

Camo, Hose Clamps, and Pixels:

Arizona's Approach for Low-Cost Intermittent Stream Monitoring

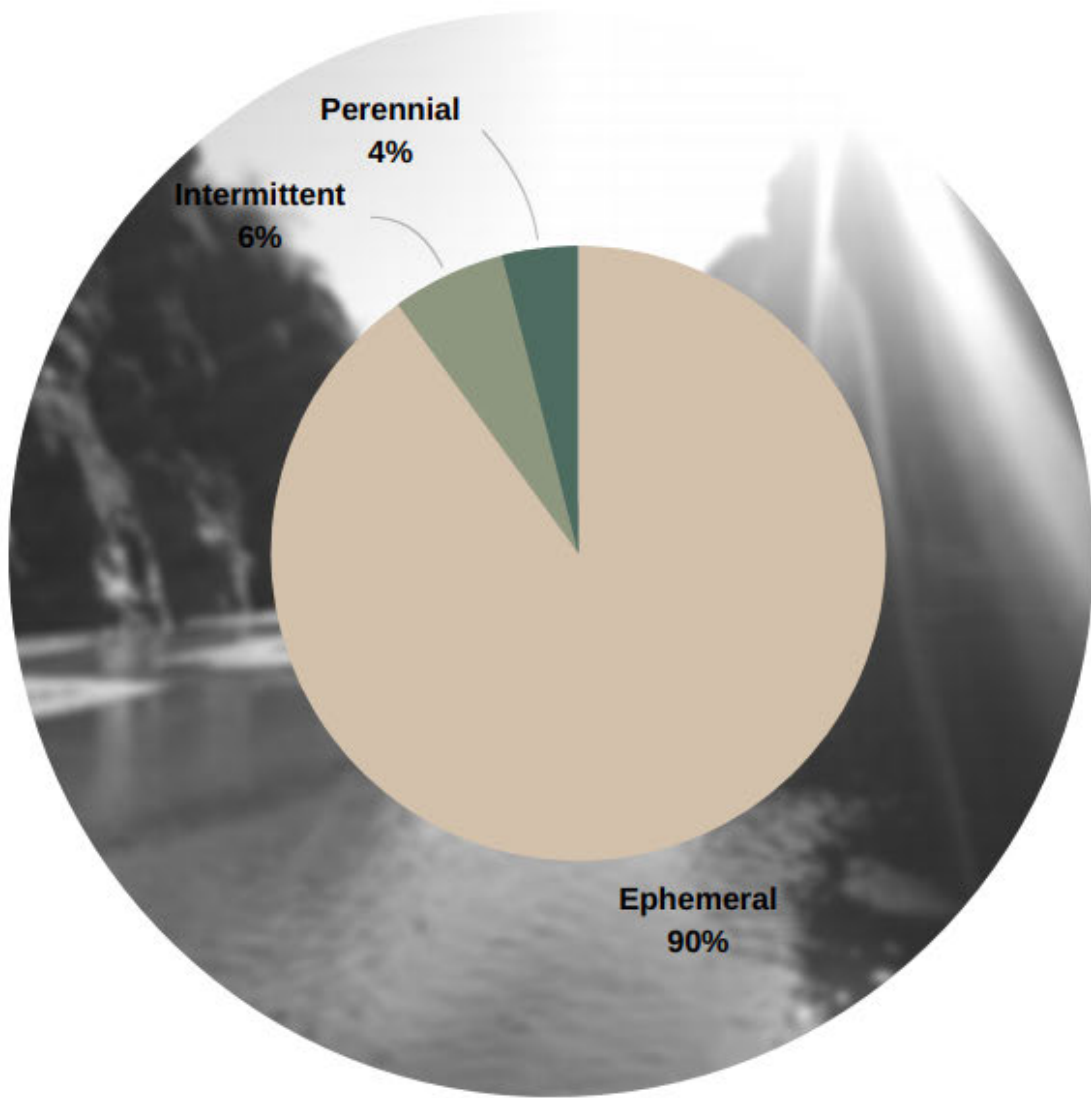
Meghan Smart, Scientist ADEQ

December 6th, 2017



Arizona Has Water!





