Probabilistic Wadeable Streams Survey In Puerto Rico

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Objectives

• Generate a statistically valid and environmentally relevant report on the condition of Puerto Rico’s streams
• Determine what percent of Puerto Rico’s streams are in good, fair, and poor condition
• Determine what is the relative importance of key stressors such as nutrients and sediments
Survey Design and Study Area

- Probability-based survey design
- 1st – 4th Strahler order
- 50 stream sites
- Additional oversample sites available
Histogram: % Forest vs # of Sites
Histogram: % Grassland/Herbaceous vs # of Sites
Histogram: % Urban vs # of Sites

# of Sites vs % Urban
What variables were measured?

• In situ temperature, pH, DO, and conductivity
• Water chemical quality and nutrient concentrations
• Benthic macroinvertebrates
• Physical habitat characteristics
Biological Methods Development

• Surveys of benthic macroinvertebrates (1994, 2006, 2009)
• Classification and reference conditions (region, elevation, conductivity)
• Candidate metric evaluation
• Index Development?
2006 Survey

Figure 1. Map of Puerto Rico and location of study sites
Candidate Metrics

- Caddisfly Richness
- % Coleopteran
- % Gastropoda
- % Chironomid
- % Non-insect
- Total Families
- % Caddisfly
- % Mayfly & Caddisfly
- % Lepidoptera
- % Mayfly
- % Diptera

- % Odonata
- % Oligochaeta
- % Dominance
- Taxa Richness
- ET Richness
- Crustacean Richness
- % Crustacean
- % Scraper
- % Collector/Filterers
- % Predators
- % Intolerant
Chemical and Physical Habitat Stressors

- Total Phosphorus
- Total Nitrogen
- Dissolved Oxygen
- Water Quality
- Riparian Disturbance
- Sedimentation
- In-stream Fish Habitat
- Riparian Vegetation
- Major Dams
21 Metrics Evaluated

- *+#CFLYRICH
- *+PRCNTCOL
- *-#PRCNTGAS
- PRCNTCHIR
- *PRCNTNINS
- TOTFAM
- +PRCNTCFCM
- PRCNTET
- +PRCNTLEP
- PRCNTMFCM
- *-PRCNTDIP
- PRCNTODON
- PRCNTOLIG
- PRCNTDOMI
- *+TAXARICH
- ETRICH
- CRUSRICH
- +PRCNTSCR
- +#PRCNTCF
- #PRCNTITOL
- #PRCNTCRUS
Chemistry vs # of Metrics

# of metrics

1. DO
2. CL
3. TOC
4. DOC
5. Residue
6. Turbidity
7. Ammonia
Rio Grande de Loiza

Rio Emajague

Rio Gurabo

Trib. of Rio Cajuitas
Metric Responses

• *modest separation of high forest land cover versus predominantly grassland/herb land cover (box score =1)

• +significant relationships with all or most of the following WQ variables: DO, chloride, TOC, DOC, TSS, turbidity, ammonia

• -significant relationship with urban land cover

• #significant relationships with habitat variables (fish cover, sediment, riparian cover)
Summary on Dams

38% with dams
62% with no dams

Distribution of Shrimps on Sites with Dams

5.26% with shrimps
94.74% without shrimps

Distribution of Shrimps on Sites without Dams

58.06% with shrimps
41.94% without shrimps