Moving to the Future of Hydrologic Data Processing…

…or seamless data processing from gage to page

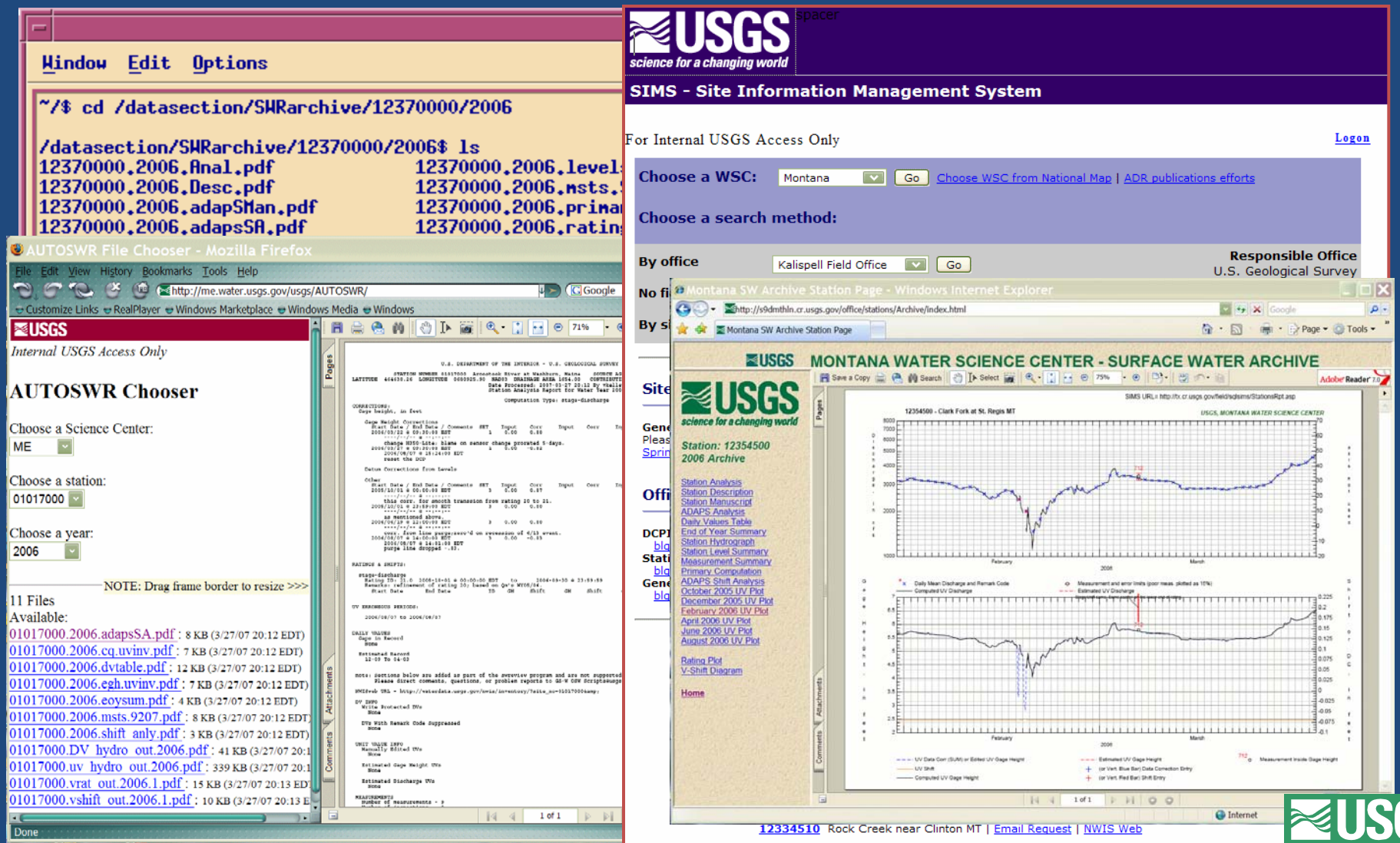
USGS

"Old Streamgagers Never Die…..

We’re moving away from paper records and annual production cycle of records….

USGS

We're moving toward electronic, continuous records ….



Here's a bit of history

- "Historical process" (1889-1970)
  - Records collected, analyzed at the end of the year, daily values published
- Internal Real-time (1970s)
  - Records collected, analyzed at the end of the year, daily values published
- Public real-time (1990s)
  - Daily and unit values collected and presented in real-time "as-is"
  - Records analyzed at the end of the year, daily values published
- Continuous, electronic records (2000s)
  - Records collected and analyzed continuously. "Published" DVs and UVs as soon as possible. Records and all supporting documents electronically computed, reviewed, and archived.

USGS

Vision

Seamless, electronic , continuous records computation from gage to page

- True seamless field connectivity
- More automated, continuous data computation
  - Application of shifts and data corrections
  - Data validation and cleanup
  - Estimating missing or backwater affected data
  - Warnings for performance, rating, data issues
- Efficient data review
  - Daily, trip-to-trip and annual reports with graphical visualization, review of automated decisions, and editing capability
  - Complete audit trail of automated/human decisions and necessary documentation (station analysis)!!!! (meaning this is really important!)
- Seamless connection to NWISWeb/Data Report

USGS

The principles haven't changed…
….. and won't!

- Impartial
- Peer reviewed
- Highest quality
- Verifiable
- Consistent
- Comparable

USGS

The foundation for USGS water information is NWIS – National Water Information System

- Requires nationally consistent field and office protocols/procedures
- Data collected and computed are directly comparable throughout nation
- Programs, procedures, and data formally reviewed and quality assured/controlled by national team of experts in addition to internal reviews

USGS

Starting at the gage and going to the page:

Going to the Field….

Go2 script will tells us where to go and what to do..

- Office of Surface Water utility script to tell when site visits needed
- Operational software used to monitor and review real-time data, ratings, station health, etc.
- Produces utility plots and email messages / reminders

