

Effects of Low, Subchronic Exposure of Commercial 2,4-D formulation on early life Stages of Native Wisconsin Game Fish Species

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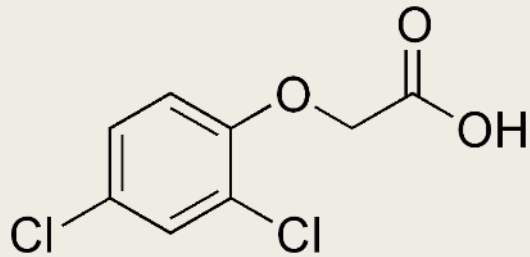




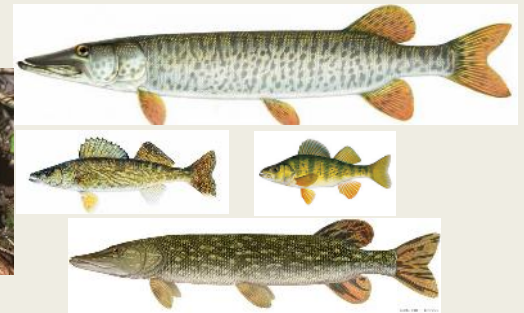
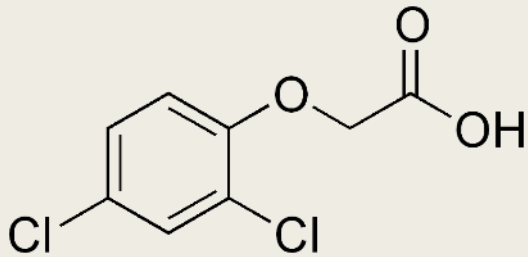
Invasive plants disturb lake recreation and ecosystems



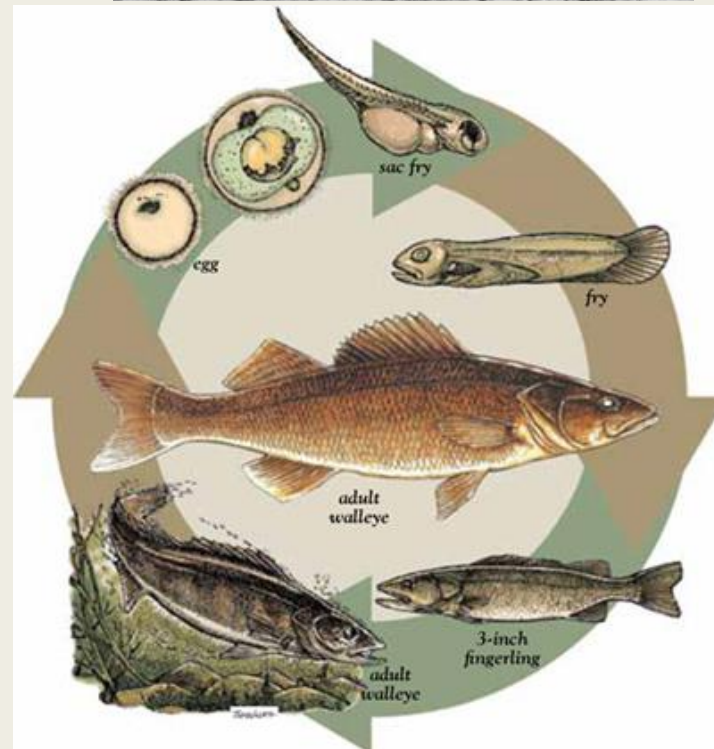
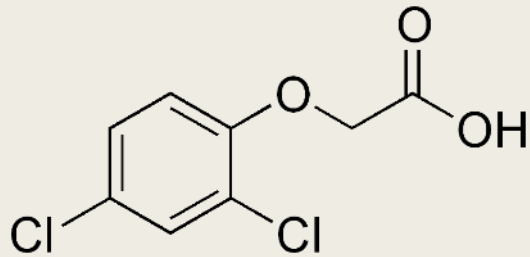
2,4-D containing herbicides: a solution to invasive weed growth



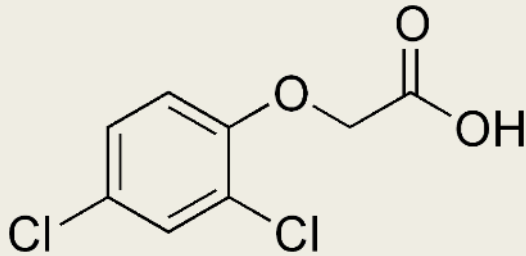
Are 2,4-D containing herbicides a risk to non-target organisms?



