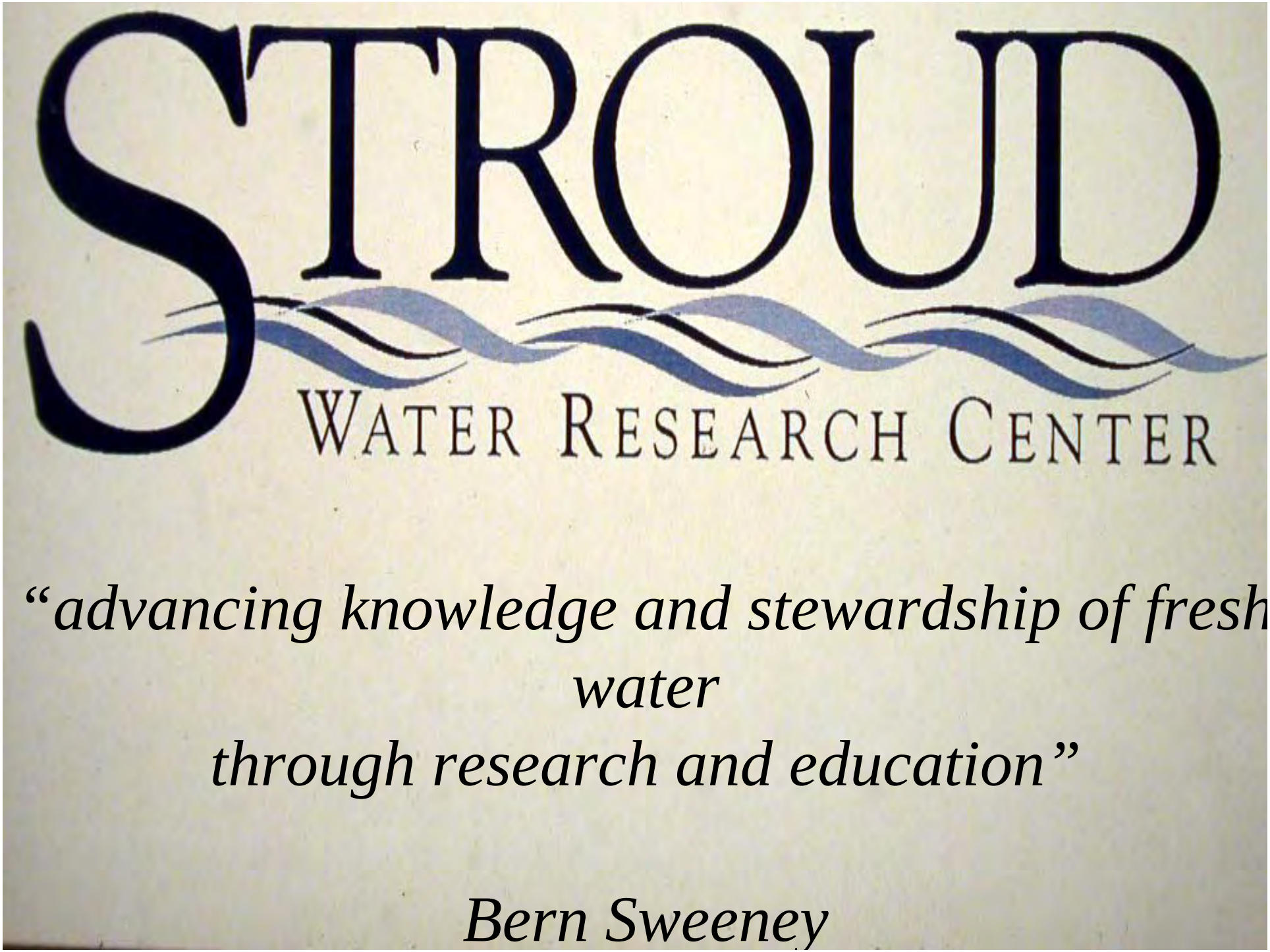
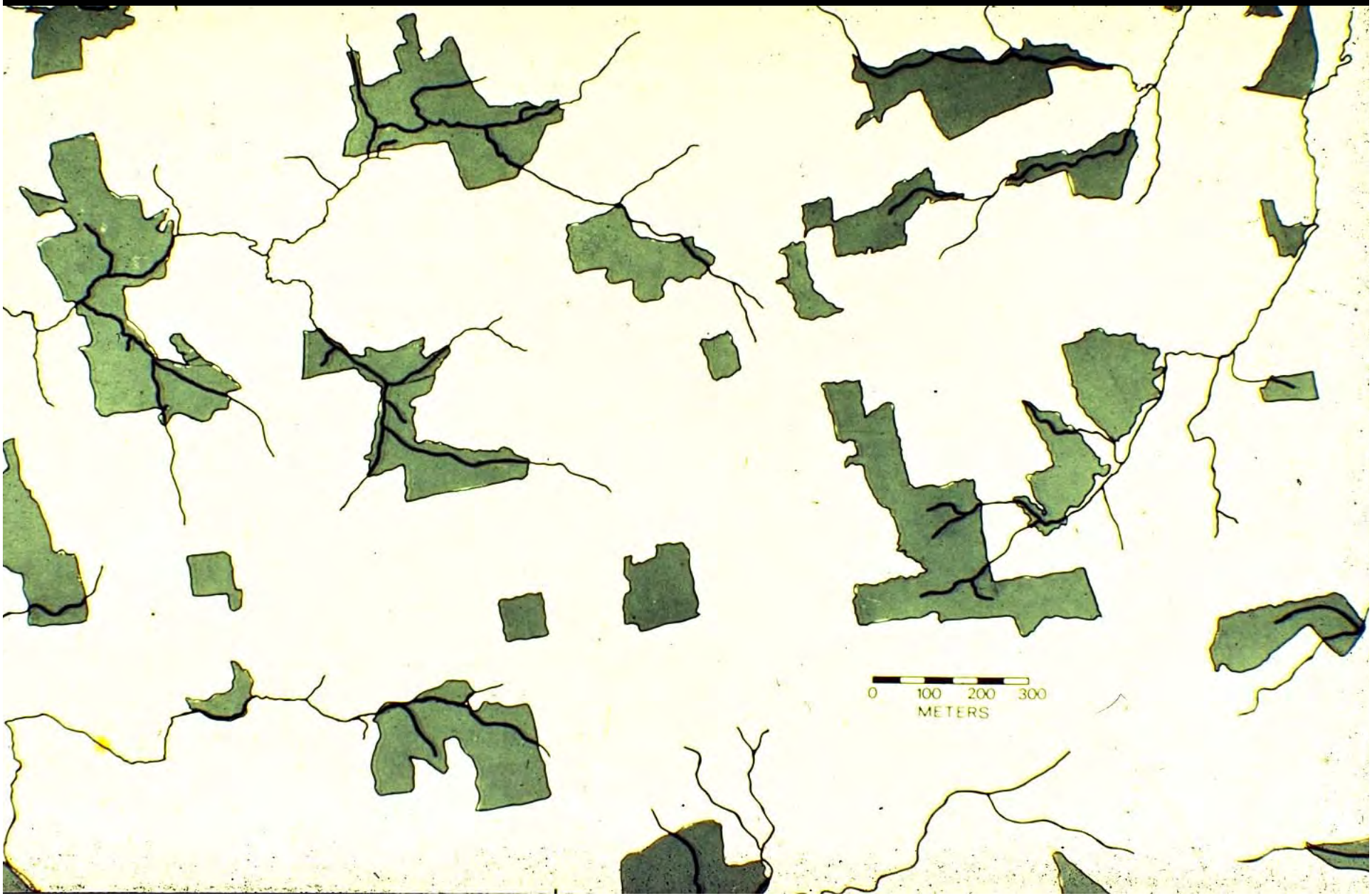

STROUD
WATER RESEARCH CENTER
"advancing knowledge and stewardship of fresh water
through research and education"
Bern Sweeney

