

# Linking research to conservation actions to help improve efforts to reduce pesticide pollution in surface waters

MT AWRA

October 10<sup>th</sup>

Rachel L Malison, PhD



**FLATHEAD LAKE  
BIO STATION**  
UNIVERSITY OF MONTANA



Montana Pesticide Stew  
Partnership Progr



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MONTANA WA1

# Montana's Waters

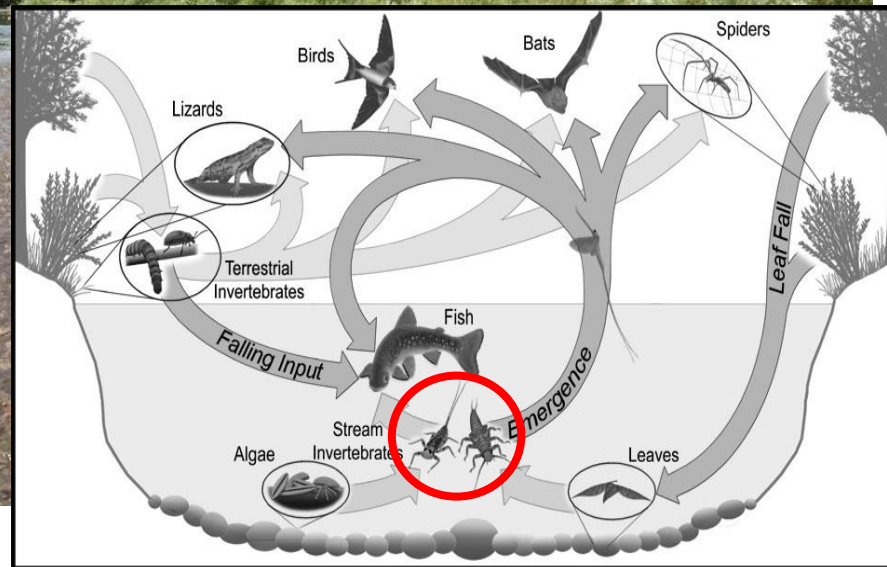
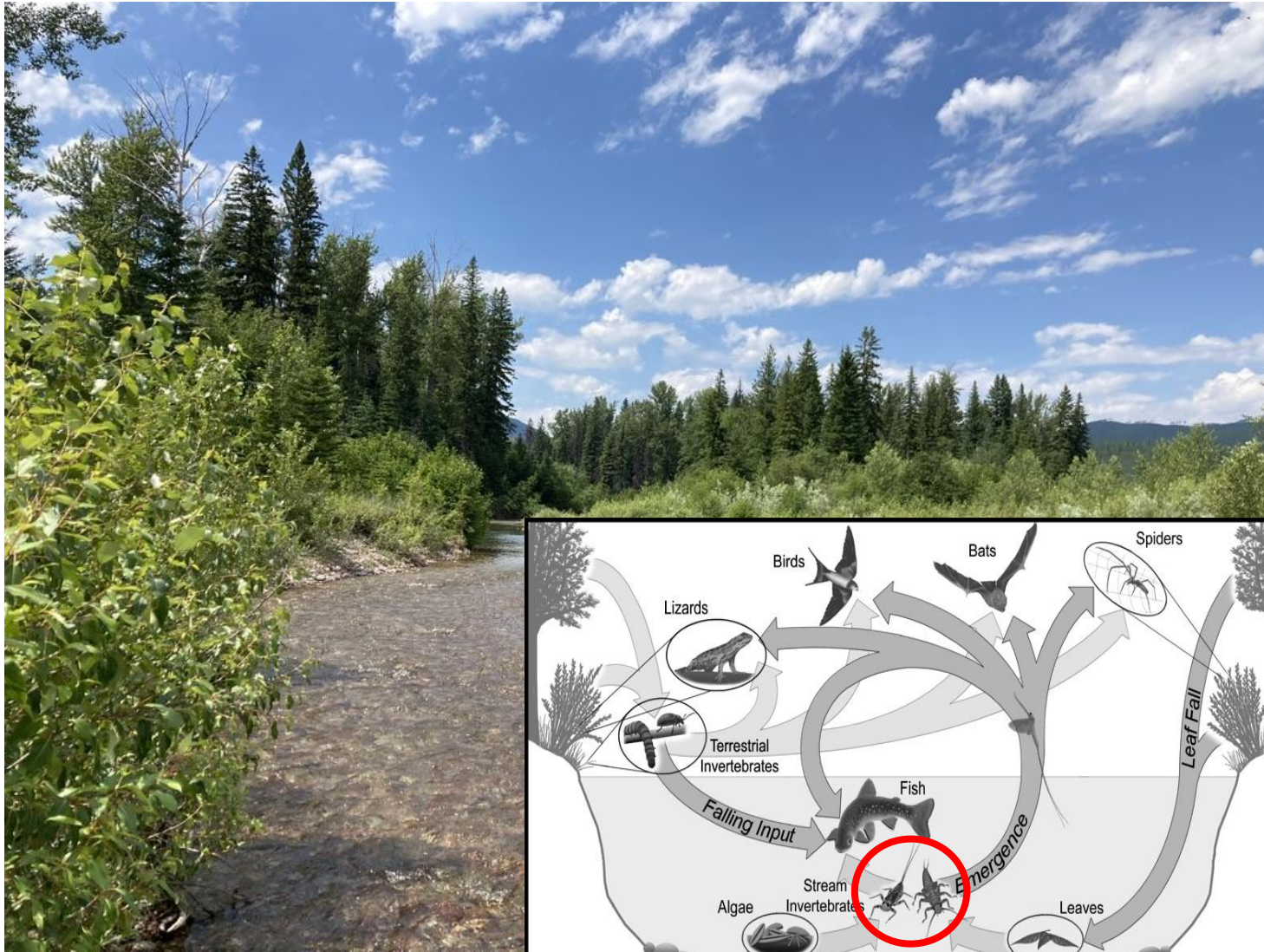


Mayflies (Ephemeroptera)

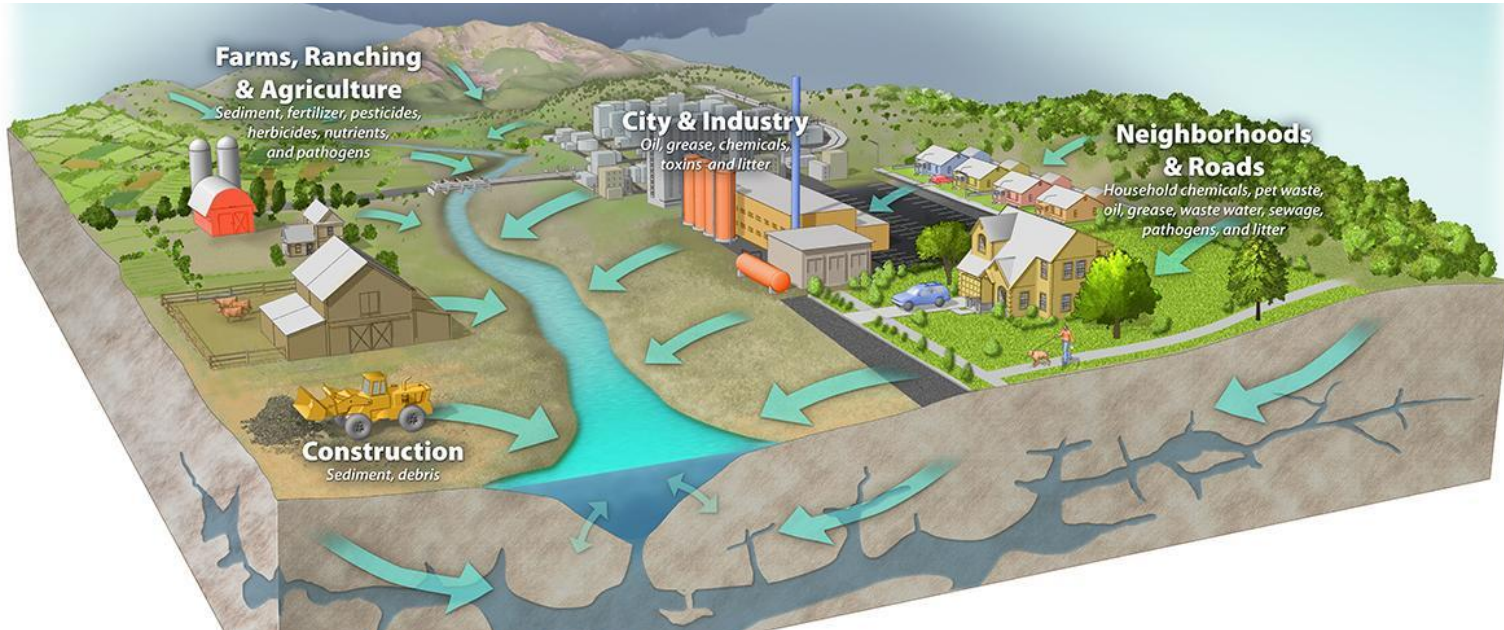


Stoneflies (Plecoptera)

Caddisflies (Trichoptera)



# Montana's Waters



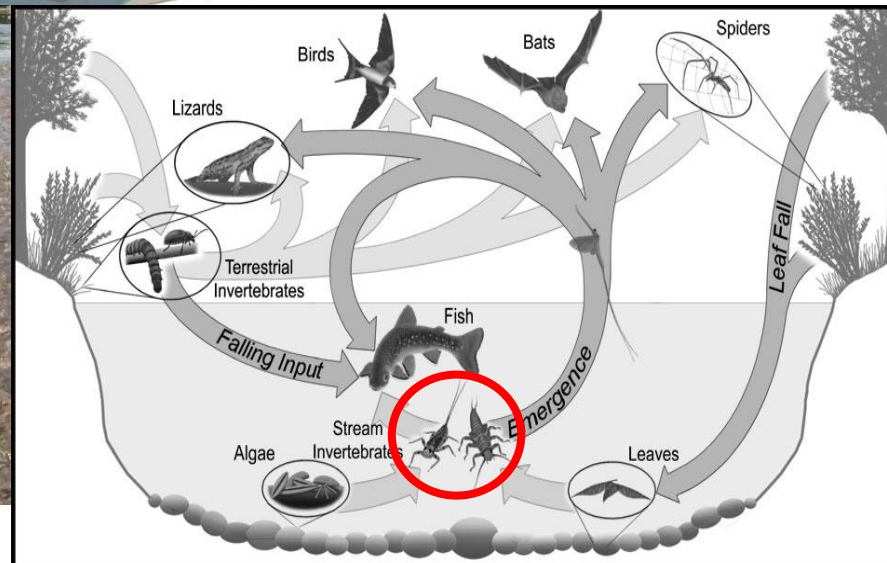
Mayflies (Ephemeroptera)



