The “Screening Value” Approach to Nutrient Criteria Development for Freshwater Wadeable Streams: Discussion of Pilot Program

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Clean Water Act

Section 101: Declaration of Goals and Policy

- Objective: “Restore and maintain chemical, physical, and biological integrity of ... nation’s waters ...”
- “interim goal … provides for the protection and propagation of fish, shellfish, and wildlife" and "for recreation in and on the water"
- “national policy … discharge of toxic pollutants in toxic amounts shall be prohibited …”

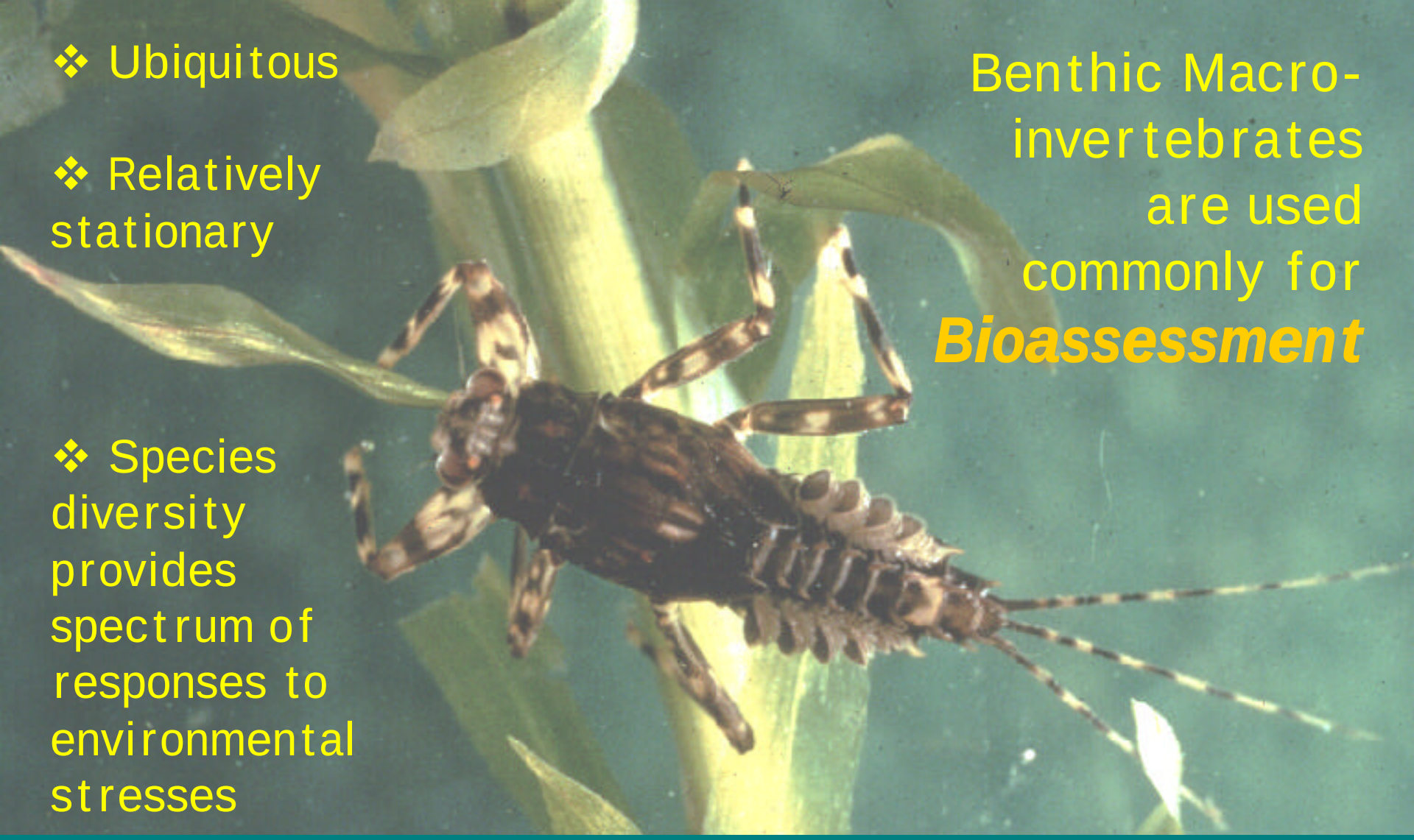
What are "criteria"?

