STANDARD OPERATING PROCEDURES FOR WATER QUALITY SAMPLE COLLECTION, PROCESSING AND DATA MANAGEMENT AT PLATTE RIVER STATE FISH HATCHERY

Edited and Revised

September 2016

SCOPE

The Platte River State Fish Hatchery collects water quality data from Platte Lake and its tributaries in an effort to quantify phosphorus concentrations in the watershed. This data will also be used to detect changes in water quality over time. The ultimate goal of this effort is to restore and preserve water quality in the Platte River watershed.

PURPOSE

The purpose of this document is to provide a detailed outline of the procedures used in sample collection and processing. Adherence to consistent sampling and processing protocol is vital to ensure data is of a known quality and integrity.

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STANDARD OPERATING PROCEDURES
COLLECTING SAMPLES FOR CHLOROPHYLL *a* ANALYSIS

1. SCOPE/ PURPOSE

1.1 This Standard Operating Procedure (SOP) describes the procedure for collecting and processing samples for Chlorophyll *a* analysis. This sample allows composite water samples to be collected from the entire column of the photic zone. It is assumed that the photic zone of the lake being studied is two times the Secchi depth.

2. REFERENCES

2.1 Handbook of Common Methods in Limnology, Lind, Owen T., 1985.

3. DEFINITIONS

3.1 Chlorophyll *a* is a photosynthetic pigment found in plants, including phytoplankton. It constitutes about 1 to 2% of the dry weight of planktonic algae; therefore the total phytoplankton biomass may be estimated based on the chlorophyll *a* concentration.

3.2 Photic zone is the column of water reaching from the surface to the photic depth. The Photic depth is the depth that receives 1% of surface illumination.

4. MATERIALS

4.1 Tube sampler.

4.2 Kemmerer.

4.3 Brown bottles.

5. SAMPLE COLLECTION PROCUDURE

5.1 The tube sampler is lowered 30 feet into the water column and then emptied into a 5 liter (L) Nalgene brown bottle labeled “TUBE”. This procedure is repeated three times to provide enough water for complete sample collection.

5.2 The Kemmerer is used to collect a composite of water samples from depths 45, 60, 75, and 90 feet. This is done by using the Kemmerer to collect a sample from each of those depths and emptying all of them into a single 5 L Nalgene brown bottle labeled “45+”.

5.3 Once the sample water is collected and transported back to the lab, the 5 L Nalgene brown bottles are shaken vigorously before pouring. This procedure is repeated following each chlorophyll *a* sample filter apparatus filling.

5.4 Carefully grab the edge of a 45 µ micro pore filter with tweezers and rinse filter with distilled water.

5.5 Place a 45µ micro pore filter (grid down) on the filtering apparatus on the vacuum pump.

5.6 Pour 200mL of the appropriate 5 L Nalgene brown bottle sample into the filtering apparatus and turn on vacuum pump.

5.7 Once all water has passed through the filter, turn off the vacuum pump.

5.8 Place the filter into a mini Petri dish and label with the date, bottle number, and the amount filtered.

5.9 Wrap Petri dish in aluminum foil, label the same as the Petri dish, and place in freezer until samples are shipped out for analysis.

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Revised:
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STANDARD OPERATING PROCEDURES
CLEANING SAMPLE AND LABORATORY CONTAINERS

1. SCOPE

1.1 These Standard Operating Procedures (SOPs) describe the methods to be used for cleaning sample and laboratory containers.

2. PURPOSE

2.1 It is critical that these procedures are followed to ensure that all sample and laboratory containers are contaminant free and that they are prepared in a way that is suitable for the activities for which they are designed.

3. MATERIALS

3.1 Hydrochloric Acid
3.2 Scrub Brush
3.3 De-ionized water

4. PROCEDURES

4.1 5 and 10 L Nalgene plastic bottles and caps

4.1.1 After samples are collected the bottles and tops should be rinsed with tap water and scrubbed with a brush to remove any dirt. The bottles are turned upside down in the sink and allowed to drain. The bottles should never be washed with detergents.

4.1.2 Rinse with a 3% mixture of hydrochloric acid (HCl). (980 mL Type III de-ionized water and 30 mL Hydrochloric acid)

4.1.3 If cleaning more than one bottle, pour HCl solution into next bottle to be rinsed.

4.1.4 If rinsing more than one bottle, order should be as follows. Watershed bottles, Wastewater Pumps Reservoir, Site 11, Site 12, Site 14, Site 15, Site 28, and Site 39.

4.1.5 Once HCl solution has been transferred, rinse bottle with Type III de-ionized water and allow to drain and dry.

4.1.6 Steps 3.1.2-3.1.4 should be done monthly or as needed to prevent buildup of possible TP on the walls of the vessels.

4.2 Erlenmeyer flask

4.2.1 Rinse with tap water and scrub with a brush to remove any dirt.

4.2.2 Rinse with a 3% mixture of hydrochloric acid.

4.2.3 Rinse with Type III de-ionized water and allow it to drain and dry.

4.3 250 mL Sample bottles and caps

4.3.1 Same procedure as Erlenmeyer flask.

4.4 Laboratory Glassware and caps

4.4.1 Same procedure as Erlenmeyer flask.

5. QUALITY CONTROL

5.1 It is critical that these procedures are followed to ensure that all equipment contaminant free.

5.2 All new containers and equipment will clean following this process.

5.2 If any container or equipment is thought to be compromised, it must be cleaned in order to keep the utmost control on sampling results.

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Revised:
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STANDARD OPERATING PROCEDURES
ISCO SAMPLERS

1. SCOPE/PURPOSE

1.1 This standard operating procedure (SOP) describes the procedure for using the ISCO portable samplers. There are two of these samplers located on the hatchery grounds. The design of the sampler allows it to sample a calibrated volume of water at programmed time intervals over a 72 hour period.

2. REFERENCES

2.1 3700 Portable Samplers – Installation and Operation Guide, Teledyne Isco, Inc., 2011

3. DEFINITIONS

3.1 Platte River State Fish Hatchery uses ISCO automated water samplers to monitor the amount total phosphorus entering and exiting the hatchery.

4. MATERIALS

4.1 ISCO sampler
4.2 Tubing

5. PROCEDURE

5.1 The ISCO sampler is opened by removing the cover that contains the keypad.

5.2 The properly labeled, acid washed, 10 L wide mouth poly carboy is placed inside the unit.

5.3 Replace cover and make sure that the sampler outlet hose is fed into the mouth of the carboy.

5.4 Press the START SAMPLING button of the keypad.

5.4 The display will read “SAMPLING 1 OF 144” or it will ask “START SAMPLING?”

5.6 If the display reads “START SAMPLING” and the sampler has not started sampling, then press the “ENTER/PROGRAM” button on the lower right of the keypad.

5.7 The sampler will start to take a sample and read “SAMPLING 1 OF 144.” Return in approximately 72 hours.

5.8 Press the red “STOP” button on the keypad. The display will read “PROGRAM HALTED”. Collect the sample and replace cover.

6. SAMPLER MANTENANCE

6.1 The sampler tubing should be replaced at least once every six months or as needed.

6.2 The sampler should be calibrated at the time of tube replacement or as needed. Refer to the manual at S:\FIS\PLIA Stuff\ISCO3700Manual.pdf.pdf.

