



SRP FLOWTOGRAPHY[®]

Evaluating Streamflow Responses Utilizing Time-Lapse Photography
Presented by Lee Ester – SRP Water Measurement Manager

Multi-State Salinity Coalition | March-2-2017 | Las Vegas, NV

Purpose: SNOWTOGRAPHY SITE EVALUATION
Site: ALLEY VIEW ABOVE STONEMAN LAKE
Date: 08/11/16

Who is Salt River Project (SRP)?

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Figure 1. Theodore Roosevelt Dam

SRP FACTS & FIGURES

POWER & WATER

- SRP is the oldest multi-purpose federal reclamation project in the United States.
- Headquartered in Tempe, AZ
- Serving Arizona since 1903.
- 10 years prior to AZ statehood.
- 6 National Forests covers 15% AZ

DAMS & LAKES

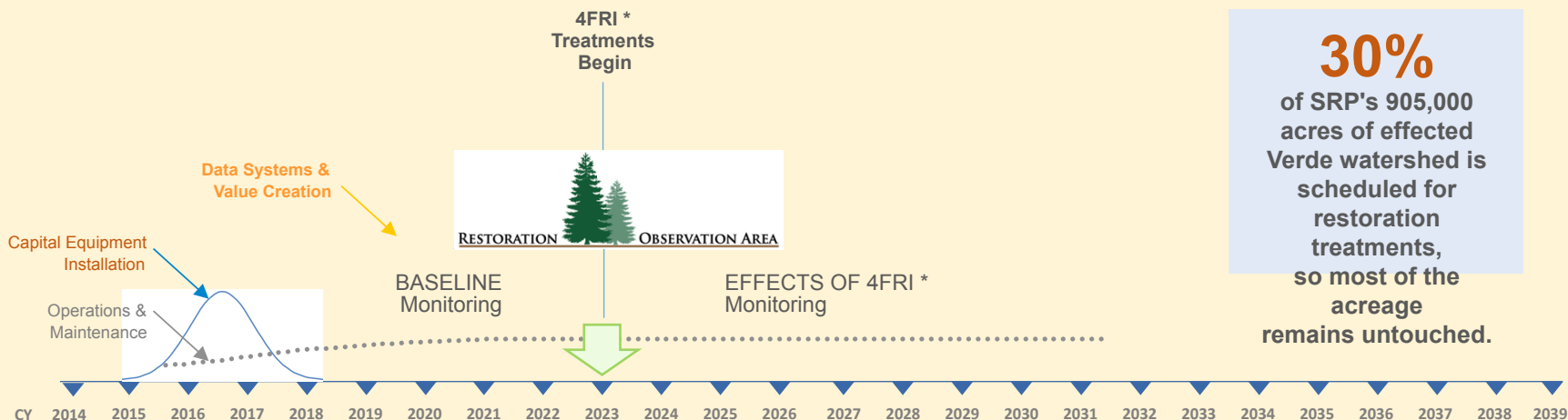
DAMS	LAKES
STEWART MOUNTAIN	SAGUARO
MORMON FLAT	CANYON
HORSE MESA	APACHE
THEODORE ROOSEVELT	ROOSEVELT
BARTLETT	BARLETT
HORSESHOE	HORSESHOE
C.C. CRAGIN	C.C. CRAGIN RESERVOIR
GRANITE REEF	

FIGURES

- Total Revenues FY16: \$3 Billion
- Employees: 5,000
- Water Deliveries: 766,283 acre-feet
- Water Storage Capacity: 2.3 Million acre-feet
- AZ Population: 6.6 Million
- Phoenix Metro Population: 3.3 Million

Watershed Objectives

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30% of SRP's 905,000 acres of effected Verde watershed is scheduled for restoration treatments, so most of the acreage remains untouched.

Detect the hydrologic impacts of proposed Forest Treatments on the Verde watershed:

- Treatment Areas
- Sub-Basin Contributions
- Impact of restoration on runoff
 - Water quality
 - Water quantity



Salt and Verde Watersheds

* - For more information about forest restoration in Arizona visit: www.4FRI.org

Forested Watershed

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Figure 1. Early Forest Conditions Early 1900's



Figure 2. Conditions Now.

