering trees and shrubs

When designing your vegetative buffer, don't forget to use some flowering trees and shrubs. They are especially valuable in areas near the roadway and entrances. A little bit of color against an evergreen background or a group of mostly white buildings is a nice treat for the eye. In addition, many flowering trees and shrubs have a pleasing fragrance (eg. lilacs, mockorange and some flowering crabapples).

#### Native grasses and wildflowers

Native grasses and wildflowers add another dimension to your vegetative buffers. The first benefit is the reduction of maintenance to the site once established. No more mowing every week where these plants live. It is recommended that a diverse seed mixture be used that will adapt to differing soils and moisture conditions. A good mixture will assure something will be in bloom through the summer. Choose varieties of 3 feet or less.

### Mowed turf

A mowed turf adjacent to the buildings is also important. Not only does it provide an organized, neat appearance that many people are familiar with, it will also aid in pest control. Be sure to select grass species that do well in both sun and shade. Also select a fast-establishing grass, such as annual rye grass, as a nurse crop to minimize erosion.

# Section 4 — Landscape standards

This section discusses some basic guidelines to use in the design and implementation of your buffer including optimum row and plant spacing, size of plant materials, advantages and disadvantages of various root conditions, and installation and maintenance.

# Windbreak plant spacing recommendations

Listed below are recommendations for spacing trees and shrubs within the buffer. These recommendations are from *Windbreak/Shelterbelt Establishment*, Natural Resources Conservation Service Conservation Practice Standard (<u>http://efotg.nrcs.usda.gov/references/public/IA/IA380Aug07.pdf</u>).

### Spacing between rows

How much spacing you put between adjacent rows depends on whether you plan to use equipment for maintenance. The spacing should be four feet wider than the width of the mower or other equipment, but not to exceed the maximum. The maximum width will depend on site conditions and function but should not exceed 20 feet. You can vary the spacing between rows or plant them equal distance apart.

Row Type/Heights	Minimum Spacing Between Rows
Between shrubs less than 10 feet in height	10 ft.
Between shrubs and trees from 10-25 feet in height	12 ft.
Between trees greater than 25 feet in height	16 ft.
Between any wide-crowned trees or conifers	20 ft.

If the adjacent rows are equal distance from each other, stagger the trees as shown below:

### Spacing within rows

Most often spacing between the plants in a windbreak is uniform. However, you can arrange trees in species groups or alternate like species to create a more visually interesting planting.

Plant Type 20-Year HeightsPlant-to-Plant Spacing within RowsShrubs < 10' tall</td>3' - 6'Shrubs and trees 10'- 25' tall5' - 10'Trees > 25' tall8' - 16'Wide species16' - 20' if additional rows (more than the minimum number) are added.

This chart shows optimum spacing between trees and shrubs:

Planting trees and shrubs closer can provide the quickest protection. As these plants grow, they can be thinned to achieve the desired spacing.

# Proper planting techniques

A successful project not only depends on having a good plan but also doing what is necessary to properly install the plants and care for them to ensure good establishment.

### Site preparation

Many times construction of the building will create undesirable conditions for healthy plant growth. Perhaps the most damaging result of construction is compaction. This leads to poor drainage and tight soils that won't allow roots to properly grow and support the plant. Here are some things to do before planting:

### Deep till the area to be planted

- Use a deep tillage tool (deep tiller or chisel plow)
- Disc/cultivate the area to level surface
- If grass or weeds establish before you are ready to plant the trees, kill the vegetation (e.g. Round Up)

### **Planting seedlings**

Planting seedlings should be done after the frost is out of the ground, while trees are still dormant. (Professionals can do it later with the proper handling and equipment).

Seedlings are living things and must be handled carefully. For the highest survival rate, treat trees carefully and plant them immediately. If planting must be delayed a few days, keep the plants in a cold, protected place with air circulation between the trees and be sure the roots are kept moist.

