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# History and Future of Glyphosate

# History

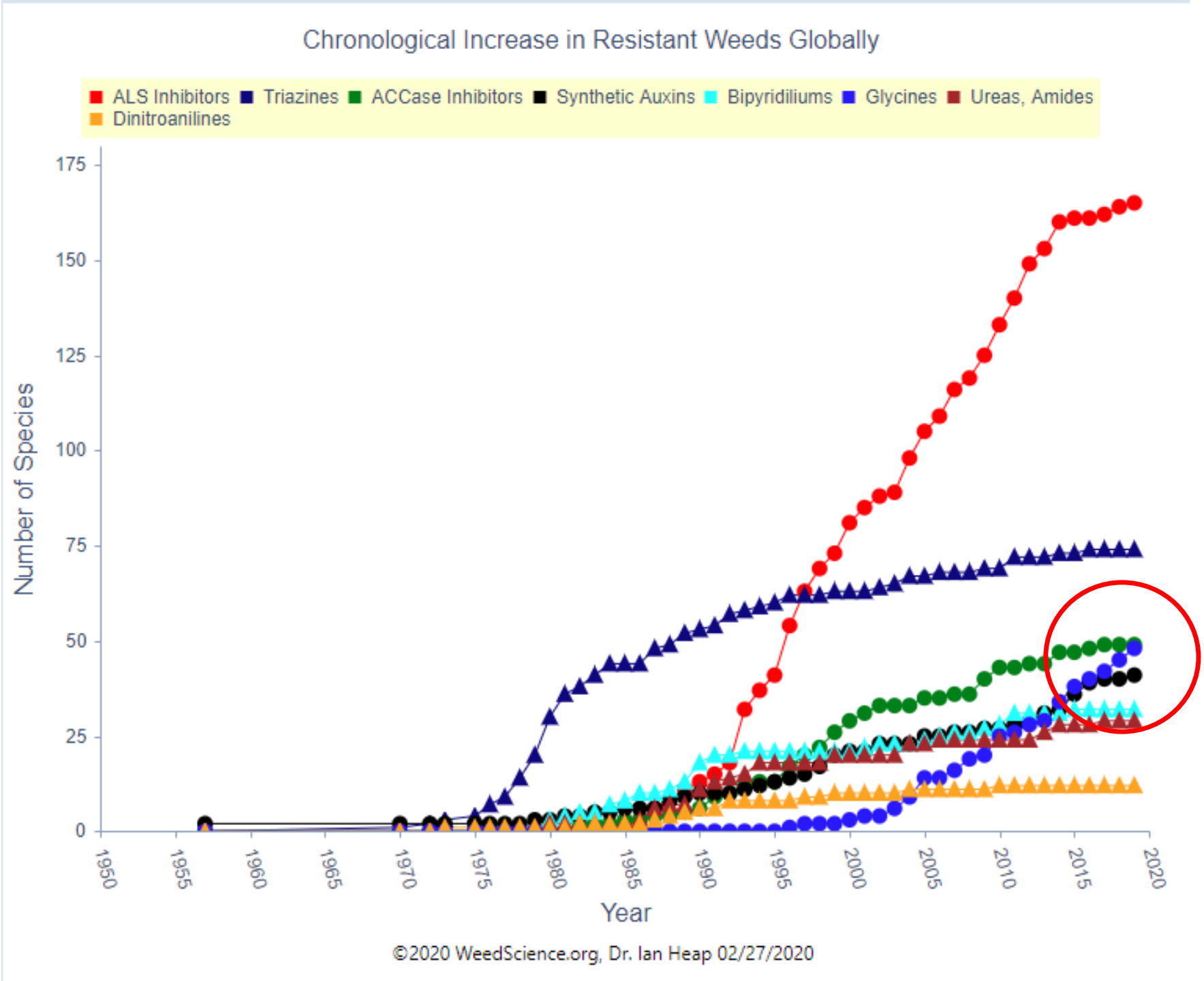
- Glyphosate (1974) – Monsanto, now Bayer
  - Available in over 750 products in US alone
    - ‘Round-up’, ‘Touchdown’, ‘Rodeo’, etc.
  - Non-selective weed control
  - Aromatic amino acid inhibitor (ESP synthase)
    - Required for protein synthesis (cell structure and function)
    - Binding site unique to glyphosate only
      - Found only in plants
  - Most widely used herbicide in the world
    - 1.6 billion kg in the US over the past 10 years (2018)

