# OFFICIAL FORECAST

**Last Updated: Mar-19**

## North Platte River Basin Forecasts

<table>
<thead>
<tr>
<th>Location</th>
<th>Variable</th>
<th>Time Period</th>
<th>Forecast Value</th>
<th>Forecast Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewellen gage (NE)</td>
<td>streamflow</td>
<td>May-July</td>
<td>252,900 acre-feet</td>
<td>High Average</td>
</tr>
<tr>
<td>Glendo reservoir (WY)</td>
<td>inflow</td>
<td>May-July</td>
<td>554,100 acre-feet</td>
<td>High Average</td>
</tr>
<tr>
<td>Alcova reservoir (WY)</td>
<td>inflow</td>
<td>May-July</td>
<td>388,700 acre-feet</td>
<td>Average</td>
</tr>
<tr>
<td>Pathfinder reservoir (WY)</td>
<td>inflow</td>
<td>May-July</td>
<td>405,700 acre-feet</td>
<td>High Average</td>
</tr>
<tr>
<td>Seminoe Reservoir (WY)</td>
<td>inflow</td>
<td>May-July</td>
<td>741,700 acre-feet</td>
<td>Average</td>
</tr>
</tbody>
</table>

## South Platte River Basin Forecasts

<table>
<thead>
<tr>
<th>Location</th>
<th>Variable</th>
<th>Time Period</th>
<th>Forecast Value</th>
<th>Forecast Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Julesburg gage (CO)</td>
<td>streamflow</td>
<td>May-July</td>
<td>90,200 acre-feet</td>
<td>Average</td>
</tr>
<tr>
<td>Kersey gage (CO)</td>
<td>streamflow</td>
<td>May-July</td>
<td>260,400 acre-feet</td>
<td>Average</td>
</tr>
<tr>
<td>South Platte higher elevations</td>
<td>max snow water equivalent</td>
<td>N/A</td>
<td>N/A</td>
<td>Only available in Jan.</td>
</tr>
<tr>
<td>South Platte lower elevations</td>
<td>precipitation</td>
<td>April-June</td>
<td></td>
<td>Probability &gt;50%: 70% Probability &lt;33%: &lt;5%</td>
</tr>
</tbody>
</table>

## Forecast Category Breakdown

<table>
<thead>
<tr>
<th>Forecast Category</th>
<th>Exceed %</th>
<th>Lewellen</th>
<th>Glendo</th>
<th>Alcova</th>
<th>Pathfinder</th>
<th>Seminoe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average</td>
<td>&lt;20%</td>
<td>&gt;372</td>
<td>&gt;562</td>
<td>&gt;523</td>
<td>&gt;531</td>
<td>&gt;885</td>
</tr>
<tr>
<td>High Average</td>
<td>20-40%</td>
<td>226-372</td>
<td>414-562</td>
<td>397-523</td>
<td>368-531</td>
<td>761-885</td>
</tr>
<tr>
<td>Average</td>
<td>40-60%</td>
<td>154-226</td>
<td>366-414</td>
<td>332-397</td>
<td>290-368</td>
<td>503-761</td>
</tr>
<tr>
<td>Low Average</td>
<td>60-80%</td>
<td>100-154</td>
<td>322-366</td>
<td>289-332</td>
<td>209-290</td>
<td>316-503</td>
</tr>
<tr>
<td>Below Average</td>
<td>&gt;80%</td>
<td>&lt;100</td>
<td>&lt;322</td>
<td>&lt;289</td>
<td>&lt;209</td>
<td>&lt;316</td>
</tr>
</tbody>
</table>

