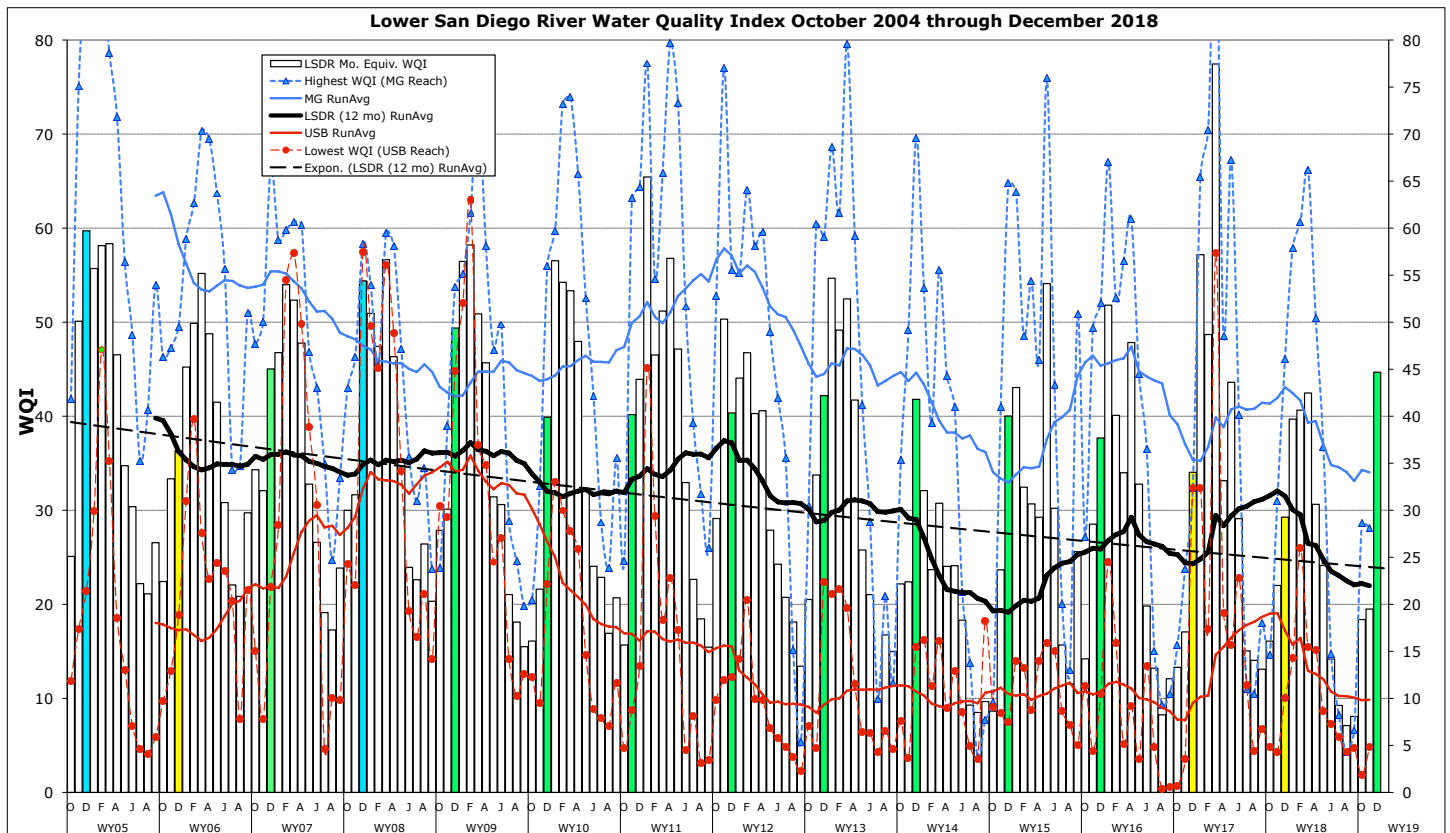


Monthly WQM Report

Lower San Diego River - December 2018



Lower SDRWQ Monitoring Data Summary

Table 1 presents a summary of water quality data monitored by SDRPF's RiverWatch Team within the Lower San Diego River watershed over the last two months (Nov/Dec) which constitute the last month of autumn and the first month of winter. The December index rose 26 points (129%) from last month to 3 points (5%) above the 14-yr monthly average of 42. The overall water quality in the lower San Diego River hydrologic unit (HSU 907.1) for the month of December 2018 is considered Fair (C).

