



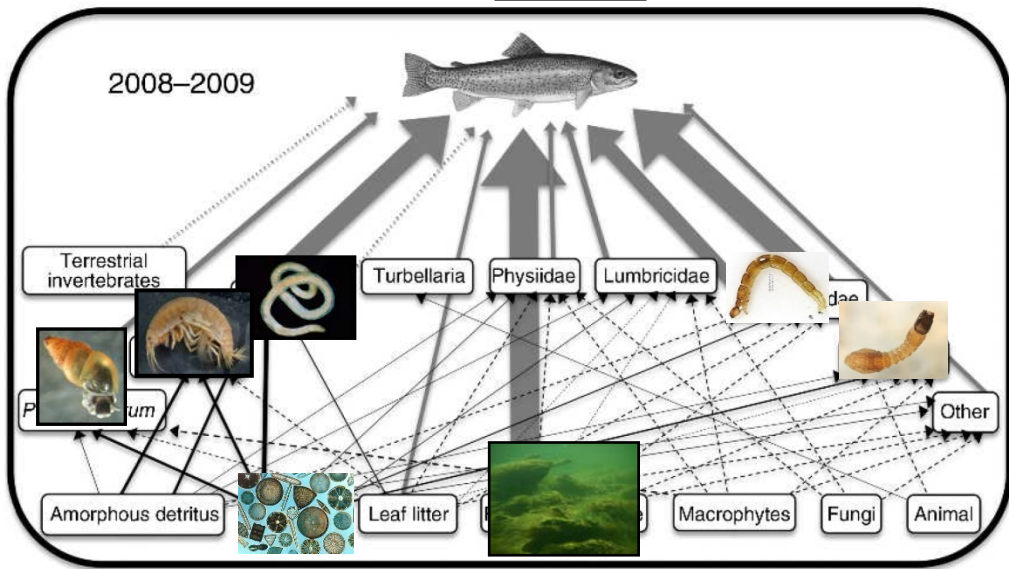
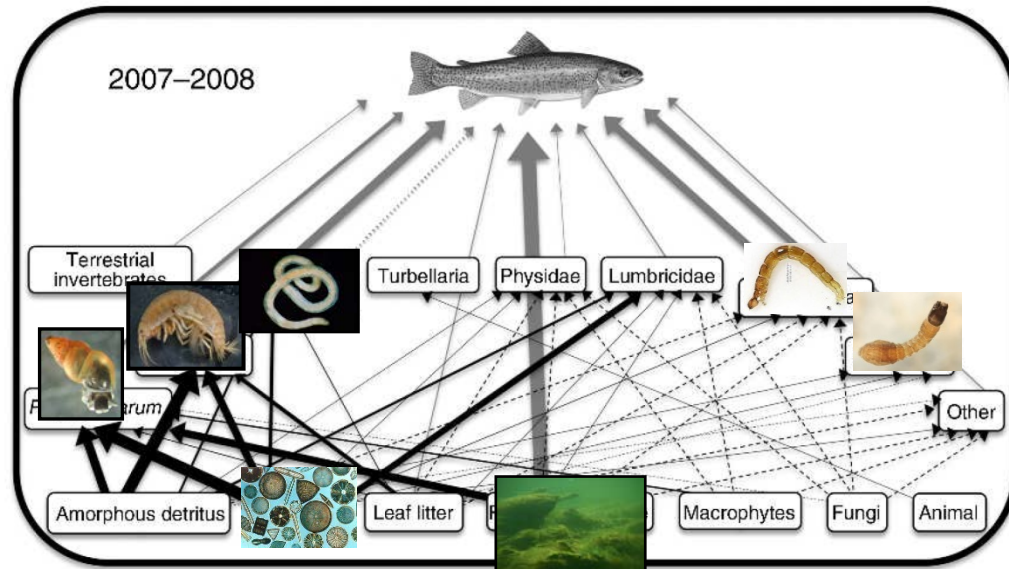
# Invertebrate drift in Glen Canyon 2007-2013

Theodore Kennedy, Mike Dodrill, Adam Copp,  
Jeff Muehlbauer

# Outline

- Colorado River food webs
- Glen Canyon invertebrate drift (2007-2009)
- Net clogging studies
- Invertebrate drift continued (2007-2013)

