

STREAM CHANNEL REFERENCE SITES FOR GEOCHEMICAL AND GEOMORPHOLOGICAL CHARACTERIZATION

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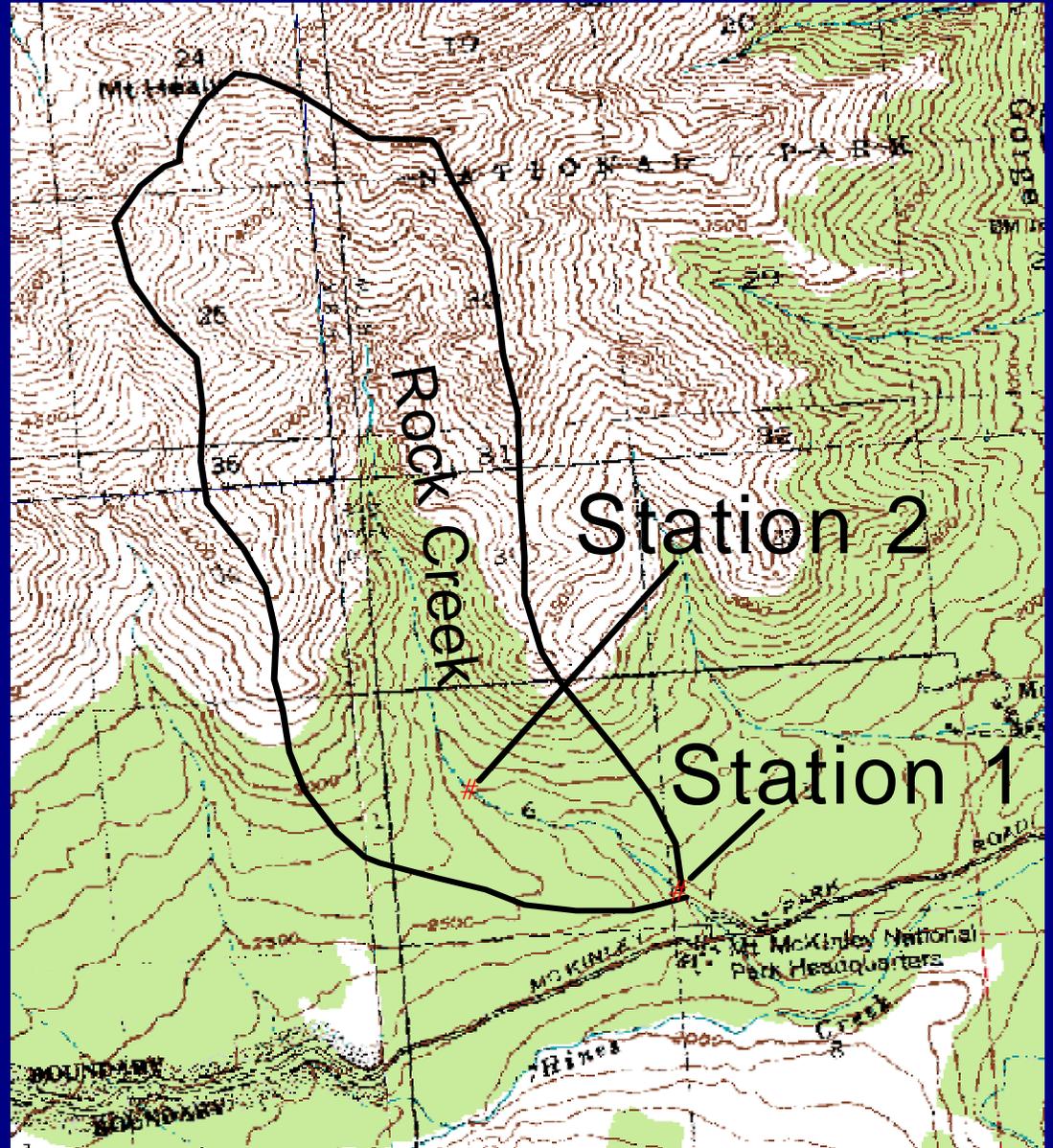
LTEM

- **Watershed Ecosystem Based Approach**
- **Water Integrates Terrestrial, Aquatic Ecosystems**
- **Conventional Hydrologic, Geochemical Measures Are Linked To Biota, Processes**
- **Watersheds Easily Defined By Soil, Vegetation, Topographic, and Hydrologic Conditions**

Rock Creek Watershed



Denali
NP&P



Rock Creek Study Area



- 1902 ACRES
- 2100 FT TO 5578 FT
- 15" PRECIP
- S-SE ASPECT
- JAN-0 deg F min
- JUL-54 deg F max

Related Rock Creek LTEM Projects

Stottlemeyer (1992)-Nitrogen Mineralization, Changes in Upstream/Downstream Chemistry.

Hanneman (1993)-Heavy Metals Sampling.

