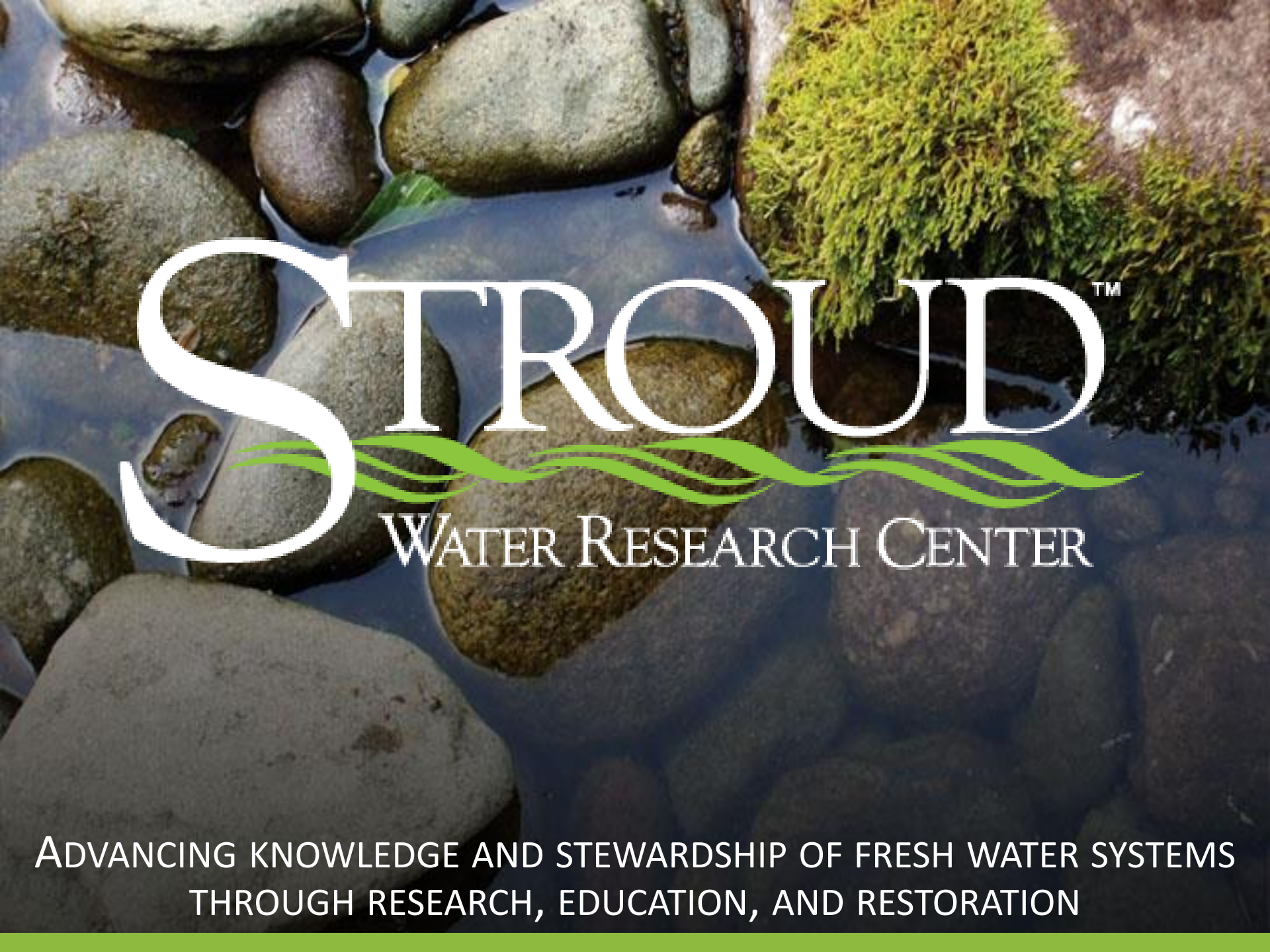

ADVANCING KNOWLEDGE AND STEWARDSHIP OF FRESH WATER SYSTEMS THROUGH RESEARCH, EDUCATION, AND RESTORATION

Healthy Streams and the Role of Streamside Forests

OVERVIEW

Status of our Streams

Forest Buffers & Restoring Healthy Streams

Forest Buffer Restoration – Role of CREP

Goal:

Streams that are healthy, resilient, & self-maintaining, & have biological, chemical, and physical integrity.

Will take *time*, *space (floodplain)* and *trees*, plus many other efforts

Why Do "Healthy Streams" matter to producers, developers, municipalities?

303d Ag Impaired Delisting Process
Agricultural Advisory Board Dec 16, 2015

Healthy streams more effectively process and eliminate pollution that gets past our BMPs. Think "free water treatment, working 24/7"