Under CWA, Water Quality Standards: include

- A "designated use" for each water body
- Water quality *criteria*: describe quality of water that will support designated use: Narrative standards and/or numeric limits
- Antidegradation policy

EPA requires all states to develop *criteria* to protect waters from impairment by nutrients.*

* See: U.S. EPA. **http://www.epa.gov/waterscience/criteria/nutrient/**
Also see: **http://www.deq.state.va.us/wqs/rule.html** "Freshwater Nutrient Criteria"

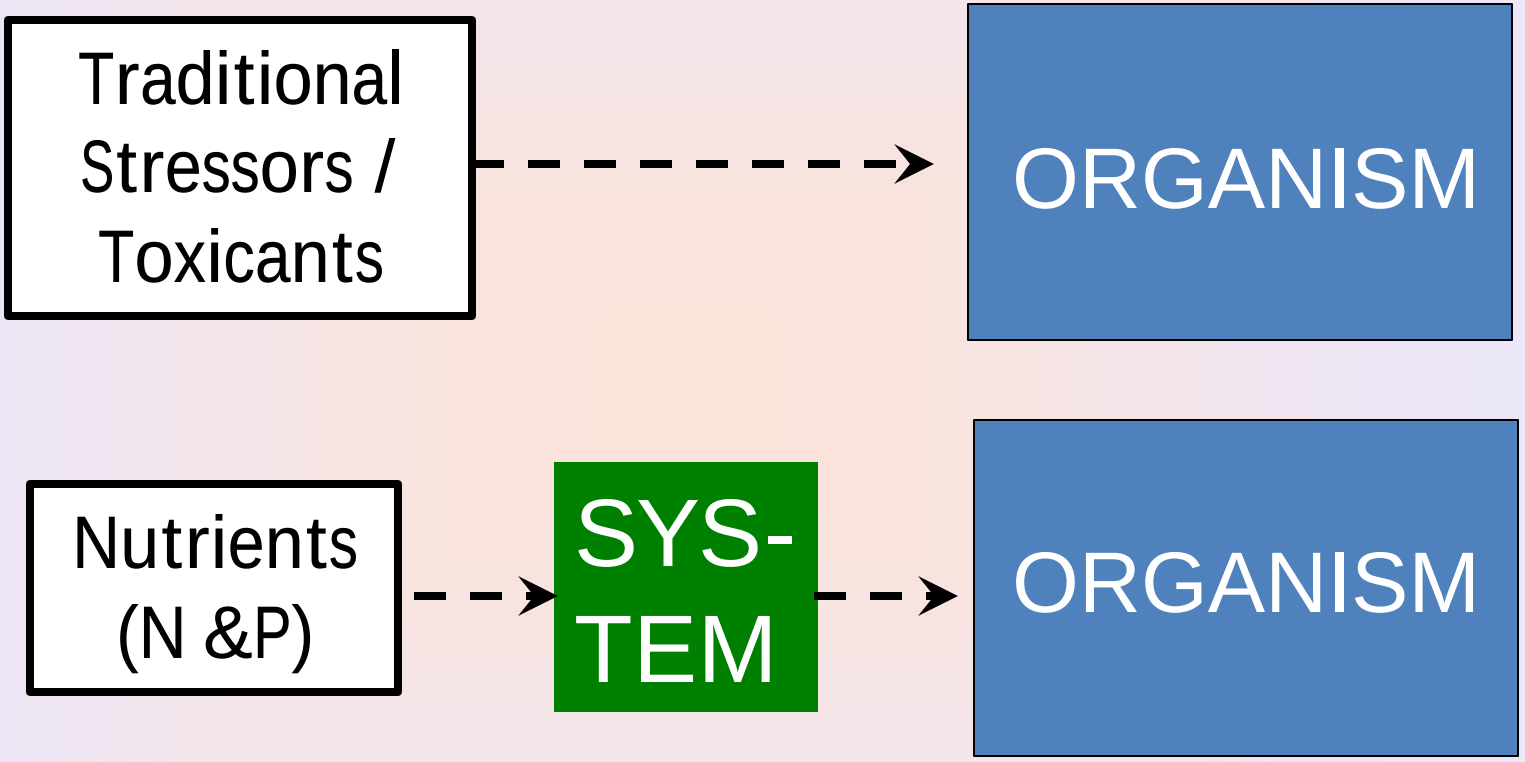


- Ubiquitous
- Relatively stationary
- Species diversity provides spectrum of responses to environmental stresses

Benthic Macro-invertebrates are used commonly for ***Bioassessment***

Designated use for all Virginia streams: “the propagation and growth of a balanced, indigenous population of aquatic life”

Nutrient Criteria Problem: How to identify streams where nutrients are impairing biota?

