Navigating the murky waters of regulation under the changing Waters of the United States definition

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ADEQ Arizona Department of Environmental Quality

Clean Air, Safe Water, Healthy Land for Everyone

Evolution of WOTUS

1870 | Supreme Court | ***The Daniel Ball*** | "navigable waters of the United States"

1974 | Federal Agencies | published rule that "navigable waters" are those waters that have been, are, or may be used for interstate or foreign commerce

1985 | Supreme Court | ***Riverside Bayview*** | upheld Corps interpretation that wetlands are part of navigable waters

1986 | Federal Agencies | published rule to include traditional navigable waters, tributaries of those waters, wetlands adjacent to those waters and tributaries, and waters used as habitat by migratory birds

Evolution of WOTUS

2001 | Supreme Court | *SWANCC* | rejected migratory bird reasoning; jurisdiction only extends to wetlands that abut navigable waters NOT physically isolated, wholly intrastate waters or ponds

2006 | Supreme Court | *Rapanos* | reinforced SWANCC to include ditches, ephemeral features, etc.; introduced "significant nexus" to include features that "significantly affect the chemical, physical, and biological integrity" of navigable waters

2015 & 2020 | Federal Agencies | rulemakings to define WOTUS under Obama and Trump administrations; both short-lived

Evolution of WOTUS

2023 January | Federal Agencies | Revised Rule mainly incorporating previous Supreme Court decisions

2023 August | Supreme Court | *Sackett* | "encompasses only those relatively permanent, standing or continuously flowing bodies of water forming geographical features that are described in ordinary parlance as streams, oceans, rivers, and lakes" and "no clear demarcation between 'waters' and wetlands"; significant nexus irrelevant

2023 September | Federal Agencies | Conforming Rule | attempt to align with Sackett; cuts out significant nexus and includes only wetlands with continuous connection

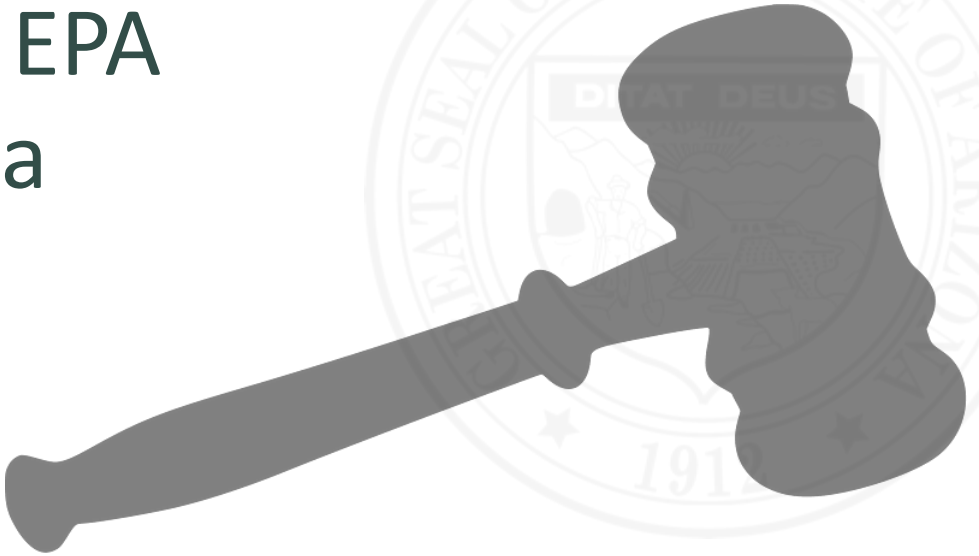
Legal latest for the Conforming Rule

November 2023 | WV, ND, IA et. al v. EPA

- Federal District Court, North Dakota

February 2024 | Texas et. al v. EPA

- Federal District Court, Texas



Preliminary injunction in 26 states:

Alabama, Alaska, Arkansas, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Montana, Nebraska, New Hampshire, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia and Wyoming

Why the WOTUS woes?

ADEQ Arizona Department of Environmental Quality

Expectation

LACK OF CLARITY!

Reality

Why the WOTUS woes?

Why the WOTUS woes?

Flow Permanency

Permanent

Relatively Permanent

Non-Relatively Permanent

Flow Regimes

Perennial

Intermittent

Ephemeral

Why is relatively permanent important?

Sackett v EPA

"the Court concludes that the CWA's use of "waters" encompasses "only those relatively permanent,standing or continuously flowing bodies of water"

Why the WOTUS woes?

