National Elm Trial in Colorado

- Established: 2005
- Located in Fort Collins, CO on west side of Centre Drive just south of Prospect Street.
- Visitors are welcome anytime
- 19 cultivars of elms originally in trial
- Soil conditions are poor from heavy machinery compaction
- Irrigation consists of a drip system with two emitters 18 inches from stem
- Insects: European elm scale and woolly elm aphid
- Diseases: No biotic diseases but winter hardiness is an issue.
- Good cultivars: Homestead, Triumph, Red Tip, Commendation and Accolade. New Harmony is the only American elm to show some resistance to European elm scale.
- Unacceptable cultivars: based on scale damage or winter mortality: Emerald Sunshine, Pioneer, Patriot Lewis and Clark, Valley Forge, Princeton, and Lacebark
<table>
<thead>
<tr>
<th>Cultivar Number</th>
<th>Cultivar Name</th>
<th>Parentage</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emerald Sunshine' or 'JFS Bieberich' (Originally 'Clone D')</td>
<td>U. propinqua</td>
<td>J. Frank Schmidt &amp; Son Co</td>
</tr>
<tr>
<td>2</td>
<td>‘Princeton’</td>
<td>U. americana</td>
<td>Princeton Nurseries</td>
</tr>
<tr>
<td>3</td>
<td>‘Frontier’</td>
<td>U. carpinifolia X U. parvifolia</td>
<td>J. Frank Schmidt &amp; Son Co</td>
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<tr>
<td>4</td>
<td>‘Homestead’</td>
<td>U. glabra X U. carpinifolia X U. pumila</td>
<td>J. Frank Schmidt &amp; Son Co</td>
</tr>
<tr>
<td>5</td>
<td>‘Morton Glossy’ Triumph</td>
<td>U. pumila X U. japonica X U. wilsoniana</td>
<td>J. Frank Schmidt &amp; Son Co</td>
</tr>
<tr>
<td>6</td>
<td>‘Morton Plainsman’ Vanguard</td>
<td>U. pumila X U. japonica</td>
<td>J. Frank Schmidt &amp; Son Co</td>
</tr>
<tr>
<td>7</td>
<td>‘Morton Red Tip’ Danada Charm</td>
<td>U. japonica X U. wilsoniana</td>
<td>J. Frank Schmidt &amp; Son Co</td>
</tr>
<tr>
<td>8</td>
<td>‘Morton Stalwart’ Commendation</td>
<td>U. carpinifolia X U. pumila X U. wilsoniana</td>
<td>J. Frank Schmidt &amp; Son Co</td>
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<tr>
<td>9</td>
<td>‘Morton’ Accolade</td>
<td>U. japonica X U. wilsoniana</td>
<td>J. Frank Schmidt &amp; Son Co</td>
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<tr>
<td>10</td>
<td>‘New Horizon’</td>
<td>U. pumila X U. japonica</td>
<td>J. Frank Schmidt &amp; Son Co</td>
</tr>
<tr>
<td>11</td>
<td>‘Patriot’</td>
<td>(U. glabra X U. carpinifolia X U. pumila) X U. wilsoniana</td>
<td>J. Frank Schmidt &amp; Son Co</td>
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<tr>
<td>12</td>
<td>‘Pioneer’</td>
<td>U. glabra X U. carpinifolia</td>
<td>J. Frank Schmidt &amp; Son Co</td>
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<tr>
<td>13</td>
<td>‘Prospector’</td>
<td>U. wilsoniana</td>
<td>J. Frank Schmidt &amp; Son Co</td>
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<td>14</td>
<td>‘Valley Forge’</td>
<td>U. americana</td>
<td>J. Frank Schmidt &amp; Son Co</td>
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<td>15</td>
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<td>U. americana</td>
<td>Princeton Nurseries</td>
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<td>16</td>
<td>‘Jefferson’</td>
<td>U. americana</td>
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<td>19</td>
<td>‘Prairie Expedition’</td>
<td>U. americana</td>
<td>Lee Nursery, Inc.</td>
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<td>'Emerald Sunshine'</td>
<td>'Morton Glossy Triumph'</td>
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<tr>
<td>2</td>
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<td>'New Horizon'</td>
<td>'Lewis &amp; Clark Prairie Expedition™'</td>
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<td>'Morton' Accolade</td>
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<td>'Athena'® Lacebark Elm 19</td>
</tr>
</tbody>
</table>

