



CAST WEBINAR SERIES ON  
**FIFRA AND ESA**

**#4**

**Developing and Adopting  
Economically Effective Pesticide  
Mitigation Strategies: Critical to the  
Survival of Agriculture and  
Endangered Species**

**Dr. Leah Moore Duzy  
Dr. Taylor Randell Singleton**





# CAST Quick Facts

- 501(c)3 membership-supported nonprofit
- Formed in 1972 as a result of 1970 National Academy of Sciences Report
- Nonpartisan and apolitical
- Membership includes 27 scientific societies; 20 universities; 19 libraries; 45 nonprofits; 21 companies; and over 500 individuals from 46 states and 7 countries
- Celebrated its 50<sup>th</sup> anniversary in 2022





The Science Source for Food,  
Agricultural, and Environmental Issues

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## Mission

CAST convenes and coordinates networks of experts to assemble, interpret, and communicate credible, unbiased, science-based information to policymakers, the media, the private sector, and the public.

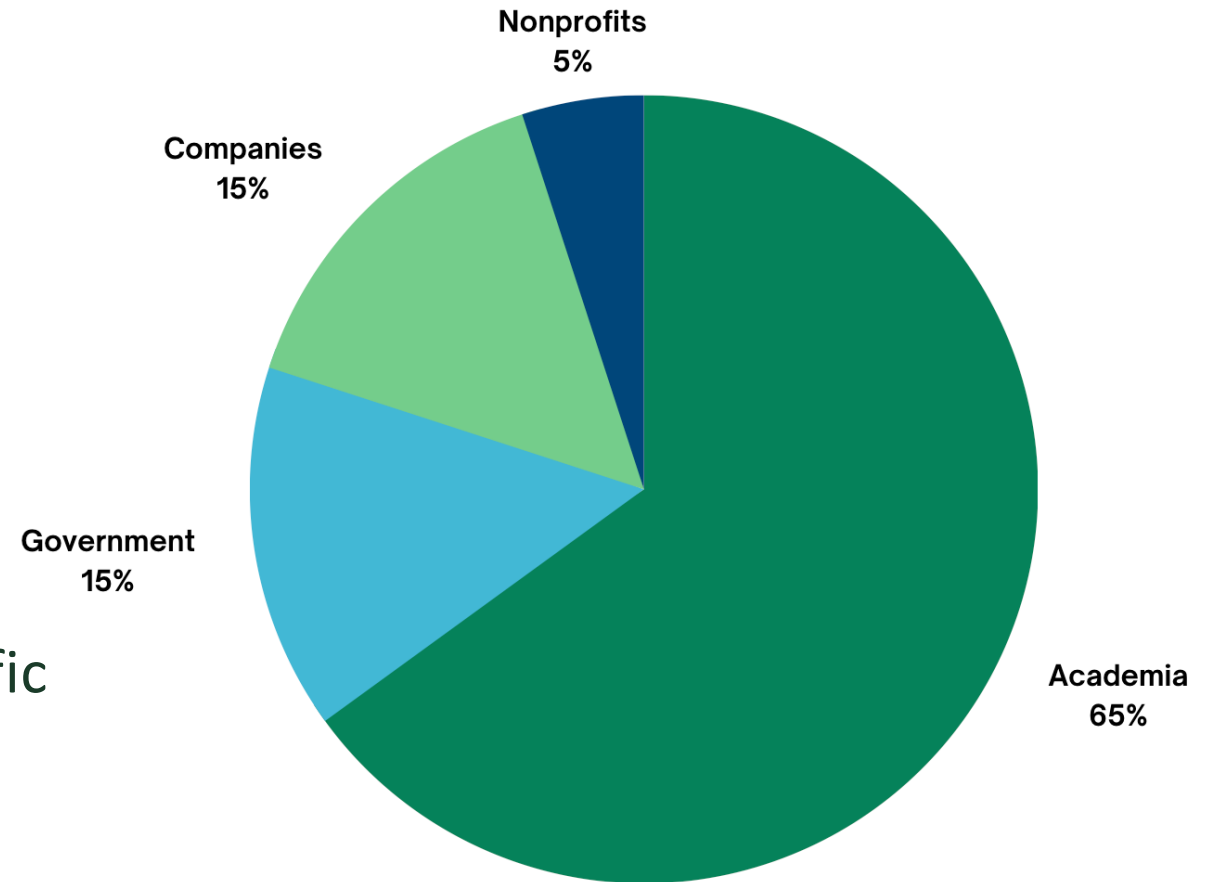
## Vision

A world where decision making related to agriculture, food, and natural resources is based on credible information developed through reason, science, and consensus building.

