White Oak, Pelican Pouch, July 28, 2018

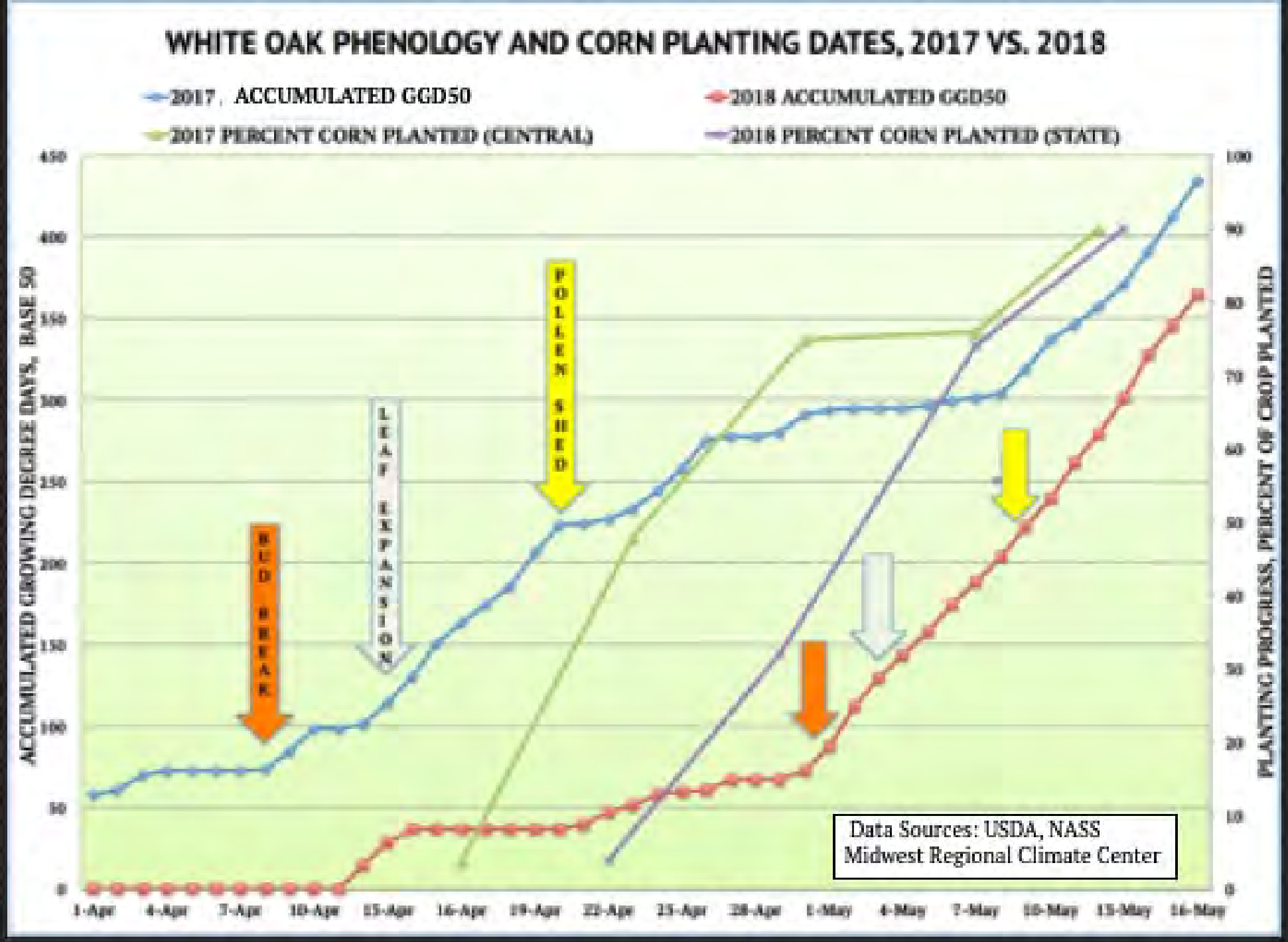
So, why the big differences in the extent of herbicide injury to central IL oaks?

2017

2018


April 28, 2017
253 GGD50

May 10, 2018
244 GGD50


WHITE OAK PHENOLOGY AND CORN PLANTING DATES, 2017 VS. 2018
2017 ACCUMULATED GGD50
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2017 PERCENT CORN PLANTED (CENTRAL)
2018 PERCENT CORN PLANTED (STATE)
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PLANTING PROGRESS, PERCENT OF CROP PLANTED
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FOLIAR SHED
Data Sources: USDA, NASS
Midwest Regional Climate Center
1-Apr
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16-Apr
19-Apr
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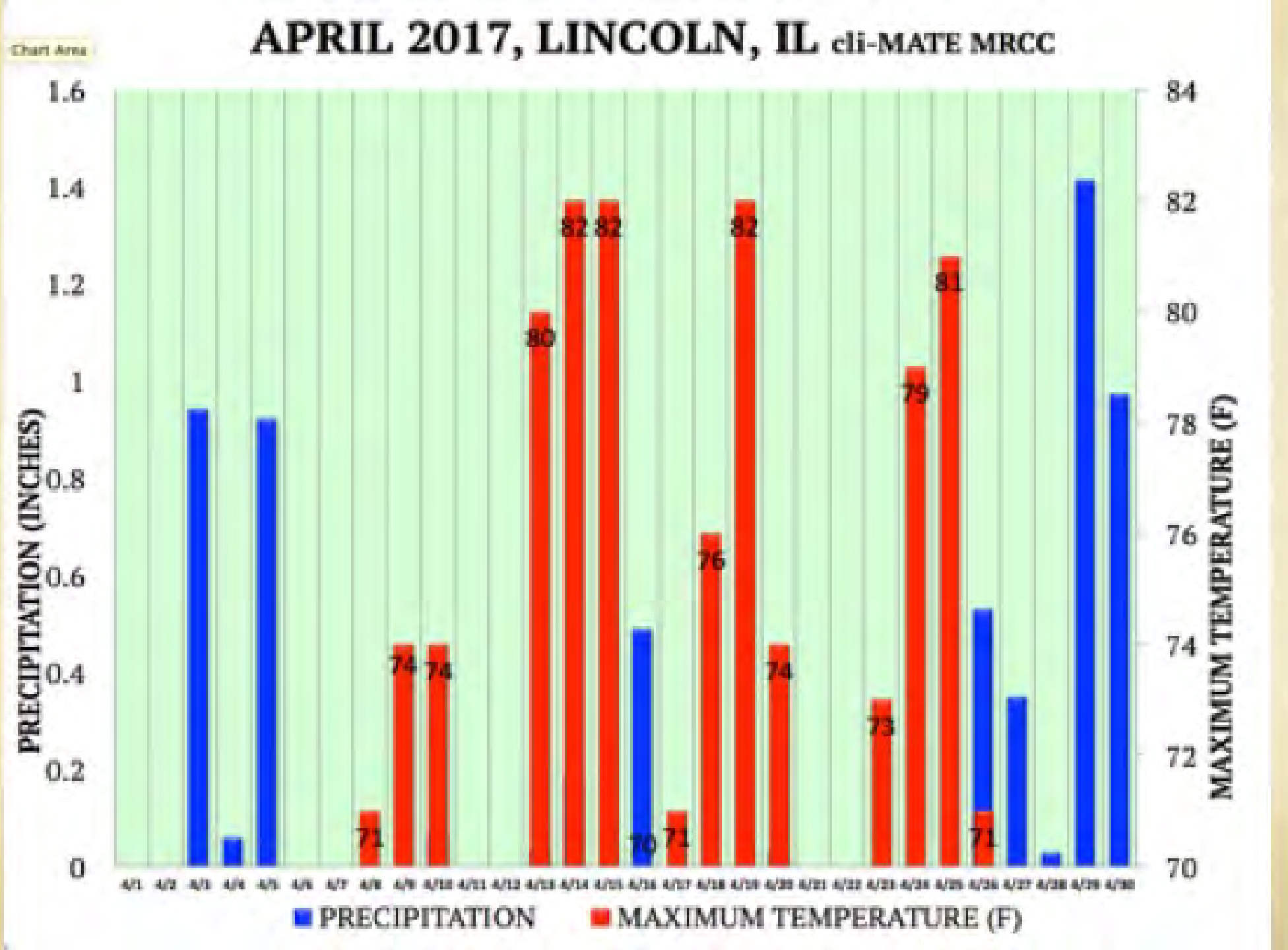
13-May
16-May


APRIL 2017, LINCOLN, IL cli-MATE MRCC
Chart Area
PRECIPITATION (INCHES)
MAXIMUM TEMPERATURE (F)
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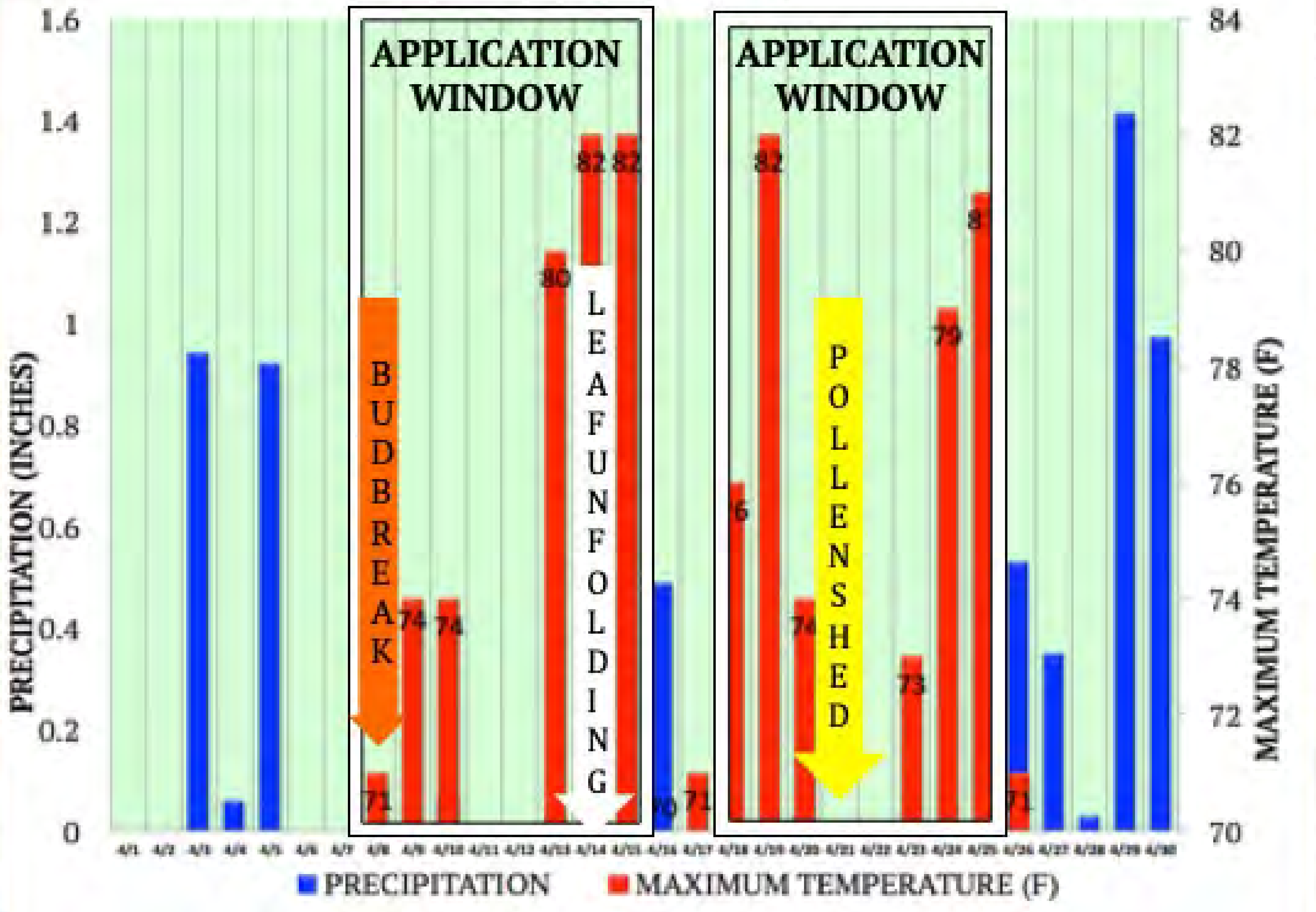