# History

- Deemed as a ‘once-in-a-century herbicide’
- Most widely used herbicide nationwide
  - Readily available at multiple different venues
  - Inexpensive
    - Can help reduce production cost in crops
  - Broad-spectrum control
  - Results are often very quick(ish)
  - Large areas of management in short amounts of time
    - Compared to hand-pulling
  - Rapid translocation within the plant
    - Moves through phloem with sugars
    - Reaches site of action within 4 hr, stops by 48 hr
  - Very low mammalian and aquatic organism toxicity
  - Very low leaching potential
  - Breaks down quickly in the environment

# History

- Multiple crops developed to be resistant to glyphosate (GR)
  - Alfalfa, cotton, canola, corn, etc.
- Many growers overused the technology and planted ONLY GR crops
- Developed heavy reliance on glyphosate for weed control…
  - Often the only utilized means of control
- Lead to increase in weeds resistant to glyphosate


Chronological Increase in Resistant Weeds Globally
ALS Inhibitors
Triazines
ACCase Inhibitors
Synthetic Auxins
Bipyridiliums
Glycines
Ureas, Amides
Dinitroanilines
Number of Species
0
25
50
75
100
125
150
175
1950
1955
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1965
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1975
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2000
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2020
Year
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# Public perceptions of glyphosate



# Public perceptions of glyphosate

**Nicky Kyle Gardening** @nickykylegarden · 5h

This has been known since mid-1980s. Just mixing the 2 ingredients in #**Glyphosate**/#Roundup alone, magnifies the product's toxicity 1000s of times. What happens when dozens are combined in our diet? We don't know! #Chemical co.'s are gambling with future #publichealth for #profit

> **Joanna Blythman** @JoannaBlythman
> The cocktail effect."Even small doses of a chemical substance can be harmful in combination with other substances" . #pesticides #additives #organic food.dtu.dk/english/news/2…

