2012 Weed Survey of Saskatchewan Canola Fields

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• 2012 Weed Survey was one aspect of a much larger study funded through the Canola Agri-Science Cluster by the Canola Council of Canada and Agriculture and Agri-Food Canada led by Dr. Owen Olfert

• “Detection, surveillance and management of weed, insect and disease pests that threaten the economic viability of crop production and the environmental health of prairie agro-ecosystems”
2012 Weed Survey is part of series of surveys of annual crops (including canola) conducted in Saskatchewan:

1976-79: 313 rapeseed fields
1986: 99 canola fields
1995: 216 canola fields (transition to HT)
2003: 344 canola fields (dry)
2012: 464 canola fields (wet)

Similar methodology allows for an assessment of changes:
- Identify weeds that have increased since 1970s
- Influence of HT canola on weeds
- Influence of weather on weeds in HT crops
• Quarter sections located across Saskatchewan were selected using a stratified random sample based on canola acreage in ecodistricts reported in census
• Contacted owners for permission to survey their nearest canola field
Methodology - Weed Sampling Pattern

Twenty 0.5 m$^2$ by 0.5 m$^2$ quadrats counted in July or August

Pattern adjusted to avoid bluffs, sloughs and other wet areas
Weed Community Structure
Weed-free Quadrats

Weed-free quadrats (%)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>30</td>
<td>25</td>
<td>50</td>
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</tbody>
</table>

HT HT
Median Total Weed Density

Median Weed Density (m⁻²)


Graph showing the median total weed density from 1970s to 2012.
Species Richness

- 130 weed species were identified in 2012
Top Species in 2012
<table>
<thead>
<tr>
<th>Rank</th>
<th>Species</th>
<th>Frequency (%)</th>
<th>Field Uniformity All</th>
<th>Field Density (#/m²) All</th>
<th>Relative Abundance</th>
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<tbody>
<tr>
<td>1</td>
<td>Green foxtail</td>
<td>49.3</td>
<td>19.9</td>
<td>8.4</td>
<td>34.1</td>
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<tr>
<td>2</td>
<td>Wild buckwheat</td>
<td>74.8</td>
<td>26.5</td>
<td>2.5</td>
<td>25.4</td>
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<tr>
<td>3</td>
<td>Wild oats</td>
<td>49.7</td>
<td>17.9</td>
<td>3.7</td>
<td>21.8</td>
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<tr>
<td>4</td>
<td>Spring wheat</td>
<td>48.3</td>
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<td>2.2</td>
<td>15.3</td>
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<tr>
<td>5</td>
<td>Spiny annual sow-thistle</td>
<td>41.1</td>
<td>30.1</td>
<td>3.7</td>
<td>15.1</td>
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<tr>
<td>6</td>
<td>Cleavers</td>
<td>36.2</td>
<td>6.5</td>
<td>1.8</td>
<td>14.7</td>
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<td>7</td>
<td>Shepherd's-purse</td>
<td>42.3</td>
<td>28.8</td>
<td>1.8</td>
<td>14.1</td>
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<tr>
<td>8</td>
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<td>20.3</td>
<td>5.3</td>
<td>1.3</td>
<td>11.1</td>
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<tr>
<td>9</td>
<td>Lamb's-quarters</td>
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<td>27.9</td>
<td>2.7</td>
<td>10.9</td>
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<td>Narrow-leaved hawk's-beard</td>
<td>28.9</td>
<td>2.7</td>
<td>1.3</td>
<td>9.6</td>
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<tr>
<td>11</td>
<td>Canada thistle</td>
<td>42.5</td>
<td>1.6</td>
<td>1.6</td>
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<tr>
<td>12</td>
<td>Dandelion</td>
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<td>5.0</td>
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<td>16</td>
<td>Perennial sow-thistle</td>
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<tr>
<td>17</td>
<td>Redroot pigweed</td>
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<td>4.1</td>
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<td>4.1</td>
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<td>4.1</td>
<td>4.1</td>
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<td>21</td>
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<td>23</td>
<td>Night-flowering catchfly</td>
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<td>3.3</td>
<td>4.1</td>
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<td>24</td>
<td>Canola</td>
<td>13.0</td>
<td>2.1</td>
<td>3.3</td>
<td>4.1</td>
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<td>25</td>
<td>Kochia</td>
<td>13.3</td>
<td>2.5</td>
<td>3.3</td>
<td>4.1</td>
</tr>
</tbody>
</table>
#1 Green Foxtail
#1 Green Foxtail