Stoneflies (Plecoptera)

NABS ([www.benthos.org](http://www.benthos.org))

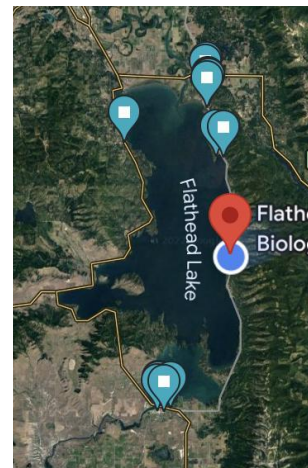
Caddisflies (Trichoptera)





# Monitoring Montana Waters

- A program at Flathead Lake Biological Station
  - Established in 1899, 125 years!
  - Mission: Research, Education, Monitoring
- Launched in 2021
- Philanthropically funded
- Supports Volunteer Water Quality Monitoring



Rachel Malison:  
Assistant Research Professor  
& MMW Program Leader



Briana Elizondo:  
BSWC Member



Tom Bansak:  
Associate Director  
Oversight Committee



Erin Sexton:  
Senior Scientist  
Oversight Committee

# Goal of MMW

Increase the capacity of water quality monitoring in Montana



Guidance



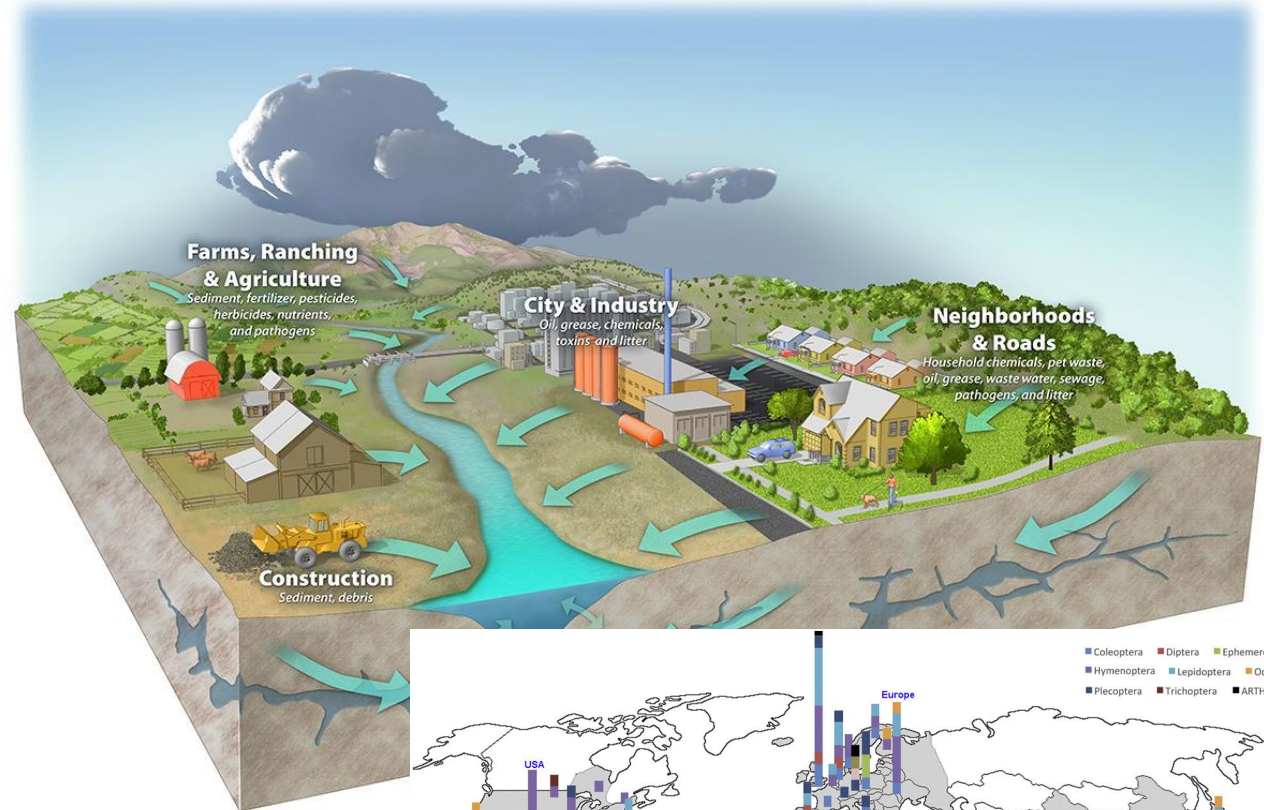
Funding



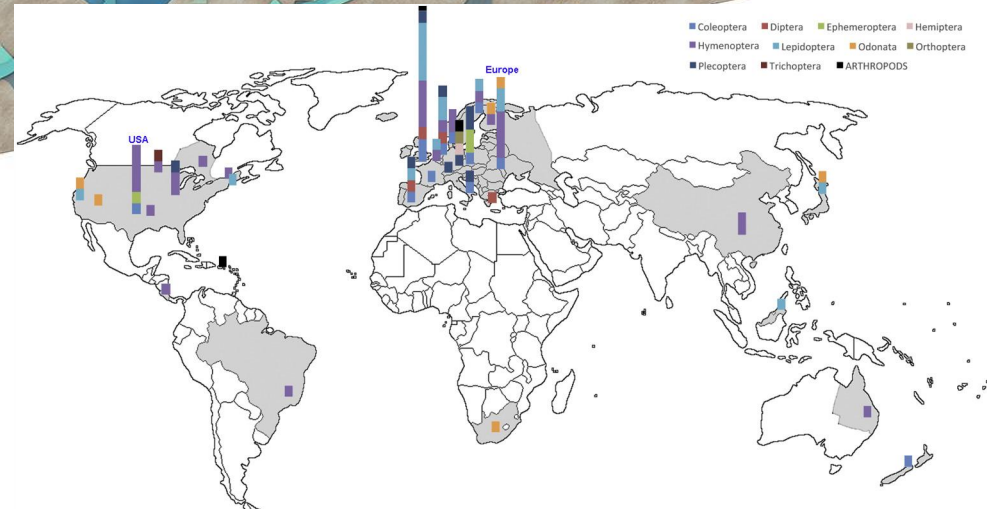
Training

- Protect the waters of Montana
  - Nutrients, sediment, E. coli, etc

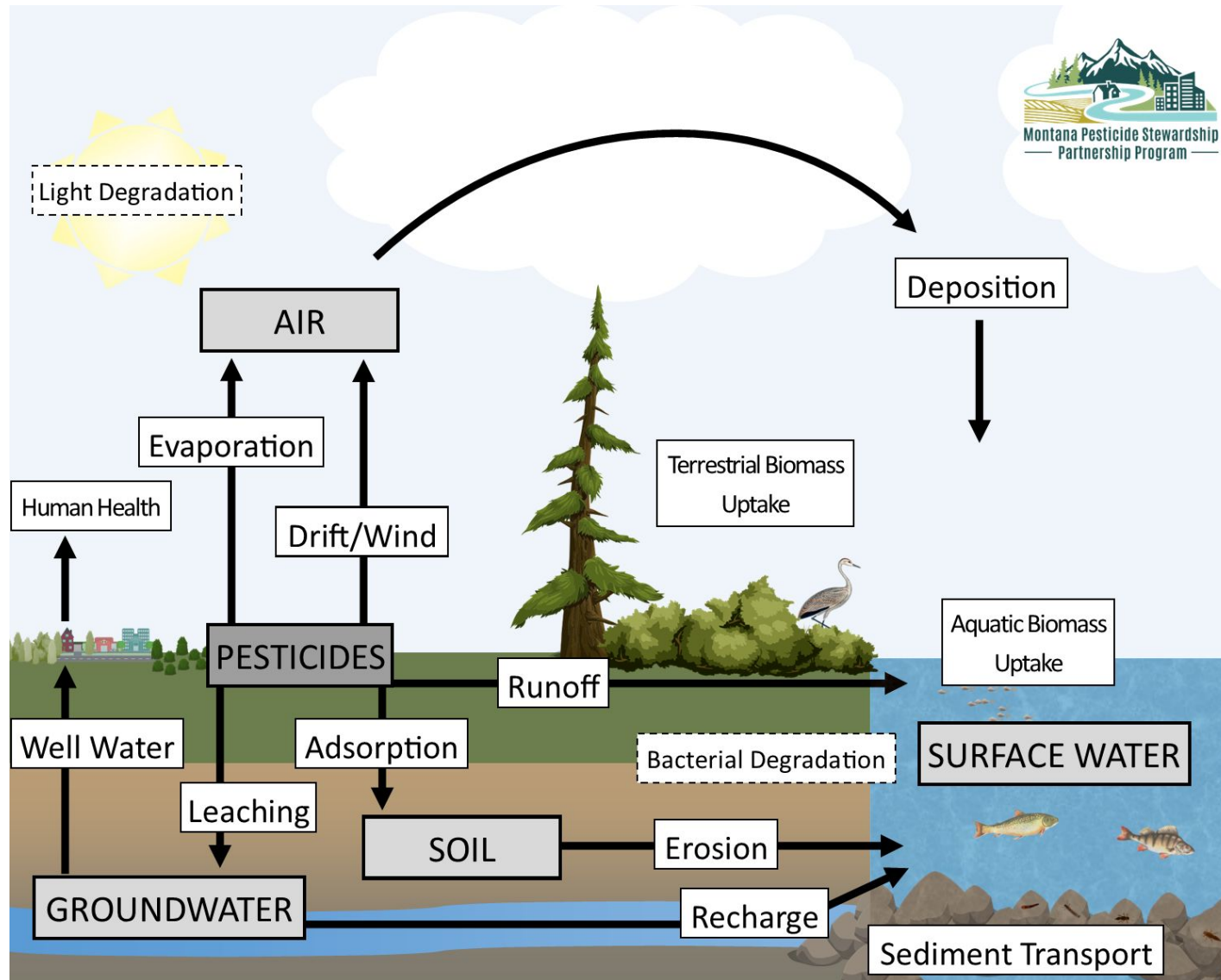
# Montana's Waters



- Pharmaceuticals
- Metals
- PFAS
- Pesticides



# Pesticides in Freshwaters



- Clean Water Act in 1972, but the threat of pesticides remains today
- By 2017, 1 billion pounds of active ingredient used per year in the US
- Agricultural and residential sources
- Designed to kill organisms (pests, weeds, fungal diseases)
  - Includes insecticides, herbicides, fungicides
- However, equally effective at killing non-target organisms
- We have very little baseline data
- Do not know risk, nor will we know if actions will make a difference

# Pesticide Stewardship Partnership Programs

- Program to create a network of organizations and people to measure, document, and implement actions to reduce pesticides
- Oregon PSPP
- WA Department of Agriculture