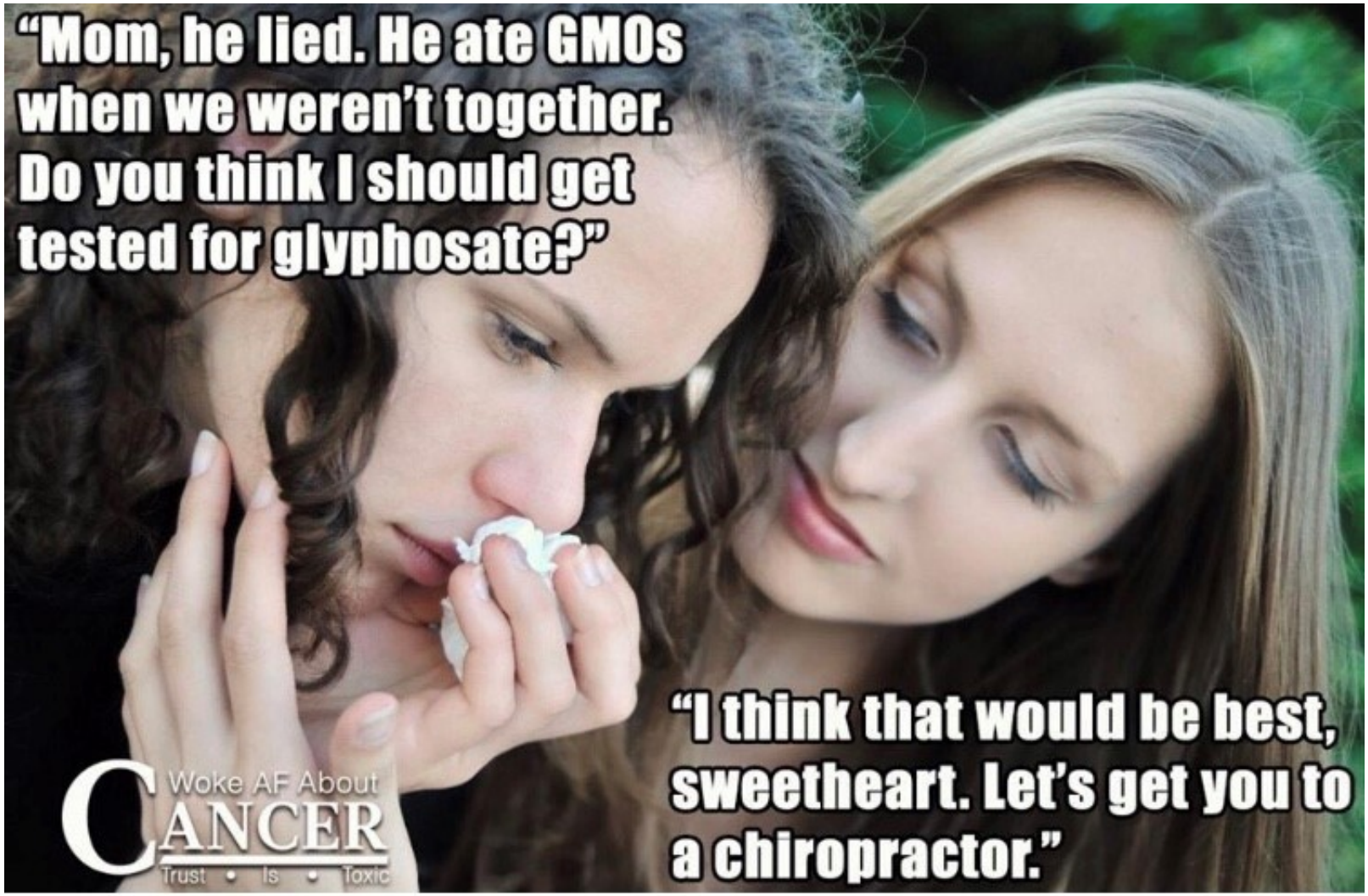
3 14 30

**Gauche Farmer©** @BeetfarmerDave · Oct 13

Hi my name is Karen K and I know nothing about #**glyphosate** but I'm an expert on how farmers should farm.

> **Karen K** @kreativekonnect
> Replying to @JodiKoberinski @BradCober
> It's not even farming...#glyphosate kills everything. Bees,Birds,Butterflies,Frogs,dogs, and HUMANS. Enough of this false narrative that it can be used safely.

# Public perceptions of glyphosate



# 2015 WHO report

- International Agency for Research on Cancer (IARC)
  - March 2015, classified glyphosate as Group 2a "probably causes cancer'
  - Only assesses potential carcinogenicity of a substance
    - Does not consider exposure or conduct risk assessments
    - Reported that certain key studies were not considered
- Lead to landmark settlements
  - Currently 42,000 pending lawsuits

# EPA Stance

## Glyphosate

## EPA Takes Next Step in Review Process for Herbicide Glyphosate, Reaffirms No Risk to Public Health

04/30/2019

part of this action, EPA continues to find that there are no risks to public health when glyphosate is used in accordance with its current label and that glyphosate is not a carcinogen. EPA is proposing management measures to help farmers target pesticide sprays on intended pests, protect pollinators, and reduce the problem of weeds becoming resistant to glyphosate.

https://www.epa.gov/ingredients-used-pesticide-products/glyphosate

# EPA Stance

## EPA Tells Manufacturers 'Don't Label Glyphosate as Carcinogen'


Environmental Topics | Laws & Regulations | About EPA | Search EPA.gov

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### News Releases

### News Releases from Headquarters > Chemical Safety and Pollution Prevention (OCSPP)

## EPA Takes Action to Provide Accurate Risk Information to Consumers, Stop False Labeling on Products

08/08/2019

https://https://www.epa.gov/newsreleases/epa-takes-action-provide-accurate-risk-information-consumers-stop-false-labeling

# Weed Science Society of America (WSSA) Stance

After reviewing the best evidence available, regulatory bodies around the world have consistently concluded that glyphosate-based herbicides are *not* likely to be carcinogenic. These agencies include the U.S. Environmental Protection Agency (EPA), the Canadian Pest Management Regulatory Agency, and the European Food Safety Authority (EFSA). Additionally, an independent 2018 Agricultural Health Study supported by U.S. National Cancer Institute found no association between glyphosate-based herbicides and cancer. That conclusion was drawn by researchers who followed the health of more than 50,000 licensed pesticide applicators over more than 20 years.