**The natural setting for a stream in this region is to be bordered by forest**

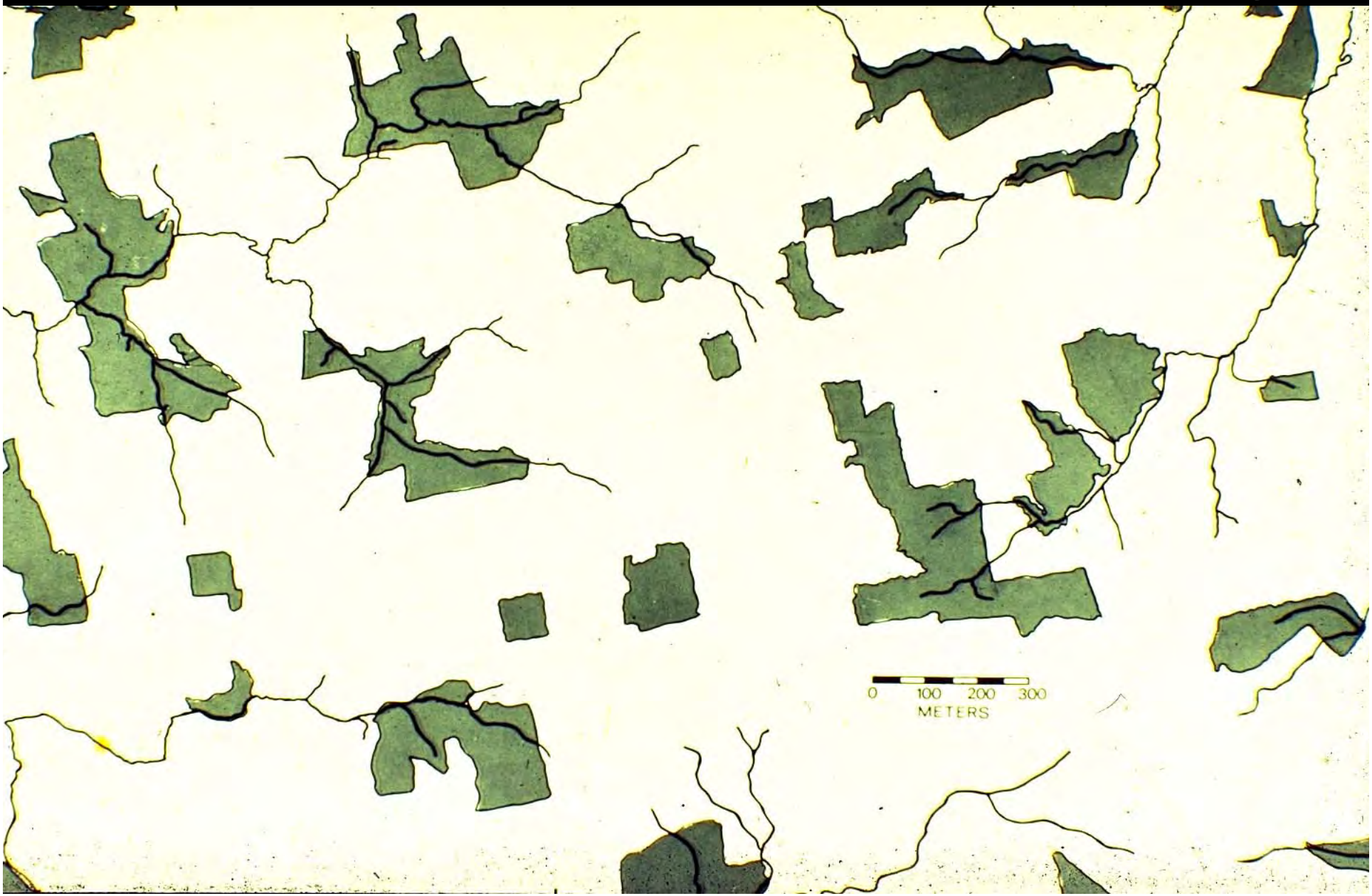
# Pennsylvania = “Penn’s Woods”


Streams naturally flowed
through old growth forests
for 1000’s of years

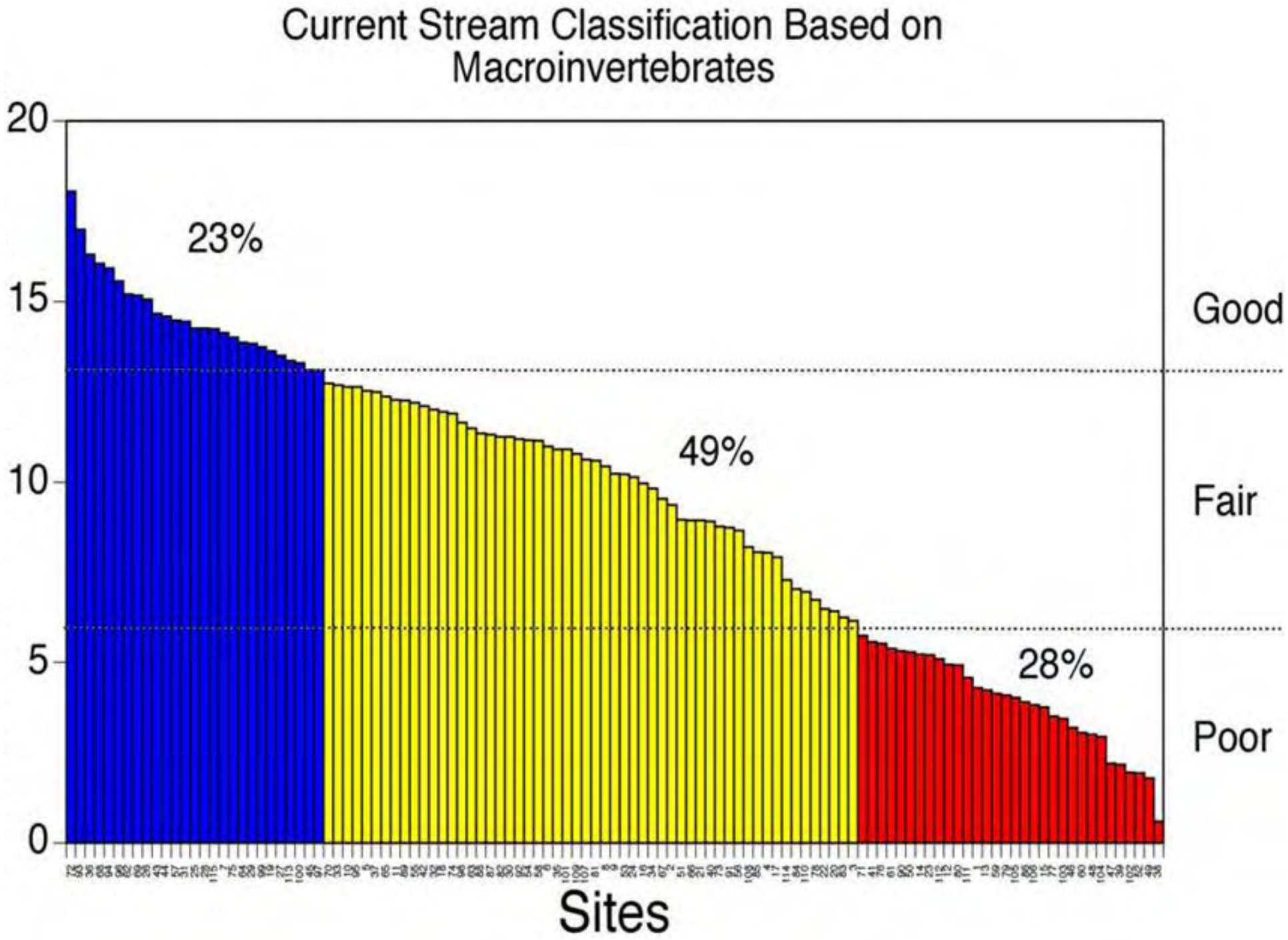
# This is our landscape today….in many areas