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An Example Farm

– Illustration by Frank McShane for Schuylkill Action Network

US EPA National River & Stream Assessment

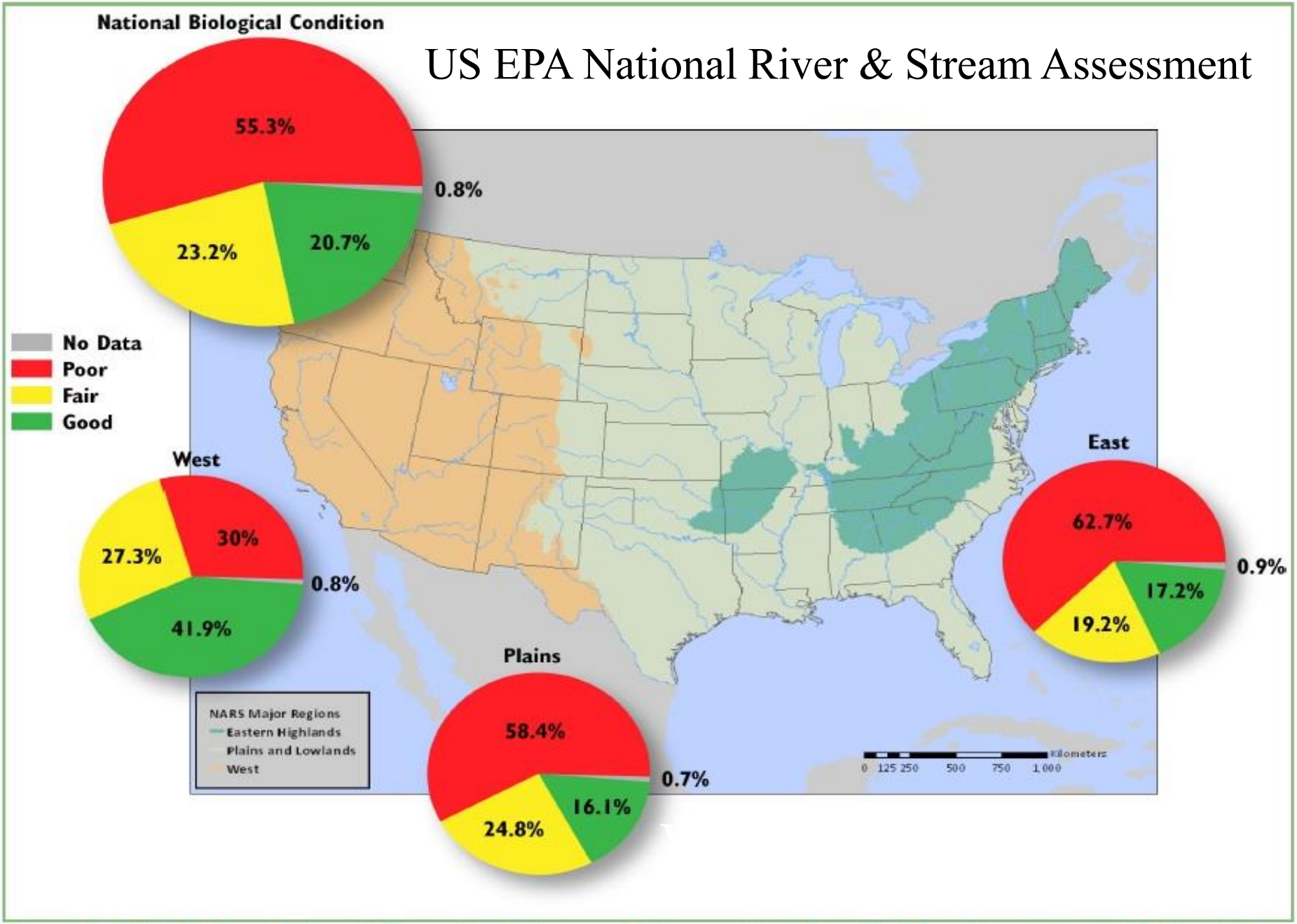
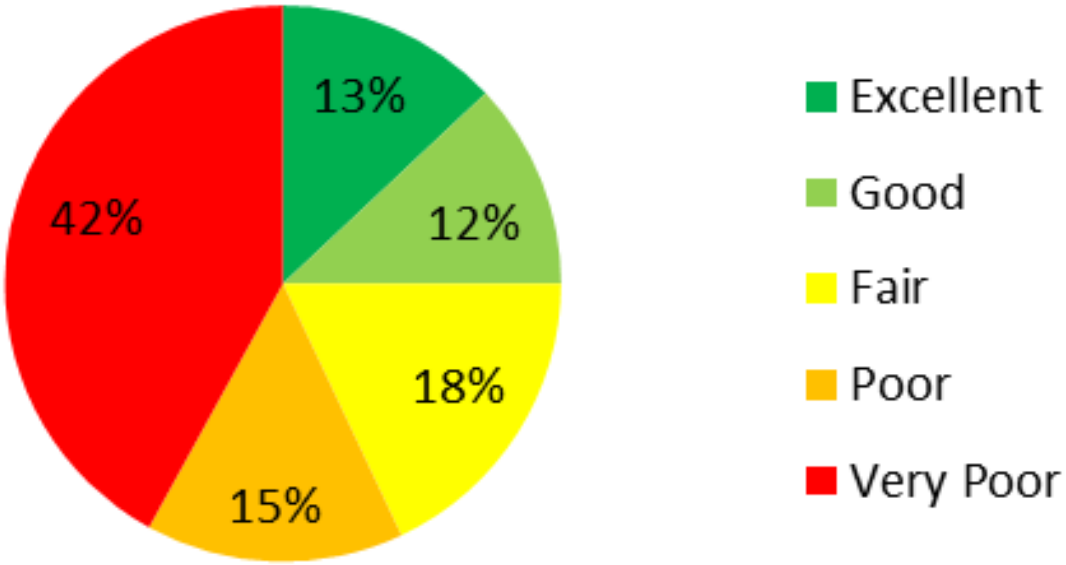


Figure 1. Biological condition of the nation's rivers and streams, based on the Macroinvertebrate Multimetric Index (EPA/NRSA).

