VI.5.4-XNAV INFORMIX DATABASE, GRIDDED DATA AND OFS PROCESSED DATA
            BASE DISPLAY PROGRAM (XNAV)

Purpose

Program XNAV is a graphical program used to display:

   o data in the Informix database
   o HRAP gridded data in XMRG format
   o point and area data in the Operational Forecast System (OFS)
     Processed Data Base
   o spatial data in a text file format

Main Features

Program XNAV displays:

   o Boundary and point features to give a geographic description of
      the area. The available map overlays are:

      Boundaries:
        River Forecast Center (RFC)
        States
        Counties
        Basins
        County Warning Areas (CWAS)
        Forecast Groups
        Rivers
        Snow Flight Lines
        HRAP Grid
        Radar Umbrellas

      Points:
        County Names
        Basin Identifiers
        Town Names
        Precipitation Data Points (PP or PC)
        Hydro Data Points (HG, HT, HP and OFS Segments)

   o radar precipitation values from xmrg files
   o gage precipitation values from the Informix database
   o RFC QPF FMAP as basin polygons and HRAP grid values
   o WFO QPF FMAP as basin polygons and HRAP grid values
   o Flash Flood Guidance (FFG) as county polygons and HRAP grid
      values
   o Thresh-R values used in FFG
   o other PE data from the Informix database
   o point or area data from the OFS Processed Data Base
   o thematic data in a text file format

Program Description

XNAV's main window (Figure 1) consists of a menu bar and the display

area. Most of XNAV's features are accessed through the menu bar's
options. The results from pressing these buttons are shown in the
display area.

When XNAV is started, the boundary and point features to be displayed
are determined by checking the following apps_defaults tokens:

```
xnav_rfc              :  RFC boundary
xnav_states           :  state boundaries
xnav_counties         :  county boundaries
xnav_cwas             :  CWAS boundaries
xnav_basins           :  basin boundaries
xnav_fgroups          :  Forecast Group boundaries
xnav_rivers           :  rivers
xnav_flights          :  snow flight lines
xnav_grid             :  HRAP grid
xnav_radars           :  radar umbrellas
xnav_hydro_segments   :  OFS Segment hydro data points
```

Whether Informix and OFS data are loaded when XNAV is started is
determined by the value of the load_db_on_boot and load_ofs_on_boot
apps_defaults tokens.

Control Menu

The Control Menu provides options for controlling the display area
(**Restore Image**, **Center Image**, **Zoom -> Zoom In**, **Zoom -> Zoom Out**),
loading the data (**Load Data -> Informix**, **Load Data -> OFS**), saving
the contents of the display to a GIF file (**Save as GIF**) and exiting
XNAV (**Quit**).

The **Zoom In** option reduces the extent of the initial display.
Pressing **Zoom -> Zoom In** displays a menu. Using the menu's options
the user can either:
   o draw a box in the display area and zoom into this area by
      pressing the box option or
   o zoom into the center of the display at a 2, 5, 10 or 20 times
      magnification by moving the cursor to where to zoom to and
      clicking the left button

The **Zoom Out** and **Restore Image** options return the display to its
initial settings. **Zoom Out** resets the extent of the display to the
default setting. **Restore Image** resets the extent and boundary
overlays to the ones shown when XNAV is started.

If the Informix and OFS data are not loaded when XNAV is started, the
Control menu's **Load Data** option loads the data. Loading OFS
automatically loads Informix. If the OFS Rating Curve identifier
does not match the Informix HB5 identifier under which the stage data
arrives, a file can be used to associate the Rating Curve and
Informix HB5 identifiers (see VI.5.4-XNAV-PARM). The file is located
in the directory specified by the xnav_params apps_defaults token and
the file name is specified by the xnav_exception_file apps_defaults
token.

After loading the data, the control menu's **Flood Check** option is available. This option uses flood stage values defined in the OFS database to check Informix and tell whether any sites are above the flood or action stage. Any sites above flood or action stage are shown in a different color when the sites with discharge data are displayed (Overlays Menu). Whether the **Flood Check** option is done when XNAV is started is controlled by the check_flood_on_boot apps_defaults token.

Overlays Menu

The Overlays menu allows the user to add and remove boundary layers, display the area's HRAP grid and display the location of sites with precipitation and discharge data. The user can choose to view all the sites with data or reduce the number of points by specifying a single type of precipitation or discharge physical element. For example, PC and PP precipitation data sites or HG, HT, HP and OFS Segment sites with discharge data can be viewed separately.