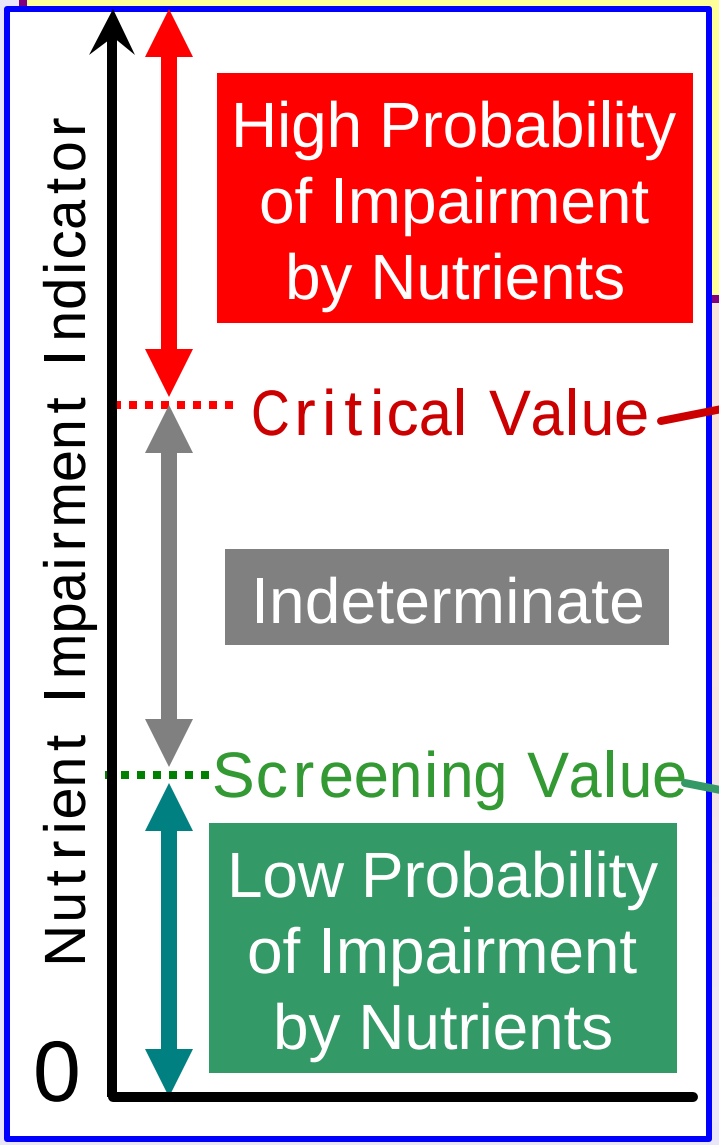


Conduct bioassessment of all streams?

Problem = expense!!

The “Screening Value” Approach to Nutrient Criteria for Wadeable Freshwater Streams:

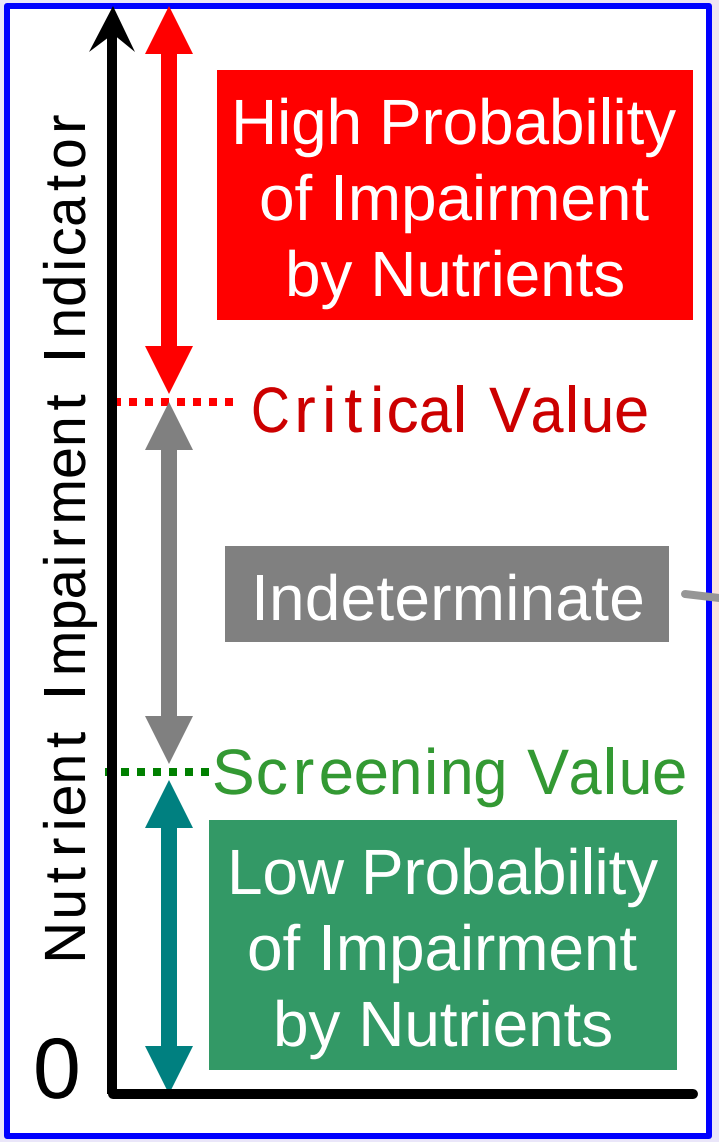
Intended to attain a high rate of correct assessment using cost-effective procedures



