Does Mosquito Control Reduce the Aquatic Invertebrates in Spring Creek, Laramie, Wyoming?

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West Nile Virus (WNV)

- West Nile Virus effects many western towns
- Laramie controls mosquitos to reduce the threat of WNV
- Spraying for mosquitos may have unintended consequences
The Mosquito Life Cycle

Live in standing water
Permethrin Regulations and Effects on Aquatic Ecosystems

- Many studies have shown that Permethrin is toxic to aquatic animals, mainly anything with gills
- 1970s the EPA required a 100 foot open-water buffer restriction for Permethrin application sites
- In 2006, the EPA removed the buffer restriction in an effort to control the spread of West Nile Virus in the United States
Permethrin Application in Laramie

Ultra-low volume fogger
Spring Creek

- Originates from a spring north of Grand Ave. (near Murdoch’s)
- City of Laramie protects spring
- Spring Creek exists entirely within City of Laramie
Spring Creek
What’s so important about such a small stream?

- Supports year-round population of brown trout (~1000 fish per mile)
- Spawning habitat for trout from the Laramie river
- Provides habitat and food for riparian birds, mammals, and amphibians
- Several organizations are involved in habitat restoration on the Laramie River
What do we know?

Morgan measured invertebrate drift immediate before spraying, immediate after spraying and 1 day after spraying.

Measuring Invertebrate Drift
Drift = downstream transport of invertebrates
Trends in Drift Samples

The density and biomass of all aquatic invertebrates increased immediately following treatment of Permethrin.
Hess Sampling

Does mosquitoes control reduce the density and biomass of invertebrates living in Spring Creek?
Methods

- Collected Hess samples:
  - Before spraying began in June
  - After 2 months of spraying in August
- Sorted invertebrates
- Identified invertebrates under a dissecting microscope
- Measured length to calculate biomass
Density of all invertebrates was lower after permethrin spraying for 2 months.
Invertebrate Biomass

Biomass of all invertebrates was lower after permethrin spraying for 2 months.
• Density of non-insect decreased after spraying
• Density of insects increased after spraying
• Biomass of non-insects was lower after spraying
• Non-insects more abundant in Spring Creek
• Insect body size was smaller after spraying (early instars)
• Annelids and crustaceans most abundant non-insects
• Densities decreased after 2 months of spraying
Biomass of non-insects decreased after 2 months of spraying, including Annelids.
Densities of true flies and mayflies increased after 2 months of spraying.

- True flies tolerant of poor conditions.
- Tolerant mayfly in the stream.
Fewer Invertebrates in Spring Creek

- Less food for fish
- Fewer adult insects emerging for birds to eat
- Fewer insects eating algae = greener stream
- Smaller insects after spraying may indicate that few insects are surviving to develop into adults
- Non-insects most abundant = sign of an impaired stream
What Does This Mean for Spring Creek?

- Permethrin applications near Spring Creek appear to be reducing non-target aquatic animals.
- Re-evaluation of treatment practices to minimize impacts on Spring Creek animals while still effectively controlling mosquito populations may be in order.
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