Ash Replacement Trees

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What Happened? DED arrived

- Dutch Elm Disease, Ophiostoma ulmi, arrived in the US in the late 1920’s via infected wood imports from Europe. This was followed by the outbreak of O. novo-ulmi in the 1940’s.
- No American or European elm species have acceptable resistance, most are very susceptible.
- DED moved across most of the US and Canada killing millions of elm in city and rural plantings and removing native elm species from future plantings in these areas.
- End of most American elm planting in the US

Emerald Ash Borer

- Primarily infects ash species
- Discovered in the United States in 2002 near Detroit, MI
- Responsible for killing millions of trees
- USDA Animal and Plant Health Inspection Service (APHIS) proposed to remove domestic quarantine regulation for EAB on 19 September 2018
So what is the next Ash replacement?

Autumn Blaze® Freeman maple lined streets?

Japanese Tree Lilac, June blooming, excellent small boulevard tree

So what is the ash replacement?

- Diversity
- No more monoculture planting
Monoculture Planting

- Trees that perform well are often overused
  - Elm, Ash, Maple
- Diversity Planting Guidelines
  - 20 – 10 – 5
    - No more than 20% of one family (Betulaceae – Birch Family)
    - No more than 10% of one genus within a family (Alnus, Betula, Carpinus, Ostrya)
    - No more than 5% of one species within a genus (Betula populifera – Paper Birch)
- Is this really followed?

So, how do we accomplish the 20-10-5 guideline?

Ulmaceae – Elm Family

Asiatic elm hybrids, as with American elm, are soil and pH adaptable

Elm Disclaimer

- All elms can get Dutch Elm Disease
- All elms need yearly pruning after planting for the first 10 – 15 years to produce proper branch structure
- Utilize (save) elm for tough sites which may help control their highly vigorous growth and save ideal planting spots for other genera.
- Ideally to match tree with specific site and not to just fill a hole to meet the diversity guideline of 20-10-5
- Don’t be afraid of Elms!!

American Elm (Ulmus americana)

- widely used in plantings across the country because of adaptability and ease of transplanting.
- Species is very susceptible to DED
- Do Not Plant. American Liberty Series Strains = DED susceptible.
- Many new DED resistant American elm cultivars available
Prairie Expedition® American Elm  
(*Ulmus americana* 'Lewis & Clark')

- Zone 3
- U.S. native
- 60 x 40’
- DED resistant

Princeton American Elm  
(*Ulmus americana* 'Princeton')

- Zone 4
- U.S. native
- 60 x 45’
- DED resistant
- Upright vase
-Introduced in the 1920’s for form.

Fully Recommended

- *Prairie Expedition*: A solid-hardy American elm that grows up to 4 feet per year. This cultivar has high DED resistance; the original tree was a survivor of the first wave of DED to come through North Dakota. NSU release.

- *Princeton*: A fully-hardy and highly DED-resistant selection of American elm. *Princeton* has a very upright form. Managers have some concern about branch angles being too acute. However, this cultivar is easy to train when it is young.

- *Valley Forge*: This cultivar also is fully-hardy and very DED-resistant, but the branch attachments may be weaker than desired. Also, some trees’ growth has been so vigorous that the central leader became too heavy and fell over, resulting in a top-planted or unornamental crown.

Partially Recommended

- The following cultivars have received relatively little testing in North Dakota. They have high resistance to DED and are likely hardy enough to survive North Dakota winters. Further testing and experience may allow us to move these into the Fully Recommended category:
  - *Colonnade* (20 anos)
  - *Jefferson* (70 anos)
  - *New Harmony* (85 anos)
  - *St. Croix* – Originated in southeastern Minnesota

Not Recommended

- The following cultivars are not recommended for North Dakota due to their poor resistance to DED and/or lack of cold hardness:
  - *American* (3 anos)
  - *Himrod* (6 anos)
  - *Stroud* (6 anos)
  - *Independence* (4 anos)
  - *Minneapolis Park* (5 anos)
  - *Washington* (5 anos)
  - *American* – seedling origin

Japanese Elm (*Ulmus japonica*)

- Native to Japan, Northern China, and Manchuria
- Northern sources are extremely hardy, to zone 2b
- Mature form resembles a small version of American elm with some seed sources.
- High DED resistance

Discovery® Japanese Elm

- Upright vase shaped in form, dense crown branching
- Good dark green foliage through the growing season.
- Yellow fall color
- Moderate growth rate
- Prune to form in younger years
- 40 x 30 – 35’
Freedom Japanese Elm

- 45 x 50’
- Useful Canadian introduction for parks and open spaces but difficult to find in the trade.

