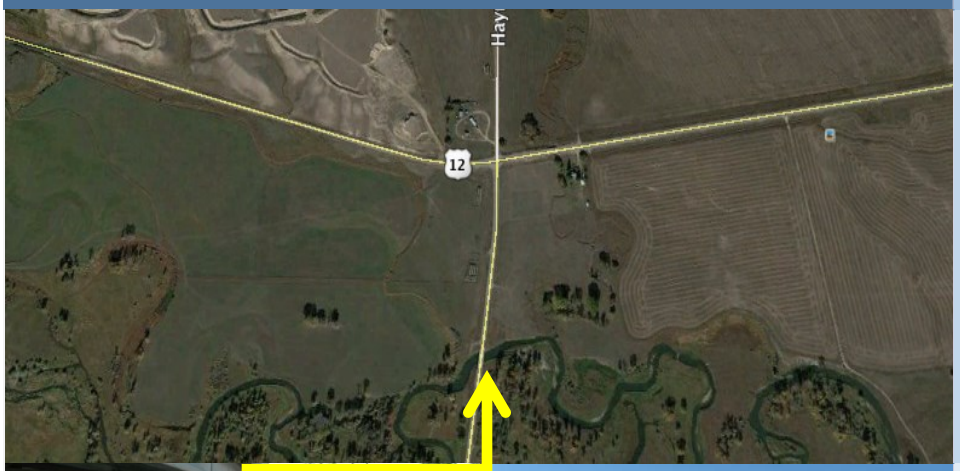
Musselshell Watershed Coalition Sampling Site 1: Twodot

Site ID: MWC_MSSL_TwoDot

Lat/long: 46.4301, -110.0721



2015 Sampling dates

Apr 30-May 2	
May 14-16	July 23-25
May 28-30	Aug 6-8
June 11-13	Aug 20-22
June 25-27	Sept 3-5
July 9-11	Sept 17-19
	Oct 1-3

Thanks to Previous monitoring volunteers!

2014:
Leon Hammond
Upper musselshell water mgmt

2013:
Leon Hammond
Upper musselshell water mgmt

Access & Monitoring: River access and sampling site is at the northwest side of the bridge. This reach is frequently de-watered in the late-summer months and flows are highly influenced by discharge from the nearby Martinsdale Reservoir. Monitoring access is just under bridge.

Photo-points: Photos should be taken from the bridge abutment facing west-southwest with the end of fence and flagging tape in the center of the frame. A marker will be in place for the camera on the abutment. Photo is at a medium downward angle looking upstream on the river with the north bank in view. The photo is bisected by a fence which separates a fishing access easement from a landowner's property. The southern bank of the stream will be slightly in frame. A stretch of the bank is covered in rip-rap on the southern side.

Driving Directions: Take Hwy 12 West from Harlowton. Travel about 12 miles and Turn left (South) on Two Dot Hwy (the town of Two Dot turn off). Continue to the bridge, and park at pullout next to bridge.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

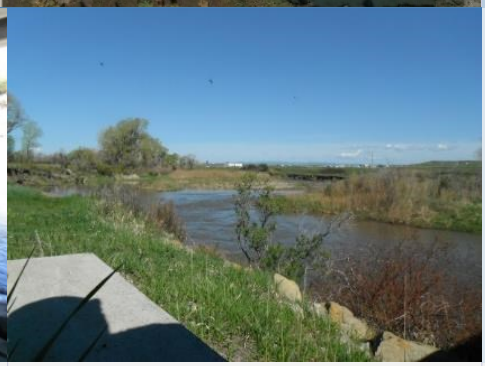
Musselshell Watershed Coalition Site 2: East Harlowton

Site ID: MWC_MSSL_EHarlow

Lat/Long: 46.4251, -109.7999

2015 Sampling dates

Apr 30-May 2	
May 14-16	July 23-25
May 28-30	Aug 6-8
June 11-13	Aug 20-22
June 25-27	Sept 3-5
July 9-11	Sept 17-19
	Oct 1-3



Thanks to Previous monitoring volunteers!