Spring 2,4-D application poses risk to young fish

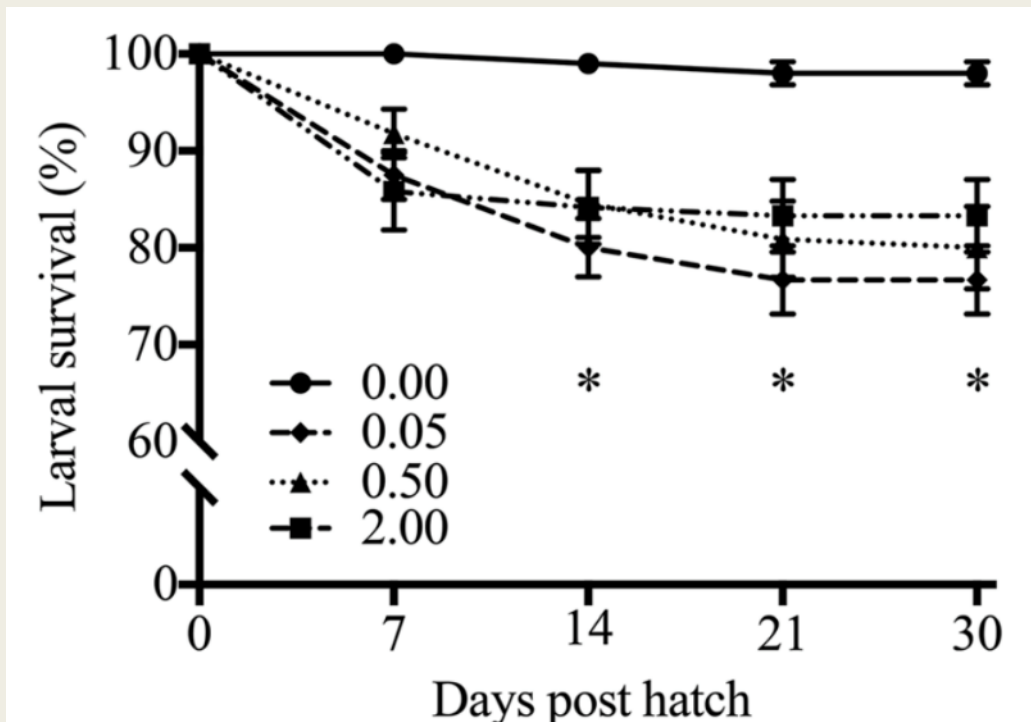


EPA guidelines on 2,4-D application



- Spot treatment up to 4 ppm
- Whole lake treatment up to 2 ppm
- Follow up treatment 21 days after application

2,4-D exposure reduces survival of larval fathead minnows



* Indicates a significant decrease in larval survival at $p < 0.05$

1. Does 2,4-D commercial herbicide formulation DMA4 have similar impacts on other game species?

2. Is the larval stage the only sensitive stage for game species?

1. Do 2,4-D commercial herbicide formulations have similar impacts on other game species?

2. Is there a critical window of exposure or are the observed survival impacts due to chronic exposure over multiple life stages

Game Species

- Muskellunge (*Esox masquinongy*)
- Northern Pike (*Esox lucius*)
- Yellow Perch (*Perca flavescens*)
- Largemouth Bass (*Micropterus salmoide*)
- White Crappie (*Pomoxis annularis*)
- White Sucker (*Catostomus commersonii*)
- Walleye (*Sander vitreus*)
- Lake Sturgeon (*Acipenser fulvescens*)



Embryo
Exposure

Larvae
Exposure

Juvenile
Exposure

Age
(days)

Embryonic stage

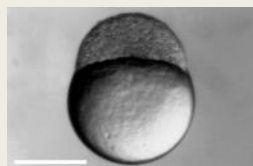
Larval stage

Juvenile stage

Fertilization Hatch

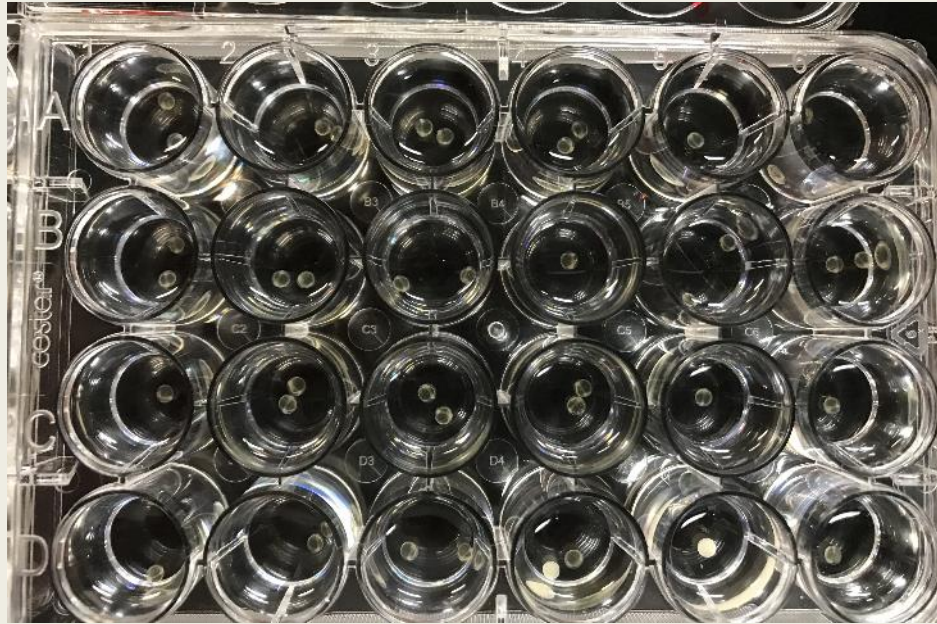
30 Days
Post Hatch

150 Days
Post Hatch



Target Concentration
0.00 (control), 0.05, 0.50, 2.00 ppm





2,4-D exposure

Age
(days)

