The background is a dark blue gradient with faint, light blue geometric patterns. On the left side, there is a large, semi-circular scale with tick marks and numbers ranging from 40 to 260. Several concentric circles and dashed lines with arrows are scattered across the background, creating a technical or scientific aesthetic.

# THE SAFE AND EFFECTIVE APPLICATION OF AQUATIC HERBICIDES

KRISTA HOFFMANN

IPM COORDINATOR, LANDS PROGRAM

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

# OVERVIEW



LAWS AND  
REGULATIONS



NON-TARGET TOXICITY  
CHARACTERIZATION



FIELD TRIALS / STUDIES

# SPOILER ALERT!

1. Must use aquatic herbicides at aquatic sites
2. Waters of the US = NPDES
3. There are herbicide options that are among the safest AND most effective



# WHEN DO I NEED TO USE AN AQUATIC HERBICIDE?



- **"Aquatic habitat"** means bodies of water, such as lakes, reservoirs, rivers, perennial and intermittent streams, wetlands, or ponds, sloughs, and estuaries.\*
- In situations where there is **direct surface water runoff** from treatment sites to aquatic habitat, **apply only those chemicals formulated for aquatic or wetland use**.\*\*

\*Source: California Code of Regulations (Title 3. Food and Agriculture) Division 6. Pesticides and Pest Control Operations

\*\*Source: California Pesticide Management Plan for Water Quality - An Implementation Plan for the Management Agency Agreement between The Department of Pesticide Regulation and The State Water Resources Control Board





# SURFACE WATER APPLICATIONS

- **If:** Application may result in discharges to waters of the United States
- **Then:** National Pollutant Discharge Elimination System (NPDES) – General Permit.



# SURFACE WATER APPLICATIONS



**require surface  
water sampling!**





# UPDATED DEFINITION “WATERS OF THE U.S.”

Source: [shutterstock.com](https://www.shutterstock.com)

## NEW “WATERS OF THE U.S.” DEFINITION – JUNE 2020 STILL INCLUDES

- Territorial seas and traditional navigable waters
- Perennial and intermittent tributaries that contribute surface water flow to such waters
- Certain lakes, ponds, and impoundments of jurisdictional waters
- Wetlands adjacent to other jurisdictional waters





# NEW “WATERS OF THE U.S.” DEFINITION – JUNE 2020

## DOES NOT INCLUDE

- Some ditches
- Prior converted cropland
- Areas dependent on artificial irrigation
- Some artificial lakes and ponds
- Most stormwater control features

For more information, refer to:

Federal Register / Vol. 85, No. 77 / Tuesday, April 21, 2020 / Rules and Regulations





# AQUATIC PESTICIDES AND THEIR SAFETY





## AQUATIC HERBICIDES REGISTRATION – MUST EVALUATE:

- potential residue in potable water, fish, shellfish, and crops that may be irrigated
- environmental fate
- how the compound breaks down
- whether or not it is absorbed by test animals
- short-term or acute toxicity to test animals
- whether or not it causes birth defects, tumors, or other abnormalities after long-term exposure
- toxicity to aquatic organisms such as waterfowl, fish, or invertebrates

# ENVIRONMENTAL PROTECTION AGENCY TOXICITY CATEGORIES

<b>Toxicity Category</b>	<b>Aquatic Organisms: Acute (mg/L)</b>
<b>practically nontoxic</b>	>100
<b>slightly toxic</b>	>10 - 100
<b>moderately toxic</b>	>1 - 10
<b>highly toxic</b>	0.1 - 1
<b>very highly toxic</b>	<0.1



