



Jason D. Jones, Arizona DEQ,
Region IX NWQMC Representative

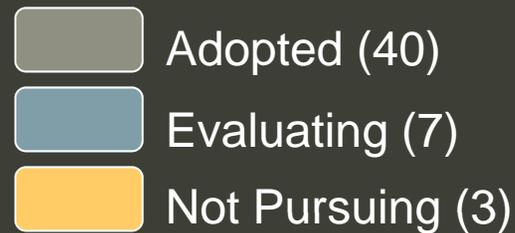
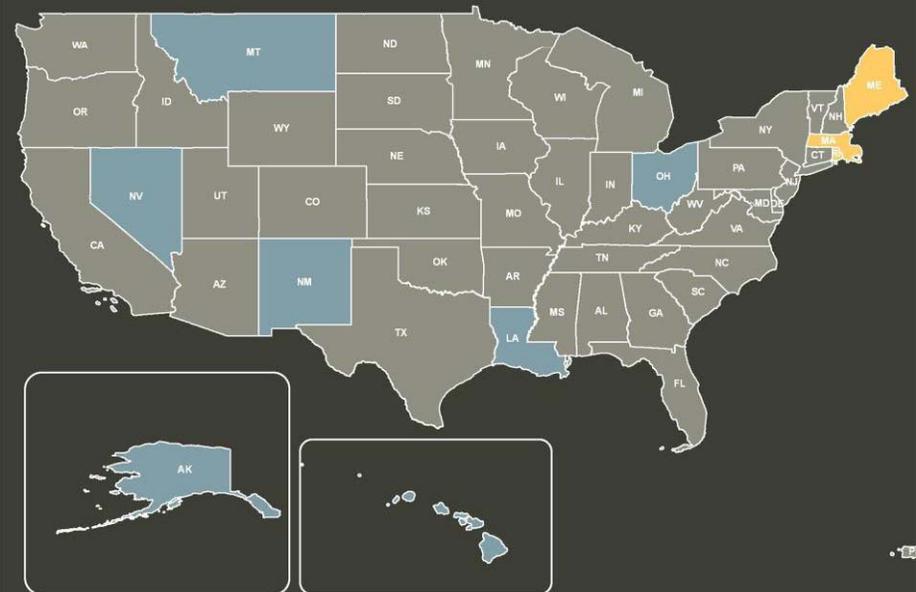