Popovics (1996)-Relationships Between Soil Water Chemistry and Nutrient Levels/Primary Productivity.

AQUATIC COMPONENT- STREAM CHANNEL REFERENCE SITES

- **SITE INTENSIVE WATER QUALITY**
 - Provides Links To Geology, Nutrient Status, Biological Productivity
- **GEOMORPHIC CHARACTERISTICS**
 - Changes In Basin Characteristics May Provide Direct Indications of Alteration In Climate or Land Use (esp.. in Arid, Arctic Lands)

Methods

- Protocol Development (USGS, USFS, COE, etc)
- 2 Channel Reference sites (1992) For Water Quality, Stream Morphology



Methods-Water Chemistry

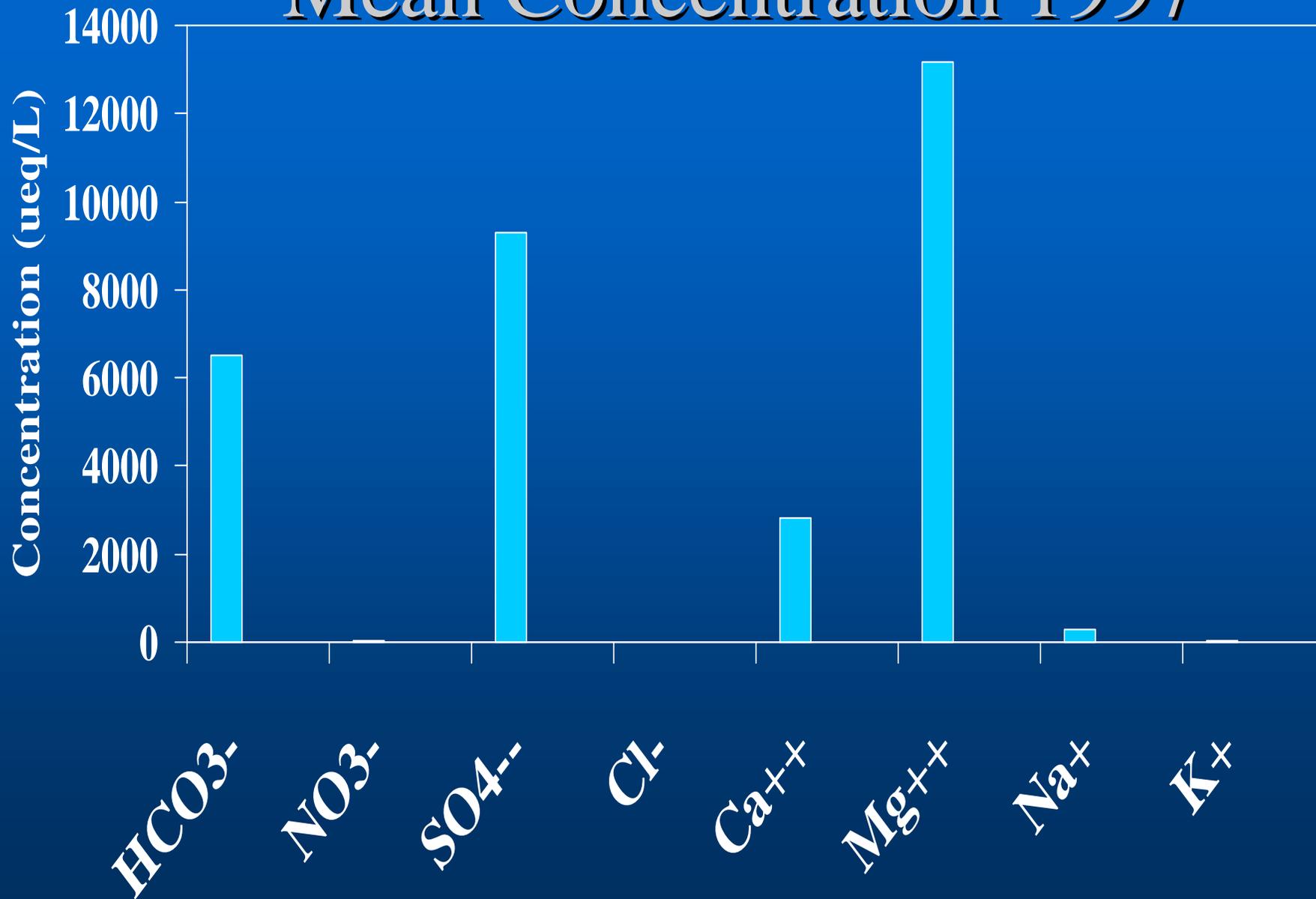
- Monthly or bi-weekly sampling
- Major Ions
- pH
- Alkalinity
- Nutrients
- TOC



RESULTS-WATER CHEMISTRY

ANALYTE (1997)	MEAN	MIN	MAX
pH	8.55	8.47	8.62
ALKALINITY (mg/L as CaCO ₃)	325	149	402
TOTAL ORGANIC CARBON (mg/L)	1.73	<mdl	2.2
CHLOROPHYLL A (mg/m ³)	0.816	0.016	3.38

