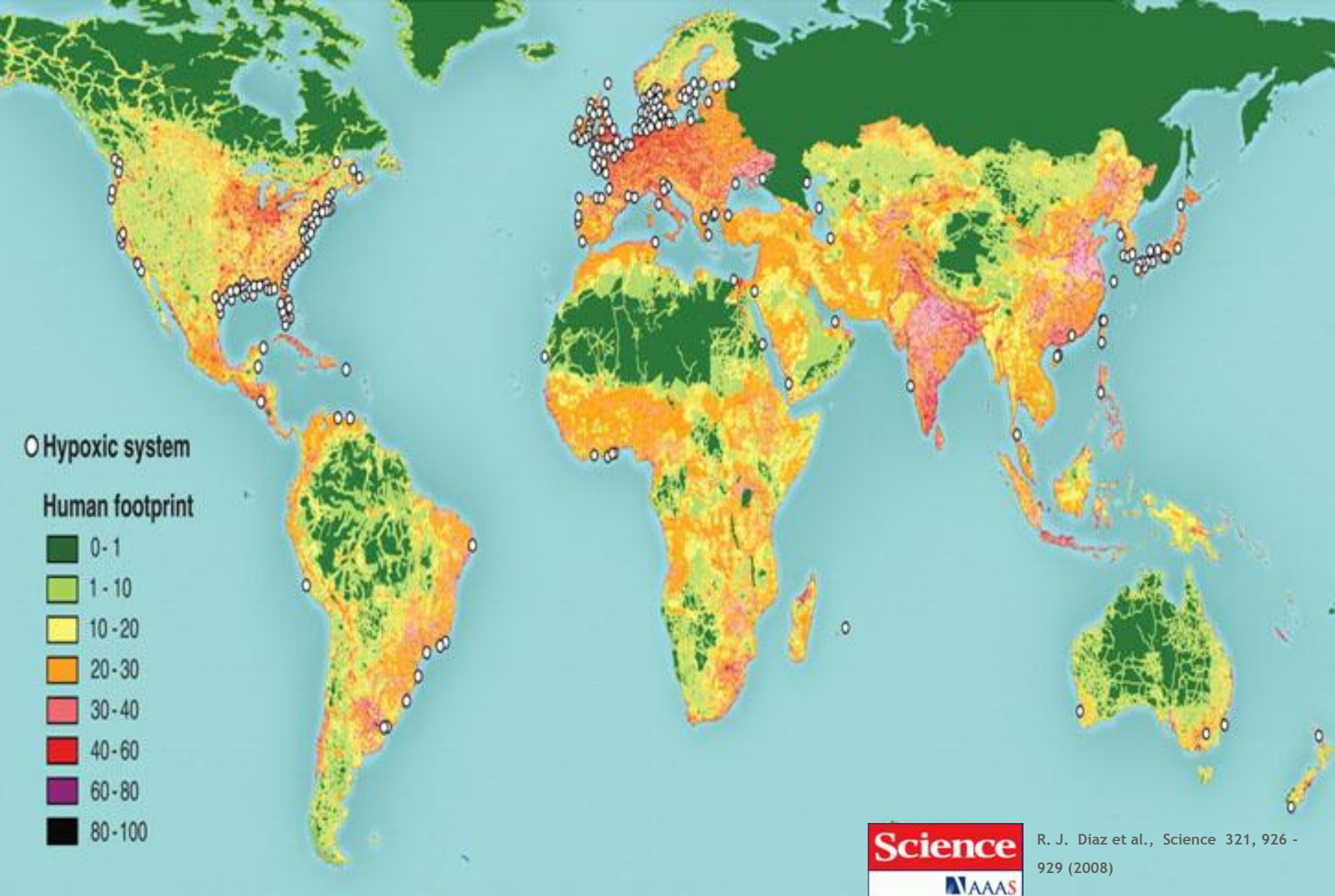




# Our Mission

To advance our global knowledge and stewardship of fresh water systems through research, education, and restoration





Ocean Dead Zones

400 + and on the

Caused  
by  
sediments  
,  
nutrients,  
and toxins  
transporte













Small streams  
are big business

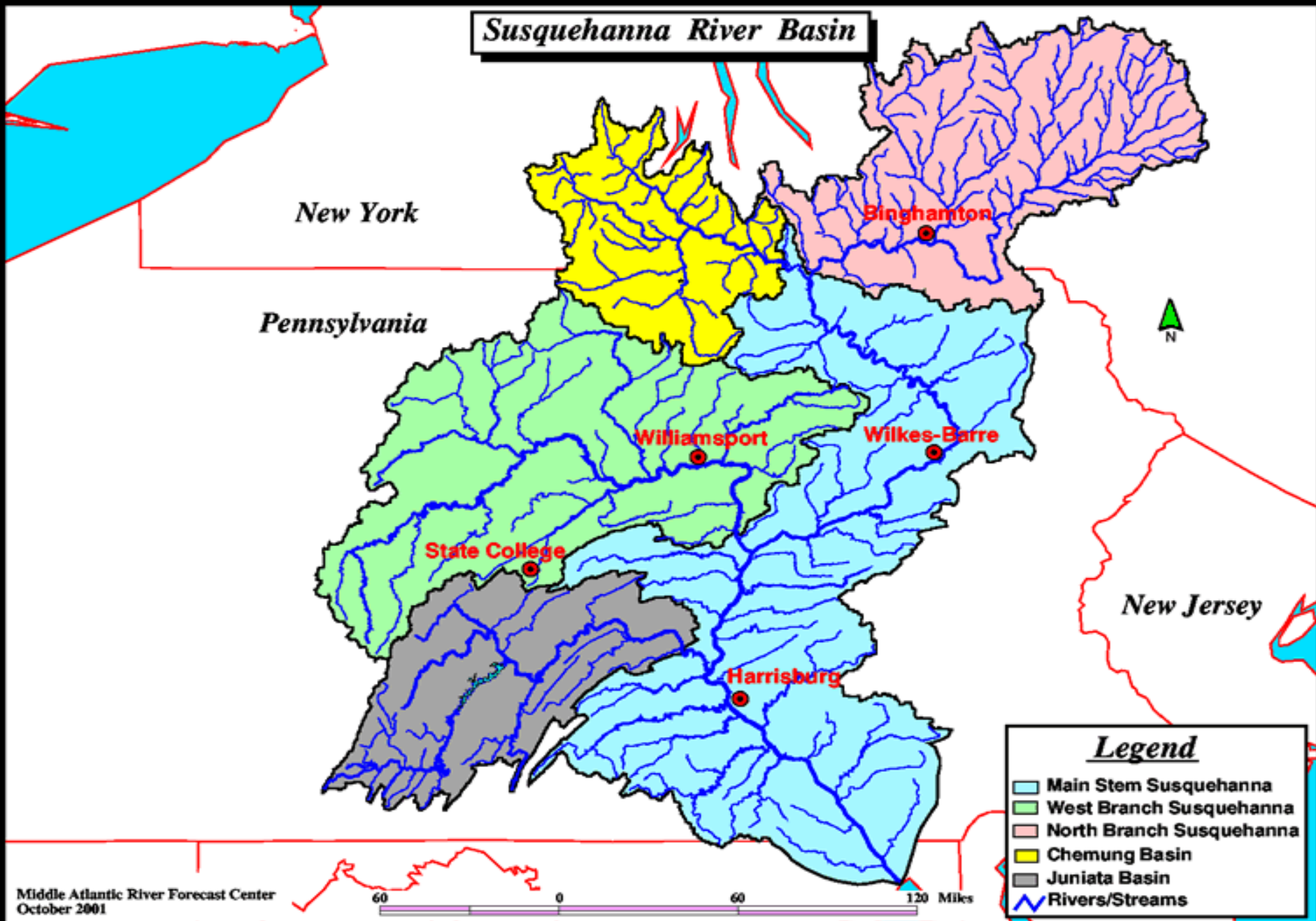


Small streams  
are big business  
(>90% in Ch Bay  
Watershed, US,  
World)

**Roadside ditches are simply small intermittent stream**



< 5% of the streams are shown on this map at this scale





Small streams  
are the heart and  
soul of every  
river system!



Small streams  
are the entry  
point for the  
majority of the  
water and “stuff”  
in a river system!  
.....because.....