Sycamore, Home, June 1, 2018

Dicamba Tolerant Soybeans, Home, June 13, 2018

Non-Dicamba Tolerant Soy, Home, June 13, 2018

Cup Plant, June 13, 2018

Rosinweed
June 13, 2018

Sycamore, Home, June 18, 2018


SYCAMORE
LOUIS NELMS
JUNE 19, 2018

SGS North America
1405 32nd Ave
Brookings, SD 57006

Certificate of Analysis

Certificate Number: 18-010011
Report Date: June 27, 2018

Client:
LOUIS NELMS
9331 N CR 3800 E
Mason City IL 62664
UNITED STATES

Sample Information:
SGS Sample Identification: MW18-06784.001
Client Sample Identification: LOUIS & PATRICIA NELMS HOME
Received: June 20, 2018
Sample/Product Type: Foliage

Analysis	Result	Units	L.O.Q.	Method
2,4-D	N.D.	PPM	0.005	GC/MS
Clopyralid	N.D.	PPM	0.005	GC/MS
Dicamba	0.14	PPM	0.005	GC/MS
MCPA	N.D.	PPM	0.005	GC/MS
Picloram	N.D.	PPM	0.005	GC/MS

Abbreviations:
L.O.Q. Limit of Quantification **L.O.D.** Limit of Detection **N/A** Not Applicable **N.D.** Not Detected

Jacob Swanson
Analytical Chemistry Supervisor
Start/End Analysis: 06/20/2018 - 06/27/2018

Sycamore, Latham Park, Lincoln, IL July 5, 2018

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Sycamore
Barton Sommers
Bur Oak Nature
Preserve
July 28, 2018

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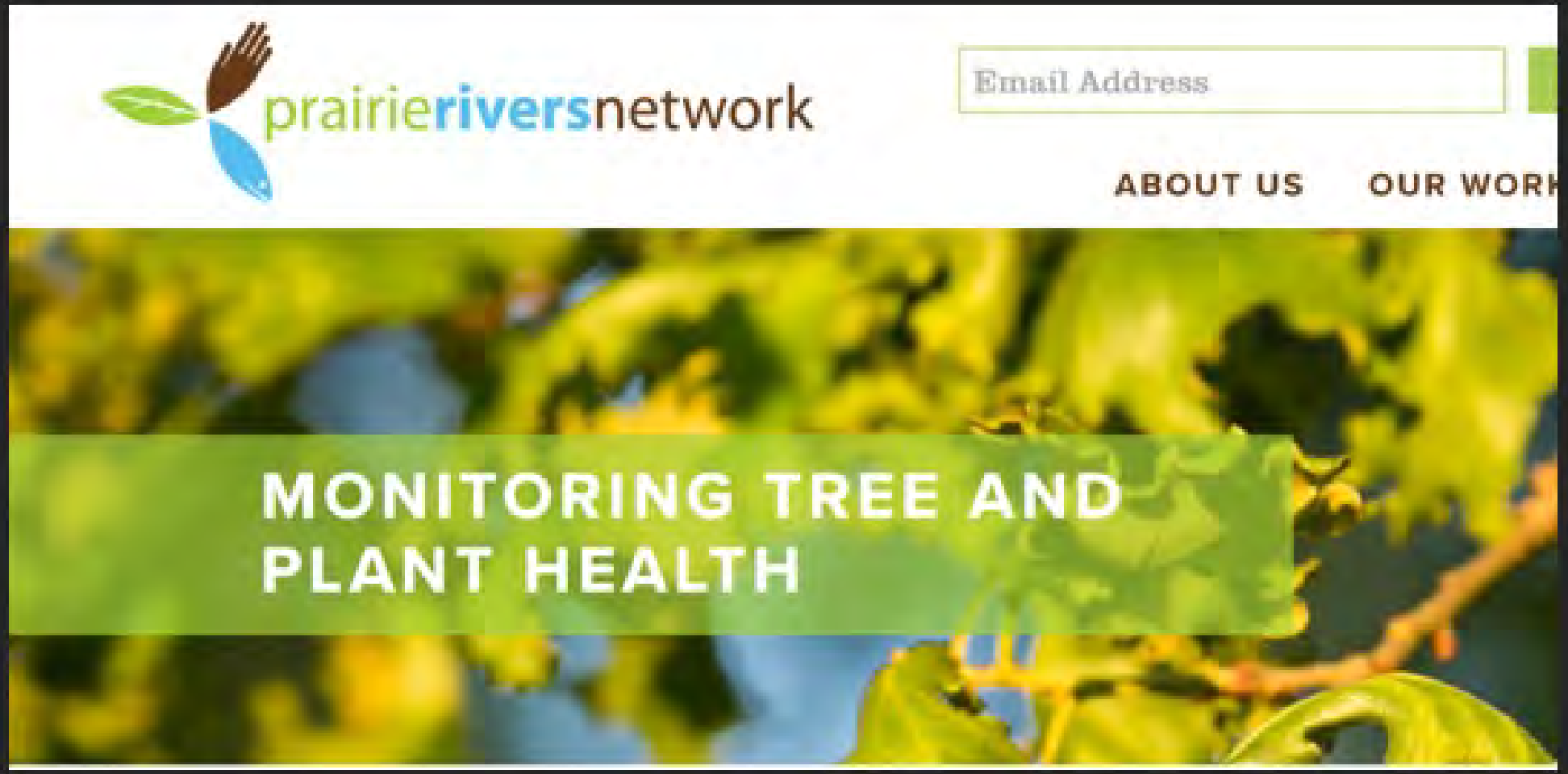

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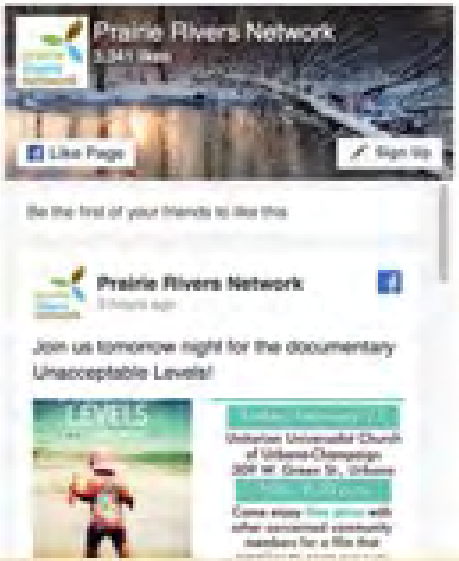

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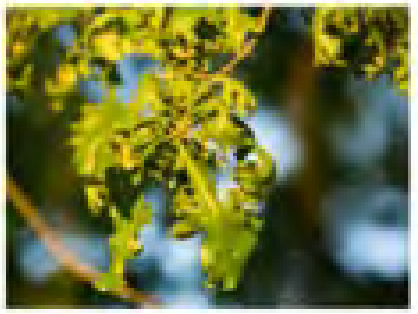
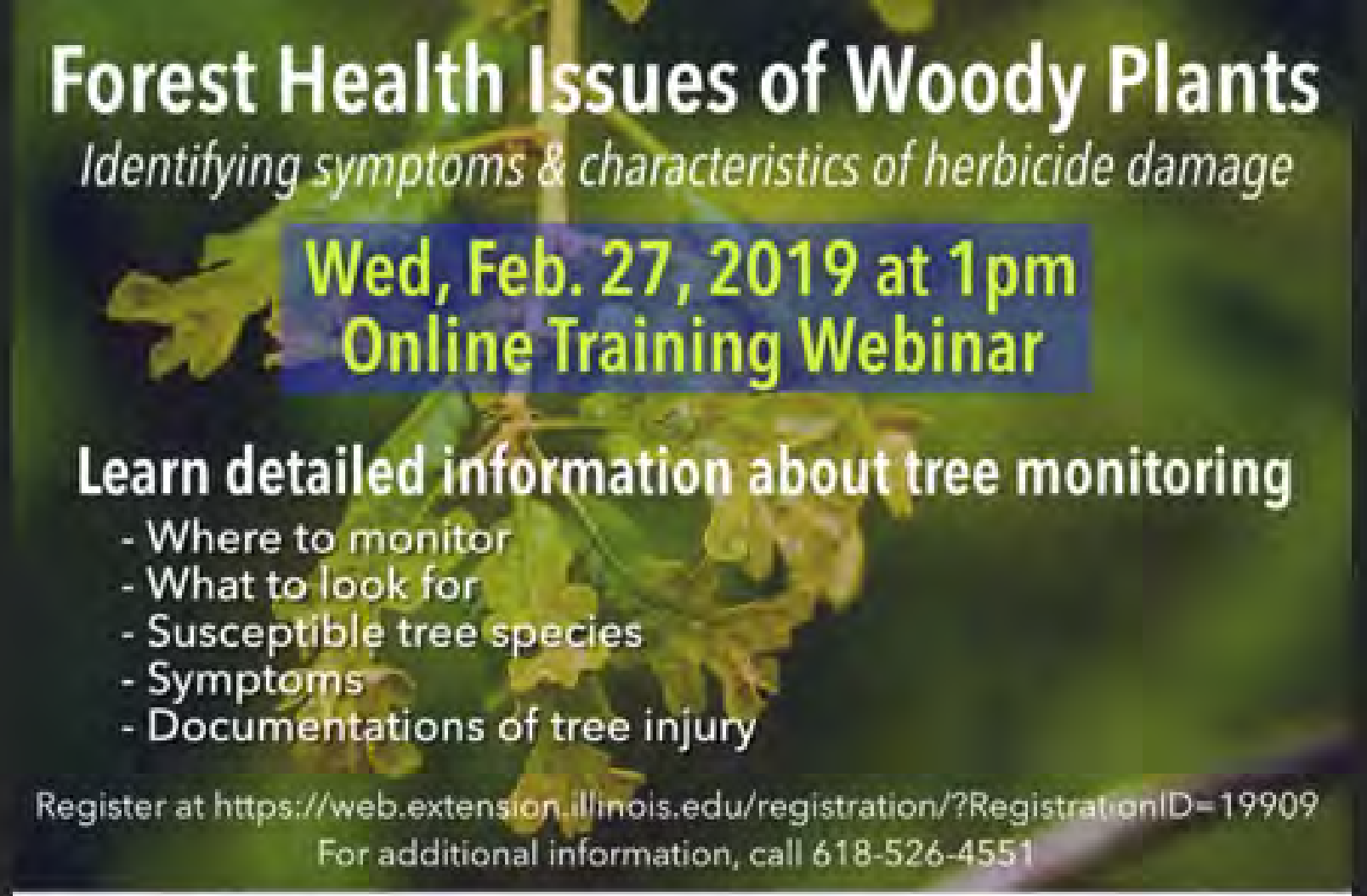


DAMAGE TO ILLINOIS'S RECORD SETTING POST OAK

Many trees are showing symptoms of exposure to herbicide drift and volitalization, including our state record-setting Post Oak:



ILLINOIS
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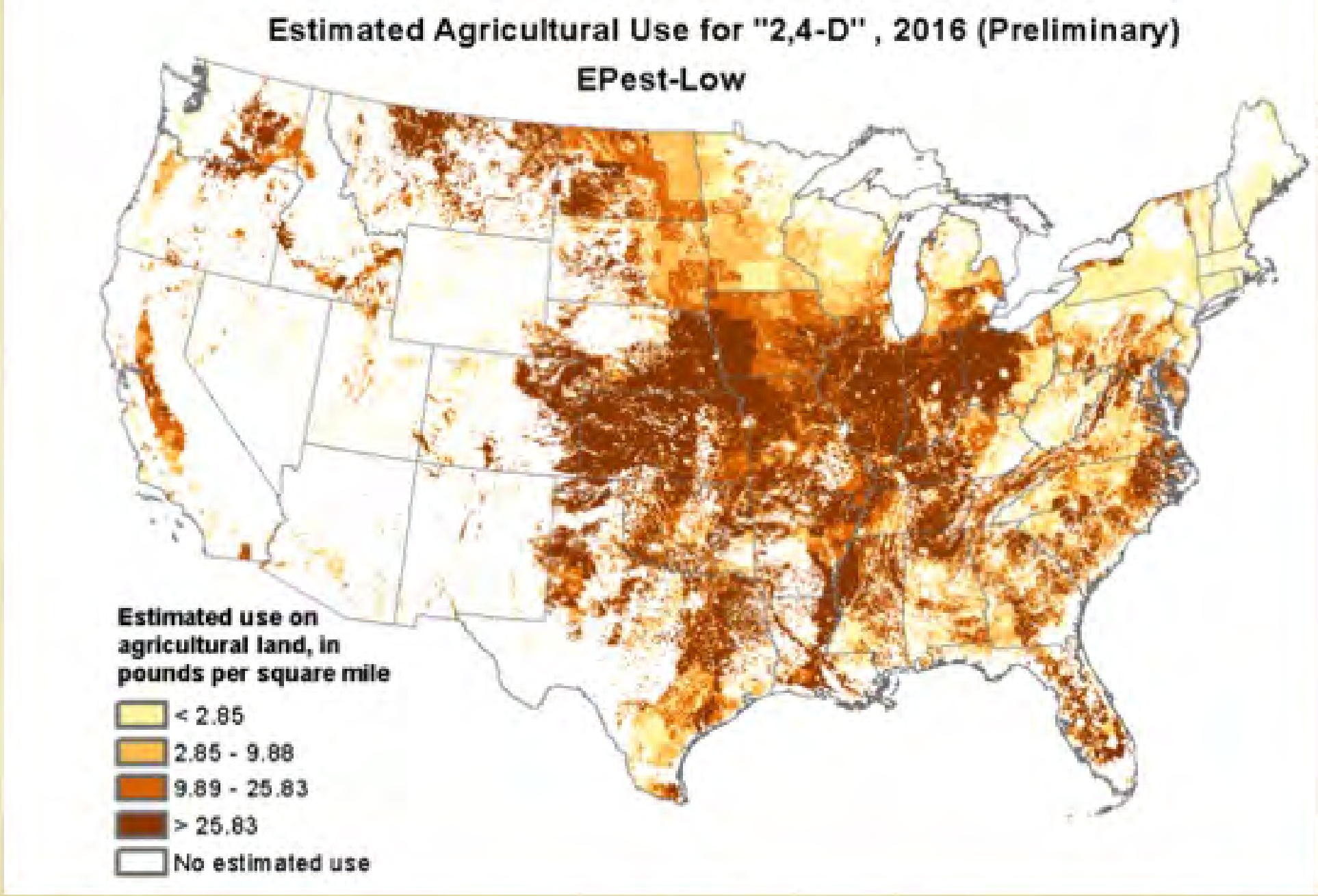
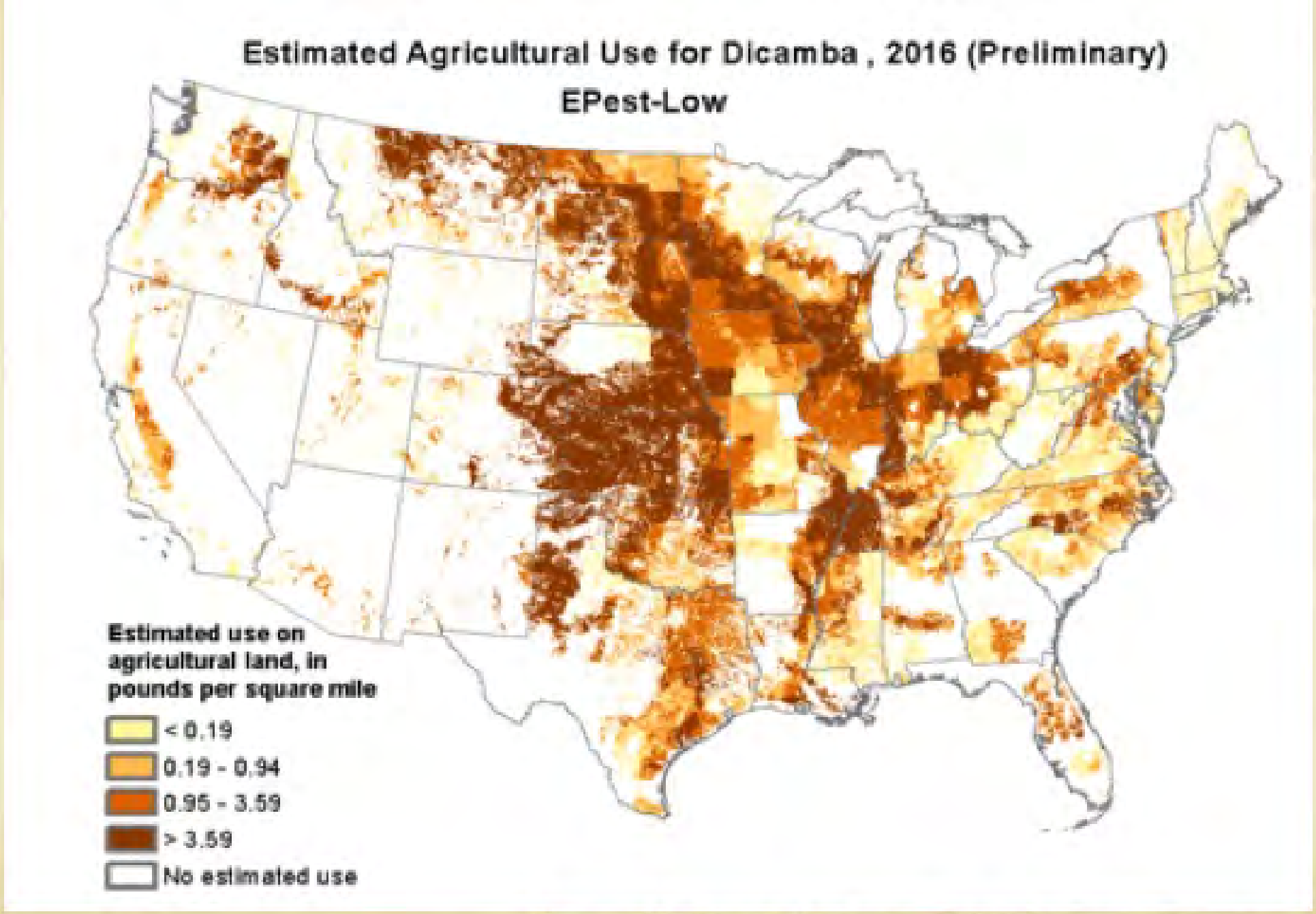
"There is uncertainty associated with the existing database for the OTT uses and how they relate to reported incidents in terms of species effects, field conditions and primary and secondary off-site movement.

... ecological effects data on non-target plants ... are required to address this uncertainty."

Source: USEPA, Registration Decision on Dicamba, Nov. 1, 2018



Source: US Dept. of Interior, US Geological Survey



Source: US Dept. of Interior, US Geological Survey

Milestones of 2,4-D

- 1941 – synthesis reported
- Early 40's: potential uses as herbicide
  - Very low concentration
  - Translocation
  - Selectivity on broadleaf weeds
  - Fast acting
- 1945 – first commercial product
- 1950 – rapidly substituting for labor

2,4-D Off-Target

- 1950 – grapes
- Early 60's – IA specialty growers attempt ban
- Phipps 1963 – "leaf blight" on plains trees
- Hibbs 1978 – injury to trees
  - 1975 – over 10% of samples submitted to INHS lab
  - Most likely to occur from PGRs
- Mohr 2004 – U of I Extension – PGRs most common cause of injury complaints
- Oak Problems – U of I Plant Clinic Report
  - Sensitive to 2,4-D and dicamba

Dicamba Milestones

- 1962 – registration of Banvel (DMA salt)
- 1970 – corn POE
- 1971 – Knake, U of I
  - Soybeans much more sensitive to dicamba than 2,4-D
  - High volatility of Banvel
  - Discouraged use in IL
- 1990 – registration of Clarity (DGA salt)
- 2017 – Dicamba tolerant soybeans, OTT "low-volatile" dicamba formulations

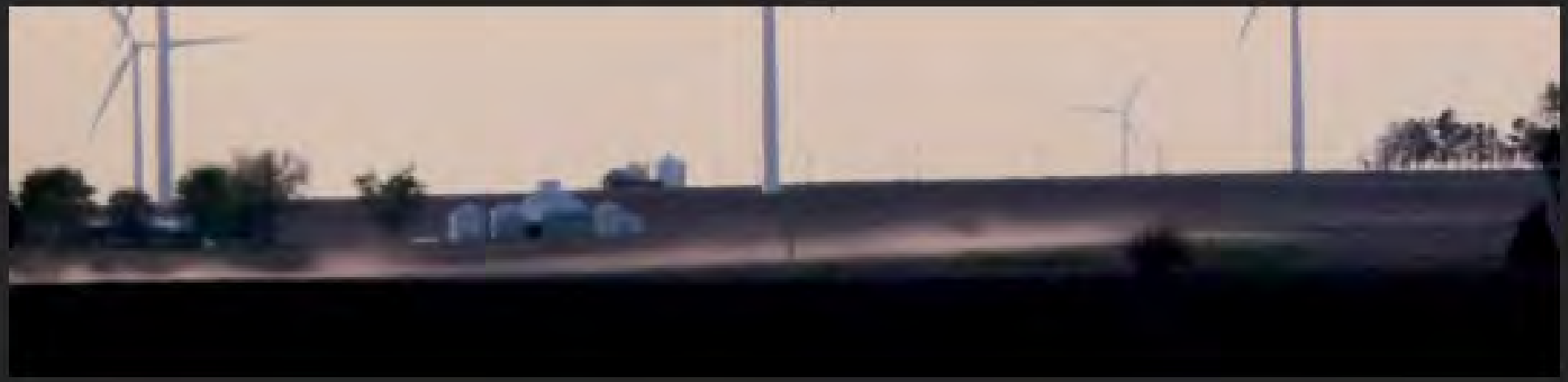
Burndown – Assumptions of Safety

- Clean field of broadleaf weeds before planting corn and soybeans
- LV 2,4-D Ester a primary tool
  - Effective and low cost
  - Difficult to control weeds
  - Broadens range of glyphosate
  - More volatile than amines
- Dicamba – more effective than 2,4-D on marestail
- Applied 7 – 30 days before planting
- *** Synchrony with Oaks and Redbuds ***

Volatility

- Liquid to gas - > potential for transport to off-target sites by wind or capture in inversions
- Vapor Pressure
  - Formulations
  - Even "low-volatile" formulations volatilize
- Environmental Factors
  - Temperature – increases from 60 to 85 degrees F
    - Can be significant at 70
    - Soil T even in early spring 10 – 15 degrees > air T
  - Relative Humidity – increases with lower RH
  - Greater from leaf surfaces than bare soil
- Time course
  - Application day = greatest
  - Continues for 2 more days
- Evidence: uniformity of injury across area

Temperature Inversion Forming
May 5, 2018 6:30 pm



Phenology and Growing Degree Days

- Phenology
  - Plant corn when oak leaves are the size of a squirrel's ear
- Growing Degree Days
  - Measure heat accumulation
  - Predict plant development
  - (Tmax + Tmin)/2 – base T
  - Start date

- 2,4-D was the final much needed step in industrializing crop production in the Midwest. It enabled the substitution of capital for the grueling and time consuming labor of controlling weeds. Before and during WWII much of that labor had abandoned the farms for better paying jobs in industry. As a result, by war's end, many farms in the Midwest had lost the war on weeds. 2,4-D emerging from the biological and chemical warfare labs and into production fields turned the tide. This and subsequent advances in chemical weed control largely selected for our two crop monocultural system in the Midwest. We are now faced with what this has wrought in environmental, ecological as well as social costs. Costs that cannot continue to be hidden by the sweep of hand, the imperative of feeding the world.