Mean Concentration 1997



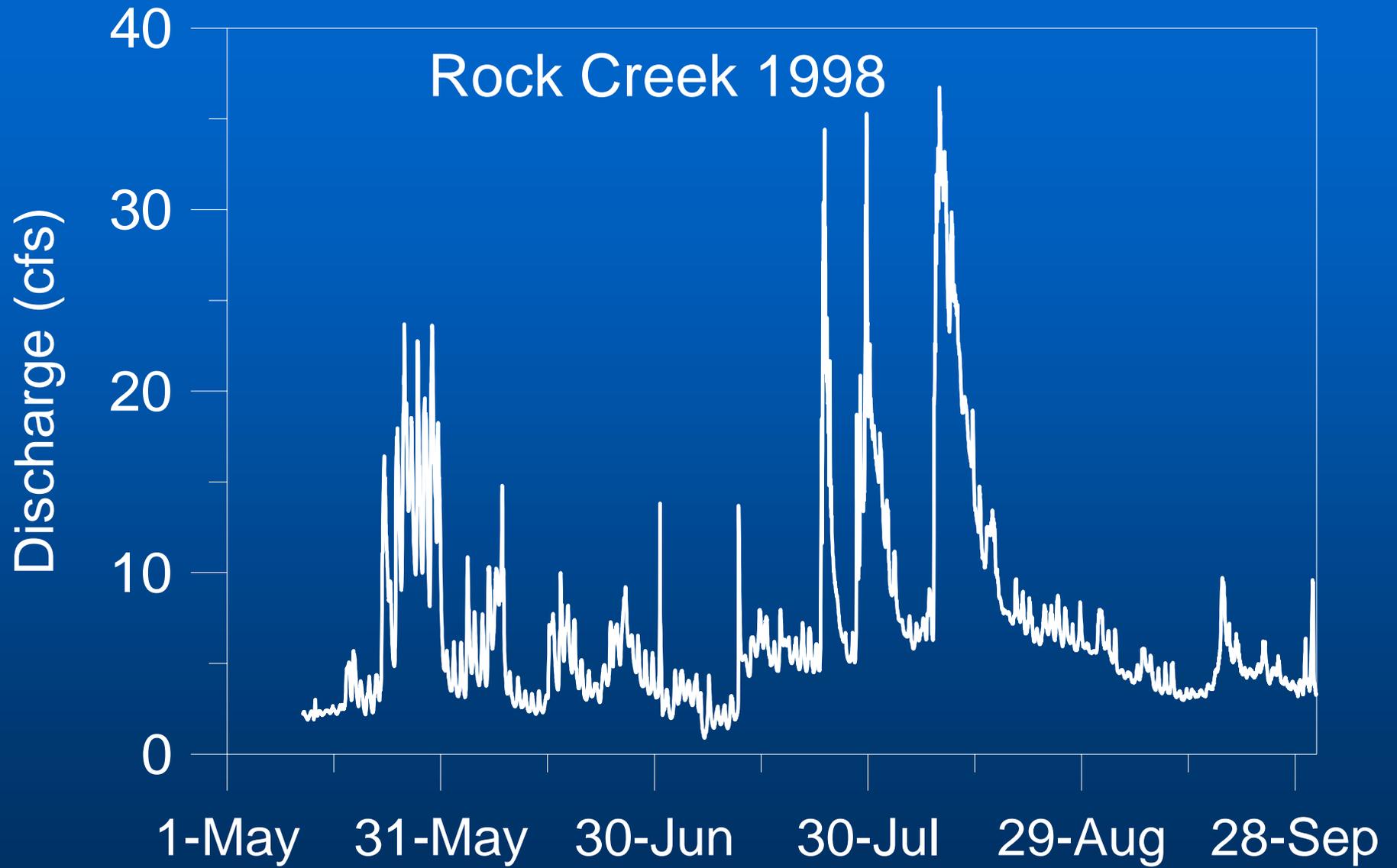
RESULTS-WATER CHEMISTRY

- **Strong Negative Correlation To Discharge (Na, Ca, K)**
- **Highly Buffered System (high pH, alkalinity)**
- **Low Nutrients, Low Carbon Inputs**
- **Mg/SO₄ and Ca/SO₄ Dominant Ion Pairs**