2014:
Leon Hammond
Upper musselshell water mgmt

2013:
Leon Hammond
Upper musselshell water mgmt

Access & Monitoring: River access is off bridge to the south west. Reach frequently becomes de-watered in the late-summer months. Monitoring is just under bridge.

Photo-points: Photos should be taken from bridge abutment on the south bank facing northwest with a steel post and green flagging tape on a peninsula on the north bank. The bridge abutment is marked to show where the camera should be. The photo is set at a medium downward angle looking upstream on the river the north bank in view as the river comes through a bend. The south bank will be in view as well along with an abandoned reach and backwater. Banks have health populations of native vegetation at the bend. The area damaged by the flood should be monitored periodically. Supplemental photos detailing the changes to the flood damaged (eroding) bank to the west of the site should be taken as well.

Directions: Take Hwy 12 East from Harlowton. Turn right (South) on Red Bridge Rd (at sewer lagoons) and continue to the bridge, and park at pullout next to bridge.

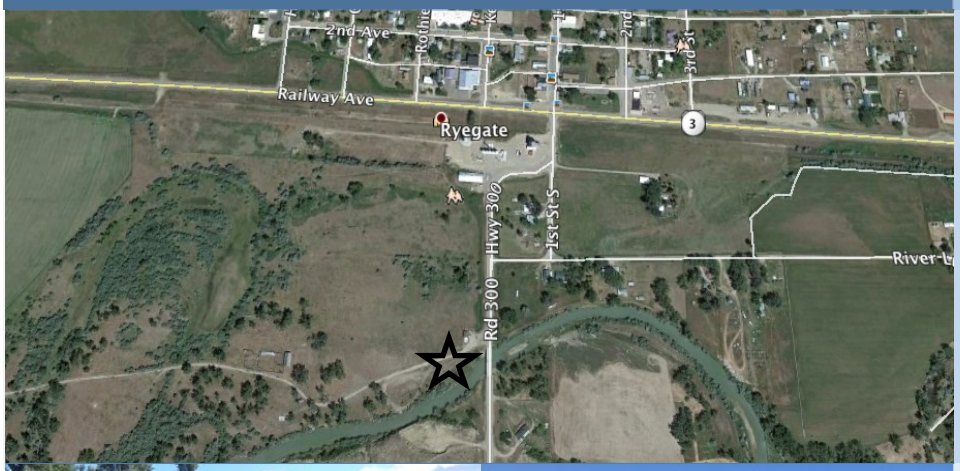
Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 3: Above Careless

Site ID: MWC_MSSL_Abv_Careless

Lat/Long: 46.293983, -109.257867



2015 Sampling dates

Apr 30-May 2	
May 14-16	July 23-25
May 28-30	Aug 6-8
June 11-13	Aug 20-22
June 25-27	Sept 3-5
July 9-11	Sept 17-19
	Oct 1-3

Thanks to Previous monitoring volunteers!

2014: Annie and John Colson, local water users

2013: David Bruner, science teacher, ryegate school

Access & Monitoring: This sampling site is upstream from the Careless Creek confluence just south of Ryegate. It represents the water quality of the Musselshell River before the discharges from Careless Creek. It is beneath the bridge south of Ryegate near the city water building.

Photo-points: Photos should be taken from the bridge south of Ryegate by the city water building facing upstream. The placement of the camera is marked on the upstream side of the bridge. The camera should be placed within this marked box and angled slightly downward.

Directions: From Ryegate, head South on 1st St S, follow the curve to the right, and park in front of the water building before the bridge. The monitoring site is immediately upstream from the bridge.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 4: below Careless

Site ID: MWC_MSSL_Blw_Careless

Lat/Long: 46.3152, -109.1849

2015 Sampling dates

Apr 30-May 2	
May 14-16	July 23-25
May 28-30	Aug 6-8
June 11-13	Aug 20-22
June 25-27	Sept 3-5
July 9-11	Sept 17-19
	Oct 1-3

Thanks to Previous monitoring volunteers!