Embryonic stage

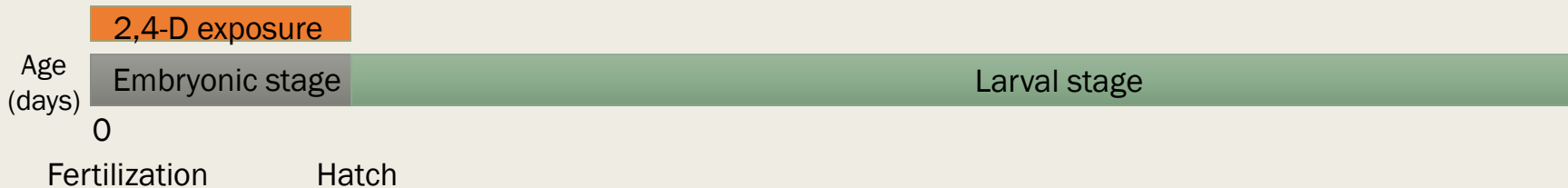
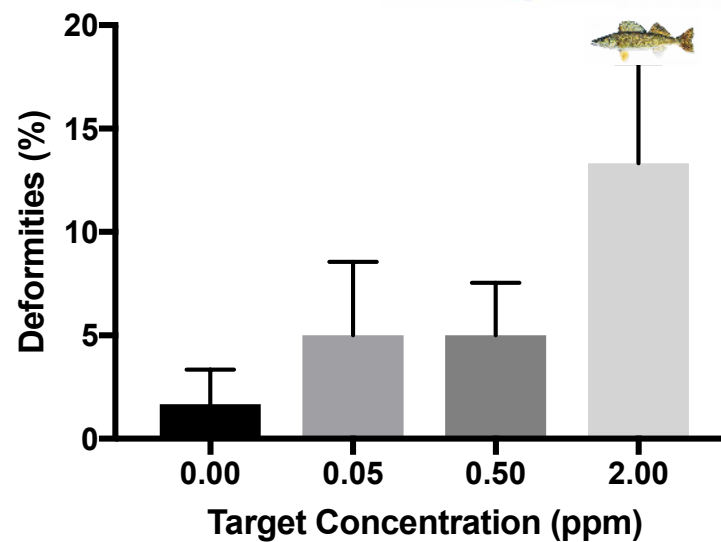
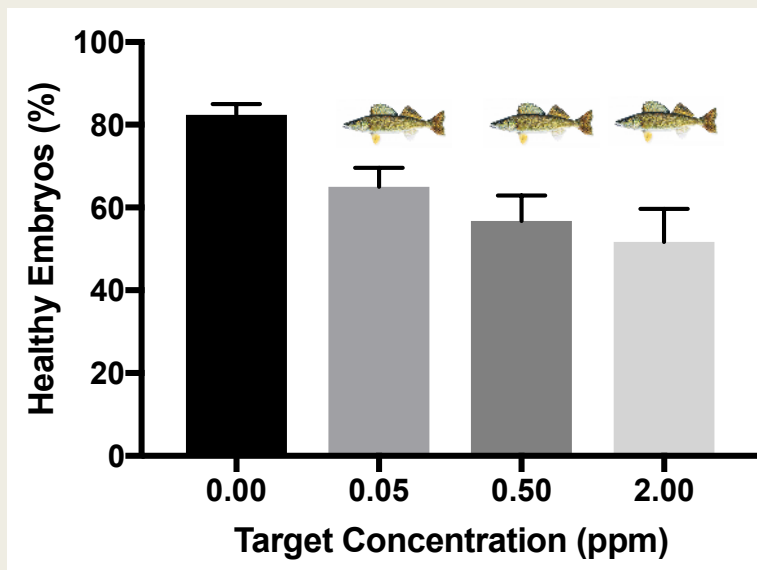
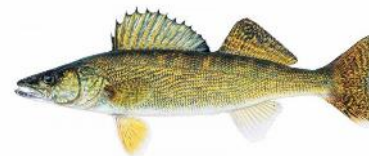
Larval stage

