

# Carson River Flood Hazard Mapping

## Carson River Watershed Forum

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**HDR Engineering Inc.**  
4/3/14



CARSON WATER  
SUBCONSERVANCY  
DISTRICT



**FEMA**

# Outline

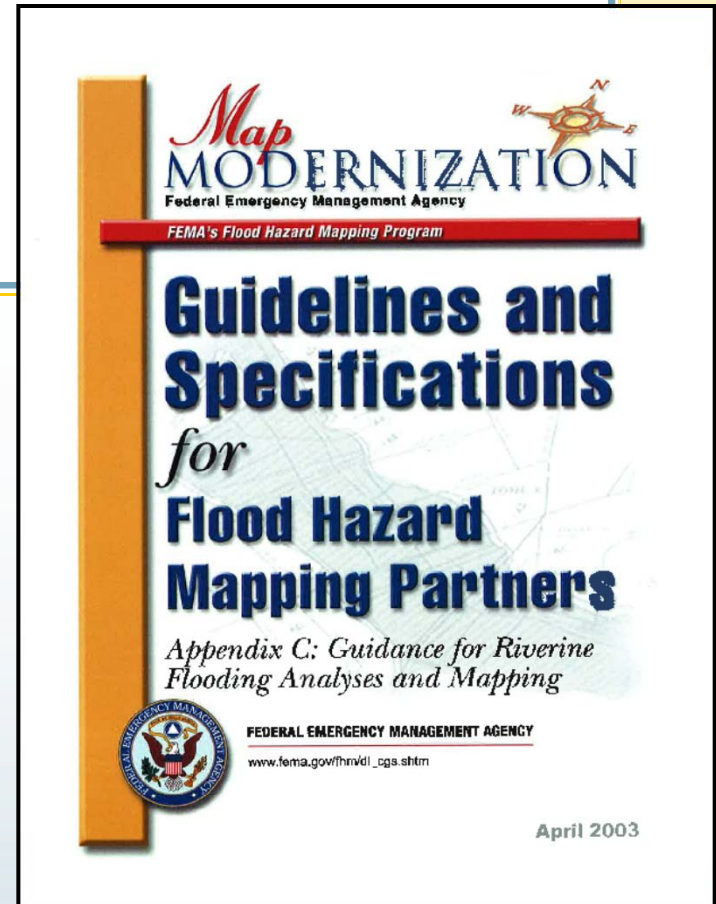
- Physical Map Revision
  - What is the process?
- Carson River Floodplain
  - Why are we re-mapping?
- Study Area
  - Where are we working?
- Hydrologic & Hydraulic Analyses
  - How are we creating new mapping & tools?
- New Flood Hazard Mapping
  - Who will be affected?
- Status
  - When will the project be complete?

# FEMA Physical Map Revision

What is the Process?

# Physical Map Revision (PMR)

- **Local** equivalent of FEMA Flood Insurance Study
  - Cooperating Technical Partner (CTP)
  - Work is done locally with community input
  - FEMA process
- More extensive than LOMR



# Carson River Floodplain

Why are we re-mapping?

