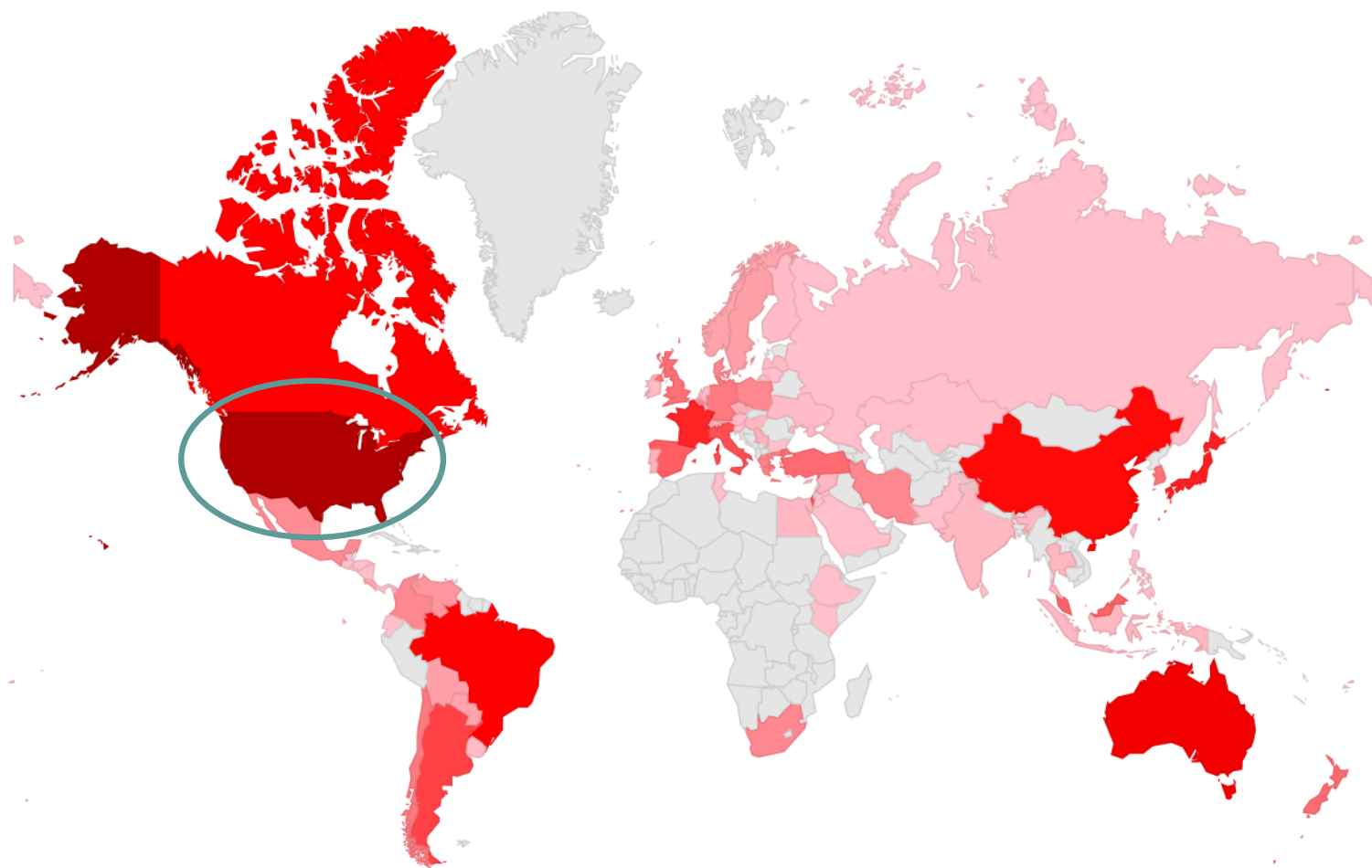




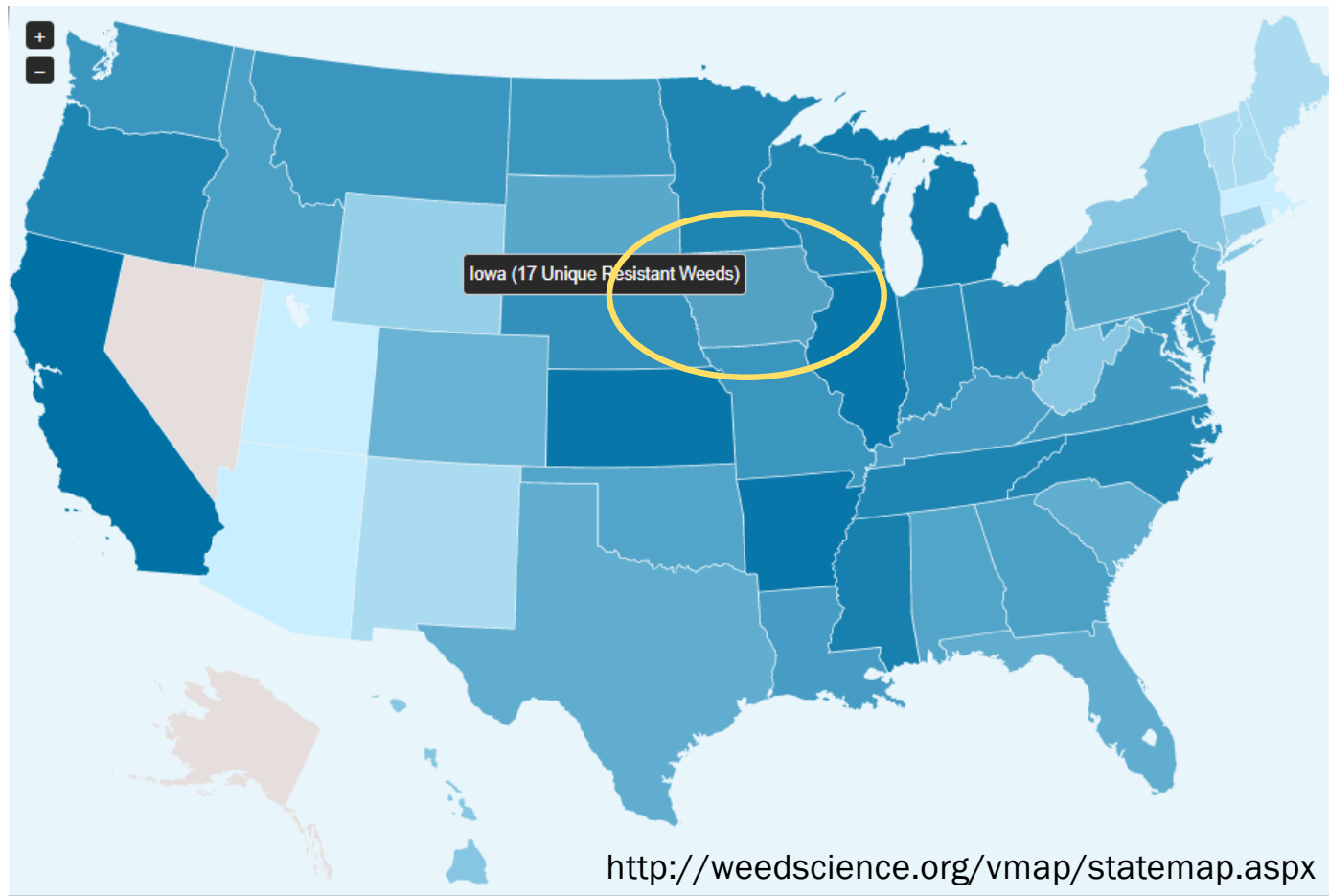
# Sociological and Human Dimensions of Herbicide Resistance Evolution and Management