2014: annie and john colson, water users

2013: David Bruner, science teacher, ryegate school

Access & Monitoring: Access is downstream (east) from Careless Creek, just off the parking area south of the highway on the north side of the river. This site monitors the water returning to the Musselshell from Deadman's basin. Receives discharge from Careless, Deadman's, and Barber Canal.

Photo-points: Photos should be taken from the bridge over Careless Creek on US 12. There is a point marked on the bridge railing facing downstream for the camera. The camera should be lined up within the marked box facing downstream at a slightly downward angle. See photo (above left)

Directions: From Ryegate, drive approximately five miles east to the bridge just after Sterling Rd. Pull into the dirt drive immediately after the bridge on the right, and park in the small dirt pullout before to the right of the gate. To walk into the monitoring site, cross the barbed wire at the HWY, and walk down the rip rap or on top of the bank to the site.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site

5: Careless creek

Site ID: MWC_Careless_Abv_Mssl

Lat/Long: 46.3152, -109.1852

2015 Sampling dates

Apr 30-May 2
May 14-16
May 28-30
June 11-13
June 25-27
July 9-11
July 23-25
Aug 6-8
Aug 20-22
Sept 3-5
Sept 17-19
Oct 1-3

Thanks to Previous monitoring volunteers!

2014: annie and john colson, water users

2013: David Bruner, science teacher, ryegate school

Access & Monitoring: This site monitors Careless Creek at the highway just above its confluence with the Musselshell.

Photo-points: Photos should be taken from the bridge over Careless Creek on US 12. There is a point marked on the bridge railing facing upstream for the camera. The camera should be lined up within the marked box facing up Careless Creek at a slightly downward angle.

Directions: From Ryegate, drive approximately five miles east to the bridge just after Sterling Rd. Pull into the dirt drive immediately after the bridge on the right, and park in the small dirt pullout before to the right of the gate. Cross barbed wire fence from south side of the highway. Walk under the bridge and open fence at loose panel held on by piece of wire. Walk to site from there.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 6: roundup/hwy 87

Site ID: MWC_MSSL_Hwy87

2015 Sampling dates

Apr 30-May 2
May 14-16
May 28-30
June 11-13
June 25-27
July 9-11
July 23-25
Aug 6-8
Aug 20-22
Sept 3-5
Sept 17-19
Oct 1-3

Thanks to Previous monitoring volunteers!

2015: matt Schmidt, big sky watershed corps

2014: luke stappler, big sky watershed corps

2013: David stout, big sky watershed corps

Access & Monitoring: River access is on the north west side of the bridge over Hwy 87. Site is close to private property. This site is upstream of Roundup. Monitoring should be done upstream of the bridge and not under it to avoid inaccurate in-stream temperature readings.

Photo-points: Photo-point site is on the bridge itself facing upstream. There is a spot marked in paint pen where the camera should be placed. Face the camera upstream with a slight downward tilt.

Directions: From Roundup, drive 2 miles South to the HWY 87s bridge, and pull off on the road immediately before the bridge on the right side of road. Turn left on the dirt road that runs parallel to the HWY. Park, walk down, and monitor upstream from the bridge.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 7: roundup/co. rd. 4

Site ID: MWC_MSSL_CoRd4

Lat/Long: 46.4464, -108.5125

2015 Sampling dates

Apr 30-May 2
May 14-16
May 28-30
June 11-13
June 25-27
July 9-11
July 23-25
Aug 6-8
Aug 20-22
Sept 3-5
Sept 17-19
Oct 1-3

Thanks to Previous monitoring volunteers!

2015: matt Schmidt, big sky watershed corps

2014: luke stappler, big sky watershed corps

2013: David stout, big sky watershed corps

Access & Monitoring: Access is on the northeast end of the bridge over the Musselshell. Monitoring site is on the north side of the river. Access is made somewhat difficult by cattle fence. Monitoring should be done upstream of the bridge and not under it to avoid inaccurate in-stream temperature readings.

Photo-points: Photo-point site is on the bridge facing upstream. There is a spot marked in paint pen where the camera should be placed. Face the camera upstream with a slight downward tilt.