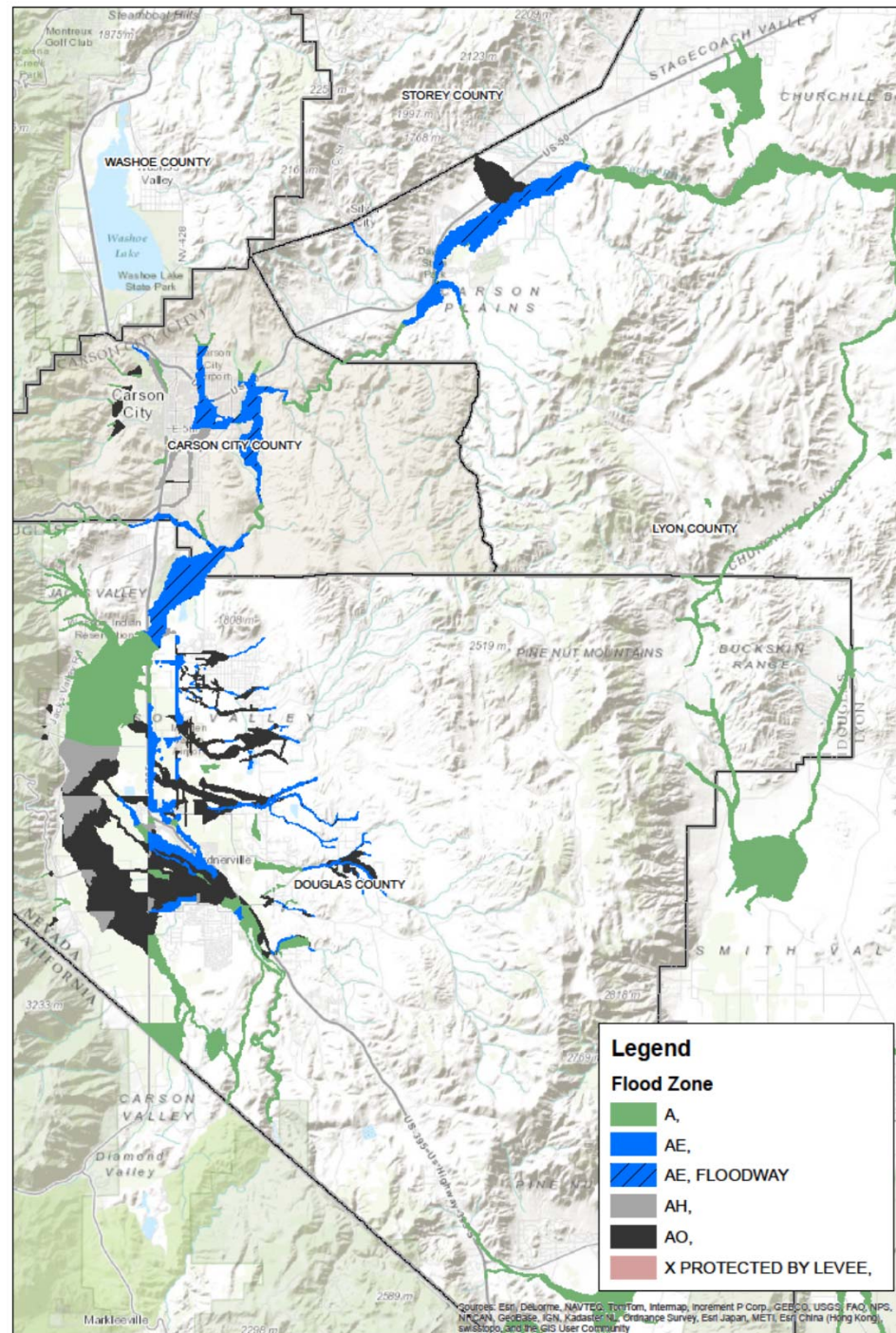
# Carson River Floodplain

“The Carson River is unique in that we have no flood control structures and have extremely limited upstream storage capability. However, we have the best flood control mechanisms available - open floodplain lands.”

-Regional Floodplain Management Plan

# Effective FEMA Flood Hazard Maps

- Lyon County, NV
  - Restudy 1992
  - DFRIM 2009
- Carson City, NV