# How CAST Accomplishes Its Mission

With the help of many volunteer contributors:

- 65 Board Members representing scientific societies, companies, nonprofits, and universities
- Nearly 200 active task force members working on CAST reports yet to be released
- Volunteer scientific experts as authors and reviewers—more than 1800 volunteers since 2008





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## Developing and Adopting Economically Effective Pesticide Mitigation Strategies: Critical to the Survival of Agriculture and Endangered Species

### Author

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**Tony Burd**

Syngenta





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# Co-Authors



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# A (Recent) History Lesson on Mitigation Measures

## Label Mitigation Measures Prior to January 2022

- County restrictions
- Buffers around water
- Soil type limitations
- Tillage limitations
- In-field buffers
- Swath distance setbacks
- Bulletins Live! Two

## Label Mitigation Measures After January 2022

- Prior to January 2022 mitigation measures
- Interim Ecological Mitigations
- Pick lists
- Mitigation Menu of Measures
- Consistent statements across labels

# A (Recent) History Lesson on Mitigation Measures

## January 2022: Enlist One/Duo

For land with **Hydrologic Soil Groups\* A & B**: The land manager/applicator must effectively implement measures in the following tables to equal a **minimum of 4 credits**.

For land with **Hydrologic Soil Groups\* C & D**: The land manager/applicator must effectively implement the measures in the following tables to equal a **minimum of 6 credits**.

Mitigation Measures		Credits
<b>Reduce number of applications</b> - Reduced number of applications of Enlist products per year. Applications may be made at any time during crop development but must maintain a minimum 12-day retreatment interval.	3 applications	0
	2 applications	2
	1 application	4
<b>Residue Tillage Management</b> : no till, strip-till, ridge-till and mulch-till		4
<b>Vegetative Filter Strips</b>	30 ft off-field vegetative buffer on down slope	HSG A or B 2
	100 ft off-field vegetative buffer on down slope	HSG C or D 0
		HSG A or B 4
	HSG C or D 1	
<b>Field border</b> : border with dense vegetative stands with a minimum width of 30 ft.		2
<b>Cover Crop</b>		2
<b>Vegetative Barrier</b> : Permanent strips of dense vegetation along the contours of the field with a minimum width of 3 ft.		2
<b>Contour Buffer Strips or Terrace</b>		2
<b>Grassed Waterway</b>		2
<b>Water and Sediment Basin</b>		1
<b>Contour Farming or Contour Strip Cropping</b>		1

\*Hydrologic Soil Group (HSG) definitions: A = Sand, loamy sand, or sandy loam; B = Sandy clay loam; C = Silt loam or loam; D = Clay loam, silty clay loam, sandy clay, silty clay or clay.

Applicators/Land Managers must meet minimum criteria described for each mitigation measure as outlined on [Enlist.com/mitigationmeasures](https://enlist.com/mitigationmeasures) to receive credits.

## April 2022: EPA's Workplan

**EPA**

**Balancing Wildlife Protection and Responsible Pesticide Use:  
How EPA's Pesticide Program Will Meet its Endangered Species Act Obligations  
2022**

## November 2022: EPA's Workplan Update

**ESA WORKPLAN UPDATE:  
Nontarget Species Mitigation for Registration Review and Other FIFRA Actions**

### Interim Ecological Mitigation #1: Surface Water Runoff

#### Proposed Revised Label Language for Pesticide Products

#### Criteria for Proposing Mitigation

#### RUNOFF MITIGATION

Users of this product must access [website address] and follow the instructions in the descriptions for one of the following mitigation measures:

- Vegetative filter strip (30 ft minimum width)
- Field border
- Field terracing/ contour buffer strips
- Contour farming
- Cover cropping
- No/reduce tillage
- Grassed waterways
- Riparian buffer zone/ riparian herbaceous zone
- Vegetative/grassed ditch banks
- Runoff retention pond/ water and sediment control basin/ sediment catchment basin/ constructed wetland
- Strip cropping
- Vegetative barriers
- Mulching with natural materials
- Alley cropping

Pesticides Koc ≤ 1000 in one soil tested that are applied by liquid spray or granules and that have ecological risk due to dissolved runoff.