TN &/or TP concentration above which the probability of impairment by nutrients is high

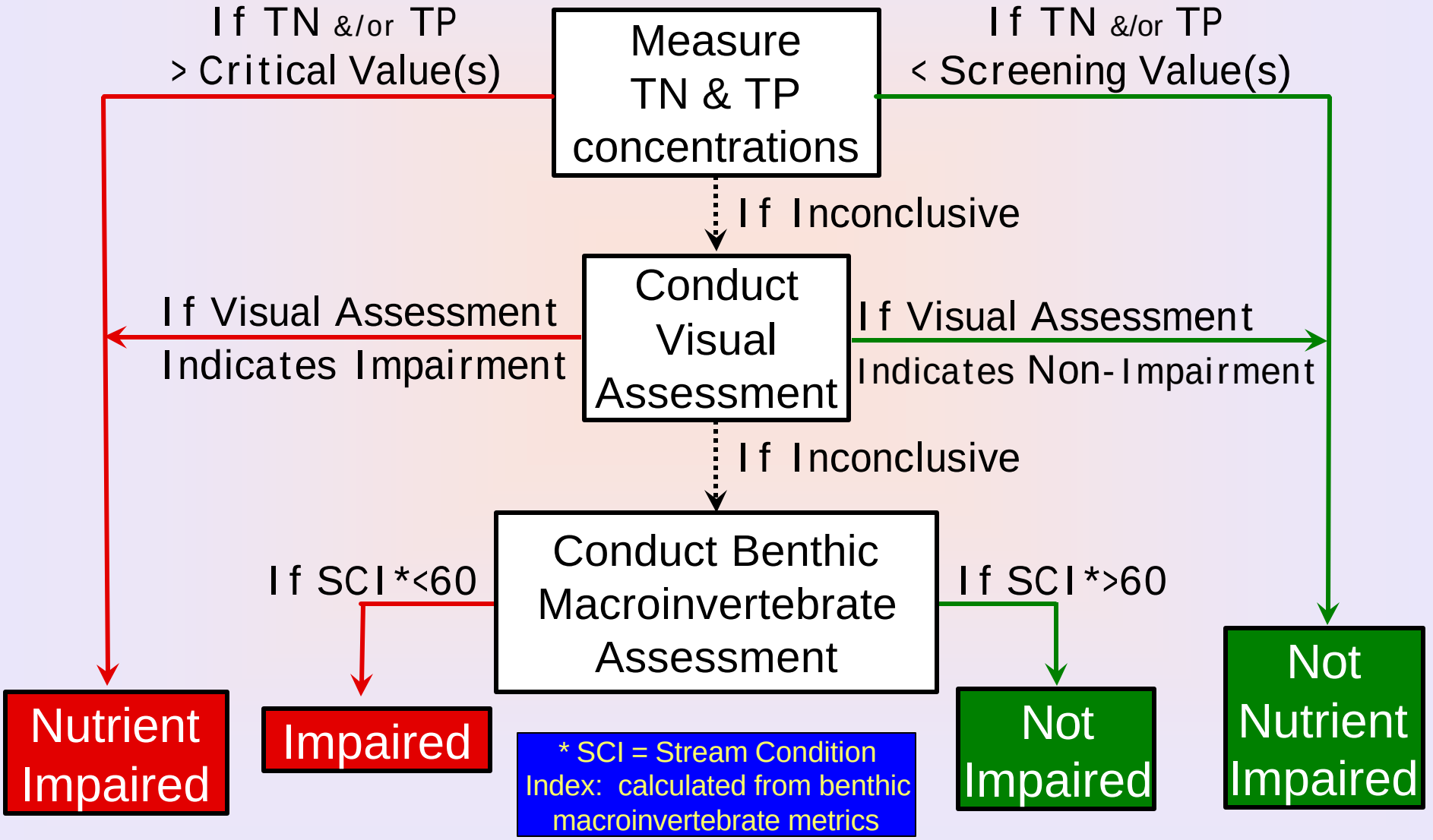
TN &/or TP concentration below which the probability of impairment by nutrients is low

The “Screening Value” Approach to Nutrient Criteria for Wadeable Freshwater Streams:

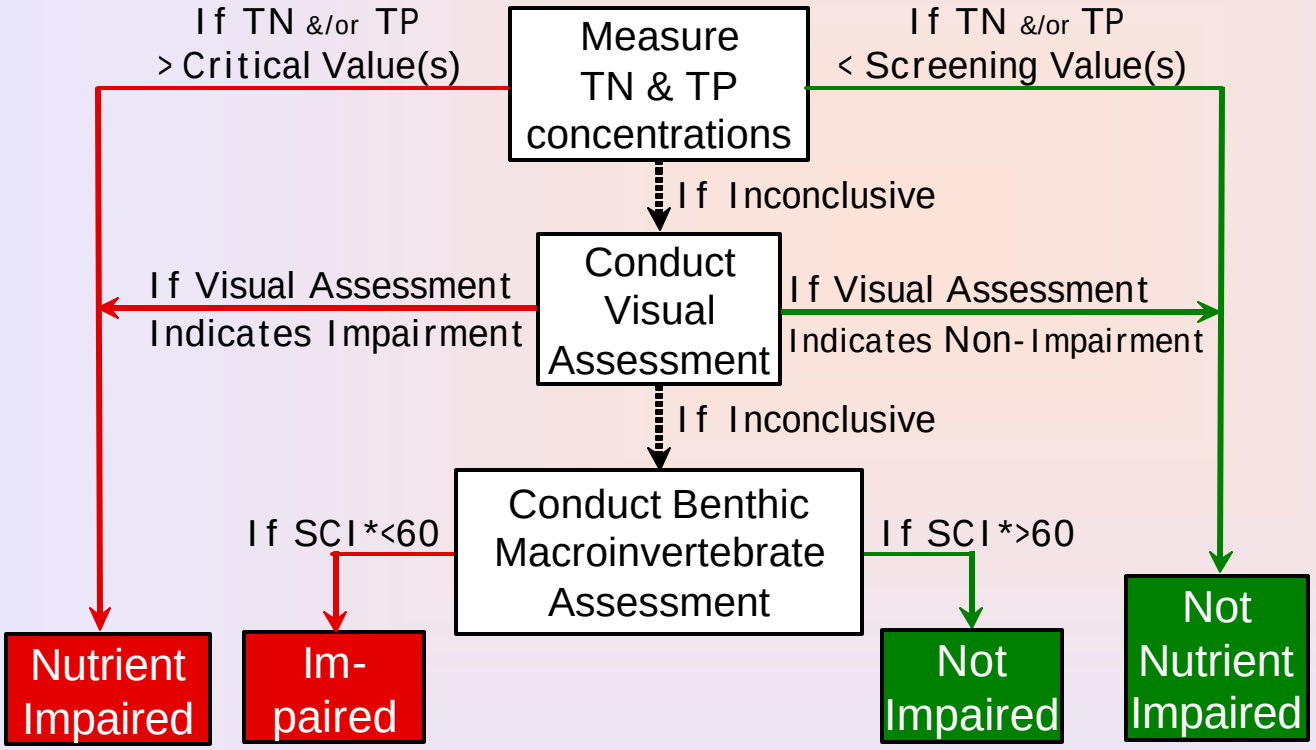


<u>Conduct Visual Assessment:</u>
DEQ biologists record observable stream and site characteristics using standardized methods anticipating they will be diagnostic for some streams.

Proposed "Screening Value" Approach to Nutrient Criteria for Wadeable Freshwater Streams



Pilot Program: Trial application of "Screening Value" protocol (all three steps) at selected sites by DEQ biologists in Spring and Fall of 2008.



Data generated by the "pilot program" to be analyzed by AAC

Pilot program purpose: Evaluate the ability of a nutrient criteria screening-value approach to achieve its intended goals:

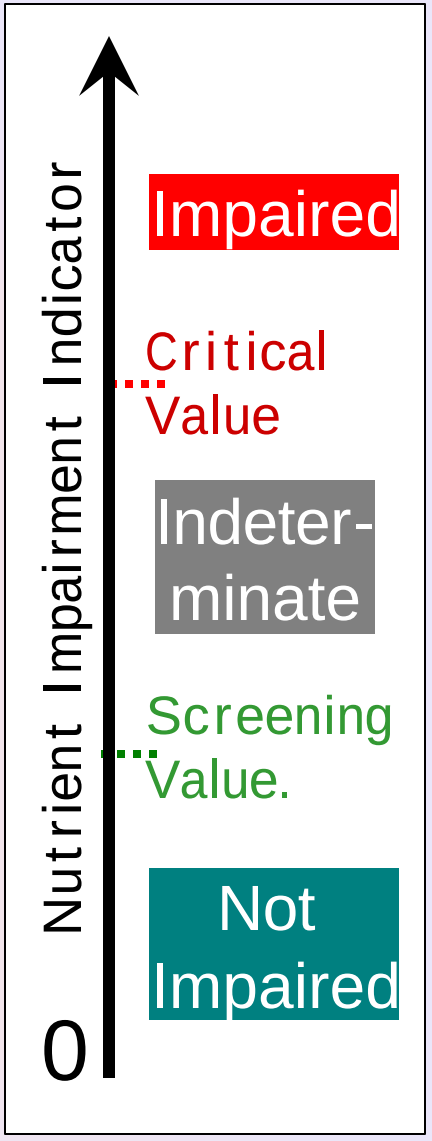
- Scientific and legally defensible criteria that will protect water quality.
- Can be implemented by DEQ with efficient use of resources.