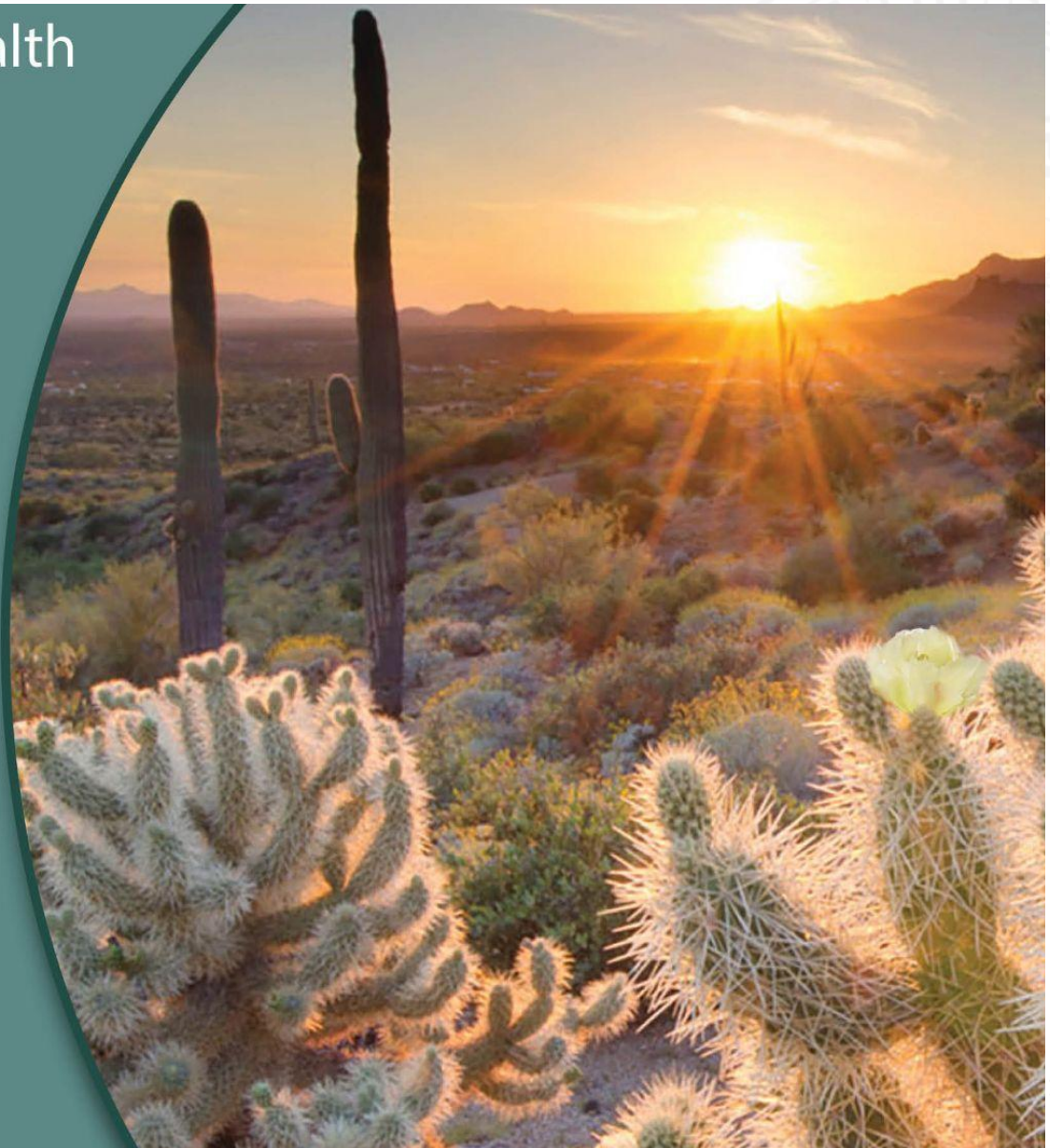
ADEQ Mission & Vision

Is to protect and enhance public health and the environment in Arizona.

Through consistent, **science-based** environmental regulation; and **clear**, **equitable engagement** and communication;

With **integrity**, **respect**, and the highest standards of **effectiveness** and **efficiency**;

Because Arizonans treasure the unique environment of our state and its essential role in **sustaining well-being** and **economic vitality**, today and for future generations.



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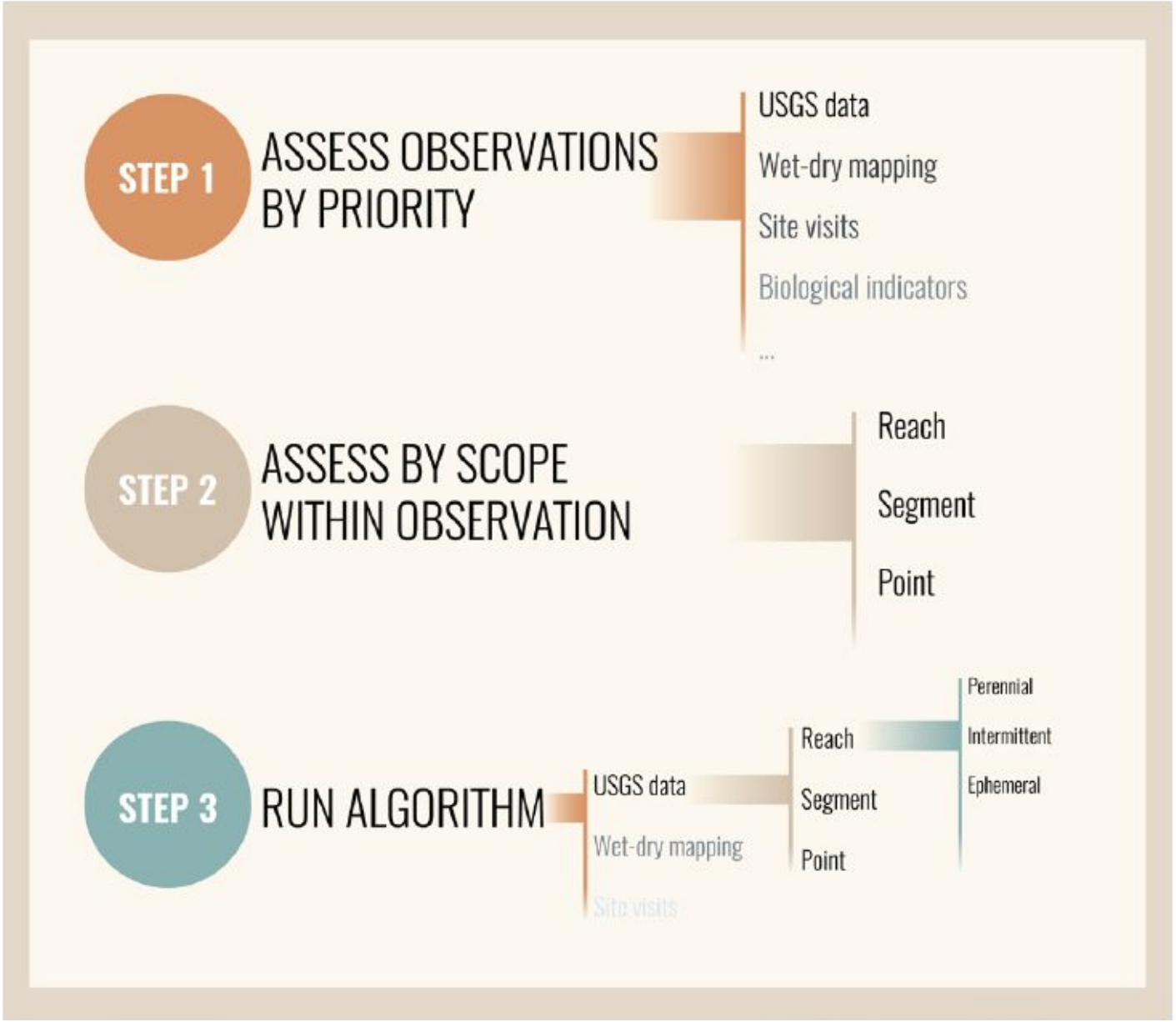
Weight of Evidence Approach