.... First order streams (and their intermittent tributaries) are everywhere!

\*\*\* conservation practices \*\*\* conservation practice

# Terraces



Permanent protection with terraces.

\*\*\* conservation practices \*\*\* conserv

# Grassed waterways



# Riparian Forest Buffer





**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**

**2014**

**Journal of the American Water Resources Association  
50(3):560-584**

# **8 parameters reviewed**

**Sediment trapping**

**Nitrate removal**

**Channel width**

**Channel meandering and bank erosion**

**Temperature**

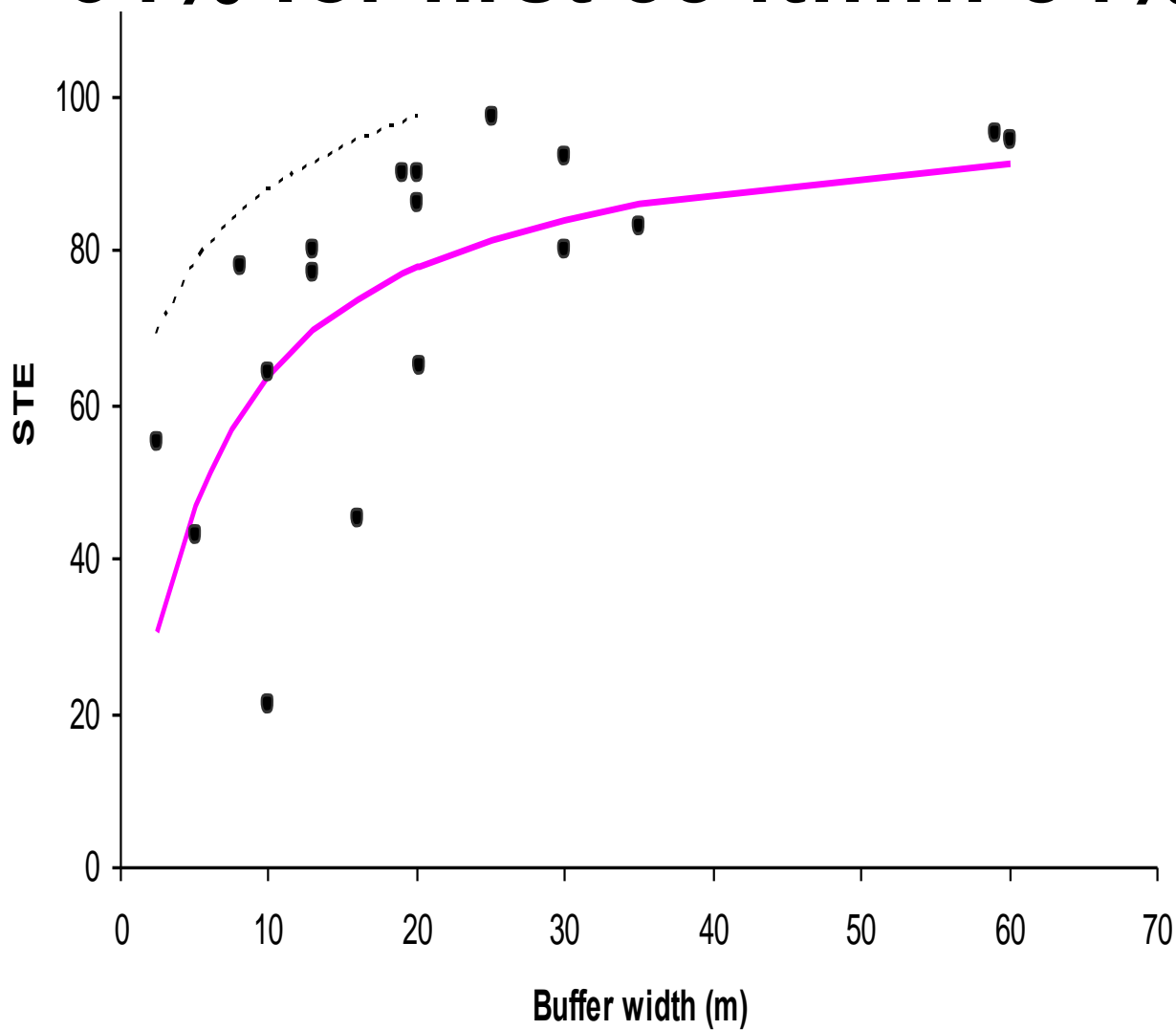
**Large woody debris**

**Macroinvertebrates**

**Fish**

# Sediment Trapping Efficiency

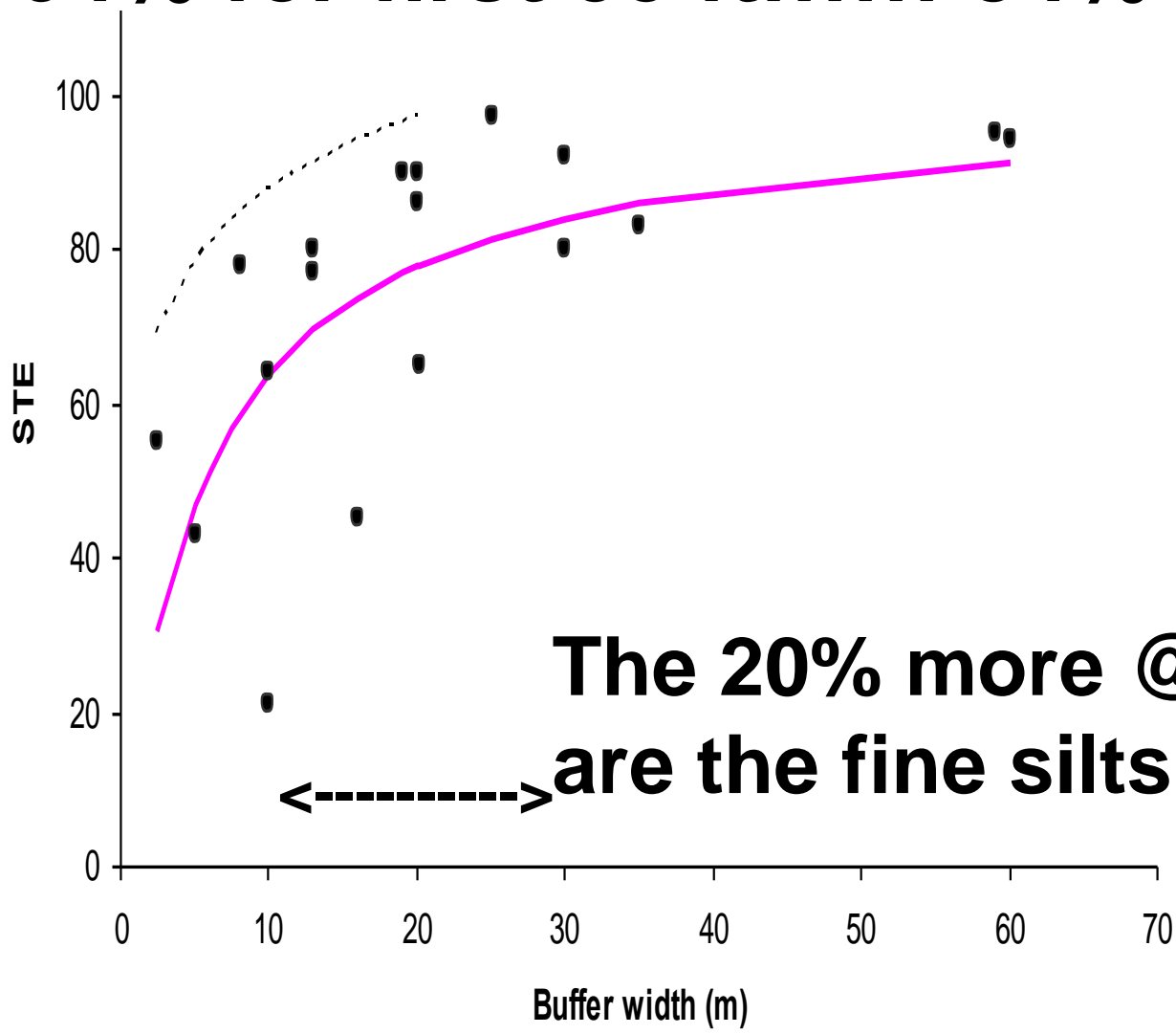
**64% for first 33 ft..... 84% for 100 ft**



