

CVHS: Study and Implementation

California Cooperative Snow Surveys

Mitch Russo, P.E.

November 6, 2014

Study team



Basic analysis approach

1. Get historical record (reservoirs and downstream).
2. Remove regulation effects.
3. Analyze frequency at 200+ points.
4. Add regulation.

Key points of CVHS procedure

- Follow basic procedures from Comp Study, but...
 - Replace design storm analysis with floods of record (and scaled historical floods) analysis
 - Enhance estimation of ungaged flow (local flow below projects)
 - Estimate directly from gage data
 - Use rainfall runoff modeling only as needed
 - Use unsteady-flow model for routing both unregulated and regulated flow
- Thus, specific enhancements:
 - Unregulated flow frequency analysis
 - Coincidence and timing of flows in regulated frequency curves (more objective and less subjective)

Advantages of “floods of record”

- Build on data and information from Comp Study, but more direct usage of historic events
- Direct usage of long period of record
- Direct usage of historic events to analyze storm patterns and coincidence of flows
- Eliminates need to make assumptions on temporal distribution (flow and rainfall events)
- Eliminates need to hypothesize storm centerings
- Facilitates update of results with increased record length

Sacramento-San Joaquin watershed



Sacramento River

- At Rio Vista = 27,000 sq mi.
- 37 reservoirs.