- Standardizes assigning flow regimes
- Based on a previous flow regime algorithm ADEQ used
- Flow regime informs aspects of surface water protection
  - Federal and state regulatory programs
  - Outstanding Arizona Waters nominations
  - Water quality standards to assign designated uses

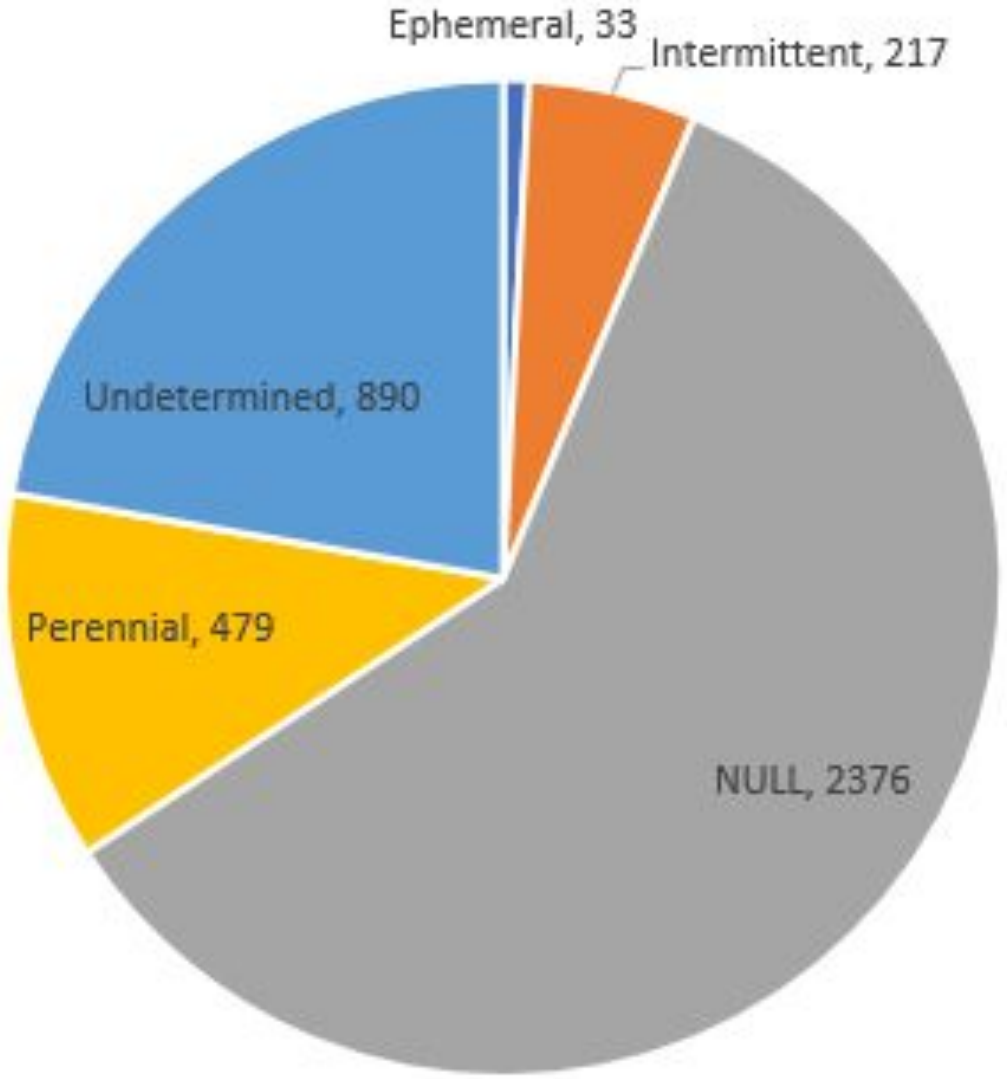
Flow Regime Algorithm | Old Way



Flow Regime Algorithm | Old Way

Problems:

- 55% of assignments = “undetermined”
- NULLs
  - No data
  - Standard Works not prepared for available data
- 82% of WBIDs have no assigned flow regime
- Scope Priority Issues



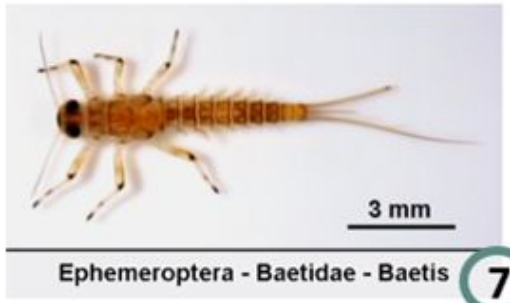
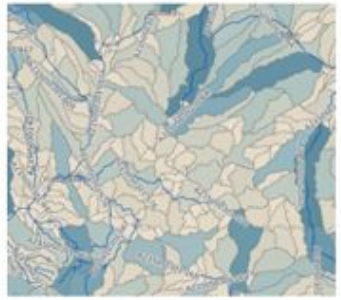
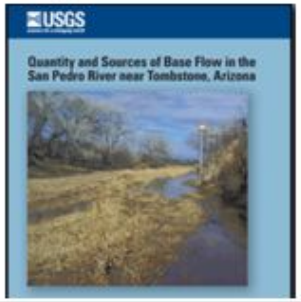
Weight of Evidence Approach

Solutions:

- Develop a new flow regime assignment tool
  - Develop SWs for all data sources available
  - Remove the Scope Priority
  - Always assign a flow regime

Weight of Evidence Approach

Observation Data Source Types

USGS Gages  9	SDAM Surveys - Reach  8	Biological Indicators  Ephemeroptera - Baetidae - Baetis 7
Wet Datapoints  6	Continuous Monitoring  5	Modeled – Merritt et al. (2021)  4
ADEQ Screening Tools  3	SDAM Surveys – Point  2	Supplemental Data  1

Weight of Evidence Approach

Observation Data Source Flow Regime Logic

USGS Gages **Ephemeral** - % of zero-flow days >= ecoregional ephemeral **Intermittent** - % of zero flow days < ecoregional ephemeral threshold and % of zero-flow days >= 0.274% **Perennial** - % of zero flow days < 9	**SDAM Surveys - Reach** **Ephemeral, At Least Intermittent, Intermittent, Perennial, or Needs More Information** - Based on streamflow duration indicators present/absent 8	**Biological Indicators** **At least intermittent** - based on observations of macroinvertebrates, fish, hydrophytes, amphibians, and crayfish 7
Wet Datapoints **At Least Intermittent -** Minimum of one season with a wet data point over at least 3 years of record, excluding all storm influenced flow events, where >0.4 inches of rain has fallen within 48 hours 6	**Continuous Monitoring** **Ephemeral** - % of zero-flow days >= ecoregional ephemeral **Intermittent** - % of zero flow days < ecoregional ephemeral threshold and % of zero-flow days >= 0.274% **Perennial** - % of zero flow days < 5	**Modeled – Merritt et al. (2021)** **Ephemeral:** Aseasonal-NP - Ephemeral and flashy (A1) **At Least Intermittent**: Weak seasonal-NP Wet Winter-spring (A2) -OR- Seasonal-NP Rain and snowmelt Summer dry (B1a) -OR- Aseasonal P -OR- Aseasonal NP (B2) **Perennial:** Weak seasonal P Rain and snowmelt -OR- Seasonal-PRain and snowmelt/ Summer dry (B1b) 4
ADEQ Screening Tools **Potentially Ephemeral**: < 50% riparian vegetation cover **Potentially Intermittent:** >= 50% riparian vegetation cover **Potentially Ephemeral**: Average depth to groundwater value > 33 feet **Potentially Intermittent**: Average depth to groundwater value <= 33 feet **Potentially Intermittent**: Waterbody occurs in snowpack region >6500 feet elevation 3	**SDAM Surveys – Point** **Ephemeral, At Least Intermittent, Intermittent, Perennial, or Needs More Information** - Based on streamflow duration indicators present/absent 2	**Supplemental Data** **Ephemeral, At Least Intermittent, Intermittent, Perennial, or Needs More Information** - Based on supplemental data available 1

Weight of Evidence Approach

Flow Regime Options

1. Ephemeral - a surface water or portion of surface water that flows or pools only in direct response to precipitation.
2. Intermittent - a surface water or portion of surface water that flows continuously during certain times of the year and more than in direct response to precipitation, such as when it receives water from a spring, elevated groundwater table or another surface source, such as melting snowpack.
3. At least Intermittent - A surface water with a high likelihood that the stream is either perennial or intermittent. In this circumstance, however, the two classes cannot be distinguished with confidence.
4. Perennial - a surface water or portion of surface water that flows continuously throughout the year.