**Buffer Width (m)**

# Sediment Trapping Efficiency

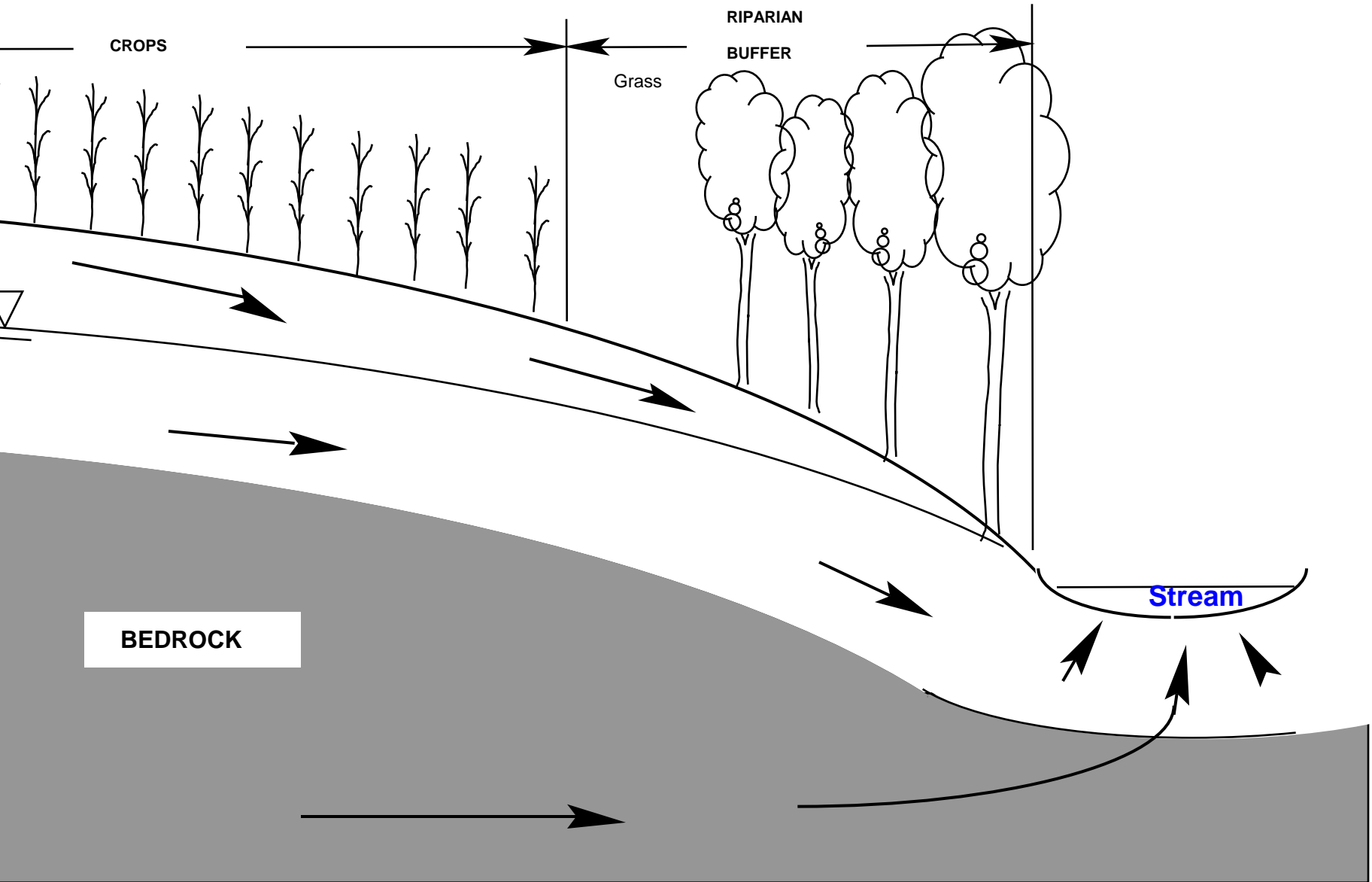
**64% for first 33 ft..... 84% for 100 ft**

