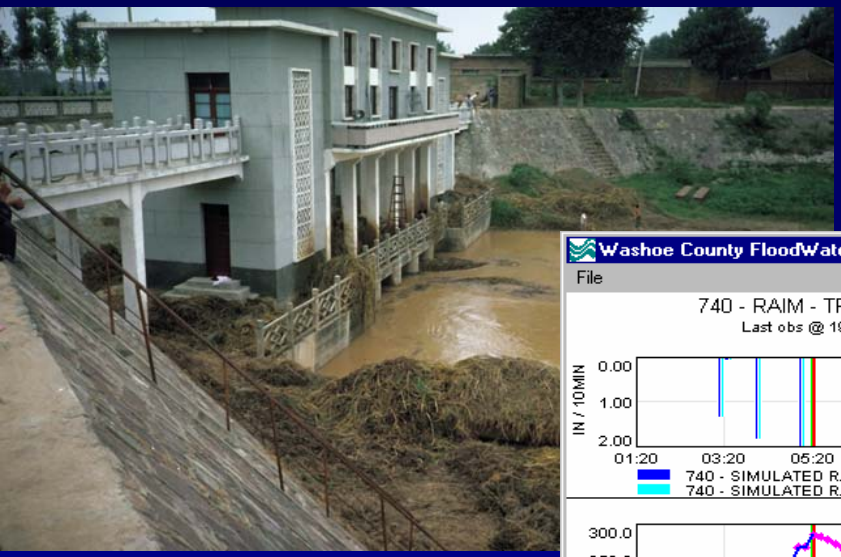
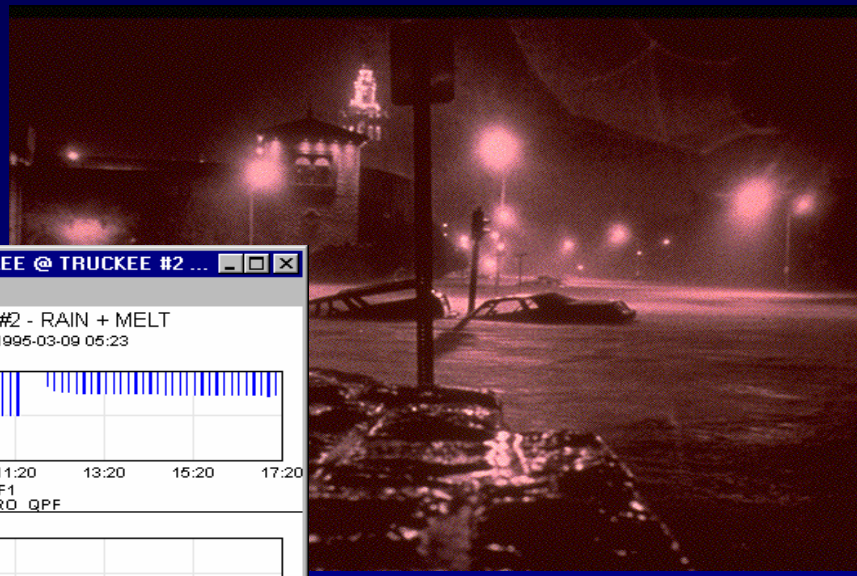
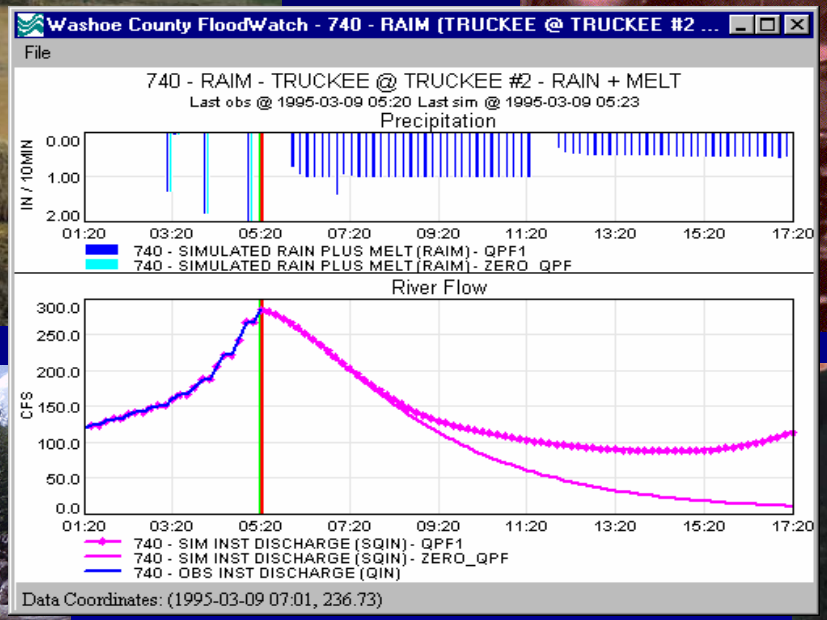
DEFINING AND ASSESSING A TOOL FOR HYDROLOGIC FORECASTING AT NWS WFOs

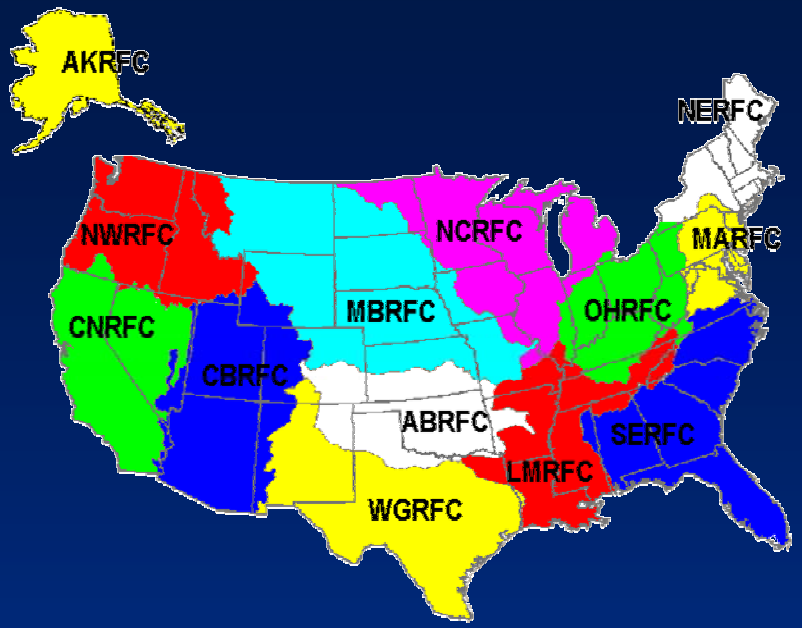


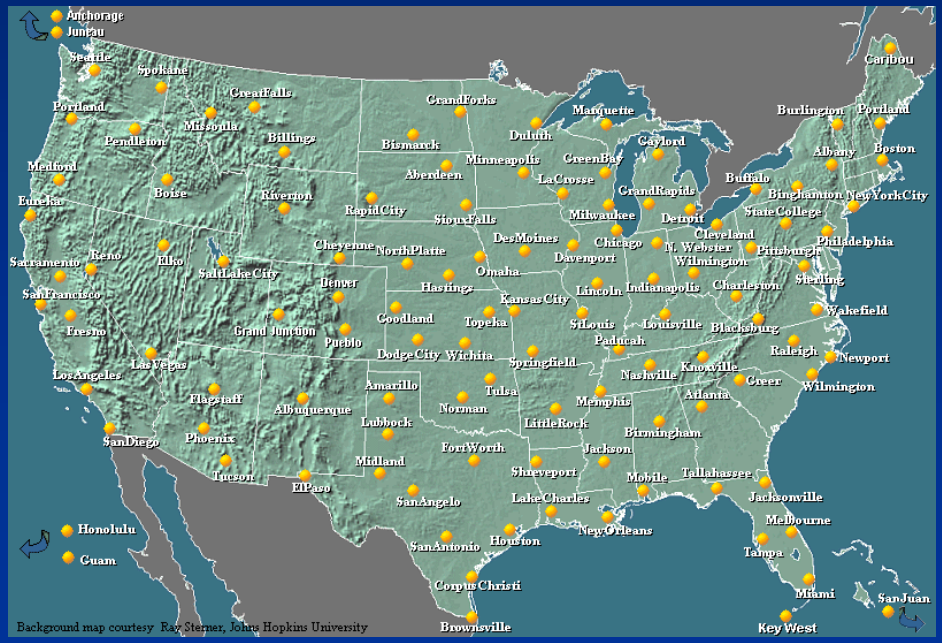




Larry Brazil, George Smith,
and Michael Thiemann

The NWS is investigating options for developing capabilities for WFOs to perform hydrologic simulations for areas linked to conditions maintained at RFCs.





The result will be a tool that produces forecasts for basins with short response times.