Notes:

A pesticide with a Koc < 1000 readily moves across and through soils in water.

# And that brings us to today...

## July 2023: EPA's Draft Herbicide Strategy

**Draft Herbicide Strategy Framework  
to Reduce Exposure of Federally Listed Endangered and  
Threatened Species and Designated Critical Habitats from  
the Use of Conventional Agricultural Herbicides**

**Draft Technical Support for  
Runoff, Erosion, and Spray Drift  
Mitigation Practices to Protect Non-Target  
Plants and Wildlife**

**Table 6-9. Potential Mitigation Measures and Efficacy Points**

Mitigation Menu Item <sup>1</sup>	Measures that qualify <sup>2</sup>	Efficacy Points
<b>Field Characteristics (one field may rely on multiple field characteristics if they are applicable)</b>		
Application area is to the west of the Interstate-35 and east of U.S. Route 395 <sup>3</sup>	Not applicable	1
Application area has predominantly sand, loamy sand, or sandy loam soil without a restrictive layer that impedes the movement of water through soil. See USDA's Web Soil Survey tool to determine soil texture: <a href="https://websoilsurvey.nrcs.usda.gov/app/">https://websoilsurvey.nrcs.usda.gov/app/</a> .	Not applicable	1
The application area has a slope of less than 2%	Naturally low slope or flat fields/ Flat laser leveled	1
<b>Application Parameters</b>		
The maximum single application rate (lbs active ingredient/acre/application) allowed on the label for the specific crop is reduced or only a partial area in the acre is treated. Considered on a per application basis. The percent reduction is calculated as the applied lbs active ingredient applied per acre divided by the maximum single application rate in lbs active ingredient per acre allowed on the label for the crop and application equipment. If only a spot or portion of the field is treated, the reduction in the application over the entire field is considered in the calculation provided the field is draining to the same area.	Reduced application rate, partial treatment of the field, banded application, spot treatment, precision agriculture or sprayers	Percent reduction = Applied application rate in lbs a.i./A divided by the maximum application rate allowed on the label for the crop in lbs a.i./A 90% reduction; 9 80% reduction; 8 70% reduction; 7 60% reduction; 6 50% reduction; 5 40% reduction; 4 30% reduction; 3 20% reduction; 2 10% reduction; 1
Follow all label requirements related to application rate including not making applications at a lower rate than the minimum required on the label to avoid resistance issues and to avoid no control of the weed/pest.		

Mitigation Menu Item <sup>1</sup>	Measures that qualify <sup>2</sup>	Efficacy Points
Soil incorporation within a few hours of application. If soil incorporation is required on the label for the crop where the application is being utilized, these points are not applicable.	Watering-in or via discing before runoff producing rain event	2
<b>In-field Management Mitigation Measures<sup>4</sup></b>		
Contour farming	Contour farming, contour tillage	2
	Contour buffer strips, contour strip cropping, prairie strip, alley cropping	3
Cover crop/continuous cropping	Cover crop, double cropping, relay cropping	1
Grassed waterway	Grassed waterway	1
In-field vegetative filter strip (not occurring on a contoured field)	Inter-row vegetated strips, strip cropping, alley cropping, strip	3
Irrigation water management	Not applicable	1
Mulch amendment with natural materials	Mulching	3
Residue tillage management	No till, reduced till	2
Terrace farming	Terrace farming, terracing, field terracing	2
<b>Adjacent to the Field<sup>4</sup></b>		
Riparian area	Riparian forest buffer, riparian herbaceous cover	3
Vegetated ditch	Vegetated ditch	1
30-foot Vegetative filter strips – adjacent to the field	Vegetated filter strip, field border, vegetative barrier	2
<b>Other Mitigation Measures<sup>4</sup></b>		
Water retention systems	Constructed wetland, irrigation and drainage tailwater recovery, retention pond, sediment basins	2
Mitigation measures from multiple categories (i.e., in-field, adjacent to the field, or water retention systems) are utilized <sup>5</sup>	See options in categories above.	1



# It is Critical to Understand...

- How pesticide use, mitigation measures, and ESA-listed species interact with each other
- The current extent and practicality of including best management practices (BMPs) already used across the agricultural landscape into the pesticide mitigation measures dialogue
- The role of existing, externally funded conservation programs in mitigating potential pesticide movement and protecting ESA-listed species
- The importance of measuring outcomes of proposed mitigation measures.



