Remining

Definition

Remining is the mining of abandoned surface and underground mines and coal refuse piles with existing pollutional discharges to extract the remaining coal and in the process perform reclamation and pollution abatement. Alternate effluent limits are granted for these operations during and after mining. The operator is not liable for treatment as long as the pre-existing discharges are not degraded above pre-remining background levels.

Aspects to be covered today.

- Introduction and Background.
- Best Management Practices (BMPs).
- Triggering Treatment and Annual Data Analysis.
- BMP-Only Permits.
- Remining Efficiency Track Record.

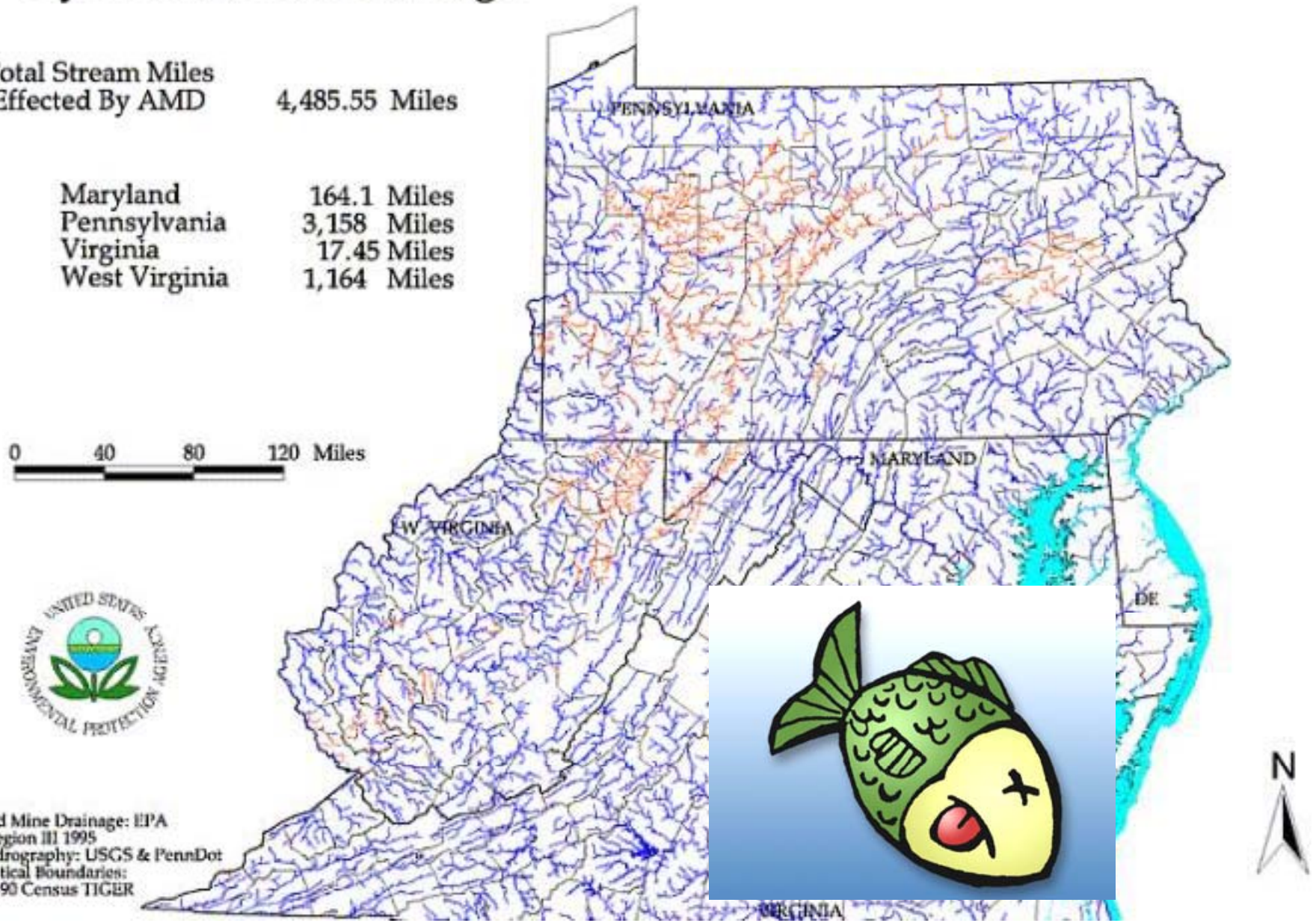
Benefits of Remining

- Reclamation of abandoned mine lands that it is unlikely the AML program will ever restore.
- Decrease or eliminate pollution loads of acidity, iron, manganese and other contaminants from pre-existing discharges.
- Utilize previously untouchable coal resources.
- Eliminate physical hazards such as abandoned highwalls, spoil piles, subsidence features, and flooded pits.

EPA REGION III
4,485 Stream Miles Effected By Acid Mine Drainage

Total Stream Miles Effected By AMD	4,485.55 Miles

Maryland	164.1 Miles
Pennsylvania	3,158 Miles
Virginia	17.45 Miles
West Virginia	1,164 Miles



Acid Mine Drainage: EPA Region III 1995
Hydrography: USGS & PennDot
Political Boundaries: 1990 Census TIGER

What the Rahall Amendment to the CWA (1987) Provided

- Exemption to Statutory Effluent Limits on iron, manganese, and pH.
- Allows site-specific standards from permit writer based on Baseline Data and Best Professional Judgment (BPJ).
- The new limits cannot exceed (be worse than) baseline (background) levels, but may be higher up toward 40 CFR § 434 standards.
- It must be demonstrated that the operation “will result in the potential for improved water quality.”

Some Significant Changes Added to the Final Rule of January 23, 2002

- At first only pre-August 3, 1977 sites were eligible. Now post August 3, 1977 forfeited sites are included.
- Instead of pH, net acidity load is used.
- Where baseline data collection is not possible, a BMP-only permit can be used.
- New statistical methodology for calculations of revised effluent limits and baseline exceedences.