A healthy forest restores ecosystems that support:

- Water quality and quantity
- Working populations: native plants and animals
- Reduced threat of destructive wildfire
- Conserve natural resources and aesthetic values

What is SRP Flowtography®?

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United States of America
United States Patent and Trademark Office

SRP Flowtography

Reg. No. 4,933,528
Registered Apr. 5, 2016
Int. Cls.: 9 and 42

TRADEMARK
SERVICE MARK
PRINCIPAL REGISTER

SALT RIVER PROJECT AGRICULTURAL IMPROVEMENT AND POWER DISTRICT
(ARIZONA MUNICIPAL CORPORATION)
2775 WASHINGTON ST.
PHOENIX, AZ 85041-603

FOR: SYSTEM COMPRISED OF COMPUTER HARDWARE AND SOFTWARE FOR COLLECTING STREAM FLOW DATA USING A STRATEGICALLY LOCATED TIME LAPSE CAMERA TO COLLECT REMOTE IMAGES OF WATER FLOW EVENTS IN STREAMS, CHANNELS, AND OTHER WATER CONVEYANCE SYSTEMS, IN CLASS 9 (U.S. CLS. 21, 23, 26, 36 AND 38);

FIRST USE: 6-30-2013, IN COMMERCE 6-30-2013.

FOR: SCIENTIFIC RESEARCH, NAMELY, COLLECTING STREAM FLOW DATA FOR OTHERS USING A STRATEGICALLY LOCATED TIME LAPSE CAMERA TO COLLECT REMOTE IMAGES OF WATER FLOW EVENTS IN STREAMS, CHANNELS, AND OTHER WATER CONVEYANCE SYSTEMS, IN CLASS 42 (U.S. CLS. 10 AND 101).

FIRST USE: 3-2-2016, IN COMMERCE 3-2-2016.

THE MARK CONSISTS OF STANDARD CHARACTERS WITHOUT CLAIM TO ANY PARTICULAR FONT, STYLE, SIZE, OR COLOR.

SN 86-967,605, FILED 12-1-2014.

JONATHAN FALK, EXAMINING ATTORNEY



Michelle K. Lee
Director of the United States
Patent and Trademark Office

Flowtography is:

- A system comprised of:
- hardware and software
- for collecting stream flow data
- using a strategically located time lapse camera
- to collect remote images
- Of water flow events
- In streams and channels



Delivering More Than Power®

----- SRP Proprietary -----



SRP Flowtography® on the Verde Watershed

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○ SUB-WATERSHEDS

1. Sycamore, 30%
2. Oak Creek, 23%
3. Dry Beaver, 9%
4. Wet Beaver, 7%

150 MILES

- All downhill
- Flagstaff Elevation: 6,909'
- Higher than Denver, CO
- Phoenix Elevation: 1,086'

SRP Flowtography® - Northern Verde Watershed

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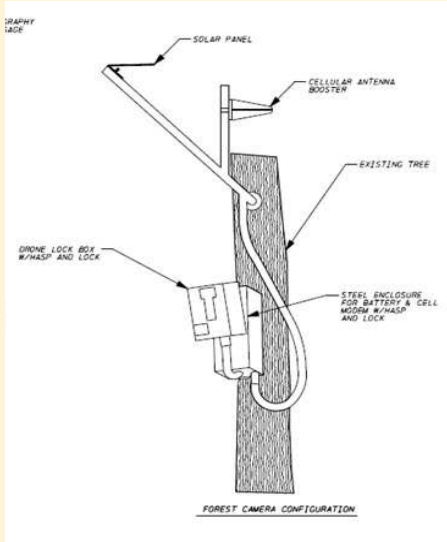