- “ours is an age of loss disguised as plenty”

- Nathaniel Popkin, A Forest of Ancient Trees, Poisoned by Rising Seas
- NYTimes, Dec. 27, 2018

Burn Down, Home, May 7, 2017

ISSUES RELATED TO OLDER, REGISTERED FORMULATIONS OF 2,4-D AND DICAMBA

- INCREASING USAGE
- NOT RESTRICTED USE PESTICIDES (RUP)
- NO TRAINING REQUIREMENTS
- HIGHER VOLATILITY (THAN OTT DICAMBA)
- NO DOWNWIND BUFFERS REQUIRED
- NO NOZZLE TYPE RESTRICTIONS
- NO RESTRICTIONS BETWEEN SUNSET AND SUNRISE (INVERSION POTENTIAL)
- CAN BE APPLIED AERIALLY
- CAN BE APPLIED IN HIGHER WIND CONDITIONS


South of Revis, August 6, 2017

South of Revis, August 6, 2017

Assumptions of Safe Spring Burndown

- Not much sensitive vegetation emerged
- Lower Spring temps = low volatility
- Low Reporting confirms safety

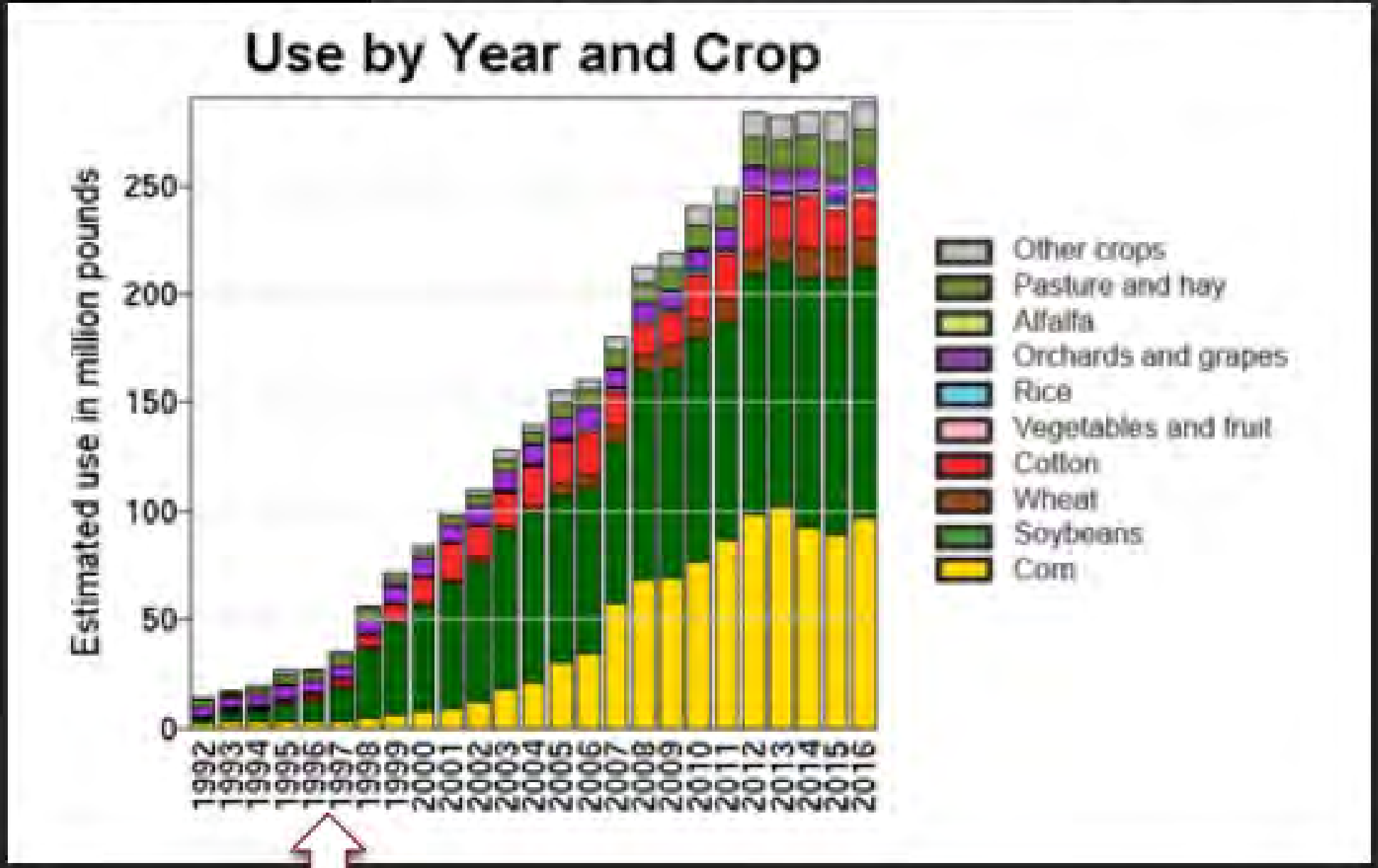

AN ILLINOIS NATURE PRESERVE
SANDRA MILLER
BELLROSE
NATURE PRESERVE
Sandra Miller Bellrose Nature Preserve has been formally dedicated as a sanctuary for native plants and animals. It is maintained in its natural condition so that present and future generations can see the Illinois landscape as it appeared in the past. This living example of our natural heritage is valuable for scientific studies and may provide habitat for rare plants and animals.

