Bear Run

Swedish-Bucket Lime Doser Demonstration

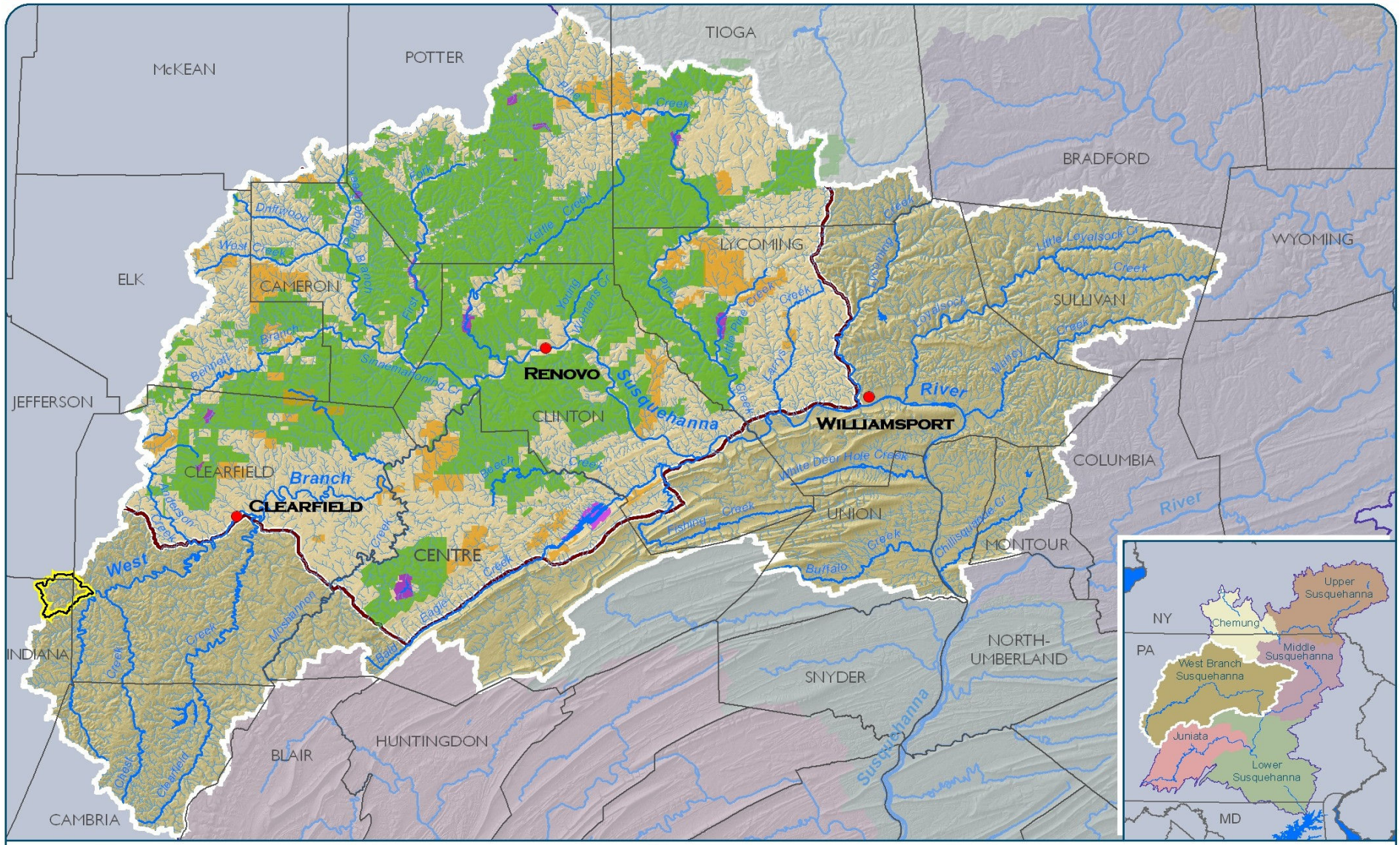
Tom Clark, AMD Program Coordinator, Susquehanna River Basin Commission

Bear Run Watershed Facts

- Is a 19.3 square mile subwatershed of the West Branch Susquehanna River
- Located in Indiana, Clearfield, and Jefferson Counties
- Much of the watershed inside SGL 174
- Very rural with an extremely small watershed population
- Impacted by AMD from past coal mining
- First recipient of a Watershed Renaissance Grant Award in the Commonwealth of PA