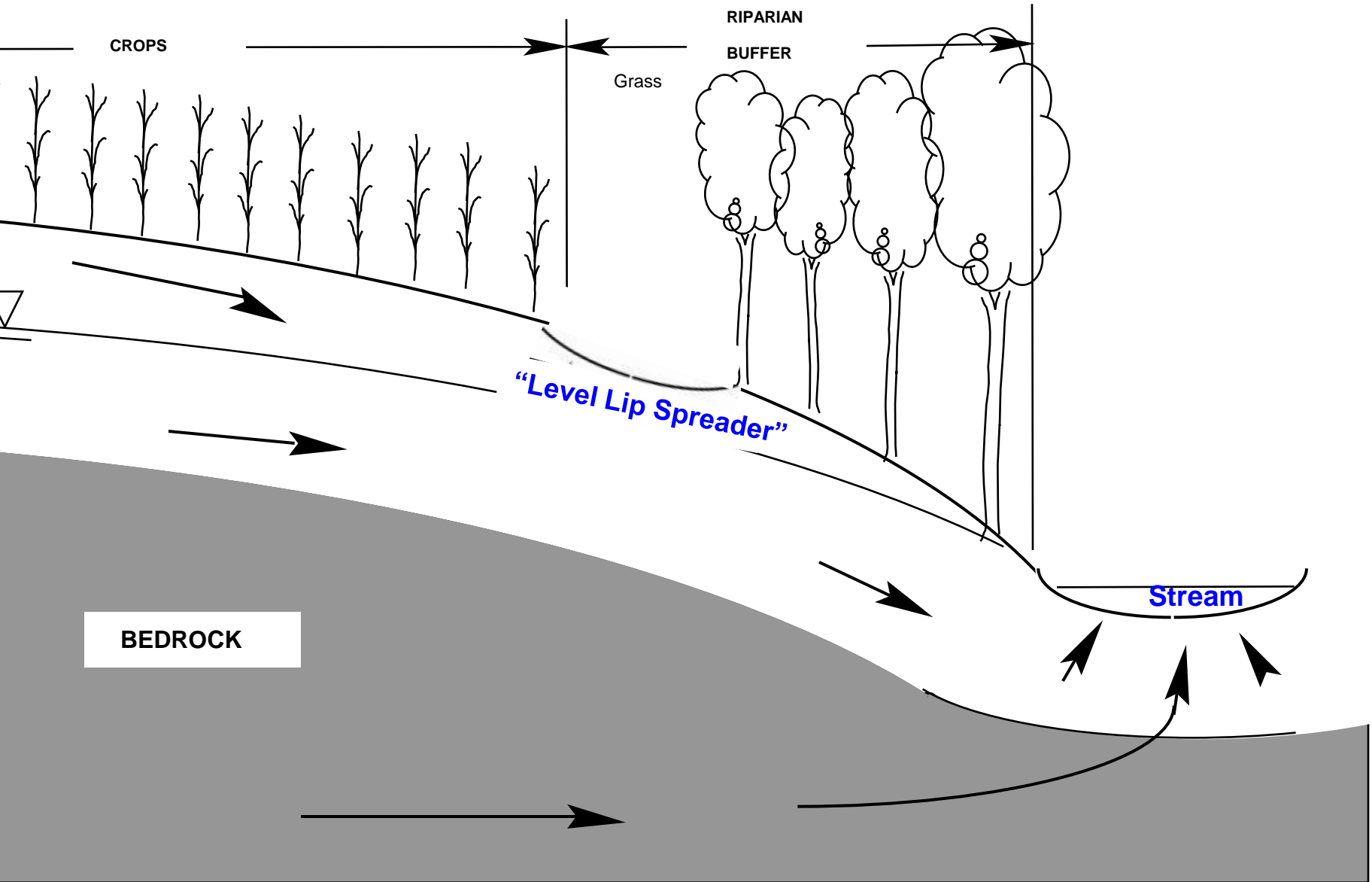


**The 20% more @ 100 ft  
are the fine silts and clays!!!**

**Buffer Width (m)**

# A level lip spreader can increase the trapping efficiency of sed



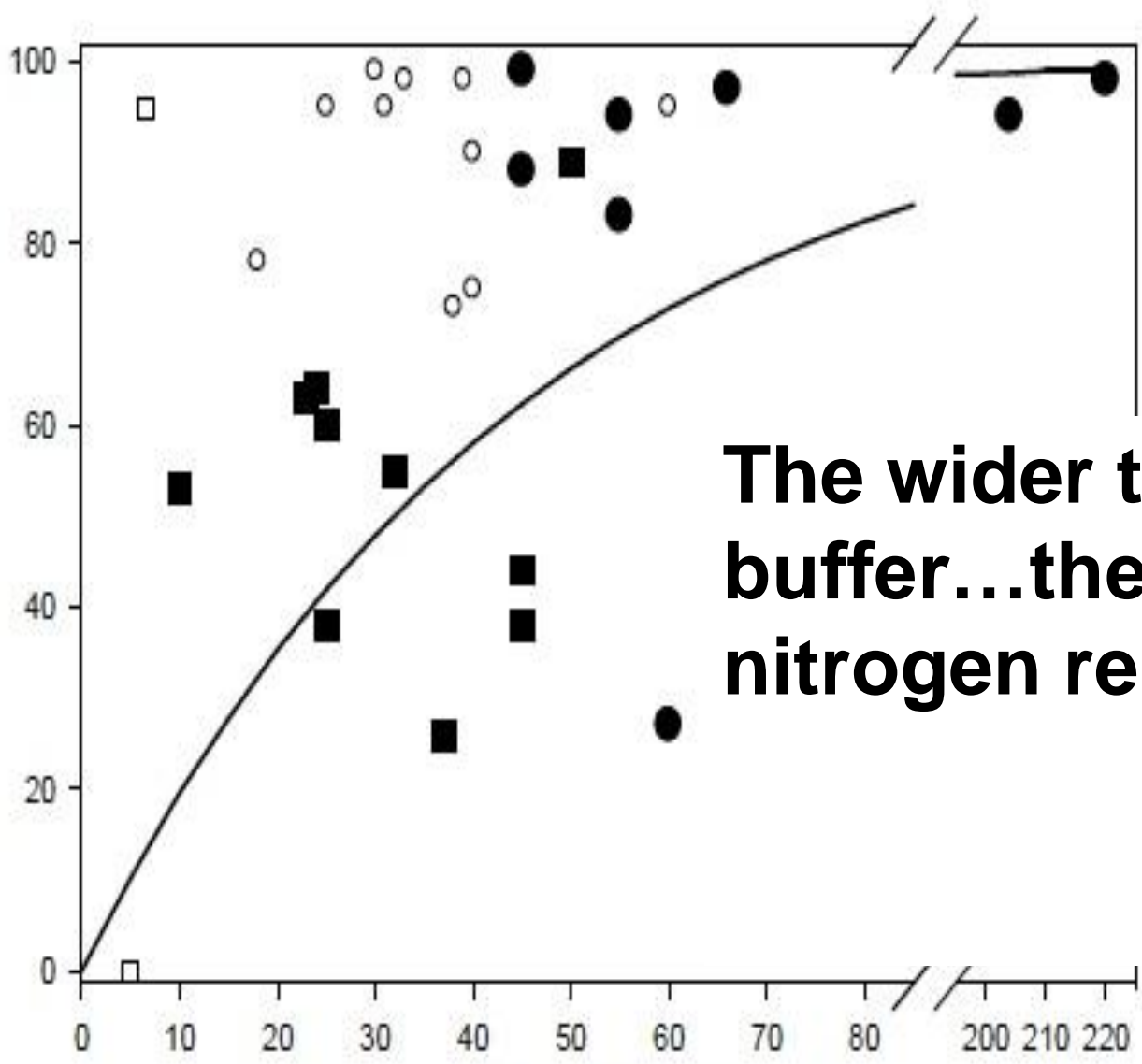




**A level lip spreader can (theoretically) capture all the sediment from most small storms**

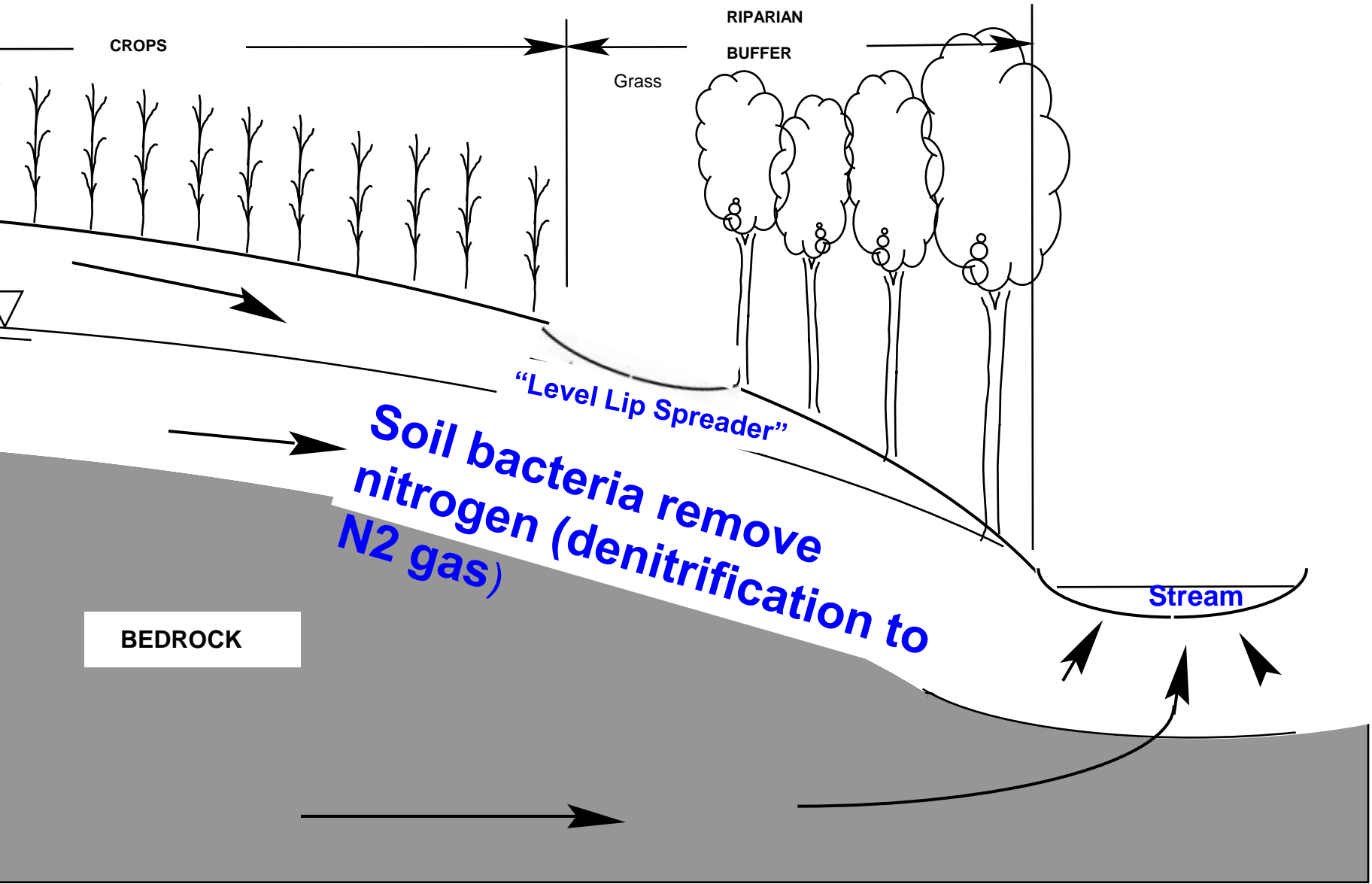


Nitrate Removal Efficiency (%)



**The wider the buffer...the more nitrogen removal!**

Buffer width (m)



***Newbold, Herbert, Sweeney, Kiry, and Alberts. 2010. Water Quality Functions of a 15-year Old Riparian Forest Buffer System. Journal of the American Water Resources Association 46:299-310***