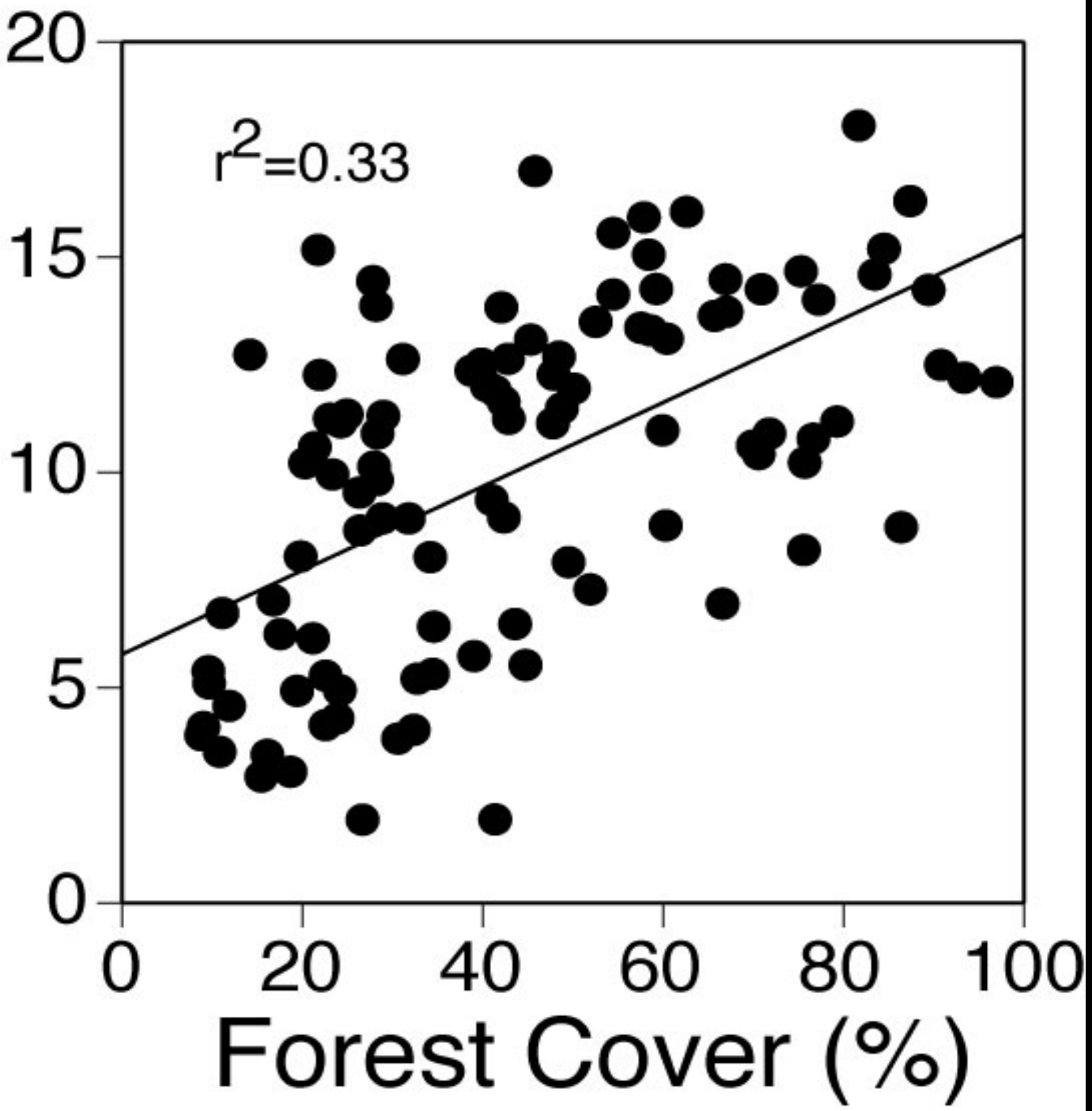


# What happens in response to this kind of change?



# ~50 % of the Philadelphia's drinking water


Current Stream Classification Based on Macroinvertebrates
20
15
10
5
0
23%
49%
28%
Good
Fair
Poor
Sites




**Water Quality**
**Score**
**Good**

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**Fair**

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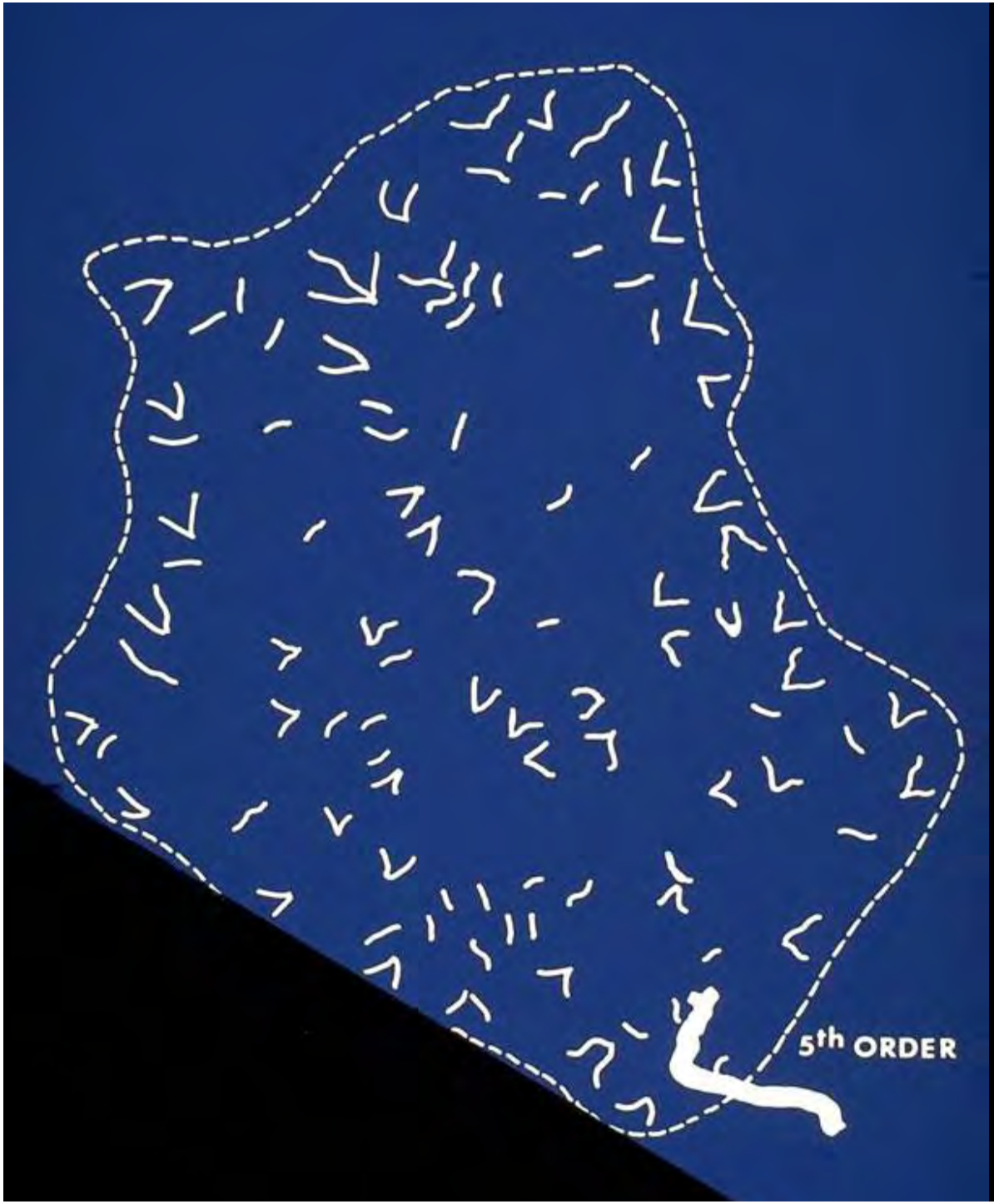
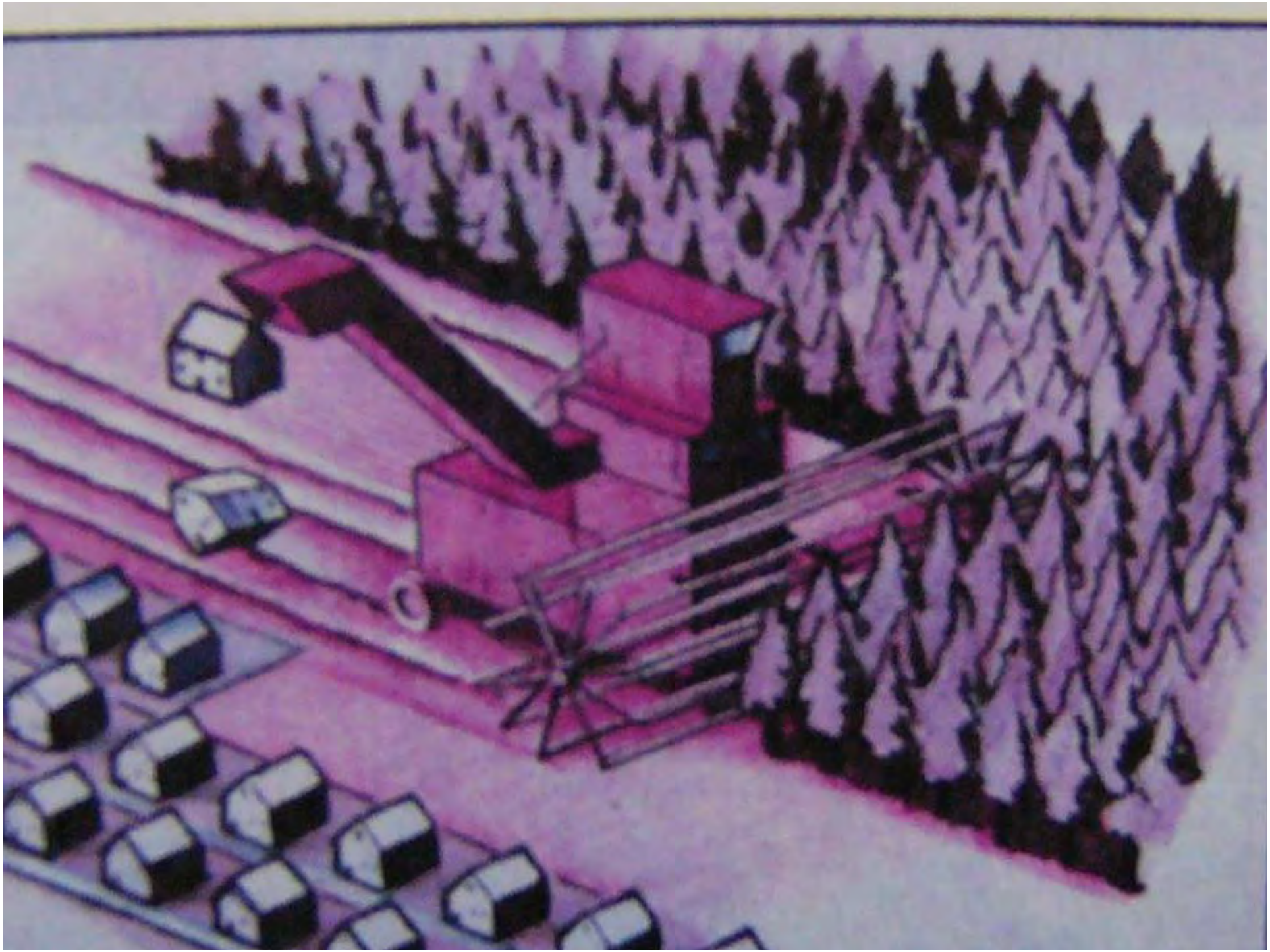
**Poor**


**The more the forest cover in the watershed…. the more small streams that are completely bordered by forest**




….because they occur throughout the watershed!