**Rank based on:** Relative Abundance
#1 Green Foxtail

- Prince Albert
- North Battleford
- Saskatoon
- Yorkton
- Regina
- Melfort
- Swift Current

**Frequency**
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

**2012**
#2 Wild Buckwheat
#2 Wild Buckwheat

Rank based on: Relative Abundance
#2 Wild Buckwheat

Not Surveyed
Absent
0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2012

Frequency
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

- Prince Albert
- North Battleford
- Saskatoon
- Melfort
- Yorkton
- Regina
- Swift Current
#3 Wild Oats
#3 Wild Oats

Frequency (%)

Rank based on: Relative Abundance
#4 Volunteer Wheat
#4 Volunteer Wheat

**Frequency (%)**

1970s: 29
1986: 17
1995: 13
2003: 5
2012: 4

**Rank based on:** Relative Abundance
#5 Spiny Annual Sow-thistle
#5 Spiny Annual Sow-thistle

Rank based on: Relative Abundance
#5 Spiny Annual Sow-thistle

**Frequency**

- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

**2012**

- Prince Albert
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current
#6 Cleavers
#6 Cleavers

Rank based on: Relative Abundance
#6 Cleavers

## Frequency

- **Not Surveyed**
- **Absent**
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

### Locations

- Prince Albert
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current

### Year

1995
#6 Cleavers

Not Surveyed
Absent
0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2003

Frequency
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

Locations:
- North Battleford
- Saskatoon
- Yorkton
- Regina
- Swift Current
- Prince Albert
- Melfort

Map areas color-coded by frequency.
#6 Cleavers

## 2012 Frequency

- **Not Surveyed**
- **Absent**
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

**Locations:**
- Prince Albert
- North Battleford
- Saskatoon
- Melfort
- Yorkton
- Regina
- Swift Current
#7 Shepherd’s-purse
#7 Shepherd’s-purse

Not Surveyed

Absent

0.1 to 10.0%

10.1 to 20.0%

20.1 to 30.0%

30.1 to 40.0%

40.1 to 50.0%

50.1 to 60.0%

60.1 to 70.0%

More than 70%

2012

Frequency

- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%
#8 Barnyard Grass Species
#8 Barnyard Grass Species

**Frequency**
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

**2003**

- Prince Albert
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current
#8 Barnyard Grass Species

## 2012 Frequency

<table>
<thead>
<tr>
<th>Not Surveyed</th>
<th>Absent</th>
<th>0.1 to 10.0%</th>
<th>10.1 to 20.0%</th>
<th>20.1 to 30.0%</th>
<th>30.1 to 40.0%</th>
<th>40.1 to 50.0%</th>
<th>50.1 to 60.0%</th>
<th>60.1 to 70.0%</th>
<th>More than 70%</th>
</tr>
</thead>
</table>

Map highlights:
- North Battleford
- Melfort
- Prince Albert
- Saskatoon
- Yorkton
- Regina
- Swift Current
#9 Lamb’s-quarters
#9 Lamb’s-quarters

**Frequency (%)**

- **1970s**: 3
- **1986**: 3
- **1995**: 7
- **2003**: 4
- **2012**: 9

**Rank based on**: Relative Abundance
#10 Narrow-leaved Hawk's-beard
#10 Narrow-leaved Hawk’s-beard

**Rank based on:** Relative Abundance
#10 Narrow-leaved Hawk’s-beard

2012

**Frequency**
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

Locations:
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current
- Prince Albert
#11 Canada Thistle
#11 Canada Thistle