Weight of Evidence Approach

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Weight of Evidence Approach

Approach:

1. Collect all available flow regime data

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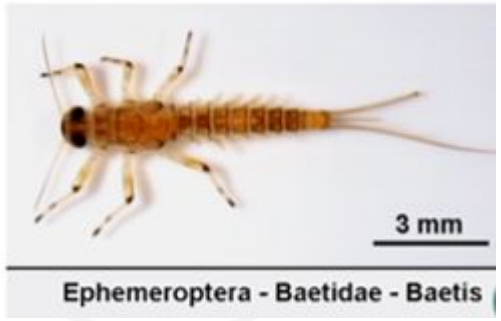
USGS Gages

SDAM Surveys - Reach

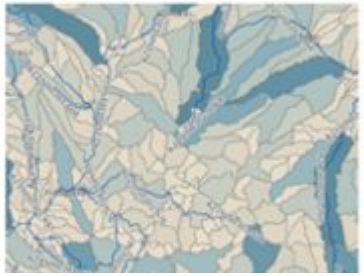
Biological Indicators



Wet Datapoints

Continuous Monitoring

Modeled – Merritt et al. (2021)



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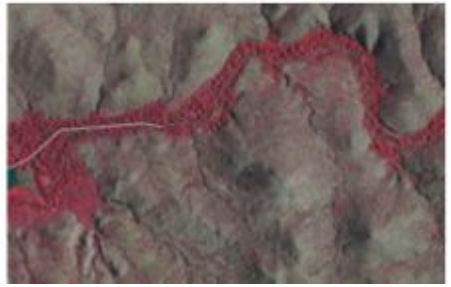
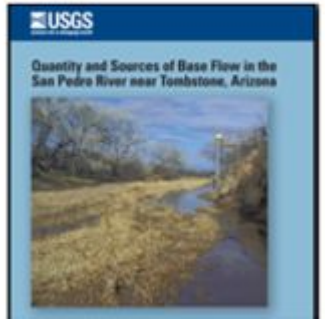


SDAM Surveys – Point

Supplemental Data



Weight of Evidence Approach

Approach:

1. Collect all available flow regime data
2. Follow the individual standard work and assign a flow regime

ADEQ. 2023a (In Development). Application of USGS Gage data in Flow Regime Assignments. ADEQ, Phoenix, AZ.

ADEQ. 2023b (In Development). Application of SDAM Data in Flow Regime Assignments. ADEQ, Phoenix, AZ.

ADEQ. 2023c (In Development). Application of Biological Data in Flow Regime Assignments. ADEQ, Phoenix, AZ.

ADEQ. 2023d (In Development). Application of Wet Data Points in Flow Regime Assignments. ADEQ, Phoenix, AZ.

ADEQ. 2023e (In Development). Application of Continuous Flow Monitoring in Flow Regime Assignments. ADEQ, Phoenix, AZ.

ADEQ. 2023f (In Development). Application of Merritt et al. (2021) GIS layers in Flow Regime Assignments. ADEQ, Phoenix, AZ.

ADEQ. 2023g (In Development). Application of ADEQ Screening Tools Data in Flow Regime Assignments. ADEQ, Phoenix, AZ.

ADEQ. 2023h (In Development). Applying Supplemental Data to Flow Regime Assignments. ADEQ. Phoenix. AZ.

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Weight of Evidence Approach

Approach:

1. Collect all available flow regime data
2. Follow the individual standard work and assign a flow regime

Data Source	Observation Priority Level	Sources	Result
Flow Duration Series	9	USGS gage data	Intermittent
SDAM (Representative Reach)	8	SDAM surveys	At least intermittent
Biological Indicators	7	SEM surveys	At least intermittent
Wet Data Points	6	EPA's Water Quality Portal and Imagery reviews (Google Earth and World Wayback from 2006-2023)	At Least Intermittent
Continuous Monitoring	5	Game camera data (2022-2023)	Intermittent
Merritt-Hawkins modeled flow regime	4	Merritt-Hawkins modeled flow regime data	At Least Intermittent
ADEQ Screening Tools	3	Combined Screening Tool Result	At least Intermittent
SDAM (Point)	2	Not available	NA
Supplemental data	1	Not available	NA

Weight of Evidence Approach

Approach:

1. Collect all available flow regime data
2. Follow the individual standard work and assign a flow regime
3. Sum the OPL scores within each flow regime category

Weight of Evidence Approach

Approach:

1. Collect all available flow regime data
2. Follow the individual standard work and assign a flow regime
3. Sum the OPL scores within each flow regime category

Data Source	Ephemeral	At Least Intermittent	Intermittent	Perennial
Flow Duration Series	No Score	No Score	9	No Score
SDAM (Reach)	No Score	16	No Score	No Score
Biological Indicators	No Score	7	No Score	No Score
Wet Data Points	No Score	6	No Score	No Score
Continuous Monitoring	No Score	No Score	5	No Score
Merritt et al. (2021) modeled flow regime	No Score	4	No Score	No Score
ADEQ Screening Tools	No Score	3	No Score	No Score
SDAM (Point)	No Score	2	No Score	No Score
Supplemental Data	No Score	1	No Score	No Score
Total	No Score	**39**	14	No Score

Weight of Evidence Approach

Approach:

1. Collect all available flow regime data
2. Follow the individual standard work and assign a flow regime
3. Sum the OPL scores within each flow regime category
4. Flow regime with the greatest score is assigned

Data Source	Ephemeral	At Least Intermittent	Intermittent	Perennial
Flow Duration Series	No Score	No Score	9	No Score
SDAM (Reach)	No Score	16	No Score	No Score
Biological Indicators	No Score	7	No Score	No Score
Wet Data Points	No Score	6	No Score	No Score
Continuous Monitoring	No Score	No Score	5	No Score
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Weight of Evidence Validation