Coal Remining Subcategory - Definitions

- **Coal Remining Operation** - Coal mining operation at a site on which coal mining was previously conducted and where the site has been abandoned or the performance bond has been forfeited.
- **Pollution Abatement Area** – Part of the permit area that is causing or contributing to the baseline pollution load of pre-existing discharges, including areas adjacent to and nearby the remining operation that also must be affected to reduce the pollution load.
- **Pre-existing Discharge** - Any discharge resulting from mining activities that have been abandoned prior to the time of a remining permit application that is not meeting effluent standards.

Baseline (Background) Sampling

- Minimum of one sample per month for 12 consecutive months.
- The samples need to be collected on a time-consistent basis.
- This number of samples is based on the need to be able to detect an increase of one standard deviation in the mean or median with a probability of at least 0.75.
- This probability is based on two-sample t-test or Wilcoxon-Mann-Whitney U test.

Baseline (Background) Sampling Continued

- Pollution loads (e.g. lbs/day) are used instead of concentrations.
- Pollution loadings are determined using contaminant concentrations and flow measurements (flow in gpm x concentration in mg/L x 0.01207 (conversion factor) = load in lbs/day).
- *NO ESTIMATES on Flows!!*
- Determine concentrations of net acidity, iron, manganese, total suspended solids, sulfate (not required, but strongly recommended), and aluminium when necessary (also not required).
- In some rare instances, it will not be possible to accurately collect a sample or determine flow. In these cases, a BMP only based permit may be employed.

Stress Good Flow Measurements

BMP Background Information

- **The alternate effluent limits only apply to pre-existing discharges within or hydrologically connected to the Pollution Abatement Areas of the remining operation.**

- **Pollution Abatement Areas – mining areas where procedures that have been shown to decrease or eliminate the existing pollution load (BMPs) are performed.**

- **Mine water "encountered" in the pit is subject to 434 standards until no longer "encountered."**

Best Management Practices (BMPs)

Procedures or techniques implemented during mining or reclamation that are expected to reduce or eliminate pre-existing environmental problems.

Implementation of BMPs is often on and above normal mining practices and procedures.

BMPs Generally Work To:

- **Physically control surface and/or ground water movement. Studies have shown that if you control flows, you will in turn control the loads.**
- **Change the geochemical conditions of the site.**
- **Reduce or prevent erosion and sedimentation.**
- **Enhance vegetation.**

Examples of BMPs

- Regrading
- Revegetation
- Daylighting
- Special Handling of Acidic or Alkaline Materials
- Alkaline Addition < 100 tons/acre
- Alkaline Addition > 100 tons/acre

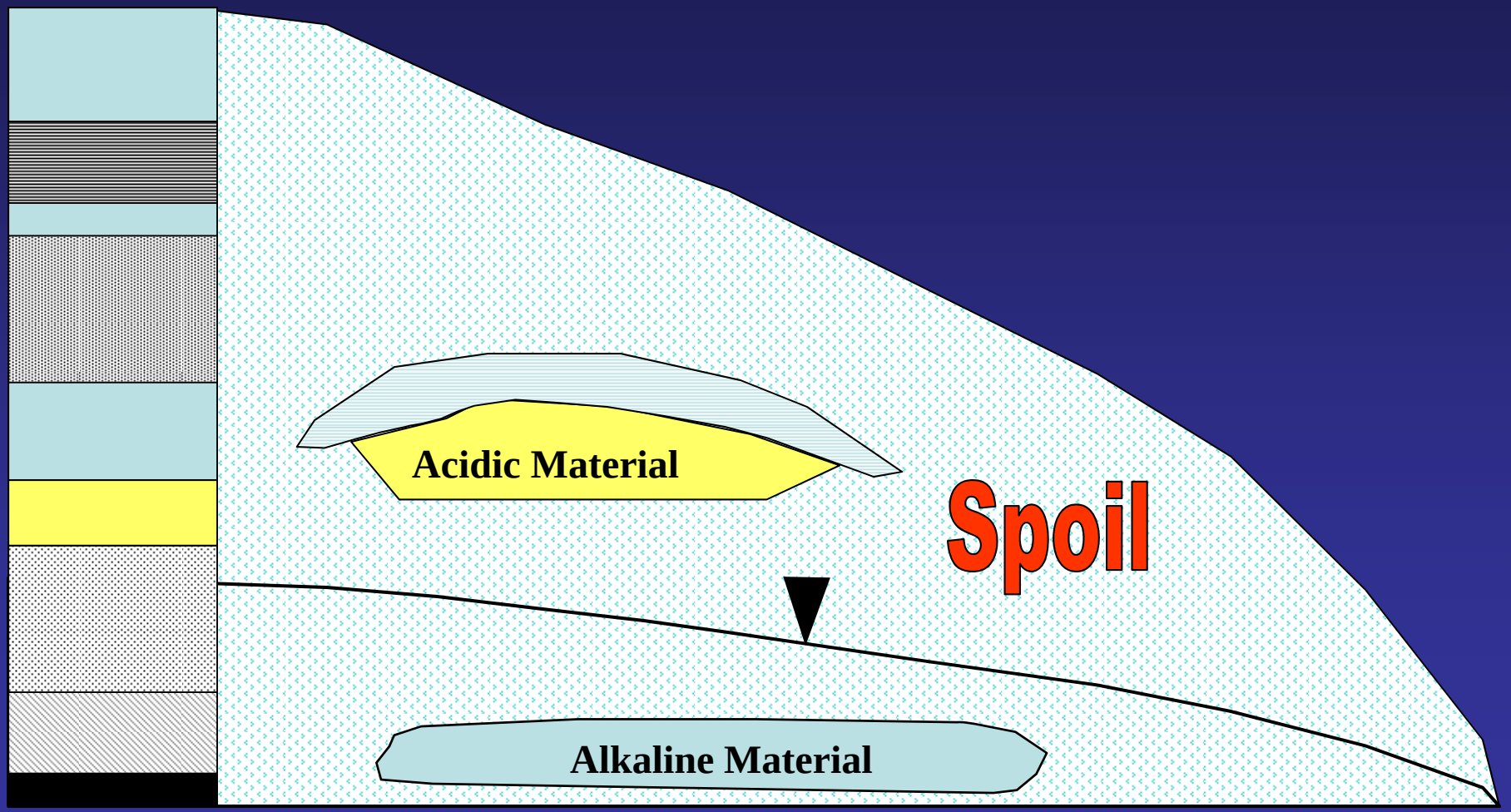
Regrading – knocking down old highwalls and filling in abandoned pits. Returning conditions back to a more natural state and gaining positive drainage.