Stream Health 2000-2010: Average Benthic Index of Biotic Integrity Rating of 10,492 Random Design Monitoring Sites



Source: Chesapeake Bay Basin-wide Benthic Index of Biotic Integrity (B-IBI)
http://www.chesapeakebay.net/indicators/indicator/health_of_freshwater_streams_in_the_chesapeake_bay_watershed

Clean stream indicators

Ephemeroptera (mayflies)

Plecoptera (stoneflies)

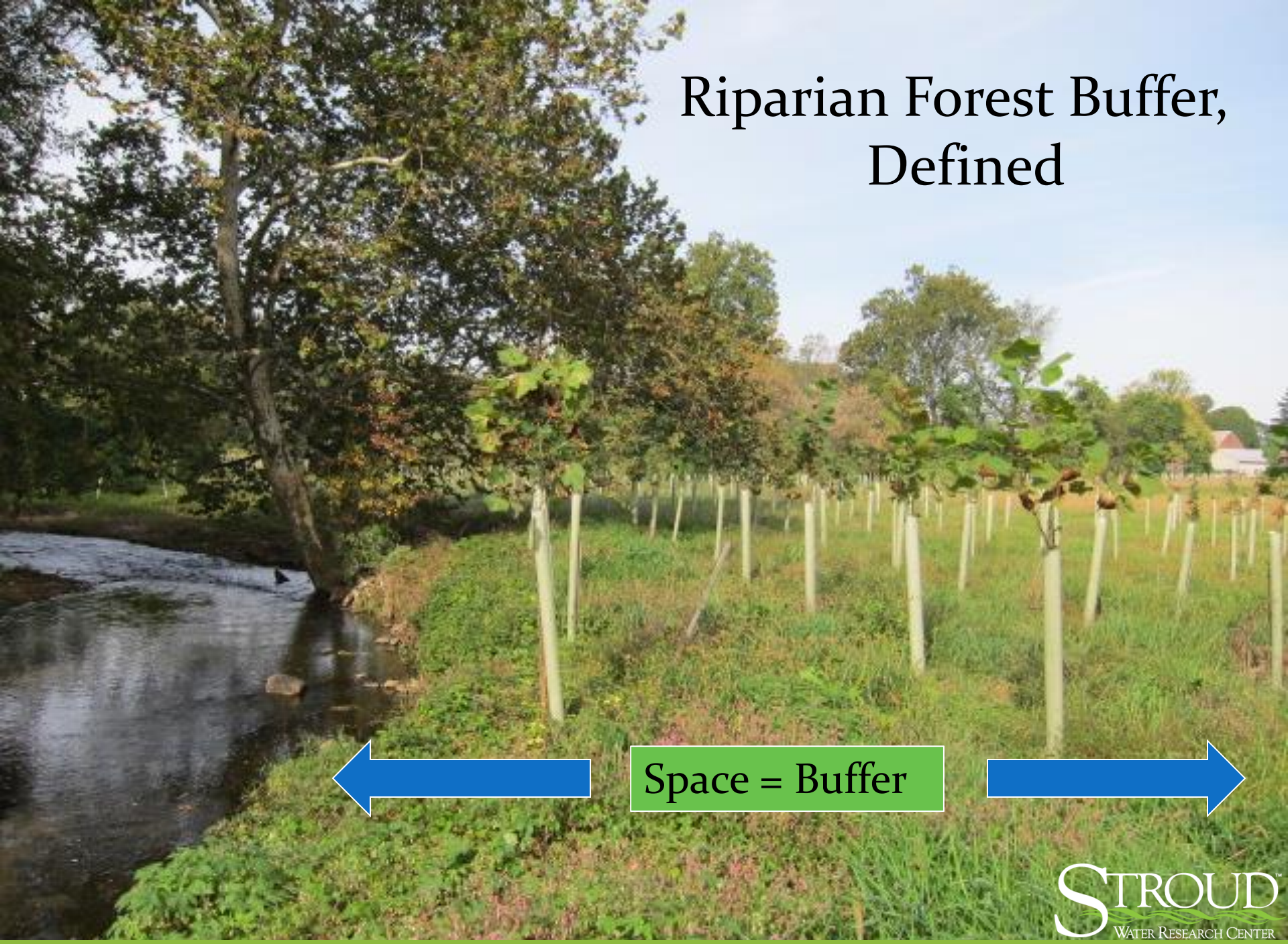
Trichoptera (caddisflies)

Pollution indicators

Annelid worms

Diptera (midges)