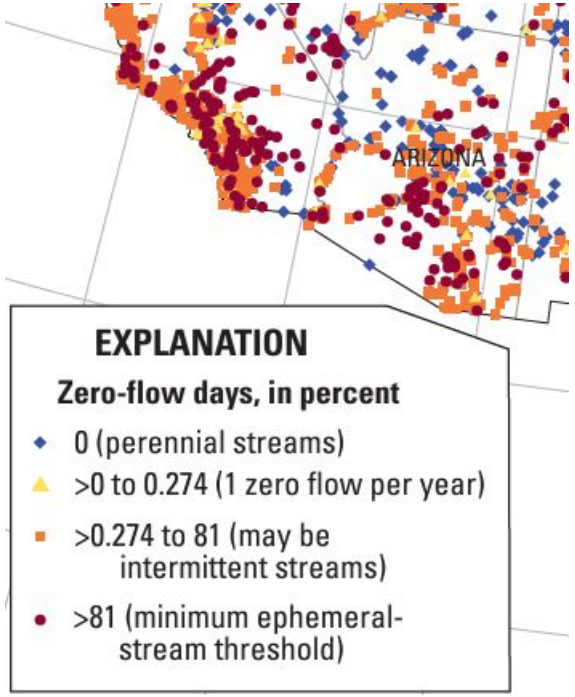
Validation steps:

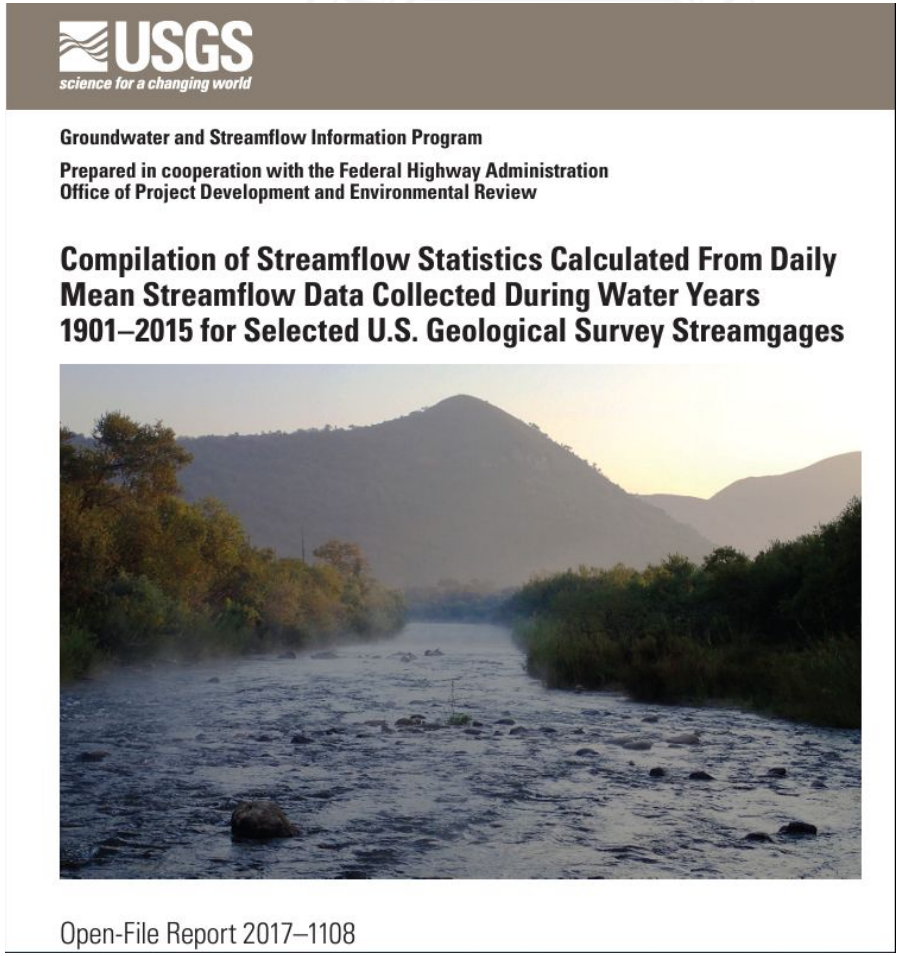
1. Select Validation Sites

Weight of Evidence Validation

Validation steps:

1. Select Validation Sites
    1. 18 perennial WBIDs

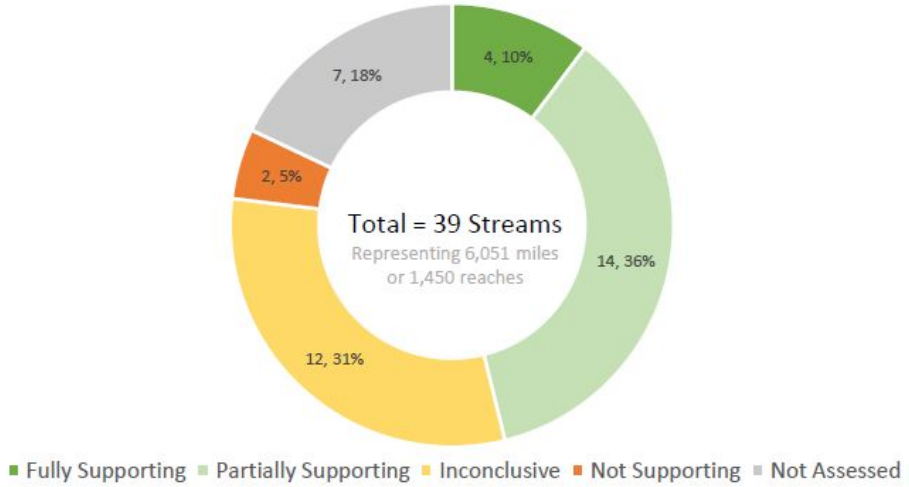




Weight of Evidence Validation

Validation steps:

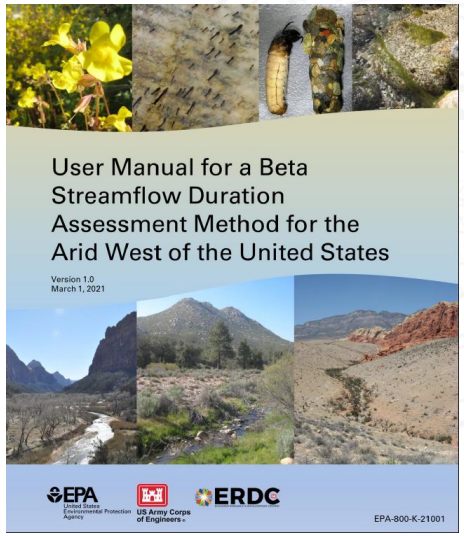
1. Select Validation Sites
    1. 18 perennial WBIDs
    2. 17 intermittent WBIDs



Weight of Evidence Validation

Validation steps:

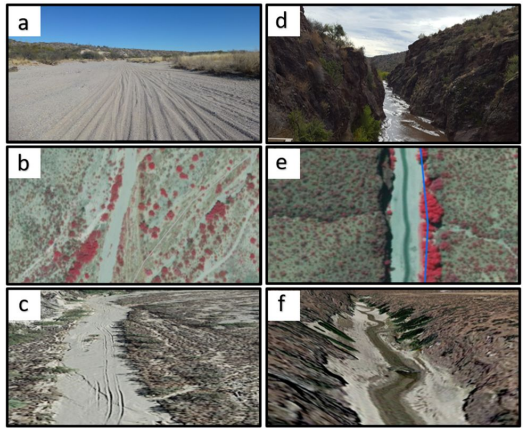
1. Select Validation Sites
    1. 18 perennial WBIDs
    2. 17 intermittent WBIDs
    3. 16 ephemeral WBIDs



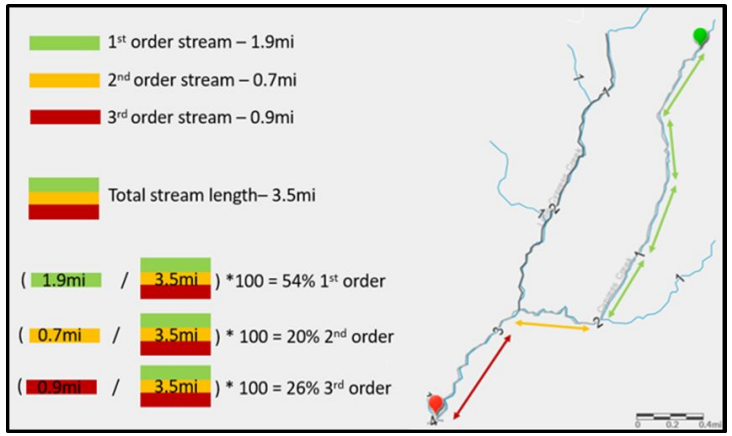
SDAM classification = Ephemeral

Representativeness Assessment

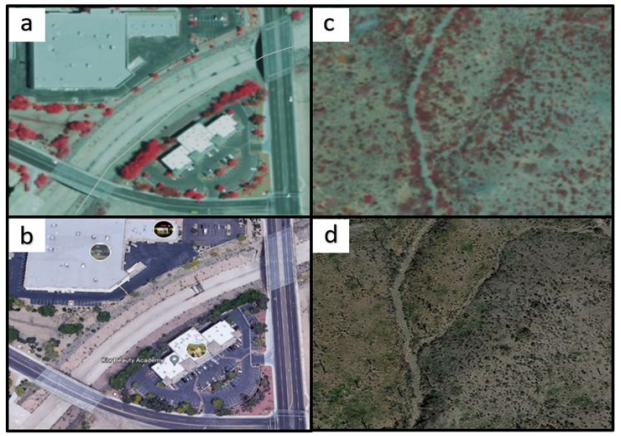
1) Channel morphology type



2) Stream order



3) Stream modifications



4) RPD drainage area

$$\left(\left(\frac{DRNAREA_{bottom} - DRNAREA_{top}}{DRNAREA_{bottom} + DRNAREA_{top}}\right) \div 2\right) \times 100$$

Weight of Evidence Validation

Validation steps:

1. Select Validation Sites
2. Assign WOE flow regime

Weight of Evidence Validation

Validation steps:

1. Select Validation Sites
2. Assign WOE flow regime
    1. Full WOE
    2. WOE – validation data source
    3. Minimum data requirements
    4. Greater flow permanence override

Weight of Evidence Validation

Validation steps:

1. Select Validation Sites
2. Assign WOE flow regime

Observation Data Type	Observation Level Score	Weight of Evidence		
		P	I	E
Flow Duration	9	x	x	x
SDAM - Reach	8	x	x	x
Biological Indicators	7	x	x	x
Wet data points	6	x	x	x
Continuous Monitoring	5	x	x	x
Modeled (Merritt et al. 2021)	4	x	x	x
Combined Screening Tools	3	x	x	x
SDAM - Point	2	x	x	x
Other	1	x	x	x
Add the observation level scores across observation data types for each flow regime category (sum the observation level score if the data type is marked "X"). Use the following logic to assign the overall Weight of Evidence flow regime category:		Flow regime category (Ephemeral, At Least Intermittent, Intermittent, Perennial) with the greatest overall score is assigned		