Specific goals:

Determine critical and screening values* that discriminate impairment status with high levels of statistical confidence.

Determine visual assessment parameters that, when applied in association with screening and critical values, discriminate impairment status with high levels of statistical confidence.

Determine resource requirements for full application.



* Via nutrient impairment indicator: TN and/or TP values that can be applied alone, in a functional combination with one another, and/or with other measured parameters.

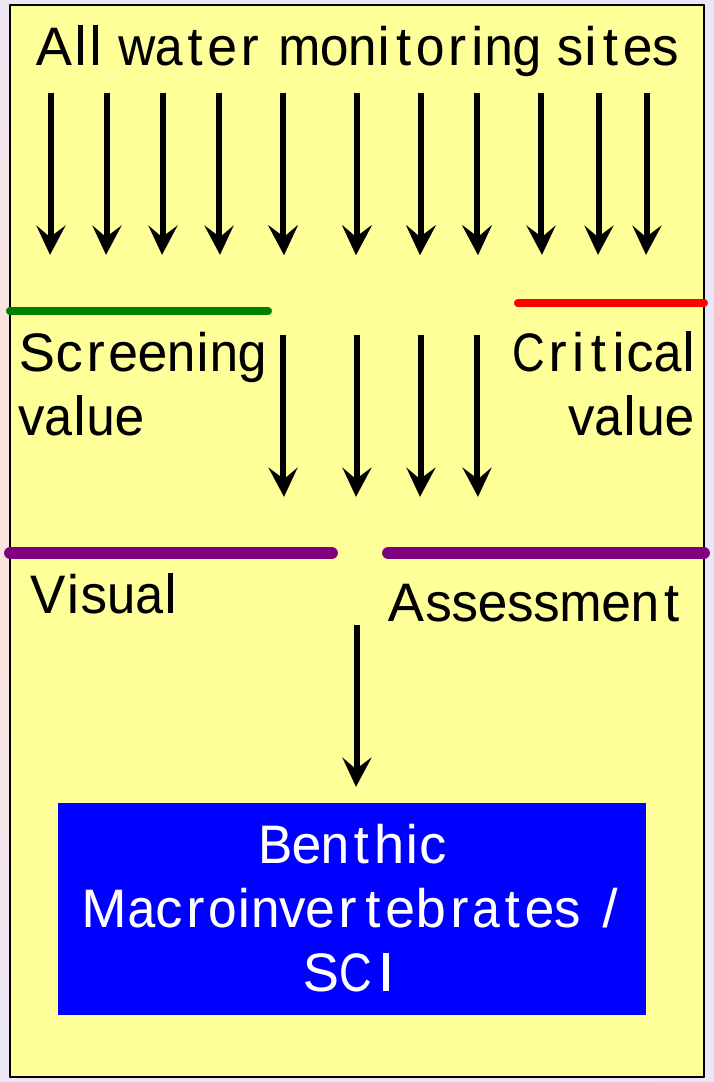
Determine resource requirements for full application.

Estimate time required to apply visual assessment protocol.

Estimate % of monitoring sites where visual assessment would be required …

Estimate time required to apply benthic macroinvertebrate assessment …

Estimate % of water monitoring sites where benthic macroinvertebrate assessment would be required …



Pilot Program Procedure

1. Select stations to be included in the study (Summer '07)

DEQ Monitoring Coordinator reviewed all DEQ data since 2001, calculated median TN and TP values for each location.