  - Hydrology 1982
  - Hydraulics & Mapping 1993
  - DFIRM 2009
- Douglas County, NV
  - Hydrology 1989
  - 1994(work done in 1991)
  - East Fork 1997





# Objectives

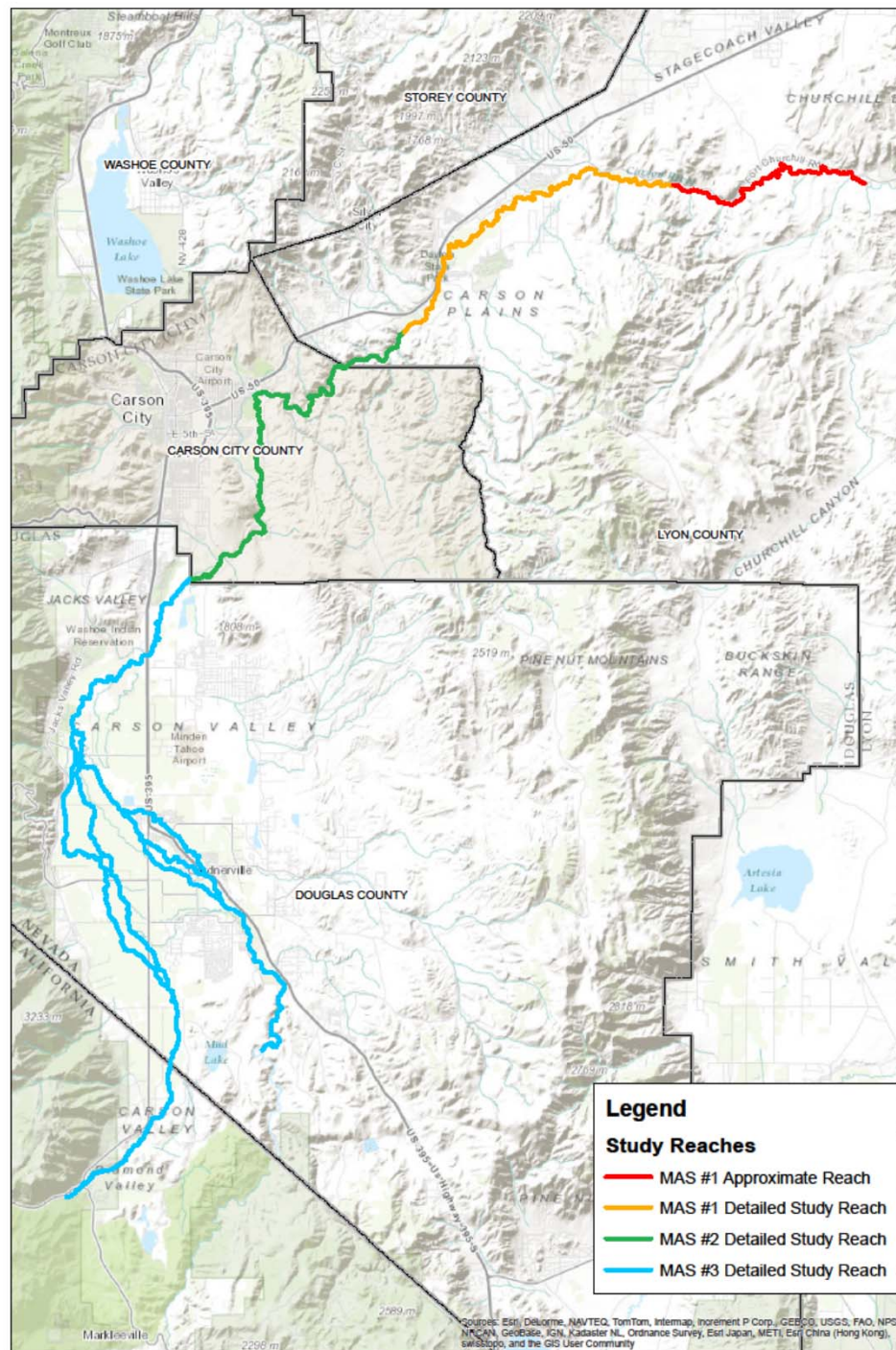
- Detailed, Up-to-date Carson River Flood Hazard Mapping (Lyon, Carson City, Douglas and Alpine Counties).
- Tool for Assessing Watershed Scale Floodplain Impacts
- Consistency in Modeling and Mapping.