Arizona's Approach to Statewide
Probabilistic Monitoring
April 2010

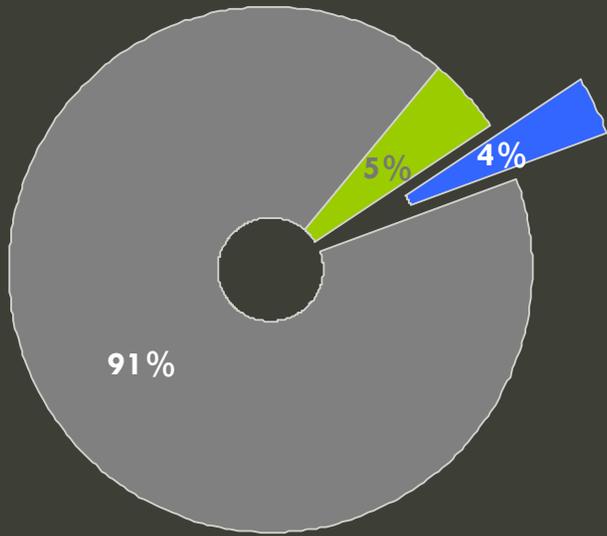


Overview

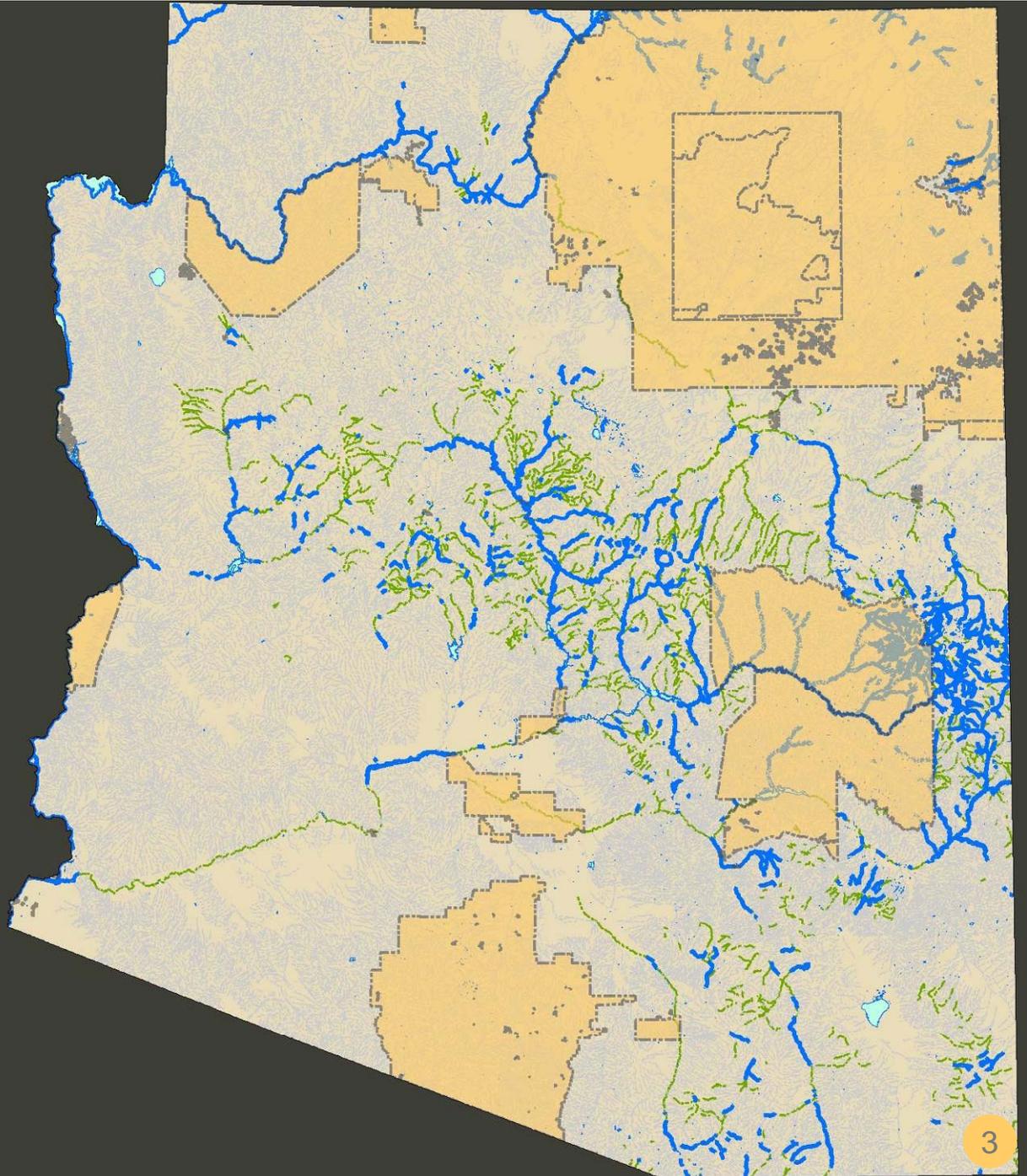
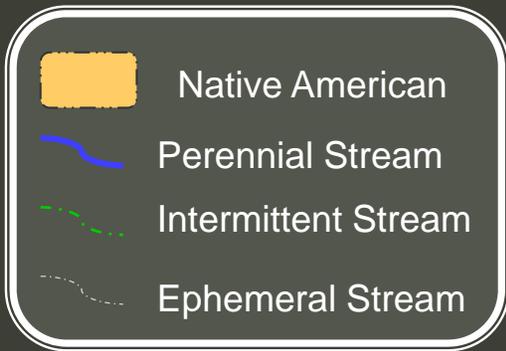
- Origins and status of probabilistic monitoring
- Arizona's approach to statewide assessment
 - ▣ Integrating probabilistic and targeted monitoring
 - ▣ Arizona / EPA methods comparison
- Is probabilistic monitoring worth the effort?



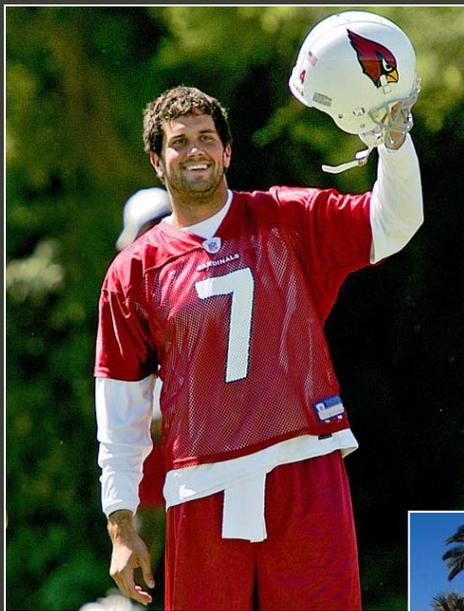
Source: Wendy Reid, EPA, August 2009



■ Ephemeral ■ Intermittent ■ Perennial



Monitoring Resources



Matt Leinart is one of the Arizona Cardinal's quarterbacks.

DEQ's annual monitoring budget equals 1/10 of this man's salary.



Arizona capitol buildings for sale.