Plot layout - Fort Collins, CO

Trees Planted April 6, 2005

New Harmony Planted May 6, 2006

'Emer II' Allee replaced with 'Princeton' May 6, 2006

Additional irrigation bubblers installed by Calvin Bly & crew May 8, 2006

'Jefferson' and 'Lewis & Clark Prairie Expedition™' American elms planted April 27, 2007

'Athena'® Classic Lacebark elms & 'Everclear'® Lacebark elms planted May 2, 2007

'= DEAD tree as of September 13, 2007
National Elm Trial Contacts

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Table 1. Relative susceptibility of elm cultivars to elm leafminer (ELM), European elm flea weevil, European elm scale, and woolly elm aphid. Evaluations are summarized from observations made at the National Elm Trial study site in Fort Collins, CO. 2009-2014 by Dr. Whitney Cranshaw. Note: European elm flea weevil populations as of 2012-2014 were minimal and should not be a concern for choosing cultivars. Current ratings are listed under each cultivar on following pages.

<table>
<thead>
<tr>
<th>Elm Cultivar</th>
<th>ELM</th>
<th>European Elm Flea Weevil</th>
<th>Elm Scale</th>
<th>Wooly Aphid</th>
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<tr>
<td></td>
<td></td>
<td>ELM</td>
<td>Leafmines</td>
<td>Shotholes</td>
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<tr>
<td>Morton Stalwart Commendation</td>
<td>HS</td>
<td>HS</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>Morton Red Tip Danada Charm</td>
<td>HS</td>
<td>HS</td>
<td>HR</td>
<td>+</td>
</tr>
<tr>
<td>Homestead</td>
<td>HS</td>
<td>HS</td>
<td>S</td>
<td>+</td>
</tr>
<tr>
<td>New Horizon</td>
<td>HS</td>
<td>S</td>
<td>HS</td>
<td>+</td>
</tr>
<tr>
<td>Pioneer</td>
<td>S</td>
<td>MR</td>
<td>S</td>
<td>+</td>
</tr>
<tr>
<td>Morton Accolade</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>-</td>
</tr>
<tr>
<td>Morton Plainsman Vanguard</td>
<td>MR</td>
<td>HS</td>
<td>HS</td>
<td>-</td>
</tr>
<tr>
<td>Patriot</td>
<td>MR</td>
<td>S</td>
<td>HR</td>
<td>++</td>
</tr>
<tr>
<td>Frontier</td>
<td>MR</td>
<td>MR</td>
<td>HS</td>
<td>+</td>
</tr>
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<td>MR</td>
<td>MR</td>
<td>MR</td>
<td>-</td>
</tr>
</tbody>
</table>

Rating of leaf mining: elm leafminer and European elm flea weevil based on a 0-10 proportional scale: 0 = no leaf mines; 1 = 1-10% of leaves with mines; 2 = 11-20% of leaves with mines; 3 = 21-30% of leaves with mines; 4 = 31-40% of leaves with mines; 5 = 41-50% of leaves with mines; 6 = 51-60% of leaves with mines; 7 = 61-70% of leaves with mines; 8 = 71-80% of leaves with mines; 9 = 81-90% of leaves with mines; and 10 = 91-100% of leaves with mines.

Rating of shothole injury by European elm flea weevil based on counts of numbers of holes in 10 leaves on each cardinal point. S= susceptible, (rating 6,7), HS= highly susceptible (rating 8,9,10) R= resistant (rating 4), MR= moderate resistance (rating 2,3), HR= highly resistant (rating 1) European elm scale and Eriosoma americanum (woolly elm aphid) based on presence (+) or absence (-). Cultivars observed to be very heavily infested with European elm scale were ranked ++
Colorado Diameter Growth/year

![Bar chart showing diameter growth/year for different varieties of trees. The chart includes varieties such as Lewis & Clark, New Harmony, Princeton, Valley Forge, Frontier, Morton Stalwart, Pioneer, Homestead, Patriot, Morton Red Tip, Morton, Emer II, JFS Bieberich, Morton Plainsman, New Horizon, Morton Glossy, and Prospector. The y-axis represents diameter growth/year (cm) ranging from 0 to 1.2, and the x-axis lists the tree varieties. Each bar represents the average growth with error bars indicating the variability.]
Colorado Height Growth/Year
Colorado Crown Width Growth/Year
Rating of Cultivars