ARIZONA

STREAMS

Total of 6,000
Intermittent
Stream Miles

Arizona 2016 Assessment

Arizona 2016 Assessment

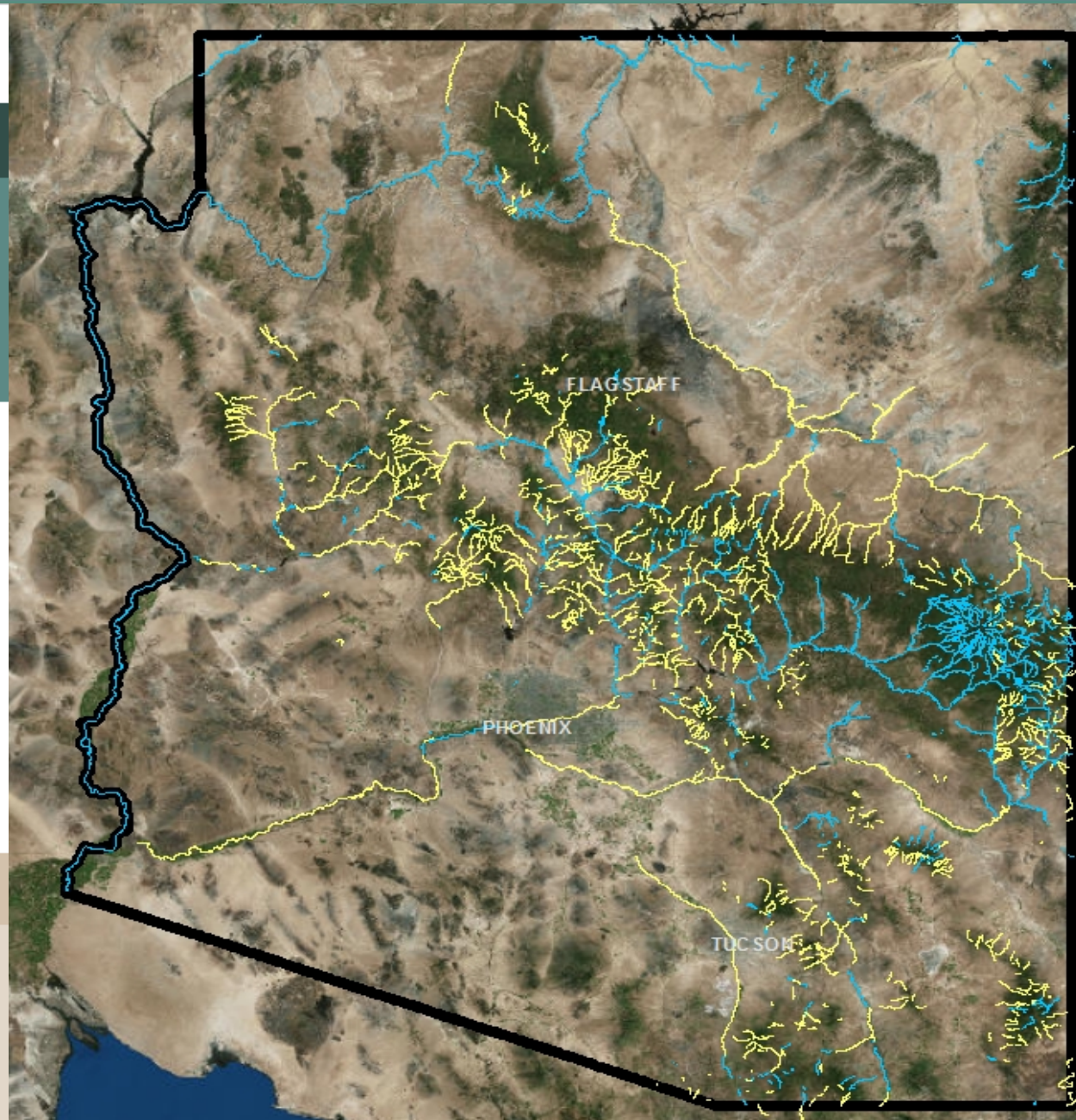
Perennial Streams

Perennial Streams = 40% Assessed



Intermittent Streams

Intermittent Streams = 12% Assessed



Three Questions

1. HOW ACCURATE IS OUR MAP?
2. WHAT'S THE FLOW CATEGORY: DAYS OF FLOW PER YEAR?
3. WHAT'S THE CONDITION OF INTERMITTENT STREAMS (GOOD, FAIR, POOR)?

Ephemeral ←————→ Perennial



?



PROBABILISTIC SURVEY

- GOAL OF 40 SITES
- 2 YEAR STUDY

Data:

- Chemistry
- Habitat
- Macroinvertebrates

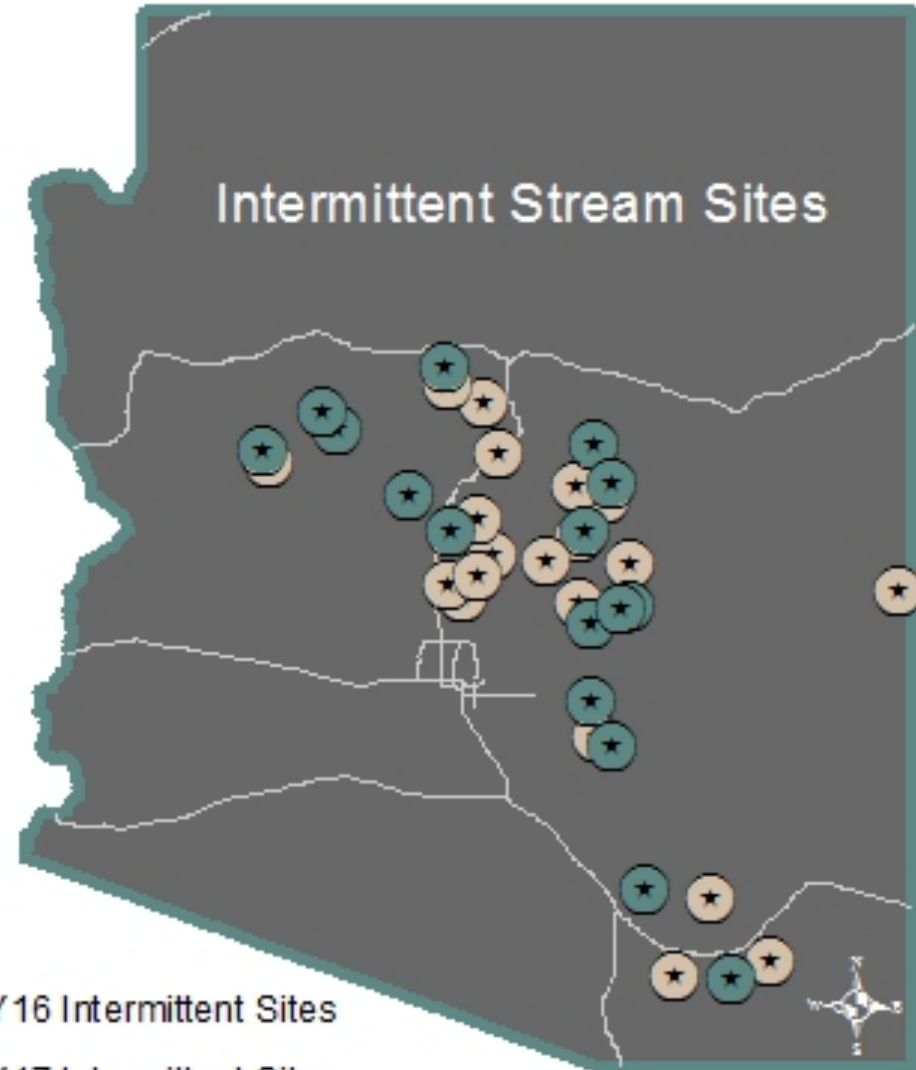
? Flow Category Data
(# days/ Year)