- Arizona DEQ budget and staff
 - ▣ Staff have been reduced by 1/3 through layoffs and frozen positions
 - ▣ The monitoring budget has been reduced more than 60% from 2008
- Arizona's budget was so bad that our legislature is trying to sell the capitol building for \$700 million dollars



Meghan Smart
Wetlands



Karyn Hanson
Lakes



Doug Towne
Groundwater



John Woods
Streams



Kate Elrod
Streams



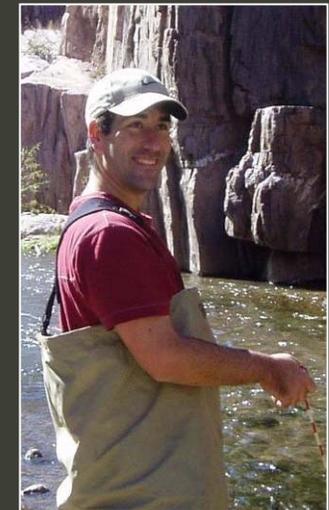
Patti Spindler
**Standards &
Biocriteria**



Dr. Lin Lawson
**Geomorphology
Ecologist**



Lee Johnson
Lakes



Jason Jones
**A little bit of
everything**

The Origin of Statewide Probabilistic Monitoring

- March 2000 GAO report blasts EPA and states
 - Assessment data in the 305(b) report are not complete because they do not represent all of the states' waters, either through a census (i.e., the monitoring of all waters in a state) or through statistical sampling that would yield data that are projectable to all state waters.
- Section 305(b) of the CWA requires states to provide a “description of the water quality of all navigable waters”

Reasons to Assess a State using Probabilistic Monitoring

- 1) **EPA pays us to.** States are paid roughly \$170,000 to do probabilistic monitoring (and for program development)
- 2) **It is required.** The Federal Register requires States to assess at least one waterbody at the state scale **and** to participate in the National Survey. EPA is in the process of removing this requirement
- 3) **It makes sense.** Random sampling = fewer samples.
- 4) **Stressor ID and Ranking.** Management tool to determine 'big picture' problems

Federal Register / Vol. 73, No. 138 / Thursday, July 17, 2008 / Notices 41071

comprehensive monitoring strategies and collaboration on statistically-valid surveys of the nation's waters. A state may request in-kind assistance from EPA under the grant to complete the survey for the sites located within its jurisdiction. If a state does not apply for funds or meet the workplan criteria in these guidelines to implement its strategy and/or complete the survey, including requesting in-kind assistance, EPA may withhold the funds allotted for this purpose and award the funds to any eligible recipient in the region, including another agency of the same state or an Indian tribe/tribal consortium for the same environmental program (40 CFR 35.117).

For Fiscal Year 2006 and beyond: Allocation of Monitoring Initiative Funds

\$18.23 million* will be distributed in the following manner:

1. \$9.77 million of these funds will be allocated as follows for implementing monitoring strategies and building monitoring program capacity—\$169,900 for each state and the \$84,950 for each territory and the District of Columbia, \$240,410 to be distributed among interstate agencies, and \$528,506 to be distributed among the 106 grant formula for tribes.
2. \$8.45 million will be allocated for surveying water quality condition nationwide. Grant recipients will use this portion of the monitoring initiative funds for statistically-valid surveys of water body condition repeated over time to determine status and trends in water condition. The distribution of these funds will be tailored based on the water body type being surveyed, i.e., coastal waters, streams, rivers, lakes, and wetlands, and the number of sample sites needed. EPA will work with states, interstate agencies, and tribes to define the target population (size and type of water body) for each survey. After this consultation, EPA will develop a list of randomly selected sites to be sampled for the survey. For each survey, approximately 1,000 sites in the contiguous 48 states will be sampled. A state or tribe in the contiguous 48 states will receive funding for each sampling site falling within its jurisdiction. A separate fund of \$450,000 will be used to support survey work in Alaska, Hawaii, Puerto Rico and the trust territories. If a grant recipient is able to

* EPA will use this numerical formula to determine the monitoring allotments for FY 2009 and beyond based on the amount of EPA's final annual budget targeted for these purposes.

sample the sites needed for its participation in a nationwide survey for less than the funds allotted for each site, the remaining funds must be used for implementation of its monitoring strategy and/or to build capacity for state-scale statistically-valid surveys.

Performance-Based Standard for Implementation of Statistical Surveys

3. To accelerate the use of state-scale statistical surveys as called for in the President's budget requests, EPA is incorporating a performance-based standard in the allotment of the section 106 Monitoring Initiative funds. This performance-based standard will start in FY 2008 with adjustments to allocations, if necessary, beginning in FY 2009. Monitoring Initiative funds may continue to be used for building state monitoring program capacity according to the guidelines, set out in March 2006 and discussed above in Section III.A.1, as long as at least five states each year adopt state-scale statistically-valid surveys as part of their state monitoring programs. During FY 2007, 30 states were implementing, as part of their monitoring network, statistical surveys at the state-scale for at least one water resource. This number serves as the baseline for the performance-based standard. The goal is to have five additional states adopt the use of state-scale statistically-valid surveys each year (i.e., 35 States in 2008, 40 in 2009, 45 in 2010, and 50 in 2011). For every state below the target of five additional states each year, beginning with the allotment of FY 2009 Monitoring Initiative funds, 20% of the Monitoring Initiative funds used for building monitoring capacity (100% equals \$169,900* per state) will be reallocated among those states implementing state-scale statistical surveys. For example, if only three additional states adopt the use of statistical surveys by the end of FY 2008 (for a total of 33 states, two states short of the goal of five additional states), 40% of the capacity building funds (i.e., \$67,960 per state*) of the 17 states not implementing statistical surveys will be evenly reallocated in FY 2009 to the 33 states that are implementing such surveys (i.e., \$35,009 per state*).