### How to plant seedlings with a wedge or straight spade

- 1. When planting any bare-root material, it is best to do so on a cloudy, cool day.
- 2. Open a hole with a wedge or spade so that it is deep enough to plant the roots without bunching up. To do this, insert the wedge deeply into the soil and move it to the side at about a 45 degree angle. Remove the wedge from the hole.
- 3. Take the tree out of the wet mulch, container, bucket or bag once the hole is ready.
- 4. Do not leave the roots exposed as they can dry out very rapidly.
- 5. Place the roots in the hole making sure they are fully extended and the tree is not too deep or shallow.
- 6. When finished, the first lateral roots should be just below the surface.
- 7. Insert the wedge about 3 inches from the tree and push away from the tree and then toward it. This will close the hole firmly around the roots (see diagrams below). Stomp your heel to close the second hole.
- 8. Water the tree.



Insert bar at 45 degree angle. Push forward to upright position.



Remove bar and place seedling at correct depth.



Hold seedling at correct depth, insert bar 3 inches from seedling.



Pull bar handle toward planter to close hole at bottom of roots.



Push bar handle forward to close hole at top of roots.



Stomp with heel to fill in the last hole.

#### How to plant bare-root trees or shrubs

For the money invested, purchasing bare root trees and shrubs is the most efficient way to go. You get a larger plant for a lot less money. However, one has to be more careful when planting bare root material. The most important thing is to be sure to keep the roots moist and not plant too deeply.

When planting any bare-root material, it is best to do so on a cloudy, cool day. It is a good idea to keep the roots soaking in a bucket of water or on a trailer covered with wet mulch, especially if the day is sunny. It's a good idea, if possible, to have a helping hand when planting. One person can hold the tree steady and upright while the other backfills.



Proper planting of bare-root tree.

- 1. First, dig a hole that is at least two times the width of the roots and deep enough to fully extend the roots and just cover them. The first horizontal root should be just below the surface.
- 2. Sometimes it works well to place a small mound of soil in the center bottom of the hole and extend the roots out over the mound.
- 3. Once you place the tree in the hole with its roots extended over the mound of soil, begin to backfill the hole with excavated soil working it in between the roots with your hand.
- 4. As you bring the soil up in the hole and around the roots, keep compressing the backfill with your hand to keep from developing air pockets which will inhibit growth and establishment.
- 5. All the time, hold the tree in place, making sure the trunk is straight, the roots fully extended and that the tree is neither too shallow or too deep in the hole. When finished the first lateral roots should be just below the soil surface.
- 6. Water the tree thoroughly to settle the soil and close any possible air pockets.

- 7. After the plant is in the ground, mulch the area around the trunk. Follow these guidelines for proper mulching:
  - A shredded bark mulch is good because as it decomposes it will also feed the tree
  - Mulch at least 6 inches beyond the drip line
  - Keep the mulch away from the trunk about 2 inches so rodents will not nest there and eat the tender bark
  - The mulch should be 2 to 4 inches deep
  - Mulching will prevent damage to the tree by mowers and prevent weeds from growing close to the new tree
  - An alternative would be to use a landscape fabric as mulch (see below)
  - Be sure that water can infiltrate the fabric (do not use plastic as it is important that water and air can infiltrate into the soil)





Pictures from Iowa State University, Department of Natural Resource and Ecology Management

#### How to plant container-grown trees or shrubs

The ideal time to plant a tree is during its dormant season (after the leaves drop in the fall and until the buds break open in the spring.) However, container-grown trees can be planted almost anytime except for the hot, dry months of summer.

Proper handling is essential to ensure a healthy future for your new trees. By following the steps below, you will help your trees or shrubs get established properly.

- 1. Dig a hole that is at least two times the width of the root ball and deep enough to just cover the roots. The first horizontal root should be just below the surface.
- 2. Remove the container the plant came in. It is important to cut any roots that circle around the root ball. Slice deeply into the root ball from top to bottom and across the bottom in several locations to sever circling roots on the surface and in the interior.

- Place the plant in the center of the hole. Straighten the plant before you start adding soil around the roots. After you determine the plant is straight, start filling in the hole with excavated soil a few inches at a time, firming the soil with your hands.
- 4. Settle with water.
- 5. After the plant is in the ground, mulch the area around the trunk spreading the mulch at least 6 inches beyond the drip line
  - Leave a few inches around the base free of mulch
  - The mulch should be 2 to 4 inches deep



6. Finally, thoroughly water your new plant

# Care and maintenance

#### Watering

Watering is perhaps the most important task in establishing a tree. The rule of thumb is 1 inch of water every 7 to10 days, including rainfall. Different soils hold moisture differently. For example, clay soils hold water for longer periods of time than sandy soil and you need to water accordingly. Most trees thrive in well-drained but not excessively drained soils. A good practice would be to scrape back some of the mulch around the tree and dig into it with a pocket knife or trowel to see how moist the soil is before watering. (You can do this on a representative sample of your trees if planting a windbreak). Over-watering has probably caused as many deaths as under-watering. Since many of the symptoms are the same, check the soil.

