

Corps Water Management System

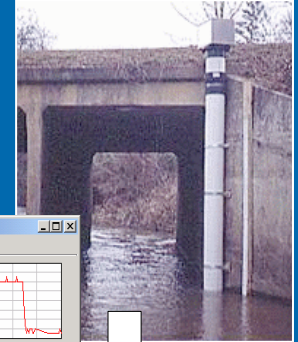
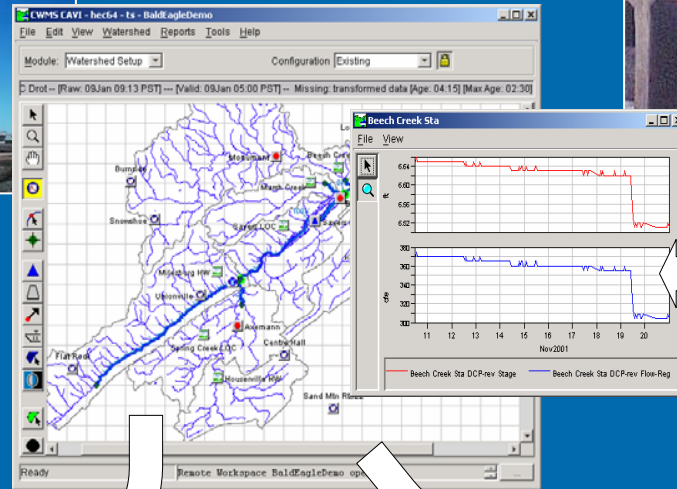
CWMS and RiverWare



US Army Corps of Engineers
Hydrologic Engineering Center

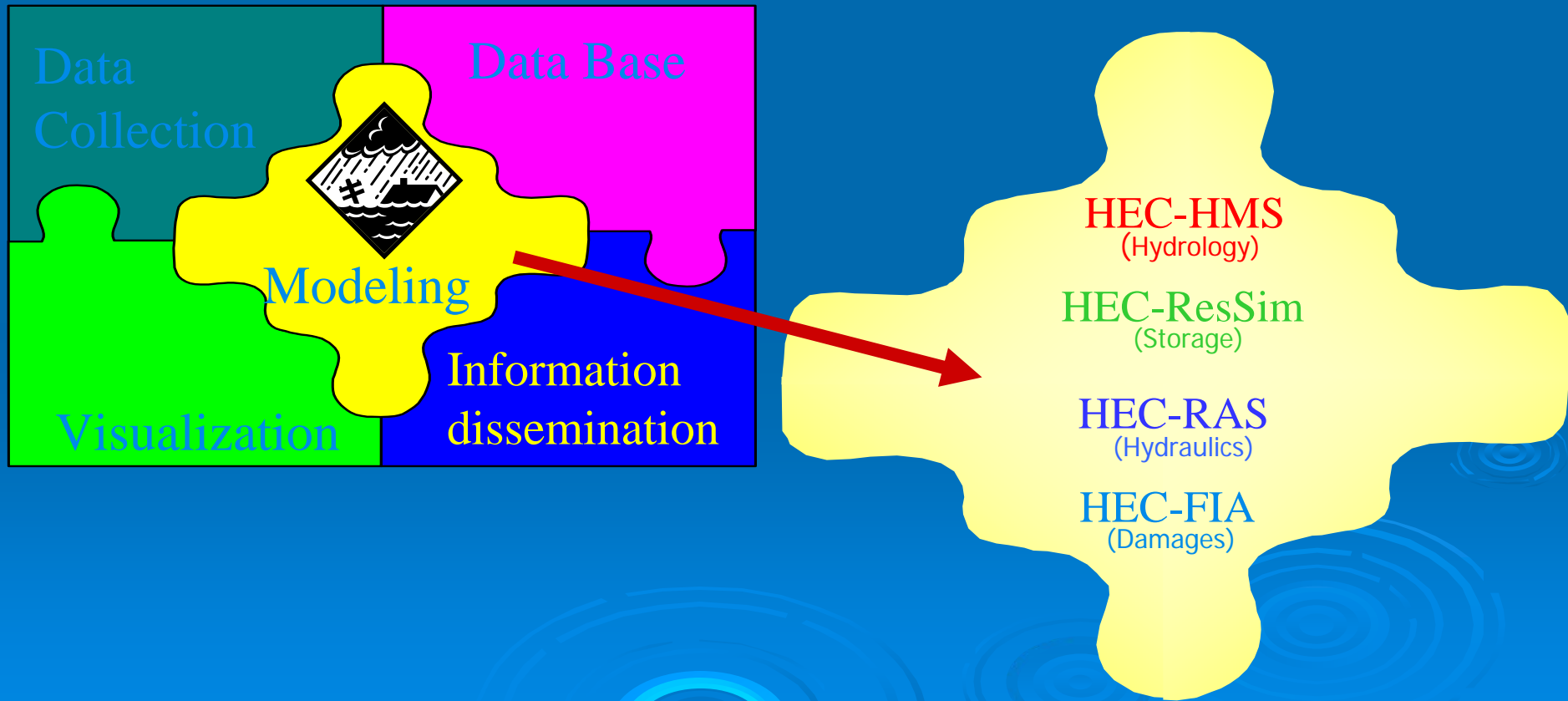
Corps Water Management System (CWMS)