# The Intersection

Pesticide Stewardship through research, education, recommendations, and enforcement



Pesticide Use

Species protection and recovery through federal, state, and local actions, as well as non-governmental organizations.

Conservation adoption through research, extension programming, conservation planning, financial program participation



Mitigation Measures

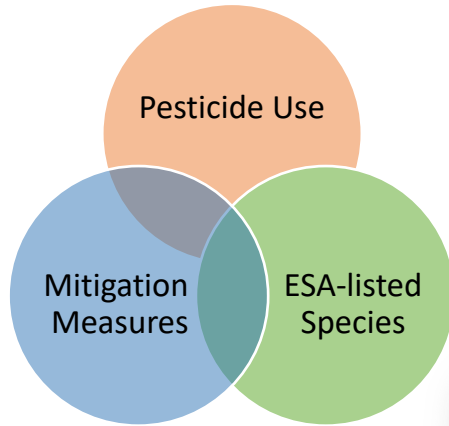
ESA-listed Species



Photo By/Credit: <https://www.fws.gov/staff-profile/kimberly-emerson>



# The Intersection: Challenges



- General descriptions of habitat
- Diverse landscape and field shapes
- Regional/crop specific production practices
- Edge-of-field/terrestrial pest pressure



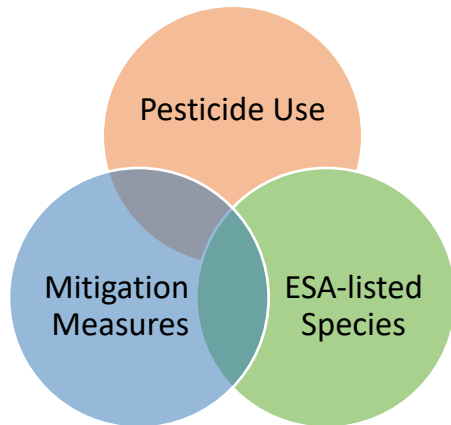
Eastern  
Nebraska



North  
Georgia



# The Intersection: Solutions



- Flexibility for complex production systems and site-specific nature of conservation planning
- Clear definitions of potential species habitat
- Education program that provides species-specific material on actions needed to aid in recovery
- Tiered approach to efficiency point system in the mitigation menu.
- Stakeholder involvement, especially stakeholders with diverse production systems

Targeted research to generate data to address the following questions:

Are growers being asked to implement and adopt mitigation measures that are not necessary, protective of, or provide a benefit to listed species?

If the ESA is driving the move to incorporate additional spray drift, sediment, and erosion mitigations into pesticide registration and use, what is the specific link to listed species and is more or less mitigation scientifically necessary?

# BMPS Being Used on the Agricultural Landscape

- “...Practical control measures (including technological, economic, and institutional considerations) that have demonstrated to effectively minimize water quality impacts.” (Ice, 2004)



Successful BMPs and conservation actions have been developed locally for specific site needs, and vary greatly from farm to farm, based on the dynamic changes that occur even within a single cropping or ecological system.

# BMPS Being Used on the Agricultural Landscape

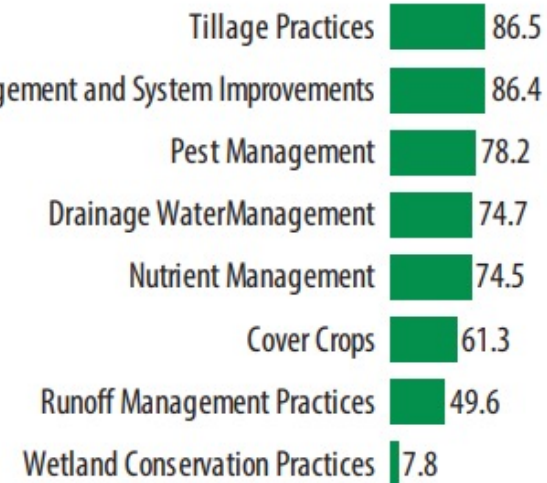


**Fig. 1 Cropland Conservation Practice** (average % of cropland\*)



\*among survey respondents who reported using a conservation practice

**Fig. 2 Cropland Conservation Practice** (% of survey respondents utilizing)



Among respondents who reported using specific cropping conservation practices, 86.5% used tillage practices. Among respondents who reported using a specific cropping conservation practice, tillage practices were applied to 83.4% of cropland.