Trees stabilize stream banks ….decreasing stream migration and erosion

# Loss of forest causes the stream to narrow…… reducing flow capacity and increasing the tendency to flood

Forested = wide

Deforested = narrow

# Forest helps infiltrate storm water

# 4” rain in three hours (forested watershed)

# 4” rain in 24 hours (75% deforested)

**Every tree counts in a watershed …especially near a stream**

# What else do streamside forests do for us?

**Streamside forests “keep stuff out” and keep it from “moving downstream”(to the drinking water intake of towns and cities….and to the estuary)**

**“Stuff” includes**

**Dissolved Organic Chemicals**

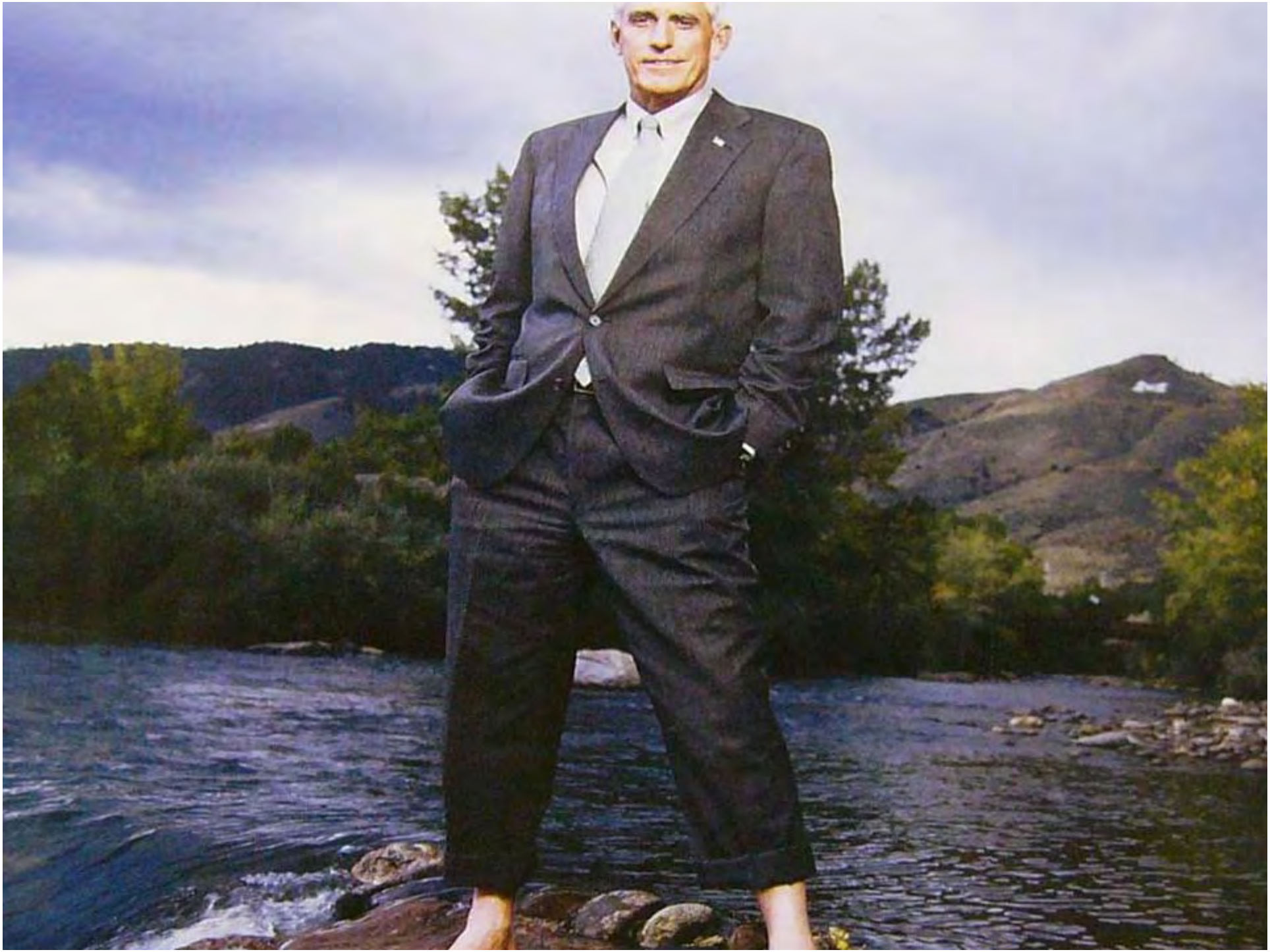
**Suspended Sediments**

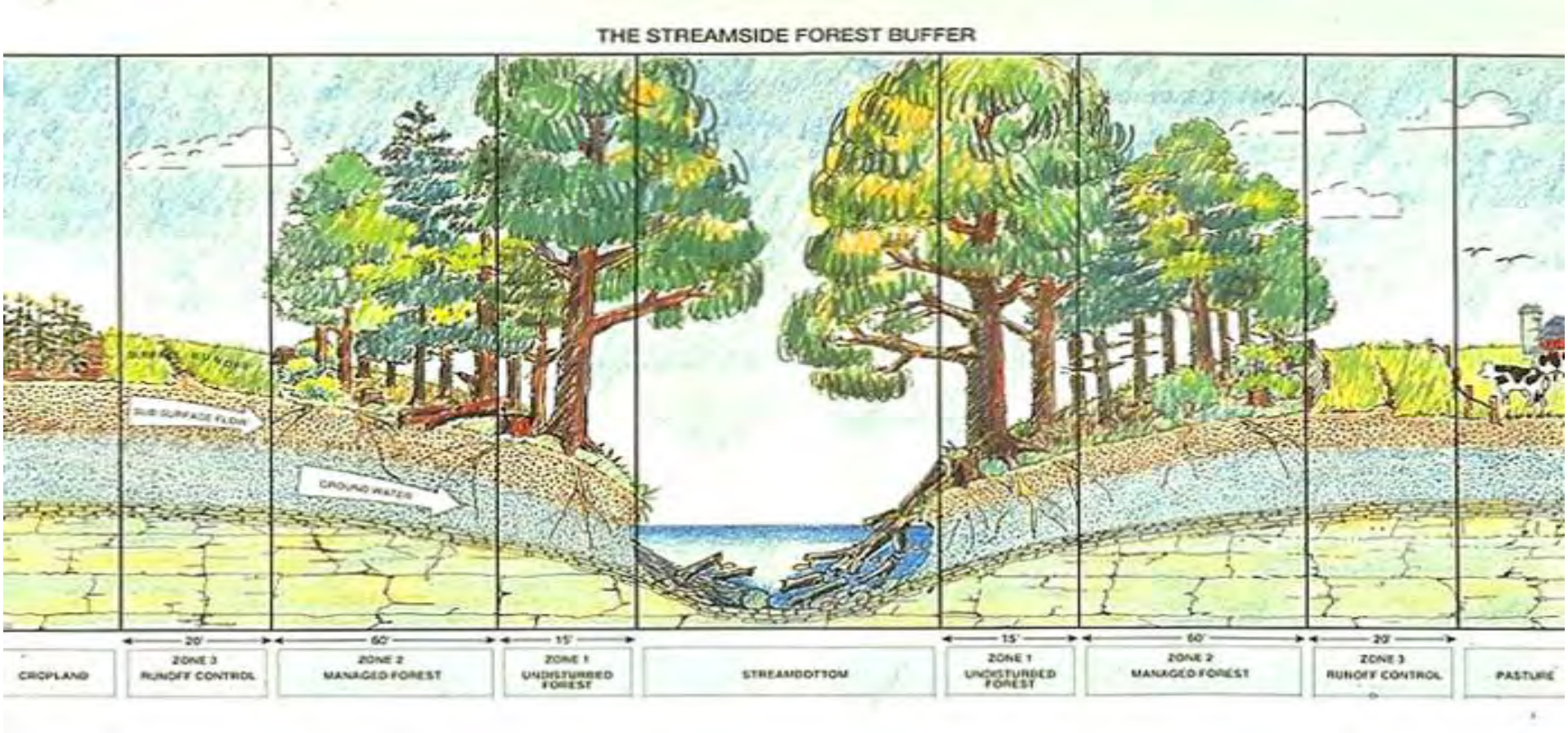
**Nutrients (e.g., Nitrogen)**

**Pathogens**

**Pharmaceuticals**

**Etc.**






**100 ft of streamside forest keeps ~1/4th of Nitrogen & 1/2 sediments out**

**(Newbold, Herbert, Sweeney, and Kiry 2009)**

Universities Council on Water Resources
Journal of Contemporary Water Research & Education
Issue 136, Pages 17-27, June 2007