![Graph showing the rating of cultivars for various factors such as foliar insect damage, scale insect damage, disease damage, and vigor rating. Heights of the bars indicate the ratings for each cultivar across different factors.]
‘Emerald Sunshine’ (*Ulmus propinqua*)

- Date: 5/20/2014
- Survival: 20% (100% Resprout)
- Diameter at 1.4m (cm): 0.8
- Height (m): 2.5
- Crown shape: Vase
- Crown width (m): 0.6
- European Elm Leaf Weevil: 20% crown affected  
  5% leaf affected
- European Elm Scale: 0% crown affected  
  0% branch surface affected
- Disease: None

‘Princeton’ (*Ulmus americana*)

- Date: 5/20/2014
- Survival: 100%
- Diameter at 1.4m (cm): 5.2
- Height (m): 5.3
- Crown shape: Vase
- Crown width (m): 1.3
- European Elm Leaf Weevil: 0% crown affected  
  0% leaf affected
- European Elm Scale: 38% crown affected  
  16% branch surface affected
- Disease: None
‘Frontier’ (*Ulmus carpinifolia X U. parvifolia*)

- Date: 5/20/2014
- Survival: 40%
- Diameter at 1.4m (cm): 3.9
- Height (m): 3.3
- Crown shape: Vase
- Crown width (m): 1.5
- European Elm Leaf Weevil: 0% crown affected
- 0% leaf affected
- European Elm Scale: 0% crown affected
- 0% branch surface affected
- Disease: None

‘Homestead’ (*U. glabra X U. carpinifolia X U. pumila*)

- Date: 5/20/2014
- Survival: 100%
- Diameter at 1.4m (cm): 6.5
- Height (m): 4.4
- Crown shape: Round and Vase
- Crown width (m): 2.2
- European Elm Leaf Weevil: 0% crown affected
- 0% leaf affected
- European Elm Scale: 0% crown affected
- 0% branch surface affected
- Disease: None
‘Morton Glossy’ Triumph
(TM (U. pumila X U. japonica X U. wilsoniana))

Date: 5/20/2014
Survival: 80%
Diameter at 1.4m (cm): 8.4
Height (m): 4.9
Crown shape: Vase
Crown width (m): 2.5
European Elm Leaf Weevil: 0% crown affected
0% leaf affected
European Elm Scale: 0% crown affected
0% branch surface affected
Disease: None

‘Morton Plainsman’ Vanguard (U. pumila X U. japonica)

Date: 5/20/2014
Survival: 80%
Diameter at 1.4m (cm): 5.7
Height (m): 4.0
Crown shape: Pyramid, Round and Vase
Crown width (m): 2.4
European Elm Leaf Weevil: 0% crown affected
0% leaf affected
European Elm Scale: 0% crown affected
0% branch surface affected
Disease: None
'Morton Red Tip' Danada Charm™ (*U. japonica* X *U. wilsoniana*)

- **Date:** 5/20/2014
- **Survival:** 80%
- **Diameter at 1.4m (cm):** 7.1
- **Height (m):** 4.4
- **Crown shape:** Pyramid, Round and Vase
- **Crown width (m):** 2.5
- **European Elm Leaf Weevil:** 0% crown affected
- **European Elm Scale:** 8% crown affected
- **Disease:** None

'Veronica Stalwart' Commendation™ (*U. carpinifolia* X *U. pumila* X *U. wilsoniana*)

- **Date:** 5/20/2014
- **Survival:** 100%
- **Diameter at 1.4m (cm):** 6.0
- **Height (m):** 3.9
- **Crown shape:** Pyramid, Round and Vase
- **Crown width (m):** 2.2
- **European Elm Leaf Weevil:** 0% crown affected
- **European Elm Scale:** 0% crown affected
- **Disease:** None
‘Morton’ Accolade ® (*U. japonica X U. wilsoniana*)

- Date: 5/20/2014
- Survival: 100%
- Diameter at 1.4m (cm): 5.9
- Height (m): 3.7
- Crown shape: Pyramid and Vase
- Crown width (m): 2.5
- European Elm Leaf Weevil: 0% crown affected
- European Elm Scale: 0% crown affected
- Disease: None