The WSSA supports the scientific evaluation conducted by EPA to determine the safety of properly applied pesticides. When determining whether to allow or discontinue use of *any* pesticide, it is important to not only weigh the costs and benefits of that pesticide, but also to understand the risks and benefits of the most likely alternatives. Decisions related to glyphosate use are no different. Ongoing research and evaluation are justified, and our society will remain current on further developments related to carcinogenic risk and glyphosate as new information becomes available.

http://wssa.net/2019/08/wssa-position-on-glyphosate/

# Glyphosate restrictions and bans

- Bernalillo County
  - County commission voted to ban the use of Roundup on county properties by 2020
- Las Cruces
  - City Council voted to ban Roundup and its principle ingredient, glyphosate, for pest control on city property once supply is exhausted
- Taos County
  - County Commissioners considering possibility of banning all pesticides, including glyphosate
- Santa Fe
  - 10-7 IPM Program for City Property = no pesticides

# Glyphosate restrictions and bans

"No city, county, or other political subdivision can adopt ordinances or rules that regulate pesticides in New Mexico. (Some municipalities have policies or memorials that govern their own use of pesticides on their own property, but they cannot regulate others' pesticide uses."

**Pesticide Control Act, Chapter 76 Article 4 NMSA**

- Any ban that would impact private/commercial use on private property would come from NMDA

# Other limitations

## Harrell's CEO provides insight on decision to discontinue glyphosate sales

Jack Harrell Jr. cites insurance concerns in letter released by company.

## A Pesticide Distributor, an Insurance Company, a Major City, and a Scientific Study Nix Glyphosate (Roundup)

15 Mar

# Alternatives???


# Other non-selective herbicide options

- Paraquat dichloride (Gramoxone SL™)
- Glufosinate* (Rely 280™)
- Pelargonic acid (Scythe™)
- ‘organic herbicides’ (acetic acid and botanical oils)

- All of these products are contact herbicides. They will not translate
  - *or they very limited translocation

# Paraquat Dichloride: One Sip Can Kill

en español

On this page:



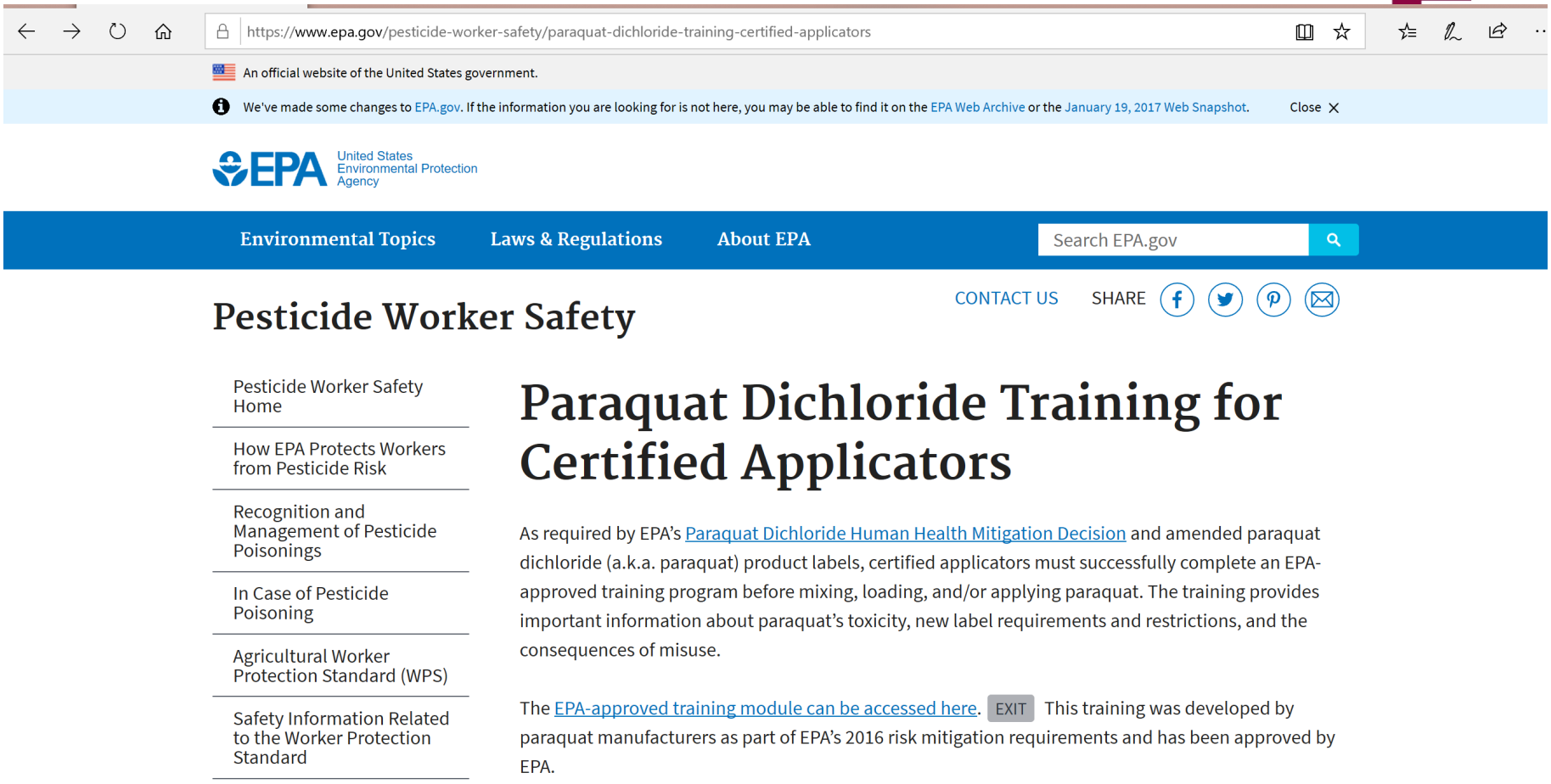
**Related Information**

Take the Paraquat Training and View Paraquat Training FAQs

# Herbicide options for pecan?

- Paraquat dichloride (Gramoxone SL™)
  - Burndown product for multiple broadleaf and grassy weeds
  - Restricted use herbicide
    - 'One sip will kill'
    - Safety training now required for application of paraquat
      - https://www.epa.gov/pesticide-worker-safety/paraquat-dichloride-training-certified-applicators
  - Contact herbicide, thus full coverage is essential
    - Not effective on perennial weeds, but will suppress top growth
  - Surfactant needed (NIS 1-2 pt/100 gal)