6.3 Any maintenance and/or modifications to the program is recorded and entered into the ISCO Log on the PM file.

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Revised:
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STANDARD OPERATING PROCEDURES FOR RUNNING THE JENWAY MODEL 6320D VISIBLE RANGE SPECTROPHOTOMETER

1. SCOPE/PURPOSE

1.1 This Standard Operating Procedure (SOP) describes the procedures for obtaining an absorbency reading for Phosphorous analysis.

2. REFERENCES

2.1 Jenway Model 6300 & 6320D Visible Range Spectrophotometers Operating Manual

3. DEFINITIONS

3.1 A Spectrophotometer is an instrument used for to determine the intensity of various wavelengths in a spectrum of light.

4. MATERIALS

4.1 Jenway Spectrophotometer
4.2 100 mm Glass Cuvette
4.3 Processed sample
4.4 Jenway 63-0 software installed on computer

5. PROCEDURES

5.1 Take cover off of Jenway and turn machine on, the switch is located in the back center, and let it warm for 30 minutes.

5.2 Open 63-Zero Software on computer desktop.

5.3 Once the software has opened click on the Photometrics tab.

5.4 Make sure in the menu options it is on ABS if running absorbencies and the wavelength factor is set at 880 nm.

5.5 Once the samples have had their proper amount of reaction time, pour the processed sample into the cuvette, insert into slot in the spectrophotometer, and close the lid.

5.6 Once reading has stabilized, click on the read button in the 63-zero program, make sure the read out is displayed in the logging area.

5.7 Once a reading has been obtained rinse the cuvette with the next sample to be read to prevent contamination from previous sample.

5.8 Repeat steps 5.5-5.7 until all your samples are run.

5.9 When all the samples have been run, save results to Jenway Files folder using the format of yymmdd for tracking purposes.

5.10 Shut off Jenway, close software, and cover.

5.11 Cuvette will be cleaned as needed, following the Cleaning SOP.

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Revised
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STANDARD OPERATING PROCEDURES
USING A KEMMERER TYPE SAMPLER

1. SCOPE/PURPOSE

1.1 This standard operating procedure (SOP) describes the procedure for using the Kemmerer type sampler at discrete depths. The design of the sampler allows transfer of water into storage bottles without agitation. Water samples are collected for a variety of analysis; including total dissolved solids, phytoplankton, zooplankton, phosphorous, calcium, and alkalinity.

2. REFERENCES

2.1 Handbook of Common Limnology Methods, Lind, Owen T., 1985

3. DEFINITIONS

3.1 The messenger is a lead device that is dropped down the line to which the sampler is attached. When it reaches the sampler it trips the device causing the plungers to close.

4. MATERIALS

4.1 Kemmer
4.2 Bottles

5. PROCEDURE

5.1 The Kemmerer is opened and lowered to the depth of interest. This is determined by measured markings on the rope to which the sampler is attached.

5.2 When the desired depth is reached the messenger is dropped to close the sampler and it is raised to the surface and lifted into the boat.

5.3 The sample is then deposited into the appropriate bottle(s) for each analysis required.

6. SAMPLER STORAGE

6.1 The sampler is stored in the open position to keep moisture from being trapped inside and to avoid plunger wear.

Author:
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Revised:
Nicole Sherretz August 24, 2016

STANDARD OPERATING PROCEDURES
USING LI-COR RADIATION SENSORS

1. SCOPE/PURPOSE

1.1 This standard operating procedure (SOP) describes the procedure for using the Li-Cor Radiation Sensor in the atmosphere and at three foot depth intervals in Platte Lake.

2. REFERENCES

2.1 Li-Cor Radiation Sensors Instruction Manual, Li-Cor Inc., 1990

3. DEFINITIONS

3.1 The spherical quantum sensor is the light bulb like device on a lowering frame to which coaxial cable is attached. The Li-Cor model LI-250 Light Meter is attached at the other end of the coaxial cable.

3.2 The Li-Cor model LI-250 Light Meter measures photosynthetic active radiation.

4. MATERIALS

4.1 Li-Cor meter
4.2 Cables

5. PROCEDURE

5.1 The spherical quantum sensor and the lower frame are held in the atmosphere on the sunny side of the boat.

5.2 Attach the other end of the coaxial cable to the light meter.

5.3 Turn on the light meter by holding the ON/CAL button for at least two seconds. Pressing the ON/CAL button once more places the meter in calibration constant mode. The calibration constant for the atmosphere is -133.7. The constant can be changed by pressing the HOLD/MULTISELECT button.

5.4 Once the proper calibration constant is selected press the ON/CAL button again to put the meter in the read mode. The proper units for the read mode are umol.

5.5 A reading is taken by pressing the AVG button, which takes a 15 second average of the current readings. Take the reading for the atmosphere at this point and recorded on the data sheet. Pressing the HOLD/MULTISELECT button puts the meter back into read mode.

5.6 The meter must now be calibrated for reading in the water. Refer to 4.2 and 4.3 for this procedure. The calibration constant for the water is -216.6.

5.7 Refer to 4.4 for the procedure of taking readings. The first reading in the water is taken with the spherical quantum sensor just under the surface of the water on the sunny side of the boat.

5.8 Readings are then taken at three foot intervals until a reading of 1% of the surface reading is achieved.

5.9 The meter is then turned off by pressing and holding the OFF button. Unplug the coaxial cable from the light meter and prepare for storage. See Section 5.

6. SAMPLER STORAGE

6.1 The light meter is stored in a plastic zip lock type bag which is placed in the tool box.

6.2 The coaxial cord is reeled up on the cord reel and a sock is placed over the spherical quantum sensor. The entire apparatus is then placed in one of the Rubbermaid totes.

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Revised:
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STANDARD OPERATING PROCEDURES
MILLIPORE DIRECT-Q 3 UV ULTRAPURE WATER SYSTEM

1. SCOPE/PURPOSE

1.1 This Standard Operating Procedure (SOP) describes the procedure for using the Millipore Direct-Q 3 UV Ultrapure Water System to produce water for laboratory and rinsing uses at Platte River State Fish Hatchery.

2. REFERENCE

2.1 DIRECT-Q 3 UV SYSTEM, User Manual, Millipore Corporation, 2006.

3. DEFINITIONS

3.1 Ultrapure water comes in two forms from the DIRECT-Q 3 UV water system. Type I water is used for mixing solution used in spectrophotometry and Type III water is used for general rinsing of lab ware.

4. PROCEDURE

4.1 Type I Water

4.1.1 Connect tubing, specified in users manual to barbed outlet at the top of the unit.

4.1.2 Put vessel to be filled under the unit and put tubing from upper outlet into bottle opening.

4.1.3 Press the blue-green button just above outlet one time and wait.

4.1.4 Water will begin to be dispensed from the unit. The system will also display the temperature and resistivity of the water that is being dispensed.

4.1.5 The unit will turn itself off when the internal reservoir is emptied or when the blue-green button is pressed once again.

4.2 Type III Water

4.2.1 Place vessel to be filled under the unit and blue ball valve.

4.2.2 Open blue ball valve.

4.2.3 Unit will drain internal reservoir through valve and continue to make Type III water at the rate of approximately 2.4 L/Hour.