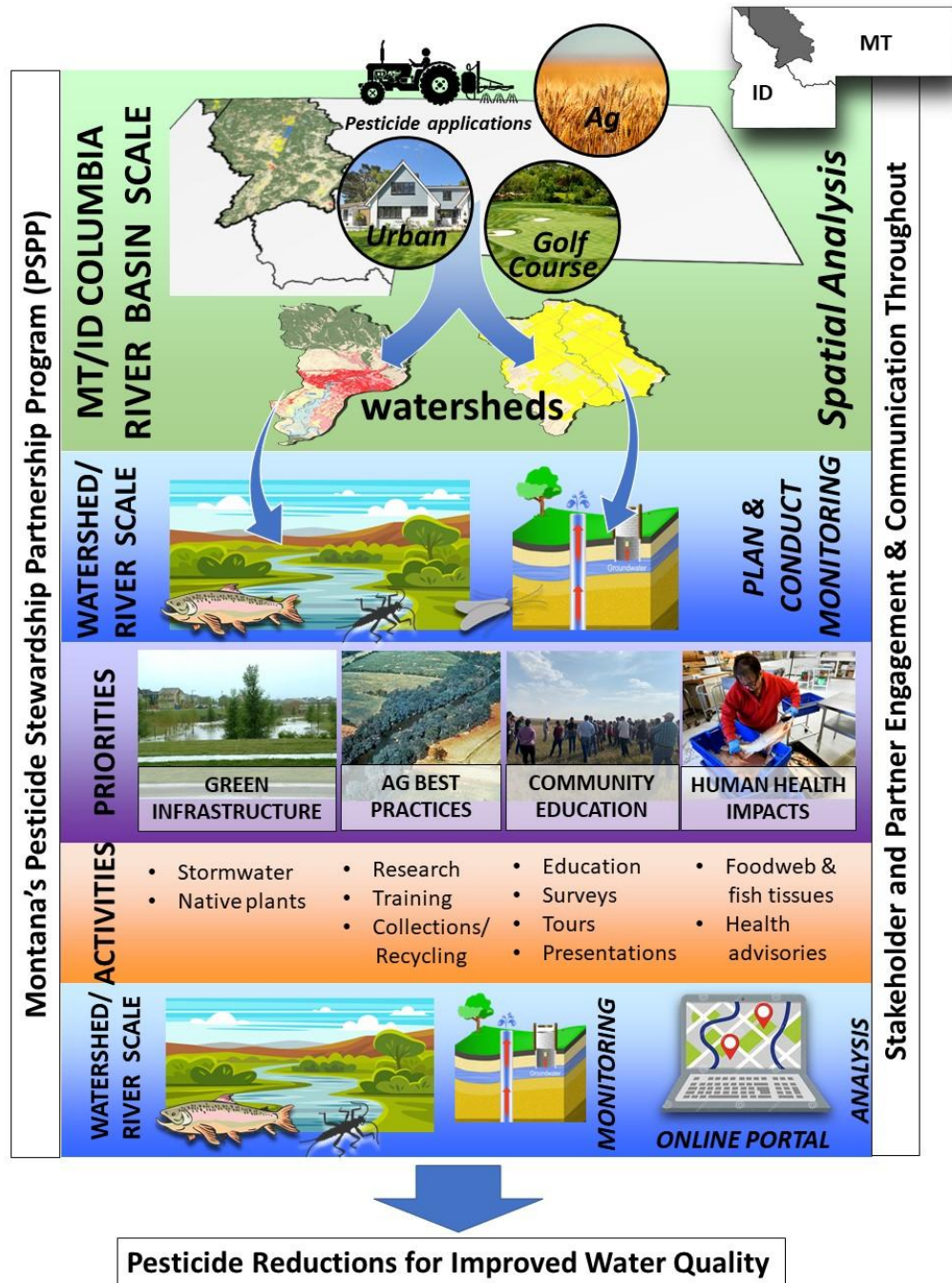
# Reducing Toxics in the Upper Columbia River Basin of Montana through a Pesticide Stewardship Partnership Program (PSPP)

Columbia River Basin Toxic Reduction Lead Funding

Total Project: \$8.8 million

EPA Funding: \$6.6 million –  
Cost Share: \$2.2 million

5 year grant



# Our Pesticide Stewardship Partnership Program

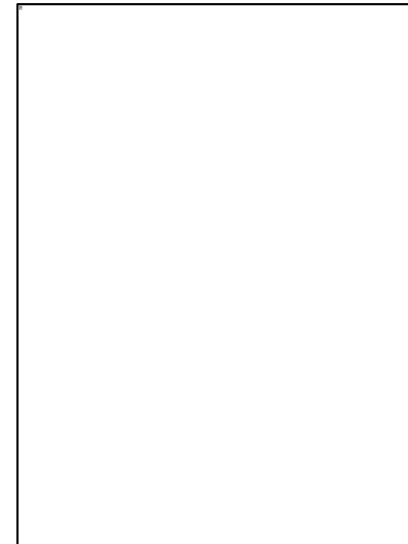
- Our Primary Team at FLBS



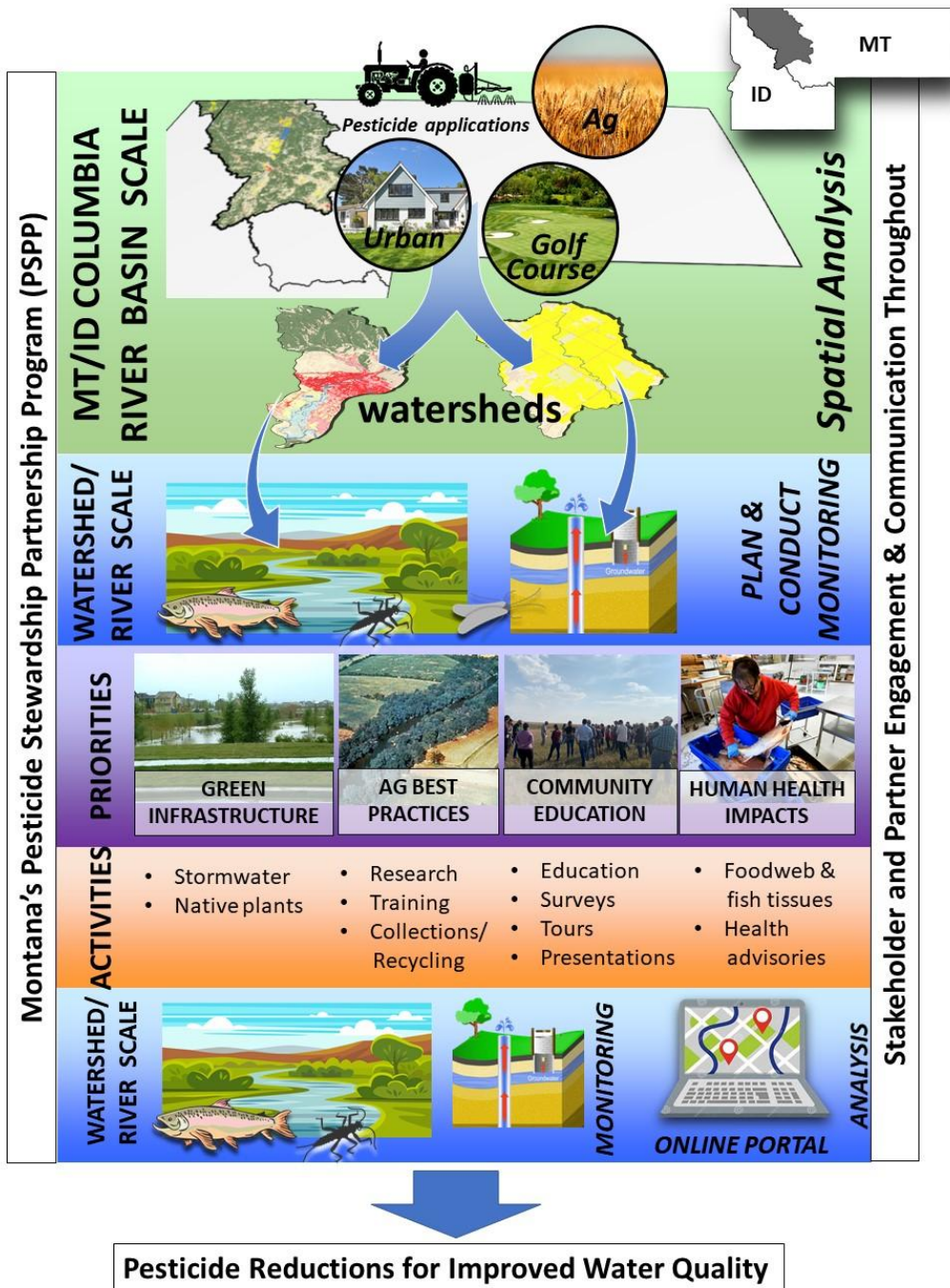
Rachel Malison:  
Principle Investigator