If your soils are well-drained or excessively drained you may wish to consider using a drip irrigation system. A good tutorial for designing a drip irrigation system is found at www.irrigationtutorials.com/dripguide.htm.

rees sure

Water trees to ensure 1 inch every 7 - 10 days. A five-gallon pail with small holes can be used as a soaker method.



Proper planting of containerized tree.

### Mulching

Keeping your trees mulched will help keep the soil moisture up and weeds and competition down. It also helps prevent injury to the trunk from string trimmers and lawn mowers. Maintain a mulch ring around your tree to about 6 inches beyond the drip line of the crown and at a depth of 2 to 4 inches. You will probably have to replenish once a year or so. Do not pile the mulch up around the tree trunk.



Properly mulched tree.

### Pruning

Pruning is generally not needed at planting time unless there are dead or broken branches. After the tree has more age you may wish to prune the lower branches of **shade** trees so you can easily mow under them and allow for good flow of breezes.

### Staking

Windbreak and heavy, balled trees do not need to be staked. However, you may want to stake bare-root or container-grown trees over 6 feet tall that have dense vegetative crown (are top heavy). Leave stakes in place for only a year or two, just long enough for the roots to get established. Use a flexible 1 to 2 inch banded material to attach the tree to the stake (strips from an old inner tube or even old panty hose). Do not use wire around the trunk! Your tree should be able to move slightly so that it develops trunk strength, but not so much that the tree begins to lean.

### Fertilizing

Although fertilizing is generally not needed, you may gain some growth opportunities if you fertilize your trees. If you do plan to fertilize, it is good to use a well-balanced fertilizer. A slow-release fertilizer would also be advised. Consult with your local Iowa Nursery and Landscape Association member to discuss the options.

# Section 5 — Plant gallery

Plant photos courtesy of Bailey Nursery (www.baileynurseries.com) unless otherwise noted.

# **Evergreen trees**



#### Techny Arborvitae — Thuja occidentalis 'Techny'

- Fast growing and winter hardy, this tree works well for screening and in windbreaks
  - <sup>D</sup> Height: 12'-15'
  - <sup>o</sup> Spread: 6'-8'
  - Exposure: Full sun to light shade
  - <sup>□</sup> Zone: 3-8

#### Other recommended arborvitae cultivar **Pyramidal Arborvitae** — *Thuja occidentalis* '**Pyramidalis**'



#### Eastern Redcedar — Juniperus virginiana

- Native Iowa tree that is tolerant of poor soils and used often in windbreaks
  - Height: 30'-50'
  - <sup>D</sup> Spread: 8'-20'
  - Exposure: Full sun
  - <sup>D</sup> Zone: 3-9



#### Eastern White Pine — Pinus strobus

- Fast grower native to Iowa with soft needles
  - <sup>D</sup> Height: 50'-80'
  - <sup>D</sup> Spread: 20'-40'
  - Exposure: Full sun to part shade
  - <sup>D</sup> Zone: 3-8



#### Norway Spruce — Picea abies

- Excellent tree for windbreaks
  - <sup>D</sup> Height: 40'-60'
  - <sup>o</sup> Spread: 25'-30'
  - Exposure: Full sun
  - <sup>•</sup> Zone: 3-6



#### Black Hills Spruce — Picea glauca densata

- A slower growing evergreen that is popular in windbreaks
  - Height: 35'-45'
  - <sup>•</sup> Spread: 25'-30'
  - Exposure: Full sun but tolerates light shade
  - <sup>D</sup> Zone: 3-6



#### Douglas Fir — Pseudotsuga menziesii

- Attractive conifer that will not tolerate dry or poor soil, should be planted in inner rows because of potential wind damage, needs neutral or slightly acidic soil
  - <sup>D</sup> Height: 40'-60'
  - <sup>D</sup> Spread: 15'-25'
  - Exposure: Full sun
  - □ Zone: 5-7



