

*Long Term Ecological Monitoring of
Streams & Rivers in Denali National
Park & Preserve, Alaska*

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Why study streams, and aquatic invertebrates in Denali?

- Water
- Why invertebrates?
 - Relatively long lived.
 - Sedentary.
 - Their communities integrate, and reflect the entire watershed.
 - Respond to Chemical & Physical disturbances.

It's 1994.....



- What do we know about Denali's Inverts?
 - Diversity?
 - Distribution?
 - Abundance?
 - Life history patterns?
 - Community Stability?

1994 - 1996 Aims

- **Conduct a Basic Inventory**
 - Who lives where?
 - How many are there?
 - Does this change?
 - Seasonally
 - Annually
- **Sampling must be Statistically robust**
 - Quantitative sampling method
 - Replicate samples

- **Baseline Information**
 - Total of 26 taxa identified
 - No. of individuals / sample was 0 - 2000
 - Significant seasonal changes
 - Obvious community differences between stream types.

Results cont...



- 6 Groups of streams were identified using TWINSPAN analysis:
 - Clearwater
 - Spring fed
 - Kantishna
 - Larger, partial glacier-fed
 - Small Unstable
 - Glacier-fed

Specific Results

- Marked annual variation in community structure detected.
- However, the same groups could be identified over time.
- One site was representative of small watersheds.
- Different stream groups had distinct physico-chemical characteristics.

Post 1996 - Where to next?

- Continue monitoring sites to assess annual variation
 - Fourteen sites, each TWINSPAN group is represented
 - Refine sampling techniques
 - -----
- Build a framework to interpret the results
 - multimetric technique
 - multivariate (predictive) technique

A framework to aid Understanding

- **Multimetric Approach**
 - A set of metrics which measure different aspects of the community
 - e.g. Number of EPT taxa
- **Multivariate Approach**
 - A predictive model
 - Physical and chemical characteristics of a site are used to predict the biotic community
- Both must be designed to be DENALI SPECIFIC

“Framework” Results

- Multimetric Approach requires a stable “reference” condition.
- Systems in Denali appear to be too dynamic to use this technique.
- Lower 48 models are NOT accurate for Denali.
- Predictive Model has an internal accuracy of 90.7%

We are Refining the framework

- More long-term data may increase the accuracy of the metrics.
- Both techniques are being tested with impaired sites.
- The predictive model is being tested with data from a different time period.