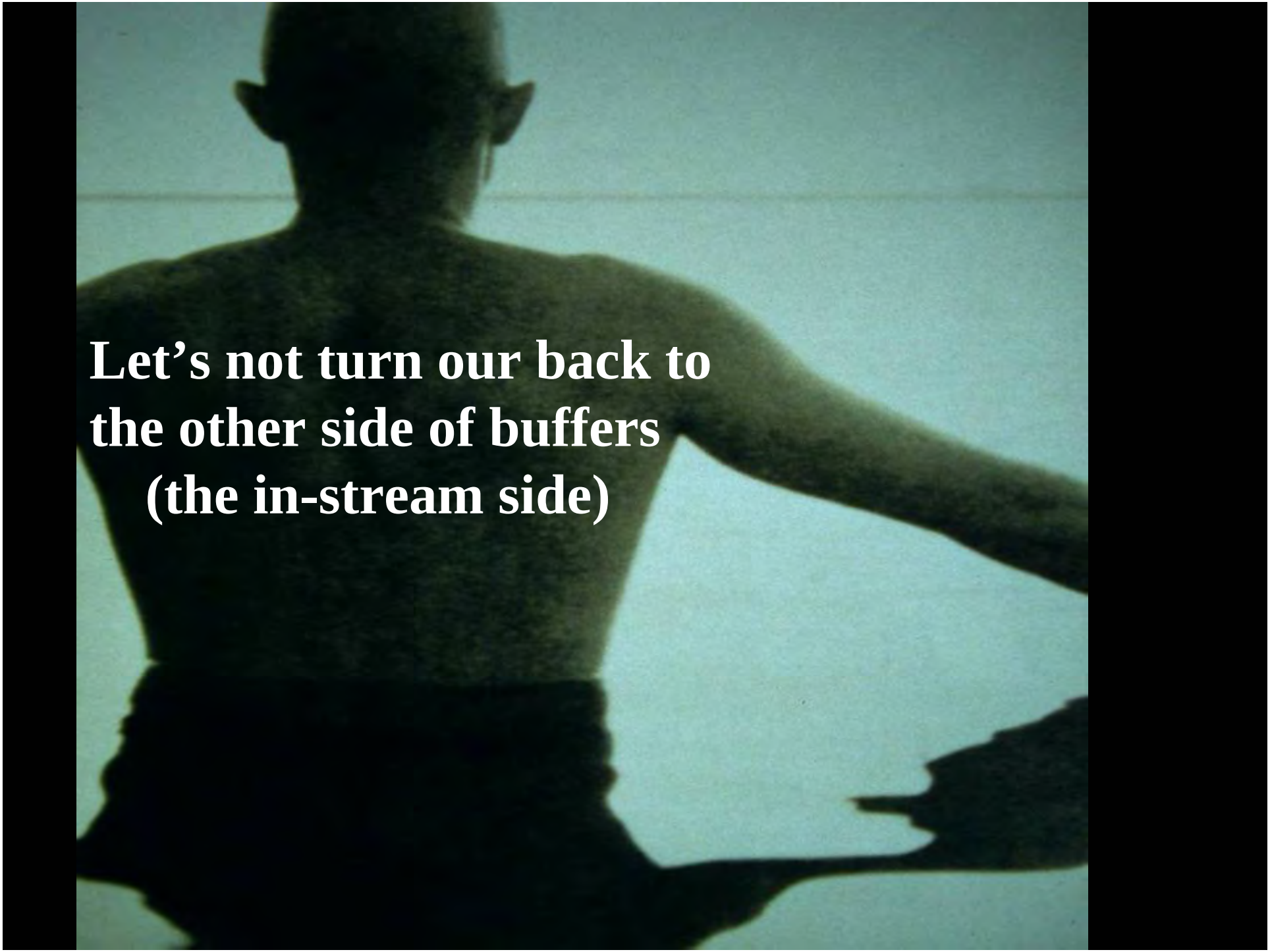
# Resurrecting the In-Stream Side of Riparian Forests

Bernard W. Sweeney and James G. Blaine

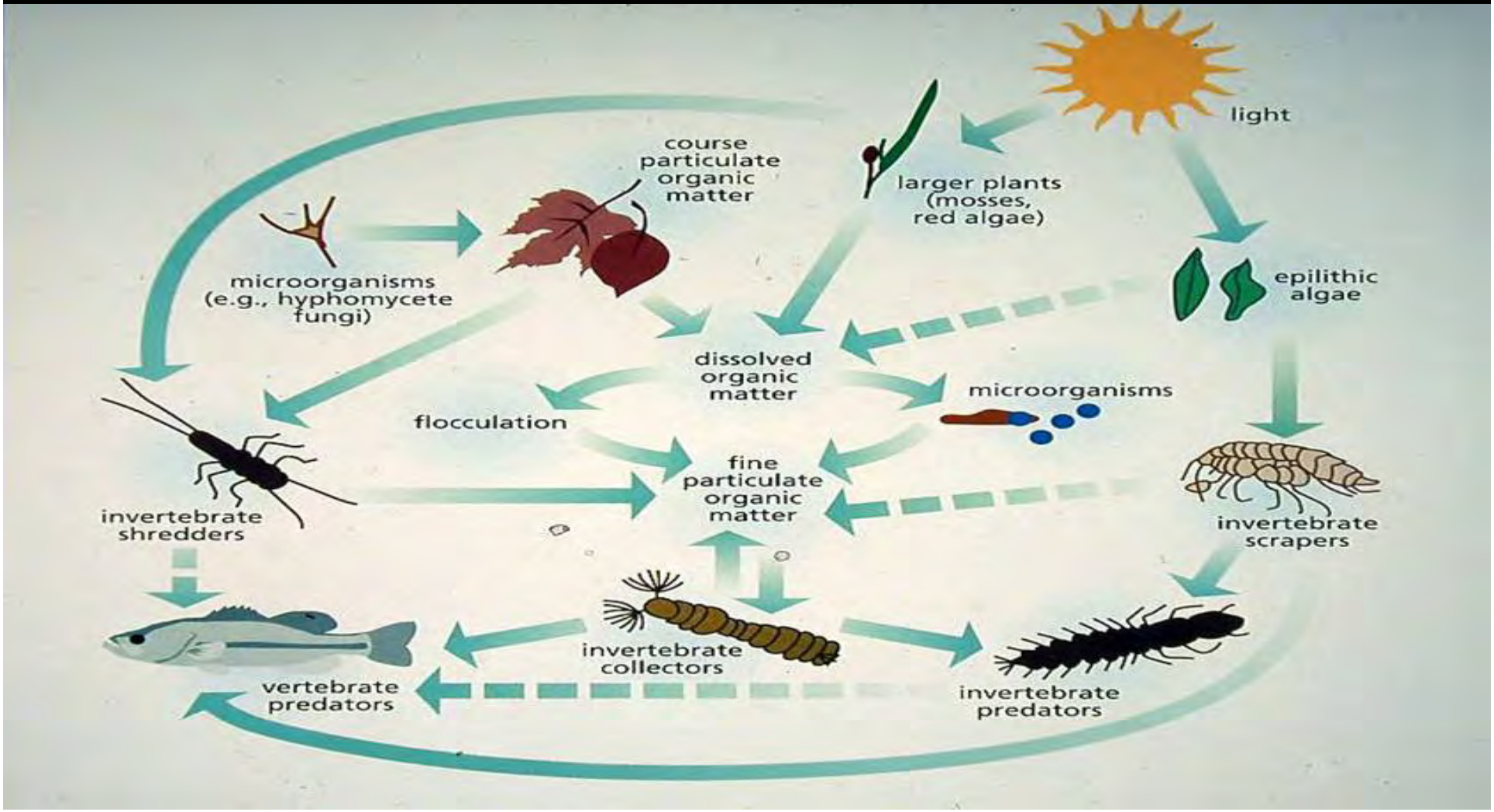
*Stroud Water Research Center, Avondale, PA*