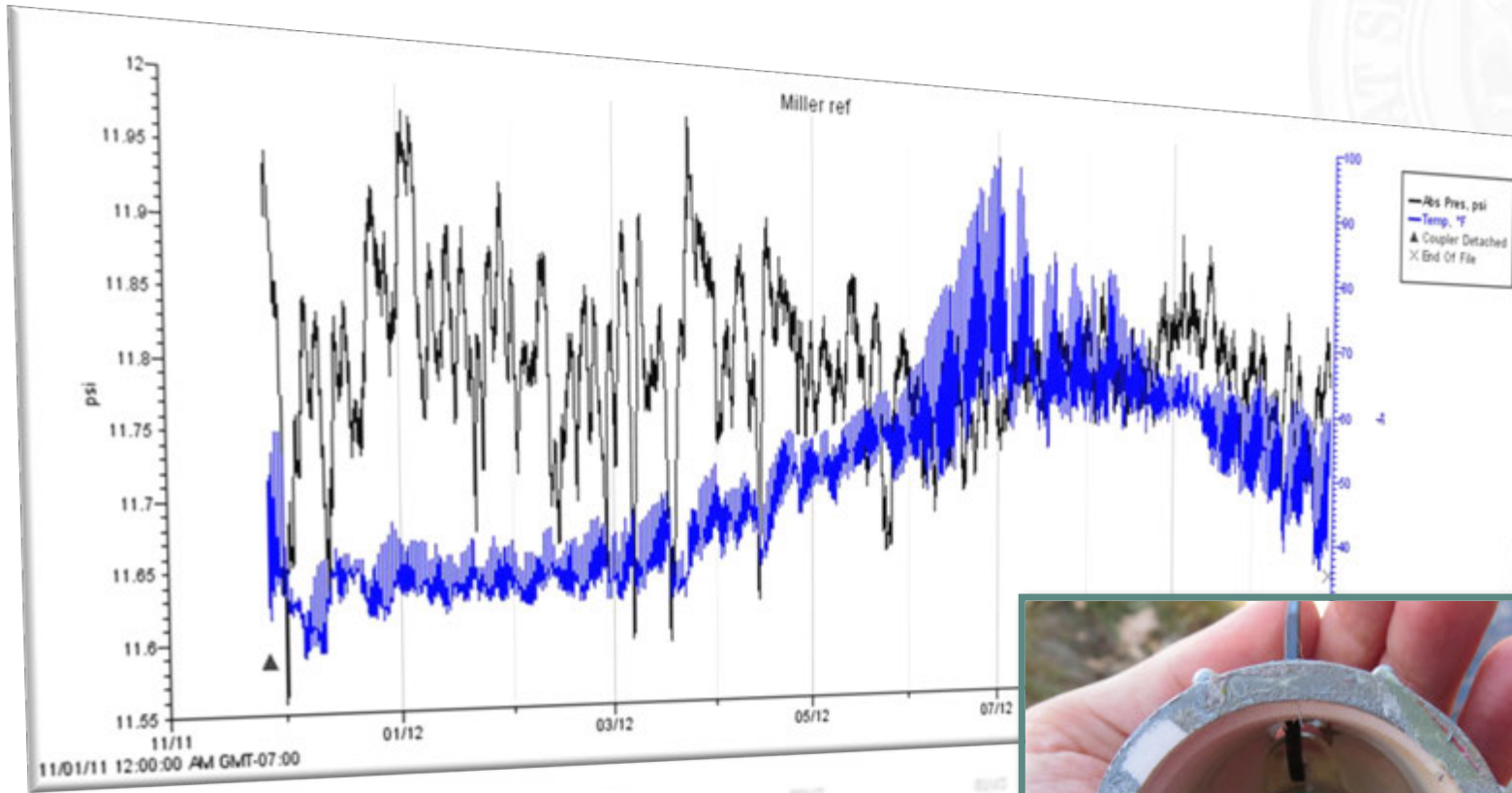
FY16 Intermittent Sites



FY17 Intermittent Sites



Is It Wet?