The following symbols are used to display the locations:

Location Type	Symbol
PP	plus sign
PC	circle
PP and PC	plus sign inside a circle
HG	triangle
HT	triangle
OFS Segment	triangle
HP	rectangle
HP and HG or HT	rectangle
HG and HT	triangle

Colors inside of the triangle and rectangle symbols indicate if the stage at the location is above flood or action stage. The color used if the stage is above flood stage is that specified by the xnav_flood_color apps_defaults token. The color used if the stage is above action stage is that specified by the xnav_action_color apps_defaults token.

Preferences

The Preferences menu has 2 options to control the main legend in the main window. The **Colors** option allows the user to change the colors used to represent each level in the legend. The **Precipitation Thresholds** option is used to change the range of values in each level.

The **Precipitation Data Filter** option is used to the minimum Radar Precipitation or Gage Precipitation value to display.

The options (**PP Data Color Mode** and **Town Display Mode**) alter the color scheme to display PP data and the resolution for displaying town names respectively.

Locator Menu

The Locator menu displays precipitation and hydrologic data points as well as county locations. The displayed data is the same as that available in the Overlays menu with the added ability to narrow the search to one station or county. After selecting **Precipitation Data Points**, **Hydrologic Data Points** or **County**, the state and county or station identifier are selected. For example, Montgomery County and station SACM2 both located in Maryland were displayed by choosing the appropriate options.

The final Locator menu option is the **Latitude/Longitude** feature that displays a box with the cursor's position in Latitude/Longitude, HRAP and Local HRAP coordinates.

Data Menu

The Data menu has options for viewing spatially varying radar and gage estimated precipitation, FMAP and grid QPF data for an RFC and WFO, FFG data at the county and HRAP grid scale and other thematic data (from Informix, OFS or a user-supplied text file).

The Data menu's **Radar Precipitation** option displays 1, 6 or 24 hour radar data:

o The **1 Hour Radar** option displays a window where the user chooses an end date and duration for the radar-estimated precipitation. The selections are used to search in the directory specified by the xnav_xmrg_dir apps_defaults token. If a duration is chosen, the images are combined and displayed. If the animation controls are used, an data is displayed using animation. If the xnav_show_p1_files apps_defaults token is set to 1, the **1 Hour Radar** option also allows the user to display Stage1 and Phase1 xmrg files. In this window the user chooses whether Xmrg, P1 or Stage I data should be displayed. If P1 is chosen, the directory specified by the xnav_P1xmrg_dir directory is searched for files of form 'p1xmrgmmddyyyyhhz' and if Stage I is chosen, the directory specified by the xnav_S1xmrg_dir apps_defaults token is searched for files of form 's1xmrgmmddyyyyhhz'.

o The **6 Hour Radar** option displays a window where the user chooses an end date and duration for 6 hour radar precipitation. Using the selected end date and duration, XNAV searches the directory specified by the xnav_xmrg_dir apps_defaults token for files of the form '6hrxmrgmmddyyyy'. These files are created using the program make6hrxrmg (see Section VI.5.4-XNAV-UTIL) which adds the 1 hour files to create a file with the 6 hour total.

o The **24 Hour Radar** option displays a window where the user chooses an end date and duration for 24 hour radar precipitation (Figure 2). Using the selected end date and duration, XNAV searches the directory specified by the xnav_xmrg_dir apps_defaults token for files of the form '24hrxmrgmmddyyyy'. These files are created using the program make24hrxrmg (see Section VI.5.4-XNAV-UTIL) which adds the 1 hour files to create a file with the 24 hour total. Figure 3 shows a display of daily radar precipitation.

The **Gage Precipitation** option has several choices for displaying Informix precipitation data:

o The **Today, Yesterday, Other** and **6-Hour** choices all produce a display of the PP-type data. Choosing either one of these automatically displays the data (Figure 4). The only exception is the **Other** option, which brings up a window for the user to select a date.

o The **Hourly PP/PC Data** option produces a display with the added step of choosing an end date and duration.