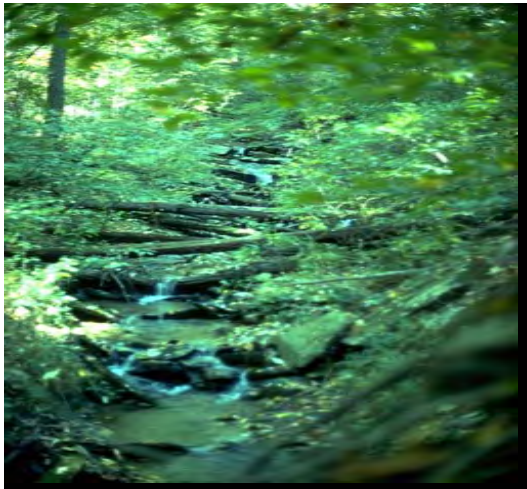
"With all the trees you folks are planting around here," the old farmer said as he watched staff members from the Stroud Water Research Center place yet another row of flags along a meadow creek on a clear fall morning, "pretty soon this whole area will be woods. You know," he went on, "when our forefathers first set foot on this ground, there wasn't a tree anywhere around here." So began a conversation with a man who had no idea that the land his family had farmed for generations in "Penn's Woods" had once been completely forested. This is less surprising than it may at first appear because within a century after the first Europeans had settled, virtually every tree in southeastern Pennsylvania (PA) had been felled. Some of the first to go were those in riparian forests, which were cut for firewood and building material, for agricultural land and access to fresh water. The streams and rivers became the flowing commons of the New World, providing drinking water and waste disposal, hydropower and irrigation, food, stored carbon (American Forests 2003). Perhaps nowhere has the destruction of America's forests been more devastating than along its streams and particularly its small streams—which are the source of most of the nation's fresh water. In fact, a recent study found 19 percent of the total length of small streams in the U.S. to be in poor condition due to "severely simplified riparian vegetation" (U.S. Environmental Protection Agency 2006).

Note our use of the phrase "riparian forests" rather than "riparian buffers." In the last two decades, many policy makers have come to recognize the need to create a physical space – or buffer – to protect their freshwater sources from the harmful effects of human activity. Such policies have been supported by a significant body of scientific research demonstrating that buffers act as barriers to keep sediment and other pollutants from running off the land and into the stream (see reviews by U.S. Environmental Protection Agency 1995, Lowrance et al. 1997, Bentrup et al. 2005, Mayer et al. 2005). As a result, riparian


Let’s not turn our back to
the other side of buffers
(the in-stream side)

# Streamside forests promote a healthier stream ecosystem capable of processing lots of pollutants…….because……





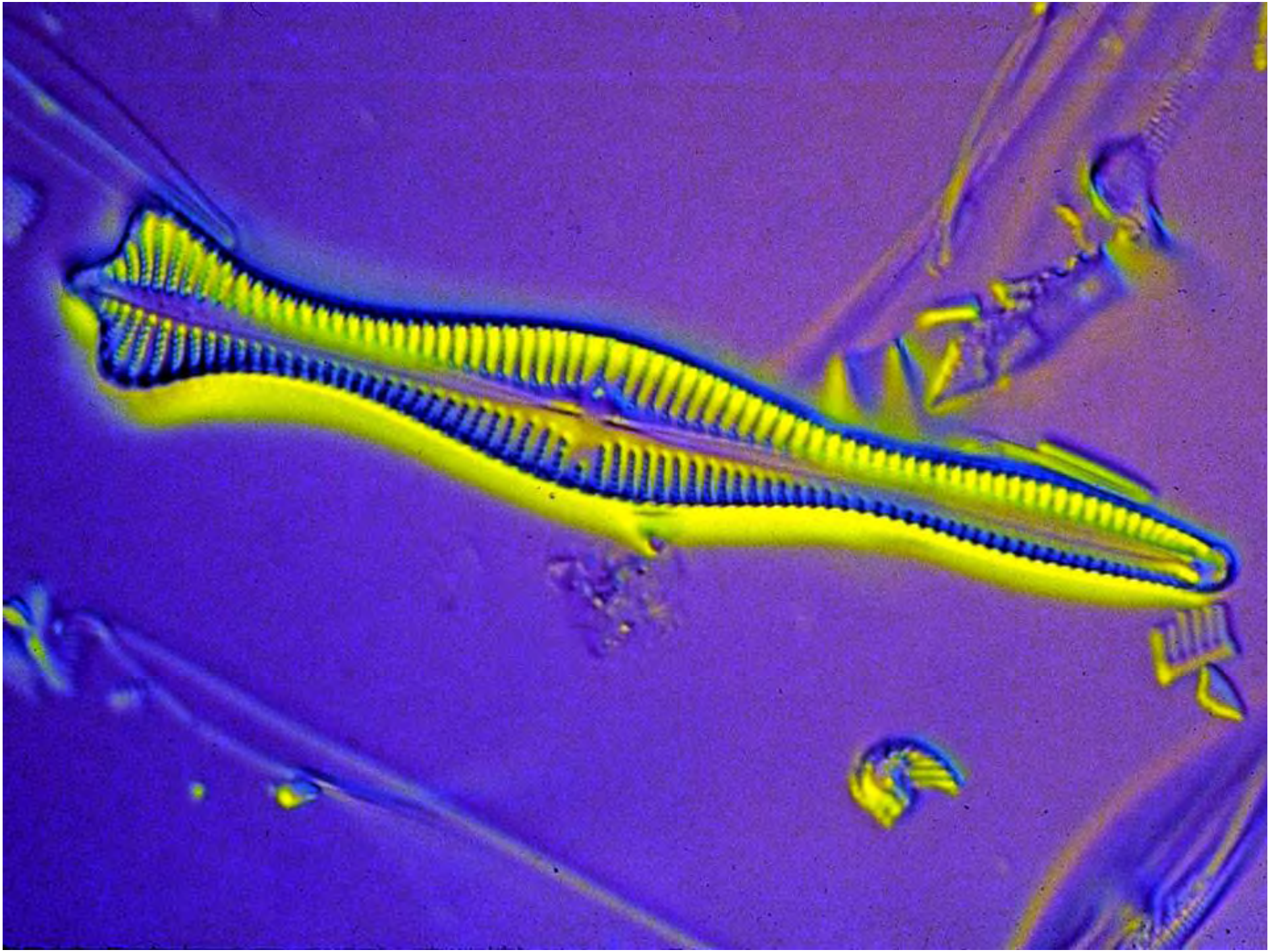
Stream animals and plants in a stream ecosystem are adapted to water / habitat conditions created by the surrounding forest