Northern Empress® Japanese Elm

Ulmus davidiana var. japonica ‘Burgundy Glow’

A smaller Japanese elm reaching 25-28’ in height, high quality summer foliage, soils and pH adaptable. Hardy zone 3.

Northern Empress® Japanese Elm

Outstanding fall color changing from apricot to burgundy red.

Japanese Elm

(Ulmus davidiana var. japonica)

- 40-50’ x 40-50’
- Partially Recommended
- Emerald Greenleaf® (JFS K2O6D): A new cultivar that has not been tested in North Dakota. However, Greenleaf® was selected from a northern seed source. Has the upright, vase-shaped form of the American elm, although a shorter mature height.
- Night Rider® - A new release that has not been tested in North Dakota, although it is being sold in Montana, Canada. Purple fall color.
- Not Recommended
- Emerald Greenleaf® (JFS-Beaver®): Lacks sufficient cold hardness for North Dakota.

Hybrid Elms

- Primarily hybrids between Asian species
  - Siberian Elm (U. pumila)
  - Japanese Elm (U. davidiana var. japonica)
  - Wilson Elm (U. wilsoniana)

Cathedral Elm (U. pumila x japonica)

- Very hardy and adaptable, umbrella to vase shaped form
- Rapid grower requiring attention to structural pruning when young
- 40-50’ x 40-50’
New Horizon Elm
(U. pumila x japonica)
- Has performed well at the NDSU Research Arboretum and in Fargo blvd. plantings
- Hardy and Adaptable
- 50 x 40'  

Accolade Elm® (U. japonica x wilsoniana)
- Vase shaped to upright in form similar to American elm
- Quality dark green glossy foliage, yellow fall color
- Rapid growing
- 60-70 x 50'

Triumph Elm™ (‘Morton Glossy’) (Accolade® x Vanguard™)
- Very tolerant to urban conditions
- Upright to upright oval form
- Glossy green quality foliage
- Strong branching habit
- 50-60 x 35-40'

For Additional information:
NDSU Extension Publication F1893

Fagaceae – Beech Family
(contains Quercus spp. – oak)
Bur Oak (Quercus macrocarpa)

- Zone 3
- Native to eastern and central United States (only oak native to ND)
- White oak group
- 50 x 50’

Upright Growing Bur Oak Cultivars

Top Gun™ - 50 x 20’
Urban Pinnacle® - 50 x 25’

Crimson Spire Oak™ (Quercus robur x alba ‘Crimschmidt’) (Quercus macrocarpa (Bur Oak))

45 x 15’, Columnar to fastigate, Has been fully hardy ND zone 4a.
Good foliage quality, mildew resistant, have not observed soil induced chlorosis. Recommended

Crimson Spire™ oak
Mid October color change to rusty red by late October to early November
Crimson Spire™ Oak
Foliage November through April is marcescent and pushed off in spring with new growth.

Prairie Stature® Oak
*Quercus x bimundorum* ‘Midwe’
- Zone 3b
- Hybrid cross with *Q. robur* x *Q. alba*
- 50 x 40’
- Rounded pyramidal form
- Excellent reddish fall color

Regal Prince® Oak  (*Quercus robur x bicolor* ‘Long’)
45 x 18’ Columnar to narrowly oval. Excellent foliage quality. Yellow fall color. Appears to be hardy to at least -30 °F.

Kindred Spirit® Oak (*Quercus robur x bicolor* ‘Nadler’)
30’ x 6’ Fastigate to tightly columnar. Fair foliage quality. Rusty red fall color, not as intense as Crimson Spire®.