#### White/Concolor Fir — Abies concolor

- Needles have bluish-green color, prefers moist, well-drained soils
  - □ Height: 50'
  - □ Spread: 30'
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-7

# Deciduous trees



#### Austree/Hybrid Willow — Salix matsudana x alba

- Rapid-growing tree popular in windbreaks
  - <sup>D</sup> Height: 35'-45' in rows, 50'-75' alone
  - Spread: varies with spacing 20'-30' when planted for shade
  - Foliage: Glossy, bluish-green
  - Fall Foliage: Yellow
  - Exposure: Full sun to light shade
  - <sup>•</sup> Zone: 4-7



#### Balsam Poplar — Populus balsamifera

- Rapid grower with balsam fragrance
  - <sup>o</sup> Height: 75'-90'
  - <sup>•</sup> Spread: 40'-50'
  - Foliage: Glossy, bluish-green
  - Fall Foliage: Yellow
  - Exposure: Full sun
  - □ Zone: 2-7

#### Other recommended poplar cultivars

Robusta Poplar — *Populus x canadensis* 'Robusta', cotton-less cottonwood Siouxland Poplar — *Populus deltoides* 'Siouxland', cotton-less cottonwood



#### Silver Queen Silver Maple — Acer saccharinum 'Silver Queen'

- Fast grower
  - □ Height: 60'
  - □ Spread: 40'
  - Foliage: Green with silver underside
  - Fall Foliage: Yellow
  - Exposure: Full sun
  - <sup>•</sup> Zone: 3-7



#### Red Maple — Acer rubrum

- Fast grower with yellow, orange and red fall colors
  - Height: 50'
  - <sup>o</sup> Spread: 35-40'
  - Foliage: Green
  - Fall Foliage: Brilliant scarlet or yellow
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-7

#### Other recommended red maple cultivars

October Glory<sup>®</sup> Maple — *Acer rubrum* 'October Glory' Red Sunset<sup>®</sup> Maple — *Acer rubrum* 'Franksred'



#### Sugar Maple — Acer saccharum

- Sugar maples have moderate growth and are known for colorful fall foliage
  - Height: 50'
  - □ Spread: 30'
  - □ Foliage: Glossy, deep green
  - Fall Foliage: Yellow, orange, red
  - Exposure: Full sun
  - <sup>•</sup> Zone: 4-7

Green Mountain Maple

#### Other recommended sugar maple cultivars

Green Mountain® Maple — Acer saccharum 'Green Mountain' Commemoration® Maple — Acer saccharum 'Commemoration'



#### Autumn Blaze® Maple - Acer x freemanii 'Jeffersred'

- Hybrid of silver and red maple with beautiful fall foliage, fast grower, drought tolerant and grows in most soils
  - <sup>•</sup> Height: 40'-50'
  - <sup>o</sup> Spread: 35'-40'
  - Foliage: Rich green, deeply lobed
  - Fall Foliage: Orange-red
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-7



#### River Birch — Betula nigra

- Fast growth, clumping or single stemmed; grows well in wet or dryer soils, attractive bark, native to Iowa.
  - <sup>o</sup> Height: 40'-50'
    - <sup>o</sup> Spread: 30'-40'
  - Foliage: Dark green
  - Fall Foliage: Golden yellow
  - Exposure: Full sun
  - <sup>**D**</sup> Zone: 4-8



#### Northern Catalpa — Catalpa speciosa

- Fast grower with fragrant white flowers in June and long bean-like seed pods, tolerant of adverse conditions.
  - <sup>o</sup> Height: 50'-60'
  - <sup>o</sup> Spread: 35'-40'
  - Foliage: Green, large, heart-shaped
  - Fall Foliage: Yellow-green
  - Exposure: Full sun
  - <sup>•</sup> Zone: 4-7

#### Common Hackberry — Celtis occidentalis

- Moderate to fast grower and drought tolerant
  - <sup>D</sup> Height: 50'-75'
  - Spread: 50'
  - Shape: Spreading, rounded
  - Foliage: Bright green
  - Fall Foliage: Soft yellow
  - Exposure: Full sun
  - □ Zone: 2-7



#### Shademaster® Honeylocust — Gleditsia triacanthos var. inermis 'Shademaster'

- Fast grower, drought resistant, thornless and fruitless
  - Height: 50'-60'
  - Spread: 30'-35'
  - Foliage: Dark green
  - Fall Foliage: Yellow-green
  - Exposure: Full sun
  - <sup>•</sup> Zone: 4-7