Methods-Geomorphic Characteristics

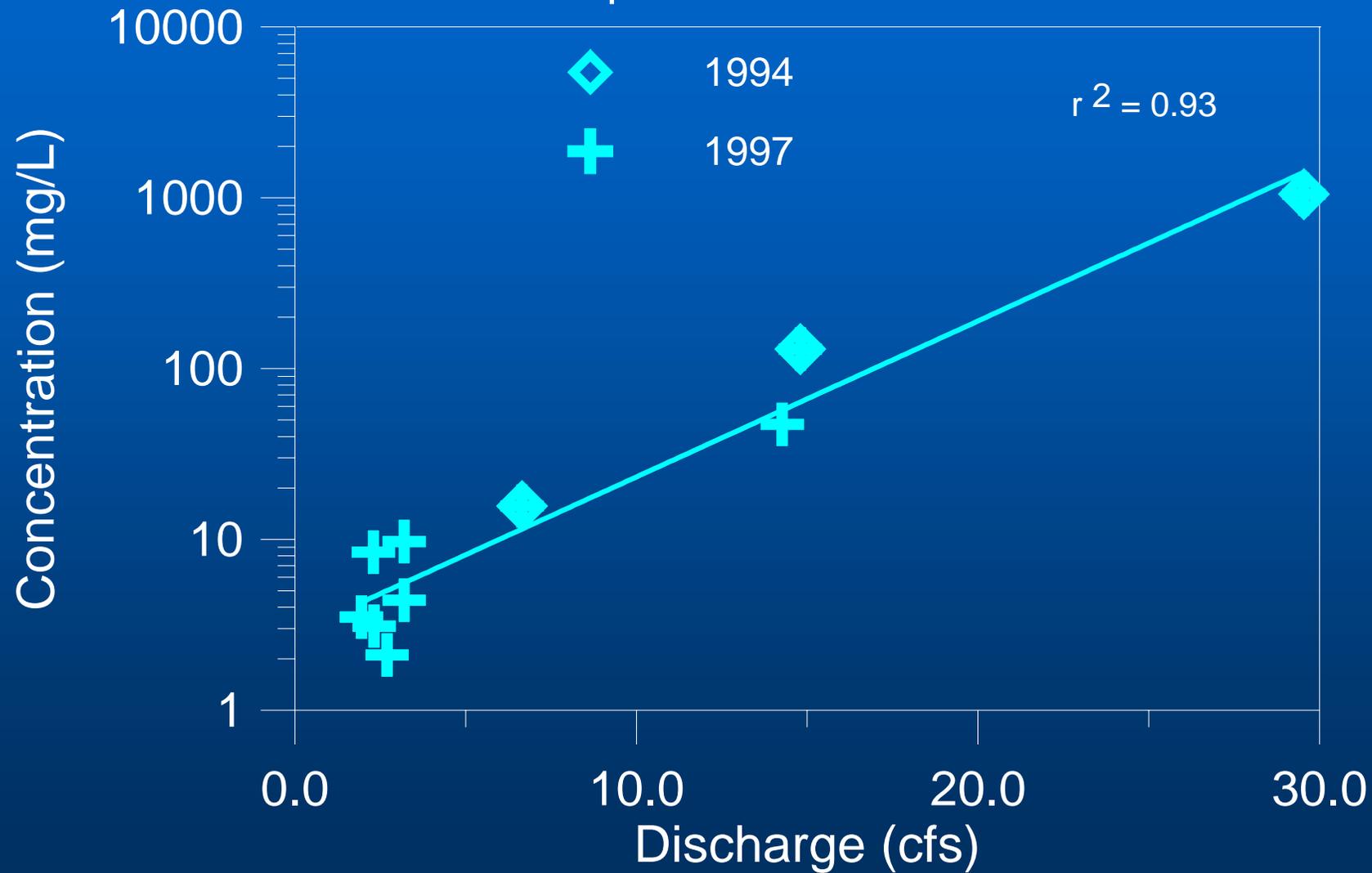
- Cross-sections, Profiles
- Pebble Counts
- Hydrograph
- Sediment Discharge