# Results

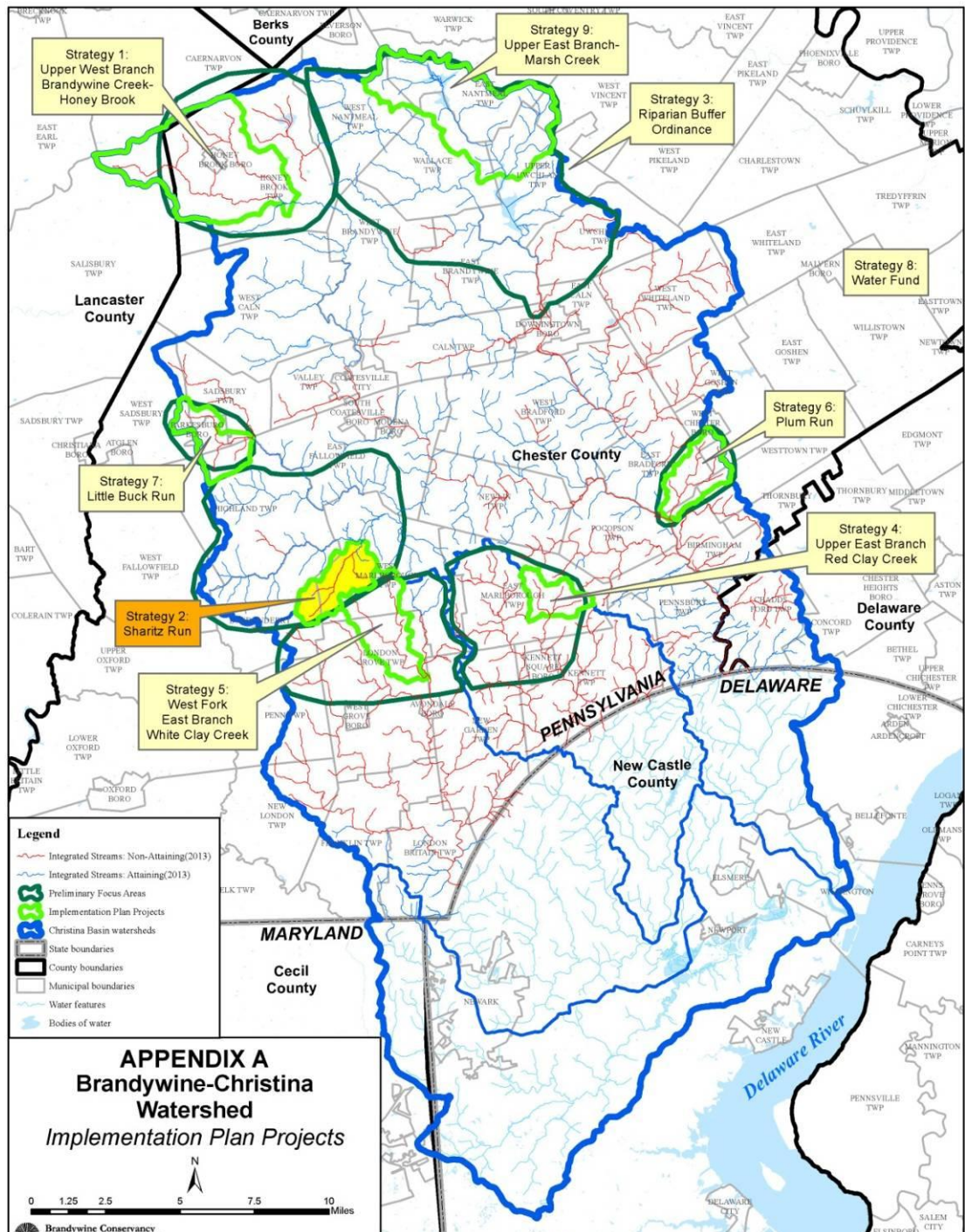
**Level lip spreader in combination  
with a 100 ft forest buffer  
kept  
43% of sediments and  
26% of the nitrogen  
out of the creek**

