

Musselshell Watershed Coalition

Salinity Meter End of Season Assessment: May 2025

In April of 2025, a drift test was conducted on all five conductivity sensors to assess meter agreement over a range of salinities. This test was conducted by Gabrielle Jawer and Bridget Warrenfeltz at Marsh Lab in Bozeman, MT. All five meters were placed in a single bucket of tap water, and slugs of salt water were added to the bucket as stated in the SOP. After each addition of salt water, specific conductivity was measured periodically to assess meter agreement over the range of salinities observed during the monitoring season.

Except for a few outliers due to poor mixing of the salt water, the relative percent difference (RPD) for LMCD1, LMCD2, LMCD3, and LMCD4 fell within the acceptable range of 0 to 5 percent. The ProPlus meter, however observed several RPD values greater than 5%, even after additional mixing.

Time (min)	LMCD 1		LMCD 2		LMCD 3		LMCD 4		ProPlus		Avg.	Notes
	SC (us/cm)	RPD	SC (us/cm)	RPD	SC (us/cm)	RPD	SC (us/cm)	RPD	SC (us/cm)	RPD		
0	277.4	0.70%	263.1	-4.49%	287.1	4.22%	263.8	-4.24%	286	3.82%	275.5	Place probes in tub of water. (1/2 full 5 gallon bucket, about 9L water)
2	268.3	-0.19%	264	-1.79%	270	0.45%	263.5	-1.97%	278.2	3.50%	268.8	
4	266.5	-0.33%	264.3	-1.15%	267.2	-0.07%	262.3	-1.90%	276.6	3.45%	267.4	
6	265.7	-0.35%	264.2	-0.91%	266.1	-0.20%	261.9	-1.77%	275.2	3.22%	266.6	
8	265.2	-0.44%	264.4	-0.74%	265.7	-0.25%	262	-1.64%	274.5	3.06%	266.4	
10	264.9	-0.47%	264.4	-0.65%	265.3	-0.32%	262	-1.56%	274.1	2.99%	266.1	First round of salt. 1L water with 0.5 teaspoon salt.
12	679	8.33%	657	4.82%	686	9.44%	599	-4.44%	513	-18.16%	626.8	
14	678	7.34%	659	4.33%	686	8.61%	598	-5.33%	537.2	14.95%	631.6	mixed water more
16	669	0.90%	664	0.15%	661	-0.30%	662	-0.15%	659	-0.60%	663.0	Second round of salt. 1L water with 1.5 teaspoon salt.
18	1263	-8.56%	1323	-4.21%	1242	-10.08%	1642	18.88%	1436	3.97%	1381.2	mixed water more
20	1314	1.31%	1313	1.24%	1283	-1.08%	1303	0.47%	1271.8	-1.94%	1297.0	
22	1311	1.20%	1311	1.20%	1283	-0.96%	1302	0.51%	1270	-3.96%	1295.4	Third round of salt. 1L water with 1.5 tsp salt.
24	1593	1.96%	1592	1.89%	1587	1.57%	1587	1.57%	1453	-7.00%	1562.4	
26	1592	1.96%	1602	2.60%	1575	0.87%	1582	1.32%	1456	-6.75%	1561.4	
28	1591	1.95%	1601	2.59%	1574	0.86%	1583	1.44%	1454	-6.83%	1560.6	
30	1593	2.05%	1600	2.50%	1575	0.90%	1582	1.35%	1455	-6.79%	1561.0	Fourth round of salt. 1L water with 1.5 tsp salt.
32	1780	2.03%	1795	2.89%	1767	1.28%	1772	1.57%	1609	-7.77%	1744.6	
34	1779	1.98%	1794	2.84%	1768	1.35%	1773	1.64%	1608	-7.82%	1744.4	
36	1776	2.43%	1794	3.47%	1765	1.80%	1772	2.20%	1562	9.91%	1733.8	Fifth round of salt. 1L water with 1.5 tsp salt.
38	3300	-0.18%	3323	0.52%	3304	-0.05%	3290	-0.48%	3312	0.19%	3305.8	
40	3310	-0.01%	3325	0.45%	3306	-0.13%	3299	-0.34%	3313	0.02%	3310.2	
42	3315	0.08%	3326	0.41%	3307	-0.16%	3303	-0.28%	3311	-0.04%	3312.4	

Then, in early May, each conductivity sensor was placed in a 1413 μ S conductivity standard to test reading accuracy before and after cleaning the meter electrodes. While RPDs between pre- and post-cleaning were less than 5% for LCMD1, LCMD2, and LCDM3, the LMCD4 and the ProPlus meters had RPD (pre vs post cleaning) magnitudes higher than 5%. All meters except the ProPlus read less than the 1413 μ S conductivity standard prior to cleaning. After cleaning, all meters except LMCD1 read less than or equal to the 1413 μ S conductivity standard. All meters read within 1% of the calibration solution after cleaning.

	LMCD 1			LMCD 2			LMCD 3			LMCD 4			ProPlus			
	Time (min)	SC (us/cm)	Temp (C)	Time (min)	SC (us/cm)	Temp (C)	Time (min)	SC (us/cm)	Temp (C)	Time (min)	SC (us/cm)	Temp (C)	Time (min)	SC (us/cm)	Temp (C)	
Year: 2025	Pre-cleaning	0	1388	22.0	0	1390	21.9	0	1368	21.9	0	1280	21.7	0	1512	21.9
		2	1389	21.8	2	1391	21.8	2	1375	21.7	2	1322	21.6	2	1522	21.7
		4	1388	21.8	4	1390	21.8	4	1377	21.7	4	1335	21.6	4	1515	21.5
		6	1388	21.8	6	1389	21.8	6	1377	21.7	6	1337	21.6	6	1514	21.4
		8	1387	21.8	8	1388	21.8	8	1378	21.7	8	1338	21.6	8	1512	21.4
		10	1388	21.7	10	1387	21.8	10	1378	21.7	10	1338	21.6	10	1509	21.3
	Post-cleaning	0	1404	22.7	0	1400	22.2	0	1394	22.7	0	1396	22.7	0	1390	23.1
		2	1409	22.8	2	1407	22.3	2	1404	22.7	2	1406	22.6	2	1400	23.1
		4	1413	22.9	4	1411	22.4	4	1410	22.8	4	1409	22.7	4	1402	23.1
		6	1415	23.0	6	1412	22.6	6	1412	22.9	6	1410	22.8	6	1402	23.1
		8	1415	23.1	8	1412	22.7	8	1413	23.1	8	1409	23	8	1402	23.2
	RPD (pre vs post clean)		-2.1%			-1.6%			-2.5%			-5.1%			7.5%	
	RPD (post clean reading vs 1413 solution)		0.2%			-0.1%			0.0%			-0.4%			-0.7%	

In summary, LMCD1, LMCD2, and LMCD 3 likely experienced less than 5% error during the 2024 field season. The difference among these meters at the end of the season was less than 5% across salinity levels and the difference from the calibration solution was less than 3%. We may also expect less than 5% error from the LMCD4 and less than 10% error from the ProPlus.