A Few Thoughts
- Who Are My Customers?
Do They Know Who I Am?
Do I Know What They Want?
Have I Asked What They Want?
- Am I Providing It To Them?
The Story of Zion National Park
Forming a Relationship
Zion National Park
I assumed responsibility of the flash flood program about 11 years prior.

I then went to Zion to talk with the Rangers on our relationship.

What relationship?
Forming a Relationship
Zion National Park

After talking with them for a bit, I came right out and asked about the job we were doing. I found out we didn’t understand each other.
The breakthrough came when I asked a simple question: *What would you like from us?*
Forming a Relationship
Zion National Park

After that visit, all sorts of good things happened

In every instance, we could provide exactly what they wanted

We just never asked!
Forming a Relationship
Zion National Park

When I call, they know who I am

They now trust our judgement
Flash Flood Potential Product
Flash Flood Potential Product

- Currently we look at the atmospheric conditions to produce the flash flood potential product.
- What if we were to integrate the geography of the area with the atmospheric conditions to obtain the potential for flash flooding?
- How would we come up with the new product?
Flash Flood Potential Index
Flash Flood Potential Index

Flash flood potential is a relative scale with regard to the rainfall runoff relationship.

The scale is essentially higher potential shown as a darker shade of red and a lower potential with a lighter shade.
## PopulateFFP_new: How it works

<table>
<thead>
<tr>
<th>Level</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dry</strong></td>
<td>POP &lt; 15* or PWAT &lt; 0.87 in</td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td>POP ≥ 15* and PWAT ≥ 0.87 in</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>POP ≥ 25 and: 1) PWAT ≥ 1 in or 2) PWAT &gt;0.87 in and 700-500 wind &lt; 20 kt</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td>POP ≥ 35 and: 1) PWAT ≥ 1.5 in or 2) PWAT &gt;1.25 in and 700-500 wind &lt; 20 kt</td>
</tr>
<tr>
<td><strong>Very High</strong></td>
<td>POP ≥ 65 and: PWAT ≥ 1.75 in</td>
</tr>
</tbody>
</table>

* user-selectable value
## Populate_BasinFFP Matrix

<table>
<thead>
<tr>
<th>CBFFPI</th>
<th>Dry</th>
<th>Low</th>
<th>Mod</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;= 6.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1 - 6.6</td>
<td>Dry</td>
<td>Low</td>
<td>Mod</td>
<td>High</td>
<td>Very High</td>
</tr>
<tr>
<td>5.4 - 6.0</td>
<td>Dry</td>
<td>Low</td>
<td>Mod</td>
<td>High</td>
<td>Very High</td>
</tr>
<tr>
<td>4.8 - 5.3</td>
<td>Dry</td>
<td>Low</td>
<td>Mod</td>
<td>High</td>
<td>Very High</td>
</tr>
<tr>
<td>4.2 - 4.7</td>
<td>Dry</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>3.6 - 4.1</td>
<td>Dry</td>
<td>Low</td>
<td>Low</td>
<td>Mod</td>
<td>High</td>
</tr>
<tr>
<td>2.9 - 3.5</td>
<td>Dry</td>
<td>Low</td>
<td>Low</td>
<td>Mod</td>
<td>High</td>
</tr>
<tr>
<td>2.3 - 2.8</td>
<td>Dry</td>
<td>Low</td>
<td>Low</td>
<td>Mod</td>
<td>High</td>
</tr>
<tr>
<td>1.7 - 2.2</td>
<td>Dry</td>
<td>Low</td>
<td>Low</td>
<td>Mod</td>
<td>Mod</td>
</tr>
<tr>
<td>1.0 - 1.6</td>
<td>Dry</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Mod</td>
</tr>
</tbody>
</table>

Low ➔ Moderate and Moderate ➔ High only for POP ≥ 30
Egypt3
Egypt 3 Slot Canyon

Basin Area 1.2 mi²

Length approximately 2.5 miles
Radar Rainfall Reflectivity Loop

12:00 PM Wednesday, September 10th, 2008

NEKRAD LEVEL-1
KICK - CEDAR CITY, UT
09/10/2008 18:00:54 GMT
LAT: 37°35'/27 N
LON: 112°51'/43 W
ELEV: 10600 FT
VCP: 11

REFLECTIVITY
ELEV ANGLE: 0.54

Legend: dBZ (Category)

- >= +75 (16)
- +70 (15)
- +65 (14)
- +60 (13)
- +55 (12)
- +50 (11)
- +45 (10)
- +40 (9)
- +35 (8)
- +30 (7)
- +25 (6)
- +20 (5)
- +15 (4)
- +10 (3)
- +5 (2)
- <= 0 (1)
Storm Total Precipitation Loop

1215pm Wednesday, September 10th, 2008
Egypt 3 Slot Canyon
One Hour Frequency Estimate

0.30 inches of rainfall in 1 hour occurs statistically at least once a year over this area.
Egypt3 Peak Flow Estimate

- Drainage area: 1.2 mi²
- Rainfall Estimate: 0.30”/hr
- Land Surface:
  - Impervious Navajo Sandstone
  - Absence of Vegetation
  - Steep slot canyon
- Time of Concentration or water to flow from top of slot canyon to outlet was calculated to be approximately 30 minutes
- Time to Peak, which is the time from the beginning of rainfall to the time of peak discharge was estimated to be 24 minutes
- Peak Discharge was estimated to be approximately 450 cfs.
- With channel dimensions as they are, it is probable that depth of flood exceeded 20 ft.
- Actual calculations and analysis methods are available.
How Much Does a Flash Flood Weigh?

- Largest Elephant = 24,000 lbs

- **Flow**
  - 1 cu ft. = 7.4805 gallons
  - 1 cu ft. = 62.42 lbs
  - 1000 cu ft./sec = 62,420 lbs/sec
  - 1000 cfs = 2.6 Large Elephants rolling by each second
Venturing Into a Flash Flood

Riverine Flood Hazard Chart for Adults

Depth – Velocity Danger Levels

- **High Danger Zone**: Almost any size adult is in danger
- **Low Danger Zone**: Almost any size adult is not seriously in danger
- **Judgement Zone**: Danger level based on engineering judgement

10 fps = 6.8 mph

SOURCE: USBR. "Downstream Hazard Classification Guidelines."
Paria River near Lees Ferry Climatology
Number of events exceeding river flows of 700 cfs
1924 through 2004
Salt Lake City WFO use of the FFPI

Storm Detected → Precipitation Intensity → Precipitation Volume → Warning?

Where is the Rainfall Occuring → Reference the FFPI → Terrestrial Response?

Issue Flash Flood Warning

Wait a Volume Scan or Two
Google Earth Flash Flood Climatology
Paria River gage

Date: 9/14/2008
Time: 6:00 pm
Description: Large flash flood along the Paria spiked the Paria gage near Kanab to over 7000cfs. Numerous thunderstorms across the state, with precipitable water values across the south near an inch.

Links: event hydrograph
       event photographs
       event summary
       real time river data
       Directions: To here - From here
The Paria river is typically more of a trickle, as evidenced in the photos below:
Contact Information

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