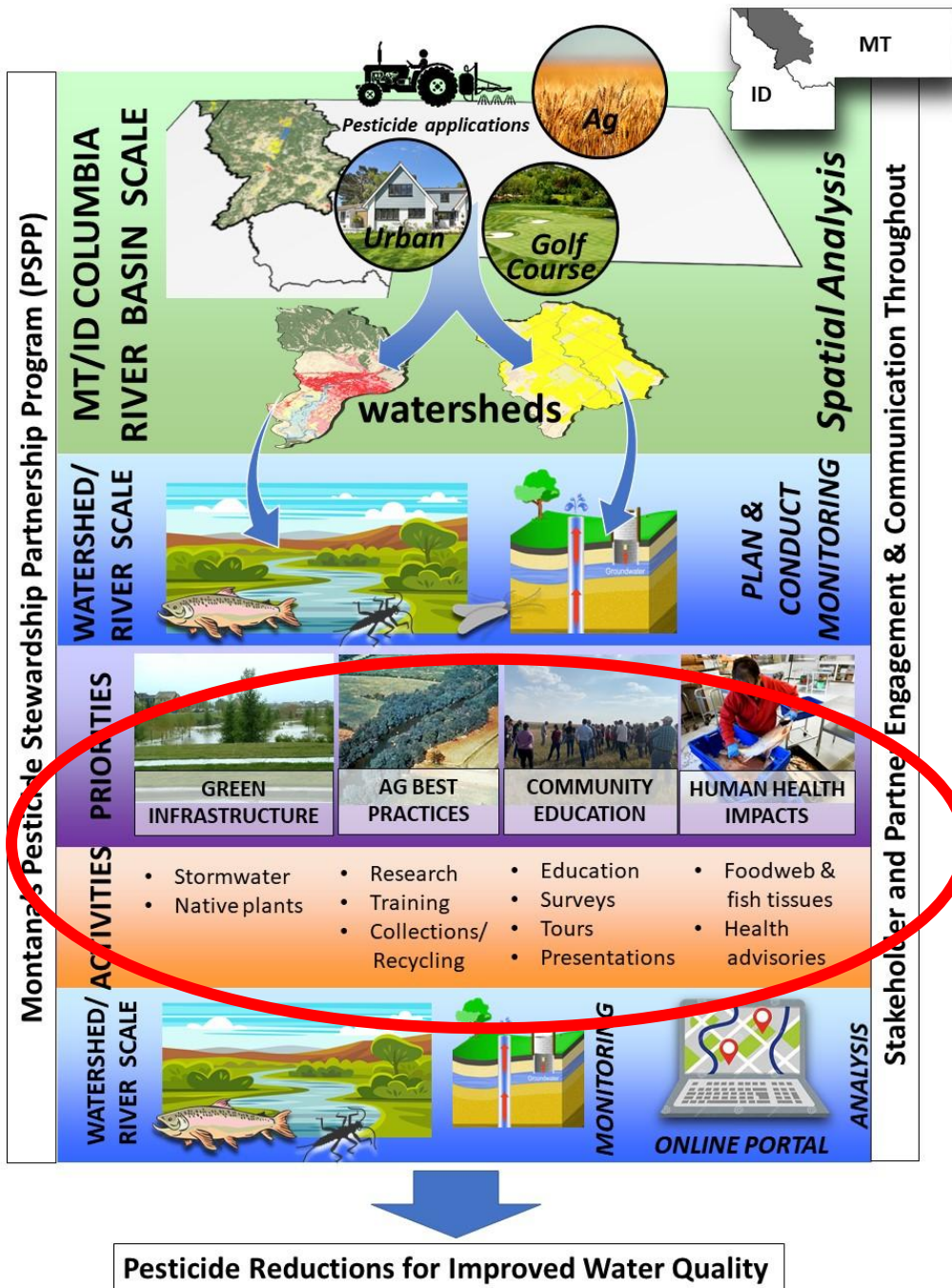
Janelle Groff:  
Project Coordinator



Jared Glass:  
BSWC Member



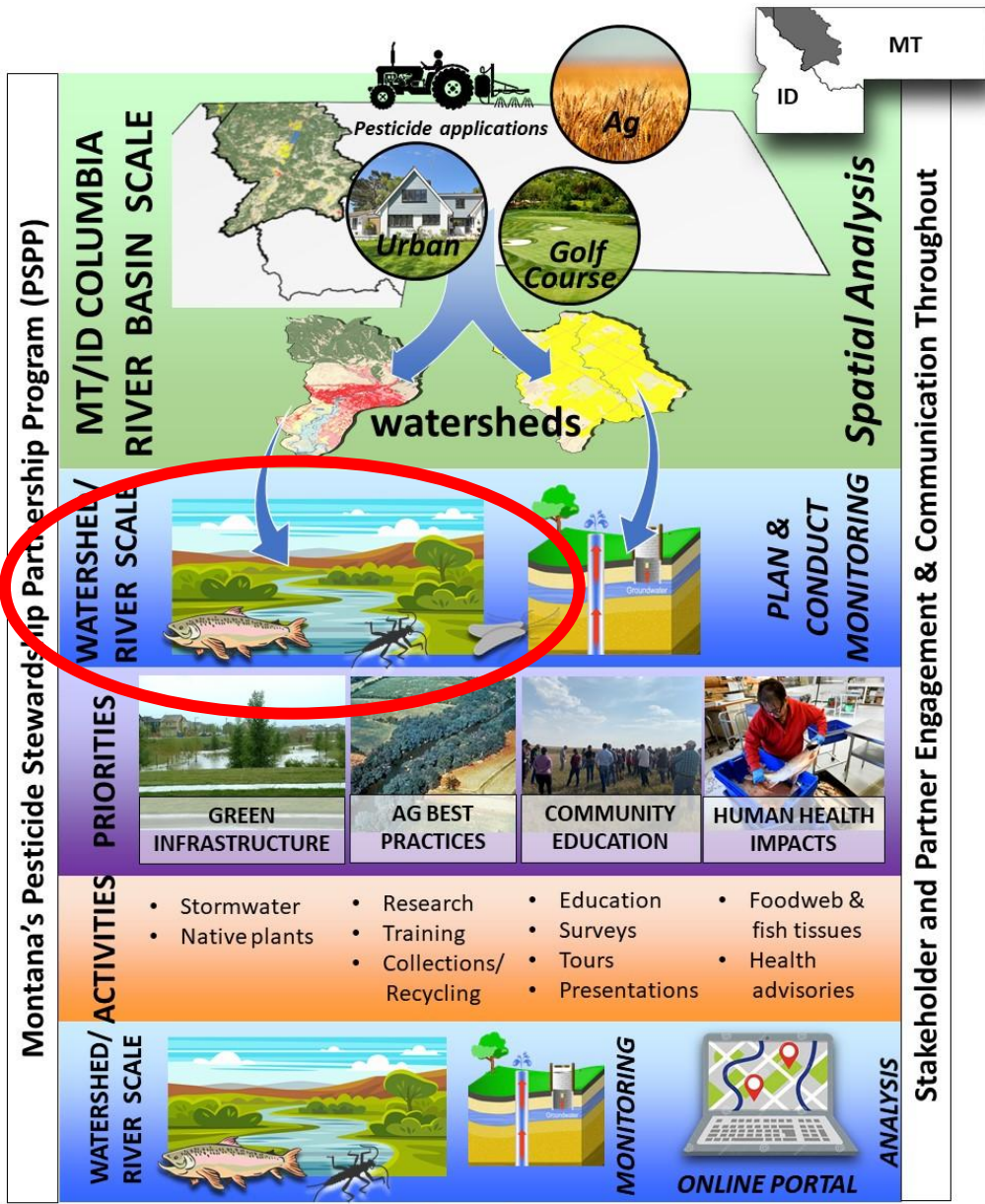
- Location: Upper Columbia of MT – 12 counties, plus Kootenai watershed
- Build and leverage partnerships and collaborations
- Build a network
- Collect baseline data on pesticide concentrations
- Implement actions
- Efforts will reduce pesticides



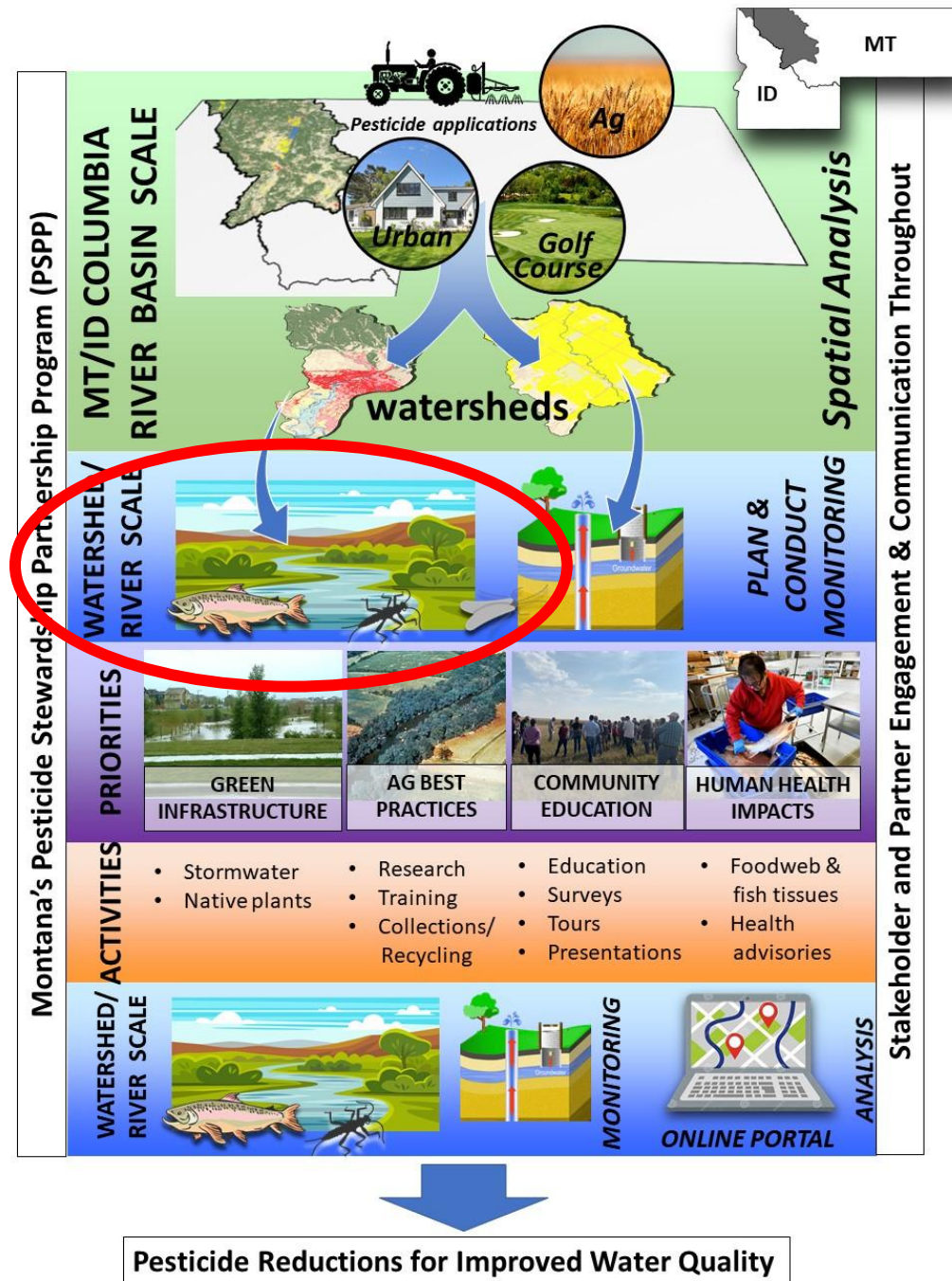
- Green Infrastructure
- Ag Best Management Practices
- Human Health Impacts
- Education and Outreach

Subawards

City of Missoula	MT DEQ
MT Department of Ag	MWCC
MSU Extension	KTOI
CSKT	



Pesticide Reductions for Improved Water Quality



67 pesticides (out of >12,000 registered in MT) have been tested on MT aquatic invertebrates. Number species in parentheses (1-4).