Directions: In Roundup, head East on 2nd Ave East until it forks. Take #4 Rd (the left fork) until the bridge over the Musselshell (approximately 2 miles). Park in the pull off on the right before the bridge. Enter through the barbed wire fence on the same side, and walk to the site. Monitor approximate 20 feet upstream from the bridge.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

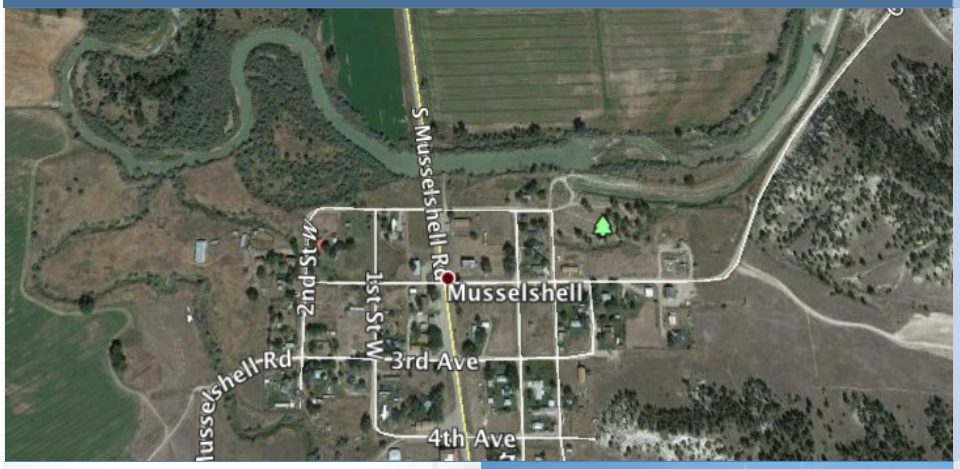
USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site

8: musselshell

Site ID: MWC_Mussel_AtMusselshell

Lat/Long: 46.5199, -108.0916



2015 Sampling dates

Apr 30-May 2	
May 14-16	July 23-25
May 28-30	Aug 6-8
June 11-13	Aug 20-22
June 25-27	Sept 3-5
July 9-11	Sept 17-19
	Oct 1-3

Thanks to Previous monitoring volunteers!

2015: Lynn rettig, delphia-melstone canal users

2014: Lynn rettig, delphia-melstone canal users

2013: Lynn rettig, delphia-melstone canal users

Access & Monitoring: Musselshell River at bridge north of Musselshell is accessible from the bridge to the south east. This site monitors the quality of water going into the north and south canals. Monitoring should take place on the south bank of the river and should not take place under the bridge.

Photo-points: Photo-point site is on the bridge facing upstream. There is a spot marked in paint pen where the camera should be placed. Face the camera upstream with a slight downward tilt.

Directions: Musselshell Bridge - Take HWY 12 East from Roundup to the Musselshell turnoff. Continue towards Musselshell and cross the Musselshell River on the bridge. On the South side of the river to the left there is a parking spot. Park here.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 9: Above mel-stone Canal

Site ID: MWC_MSSl_Abv_Canal

Lat/Long: 46.7246, -107.8271

2015 Sampling dates

Apr 30-May 2	
May 14-16	July 23-25
May 28-30	Aug 6-8
June 11-13	Aug 20-22
June 25-27	Sept 3-5
July 9-11	Sept 17-19
	Oct 1-3

Thanks to Previous monitoring volunteers!

2015: Lynn rettig, delphia-melstone canal users

2014: Lynn rettig, delphia-melstone canal users

2013: Lynn rettig, delphia-melstone canal users

Access & Monitoring: The monitoring site is on the shore off the left side of this picture, just down from the bridge. Monitor water quality on the Musselshell above Delphia/Melstone South Canal.

Photo-points: Take from marked spot on bridge over the start of the South canal facing up the Musselshell River. Tilt camera slightly downwards.