0

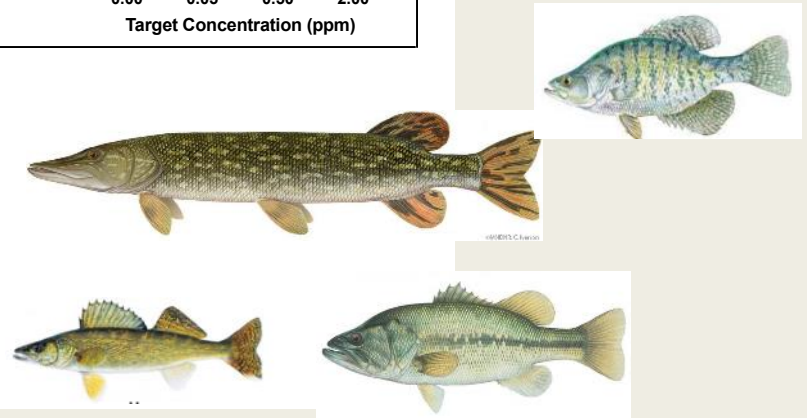
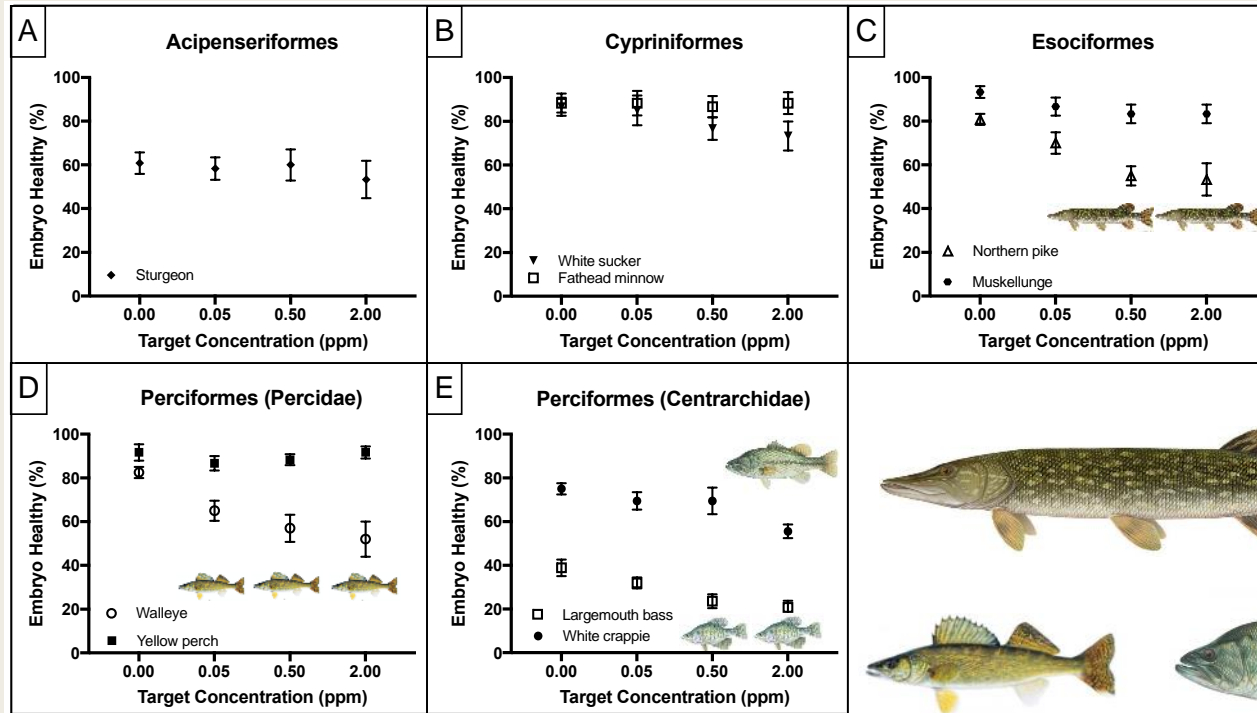
Fertilization