# Study Area

Where are we working?

# Study Area

- 4 Year Plan
  - 1 Lyon County
  - 2 Carson City
  - 3 Douglas/Alpine County Modeling
  - 4 Douglas/Alpine County Mapping

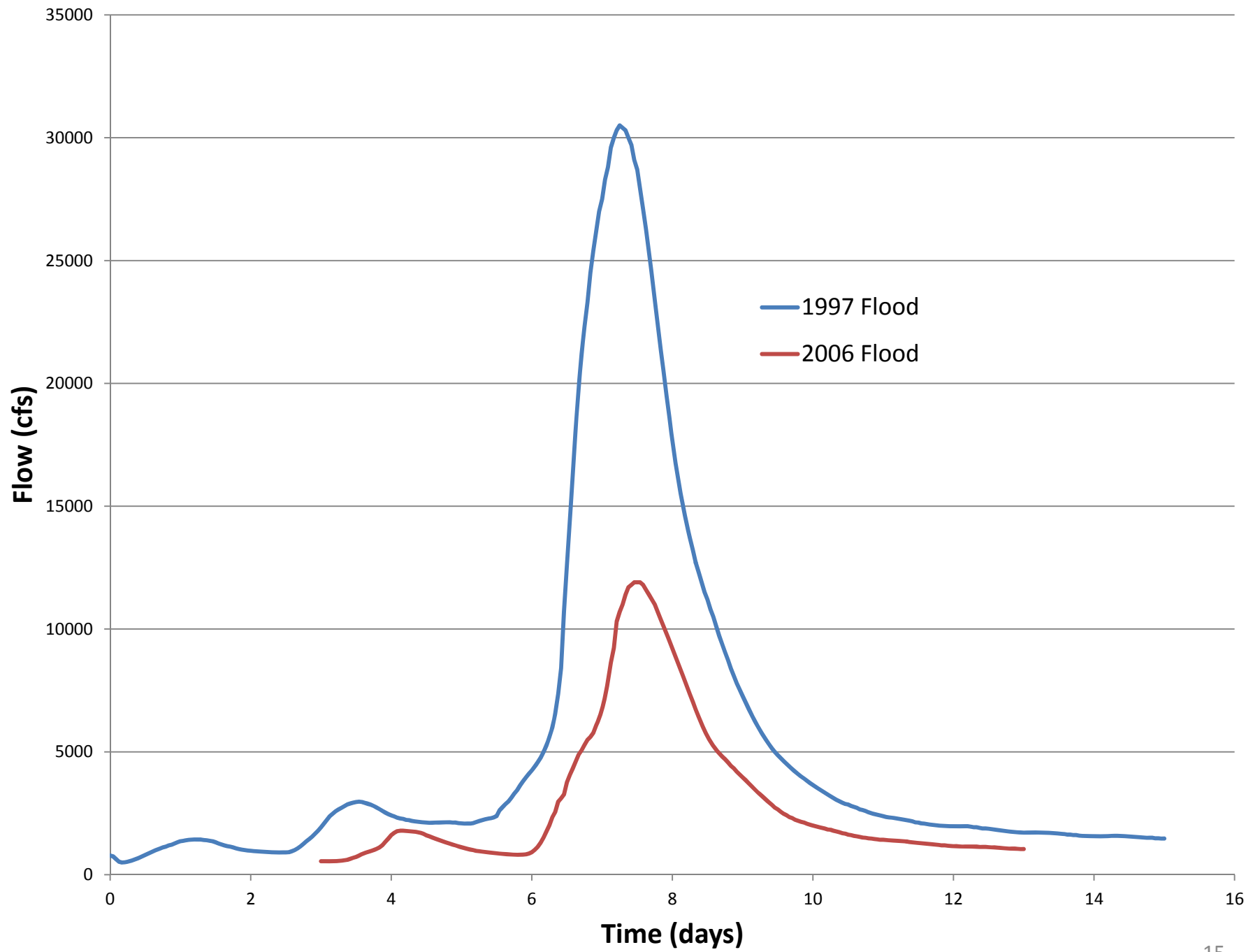


# Hydrologic and Hydraulic Analyses

How are we creating new mapping & tools?