Unintended Consequences

Off-Target Impacts of Ag Herbicides on Native Plants

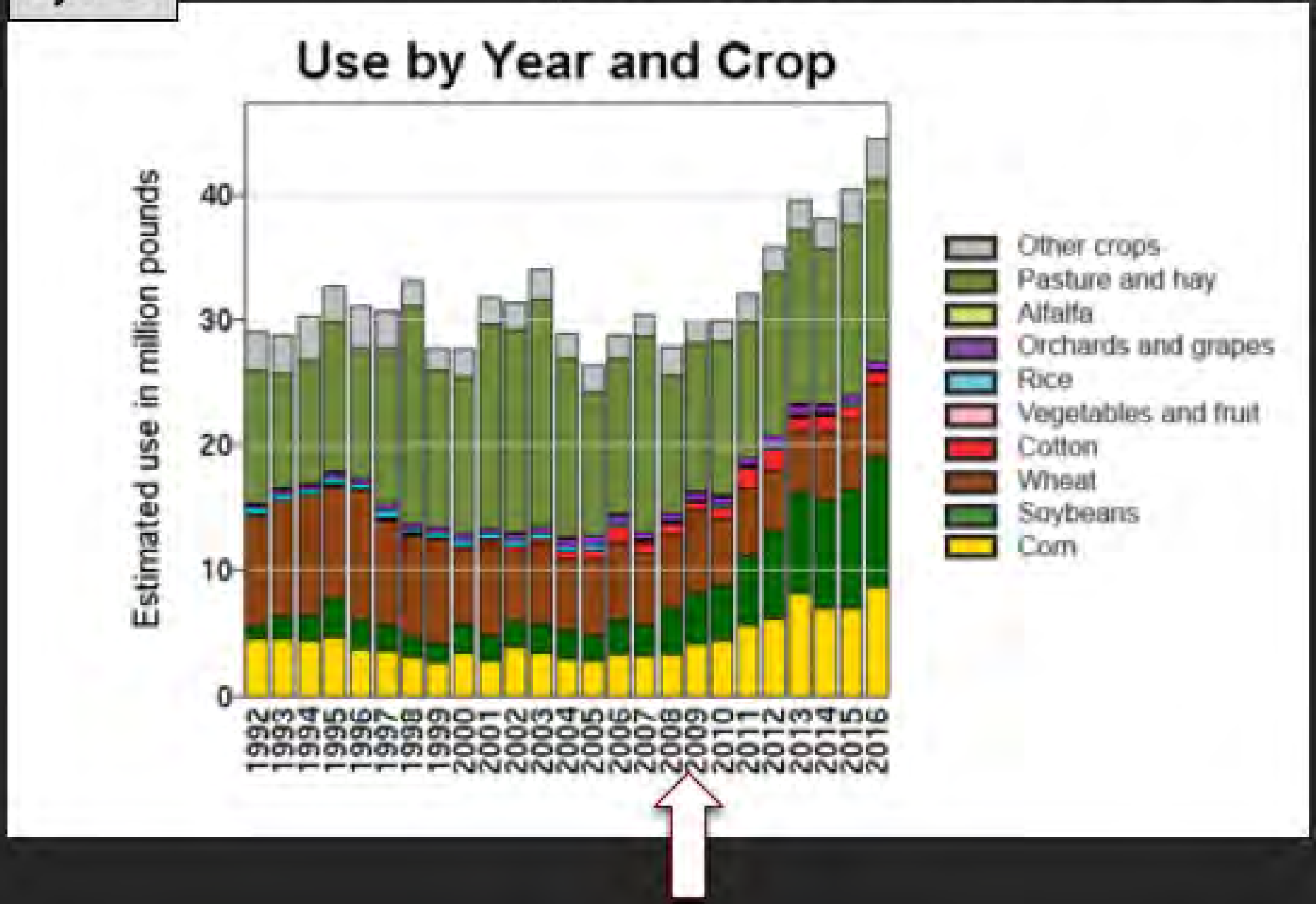
Glyphosate

Source: US Dept. of Interior, US Geological Survey



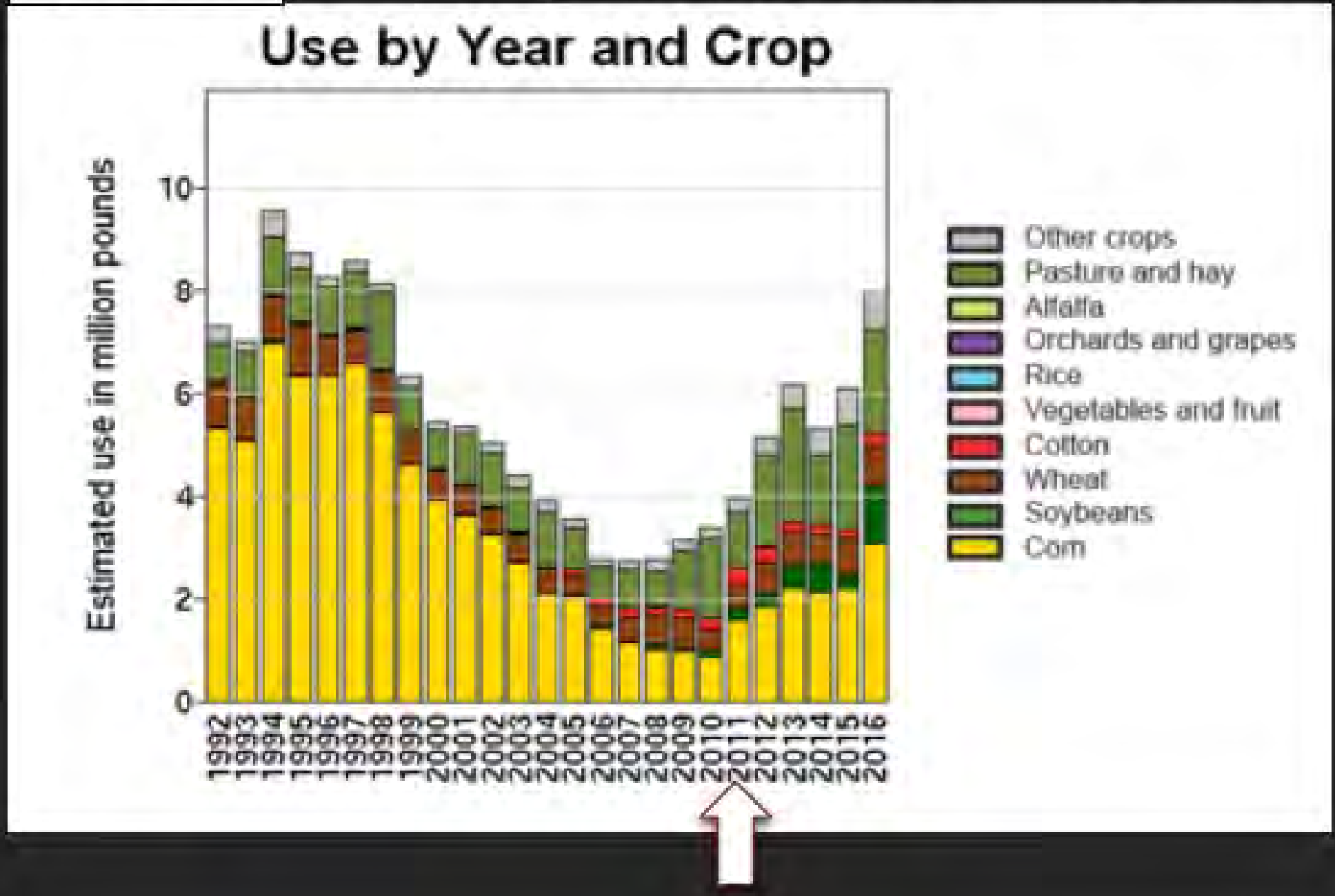
2,4-D

Source: US Dept. of Interior, US Geological Survey



Dicamba

Source: US Dept. of Interior, US Geological Survey



White Oak, Home,
May 7, 2017, 274 GGD50

White Oak, Home, May 7, 2017, 274 GGD50

Pin Oak, Home, May 7, 2017
274 GGD50

Redbud, Home, May 7, 2017, 274 GGD50

White Oak, Home, June 12, 2017
905 GGD50

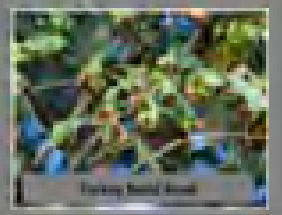
Rosinweed, Home, July 17, 2017

2015, Washington Co., IL; Marty Kemper

Oak damage (by township) observed in growing season 2015, Washington County, Illinois

Initial damage observed was primarily leaf curling at leaf out. Necrosis tended to progress throughout the growing season. Photos span the growing season.

Townships without colored boxes were not surveyed. Colors are subjective visual estimate of observed damage: red - extreme, lighter red - severe, yellow - light to moderate. Damage was primarily to post and white oak, although black oak and shingle oak also showed widespread symptoms. Pin oak and hickory damage was sporadic. Virtually no oak stands were observed without at least some symptoms.



Sites Monitored in 2017

Redbud, Revis, August 6, 2017

Bur Oak, Revis, August 6, 2017

Revis, August 6, 2017

Bur Oak
Revis
August 6, 2017

Sycamore, Revis, August 6, 2017

Redbud, Bellrose, August 7, 2017

White Oak, Bellrose, August 7, 2017

White Oak, Bellrose, August 7, 2017

Box Elder, Bellrose, August 7, 2017

Bur Oak, Funk's Grove, August 14, 2017

Bur Oak
Funk's Grove
August 14, 2017

Sugar Maple, Funk's Grove, August 14, 2017

Rosinweed, Funk's Grove, August 14, 2017

White Oak, Weldon Springs, October 6, 2017

Ramsey Lake State Park, October 18, 2017

White Oak
Ramsey Lake
October 18, 2017

White Oak, Ramsey Lake, October 18, 2017

White Oak
Revis
January 31, 2018

HortScience 43(7): 2076–2080. 2008.

Injury on White Oak Seedlings from Herbicide Exposure Simulating Drift

Jayesh B. Samtani, John B. Masiunas, and James E. Appleby
University of Illinois

Swollen Bud	Leaf Unfolding	Expanded Leaf

HortScience 43(7): 2076-2080. 2008.

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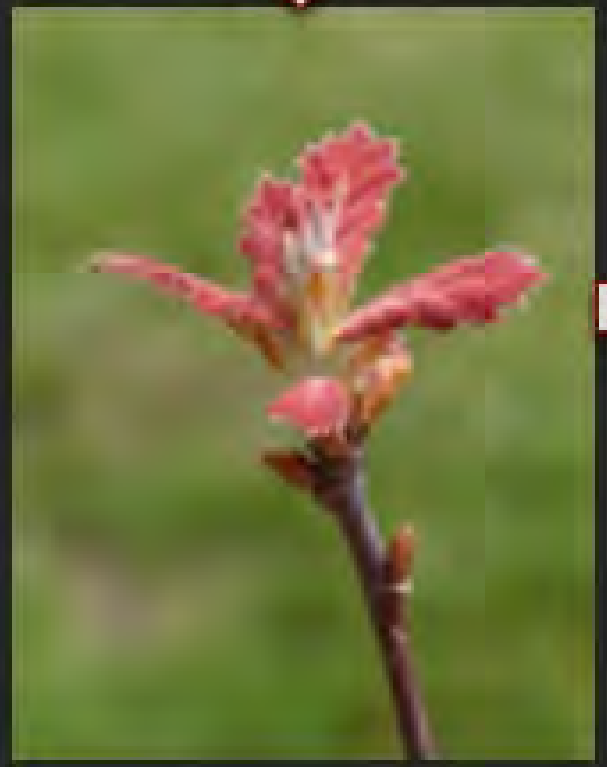
Jayesh B. Samtani, John B. Masiunas, and James E. Appleby
University of Illinois

- Visible injury 5 days after treatment at leaf unfolding
- Greatest injury after treatment at leaf unfolding
- Still visible 90 days after treatment

2,4-D Ester
1% Label Rate



Source: Jayesh Samtani and James E. Appleby

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10% label rate

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Dicamba
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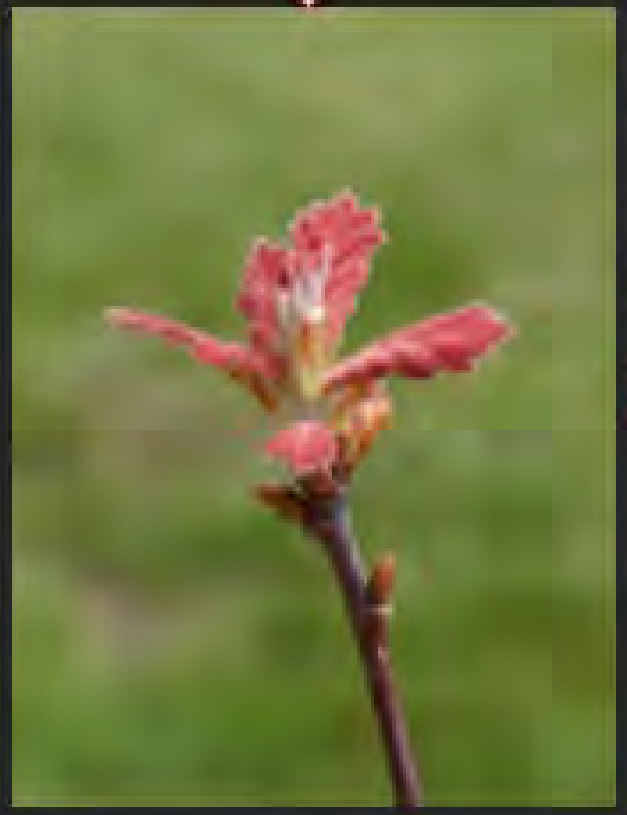

Source: Jayesh Samtani and James E. Appleby

White Oak, April 28, 2018
75 GGD50

White Oak, April 29, 2018
75 GGD50

White Oak
May 1, 2018
83 GGD50


White Oak
May 2, 2018
101 GGD50
CM

White Oak
May 3, 2018
127 GGD50


White Oak
May 4, 2018
147 GGD50
CM

White Oak
May 6, 2018
161 GGD50

White Oak
May 7, 2018
195 GGD50

White Oak, May 8, 2018, 208 GGD50

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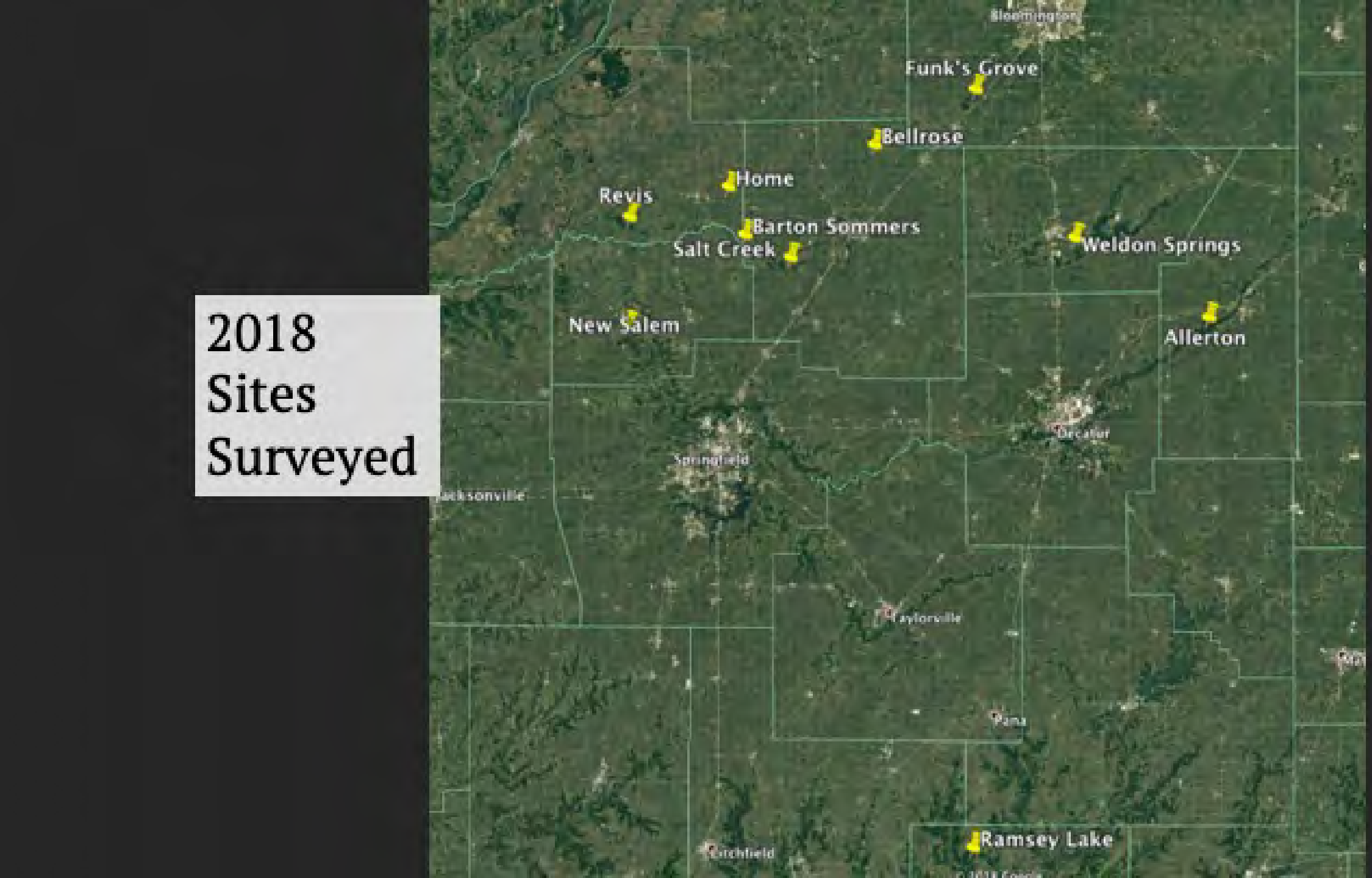
White Oak, May 9, 2018, 222 GGD50

White Oak, May 11, 2018, 264 GGD50

White Oak, May 22, 2018
495 GGD50

White Oak, June 1, 2018
753 GGD50

White Oak, June 11, 2018, 979 GGD50


2018
Sites
Surveyed
Funk's Grove
Bellrose
Home
Revis
Barton Sommers
Salt Creek
Weldon Springs
New Salem
Allerton
Springfield
Decatur
Jacksonville
Taylorville
Pana
Ramsey Lake
Litchfield