THE TOOL HAS A NUMBER OF REQUIREMENTS

- It must be ROBUST
- It should NOT require a lot of user interaction
- It should NOT require the user to be a hydrologic forecaster

- It must be SIMPLE and FLEXIBLE

➔ Flexible enough to handle a wide range of hydrologic conditions that occur in small basins (response times less than a day)

➔ And include the ability to model snowmelt, rainfall/runoff, and the effect of small impoundments

- It should be CONSISTENT with the modeling approach used at the RFC

➔ so that information from the RFC concerning hydrologic conditions of the area can be used to ensure proper operation of the WFO tool

- It should allow for EASY modification of inputs

  - ➔ Updating of rating curves
  - ➔ Changes to the data network
  - ➔ Input of Quantitative Precipitation Forecasts (QPF) and temperature forecasts

- One option being actively investigated is

FloodWatch

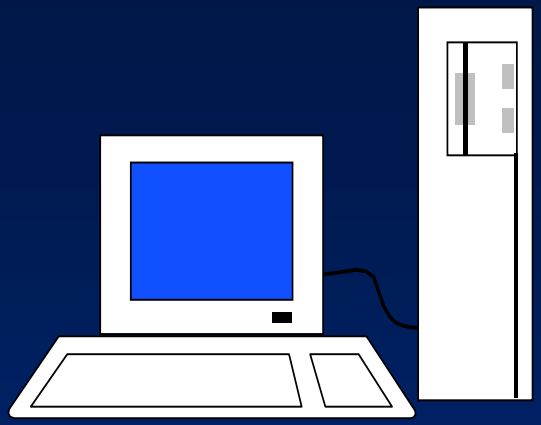
- FloodWatch has been implemented at the

Reno WFO

FloodWatch simulates streamflow at user-defined points in a watershed

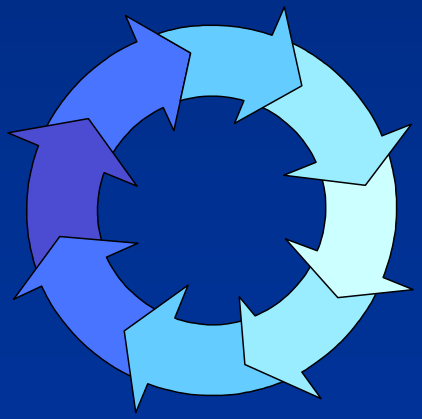
USING

- Real-time observed data
  - Precipitation, Streamflow, Reservoir Elevations, Temperature, Snowmelt, other
- Forecasted precipitation if available



A Windows-based PC
streamflow forecasting tool

A "hands-off" application,
requiring little to no user interaction



A continuous system
that updates streamflow
forecasts several times an hour

System input

Real-time data

Operations and Models

System output

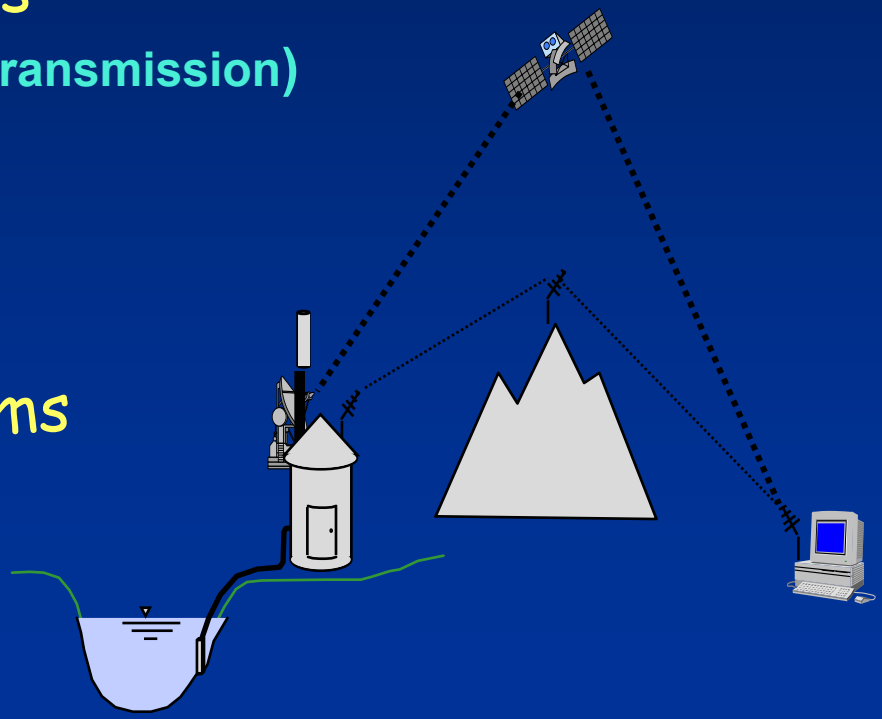
Streamflow forecasts

compatibility with
multiple real-time data types

- ALERT Systems (event based transmission)
- Continuous observations
- Regular reports
- Radar

and data collections platforms

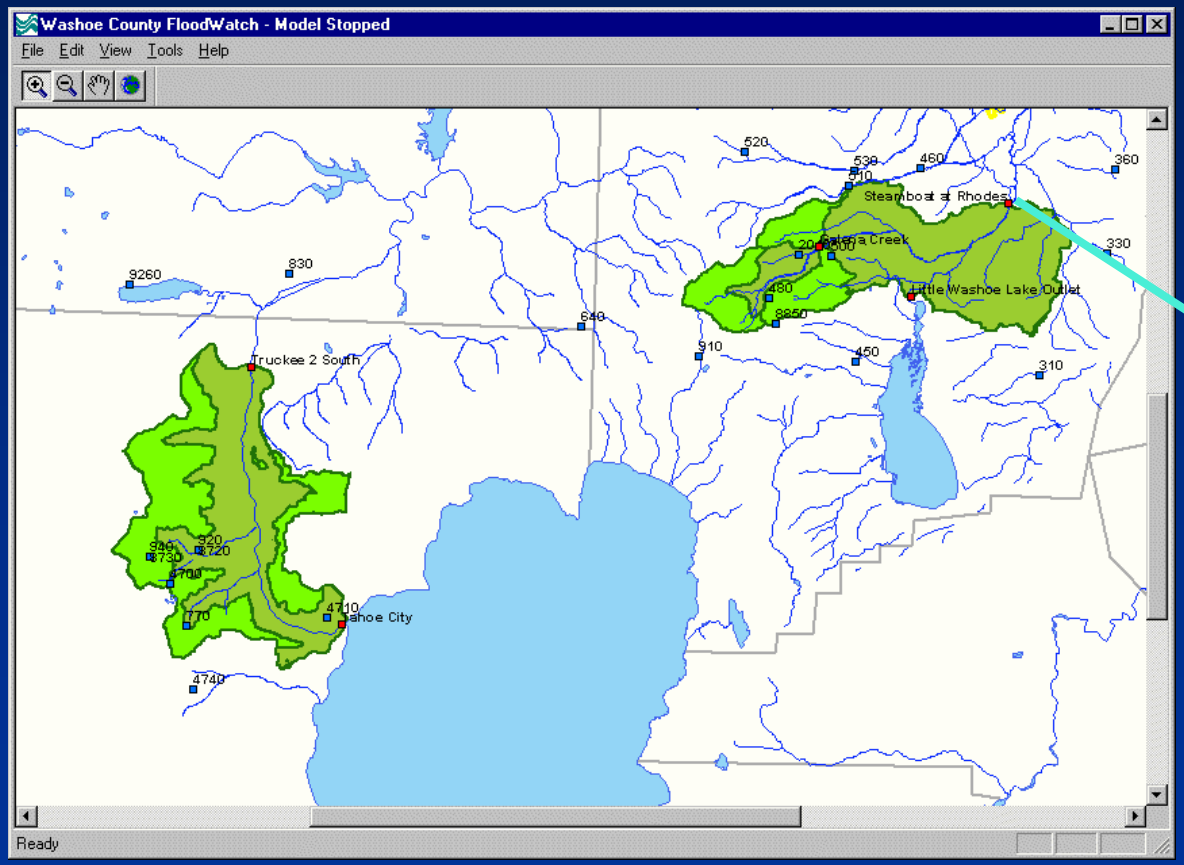
- StormWATCH (DIAD)
- PCBase2 (Sutron)
- Standard Hydrologic
- Exchange Format (SHEF)



Additional Features of FloodWatch

Interactive map interface

The main window of FloodWatch is a map interface that includes basin boundaries, rivers, and stations.

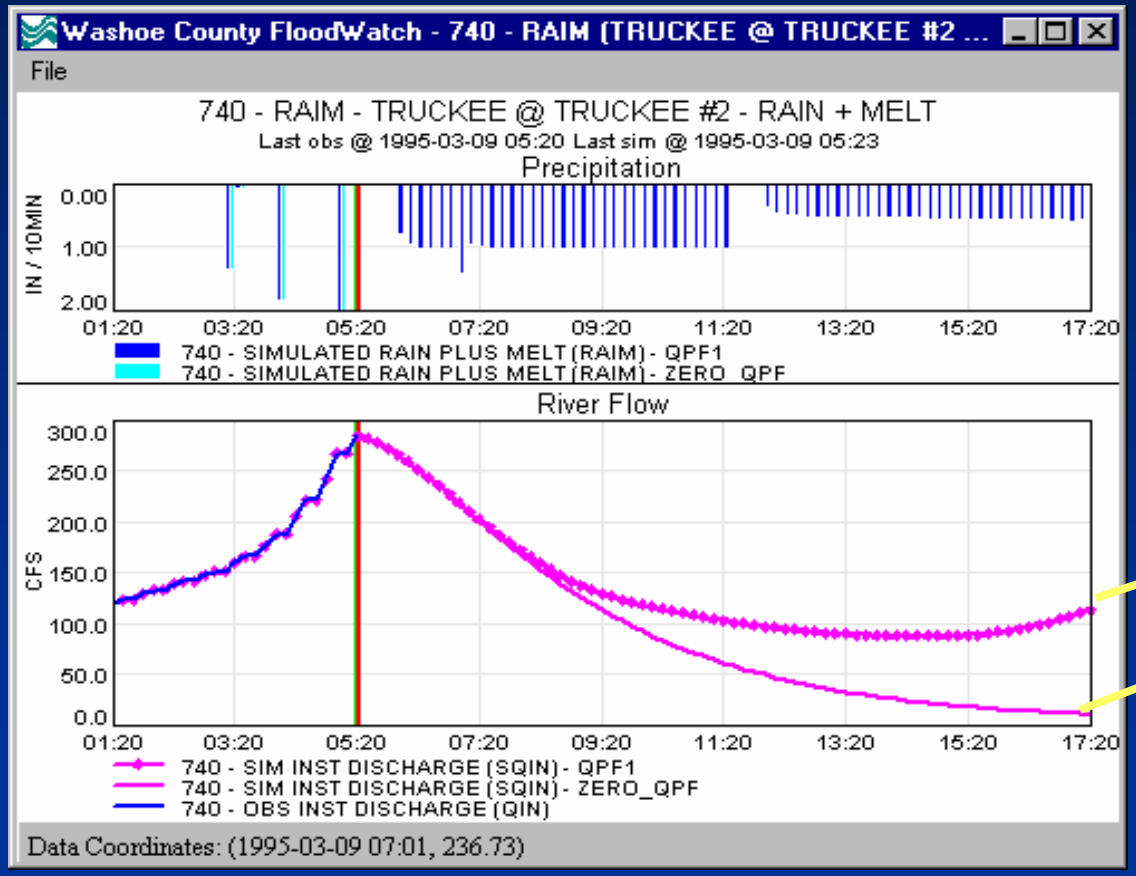


Click on a station to see station data in tables, summaries, or plots

Additional Features of FloodWatch

Quantitative Precipitation Forecast (QPF)