# Sharitz Run Restoration Project

NFWF 2014-2016

Flood mitigation /  
Water Quality  
Improvement

Goal: 303d delisting  
to cold water trout  
fishery in <10 years

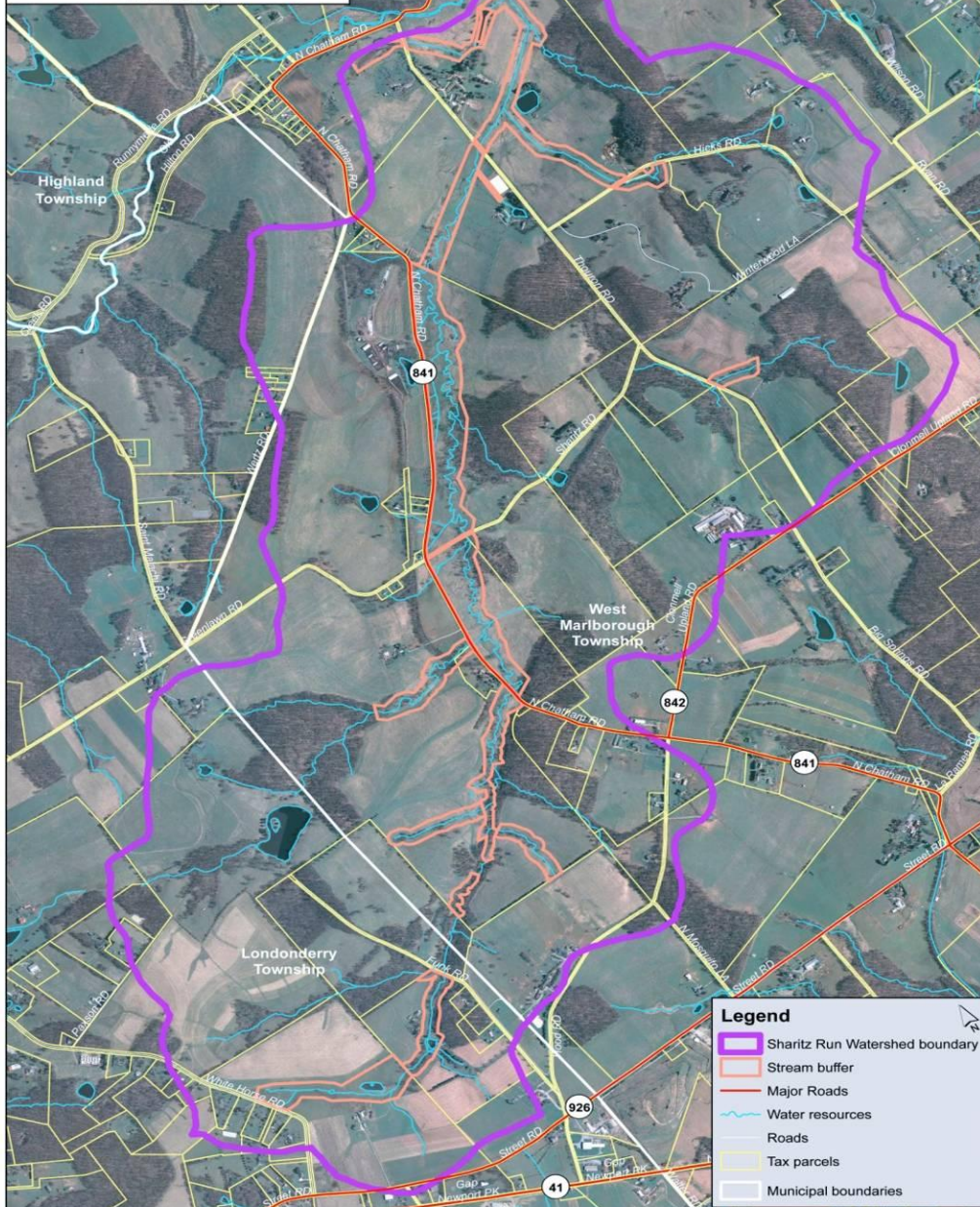


## Strategy 2: Sharitz Run Watershed

0 1,200 2,400 Feet

Brandywine Conservancy

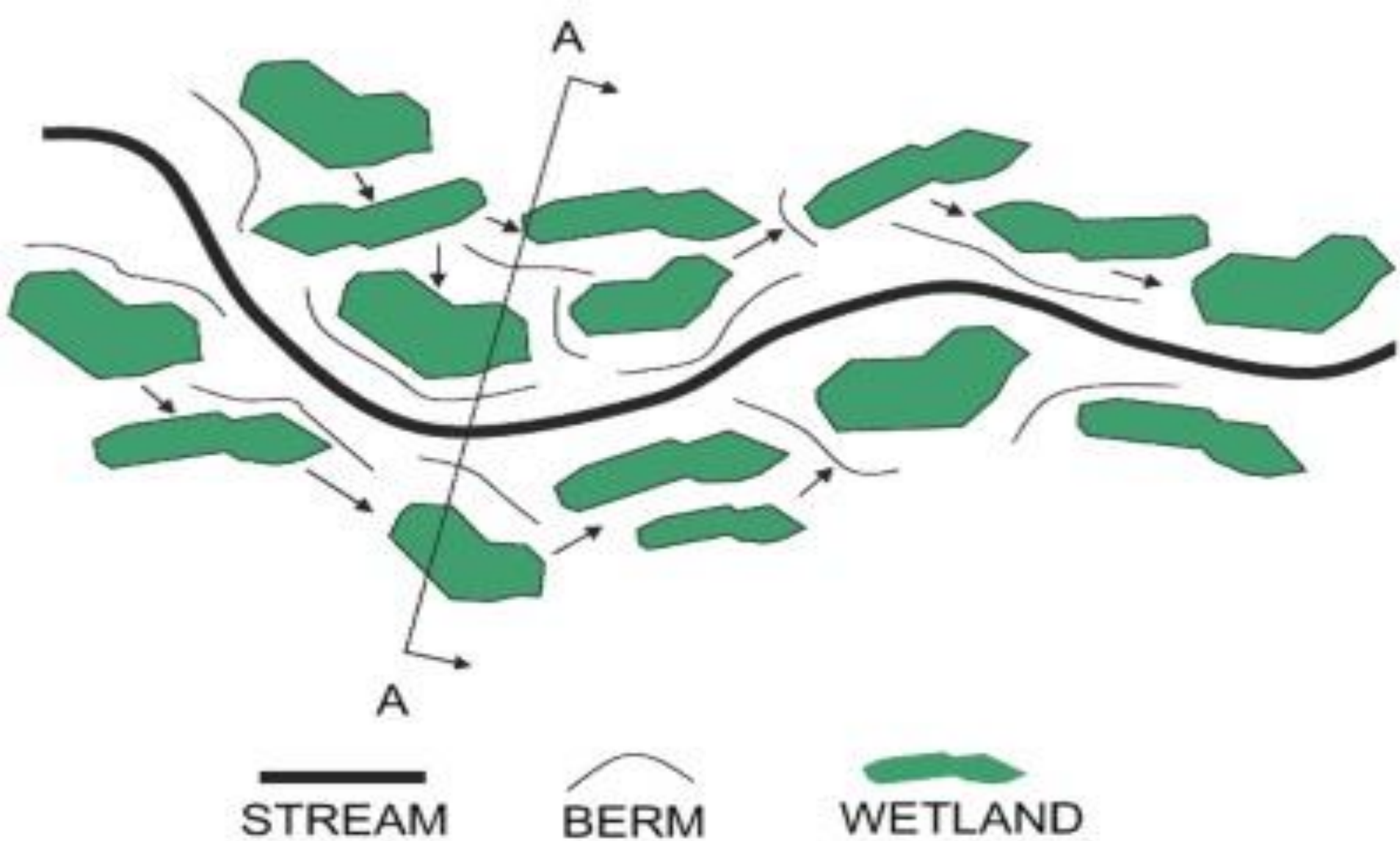
Environmental Management Center  
1010 S. Brandywine Ave. Suite 100  
Wilmington, DE 19801  
Note: This map is for illustrative purposes only  
and does not constitute a valid survey.  
Data source: Aerial data from DVMPC, 2010.  
Map created: August 13, 2013.



8.5 miles of 100 ft wide  
forest buffers  
(39,000 trees) with  
level lip spreaders

Large woody debris  
additions to 1<sup>st</sup> and 2<sup>nd</sup>  
order tributaries (pre-  
Columbian levels)

Flood pocket wetlands  
w level lips on road  
ditches & mainstem





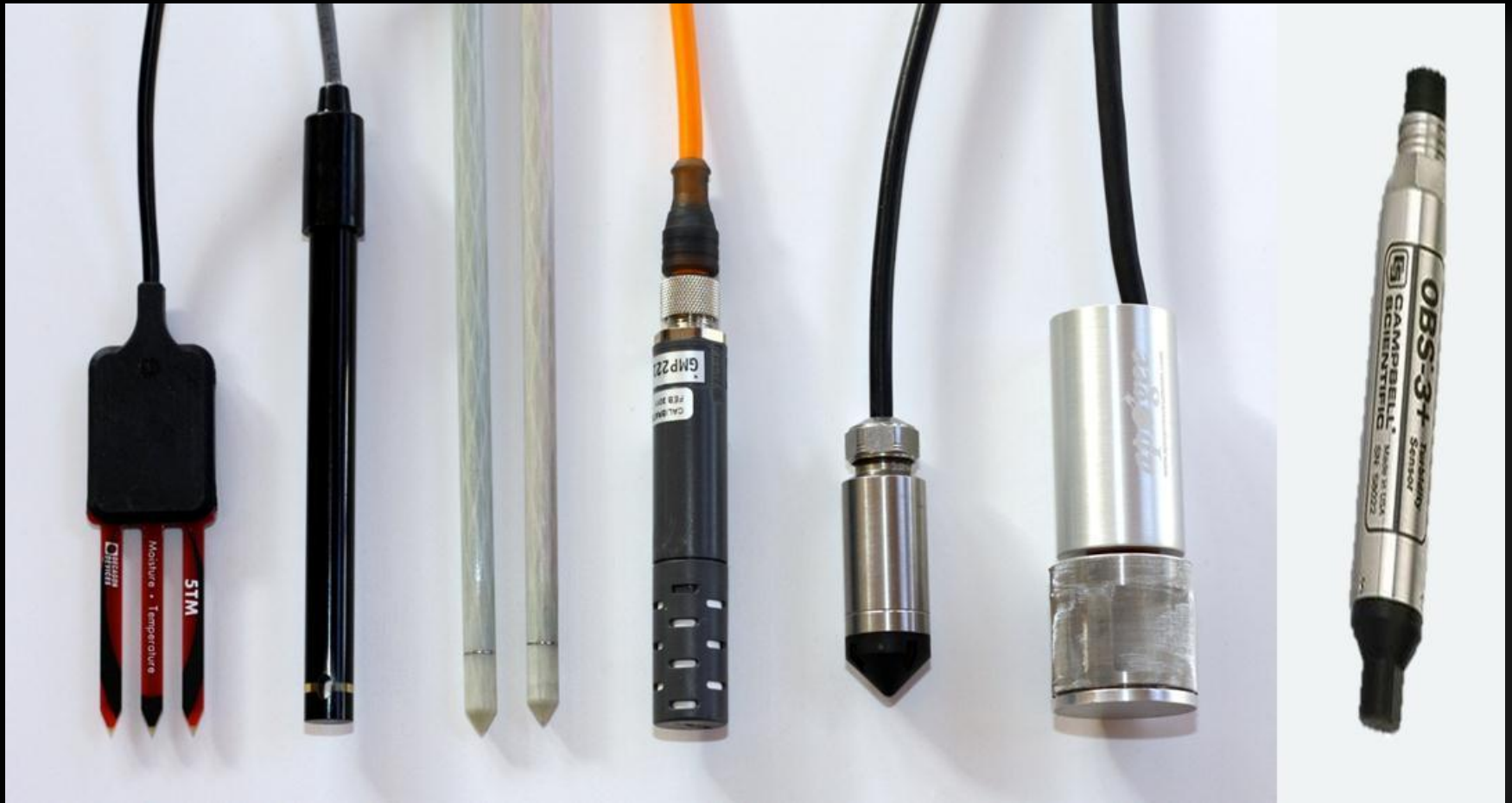




04.24.2014 13:42



# Sensor Technology

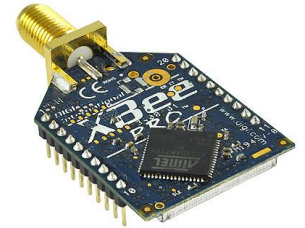
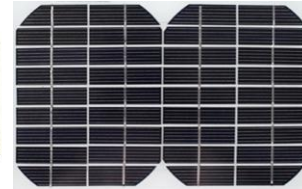
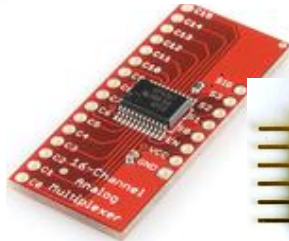
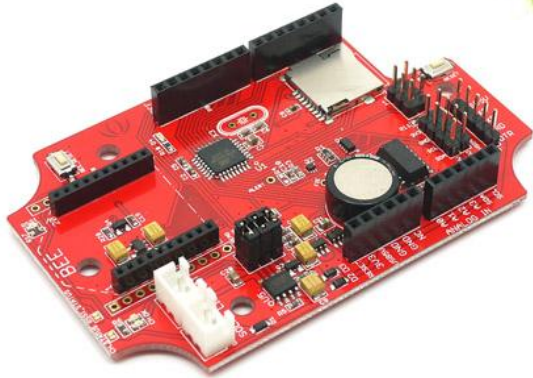