- Comprehensive, integrated system for real-time water control decisions
 - Collect data from remote gauges
 - Quality assurance, database, data visualization
 - Complete simulation modeling for decision support
- Implemented at all 42 Corps offices with water control missions



CWMS - Model Integration

CWMS is an integrated suite of real-time water resources software.



CWMS Models

- HEC-HMS - Hydrologic Modeling System
 - Computes streamflow throughout a river basin given precipitation (such as NexRad radar rainfall) and watershed runoff characteristics.
- HEC-RES – Reservoir Evaluation System
 - Simulates reservoirs' operations throughout a river basin given streamflows and operating rules for at-site and downstream flow limitations.
- HEC-RAS – River Analysis System
 - Computes river velocities, stages, and inundated areas given streamflow and river/floodplain geometry and hydraulic characteristics.
- HEC-FIA – Flood Impact Analysis
 - Computes damages to structures and other contents of the floodplain, including environmental, given river stages and damage relationships.

Integrating RiverWare into CWMS

Corps Water Management System



US Army Corps of Engineers
Hydrologic Engineering Center

Participants

➤ Corps district offices

- Ft. Worth
- Little Rock
- Albuquerque
- Tulsa
- KansasCity

➤ CADSWES

- RiverWare Dev. Team

➤ HEC

- CWMS Dev. Team

Activities to Date

- 2 Meetings
 - May 2004 at HEC to launch and set goals
 - August 2004 at CADSWES to discuss technical issues
- Functional Requirements Statement
- High-Level design document with cost estimates

Requirement Highlights

- **RiverWare – DSS interface**
- Include RiverWare in list of available models
- Add Pre-configured CWMS icons for RiverWare objects
- Utilize DSS-Vue Graphical Time-series editor for RiverWare input time-series data
- Execute RiverWare as part of CWMS forecast
- Access RiverWare user interface from CWMS
- Provide RiverWare-specific plots and reports in CWMS

Design Highlights

- RiverWare generated Object-Slot list
- RiverWare native DMI for HEC-DSS data
- CWMS modifications to support Add-ins for integration of “Other” models
 - Framework for Model Specific Icons, Plots, Reports, Editors, Model Integration and Execution, and access to Model GUI.
- CWMS team development of RiverWare Add-in.
 - Implementation of Model Specific Icons, Default Plots for Subset of Riverware Object Types, Standard Reports
 - Script to run RiverWare within program sequence
 - Script to access RiverWare Editor for model objects.

ResSim: Tightly Integrated

The screenshot displays the CWMS CAVI - HEC65 V1.3 q0pd - NorthBranch_PS10 software interface. The window title is "CWMS CAVI - HEC65 V1.3 q0pd - NorthBranch_PS10". The menu bar includes File, Edit, View, Forecast, Reports, Tools, and Help. The Module dropdown is set to "Model Interface".

The main display area shows a map of a river system with several reservoirs. A context menu is open over a reservoir labeled "ResSim". The menu items are:

- Edit Reservoir: Jennings Randolph
- Plot
- Plot Power
- Plot Releases
- User Plots
- Release Decision Report

The map shows a river network with labels such as "WESTVACD", "Luke", "Westernport", "Piedmont", "Randolph", "Deep Run", "116K", and "5K". A red line indicates a forecast path, and a blue line indicates a lookback path. The coordinates at the bottom are "-290327 east, 4090645 north". A status bar at the bottom indicates "Remote Workspace NorthBranch_PS10 opened".