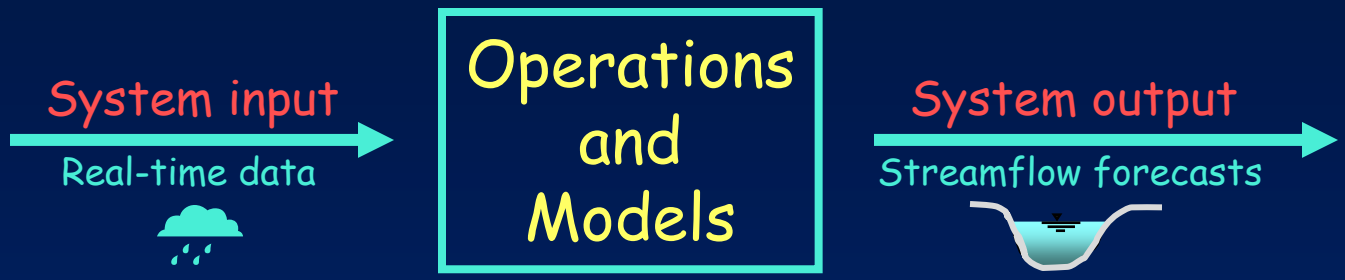
A QPF scenario can be entered to test the basin response to potential future precipitation.



Resulting streamflow forecasts are plotted

with and without

future precipitation for comparison

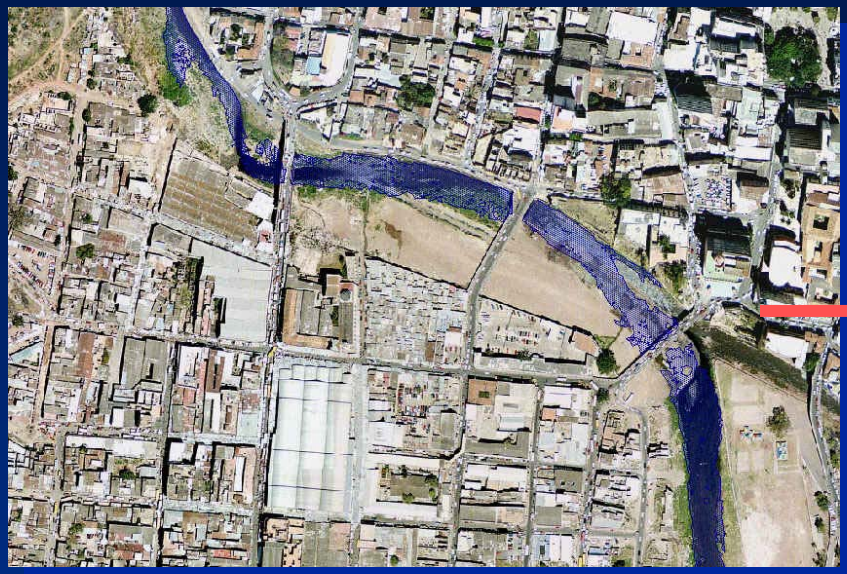


- routing model
  - Lag/K
- reservoir model
  - water balance
- snow-melt model
  - SnowPack Model
- diversion operations
  - time series operations
- rainfall-runoff model
  - Sacramento Model
- runoff time distribution
  - Unit Hydrograph
- open channel hydraulics model
  - HEC-RAS

Several commonly used operations and models are available

Additional Features of FloodWatch

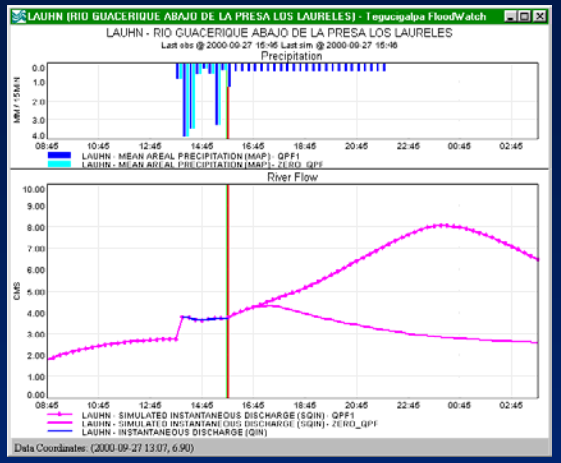
Integration with HEC-RAS for Flood Inundation Mapping



Water surface profiles are generated with HEC-RAS and can then be used for **Flood Inundation Mapping**

Online hydrometerological information to aid in monitoring the current conditions and making Quantitative Precipitation Forecasts

Internet Data Feed



Streamflow Forecasts

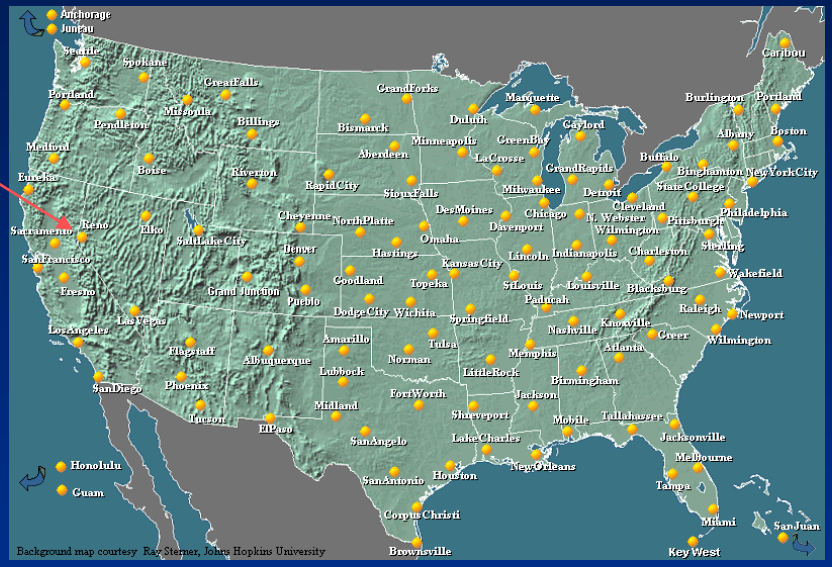
Public Warnings

ALERTA A LA PUBLICA:

MAS QUE 30 MM DE LLUVIA HAN SIDO OBSERVADOS EN PARTES DE LA CUENCA ALTA POLOCHIC EN LAS ULTIMAS 3 HORAS. ES SUFICIENTE PARA CAUSAR INUNDACIONES RAPIDAS DE CANALES Y ARROYOS, ADEMAS DE RIOS PEQUEÑOS.

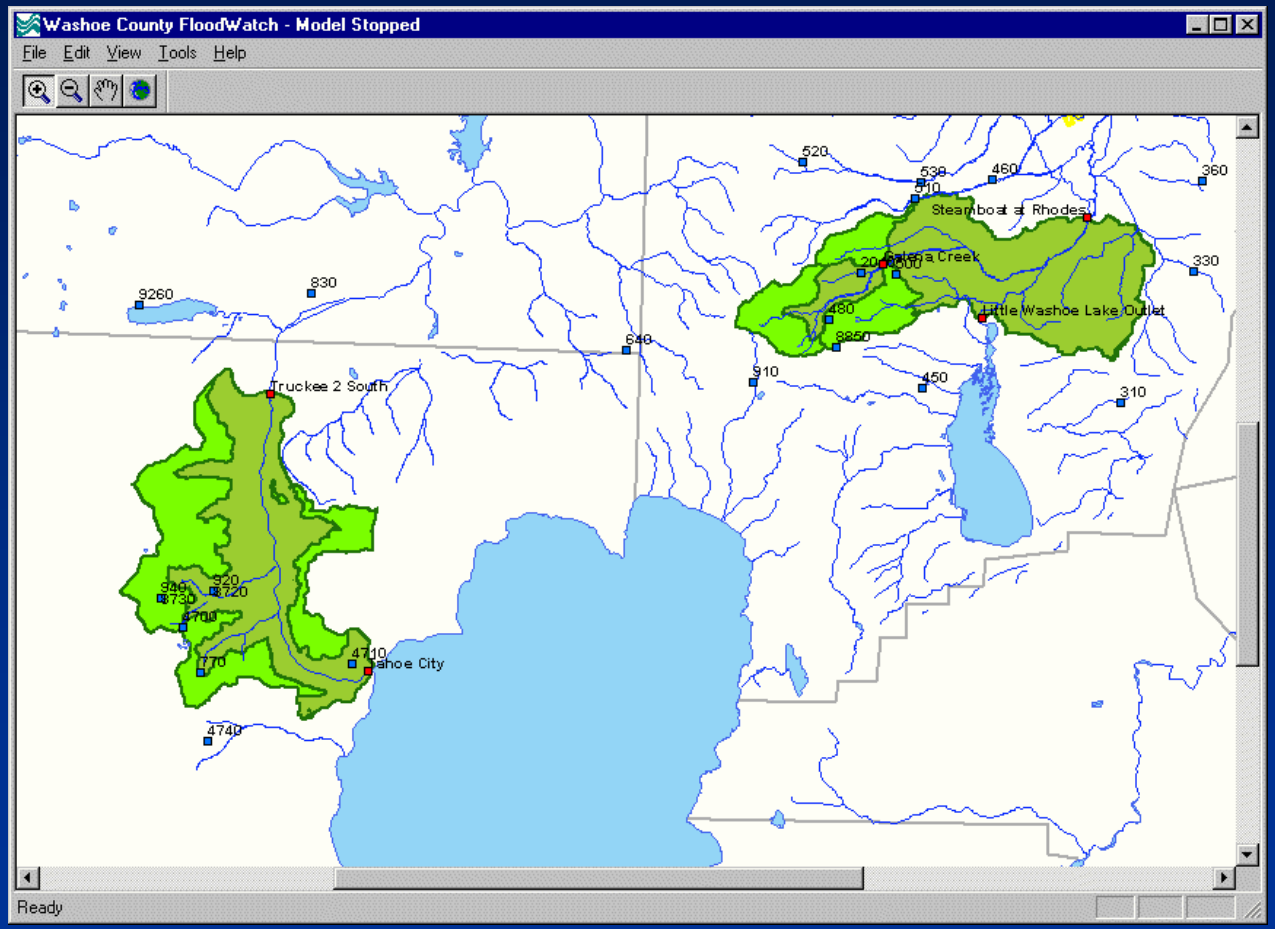
FloodWatch Implemention
Washoe County and Reno WFO