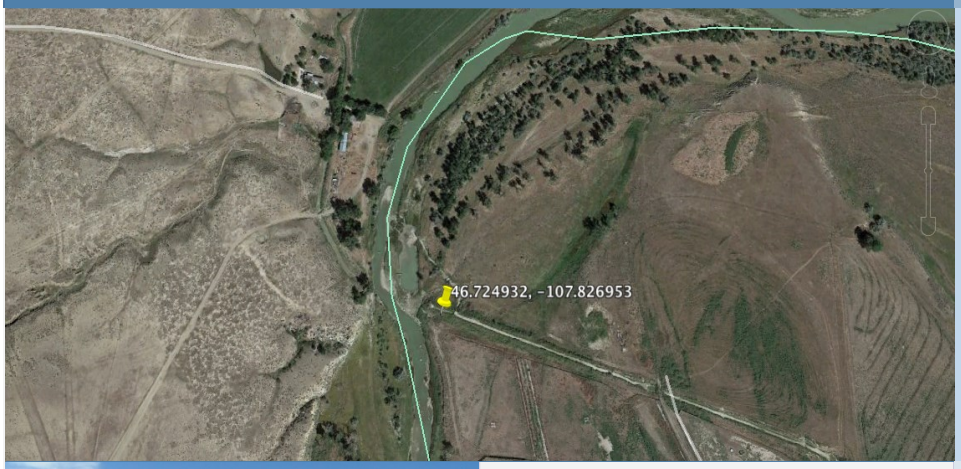
Directions: Go back out from Musselshell to HWY 12 and head east again. Go past the town of Melstone about a mile and turn North onto the Mosby Road. Maybe about 8 miles you will find a county road that goes east. It is almost to the end of the pavement. If you leave the pavement you have gone too far. After you head east you will find a bridge that crosses the Musselshell River. Park on the East side of the bridge and monitor.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 10: Delphia Melstone Canal, south end

Site ID: Site ID: MWC_MSSL_Blw_Canal



2015 Sampling dates

Apr 30-May 2
May 14-16
May 28-30
June 11-13
June 25-27
July 9-11
July 23-25
Aug 6-8
Aug 20-22
Sept 3-5
Sept 17-19
Oct 1-3

Thanks to Previous monitoring volunteers!

2015: Lynn rettig, delphia-melstone canal users

2014: Lynn rettig, delphia-melstone canal users

2013: Lynn rettig, delphia-melstone canal users

Access & Monitoring: Monitor at approximately where the arrow is. It's on the same side of the river as the photo point. Site monitors water quality on the Delphia/Melstone South Canal above its confluence with the Musselshell.

Photo-points: Place camera on pipe on the river side of the head-gate. Tilt the camera slightly downwards while pointing up-stream.

Directions: Continue East from the "above Melstone canal" spot less than 1/4 mile. There will be an old Feed-lot on your left. Turn into feed lot and go north through the Feedlot until you come out on the north side. You will cross the South Canal and imme-diately turn West and it will take you to the river and to where the South Canal dumps back into the river. Park and walk down to the river to moni-toring spot.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 11: musselshell above flatwillow

Site ID: MWC_MSSL_Abv_Flatwillow

Lat/Long: 46.9277, -107.9304

2015 Sampling dates

Apr 30-May 2
May 14-16
May 28-30
June 11-13
June 25-27
July 9-11
July 23-25
Aug 6-8
Aug 20-22
Sept 3-5
Sept 17-19
Oct 1-3

Thanks to Previous monitoring volunteers!

2014: Jolene Shaw, local water user

2013: Jay woodford, local water user

Access & Monitoring: Monitor right next to where a person would be standing to take these picture, which can be found by looking for the spot where the Woodford driveway is closest to the river and scrambling down the steep bank. Site is located on the Musselshell above its confluence with Flat Willow Creek.

Photo-points: Photo-point is taken at the low water crossing downhill from the Woodford residence facing upstream towards the cliffs, and downstream toward the eroding bank, and directly across the river as well.