Dr. Katherine Dentzman  
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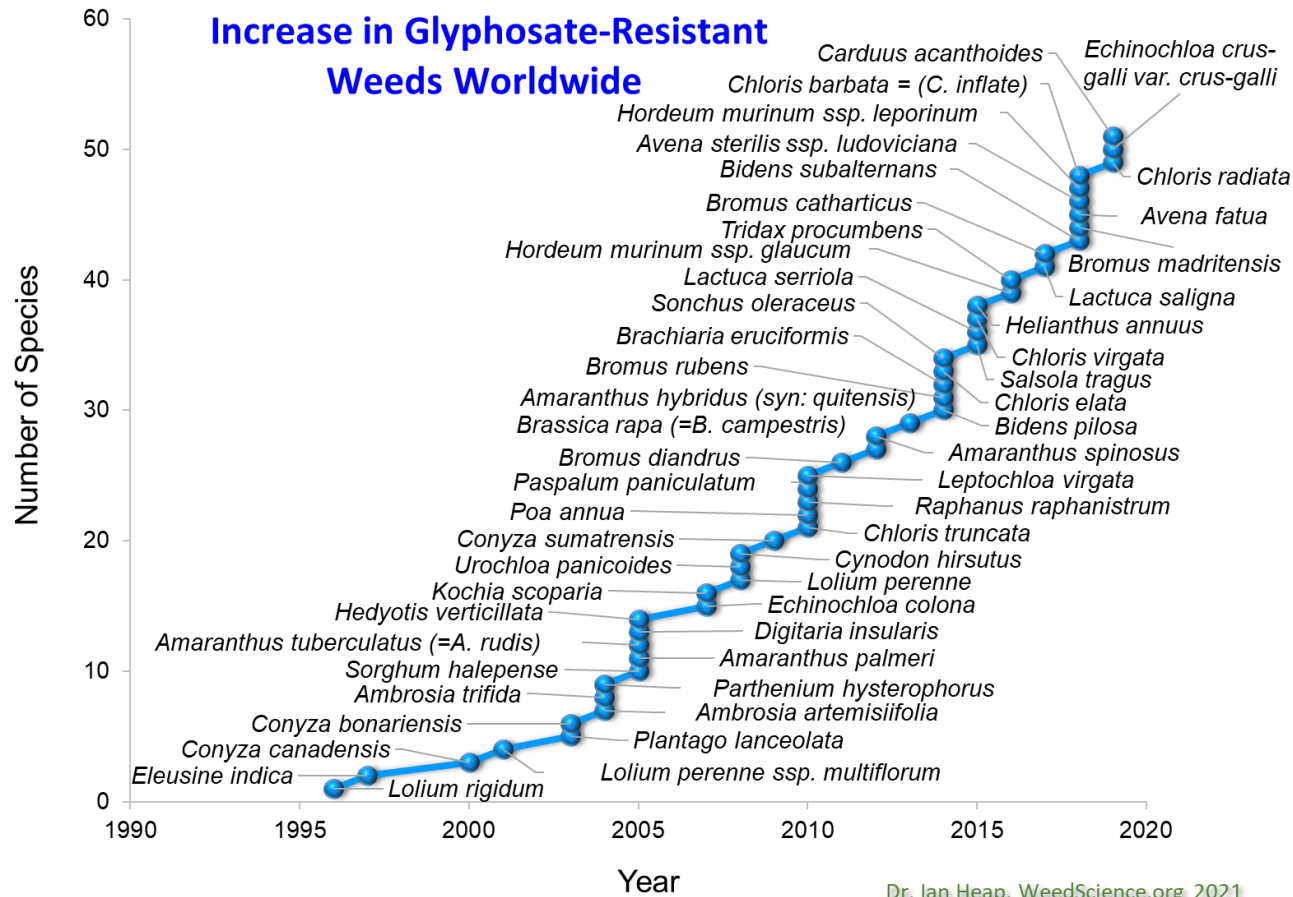


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<http://weedscience.org/Pages/GeoChart.aspx>