Installation at Reno, Nevada
WFO and County Offices



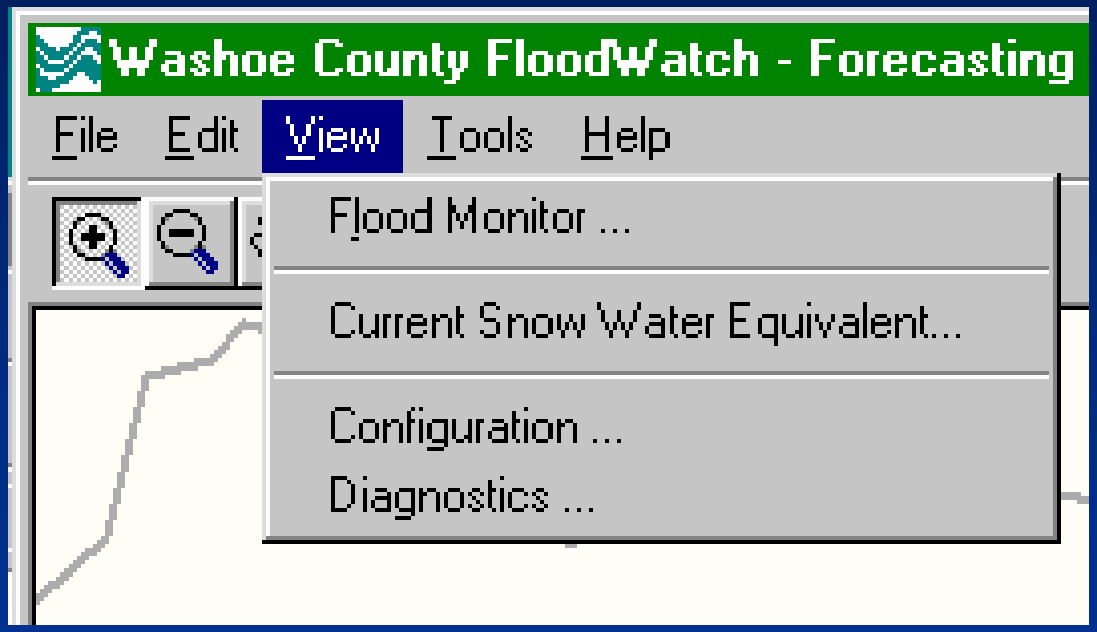
- Four forecast points:
  - Truckee River, North Truckee River
  - Galena Creek, Steamboat Creek
- Uses real-time observations
  - precipitation, temperature, streamflow
- Runs on 10 minute time interval
- Uses NWS Snowpack and Sacramento Soil Moisture Accounting models
- Accounts for diversions and reservoir operations
- Updating with snowpack and streamflow observations
- Data quality control procedures
- Allows use of QPF

Main Interface



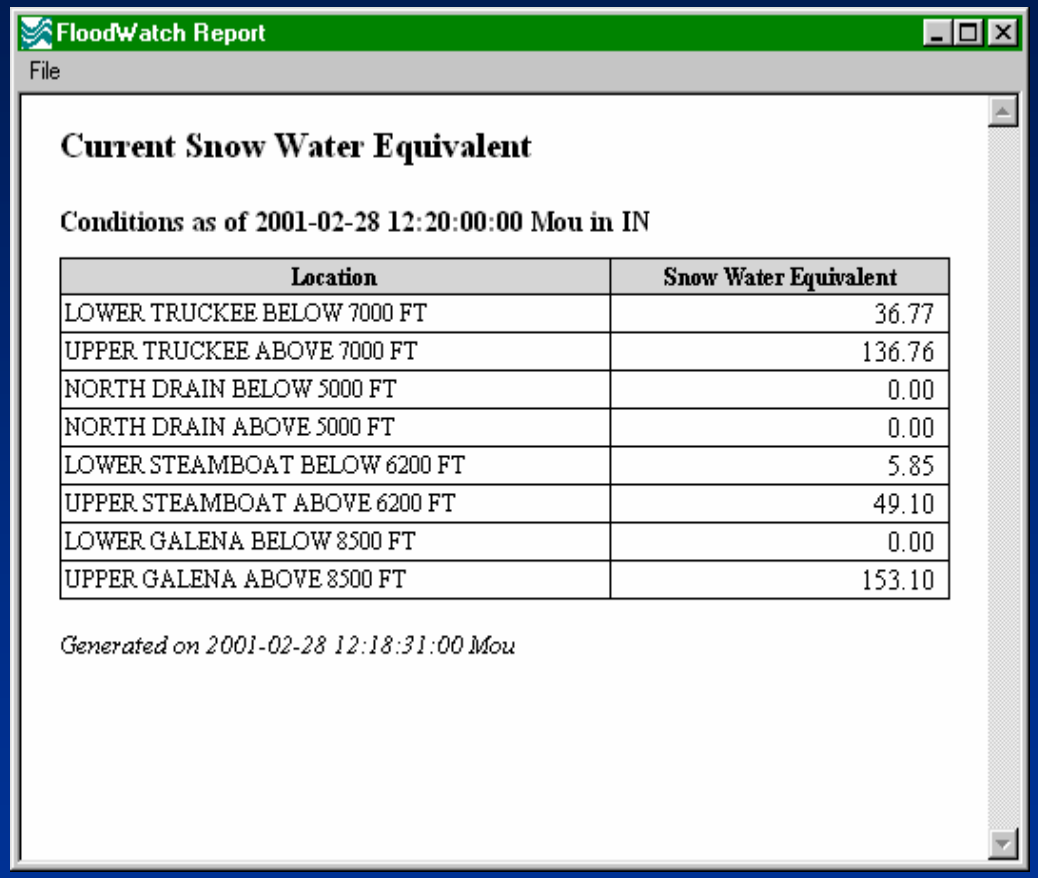
- Simple map tools for zooming, scrolling
- FloodWatch is designed to run hands-off so menus are streamlined

View Menu



tr1

Current Snow Conditions


FloodWatch Report

File

Current Snow Water Equivalent

Conditions as of 2001-02-28 12:20:00:00 Mou in IN

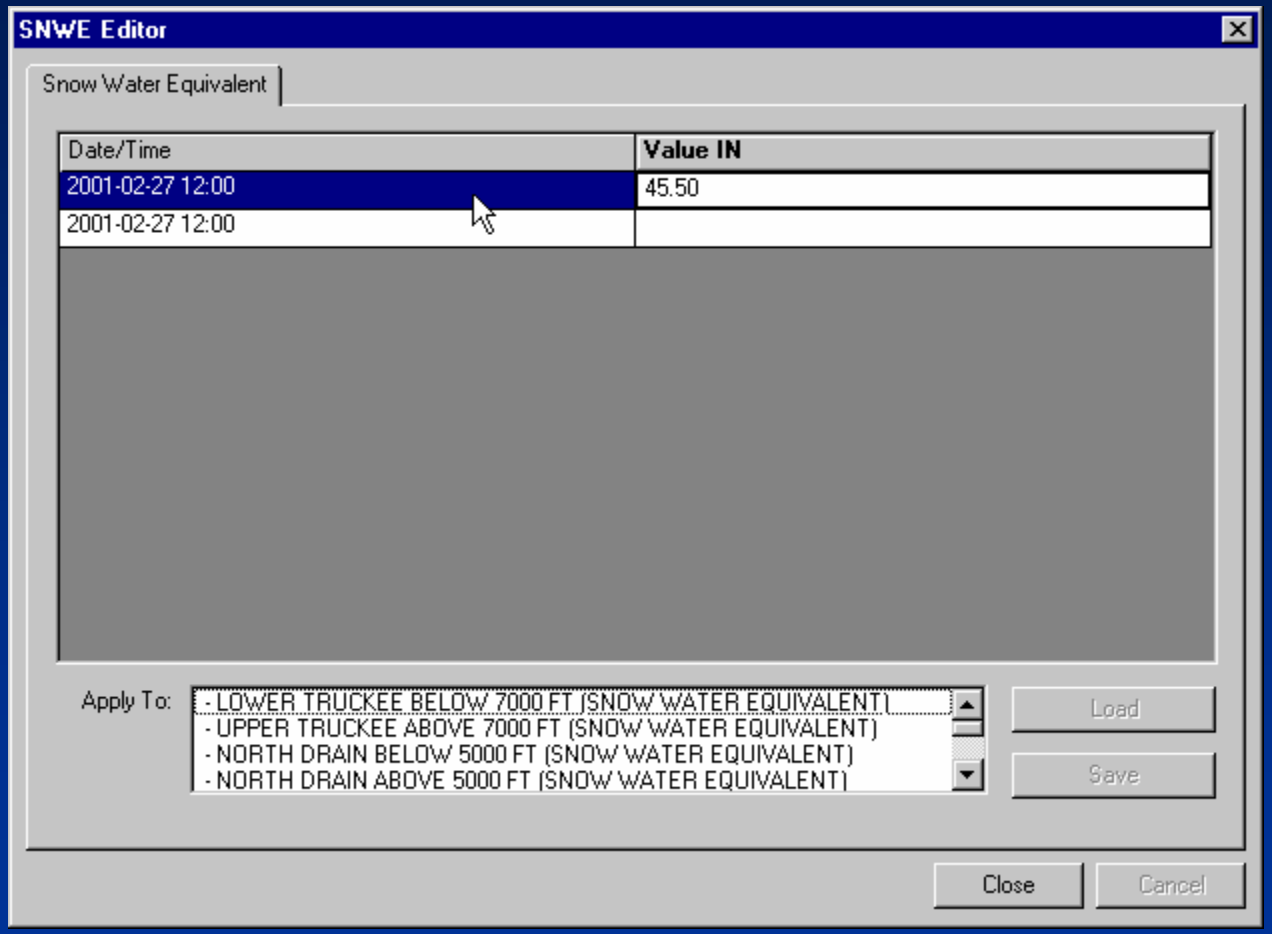
Location	Snow Water Equivalent
LOWER TRUCKEE BELOW 7000 FT	36.77
UPPER TRUCKEE ABOVE 7000 FT	136.76
NORTH DRAIN BELOW 5000 FT	0.00
NORTH DRAIN ABOVE 5000 FT	0.00
LOWER STEAMBOAT BELOW 6200 FT	5.85
UPPER STEAMBOAT ABOVE 6200 FT	49.10
LOWER GALENA BELOW 8500 FT	0.00
UPPER GALENA ABOVE 8500 FT	153.10