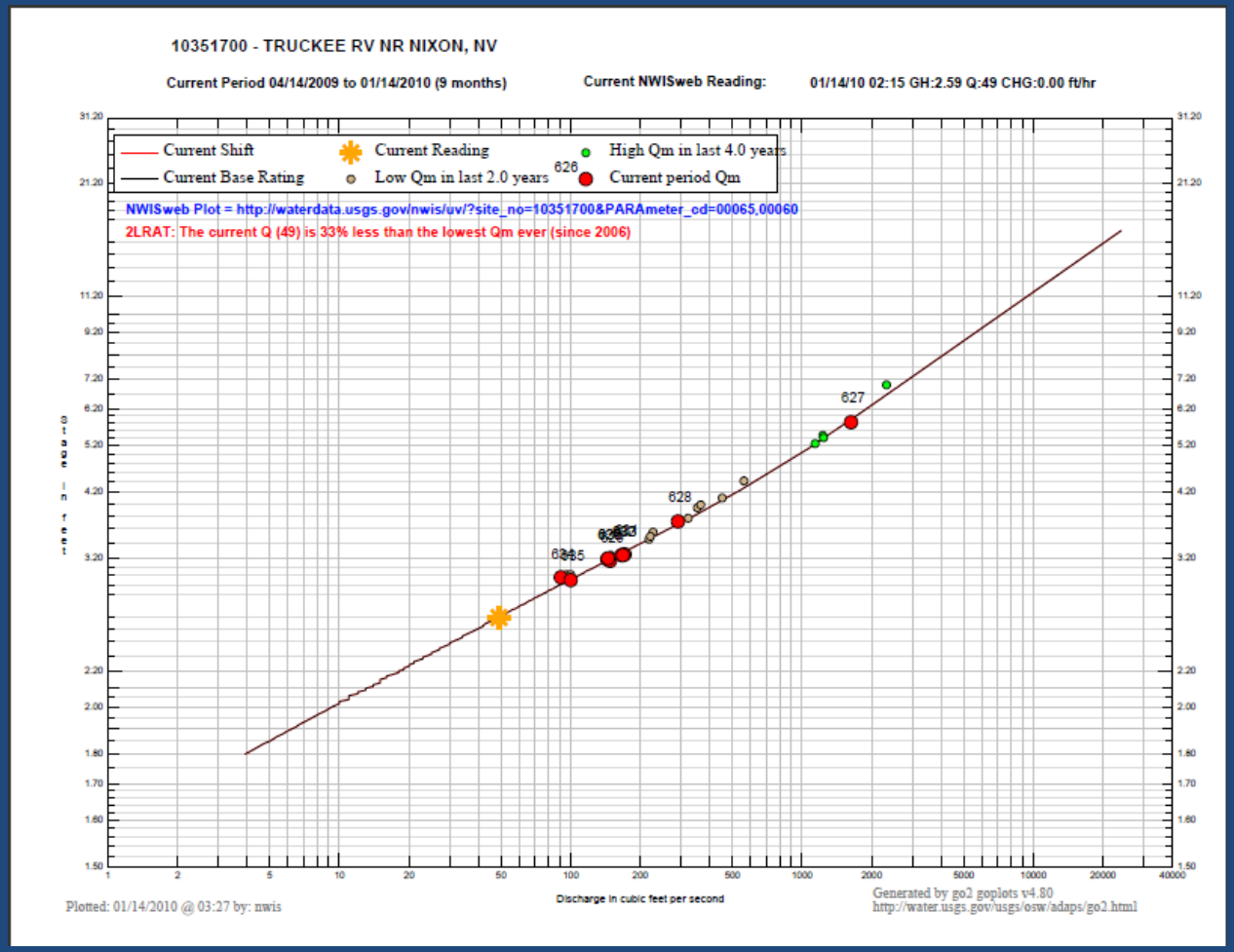
USGS

Go2 tests and evaluates incoming data….

- Time
- Rating
- DCP/Modem
- Spike
- Dam
- Critical Streamflow

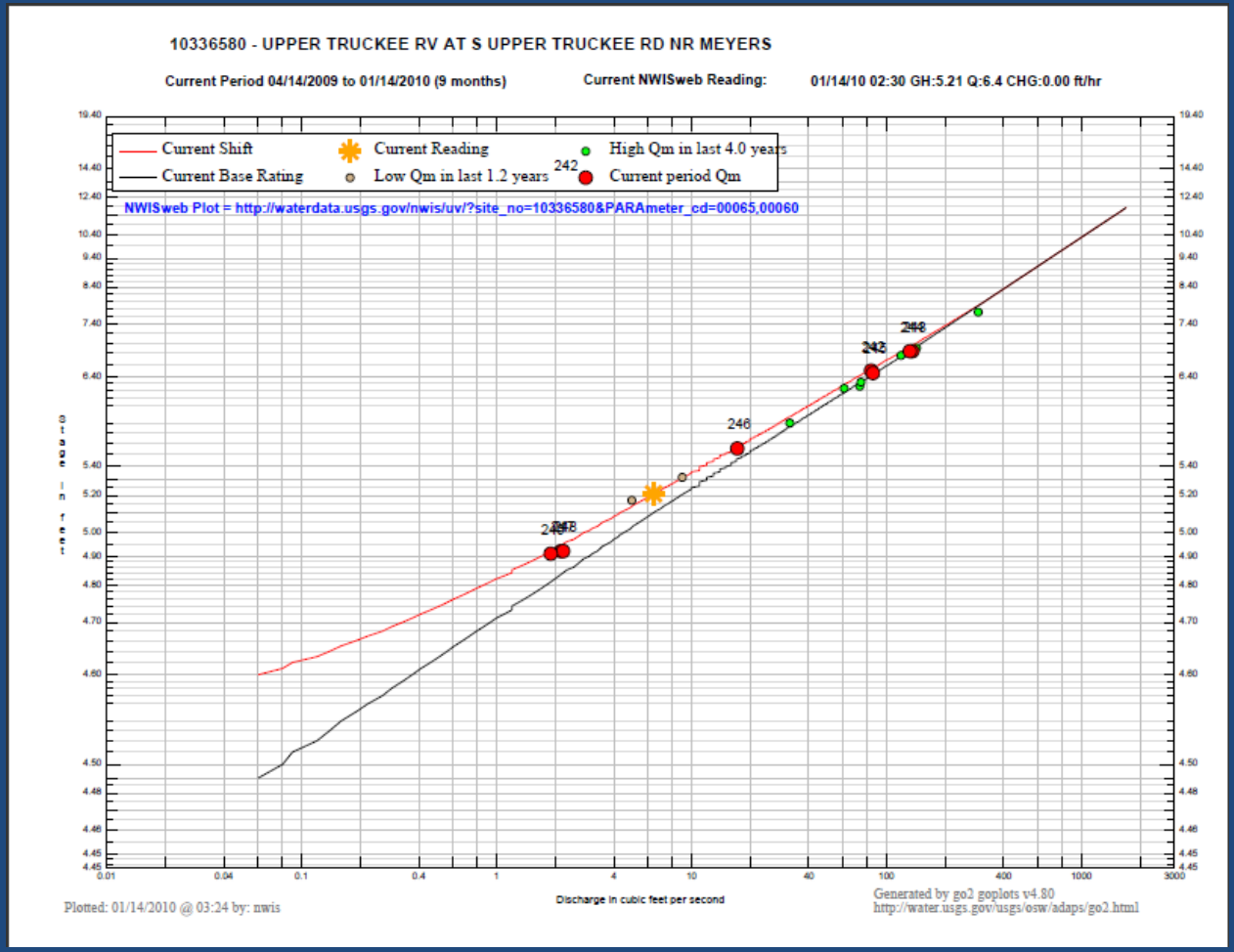
USGS

Go2 plot indicates a measurement is needed



USGS

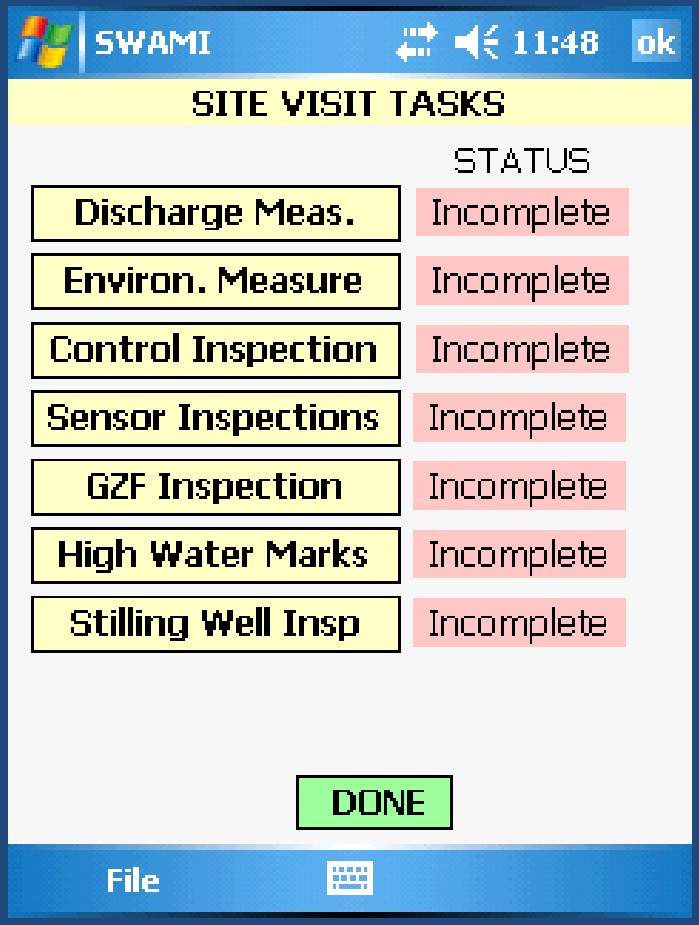
Go2 plot indicates no problems with current stage and discharge



USGS

We're moving toward paperless field documentation with SWAMI….