Process and Criteria for Determining Implementation of Statistical Surveys as a Component of a State's Monitoring Program

At the end of each fiscal year beginning in FY 2008, a state must submit a certification to EPA that the

state is implementing a state-scale statistically-valid survey meeting the criteria set out below. EPA, through Headquarters and Regional Monitoring Coordinators consultation, will make a determination on the status of state implementation of state-scale statistical surveys based on the state's certification and adherence to the following criteria:

 - a. State is implementing a statistical survey design that provides condition estimates for a population of waters (e.g., streams, rivers, lakes, coastal waters, or wetlands) of the state based on an unbiased, representative sample of a subset of those waters.
 - i. The state assesses water quality conditions using core indicators for at least one designated use consistent with the Elements of a State Water Monitoring and Assessment Program guidance. Over time, state surveys incorporate a full suite of appropriate biological, chemical and physical indicators as described in the guidance. Initial statistically-valid, probability surveys (through 2012), however, may be based on a subset of indicators tailored to specific water quality issues (e.g., biological integrity, recreation, fish consumption, etc.).
 - ii. The implementation of a state-scale statistically-valid survey may span several years. A state may use a rotating basin approach and survey different watersheds over time, or spread the sites required across the state over multiple years—as long as those surveys can be aggregated for a state-scale survey. For example, a state may choose to sample 10 sites each year over a five-year period.
 - iii. States may use methods and protocols employed in the national surveys, or state methods.
 - iv. State surveys aim to achieve 90% confidence +/- 10%. This typically requires about 50 sites.
 - v. Surveys assess at least one water type (streams, lakes, rivers, coastal waters, or wetlands).
 - vi. A state's monitoring strategy indicates a commitment to continuing statewide statistical surveys as a component of its comprehensive monitoring program.
 - b. State continues to participate in the national/regional scale surveys, unless the state-scale survey is fully consistent with national survey design and methodology.
 - c. State reports the results of the state-scale survey by 2012, preferably as a component of the state's Integrated Report/2005/2024 (narrative form) and/or in the probability survey module of the Assessment Database. (EPA will modify this module to accommodate state assessment categories, e.g., good/

AZ Probabilistic Monitoring History

- 2004. AZ Game & Fish completes the first state-wide probabilistic survey for Arizona as part of Western EMAP.
 - ▣ EPA methods
 - ▣ Wadeable perennial streams
- 2007. AZDEQ conducts methods comparison study in the Little Colorado Watershed.



EMAP Training with USGS, AZDEQ and AZG&F (2007).

Jason Jones



Site reconnaissance near Springerville, AZ (2007).

Jason Jones

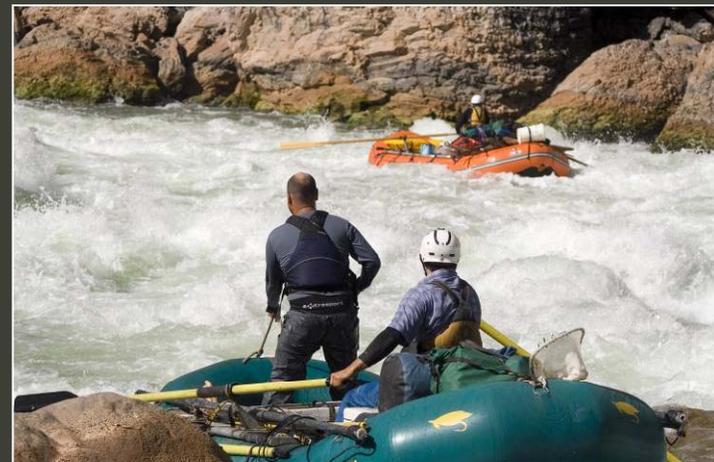
AZ Probabilistic Monitoring History

- 2008 & 2009. AZDEQ is one of a dozen or so states that participates in the EPA National River & Stream Survey
 - Survey now includes non-wadeable and intermittent streams
 - AZ was the first and last state to sample
- 2007 to 2010. AZDEQ monitors 51 random sites throughout AZ using state methods



Jason Jones

Periphyton sampling (2007).