# BMPS Being Used on the Agricultural Landscape

## Water quality is a big challenge, and requires partnerships to solve

Kansas State University

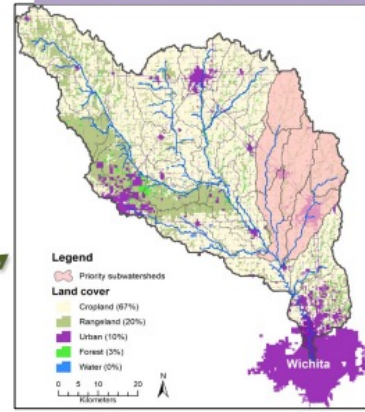
Watershed Restoration & Protection Strategy (WRAPS)

KS Dept of Health & Environment (KDHE)

Agricultural Players

Rural landowners

Farmers & ranchers



Urban players

City of Wichita  
- Stormwater  
- Drinking water  
- Wastewater

Developers

Rate payers (citizens)

One water resource: the Little Arkansas River

- Drinking water source
- TMDL-regulated for sediment, bacteria, nutrients, pesticides

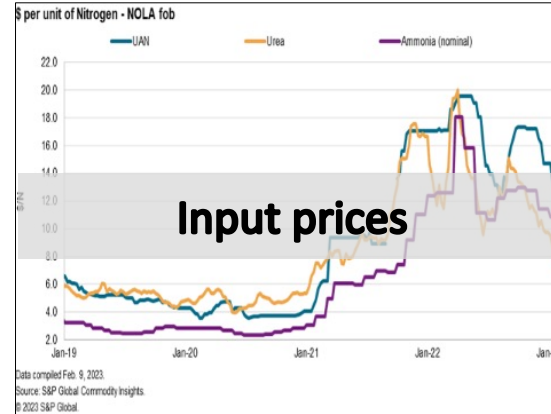
**K-STATE**  
Research and Extension

Included an education and awareness campaign with growers, pesticide dealers, and crop consultants.

- City of Wichita (Kansas) has worked with farmers to provide incentives for implementing atrazine BMPs to reduce atrazine entering the Little Arkansas River.
- From inception in 2006 through 2022, more than 1,300 farmers have implemented atrazine BMPs (92% participation rate) on nearly 300,000 acres, reducing runoff by approximately 50%.

BMPs include options such as: soil incorporation, changes in timing, changing application method, and buffers

# Challenges in Agriculture



.....etc.



# Farm Sustainability



*Productive Farmland & Economical Products*



*Healthy Land/Water for Habitat & Other Ecological Services*

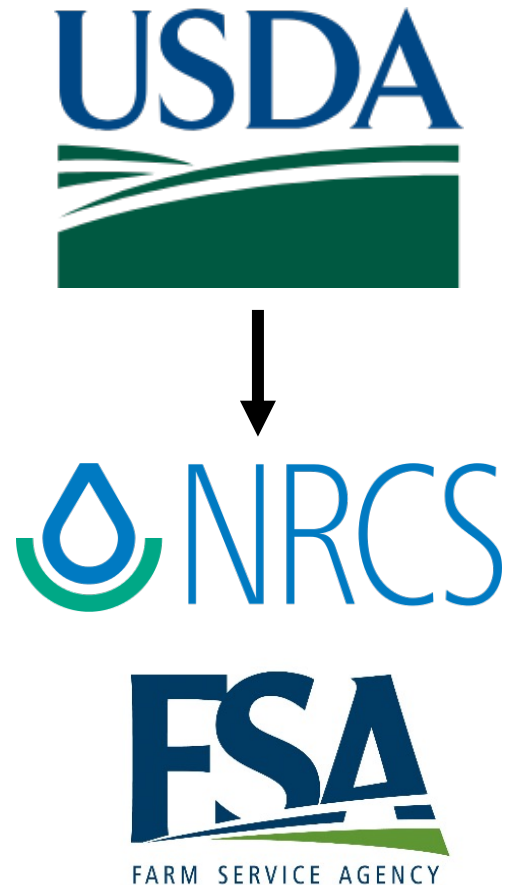


*Generational Farms Continue to Steward the Land*



# Conservation Programs

- Critical component of farm sustainability
  - Help implement BMPs
  - Infrastructure for mitigating movement of pollutants
- Services provided:
  - Information/planning
  - Financial support
  - Equipment
  - Technical assistance for installation