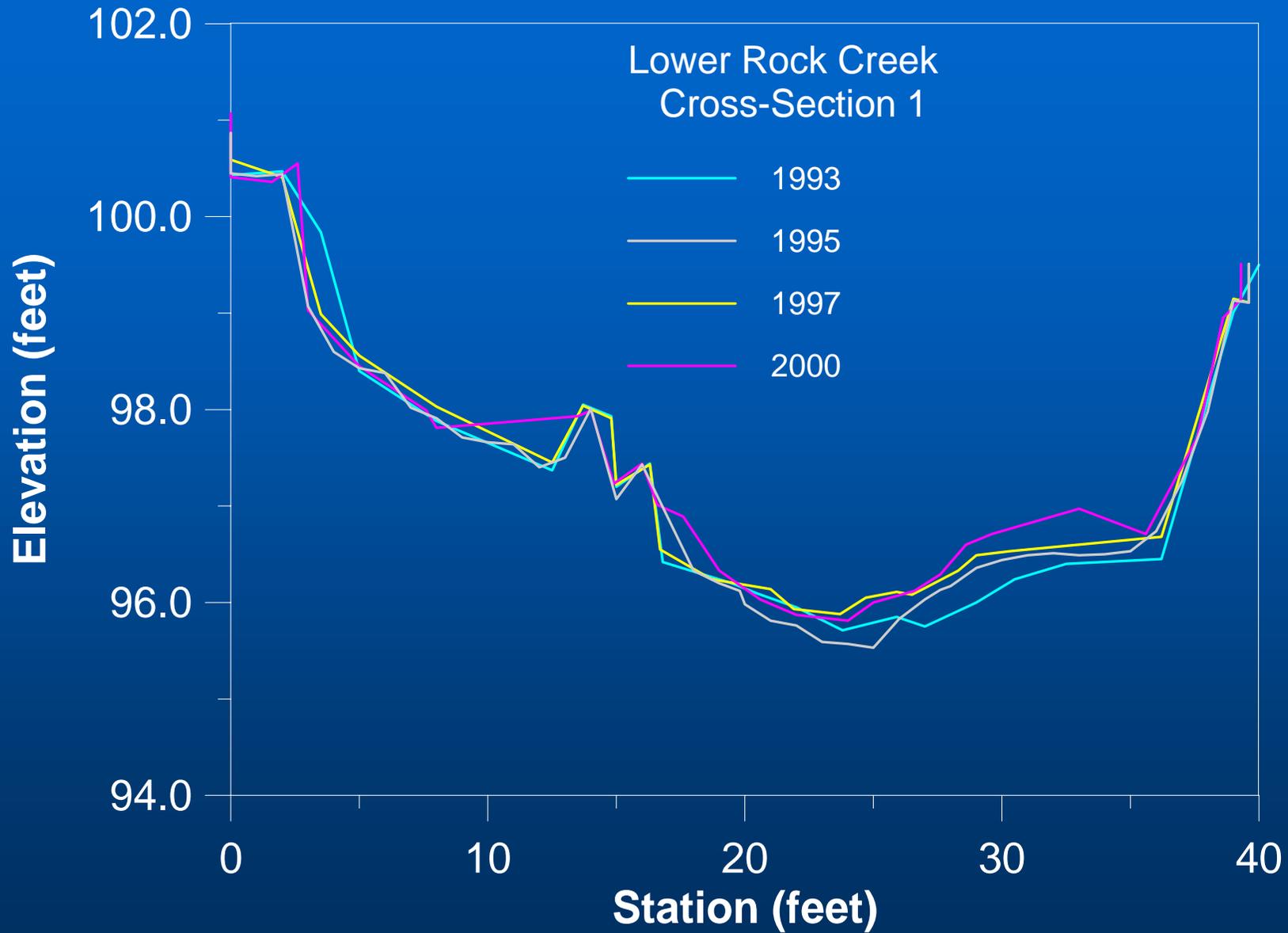


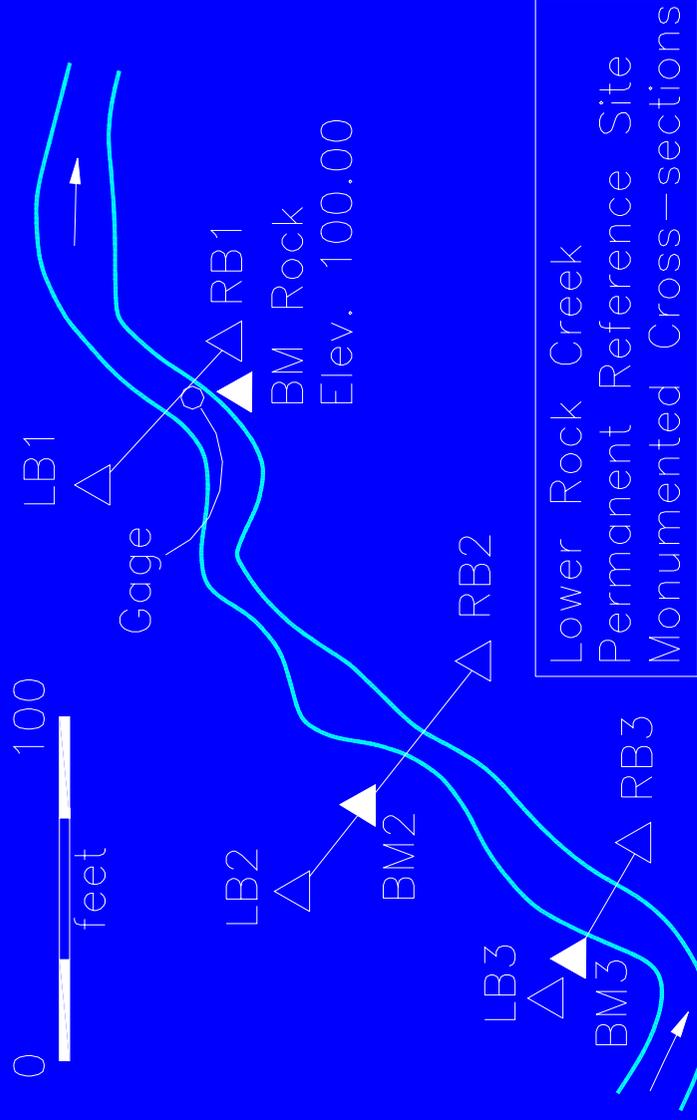
Rock Creek Suspended Sediment





- **Permanently Monumented Cross-sections to show patterns of:**
- **Erosion**
- **Deposition**
- **Lateral Movement**