| Table 1 - November/December 2018 WQM Data Summary | | | | | | | |
|--|------------------|-------------------|--------------------|-------------------|---|---------------------|---------------------|
| | West - MV | Mid - MG | East - SB | LSDR | Percent Variance from | | |
| [Sites] | [1-7] Nov/Dec | [8-10] Nov/Dec | [11-15] Nov/Dec | [1-15] Nov/Dec | Last Mo (11-'18) | Last Yr (12-'17) | 14-Yr Avg (Dec.) |
| Temperature, oC | 14.7/14.4 | 12.3/12.0 | 13.2/13.4 | 13.5/13.5 | 0% | 24% | 14% |
| Sp.Cond., mS/cm | 3.45/1.85 | 2.55/1.73 | 2.51/1.95 | 3.09/1.97 | -36% | -36% | 9% |
| DO, mg/L | 4.45/7.66 | 9.57/7.97 | 4.01/4.17 | 5.22/6.33 | 21% | 10% | -4% |
| DO, % of Sat. | 44/75 | 92/77 | 38/40 | 51/61 | | | |
| pH | 7.48/7.61 | 7.37/7.93 | 8.68/7.51 | 8.19/7.56 | -8% | -6% | -2% |
| 3-day ADF, cfs | 0.7/13.4 | 0.6/8.8 | 0.6/8.3 | 0.6/10.2 | 1578% | 336% | -60% |
| WQ Index | 21/55 | 28/62 | 14/26 | 19/45 | 129% | 53% | 5% |
| Grade(Nov/Dec) | E+/B | D/B | E-/D- | E/C | | | |
| November/ December '18 | Poor/ Good | Marginal/ Good | Poor/ Marginal | Poor/ Fair | Index up 26 points overall from last month | | |

DO values below the pre-hypoxic threshold of 4 mg/L (45 %Sat.) are expressed in red.

LSDR **water temperatures** remained steady at 13.5 oC the same as last month at a level 24% above last December and 1.7°C (14%) greater than the 14-yr norm. **Specific conductivity** of 1.97 mS/cm is 36% below both last month's average and a year ago but remains 9% above the 14-yr norm of 1.80 mS/cm. The overall **dissolved oxygen** level of 6.33 mg/L (61%Sat) is up 21% above last month and 10% above a year ago, at only 4% under the 14-yr monthly norm of 6.68 mg/L (63% Sat). **Streamflow** over the antecedent 3-day monitoring period of 13.4 cfs is up 1578% from last month to 336% above a year ago but still 60% less than the 14-yr norm of 25 cfs. This month's LSDR **water quality index** (WQI) rose 26 points from last month to 45, 129% above November and 3 points above the 14-yr monthly norm of 42. Last December WQI was 29.

Conclusion: The overall LSDR water quality index rose two grade levels from **19(E) to 45(C)** over the past 30 days.

A summary of monthly WQI values occurring over the past two years of record for the three sections of the lower San Diego River system and the overall LSDR average, are expressed in **Table 2** along with average daily 30-day antecedent flow (ADF) and total monthly rainfall (MRF).

| Table 2 - WQI Values, Average Daily Flow and Monthly Rainfall (Dec. 2016 - Dec. 2018) | | | | | | | |
|--|----------------|---------------|----------------|---------------|-----------|------------|-------------|
| | Mission Valley | Mission Gorge | Santee Basin | LSDR | | ADF, cfs | MRF, in |
| Dec.'16 | 30(D) | 32(D) | 38(D+) | 34(D) | WW | 87 | 4.22 |
| Jan. '17 | 61(B) | 65(B) | 49(C+) | 57(B) | WW | 105 | 3.01 |
| Feb. | 46(C) | 70(B) | 38(C-) | 49(C+) | WW | 93 | 3.14 |
| March | 82(A) | 94(A+) | 64(B) | 77(A-) | WW | 23 | 0.07 |
| April | 31(D) | 49(C) | 28(D) | 33(D) | | 6.3 | 0.02 |
| May | 43(C) | 67(B) | 32(D) | 44(C) | | 6.9 | 0.92 |
| June | 22(E) | 40(C) | 31(D) | 29(D) | | 2.0 | 0.00 |
| July | 17(E) | 11(F) | 15(E-) | 15(E) | DW | 1.0 | 0.00 |
| Aug | 18(E) | 11(F) | 12(F+) | 14(E-) | DW | 1.0 | 0.00 |
| Sept | 15(E) | 18(E) | 9(F) | 13(E-) | DW | 0.9 | 0.08 |
| Oct. | 20(E) | 15(E) | 13(E-) | 16(E) | DW | 1.4 | 0.01 |
| Nov. | 25(D-) | 31(D) | 15(E) | 22(E) | | 1.4 | 0.01 |
| Dec.'17 | 26(D-) | 46 (C) | 24(D-) | 29 (D) | | 2.3 | 0.02 |
| Jan.'18 | 41(C) | 58(B) | 29(E+) | 40(C) | WW | 13 | 1.74 |
| Feb. | 41(C) | 61(B) | 31(D) | 41(C) | | 4.4 | 0.02 |
| March | 42(C) | 66(B) | 31(D) | 42(C) | WW | 26 | 1.51 |
| April | 31 (D) | 50 (B-) | 22 (E) | 31 (D) | | 2.4 | 0.30 |
| May | 24 (E+) | 37 (D+) | 18 (E) | 24 (E+) | | 1.4 | 0.12 |
| June | 12 (F+) | 15 (E) | 16 (E) | 14 (E) | DW | 0.7 | 0.00 |
| July | 12 (F+) | 8 (F) | 8 (F) | 9 (F) | DW | 0.4 | 0.00 |
| Aug | 8 (F) | 4 (F) | 8 (F) | 7 (F) | DW | 0.3 | 0.02 |
| Sept | 9 (F) | 7 (F) | 8 (F) | 8 (F) | DW | 0.2 | 0.00 |
| Oct | 24 (D-) | 29 (D) | 9 (F) | 18 (E) | | 3.5 | 0.57 |
| Nov | 21 (E+) | 28 (D) | 14 (E-) | 20 (E) | | 1.0 | 0.80 |
| Dec. '18 | 55 (B) | 62 (B) | 26 (D-) | 45 (C) | WW | 8.4 | 2.60 |