Revegetation – promoting vegetative growth once the site is regraded.

Daylighting – surface mining through abandoned underground mine workings.

Special Handling – acidic or alkaline materials are identified, segregated, stockpiled, and selectively placed in the backfill.

Special Handling Continued – addition of low permeability cap.



Alkaline Addition – importation of alkaline material to reduce or offset a net acidic overburden. Application rates of less than or greater than 100 tons/acre.

Examples of BMPs Continued

- Water Handling Systems
- Coal Refuse Removal
- Biosolids Addition
- Mining of Highly Alkaline Strata
- Alkaline Material Redistribution
- Passive Treatment Technologies

Special Water Handling – managing surface and ground water to reduce AMD production.

Coal Refuse Removal – reprocessing and in many cases total removal to cogeneration plants.

Biosolids addition – used to promote growth of vegetative cover.

Mining of Highly Alkaline Strata - the mining plan promotes mining into higher overburden to encounter more alkaline material

Alkaline Material Redistribution – relocate alkaline material from one portion of the site to another

Passive Treatment Technology – additional means of improving water quality.

Operational Procedures BMPs

Actions conducted during mining to reduce the pollution loads

- ✓ Rapid mining and maintaining concurrent reclamation.
- ✓ Maximize regrading and revegetation.
- ✓ Off-site disposal of acidic materials.
- ✓ Limiting auger mining.
- ✓ Time limits on coal stockpiling.
- ✓ Reconsider overburden quality.
- ✓ Coal refuse removal (reprocessing or complete).
- ✓ Maximize the amount of daylighting.

