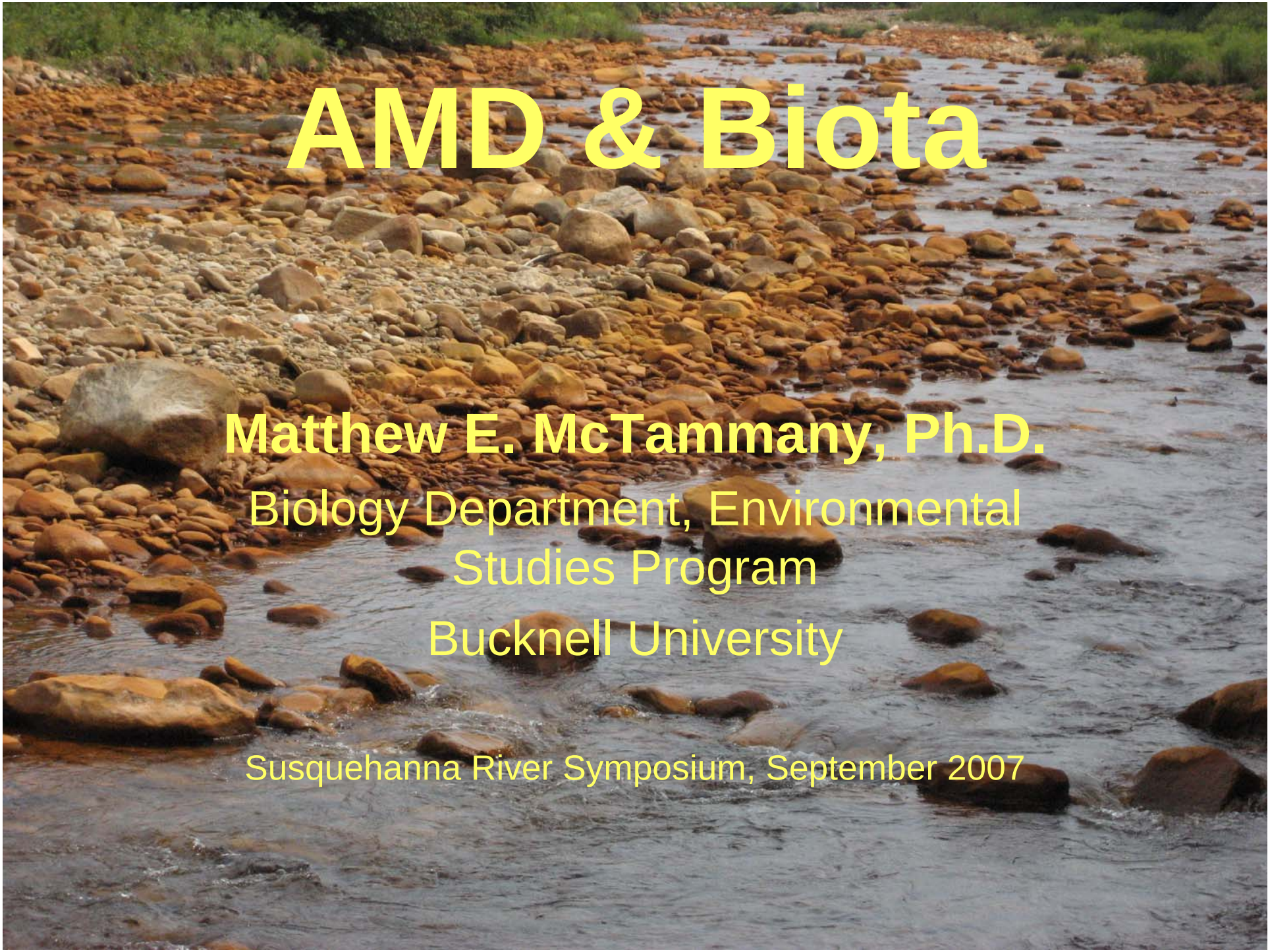

AMD & Biota

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Types of Biota

Microbes – algae, bacteria, fungi

Invertebrates

Fish

Life in Flowing Water

- Flow
- Oxygen
- Osmoregulation

AMD issues for biota

- Acidity
- Dissolved metals
- Precipitated metals
- Indirect effects on communities
- Other issues – siltation, temperature, flow, etc.
- Organisms considered – algae, benthic macroinvertebrates, fish
- Lots of other organisms, but not enough time

Acidity & Dissolved Metals

- Acidity challenges to biota – internal pH regulation, leaching chemicals from cells, burning of sensitive tissues (e.g., gills on bugs and fish, soft-bodied organisms)
- Metals challenge to biota – plating gills of bugs and fish
  - Specific metals (Cd, Cu, Zn, Al, As, Fe, etc.), increased toxicity in acidic environments
  - Overall dissolved load can be very high ~5 ppt (seawater 35 ppt) – physiological stress of osmoregulation