Mongolian Oak (*Quercus mongolica*)
35 x 30’ Small to midsized Asian oak
- Hardy, Zone 3b, adaptable to soils up to pH 7.6
- Dark green foliage, often marcescent (attached).
- Hard to find

Beacon® Swamp White Oak
*Quercus bicolor* ‘Bonnie and Mike’
40 x 15’ Narrowly columnar, poor foliage quality, moderate to severe winter damage and foliar chlorosis.
*Not presently recommended under our conditions.*
Betulaceae – Birch Family

Prairie Horizon® Manchurian Alder (Alnus hirsuta ‘Harbin’)
- Zone 3
- Native of China
- 30 x 25’

Northern Tribute® River Birch (Betula nigra ‘Dickinson’)
- Zone (3)4
- U.S. native
- 35 x 30’
- pH tolerant

American Hornbeam (Ostrya virginiana)
- Zone 3 – 9
- U.S. native
- 40 x 30’
- Drought tolerant
- pH tolerant
- Soil adaptable
- Not salt tolerant

Bignoniaceae - Trumpet creeper or Catalpa Family

Ostrya virginiana 'JFS-KWS'
Autumn Treasure® Hornbeam
Zone: 4  Height: 40’  Spread: 20’
Shade: Upright pyramidal to conical
Fall Color: Golden yellow
At last, a hornbeam suited for city living. Predictably upright narrow form facilitates uniform street tree plantings. Unlike many trees of sending origin that hold brown leaves throughout the winter, this leaf drop to clean and complete.
Northern Catalpa (Catalpa speciosa)

- Zone 4 – 8
- U.S. Native
- 55 x 35’
- Tolerant of drought and air pollution
- Tolerant of a wide range of soil conditions including both wet and dry soils
- Tolerant of seasonal flooding
- No serious insect or disease problems
- Susceptible to verticillium wilt

Cannabaceae - Hemp Family

(Cannabis spp. – hemp – is the largest genus in the family so it should be the hackberry family)

Hackberry (Celtis occidentalis)

- Zone 3
- Native is as well suited for the plains and rural areas as it is for urban sites.
- Cold hardy and tolerant of winds and varied conditions,
- 40 - 70 feet with a 50-foot spread and has a broad crown with arching branches.

Fabaceae – Legume, Pea or Bean Family
American Yellowwood (Cladrastis kentukea)
- Zone 4
- U.S. Native
- 30 x 40'
- Fragrant flowers bloom in May to early June
- Urban tolerant
- pH tolerant
- Pest free
- Native bee friendly
- ‘Perkins Pink’ – pink-flowered form

Thornless Honeylocust (Gleditia triacanthos var. inermis)
- Zone 3/4
- Native to parts of the central United States
- Northern Acclaim® (‘Harve’)
  - NCSU selection
  - Hardiest of all the cultivars, Zone 3 hardy
- Need to diversify with additional available adapted cultivars for Zones 3b through 4

One of the most popular cultivars which has resulted in a monoculture planting of a single clone

Kentucky Coffeetree (Gymnocladus dioicus)
- Zone 3/4
- U.S. Native
- 40 x 35'
- Pest Free
- Tolerant of urban conditions
- It’s kind of an ugly duckling when first planted, but then it grows into a wonderful tree
Gymnocladus dioica "Espresso™'

**Espresso™ Kentucky Coffee Tree**

*Zone: 4  Height: 30’  Spread: 15’*

Shade:牍 ta ve e shaped with upright arching branches

Foliage: Huge doubly compound leaves, lush green,

Fall Color: Yellow

The huge doubly compound leaves give this tree a tropical feel, and the arching branches present an eye-catching form. This is a seedless selection. Good tolerance of heat, drought, and cold.

**Other Coffeetree Cultivars**

- **Stately Manor** - narrow habit of growth
- **Prairie Titan™ (J.C. McDaniel)** - narrow habit of growth
- **Skinny Latte™ (Morton)** - narrow habit of growth
- **Decaf® (MckBrachled)** - exhibits much greater branching than the species

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**Amur maackia (Maackia amurensis)**

- **Zone 3**
- **Native to China and Korea**
- **25 x 25’**
- **Pest free**
- **Tolerant of urban condition**
- **Fixes own nitrogen which allows for planting in poor soil conditions**
- **Flowers in mid-summer when very little else is blooming**
- **Great candidate for street tree**

