# New National Weather Service Western Water Supply Forecast Services

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Seasonal runoff volume forecasts are a coordinated effort between the NWS, the NRCS, US Bureau of Reclamation, USGS, and other state and local water agencies. These forecasts provide water managers, farmers, and outdoor enthusiasts with projections of natural streamflow volumes useful for water management, seasonal planning, and drought forecasting. NOAA/NWS recently debuted a website that consolidates all water supply forecasts onto a common map with site-specific forecast tools and information (See On the Web Box). This article gives an overview of the forecast methodology, various features on this website, and general tips on how to navigate through the website.

Forecasts of natural flows are made on the first of each month from January – June for the total runoff volume of the runoff season (usually April – July) for several hundred gauged points. Most stream gauges do not reflect natural flow because upstream diversions reduce the natural flow. Before they can forecast natural flows, forecasters must first reconstruct them by adjusting the observed regulated flows by all known upstream allocations to get a close approximation of streamflow volumes absent known water diversions. Forecasters model the relationship between the reconstructed natural runoff and observable hydrologic parameters (i.e. snowpack, precipitation and soil moisture) in order to forecast natural flows for the runoff season. Forecasts are adjusted as hydrologic and climate conditions change throughout the winter and spring. For example, as we move into the 2007 runoff season, temperatures and precipitation amounts will largely shape the rate and timing of snowmelt and the remainder of the seasonal runoff volume forecasts.

On the new NOAA/NWS website, users can zoom into a desired region, customize data input layers shown, and view site-specific runoff forecast information including individual forecast plot graphs. While this map displays the common forecasts of all agencies involved, different forecast points used by various forecast agencies account for the difference in shading extrapolation and percent of average range categories in this map. (In comparison to other streamflow forecast maps from the NRCS as shown on page 20.) The **map** of seasonal runoff volume forecasts (Figure 16a) shows color-coded percent of average seasonal runoff volume forecasts. Percent of average runoff volume projection categories range from below 70% to above 130%

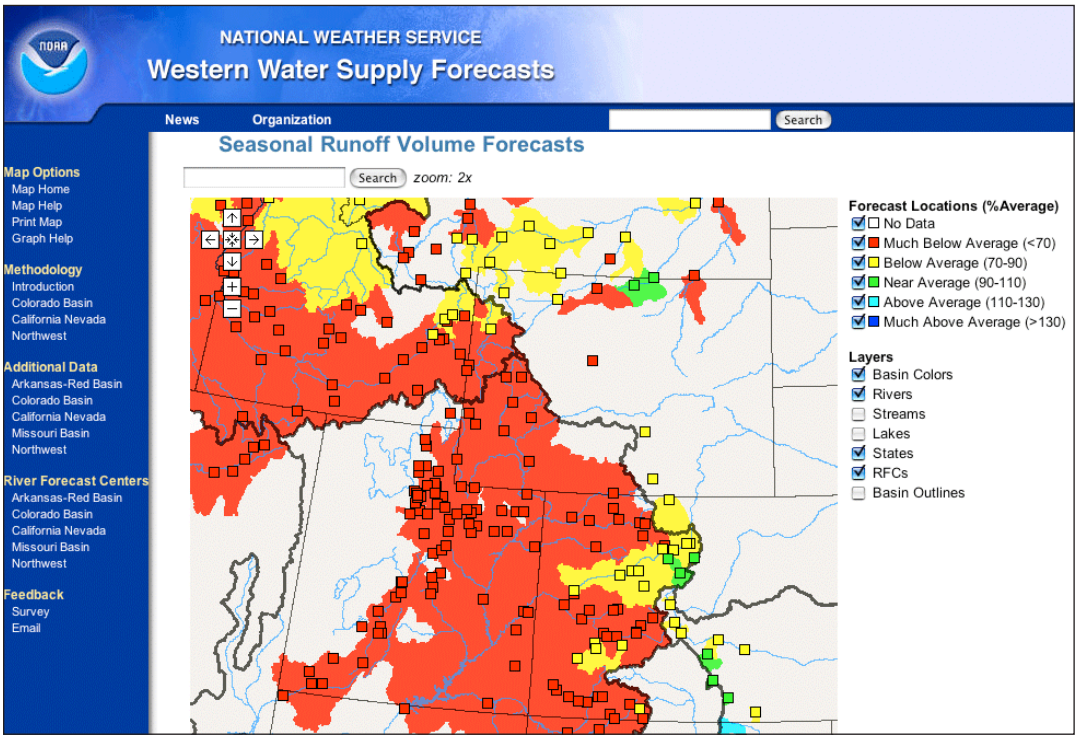


**Figure 16a.** New NOAA/NWS seasonal runoff volume forecast map for the western US as a percent of average. Zoomed in from map on homepage (www.cbrfc.noaa.gov/westernwater). (Data though May 1, 2007.)