# 2008 Controlled Flood Restructured the Glen Canyon Food Web

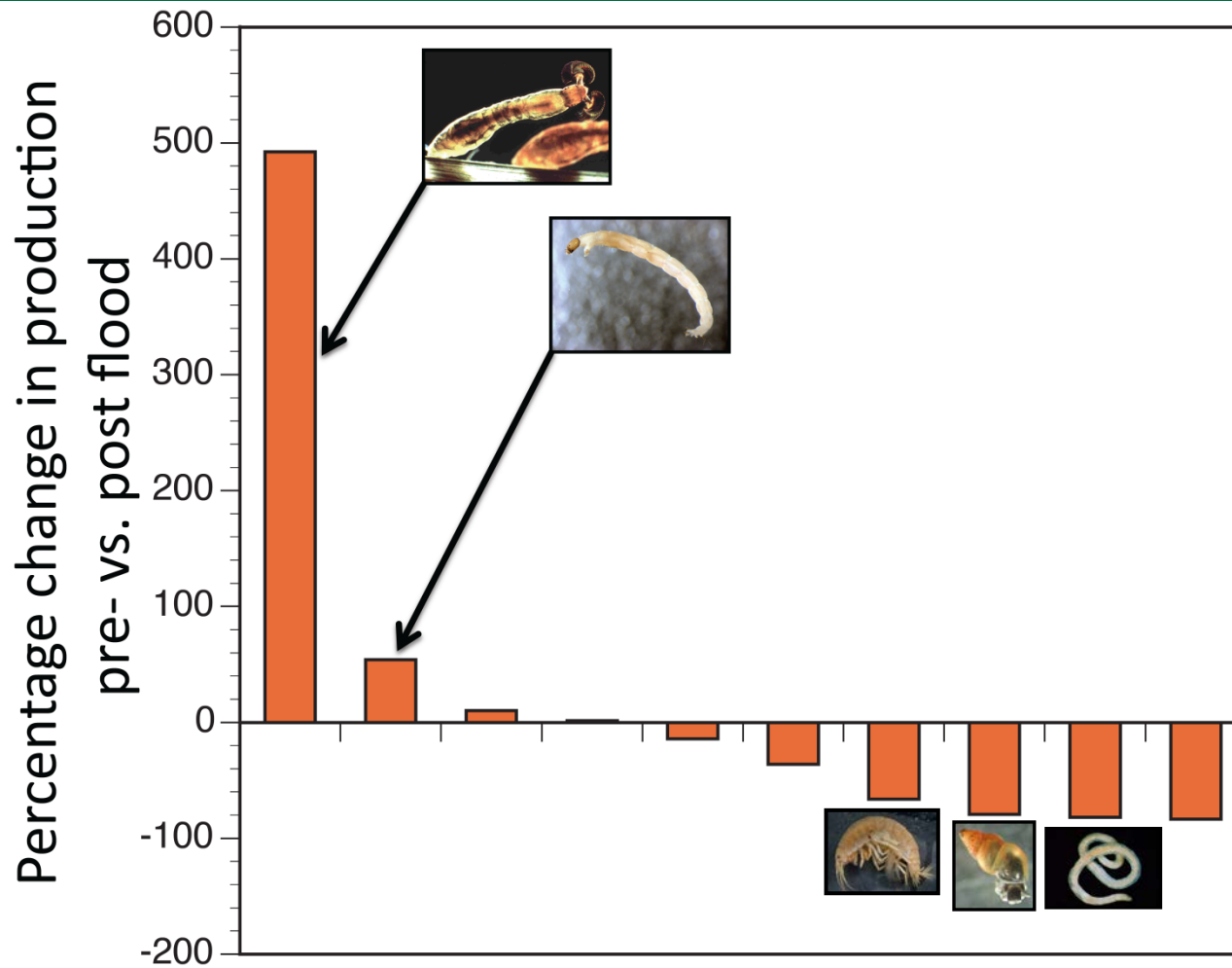


Flows to invertebrates  
(g AFDM·m<sup>-2</sup>·yr<sup>-1</sup>)



From Cross and others, 2011

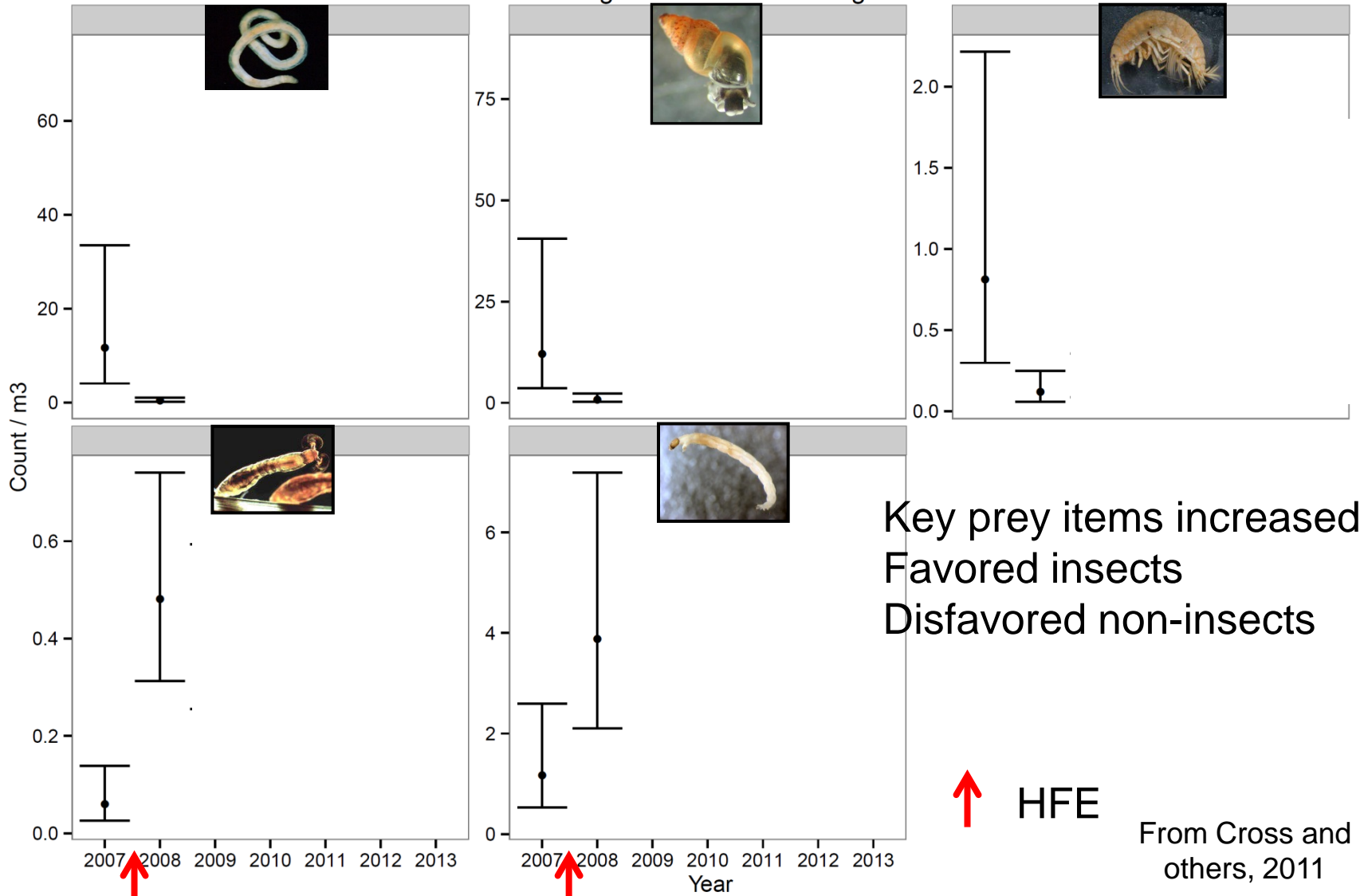
# Production of preferred prey increased