*units: thousands of acre-feet*

## Forecast Category Breakdown for South Platte River Basin

<table>
<thead>
<tr>
<th>Forecast Category</th>
<th>Exceed %</th>
<th>Julesburg</th>
<th>Kersey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average</td>
<td>&lt;20%</td>
<td>&gt;332</td>
<td>&gt;554</td>
</tr>
<tr>
<td>High Average</td>
<td>20-40%</td>
<td>101-332</td>
<td>272-554</td>
</tr>
<tr>
<td>Average</td>
<td>40-60%</td>
<td>38-101</td>
<td>143-272</td>
</tr>
<tr>
<td>Low Average</td>
<td>60-80%</td>
<td>14-38</td>
<td>58-143</td>
</tr>
<tr>
<td>Below Average</td>
<td>&gt;80%</td>
<td>&lt;14</td>
<td>&lt;58</td>
</tr>
</tbody>
</table>

*units: thousands of acre-feet*
Discussion

The weak El Nino event in the eastern Tropical Pacific continues. Its affect on the atmosphere continues to be weak to negligible, although the recent few weeks have experienced several storms over the southwest US in a manner reminiscent of an El Nino. Figure 1 shows the 500-mb (~18,000 feet) geopotential height anomaly over the past 30 days. Note the strong negative (low-pressure) anomaly over the Pacific Northwest, a stark departure from earlier this winter when no such anomaly was seen over western North America and the eastern North Pacific Ocean. Whether this can be attributed to El Nino is uncertain, and it is possible that this pattern change is progressive and will not last long. Nonetheless, sub-surface ocean temperatures remain substantially warmer than normal along parts of the Pacific equatorial region, implying a chance for this El Nino event to re-strengthen. However, this outcome becomes increasingly less likely the farther out from winter we head. Regardless, a weak/moderate El Nino has little to no impact on the North Platte basin, but does imply above normal spring precipitation in the South Platte basin as is currently being forecasted.

The North Platte and South Platte basin snowpack is currently tracking very close to seasonal normal, which at this point in the season begins to greatly reduce the chance of a very low spring runoff.

The latest North Platte forecast showed significantly higher projected flows at all sites, likely incorporating the change in the recent atmospheric circulation. Notably, the Lewellen projected increased to 263K acre-feet (on the low side of the High Average category), up from 136K only a month ago. Interestingly, the probabilistic Low Flow forecast showed little change for both Lewellen and Guernsey, suggesting that the recent increase in the deterministic forecast value may be slightly exaggerated due to short-term atmospheric pattern changes that may not persist. Overall though, the chance of very low flow appears to be significantly reduced now, compared to the earlier forecasts.

On the South Platte, both Julesburg and Kersey saw ~10% increases in forecasted flow. However, both sites remain in the Average category, as in the February forecast.

Figure 1: 500 millibar geopotential height anomalies over the past 30 days. Source: NOAA ESRL Map Room.
PROBABILITY OF LOW FLOW

During 2018, additional forecasts were developed to inform the probability of “Low Flow” for (i) Guernsey April-September outflow and (ii) Lewellen May-July streamflow. These forecasts are being used operationally for the first time. Note that Low Flow was defined as flow below the 25\textsuperscript{th} percentile at each site, which translates to 2,931 c.f.s. for Guernsey outflow and 621 c.f.s. for Lewellen. Thus, the climatological probability of Low Flow is 25%.

Table 1 shows the probability of Low Flow, with the latest projections of 11\% and 30\% at Guernsey and Lewellen, respectively. This amounts to little or no change compared to the February forecast. The reason for the substantially lower Guernsey probability is due to the relatively high reservoir storage that currently exists at the major North Platte reservoirs.

Table 1: Probability of Low Flow at Lewellen and Guernsey Reservoir.

<table>
<thead>
<tr>
<th>Forecast Location</th>
<th>Time Period</th>
<th>Probability of flow &lt;25%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forecast Time</td>
<td>Nov ‘18</td>
</tr>
<tr>
<td>Guernsey res. outflow</td>
<td>Apr - Sep</td>
<td>17%</td>
</tr>
<tr>
<td>Lewellen streamflow</td>
<td>May - Jul</td>
<td>44%</td>
</tr>
</tbody>
</table>

RESERVOIR STORAGE

As of March 1, 2019, the total reservoir storage at the five main reservoirs upstream of Lake McConaughy (Seminole, Pathfinder, Alcova, Glendo and Guernsey) was 1,754,663 acre-feet. Using data from 1959-present, this value is in the 64\textsuperscript{th} percentile for the date, with little change from the February value**. Although total storage has decreased significantly over the past 2 years, it continues to remain high enough to buffer against a significant precipitation deficit for at least one more runoff season during spring 2019.

