A cooperative State and USGS statewide water quality monitoring network: accomplishments and lessons learned after 15 years

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opportunities to excel

Some ~~difficulties~~ with maintaining a long-term statewide monitoring network

It often takes a long time to get meaningful trend data

Things change:

- Priorities change –
  - "Classic" chemical-based WQ measures to bioassessment to integrated assessment
  - Water quality standards change (bacteria, dissolved metals, fish tissue based water quality criteria for mercury
  - Antidegradation to TMDLs
  - Stakeholder priorities change
  - Agency staff change
- Methods change
- Budgets little changed
  - 1989 ~ $200,000/yr
    2006 ~ $230,000/yr

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Initial Network Design (1989-1995)

Antidegradation focus

- maintaining “high quality” waters which have better quality than that required by numeric criteria
  - protecting existing aquatic life and recreational beneficial uses of waters
  - Apparent emphasis on nutrient enrichment in agriculturally influenced waters

Photo: Barry Bean, Idaho Power Co.

Initial Network Design (1989-1995)

56 Sites chosen

- "Integrator" sites – located near the outflow of major hydrologic basins
- Represent major upstream land uses
- Located with existing streamflow-gaging network

- Width and depth integrated sample collection; samples representative of channel cross-section at the time of sampling;
- bimonthly sampling year-round

Chemical and physical parameters measured

- no direct measures of aquatic life uses

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Initial Network Design (1989-1995)

Complement other efforts

- Built around 7 then-existing sites of the late USGS National Stream Accounting Network (NASQAN) sites , 3 NASQAN sites continued
- 3 USGS National Water Quality Assessment (NAWQA) status and trends sites

Annual, biennial, and triennial sample rotation

- Annual: active WQ management efforts
- Biennial: WQ and land use expected to change slowly
- Triennial: Future development concerns

No explicit consideration of reference conditions

Emphasis on maximizing data collection

- All budget devoted to data collection, none to interpretation

USGS

1996-to date

Mindset change #1 – Use biological data to evaluate biological uses!

- Added invertebrate and fish collection
- Added reference-like sites
- Added continuous temperature loggers
- Monthly chemical sampling during April-September
- Dropped most chemical sampling (trace metals, pesticides)
- Dropped and replaced sites

Mindset change #2 – Data are not self-interpreting

- Devoted 1 full year's budget to data interpretation

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Data Availability and Interpretation

Raw data:

- 1989-2001 – Published in water-year annual data reports
- More recently – Chemical and physical data available via USGS National Water Information System Web site (NWISWeb).
- Biological data available through locally administered interactive mapping web site

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USGS NWISWeb Data for Idaho - Microsoft Internet Explorer

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Address http://waterdata.usgs.gov/id/nwis/#top_of_page Go Links

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Water Resources

Data Category: Home Geographic Area: Idaho go

NWISWeb Data for Idaho

Data Category

Real-time **Current-conditions** data transmitted from selected surface-water, ground-water, and water-quality sites

Site information Descriptive site information for all sites with links to all available water data for individual sites.

Surface water Water flow and levels in streams, lakes, and springs.

Ground water Water levels in wells.

Water quality Chemical and physical data for streams, lakes, springs, and wells.

Introduction

These pages provide access to water-resources data collected at approximately 1.5 million sites in all 50 States, the District of Columbia, and Puerto Rico. Online access to this data is organized around the categories listed to the left.

The USGS investigates the occurrence, quantity, quality, distribution, and movement of surface and underground waters and disseminates the data to the public, State and local governments, public and private utilities, and other Federal agencies involved with managing our water resources.

About Us **Help** **Tutorial**

Questions about data — Idaho NWISWeb Data Inquiries
Feedback on this website — Idaho NWISWeb Maintainer

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Explanation of terms

NWISWeb Data for Idaho
http://waterdata.usgs.gov/id/nwis?

Retrieved on 2006-05-09 17:01:03 EDT

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USGS Water Quality Samples for Idaho: Sample Data - Microsoft Internet Explorer

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Water Resources

Data Category: Water Quality

Geographic Area: Idaho

go

Water Quality Samples for Idaho

Some complex retrievals may take a few minutes.

Site Selection Criteria

Choose one or more criteria to use for selecting sites:

Site -- Location --	Site -- Identifier --	Site -- Attribute --	Data -- Attribute --
☐ County	☐ Site Name	☐ Site type	☐ Number of observations
☐ Hydrologic Unit	☐ Site Number	☐ Drainage area	☐ Period of record
☐ Lat-Long box	☐ Multiple Site Numbers	☐ Well depth	☐ Sample medium type
	☐ Agency Code	☐ Hole depth	☐ Parameter groupings
	☐ File of Site Numbers	☐ National aquifer (by code)	
		☐ National aquifer (by name)	
		☐ Local aquifer (by code)	
		☐ Local aquifer (by name)	

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Explanation of terms

Water Quality Samples for Idaho: Sample Data

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http://idims.wr.usgs.gov - Idaho District Internet Mapping - Microsoft Internet Explorer

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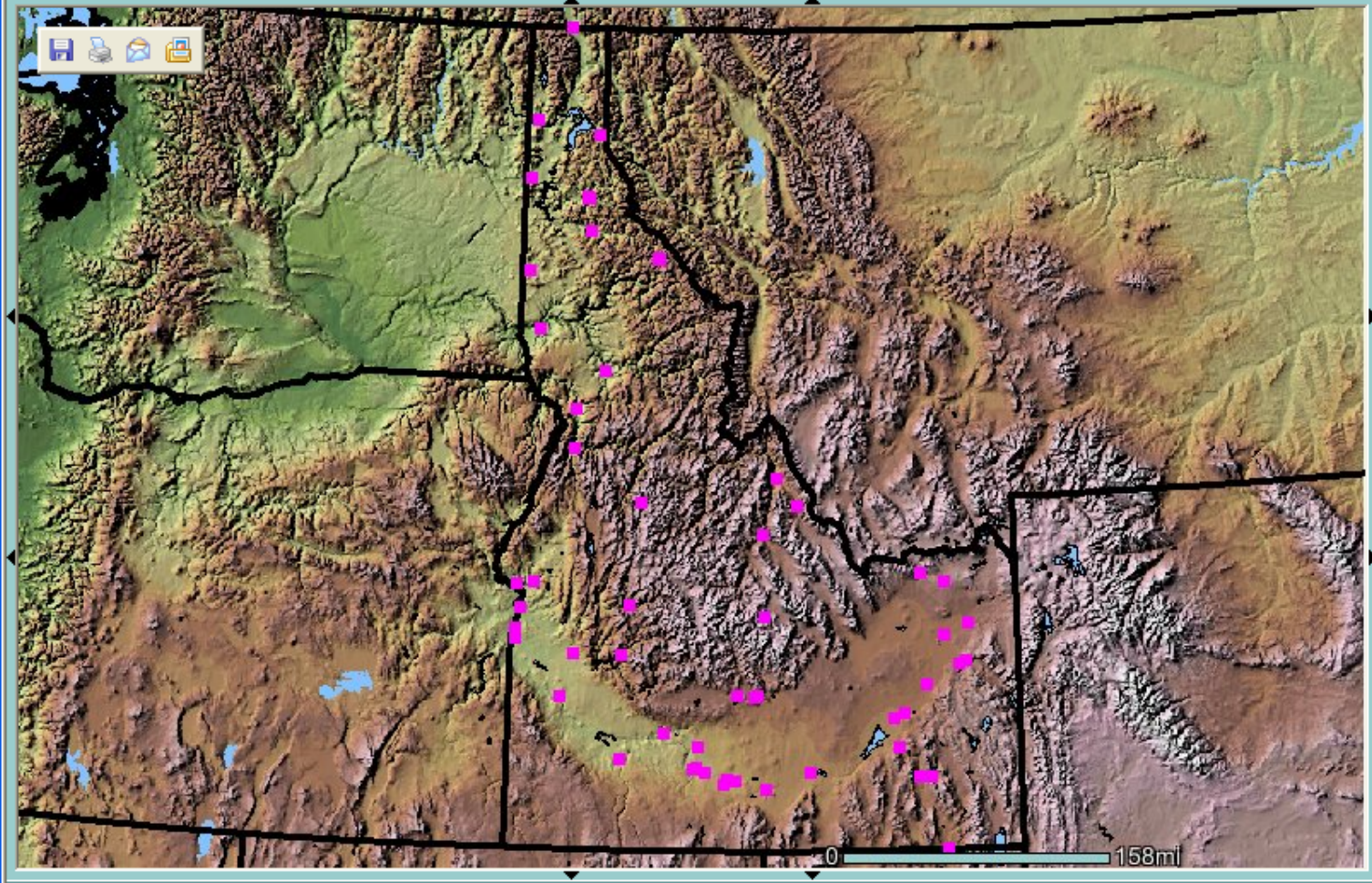
Idaho Data

Overview | Help | ZoomIn | ZoomOut | ZoomLast | FullExtent | Pan | Identify | Query | Measure | Clear | UseSelect | Line/Poly | Print | Hyperlink | Refresh



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- [ ] Stream_Gages
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- [ ] Cities
- [ ] Counties
- [x] Waterbodies
- [ ] Township/Range
- [x] Shaded_Relief