4.2.4 Once bottle is filled to desired level, close valve and remove vessel and put cap on.

5. MAINTENANCE

5.1 Smartpak must be replaced and new one installed and flushed when the pack alarm display is blinking.

5.2 Vent filter must be replaced when the Smartpak is replaced.

5.3 Millipack must be replaced and new one installed and flushed when the Smartpak is replaced.

5.4 UV lamp must be replaced when the UV lamp alarm display is blinking.

5.5 The system and the tank should be sanitized yearly.

5.6 The screen filter on the inlet tubing female fitting should be checked and cleaned twice yearly.

5.7 All of the maintenance procedures can be seen in full detail by looking at the manual.

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STANDARD OPERATING PROCEDURES
FOR COLLECTING SAMPLES FOR PHYTOPLANKTON ANALYSIS

1. SCOPE/ PURPOSE

1.1 This Standard Operating Procedure (SOP) describes the procedure for using the tube sampler to collect samples for phytoplankton analysis. This sample allows a composite water sample to be collected from the entire column of the photic zone. It is assumed that the photic zone of the lake being studied is two times the Secchi depth.

2. REFERENCES

2.1 Handbook of Common Methods in Limnology, Lind, Owen T., 1985.

2.2 Fish Hatchery Management, Piper, et al., 1982.

3. DEFINITIONS

3.1 Phytoplankton are minute plants suspended in water with little or no capability for controlling their position.

3.2 Photic zone is the column of water reaching from the surface to the photic depth. The Photic depth is the depth that receives 1% of surface illumination.

4. MATERIALS

4.1 Tube sampler.

4.2 5 L brown Nalgene bottle.

4.3 10 L Nalgene bottle.

4.4 Four 250 mL bottles.

5. SAMPLE COLLECTION

5.1 Phytoplankton is collected seasonally (spring, summer, fall)

5.2 The tube sampler is lowered 30 feet into the water column and then emptied into a 5L brown Nalgene bottle labeled “Tube”.

5.3 The bottle is then shaken vigorously and one 250 mL bottle is filled.

5.4 Add 10 drops of Lugol iodine to the 250 mL sample bottle and mix.

5.5 Pour the remaining sample into the 10L nalgene bottle. The contents will be processed at the hatchery lab.

5.6 This procedure is repeated three times to provide enough water for complete sample collection.

5.7 The Kemmerer is used to collect a composite of water samples from depths 45, 60, 75, and 90 feet. This is done by using the Kemmerer to collect a sample from each of those depths and emptying all of them into a single 5 L Nalgene brown bottle labeled “45+”.

5.8 From the “45+” 5 L brown Nalgene composite bottle, shake vigorously and fill one 250 mL bottle.

5.9 Add 10 drops of Lugol iodine to the 250 mL sample bottle and mix.

5.10 Put all 250 mL sample bottles in cooler for transport back to the hatchery laboratory.

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Revised:

STANDARD OPERATING PROCEDURES
FOR PROCESSING TOTAL PHOSPHOROUS (TP) ANALYSIS

1. SCOPE/ PURPOSE

1.1 This Standard Operating Procedure (SOP) describes the procedure of processing samples for Total Phosphorous (TP) analysis. These results can be used for performance evaluation of hatchery methods and processes, as well as watershed trends.

2. REFERENCES

2.1 Standard Methods. American Public Health Association. 2005.

3. DEFINITIONS

3.1 Total phosphorous (TP) is a combination of the different forms of Phosphorus including dissolved and non-dissolved orthophosphate.

3.2 Photic zone is the column of water reaching from the surface to the photic depth. The Photic depth is the depth that receives 1% of surface illumination.

4. MATERIALS

4.1 Water Samples.
4.2 Di-ionized (DI) water from Millipore Direct-Q3 UV (Type I).
4.3 100ml Test Tubes.
4.4 Conc. Sulfuric Acid.
4.5 Sodium Hydroxide, 10N
4.6 Ammonium Molybdate Tetrahydrate.
4.7 Abscorbic Acid.
4.8 Antimony Potassium Tartrate Trihydrate.
4.9 Potassium Persulfate.
4.10 Assorted laboratory glassware.
4.11 Alumium foil.
4.12 Cut-off calibrated graduated cylinder (50 mL)
4.13 Weigh boats
4.14 Purchased Phosphorus standards.
4.15 Parafilm.
4.16 Repeating Pipetter and dispensing tips.
4.17 Digester.
4.18 Stir plate and stir bar.
4.19 Jenway Spectrophotometer.
4.20 100 mm glass cuvette.
4.21 Kimberly Clark Kimwipes

5. SAMPLE PROCESSING

5.1 Gather samples to be processed and the corresponding bottle report. Import the bottle report in to the PRSFH Lab Data Template and create a new file using the format of "PRSFH Lab Data yymmdd". Once imported, the TP Results page will automatically list the samples to be processed in the order they should be read.

5.2 Put the appropriate number of test tubes in rack for the samples to be processed and four additional for the standards to be read and the calibration blank.

5.3 For the calibration blank, rinse test tube, calibrated graduated cylinder, and sample funnel with Type I DI water. Add 50 mL of Type I DI water using the calibrated graduated cylinder, and the sample funnel to the test tube.

5.4 Starting with the standards, agitate well, pour a small amount in to the test tube using the appropriately labeled funnel; and cap, shake, and drain. Also pour a small amount of the standard in to the cut-off graduated cylinder, and pour off while rotating to thoroughly rinse the vessel. These steps are done to rinse the labware with the standards prior to gathering the amount to be processed.

5.5 After the labware has been rinsed properly, agitate standard once again and fill calibrated graduated cylinder with 50 mL of standard and pour in to test tube using the standards funnel.

5.6 Repeat steps 5.4 and 5.5 using water samples to be processed instead of standards and the sample funnel.

5.7 Turn on digester and let it go through its start up cycle. Once it has done so, turn off and then back on to set soak time at 150 minutes @ 121° C.

5.8 Add 1.0 mL of 11N Sulfuric acid to each test tube, including the calibration blank, standards, and water samples.

5.8.1 To make 11N Sulfuric acid, mix 300 mL of conc. Sulfuric acid with 700 mL of Type I DI water and store in glass stoppered flask.

5.9 Add 0.5 grams of Potassium Persulfate to each test tube, including the calibration blank, standards, and water samples. Once added, screw cap tight, and invert tube twice.

5.10 Place each test tube, including the calibration blank, standards, and water samples in to digester block. Soak tubes for 150 minutes @ 121° C.

5.11 Once the tubes have been fully digested, remove and allow to cool to room temperature.

5.12 Add 1 mL of 10N Sodium Hydroxide to each test tube, including the calibration blank, standards, and water samples.

5.13 Make Ascorbic acid solution by mixing Ascorbic acid in to Type I DI water in the following proportion. 1.76 g to 100 mL of Type I DI water. Put the solution on the stir plate with the stir bar, and mix. This is a one-time use solution only, discard any extra.

5.14 Make combined reagent using the following proportions, in this order, and stir after each addition. 50 mL of 5N Sulfuric acid, 5 mL of Antimony Potassium Tartrate solution, 15 mL of Ammonium Molybdate solution.