Decagon, Sensorex, Vaisala, Keller America, Apogee  
soil moisture, conductivity, redox, carbon dioxide, water depth, oxygen, turbidity

# Open Source Electronics

data-loggers &

radios



16-channel  
Multiplexer

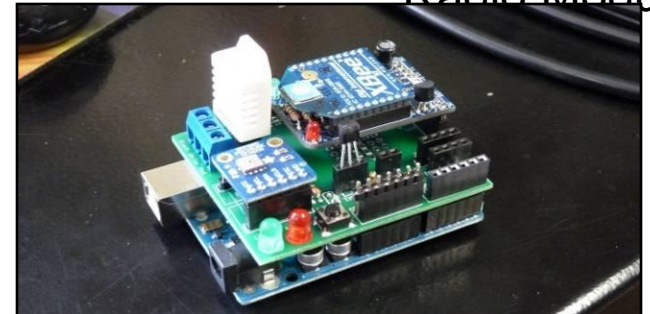
18-bit A/D  
Converter

Solar Panel

XBee ZigBee  
Radio Modules

Seeeduino  
Stalker

Microprocessor &  
Datalogger

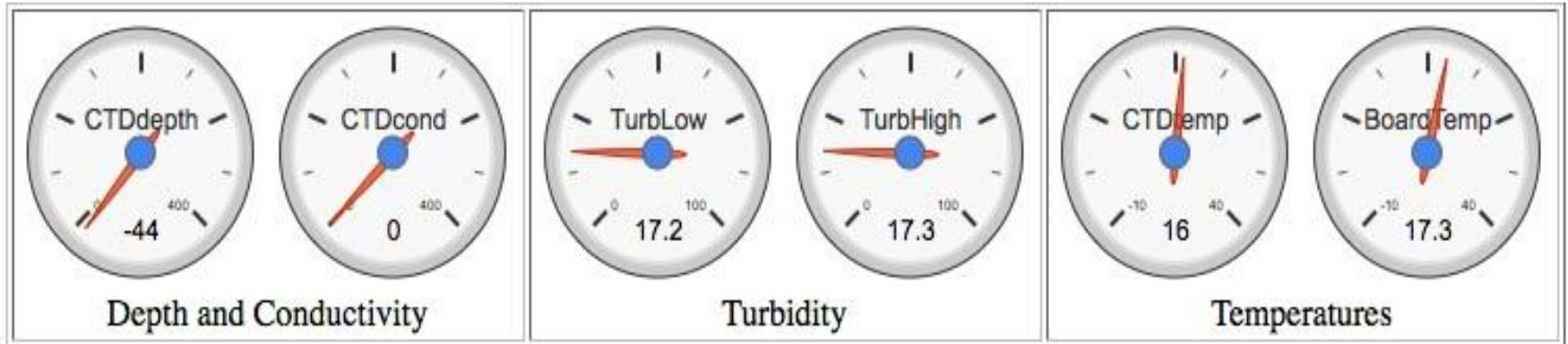




## Lateset readings:

At 2014-09-29 20:42:39 EST:

CTD Depth= -44mm, CTD Temp= 16 degreesC, CTD Conductivity= 0 uS/cm  
Turbidity Low= 17.2 NTU, Turbidity High= 17.3 NTU, Board Temp= 17.3 degreesC



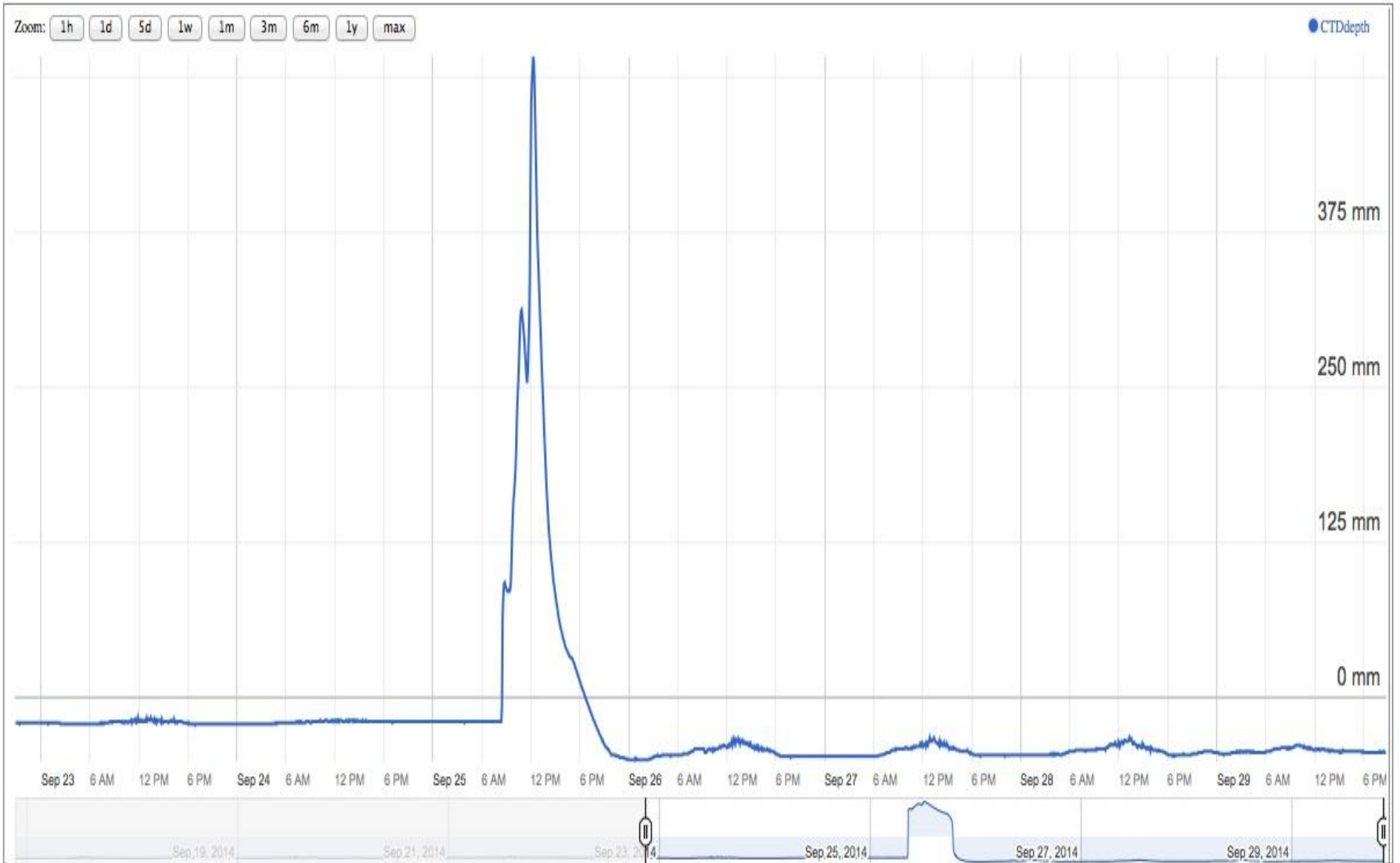
Show all data in the database [as table](#) or [as CSV text](#)  
[Get raw CSV text file](#) or [see simple text of latest readings](#)