Riparian Forest Buffers & Their Role in Healthy Streams


Riparian Forest Buffer, Defined
Space = Buffer
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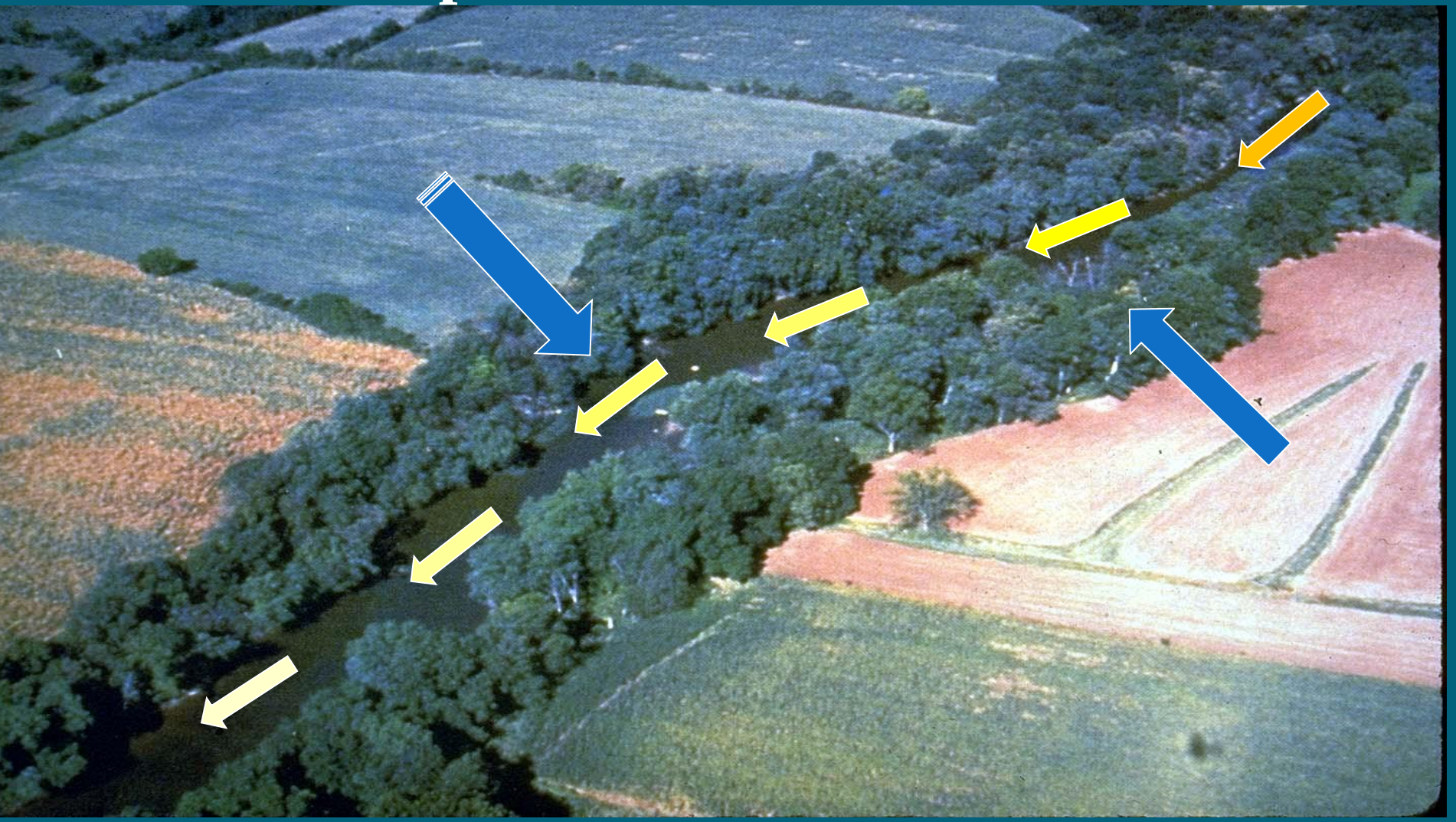
Streamside Forested Buffers

Don’t Just Filter…. They restore function so streams are part of the BMP treatment train



AMERICAN WATER RESOURCES ASSOCIATION

Community, Conversation, Connections

STREAMSIDE FOREST BUFFER WIDTH NEEDED TO PROTECT STREAM WATER QUALITY, HABITAT, AND ORGANISMS: A LITERATURE REVIEW

Bernard W. Sweeney and J. Denis Newbold
Stroud Water Research Center
Avondale, PA

238 scientific studies reviewed
8 factors reviewed

Nitrate removal effectiveness
Sediment trapping efficiency
Stream width optimization
Channel erosion protection
Temperature control
Woody habitat
Macroinvertebrate health
Fish health

For nitrogen:

On average*:

~20% trapped by a 35 ft buffer
~48% trapped by a 100 ft buffer

Good News / Bad News Story
48% removed --- 52% gets in!

*Sweeney, B. W. and J. D. Newbold. 2014. Streamside Forest Buffer Width Needed To Protect Stream Water Quality, Habitat, And Organisms: A Literature Review. Journal of the American Water Resources Association 50(3):560-584

We need the stream to process and detoxify contaminants that reach the stream. Do forests increase a stream's ability to do this?