Name of Pesticide (# of species tested on)	Type	Class
2, 4-D Butyl Ester (2); 2,4-D Butyric Acid (1); 2,4-D Propylene Glycol Butyl Ether Ester (2)	Herbicide	Organic Phenoxy
Acephate (2) ; Azinphos-methyl (1) ; Chlorpyrifos (2); Diazinon(1); Dichlorvos(1) ; Dicrotophos; Dimethoate (1) ; Disulfoton (2); Ethion(1); Fenthion (2); Malathion (5); Methyl Parthion (2); Mevinphos (1); Naled (1); Omethoate Dimethoate Degradate (1); Parathion(4) ; Phorate (2); Phosphamidon (1) ; Temephos(2); Tribufos (1); Trichlorfon (6); Trichlorfon 80 WP formulation (1); Phorate sulfoxide (2); Crotoxyphos (2)	Insecticide	Organophosphate
Allethrin (1)	Insecticide	Pyrethroids
Aminocarb (1); Carbaryl (2); Methiocarb (2); Methomyl (3); Methomyl 24LC formulation (3); Propoxur (1)	Insecticide	Carbamate
Captafol (1)	Fungicide	Carboxamide
Cypermethrin (1)	Insecticide	Synthetic pyrethroid
DDT (Cancelled in U.S.) (5) ; Dichloro diphenyl dichlorethane (TDE) (1); Dicofol (1); Endosulfan (1); Heptachlor (Cancelled in U.S. (3); Lindane (1); Toxaphene (Cancelled in U.S.) (3); Strobane (1)	Insecticide	Organochlorine
Dichlobenil (1)	Herbicide	Benzonitrile
Diflubenzuron (1)	Insecticide	Benzoylurea
Diuron (1)	Herbicide	Arylurea
Dieldrin (Cancelled in U.S.)(2) ; Endrin (Cancelled in U.S.)(5); Methoxychlor (2)	Insecticide	Organochloride
EPN (Cancelled in U.S.) (1); Fenitrothion (4); Fenitrothion EC formulation(1)	Insecticide	Phosphorothioate
Fipronil (1)	Insecticide	Phenylpyrazole
Molinate (1)	Herbicide	Thiocarbamate
Paraquat dichloride (1)	Herbicide	Viologen
Rotenone (2)	Insecticide	Rotenoids
Simazine (1)	Herbicide	Triazine
Endothall dimethylalkylamine salt Hydrothol 191(1); Endothall dipotassium salt (1)	Herbicide	Dicarboxylic acid
Trifluralin (1)	Herbicide	Dinitroanilines
Ethylene dichloride (1)	Insecticide	Halogenated aliphatic
Fenaminosulf (canceled in the U.S.) (1)	Fungicide	Unknown
Niclosamide; Niclosamide ethanolamine salt (1)	Molluscicide	Unknown
DDAC /bentonite clay complex (1:10 ratio) (1)	Bactericide & Fungicide	Unknown
Trifluoro-4-nitro-m-cresol (TFM) (1)	Piscicide	Unknown

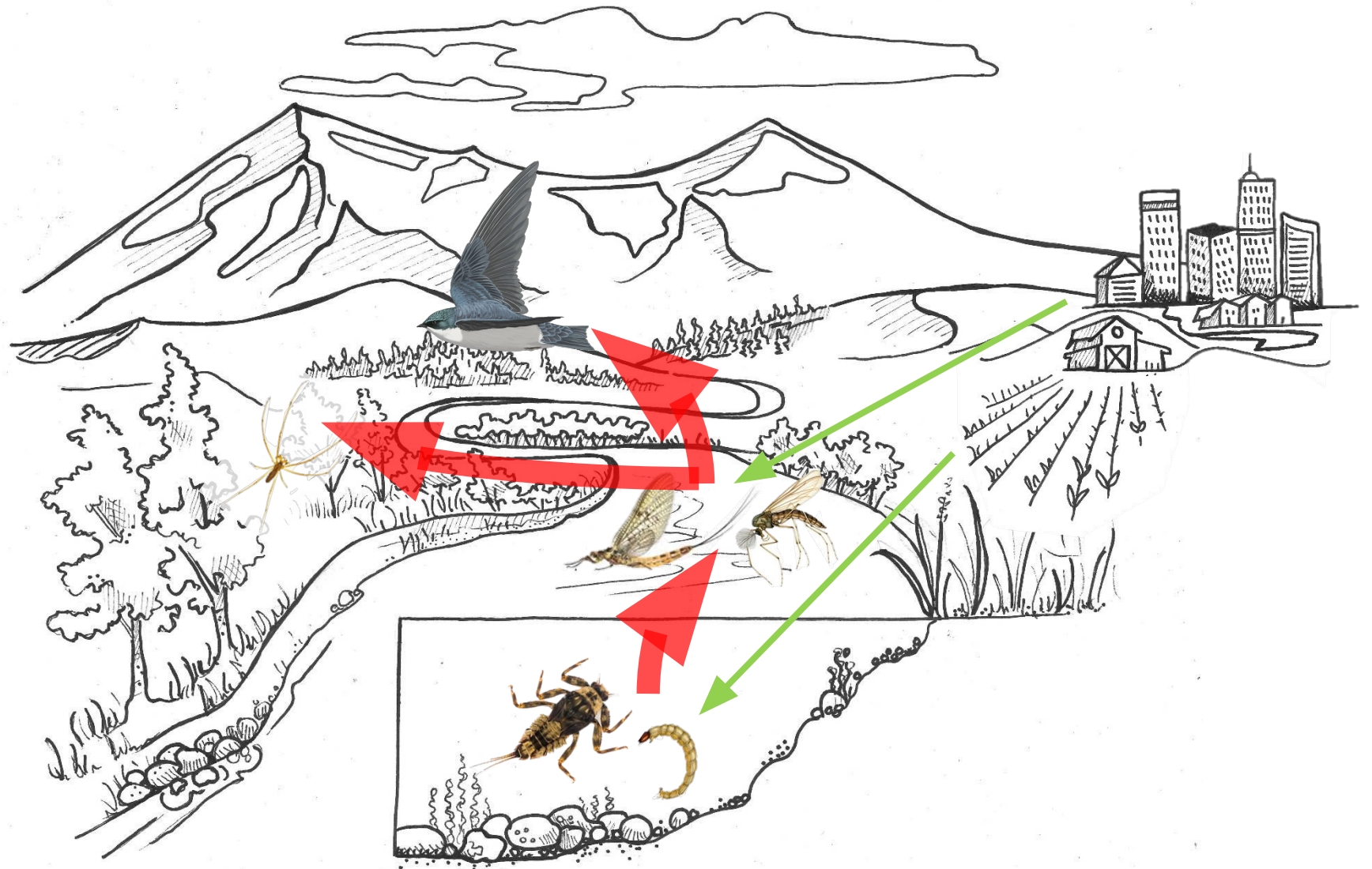
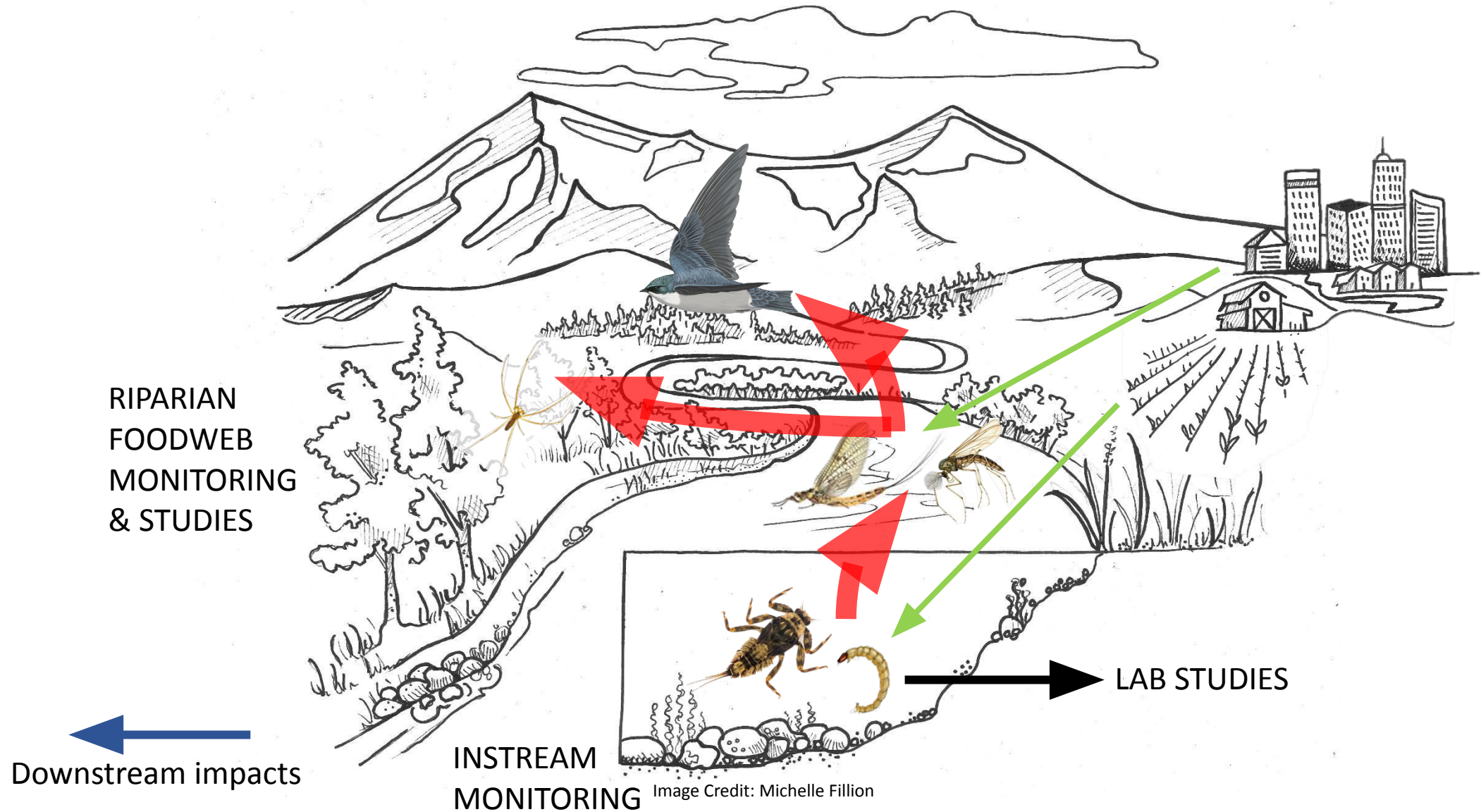