Initiation and Discontinuing of Treatment

Treatment Triggering Mechanisms

Two Distinct Methods

Monthly checks

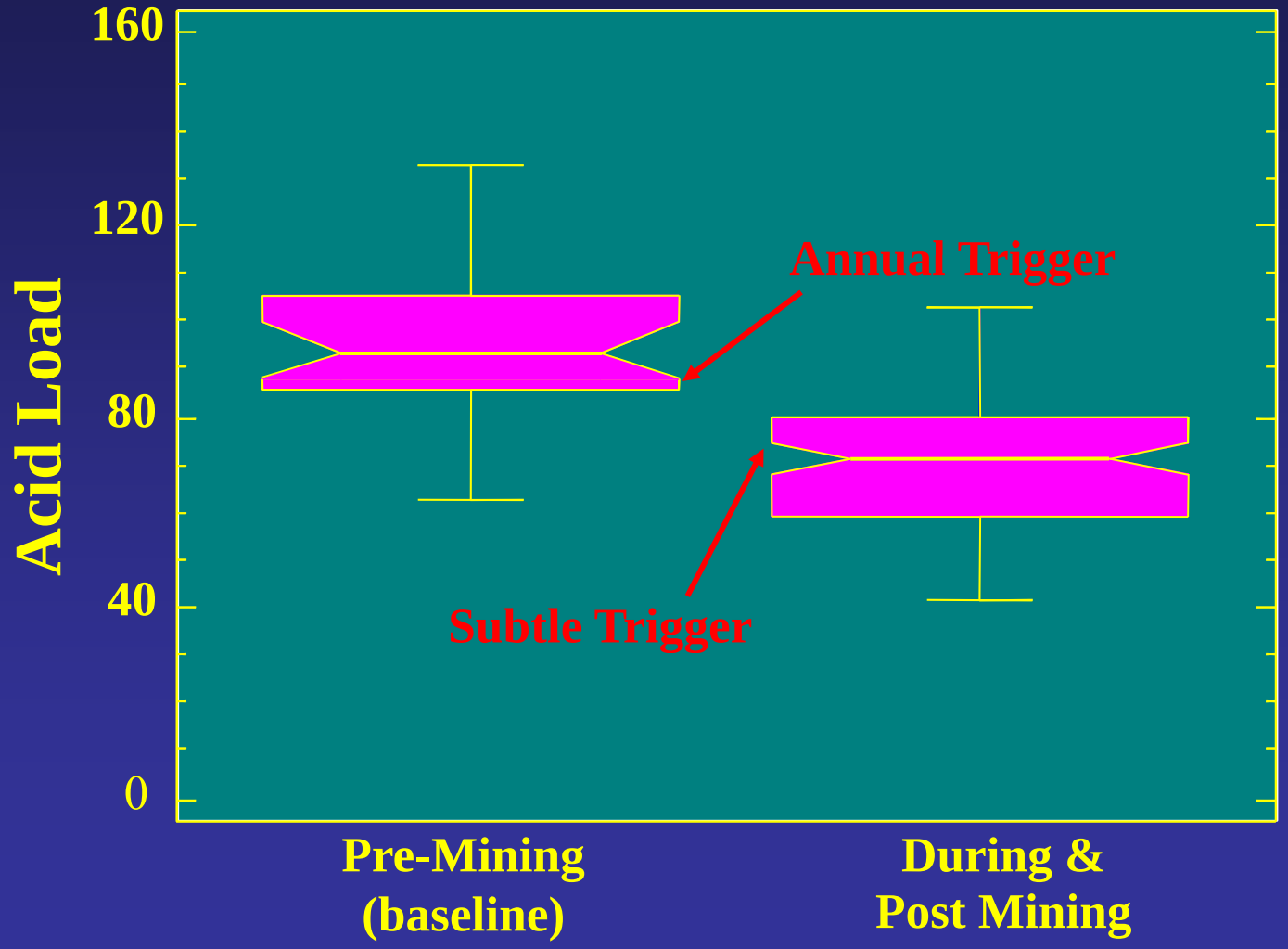
Annual analysis

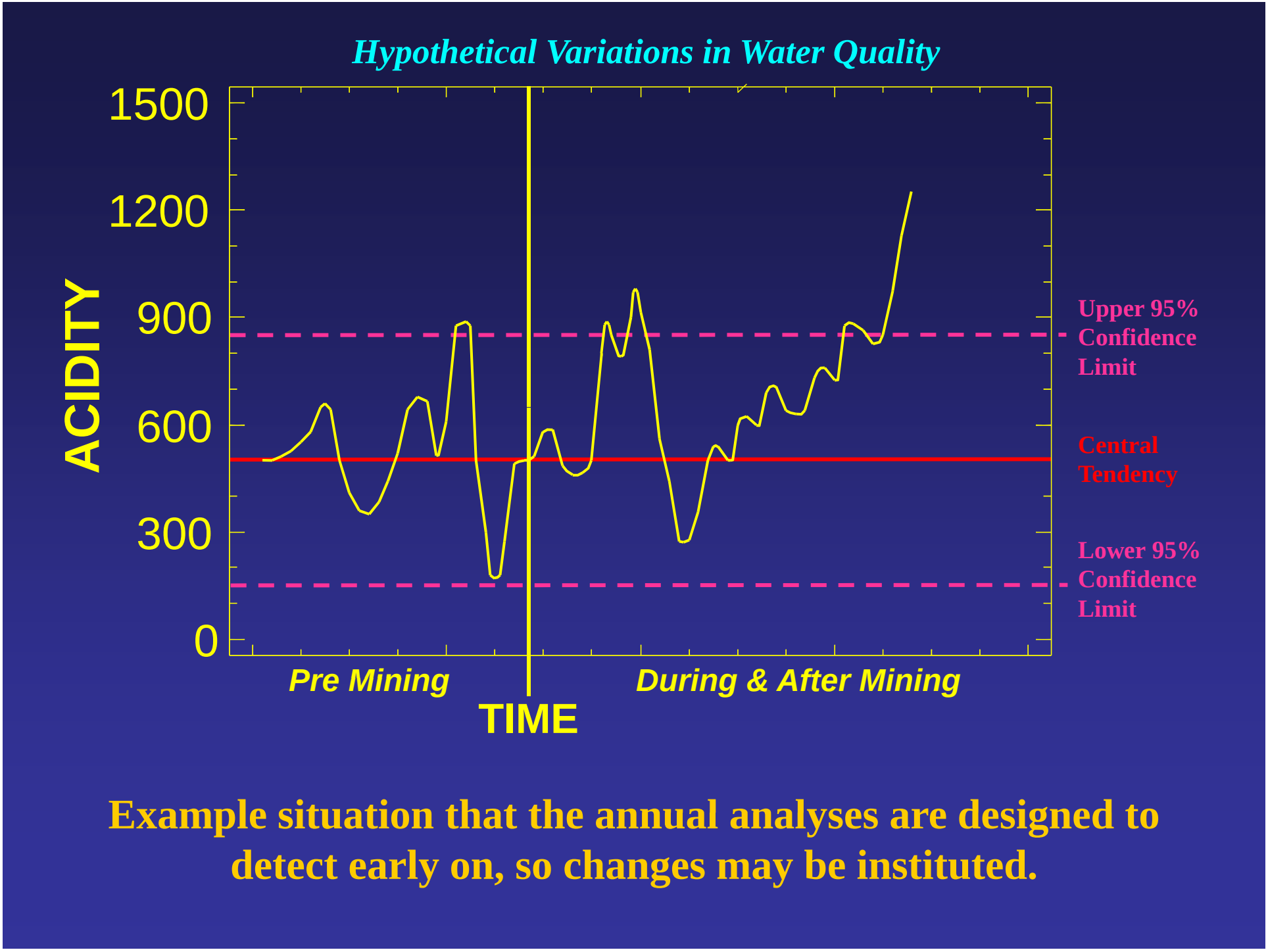
Triggering and Untriggering Treatment

Monthly Analysis

- If two consecutive monthly samples exceed the single observation trigger (L), this triggers weekly monitoring.
- If four consecutive weekly samples exceed the single observation trigger, then treatment is triggered.
- Treatment continues until the discharge no longer exceeds the single observation trigger without treatment.

Graphic Representation of Annual Triggering (Notched Box-and-Whisker Plot)





Example situation that the annual analyses are designed to detect early on, so changes may be instituted.

BMP-Only Permits

There are provisions within the regulations to allow for BMP-only based permits. This is where collection of accurate water quality and/or quantity data is not possible.

These types of permits are the exception rather than the rule for remining.

Some Reasons Why Baseline Data Cannot Be Accurately Determined

→**Steep-sloped areas – physically unable to determine flow.**

→**Direct stream discharge – unable to segregate discharge from in-stream water.**

→**Large areas of diffuse flow or seepage – not possible to obtain accurate flow or representative sample.**

→**Too many discharges – economically infeasible to measure and sample all points.**

→**High-volume discharges - too large adequately sample or accurately measure flow.**

Steep-sloped inaccessible discharge points

Base Flow Seepage

Widespread Seepage

Too Many Discharges to Sample

Very Large Volume Discharges

BMP-Only Permits

- **Compliance is based on the performance of all BMPs as defined in the Pollution Abatement Plan, rather than a rigorous monitoring of effluent pollution loads.**
- **Based on historical records of BMP use at completed remining sites, specific BMPs and levels of BMP implementation will be required of these sites.**
- **Until there is a good history of these types of remining permits, they will be somewhat rare.**