# Hydrology

- Unsteady-state Flow Model
  - Hydrograph input (time vs. flow)
  - Non standard
  - Traditional flood studies use steady state
  - Assess **timing** and **volume** impacts to the floodplain



# Hydrology

- Effective FEMA Flood Insurance Study
  - Hydrology based on 80's and early 90's estimates
  - Revised peak flow estimates
  - Include 1997 and 2006 events

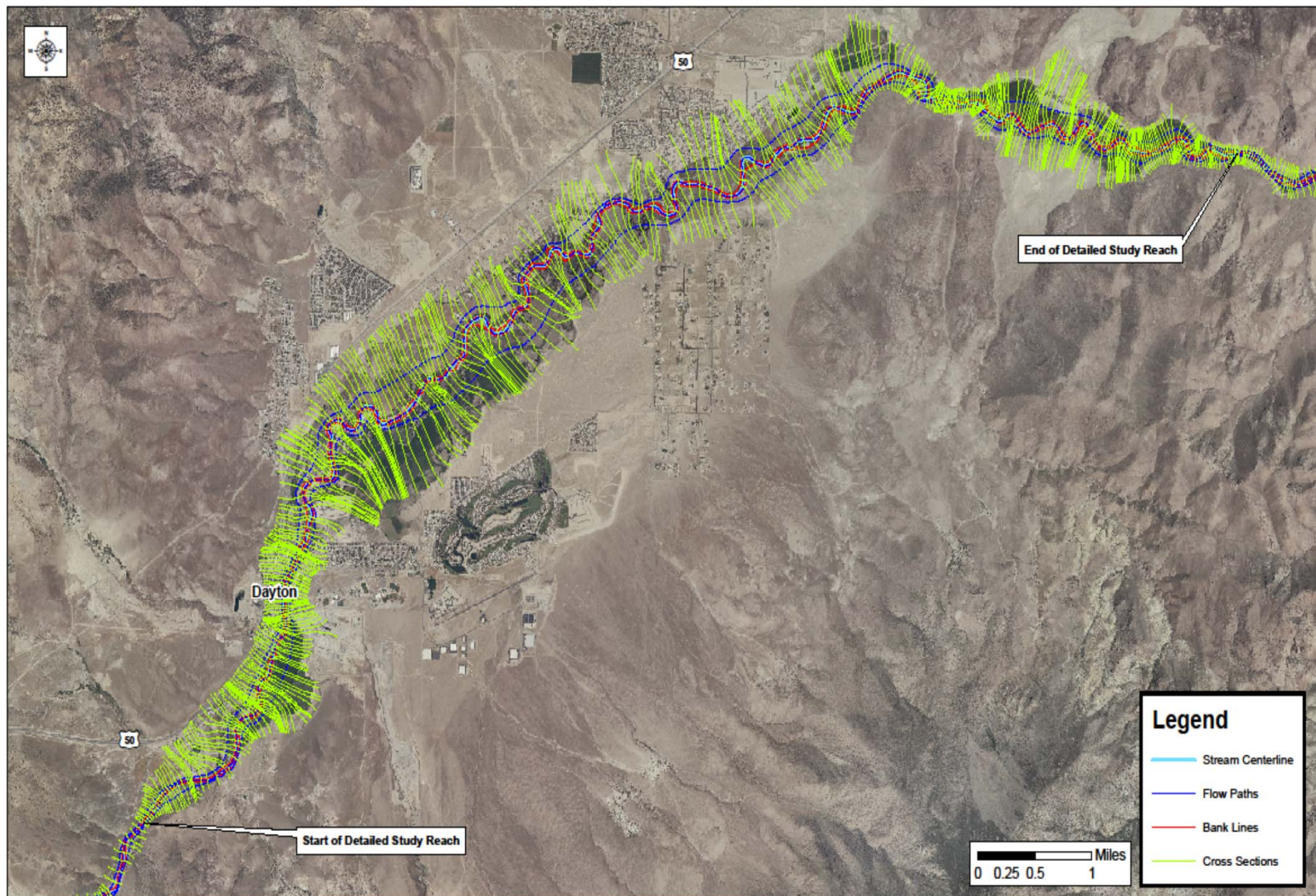


# Hydrology

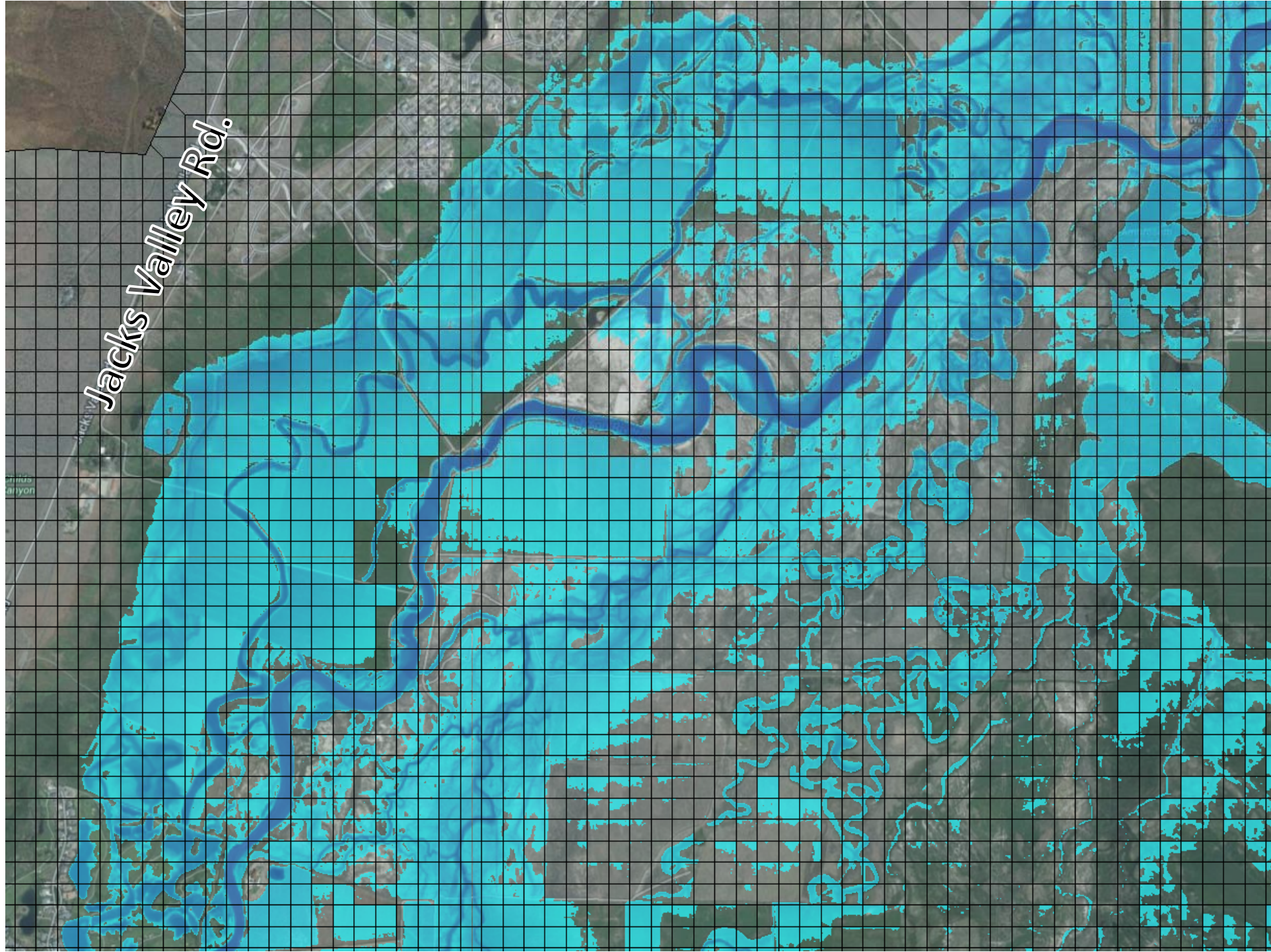
<b>Streamgaging Station</b>	<b>Description</b>	<b>Effective (cfs)</b>	<b>Proposed (cfs)</b>
10308200	EFCR Markleeville	23,556	22,974
10309000	EFCR Gardnerville	21,694	21,305
10310000	WFCR Woodfords	8,465	6,985
10311700	Carson City	36,000	33,500
10311000	Dayton	36,000	30,700

# Hydraulic Model

- US Army Corps of Engineers' HEC-RAS
- One & Two Dimensional Model
- Model Elements
  - Stream Centerline
  - Flow Paths
  - Cross Sections
  - Bank Lines
  - Computational Mesh