U.S. Department of the Interior, U.S.Geological Survey
Contact: Jacque Coles
URL: http://idims.wr.usgs.gov

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Biological data are web served

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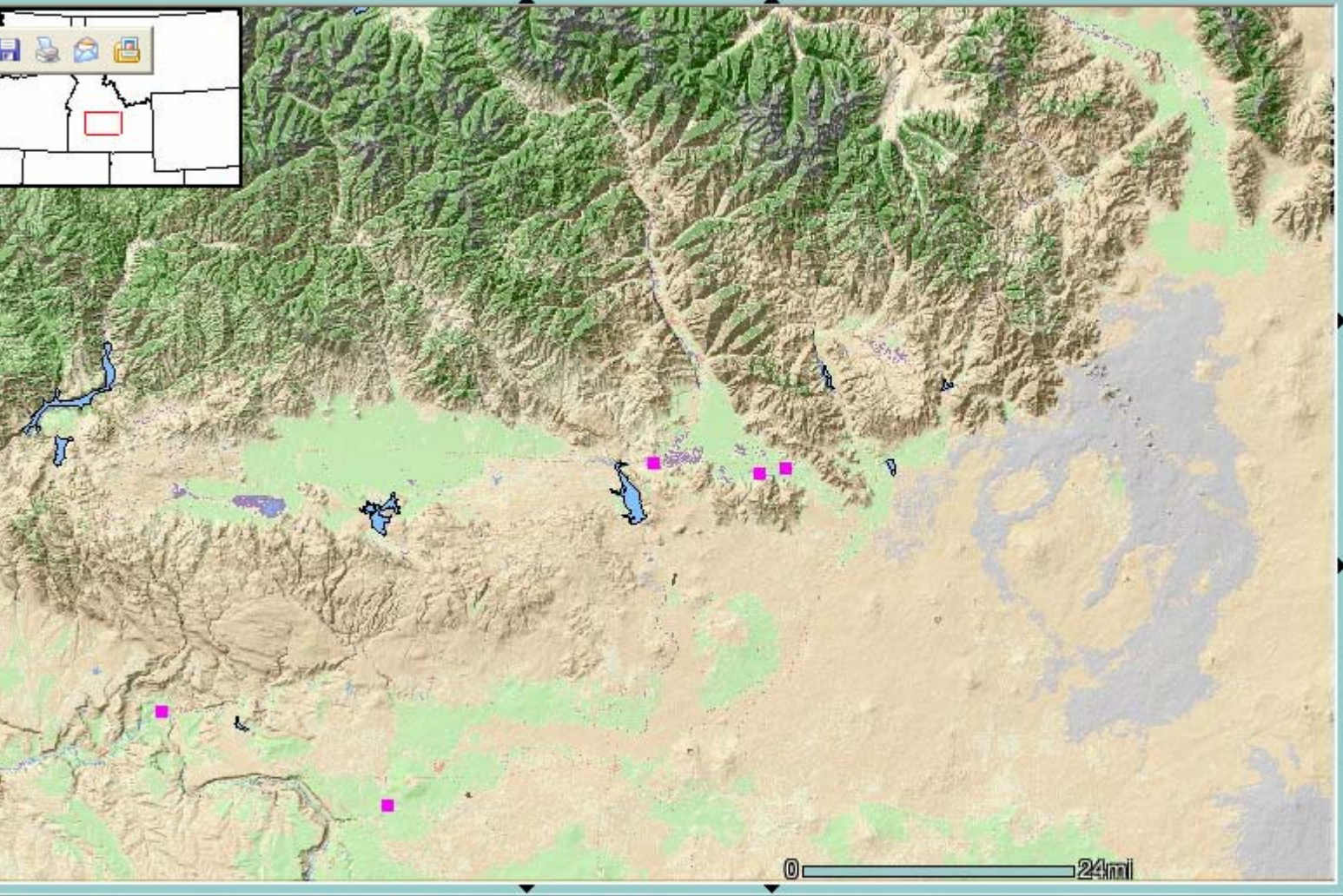

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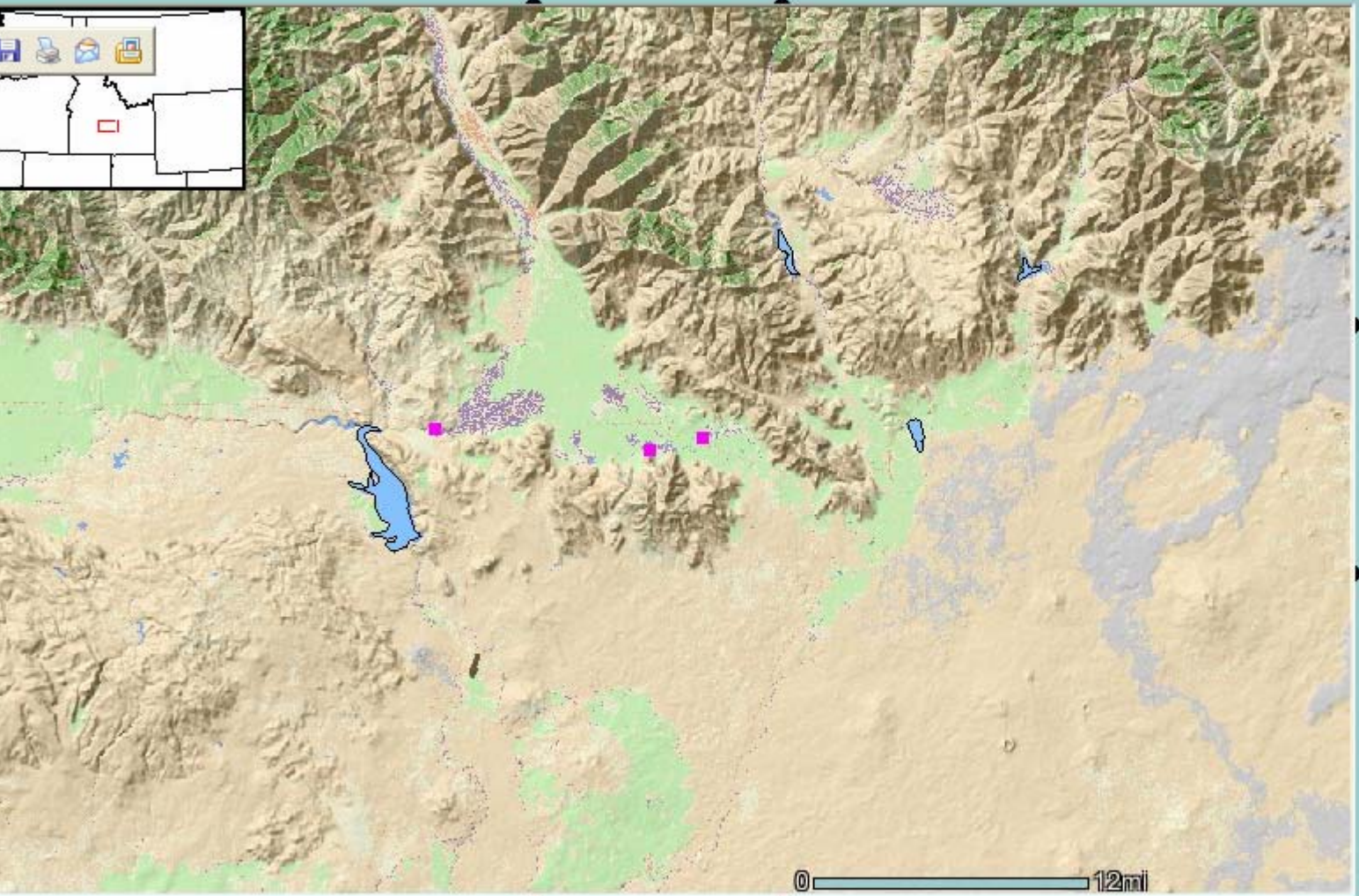