On the right side, there is a "Model Interface" panel with the following information:

- Forecast: 30 Jul 2001, 1700
- Lookback: 27 Jul 2001, 0600
- End: 01 Aug 2001, 2300
- Time Zone: GMT-05:00
- Current: 23 Sep 2004, 11:16:22

Below this information is a section for "30Jul2001,1700 GMT-05:00" with the following options:

- Daily Forecast - Normal Ops
- Storm - Normal Ops
- 4 in storm + Train Wreck
- 7DNBE

There is a "Compute Storm - Normal Ops" button and a "Scripts" section below it.

RiverWare Object Icons

The screenshot displays the RiverWare software interface. The main window, titled "CWMS CAVI - HEC65 V1.3 q0pd - NorthBranch_PS10", shows a map of a river network with various locations labeled, including Savage, WESTVA CO - L, Piedmont, New Creek, 50K, Wills Creek, Cumberland, Ridgely, MD Rural - D, Pinto, WV Rural - DS, MD Rural - D, and WV Rural - Pinto. A green arrow points from a location on the map to a detailed view in the "Graphical Editor" window.

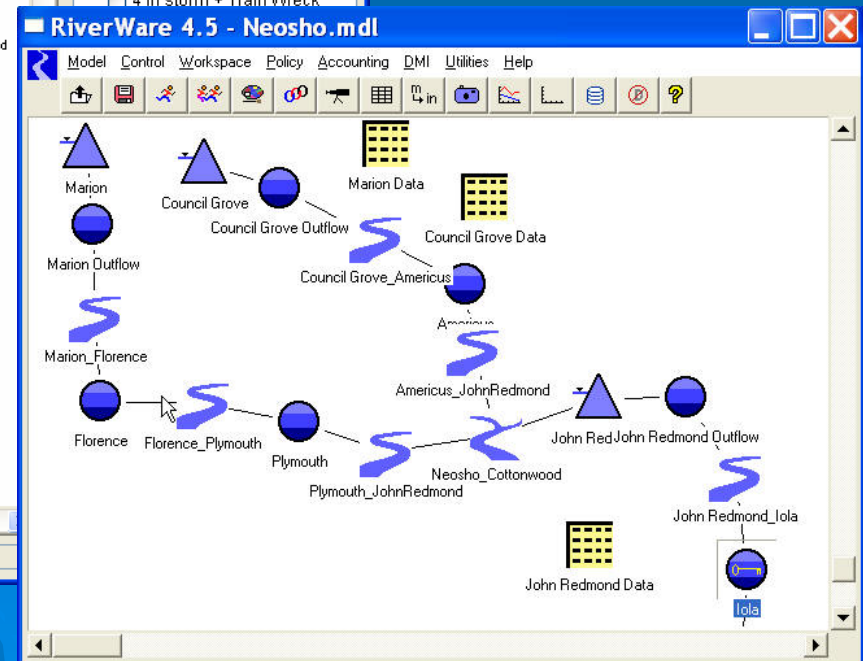
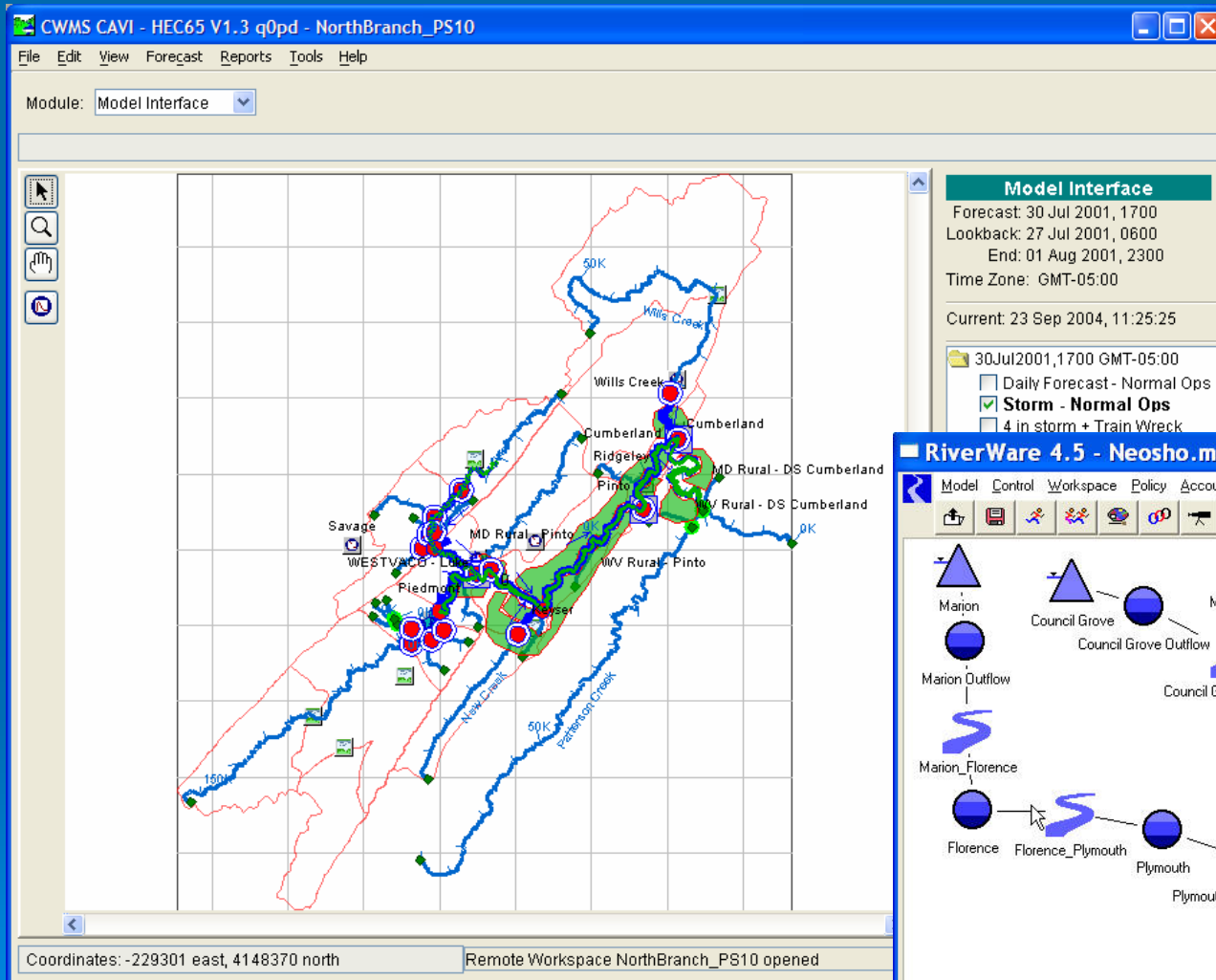