- SWAMI - Electronic Surface Water Measurement and Inspection Field Form
- Supports
  - Measurements
  - Instrument inspections and readings
  - Control inspections
  - High-water marks
  - Station Levels
  - Air and water temperature (environmental measurements)



USGS

What is SWAMI?

- Field application for recording all aspects of a Surface Water Site Visit using handheld PocketPC or laptop
- Direct collection of measurement data
- Outputs files for direct processing into NWIS via the SiteVisit loader
- Fits vision of SiteVisit system in ADAPS
  - Seamless electronic data collection TO →
  - Complete and automatic data input TO →
  - Data archival

USGS

We're Moving to Seamless input of Field Data to Data Base Using SiteVisit

- Database (29 fields to hundreds) for all aspects of measurements and inspections
- Windows desktop graphical user interface
  - Quick Entry
  - Full editor
  - Reports
- Supports SWAMI/CHIMP field software

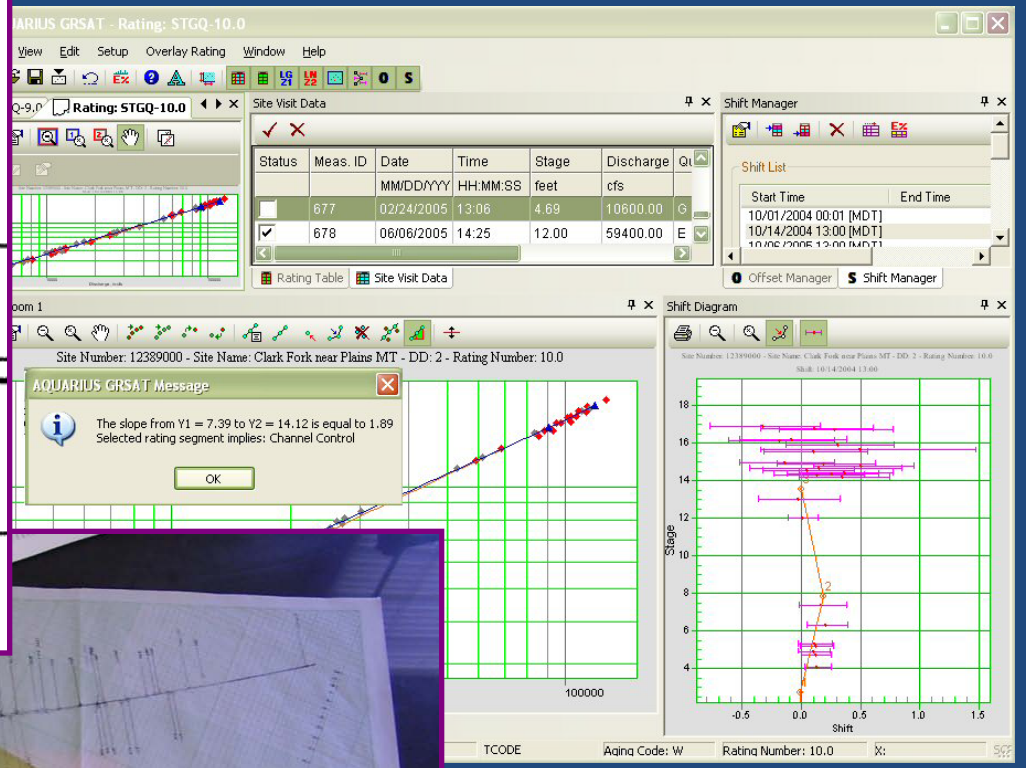
USGS

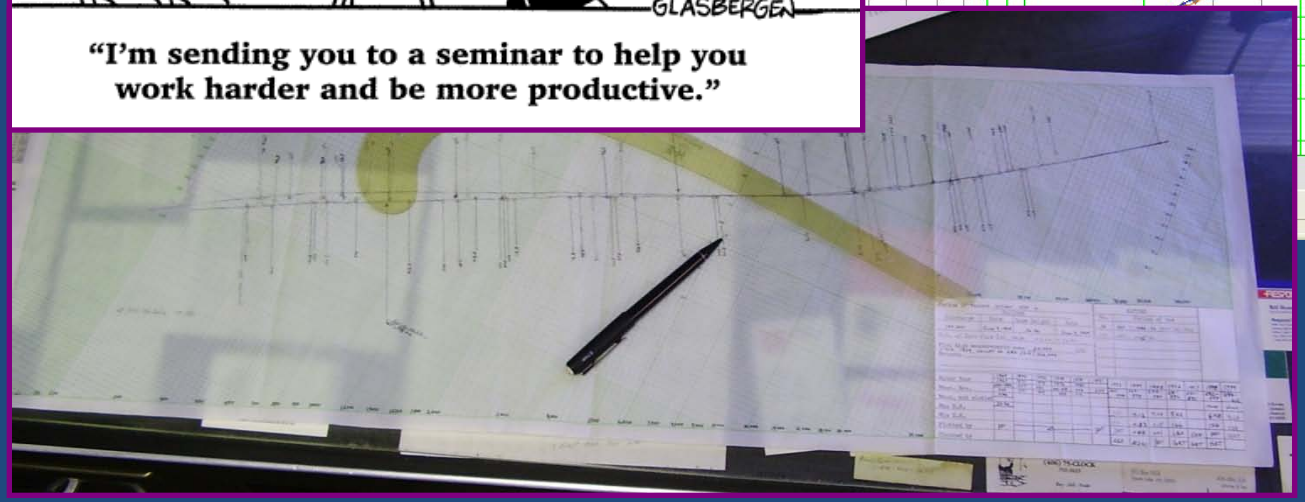
Vision of SiteVisit

- Electronic data collection
  - Direct entry info field computer using SWAMI
  - No paper
- Complete and automatic loading
  - All data into database
  - No hand entry
- Data archival
  - Storage of original data in un-editable file (Measured unit values for site visit data)