Hatch

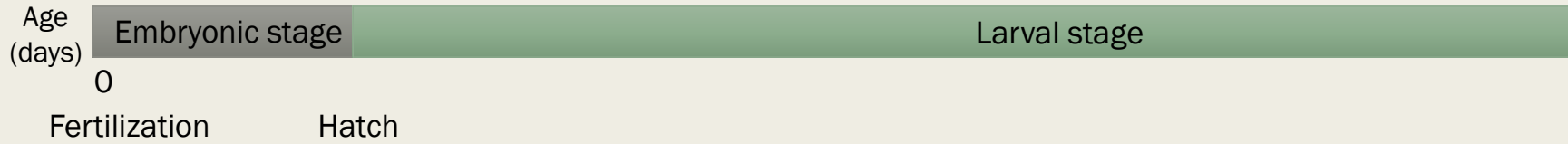
DMA4 Decreases Walleye Embryo Survival



DMA4 Decreases Embryo Survival

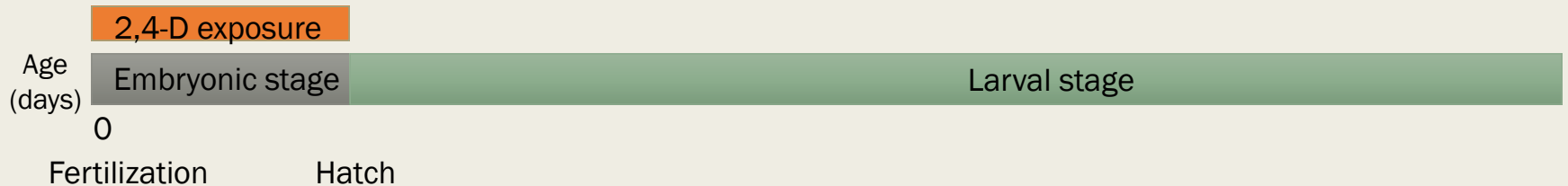


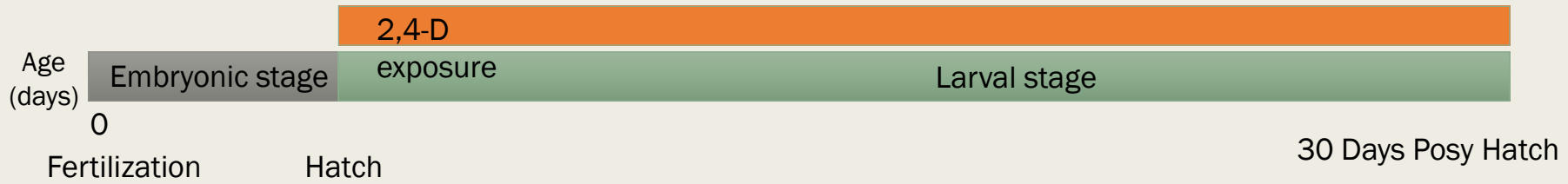
2,4-D exposure



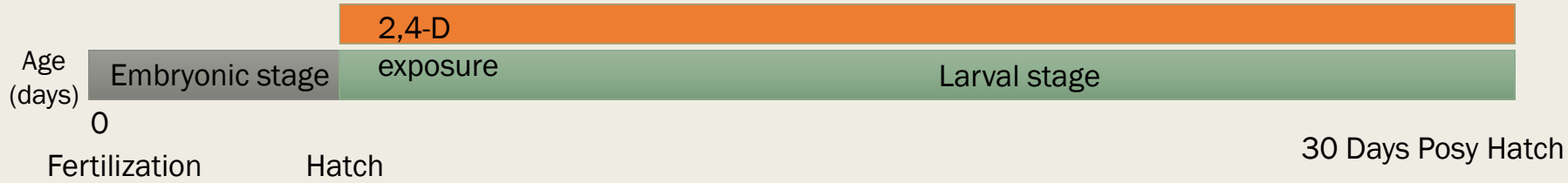
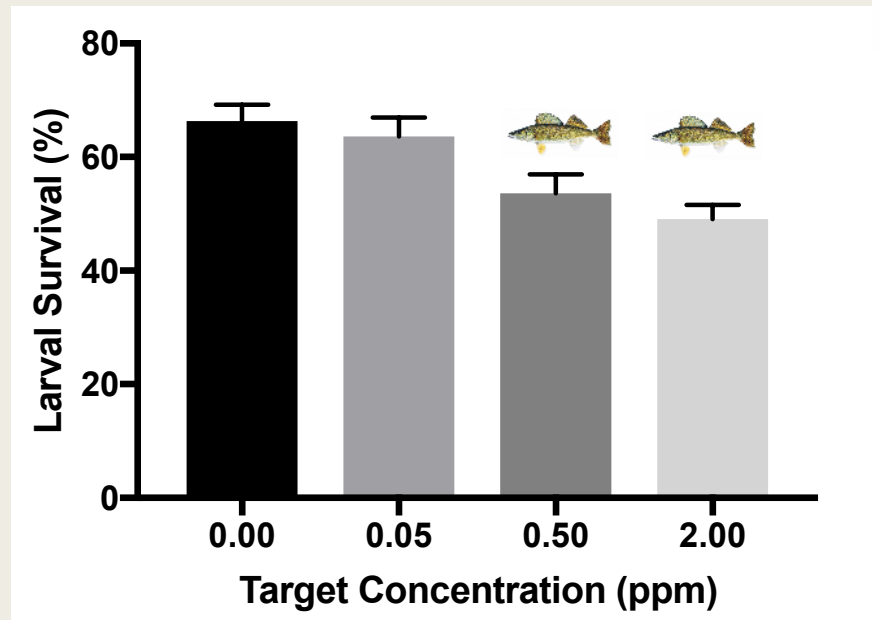
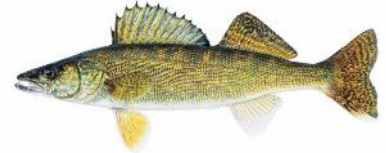
DMA4 Decreases Embryo Survival