The **FFG** option has 3 choices (**County FFG**, **Gridded FFG** and **Thresh-R Values**). The County FFG option requires running the program ffgoutput (see Section VI.5.4-XNAV-UTIL) which reads all the 'FFG*' files in the directory specified by the token xnav_ffg_dir apps_defaults token and creates an FFG date-stamped file (e.g. 'FFGyyyymmdd'). The date-stamped file contains the 1, 3, 6, 12 and 24 hour county FFG values. XNAV looks in the directory specified by the xnav_data_dir apps_defaults token for the FFG date-stamped files to produce either a numerical point or color-coded polygon display of FFG values. For the **Gridded FFG** option, XNAV looks in the directory specified by the xnav_ffg_grid_dir apps_defaults token for files of the form 'gridffg*hr' or where '*' is either 1, 3, 6, 12 or 24 to produce a display of FFG values on an HRAP grid. The **Thresh-R Values** option displays grid-based 1, 3, 6, 12 or 24 hour threshold runoff. To display these values, XNAV looks in the directory specified by the ffg_gridro_dir apps_defaults token for files of the form 'xhr*' where '*' is 1 ,3, 6, 12 or 24.

The **RFC QPF** and **WFO QPF** options produce output similar to the FFG options. Choosing the **RFC QPF -> FMAP** option brings up a window where the user chooses whether to display 1st, 2nd, 3rd or 24 hour QPF values. XNAV then looks in the directory specified by the xnav_rfc_fmap_dir apps_defaults token for files of the form '*.d' and overlays the values on the basin boundaries layer. The **RFC QPF -> Gridded** option allows the user to view 6 and 24-hour QPF values at the HRAP grid scale. To display the data, XNAV searches the directory specified by the xnav_qpf_bin apps_defaults token for files of the form 'QPF_Grid_24*' or 'QPF_Grid_6*'. The **WFO QPF -> FMAP** option is similar except for the additional step of running the program wfoqpf (see Section VI.5.4-XNAV-UTIL) that takes all the 'WFO*' files in the directory specified by the xnav_wfo_qpf_dir apps_defaults token and produces a 'WFO*' time-stamped file. This file is placed in the directory specified by the xnav_data_dir apps_defaults token XNAV overlays and displays the date-stamped file on the basin layer.

The final three Data menu options (**Other PE Data**, **OFS PRDTS Data** and **Miscellaneous Data**) are to display other spatially varying thematic data.

Selecting **Other PE Data** brings up a window where the user chooses the PE type, date and time. The PE types available for display are determined using the xnav_pe apps_defaults token.

The **OFS PRDTS Data** option displays point or area data found in the OFS database. The user first selects whether the data are point or area values. Point values are displayed as a point, line or bar plot after choosing a type, date and time. Area values are displayed in XNAV's display area after specifying the type, date and duration. The OFS data types available for display are specified in the file ofs_data_types located in the directory specified by the xnav_params apps_defaults token.

The **Miscellaneous Data** option allows the user to display spatial data read from a text file. The data are read from a file in the directory specified by the xnav_misc_dir apps_defaults token and must be in the following format specified below.

A point data file produces a display where the values are plotted at the corresponding spatial location. A display of area data can plot values or it can be a polygon type display where the values are shown by basin or county.

Other Options

In addition to the options available in XNAV's menubar, there are features that give a synopsis of the Informix precipitation and discharge data.

Pressing the middle mouse button (or both left and right mouse buttons) on the display area locates the closest station relative to the cursor's position with PP or PC data. If any station data is on the current display, clicking the middle mouse button (or both left and right mouse buttons) allows the user to edit its value. From this box the user can edit the displayed value by pressing the Edit button. Pressing the Edit button brings up a second box where the current value is displayed and changes are made. The user can change the current value to a new value, set it to zero or to missing.

The right mouse button displays similar information for sites with HG, HT or HP PE-type discharge data. Pressing the right mouse button produces the window shown in Figure 5. The displayed hydrograph shows observed and forecasted values in the Informix database and model predictions from OFS. The observed values are shown with 'o' characters, forecasted values with a number (e.g. 1,2,3) and OFS predicted values with line-connected 'x' characters. Observed values are edit by clicking the value on the hydrograph using the middle mouse button (or both left and right mouse buttons). Clicking on a value displays a box with the current value and some options for changing it.

Program outputbadobs (see Section VI.5.4-XDAT-UTIL) can be used to access the Informix database and creates an ASCII SHEF encoded file of all of the data that has been put into the rejected data table.

The window shown in Figure 5 also has a Rating Curve and **Rules of Thumb** button. The **Rating Curve** button displays the Rating Curve at the selected site and the **Rules of Thumb** button displays a text file with notes for the selected site. The file name is that of the site

and is located in the directory specified by the xnav_rules_dir
apps_defaults token. If no file is found, the **Create Rules of Thumb**
button displays a text file with notes for the selected site.