Is It Wet?



TLC500 2014/12/04 16:50:13

Camera Set-up



Light weight solar panel



M-550 Moultrie trail camera



12 v Battery with regulator

Total Cost= \$330.00

Continuous Improvement



M-880 Moultrie
Trail Camera

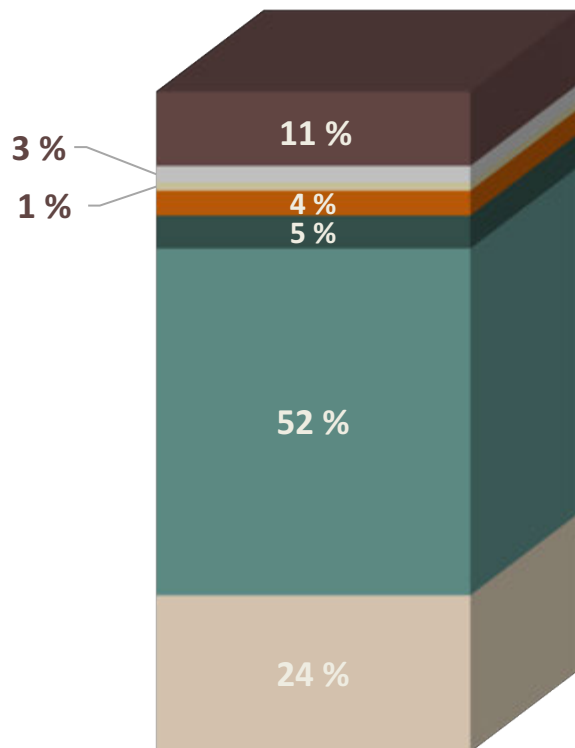


Solar panel and battery in one!

Total Cost= \$210.00

Probabilistic survey design: great for stats, hard on time!

Out of 80 Sites 19 Target Sites



- Uncertain: Barrier and Effort
- Uncertain: Access Denied
- Non-target Other: EDW regulated Flow
- Non-target: Map Error Tribal Land
- Non-target: Map Error Perennial
- Non-target: Map Error Ephemeral
- Target (Sample)



Hydrologic Indicators



Vegetation

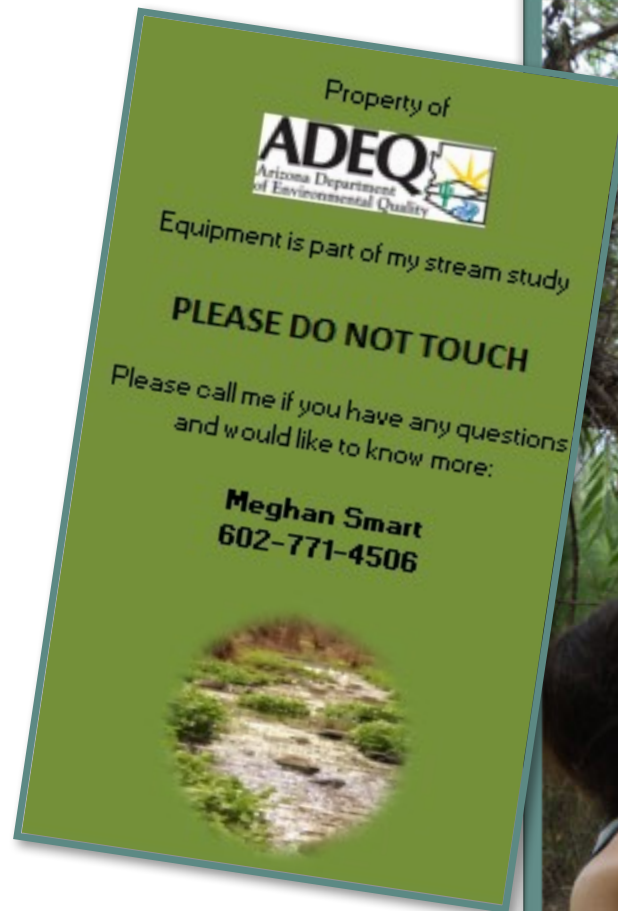


Water



Soil

- Above bankfull
- Guess where water will be
- Face camera upstream
- Capture multiple habitats
- Test Shots
- Camo
- Positive information tag



Salome Creek Example

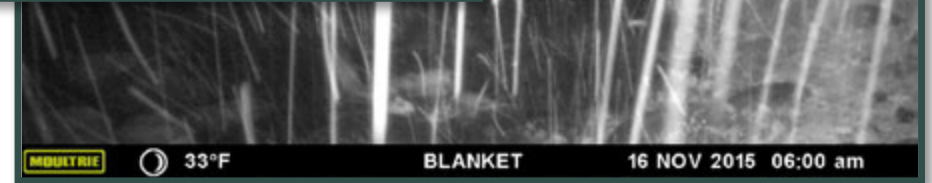


What is going on?