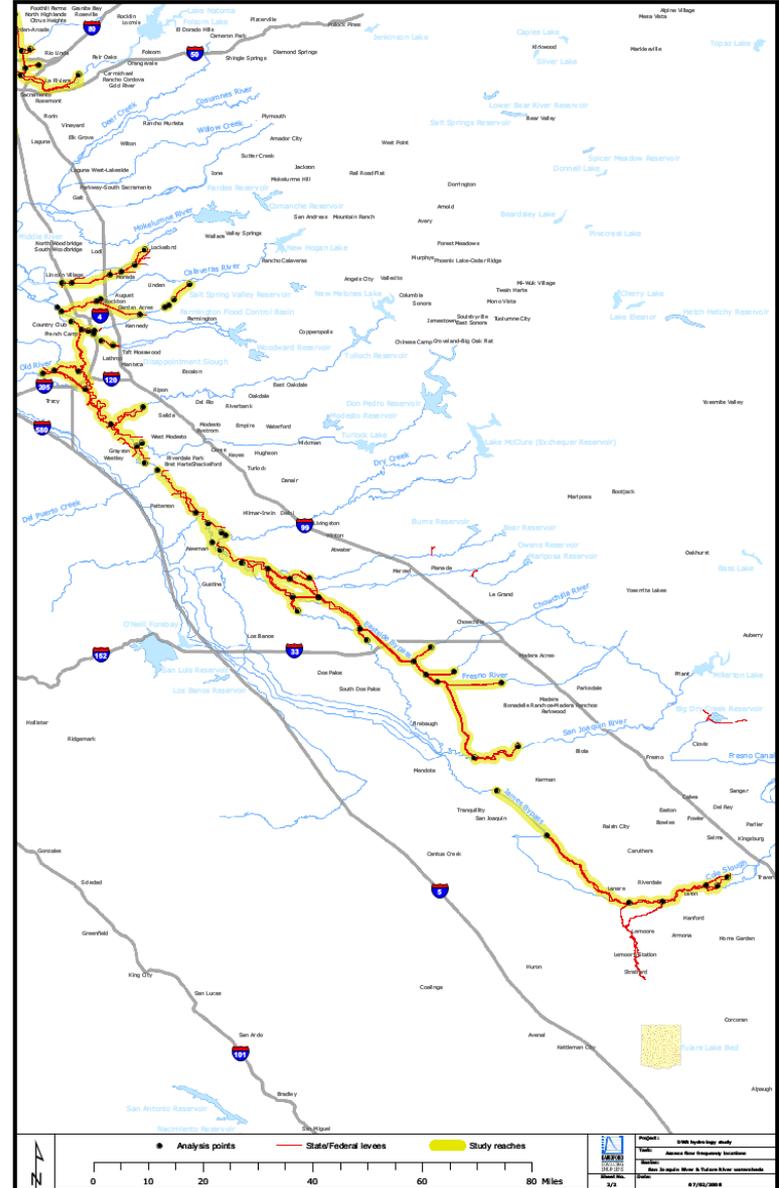
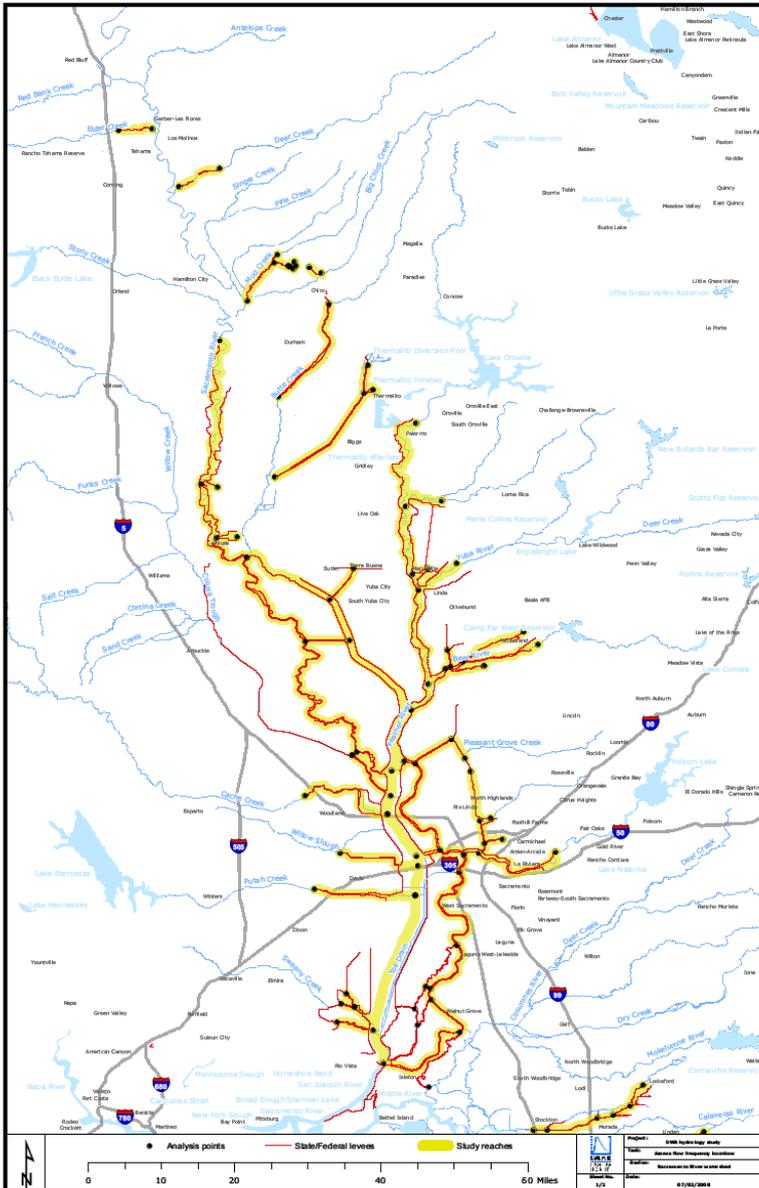
San Joaquin River

- At Mokelumne River = 20,000 sq mi.
- 36 reservoirs.

Geographical Extent of CVHS

- 201 index points within federal-state levees in Central Valley including the lower Kings River
- In contrast, 2002 Comprehensive Study analyzed about 40 centering locations within the Sacramento and San Joaquin River systems
- Probably most complex hydrology study ever done by the Army Corps of Engineers in southwestern U.S.