Miscellaneous Data Files

The following is the format for a miscellaneous data file:

Line 1: AREA or POINT
Line 2: description of data followed by units (no spaces in
          description)
Line 3: if AREA data, what outline to use (basins or counties)
Line 3: if POINT data, either:
              o latitude/longitude and value or
              o identifier and value (where identifier is valid
                  identifier in the Informix database)

The following are examples for area and point data files:

AREA
SNOW_DEPTH_FROM_NOHRSC_FLIGHTS INCHES
BASIN
LITA4 28
PPFK1 44
TIFM7 54
DDCK1 2
GECO2 9
WATO2 14
CNGK1 33
FNEC2 8
GOLN5 10
CHLT2 5

Sample file for point (latitude longitude value):

POINT
24-HR_COOP_SNOW_RPTS INCHES
35.08   96.82   1.3
35.31 103.37   6.9
33.89   98.93 22.6
36.89   99.39 14.2
38.28   98.15   8.9
39.14 106.30 12.7
38.30   96.01   3.5
37.14   94.35 18.4
34.95   92.77   2.1
34.07   94.95 10.0

Geographic Data Files

A description of how to create geographic data files used for the map
overlays is in I.2-UNIX-SETUP-GEO.

Parameter Files

The parameter files used by XNAV to set values for the user are described in IX.5.4-XNAV-PARM.