# MAS 3 Preliminary 2D Modeling

HEC-RAS Alpha/Beta Testers  
for 2D modeling



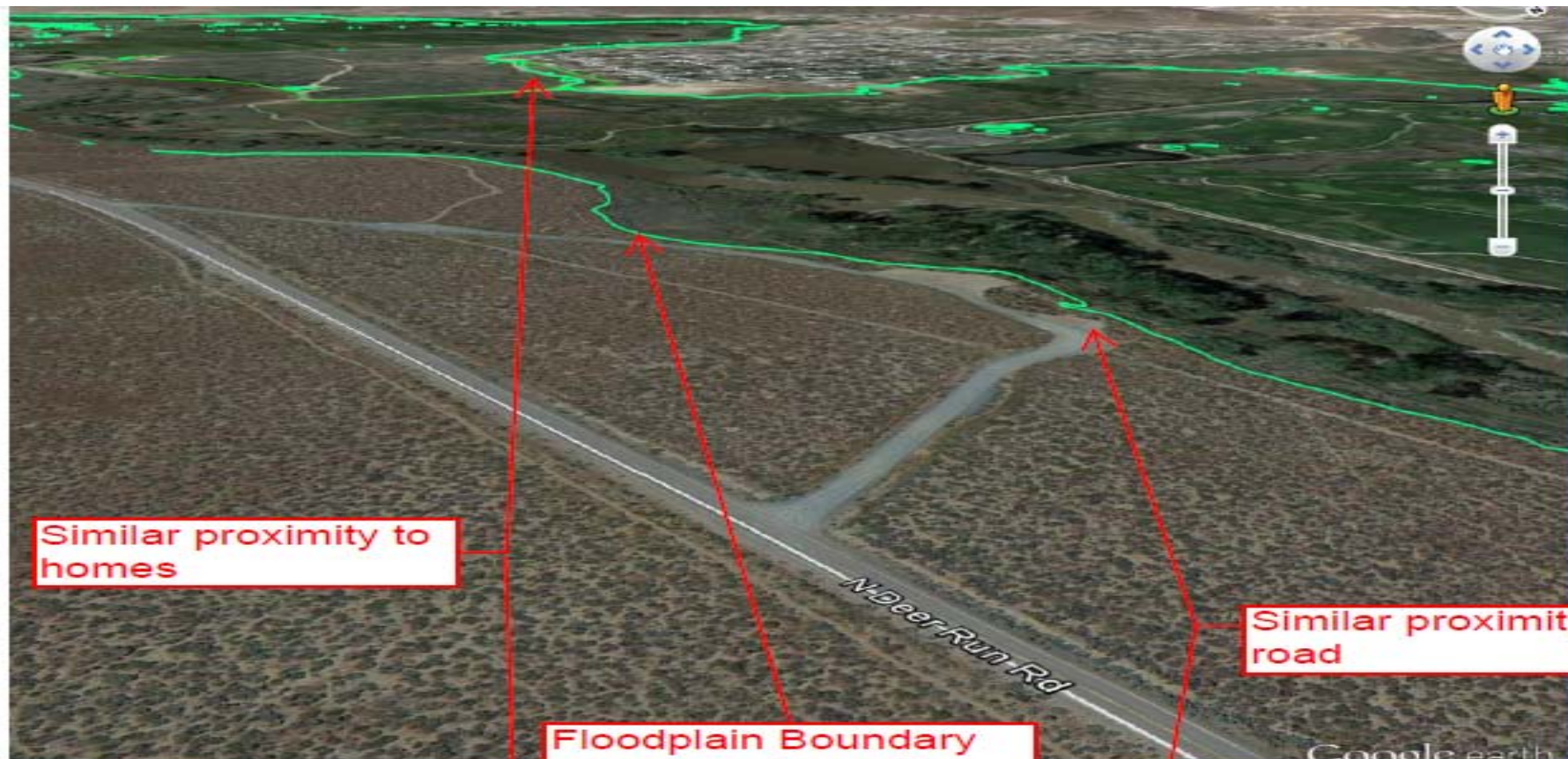


# Model Validation

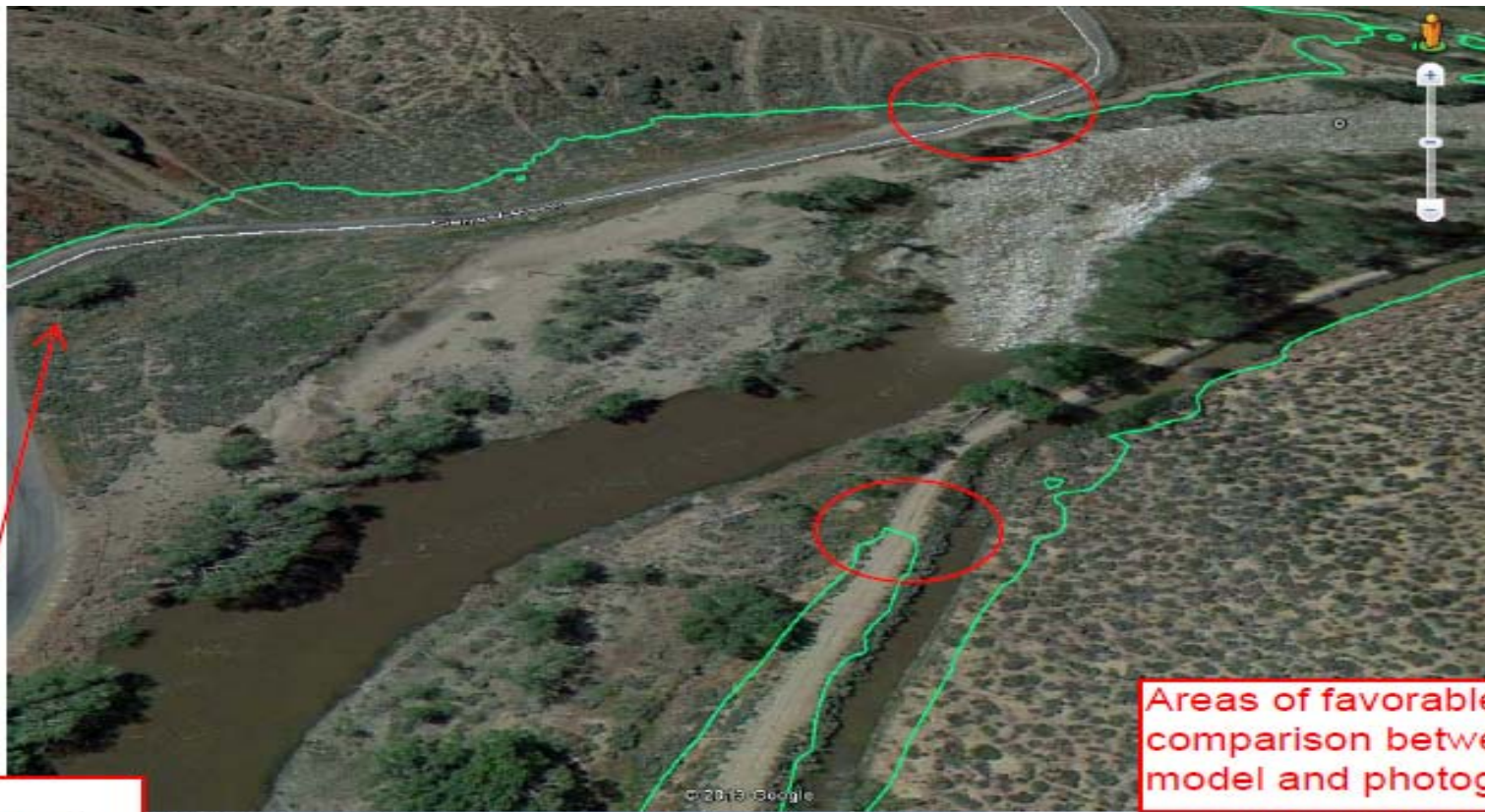
## *1997 Event Photos*

- USGS Photo Series (Pat Glancy)
- Preliminary Floodplain Boundaries Compared to Photos
- Rating Curve Comparisons
  - Carson City Streamgage
  - Deer Run Streamgage