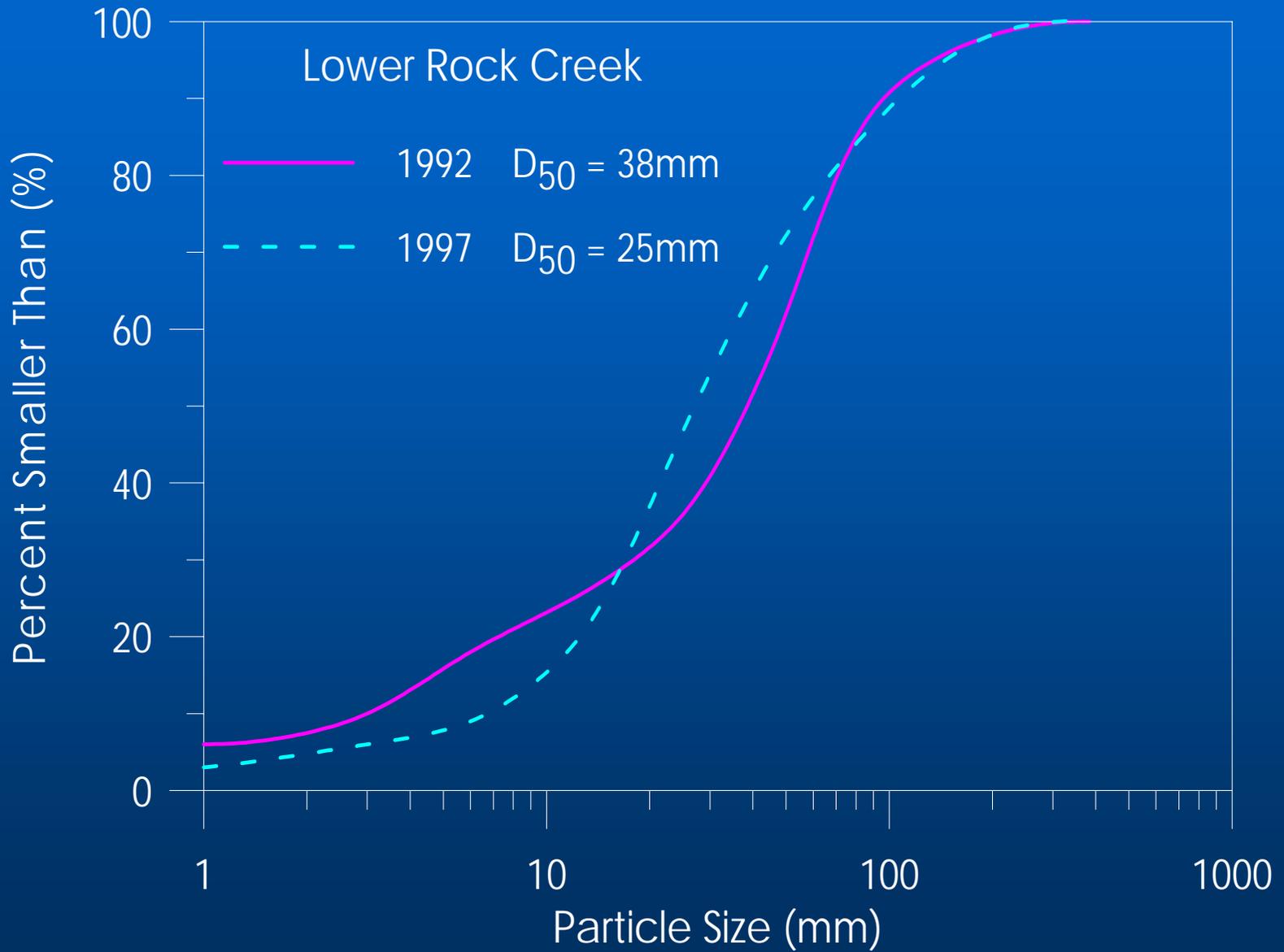




Pebble Count

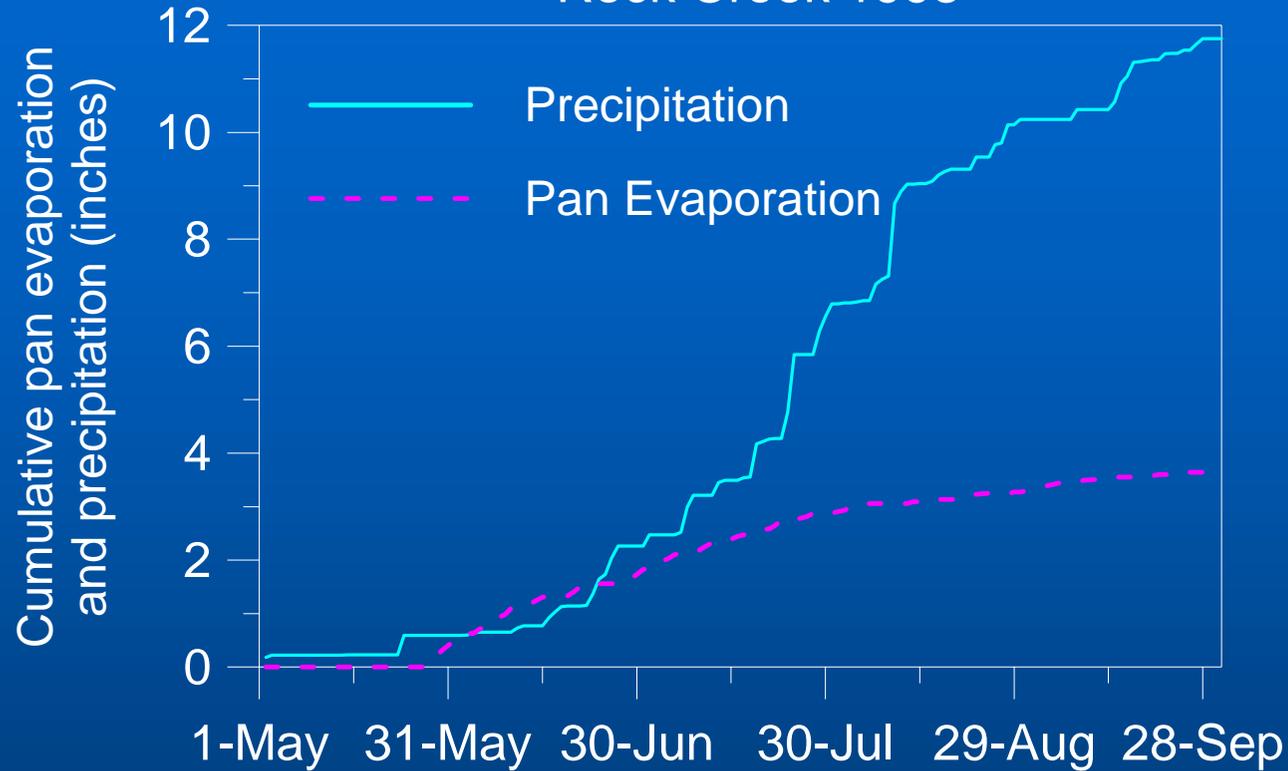
- Quantifies Stream Bed Particle Sizes
- Describes Channel Type
- Defines Bed Roughness
- Characterizes Habitat Substrate





- **ROSGEN TYPE A-3**
- **STEEP (5-6%), ENTRENCHED, CONFINED**
- **LOW SINUOSITY**
- **UNCONSOLIDATED, HETEROGENOUS MATERIAL**
- **HIGH ENERGY/HIGH SEDIMENT SUPPLY**
- **BEDFORM-STEP/POOL CASCADING CHANNEL**

Rock Creek 1998



Precip 11.75”
Pan Evap 3.64”

Precipitation is the Dominant Hydrologic Process-Contrasts to Small Arctic Watersheds, Where Evapotranspiration Far Exceeds Summer Rainfall.

Precipitation and Evapotranspiration Account For Virtually All Runoff (Soil Recharge Has No Importance In Hydrologic Ecology)