Generated on 2001-02-28 12:18:31:00 Mou

- Based on model results
- Use as a reference to know whether observations should be entered
- Can print or save to file

tr1

Editing Snow Water Equivalent



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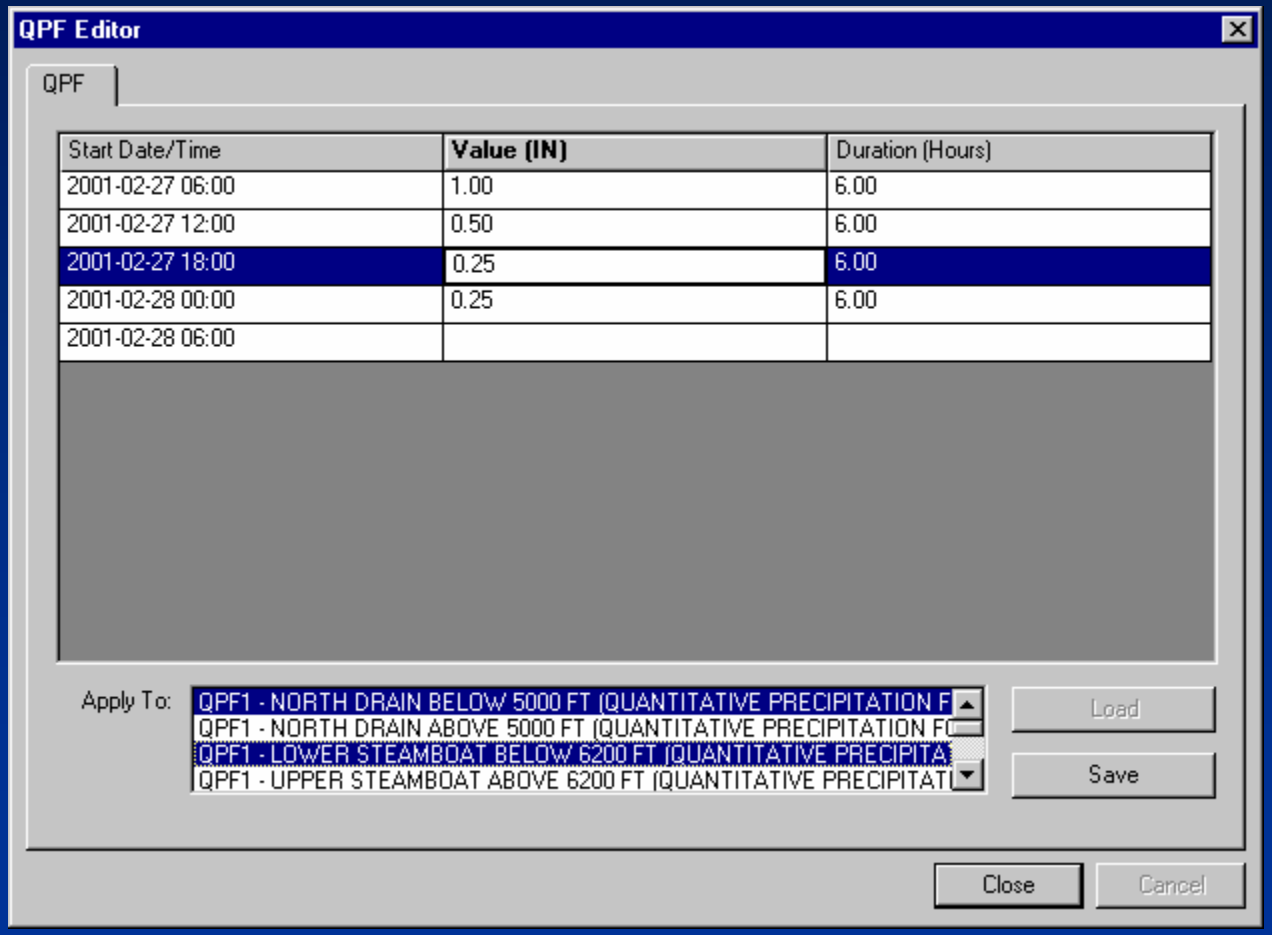
Editing QPF
(Quantitative Precipitation Forecast)



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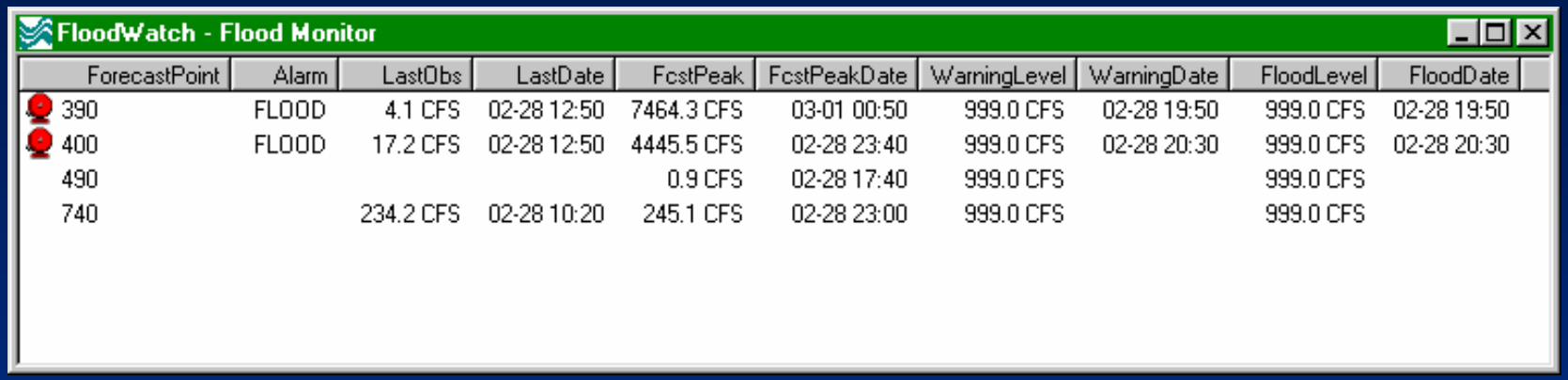
The Flood Monitor