SRP Flowtography® and Snowtography Locations in Northern Arizona

How SRP Flowtography® is Installed

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1. Camera Configuration



2. Pole Mount



3. Camera Tree Mount Installation



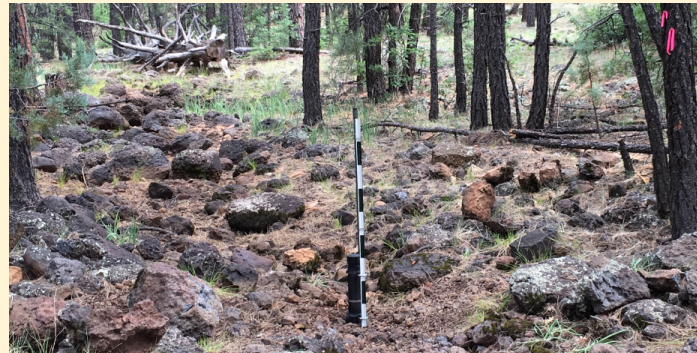
4. Camera Close-Up



5. Water Channel Preparation



6. Event Gauge Positioned



7. Travel Methods and Accessibility



Seasonal Landscape Variations

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Spring



Summer Monsoon



PAST

The past contains no images of what occurs at a stream except during isolated field visits.

PRESENT

Timed images can be compared to electronic or static time series data for precise stage calibration and event analytics.

FUTURE

Images over many years provide a legacy record of visual awareness to stream activity, climate change and overall watershed health.

Wildlife Activity



Winter Season



SRP Flowtography® Records Natural Events

“Turning Up The Heat”



“Who Would Have Guessed?”



SRP Flowtography® - “A Year in Minutes” = SRP Flo-Motion

FLO-MOTION at One Site in 2016

THE IMAGES

Time lapse images collected from SRP FLOWTOGRAPHY.

ACCUMULATED PRECIPITATION

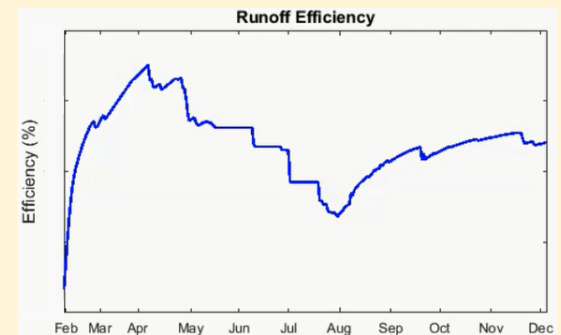
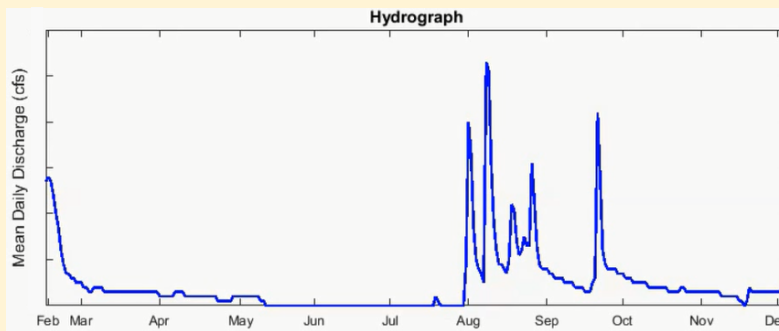
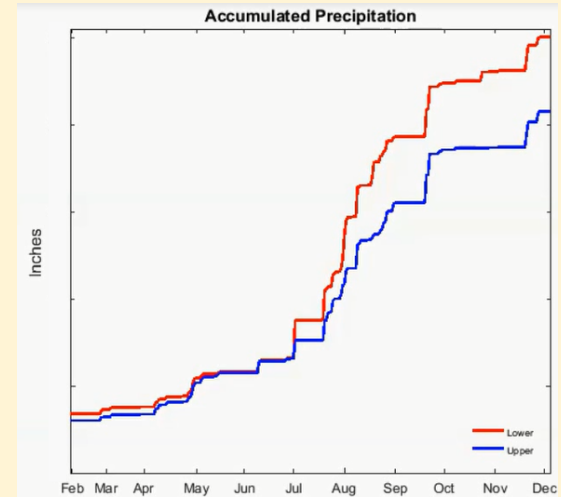
Event driven includes rain and snow by day.