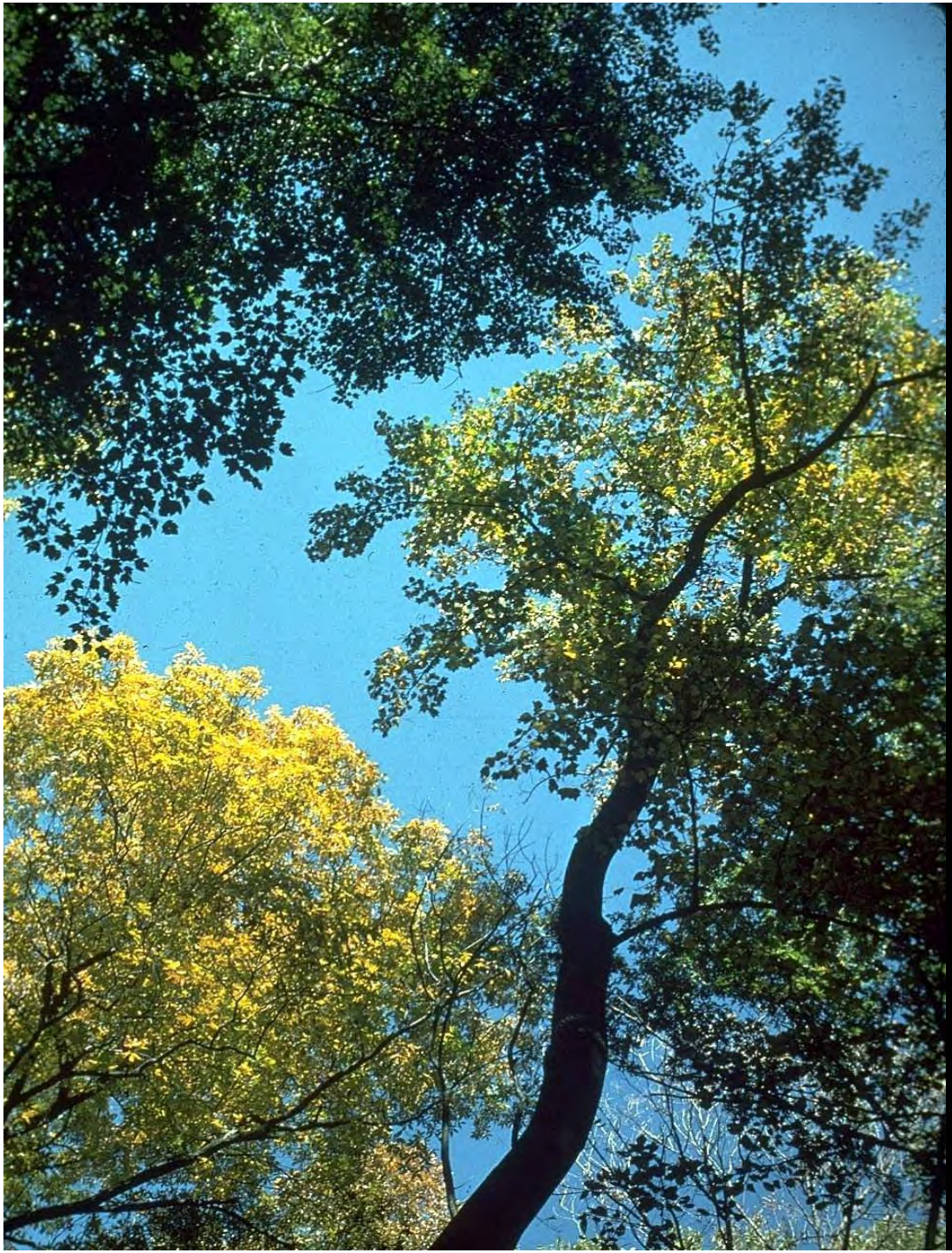

Streamside
forests shade
the stream

Many small stream species
are classified as
“Cold Water Species”

They need “summer cool” conditions

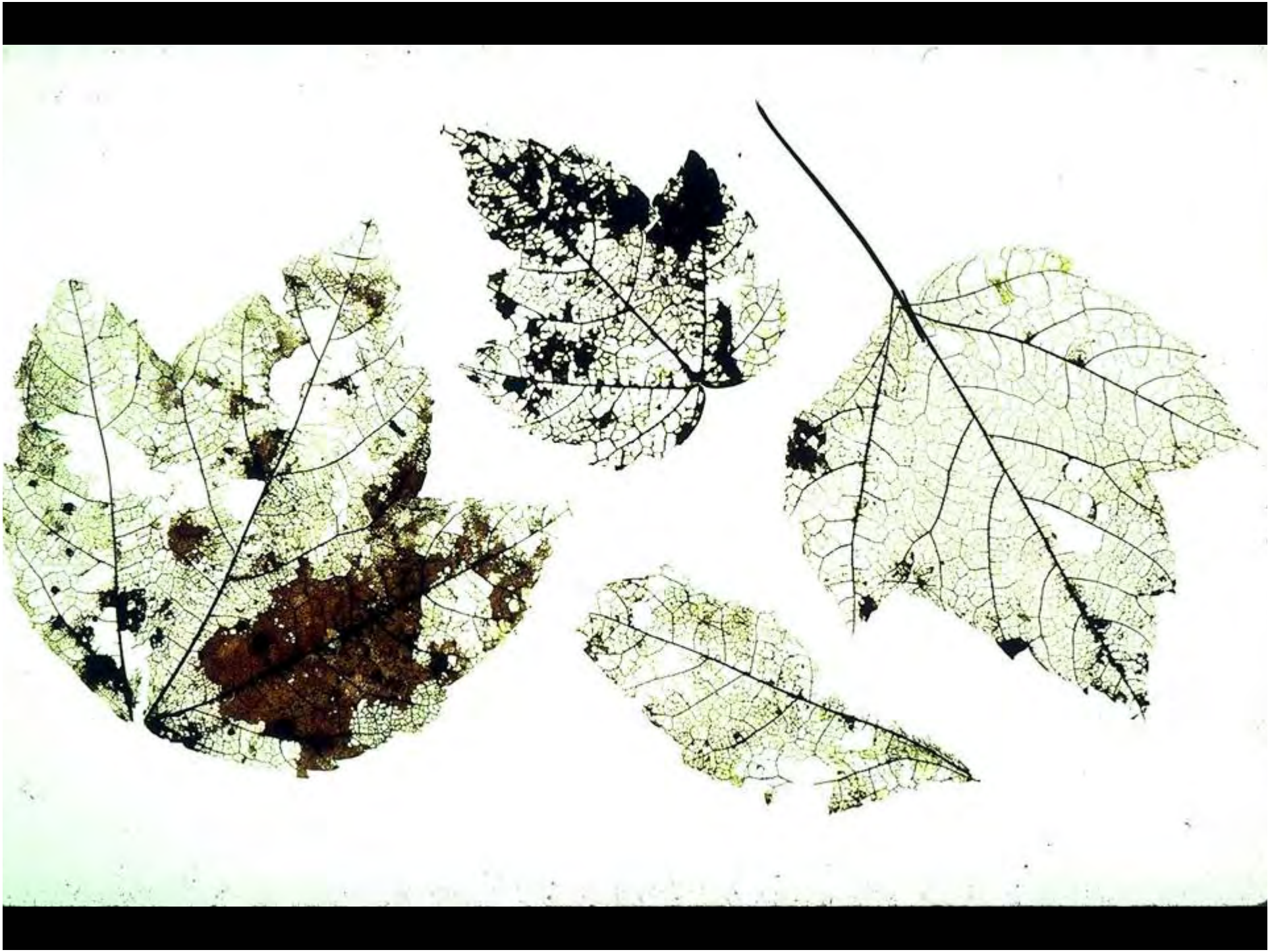

Shaded
streams
have
better
food





Forested streams have more food and a greater variety

# 10,000 lbs/acre/year



Streamside forests, by improving stream health,  increase the ability of the stream ecosystem to process 2-10x more pollutants

(Sweeney et al. 2004)

**Take note ….**
**the “in-stream side”**
**makes riparian forests**
**BMP’s**
**for both point and non-point pollution!**