# Value to the Farm

- VERY costly to implement some BMPs
  - Long-term financial investment
  - Loss of production land
  - Special equipment
  
- Help for practices without direct ROI (\$):
  - Overcome financial barriers
  - Opportunities for all to participate
  - Environmental objectives



# Mitigating Pesticide Movement

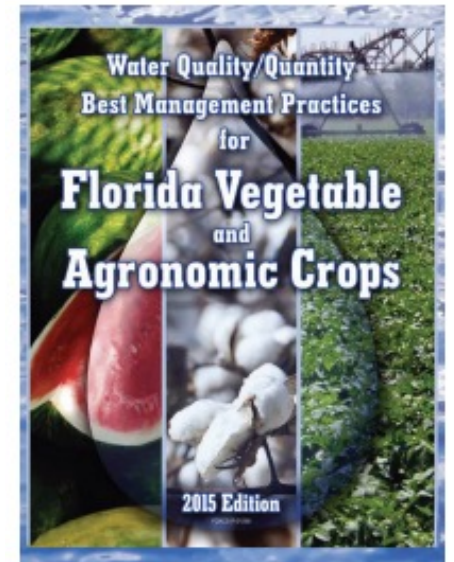
- Conservation programs are a critical component:
  - Infrastructure and information
  - Designed for mitigating pollutant movement
- Unique opportunity:
  - Work with local experts
  - Address specific land characteristics
  - Understand local landscape
  - Design/implement suitable practices



