WSDA – WSU Leaf Index Management Tool

http://feql.wsu.edu

EPA-R7 Workshop March 4-5 2014
WSDA – WSU Leaf Index Management Tool

- Introduction
- Leaf Indexing as a Management Tool
- Recording Observations
- Site Selection
- How to Get Started
- How to End
Washington State Department of Agriculture
Leaf Indexing Report Form

Completed forms should be mailed to:
WSDA Pesticide Management Division
21 N. 1st Ave., Suite #236
Yakima, WA 98902

Phone: 509-225-2647  Fax: 509-575-2210

Name / Contact: CHARLES CARLY
Phone #: 509-225-2647
Vineyard Name: DOWNTOWNE VINEYARDS
Location: ROAD 2004 - YAKIMA
County: YAKIMA
Section: 24  Township: 13N  Range: 18E

Varieties Affected

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bud Break</th>
<th>Bloom</th>
<th>Set</th>
<th>Pea Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERLOT</td>
<td>MAY 6 2004</td>
<td>JUNE 7 2004</td>
<td>JUNE 15 2004</td>
<td>JUNE 28 2004</td>
</tr>
</tbody>
</table>

Location (Block, Row): MERLOT BLOCK 3 NW  ROW 10
Make observations at least once a week/ One variety per sheet

<table>
<thead>
<tr>
<th>Variety: MERLOT</th>
<th>Year 2004</th>
<th>If Yes</th>
<th>If Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerged Leaf Position</td>
<td>Observation Date</td>
<td>Any Phenoxy Symptoms Observed Yes or No</td>
<td>Severity rating Scale 0-5</td>
</tr>
<tr>
<td>I Basal</td>
<td>MAY 10</td>
<td>Y</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
<td>Y</td>
<td>2</td>
</tr>
<tr>
<td>3 4</td>
<td>24</td>
<td>Y</td>
<td>2 3</td>
</tr>
<tr>
<td>5 6 7</td>
<td>31</td>
<td>Y</td>
<td>2 4 6</td>
</tr>
<tr>
<td>8 9 10</td>
<td>JUNE 7</td>
<td>Y</td>
<td>4 7 3</td>
</tr>
<tr>
<td>11 12 13</td>
<td>14</td>
<td>Y</td>
<td>5 5 4</td>
</tr>
<tr>
<td>14 15</td>
<td>21</td>
<td>Y</td>
<td>2 1</td>
</tr>
<tr>
<td>16 17</td>
<td>28</td>
<td>N</td>
<td>1 0</td>
</tr>
<tr>
<td>18 19 20</td>
<td>JULY 5</td>
<td>N</td>
<td>0 0 0</td>
</tr>
<tr>
<td>21 22</td>
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<td>0 0</td>
</tr>
<tr>
<td>25 26</td>
<td>26</td>
<td>N</td>
<td>0 0</td>
</tr>
<tr>
<td>No New Leaves</td>
<td>AUGUST 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
No visible symptoms of phenoxy-like herbicide contact. Margins and lobes are well defined.

Possible rugose (bumpy) features on leaf surface. Possible shortening of lobes and sinus.

Will have rugose features as well as marginal disfiguration. The leaf is not able to fully open.

Possible rugose (bumpy) features on leaf surface. Possible shortening of lobes and sinus.

Definite deformation of leaf margins and sinuses. Venation will appear almost parallel.

Diminished or possible lack of sinus. Leaf will be significantly smaller than those with a lesser rating.

Grossly deformed leaf. Veination will be parallel. The leaf will be severely dwarfed.

Leaf Indexing as a Management Tool

• Weekly producer observations can be critical for assessing timing-severity of herbicide exposure
• These observations must be conducted uniformly by someone on site full time
• After training, observers can be easily trained
Objective

- Record bud break
- Record the date leaves unfurl
- Numerically record the node/leaf position
- The number must correlate to a date
- Weekly readings returning to the same grape shoot to establish a historical record
The Observation Process

Same day of the week

- Record the date of Bud Break or Bud Burst
- Next week record the unfurling of any leaf
  Example: Two leaves unfurled since last week, the basal leaf is number 1, the next leaf is number two, RECORD THE DATE NEXT TO #1 and #2
- There is a lag time between the herbicide exposure and the expression of herbicide symptoms
The Observation Process, continued

• Next week look for and record any symptoms on #1 and #2 (the leaves that unfurled last week)
• Recording the date on the new leaf positions.
• A pattern develops, recording the date of new leaves and observing the development of the preceding leaves for symptoms.
• Always looking back for symptoms
Recording Observations

Recording Date/Observations

- Observations for herbicide symptoms will be recorded on next visit to site, April 11

