

Musselshell Watershed Coalition

Salinity Meter End of Season Assessment: October 2019

Summary prepared by Mitchell Hoffman and Adam Sigler 10/31/2019

On October 30, 2019, all 5 meters were assessed at the same time for reading agreement. This was conducted at the USDA NRCS Field Office in Winnett, MT by Mitchell Hoffman. Meter readings were recorded in 1413 solution before and after cleaning the meter electrodes. The relative percent differences (RPD) between pre and post cleaning was typically less than 3%, with the exception of LMCD 4 which was exceptionally dirty. The ProPlus had a post cleaning RPD of 6.7% which is high, all other meters read within 1% of the solution.

		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)	
2019	Pre-cleaning	0	1337	20.0	0	1416	20.6	0	1435	21.0	0	1463	20.5	0	1543	20.0	
		2	1373	20.0	2	1418	20.7	2	1425	21.2	2	1467	20.7	2	1456	20.0	
		4	1372	20.1	4	1419	20.7	4	1425	21.2	4	1475	20.7	4	1479	20.1	
												6	1481	20.8	6	1509	20.0
												8	1485	20.8	8	1512	20.0
												10	1489	20.9			
	Post-cleaning	0	1415	20.1	0	1398	20.0	0	1403	20.0	0	1400	20.2	0	1501	20.1	
		2	1405	20.1	2	1401	20.0	2	1403	20.1	2	1408	20.1	2	1507	20.0	
		4	1402	21.0	4	1403	20.0	4	1403	20.1	4	1408	20.1	4	1507	20.0	
		6	1402	20.8													
		RPD (pre vs post clean)		-2.2%		1.1%		1.6%		5.6%		0.3%					
		RPD (post clean reading vs 1413 solution)		-0.8%		-0.7%		-0.7%		-0.4%		6.7%					

All five meters were then placed in the same tub of water and readings were recorded simultaneously while slugs of salt water were added in accordance with the SOPs, to assess agreement among the meters over the range of salinities observed during the monitoring season. The full results are in the table below. When given a adequate time to take a stable reading, the probes all performed fairly well, particularly at the lower salinity levels more likely to be seen in the Musselshell. At low salinity, all probes had RPDs from the mean of less than 6%. There were some spikes the RPDs following the addition of salt, but after several readings RPDs mostly returned to lower levels, demonstrating the need to give probes enough time in the field to take proper readings. In the 2019 season we saw measurements max out at around 2500 uS/cm so it's unlikely that RPD was ever higher than 6% during field measurements.

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	1715	-0.53%	1690	-1.98%	1697	-1.58%	1707	-1.00%	1812	5.09%	1724.2	Placed probes in tub of Winnett NRCS field office tap water.
1	1715	-0.64%	1692	-1.97%	1699	-1.56%	1707	-1.10%	1817	5.27%	1726.0	
5	1716	-0.72%	1690	-2.22%	1705	-1.35%	1710	-1.06%	1821	5.36%	1728.4	
8	1716	-0.59%	1689	-2.16%	1701	-1.46%	1703	-1.34%	1822	5.55%	1726.2	
10	3328	-7.97%	3343	-7.56%	4409	21.92%	3512	-2.89%	3490	-3.50%	3616.4	Added salt water to the tub of tap water/probes, mixed in the salt water.
12	3322	-4.61%	3282	-5.75%	3803	9.21%	3473	-0.27%	3532	1.42%	3482.4	
15	3293	-3.34%	3258	-4.37%	3594	5.49%	3343	-1.87%	3546	4.09%	3406.8	
17	3282	-3.13%	3252	-4.01%	3528	4.13%	3331	-1.68%	3547	4.69%	3388.0	
19	3931	-5.88%	4185	0.21%	4090	-2.07%	3749	-10.23%	4927	17.97%	4176.4	Added salt water to the tub of tap water/probes, mixed in the salt water.
21	3912	-5.10%	4050	-1.76%	4135	0.31%	3784	-8.21%	4731	14.76%	4122.4	
23	3890	-4.36%	3970	-2.39%	4130	1.54%	3865	-4.97%	4481	10.17%	4067.2	
25	3882	-4.15%	3925	-3.09%	4107	1.40%	3937	-2.79%	4400	8.64%	4050.2	
28	4441	-7.20%	4650	-2.83%	4988	4.23%	4757	-0.59%	5091	6.39%	4785.4	Added salt water to the tub of tap water/probes, mixed in the salt water
30	4518	-3.45%	4559	-2.58%	4730	1.08%	4647	-0.70%	4944	5.65%	4679.6	
35	4536	-1.86%	4480	-3.08%	4618	-0.09%	4600	-0.48%	4877	5.51%	4622.2	

In summary, the difference among meters at the end of the season was less than 6%, and the difference from calibration solution was less than less than 1%, with the exception of the ProPlus which was less than 7%. This verified high level of accuracy without calibration during the season indicates that the current procedure of calibrating only once at the beginning of the season and checking again at the end produces accurate results while dramatically reducing strain on volunteers.