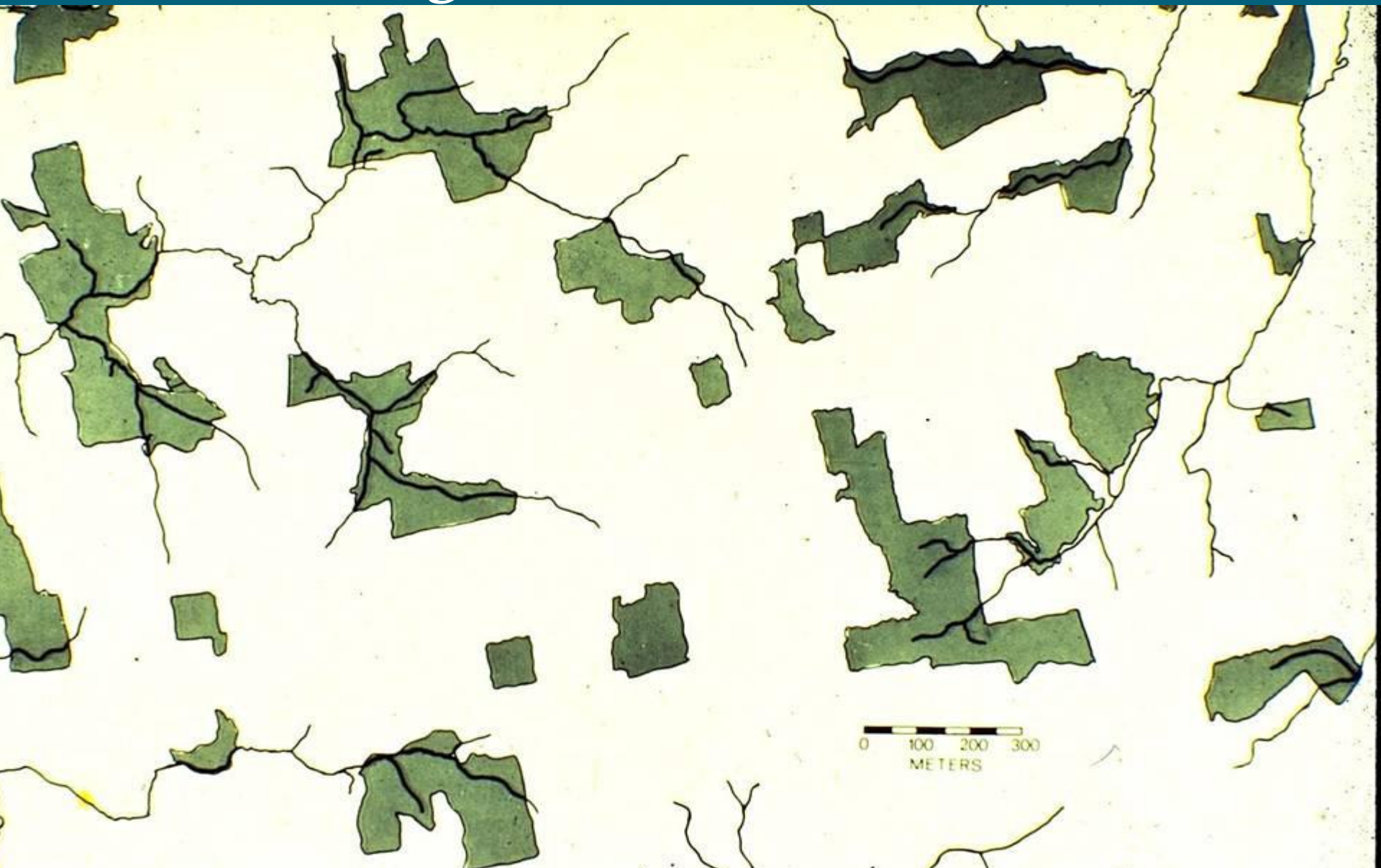
We Looked to Streams for Answers

Proceedings of the National Academy of Sciences, Sept 2004

We Compared:

Forested vs Unforested Sections of 16 PA Streams

Only Difference: We looked at streams flowing through forests and meadows



Findings: Forested Sections of Streams:

- Had 3-5x more biological activity
- More macroinvertebrates – the "good bugs"
- Removed 2-8x more nitrogen pollution

…than stream areas with healthy grass buffers

But Why???

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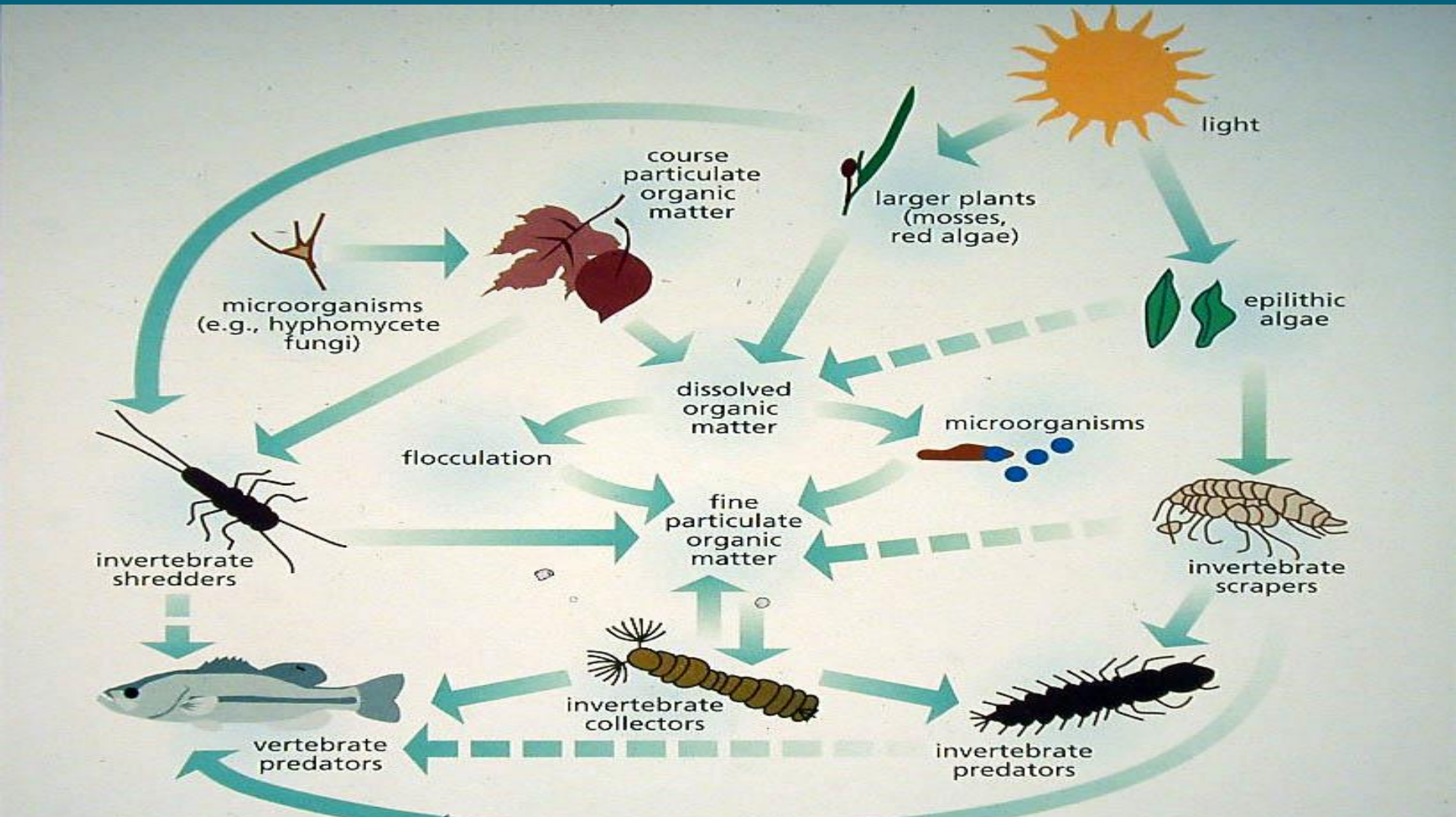
Trees restore a healthy stream that supports more "workers"& healthier "workers"