Whitford Canyon- High Flow Example



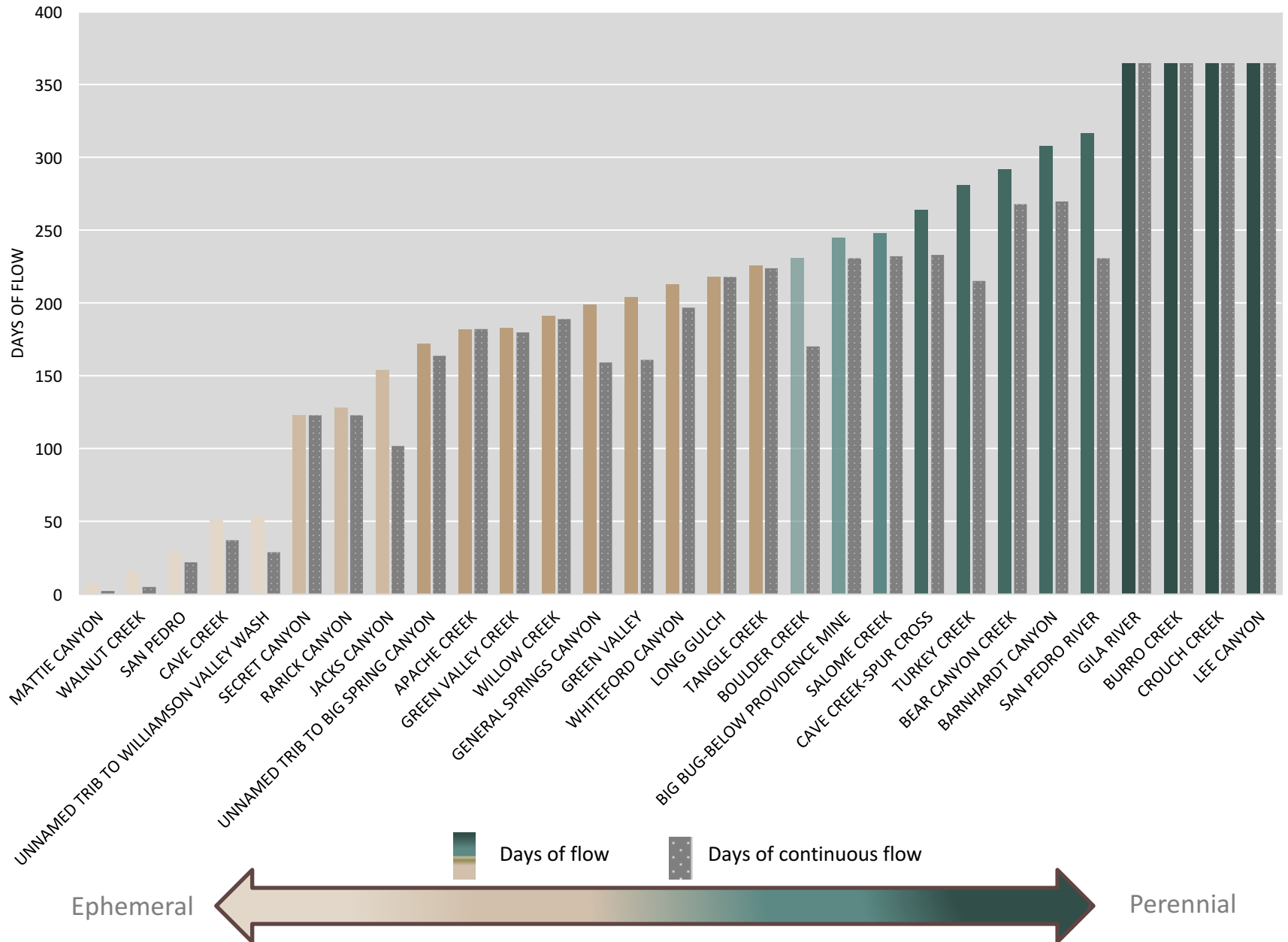
Big Bug Example- Weather Example



Mattie Canyon- Flash Flood Example



Intermittent Stream Range of Flow Conditions



Wildlife



US

8 am

m

MOULTRIE

71°F

MOON UNIT

12 AUG 2016 06:39 pm

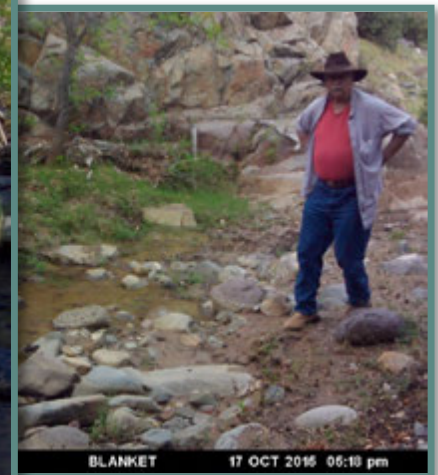
MOULTRIE

71°F

APPLE

12 SEP 2016 12:15 am

Animals of Another Sort



Wildlife Infographic

Infographic Representing Wildlife and Human Camera Encounters

Site ID	# of People  = 20	# Days with Wildlife  = 20
SRREY001.45	0	6
LCWIL018.74	2	24
VRUWV001.55	4	47
VRUBS001.35	1	19
LCJCC045.76	0	49
SRSAL008.74	0	49
SRGVL011.66	1	50
MGWHC003.78	2	49
MGLOG000.56	10	42
VRAPA002.31	1	21
MGBGB023.15	2	60
SPSPR108.03	0	15
SRFIN000.78	0	48
SCBCN002.27	617	4
MGGLR312.41	0	12
BWBRO037.65	4	26

* 2016 data example

Probabilistic Study Statistics



- 29 cameras deployed
- Over 151,000 photos taken
- 73 GB of data collected



- 3 cameras lost to flooding



- 3 cameras lost to fire



- 2 cameras stolen, 1 SD card stolen

Juniper Fire



Mother Nature Won!