The "Graphical Editor" window shows a hydrograph plot of Stage (ft) versus time (Feb 2004). The plot displays a blue line representing the stage over time, with a shaded area indicating the observed data. The stage starts at approximately 7.6 ft on Feb 13, drops to about 7.4 ft on Feb 15, and then fluctuates between 7.2 ft and 7.4 ft through Feb 24.

Below the plot is a data table with the following columns: Date/Time, Original (ft), Estimate/Entry (ft), Revised (ft), and buttons for Estimate, Estimate All, Accept, Accept All, Add, and Delete.

Date/Time	Original (ft)	Estimate/Entry (ft)	Revised (ft)	
12Feb2004, 12:00	7.62	--	7.62	Estimate
12Feb2004, 13:00	7.62	--	7.62	Estimate All
12Feb2004, 14:00	7.62	--	7.62	Accept
12Feb2004, 15:00	7.62	--	7.62	Accept All
12Feb2004, 16:00	7.62	--	7.62	Add
12Feb2004, 17:00	7.61	--	7.61	Delete
12Feb2004, 18:00	7.61	--	7.61	
12Feb2004, 19:00	7.61	--	7.61	
12Feb2004, 20:00	7.62	--	7.62	
12Feb2004, 21:00	7.61	--	7.61	
12Feb2004, 22:00	7.62	--	7.62	

At the bottom of the main window, the coordinates are -255232 east, 4060984 north, and the status bar indicates "Remote Workspace NorthBranch_PS10 opened".