From Cross and others, 2011

# 2008 Flood Restructured Food Web

Long-term drift monitoring

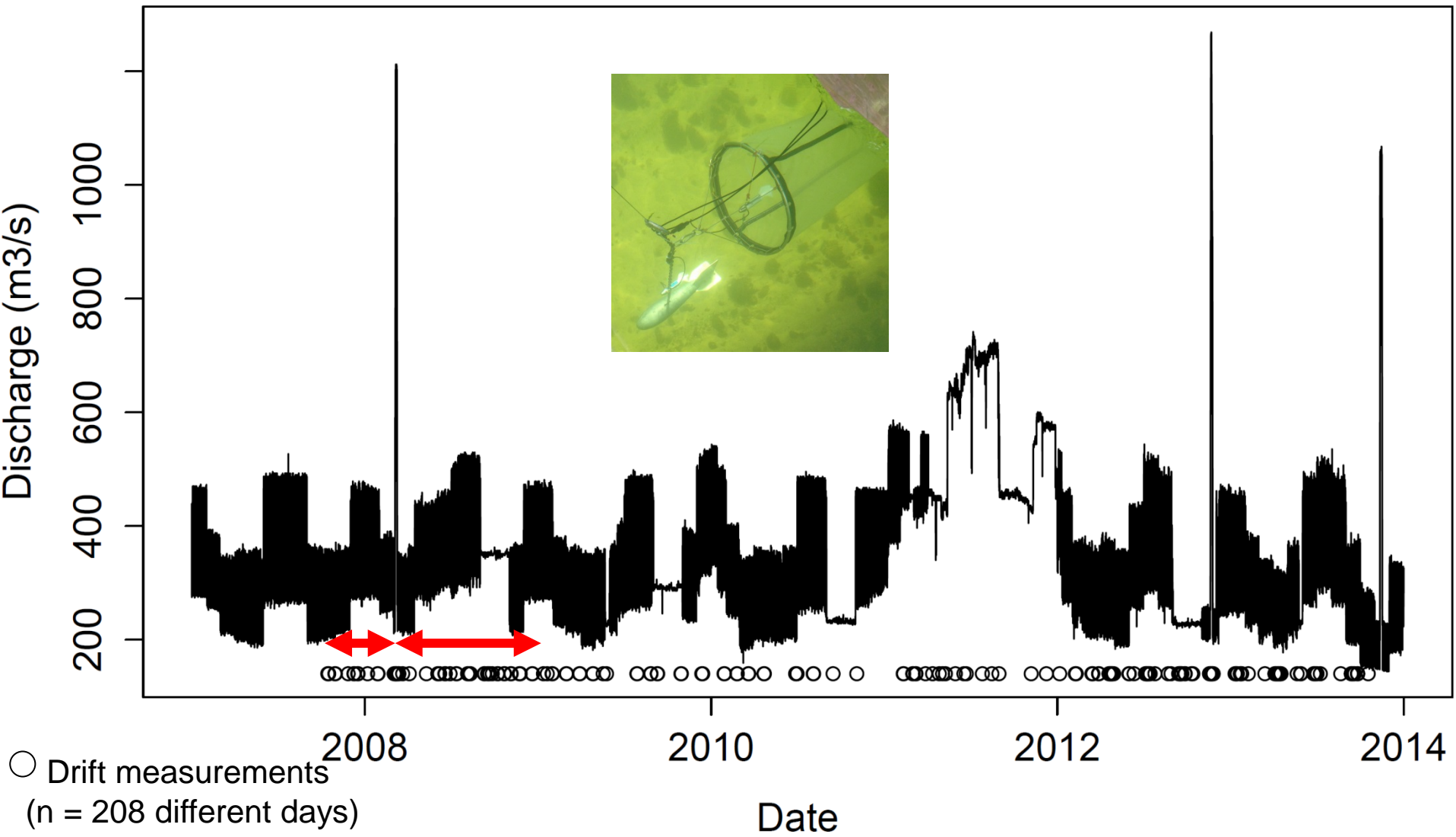


Key prey items increased  
Favored insects  
Disfavored non-insects

↑ HFE

From Cross and others, 2011

# Drift Period of Record



## The relation between invertebrate drift and two primary controls, discharge and benthic densities, in a large regulated river

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- Discharge is primary control of drift over short time scales (within day)
- Benthic density is primary control of drift over long time scales (months to years)

# Net clogging studies

- Drift sampling protocol (5 min samples) informed by sediment monitoring studies
  - DON'T CLOG YOUR NET!!!
- But some species are rare in drift samples
- Question: Can we get a better handle on rare species by collecting longer samples?