‘New Horizon’ (*U. pumila X U. japonica*)

- Date: 5/20/2014
- Survival: 40%
- Diameter at 1.4m (cm): 8.5
- Height (m): 5.7
- Crown shape: Vase
- Crown width (m): 3.3
- European Elm Leaf Weevil: 0% crown affected
- European Elm Scale: 45% crown affected, 25% branch surface affected
- Disease: None
‘Patriot’ (U. glabra X U. carpinifolia X U. pumila) X U. wilsoniana

Date: 5/20/2014
Survival: 60%
Diameter at 1.4m (cm): 4.3
Height (m): 4.6
Crown shape: Oval and Vase
Crown width (m): 1.7
European Elm Leaf Weevil: 0% crown affected
   0% leaf affected
European Elm Scale: 58% crown affected
   40% branch surface affected
Disease: None

‘Pioneer’ (U. glabra X U. carpinifolia)

Date: 5/20/2014
Survival: 100%
Diameter at 1.4m (cm): 8.3
Height (m): 4.7
Crown shape: Round and Vase
Crown width (m): 2.4
European Elm Leaf Weevil: 0% crown affected
   0% leaf affected
European Elm Scale: 32% crown affected
   10% branch surface affected
Disease: None
‘Prospector’ (*U. wilsoniana*)

- **Date**: 5/20/2014
- **Survival**: 100%
- **Diameter at 1.4m (cm)**: 5.7
- **Height (m)**: 3.6
- **Crown shape**: Oval, Pyramid and Vase
- **Crown width (m)**: 2.3
- **European Elm Leaf Weevil**: 0% crown affected
  - 0% leaf affected
- **European Elm Scale**: 0% crown affected
  - 0% branch surface affected
- **Disease**: None

‘Valley Forge’ (*U. americana*)

- **Date**: 5/20/2014
- **Survival**: 60%
- **Diameter at 1.4m (cm)**: 5.7
- **Height (m)**: 4.8
- **Crown shape**: Oval, Pyramid and Vase
- **Crown width (m)**: 3.0
- **European Elm Leaf Weevil**: 0% crown affected
  - 0% leaf affected
- **European Elm Scale**: 98% crown affected
  - 92% branch surface affected
- **Disease**: None
‘New Harmony’ (*U. americana*)

- Date: 5/20/2014
- Survival: 100%
- Diameter at 1.4m (cm): 5.2
- Height (m): 4.5
- Crown shape: Round and Vase
- Crown width (m): 1.7
- European Elm Leaf Weevil: 0% crown affected
- 0% leaf affected
- European Elm Scale: 18% crown affected
- 5% branch surface affected
- Disease: None

‘Jefferson’ (*U. americana*)

- Jefferson was found to be the same cultivar as Princeton
- Date: 5/20/2014
- Survival: 20%
- Diameter at 1.4m (cm): 2.1
- Height (m): 4.72
- Crown shape: Vase
- Crown width (m): 0.3
- European Elm Leaf Weevil: 0% crown affected
- 0% leaf affected
- European Elm Scale: 0% crown affected
- 0% branch surface affected
- Disease: None
‘Lewis and Clark’ Prairie Expedition
®*(U.americana)*

Date: 5/20/2014
Survival: 100%
Diameter at 1.4m (cm): 4.1
Height (m): 3.3
Crown shape: Oval, Pyramid and Vase
Crown width (m): 1.7
European Elm Leaf Weevil: 0% crown affected
0% leaf affected
European Elm Scale: 98% crown affected
865% leaf affected
Disease: None

‘Athena Classic’ Lacebark Elm *(U. parvifolia)*

Date: 5/20/2014
Survival: 0%
Diameter at 1.4m (cm): NA
Height (m): NA
Crown shape: NA
Crown width (m): NA
European Elm Leaf Weevil: NA
European Elm Scale: NA
Disease: None

No Picture Available
‘Everclear’ Lacebark Elm (U. parvifolia)

Date: 5/20/2014
Survival: 0%
Diameter at 1.4m (cm): NA
Height (m): NA
Crown shape: NA
Crown width (m): NA
European Elm Leaf Weevil: 0% crown affected
0% leaf affected
European Elm Scale: 0% crown
0% leaf affected
Disease: None

Winter kill and scale
European elm scale images
Pruning