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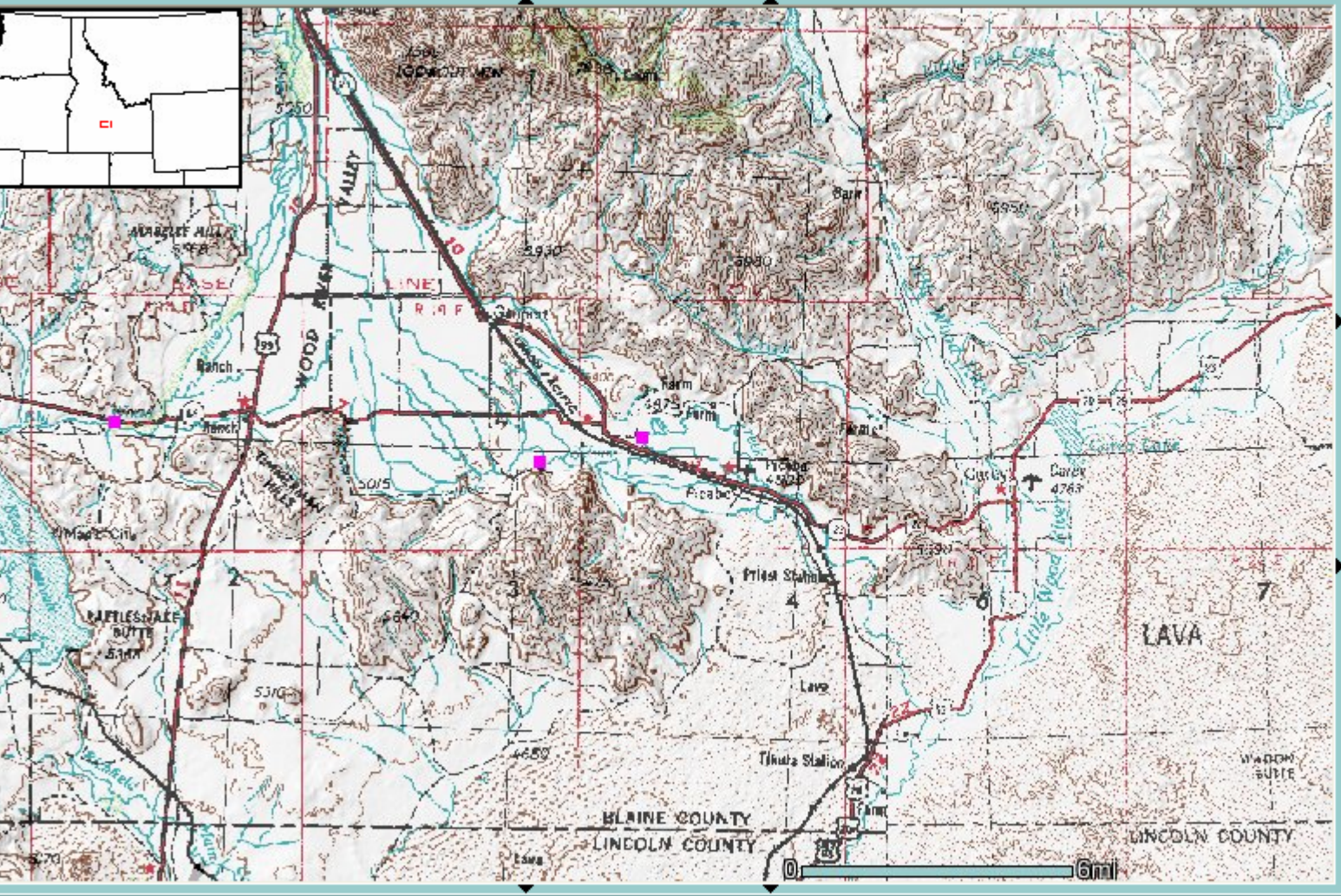

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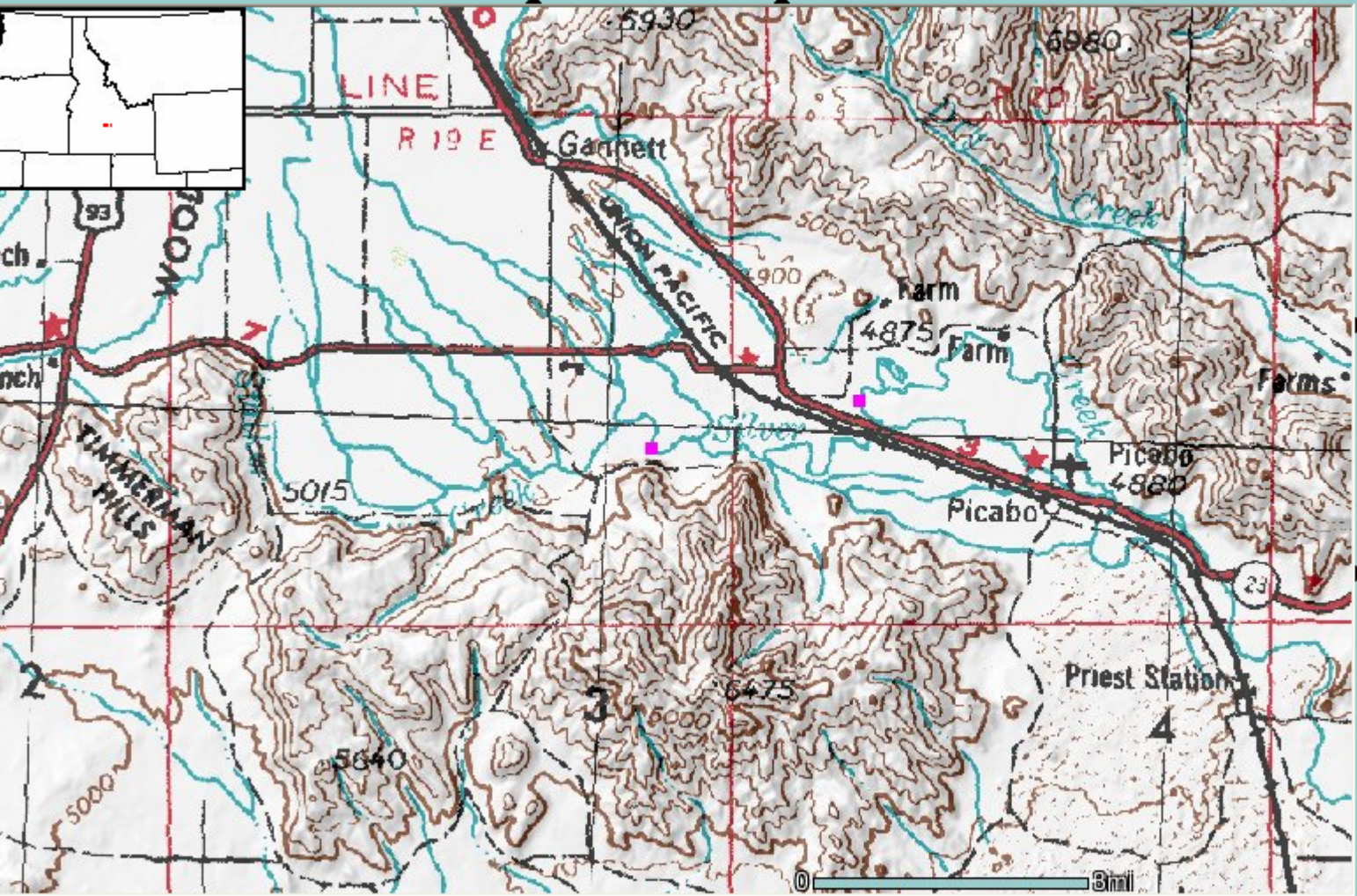

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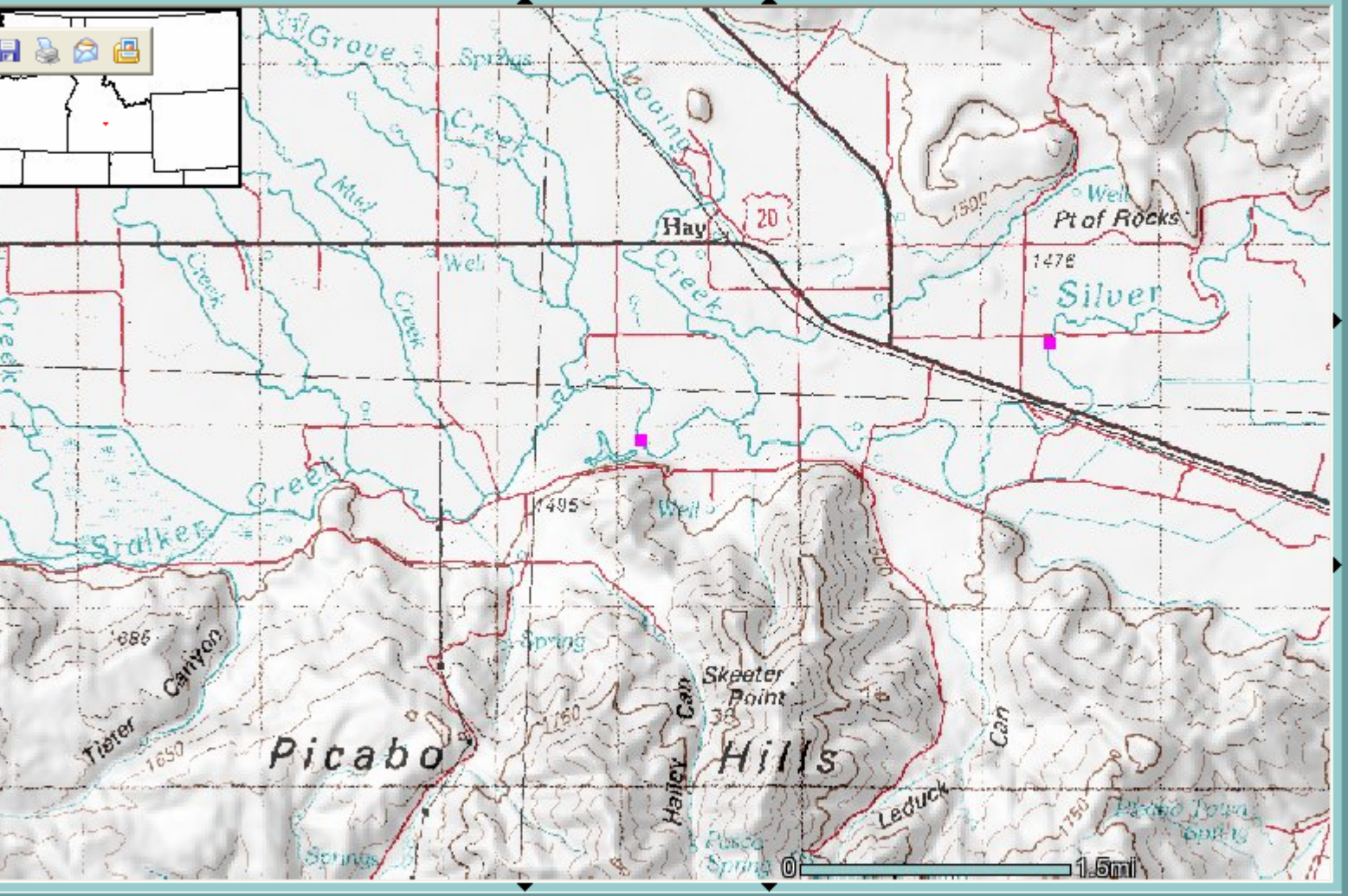