USGS

We're moving toward paperless in the office ….ratings and shifts using GRSAT





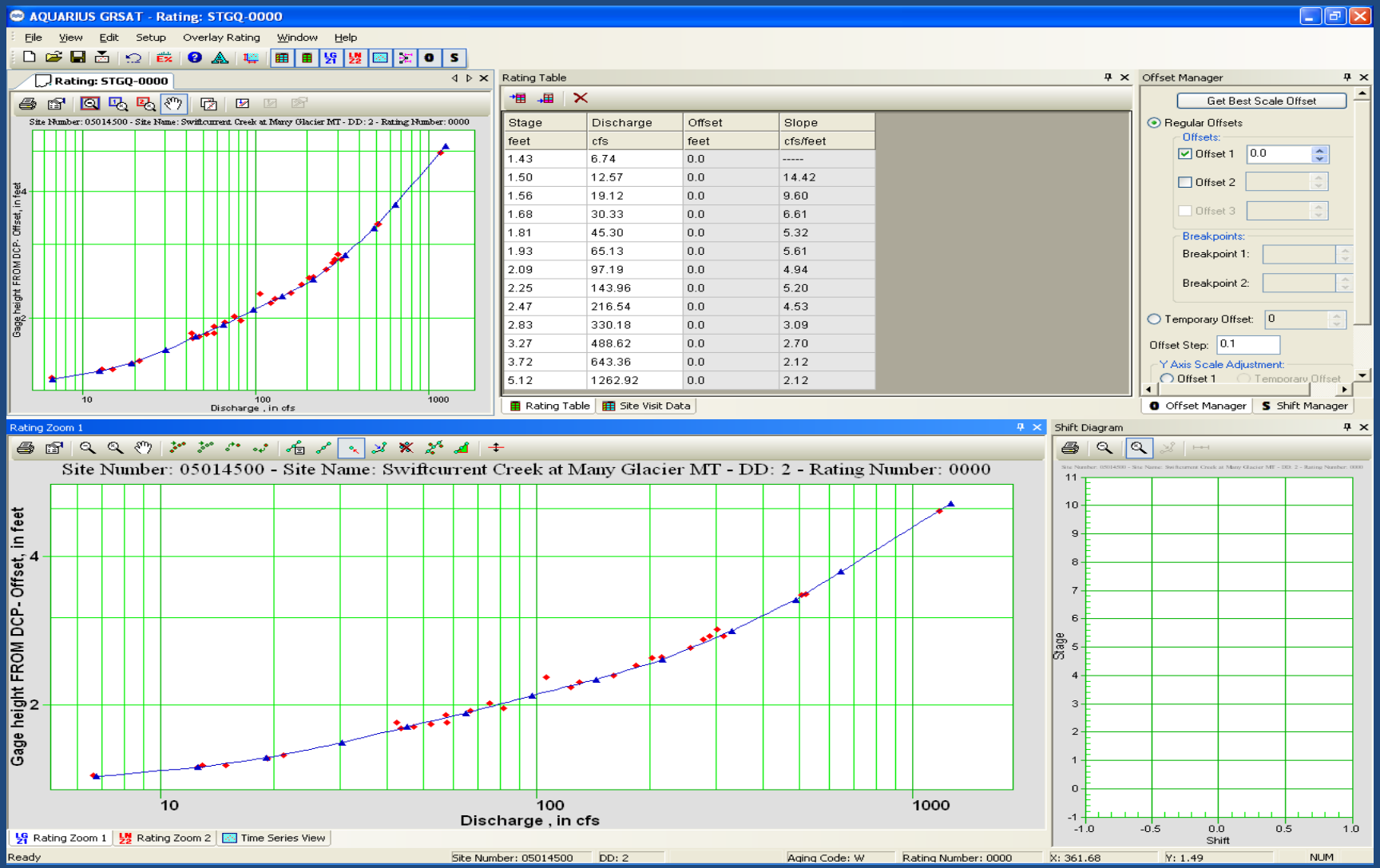
USGS

What does GRSAT do??

- GRSAT – Graphical Rating and Shift Application Tool
- GRSAT enables you to quickly and intuitively develop stage-discharge curves and shift corrections in a digital environment.
- GRSAT is a PC-based application that interacts with NWIS databases to provide a graphical interface to rating and shift development.
- GRSAT follows the standards for rating curves developed by the United States Geological Survey.