BEAR RUN WATERSHED & THE PENNSYLVANIA WILDS

In Reference to the West Branch Susquehanna Subbasin



State Forest
State Park
Gameland
PA Wilds Boundary
Population Center
County Boundary
Major Stream
Water Body
Bear Run Watershed

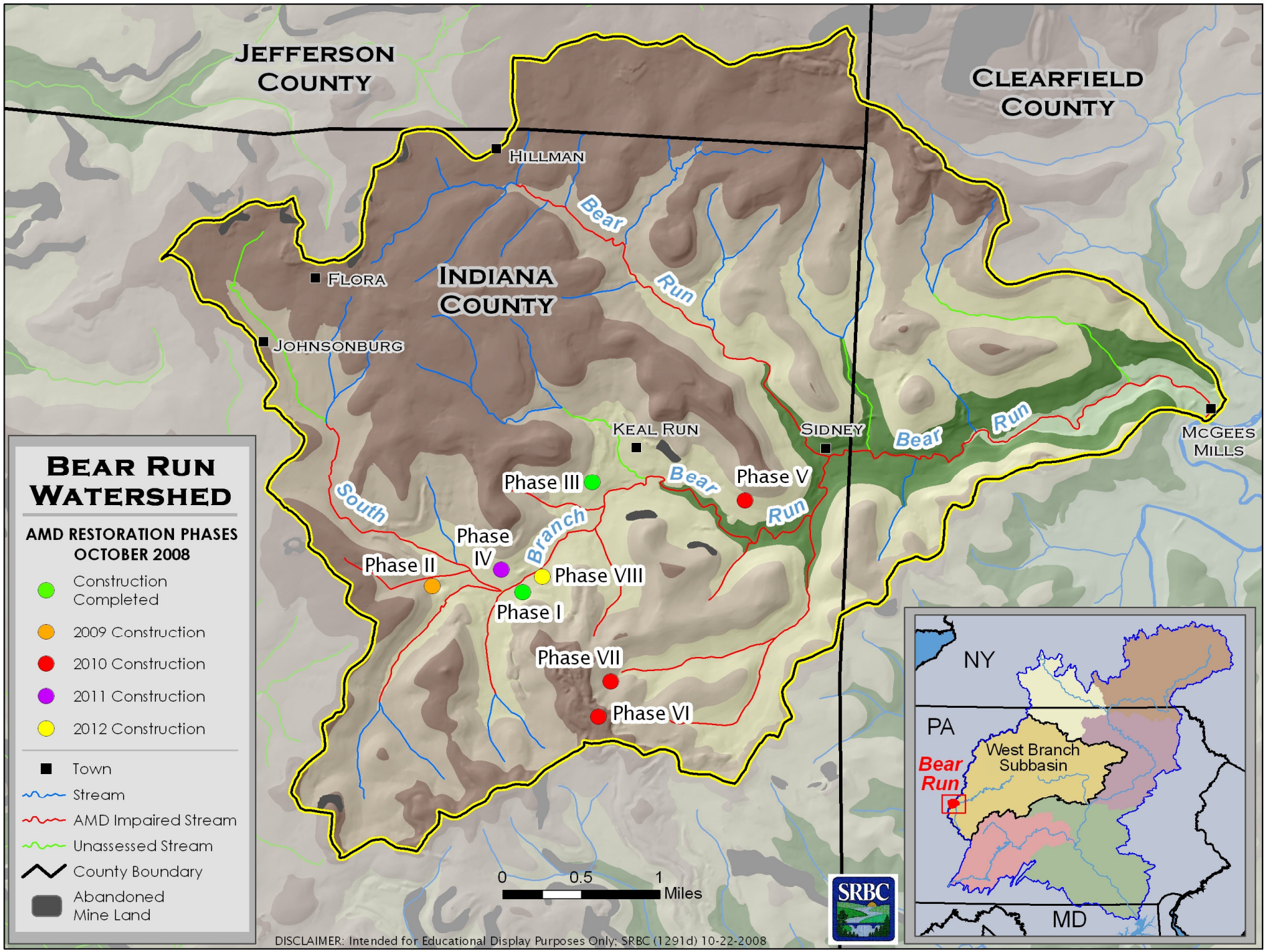
2007

Sources
Major Water Features: National Hydrography Dataset (NHD), USGS; Subbasins: SRBC, 2006; Population Centers: Environmental Systems Research Institute;

County Line: PA Department of Transportation, Cartographic Information Division, 1997; PA Wilds, State Parks, State Forests: PA Department of Conservation & Natural Resources; Gamelands: PA Game Commission, 2004.