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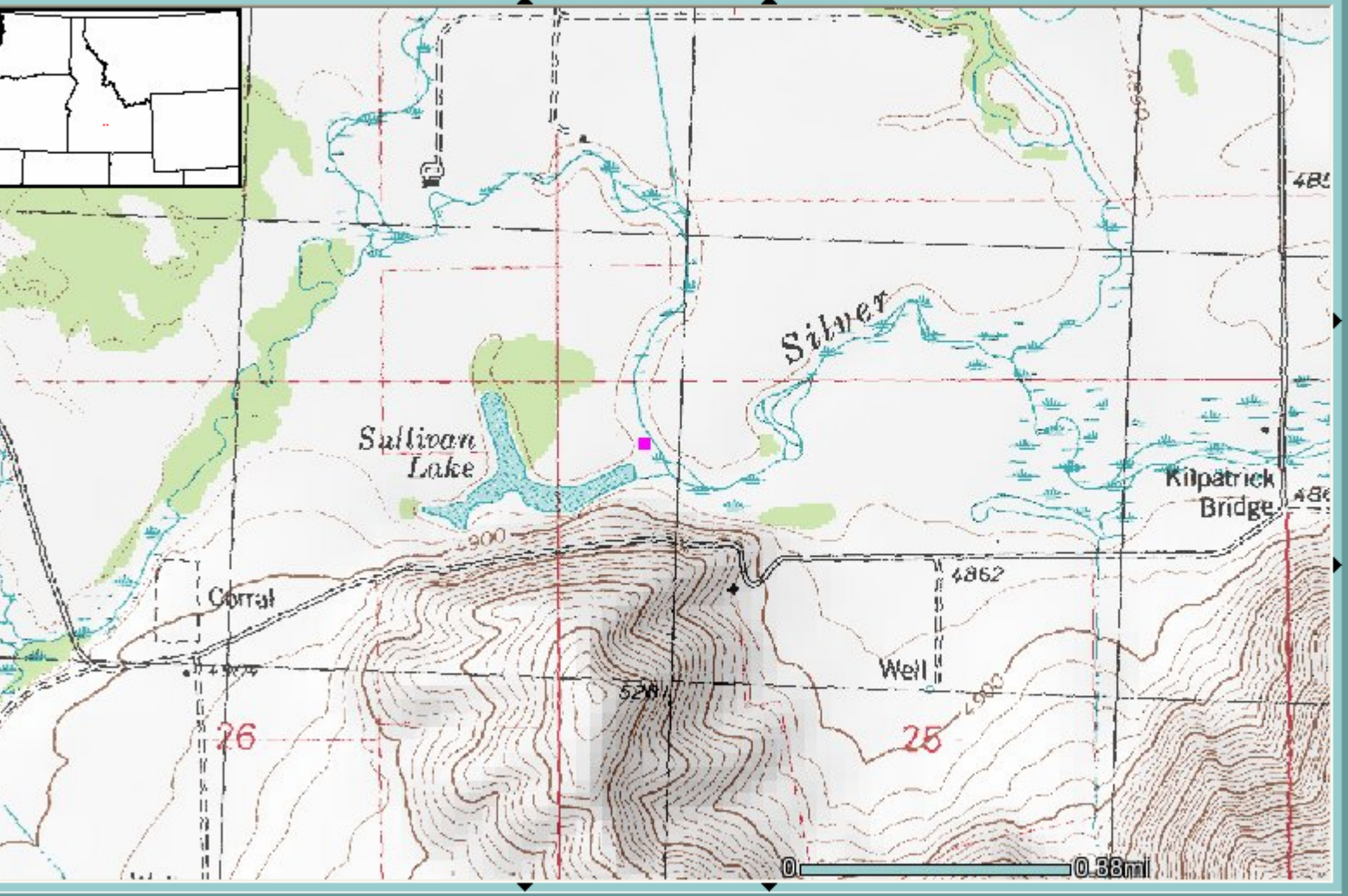

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- [x] Gray 30M Relief

http://idims.wr.usgs.gov - Query/Selection Results - Microsoft Internet Explorer

Statewide Network

c	ID	NAME	YEAR	SAMPLE	LONGITUDE	LATITUDE	URL
	0	Silver Creek at Nature Conservancy	2001	Macroinvertebrate qualitative multiple habitat	-114.15333	43.315	http://idims.wr.usgs.gov/website/statewide/
	0	Silver Creek at Nature Conservancy	2001	Macroinvertebrate quantitative richest targeted habitat	-114.15333	43.315	http://idims.wr.usgs.gov/website/statewide/
	0	Silver Creek at Nature Conservancy	2001	Fish community	-114.15333	43.315	http://id.water.usgs.gov/projects/fish/index
	0	Silver Creek at Nature Conservancy	2004	Fish community	-114.15333	43.315	http://id.water.usgs.gov/projects/fish/index
	0	Silver Creek at Nature Conservancy	2001	Macroinvertebrate quantitative richest targeted habitat and qualitative multiple habitat	-114.15333	43.315	http://idims.wr.usgs.gov/website/statewide/
	0	Silver Creek at Nature Conservancy	2004	Macroinvertebrate quantitative richest targeted habitat and qualitative multiple habitat	-114.15333	43.315	http://idims.wr.usgs.gov/website/statewide/
	0	Silver Creek at Nature Conservancy	2004	Periphyton chlorophyll-a and biomass	-114.15333	43.315	

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K26

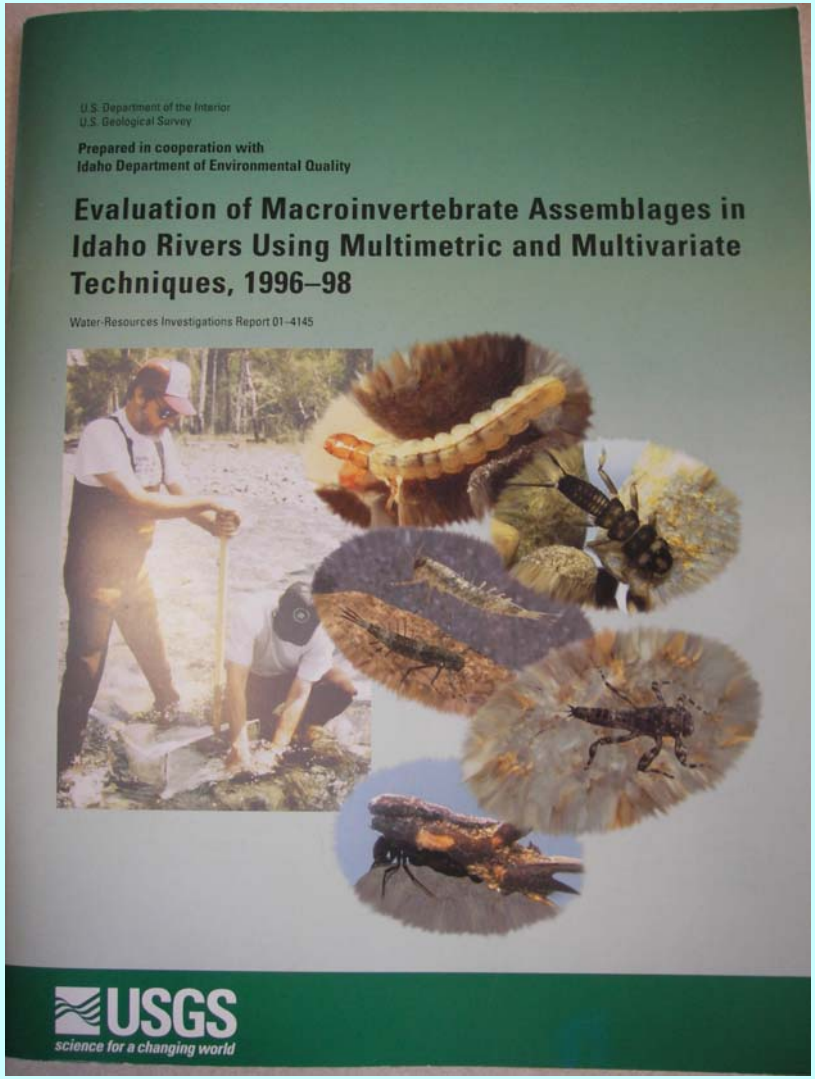
Silver Creek at Nature Conservancy Preserve, June 15, 2004
Benthic invertebrates. Riffles sampled with a Slack sampler, 1.25 m2 area (500 micron).
Riffle sample abundances per square meter. Analysis by EcoAnalysts, Inc.
Qualitative sample taken from several habitats that include main channel, near bank and island margins,macrophytes, cobble/gravel, wood and leaf litter