Redbud, Revis, May 9, 2018

Wild Grape, Revis, May 9, 2018

Bur Oak
Revis
May 9, 2018

White Oak, Bellrose, May 23, 2018

White Oak
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White Oak, Bellrose, May 23, 2018

White Oak
Pelican Pouch
Clinton Co., IL
July 27, 2018

White Oak, Pelican Pouch, July 28, 2018

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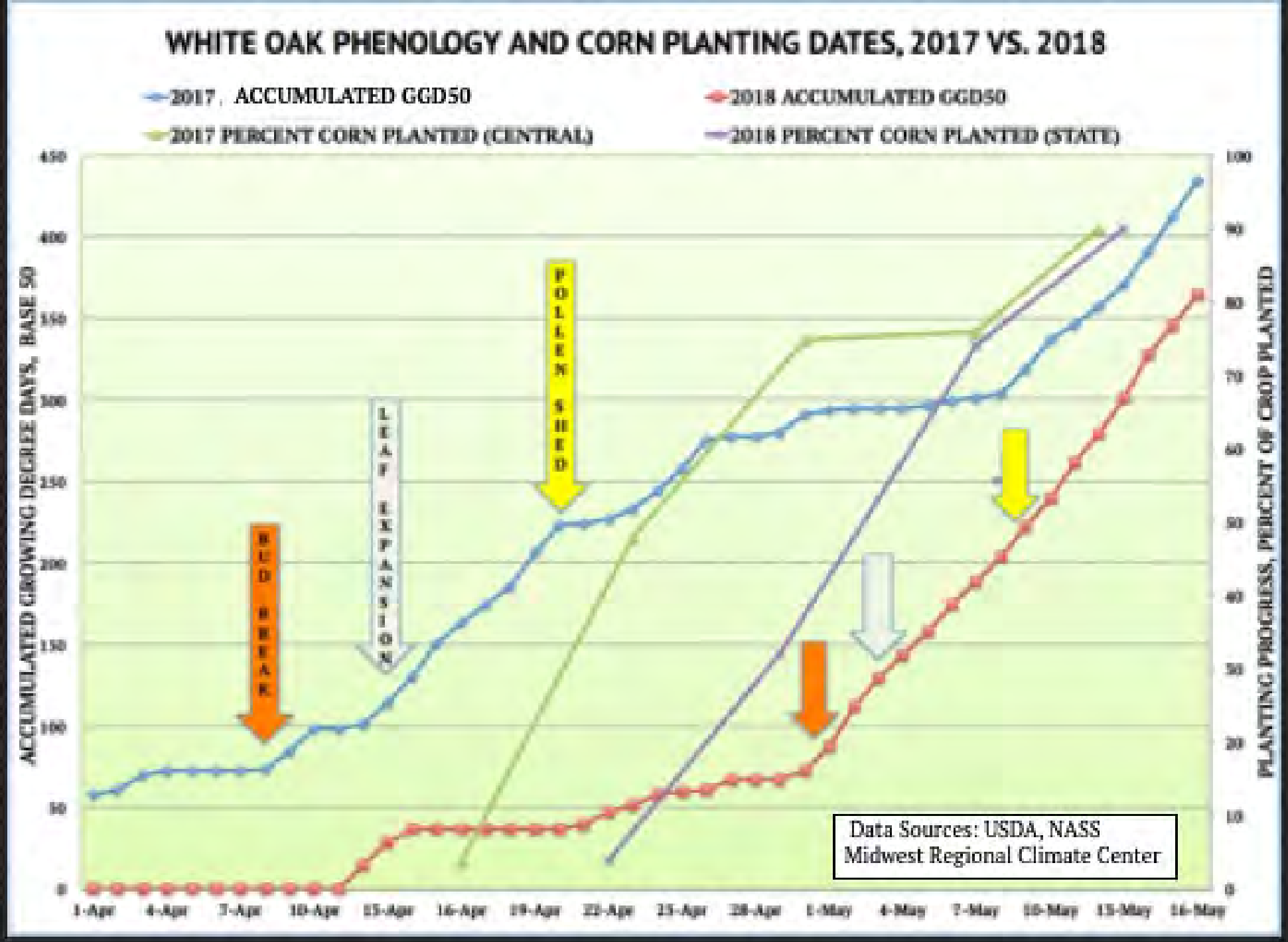
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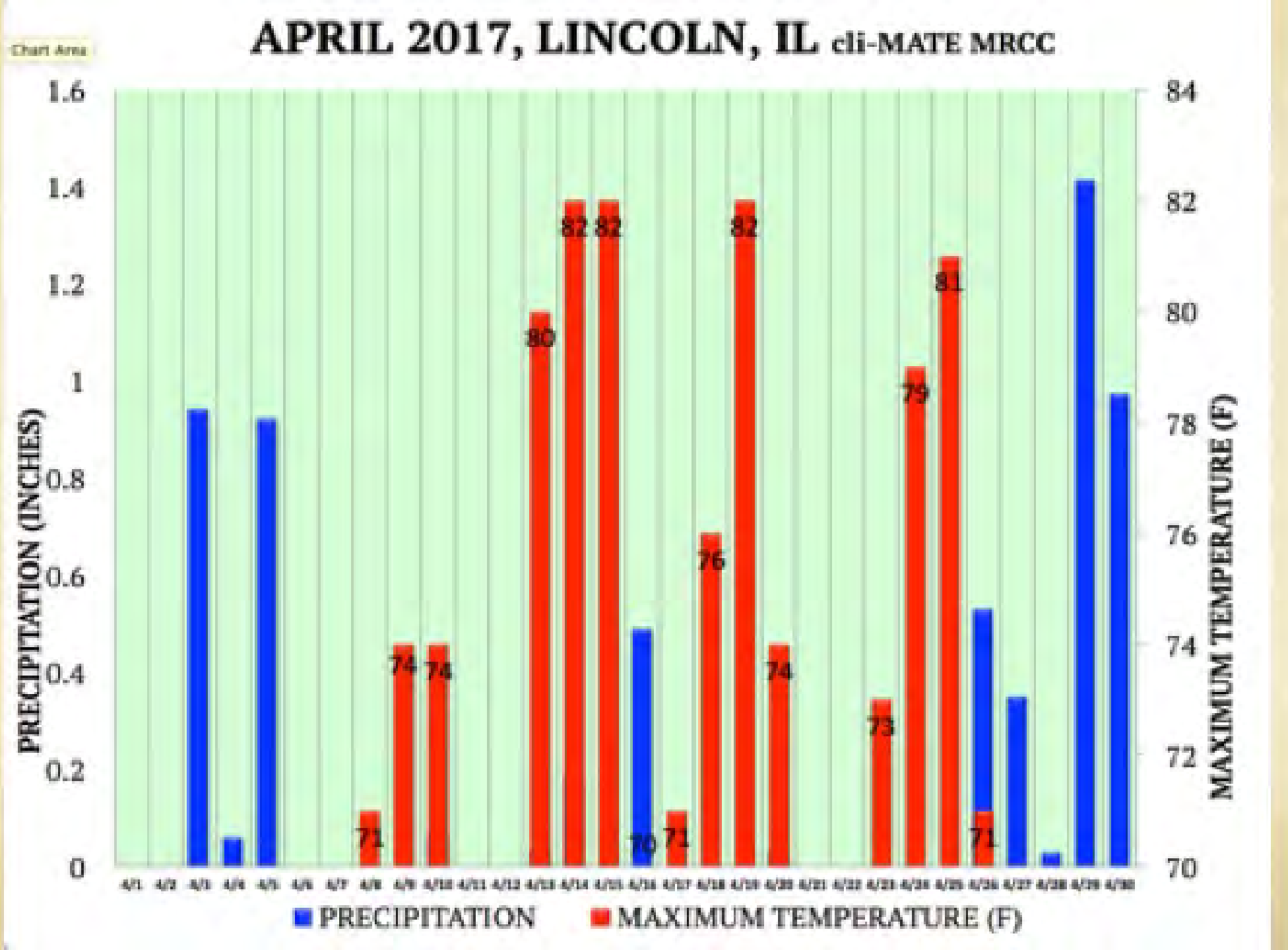
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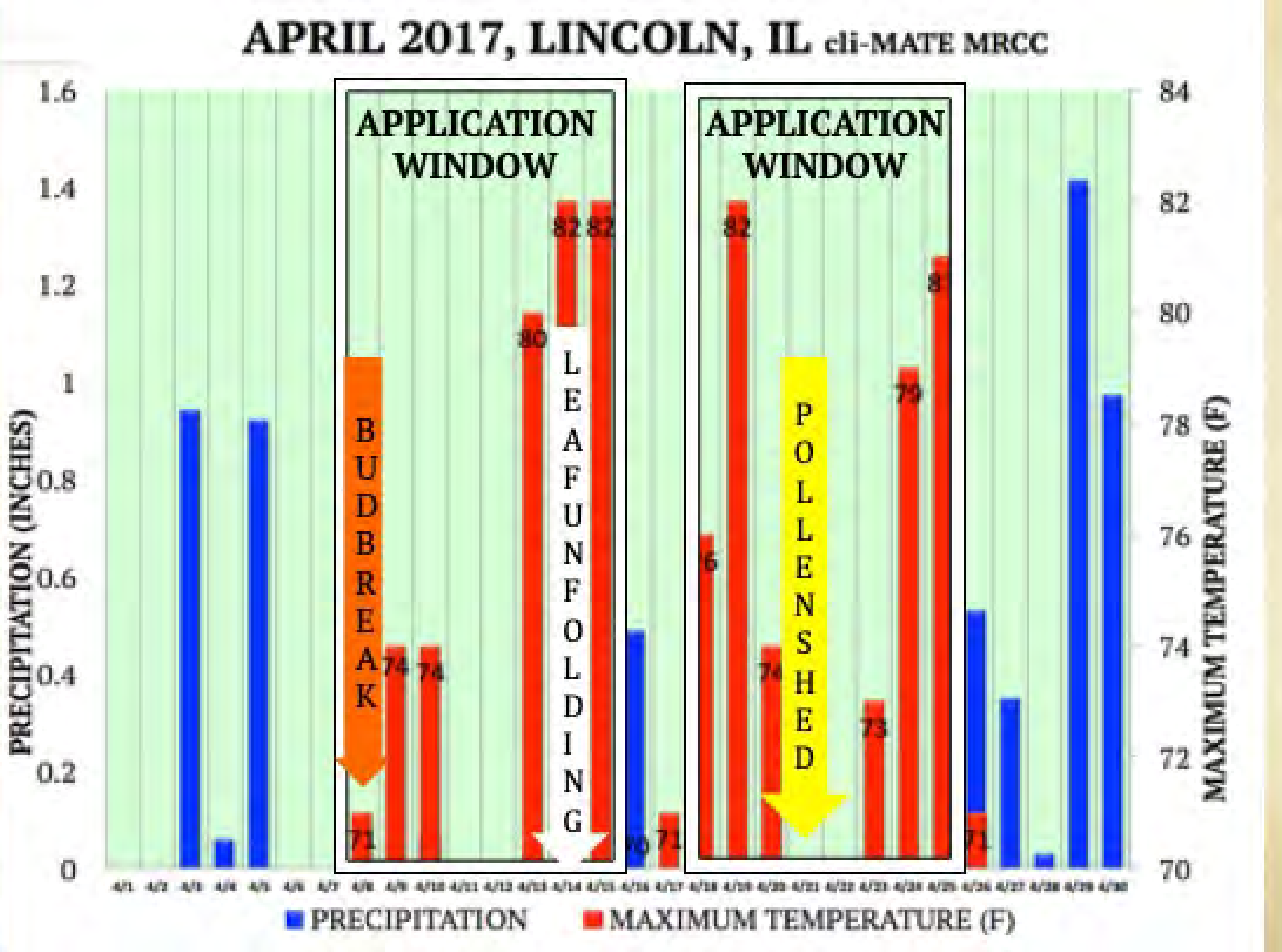
MAXIMUM TEMPERATURE (F)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APPLICATION WINDOW
APPLICATION WINDOW
BUDBREAK
LEAF UNFOLDING
POLLEN SHED
PRECIPITATION (INCHES)
MAXIMUM TEMPERATURE (F)
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1.4
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SYCAMORE
LOUIS NELMS
JUNE 19, 2018