Image Credit: Michelle Fillion





Travis Schmidt, USGS



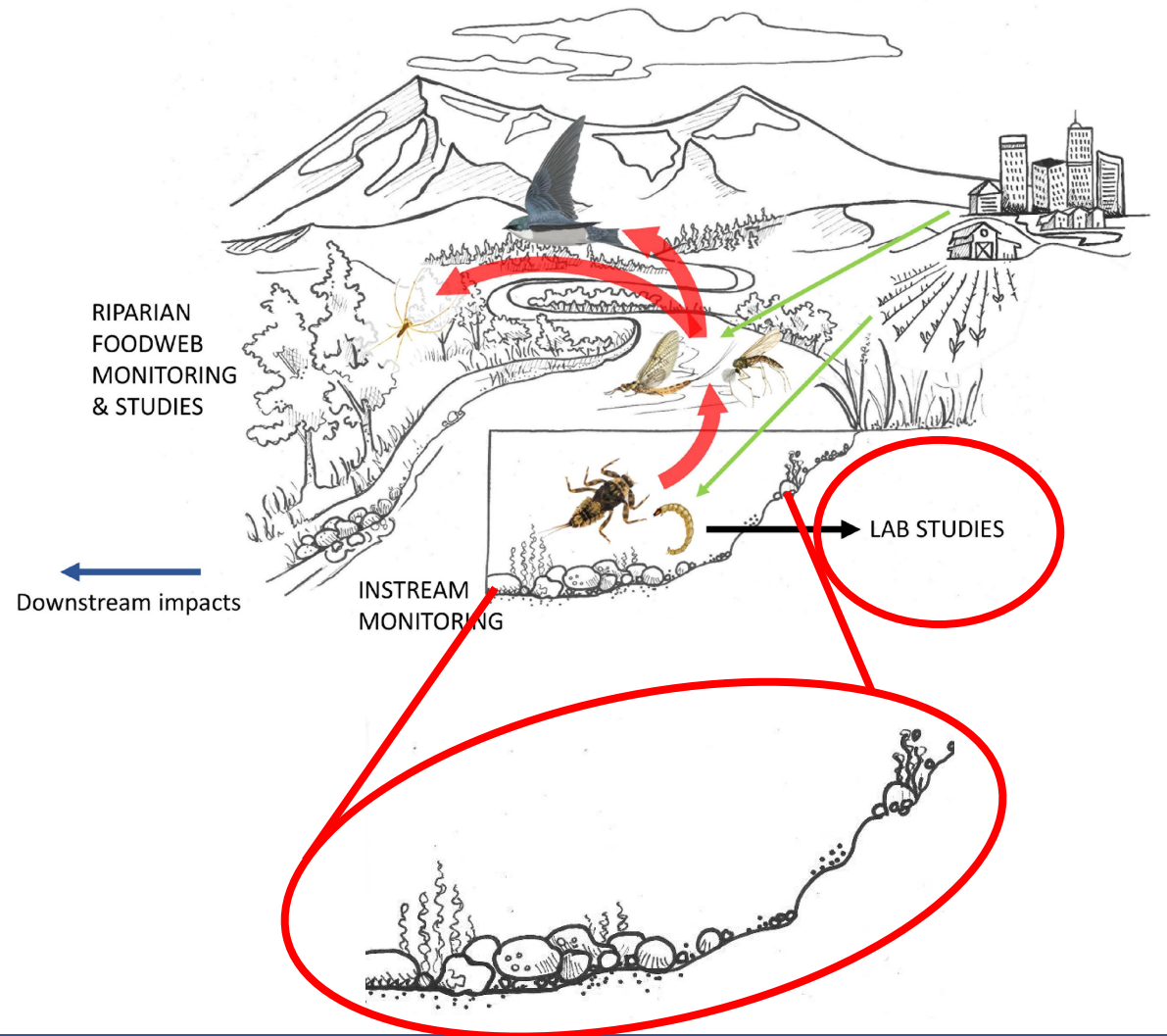
Megan Fyelling, UM



Ben Colman, UM



Brian Balmer, USFWS





Travis Schmidt



Michelle Fillion & Molly Maloney

# 10-day mesocosm experiment at USGS Helena facility



Sheep Creek



Chris Hyder – Intern



Jared Glass – BSWC Member



## Study Design:

- 10 days
- 18 “streams”
- 3 fungicides used:  
azoxystrobin,  
pyraclostrobin,  
propiconazole

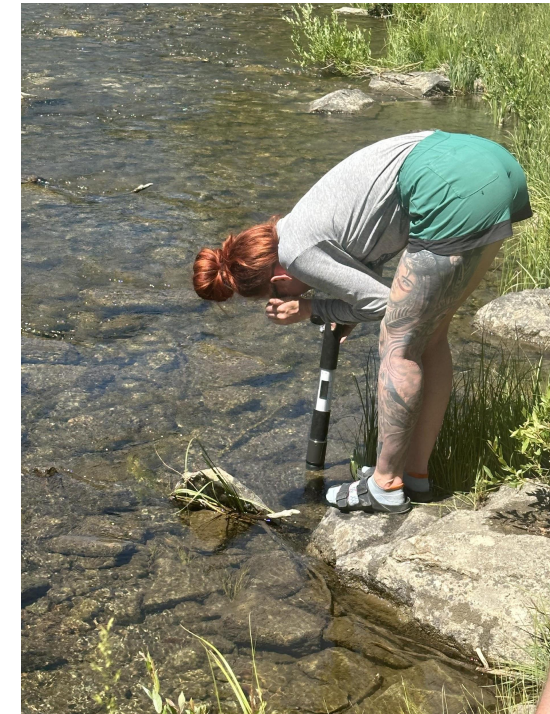


- Added periphyton slurry to buckets and began fungicide dosing
- 3 tiles scraped from each unit 4 times
- Water samples collected 3 times for nutrients
- 1 tile 'benthoTorched' 3 times
- Samples brought back to FLBS to be analyzed for chlorophyll  $\alpha$  and ash-free dry mass



# Response Variables

- Chlorophyll  $\alpha$  & ash-free dry mass
- Periphyton biomass accrual over time
- BenthosTorch tells us species composition:
  - Cyanobacteria
  - Green algae
  - Diatoms
- Water quality:
  - Silica
  - TP/TN
  - Nox/SRP
  - Ammonia
- Awaiting last results and analysis



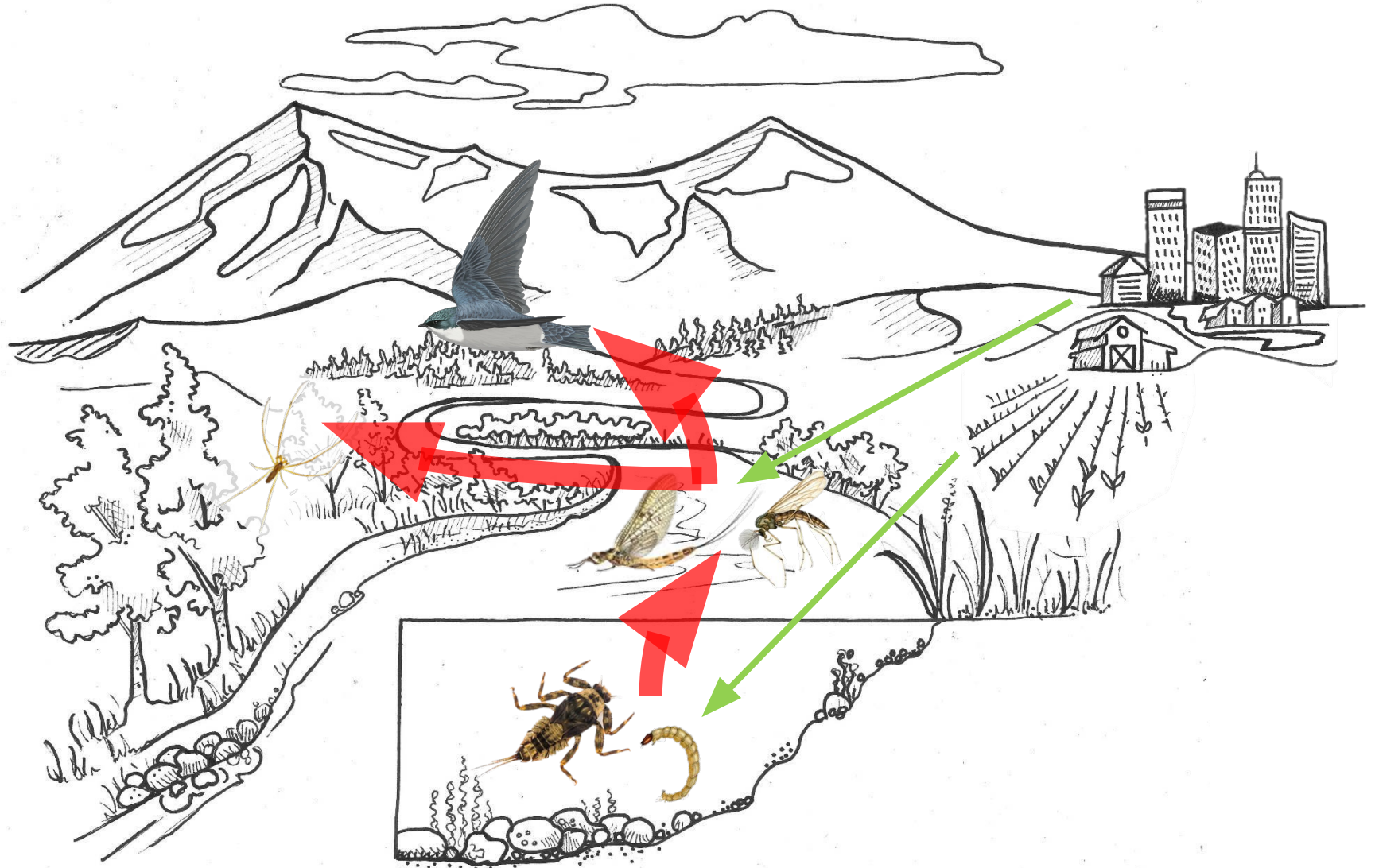
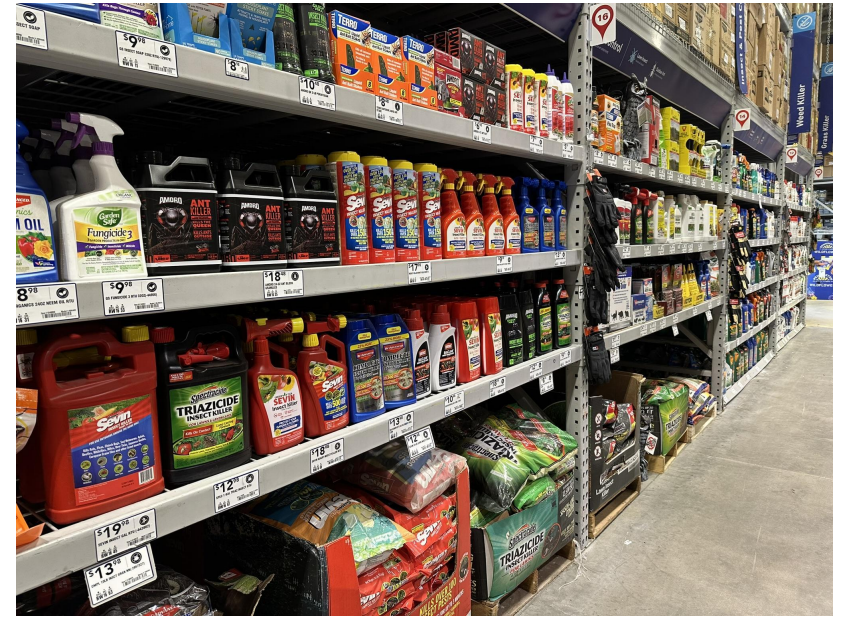