	Site ID Number	4318541140912	4318541140912
	EcoRegion	Snake River	Snake River
	Sample Area (m^2)	1.25	
		Riffle sample	qualitative multiple habitat
Ephemeroptera	Baetidae	42.72	0.00
	Baetis tricaudatus	132.43	153.60
	Ephemerella inermis/infreque	194.38	0.00
	Paraleptophlebia sp.	6.41	0.00
	Tricorythodes sp.	8.54	729.60
Odonata	Coenagrionidae	2.14	57.60
Plecoptera	Hesperoperla pacifica	6.41	0.00
	Isoperla sp.	12.82	0.00
Coleoptera	Cleptelmis addenda	10.68	0.00
	Dubiraphia sp.	0.00	57.60
	Hydroporinae	8.54	0.00
	Microcylloepus sp.	0.00	729.60
	Optioservus sp.	57.67	0.00
	Stenelmis sp.	0.00	153.60
	Zaitzevia sp.	25.63	0.00
Diptera-Chironomi	Cricotopus bicinctus gr.	4.27	19.20
	Limnophyes sp.	2.14	0.00
	Micropsectra sp.	4.27	0.00

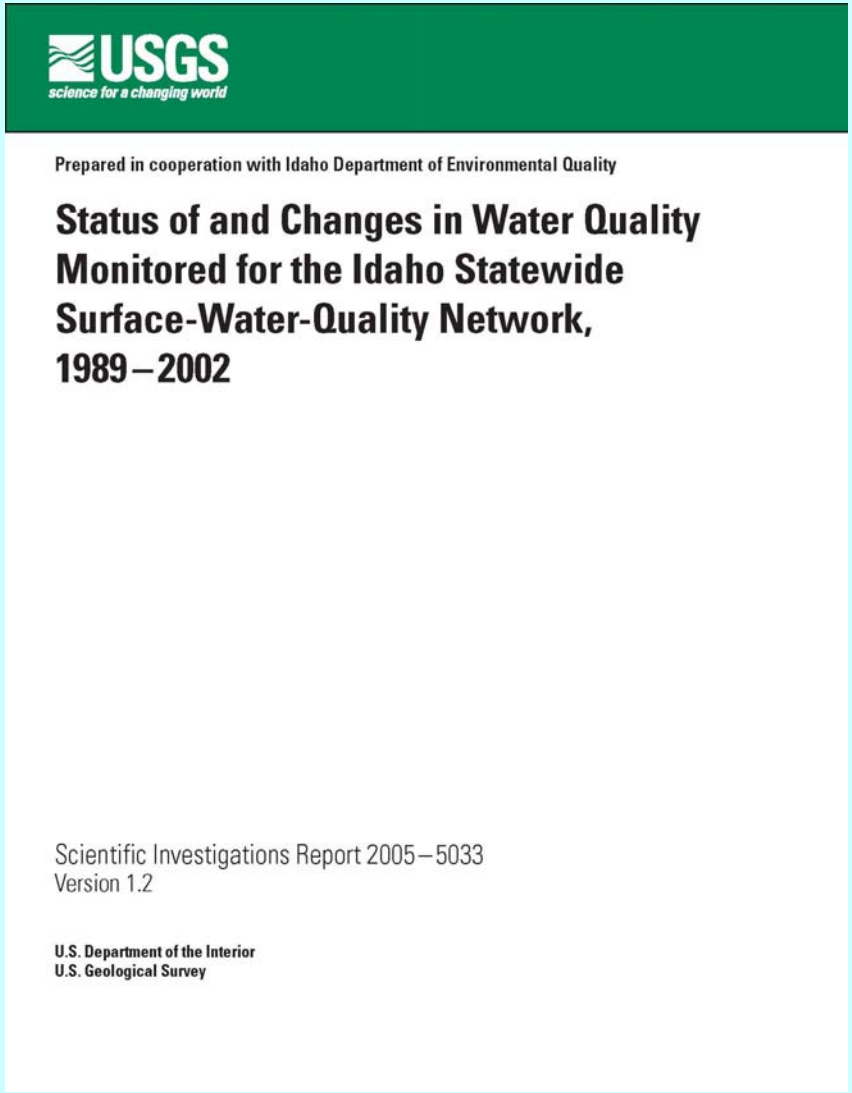
Sheet1 Sheet2 Sheet3

Unknown Zone

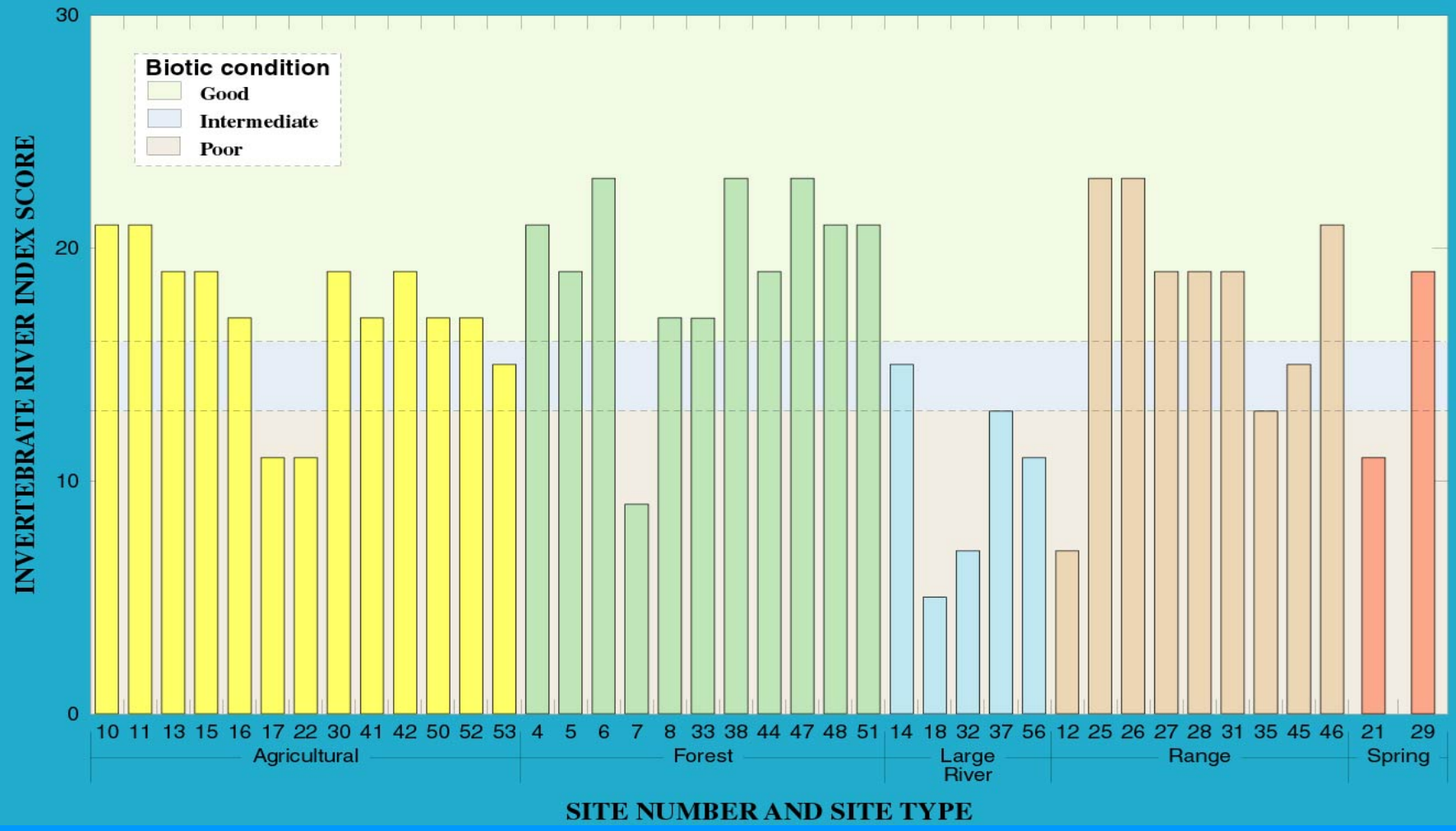
Interpretive Reports



Maret and others, 2001



Hardy and others, 2006



Invertebrate river index (IRI) and biological condition categories by site type, 1996-1998