Weight of Evidence Validation

Validation steps:

1. Select Validation Sites
2. Assign WOE flow regime
3. Assess WOE accuracy

Weight of Evidence Validation

Validation steps:

1. Select Validation Sites
2. Assign WOE flow regime
3. Assess WOE accuracy
    1. Compare WOE FR Vs validation FR

Validation Flow Regime	Correct WOE Assignment
Ephemeral	Ephemeral
Intermittent	Intermittent
	At Least Intermittent
Perennial	
	Perennial

Weight of Evidence Validation

Validation steps:

1. Select Validation Sites
2. Assign WOE flow regime
3. Assess WOE accuracy
    1. Compare WOE FR Vs validation FR
    2. Compare WOE individual data source FR Vs validation FR

Validation Flow Regime	Correct WOE Assignment
Ephemeral	Ephemeral
Intermittent	Intermittent
	At Least Intermittent
Perennial	
	Perennial

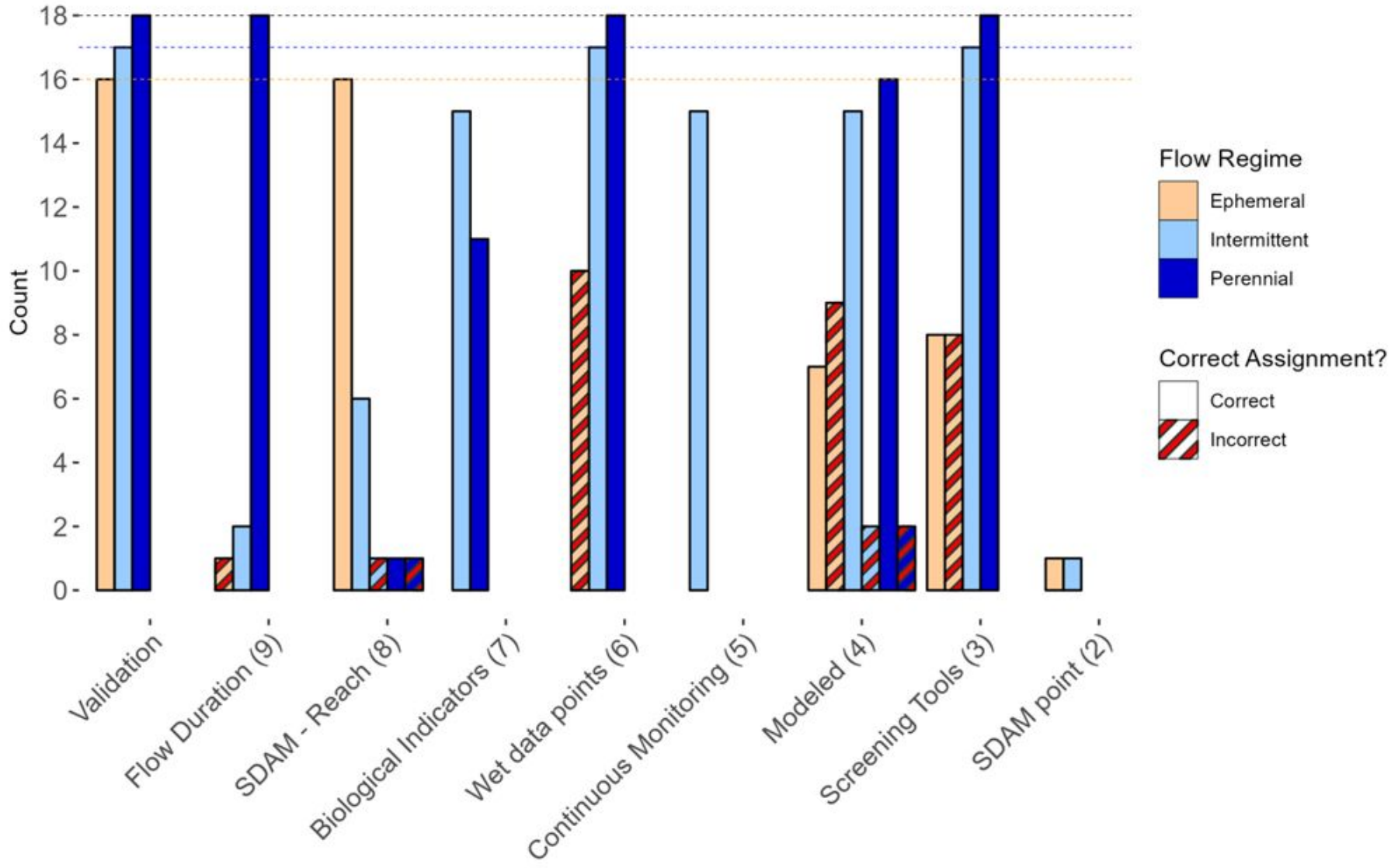
Weight of Evidence Validation

Results: 1) WOE FR Vs validation FR

Validation Assessment Category	Weight of Evidence Accuracy
% Perennial correct	100
% Intermittent correct	100
% Ephemeral correct	75
% Total correct	92

Weight of Evidence Validation

Results: 2) individual data source FR Vs validation FR



Future of Weight of Evidence Approach

Future Steps:

1. Publish results in a peer-reviewed journal

1. Legal clarity on how flow regime is translated into flow permanency

Why the WOTUS woes?

Erin Jordan
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ADEQ
Arizona Department of Environmental Quality

Clean Air, Safe Water,
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