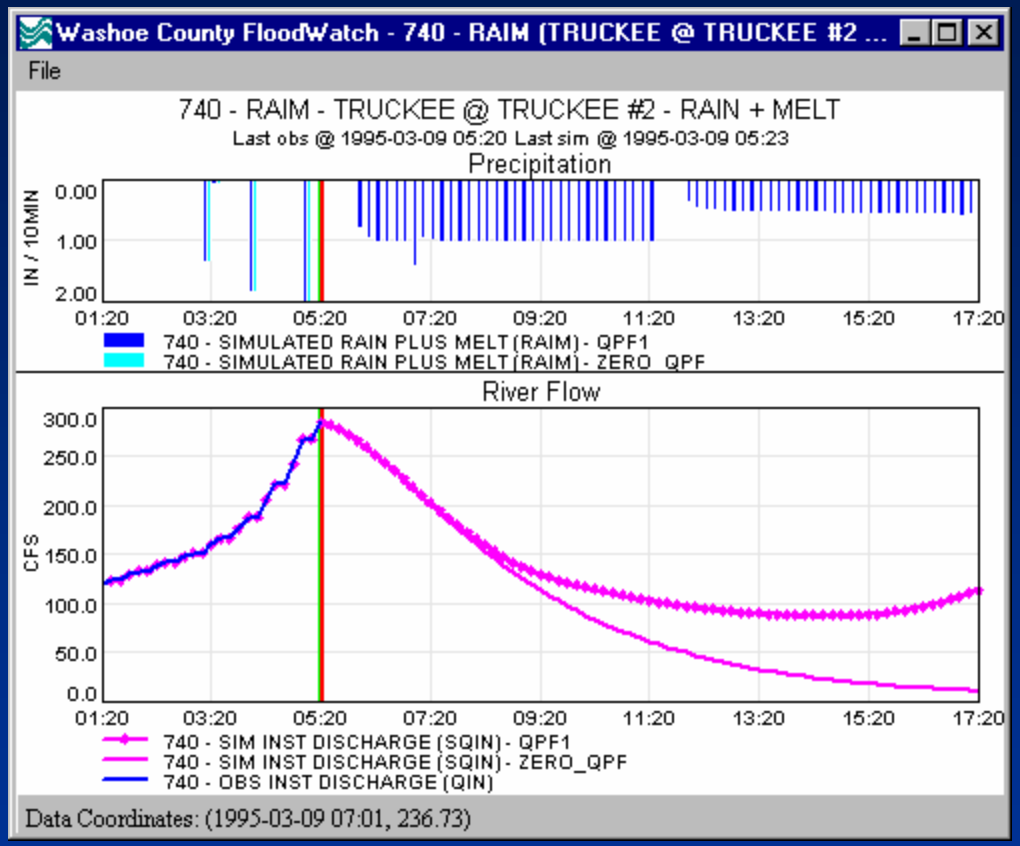


ForecastPoint	Alarm	LastObs	LastDate	FcstPeak	FcstPeakDate	WarningLevel	WarningDate	FloodLevel	FloodDate
390	FLOOD	4.1 CFS	02-28 12:50	7464.3 CFS	03-01 00:50	999.0 CFS	02-28 19:50	999.0 CFS	02-28 19:50
400	FLOOD	17.2 CFS	02-28 12:50	4445.5 CFS	02-28 23:40	999.0 CFS	02-28 20:30	999.0 CFS	02-28 20:30
490				0.9 CFS	02-28 17:40	999.0 CFS		999.0 CFS	
740		234.2 CFS	02-28 10:20	245.1 CFS	02-28 23:00	999.0 CFS		999.0 CFS	

- Lists important information for each forecast point
- Displays alarm conditions if present
- Can use this display as a summary of conditions independent of plots
- Right click on Forecast Point to show plot

tr1

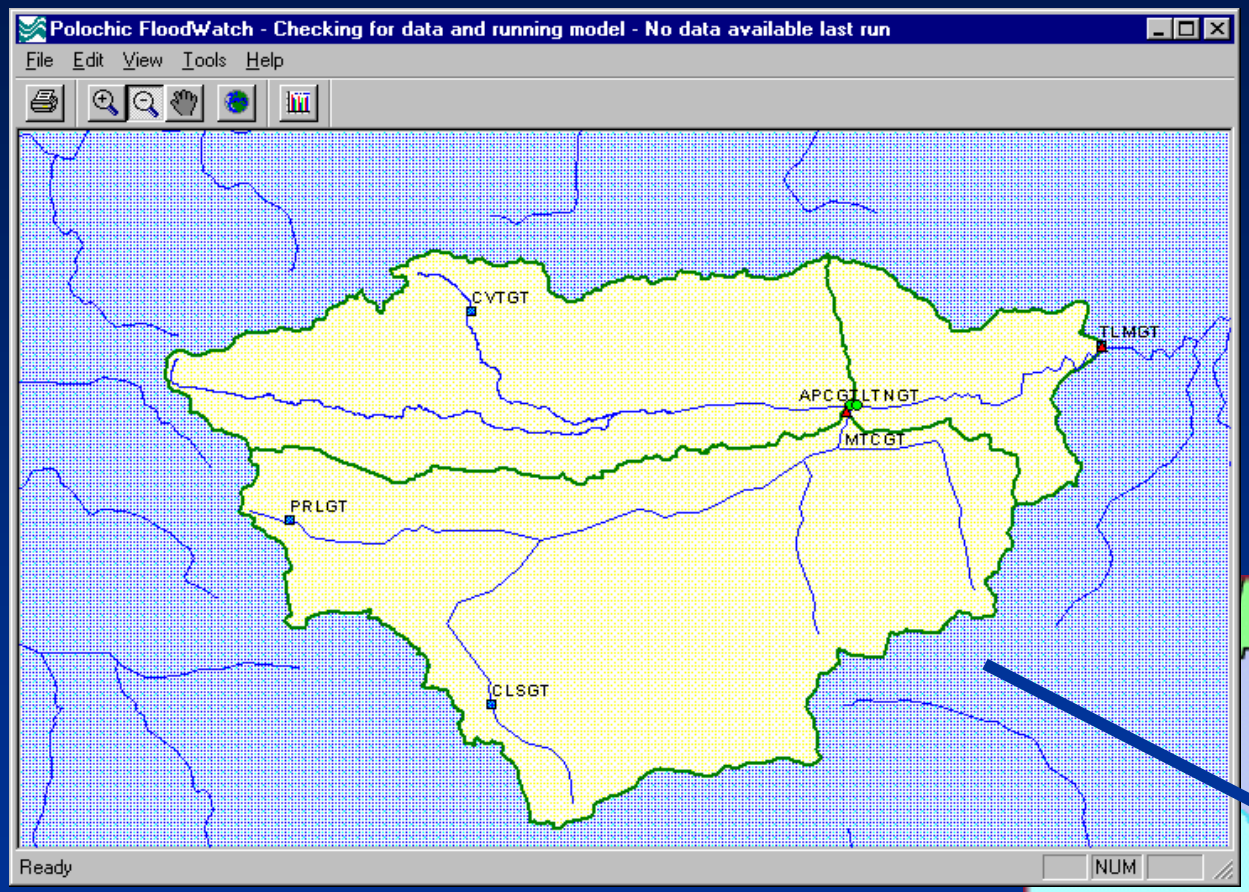
Site Specific Forecasts



- Precipitation on top, resulting flow on bottom
- Configured at installation
- Can switch between flow/stage
- Use mouse tracker to read values
- Can print, cut/copy/paste, save image