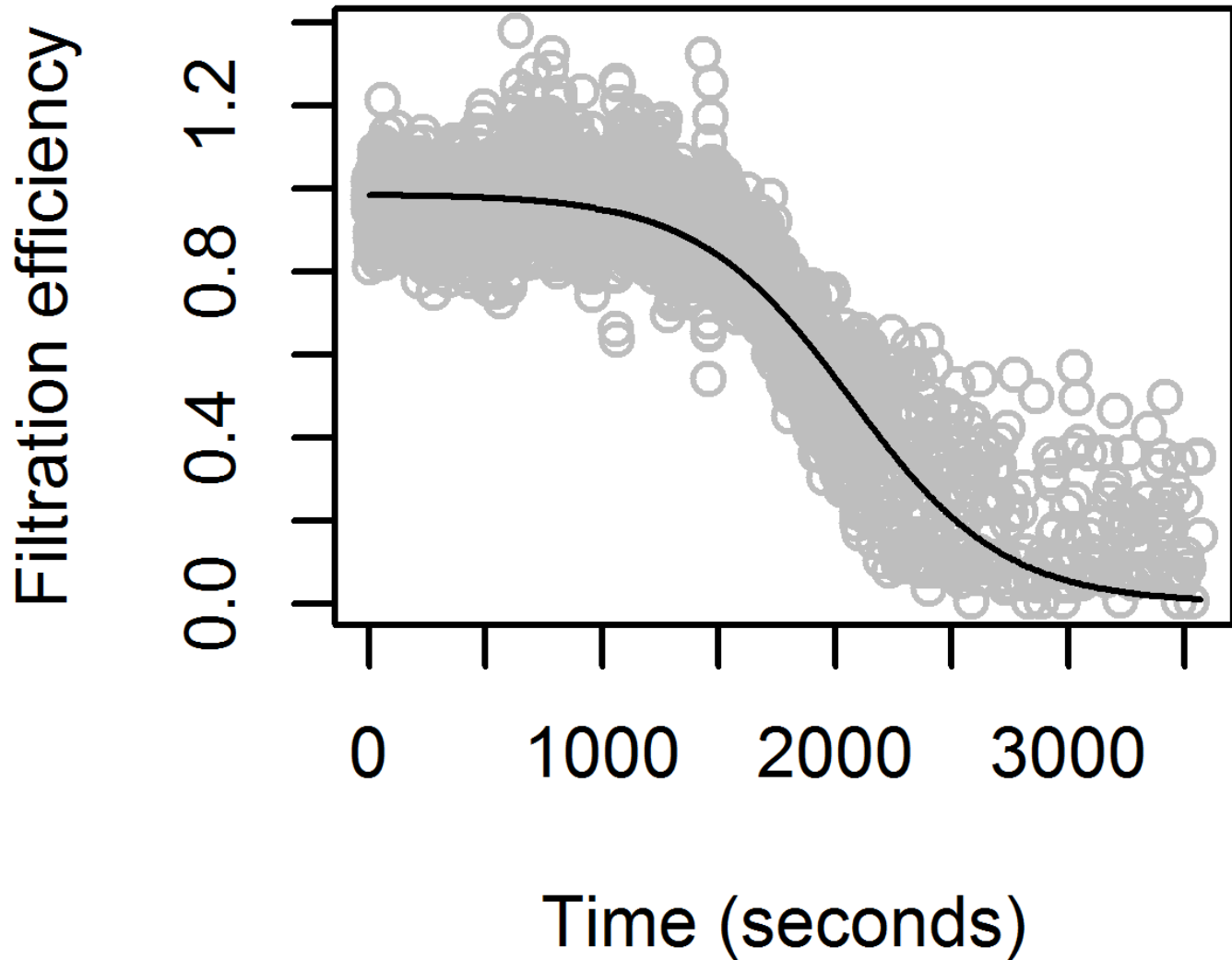


# Net clogging studies

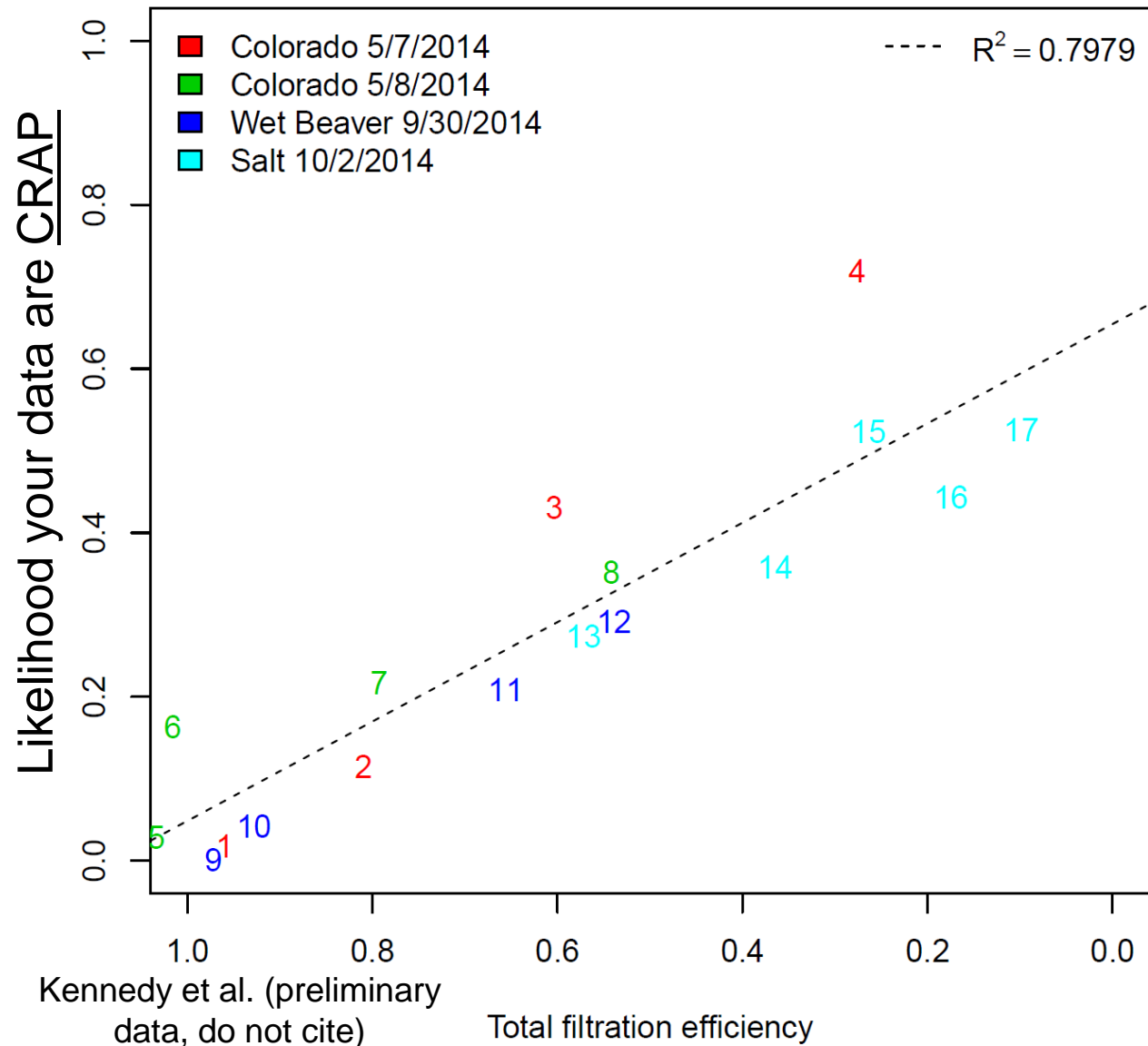
- Approach:
  - Measure Filtration Efficiency (FE)
    - $FE < 0.9$  is bad (see Sabol and Topping 2013)
  - Estimate how long until nets begin clogging ( $FE < 0.9$ )
  - Estimate error that is introduced when nets clog