5.14.1 To make 5N Sulfuric acid, mix 140 mL of conc. Sulfuric acid in to 860 mL Type I DI water. Store in a glass stoppered flask.

5.14.2 To make Antimony Potassium Tartrate solution, dissolve 3.42 g of Antimony Potassium Tartrate powder in to 1 L of Type I DI water. Store in a glass stoppered flask.

5.14.3 To make Ammonium Molybdate solution, dissolve 40 g of Ammonium Molybdate powder in to 1 L of Type I DI water. Store in a glass stoppered flask.

5.15 Mix the combined reagent (5.14) with the Ascorbic acid solution (5.13) in the following proportion. Mix 70 mL of combined reagent with 30 mL of Ascorbic acid solution on the stir plate using the stir bar. Yellow color should form upon the mixing of the two solutions. If no color occurs, then repeat steps 5.13 and 5.14 before combining.

5.16 Take mixed solution and put aluminum foil over the top and place in small red cooler to keep out of the light.

5.17 Once the calibration blank, standards, and water samples have reached room temperature, the mixed solution can be added to each test tube. Using repeating pipetter, add 8 mL of mixed solution to each tube, cap, and invert twice.

5.18 Upon adding the mixed solution to the final tube, start a timer for 20 minutes.

5.19 After 20 minutes is up, the samples are ready to be read.

5.20 Calibrate the spectrophotometer at 880 nm by pouring the contents of the calibration blank tube in to the cuvette. Once the absorbency has stabilized press the CAL button on the spectrophotometer. It should now read 0.00 with the cuvette still in the unit.

5.21 The first tubes to be read are the standards. These values must be put in to the lab data file for updating the standard curve. If the curves remain within tolerance the rest of the samples may be run.

5.22 Following the Jenway SOP read the rest of the samples and import the Jenway file in to the lab sheet. This will automatically calculate the TP for each sample.

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Revised:
Nicole Sherretz September 22, 2016

STANDARD OPERATING PROCEDURES PROCESSING TOTAL SUSPENDED SOLIDS

1. SCOPE/PURPOSE

1.1 This standard operating procedure (SOP) describes the procedure for processing samples for total suspended solids (TSS) in the Platte River State Fish Hatchery water quality lab. TSS in water is measured by the mass of non-filterable material collected and dried in a known volume of water.

2. REFERENCES

2.1 Standard Methods. American Public Health Association. 2005

3. DEFINITION

3.1 Prepare a Xenosep Pre-Weighed TSS filter, these filters are pre-washed, pre-dried, pre-desiccated and pre-weighed in accordance with Standard Methods 2540D, they are ready to use out of the box. Each filter consists of a 1.5µm binder-free, glass microfiber filter that has been rinse 3 times with 20mL aliquots of reagent grade water, dried at 105 ºC for at least 1 hour, desiccated to room temperature, weighed to the nearest 0.1mg and then placed in an aluminum pan with an affixed heat resistant label with filter weight.

4. MATERIALS

4.1 Xenosep Pre-Weighed TSS filter
4.2 Vacum Pump
4.3 Tweezers
4.4 1 L Graduated Cylinder
4.5 50mL Graduated Cylinder

5. PROCEDURE

5.1 Remove filter disk from aluminum pan and place on filtering apparatus using tweezers, seat the filter by wetting it with a few mLs of deionized water, turn on vacuum pump.

5.2 Agitate sample to be processed by vigorously shaking sample repeatedly as it is poured in to a 1 L graduated cylinder.

5.3 Measure out 1 L of sample water or the total amount of sample. If not 1 L record the amount to be filtered on the data sheet.

5.4 Pour the sample in to the filtering apparatus.

5.5 Rinse the graduated cylinder and the filtering apparatus with deionized water multiple times to capture any residual material that may have adhered to the walls of the labware.

5.6 Continue vacuum to remove all traces of water and then turn off vacuum pump.

5.7 Remove the disk from filtering apparatus and transfer to the aluminum drying dish using filter tweezers.

5.8 Place drying dish in drying oven at 103-105ºC for 1 hour.

5.9 Place drying dish in desiccator and allow it to come to room temperature.

5.10 Remove the filter from desiccator and weigh using an analytical balance that is properly calibrated for accuracy and precision.

5.11 Record weight of filtered and dried sample and record value on the data sheet

5.12 Calculate the TSS by using the following equation

$$\text{mg TSS/L} = ((A - B) \times 1000) / \text{sample volume, mL}$$

where: A= weight of filter + dried residue, mg, and B = weight of filter, mg.

Author:
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Revised:
Nicole Sherretz September 22, 2016

STANDARD OPERATING PROCEDURES PROCESSING TURBIDITIES USING HACH TURBIDIMETER

1. SCOPE/PURPOSE

1.2 This standard operating procedure (SOP) describes the procedure for using the Hach Turbidimeter (Model Number 2100N) in the Platte River State Fish Hatchery water quality lab. Turbidity in water is the presence of suspended solids, which reduce the transmission of light either through scattering or absorption.

2. REFERENCES

2.1 Laboratory Turbidimeter Instruction Manual, Hach Company, 1999

3. DEFINITIONS

3.1 The turbidimeter is used to measure the presence of suspended solids.

4. MATERIALS

4.1 Turbidimeter
4.2 Sample tube
4.3 Silicone oil
4.4 Oiling cloth

5. PROCEDURE

5.1 Warm samples to room temperature to avoid condensation on the sides of the sample tube.

5.2 Turn ON turbidimeter and allow warm up time of 30 minutes.

5.2.1 Fill sample tube to the white line at the top. Apply a thin bead of silicone oil to the surface of the sample cell. Spread the oil uniformly across the surface using the black oiling cloth. The surface should appear dry, not wet.

5.2.2 The sample cell is then placed into the turbidimeter. Open the cover and line up the white down arrow on the sample cell with the arrow on the turbidimeter. Close cover and press ENTER.

5.3 The first number to appear on the display is used for the first reading, readings are NTU. Readings are done in triplicate, repeat procedure with two more samples.

5.4 The meter's calibration must be checked every lake and/or tributary sampling day.

5.4.1 Agitate standards and measure each of them and record values in S:\FIS\PLIA Stuff\DO, pH, and Turbidity Calibration.xls.

5.4.2 Calibrate the unit following the "Quick Reference Guide" procedures and the Formazin standards.

5.4.3 After calibrating the unit, measure the samples from the lake and/or tributary sampling.

5.4.5 Once all samples have been completed, re-agitate the Formazin standards and measure each of them and record values in S:\FIS\PLIA Stuff\DO, pH, and Turbidity Calibration.xls.