Stream organisms need high quality food
Leaves and dissolved carbon are key

….a small forested stream can receive up to 10,000 lbs leaves/ac

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This stream has no leaves and is missing many species


Forested streams are cooler in summer and have shady, filtered light…..

Many small stream species are classified as "Cold Water Species"

Need "summer cool" conditions - ≤(68 °F)

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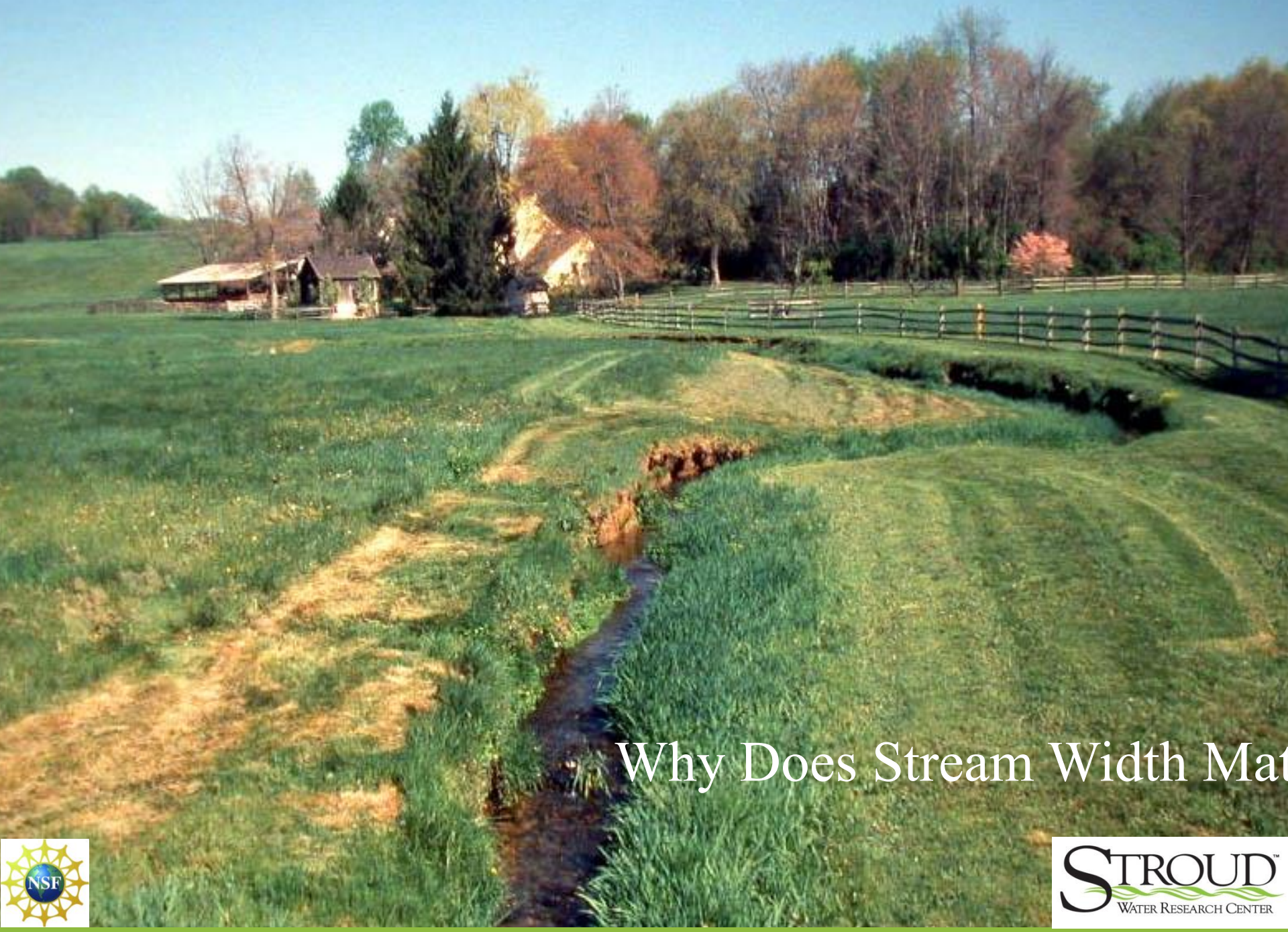
.....that grows more food for the stream

Full sun grows long, stringy algae (poor food)

Forested stream banks and channels are more stable and have better habitat – no human interventions required!