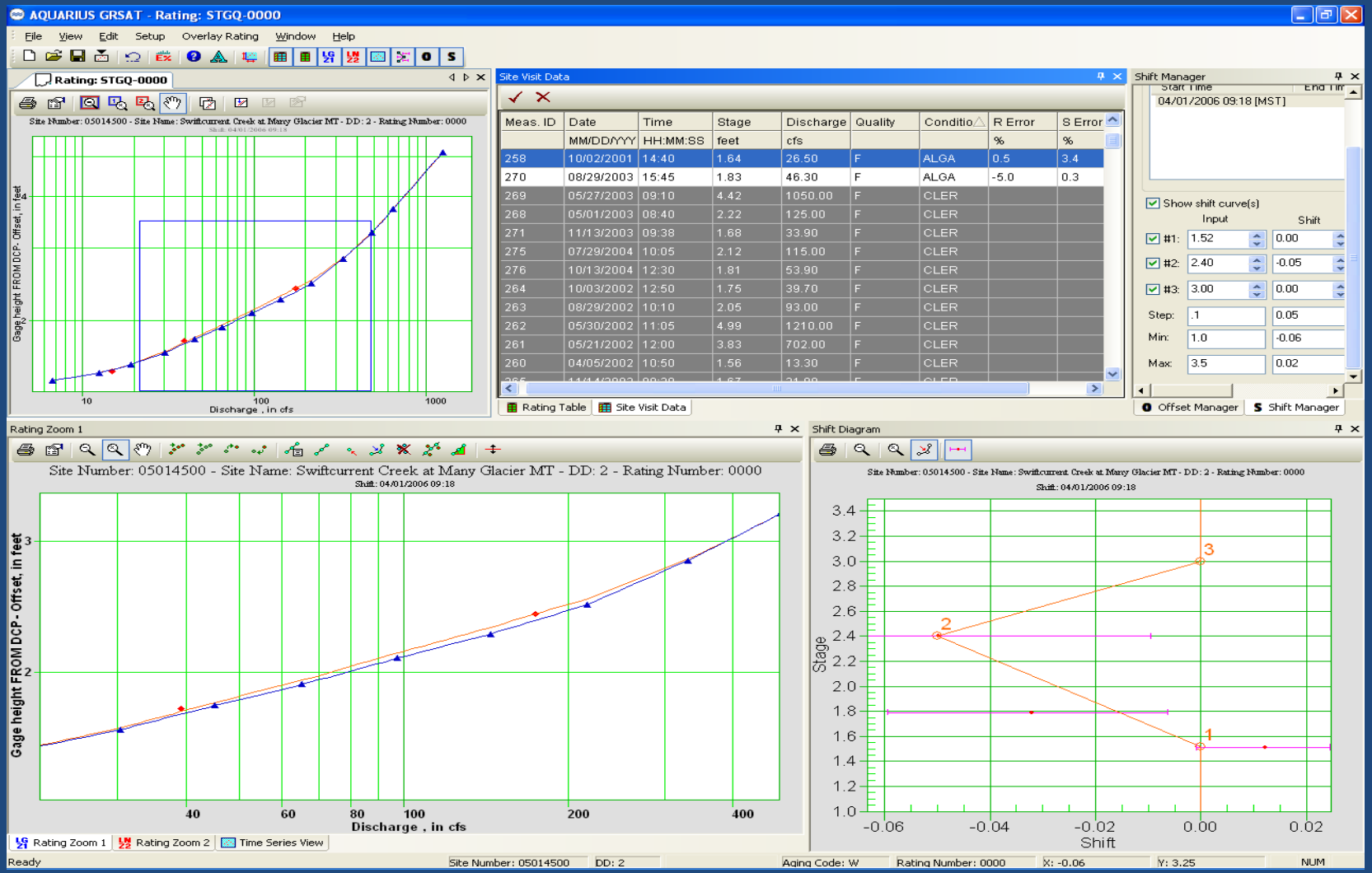
USGS

Using GRSAT for rating development



USGS

Using GRSAT for shift development



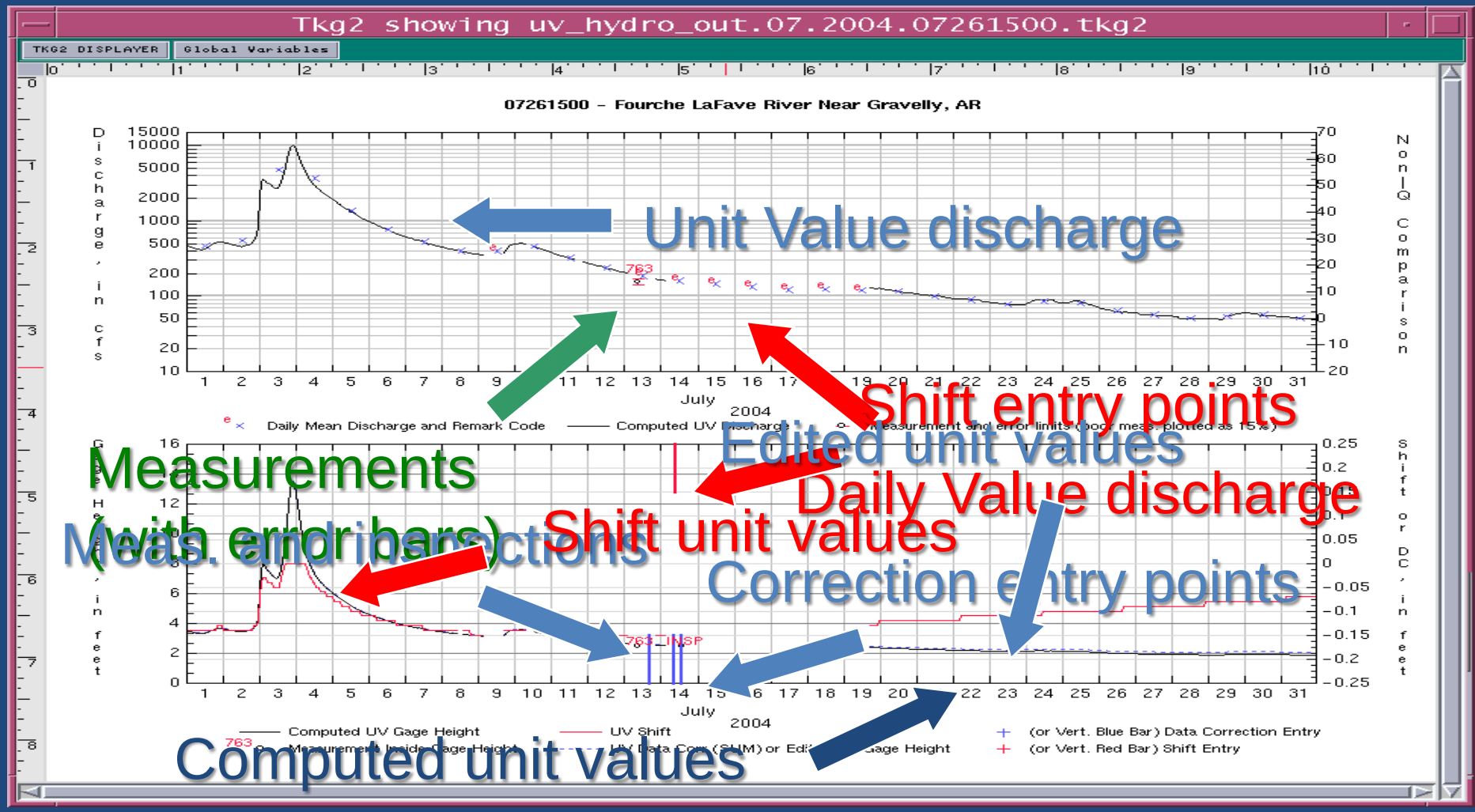
USGS

We're moving toward paperless reviews of streamflow records using SWReview

- SWReview script is a method to facilitate review of surface-water time-series records by retrieval of various graphical plots and ADAPS tables.
- Coupled with the Station Analysis, SWReview output makes a "complete" records package.