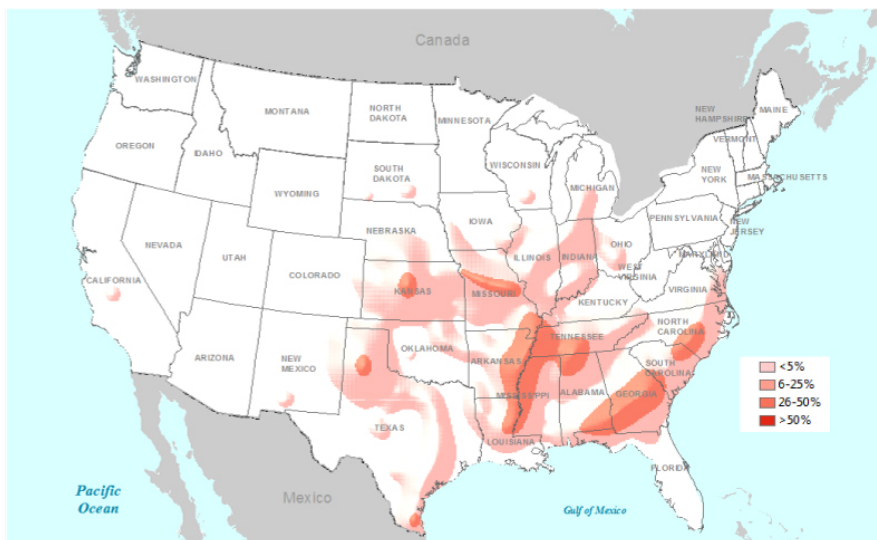


## Increase in Glyphosate-Resistant Weeds Worldwide



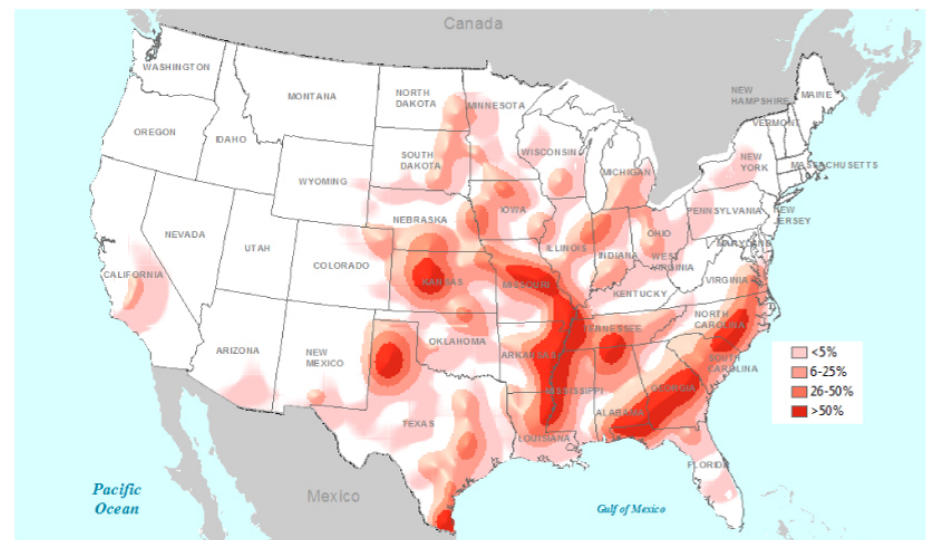
Dr. Ian Heap, WeedScience.org 2021





## PALMER AMARANTH SPREAD USING PROACTIVE MANAGEMENT

Maps courtesy of Dr. Bagavathiannan, Dr. Norsworthy funded by Bayer



## PALMER AMARANTH SPREAD - WORST-CASE BY 2020

# Pest Resistance as a Sociological Issue

- **Sociology** – the study of groups of people and their interactions
  - Why is society organized like it is? How does it function (or not)?
  - Why do people do what they do? How is this shaped by society and group identity?

How farmers make management decisions in light of societal expectations and constraints

# Research Methodology



Qualitative



Quantitative

- **Qualitative**
  - Focus groups
  - Interviews
  - Community meetings
  - Listening sessions
  - Content analysis
- **Quantitative**
  - Surveys

# Social Context of Herbicide Resistance

- **Techno-optimism**
  - Belief that a new miracle herbicide will be developed
- **Individualism**
  - Belief in the sanctity of farmers' autonomy and agency



"You can't tell me that it can't be done. You can't tell me that there ain't a chemical out there to kill that weed. I will never believe it."

"I think we're all probably hoping somewhere in that chemistry, there's something that comes around that's a new version. Yeah, stall long enough, maybe they'll figure something out, give us another product. That's about it."

*"That's the hope. I would say that might be all it is, is hope."*

"In other words, trying to keep a company keeping new products moving in the pipeline – because that's what's eventually is going to have to happen is...this is never going to go away. You're always going to have an issue with whatever herbicide comes out. So keeping new options coming is more important than really the agricultural practices and all that."

"Roundup definitely allowed people to get bigger because it worked so good for so long that you could double your acres easily and get the work done. But I don't see the cultivator coming back."

(laughter). I think we're going to have to find chemicals."

"We'd get a silver bullet, and everyone loads their gun up with the silver bullet and just empties it. Well by then everything starts getting resistant to it, we've got to find another bullet. Well know we're looking for gold bullets, not silver bullets!"  
[laughter]

## Techno-Optimism

“My answer would be nothing. I don’t see myself going up and knocking on the door, and saying, ‘you need to get rid of your weeds.’ And I think that’s probably going to be a typical answer. Economics have to run the show.”

Participant 1: “Bite your tongue.” Moderator: “Hmm?” Participant 1: “Bite your tongue and wait.” Participant 2: “Harder.” Participant 3: “Yeah, till it bleeds.”