Launch RiverWare GUI



Utilize HEC-DSSVue for RiverWare Input Time-Series Data

HecDssVue

File Edit View Display Utilities Help

File Name: C:\Program Files\HEC\HecDssVue\...
Pathnames Shown: 17 Pathnames Selected: 0

Search A:
By Parts: B:

Number	A part	B part
1	GREEN RIVER	GLENFIR
2	GREEN RIVER	GLENFIR
3	GREEN RIVER	GLENFIR
4	GREEN RIVER	OAKVILLE
5	GREEN RIVER	OAKVILLE
6	GREEN RIVER	OAKVILLE
7	GREEN RIVER	OAKVILLE
8	GREEN RIVER	OAKVILLE
9	GREEN RIVER	OAKVILLE
10	GRFFN RIVFR	WVAI NIIT

Select De-Select Clear

No time window set.

Graphical Editor

File Edit View

Selected Data Set: /GREEN RIVER/OAKVILLE/ELEVATION/01 MAY1992/1 HOUR/OBS/

Flow (CFS)

ELEVATION (FEET)

May1992

OAKVILLE OBS FLOW-RES OUT

OAKVILLE OBS ELEVATION

Date/Time	Original (FEET)	Estimate/Entry (FEET)	Revised (FEET)
01May1992, 02:00	912.37	--	912.37
01May1992, 03:00	912.37	--	912.37
01May1992, 04:00	912.35	--	912.35
01May1992, 05:00	912.35	--	912.35
01May1992, 06:00	912.33	--	912.33
01May1992, 07:00	912.29	--	912.29
01May1992, 08:00	912.29	--	912.29
01May1992, 09:00	912.29	--	912.29
01May1992, 10:00	912.27	--	912.27
01May1992, 11:00	912.27	--	912.27
01May1992, 12:00	912.27	--	912.27

Estimate
Estimate All
Accept
Accept All
Add
Delete

DSS-View Add-Ons

The screenshot displays the HecDssVue application window with the following details:

- File Name:** C:\Program Files\HEC\HecDssVueBeta\sample.dss
- Pathnames Shown:** 17 | **Pathnames Selected:** 0 | **Pathnames in File:** 32 | **File Size:** 90 KB
- Search:** A: [] C: [] E: []
- By Parts:** B: [] D: [] F: []

The main data table in the background is as follows:

Number	A part	B part	C part
1	GREEN RIVER	GLENFIR	FLOW
2	GREEN RIVER	GLENFIR	FLOW
3	GREEN RIVER	GLENFIR	PRECIP-IN
4	GREEN RIVER	OAKVILLE	AIRTEMP
5	GREEN RIVER	OAKVILLE	ELEVATIO
6	GREEN RIVER	OAKVILLE	FLOW-RE
7	GREEN RIVER	OAKVILLE	PRECIP-IN
8	GREEN RIVER	OAKVILLE	STAGE-O
9	GREEN RIVER	OAKVILLE	STORAGE
10	GRFFN RIVFR	WVAI NIIT	FI OW-RE

The **USGS Download** dialog box includes:

- Start Date:** []
- End Date:** []
- Get Data** column with checkboxes:
- USGS Station ID** column
- Select All** and **Deselect All** buttons
- Get Data** button

The **Obtain stations by state** sub-dialog box features:

- Select State:** California
- Sort by Name** | **Sort by Station ID**
- OK** and **Cancel** buttons

At the bottom of the HecDssVue window, there are buttons for **Select**, **De-Select**, **Clear Selection**, and a status bar indicating **No time window set.**

Review Points

- CWMS – Corps Water Management System
- RiverWare Integration Project
 - Add a Native DMI to RiverWare for accessing HEC-DSS time-series data. Also, develop the means to produce an Object-Slot list of an active Model File for use as an interface to CWMS.
 - Make RiverWare one of the models available for use in an CWMS integrated watershed modeling sequence.
 - Facilitate RiverWare model-data I/O in CWMS through:
 - Default Plots and Reports
 - DSS-Vue Graphical Editor
 - RiverWare GUI