**Note: there was an ~10\% underestimate error in the storage percentiles reported in the November-February forecasts. However, this did not affect the actual Low Flow probability calculation, as it is only provided for reference.
COMPARISON TO OTHER FORECASTS

Forecasts developed herein are compared to similar forecasts from the US Bureau of Reclamation (USBR), the Natural Resources Conservation Service (NRCS) and the Climate Prediction Center (CPC).

USBR
Link: https://www.usbr.gov/gp/lakes_reservoirs/wareprts/wsnpjan.pdf

The February 1 USBR forecast is shown in Table 2 (the March update was unexpectedly not available when this forecast was completed). Above normal (+19%) volumetric flow was expected at Seminole Reservoir with slightly below normal (-10%) flow at Glendo. These numbers were higher than our February forecast but more consistent with our March forecast, though our estimates at Glendo are notably higher.

Table 2: USBR projected flow, as of the February 1 update.

<table>
<thead>
<tr>
<th>Forecast Points</th>
<th>February 1, 2019 Forecast of April-July Runoff</th>
<th>30 Yr. April-July Runoff</th>
<th>Expected % of Avg.</th>
<th>Comparative Actual April - July Runoff</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reasonable Maximum¹</td>
<td>Expected</td>
<td>Reasonable Minimum¹</td>
<td>W. Yr. 2018</td>
</tr>
<tr>
<td>Seminole Reservoir</td>
<td>1060</td>
<td>810</td>
<td>560</td>
<td>693</td>
</tr>
<tr>
<td>Sweetwater River above Pathfinder Reservoir</td>
<td>75</td>
<td>50</td>
<td>25</td>
<td>54</td>
</tr>
<tr>
<td>Alcova to Glendo</td>
<td>180</td>
<td>120</td>
<td>60</td>
<td>134</td>
</tr>
</tbody>
</table>

¹ The probability is estimated to be 9 chances in 10 that the actual volume will fall between the reasonable minimum and reasonable maximum.
² Average is based on the 1989-2018 period.

NRCS
Link: http://www.wrds.uwyo.edu/wrds/nrcs/snowpack/snowmap.html

NOTE: The February update was unavailable as of this forecast. An inquiry has been submitted to NRCS. The January forecast is again shown below, with updated discussion.

Tables 3 and 4 show forecasts of North Platte River spring/summer flow for the Upper and Lower parts of the river, respectively. All sites are forecasted to be within 8% of their average value, except the Sweetwater River near Alcova, which is forecasted to see 66% of its normal flow. **Overall, the NRCS forecast was higher than our forecast as of February, but is more consistent with our March estimates. However, keep in mind that the NRCS predictions are strongly constrained by current snowpack, which is very close to average. Thus, we expect little to no change in the February NRCS update.**
Table 3: NRCS forecast for Upper North Platte River