Participant 1: “Just think, shoot the neighbor” (laughter) Participant 2: “Hoping he’ll die. Hoping he’ll die soon.” Participant 3: “Oh yeah.”

“If it’s at the back end, maybe if it was a few plants you could go out there and pull them by hand if they don’t fire at you from the house or something.”

“I had some neighbors come up to me concerned about another neighbor in our area that has issues with spraying. But I mean, nobody did anything about it. But they’re concerned.”

“I do ask a lot of my friends, ‘What did you use? What did you use?’ And then compare it to what I’m doing. And it would be nice to have a bigger bank of that knowledge.”

## Individualism

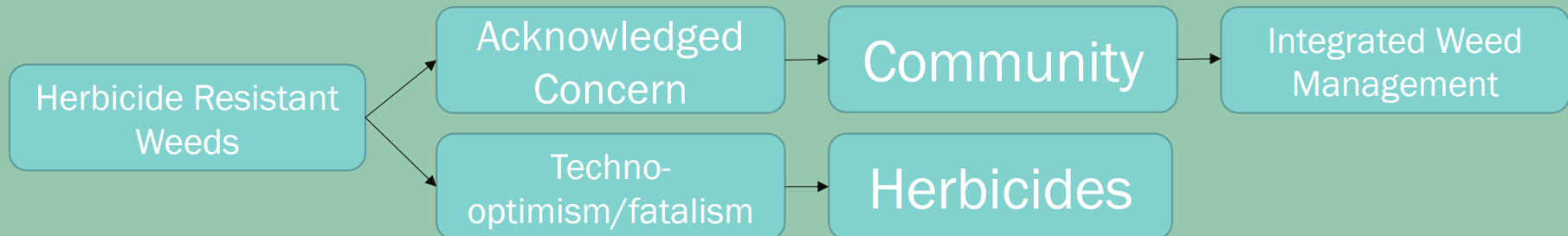


# Community as a Way Forward

a farmer-led local organization

Should the **government** develop a policy to require farmers to develop an approved plan to manage herbicide resistant weeds?

29%



# Community as a Way Forward



Figure 4. First Zero Tolerance field – Phillips County – involved stakeholders: county Extension agent, local conservation district rep, NRCS agent, farmer and former Extension weed scientist.

<https://www.uaex.edu/publications/pdf/FSA2177.pdf>

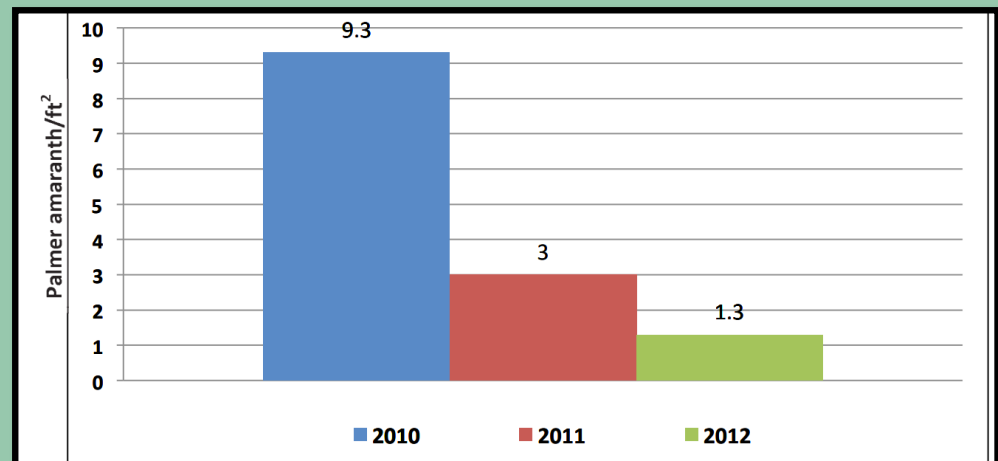


Figure 5. Palmer amaranth seedbank reduction based on soil samples after 2 years of incorporating resistance management and Zero Tolerance strategies. Corn 2010, Liberty Link Soybean 2011 with a final count in 2012.

# It's Not Just Farmers!

- 'Superweeds' messaging reinforces techno-optimism/fatalism
  - Extension specialists
  - Public sector weed scientists
  - Agronomists

Bétrisey, F., Boisvert, V., & Sumberg, J. (2021). Superweed amaranth: metaphor and the power of a threatening discourse. *Agriculture and Human Values*, 1-16.