#### Bloodgood London Planetree — Platanus x acerifolia 'Bloodgood'

- Fast grower and hardy, resistant to drought, heat, pollution and tolerates poor soils, hybrid of the American Sycamore (which also could be used in more northern locations)
  - Height: 90'
  - <sup>o</sup> Spread: 60'-70'
  - Foliage: Green
  - Fall Foliage: Yellow
  - Exposure: Full sun
  - <sup>D</sup> Zone: 5-8



#### Swamp White Oak — Quercus bicolor

- Good tree for wet soils, but also tolerates dryer conditions, moderate growth
  - Height: 50'-60'
  - <sup>o</sup> Spread: 40'-50'
  - Foliage: Dark green with white beneath
  - Fall Foliage: Yellow-brown to red
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-8

#### Red Oak — Quercus rubra

- Fastest growing oak, native to Iowa, transplants well
  - <sup>•</sup> Height: 60'-80'
  - Spread: 50'
  - Foliage: Glossy, dark green
  - Fall Foliage: Red to red-brown
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-8

#### American Linden — *Tilia americana*

- Fast-growing tree that prefers moist soils,
  - fragrant yellow flowers and a good shade tree
    - <sup>o</sup> Height: 75'-90'
    - <sup>o</sup> Spread: 40'-50'
    - Foliage: Large, dark green
    - Fall Foliage: Pale yellow
    - Exposure: Full sun
    - <sup>D</sup> Zone: 3-8



Homestead Elm — Ulmus 'Homestead'

- Resistant to Dutch Elm disease, fast grower
  - Height: 60'
  - □ Spread: 35'
  - Foliage: Dark green
  - □ Fall Foliage: Yellow
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-7

#### Other recommended elm cultivars

Princeton American Elm



#### Green Vase® Zelkova — Zelkova serrata 'Green Vase'

Princeton American Elm — Ulmus americana 'Princeton'

Valley Forge American Elm — Ulmus americana 'Valley Forge'

- Vase-shaped form similar to elms with moderate growth, tolerant of pollution
   Peight: 60'-70'
  - Spread: 35'-40'
  - Shape: Vase-shaped
  - Foliage: Green
  - Fall Foliage: Bronze-red
  - Exposure: Full sun
  - <sup>D</sup> Zone: 5-8

# Understory/flowering trees

Use in outside rows for color and variety, in shrub rows or in ornamental groupings.



#### Amur Maple — Acer ginnala

- Hardy and adaptable multi-stemmed small tree with fragrant flowers and beautiful fall color
  - <sup>D</sup> Height: 15'-20'
  - <sup>o</sup> Spread: 20'-25'
  - Foliage: Glossy green
  - Fall Foliage: Orange to scarlet
  - □ Exposure: Full sun to part shade
  - <sup>•</sup> Zone: 3-7



#### Autumn Brilliance® Serviceberry — Amelanchier x grandiflora 'Autumn Brilliance'

- Small tree has white flowers in early spring, purple fruit and beautiful fall color
  - <sup>D</sup> Height: 20'-25'
  - <sup>D</sup> Spread: 15'
  - Foliage: Blue-green, small
  - Fall Foliage: Brilliant red-orange
  - Exposure: Full sun to part shade
  - □ Zone: 3-8



#### Allegheny Serviceberry — Amelanchier laevis

- Small, multi-stemmed native tree with white flowers in early spring, edible purple fruit in June, excellent for wildlife, similar to other serviceberries
  - Height: 25'
  - Spread: 15'
  - Foliage: Green
  - Fall Foliage: Orange
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-7



#### Redbud — Cercis canadensis

- This handsome tree bears small pink flowers in spring before leaves appear, then brown fruit pods form, does well in sun and part shade
  - <sup>D</sup> Height: 20'-30'
  - <sup>o</sup> Spread: 20'-25'
  - Foliage: Deep green
  - Fall Foliage: Brilliant yellow
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-9





#### Thornless Cockspur Hawthorn — Crataegus crus-galli var. inermis

- Thornless, rust-resistant ornamental that has white flowers in June and red fruit in the fall, prefers moist soil, but is drought tolerant
  - <sup>o</sup> Spread: 15'-20'
  - Foliage: Dark green, glossy
  - Fall Foliage: Orange
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-7