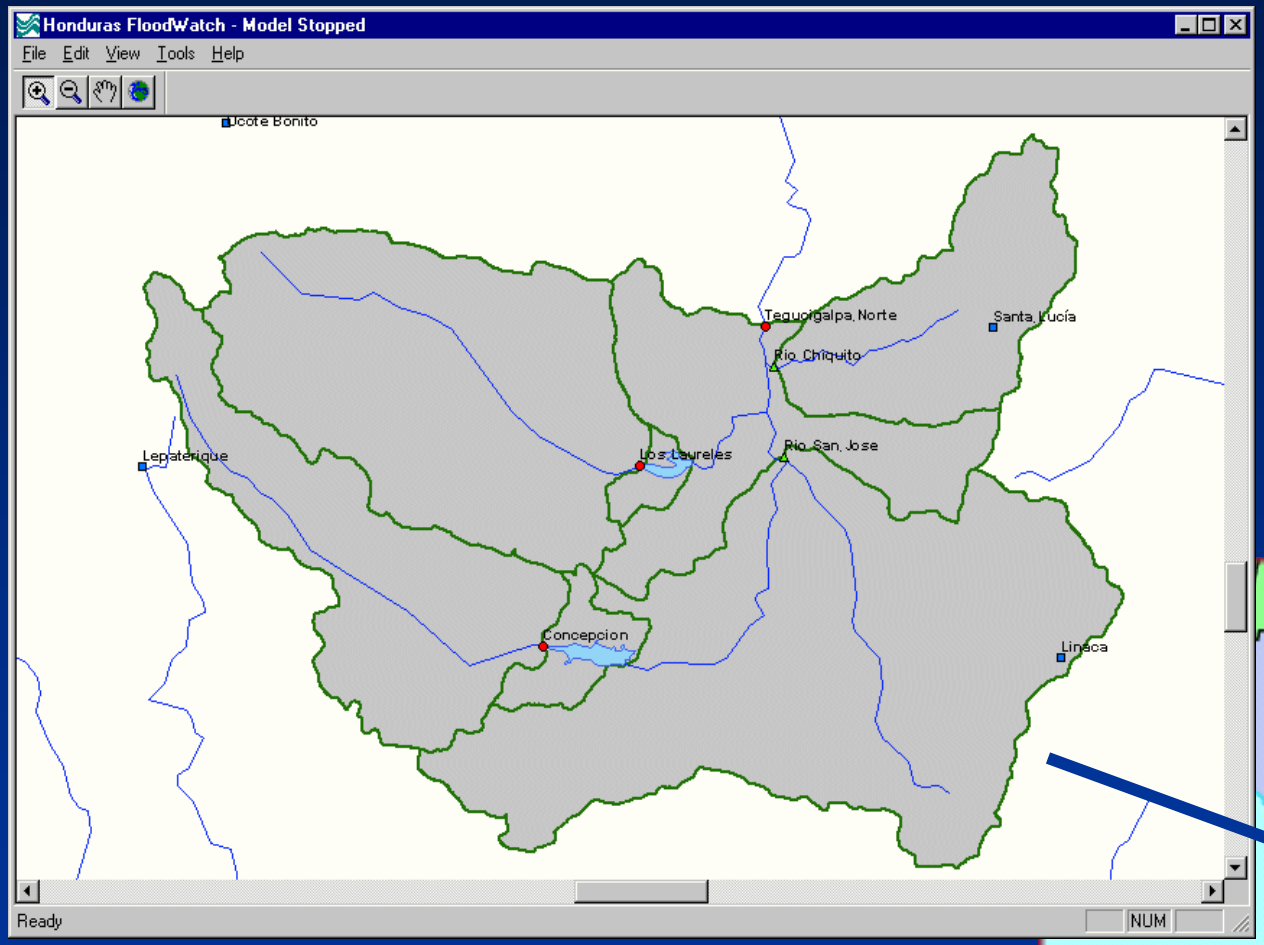
tr1

FloodWatch Flood Warning System
Río Polochic Basin, Guatemala



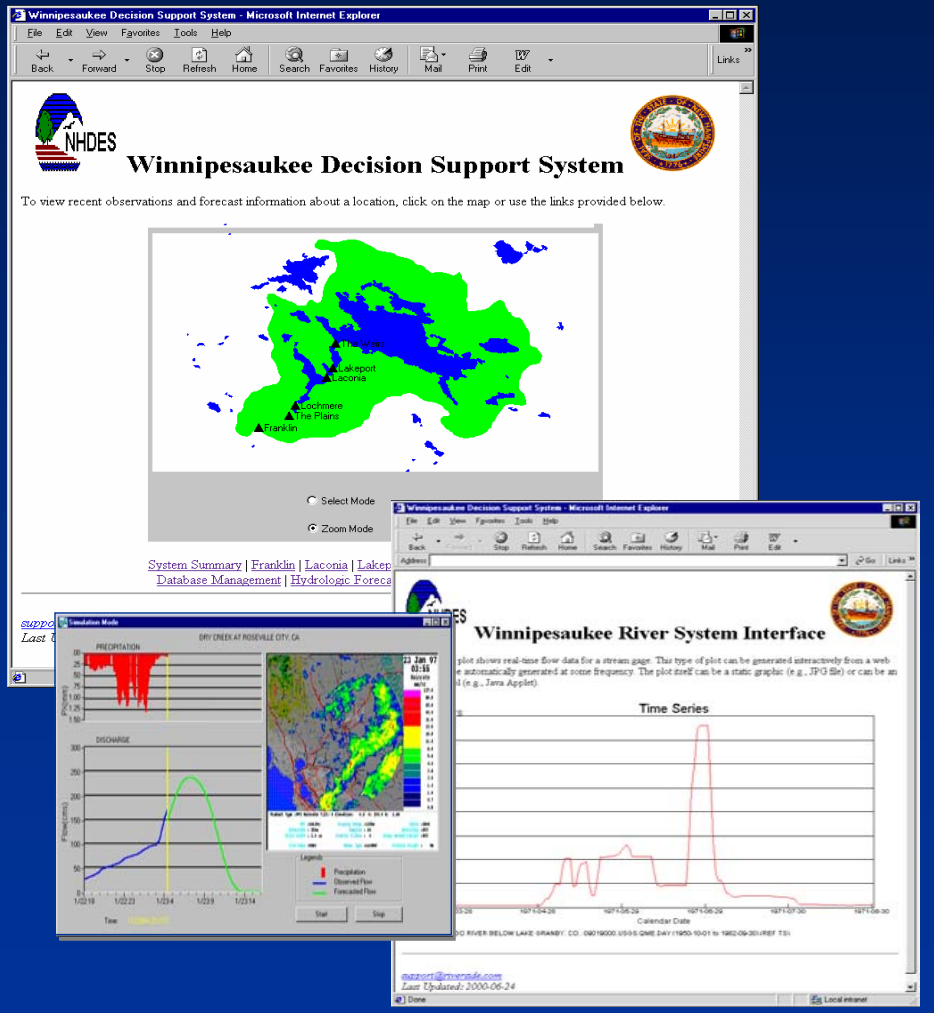
FloodWatch Flood Warning System

Río Choluteca and Río Aguan Basins, Honduras



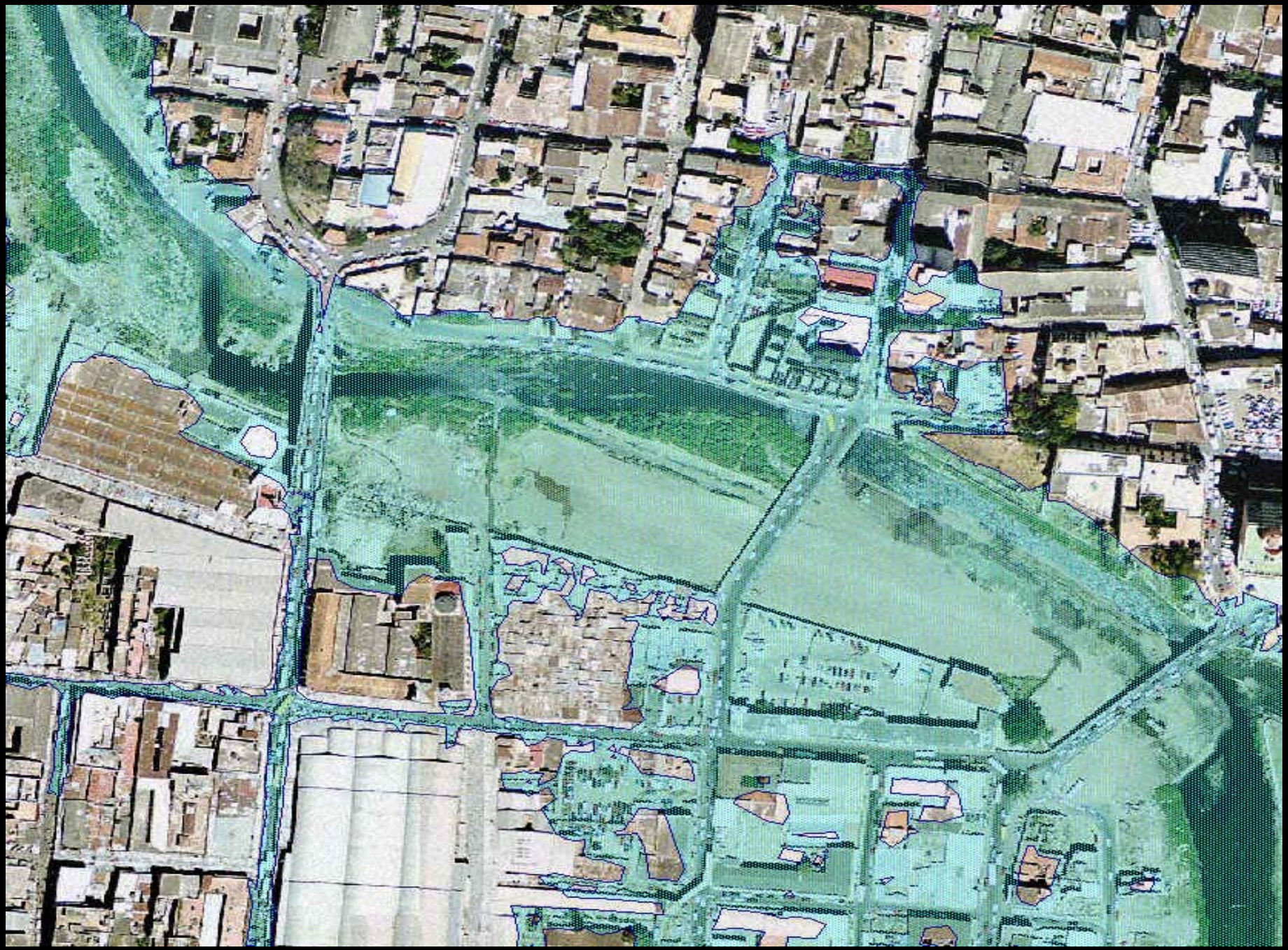
Winnipesaukee River Forecast and Reservoir Operations Model

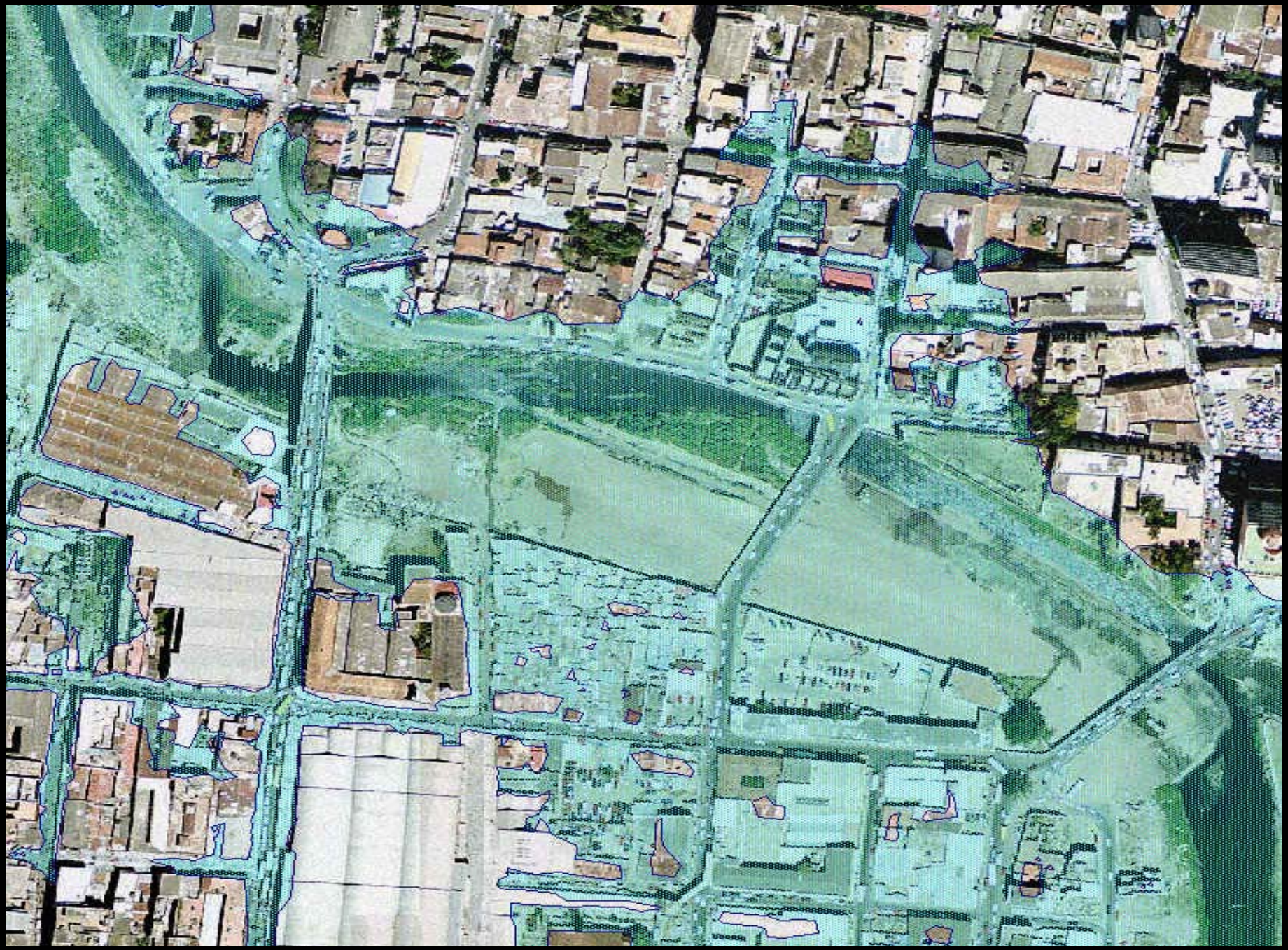
- Multi-purpose reservoir operations
  - **Flood control**
  - **Hydropower**
  - **Recreation**
- FloodWatch implementation coupled with reservoir optimization
- Real-time data collection network
- Gridded multi-sensor precipitation and QPF from NERFC
- Web-based product dissemination