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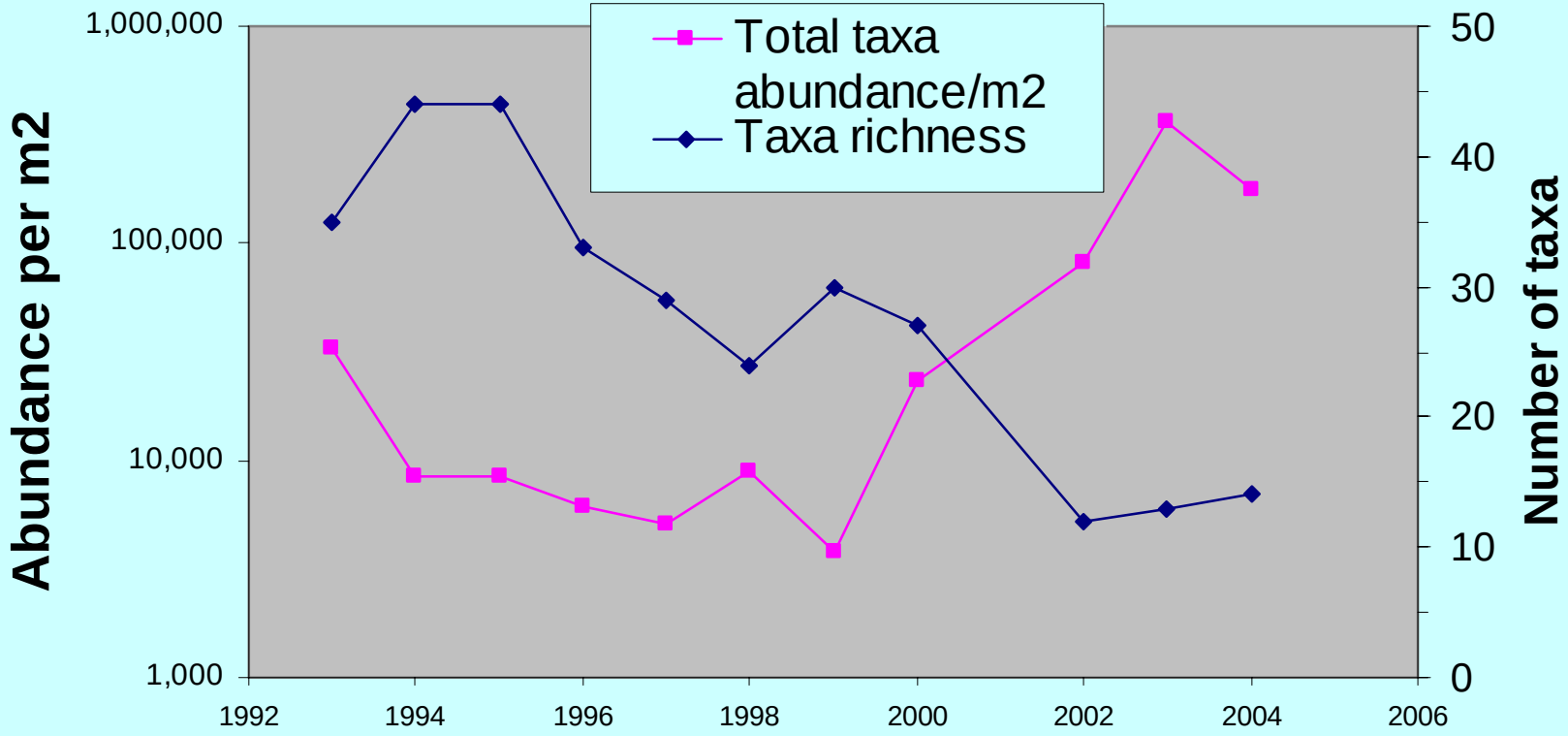
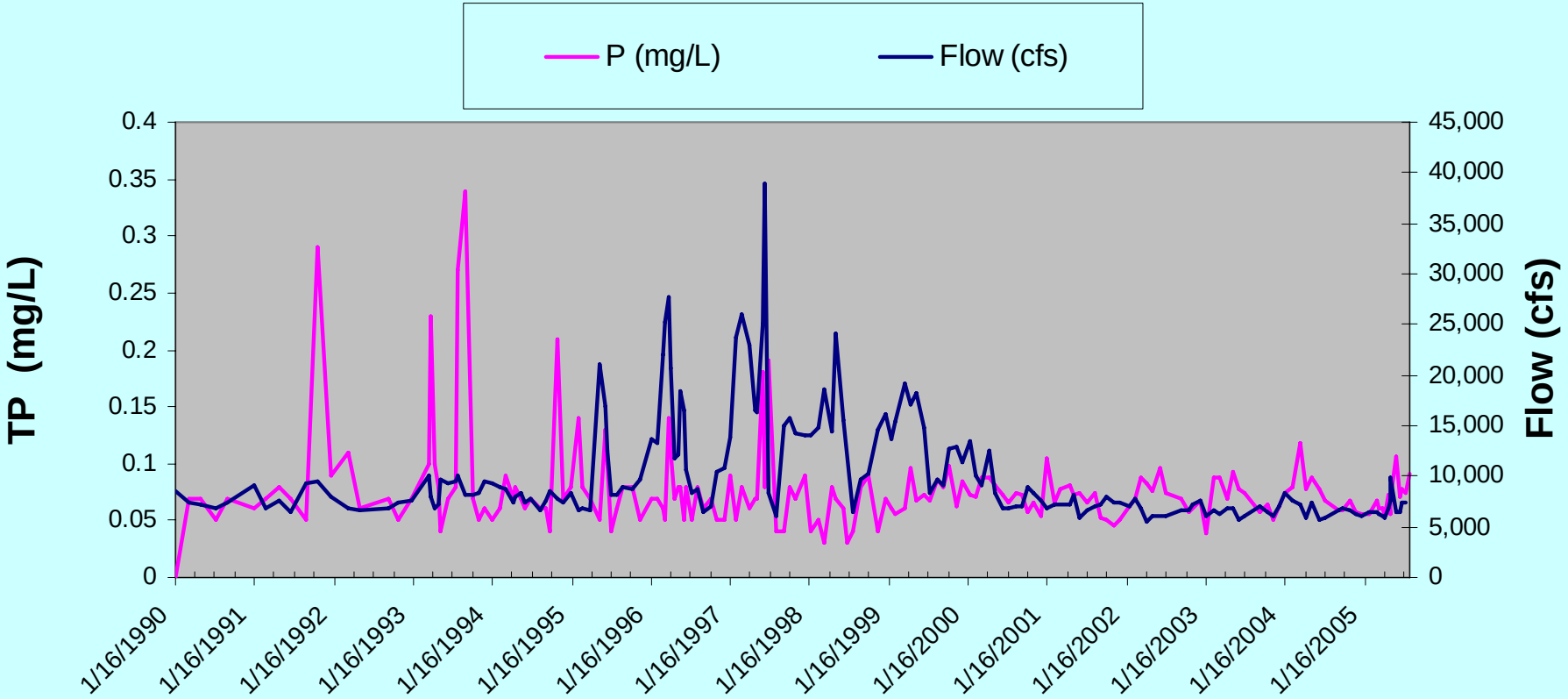
Long-term diversity and abundance patterns