Study area index points



Floods of Record Approach

Areas with good gage coverage

Scaled historic floods routed through reservoir & hydraulic models to target 10% through 0.5% ACE flood events

Use 4 historic pattern floods for each watershed (Sacramento and San Joaquin Rivers)

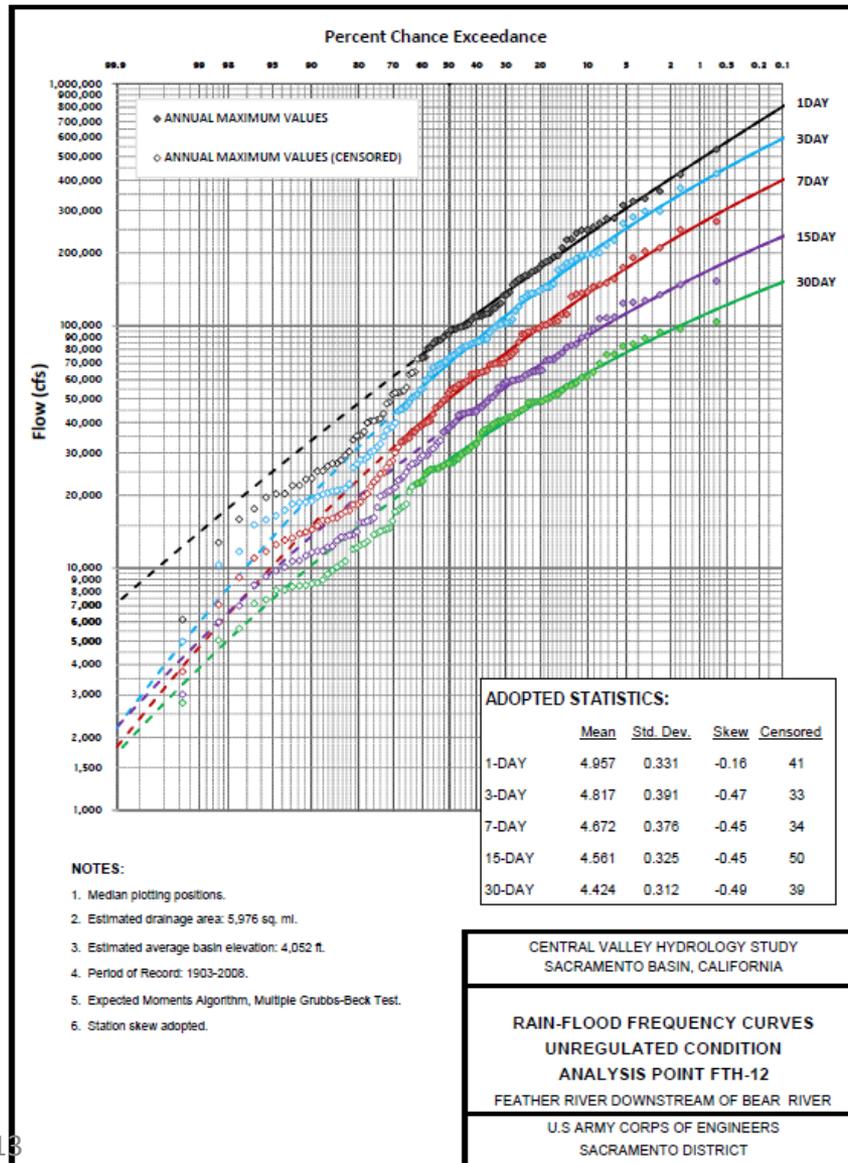
Floods-of-record dataset

- Data augmentation process completed to “fill in” time series to create watershed event.
- Augmented data used “with care” during regulated flow simulations.
- Index point unregulated frequency curves have strict rules about amount of augmented data utilized.