<table>
<thead>
<tr>
<th>UPPER NORTH PLATTE RIVER BASIN</th>
<th>Forecast Period</th>
<th>90% (KAF)</th>
<th>70% (KAF)</th>
<th>50% (KAF)</th>
<th>% Avg</th>
<th>30% (KAF)</th>
<th>10% (KAF)</th>
<th>30yr Avg (KAF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Platte R nr Northgate</td>
<td>APR-JUL</td>
<td>105</td>
<td>182</td>
<td>235</td>
<td>104%</td>
<td>290</td>
<td>365</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>118</td>
<td>200</td>
<td>260</td>
<td>104%</td>
<td>315</td>
<td>400</td>
<td>250</td>
</tr>
<tr>
<td>Encampment R nr Encampment²</td>
<td>APR-JUL</td>
<td>75</td>
<td>111</td>
<td>135</td>
<td>105%</td>
<td>159</td>
<td>195</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>83</td>
<td>120</td>
<td>145</td>
<td>105%</td>
<td>170</td>
<td>205</td>
<td>138</td>
</tr>
<tr>
<td>Rock Ck nr Arlington</td>
<td>APR-JUL</td>
<td>35</td>
<td>46</td>
<td>53</td>
<td>108%</td>
<td>60</td>
<td>71</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>36</td>
<td>47</td>
<td>55</td>
<td>108%</td>
<td>63</td>
<td>74</td>
<td>52</td>
</tr>
<tr>
<td>Sweetwater R nr Alcova</td>
<td>APR-JUL</td>
<td>3.5</td>
<td>25</td>
<td>39</td>
<td>68%</td>
<td>53</td>
<td>75</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>5.2</td>
<td>28</td>
<td>43</td>
<td>67%</td>
<td>58</td>
<td>81</td>
<td>64</td>
</tr>
<tr>
<td>Seminole Reservoir Inflow</td>
<td>APR-JUL</td>
<td>375</td>
<td>605</td>
<td>760</td>
<td>108%</td>
<td>915</td>
<td>1140</td>
<td>715</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>415</td>
<td>650</td>
<td>815</td>
<td>108%</td>
<td>975</td>
<td>1220</td>
<td>770</td>
</tr>
</tbody>
</table>

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

Table 4: NRCS forecast for Lower North Platte River

<table>
<thead>
<tr>
<th>LOWER NORTH PLATTE RIVER BASIN</th>
<th>Forecast Period</th>
<th>90% (KAF)</th>
<th>70% (KAF)</th>
<th>50% (KAF)</th>
<th>% Avg</th>
<th>30% (KAF)</th>
<th>10% (KAF)</th>
<th>30yr Avg (KAF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Prele Ck ab La Prele Reservoir</td>
<td>APR-JUL</td>
<td>3.2</td>
<td>13.8</td>
<td>21</td>
<td>106%</td>
<td>28</td>
<td>39</td>
<td>19.9</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>2.9</td>
<td>13.7</td>
<td>21</td>
<td>106%</td>
<td>28</td>
<td>39</td>
<td>19.9</td>
</tr>
<tr>
<td>North Platte R bl Glendo Reservoir</td>
<td>APR-JUL</td>
<td>270</td>
<td>590</td>
<td>805</td>
<td>98%</td>
<td>1020</td>
<td>1340</td>
<td>820</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>285</td>
<td>610</td>
<td>835</td>
<td>98%</td>
<td>1060</td>
<td>1380</td>
<td>850</td>
</tr>
<tr>
<td>North Platte R bl Guernsey Reservoir</td>
<td>APR-JUL</td>
<td>255</td>
<td>585</td>
<td>805</td>
<td>98%</td>
<td>1030</td>
<td>1380</td>
<td>820</td>
</tr>
<tr>
<td></td>
<td>APR-SEP</td>
<td>270</td>
<td>605</td>
<td>835</td>
<td>98%</td>
<td>1060</td>
<td>1400</td>
<td>850</td>
</tr>
</tbody>
</table>

1) 90% and 10% exceedance probabilities are actually 95% and 5%
2) Forecasts are for unimpaired flows. Actual flow will be dependent on management of upstream reservoirs and diversions
3) Median value used in place of average

CPC

Figure 2, below, shows the latest March-May 2019 precipitation forecast from the CPC. Both the North Platte and South Platte continue to be forecasted to experience above normal springtime precipitation by the CPC, though with less confidence than the last update. The CPC forecast is generally consistent with the expectation of a weak to moderate El Nino persisting into the spring, and also consistent with our latest South Platte precipitation projection.
Figure 2: Climate Prediction Center’s 3-month precipitation probability forecast for March-May 2019.