<table>
<thead>
<tr>
<th>Emerged Leaf Position</th>
<th>Observation Date</th>
<th>Any Symptoms Observed</th>
<th>Severity rating</th>
<th>Did it Rain</th>
<th>Yes or No</th>
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<tbody>
<tr>
<td>1 Basal</td>
<td>April 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Look back to record symptoms because of lag time between exposure and visual symptoms
# Record Observations Weekly

**EPA-R7 Workshop March 4-5 2014**

## Varieties Affected

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bud Break</th>
<th>Bloom</th>
<th>Set</th>
<th>Pea Size</th>
</tr>
</thead>
</table>

## Location (Block, Row)

MERLOT BLOCK 3 NW ROW 10

## Make observations at least once a week/ One variety per sheet

<table>
<thead>
<tr>
<th>Variety</th>
<th>Year</th>
<th>If Yes</th>
<th>If Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MERLOT</td>
<td>2004</td>
<td></td>
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<table>
<thead>
<tr>
<th>Emerged Leaf Position</th>
<th>Observation Date</th>
<th>Any Phenox Symptoms Observed Yes or No</th>
<th>Severity rating Scale 0-5</th>
<th>Did it Rain Yes or No</th>
<th>Date</th>
<th>Amount</th>
<th>Duration</th>
<th>Wind Dir.</th>
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</thead>
<tbody>
<tr>
<td>1 Basal</td>
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<td>Y</td>
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<td></td>
<td></td>
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<tr>
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<td>Y</td>
<td>2</td>
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</tr>
<tr>
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<td>8 9 10</td>
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<td>Y</td>
<td>5 5 4</td>
<td>Y</td>
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<td>6AM-3PM</td>
<td>9HRS</td>
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<td>Y</td>
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<td>Y</td>
<td>JUNE 9</td>
<td>.2&quot;</td>
<td>8:10AM-3:7PM</td>
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<td>JULY 5</td>
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<td>N</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No New Leaves</td>
<td>AUGUST 2</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Charles Carly
Phone #: 509-225-2877
Down Towne Vineyards
Yakima
Section: 24 Township: 13N Range: 18E**
Why Weekly Readings?

• Weekly readings place somebody in the vineyard specifically to make observations for herbicide symptoms

• Timely decisions need to be made to grow the plants through the herbicide exposure using irrigation and a complete nutritional program as nitrogen alone is not enough
# Recording Severity of Injury

## Recording Observations

<table>
<thead>
<tr>
<th>Name / Contact:</th>
<th>CHARLES CARLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone #:</td>
<td>509-225-2677</td>
</tr>
<tr>
<td>Vineyard Name:</td>
<td>DOWN TOWNE VINEYARDS</td>
</tr>
<tr>
<td>Location:</td>
<td>ROAD 2004 - YAKIMA</td>
</tr>
<tr>
<td>County:</td>
<td>YAKIMA</td>
</tr>
<tr>
<td>Section:</td>
<td>24</td>
</tr>
<tr>
<td>Township:</td>
<td>13N</td>
</tr>
<tr>
<td>Range:</td>
<td>1BE</td>
</tr>
</tbody>
</table>

| Location (Block, Row): | MERLOT BLOCK 3 NW   ROW 10 |

Make observations at least once a week! One variety per sheet.

### Variety: MERLOT Year: 2004

<table>
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<th>Any Phenoxy Symptoms Observed Yes or No</th>
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<th>Duration</th>
<th>Wind Dir.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Basal</td>
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<td>Y</td>
<td>2</td>
<td>N</td>
<td>N</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>MAY 17</td>
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<td>N</td>
<td>N</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 4</td>
<td>MAY 24</td>
<td>Y</td>
<td>2.3</td>
<td>N</td>
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<td>0</td>
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<tr>
<td>5 6 7</td>
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<td>N</td>
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<tr>
<td>11 12 13</td>
<td>JUNE 14</td>
<td>Y</td>
<td>6.5 Y</td>
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<td>JUNE 1</td>
<td>.34</td>
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<td>9HRS</td>
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<td>14 15</td>
<td>JUNE 21</td>
<td>Y</td>
<td>2.1</td>
<td>Y</td>
<td>JUNE 9</td>
<td>.2</td>
<td>8AM-3PM</td>
<td>6HRS</td>
</tr>
<tr>
<td>16 17</td>
<td>JUL 5</td>
<td>N</td>
<td>10</td>
<td>N</td>
<td>N</td>
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</tr>
<tr>
<td>No New Leaves</td>
<td>AUGUST 2</td>
<td>N</td>
<td></td>
<td>N</td>
<td>N</td>
<td>0</td>
<td></td>
<td></td>
</tr>
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</table>

EPA-R7 Workshop March 4-5 2014
No visible symptoms of phenoxy-like herbicide contact. Margins and lobes are well defined.

