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Stewardship-Level Macroinvertebrate Index Development for Northern New Jersey High Gradient, Pinelands and Coastal Plain Streams

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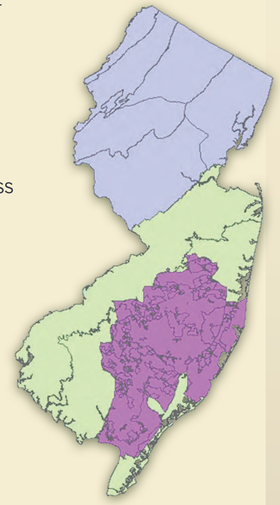
TETRA TECH

Overview

The New Jersey Department of Environmental Protection (NJDEP) Volunteer Monitoring Program and the Watershed Watch Network are two programs that allow volunteers to contribute to NJDEP stream assessment efforts. The volunteer programs have relied on general assessment tools that have not been specifically calibrated for each ecoregion of the state. Volunteer assessment tools were reviewed and refined by: 1) evaluating the effectiveness of the Volunteer Water Quality Index at discriminating between reference and stressed samples in the Northern High Gradient, Coastal Plain, and Pinelands regions; and 2) developing valid order level multi-metric indices for those regions in which the Volunteer Water Quality Index has limited effectiveness.



Pinelands
Coastal Plain
Northern High Gradient

Methods

Data source: State biomonitoring samples (NJDEP Ambient Monitoring sites)

Data reduction: Taxonomic identifications were collapsed to the Volunteer-level taxonomic units (orders and families)

Metrics: The NJ Volunteer Water Quality Index; the professional indices used by NJDEP in the Northern High Gradient, Coastal Plain, and Pinelands; and sixteen additional order-level metrics were calculated for samples in each region.

Volunteer field form

Pollution Intolerant	Pollution Sensitive	Pollution Tolerant
Example: ☒ Mayfly 23	☐ Net Spinning Caddisfly	☐ Black Fly
☐ Mayfly	☐ Alderfly	☐ Midge Fly
☐ Stonefly	☐ Damselfly	☐ Lunged Snails
☐ Caddisfly not net spinners	☐ Dragonfly	☐ Aquatic Worms
☐ Dobsonfly/Fish Fly	☐ Crane Fly	☐ Leeches
☐ Watersnipe Fly	☐ Sowbugs	
☐ Riffle Beetle	☐ Scud	
☐ Water Penny	☐ Crayfish	
☐ Gilled Snails	☐ Clams/Mussels	
# of checks * 3 =	# of checks * 2=	# of checks * 1 =

Add the three calculated numbers together to find your total index value and rate your stream using the rating values below.

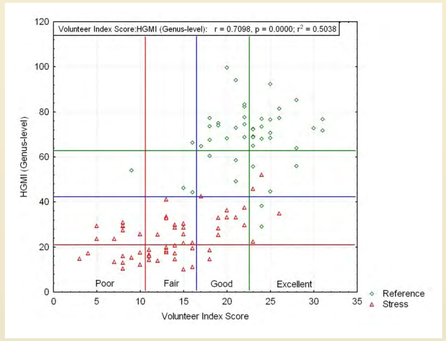
Total Index Value_____

Water Quality Rating

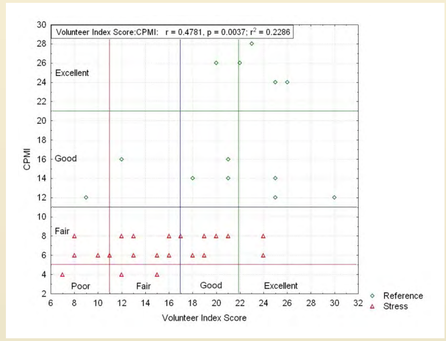
____ Excellent (>22) ____ Good (17-22) ____ Fair (11.16) ____ Poor (<11)

Results

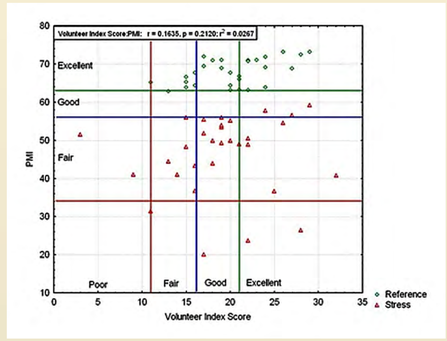
Northern High Gradient



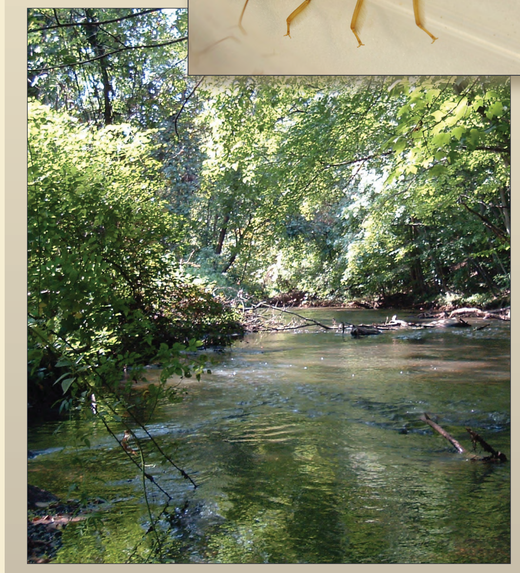
Coastal Plain



Pinelands



Relationships between the professional indices used in each region [High Gradient Macroinvertebrate Index (HGMI), Coastal Plain Macroinvertebrate Index (CPMI) and Pinelands Macroinvertebrate Index (PMI)] and the (original) Volunteer Water Quality Index



South Branch Big Timber Creek, NJ

Relationships between the CPMI and PMI and the (newly developed) Volunteer Coastal Plains Macroinvertebrate Index (VCPMI) and the Volunteer Pinelands Macroinvertebrate Index (VPMI)

Table 1. Scoring formulas for Volunteer Coastal Plains Macroinvertebrate Index (VCPMI)

Metric #	Metric Name	Scoring Formula
1	Number of EPT Taxa (-)	100 * metric #1 / 3
2	Percent NonInsect Taxa (+)	100 * (62.5- metric # 2) / (62.5-16.67)
3	Beck's Biotic Index (-)	100 * metric #3 / 14
4	Percent Intolerant Taxa (-)	100 * metric #4 / 44.4
5	Percent Worm, Leech and Lunged Snail Individuals (+)	100 * (46.2- metric #5) / (46.2-1.85)

Table 2. Scoring formulas for Volunteer Pinelands Macroinvertebrate Index (VPMI)

Metric #	Metric Name	Scoring Formula
1	Percent Crustacea & Mollusca Taxa (+)	100 * (47.2- metric # 1) / (47.2-0)
2	Number of Insect Taxa (-)	100 * metric #2 / 10
3	Number of EPT Taxa/(Number of Tolerant Taxa + 1) (-)	100 * metric # 3 / 1
4	Percent Worm, Leech and Lunged Snail Individuals (+)	100 * (64.7 - metric # 4) / (64.7-0)
5	Number of Tolerant Taxa (+)	100 * (4- metric # 5) / (4-2)

The Volunteer Water Quality Index performed well in the Northern High Gradient region. It was slightly less effective at discriminating between reference and stressed samples in the Coastal Plain region, and performed poorly in the Pinelands regions. Two new multi-metric indices, the Volunteer Coastal Plains Macroinvertebrate Index (VCPMI) and the Volunteer Pinelands Macroinvertebrate Index (VPMI), were developed to help assess volunteer-collected data in these regions.

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