5.5 When finished using the turbidimeter, turn OFF and replace transparent dust cover.

Author:
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Revised:
Nicole Sherretz September 22, 2016

STANDARD OPERATING PROCEDURES

REQUIRED REPORTING

Reports and Notifications Required:

Reports and or notifications will be distributed to all parties to include but not be limited to the following:

- Operational log – Updated and distributed within one week of the end of every month.
- Hatchery Phosphorus data analysis results – To be distributed within two business days of analysis.
- Lake and Tributary data analysis – To be distributed within two business days of analysis.
- Hatchery Database updates – To be distributed within two business days of phosphorus analysis.
- Hatchery Measurement device calibration results – Within one week of device calibration.
- Hatchery NPDES reports – Within three weeks of the end of each month.
- Anti-biotic reports – Yearly within one month of year end.
- Sludge tank removal and data – Within one week of removal and with location of deposition of contents. Phosphorus report distribution within two business days of analysis.
- Hatchery flowmeter calibration results – Within one week of calibration.
- Fall Salmon Run:
    - Notification of intended installation of upper and lower weir – Five days prior to installation and or removal of either weir as well as report as to actual removal date.
    - Notification of fish passage– Must notify PLIA within 48 hours of intended upstream fish passage from the lower weir or unless otherwise agreed to by both parties.
    - Upper and lower weir fish passage and harvesting reports – within 24 hours of passing or harvesting at either location.
    - Annual Summary Report – Within six weeks of last passage or harvest at either weir.

STANDARD OPERATING PROCEDURES
SAMPLING PREPARATION

1 SCOPE

1.1 The Platte River Fish Hatchery collects water quality data from Platte Lake and its tributaries as part of an ongoing water quality program. This data is used to detect changes in water quality over time.

2 PURPOSE

2.1 The purpose of this document is to provide a detailed outline of the procedures used in sample collection. Adherence to a consistent sampling protocol is vital to ensure data is of a known quality and integrity.

3 RESPONSIBLITIES

3.1 The Technician performing the preparation work shall be trained in standard procedures described within.

4 PROCEDURE

4.1 Day before event –

4.1.1 Conduct an inspection of YSI, sonde, all electronic equipment, and change batteries if needed.

4.1.2 Inspect boat and trailer and make sure there is plenty of gas in can.

4.1.3 Gather together equipment.

4.1.4 Gather together bottles and coolers.

4.1.5 Clean any equipment or bottles that have not been cleaned.

4.2 Day of event -

4.2.1 Calibrate YSI following SOP before departure.

4.2.2 Fill coolers with ice or ice packs if weather dictates.

4.2.3 Conduct sampling in accordance with SOPs.

4.2.4 After sampling is completed. Return all equipment to designated storage location and conduct post calibration check on YSI.

4.2.5 Refrigerate samples.

4.2.6 Run calibration, samples, and drift check on turbidimeter following SOP.

4.2.7 Clean bottles and related equipment.

4.3 Day after event -

4.3.1 If not done already, conduct any items not complete from the day before.

4.3.2 Conduct maintenance as needed on any equipment.

Author:
Aaron Switzer 2003
Revised:
Nicole Sherretz August 24, 2016

STANDARD OPERATING PROCEDURES
PLATTE HATCHERY FLOW CALIBRATIONS

1. SCOPE

1.1 At Platte River Fish Hatchery there are two pumps for the Brundage Creek water supply, Brundage Pump 5 and Brundage Pump 6. These pumps are controlled with Variable Frequency Drive (VFD) and can be set at different hertz (Hz) depending on the amount of water desired for quality fish rearing.

2. PURPOSE

2.1 The purpose of this document is to provide a detailed outline of the procedures used in flow calibration. Adherence to a consistent sampling protocol is vital to ensure data is of a known quality and integrity.

3. RESPONSIBILITIES

3.1 Inform maintenance to do annual impeller clearance check/adjustment prior to beginning tests.

3.2 Turn oxygen flow meters up on all tanks inside and out, but note the previous settings. At least one hour prior to running tests turn outside oxygen flow meters up as high as possible or 9.0 LPM.

3.3 Be sure the outside raceways are set up using serial reuse water including the pumps outside of C filter building.

3.4 Have all employees included in the process review this SOP and have employees that are observing the fish and oxygen levels know that 60% oxygen saturation is the low level in which all flows must be restored to normal operation, At this point the bucket tests will conclude for that day, and resume at a later point.

3.4 Post employees at the following locations:

1. Headtank- 2 people to open/close valves and monitor level logger
2. Hatchery Building/Outside raceways- 1-2 people monitoring oxygen levels and fish behavior.
3. Alarm Computer- 1 person to turn off alarms while testing

4. MATERIALS

4.1 Hobo level logger
4.2 Watch for timing tests
4.3 Hach meter for measuring oxygen levels

5. PROCEDURES FOR TESTING BRUNDAGE PUMPS

5.1 Direct employees to monitor oxygen levels with a dissolved oxyden meter in the hatchery building and outside raceway throughout the test.

5.2 Close the spring water valve to the outside head tank so that the valve is completely seated and flow meter registers 0.00 GPM.

5.3 Close any creek water valves that are feeding the inside hatchery rearing tanks, note the previous setting so the correct flow can be added once test is complete.

5.4 Lower the level logger in the stilling well that is set up in the head tank. Do not allow it to extend below the length of the stilling well.

5.5 Turn off hatchery reuse pump(s).

5.6 On top of the head tank, make sure that the valve feeding A and B series and the valve that direct feeds C series are completely closed, in order to completely seal head tank.

5.7 Allow the water level to reach the top of the outside head tank.

5.8 Turn off the Brundage Creek pump and observe the water level in the head tank for 10 minutes. THE WATER LEVEL SHOULD NOT CHANGE!!! If there is a change then a valve isn't completely sealed and needs to be closed. Check for open valve and repeat this step once all valves are closed.

5.9 Turn the Brundage Creek pump on and make sure that controller has the correct Hz, as etermined by usage, running for the test.

5.10 Open the head tank drain valve.

5.11 Allow the head tank to drain to the bottom of the stilling well, the depth is about 6 feet.

5.12 Close the head tank drain valve and allow the tank to refill.

5.13 Record the time at the beginning of the refill and when the tank is completely full.

5.14 If needed repeat steps 5.7-5.13, so that triplicate filling of the head tank are complete for each setting of the pump(s) being tested. Each trial must be 90 seconds or longer, and if one trial is greater than five minutes then it may serve for all three trials. This is typically the case when running the pumps at lower speeds.

5.15 After all tests are complete return all valves and pumps to previous settings, including restoring Brundage Creek water to the inside raceways, turning on serial reuse pumps and turning off the serial reuse pumps outside of C filter building.

5.16 Continue to have employees monitor fish and oxygen levels in the hatchery building and outside raceways for 30 minutes.

5.17 Once oxygen levels have reached 7-9 mg/L at the tail of each series, turn back oxygen flow meters to previous setting recorded in step 3.2.

Author:
Nikki Sherretz 2016
Revised:
Aaron Switzer September 22, 2016

STANDARD OPERATING PROCEDURES
PLATTE HATCHERY, BIG PLATTE LAKE, AND TRIBUTARY SAMPLING

4. SCOPE

4.1 The Platte River Fish Hatchery collects water quality data from Platte Lake and its tributaries as part of an ongoing water quality program. This data is used to detect changes in water quality over time.

5. PURPOSE

5.1 The purpose of this document is to provide a detailed outline of the procedures used in sample collection. Adherence to a consistent sampling protocol is vital to ensure data is of a known quality and integrity.

6. RESPONSIBILITIES

6.1 The individual technician responsible for sampling shall be trained in the standard operating procedures described within.

