

Musselshell Watershed Coalition

Salinity Meter End of Season Assessment: March 2023

In March of 2023, a drift assessment was conducted on all 5 conductivity sensors to evaluate meter agreement over a wide range of conductivities. Both assessments were conducted by Raeya Gordon at Marsh Lab in Bozeman, where the MSU Extension Water Quality Program is located. The meters were placed in a tub of water (approximately 9L) and readings were recorded at regular intervals. Slugs of salt water were added periodically to assess the drift of meters over the range of salinities that could be measured during the monitoring season. The relative percent difference (RPD) between the five meters was within an acceptable range. When the meters were initially placed into the tub of water, or when a new slug of salt water was just added, the RPD reached as high as 35% in one instance. After allowing time for proper mixing and the meters to equilibrate, the RPDs didn't exceed 5%. For the best assessment of the previous season's data quality, the calibration should be done last. Notably, all four LMCD meters were calibrated before these evaluations.

Time (min)	LMCD 1		LMCD 2		LMCD 3		LMCD 4		ProPlus		Avg.	Notes
	SC (uS/cm)	RPD										
0	215.4	-6.09%	224.6	-2.08%	220.6	-3.82%	218.4	-4.78%	267.8	16.76%	229.4	Place probes in tub of water. (1/2 full 5 gallon bucket, about 9L water)
2	212.6	-1.17%	209.3	-2.71%	210.8	-2.01%	210.1	-2.33%	232.8	8.22%	215.1	
4	213.2	-2.07%	210.6	-3.26%	218.5	0.37%	210.8	-3.17%	235.4	8.13%	217.7	
6	212.3	-1.29%	210.8	-1.99%	222.8	3.59%	209.9	-2.41%	219.6	2.10%	215.1	
8	212.3	-1.76%	211.2	-2.27%	222.9	3.15%	209.9	-2.87%	224.2	3.75%	216.1	
10	868	-8.67%	867	-8.78%	1286	35.31%	863	-9.20%	868	-8.67%	950.4	First round of salt. 1L water with 0.5 teaspoon salt.
12	868	0.37%	865	0.02%	862	-0.32%	862	-0.32%	867	0.25%	864.8	
14	868	0.42%	864	-0.05%	862	-0.28%	860	-0.51%	868	0.42%	864.4	
16	2447	0.08%	2448	0.12%	2441	-0.16%	2434	-0.45%	2455	0.41%	2445.0	Second round of salt. 1L water with 1.5 teaspoon salt.
18	2447	0.08%	2449	0.16%	2441	-0.16%	2433	-0.49%	2455	0.41%	2445.0	
20	2449	0.17%	2448	0.13%	2442	-0.11%	2430	-0.61%	2455	0.42%	2444.8	
22	3763	-0.14%	3776	0.21%	3768	-0.01%	3737	-0.83%	3797	0.76%	3768.2	Third round of salt. 1L water with 1.5 tsp salt.
24	3768	-0.11%	3777	0.13%	3771	-0.03%	3747	-0.66%	3797	0.66%	3772.0	
26	3765	-0.07%	3776	0.22%	3765	-0.07%	3739	-0.76%	3794	0.70%	3767.8	
28	3763	-0.11%	3775	0.21%	3764	-0.08%	3739	-0.75%	3795	0.74%	3767.2	
30	4925	-0.42%	4948	0.04%	4940	-0.12%	4917	-0.59%	5000	1.09%	4946.0	Fourth round of salt. 1L water with 1.5 tsp salt.
32	4931	-0.23%	4948	0.11%	4943	0.01%	4889	-1.08%	5002	1.20%	4942.6	
34	4930	-0.28%	4945	0.03%	4942	-0.03%	4900	-0.88%	5001	1.16%	4943.6	
36	5868	-0.87%	5894	-0.43%	5963	0.74%	5894	-0.43%	5978	0.99%	5919.4	Fifth round of salt. 1L water with 1.5 tsp salt.
38	5875	-0.80%	5894	-0.48%	5968	0.77%	5893	-0.50%	5982	1.01%	5922.4	
40	5868	-0.92%	5907	-0.26%	5966	0.74%	5889	-0.56%	5981	0.99%	5922.2	
41	5865	-0.95%	5908	-0.23%	5967	0.77%	5886	-0.60%	5981	1.01%	5921.4	

After the drift assessment, the meters were placed in 1413 conductivity standard before and then after cleaning the meter electrodes. The relative percent difference (RPD) between pre and post cleaning was no greater than 0.5% for all meters. The ProPlus had a 2.2% RPD between post cleaning and the 1413 standard, the greatest RPD of all the meters

		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)
2023	Pre-cleaning	0	1519	23.4	0	1405	23.4	0	1408	23.4	0	1435	22.1	0	1436	
		2	1420	23.3	2	1411	23.4	2	1409	23.3	2	1433	22.3	2	1436	
		4	1420	23.3	4	1413	23.4	4	1411	23.3	4	1428	22.3	4	1437	
		6	1420	23.3	6	1414	23.4	6	1412	23.3	6	1427	22.4	6	1439	
		8	1419	23.3	8	1415	23.4	8	1412	23.4	8	1426	22.5	8	1440	
	Post-cleaning	0	1419	22.7	0	1406	22.8	0	1411	23.0	0	1425	22	0	1429	
		2	1427	22.7	2	1417	22.8	2	1406	22.8	2	1444	22	2	1437	
		4	1423	22.9	4	1422	22.9	4	1414	23.0	4	1429	22.3	4	1440	
		6	1425	22.8	6	1422	22.9	6	1415	23.0	6	1430	22.3	6	1441	
		8	1424	22.9	8	1422	22.9	8	1516	23.0	8	1430	22.4	8	1443	
	RPD (pre vs post clean)															-0.3%
			-0.4%			-0.5%			-0.3%			-0.2%				-0.3%
	RPD (post clean reading vs 1413 solution)					0.6%			0.2%			1.1%				2.2%