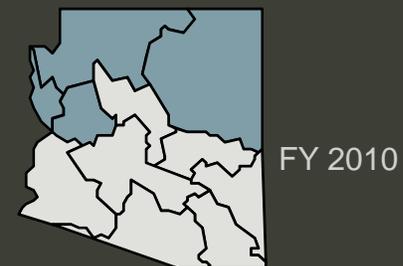
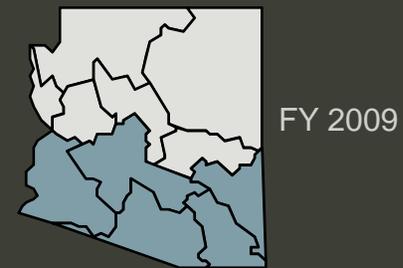
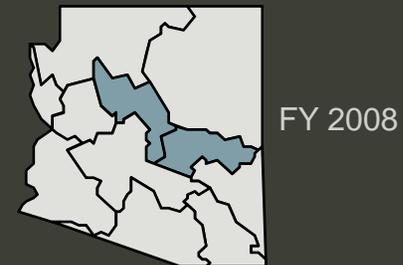


Jason Adams

Lava Falls in the Grand Canyon (2009).

Integrating Targeted & Probabilistic Monitoring

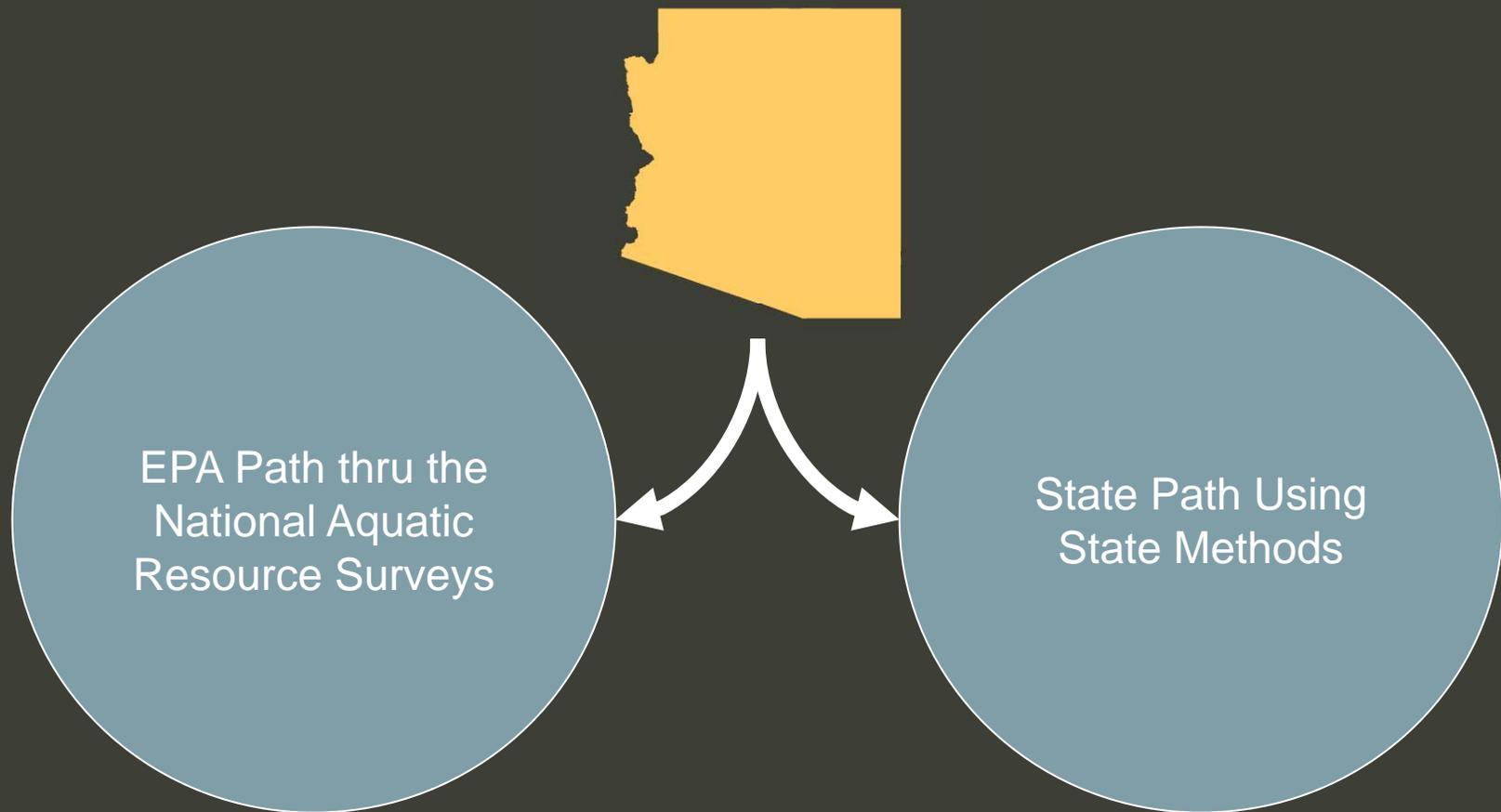
- Targeted & probabilistic sites are sampled quarterly so that they may be used in the 305(b) assessment
- Probabilistic sites answer 2 questions
 - ▣ What is the water quality of the state?
 - ▣ What is the water quality at that site?
- 30 targeted sites
- 17 random sites
- Arizona was divided into 3 'Monitoring Regions' to make logistics easier (rotating basin)



Monitoring Regions by year.