# TOXICITY CATEGORY BY HERBICIDE (AND ADJUVANT)

Active Ingredient	Toxicity Category		NPDES Maximum Limitation
	Fish (ppm)	Inverts (ppm)	
imazamox (Clearcast)	>100	>100	none
triclopyr triethylamine (Garlon 3A)	>100	>100	13.0 ppm <sup>a</sup>
imazapyr (Habitat, Polaris)	>100	>100	11.2 ppm <sup>a</sup>
fluridone (Sonar)	>1 - 10	>1 - 10	0.56 ppm
flumioxazin (Clipper, Propeller)	>1 - 10	>1 - 10	none
carfentrazone (Stingray) <sup>b</sup>	>1 - 10		none
glyphosate (Roundup Custom, Rodeo)	>1 - 10	0.1 - 1	0.70 ppm
endothall (Aquathol K)	0.1 - 1	0.1 - 1	0.10 ppm
diquat (Reward)	>1 - 10	<0.1	0.02 ppm
2,4-D <sup>c</sup>	<0.1	<0.1	0.07 ppm
acrolein (Magnacide) <sup>c</sup>	<0.1	<0.1	0.021 ppm
copper (Harpoon)	<0.1	<0.1	0.015 - 0.020 ppm
nonylphenol (R-11, Activator 90, No Foam A)	<0.1	<0.1	0.0066 ppm

Source: USEPA ECOTOX Database (<https://cfpub.epa.gov/ecotox/>)



# R-11<sup>®</sup>

SPREADER ACTIVATOR - NONIONIC SURFACTANT



## PRINCIPAL FUNCTIONING AGENTS

Alkylphenol ethoxylate, butyl alcohol,  
Dimethylpolysiloxane .....

% BY WT.

90%

## CONSTITUENTS INEFFECTIVE AS SPRAY ADJUVANTS .....

10%

Total.....100%

Surfactant Content.....80%

WA Reg. No. 2935-50142

KEEP OUT OF REACH OF CHILDREN



WARNING

# IS IT A NONYLPHENOL ADJUVANT?

CHECK THE LABEL FOR  
"ALKYLPHENOL ETHOXYLATE"



# AGRI-DEX<sup>®</sup>

## A Crop Oil Concentrate



### \*PRINCIPAL FUNCTIONING AGENTS:

Heavy range paraffinic oil, Polyol fatty acid esters, and Polyethoxylated derivatives thereof .....	99.0%
CONSTITUENTS INEFFECTIVE AS SPRAY ADJUVANTS .....	1.0%
TOTAL .....	100.0%

Surfactant Content: .....	17.0%
Unulfonated Oil Residue (UR) Value .....	95.0% minimum

\*All ingredients are accepted for use under CFR 40, 180.  
**CONTAINS PETROLEUM DISTILLATES**

**KEEP OUT OF REACH OF CHILDREN**

### WARNING

May be harmful if swallowed  
May be harmful in contact with skin  
Harmful if inhaled  
Causes mild skin irritation  
Causes eye irritation

5905-50094-AA



ADJUVANTS  
Oil

WILBUR-ELLIS<sup>®</sup>  
Ideas to Grow With<sup>™</sup>

## COMPETITOR<sup>®</sup>

### MODIFIED VEGETABLE OIL

#### PRINCIPAL FUNCTIONING AGENTS:

Ethyl Oleate, Sorbitan Alkylpolyethoxylate Ester, Dialkyl Polyoxyethylene Glycol.....	% BY WT. 98.0%
CONSTITUENTS INEFFECTIVE AS SPRAY ADJUVANT .....	2.0%
TOTAL .....	100.0%

CA Reg. No. 2935-50173

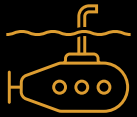
WA Reg. No. 2935-04001

**KEEP OUT OF REACH OF CHILDREN**  
**PRECAUTIONARY STATEMENTS**

Avoid contact with skin and eyes. Avoid breathing mist or spray.