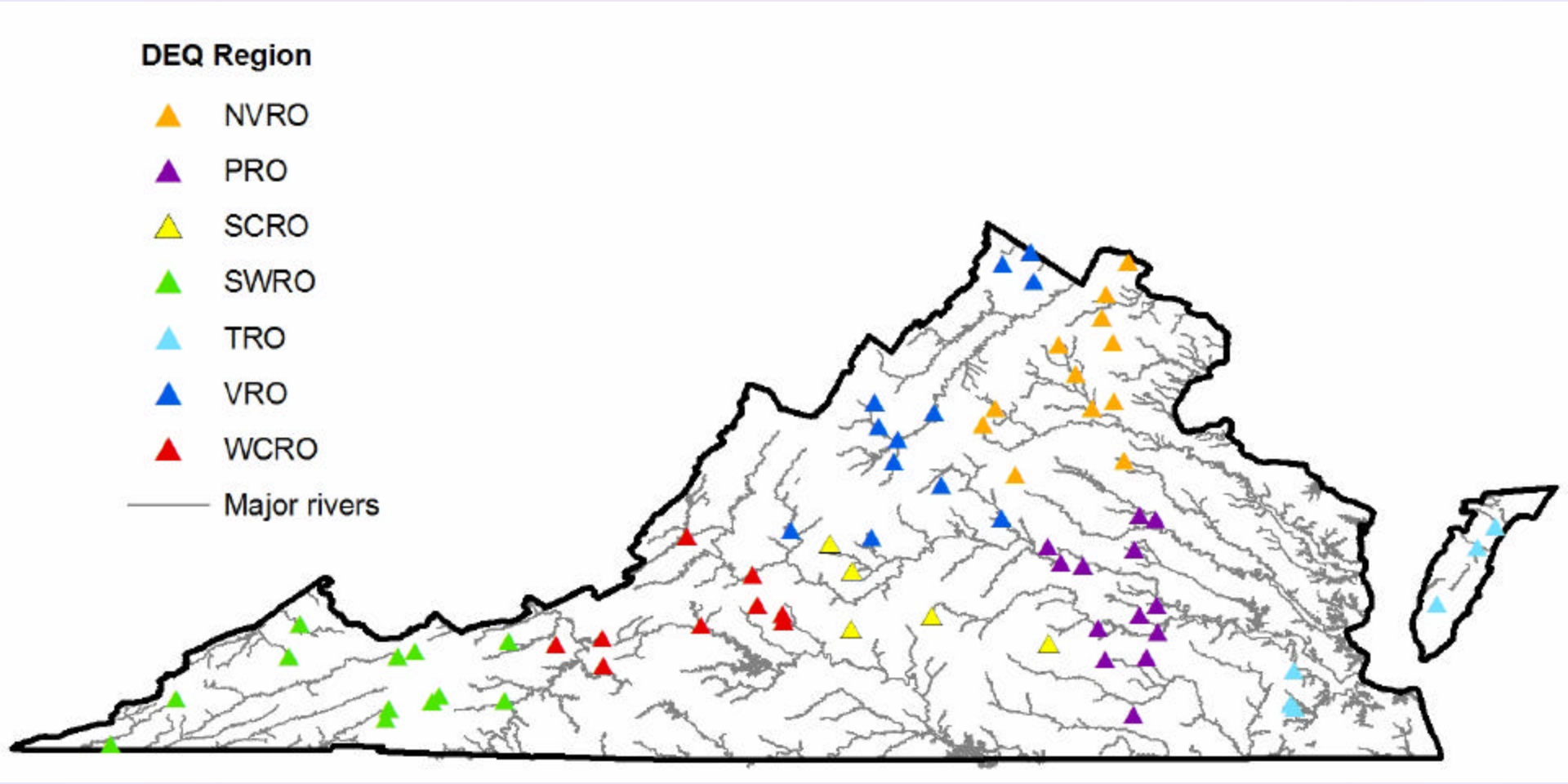
Empirical analysis of DEQ data, defined the following TN and TP categories for use in station selection:

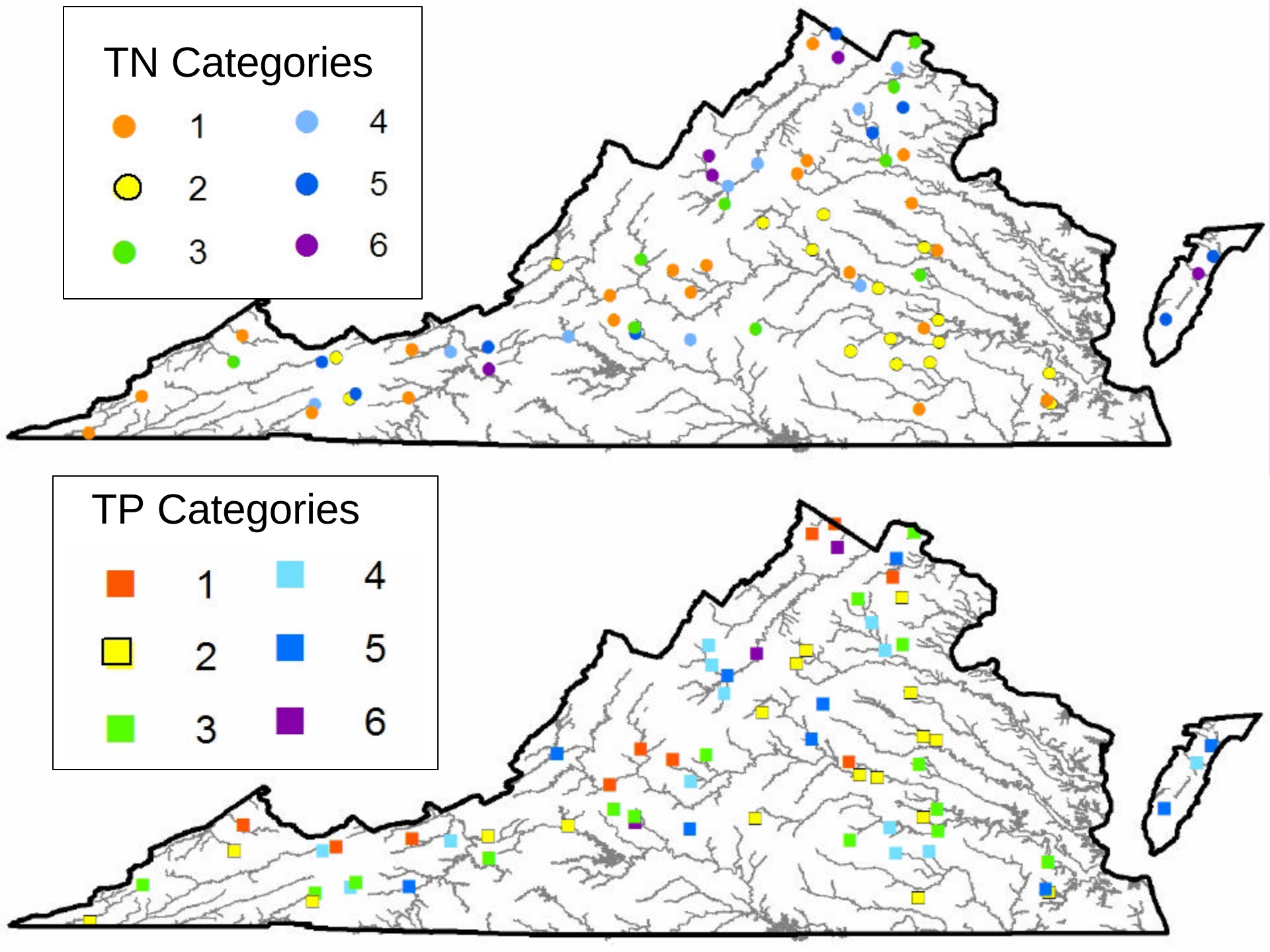
CATE-GORY	TN (mg/L)	TN (# obs)	TP (mg/L)	TP (# obs)
1	<0.5	258	<0.02	180
2	0.5 - <1.0	396	0.02 - <0.04	331
3	1.0 - <1.5	132	0.04 - <0.06	210
4	1.5 - <2.0	65	0.06 - <0.10	123
5	2.0 - <3.0	41	0.1 - <0.20	60
6	>=3.0	35	>=0.2	23

List of monitoring locations, classified by TN and TP category based on recent monitoring, and the following site selection requirements were distributed to each DEQ Regional office :

1. Wadeable, suitable for benthic collection.
2. Not known to be influenced by major urban inputs, toxic inputs likely to cause benthic impairments, point source discharges.
3. Well distributed among TN and TP categories.
4. Choose sites that are not clustered and are representative of the entire region.

Stations Selected




TN Categories
1
2
3
4
5
6
TP Categories
1
2
3
4
5
6

Distribution of TN and TP levels among locations selected for the pilot program

		TP_CAT						All
		1 <0.02 mg/L	2 0.02 - <0.04	3 0.04 - <0.06	4 0.06 - <0.10	5 0.1 - <0.20	6 >=0.2 mg/L	
TN_CAT	1 <0.5 mg/L	6	8	4	1	2		21
	2 0.5 - <1.0	1	4	4	4	3		16
	3 1.0 - <1.5	2	2	3	2			9
	4 1.5 - <2.0		2	2	1	3	1	9
	5 2.0 - <3.0	1	2	1	2	2	1	9
	6 >=3.0 mg/L			1	3		1	5
All		10	18	15	13	10	3	69

Note: From a data analysis standpoint: the optimal situation would be for locations to be evenly distributed among the above category combinations.

2. Winter 2008

AAC meets with biologists to discuss pilot program

3. Spring 2008:

DEQ Biologists implement the protocol at ½ of the stations:

Water quality: Data goes into CEDS database, as per standard procedures.

Visual Assessment: Data maintained by DEQ regions and transmitted to Va Tech.

Benthic Macroinvertebrate Assessment: Data handled as per standard procedures (includes habitat assessment).

Conduct all 3 steps at each location. Record time and other resources required for program implementation (visual assessment and elsewhere?)

4. Summer 2008

Data from the spring sampling to be assembled and made available to the AAC and to interested parties within DEQ for analysis.

The AAC to review data, conduct preliminary data analysis, meet with regional biologists, and discuss with biologists whether or not midcourse corrections are needed.

5. Fall 2008

Spring 2008 procedures to be repeated with the other half of the selected sites.

6. Winter 2008-09:

AAC: Analyzes data; prepares report for DEQ.

DEQ (in consultation with EPA): Makes determination on whether or not the Screening Value approach is viable.

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