7. PROCEDURES

7.1 Platte Hatchery sampling - per location (NOTE: Sample only the water sources being used at the present time.)

4.1.1 Wastewater Pumps Reservoir (10)

Equipment and bottles
- (3) 250ml acid washed plastic bottles
- (1) Hatchery Data Sheet
- (1) Labeled Turbidity bottle

Step 1: Remove 10 liter Nalgene bottle from ISCO sampler.
Step 2: Shake sample container vigorously.
Step 3: Pour a small amount of sample water into 250ml plastic bottle. Recap shake and empty.
Step 4: Shake Nalgene bottle one more time.
Step 5: Refill to neck of bottle.
Step 6: Repeat for two remaining bottles. Swirl Nalgene bottle to keep sample well mixed before filling each bottle.
Step 7: Place sample bottles in refrigerator.
Step 8: Shake Nalgene bottle and collect sample for turbidity.

4.1.2 Brundage Spring (11)

Equipment and bottles (1100 series – pink labels)
- (3) 250ml acid washed plastic bottles
- (1) Hatchery Data Sheet
- (1) Labeled Turbidity bottle

Step 1: Remove 10 liter Nalgene bottle from Sigma sampler.
Step 2: Take temperature of sample water from mixing drum, turn off pump and drain drum.
Step 3: Perform maintenance/cleaning on pump, assembly and drum.
Step 4: Shake sample container vigorously.

Step 5: Pour a small amount of sample water into 250ml plastic bottle. Recap shake and empty.
Step 6: Shake Nalgene bottle one more time.
Step 7: Refill to neck of bottle.
Step 8: Repeat for two remaining bottles. Swirl Nalgene bottle to keep sample well mixed before filling each bottle.
Step 9: Place sample bottles in refrigerator.
Step 10: Shake Nalgene bottle and collect sample for turbidity.

4.1.3 Brundage Creek (12)

Equipment and bottles (1200 series – yellow labels)
(3) 250ml acid washed plastic bottles
(1) Hatchery Data Sheet
(1) Labeled Turbidity bottle

Step 1: Remove 10 liter Nalgene bottle from Sigma sampler.
Step 2: Take temperature of sample water from mixing drum, turn off pump and drain drum.
Step 3: Perform maintenance/cleaning on pump, assembly and drum.
Step 4: Shake sample container vigorously.
Step 5: Pour a small amount of sample water into 250ml plastic bottle. Recap shake and empty.
Step 6: Shake Nalgene bottle one more time.
Step 7: Refill to neck of bottle.
Step 8: Repeat for two remaining bottles. Swirl Nalgene bottle to keep sample well mixed before filling each bottle.
Step 9: Place sample bottles in refrigerator.
Step 10: Shake Nalgene bottle and collect sample for turbidity.

4.1.4 Effluent Pond Intake (14)

Equipment and bottles (1400 series – green labels)
(3) 250ml acid washed plastic bottles
(1) Hatchery Data Sheet
(1) Labeled Turbidity bottle

Step 1: Remove 10 liter Nalgene bottle from Sigma sampler.
Step 2: Take temperature of sample water from mixing drum, turn off pump and drain drum.
Step 3: Perform maintenance/cleaning on pump, assembly and drum.
Step 4: Shake sample container vigorously.
Step 5: Pour a small amount of sample water into 250ml plastic bottle. Recap shake and empty.
Step 6: Shake Nalgene bottle one more time.
Step 7: Refill to neck of bottle.
Step 8: Repeat for two remaining bottles. Swirl Nalgene bottle to keep sample well mixed before filling each bottle.
Step 9: Place sample bottles in refrigerator.
Step 10: Shake Nalgene bottle and collect sample for turbidity.

4.1.5 Upper Discharge (15)

Equipment and bottles (1500 series – red labels)
(3) 250ml acid washed plastic bottles
(1) Hatchery Data Sheet

(1) Labeled Turbidity bottle

Step 1: Remove 10 liter Nalgene bottle from Sigma sampler.
Step 2: Take temperature of sample water from mixing drum, turn off pump and drain drum.
Step 3: Perform maintenance/cleaning on pump, assembly and drum.
Step 4: Shake sample container vigorously.
Step 5: Pour a small amount of sample water into 250ml plastic bottle. Recap shake and empty.
Step 6: Shake Nalgene bottle one more time.
Step 7: Refill to neck of bottle.
Step 8: Repeat for two remaining bottles. Swirl Nalgene bottle to keep sample well mixed before filling each bottle.
Step 9: Place sample bottles in refrigerator.
Step 10: Shake Nalgene bottle and collect sample for turbidity.

4.1.6 Clarifier Overflow (28)

Equipment and bottles (2800 series – orange labels)
(3) 250ml acid washed plastic bottles
(1) Hatchery Data Sheet
(1) Labeled Turbidity bottle

Step 1: Remove 10 liter Nalgene bottle from ISCO sampler.
Step 2: Shake sample container vigorously.
Step 3: Pour a small amount of water into 250ml plastic bottle. Recap shake and empty.
Step 4: Shake Nalgene bottle one more time.
Step 5: Refill to neck of bottle.
Step 6: Repeat for two remaining bottles. Swirl Nalgene bottle to keep sample well mixed before filling each bottle.
Step 7: Place sample bottles in refrigerator.
Step 8: Shake Nalgene bottle and collect sample for turbidity.

4.1.7 Backwash Line (39)

Equipment and bottles (3900 series – white labels)
(3) 250ml acid washed plastic bottles
(1) Hatchery Data Sheet
(1) Labeled Turbidity bottle

Step 1: Remove 10 liter Nalgene bottle from ISCO sampler.
Step 2: Shake sample container vigorously.
Step 3: Pour a small amount of sample water into 250ml plastic bottle. Recap shake and empty.
Step 4: Shake Nalgene bottle one more time.
Step 5: Refill to neck of bottle.
Step 6: Repeat for two remaining bottles. Swirl Nalgene bottle to keep sample well mixed before filling each bottle.
Step 7: Place sample bottles in refrigerator.
Step 8: Shake Nalgene bottle and collect sample for turbidity.

4.2 Big Platte Lake

Equipment Requirements

Boat and motor
Life jackets
YSI 600R/Sonde/cord
Kemmerer/messenger
Secchi disk/line
Tube sampler
GPS
Extra batteries C/AA/ 9V
Pencil x2
Lake Data Sheet

Bottles

(2) 10 L acid washed plastic bottle
(1) 15 L acid washed plastic bottle

4.2.1 90+ ft Location

Step 1: Record the lake gauge height (by outhouse) on data sheet.
Step 2: Locate sampling waypoint on GPS unit and anchor boat at that position.
Step 3: Lower secchi disk until it is no longer visible on the shaded side of the boat. Record the number of feet that it was lowered in to the water on the datasheet. (see Secchi Disk SOP)
Step 4: Calibrate YSI 650 MDS and 600R sonde for depth (see YSI calibration SOP).
Step 5: Lower sonde on cable to each required depth. Allow values to stabilize approximately two minutes and record values for temperature, conductivity, D.O, pH and ORP on data sheet.
Step 7: Use Kemmerer to collect water at the surface and place water in a 10L plastic bottle. Lower and collect samples at 7.5, 15, 30, 45, and 60 feet and place the water in the 15L plastic bottle. Lower the Kemmerer and collect samples at 75, and 90 foot depths, and place in the remaining 10L bottle. (See Kemmerer SOP)

4.3 Tributaries – per location

4.3.1 North Branch Platte River at Dead Stream Rd.

Equipment and bottles

(1) Dip Sampler
(3) 250ml acid washed plastic bottles
(1) 200ml rinsed bottle
(1) Tributary Data Sheet
(1) PVC Staff Gage
(1) YSI and Sonde

Step 1: Lower Dip Sampler off center of catwalk.
Step 2: Fill bottle, agitate and empty.
Step 3: Refill to neck of bottle.
Step 4: Repeat for two remaining bottles.
Step 5: Record bottle numbers on data sheet.