Directions: From Winnett, head East on HWY 200 for approximately 25 miles until the HWY 500/Melstone Rd intersection right before the town of Mosby. Turn Right (South) on HWY 500 and drive approximately 5 miles until you see a sign for the Woodford ranch. Turn left at the sign, and take the road that curves to the right below the hill where the house is perched. The road will take you past a pen and stables on your left, and it will curve left around these to a gate. Open the gate and drive about 300 feet to the low water crossing. Monitor and take photo points there.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Musselshell Watershed Coalition Sampling Site 12: musselshell below flatwillow

Site ID: MWC_MSSL_Blw_Flatwillow

Lat/Long: 46.9166, -107.9260

2015 Sampling dates

Apr 30-May 2	
May 14-16	July 23-25
May 28-30	Aug 6-8
June 11-13	Aug 20-22
June 25-27	Sept 3-5
July 9-11	Sept 17-19
	Oct 1-3

Thanks to Previous monitoring volunteers!

2014: Jolene Shaw, local water user

2013: Jay woodford, local water user

Access & Monitoring: Go through gate into RV park area, and go through RV park until second gate. Cross this gate as well, and monitor where these photos were taken.

Photo-points: Take photos as closely as possible to those shown.

Directions: Coming from the Woodford Ranch, head back towards HWY 200. Immediately upon crossing the bridge over Flatwillow, there is a two track and a gate to your right. Go through gate, and turn left. Follow the two track until it dead ends at the river with a long gravely beach down to your left along the river. You can drive down to monitor or you can park and walk. The shore can be muddy.

Thanks for participating in your local watershed! DON'T FORGET TO UPLOAD YOUR DATA: http://msuewq.pythonanywhere.com/

USERNAME: _____ PASSWORD:_____

Remember:

Clean Probe Vents with Pipe Cleaners Before Use.

Photo Points! (see other side of this page)

Do you have more than one site?

Enter data online immediately after sampling. Your downstream neighbors may need to know what's coming.

Don't take measurements in the shadow of a bridge. This could interfere with temperature readings.

If you miss a sampling window, you should still take a measurement. Late is better than never. If you can't make it to site, call coordinator at 406-429-6646 ext. 2#

Unplug and Neatly Coil Probe from Unit After Use

Site #	**Date**	**Time**	**Spc. Conductivity**	**Temperature**

Updated 2/3/2016

Salinity Monitoring End of Season Protocol

Musselshell Watershed Coalition

In 2015, MWC decided to calibrate at the beginning and end of the season instead of having their volunteers calibrate the meters before sampling. This helped streamline the sampling process for the volunteers, and a protocol was written to assess any differences between the meters and to see if this change made any significant differences in data collection.

The following protocol is to be done by the coordinator at the end of the sampling season.

Determining Drift Between Meters

1. Assess the condition of meters before any modifications are made. Do not replace batteries unless the meter is completely dead.
2. Gather salt and a bucket that is large enough to test all of the meters together. Fill the bucket about halfway with water to ensure that the meters will be submerged.
3. Place all meters in tap water at the same time and allow the meters to equilibrate for 10 minutes. Record the values for all meters every few minutes while they are equilibrating.
4. Add some salt in a bottle and fill with water. Shake the bottle to dissolve and thoroughly mix the salt. *Note: ½ teaspoon of table salt (NaCl) in 1L of tap water from Marsh Labs produces an SC of ~6,900 uS/cm.*
5. Pour the salt water into the bucket of water. Record the values for all meters every few minutes until the meters have equilibrated.
6. Repeat Step 5 two more times.
7. Calculate the average SC for the five meters for each time values were recorded.
8. Using the average, calculate a relative percent difference (RPD) for each meter.

$$RPD = \frac{(Meter-AVG)}{AVG} \times 100$$

Calibration Check

1. Place each uncleaned meter into fresh calibration solution and record values every few minutes until meters equilibrates.
2. Clean each meter with pipe cleaners on the contacts and retest in fresh calibration solution. Record values every few minutes until meters equilibrate.
3. Assess drift between the uncleaned and cleaned meter from the calibration solution used at the start of the season by calculating a RPD value.