# How quickly do nets clog?

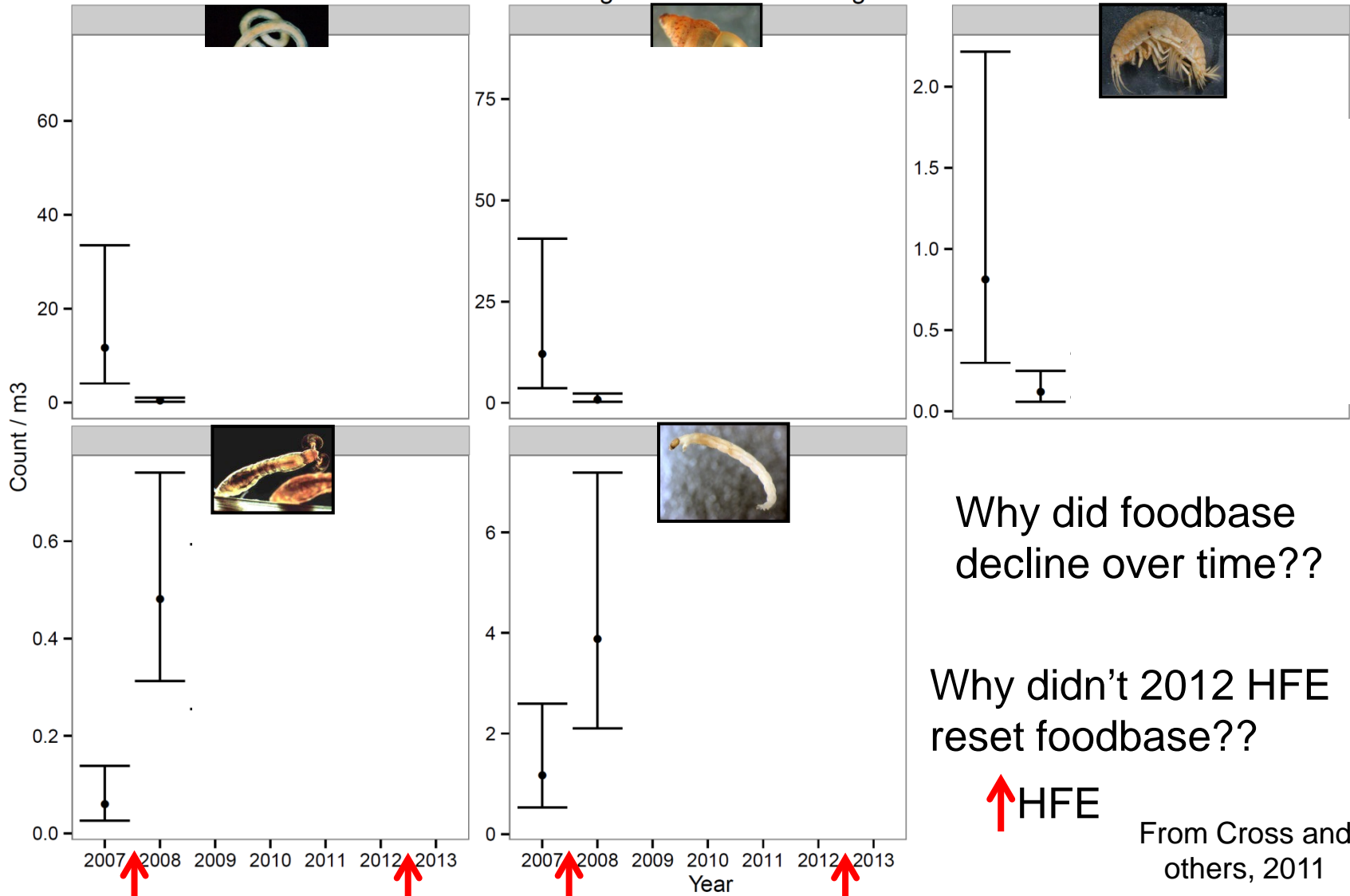


# How much error is introduced when nets clog?



# 2012 Flood Did Not Restructure