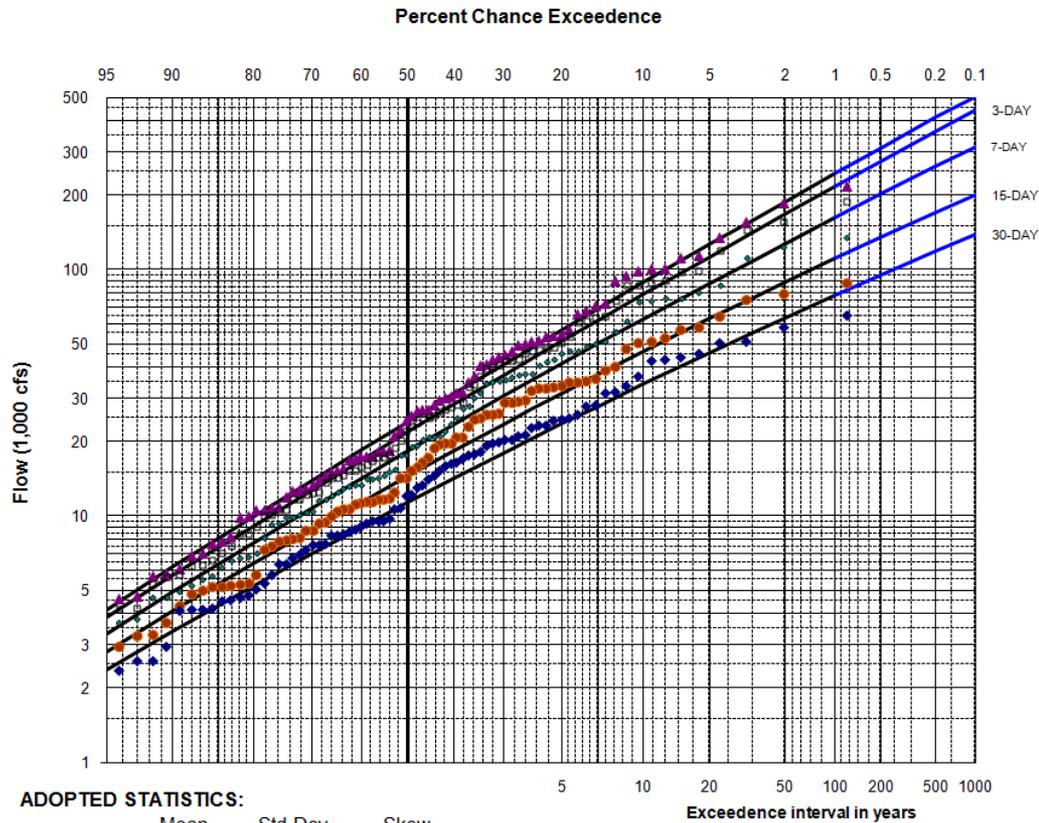
New Unregulated Frequency Curves

1. Used PeakFQ software from USGS
2. For SJQ River watershed: Used normal B17b procedure. Used weighted combination of station and new USGS regional skew (volume frequency)
3. For Sacramento River: Regional skew did not work well in some areas like upper watershed below Shasta. Instead, used new Expected Moments Algorithm and Multiple Grubb-Beck censoring test. Due to significant censoring of lower flows, we did not use the regional skew in this watershed.

Feather River below Bear River Confl.



San Joaquin River at Vernalis



Products -

- **Unregulated flow frequency curves (plus new regional skew analysis)**
- **Unregulated hourly boundary condition hydrographs for over 100 different events (CVHS used 4 events per watershed)**
- **Existing condition HEC-Res Sim models for Central Valley**
- **Existing Condition HEC-RAS models (CVHS or CVFED)**
- **Methodology for studies involving floods**

Products – Existing Condition Tools

System-wide Reservoir Models (Res-Sim)

Kings and San Joaquin Rivers

Sacramento River

Use existing USACE Water Control
Diagrams

*For CVHS, Folsom = 2004 SAFCA Diagram (not JFP)

** Note: Joint Federal Project (JFP) model for American River available from USACE (called J602). USACE also working on Folsom Dam raise model.

Products – Existing Condition Tools

CVHS HEC-RAS hydraulic models:

San Joaquin River

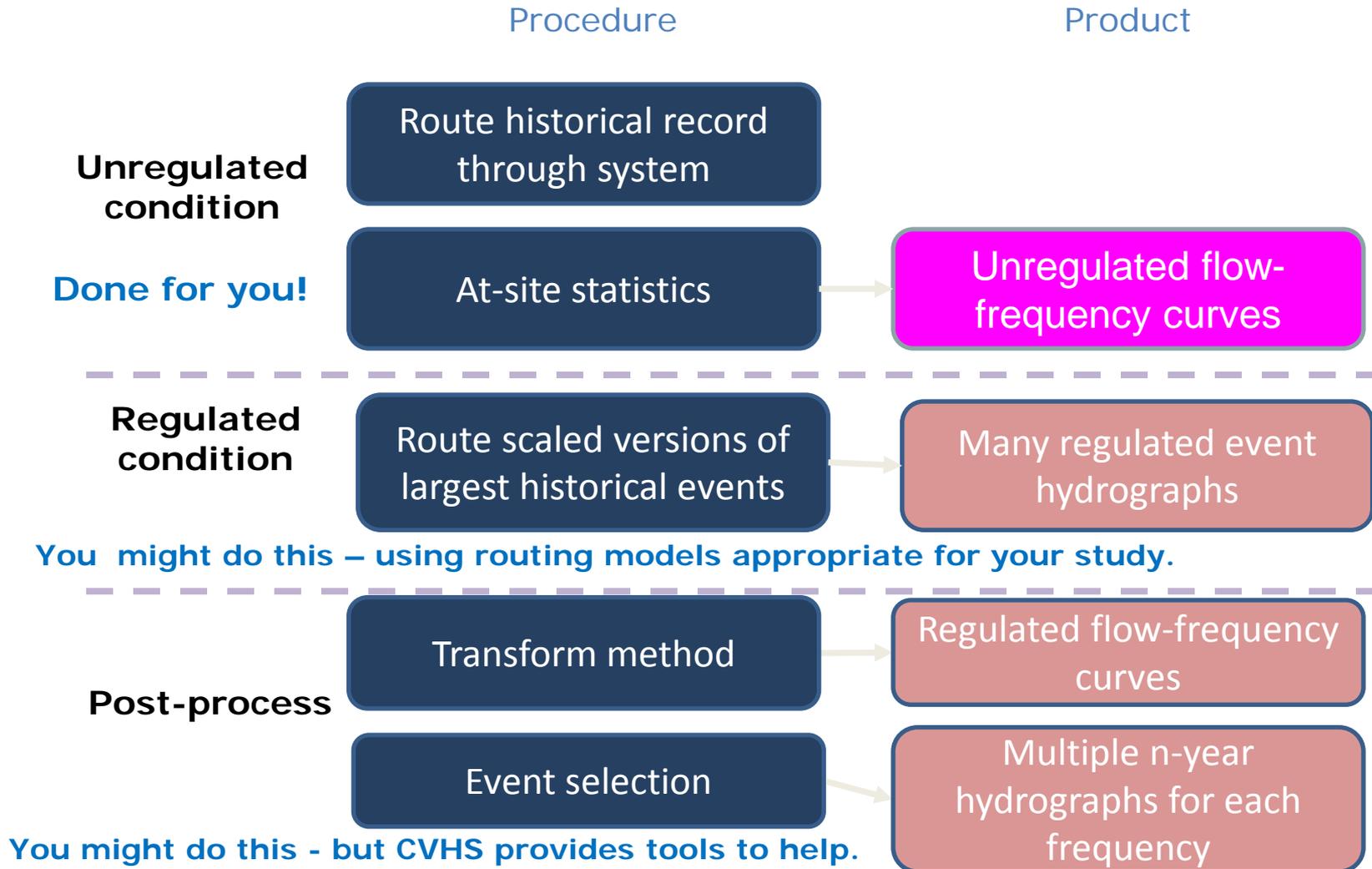
Sacramento River

Based on Comprehensive Study UNET models converted to HEC-RAS..except Lower Sacramento R. uses American River Common Features GRR HEC-RAS

Top of levees revised to match CVFED HEC-RAS model “existing condition” top of levee profile.

We assume routed flow overtops levees but does not fail them (no levee fragility).