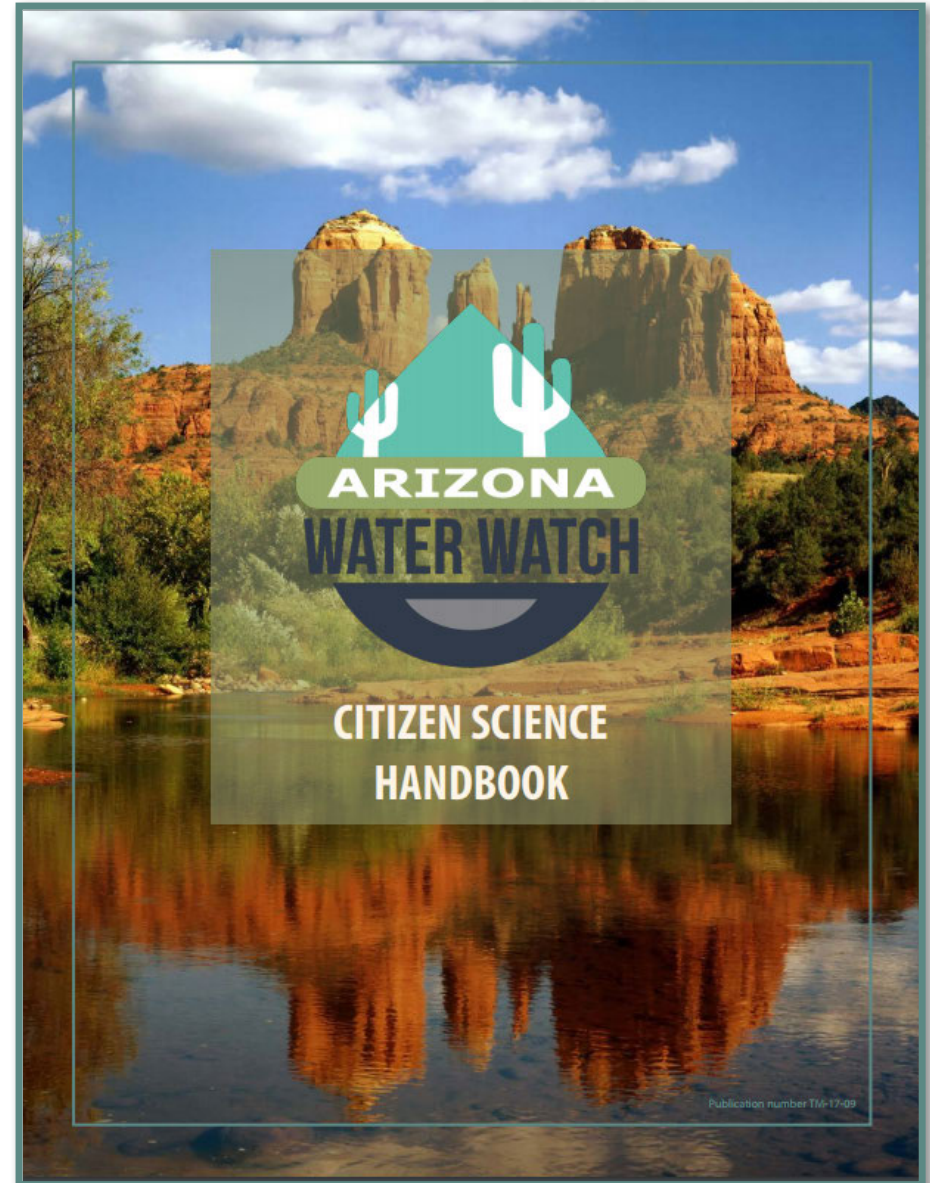


Where Do We Go From Here?