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Definite deformation of leaf margins and sinuses. Venation will appear almost parallel.

Grossly deformed leaf. Veination will be parallel. The leaf will be severely dwarfed.

Diminished or possible lack of sinus. Leaf will be significantly smaller than those with a lesser rating.

What is Important

Changes in leaf size, shape and symptomology

What date did this leaf unfurl?
What is Important – Node Spacing

SGR herbicide exposure event. What was the date this leaf unfurled?
Caution

- New shoots are tender and easily broken if handled. Observe and take notes in a pocket notebook.
- Once the shoot and leaves become more mature numbers can be written on the leaves and shoot.
## Recording Rain Events

### Name / Contact:
- Charles Carly
- Phone #: 509-225-2647

### Vineyard Name:
- Down Towne Vineyards

### Location:
- Road 2004 - Yakima
- County: Yakima
- Section: 24
- Township: 13N
- Range: 1BE

### Varieties Affected

<table>
<thead>
<tr>
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<th>Bud Break</th>
<th>Bloom</th>
<th>Set</th>
<th>Pea Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merlot</td>
<td>May 6, 2004</td>
<td>June 7, 2004</td>
<td>June 15, 2004</td>
<td>June 28, 2004</td>
</tr>
</tbody>
</table>

### Location (Block, Row):
- Merlot Block 3 NW Row 10

### Make observations at least once a week / One variety per sheet

#### Variety: Merlot Year: 2004

<table>
<thead>
<tr>
<th>Emerged Leaf Position</th>
<th>Observation Date</th>
<th>Any Phenox Symptom Observed Yes or No</th>
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<th>Did it Rain Yes or No</th>
<th>Date</th>
<th>Amount</th>
<th>Duration</th>
<th>Wind Dir.</th>
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</thead>
<tbody>
<tr>
<td>1 Basal</td>
<td>May 10</td>
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<td>2</td>
<td>N</td>
<td></td>
<td></td>
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<td>June 21</td>
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<td>8-10am 3-7pm 6hrs</td>
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<td>16, 17, 28</td>
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</tr>
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</table>
Record Rain Events

Rainwater can transport certain herbicides

Leaf without cutin adsorbs rain
Leaf with cutin repels rain
Rain is a source of herbicide transport. Water beads are formed on leaves with the waxy cutin layer formed. Water soaks into the leaves on the shoot tip (center), and is a path for an herbicide to enter the grape plant. This vineyard suffered $290,000 in damages from a single rain event, WSDA case 33Y-00.
How Many Locations Should be Checked and Which Variety?

- The number of shoots selected will depend on your time and ability to observe the shoots on a weekly basis throughout the growing season; a minimum of three is recommended.
- The variety selected for observation will not be as important as selecting a set of varietal shoots that you will be able to observe weekly.
- Generally white varieties exhibit more symptoms than red varieties.
How to Get Started

Tools
Where Do I Start In This Vast Vineyard?
Select a Location to Monitor
Landmark near a driveway. Make it easy!
How to Get Started

Row Location Marker

Flagging tape
How to Get Started

Row Location Marker

Use a marker/color not common in the vineyard
Mark the shoot

Flagging tape works well to mark the shoot. Tie to the vine/wire near the base of the shoot. ANYTHING TIED TO THE NEW SHOOT WILL CREATE WIND RESISTANCE AND IS EASILY BROKEN
A reference in the row is helpful

A ground reference is helpful when returning to the vineyard, flags are not always the best markers in windy areas.
Keep the shoot upright

Horizontal shoots will give false readings as they will not grow out of the symptom as illustrated in the photo.
### How to Get Started

**GPS location is helpful**

![GPS Location](image)

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAF INDEX</td>
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<table>
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<th>Modified</th>
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<tbody>
<tr>
<td>NW</td>
<td>15-MAR-13 2:04:17 PM</td>
</tr>
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</table>

Delete  Show Map  OK
How to Get Started

Inform Crews Not to Disturb Shoot
pruning, thinning, training...
How much time?

- Reading the shoot takes about 5 minutes
- 12 week period starting at bud break
- 12 observation X 5 minutes = ONE HOUR FOR THE SEASON
- Note: there is lag time between the exposure and the exhibition of herbicide symptoms
- Take readings same day of each week
Full Time Person at the Vineyard?

• Most cases investigated by WSDA come about by a good observer working in the field full time and reporting the issue to management.

• An onsite full time person can also record weather events. It is very important to record rain events. There are many isolated showers and only a portion of the vineyard may receive rain.
Selecting an Observer

• Please do not push the observer duty to a field consultant or other service provider to the vineyard. They are not on the property full time and they are there looking for things other than herbicide symptoms.
How to End the Season

Remove the Indexed Shoot at the End of the Season for an Historical Record

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http://feql.wsu.edu