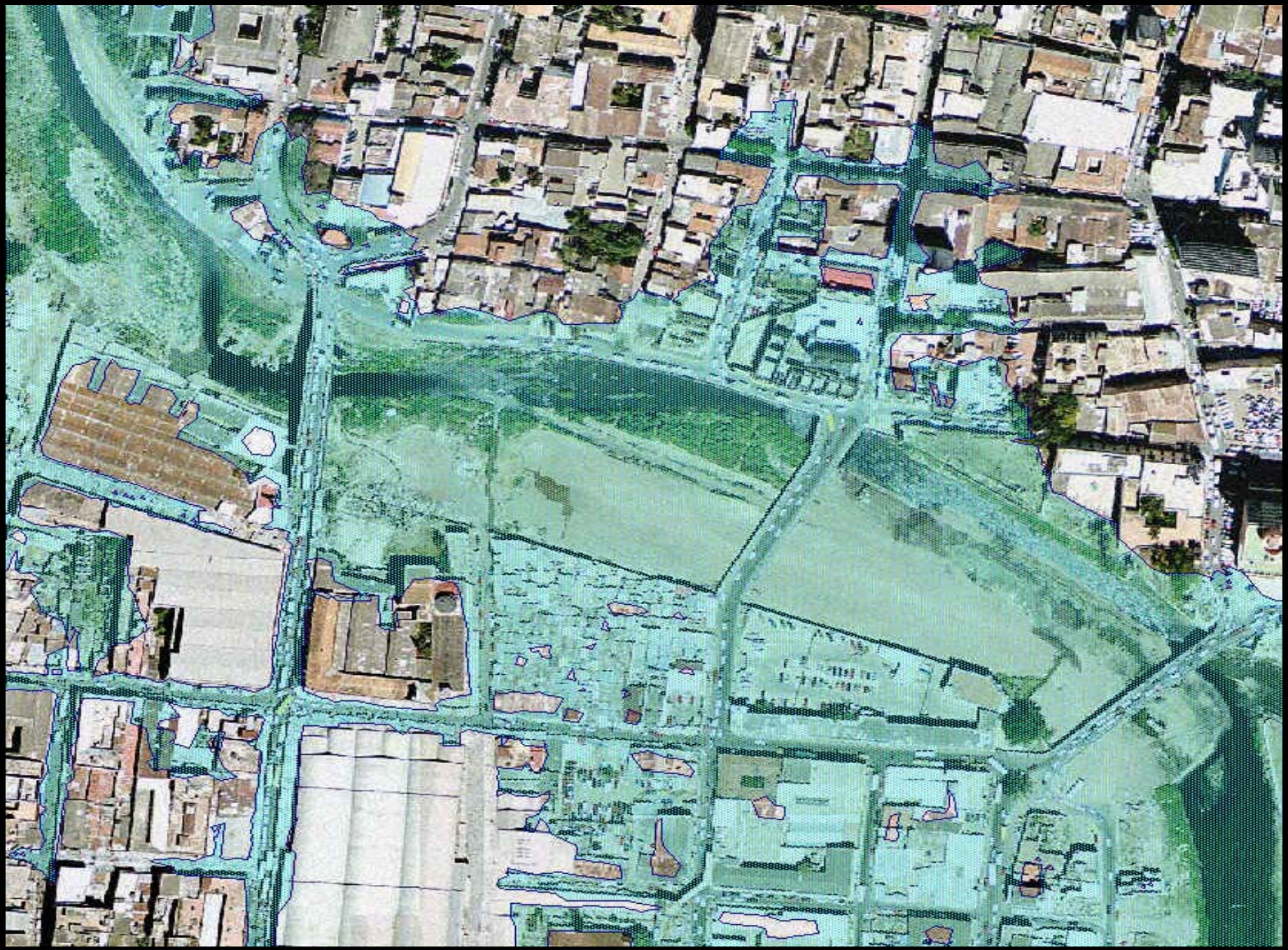


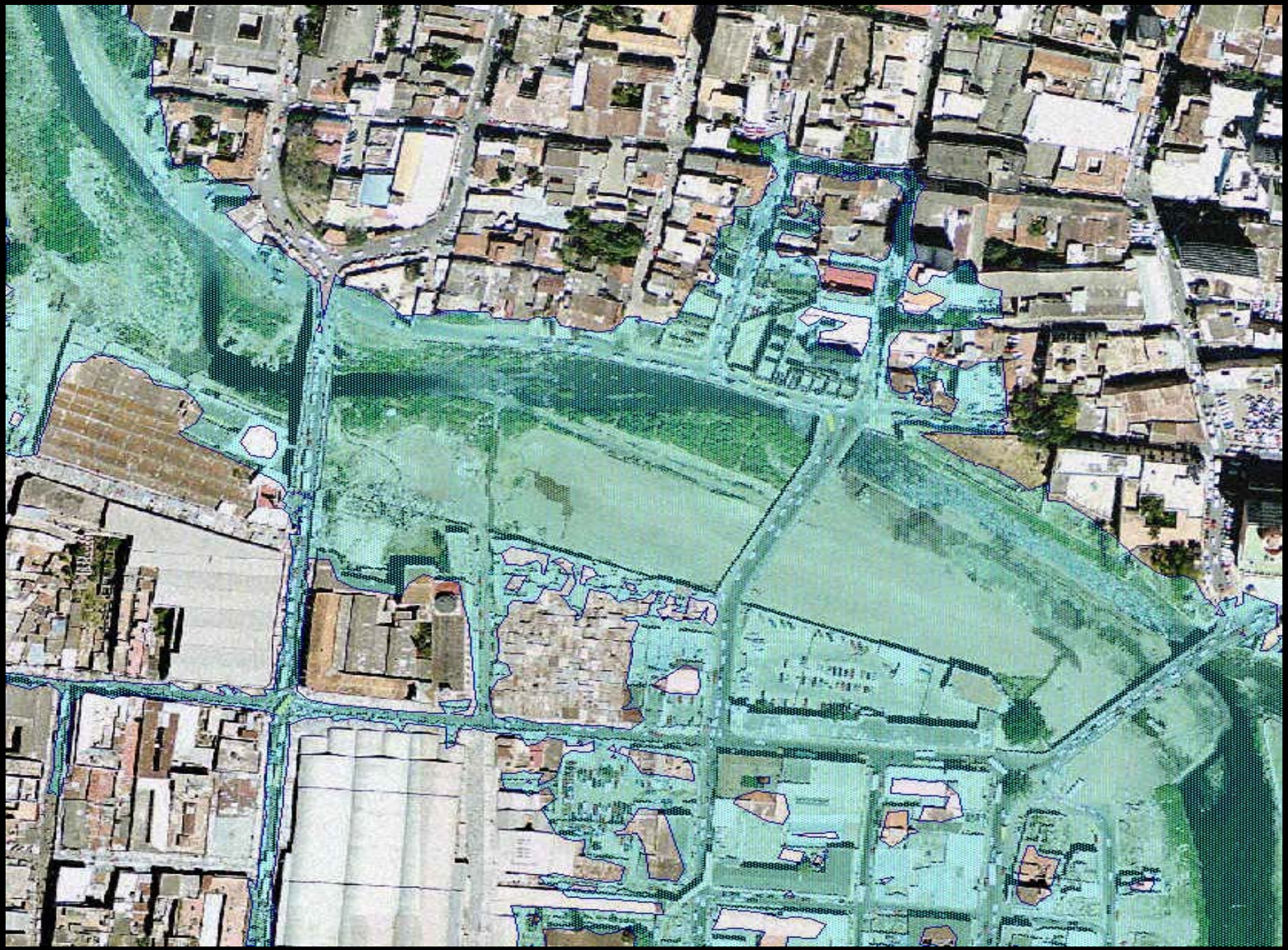
Planned FloodWatch Enhancements

- Additional QA/QC features
- Full alarms (checks on different data types, trends, upper/lower limits)
- Full integration of map interface and plots
- Data entry/edit tools for HydroBase
- Further optimize speed
- Addition of probabilistic forecasts
- Enhanced flood mapping capabilities









Outlook for the FUTURE

- NWS is committed to providing short lead time hydrologic forecasts at WFOs
- NWS is assessing a number of tools to meet the hydrologic forecasting needs of the WFOs
- FloodWatch continues to be implemented for numerous non-NWS users for local, regional and international applications
- FloodWatch is an obvious candidate under consideration for meeting WFO hydrologic forecasting needs nationwide

Thank you!