Small stream channels are signficantly wider and slower and shallower....when they are bordered by a forest

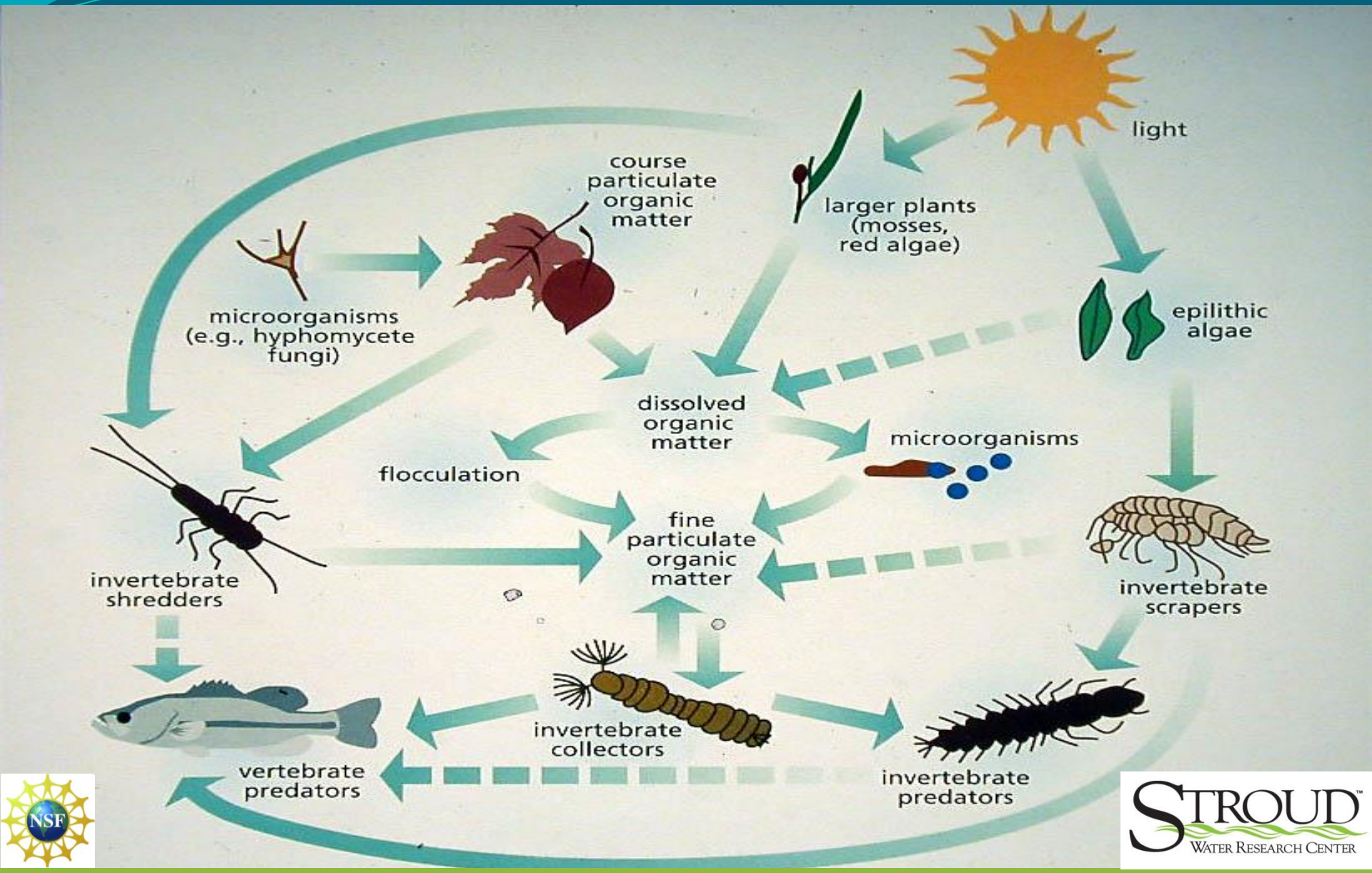

Why Does Stream Width Mat

Forested streams have more ecosystem per unit length …. and thus more potential ecosystem services

Forested

Deforested (grass)

Wider Streams Have More of this Ecosystem



Take Home #1:

Less Pollution…More Bugs…Better Water Treatment

Healthy, biologically active streams can process & reduce pollutants that get past our land-based BMPs, while restoring the aquatic life that removes streams from the "impaired" list.

Take Home #2:

Restored streamside forests, are a “foundation” BMP. How to make attractive to farmers?

Why Buffers as a "foundation" BMP?