Four native game species were impacted at the embryo life stage

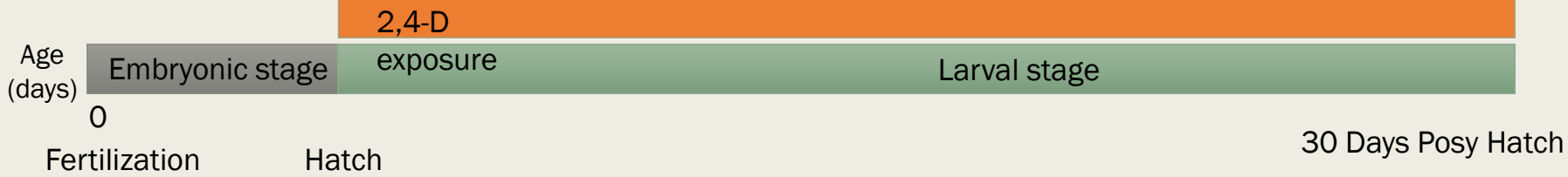
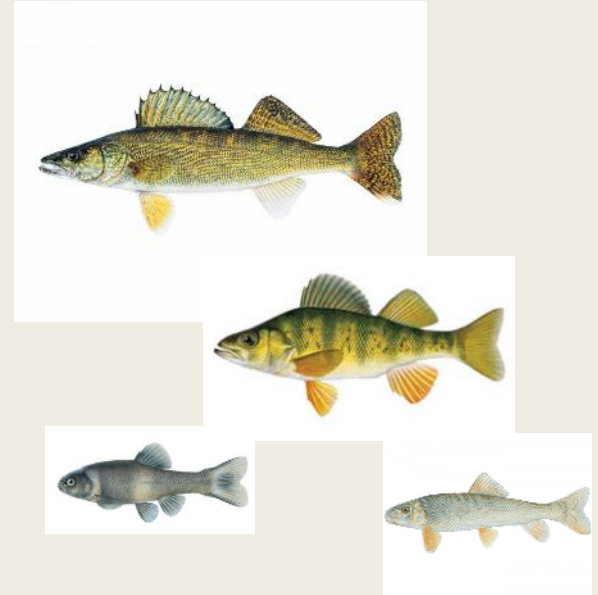
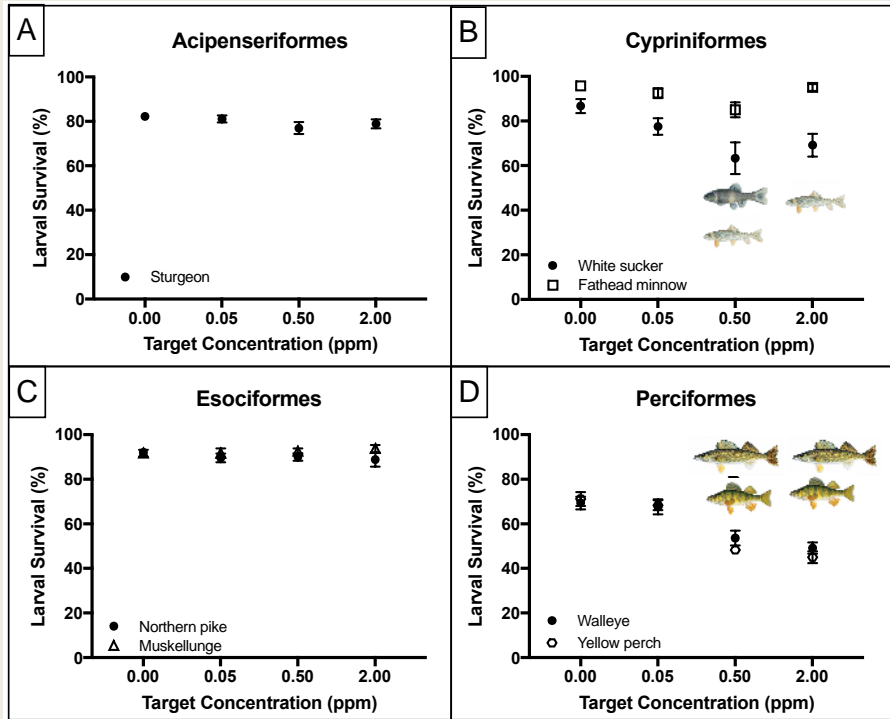