# Paraquat dichloride label restrictions



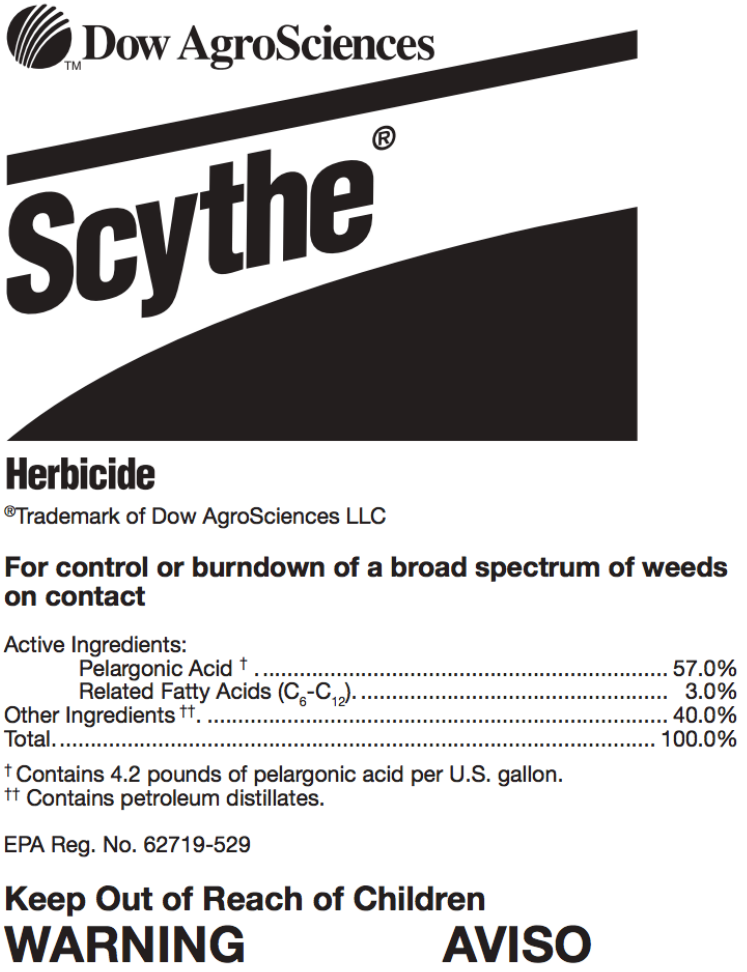

https://www.epa.gov/pesticide-worker-safety/paraquat-dichloride-training-certified-applicators

# Herbicide options for pecan?

- Glufosinate (Rely 280™)
  - Will also help control woody species (weeds)
    - 'Locally Systemic'
      - Moves within treated foliage but does not translocate
      - Primarily a contact herbicide
    - Burns pretty hot, but minimum effects on perennial weed control
      - bindweed, bermudagrass, etc.
      - Very quick injury results

# Herbicide options for pecan?

- Pelargonic acid (Scythe™)
  - Works better in warm weather
    - Limited injury in cold weather
  - Symptoms visible within 30 min.
  - Not a certified ‘organic’ option, considered to be a ‘herbicidal soap’
  - Expensive and malodorous
  - Most effective on annual broadleaf seedlings



**Specimen Label**

Dow AgroSciences™

**Scythe®**

**Herbicide**

®Trademark of Dow AgroSciences LLC

**For control or burndown of a broad spectrum of weeds on contact**

| | |
|---|---|
| Active Ingredients: | |
| Pelargonic Acid † | 57.0% |
| Related Fatty Acids ($C_6$-$C_{12}$) | 3.0% |
| Other Ingredients †† | 40.0% |
| Total | 100.0% |

† Contains 4.2 pounds of pelargonic acid per U.S. gallon.
†† Contains petroleum distillates.