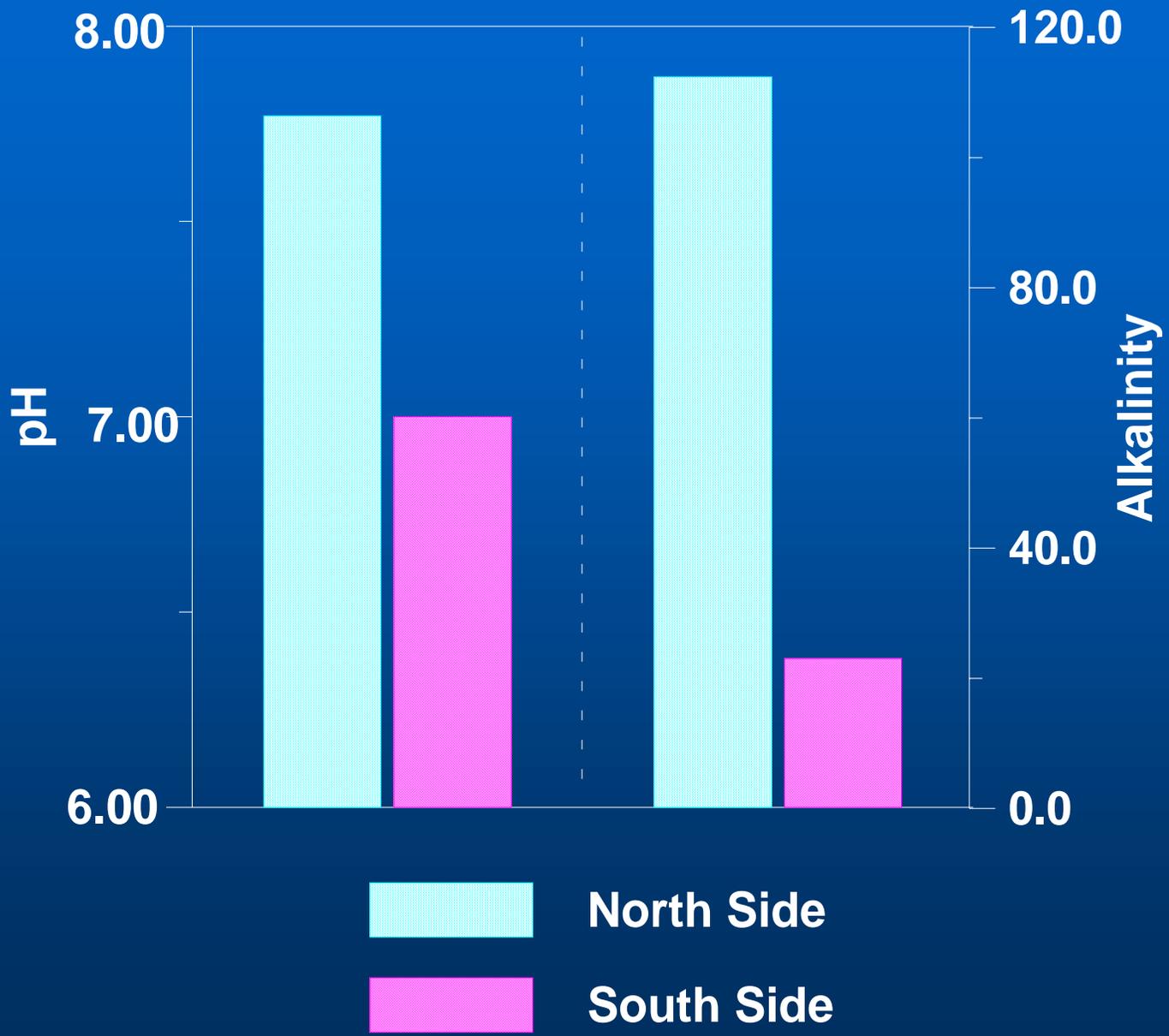
Type of Storage (Snowpack vs GW or Canopy) Have Important Implications for Streamflow, Availability of Water To Vegetation, etc.

Snowpack Storage Has Rapid 'Turnover Rate'-Landscape Has Little Memory From Year to Year.

(GW Dominated System Transmits Effects of Surplus or Deficit For a Number of Years).

USFS/NPS Parkwide Water Quality Reconnaissance 1994-1996

- **Chemistry, TDS, DO, Discharge, Turbidity, DOC**
- **North Side-32 Clear Water Streams, 11 Glacial-Fed Streams**
- **South Side-11 Clear Water Streams, 8 Glacial-Fed Streams**



- **Higher pH/Alk/Ion Conc. on North Side
Associated With More Basic Marine and
Easily Weathered Volcanic Rocks**
- **Lower pH/Alk/Ion Conc. On South Side
Associated With More Acidic Igneous
Plutons and less Carbonaceous Marine
Rock**
- **Turbidity/Suspended Sediment Not
Significantly Different Between Geologies**

USGS NAWQA Study-Cook Inlet

- **Obtain Baseline Qw Data at DENA, LACL, KATM**
- **Original DENA Sites, Colorado, Costello Creeks (mined vs. unmined)**
- **National NAWQA Protocols Used to Describe Physical, Chemical, Biological Characteristics**
- **Study Began 1998**

USGS Study-Costello, Camp Creeks

- **1999,2000-USGS/NPS Partnership Program, DENA Funding, DOI Match Program**
- **Water Quality-Chemistry, Nutrients, TOC, Metals**
- **Fish Tissue-Trace Metals**
- **Stream Sediments-Trace Metals, SVOCs**
- **Physical Habitat Surveys, Macro-Inverts**
- **10 Sites From Edwards/Tranel Resampled**

USGS Study-Costello, Camp Creeks

- **High Selenium Values in Fish Tissue**
- **High SVOCs in Stream Sediments (mining effects, snowmachines, ??)**
- **Additional work to determine if Qw on South Side streams can be related to basin characteristics (rock type, glaciers, etc.)**

Future Direction

- **Need to look at long-term trends in watershed nutrient budgets, and response to change.**
- **Large Soil Organic N and C pools**
- **Slight Soil Warming Could Increase Streamwater Inorganic N, DON, DOC**