DMA4 Decreases Walleye Larval Survival

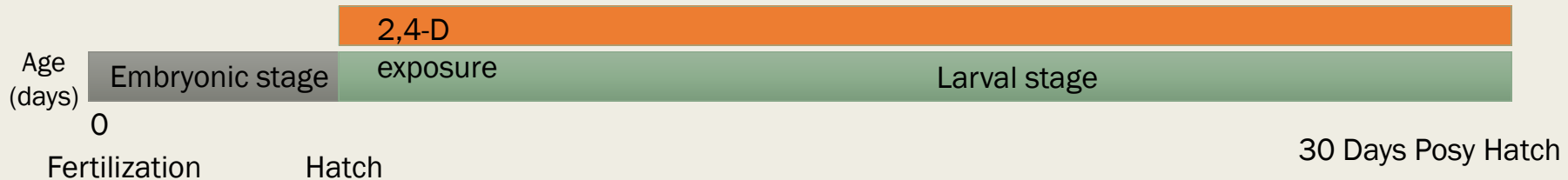


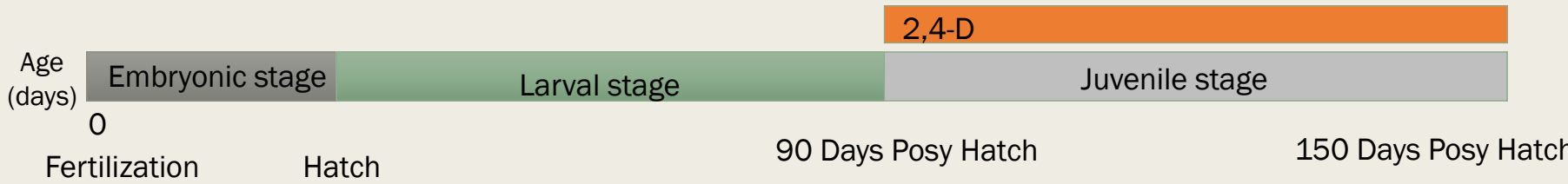
DMA4 Decreases Larval Survival



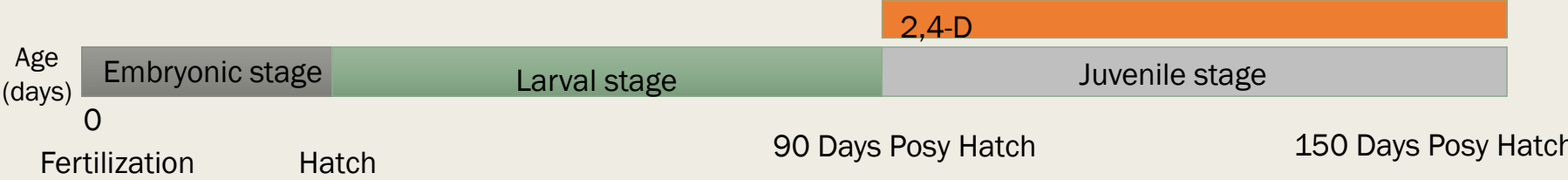
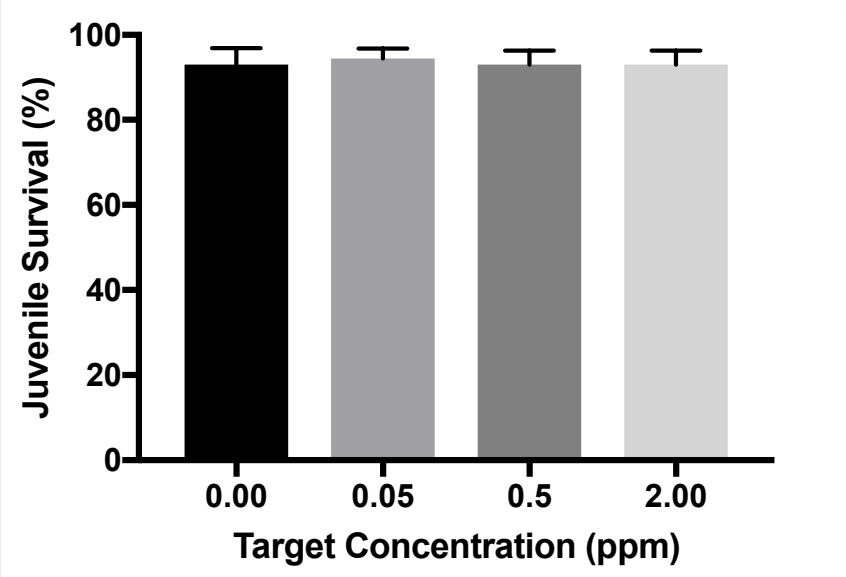
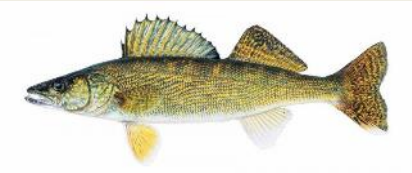
DMA4 Decreases Larval Survival

Four native game species were impacted at the larval life stage

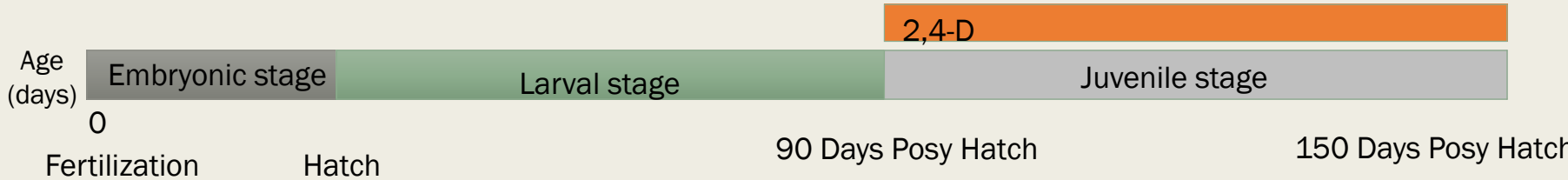
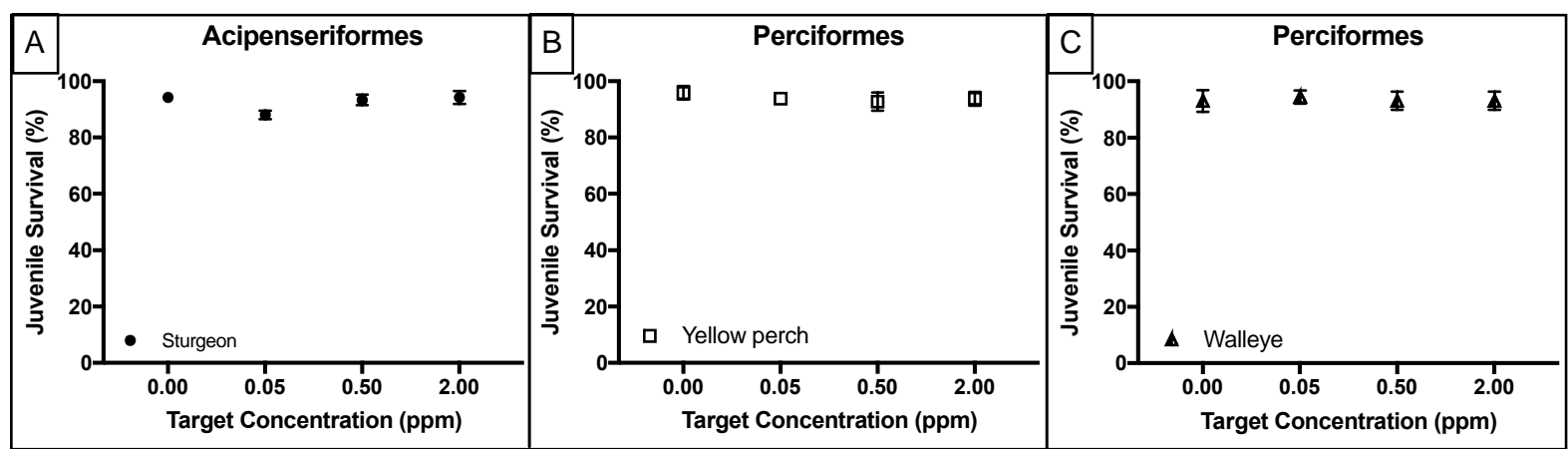