#### **Crab Apples**



#### Prairifire Crab — Malus 'Prairifire'

- Disease resistant crab with good summer foliage, pinkish-red blooms and fruit that remains into winter
  - <sup>D</sup> Height: 15'- 20'
  - □ Spread: 20'
  - Foliage: Green
  - Fall Foliage: Orange-red
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-7

#### Other recommended crabapple cultivars

Adirondack Crab — Malus 'Adirondack', white with pink-edged flowers Dolgo Crab — Malus 'Dolgo', pink buds with white blooms Snowdrift Crab — Malus 'Snowdrift, white flowers Royal Raindrops Crab — Malus 'Royal Raindrops', pinkish-red flowers, purple foliage Adams Crab — Malus 'Adams', pink blooms and red fruit

#### American Plum — Prunus americana

- Native small tree/large shrub with early spring flowers and edible fruit,
  - hardy and adaptable to a variety of soil types
    - <sup>D</sup> Height: 15'-20'
    - <sup>o</sup> Spread: 10'-12'
    - Foliage: Medium green
    - Fall Foliage: Yellow
    - Exposure: Full sun
    - □ Zone: 3-8



#### Chokecherry — Prunus virginiana

- This native small tree/large shrub is ideal for wildlife, white flowers in May with purple fruit, good in thickets and good shade tolerance; not to be confused with the Choke<u>b</u>erry shrub
  - <sup>D</sup> Height: 20'-30'
  - <sup>D</sup> Spread: 18'-25'
  - Foliage: Dark green
  - Fall Foliage: Yellow
  - Exposure: Full sun
  - <sup>D</sup> Zone: 3-6

# Shrubs



#### Redosier Dogwood — Cornus sericea

- Multi-stemmed shrub with bright red bark making it an attractive plant for winter color, white berries are valuable for wildlife food
  - <sup>D</sup> Height: 7'-10'
  - <sup>D</sup> Spread: 10'-15'
  - Foliage: Dark green
  - Fall Foliage: Purple
  - □ Exposure: Full sun to part shade
  - <sup>D</sup> Zone: 2-7



Autumn Magic Black Chokeberry

# Brilliant Red Chokeberry — Aronia arbutifolia 'Brilliantissima'

- White flowers in May, brilliant red berries and foliage in fall, plant in moist or well-drained soils
  - □ Height: 6'-9'
  - □ Spread: 5'-8'
  - Foliage: Dark green
  - Fall Foliage: Brilliant scarlet
  - Exposure: Full sun
  - <sup>D</sup> Zone: 5-8

#### Other recommended Chokeberry cultivars:

#### Autumn Magic Black Chokeberry — *Aronia melanocarpa* 'Autumn Magic' Iroquois Beauty<sup>™</sup> Black Chokeberry — *Aronia melanocarpa* 'Morton'



#### Shadblow Serviceberry — Amelanchier canadensis

- Suckering large shrub, white flowers in early spring with red-purple edible fruit
  - <sup>D</sup> Height: 20'-25'
  - <sup>o</sup> Spread: 10'-15'
  - Foliage: Gray-green
  - Fall Foliage: Yellow to red
  - Exposure: Full sun
  - <sup>**D**</sup> Zone: 4-8



#### American Hazelnut — Corylus americana

- Native shrub in Iowa, nuts provide good food for wildlife
  - Height: 6'-8'
  - <sup>D</sup> Spread: 6'-8'
  - Foliage: Dark green
  - Fall Foliage: Yellow-green
  - Exposure: Full sun
  - <sup>D</sup> Zone: 4-9



#### Sweet Mockorange — Philadelphus coronarius

- White, fragrant flowers in late May to early June, prefers moist, well-drained organic soils
  - Height: 10'-12'
  - Spread: 6'-8'
  - Foliage: Deep green
  - Fall Foliage: Insignificant
  - Exposure: Full sun
  - <sup>•</sup> Zone: 4-8

Other recommended Mockorange cultivar Minnesota Snowflake Mockorange — Philadelphus x virginalis 'Minnesota Snowflake'