SGS North America
1405 32nd Ave
Brookings, SD 57006

Certificate of Analysis

Certificate Number: 18-010011
Report Date: June 27, 2018

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LOUIS NELMS
9331 N CR 3800 E
Mason City IL 62664
UNITED STATES

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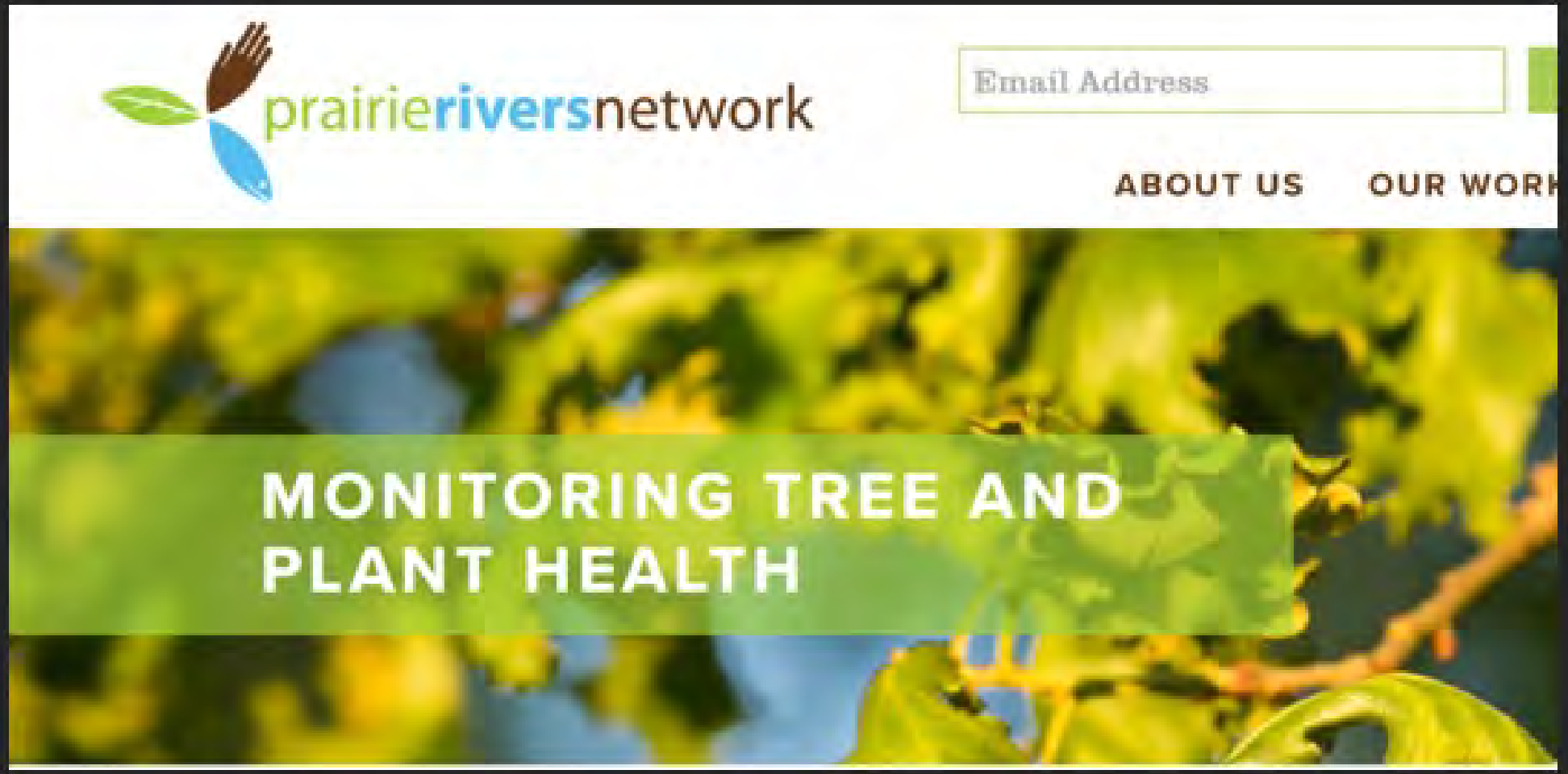

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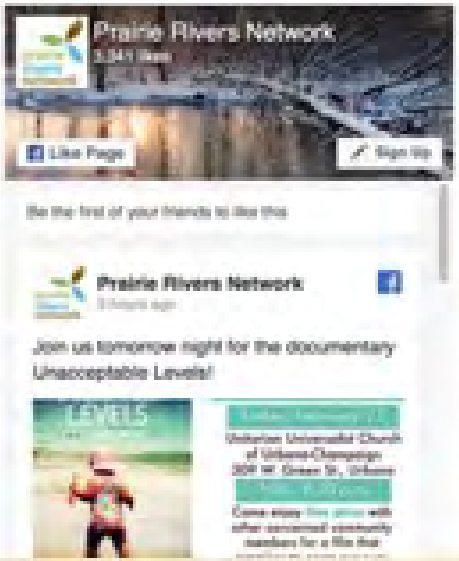

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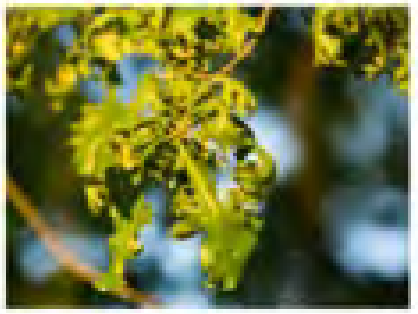

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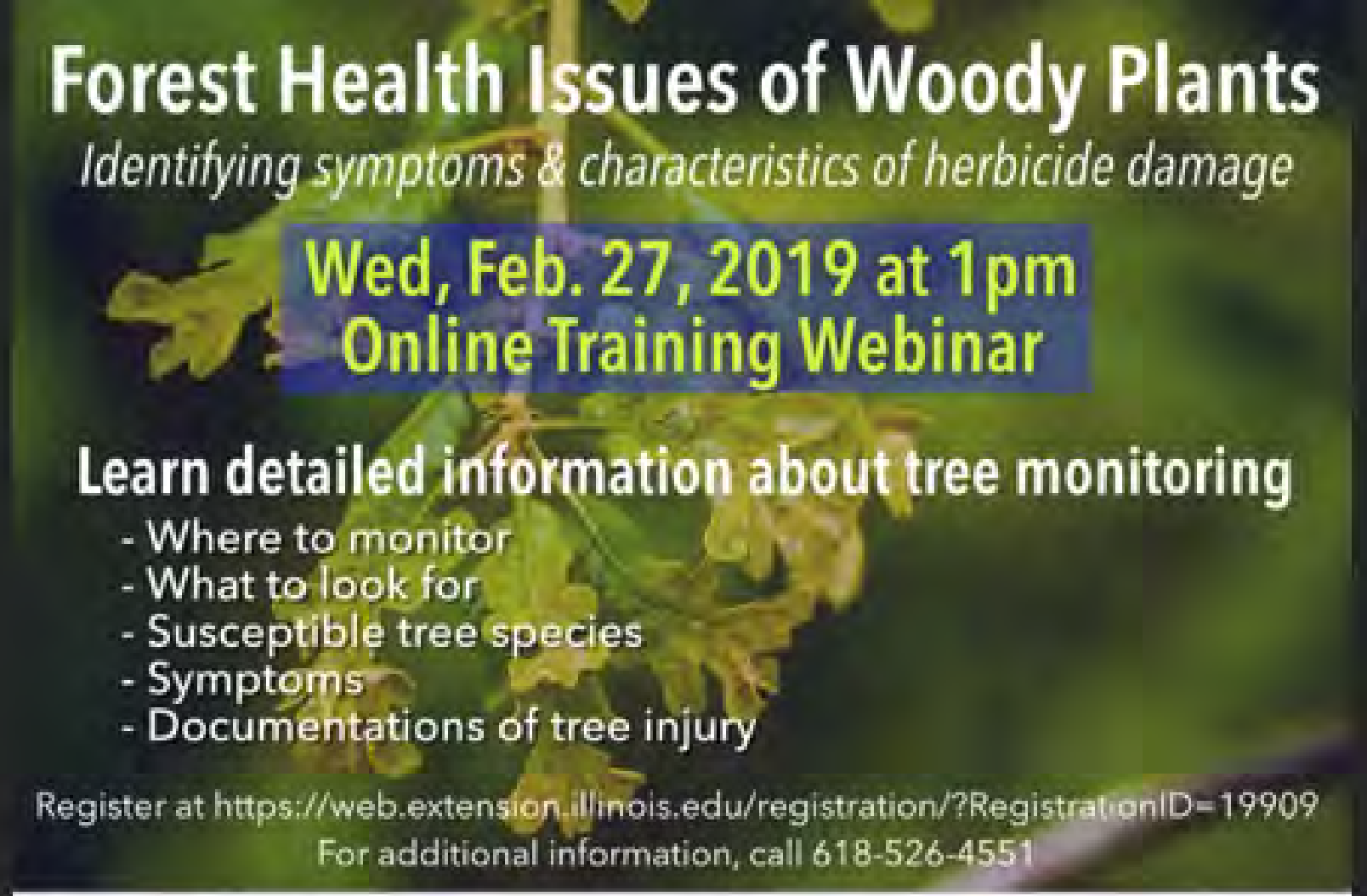

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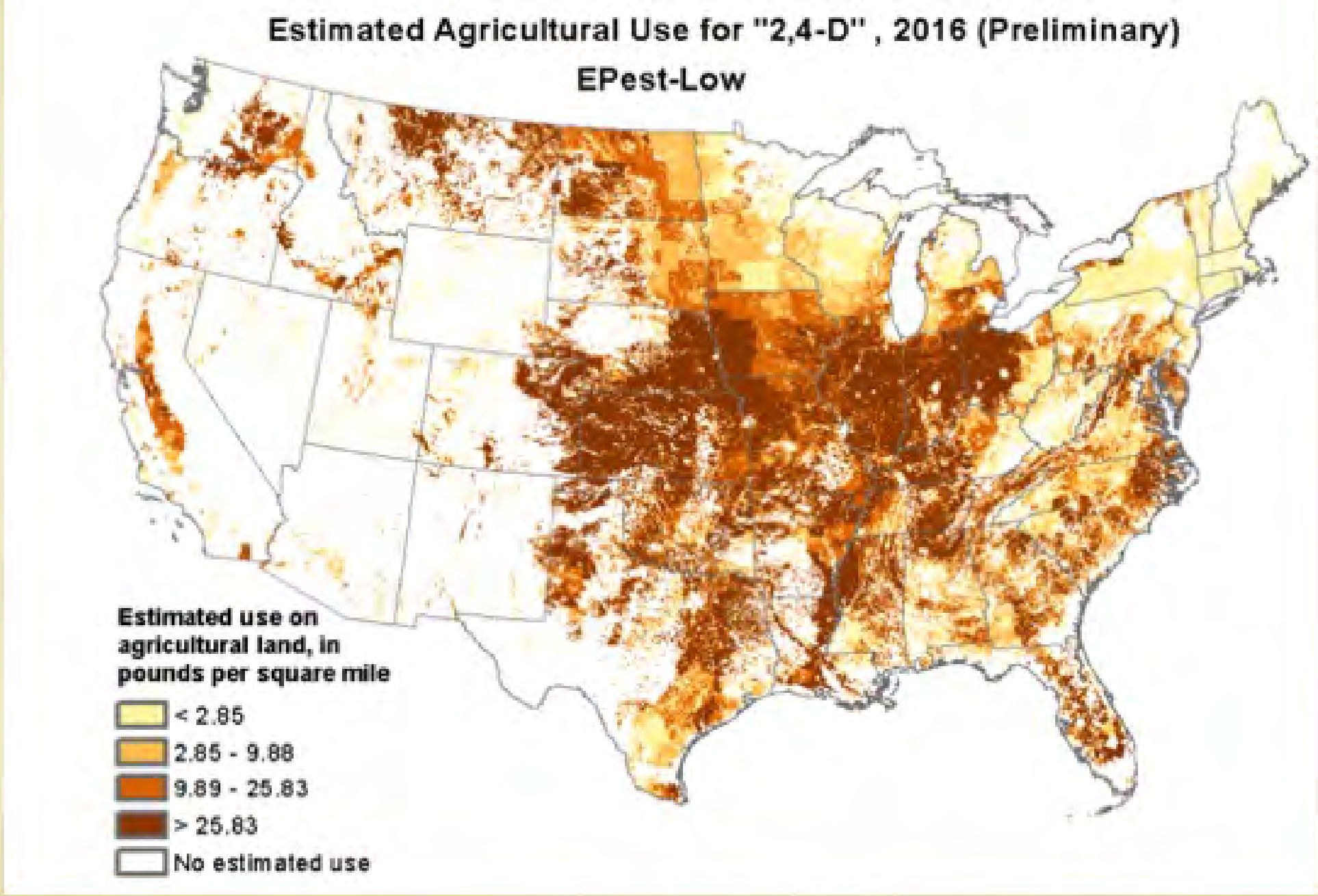
Extension
COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