Image Credit: Michelle Fillion

# How do you fit in?



## RESEARCH ARTICLE SUMMARY

### ECOLOGICAL ECONOMICS

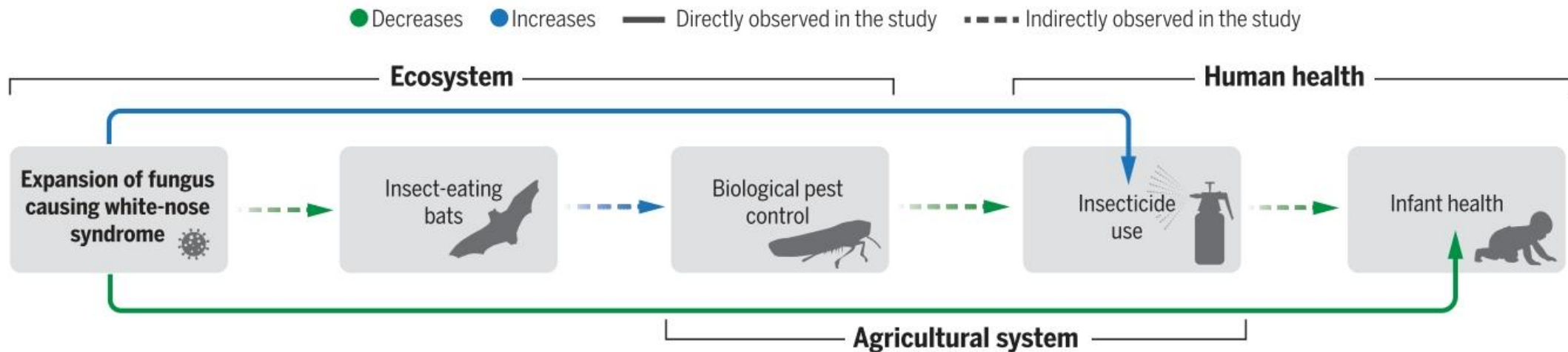
# The economic impacts of ecosystem disruptions: Costs from substituting biological pest control

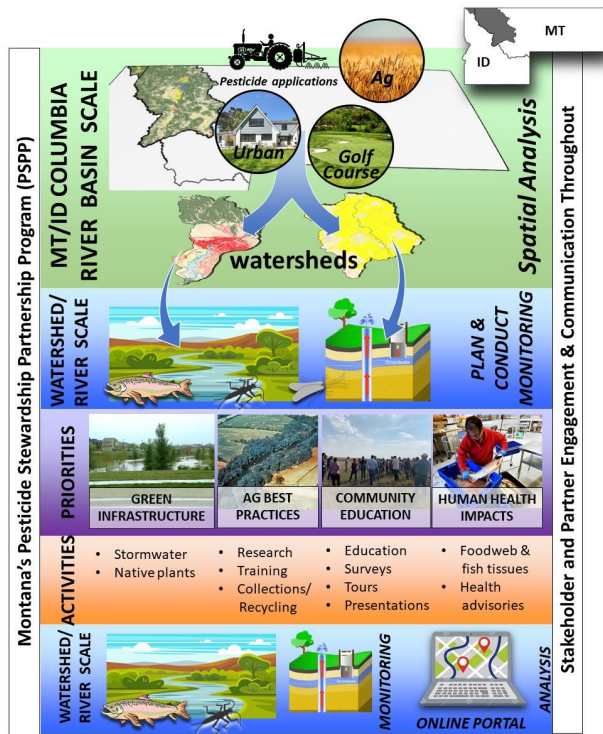
Eyal G. Frank

health impacts of pesticides when regula  
them individually.

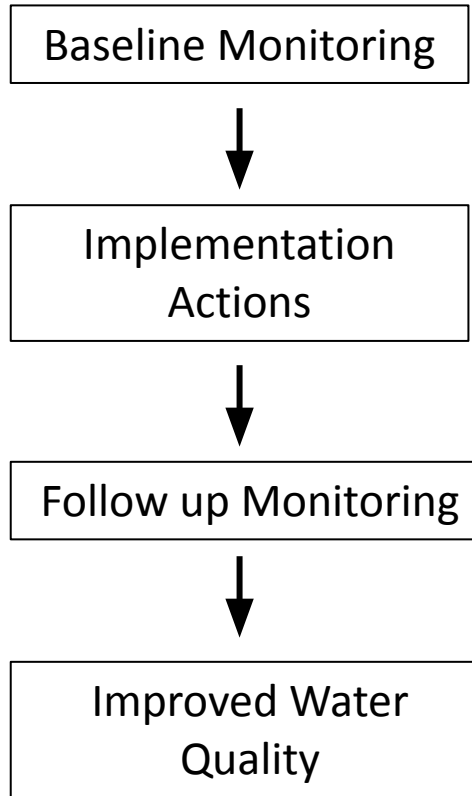
The staggered expansion of the wildlife  
ease supports the causal interpretation of  
results. Any additional alternative explana  
would need to change along the expans  
path of the wildlife disease around the se  
timing of its expansion. In additional analy  
I demonstrate that changes in crop comp  
tion, in other types of mortality, or in e  
conomic conditions fail to explain the obser

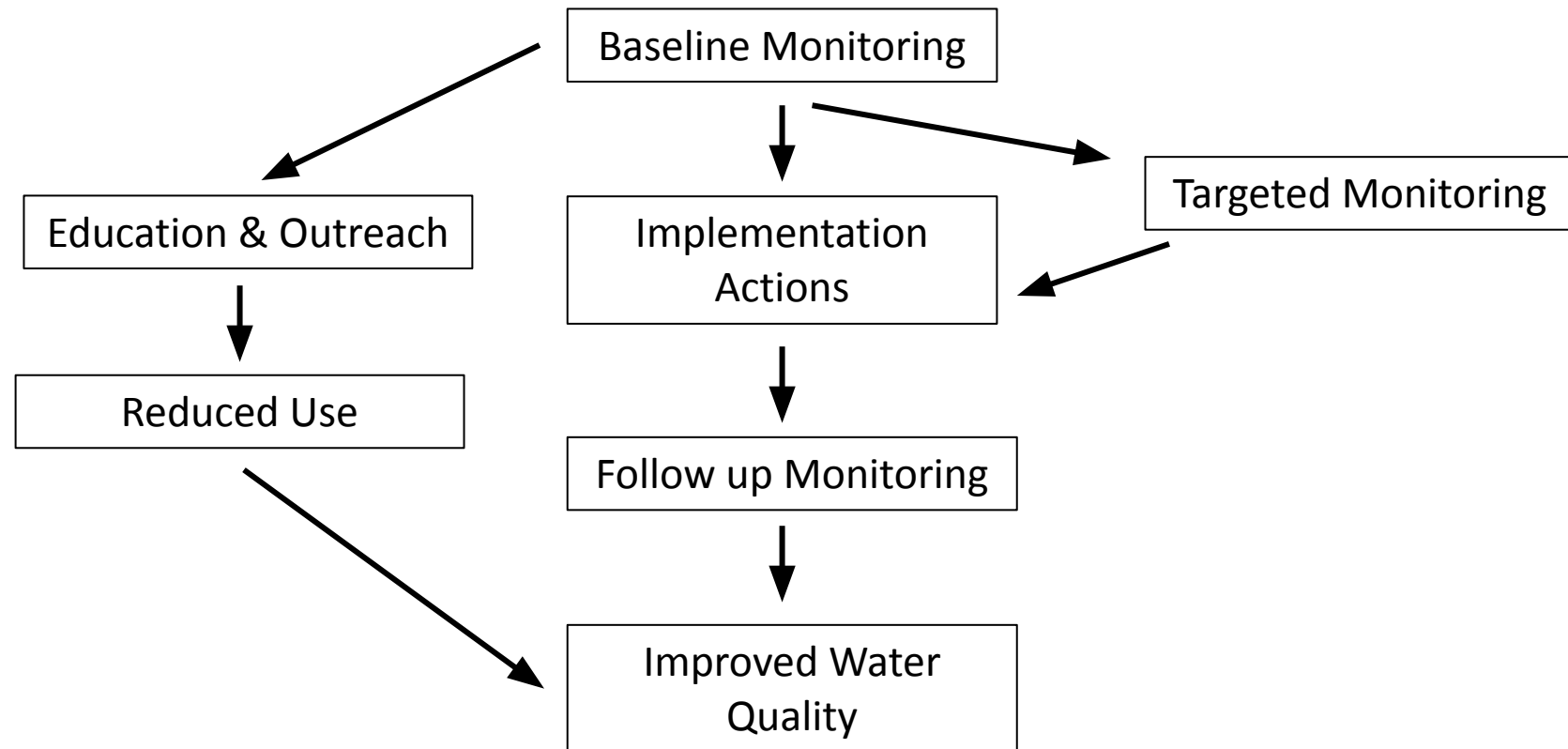
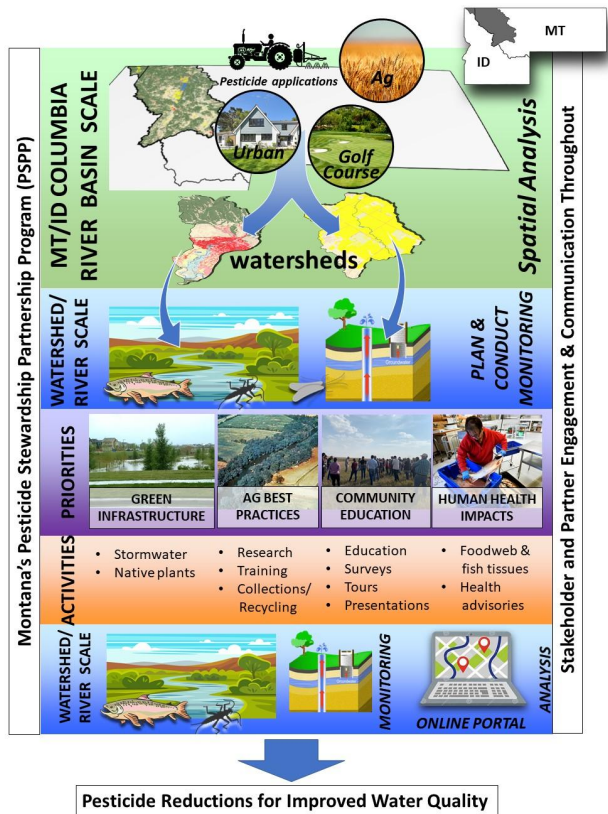
**S** READ THE FULL ARTICLE AT  
<https://doi.org/10.1126/science.adg0344>