0 5 10 20 Miles

Susquehanna River Basin Commission
Disclaimer: Intended for Educational Display Purposes Only
SRBC (1291a) 03-13-2007


Jefferson County
Clearfield County
Indiana County
Hillman
Flora
Johnsonburg
Keal Run
Sidney
McGees Mills
Bear Run
South Branch Bear Run
Phase I
Phase II
Phase III
Phase IV
Phase V
Phase VI
Phase VII
Phase VIII
Bear Run Watershed
AMD Restoration Phases
October 2008
Construction Completed
2009 Construction
2010 Construction
2011 Construction
2012 Construction
Town
Stream
AMD Impaired Stream
Unassessed Stream
County Boundary
Abandoned Mine Land
0
0.5
1
Miles
NY
PA
MD
West Branch Subbasin
Bear Run
SRBC
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Phase V-VII Water Quality

Discharge	Flow	pH	Alk.	Acid.	Fe	Al
	GPM	SU	mg/l	mg/l	mg/l	mg/l
V	111	3.1	0.0	144.0	4.1	14.6
VI	60	2.6	0.0	329.0	27.5	18.2
VII	64	3.1	0.0	175.0	4.0	19.4

Phase V-VII Treatment Alternatives

- **No Treatment** – Bear Run continues to be impaired
- **Passive Treatment (VFWs)** – Risk of malfunction due to heavy acidity and aluminum loading
- **Active Treatment** – High operational costs
- **Passive/Active Fusion** – Benefits of both while lessening the risks and costs

Swedish-Bucket Lime Dosing Silo

- Direct relationship between lime dose amount and flow (can either adjust flow or lime quantity)
- Uses no electricity, only the power of the water flow
- Has only three moving parts, maintenance is minimal, easy, and cheap
- Small footprint
- Minimizes thermal pollution


DANGER
CORROSIVE
DANGER
CORROSIVE

Swedish-Bucket Test

- One-ton test unit installed on the Banks Coal #1 Discharge
- Similar water quality to the Phase V-VII discharges, just less flow and more accessible
- Filled with ½ ton of hydrated lime
- Data logger installed ¼ mile downstream on Murray Run
- Tested from May 11th – May 18th 2009
- Doser online May 13th – May 18th 2009