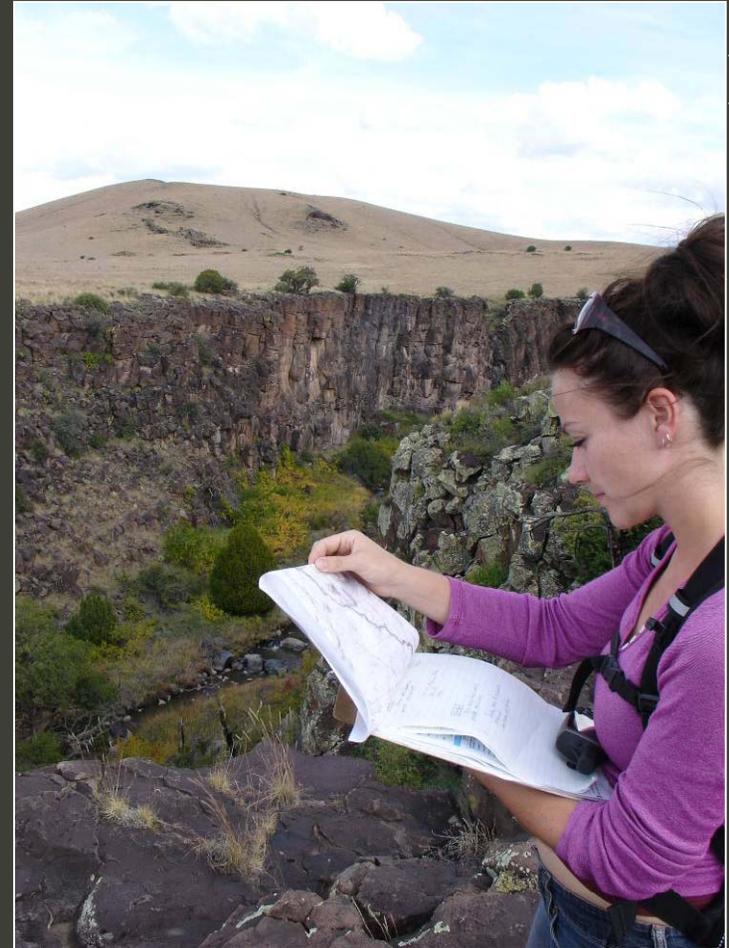
2 Paths to a Statewide Assessment

Statewide Assessment



Top 3 Reasons Arizona Chose the State Path this Time Around

1. Arizona standards require representative samples
 - ▣ Grab sample do not represent all streams
 - ▣ More than one visit is needed to assess a stream reach
2. The national index period of late May to September does not represent the hydrologically stable period for Arizona
3. ADEQ's map of perennial and intermittent streams is twice as accurate

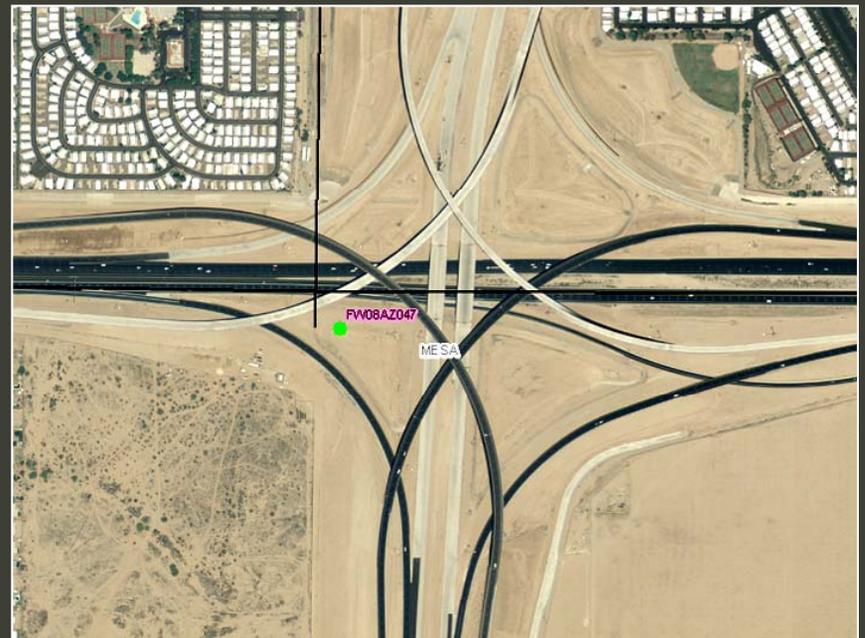


Jason Jones

This site was rejected because of access issues. The Little Colorado River is at the base of an inaccessible canyon (2007).