# NONYLPHENOL ADJUVANT ALTERNATIVES

# EFFICACY



Submersed (submerged)



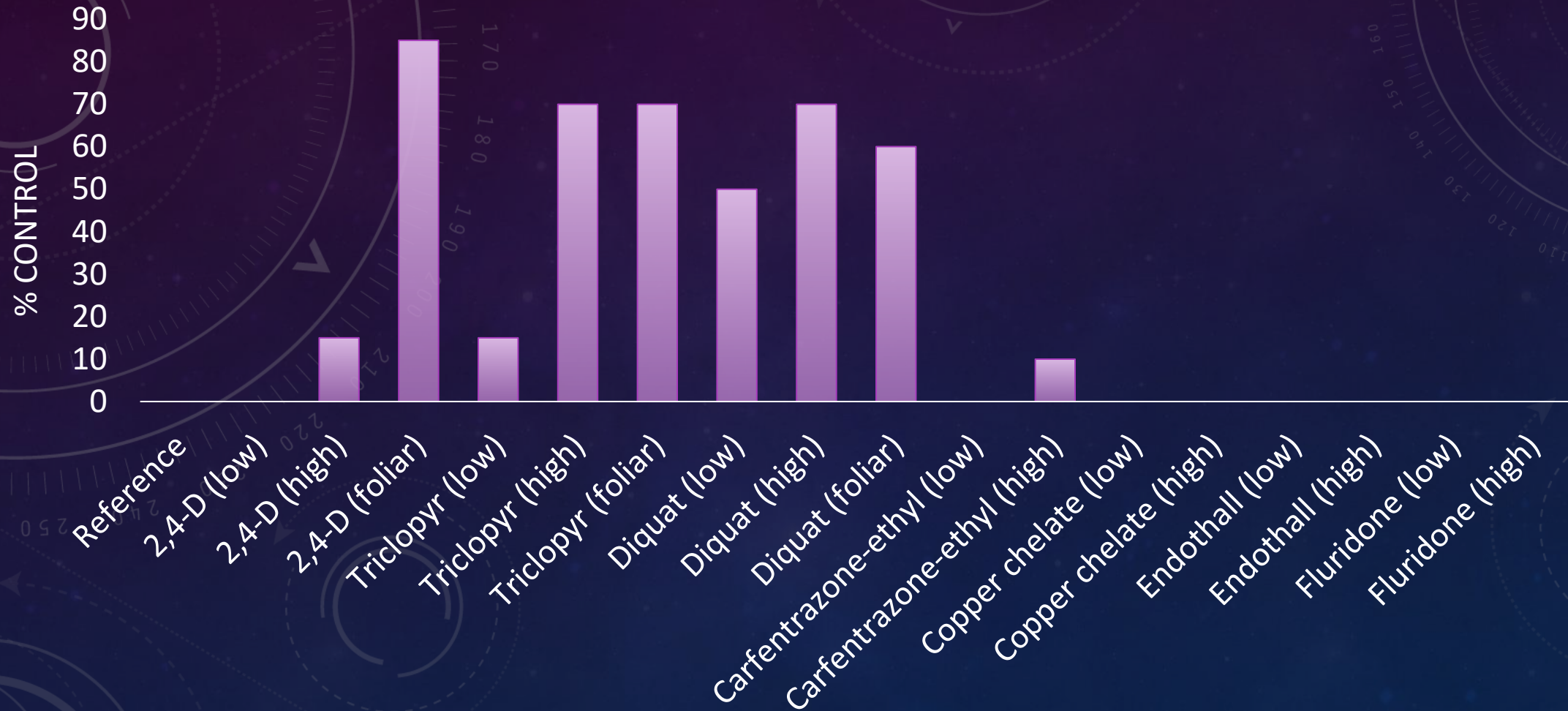
Floating



Emergent



Parrot Feather (*Myriophyllum aquaticum*)  
Percent Control 6 Weeks Post-Treatment



Source: Madsen et al. 2010

## Water Primrose (*Ludwigia peploides*) Biomass at 12 Weeks Post-Treatment



Source: Sartain et al. 2015



## Common Reed (*Phragmites australis*) Biomass at 12 Weeks Post-Treatment



Source: Cheshier et al. 2012 (note: bar graph is an approximation of data, not quantitative)

# Thank you!

## SUMMARY

- Must use aquatic herbicides at aquatic sites
- Waters of the U.S. = NPDES
- Opt for herbicides that safe AND effective

Contact: [Krista.Hoffmann@Wildlife.ca.gov](mailto:Krista.Hoffmann@Wildlife.ca.gov) (two f's, two n's)