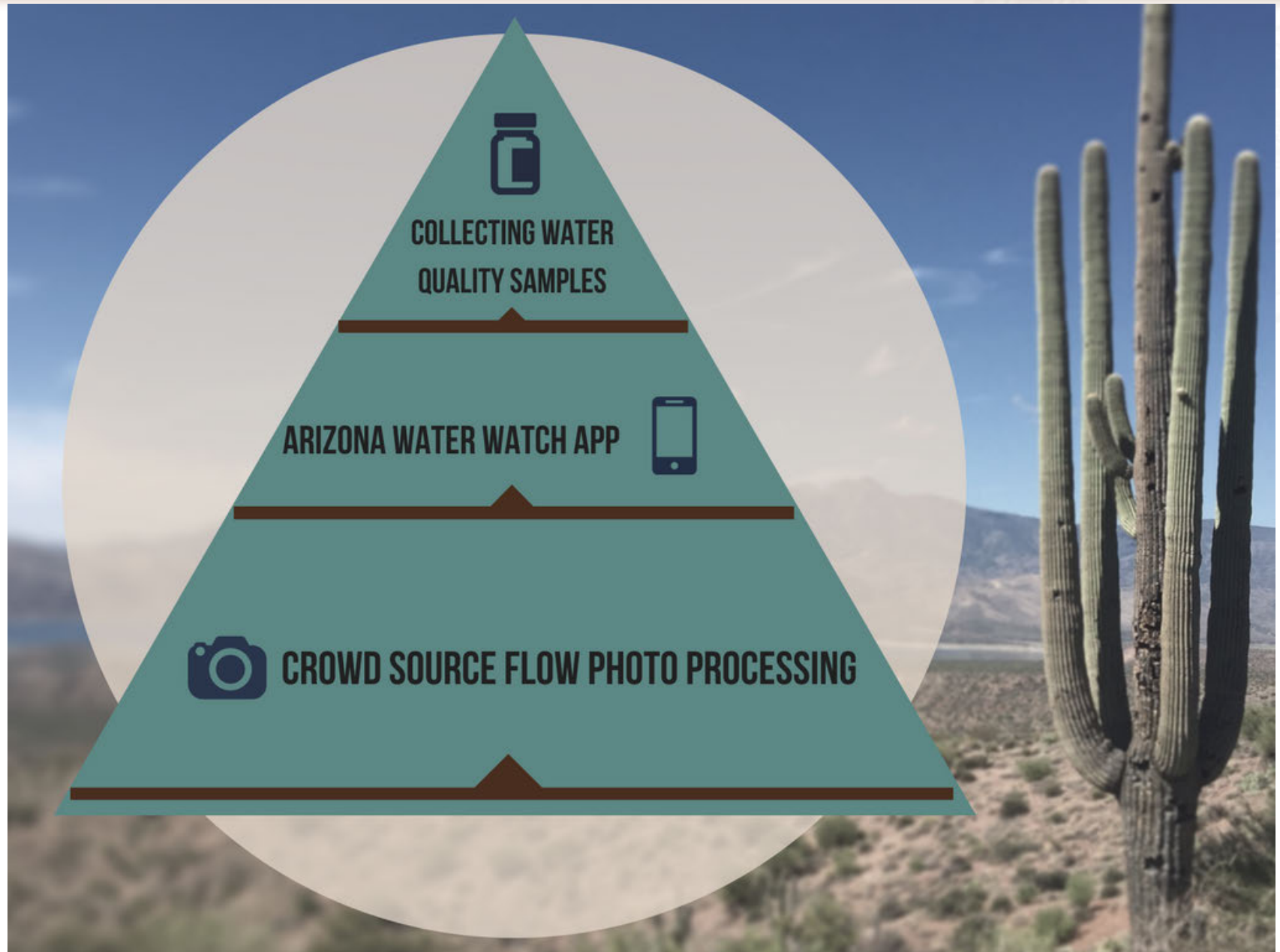


- Assess condition of intermittent streams for the 1st time ever in Arizona using a probabilistic design!
- Classify intermittent streams into flow categories
- Identify stressors
- Update intermittent stream map
- Identify macroinvertebrate community within each flow category.
- Use a targeted and probabilistic study design approach.
- Identify “missed” chemistry samples
- Automate photo processing

- 151,000 photos to processes...
- Streams to sample...
- Cameras to maintain...



Multi-Level Volunteer Opportunities



Collecting Water Quality Samples



AWW # _____ (Internal Use Only)