Food Web

Long-term drift monitoring



Why did foodbase decline over time??

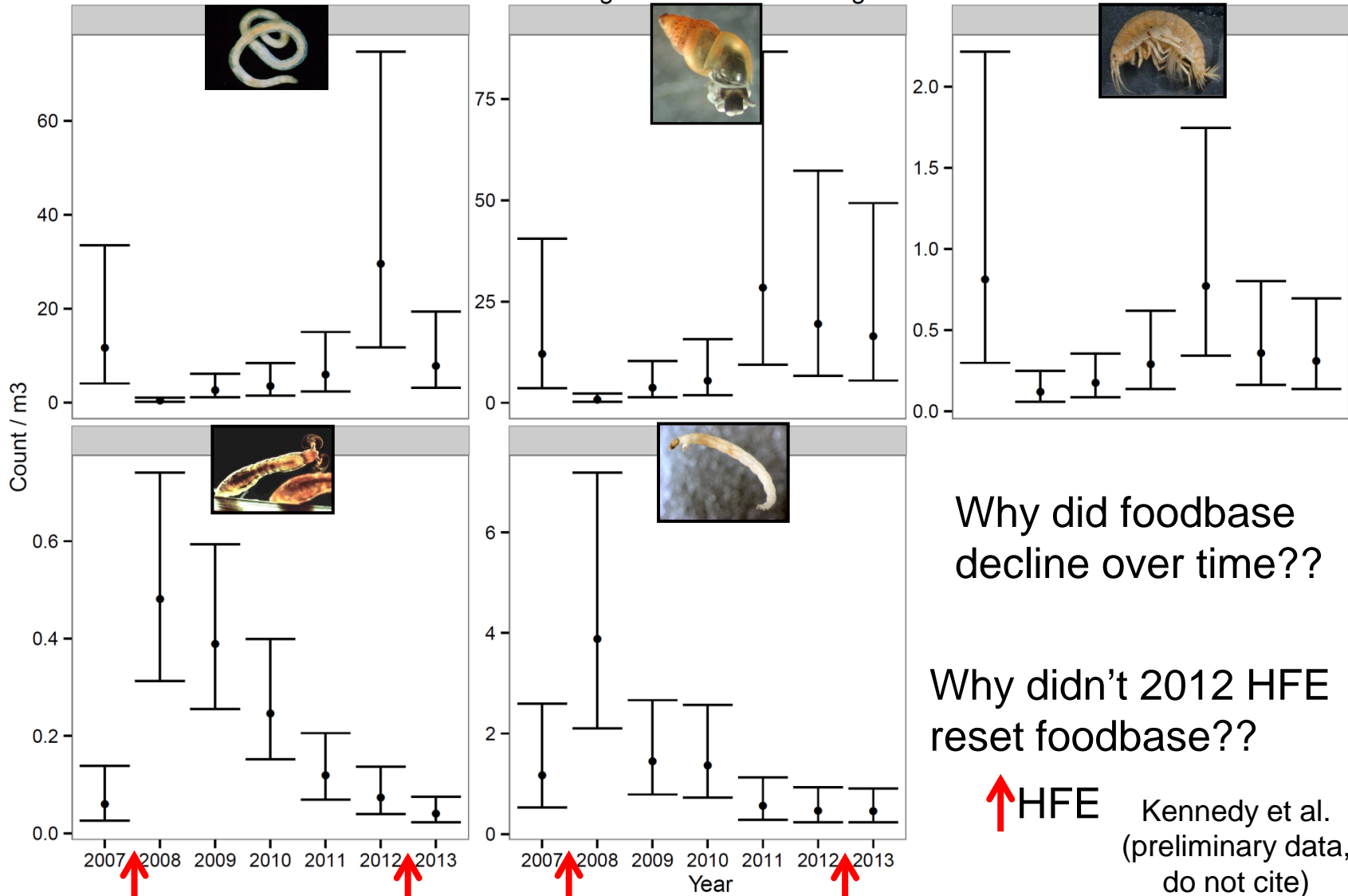
Why didn't 2012 HFE reset foodbase??