- Effective pollution reductions
- Healthier streams that self-purify
- Low cost with state/federal funding
- Decreasing O & M costs over time
- Increasing performance with age
- Wildlife, climate, people & pollinator benefits

How to grow a streamside forest

What to plant? How to plant? What size to plant?
How to protect the new forest from deer, voles, and invasive plants?

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Tools for Forested Buffer Restoration

- **USDA's Conservation Reserve Enhancement Program**
- USDA's Environmental Quality Incentives Program
- REAP state tax credit
  (Resource Enhancement and Protection Act)
- other: TreeVitalize, watershed groups, etc.

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CREP is tops on project costs

Program	Installation costs typically covered	Costs covered for Post-planting care
CREP	100-125%	3 yrs, 100% on key parts
EQIP etc.	~75-90%	none
REAP	75%	3 years, 75%
other	varies; TV, GG	typically none

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CREP pays installation costs AND rent for the land

- ~$100 to $350+ per acre per year; check with FSA
- Second 15-year contract would double

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Critical: Control vegetation around the shelter, typically with aquatics-approved herbicide.
Years 1-5 most critical for maintenance tasks

Getting Started with CREP

- Landowner calls county Farm Service Agency
  - no obligation, starts process
  - Chesapeake Bay Foundation staff assists

- www.creppa.org has info, too

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Farm Stewardship Program Incentives:

- Encourage use of CREP for buffers
- $4000 per acre of buffer as "voucher"
  - Vouchers pay for ag BMPs
  - Vouchers work twice
- double vouchers for permanent buffers

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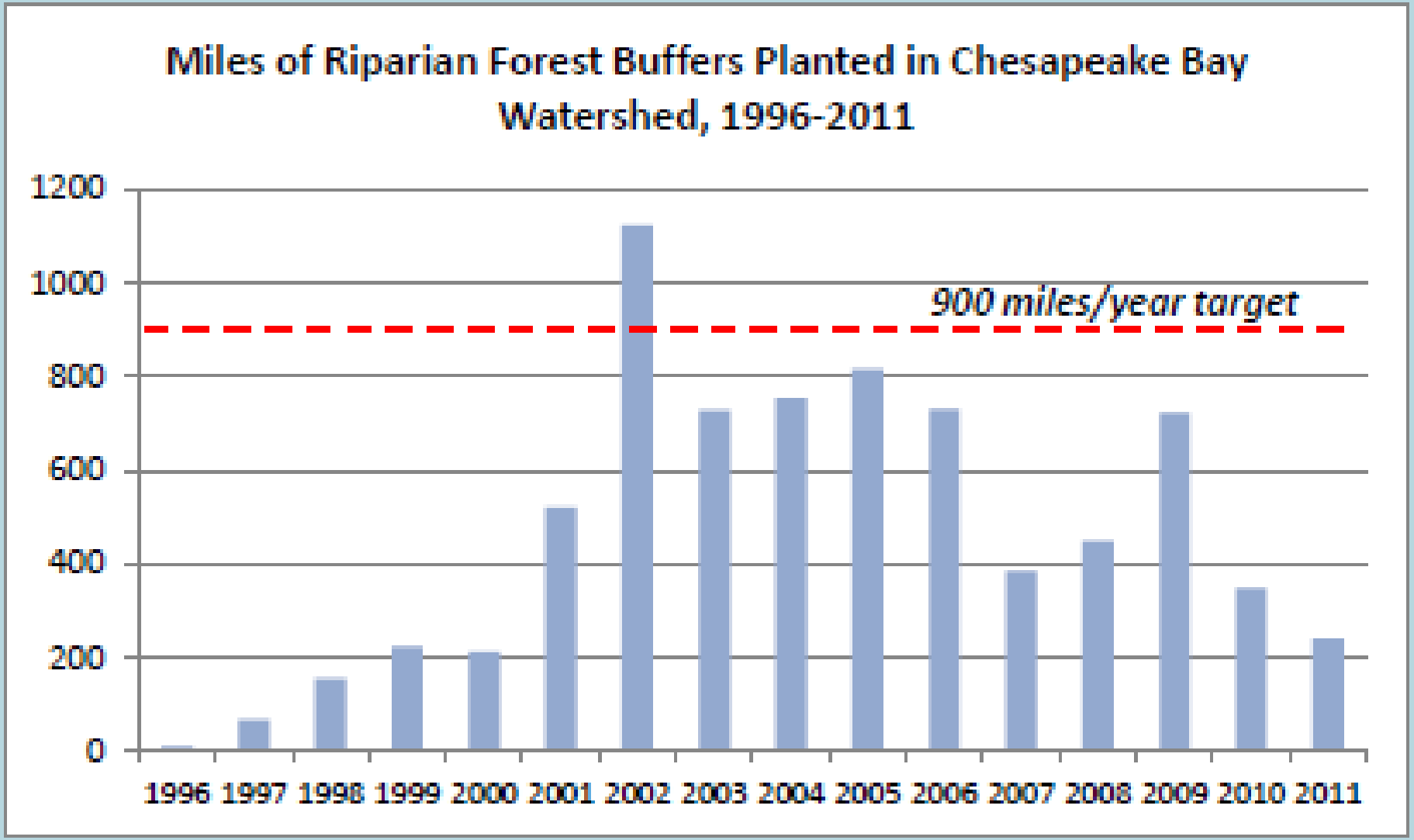

Figure 1.2. Miles of riparian forest buffer planted from 1996 to 2011. Source: Chesapeake Bay Program


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Thank You!

Lamonte Garber
Stroud Water
Research Center
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www.stroudcenter.org