Apps_defaults Tokens

XNAV uses apps_defaults tokens to set execution options and path names. A description of the tokens is in I.2-UNIX-XNAV.
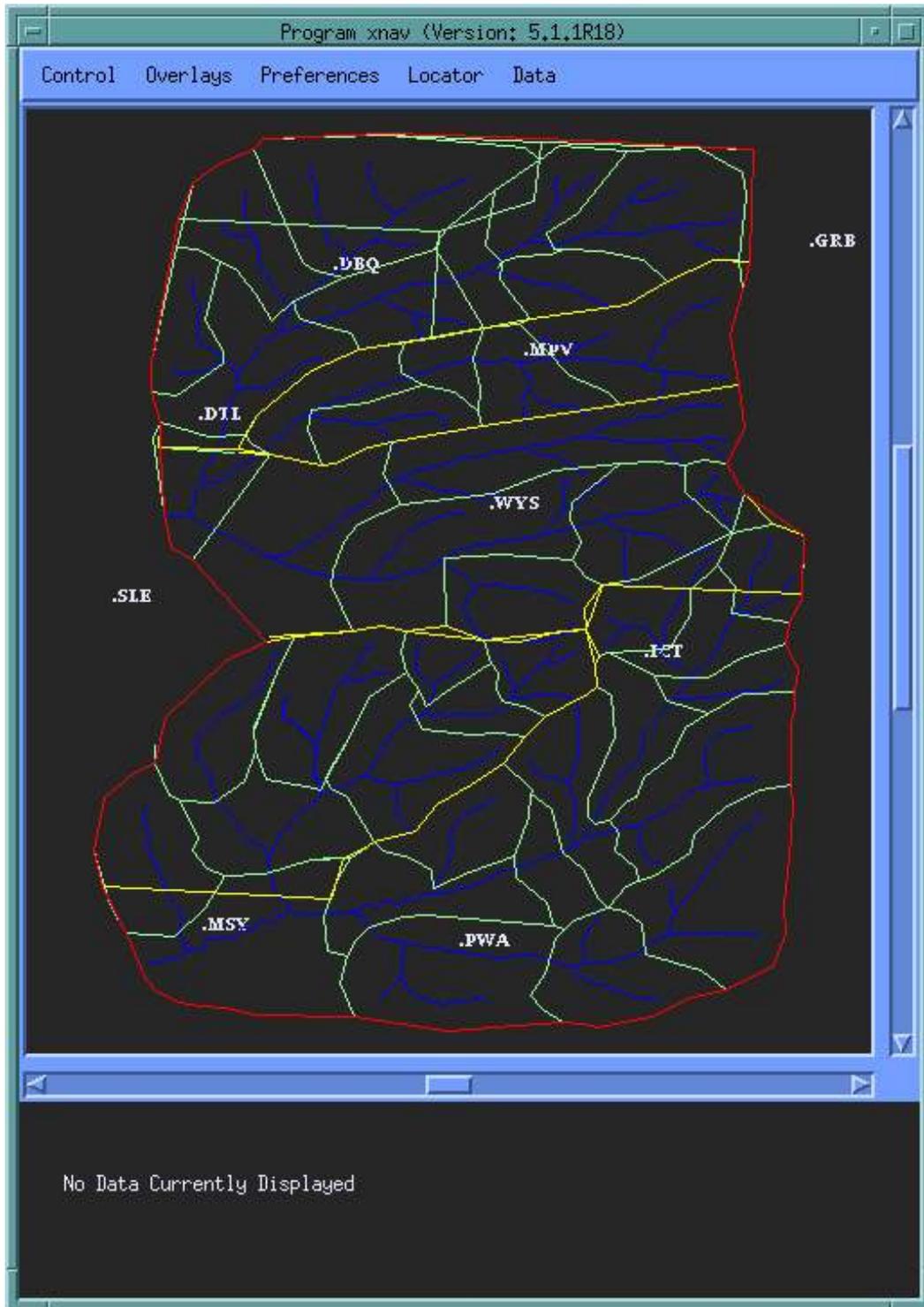
Figure 1. XNAV Main Window
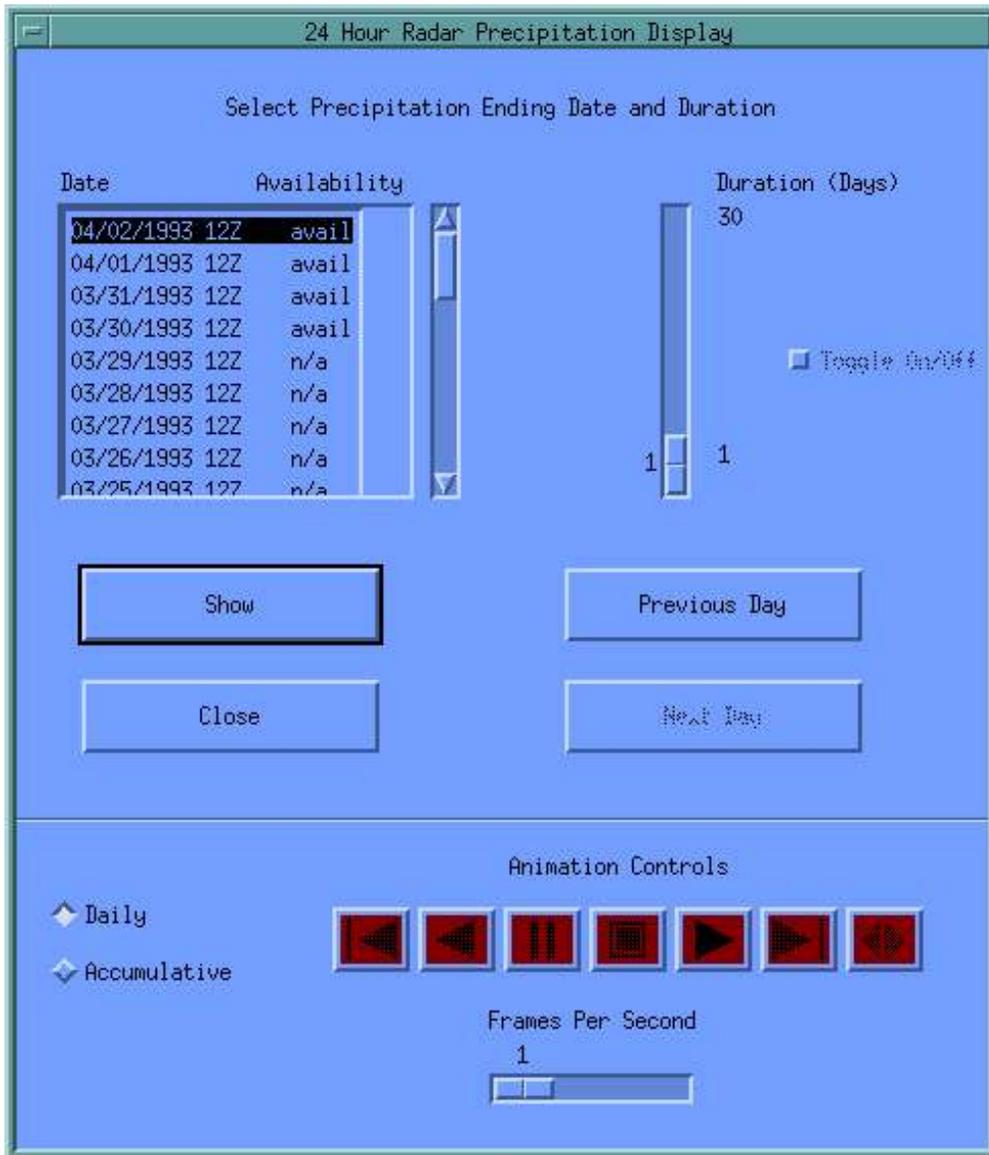