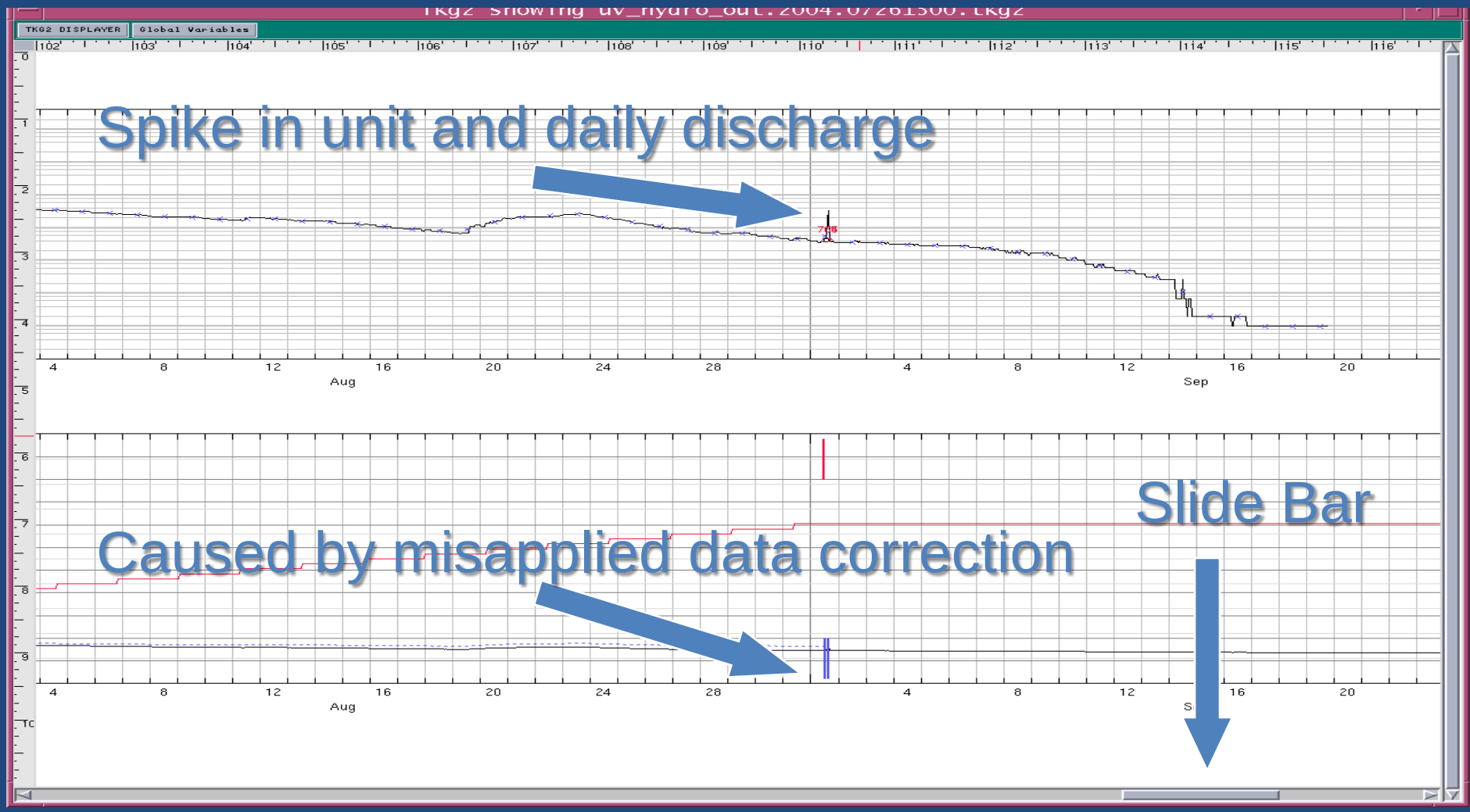
USGS

Monthly Plot

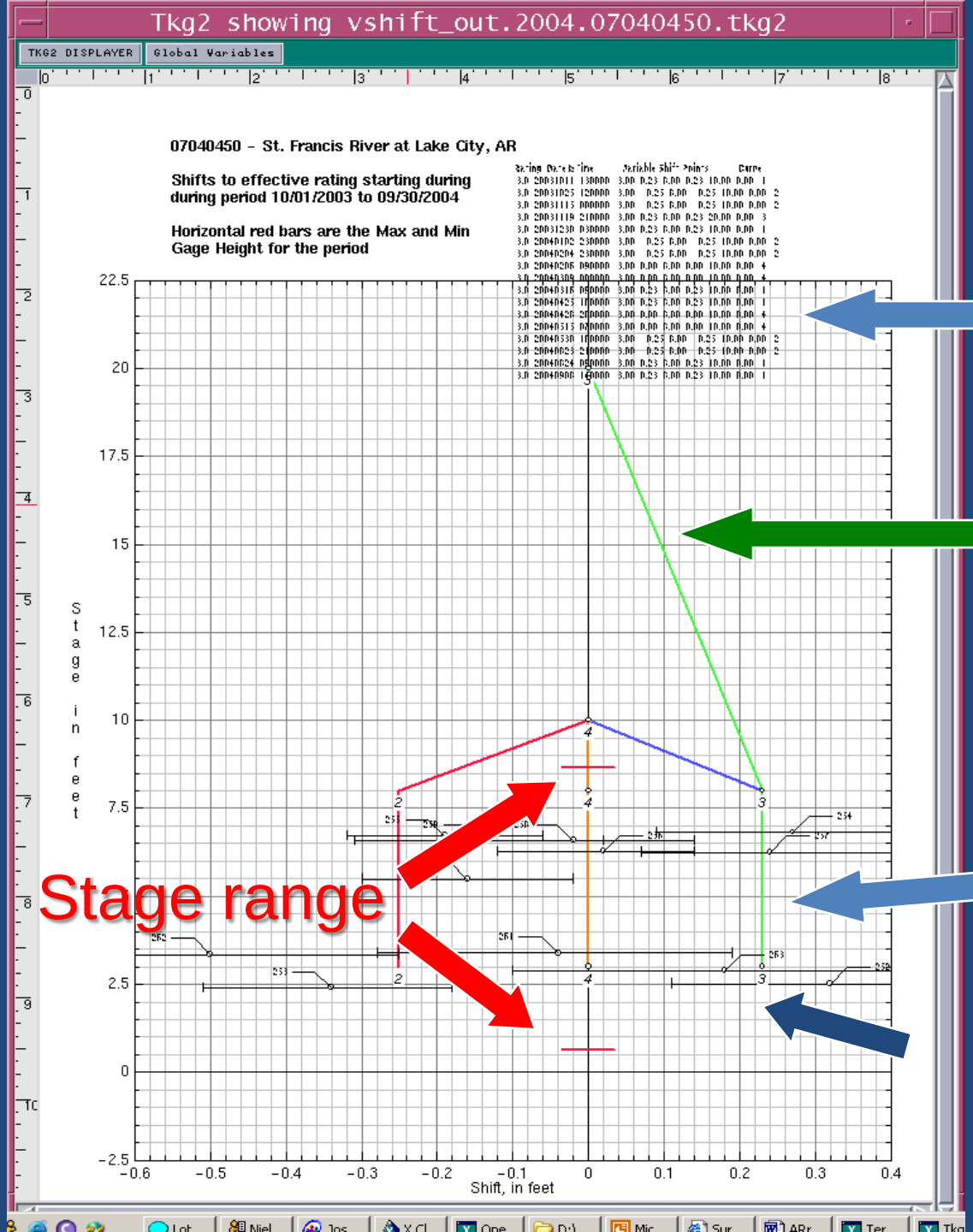


USGS

Annual Plot



USGS



Shift Plot

Shift table

Bad input point

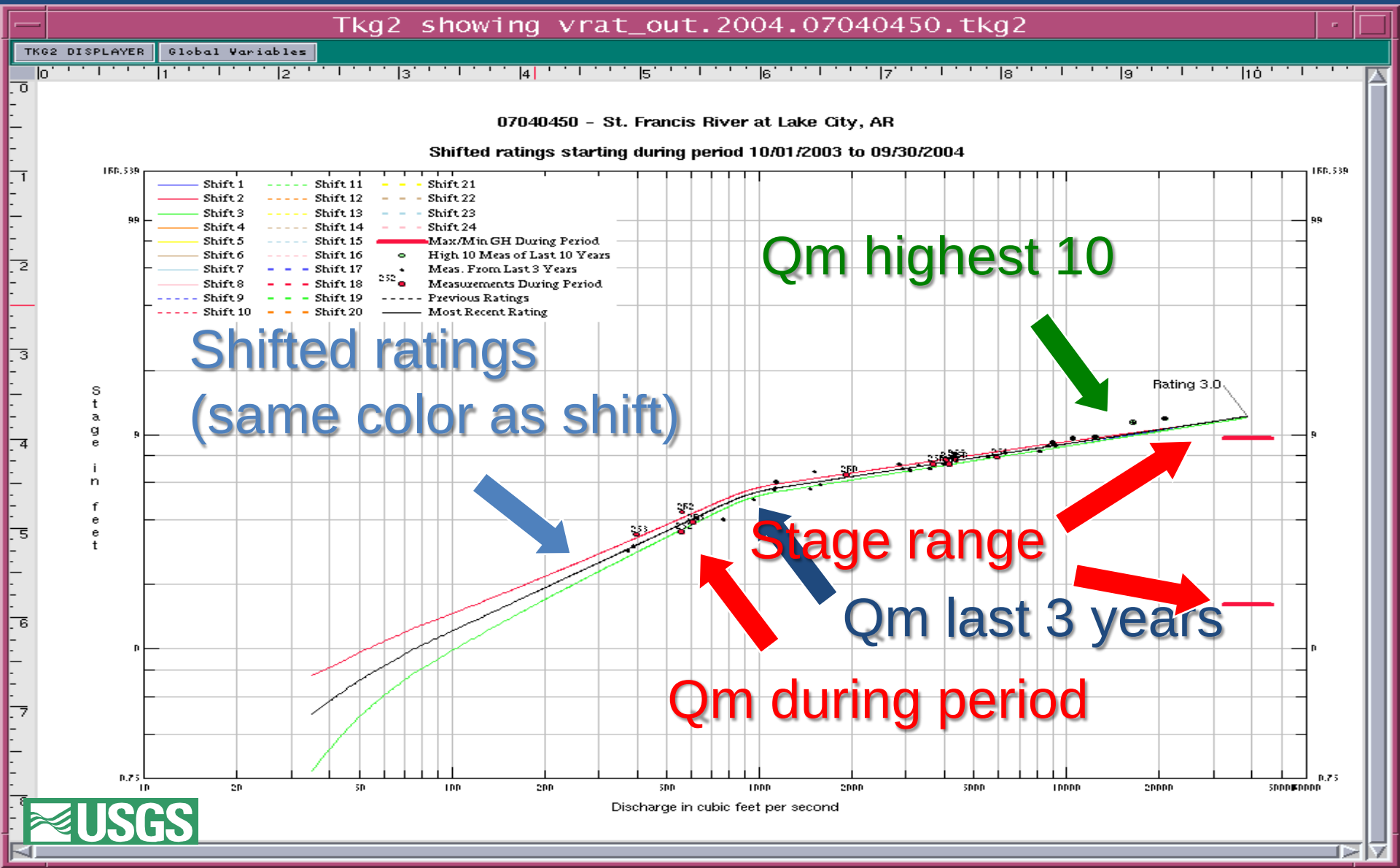
All shifts

Stage range

Qm with error bars

USGS

Rating Plot


Tkg2 showing vrat_out.2004.07040450.tkg2
TKG2 DISPLAYER
Global Variables
07040450 – St. Francis River at Lake City, AR
Shifted ratings starting during period 10/01/2003 to 09/30/2004
Shift 1
Shift 2
Shift 3
Shift 4
Shift 5
Shift 6
Shift 7
Shift 8
Shift 9
Shift 10
Shift 11
Shift 12
Shift 13
Shift 14
Shift 15
Shift 16
Shift 17
Shift 18
Shift 19
Shift 20
Shift 21
Shift 22
Shift 23
Shift 24
Max/Min GH During Period
High 10 Meas of Last 10 Years
Meas. From Last 3 Years
Measurements During Period
Previous Ratings
Most Recent Rating
Rating 3.0
Shifted ratings
(same color as shift)
Qm highest 10
Stage range
Qm last 3 years
Qm during period
Stage in feet
Discharge in cubic feet per second
USGS

Augmented ADAPS Station Analysis

note: Meaurement and peak sections below are added as part of the swreview program and are not supported by NWIS. Please direct comments, questions, or problem reports to GS-W OSW Scripts@usgs.gov

MEASUREMENTS
  Number of measurements - 10
  Number of inspections - 0
    Range of measurement numbers   : #332 to #341
    Range of measured discharge   : 7.86 to 1510.0
    Range of computed discharge   : 2.4 to 15100
    # of DVs 50% over max. meas. Q   : 12
    # of DVs 50% below min. meas. Q : 0
    Range of measured gage height   : 10.43 to 12.71
    Range of computed gage height   : 10.30 to 26.24
    Range of measurement shifts   : -0.02 to 0.12
    Range of percent differences   : -3.6 to 3.6

Measurement info

PEAK DISCHARGE
  Five highest instantaneous discharges for water year 2005:
   note: Only highest discharge shown if multiple peaks occurred on the same day.