Tree and  
submerged road

Areas of favorable  
comparison between  
model and photograph







Houses and limits of flooding compare favorably



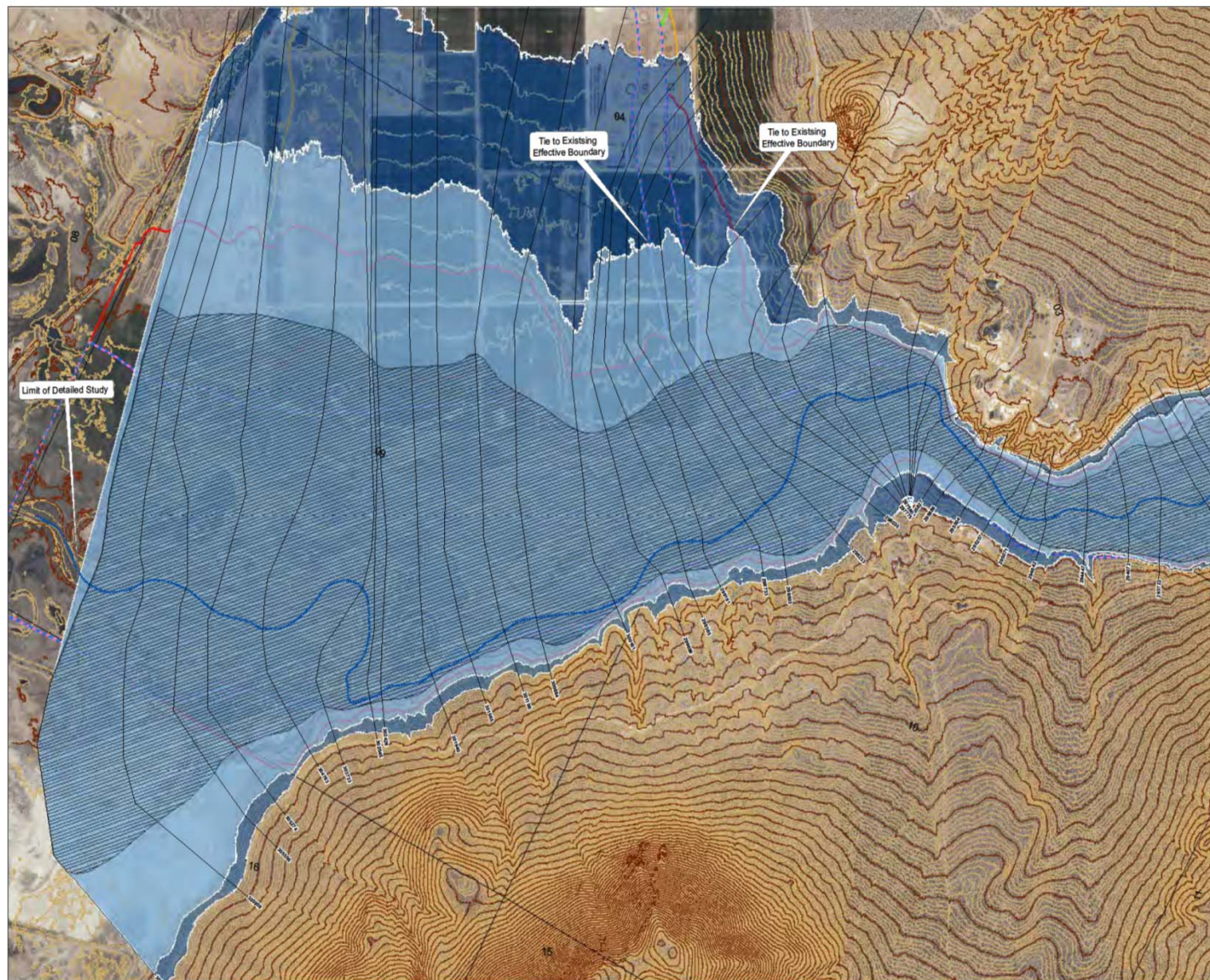
# New Flood Hazard Mapping

Who will be affected?

# Floodplain Mapping

- Flood Hazard Mapping
  - 1-percent floodplain
  - 1-percent floodway
  - 0.2-percent floodplain
- Detailed Mapping with BFEs
- Following FEMA Guidelines
- Physical Map Revision Process





### Legend

- 1-PERCENT WATER SURFACE ELEVATION
- CROSS SECTION CUT LINES
- RIVER ALIGNMENT
- PROPOSED FLOODWAY
- PROPOSED 1-PERCENT FLOODPLAIN**
  - AE
  - A
  - Shaded X
- PROPOSED 0.2-PERCENT FLOODPLAIN
- PROPOSED 1-PERCENT TRIBUTARY TIE-IN
- + BENCHMARK REFERENCE
- SECTION LINES
- 2 FT CONTOURS
- 10 FT CONTOURS

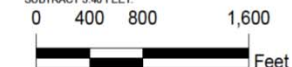
### Effective FEMA Flood Zones

- FLOODWAY
- AE
- AO
- A
- SHADED ZONE X

### BENCHMARK INFORMATION

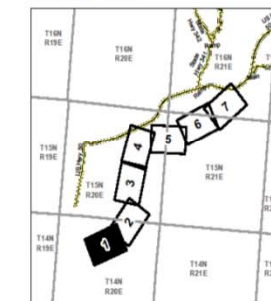
BM ID: KR 1022  
 DATUM: NAVD 88, ELEVATION: 4396.21  
 NORTHING: 14753734.843, EASTING: 2335717.348  
 EXISTING CONTROL MONUMENT

GENERAL CONVERSION FROM NAVD 88 TO NGVD 29,  
 SUBTRACT 3.40 FEET.



SCALE: 1" = 400'  
 CONTOUR INTERVAL = 2'

### INDEX MAP



CARSON RIVER PHYSICAL MAP REVISION,  
 CARSON CITY, NEVADA  
 FOR CARSON WATER SUBCONSERVANCY DISTRICT

HDR PROJECT NUMBER: 171712

SHEET 1 OF 7  
 FEBRUARY 2012

## CARSON RIVER REDELINEATION DRAFT WORK MAP CARSON CITY, NEVADA



9005 DOUBLE R BOULEVARD, SUITE 101  
 RENO, NV 89521  
 (775) 337-4726

AERIAL PHOTOGRAPHY PREPARED BY UNITED STATES NATIONAL AGRICULTURAL IMAGERY PROGRAM  
 FLIGHT DATE: AUGUST 2010

GROUND CONTROL SURVEY DATA PREPARED BY R.O. ANDERSON, INC.  
 GROUND CONTROL/ELEVATION REFERENCE MARKS FOR HORIZONTAL AND VERTICAL SURVEY  
 CONTROL ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83) AND NORTH AMERICAN  
 VERTICAL DATUM OF 1988 (NAVD88) RESPECTIVELY.

LIDAR COLLECTED BY BAE SYSTEMS; DATA ACQUIRED JUNE 2004.

CONTENTS OF THIS MAP WERE PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP  
 ACCURACY STANDARDS FOR 1" = 100' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

# Project Status

When will the project be complete?

# Project Status

- MAS 1 (Lyon Co.)
  - Submitted to FEMA
- MAS 2 (Carson City)
  - Finalizing Mapping
    - Summer 2014
- MAS 3 (Douglas & Alpine)
  - Preliminary 2D modeling
    - Fall 2015