↑ HFE

From Cross and others, 2011

# 2012 Flood Did Not Restructure Food Web

Long-term drift monitoring

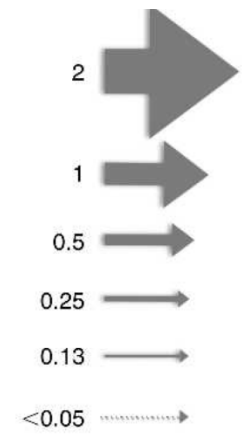
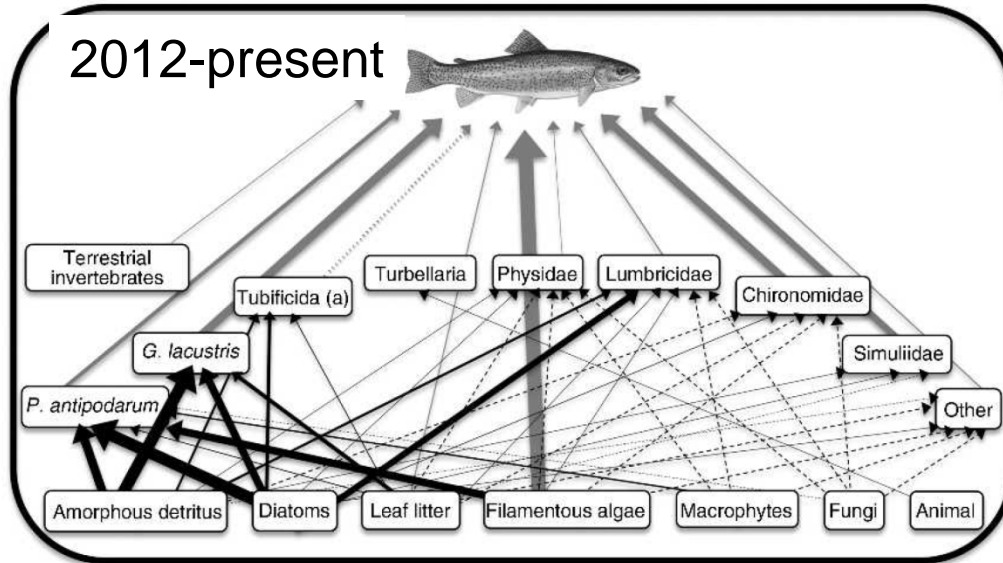


Why did foodbase decline over time??

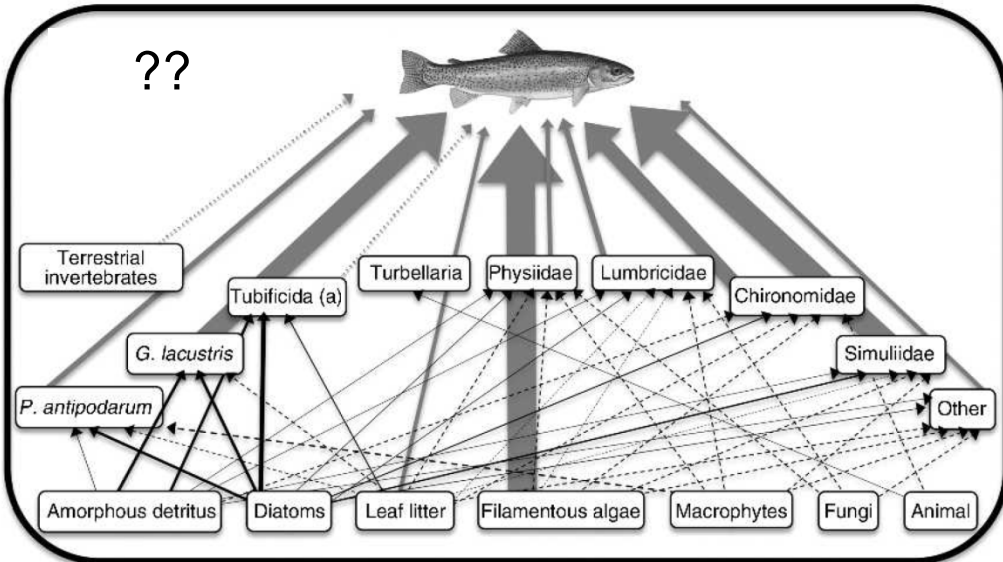
Why didn't 2012 HFE reset foodbase??