05/13/2009 04:31 PM

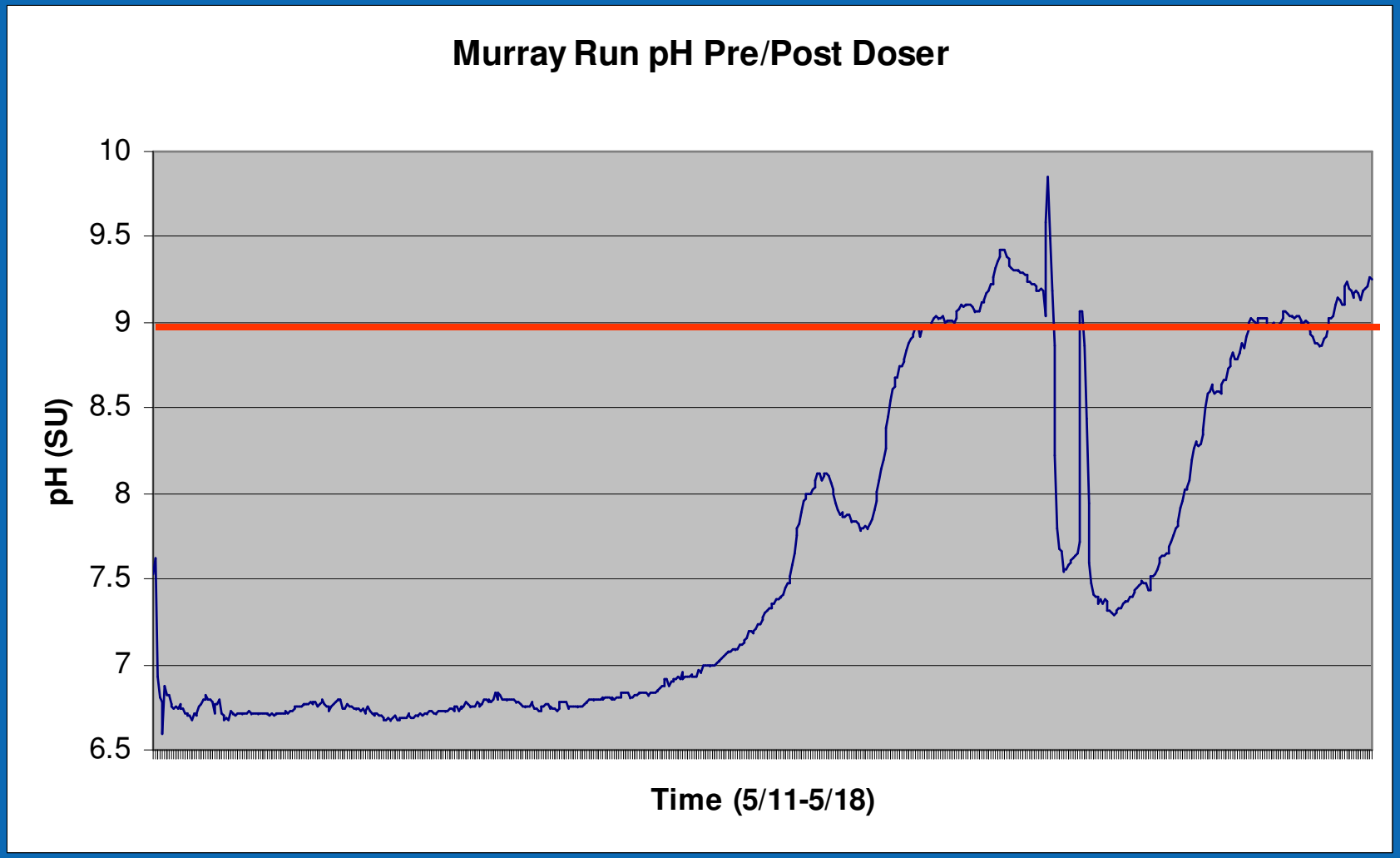

05/15/2009 11:22 AM


05/11/2009 02:28 PM


05/13/2009 03:24 PM


05/11/2009 02:21 PM

Swedish-Bucket Test Results



Swedish-Bucket Test Conclusions

- Swedish-Bucket Doser viable technique for high acidity/metal concentrated discharges
- Could scale back dosage by ½ for the Banks #1 Discharge treatment (1/4 ton/week = $1,440/year)
- Lime reaction does increase water temperature of discharge slightly (9.9 ^{O}C – 14.7 ^{O}C)
- Majority of lime dispensed seemed to be dissolved

Perfect Situation

Consistent flow + elevation + length = ⇧ dissolution

Passive vs. Swedish Bucket Cost Comparison

	Phase V		Phase VI		Phase VII	
	Passive (VFW)	Doser	Passive (VFW)	Doser	Passive (VWF)	Doser
Design and Construction*	$159,192	$134,314	$114,585	$127,635	$111,655	$124,705
Yearly Operation and Maintenance*	$6,482*	$4,417**	$5,407*	$5,961**	$4,656*	$3,623**
25 Year Life**	$521,751***	$295,355**** (-$226,396)	$396,242***	$344,969**** (-$51,273)	$365,931***	$256,797**** (-$109,134)