BMP Only Permits Continued

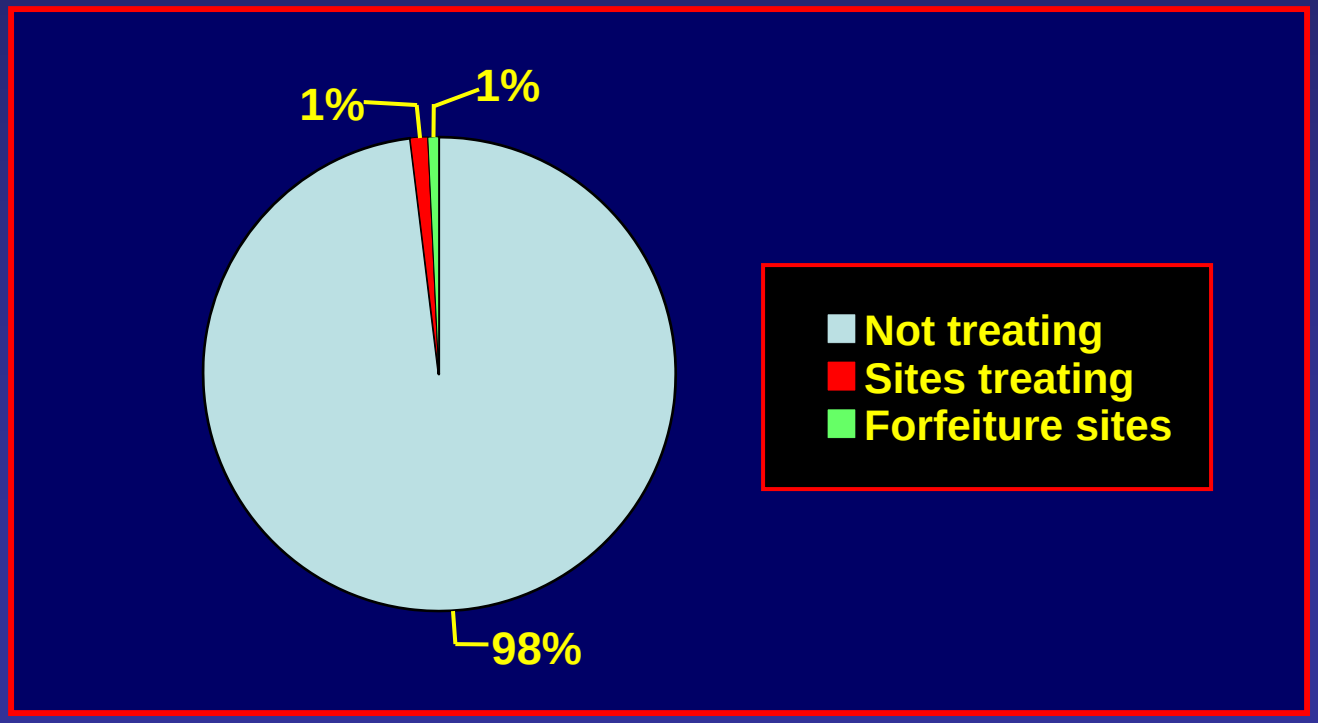
- Success is measured through inspection to ensure that the BMPs are properly and completely performed as proposed by the operator and approved by the regulating authority.
- In some cases, the receiving stream may be monitored to access the overall impact of the operation.
- Stream monitoring is recommended, but not required. There are cases where it is infeasible, such as a large river (e.g., Monongahela River).

Remining Efficiency Track Record

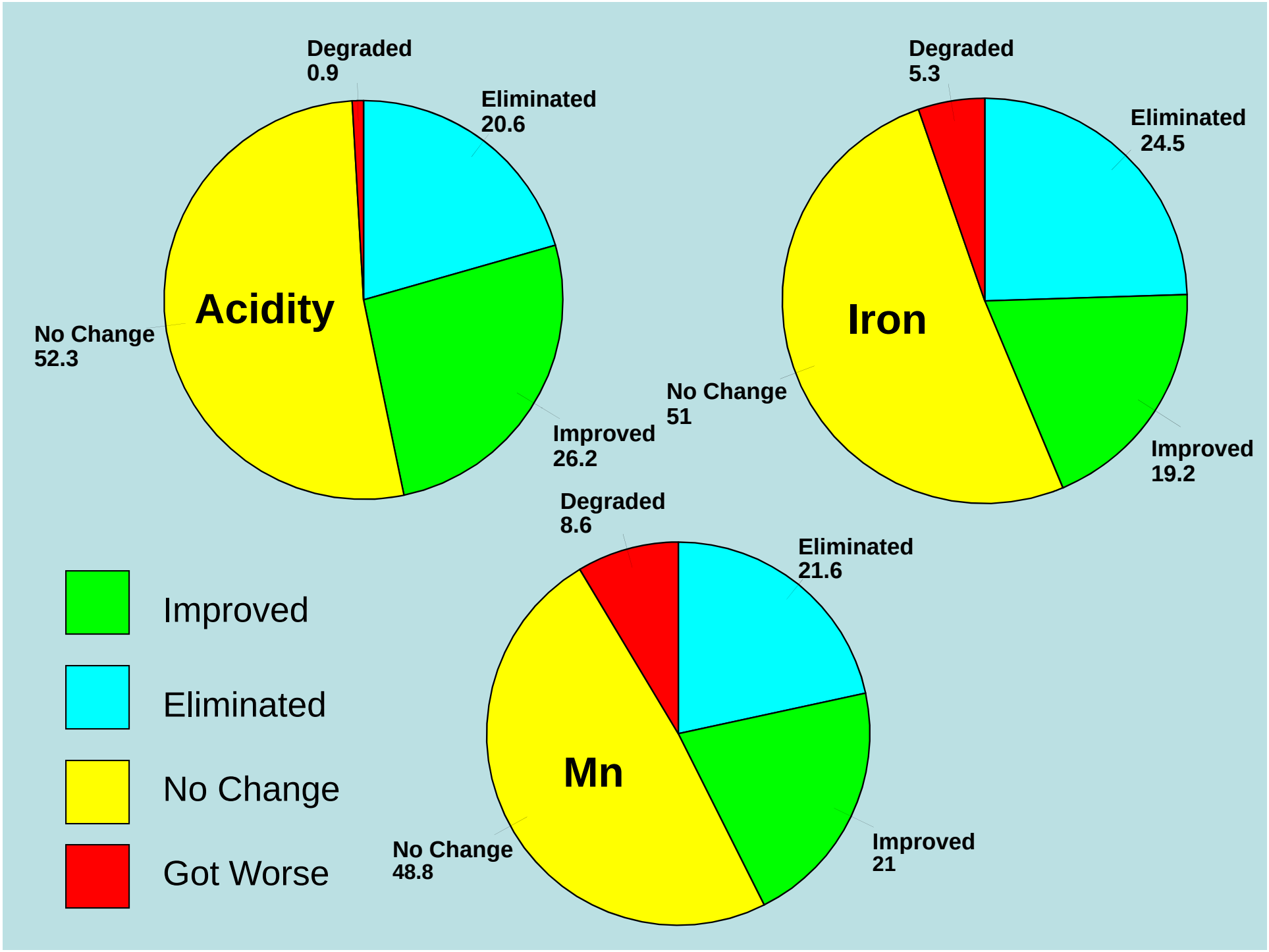
Pennsylvania Remining Permits Which Required Treatment as of June, 1997 (IMCC, 1997)