Taxa richness and abundance, Snake River at King Hill, 1993-2004, USGS 13154500



Flow and Phosphorus Patterns over 15-years



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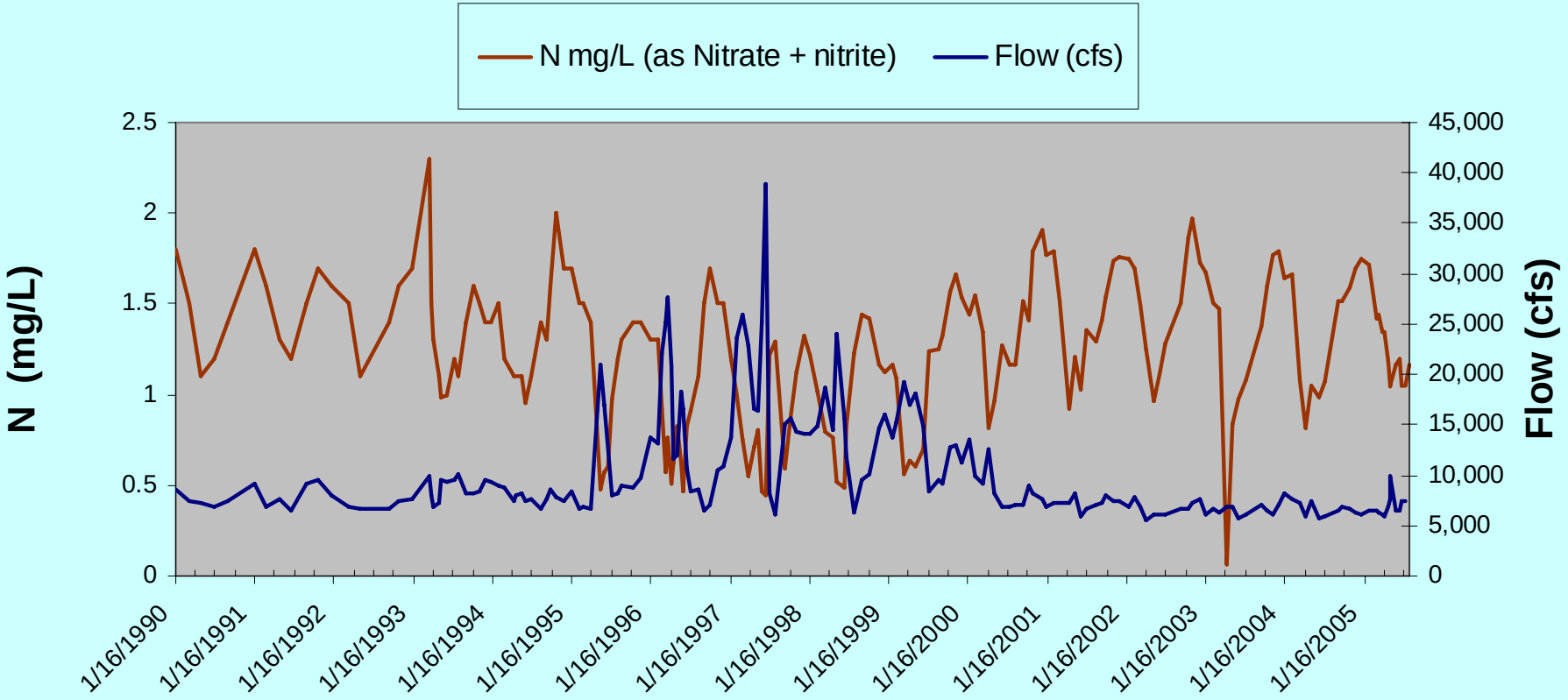
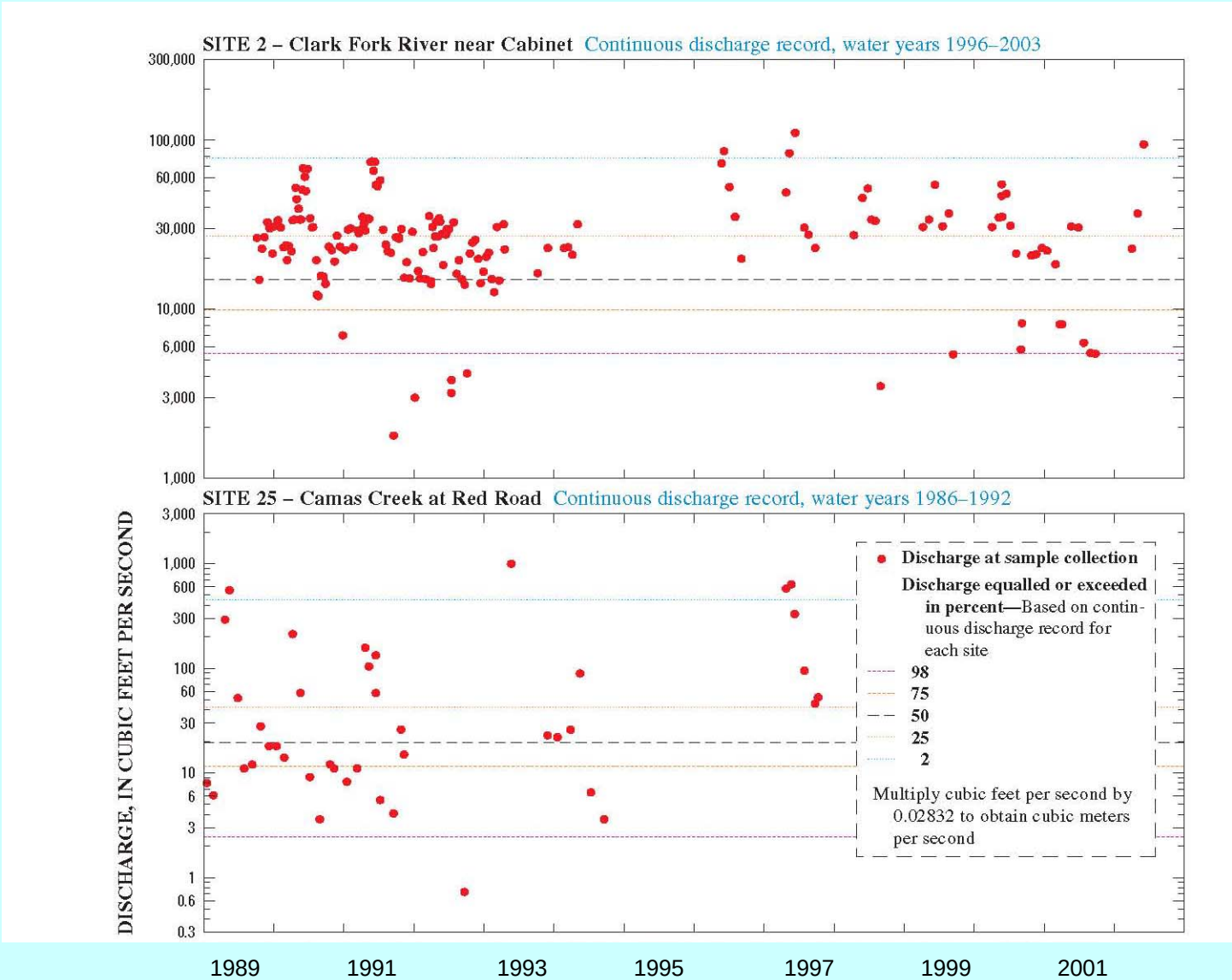
Flow and Nitrogen Patterns over 15-years

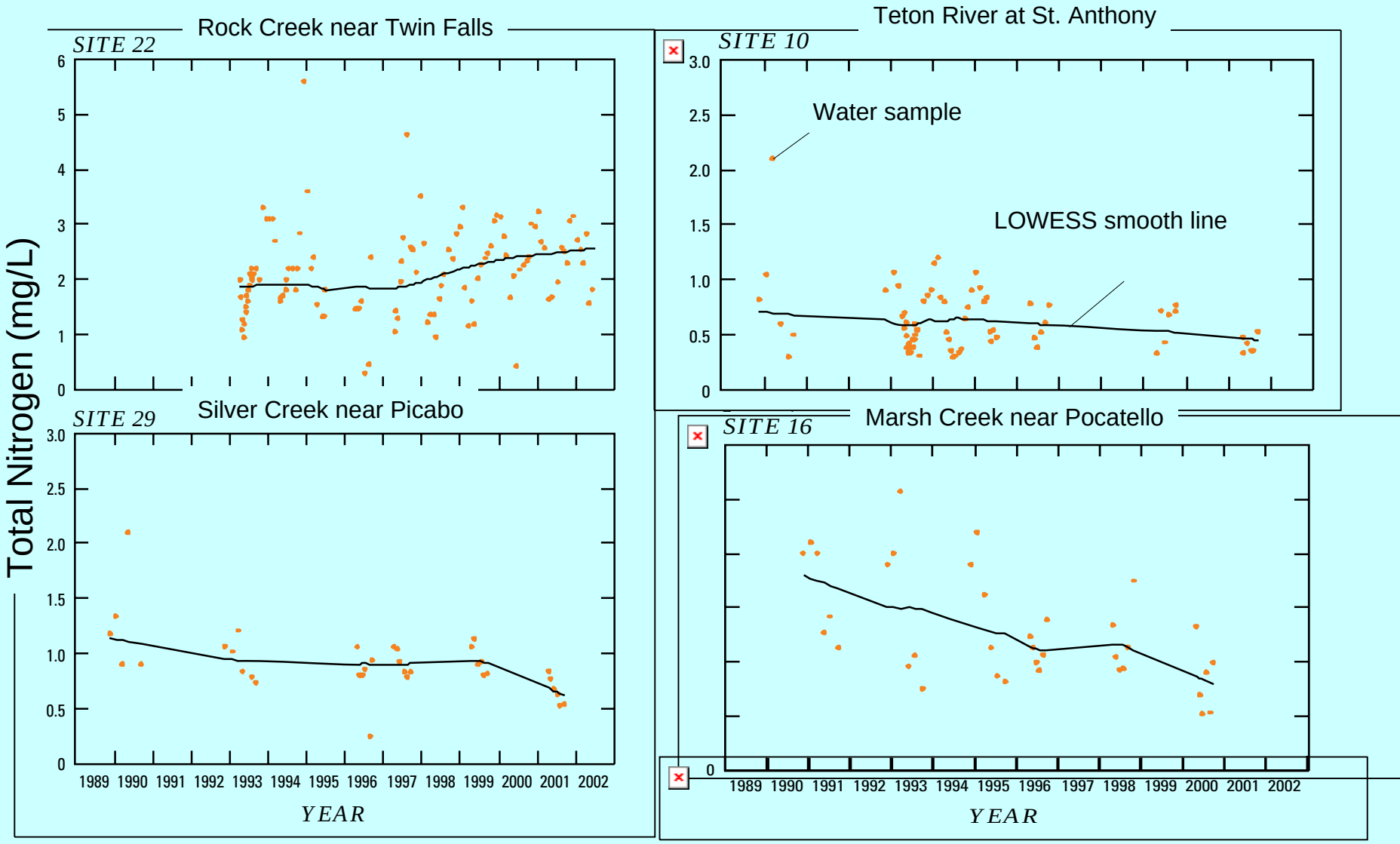


Can monthly sampling be representative of long-term hydrologic conditions?

Yes, generally.