↑ HFE Kennedy et al. (preliminary data, do not cite)

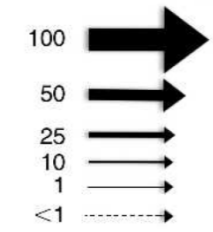
2012-present



??

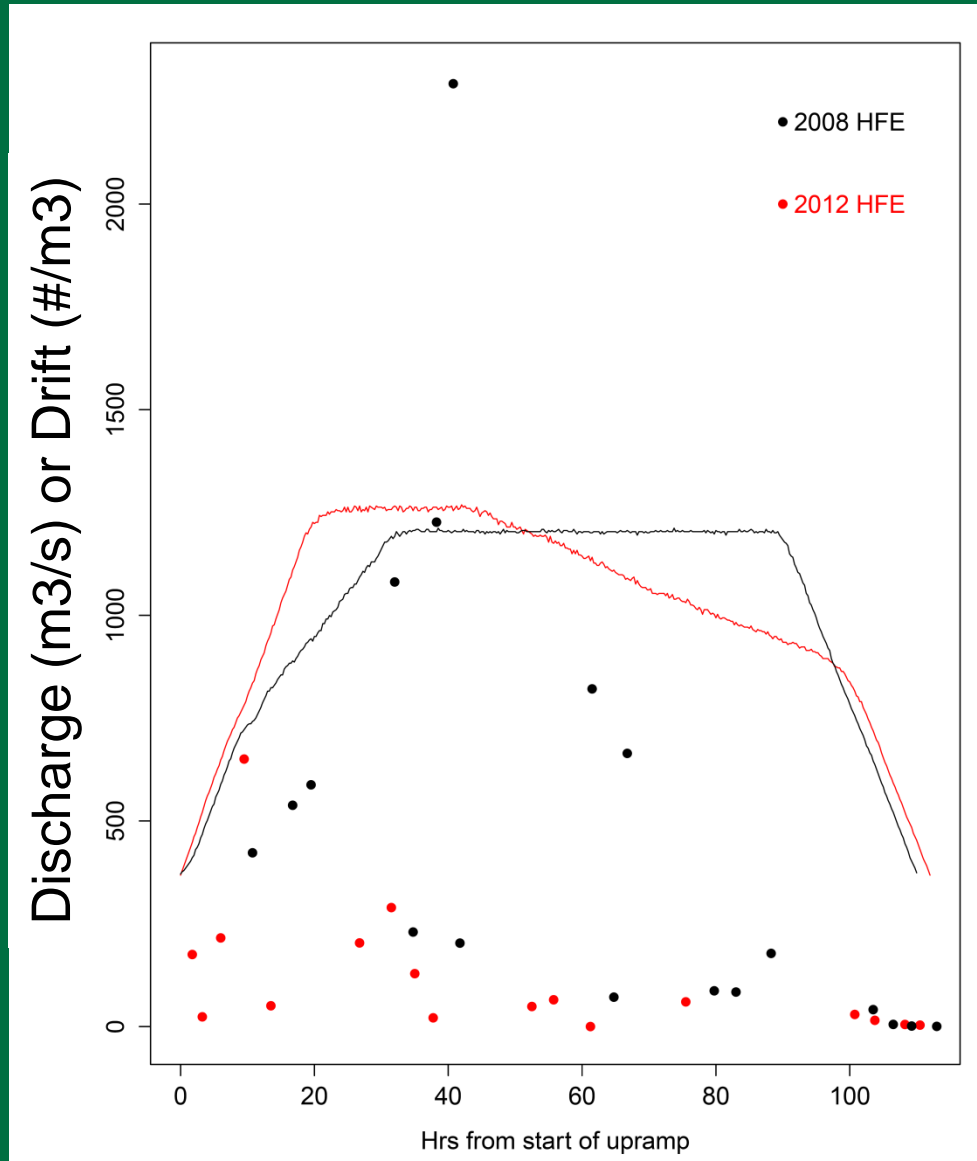


Flows to invertebrates  
(g AFDM·m<sup>-2</sup>·yr<sup>-1</sup>)



From Cross and others, 2011

# Mudsnail export during floods



2008:  
export of ~190 Billion mudsnails

2012:  
export of ~40 Billion mudsnails

Kennedy et al.  
(preliminary data,  
do not cite)