*Equals 3.5% percent of design and construction/year + sludge removal/year

**Equals hydrated lime cost/year + sludge removal/year

***Equals O&M over 25 years with 3.0% inflation and limestone addition at year 25

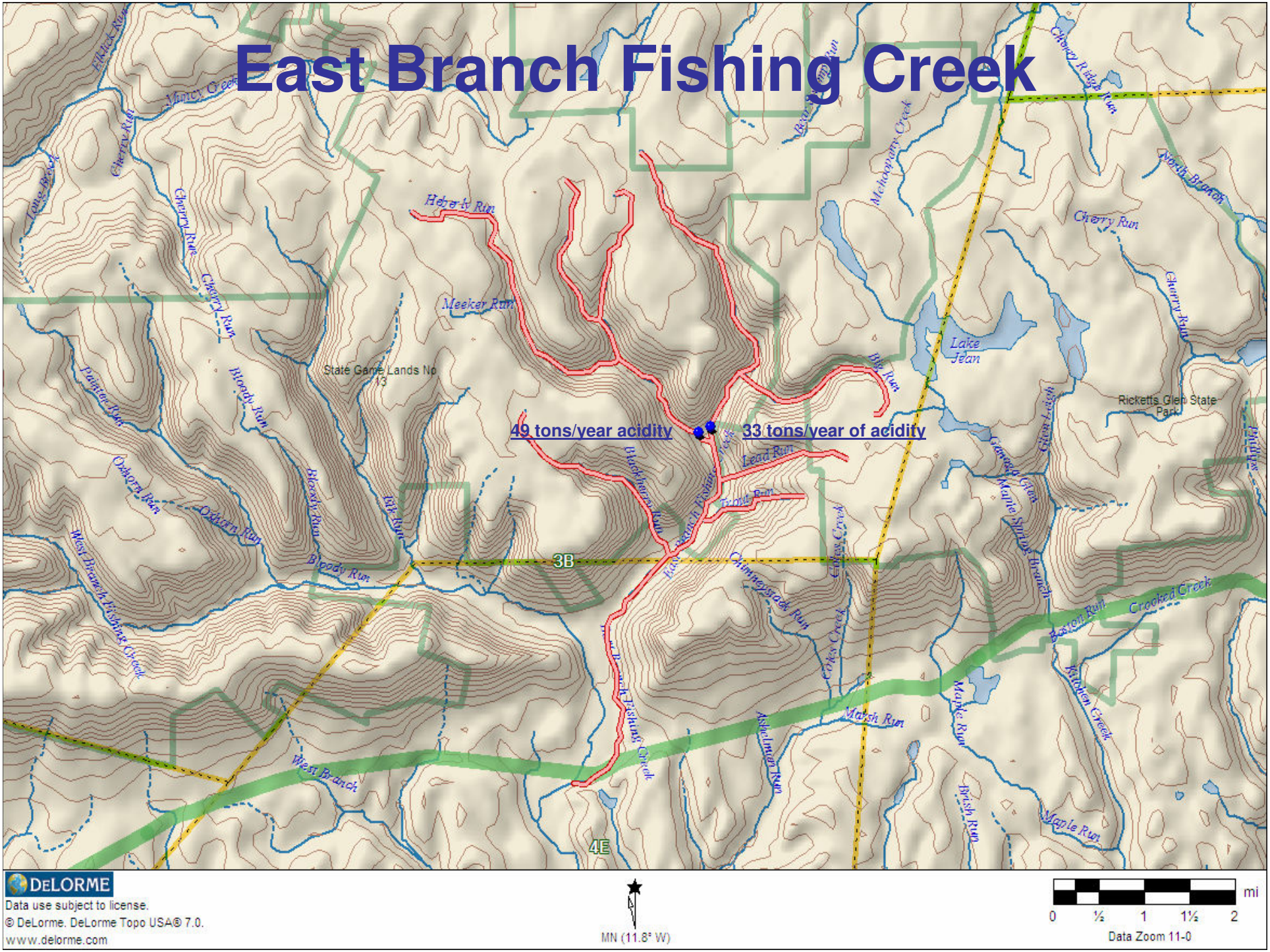
****Equals O&M over 25 years with 3.0% inflation

Right Circumstances for Success

- Passive treatment is risky
- Discharge needs to have elevation and length from stream to allow proper mixing
- Easily accessible for lime truck
- Inconspicuous as possible
- Trust fund is recommended for annual lime cost
- ACID RAIN IMPAIRED STEAMS!!!

Acid Rain = Perfect Fit

- Inoculate right into stream
- Better/easier management/Consistent dose
- Constant flow and turbulence = high dissolution rate
- No ponds = no sludge removal
- Short stream sacrifice for massive stream restoration
- Low cost, especially per stream miles restored