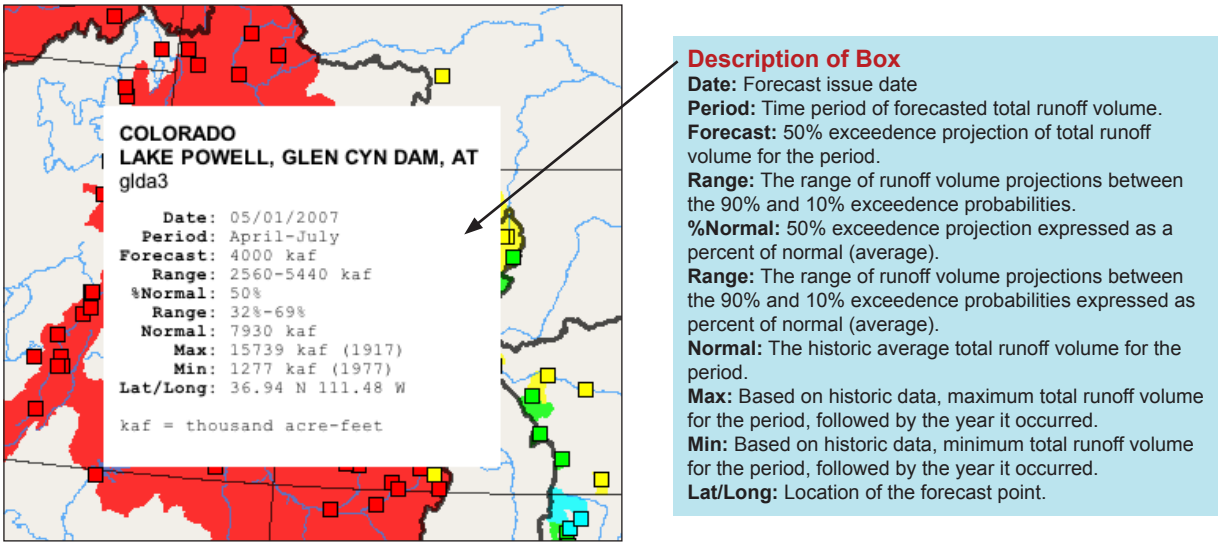


**Figure 16b.** Detailed forecast information provided by NOAA/NWS at Glen Canyon Dam. To see this from map in Figure 16a, place cursor over desired forecast location box to retrieve site-specific forecast information. (Data through May 1, 2007.)

of average with 20% increments between each category. Water supply forecasts are made only for gauged basins with potentially significant amounts of snow melt. Boxes on the right side of the graph under the "Layers" heading allow users to add or remove map content including lakes, streams, state lines, and smaller river basin outlines.

Specific forecasts can be obtained by clicking on the map or using the search button query to zoom into or locate desired region. Click on the map to zoom into desired region, and place the cursor over the **forecast location box** to show forecast information including forecast period, issuance date, and the range of forecasts between the 90 - 10% exceedence probabilities as a percent of average and in 1000 acre feet (kaf) (Figure 16b). Historical mean, maximum, and minimum flow periods are also included. Forecast periods depend on basin climatology and user requirements. In general, forecast periods are April – July, but may be April - September in more northerly basins.

The current **forecast evolution** is displayed in graphical format by clicking on a forecast location box (Figure 16c). These plot graphs allow users to compare observed and forecasted streamflow volumes for the current water year with normal (average) flows broken down monthly or as total volume accumulation. The most probable forecasts (50% exceedence probability) for the current water year are displayed on the forecast plot as red circles. They are positioned as a function of their issuance date, allowing the forecast user to easily see the evolution of the current forecast. The range of forecasts between the 90 - 10% exceedence probabilities is displayed by the red triangles and the red vertical lines above and below the red circles. Users can customize plots by adding or removing content to suit their needs.

Development continues on this website and in the coming months and years, several improvements are planned:

- **Forecast Evaluation Tool:** A forecast evaluation tool will be available on line later this year. This tool will access a large archive of forecasts and forecast tools and allow users to assess forecast skill through a variety of methods.