<http://swrcsensors.dreamhosters.com/>

“SL034 Turbidity / CTD logger near Chestertown MD”

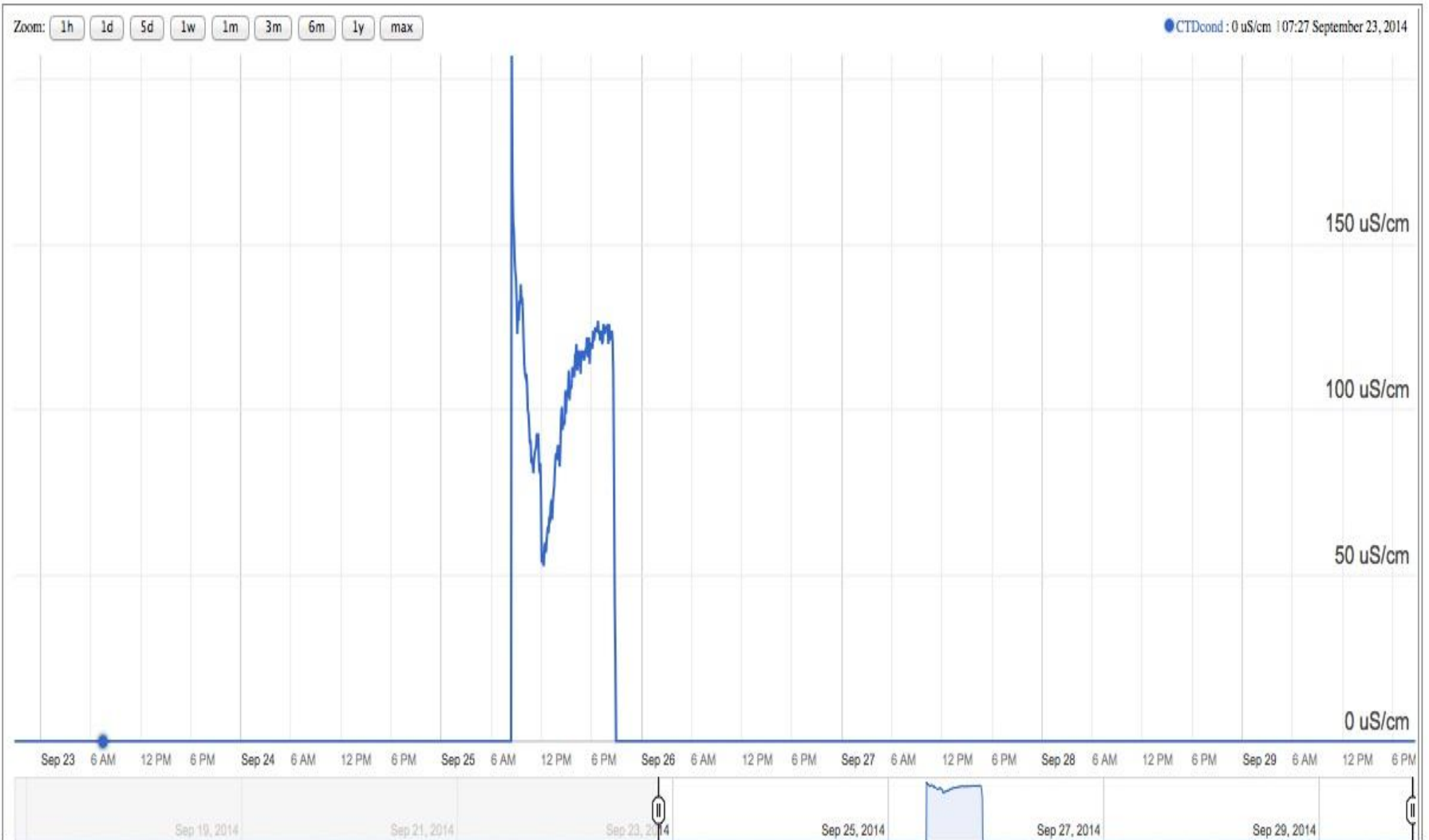
# SL034 - Water Depth

Water Depth (in millimeters)



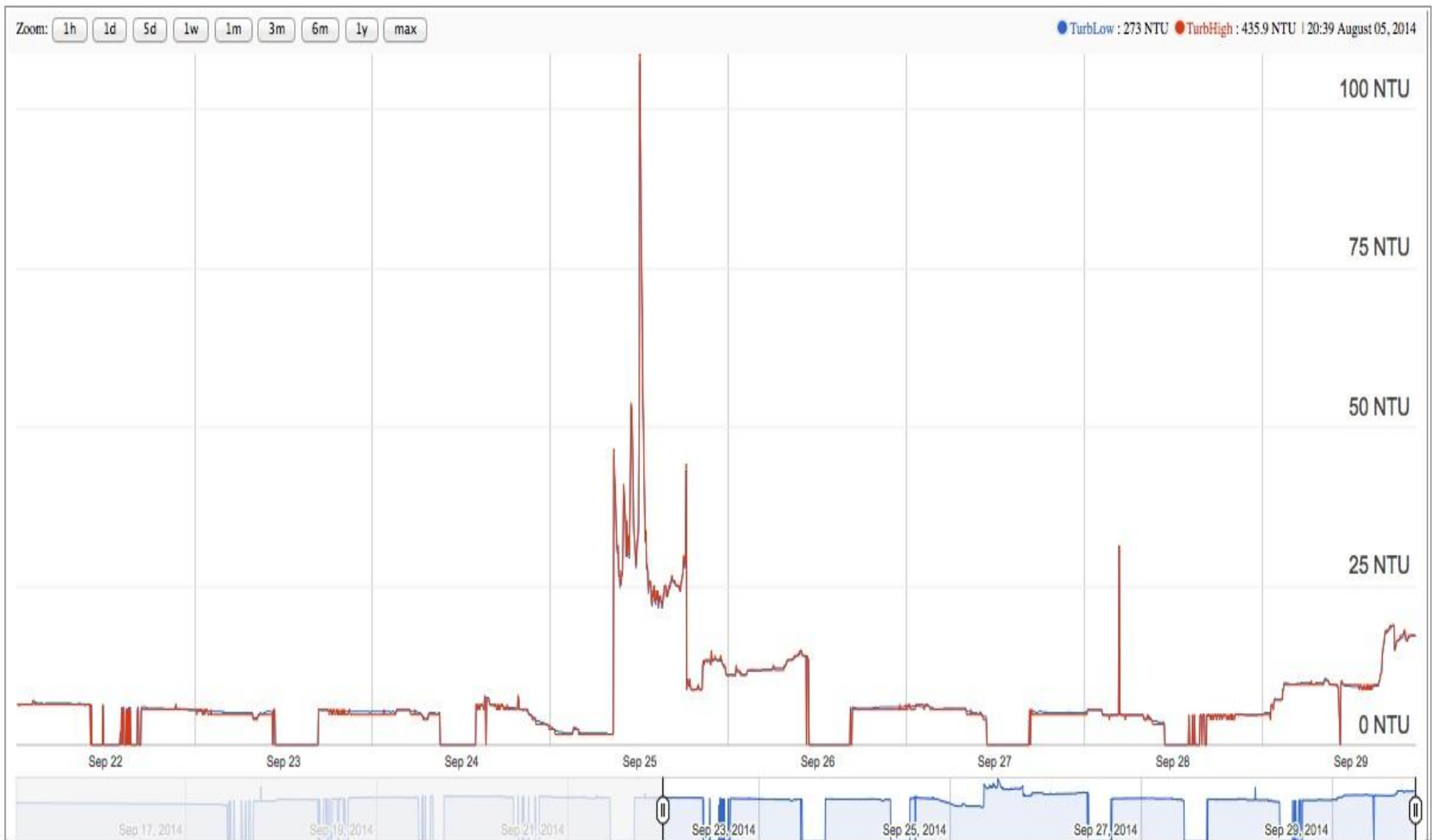
# SL034 - Water Conductivity

Conductivity(in uS/cm)



# SL034 - Water Turbidity

Turbidity (in NTU)



# Technology meets the Watershed Restoration



# Technology meets the Watershed Restoration





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