**Frequency (%)**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
<td>14</td>
<td>5</td>
<td>6</td>
<td>11</td>
</tr>
</tbody>
</table>

*Rank based on: Relative Abundance*
#12 Dandelion
#12 Dandelion

Rank based on: **Relative Abundance**
#12 Dandelion

Not Surveyed

Absent

0.1 to 10.0%

10.1 to 20.0%

20.1 to 30.0%

30.1 to 40.0%

40.1 to 50.0%

50.1 to 60.0%

60.1 to 70.0%

More than 70%

Frequency

1995

- Prince Albert
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current
#12 Dandelion

Not Surveyed
Absent
0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2003

Frequency
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

Locations:
- Prince Albert
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current
#12 Dandelion

## Frequency

- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

### 2012

- Prince Albert
- North Battleford
- Saskatoon
- Melfort
- Yorkton
- Regina
- Swift Current
#13 Willowherb Species

Rank based on: Relative Abundance
#13 Willowherb Species

## Frequency

| Frequency | 2012
|-----------|-----
| Not Surveyed |   |
| Absent |   |
| 0.1 to 10.0% |   |
| 10.1 to 20.0% |   |
| 20.1 to 30.0% |   |
| 30.1 to 40.0% |   |
| 40.1 to 50.0% |   |
| 50.1 to 60.0% |   |
| 60.1 to 70.0% |   |
| More than 70% |   |

## Locations

- Prince Albert
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current
#14 Broad-leaved Plantain
#14 Broad-leaved Plantain

Rank based on:  Relative Abundance
#14 Broad-leaved Plantain

Not Surveyed

Absent

0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2012

Frequency

Not Surveyed
Absent
0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

Locations:
- North Battleford
- Prince Albert
- Saskatoon
- Melfort
- Yorkton
- Regina
- Swift Current
#15 Biennial Wormwood
#15 Biennial Wormwood

**Rank based on:** Relative Abundance
#15 Biennial Wormwood

## Frequency

- **Not Surveyed**
- **Absent**
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

### 2003

- Prince Albert
- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current
#15 Biennial Wormwood

Not Surveyed
Absent
0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2012

Frequency
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

Map showing the frequency of Biennial Wormwood in various locations such as Prince Albert, North Battleford, Saskatoon, Melfort, Yorkton, Regina, and Swift Current in 2012.
#16 Perennial Sow-thistle
#16 Perennial Sow-thistle

Rank based on: # Relative Abundance
#16 Perennial Sow-thistle

Not Surveyed
Absent 0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2012

- North Battleford
- Melfort
- Saskatoon
- Yorkton
- Regina
- Swift Current

Frequency
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%
#17 Redroot Pigweed

Rank based on: Relative Abundance
#17 Redroot Pigweed

## 2012

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Surveyed</td>
<td>Black</td>
</tr>
<tr>
<td>Absent</td>
<td>White</td>
</tr>
<tr>
<td>0.1 to 10.0%</td>
<td>Light Green</td>
</tr>
<tr>
<td>10.1 to 20.0%</td>
<td>Green</td>
</tr>
<tr>
<td>20.1 to 30.0%</td>
<td>Dark Green</td>
</tr>
<tr>
<td>30.1 to 40.0%</td>
<td>Light Blue</td>
</tr>
<tr>
<td>40.1 to 50.0%</td>
<td>Dark Blue</td>
</tr>
<tr>
<td>50.1 to 60.0%</td>
<td>Blue</td>
</tr>
<tr>
<td>60.1 to 70.0%</td>
<td>Dark Blue</td>
</tr>
<tr>
<td>More than 70%</td>
<td>Black</td>
</tr>
</tbody>
</table>

- **Prince Albert**
- **North Battleford**
- **Saskatoon**
- **Melfort**
- **Yorkton**
- **Regina**
- **Swift Current**
#18 Foxtail Barley
#18 Foxtail Barley