- **NWS Ensemble Streamflow Predictions:** Users will be able to access forecasts directly from the NWS ensemble streamflow prediction (ESP) system. ESP leverages the NWS continuous hydrologic model for forecasting capabilities. Initial plans will allow users access to ESP forecasts for the specified water supply forecast periods. However, in 2008, users will increasingly be able to customize forecast information from ESP for runoff volumes from a user definable forecast window, time to peak flows, and a wide variety of new information.

• **Water Resources Information:** Information beyond the traditional scope of water supply forecasts is being considered for addition to the website in future years. This information may include soil moisture, snow pack, and climate signals.

NOAA/NWS is looking for feedback. Please take a minute and take the survey located under the "Feedback" navigation bar located on the left side of the website.

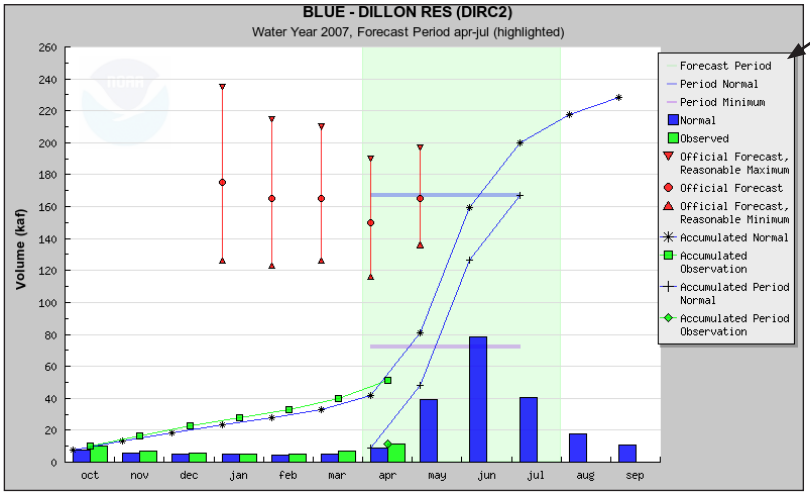


**Figure 16c.** Streamflow volume (kaf) forecast graph for inflow into Dillon Reservoir, generated by the NOAA/NWS. (Data through May 1, 2007.) The evolution of seasonal volume forecasts issued is shown in red vertical lines on the graphs. For inflow into Dillon Reservoir in northern Colorado, near average snowpack coupled with warm temperatures has resulted in a slight reduction of April-July streamflow volume forecasts since the first forecast was issued in January.

## Description of Key

**Forecast Period:** Forecast is for the total runoff volume occurring in this time period. Highlighted in pale green.
**Period Normal:** Average total runoff volume in kaf for the forecast period on historic data. Highlighted as horizontal blue line within shaded forecast period.
**Period Minimum:** Minimum total runoff volume in kaf for the forecast period based on historic data. Highlighted as horizontal pink line within in the shaded forecast period.
**Normal:** Average total monthly runoff volumes in kaf. Shown as vertical blue bars.
**Observed:** Observed total monthly runoff volumes in kaf for current water year. Shown as vertical green bars.
**Official Forecast, Reasonable Maximum:** Official maximum forecast in kaf based on a 10% exceedence probability. Shown as downward-pointing red triangle in the month in which the forecast was made.
**Official Forecast:** Official most probable forecast in kaf based on a 50% exceedence probability. Shown as a red circle in the month in which the forecast was made.
**Official Forecast, Reasonable Minimum:** Official minimum forecast in kaf based on a 90% exceedence probability. Shown as upward-pointing red triangle in the month in which the forecast was made.
– Note that the progression of these red official forecast lines shows how the forecast evolves as the winter and spring progresses.
**Accumulated Normal:** Accumulated monthly average runoff volumes for each month starting at the beginning of the water year, October 1. Shown as a blue line with stars.
**Accumulated Observation:** Accumulated observed monthly runoff volumes starting at the beginning of the water year, October 1. Shown as a green line with green boxes.
**Accumulated Period Normal:** Accumulated monthly average runoff volumes for each month starting at the beginning of the forecast period. Shown as a blue line with plus signs.
**Accumulated Period Observation:** Accumulated observed monthly runoff volumes for the forecast period. Shown as a green line with green diamonds.

## On the Web

- The new NOAA/NWS Seasonal Runoff Volume Forecast website is: http://www.cbrfc.noaa.gov/westernwater.
- For additional information about the NOAA/NWS forecast maps and graphs, including additional map and graph help tutorials, methodology used, and links to the RFC's, please visit the NWS Western Water Supply Forecast webpage or contact Kevin Werner at Kevin.werner@noaa.gov.