#### Center Glow<sup>™</sup> Ninebark — Physocarpus opulifolius 'Center Glow'

- Creamy-white flowers in spring, colorful foliage
  - <sup>D</sup> Height: 8'-10'
  - <sup>D</sup> Spread: 8'-10'
  - Foliage: Red and yellow
  - Fall Foliage: Insignificant
  - Exposure: Full sun
  - <sup>D</sup> Zone: 3-7

#### Other recommended Ninebark cultivar: Snowfall Ninebark — *Physocarpus opulifolius* 'Snowfall'



#### Nanking Cherry — Prunus tomentosa

- White/pinkish blooms in early spring with edible fruit in June and July, great shrub for wildlife
  - Height: 8'-10'
  - □ Spread: 10'-15'
  - Foliage: Soft green
  - Fall Foliage: Dark green
  - Exposure: Full sun
  - □ Zone: 2-6



#### Common Purple Lilac — Syringa vulgaris 'Cultivars'

- Fragrant, purple flowers in May, many cultivars available
  - <sup>D</sup> Height: 12'-15'
  - <sup>•</sup> Spread: 8'-12'
  - Shape: Upright, vase-shaped
  - Foliage: Blue-green
  - Fall Foliage: Blue-green
  - Exposure: Full sun
  - <sup>D</sup> Zone: 2-7

Other recommended cultivar Albert F. Holden Lilac - Syringa vulgaris 'Albert F. Holden'



#### American Cranberrybush — Viburnum trilobum

- This hardy, native shrub blooms in late May with red berries lasting into winter, good fall color; also called Highbush Cranberry
  - <sup>o</sup> Height: 10'-12'
  - <sup>D</sup> Spread: 10'-12'
  - Foliage: Dark green
  - Fall Foliage: Deep red
  - Exposure: Full sun
  - □ Zone: 2-7

# Prairie grasses and forbs

Grasses and wildflowers (forbs) were the predominate groundcover for the state of Iowa pre-European settlement. They are deep-rooted plants that helped build our world-renowned topsoil. Listed below are a few species of both grasses and wildflowers that you may want to consider in your plantings. Most are less than 3 feet tall. Several that are taller are listed because of their visual appeal. Use these plants in large areas adjacent to mowed turf or in front of windbreaks.

# Recommended prairie plants

#### Grasses

- Little Bluestem/Schizachyrium scoparium
- Prairie Dropseed/Sporobolus heterolepis
- Sideoats Gramma/Bouteloua curtipendula
- Junegrass/Koeleria macrantha
- Sedges for wet soils/Carex species

### Wildflowers (forbs):

- Nodding Pink Onion/Allium cernuum
- Butterflyweed/Asclepias tuberosa
- Smooth Aster/Aster laevis
- Canada Milk Vetch/Astragalus canadensis
- Lanceleaf Coreopsis/Coreopsis lanceolata
- White Prairie Clover/Dalea candida
- Purple Prairie Clover/Dalea purpurea
- Shootingstar/Dodecatheon meadia
- Purple Coneflower/Echinacea purpurea
- Pale Purple Coneflower/Echinacea pallida
- Yellow Coneflower/Ratibida pinnata
- Prairie Blazingstar/Liatris pycnostachya
- Wild Quinine/Parthenium integrifolium
- Smooth Penstemon/Penstemon digitalis
- Orange Coneflower/Rudbeckia fulgida
- Black Eyed Susan/Rudbeckia hirta
- Ohio Spiderwort/Tradescantia ohiensis
- Golden Alexanders/Zizia aurea



# Technical resources

#### Windbreak/Shelterbelt Establishment

NRCS Conservation Practice Standard <u>http://efotg.nrcs.usda.gov/references/public/IA/IA380Aug07.pdf</u> Note: An excellent resource for planning windbreaks/odor buffers.

#### 2007 Iowa Woodland Suitability Recommendations

<u>ftp://ftp-fc.sc.egov.usda.gov/IA/technical/WoodlandSuitability.pdf</u> Note: Tells which trees are good for your particular soil type.

#### Iowa DNR Watershed Atlas

<u>http://www.iowadnr.gov/mapping/</u> Note: A source for a multitude of information. A good source to find your soil type, topography, recent aerial view, etc.

#### University of Connecticut Plant Data Base

http://www.hort.uconn.edu/plants/index.html

Note: An excellent source to view pictures and information for various plants by either common name or scientific name; may not have all, but will have most.