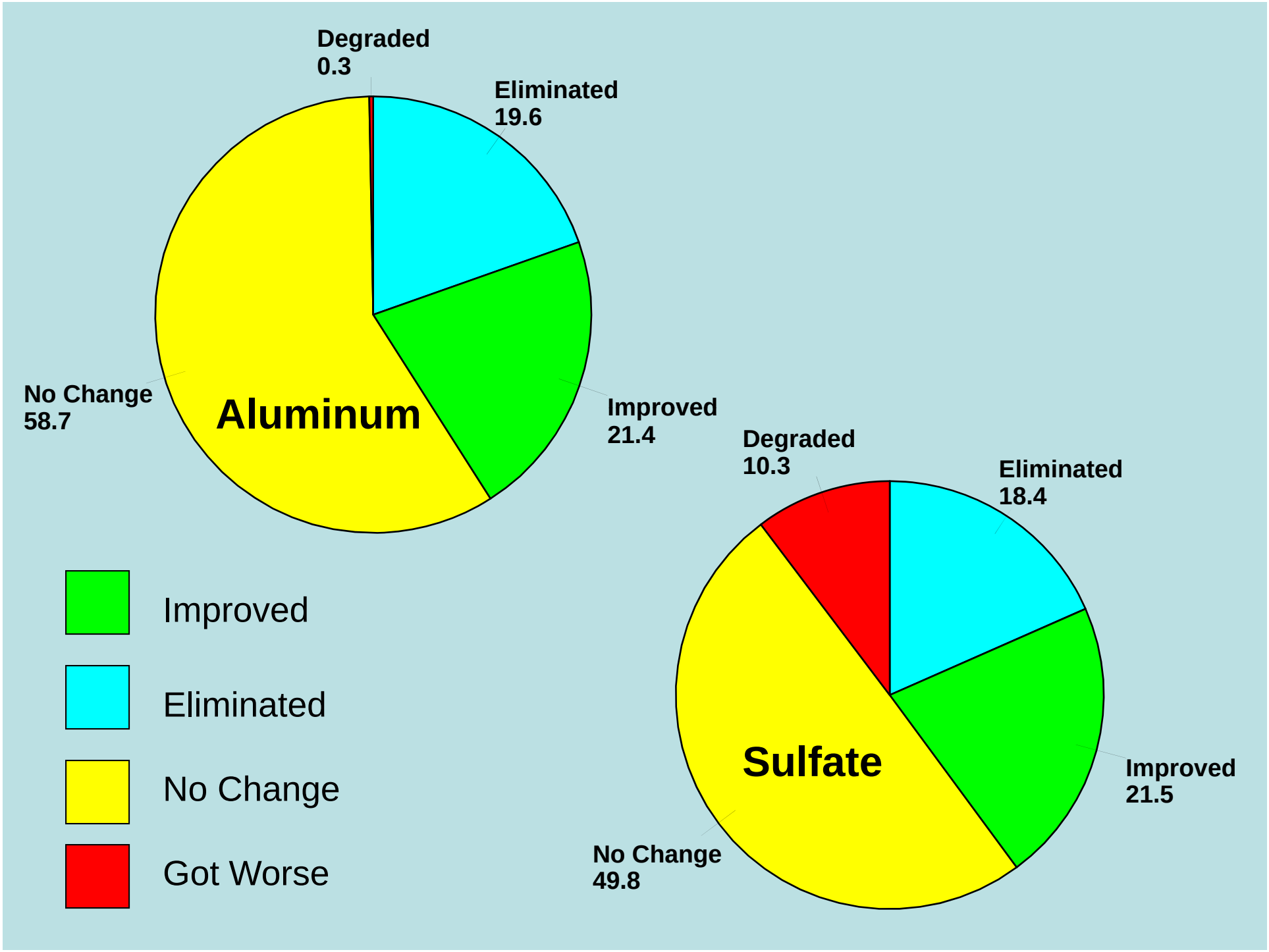
	Bituminous Region	Anthracite Region	Totals
Permits Issued	248	12	260
Currently Treating	3	0	3
Forfeited due to AMD	2	0	2
Required Treatment	11	0	11

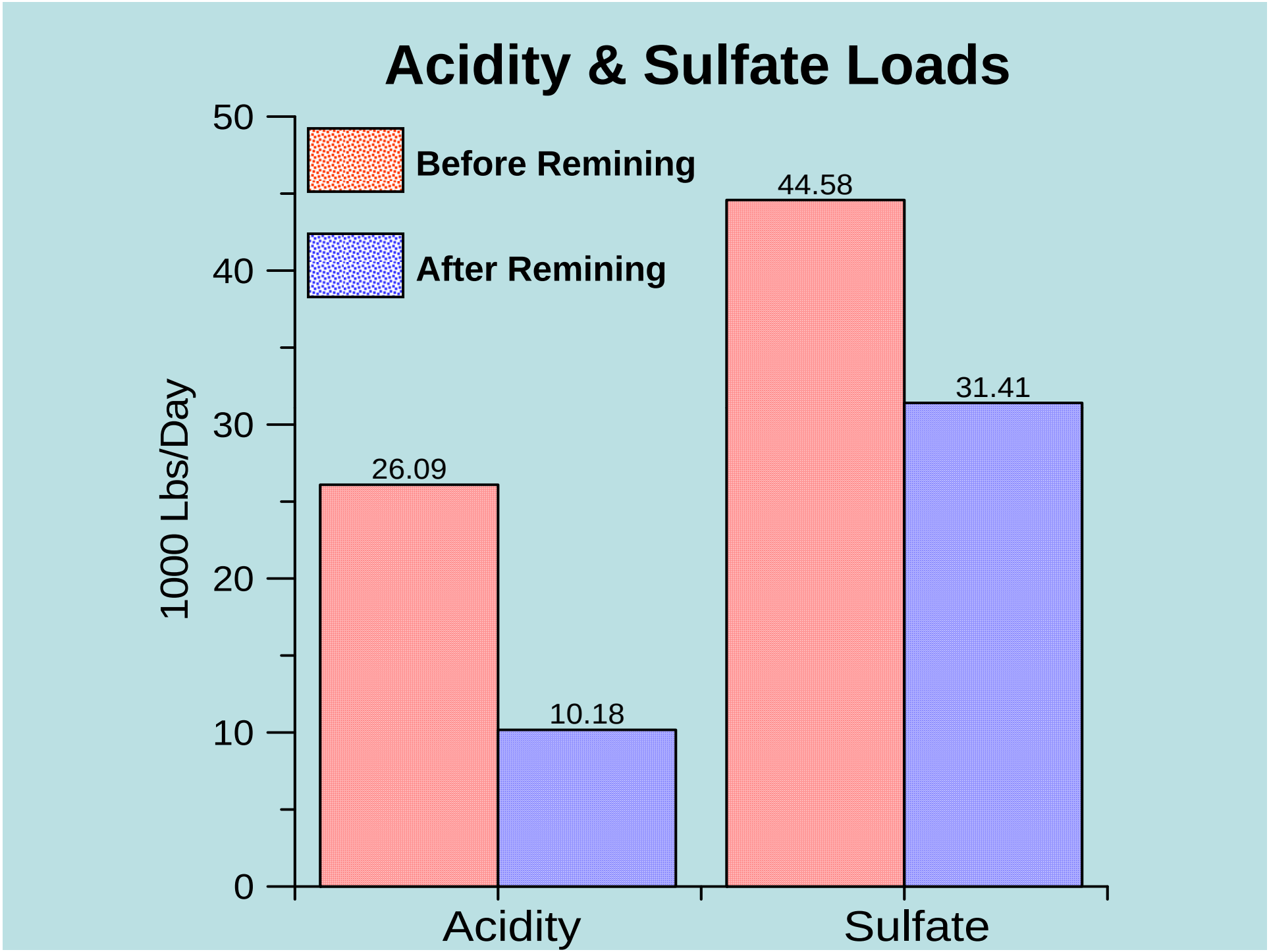
Status of 260 Pennsylvania Remining Permits (IMCC, 1997)