East Branch Fishing Creek
49 tons/year acidity
33 tons/year of acidity
Meeker Run
Lead Run
Big Run
Lake Jean
Ricketts Glen State Park
State Game Lands No 13
Cherry Run
Bloody Run
Oxbow Run
Chimneystack Run
Elkes Creek
Crooked Creek
Marsh Run
Maple Run
West Branch
3B
4E
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MN (11.8° W)
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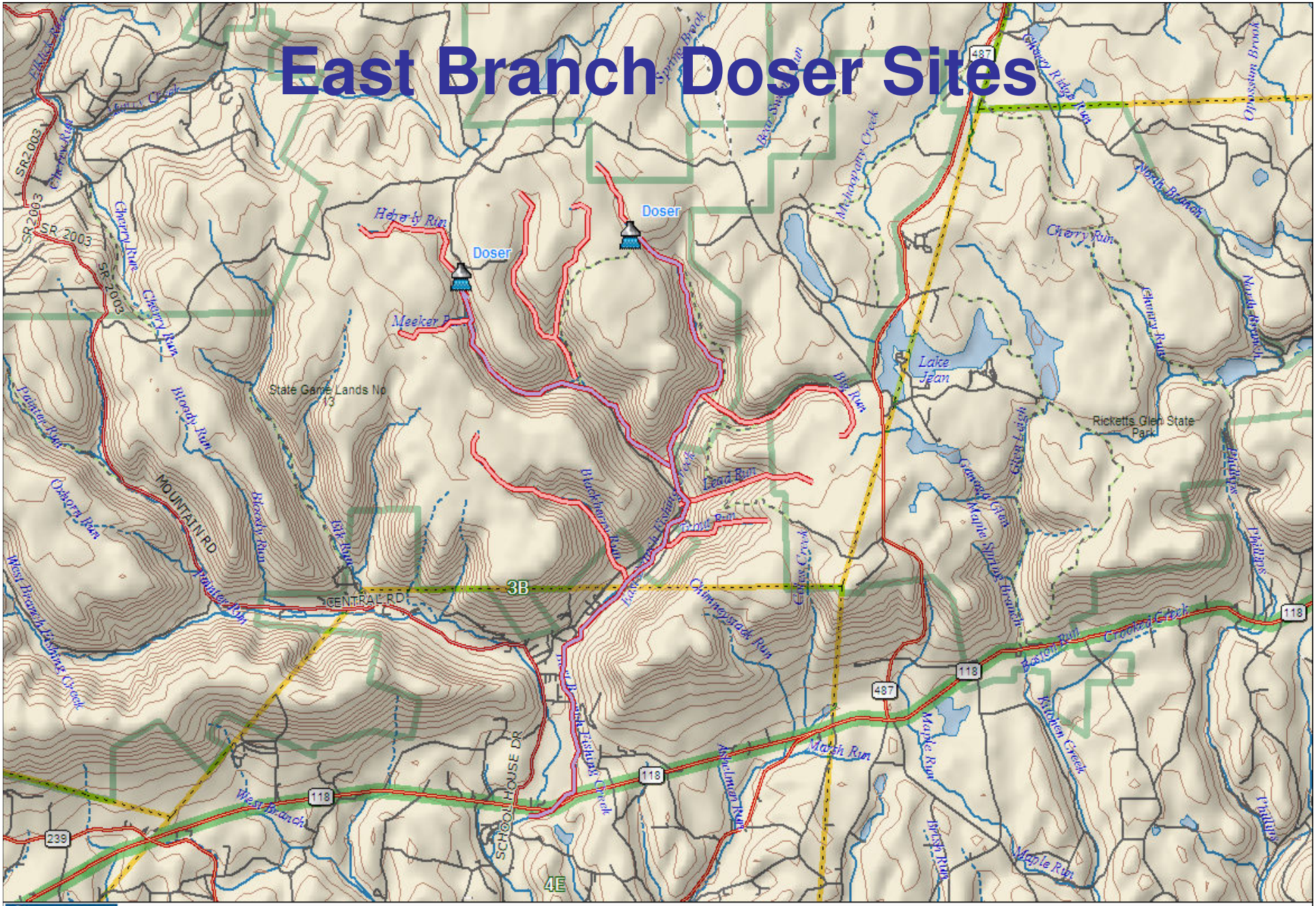
East Branch Doser Sites



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East Branch Doser Costs

- Two dosers = ~$200,000 construction
- ~80 tons hydrated lime per year = $9,600/year
- 11 miles of HQ-CWF Class A trout water restored
- Cost per mile first year = $19,054.55
- Cost per mile second year = **$872.73**
- Local economic gains due to recreation

Doser Conclusion

- Possibly the best way to treat high acidity/metal mine discharges
- Best situations are streams impacted by atmospheric deposition…**under utilized**
- There is an annual cost, but at least you know what that cost is going to be every year
- Watershed consultants steer groups away from these due minimal design and permitting (i.e. they do not make any money)
- Dosers made in Brookville, PA
- Single handily have brought back the headwaters of the Potomac River


Questions/Comments