CVHS products for your study



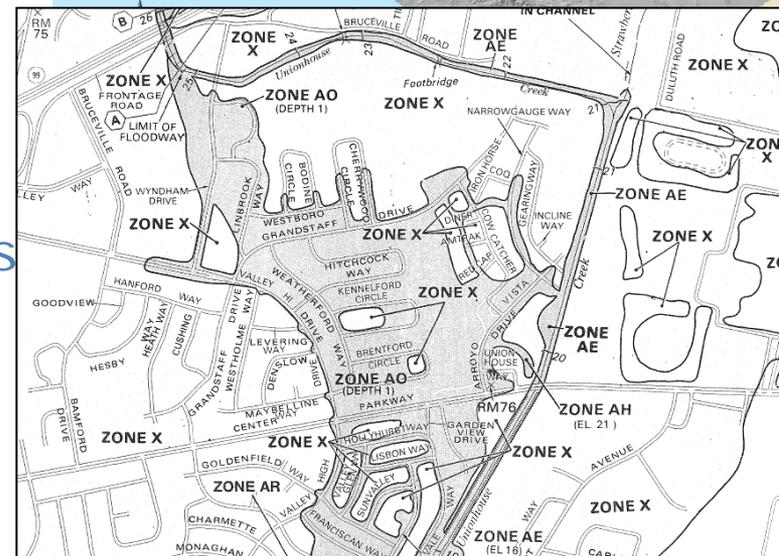
* and scaled historical events

Individual Study Purposes & Decisions

- Every study must make decisions about what the regulated condition should be and how it should be modeled.
- Study purpose, requirements, and resources guide those decisions.
- A new or modified regulated condition model may be appropriate for your study.

Uses of CVHS

- Results characterize flood risk for:
 - Existing condition /operation of system.
- Set baseline for later alternative analysis (structural and non-structural).
- Tools/data available for alternative “baselines” (such as reservoir models and unregulated boundary condition hydrographs)
- CVHS starting storage assumptions at reservoirs vetted with FEMA

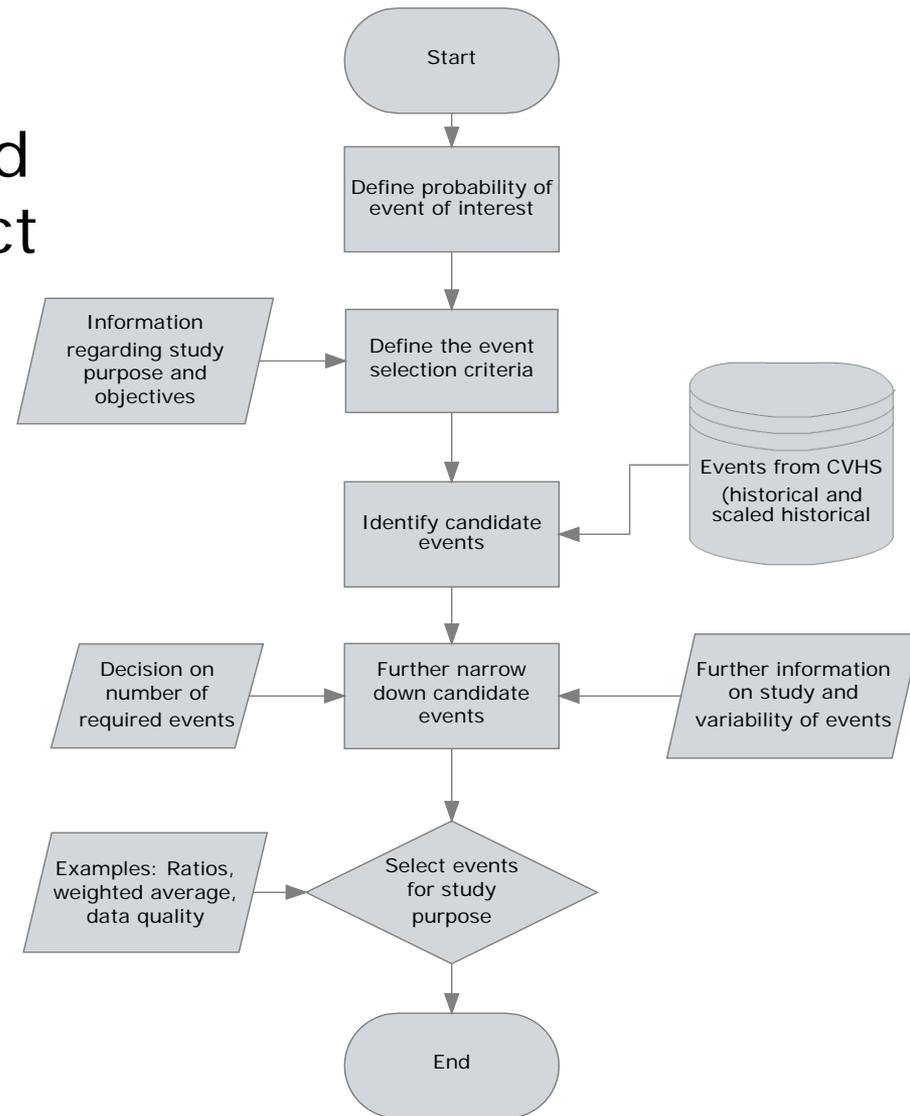


Applications of CVHS Products or Methods

- 1. Planning studies
- 2. Pre-construction Engineering Design
- 3. FEMA floodplains
- 4. Floodplain mapping and inundation studies
- 5. In-channel flood profiles