Date	Time	Q	Qrem	Qflag	Ght	GHTrem	GHTflag
2004.11.24	033000	12100			24.88		
2004.11.30	153000	10800			23.76		
2004.12.06	200000	15100			26.24		
2004.12.23	003000	10800			23.78		
2005.08.30	050000	12500			25.18		

Peaks

USGS

We're moving to Continuous Records Processing so hydrologic data is quickly approved and finalized

- **Continuous records processing is the collection, analysis, review, and approval of time-series hydrologic data on a continuous (sub-water year) basis. At any given time, the time-series data will be as close to approval as computational methods and hydrologic interpretation will allow.**

USGS

CRP Guiding Principles

- Data Driven
  - This means that streamflow or other time-series information is not approved until the analyst and reviewers are satisfied that the data are ready for **approval and distribution without caveat.**
  - The approval criteria will **depend on the individual site** and its climatic and hydraulic characteristics, the stability of those characteristics, and the field protocols being used at that site.

USGS

CRP Guiding Principles

- Accuracy maintained
  - –High standards of accuracy and precision must be maintained in all data collection and analysis procedures.
  - –The USGS must provide the best data to the public as soon as possible.

USGS

Into the Future….

We're moving to increase our functionality of communicating hydrologic data

Strategic Actions

- *Expand and modernize* USGS monitoring and communications capabilities to take full advantage of technology advances in order to deliver robust and reliable products.

- Develop communication strategies and decision-support products that focus on understanding societal risk and resilience to natural hazards, and *develop new individualized ways* of communicating hazards and hazard assessments to local audiences and to targeted audiences with different needs.

USGS

Immediate Needs

- RTAlert—Streamgage alert notification program using data from NWISWeb
  - Deliver via email & text
  - Must be for SW, GW, QW
  - User defined thresholds
  - Similar to NC WSC system

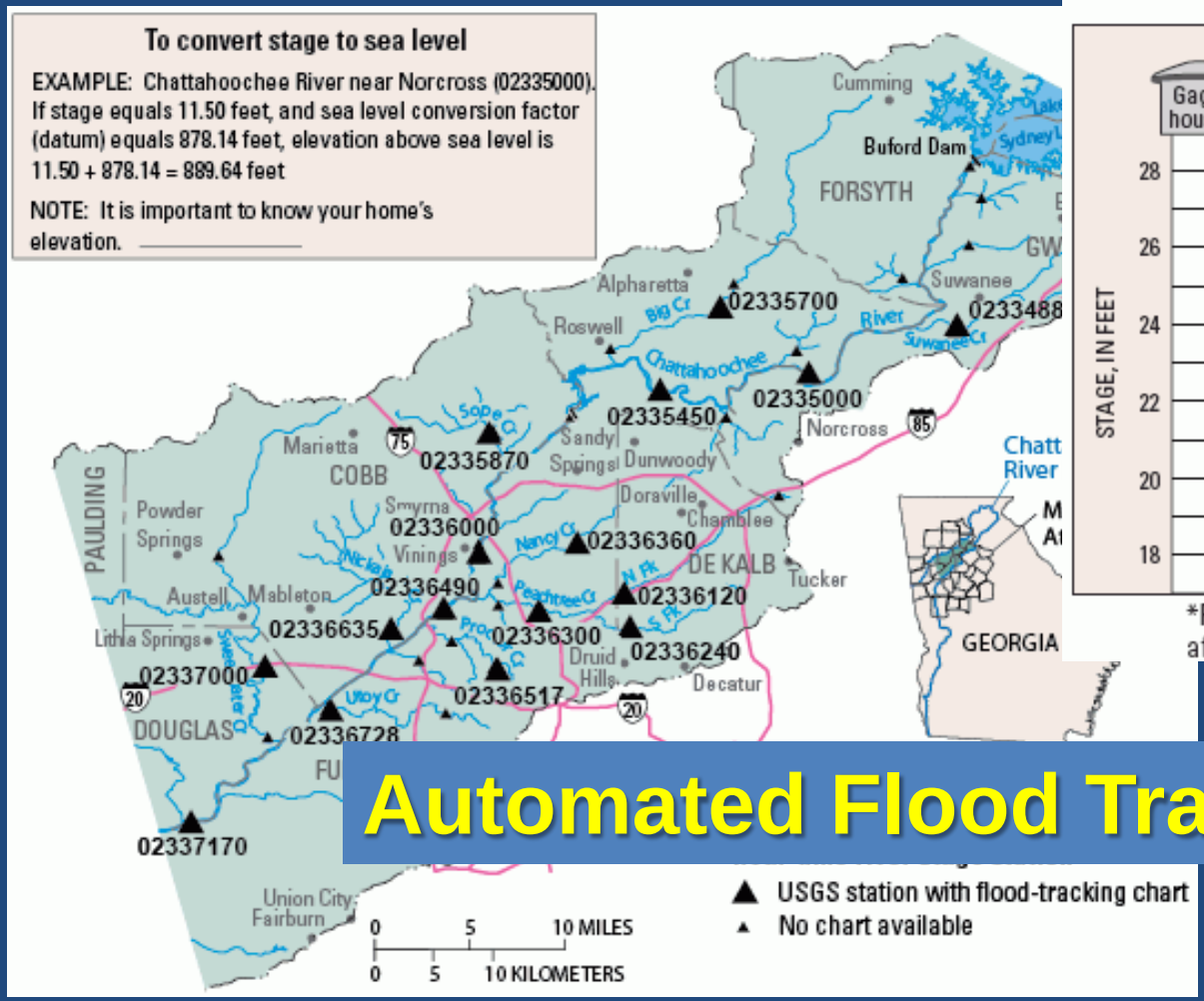
http://nc.water.usgs.gov/alert/

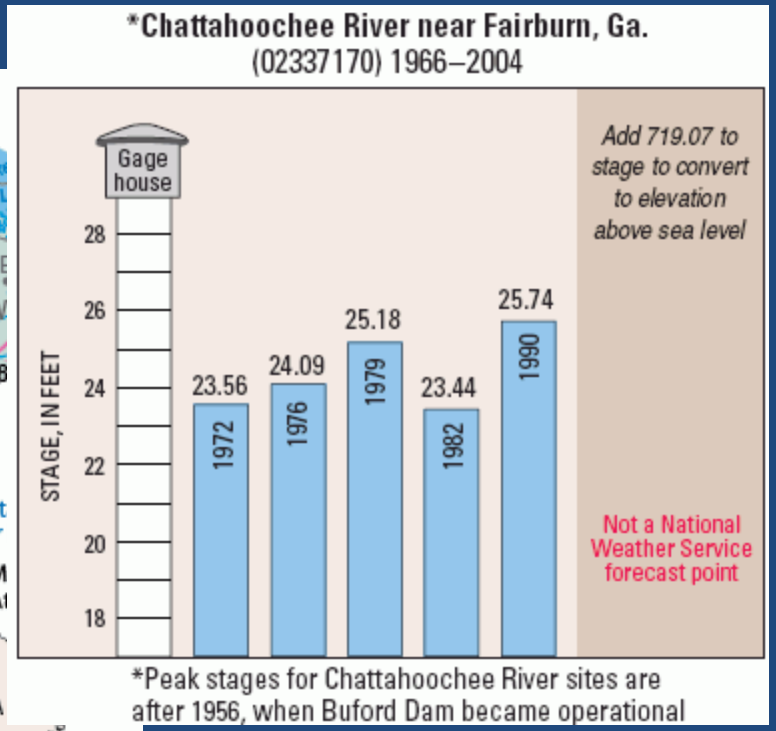
USGS

Immediate Needs

- Alternatives to Web delivery of RT data
  - Media such as Facebook, Twitter, and YouTube
  - National support for Streamail (GaWSC)
  - XM radio and/or GPS delivery to push data to vehicles via satellite
  - Automated voice servers & fax services
  - Create an IT infrastructure convenient to data mining – work with partners including private sector
  - Reverse 911 systems