Rank based on: **Relative Abundance**
#18 Foxtail Barley

2012

**Frequency**
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%
#19 Marsh Cudweed

Rank based on: **Relative Abundance**
#19 Marsh Cudweed

Not Surveyed
Absent
0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2012

- Prince Albert
- North Battleford
- Saskatoon
- Melfort
- Yorkton
- Regina
- Swift Current
#20 Round-leaved Mallow
#20 Round-leaved Mallow

Rank based on: **Relative Abundance**
#20 Round-leaved Mallow

**1995**

<table>
<thead>
<tr>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Surveyed</td>
</tr>
<tr>
<td>Absent</td>
</tr>
<tr>
<td>0.1 to 10.0%</td>
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<tr>
<td>10.1 to 20.0%</td>
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<tr>
<td>20.1 to 30.0%</td>
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<tr>
<td>30.1 to 40.0%</td>
</tr>
<tr>
<td>40.1 to 50.0%</td>
</tr>
<tr>
<td>50.1 to 60.0%</td>
</tr>
<tr>
<td>60.1 to 70.0%</td>
</tr>
<tr>
<td>More than 70%</td>
</tr>
</tbody>
</table>

Locations:
- Prince Albert
- North Battleford
- Saskatoon
- Melfort
- Yorkton
- Regina
- Swift Current
#20 Round-leaved Mallow

## 2003

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage Range</th>
</tr>
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<td>Not Surveyed</td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td>0.1 to 10.0%</td>
<td></td>
</tr>
<tr>
<td>10.1 to 20.0%</td>
<td></td>
</tr>
<tr>
<td>20.1 to 30.0%</td>
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<tr>
<td>30.1 to 40.0%</td>
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<tr>
<td>40.1 to 50.0%</td>
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</tr>
<tr>
<td>50.1 to 60.0%</td>
<td></td>
</tr>
<tr>
<td>60.1 to 70.0%</td>
<td></td>
</tr>
<tr>
<td>More than 70%</td>
<td></td>
</tr>
</tbody>
</table>

- **North Battleford**
- **Melfort**
- **Saskatoon**
- **Yorkton**
- **Regina**
- **Swift Current**
- **Prince Albert**
#20 Round-leaved Mallow

Not Surveyed
Absent
0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2012

Frequency
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%
#25 Kochia
#25 Kochia

Rank based on: Relative Abundance
#25 Kochia

**Not Surveyed**
- Absent
  - 0.1 to 10.0%
  - 10.1 to 20.0%
  - 20.1 to 30.0%
  - 30.1 to 40.0%
  - 40.1 to 50.0%
  - 50.1 to 60.0%
  - 60.1 to 70.0%
  - More than 70%

**1995**

- **Prince Albert**
- **North Battleford**
- **Melfort**
- **Saskatoon**
- **Yorkton**
- **Regina**
- **Swift Current**

**Frequency**
- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%
#25 Kochia

Not Surveyed

Absent

0.1 to 10.0%
10.1 to 20.0%
20.1 to 30.0%
30.1 to 40.0%
40.1 to 50.0%
50.1 to 60.0%
60.1 to 70.0%
More than 70%

2012

Frequency

- Not Surveyed
- Absent
- 0.1 to 10.0%
- 10.1 to 20.0%
- 20.1 to 30.0%
- 30.1 to 40.0%
- 40.1 to 50.0%
- 50.1 to 60.0%
- 60.1 to 70.0%
- More than 70%

Map showing distribution of Kochia across different locations in 2012.
Summary

- Wet conditions in 2012 led to weedier fields due to difficulties with timing of in-crop herbicide applications
- Allows a good representation of geographic distribution of weed species
- Several species increasing since 1970s including: wild buckwheat, spiny annual sow-thistle, cleavers, barnyard grass, biennial wormwood, foxtail barley and round-leaved mallow
- Species that are decreasing include lamb’s-quarters, stinkweed, annual smartweed, field horsetail, wild mustard, Russian thistle, flixweed, bluebur, cow cockle
- Will be collecting management data to relate to weed data
Thank you to all the producers who agreed to let us survey your fields!