Step 6: Fill 200ml bottle for turbidity readings.
Step 7: Read staff gauge height at the upper section of the fish ladder and record value on data sheet.
Step 8: Lower PVC staff gage along the north keyway on the dam read staff gage at the top of the keyway and record value on data sheet.
Step 9: Take photo of water that includes substrate.
Step 10: Using YSI and sonde allow unit to stabilize after approximately two minutes and record values on data sheet.

4.3.2 Platte River at US Hwy31 Bridge below Honor

Equipment and bottles

(3) 250ml acid washed plastic bottles
(1) 200ml rinsed bottle
(1) Tributary Data Sheet
(1) YSI and sonde

Step 1: On the down stream side of the bridge, face up stream and take out bottle and hold up stream.
Step 2: Fill bottle, agitate and empty.
Step 3: Refill to neck of bottle.
Step 4: Repeat for two remaining bottles.
Step 5: Record bottle numbers on data sheet.
Step 6: Fill 200ml bottle for turbidity readings.
Step 7: Read gauge height and record value on data sheet.
Step 8: Take photo of water that includes substrate.
Step 9: Using YSI and sonde allow unit to stabilize after approximately two minutes and record values on data sheet.

4.3.4 Platte River at Stone Bridge

Equipment and bottles

(3) 250ml acid washed plastic bottles
(1) 200ml rinsed bottle
(1) Tributary Data Sheet

Step 1: On the down stream side of the bridge, face up stream and take out bottle and hold up stream.
Step 2: Fill bottle, agitate and empty.
Step 3: Refill to neck of bottle.
Step 4: Repeat for two remaining bottles.
Step 5: Record bottle numbers on data sheet.
Step 6: Fill 200ml bottle for turbidity readings.
Step 7: Read gauge height and record value on data sheet.
Step 8: Take photo of water that includes substrate.

Author:
Aaron Switzer 2003
Revised:
Aaron Switzer September 22, 2016

STANDARD OPERATING PROCEDURES
SLUDGE HAULING

1. SCOPE

1.1 The Platte River Fish Hatchery collects water quality data from Platte Lake and its tributaries as part of an ongoing water quality program. This data is used to detect changes in water quality over time. Part of this program includes modeling of a phosphorus budget for the Platte River State Fish Hatchery. The phosphorus contained in the sludge that leaves the hatchery is a major component of the whole-hatchery phosphorus budget.

2. PURPOSE

2.1 The purpose of this document is to provide a detailed outline of the procedures used in sample collection while the sludge tank is being emptied. Adherence to a consistent sampling protocol is vital to ensure data is of a known quality and integrity.

3. RESPONSIBLITIES

3.1 The Technician performing the preparation work shall be trained in standard procedures described within.

4. MATERIALS

4.1 Sludge collection bottles
4.2 Data Sheets
4.3 Digital Camera

5. PROCEDURE

5.1 Day of event –

5.1.1 Meet with truck drivers to discuss sampling protocol.

5.1.2 Collect three 250 ml samples from each load leaving the hatchery grounds. Collect samples at the beginning, middle and end of each load.

5.1.3 Record date, time, gallons loaded and sample bottle numbers.

5.1.4 It is essential that the Technician ride along or follow truck drivers to the injection site. Digital photographs should be taken at the site and GPS coordinates recorded. Photos should include the injection unit during the actual injection process. Send this information, including photos, to the PLIA contacts.

5.1.5 Combine all samples from triplicate sampling during emptying in to a composite carboy for later analysis.

5.2 Day after event –

5.2.1 Visually monitor level of sludge tank

5.3 Weeks after event –

5.3.1 Monitor level of sludge tank during refill, and average sludge depth once a month and enter in to preventative maintenance data sheet.

Author:
Aaron Switzer 2003
Revised:
Nicole Sherretz August 24, 2016

STANDARD OPERATING PROCEDURES
SECCHI DEPTH TRANSPARENCY

1. SCOPE/ PURPOSE

1.1 Secchi disk transparency is used to estimate photic depth.

2. REFERENCES

2.1 Handbook of Common Methods in Limnology, Lind, Owen T., 1985.

3. DEFINITIONS

3.1 The Secchi disk is a 20-cm disk on which opposite quarters are gloss black and gloss white.

3.2 Photic zone is the column of water reaching from the surface to the photic depth.

3.3 The photic depth is the depth that receives 1% of surface illumination.

4. MATERIALS

4.1 Secchi disk.
4.2 Calibrated line.

5. PROCEDURES

5.1 Lower the Secchi disk on the calibrated line until it disappears from view. Record this depth.

5.2 Raise disk until it reappears and record depth.

5.3 The average of these depths is “Secchi Disk Transparency.”

5.4 Make the determination of Secchi disk transparency in the shade of the boat.

5.5 Do not wear sunglasses when making the determination.

Author:
Aaron Switzer 2003
Revised:

STANDARD OPERATING PROCEDURES FOR WATER SAMPLE SHIPPING

1. SCOPE

1.1 The Platte River Fish Hatchery collects water quality data from Platte Lake and its tributaries as part of an ongoing water quality program. This data is used to detect changes in water quality over time. Part of this program includes modeling of a phosphorus budget for the Platte River State Fish Hatchery. This data is used to detect changes in water quality over time.

2. PURPOSE

2.1 The purpose of this document is to provide a detailed outline of the procedures used in sample preparation and collection. Adherence to a consistent sampling protocol is vital to ensure data is of a known quality and integrity.

3. RESPONSIBLITIES

3.1 The employee performing the preparation work shall be trained in standard procedures described within.

4. MATERIALS

4.1 Cooler
4.2 Bottles
4.3 Data sheets
4.4 Ice packs
4.5 Clear packing tape

5. PROCEDURE

5.1 Gather cooler and bottles.

5.2 Be sure to check each bottle cap and bottle to ensure that they are securely fastened and not damaged or leaking.

5.3 Add the data sheet and any additional packing material.

5.4 Place an ice pack in the cooler and close the lid tight.

5.5 Use the clear packing tape in the lab to secure the cooler lid.

5.6 Using UPS smart pick up and send to receiving address.

Author:
Aaron Switzer 2003
Revised:
Nicole Sherretz Septemebr 22, 2016

STANDARD OPERATING PROCEDURES
SIGMA MODEL 900 PORTABLE SAMPLER

1. SCOPE/PURPOSE

1.1 This standard operating procedure (SOP) describes the procedure for using the Sigma 900 portable samplers. There are five of these samplers located on the hatchery grounds. The design of the sampler allows it to sample a calibrated volume of water at programmed time intervals over a 72 hour period.