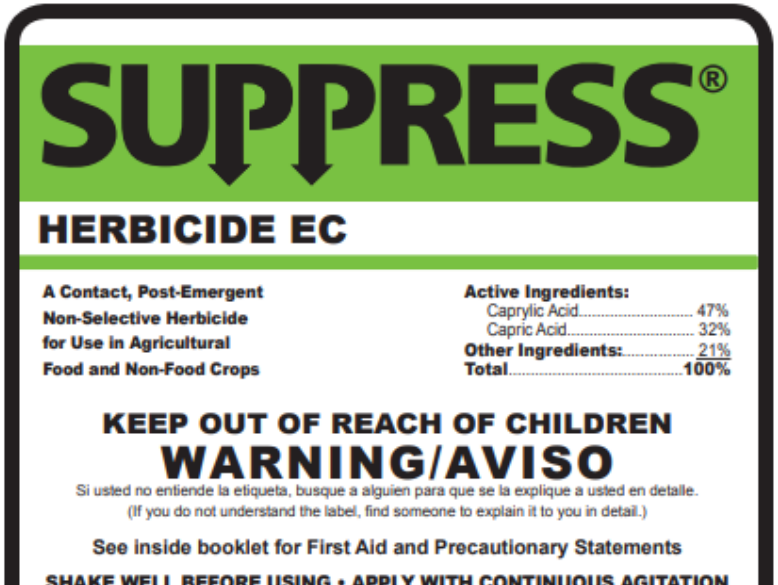
EPA Reg. No. 62719-529

**Keep Out of Reach of Children**

**WARNING** **AVISO**

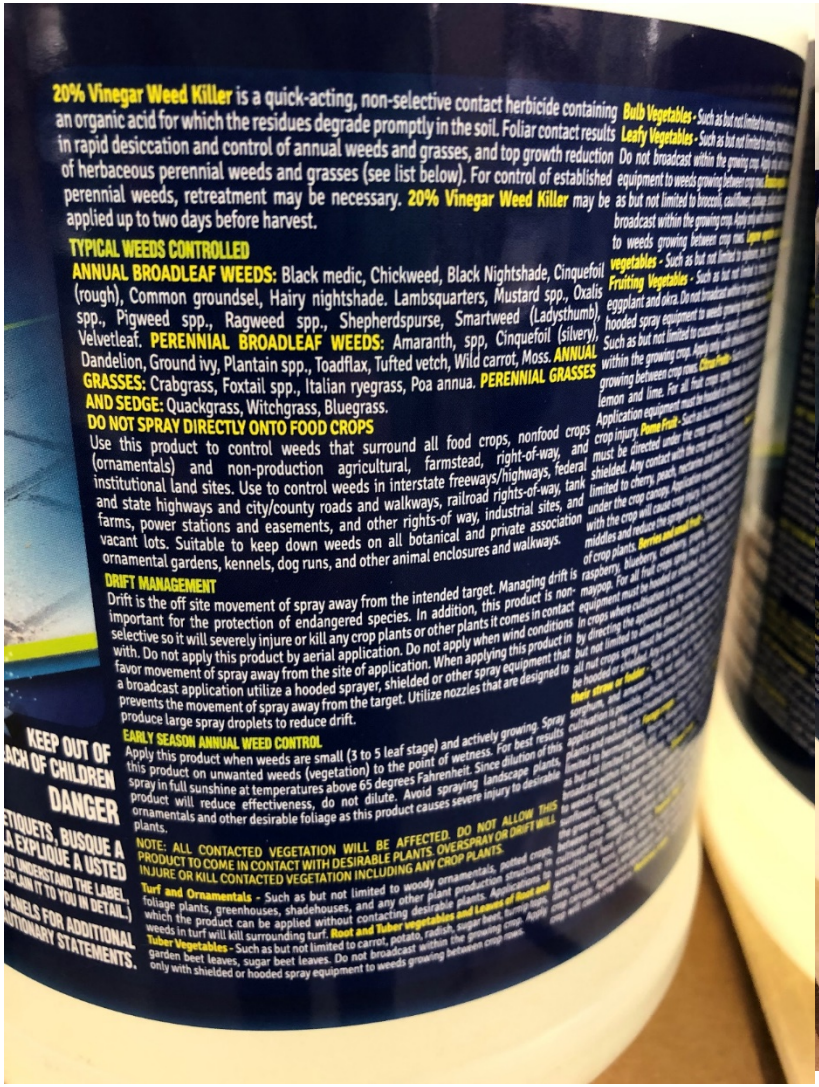
# OMRI-Certified (Organic Materials Review Institute)

- Ammonium nonanoate (Axxe™) is OMRI certified version of pelargonic acid
- Ammoniated soap of fatty acid (Final-San-O™)
- Caprylic + Capric Acids (Suppress™)
  - Emulsifiable concentrate of two short-chain fatty acids
- These products are fast-acting, contact only
  - Destroy integrity of leaf surface and cell walls



# OMRI-Certified Herbicides

- Acetic acid (vinegar)
  - Must be labeled as an herbicide
    - Household vinegar not labeled
  - Non-selective contact herbicides
  - Most effective on seedling annual broadleaf weeds
    - Only burn foliage of perennial and more mature annual weeds
    - Will not control perennials
  - Complete spray coverage is essential
  - Symptoms within 30 min.
  - Expensive



# Acetic Acid (Vinegar)

- ‘Natural’ or ‘Organic’ does not always mean “safe”
- Most of these products contain signal word of warning to danger on label
- Avoid contact with skin, eyes, and avoid inhaling
  - Can cause blindness
- Corrosive to tin, aluminum, iron, and concrete
- Deadly to aquatic organisms and amphibians

# What about perennial weeds?

- Rely on an arsenal of selective post-emergence products to target specific weeds
  - Sethoxydim, halosulfuron, flumioxazin
  - Also utilize PRE herbicide practices to keep annual populations down and reduce need for POST herbicide applications
    - Pendimethalin, trifluralin, isoxaben

- INTEGRATED WEED MANAGEMENT!