prairierivers network

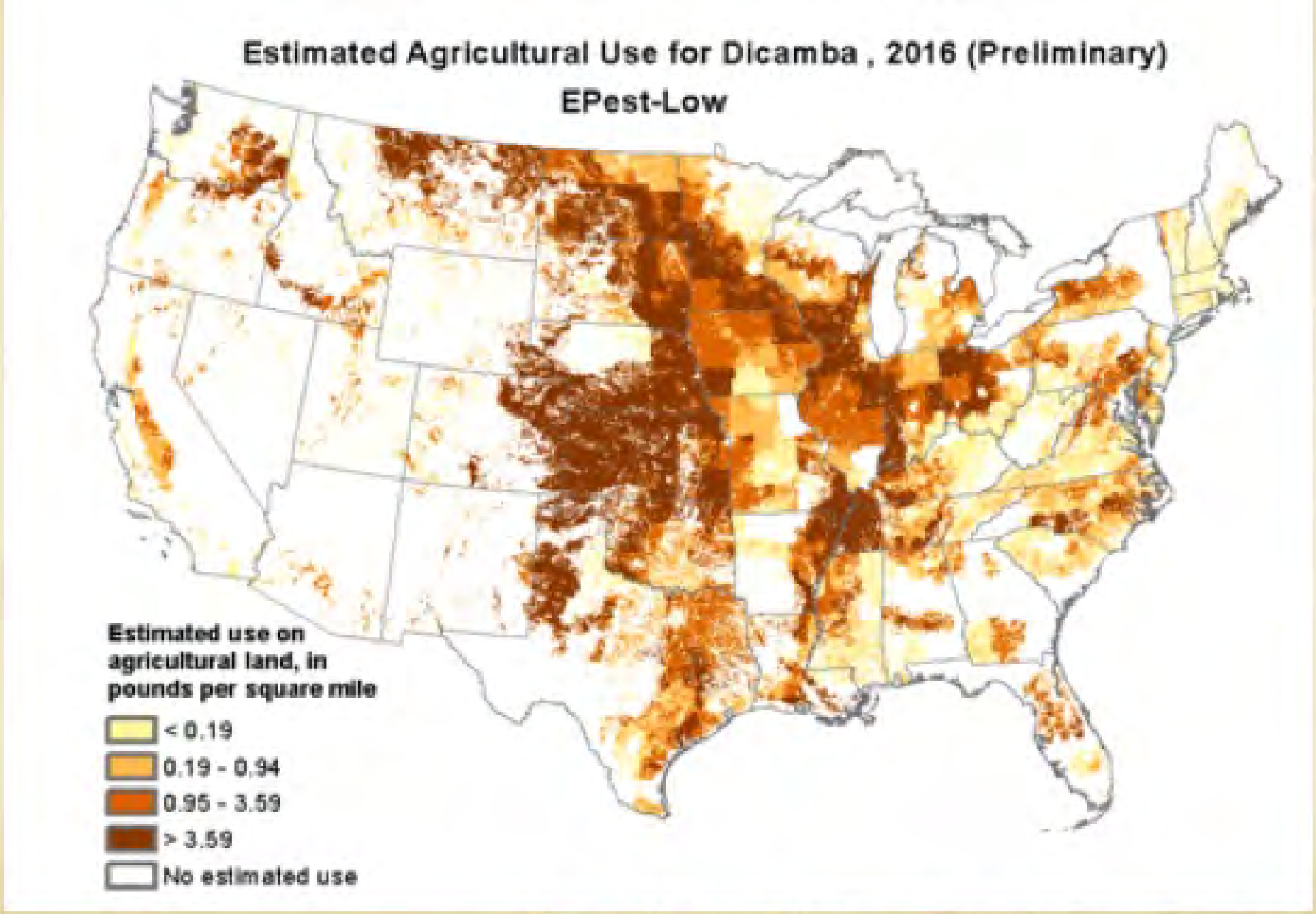
"There is uncertainty associated with the existing database for the OTT uses and how they relate to reported incidents in terms of species effects, field conditions and primary and secondary off-site movement.

... ecological effects data on non-target plants ... are required to address this uncertainty."

Source: USEPA, Registration Decision on Dicamba, Nov. 1, 2018



Source: US Dept. of Interior, US Geological Survey



Source: US Dept. of Interior, US Geological Survey

Milestones of 2,4-D

- 1941 – synthesis reported
- Early 40's: potential uses as herbicide
  - Very low concentration
  - Translocation
  - Selectivity on broadleaf weeds
  - Fast acting
- 1945 – first commercial product
- 1950 – rapidly substituting for labor

2,4-D Off-Target

- 1950 – grapes
- Early 60's – IA specialty growers attempt ban
- Phipps 1963 – "leaf blight" on plains trees
- Hibbs 1978 – injury to trees
  - 1975 – over 10% of samples submitted to INHS lab
  - Most likely to occur from PGRs
- Mohr 2004 – U of I Extension – PGRs most common cause of injury complaints
- Oak Problems – U of I Plant Clinic Report
  - Sensitive to 2,4-D and dicamba

Dicamba Milestones

- 1962 – registration of Banvel (DMA salt)
- 1970 – corn POE
- 1971 – Knake, U of I
  - Soybeans much more sensitive to dicamba than 2,4-D
  - High volatility of Banvel
  - Discouraged use in IL
- 1990 – registration of Clarity (DGA salt)
- 2017 – Dicamba tolerant soybeans, OTT "low-volatile" dicamba formulations

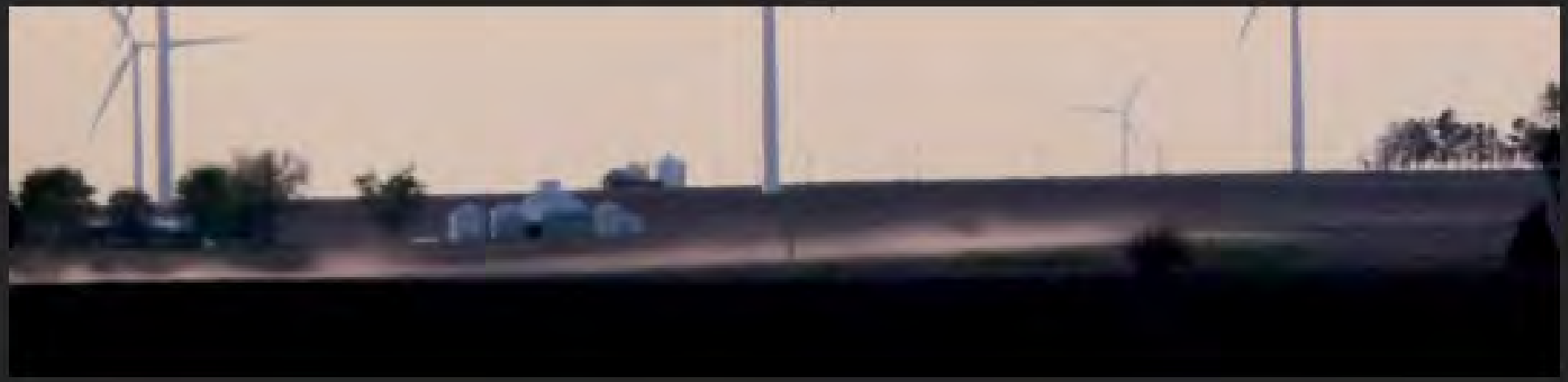
Burndown – Assumptions of Safety

- Clean field of broadleaf weeds before planting corn and soybeans
- LV 2,4-D Ester a primary tool
  - Effective and low cost
  - Difficult to control weeds
  - Broadens range of glyphosate
  - More volatile than amines
- Dicamba – more effective than 2,4-D on marestail
- Applied 7 – 30 days before planting
- *** Synchrony with Oaks and Redbuds ***

Volatility

- Liquid to gas - > potential for transport to off-target sites by wind or capture in inversions
- Vapor Pressure
  - Formulations
  - Even "low-volatile" formulations volatilize
- Environmental Factors
  - Temperature – increases from 60 to 85 degrees F
    - Can be significant at 70
    - Soil T even in early spring 10 – 15 degrees > air T
  - Relative Humidity – increases with lower RH
  - Greater from leaf surfaces than bare soil
- Time course
  - Application day = greatest
  - Continues for 2 more days
- Evidence: uniformity of injury across area

Temperature Inversion Forming
May 5, 2018 6:30 pm



Phenology and Growing Degree Days

- Phenology
  - Plant corn when oak leaves are the size of a squirrel's ear
- Growing Degree Days
  - Measure heat accumulation
  - Predict plant development
  - (Tmax + Tmin)/2 – base T
  - Start date

- 2,4-D was the final much needed step in industrializing crop production in the Midwest. It enabled the substitution of capital for the grueling and time consuming labor of controlling weeds. Before and during WWII much of that labor had abandoned the farms for better paying jobs in industry. As a result, by war's end, many farms in the Midwest had lost the war on weeds. 2,4-D emerging from the biological and chemical warfare labs and into production fields turned the tide. This and subsequent advances in chemical weed control largely selected for our two crop monocultural system in the Midwest. We are now faced with what this has wrought in environmental, ecological as well as social costs. Costs that cannot continue to be hidden by the sweep of hand, the imperative of feeding the world.

- “ours is an age of loss disguised as plenty”

- Nathaniel Popkin, A Forest of Ancient Trees, Poisoned by Rising Seas
- NYTimes, Dec. 27, 2018

Burn Down, Home, May 7, 2017

ISSUES RELATED TO OLDER, REGISTERED FORMULATIONS OF 2,4-D AND DICAMBA

- INCREASING USAGE
- NOT RESTRICTED USE PESTICIDES (RUP)
- NO TRAINING REQUIREMENTS
- HIGHER VOLATILITY (THAN OTT DICAMBA)
- NO DOWNWIND BUFFERS REQUIRED
- NO NOZZLE TYPE RESTRICTIONS
- NO RESTRICTIONS BETWEEN SUNSET AND SUNRISE (INVERSION POTENTIAL)
- CAN BE APPLIED AERIALLY
- CAN BE APPLIED IN HIGHER WIND CONDITIONS


South of Revis, August 6, 2017

South of Revis, August 6, 2017

Assumptions of Safe Spring Burndown

- Not much sensitive vegetation emerged
- Lower Spring temps = low volatility
- Low Reporting confirms safety


AN ILLINOIS NATURE PRESERVE
SANDRA MILLER
BELLROSE
NATURE PRESERVE
Sandra Miller Bellrose Nature Preserve has been formally dedicated as a sanctuary for native plants and animals. It is maintained in its natural condition so that present and future generations can see the Illinois landscape as it appeared in the past. This living example of our natural heritage is valuable for scientific studies and may provide habitat for rare plants and animals.