DMA4 does not impact Walleye Juvenile Survival

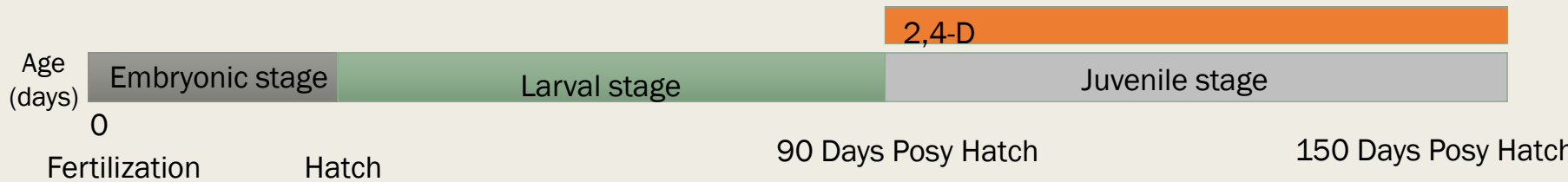


DMA4 does not impact Juvenile Survival



DMA4 does not impact Juvenile Survival

Zero native game species were impacted at the juvenile life stage

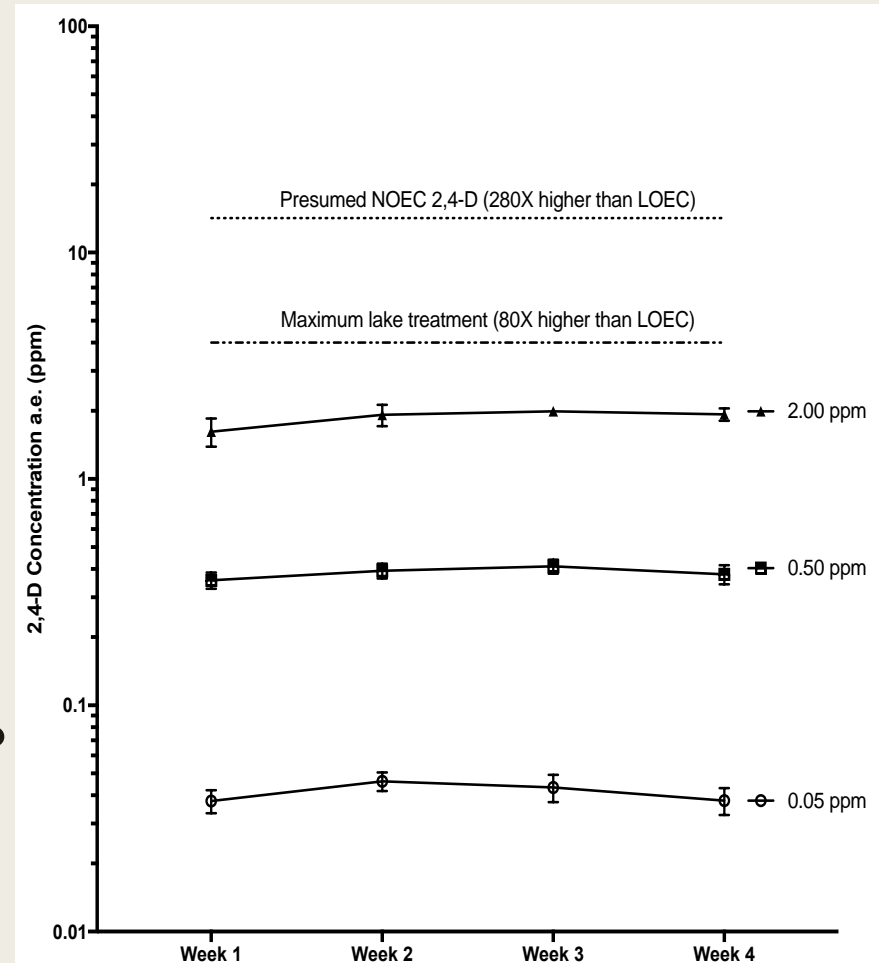


Summary

- 7/9 species tested had one life stage sensitive to environmentally relevant concentrations
- 1 species tested had two life stage sensitive to environmentally relevant concentrations sensitive
- Both embryo and larval stage is sensitive to environmentally relevant concentrations

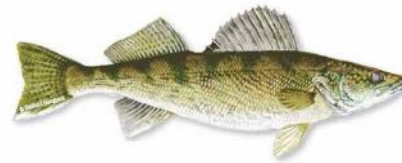
Conclusions

- Environmental relevant concentrations
- Avoid application during spawning season
- What species are in the lake?



Future Directi

- Water Parameters
- Non-lethal impacts
 - *Essential Behaviors*



Acknowledgements

Dr. William Karasov Embryo/fish collection:
Dr. Terence Barry Wild Rose Fish Hatchery
Dr. Emily Stanely Art Oehmcke Hatchery
Dr. Marc Wolman Lake Mills Hatchery
Dr. Daniel Preston Nevin Hatchery
Nancy Hefty
Jeff Mosher
Steve Merson
Tyler Nelson

Lab Members:
Paul Hoppe, Katie Hausmann, Cherry
Tsai, Emily Cornelius, Jake Olson

Undergraduates:
Morgan Walcheck, Analise Lingborg,
Caroline Barry, Brian Anton, Evan
Routhier, Adeela Ali, Craig Kunkel

Funding:



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