The **cover page** chart presents monthly WQI values and their range (high-low) for the Lower San Diego River as determined over 14 years of RiverWatch monitoring. December values (first month of winter and the wet weather period) for each year are expressed as color-shaded bar columns. Blue bars are B/Good (WQI>50), Green, as this year, are C/Fair (38-49) and Yellow are D/Marginal with monthly WQI's between 25 and 37. Running average index values for LSDR (all sites) are shown as a heavy black line. Monthly values for the consistently highest/best quality reach (Mission Gorge) are shown as a blue line while the consistently lowest/poorest reach (Upper Santee Basin) are shown in red. A downward slope in the index in WY18 is attributed to low oxygen levels occurring in with well-below normal seasonal streamflow. The overall (straight-line) trend of -2.5% per annum decline since late 2004 is expressed as a dashed black line.

Monthly WQI values extending from Oct. 2004 through Dec. 2018 are presented in **Chart 1** (next page) together with 12-mo. running average trendlines for each of the five principal reaches of the river and overall (i.e., lower SDR). The current running average WQI of 23 is 24% below the 14-yr LSDR flow weighted average of 31. In comparison, a year ago, the Dec. running average WQI was 32, two percent above the norm. The monthly low for December of 19 (38% below the norm) occurred in WY15. The highest WQI (60) for December occurred in 2004. The overall LSDR trendline, shown dashed in black, has declined by approximately ten index points (25%) over 14 years.

Monthly and 12-mo. running average WQI values for the poorest reach (Upper Santee Basin) and best (Mission Gorge) are presented in **Chart 2** on the next page. Although water quality improved to an extent within the Upper Santee Basin over the past year, resurgent growth and subsequent decay of invasives such as primrose-willow (*Ludwigia hexstapetala*) in conjunction with very low flow and extensive algal blooms are considered primary causes of deteriorated water quality both in the upper portion of the Santee Basin and the upper reach of Mission Valley. The steepest downward trend (red dashed line) is associated with the poorest reach (Upper Santee Basin) as evidenced by sites 13 and 14.

Spatial WQI values by monitoring site over the past three months are shown in **Charts 3, 4 and 5** on page 6. The December index (color bars w/index values in black) values are considerably higher than last month. This month seven out of 15 sites are B(Good) whereas last month none were above C (Fair). Last month 11 out of 15 sites were E(Poor) or F(Very Poor) while this month only one was Poor and one Very Poor. October saw ten sites Poor or Very Poor, two Intermediate (1 Marginal and 1 Fair) and two B(Good). Streamflow resulting from a 2.6 inch monthly rainfall is the primary cause of this month's water quality improvement.

The December WQI reached the C/Fair range or 'green' level for the first time in 22 months. The Dec. index has been in this range (38-49) ten out of the past 15 years. It has been higher (B-Good/blue) only twice (12/'04 and 12/'06) and lower (D-Marginal/yellow) three times (12/'05, 12/'16 and 12/'17). December 2018 rainfall and streamflow were the highest on record since February 2017. The January index is often higher than December due to further decline in water temperatures, greater daily flow from storm runoff and elevated dissolved oxygen levels. The wet weather period (Dec-March) typically results in the best water quality metrics in the river.

This year's dry weather period (extending from April through Nov.) saw some of the lowest daily flows recorded at the two USGS stream gauging stations in the past 14-years. JCK (12/23/18)