Intermediate Needs





Automated Flood Tracking Charts

USGS

Intermediate Needs

Blanchard River at Findlay, OH (FDYO1)

Data Type
- (•) Inundation Levels
- ( ) Flood Categories
- ( ) Current/Forecast

Inundation Levels

NAVD88	Stage
772.2	**18.4**
771.8	18.0
770.8	17.0
770.3	16.5
769.8	16.0
769.3	15.5
768.8	15.0
767.8	14.0
766.8	13.0
Major Flooding Begins	
765.8	12.0

To see all current watches and warnings, **click here**

2500 5000 10000 Feet

Inundation mapping

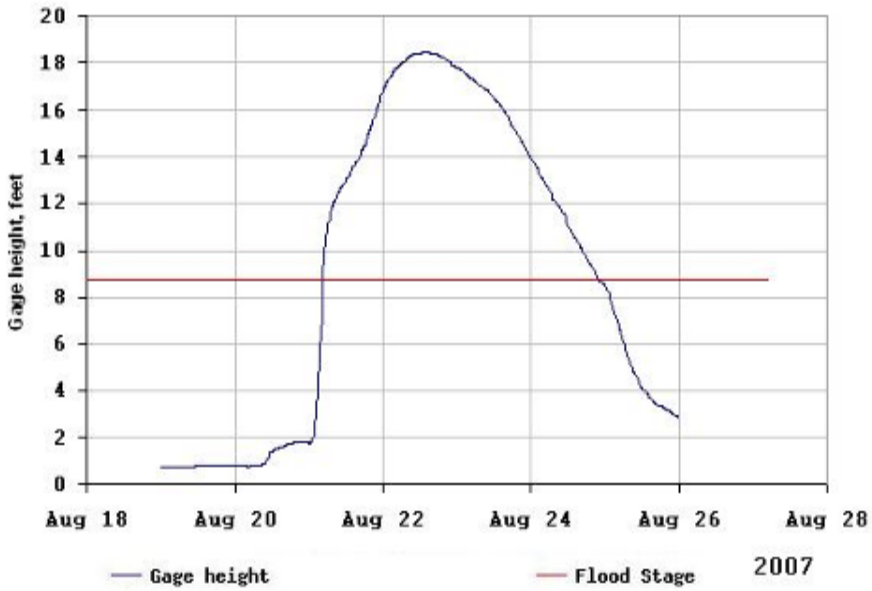
Chance of Exceeding Levels During Entire Period

Image Type: (•) Standard (Faster Download) ( ) Detailed (Slower Download)

Current Stage: 1.60 ft at 20:00 UTC 04/28

USGS

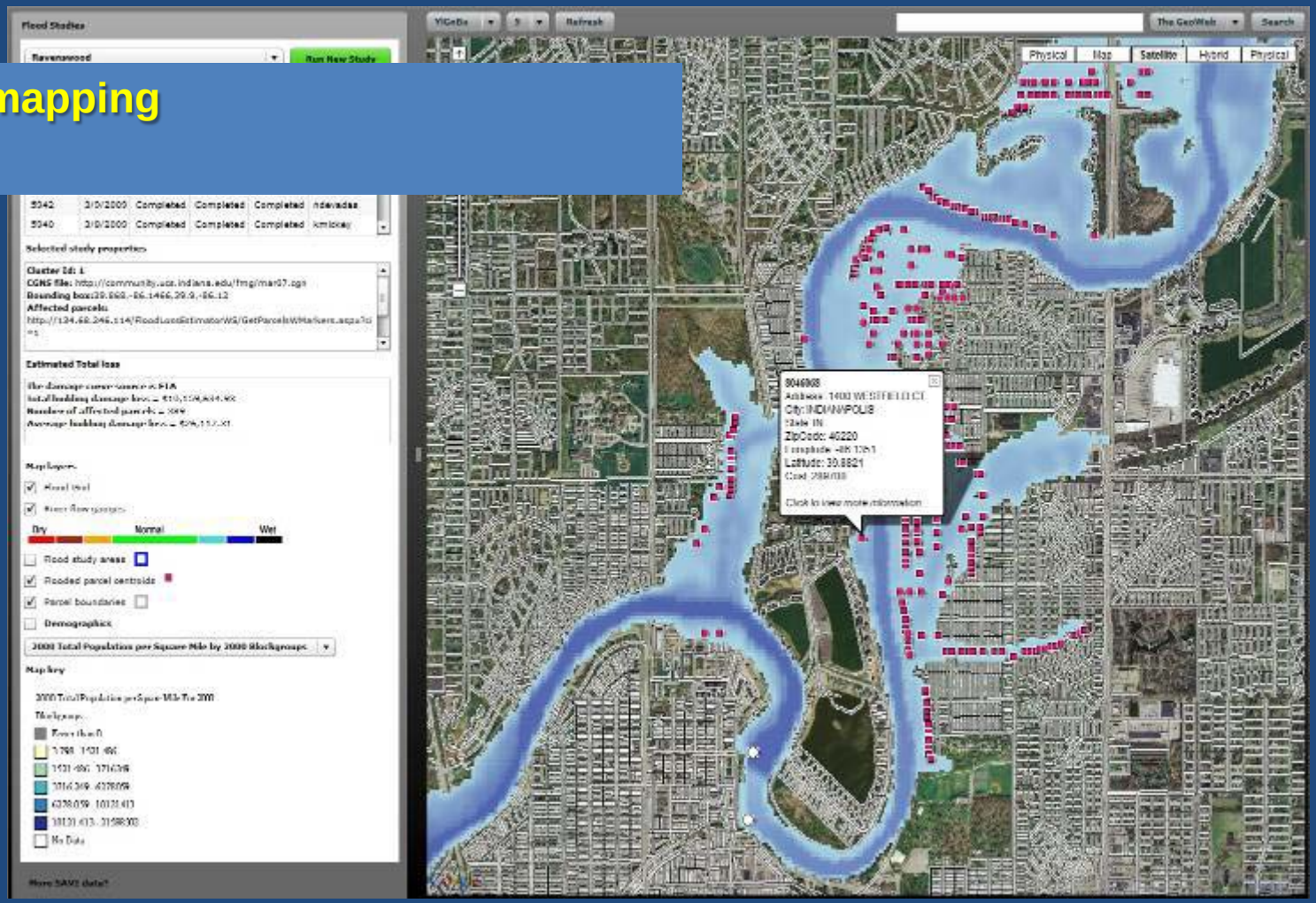
USGS 04189000 Blanchard River near Findlay OH



USGS

Intermediate Needs

Inundation mapping



USGS

Moving to the Future of Hydrologic Data Processing

"Old Streamgagers Never Die…..

USGS