ADEQ CITIZEN SCIENCE DATA FORM

PROJECT NAME: _____ FIELD CREW: _____

SITE NAME: _____ ADEQ SITE ID: _____

/ / / 2017
 : AM
 LATITUDE: _____
 : PM
 LONGITUDE: _____
NAD 83



FIELD DATA: FILL IN THE BLANKS

AIR TEMPERATURE: _____ °C

WATER TEMPERATURE: _____ °C

DISSOLVED OXYGEN: _____ mg/L

_____ %

pH: _____ SU

SPECIFIC CONDUCTIVITY: _____ uS/cm

TOTAL DISSOLVED SOLIDS: _____ mg/L

TURBIDITY _____ NTU

SAMPLE COLLECTION INFO: CIRCLE ALL APPLICABLE INFORMATION IN EACH SECTION

GRAB
 POLE

LEW --- 3/4 --- 1/2 --- 1/4 --- REW
LOOKING DOWNSTREAM

RIFFLE
 RUN
 POOL

Samples Collected: _____ QC SAMPLE NAME: _____

E. COLI
 METALS
 NUTRIENTS
 SSC
 INORGANICS

CIRCLE IF APPLICABLE B=BLANK D=DUPLICATE

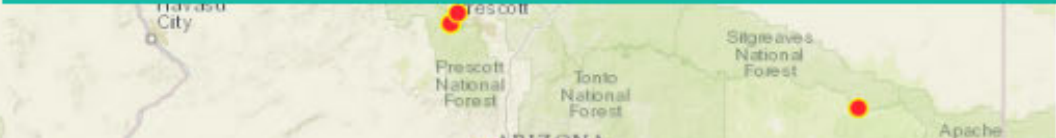
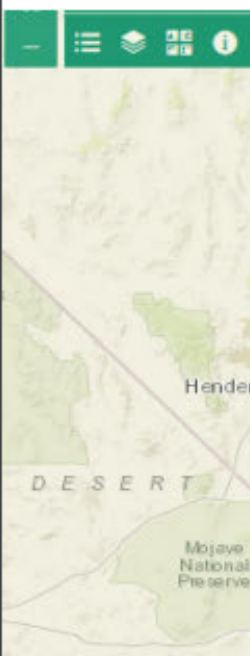
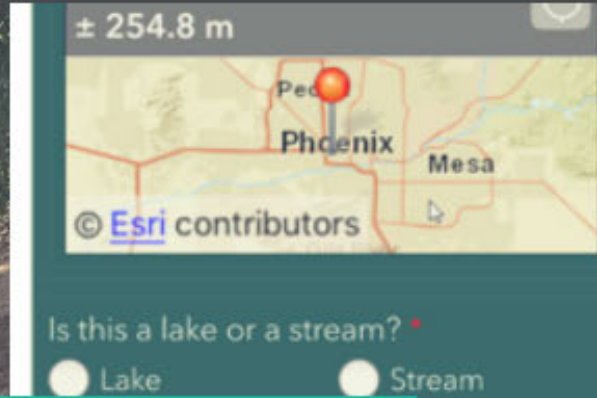
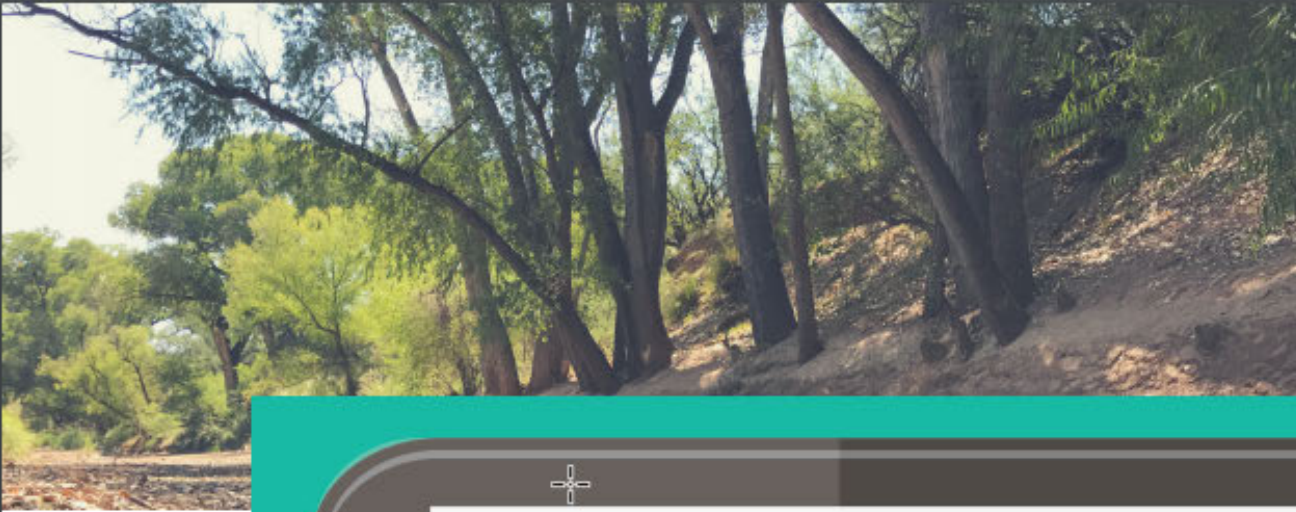
E. COLI: CIRCLE AND FILL IN APPLICABLE INFORMATION

DILUTION: NONE 1:10 1:100 MEDIA: COLILERT 18 COLILERT 24

	COLLECTED	INCUBATED	COUNTED	LRG. WELL	SM. WELL	MPN
REGULAR:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	AM _____ PM _____	AM _____ PM _____	AM _____ PM _____	L _____ S _____		
DUPLICATE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	AM _____ PM _____	AM _____ PM _____	AM _____ PM _____			
DI BLANK:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NA _____	AM _____ PM _____	AM _____ PM _____			

1 of 2

Arizona Water Watch App



Flow Finder: Crowd Sourcing Photo Processing



Help scientists from the comfort of your own home by viewing our intermittent stream camera images and answering questions!

The screenshot shows the mobile app interface for "Flow Finder: Arizona Water Watch". At the top, there is a navigation bar with tabs: "FLOW FINDER: ARIZONA WATER WATCH", "ABOUT", "CLASSIFY" (which is underlined), "TALK", "COLLECT", "RECENTS", "LAB", and "ARIZONA WATER WATCH HOMEPAGE". The main content area is a large photo of a rocky stream bed. Overlaid on the photo is a teal banner with the text "AVAILABLE SOON!". To the right of the photo is a "Flow Observation?" menu with four radio button options: "Flowing", "Pooled", "Dry" (which is selected and highlighted in blue), and "Not Sure". Below the menu are "Back" and "Next" buttons, with "Next" being green. At the bottom of the screen, there is a status bar with "MOULTRIE", a temperature of "73°F", the location "PILOT INSPK", and the date and time "15 AUG 2015 01:34 pm". On the far right edge, there is a vertical "FIELD GUIDE" button.

Time-Lapse Video: Salome Creek July 2015- January 2016

DITAT DEUS





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Thank you!!!

It takes a group of people to help save the world!

- Monitoring Unit at ADEQ
- Watershed Protection Unit at ADEQ
 - Lee Ester at SRP
 - Byrant Dickens at ADEQ