Better Maps = Less Recon

- **84%** of AZ sites in EPA's Wadeable Stream Assessment sites were 'non-target'
- In 2007, ADEQ contracted USGS to model perennial stream flow in Arizona (Anning, OFR 2009-1269)
- The new map decreased the non-target rate to **41%**
- Non-target stream reaches are dropped from the map
- Not perfect, but getting better



This is an example of a non-target site that shouldn't be included in the target population (2008 NRSA).

Methods Comparison

- Can National Survey Data be used by Arizona?

- ▣ Grab samples not always sufficient for the assessment (1/3 of samples excluded)
- ▣ Macroinvertebrates and bottom deposits are comparable for cold water streams
- ▣ Habitat partly comparable

Verdict → Some data can be used in the 305(b) assessment

- Can Arizona's data be used in the National Survey?

- ▣ DEQ would need to collect fish, enterococci and algae samples
- ▣ Target populations are drastically different
- ▣ DEQ would need to include intermittent and non-wadeable streams

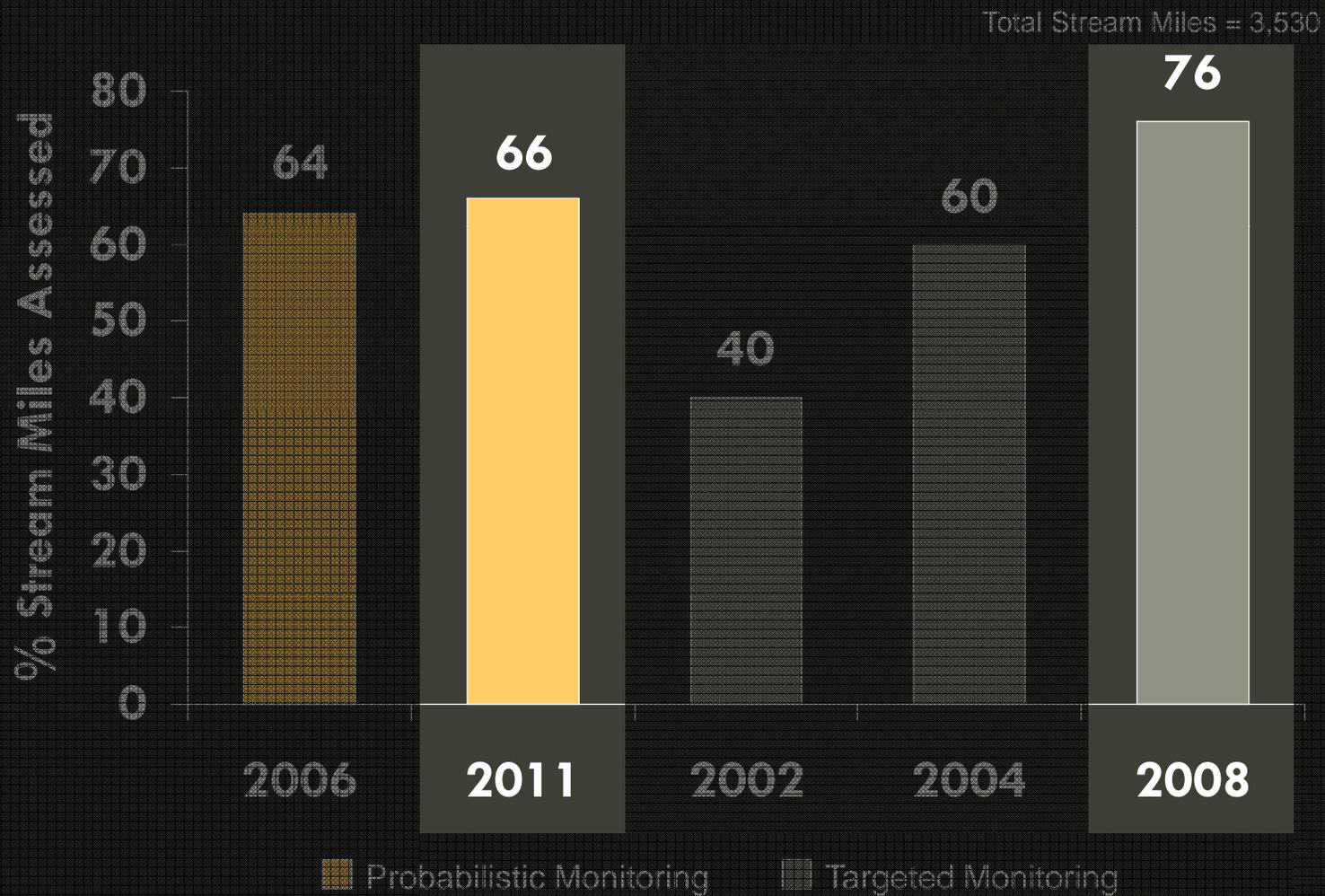
Verdict → It is unlikely that AZ will be able to overcome all of these hurdles