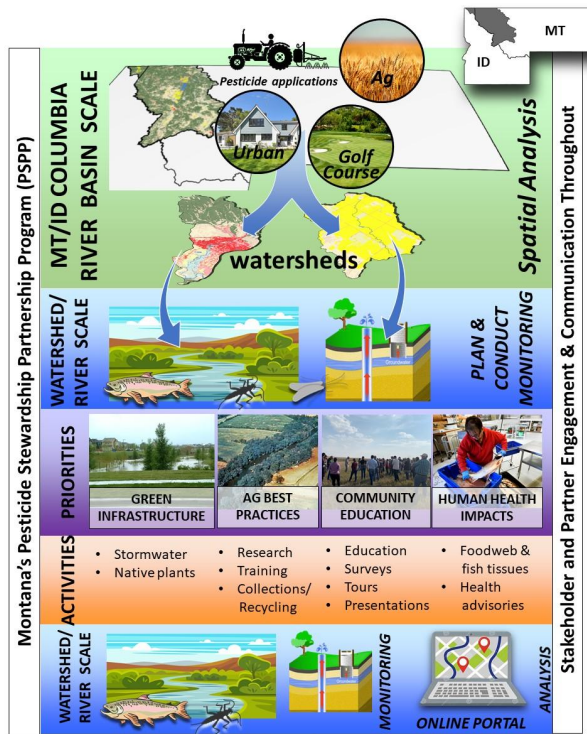




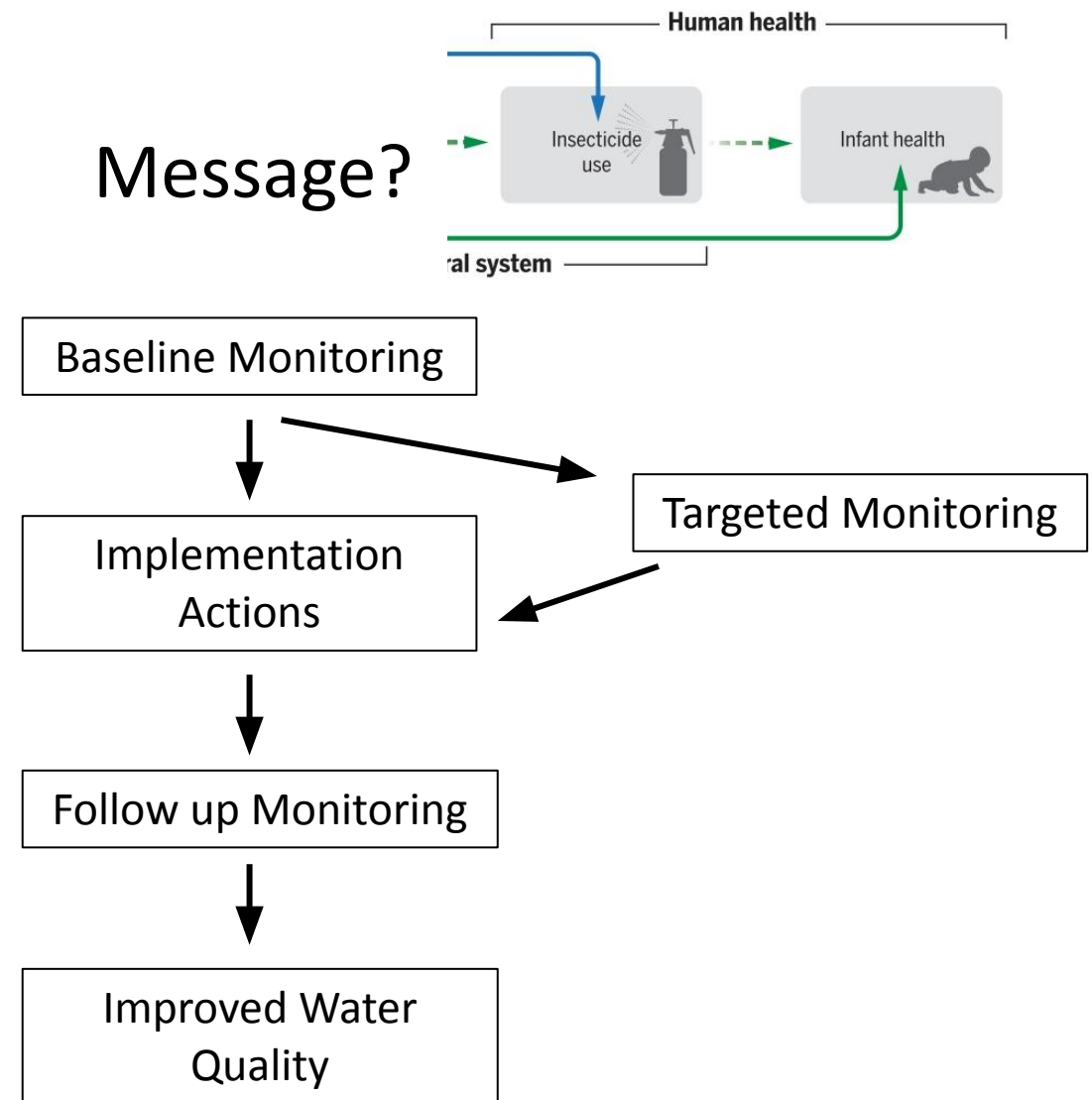
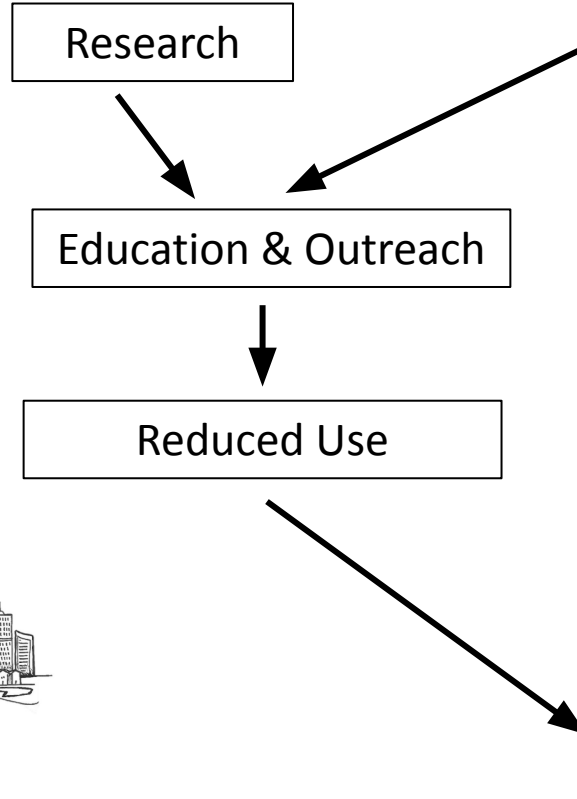
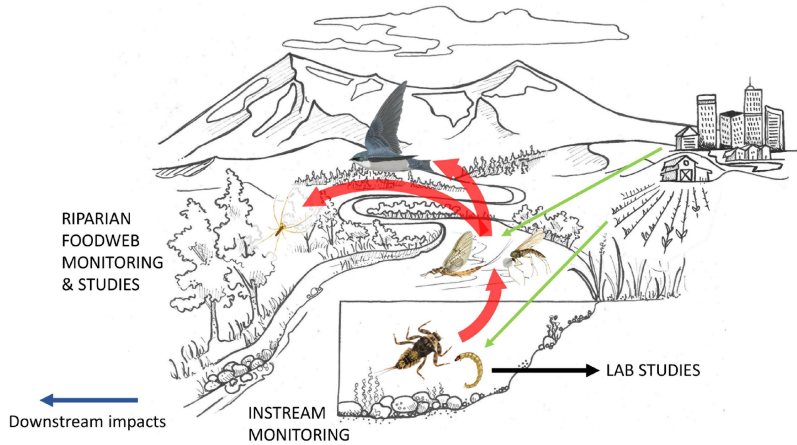
Pesticide Reductions for Improved Water Quality





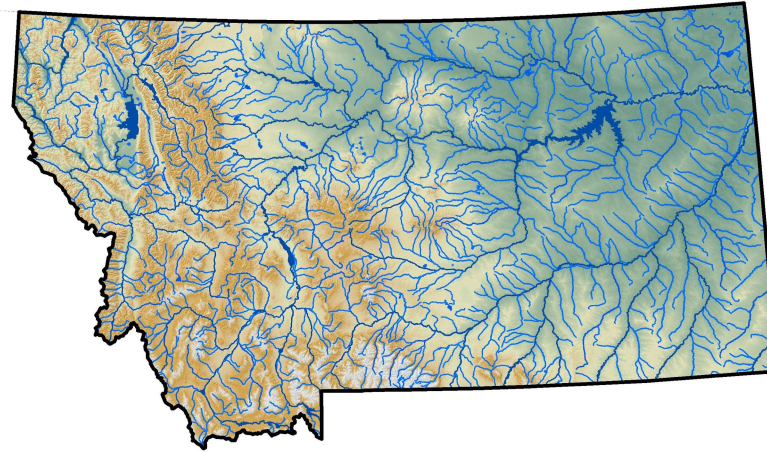


Pesticide Reductions for Improved Water Quality



# Summary

- Without water quality data we cannot protect our waters
- Through MMW we support the collection of scientifically credible data by volunteers
- With the PSPP we hope to build a network, collect data, provide education and outreach and protect our waters
- Please engage
- Join our annual meeting at FLBS Oct 28<sup>th</sup>-29<sup>th</sup>!



# Questions?

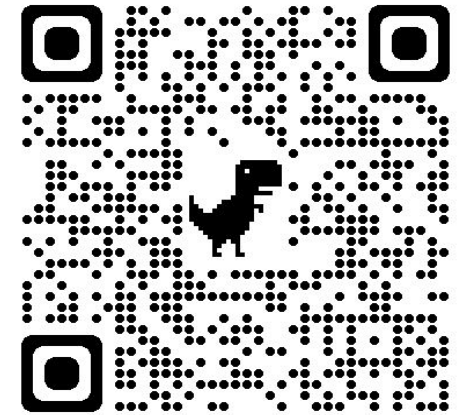
- Reach out if interested or with questions
- Malison Contact info:  
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406-872-4518  
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