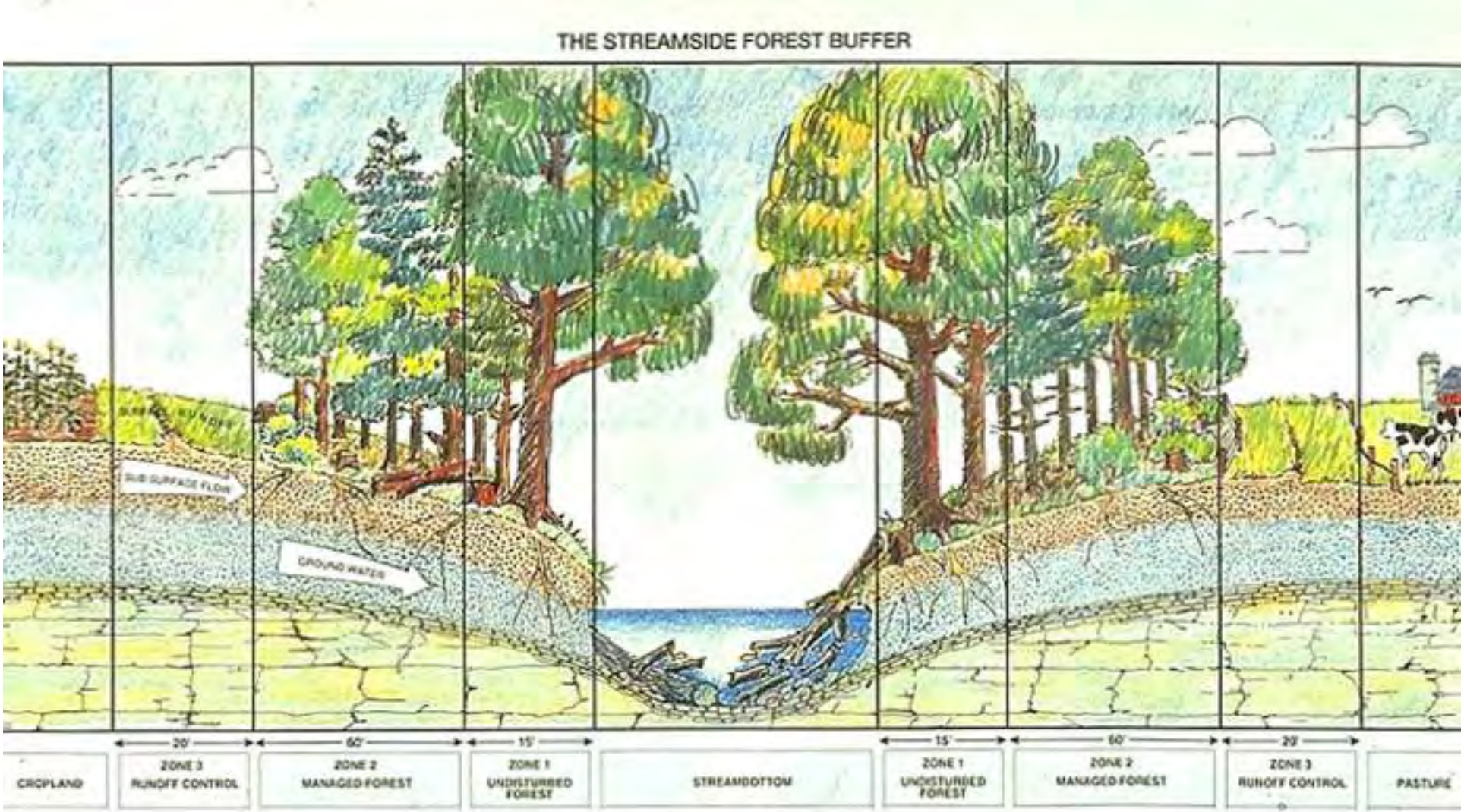
**(In Preparation)**

**Sweeney, B. W. and J. D. Newbold (2009)**

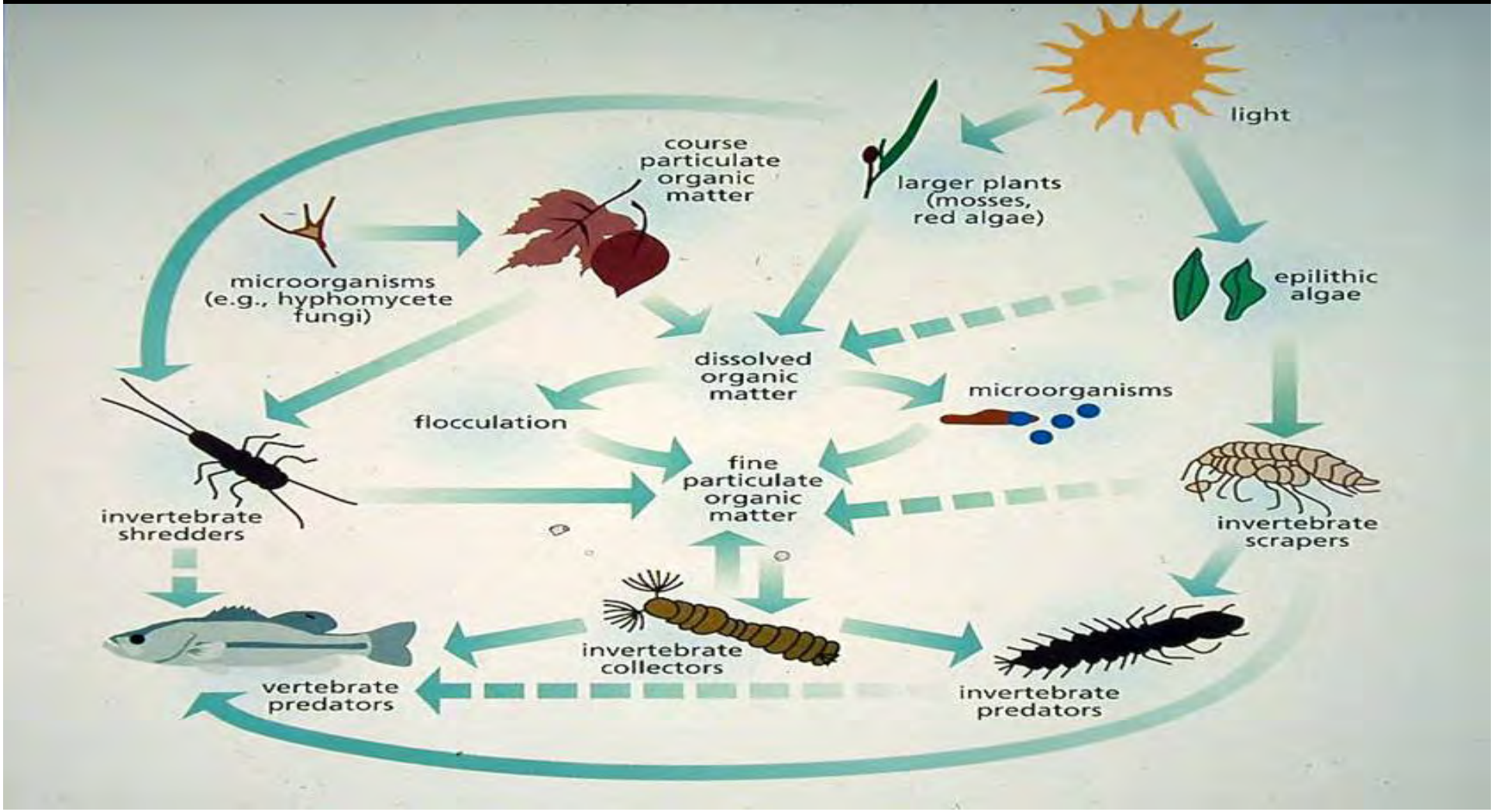
**Streamside Forests for Protecting and Enhancing Water Quality and Stream Ecosystem Health and Services: How Wide Should They Be?**

**Journal of the Water Resources Assoc**

# At least 100 ft to keep stuff out



# At least 100 ft to promote a healthy stream ecosystem capable of processing pollutants



# 100 ft buffer

# Safe

# vs

# Risky

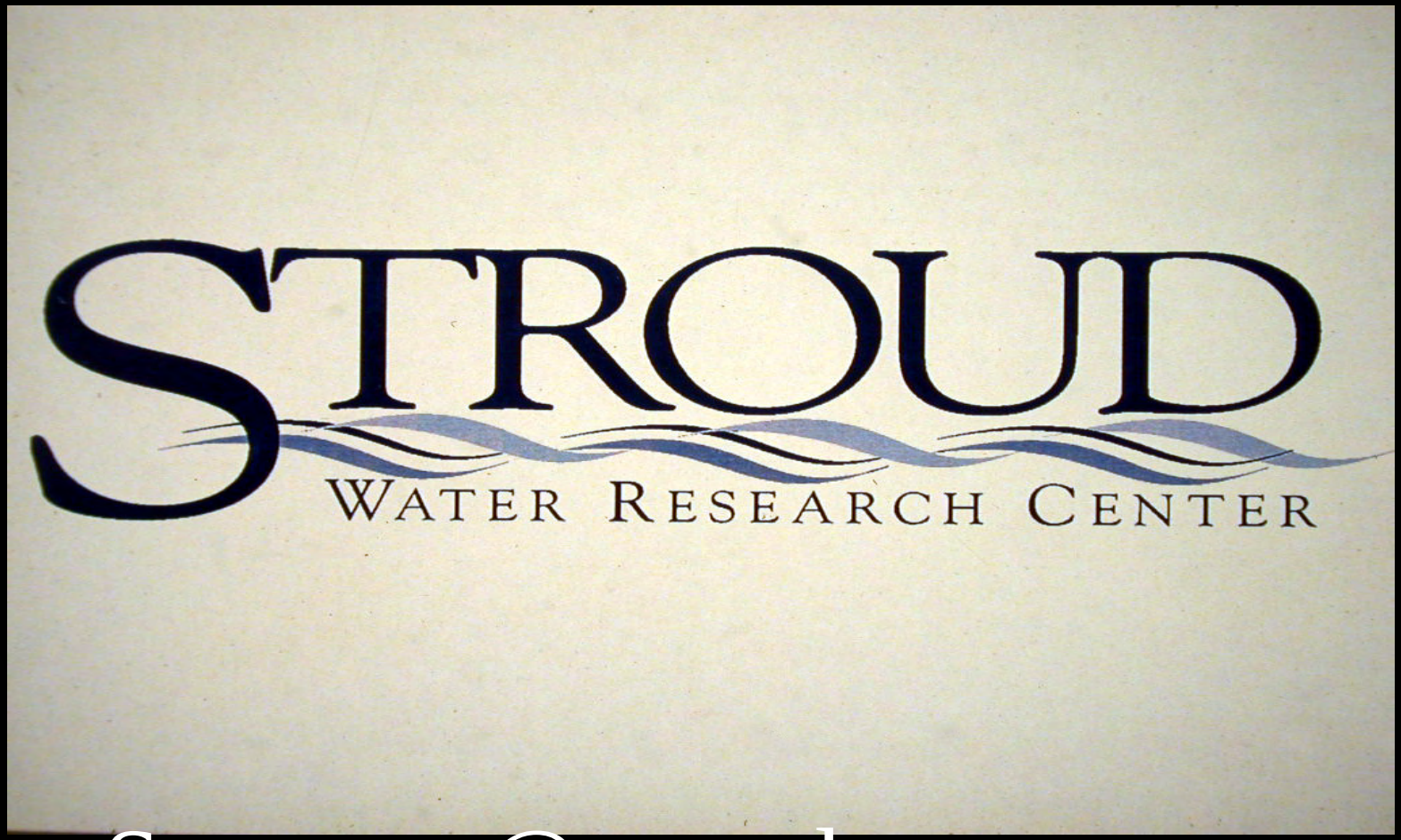
**Engineers usually build in a safety factor.**

**Engineers usually build in a safety factor.**

**They <u>double</u> it!**

"It's comforting to know that we have safety boots and hats."

WWW.STROUDCENTER.ORG




Sweeney@stroudcenter.org