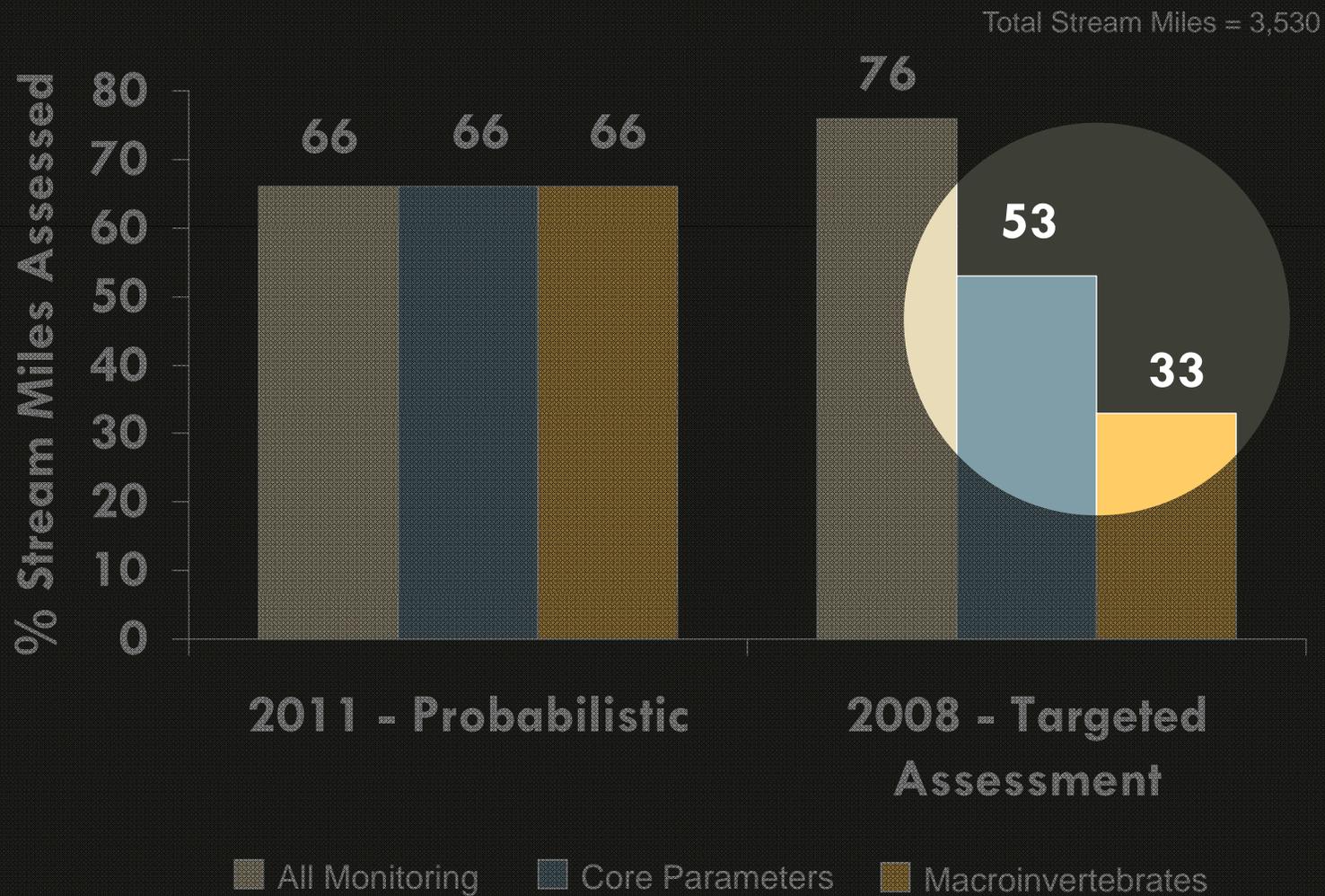
Patti Spindler sampling macroinvertebrates

Jason Jones

Percentage of Arizona Stream Miles Assessed Using Targeted and Probabilistic Monitoring



Percentage of Arizona Stream Miles Assessed Using Targeted and Probabilistic Monitoring



Is Statewide Probabilistic Monitoring Worth The Effort?

- Yes
 - ▣ Better bug and core parameter representation
 - ▣ Stressor identification
 - ▣ New sites
- Yearly surveys are excessive. ADEQ moving to 3 years 'on' 2 years 'off' schedule
- AZ supports national and state scale surveys, but ... **170K is not enough** to do state-wide surveys, build state capacity and to participate in the national surveys.



Crayfish identified as #1 macroinvertebrate stressor

<http://pathfinderscience.net>



Clear Creek (Eastern Arizona).

Jason Jones



Questions?