Acidity & Dissolved Metals

- Effects on algae – excludes many taxa, few tolerant taxa (e.g., *Eunotia*, *Mougeotia*)
- Effects on bugs – excludes many taxa (e.g., mayflies very sensitive, gills & soft bodies), few tolerant taxa (e.g., stoneflies, hellgrammites, beetles, some fly larvae)
- Effects on fish – excludes most taxa, brook trout acid-tolerant to a point (pH 5ish)

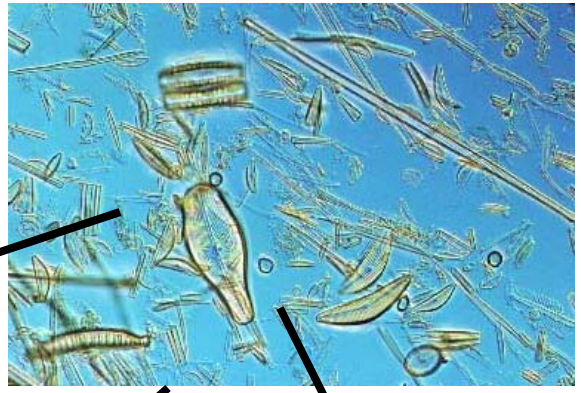
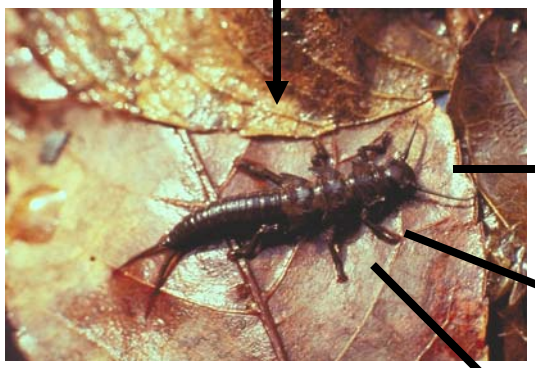
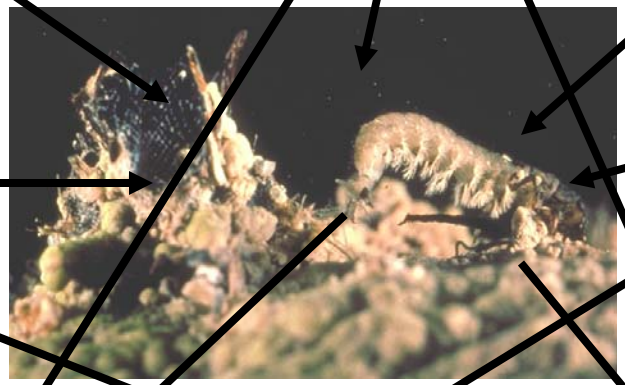
Precipitated Metals & Biota

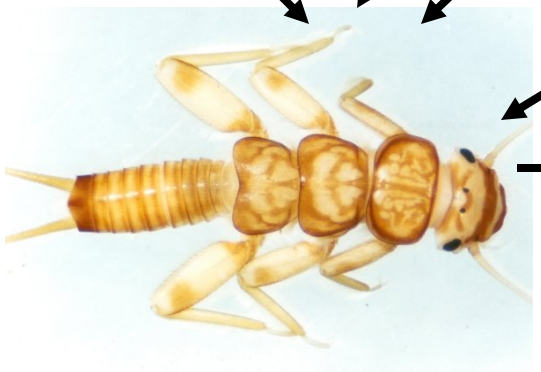
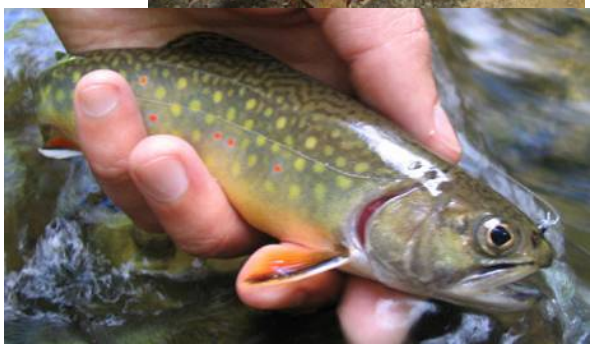
Precipitated Metals

- Challenge to biota, especially benthic organisms – clogging substrate, smothering organisms, unstable substrate, certain precipitates “slippery”
- Effects on algae – almost excluded, oxidizing microzones due to photosynthesis stimulate additional precipitation of metal hydroxides
- Effects on bugs – most excluded, some “burrowers” tolerant (worms, some flies), hellgrammites, dragonflies
- Effects on fish – benthic fish directly affected, other fish less directly affected

Indirect Effects



Potential for Recovery

- Time scale depends on specific impact and group of organism
- Recolonization – drift, aerial dispersal, swimming, introduction
- Extent of disturbance across landscape, proximity of colonists