CVHS and event selection

- CVHS results require event selection
 - Events can be selected on a project-by-project basis
 - Standard events can be selected (and accepted) as representative of a 100-yr flow



Event magnitude	Event hydrograph for Sacramento River @ Verona
50 yr	1997 event, 1986 event X 1.5
100 yr	1997 event X 1.2, 1986 event x 1.7
200 yr	1997 event X 1.4, 1986 event X 2.0

If CVHS models do not match your study needs....

- Route CVHS boundary condition hydrographs through your own models
 - Reservoir model – USACE has produced baseline
 - Hydraulic model
- *Use CVHS unregulated freq. curves to assign a probability to event simulation runs
 - * Using critical duration

Q: Where can I get the CVHS models?

A: www.CVHydrology.org has online request form

A2: In near future, "Library of Models"

<http://cdec4gov.water.ca.gov>

Q: Where can I get products and reports?

www.CVHydrology.org

www.cvhydrology.org

The screenshot shows a web browser window displaying the Central Valley Hydrology Study website. The browser's address bar shows 'cvhydrology.org'. The website header includes the title 'Central Valley Hydrology Study' and a search bar. Below the header, there are navigation tabs for 'Forums' and 'Members'. The main content area features a 'Welcome to the CVHS Web forum' message and a list of forum topics. A 'Sign In' modal is overlaid on the right side of the page, containing a sign-in form with fields for 'Username' (containing 'CVHS_GEN') and 'Password' (containing 'featherriver').

Central Valley Hydrology Study

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Forums Members View New

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Recent Topics

- Data request form
CVHS_TEAM - Feb 25 2012
- 3/7/13 – CVHS Draft Re
Frequency Curves Work
CVHS_TEAM - Mar 07 2013

About cvhydrology.org

We've reorganized the CVHS Web forum and added new content, including status updates and answers to new FAQs. As before, we welcome your input—you can post comments and questions in the "Discussion" forums below.

1 topics
0 replies

Introduction
By CVHS_TEAM
27 Mar 2012

Help with cvhydrology.org

1 topics
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Contact the CVHS team
By CVHS_TEAM
17 Apr 2012

Study overview

Introduction, tasks, and status

2 topics
0 replies

Tasks and status
By CVHS_TEAM

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CVHS Task 8 rainfall-runoff analysis draft reports

Started by CVHS_TEAM , 05 Feb 2013



0 replies
94 views



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CVHS final ULOP/ULDC regulated frequency curves

Started by CVHS_TEAM , 04 Feb 2013

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CVHS draft unregulated flow frequency curves

Started by CVHS_TEAM , 29 Nov 2012

0 replies
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Other relevant studies

Started by CVHS_TEAM , 24 Jul 2012

0 replies
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CVHS_TEAM
24 Jul 2012

CVHS maps and GIS shapefiles

Started by CVHS_TEAM , 12 Apr 2012

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12 Apr 2012

CVHS presentations

Started by CVHS_TEAM , 22 Oct 2009

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CVHS_TEAM
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CVHS reports and memoranda

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20 Oct 2009



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CVHS reports and memoranda

Started by CVHS_TEAM, Oct 20 2009 01:45 PM



1

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CVHS_TEAM

#1

Administrator



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★★ Admin

67 posts

Posted 20 October 2009 - 01:45 PM

These a

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Interim work product technical memoranda

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[06142010_PD2_Common_Features_HEC-RAS_Model_Review.pdf](#) 358.65K 13 downloads

Key documents

- Data management plan, Nov 2007.
- **Procedure document, March 2008.**
- Response to comments on Procedure document, September 2008.
- **CVHS product uses, May 2009.**
 - Includes description of applications of products for both unsteady and steady flow.
- Project management plan, June 2009.
- Ungaged watershed analysis procedures, Sept 2010.
- Technical procedures document, Oct 2010.
 - Includes a series of technical appendices.