# It's Not Just Farmers!

## **DO FARMERS JUST USE WEED KILLERS TO CONTROL WEEDS?**

There's no single solution when it comes to crop protection. Herbicides are one tool farmers can use to complement other common and effective practices, such as cover crops, tilling, crop rotation and proper timing of planting. Use of weed killers can allow farmers to adopt conservation tillage practices that help minimize soil disturbance, which can reduce soil erosion and greenhouse gas emissions.

- From 2017-2019, seed and chemical companies emphasize...
  - Rotating herbicides, adding herbicides, new herbicides
  - Individual farmer responsibility
  - Increasingly IWM – with strong herbicide focus

# It's Not Just Farmers!

- Washington State Noxious Weed Control Board
  - Strengths
    - Public relations and outreach
    - Training and networking capacity of Cooperative Weed Management Areas
    - Common goals to eliminate weed issues
  - Future
    - Expand County Weed Board cost-sharing programs to address some HR weeds

# It's Not Just Farmers!



## Crop Advisors



## Individual 'bad' farmer focus



## Also recognize barriers

Economics  
Sources of Information  
Techno-optimism  
Crop Advisor Priorities

“You have a marriage of the industry as a sales tool and the industry as an information tool [...] it can muddy the waters.”

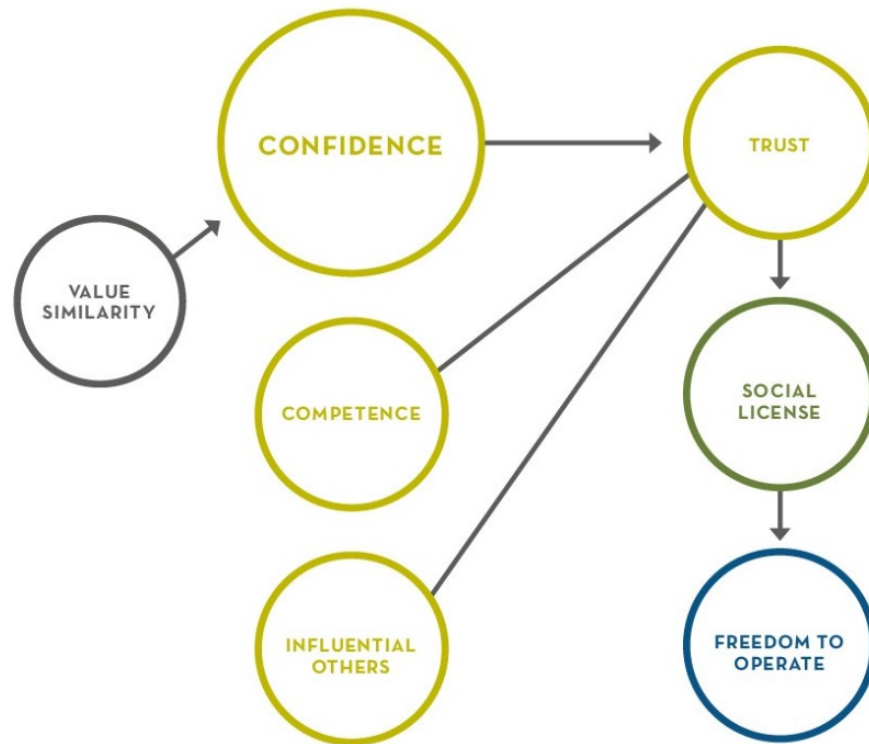
“You know going into the conversation it's going to be something that they're not going to want to hear. So it makes you hesitant to even do it, but you got to do your job I guess.”

“It really comes down to the manager [...] the more proactive managers can absolutely handle the issues as they arise”

“They're not receiving the same information we get. Cause our crop consultant organization, we get a different spiel than if you go to a farmers' meeting. The same representative, what he tells them is totally different. He knows that he can't throw as much smoke around with us as he can with the grower.”