Figure 2. 24 Hour Radar Precipitation Display Window
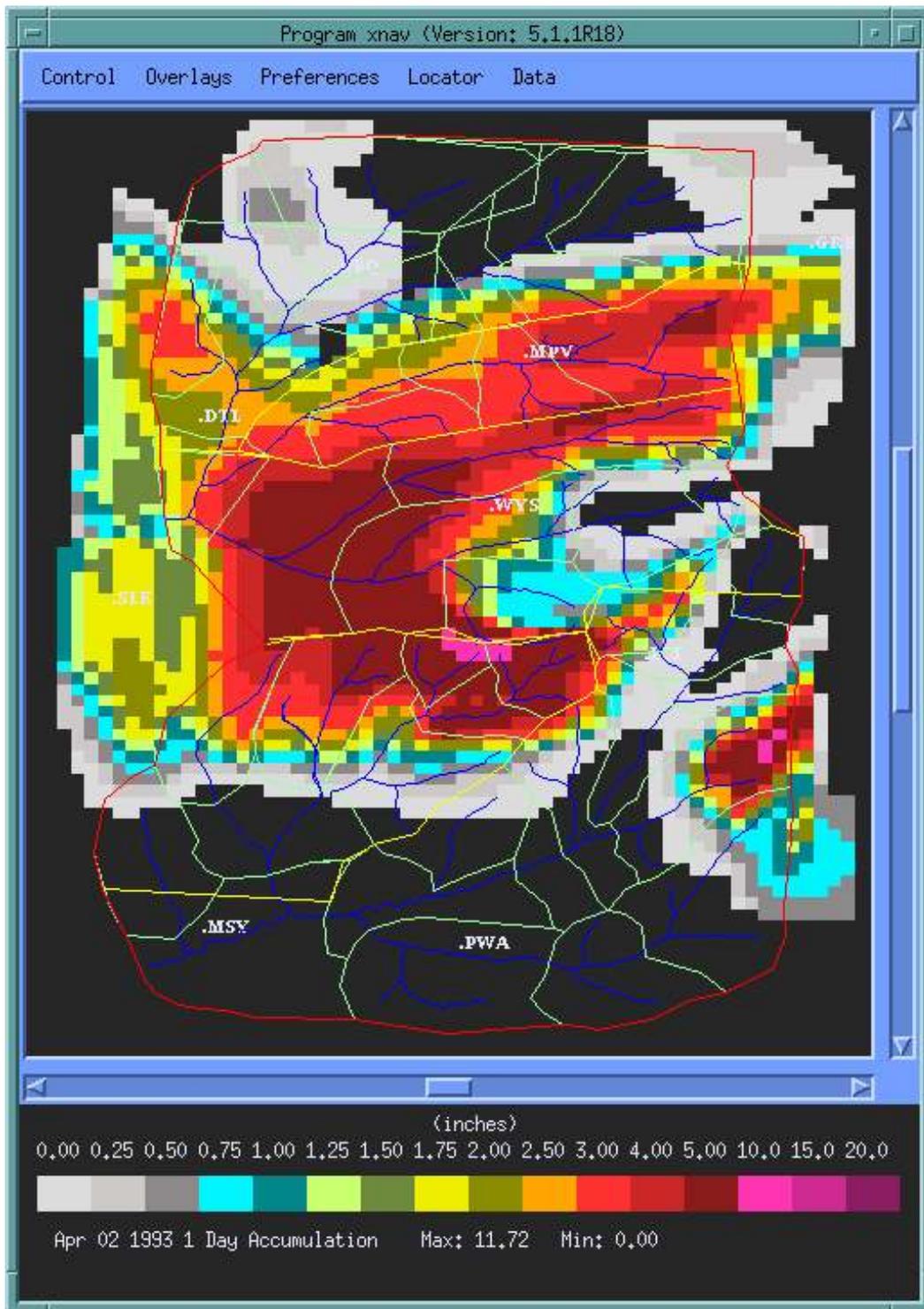
Figure 3. Daily Radar Precipitation Display

Figure 4.   Gage Precipitation Data Display

Figure 5. Discharge Information Display