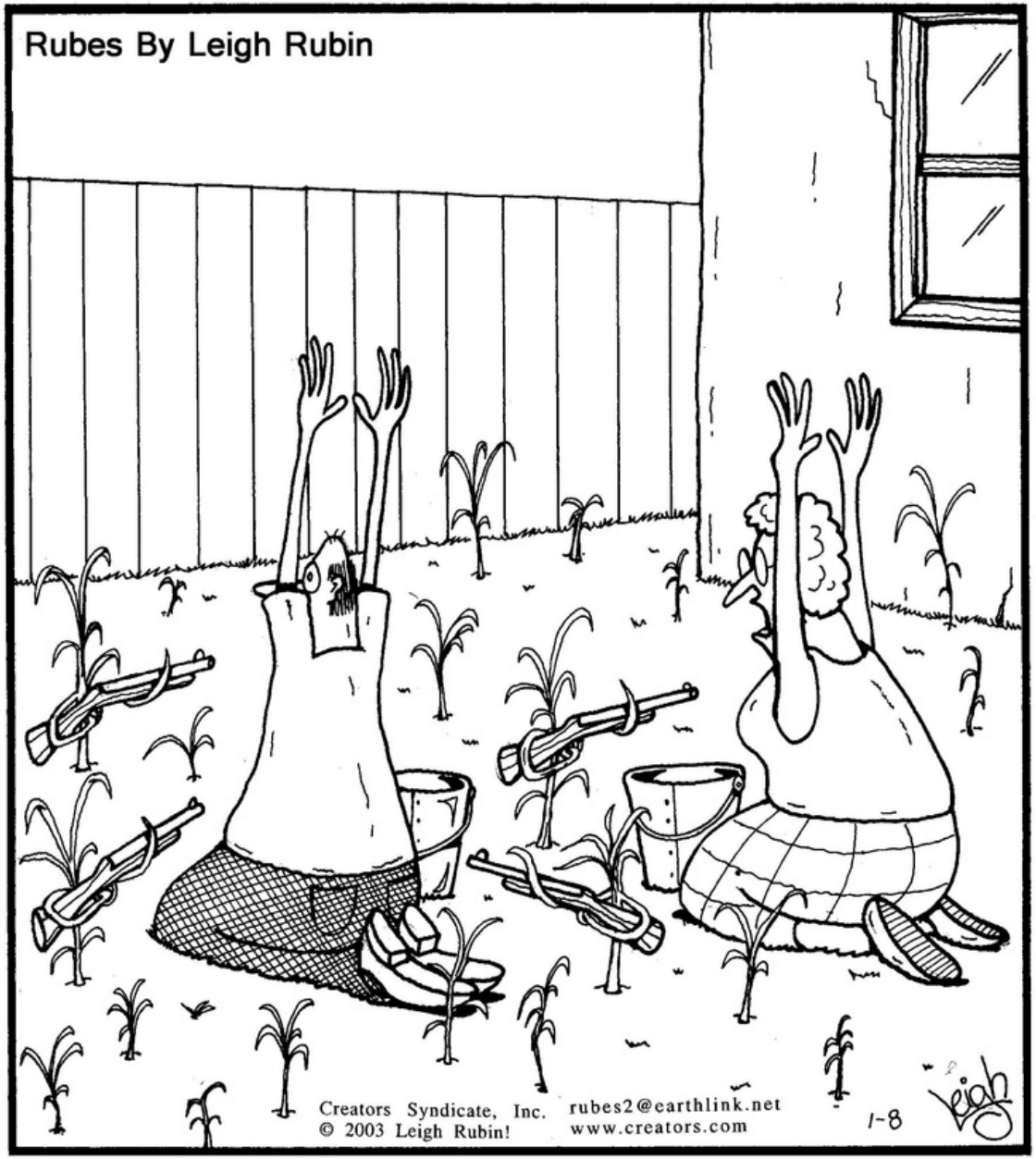
# Where do we go from here?

- We must begin preparing for the inevitability of weed management without traditional herbicides as a tool
- IWM is becoming more and more important

# Integrated Weed Management

# Integrated weed management

- Develop a management plan
  - Focus on integrating management practices
  - Focus on sustainability rather than immediate control
- Get the word out about how awesome your team is!
  - Social media, local publications, city council, legislatures
- Never stop learning, be open to implementing newer technologies as they become available
  - Utilize your local extension services to help with questions!
- Lead by example
  - Always be observed as a excellent steward of management practices
    - Follow the label, wear proper PPE, keep thorough records, provide annual trainings for employees, etc.




"We never should have waited this long ...
Now the weeds have *completely*
taken over."

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