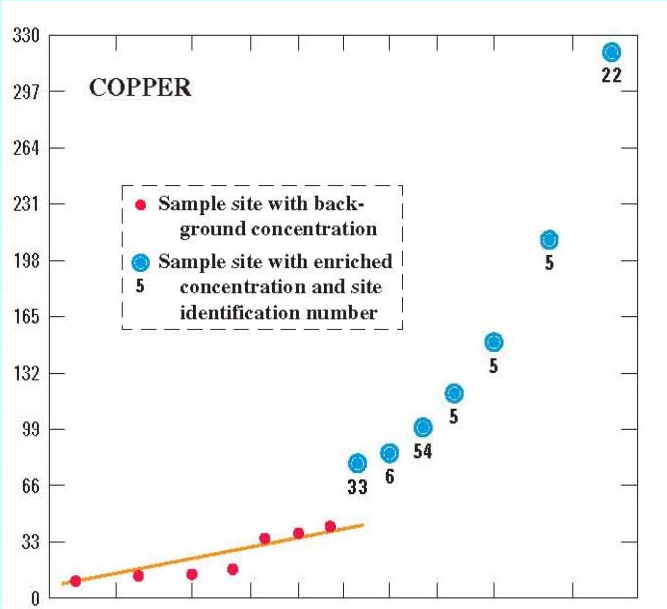


Total Nitrogen Patterns

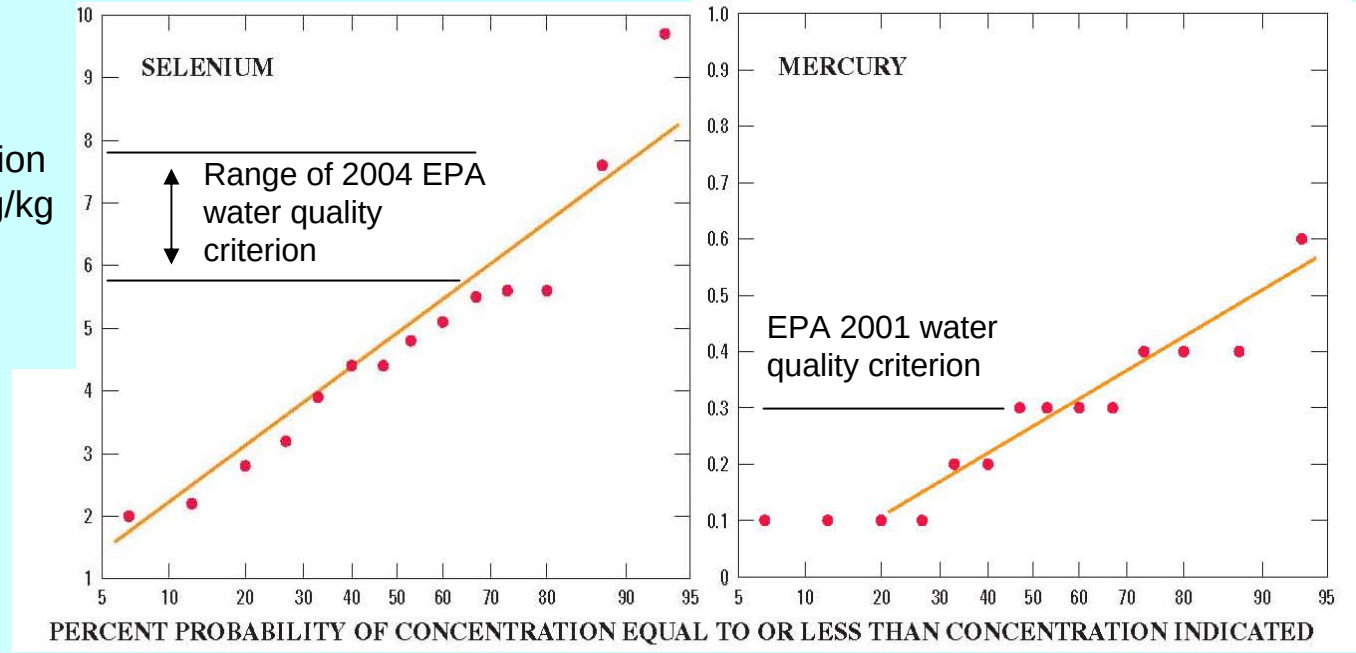


Trace Metals in Fish Tissue, 1996-2000

Metal concentration in liver (mg/kg dry wt.)



Metal concentration in liver (mg/kg dry wt.)



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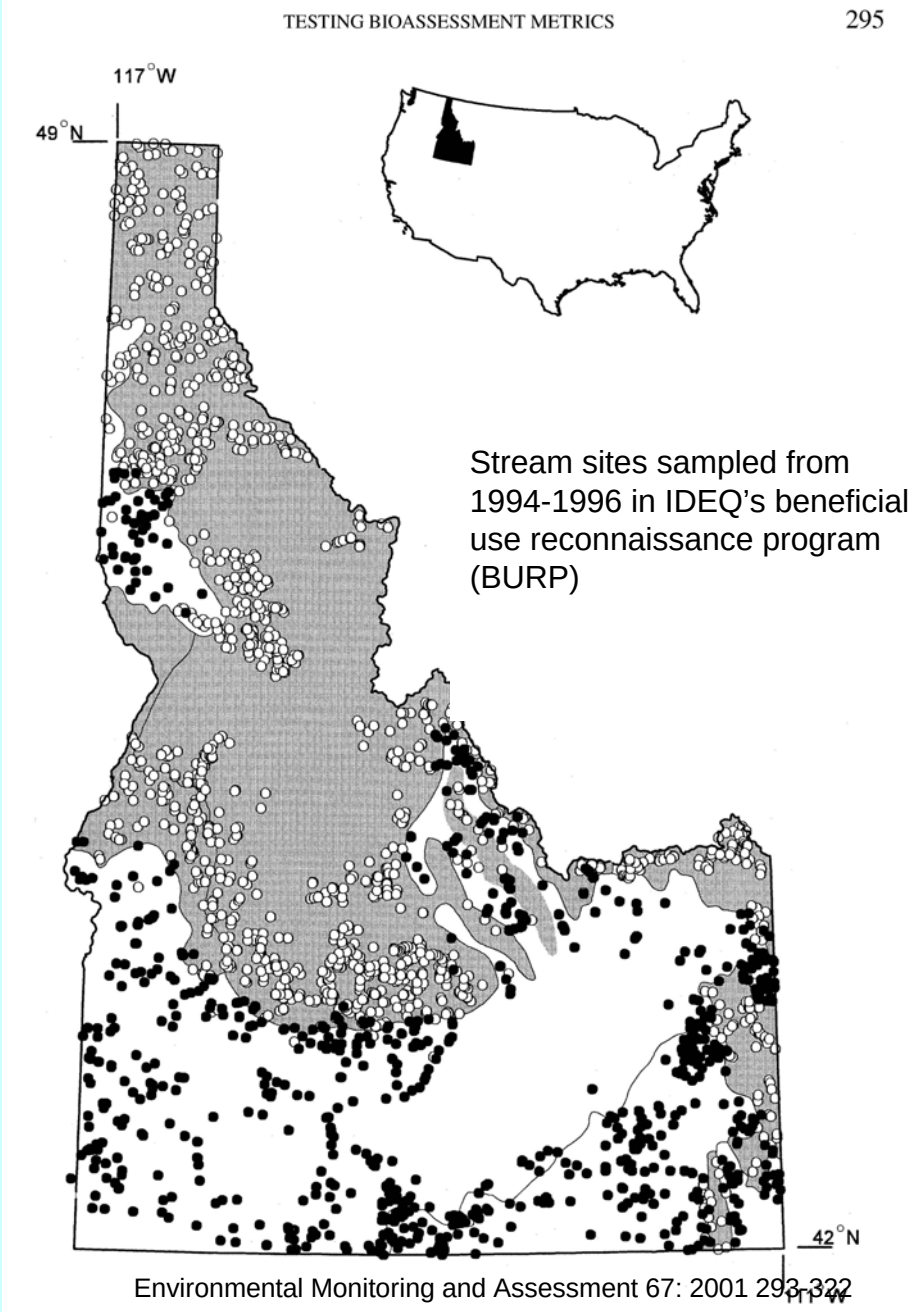
Fixed-site trends network complements other state monitoring programs

Idaho has a spatially intensive biological and habitat assessment program (>4000 wadable stream sites sampled)

Few sites are sampled more than once

In contrast, the trends network has a temporally rich dataset at relatively few sites



Future directions?

Basic design seems reasonably sound

Budget does not keep pace with costs, requires inevitable reduction in effort

We could do a better job of making the monitoring data easier to find and more accessible (although it is quite accessible now)

Future issues that might be important to monitoring:

- Mercury in fish
- Nutrients remain an important issue
- Are possible trends in nutrient concentrations related to changing management practices, physical variables, or chance?

USGS

A partial list of those who have contributed to the effort over the years:

Idaho Department of Environmental Quality

- Don Essig, Mary Anne Nelson, Michael McIntyre, and Bill Clark (retired)

U.S. Geological Survey

- Deb Parliman, Ivalou O'Dell, Dorene MacCoy, Ross Dickinson, Doug Ott, Terry Maret, Bob Reaves, Jake Jacobson, Rick Backsen Mark Hardy and Walton Low.
- Presenter: Chris Mebane, cmebane@usgs.gov

- Reports and raw data: http://id.water.usgs.gov/

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