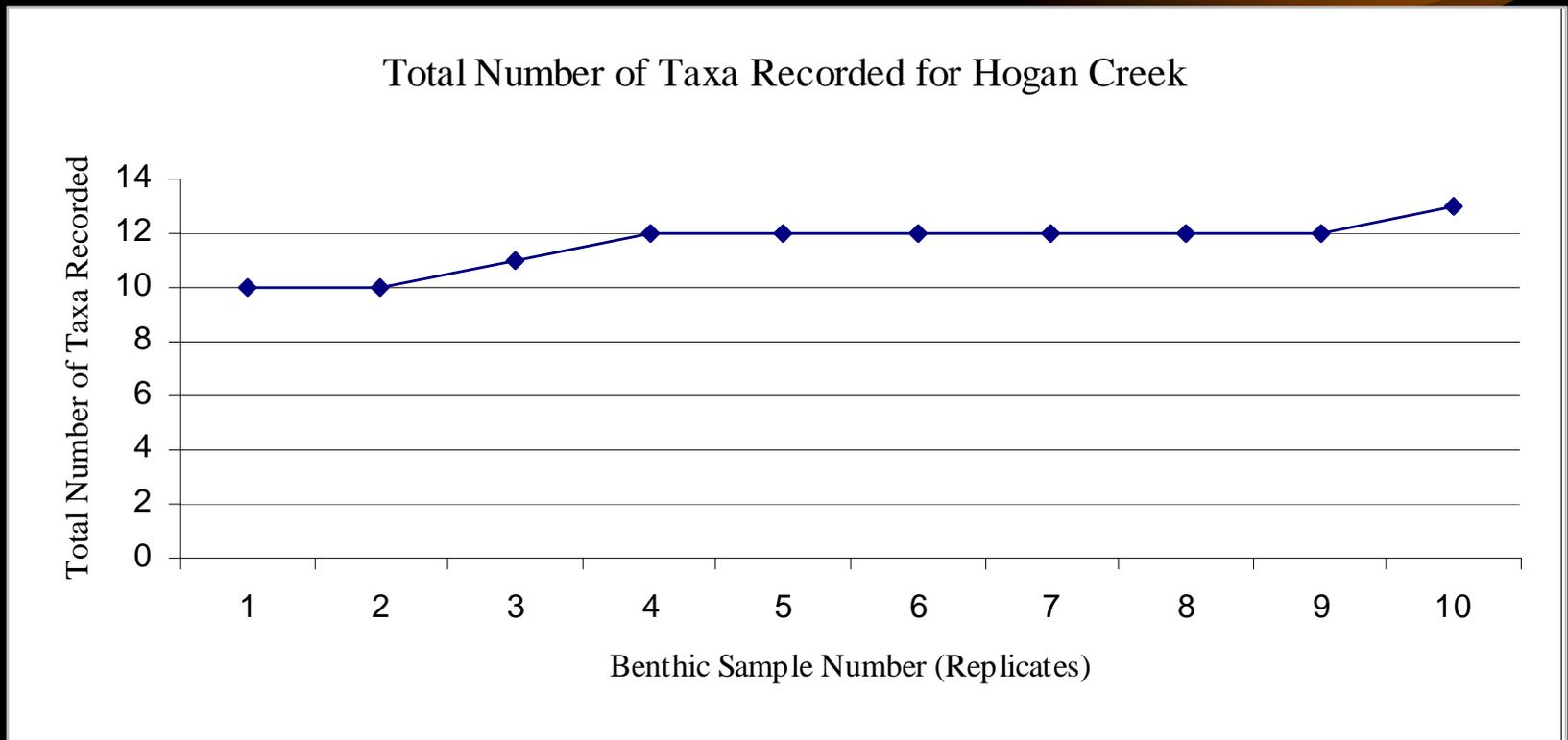
Continued Monitoring Efforts



- Number of replicates required
- Assessing other sampling methods
- Other monitoring tools
 - Chlorophyll “a”
 - Artificial Substrate
 - Natural Substrates
 - Invertebrate Biovolume

Continued Monitoring Results

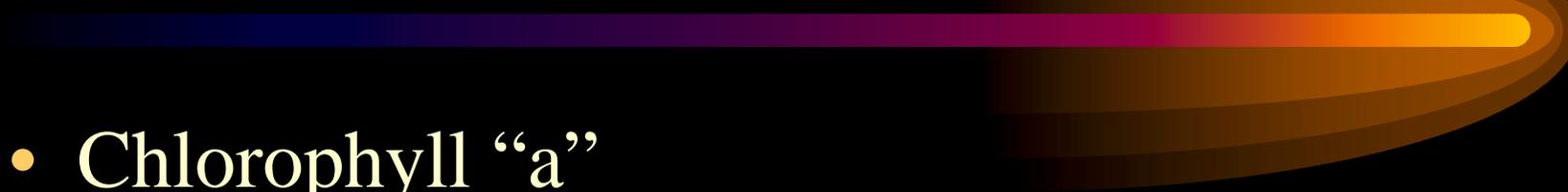
- Number of Replicates Required



Continued Monitoring Results - Sampling Techniques

- Surber samples take less field time
- Surber samples are smaller, and so are easier to sort
- Surber samples appear to capture a much higher diversity of organisms
- Surber samples are quantitative, so results can be assessed statistically.

Continued Monitoring Results - Other Techniques



- Chlorophyll “a”
 - Artificial substrates susceptible to flow events
 - Natural substrates produce highly variable results
- Invertebrates are often too small to collect non-destructive biomass data.

What Do We Know?

- Distribution, diversity, density of invertebrates.
- Spatial and temporal variation patterns.
- Distinct “types” of streams in Denali
- Community structure is closely related to physical & chemical features
- We have a simple, effective monitoring technique
- We have an accurate framework for interpreting, and acting on the results

Current Work

- Analyzing the long term data set
 - Trends
 - Linkages
- Testing the predictive model & metrics using impaired sites.
- Examining the Chironomidae in more detail
 - Identification
 - Relationships to other taxa
 - As a bioassessment tool

The Future

- We have an effective monitoring technique.
- We have developed a long term data set for a variety of sites.
- We have a model which will allow the assessment of streams which may become a concern in the future.
- Immediate future - Lunch