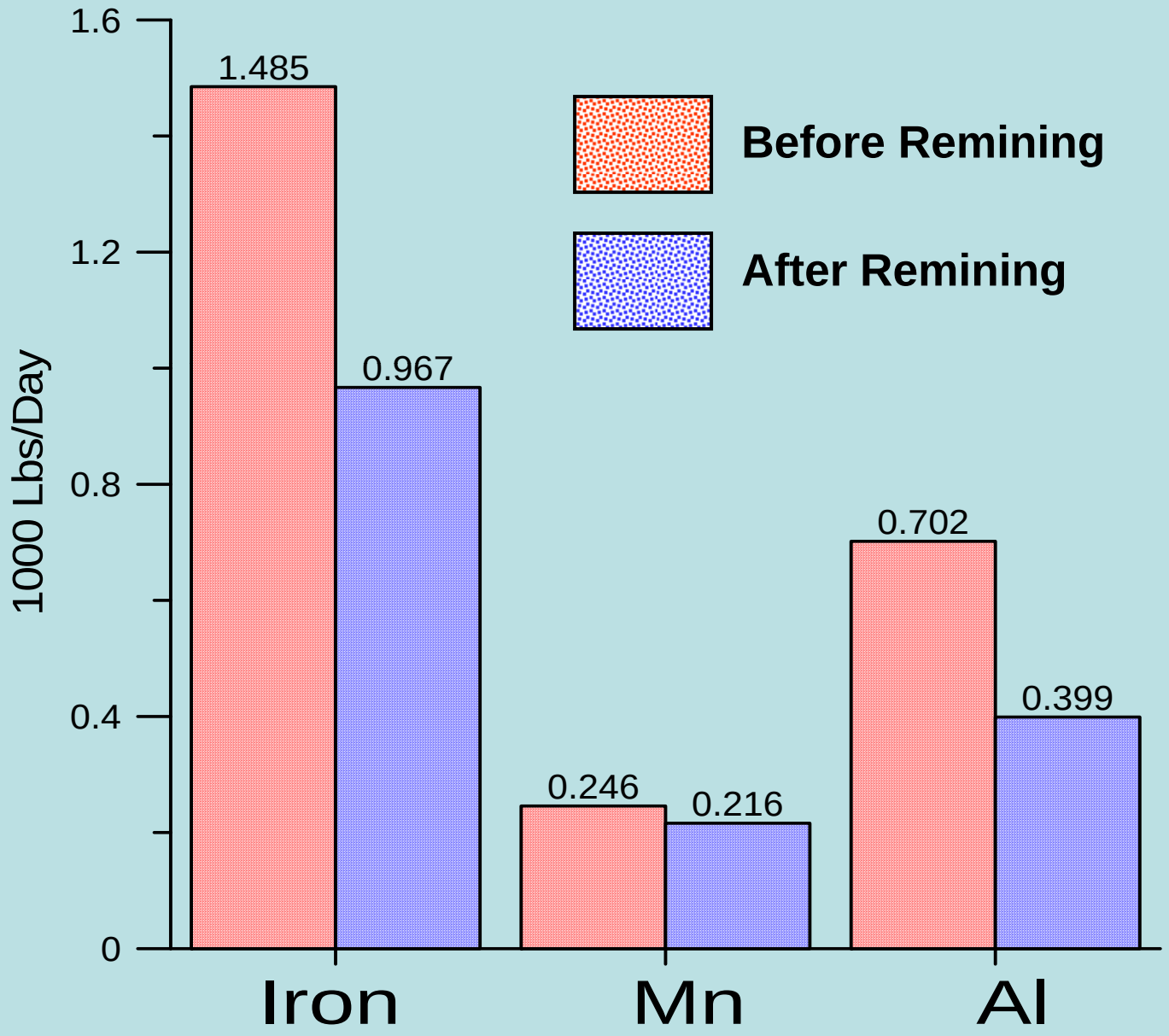
The following data are a subset of the data from the last slide. They represent 112 permits and 230 discharges. The sites had been completed for at least one year.