#### **Farmstead Windbreak**

1. Planning

<u>http://www.extension.iastate.edu/Publications/PM1716.pdf</u> Note: Good guidance for plant selection, plant establishment and general considerations for care and maintenance.

2. Establishment, Care, and Maintenance

http://www.extension.iastate.edu/Publications/PM1717.pdf

Note: Good guidance for plant selection, plant establishment and general considerations for care and maintenance.

#### Grass and Weed Control for Tree and Shrub Plantings

<u>http://www.iowadnr.gov/forestry/pdf/weeds.pdf</u> Note: A guide to care and maintenance of seedling plantings, but also can be adapted for larger plants.

#### Iowa Wind Roses

http://mesonet.agron.iastate.edu/sites/windrose.phtml?station=DSM&network=IA\_ASOS Note: Shows wind direction by month (and averaged over a period of years) for Iowa; select location nearest your site.

Windbreak Trees www.windbreaktrees.com

#### www.Kellytreefarm.com

Note: A good site by Kevin Kelly that has useful information.

# Additional resources

Native plant information and nurseries (grasses and forbs)

The Iowa Living Roadways Trust Fund www.iowalivingroadway.com

Ion Exchange <u>http://www.ionxchange.com</u> Note: Good information on native grass and wildflowers. Located near Harpers Ferry, Iowa.

Prairie Moon Nursery <u>http://www.prairiemoon.com</u> Note: Good information on native grass and wildflowers (out of Minnesota).

Prairie Nursery http://www.prairienursery.com Note: Good information on native grass and wildflowers (out of Wisconsin).

The Prairie Flower <u>www.theprairieflower.com</u> Note: Located near Spencer, Iowa.

Osenbaugh's Prairie Seed Farms www.prairieseedfarms.com Note: Located near Lucas, Iowa.

# Green Farmstead Partners program collaborators

Coalition to Support Iowa's Farms P.O. Box 9127 Des Moines, IA 50306 800-932-2436 (office) www.supportfarmers.com

Trees Forever 770 7th Ave. Marion, IA 52302 800-369-1269 (office) www.treesforever.org

Iowa Nursery and Landscape Association

900 Des Moines Street Des Moines, IA 50309 800-383-1682 (office) www.iowanla.org

# Goals assessment and site inventory worksheet

There is more to creating vegetative buffers for your livestock enterprises than meets the eye. It is highly recommended that you enlist the help of a design professional to create a good design that meets your goals and needs but also is as technically accurate and visually appealing as possible.

It is suggested that you fill out and share this worksheet with your design professional.

# Goals assessment

Check those items that apply to your needs.

\_\_\_\_\_ Animal health; warmer in winter and cooler in summer

\_\_\_\_\_ Odor reduction

\_\_\_\_\_ Energy efficiency

\_\_\_\_\_ Windbreak for protection from winter winds

\_\_\_\_\_ Shade for cooling

\_\_\_\_\_ Less mowing/maintenance to reduce fuel costs

\_\_\_\_ Snow management

\_\_\_\_\_ Aesthetics

\_\_\_\_\_ Water quality/storm water management

Any other reasons you have to install vegetative buffers \_\_\_\_\_

# Site inventory

List information needed to design the site

#### Operational information

Location of overhead utilities (present or future)

Location of underground utilities (present or future)

Location of wells and water lines \_\_\_\_\_

Electronic cables

Situation of buildings (e.g., N-S; NE-SW, etc.)

# Resources

Type of ventilating system and requirements for that type of facility
How/where you move livestock
How feed is handled
How manure is handled and transported
Equipment needed to maintain site
Determine where the snow drifts and how it is handled
Amount available to invest per hog to install and maintain the buffer
Natural resource information Soil types at site
Drainage capabilities/characteristics at site
Direction of prevailing winds in winter and summer How your operation affects water and air quality — ventilation and manure application
Cultural information How the operation affects your lifestyle
Location of neighbors most affected
Neighbors who have voiced concern or disapproval of your operation

# Site map

Draw a map of your site with information gathered from your site inventory.

Ν



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lowa Cattlemen's Association, Iowa Corn Growers Association, Iowa Farm Bureau Federation, Iowa Pork Producers Association, Iowa Poultry Association, Iowa Soybean Association, Iowa Turkey Federation, Midwest Dairy Association