HYDROGRAPH

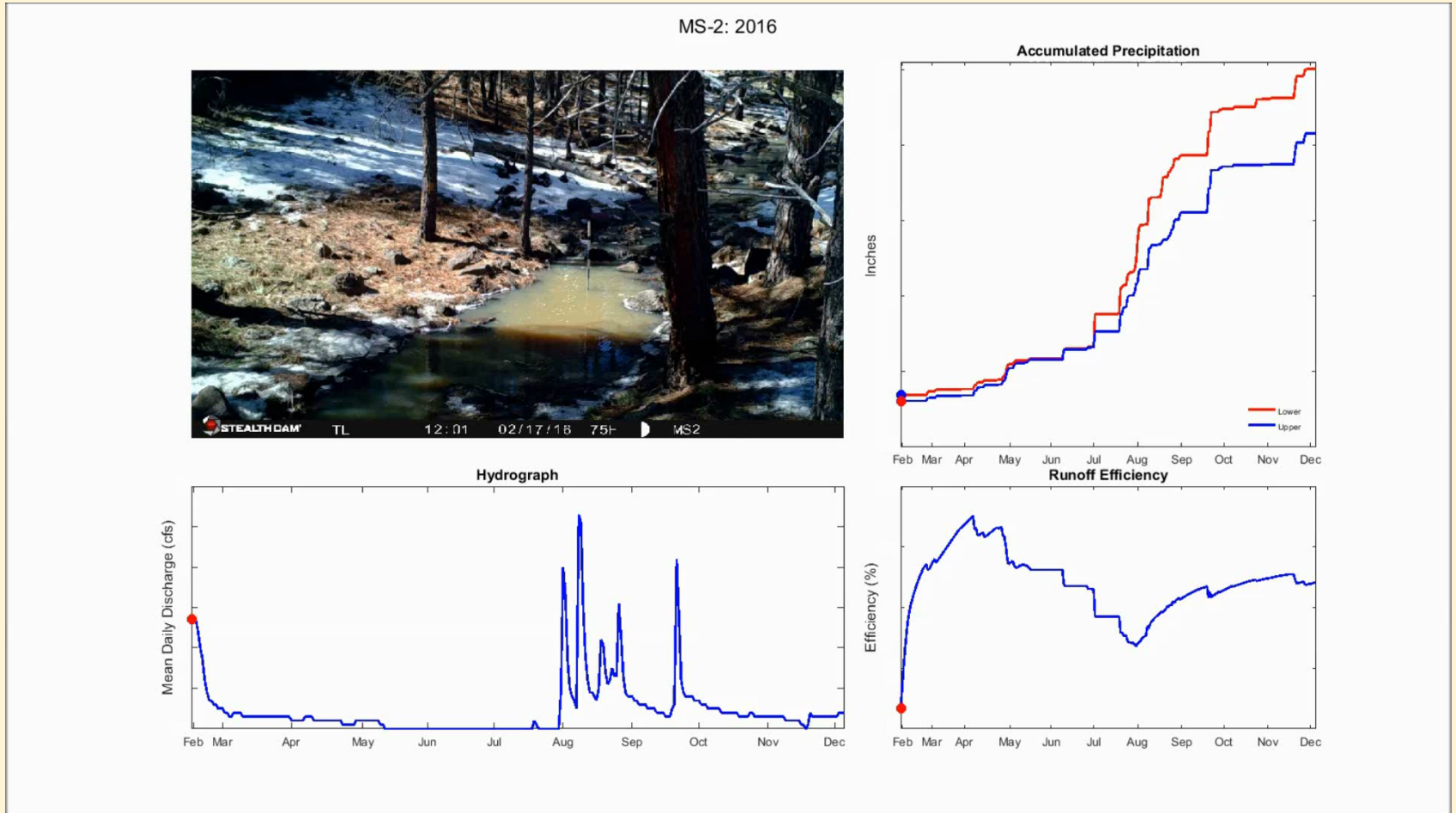
Recorded mean daily stream flow per day.

RUNOFF EFFICIENCY

A running average of accumulating precipitation divided by accumulating streamflow.



“A Year in the Sycamore in Minutes”



In Closing, If You Ask Me...

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Flowtography Moooo-ves Me!

- Mind the Watershed
- Measure it to Manage it
- *Eat More Chicken*

Bullying the Event Gage



Questions?