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**Maackia macrocarpa**

*Zone: 3  Height: 30’  Spread: 12’*

Shade: Upright tree

Foliage: Green with glossy leaves

Fall Color: Yellow

This unique plant is a must-have for any garden, with its ability to build into beautiful, multi-stemmed showpieces. The elegant canopy of showy flowers draws the eye to every corner of the garden. Maackia macrocarpa is a winner!
Ginkgoaceae – Ginkgo Family
Monotypic family – only one genus

Ginkgo (Ginkgo biloba)
• Zone 3 – 8
• Native to Southern China
• 60 x 35’ (cultivar dependent)
• Urban tolerant
• Soil and air pollution tolerant

Ginkgo Cultivars
• ‘Autumn Gold’ – Male cultivar typically growing at maturity to 40-50’ with a symmetrical, broadly spreading habit. Leaves turn a uniform golden yellow in autumn
• ‘Fastigiata’ – Male cultivar typically growing at maturity to 30-50’ tall with upright, narrowly conical habits that are just slightly broader at the base

Magnoliaceae – Magnolia Family

Spring Welcome® Magnolia
*Magnolia x loebneri ‘Ruth’*
Malvaceae – Mallow Family
(contains subfamily Tiliioideae which contains Tilia spp. – Linden)

American Linden (Tilia americana)
- Zone 3
- Cultivar use important for size and form
- pH adaptable
- Not air pollution tolerant
- Pest – Japanese beetle

Littleleaf Linden (Tilia cordata)
- Zone 4
- 50 x 30'
- pH adaptable
- Pollution tolerant
- Pest – Japanese beetle

Greenspire® Littleleaf Linden

Golden Cascade Littleleaf Linden
Oleaceae – Olive Family
(same family as Fraxinus spp. – ash)

Japanese Tree Lilac (*Syringa reticulata*)
- Zone 3
- Native to northern Japan
- 25 x 20’
- Flowers early June
- Pest free
- Salt and salt spray tolerant
- Snowdance™ (‘Bulnco’), 20 x 20’, sterile (produces no seed), flowers at early age

Summer Aspire™ Japanese Tree Lilac
(*Syringa reticulata* ‘SumDak’)
- Zone 3
- Native to northern Japan
- 35 x 15’
- Flowers early June
- Pest free

Rosaceae – Rose Family

Prairie Gem® Flowering Pear
(*Pyrus ussuriensis* ‘MorDak’)
- Zone 3 – 6
- 25 x 20’
- Fast growth rate
- Showy flowers emerge before foliage
- Tolerant of urban pollution
- Can produce fruit but not invasive like Callery pear
- High fireblight resistance
Ming Amur Chokecherry
(Prunus maackii ‘Ming’)
- Zone 2b – 6
- 20 x 12’
- Native to Korea, China, and Russia
- A small to medium upright tree with white flowers and bright amber to deep coppery-orange bark which curls as it peels off
- The distinctive bark provides year-round accent to any landscape
- Resistant to black knot and frost cracking

Spring Snow Flowering Crabapple
Malus ‘Spring Snow’
- Zone 4
- 25 x 20’
- Showy fragrant white spring flowers
- Tolerant of urban air pollution
Rutaceae – Rue or Citrus Family
(Family is related to Sapindaceae – Soapberry Family which contains Acer spp. – maple)

Marilee® Flowering Crabapple
(Malus ‘Jarmin’)
- Zone 3/4
- 24 x 10’
- Narrow upright
- Pink budded, double white large flowers
- Fruitless
- Good disease resistance

Amur Corktree
(Phellodendron amurense)
- Zone 3/4
- Native to China, Manchuria and Japan
- 40 x 35’
- Pest Free

Boulevard Planting in Fargo, ND – Phellodendron, Freeman maple, Hybrid elm
Sapindaceae – Soapberry Family
(contains old families of Aceraceae – Acer spp. and Hippocastanaceae – Aesculus spp.)

Soil induced chlorosis typical with Sugar, Red, Silver and Freeman Maple

State Street™ Miyabe’s Maple
*Acer miyabeii ‘Morton’*
- Zone 4 – 7
- Native to Japan
- 45 x 35’
- Urban tolerant
- Soil, pH and drought tolerant
- Moderately salt tolerant

Ohio Buckeye (Aesculus glabra)
- Zone 3 – 7
- 25 x 25’
- Native to the U.S.
- Utility friendly
- Pests – Japanese beetles
- Homestead and Autumn Splendor