Degraded
0.9
Eliminated
20.6
Acidity
No Change
52.3
Improved
26.2
Degraded
5.3
Eliminated
24.5
Iron
No Change
51
Improved
19.2
Degraded
8.6
Eliminated
21.6
Mn
No Change
48.8
Improved
21
Improved
Eliminated
No Change
Got Worse

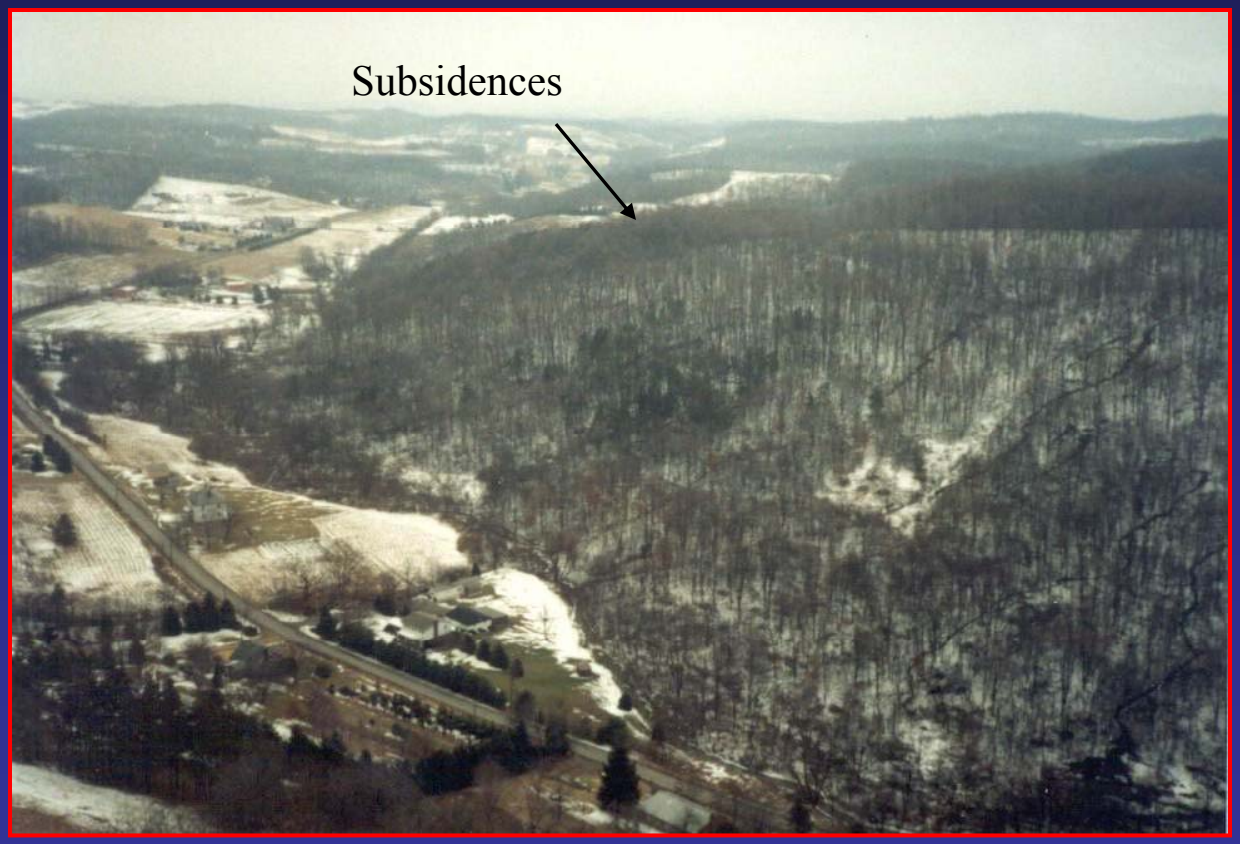

Degraded
0.3
Eliminated
19.6
No Change
58.7
Aluminum
Improved
21.4
Improved
Eliminated
No Change
Got Worse
Degraded
10.3
Eliminated
18.4
Sulfate
Improved
21.5
No Change
49.8

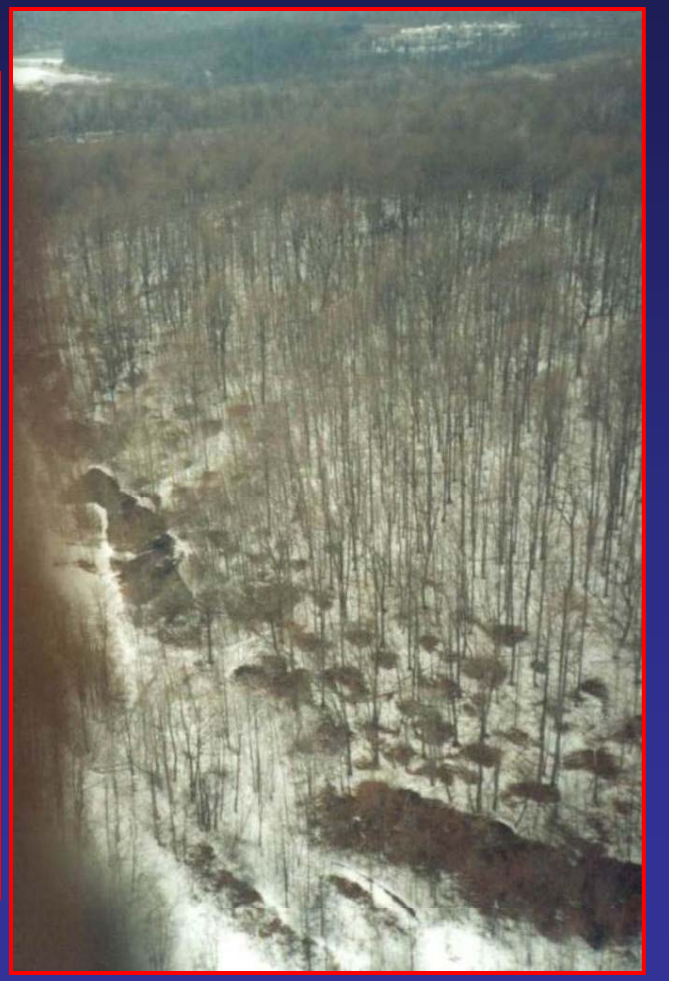

Acidity & Sulfate Loads
Before Remining
After Remining
1000 Lbs/Day
50
40
30
20
10
0
26.09
10.18
44.58
31.41
Acidity
Sulfate

Iron, Manganese & Aluminum Loads



Trees Mills Solar Mine





Revegetation at Trees Mills

That's All Folks!