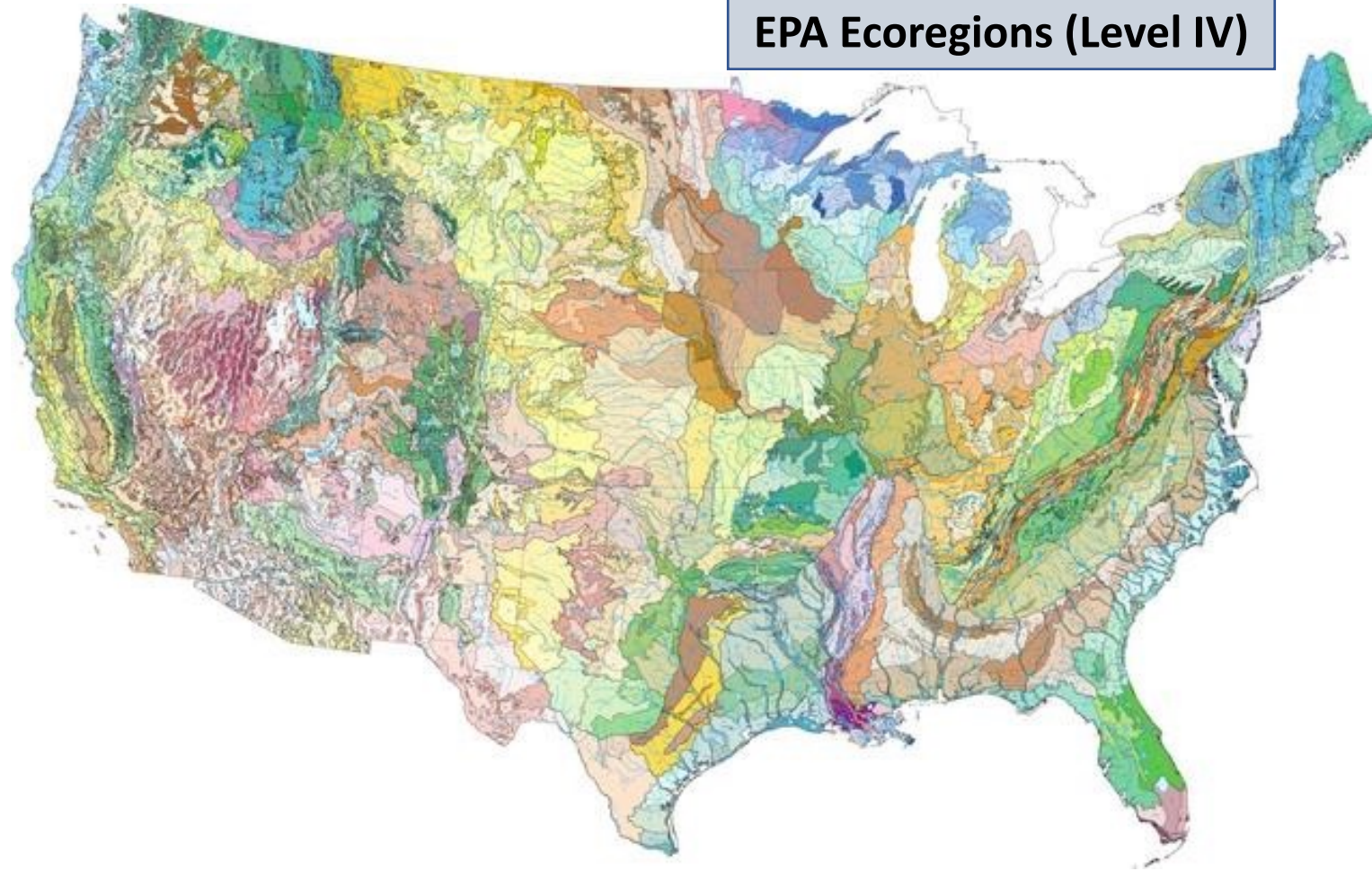


# Commodity Specific / State Programs

- More refined approach:
  - BMPs at a smaller scale; specific needs
  - *Local bridge to regulatory compliance*
- **Michigan Agriculture Environmental Assurance Program:**
  - Reducing risk to environment from pollution
  - 6,000+ enrolled farmers
- **Florida Dept. of Agriculture BMP program:**
  - Commodity specific
  - Multiple categories based on concern



# Diversity around the U.S.



EPA Ecoregions (Level IV)





# Leveraging Conservation Programs

***Conservation programs + financial assistance +  
science-based mitigation measures***

- ✓ Realistic opportunity of successful adoption
- ✓ Credit on proposed mitigation menu
- Barriers to continued participation:
  - Grow conservation efforts
  - Continued financial assistance
  - Federal, state, local level





# Measurable Outcomes

- How do we scientifically measure success?
  - Document need for mitigation
  - Impacts from adopting practices
- GREAT opportunity for science community to work together:
  1. What mitigation is needed?
  2. Existing conservation practices
  3. Reduction already occurring
  4. Fully understand baseline



# Concluding Thoughts

- Pesticide use forms foundation of food production:
  - Protect yields, maximize production
  - Sustaining world population
  - Mitigation adds new level of complexity

***Economical + environmentally viable food, feed,  
and fiber production  
= ultimate challenge***



# Top 3 Takeaways

1. Incorporating mitigation into regulatory framework changes site-specific nature of conservation practices
2. Entities must work together to achieve common goal – protect family farms and listed species, feed the world
3. Build mitigation practices on a foundation of sound science





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**Thank you for your participation!**  
**Questions?**

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## Upcoming Webinars

**February 20**

FIFRA, ESA and Pesticide Consultation: Understanding and Addressing the Complexities

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**March 12**

State Regulatory Agencies as Conduit for Informing Local Conditions in Federal Pesticide Processes

# New CAST Paper

Download Now!



[cast-science.org/publications](https://cast-science.org/publications)



## RNA INTERFERENCE IN AGRICULTURE: METHODS, APPLICATIONS, AND GOVERNANCE

### Upcoming Papers

**February 27**

(webinar release with NAISMA)

Preventing the Next Plant Invasion: Opportunities and Challenges

**March 20**

(in-person rollout in St. Louis, MO)

Applications, Benefits, and Barriers of Genome Edited Crops





# Borlaug CAST<sup>®</sup> Communication Award

The annual award celebrates professionals in the agricultural, environmental, or food sectors who have significantly contributed to advancing science in the public policy domain.

**2024**  
**NOMINATIONS ARE**  
**OPEN**



## **Who Can Be Nominated?**

Individuals who excel in promoting agriculture through various channels such as research, teaching, extension, or mass communication.

## **How to nominate?**

To nominate an individual, visit the CAST website ([cast-science.org/bcca](https://cast-science.org/bcca)) to download the 2024 nomination packet and for more information.

## **Deadline**

The deadline for nominations is ~~midnight on February 12, 2024~~, has been extended to March 11.



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