## TRUST MODEL



## Forming Communities

# Community Management Principles for Pest Resistance



<https://www.economist.com/feast-and-famine/2012/06/18/elinor-ostrom>

1	2	3	4
Set clear <b>boundaries</b> (geographic area, community)	Be aware of farmer, community <b>differences</b> and needs	Allow community to <b>lead/govern itself</b>	Establish <b>shared goals/values</b> through active communication
5	6	7	8
<b>Raise awareness</b> of the need for community-based management	Recognize <b>individual contributions</b> and <b>struggles</b>	Engage <b>diverse actors</b>	Start <b>simple</b> and <b>monitor</b> progress

# Community Management Initiatives

- Iowa Pest Resistance Management Program
- Idaho/Washington Initiative
- Stakeholders
  - Farmers
  - NRCS
  - Extension
  - Local No-Till Organization
  - Commodity Groups
  - Agri-chemical Retailers
- Once monthly Zoom meetings

## Community-Based Management Principles for Herbicide Resistant Weed Management:

### A Get-Started Toolkit

#### 1. Set clear boundaries

Description: Establish clear geographic boundaries for the community and the resource. Who/what is in this community? Who/what is outside? Is it clearly defined?

Questions to answer:

- a. What are the geographic (aka physical) boundaries of your community? What are the landmarks that show where it ends/begins?

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- b. Are weed problems evenly spread throughout your community? Where are they clustered?

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- c. Who are the people in your community (ex. farmers, specific retailers, etc.)?

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- d. Is there any group of people that are nearby but not part of your community? How might their actions impact your community?

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# Camas Prairie Community Herbicide Resistance Management Initiative

## Guiding Document

Our group of growers in the Camas Prairie region of Idaho recognizes the negative impacts of herbicide resistant weeds on dryland wheat systems in the area and the need for

**Table 1. Communication Planning** (Lasley & Chase 2017; <https://store.extension.iastate.edu/product/A-Model-for-Community-Change>)

Public/Audience	Communication Channel	Message
High schoolers, FFA, 4-H	Speakers at their meetings, information sheet for advisors to hand out	Raise awareness that this is an issue, mix your modes of action, how resistance develops, BMPs, effective veg and restoration management tool – needs to be used per label and mode of action, accurate weed identification
People putting land in CRP, SAFE, landowners, etc.	Informational handout at FSA, hardware stores (Lowe's, etc.) – start w/ WSU extension bulletin	What it is, how it develops, the issues it causes, management entailed. Entire pest management picture – biological element. Accurate weed identification
Producers for sure, maybe private landowners?	Survey – increases awareness even by taking it! Then send results back out.	What is our baseline, how aware are people?
Producers transitioning from conventional to reduced or no-till	NRCS, Direct Seeders Association (Doug Poole), Ag Expo. Yearly convention good place to have a seminar.	That it's a real issue, it's coming! Mix your modes of action, use labeled rates, BMPs, proper timing, don't skimp. Economic tradeoffs

# Toolkit of Community Management Ideas

## Community Herbicide Resistance Management Initiative Ideas Toolbox

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<i>Grant Funding Opportunities</i> .....	2

### Incentives

#### Overview:

Incentives are rewards, usually in the form of monetary payments, distributed to individuals or groups for abiding by a voluntary set of rules, principles, or standards over a set period of time. Key elements include the amount of the incentive, where the funding will come from, how it will be distributed, what standards will be used, and how it will be determined that participants are meeting those standards.

#### Ideas from Real Communities/Farmers/Other Stakeholders:

- A fund that covers 50% of the cost of a specific herbicide or herbicides if farmers abide by a given set of rules
- Payments to growers and public land-owning entities in a defined region for controlling a specific weed
- Payments to encourage/assist farmers in experimenting with alternative chemical control options

#### Examples of How It's Been Done in Community Management:

- A group of wheat growers in Morrow County, OR met twice monthly for a year to discuss an incentive plan for controlling herbicide resistant Russian thistle in their county. They drafted and submitted a grant to NRCS' RCPP program. In order to receive a payment, growers and other entities would need to have no more than 5 Russian thistles larger than a volleyball per 100 acres in the first year of the program. Compliance was to be monitored by the local Soil Conservation District and incentives paid out by NRCS. The grant was not funded in the first year it was submitted, but there is intention to revise and resubmit the proposal.

#### Resources:

# Roadblocks

Limited number of highly aware/concerned farmers participating

What happens when the 'champion of the cause' leaves?

Community ownership of effort

Lack of time, other priorities

Translating from ideas into action





## Takeaways

- Importance of social science to addressing agronomic issues such as pest resistance
- Connected roles of all groups in a community
- Constraints (economic, ideological, social, etc.) that prevent action on issues like herbicide resistance
  - How we can begin to address them