2. REFERENCES

2.1 Model 900 Standard Portable Sampler – Instrument Manual, American Sigma, 2002

3. DEFINITIONS

3.1 Platte River State Fish Hatchery uses this type of automated sampler to monitor the amount total phosphorus entering and exiting the hatchery.

4. MATERIALS

4.1 Sigma Sampler
4.2 Tubing

5. PROCEDURE

5.1 The Sigma sampler is opened by removing the cover that contains the keypad.

5.2 The properly labeled acid washed 10L wide mouth poly carboy is placed inside the unit.

5.3 Replace cover.

5.4 Press the START button located in the center of the keypad at the top.

5.5 The display will read “START OR RESUME PROGRAM?” - press the START button.

5.6 Within 30 seconds the display will read “PROGRAM RUNNING”.

5.7 Return in approximately 72 hours.

5.8 Press the CHANGE/HALT key, #2 on the keypad. The display will read “PROGRAM HALTED”. Collect the sample and replace cover.

6. SAMPLER MANTENANCE

6.1 The sampler tubing should be replaced at least once every six months or as needed (i.e. leaking, damaged).

6.2 The sampler should be calibrated at the time of tube replacement or as needed. Refer to the Sigma binder in the lab for these methods.

6.3 Any maintenance and/or modifications to the program is recorded and entered into the Sigma log sheet, which is located at the sampling sites.

Author:
Aaron Switzer 2003
Revised:
Aaron Switzer September 22, 2016

STANDARD OPERATING PROCEDURES
HOBO WATER LEVEL LOGGER

1. SCOPE/ PURPOSE

1.1 The HOBO water level logger is used to as an aid in calibrating flow rates of water entering and exiting the hatchery.

2. DEFINITIONS

2.1 The water level logger is a 6" x 1" solid stainless steel cylinder.

2.2 The Optic USB Base Station is device used for communication between the water level logger and the computer. It is located in the laboratory at the hatchery.

2.3 The stilling well is a 4" PVC pipe that is used to stabilize the water surrounding the level sensor.

3. MATERIALS

3.1 HOBO water level logger
3.2 Optic USB Base Station
3.3 HOBOware Pro Software

4. PROCEDURES

4.1 Launching Logger

4.1.1 Insert water level logger into optic USB base station and open HOBOware program on computer desktop.

4.1.2 Follow onscreen prompts to launch logger.

4.1.3 Once logger is successfully launched remove from base station and transfer to location being tested.

4.1.4 Insert water level logger into screw cap and lower into water. If possible, use of a stilling well will increase precision of measurements.

4.2 Retrieving Logger

4.2.1 Remove water level logger from the location being tested.

4.2.2 Insert water level logger into optic USB base station and open HOBOware program on computer desktop.

4.2.3 Follow onscreen prompts to retrieve data from logger.

4.2.4 Transfer data into an Excel spreadsheet.

Author:
Aaron Switzer 2003
Revised:
Paul Stowe 2016

STANDARD OPERATING PROCEDURES FOR CALIBRATION OF YSI 650 MDS AND 600R SONDE

1 SCOPE

1.1 The Platte River Fish Hatchery collects water quality data from Platte Lake and its tributaries as part of an ongoing water quality program. This data is used to detect changes in water quality over time.

2. PURPOSE

2.1 This (SOP) describes the proper procedure for calibration of YSI 650 MDS and 600R sonde units. These instruments are used for the collection of water quality data on Big Platte Lake and its tributaries. Adherence to a consistent calibration protocol is necessary to ensure effective and consistent water quality data collection.

3. REFERENCES

3.1 YSI Environmental Operation Manual

4. MATERIALS

4.1 YSI meter
4.2 Calibration solutions
- 4.2.1 KCL solution
- 4.2.2 Zobell solution
- 4.2.3 pH 4, 7, & 10 buffer

4.3 Calibration cup
4.4 Distilled water
4.5 Vacuum Pump
4.6 Air stones
4.7 2- 10L Glass bottles
4.8 Ice

5. CALIBRATION

5.1 The YSI 650 MDS and 600R sonde are calibrated in the lab at Platte River State Fish Hatchery. All calibration solutions are stored in the lab. The YSI 650 MDS and 600R devices must always be calibrated prior to use on the day that they are used in the field.

5.2 Conductivity Calibration

5.2.1 Rinse the calibration cup twice with distilled water, then once with 0.02N KCL solution. Fill the calibration cup with the 0.02N KCL solution such that the conductivity block is fully submerged. Tap the sonde unit to dislodge any possible air bubbles.

5.2.2 Select “Sonde Menu”, then “calibrate”, “conductivity”. Then “spcond”.

5.2.3 Enter the value 2.76 ms/cm for calibration of (0.02N KCL). The display will then return to the data display screen, with the option “calibrate” highlighted. Record the displayed spcond value as the initial reading. Then select enter; the calibration will stabilize and be completed. Record the displayed value in the YSI calibration logbook as the calibrated value. Select the highlighted option

"continue" by pressing enter. The display will then continue with options. Advance to "sonde run".

5.2.4 Rinse the calibration cup twice with distilled water then once with 0.01N KCL solution. Fill the calibration cup with the 0.01N KCL solution such that the entire conductivity block is fully submerged. Tap the unit to dislodge any air bubbles.

5.2.5 Record the displayed conductivity value in the logbook as the "initial reading".

5.2.6 After use in the field, conduct the post-calibration procedure by repeating 5.2.1 and 5.2.3. The displayed value for each solution should be recorded as the "after use" value. The difference between the "after use" value and the "calibrated value" (for 0.02N KCL) and "initial value" (for 0.01N KCL) should be recorded as drift.

5.3 Oxidation Reduction Potential (ORP)

5.3.1 To determine if the sensor is functioning correctly place the probe in 3682 Zobell solution and monitor the millivolt reading. The probe should read in the range of 221-241 at normal ambient temperature (17-32 degrees Celsius). If the reading is outside this range, the probe can be calibrated to the correct value outlined in section 2.6.1 of the operations manual.

5.4 Temperature

5.4.1 The temperature sensor is factory calibrated.

5.5 Depth Calibration

5.5.1 Calibration of depth should occur in the field immediately prior to use.

5.5.2 Suspend sonde unit so that the probe is just above water surface. Select "sonde menu", then "calibrate", then "pressure –ABS" on display unit. Enter calibration value (0.0 feet). The display will then return to the data display screen, with the option "calibrate" highlighted. Select enter, and the calibration will stabilize and be complete.

5.6 pH Calibration

5.6.1 Remove the weighted probe guard from the sonde. Rinse calibration cup and probes with distilled water. Thoroughly mix container of pH 7 buffer, making sure the solution is dated and fresh. Rinse the probes in the calibration cup with pH 7 buffer, and then fill the cup with buffer until all probes are submerged. Allow readings to stabilize for approximately 90 seconds.

5.6.2 Select "Sonde Menu", then "Calibrate", then "pH" then "3 point cal" on the display unit. Enter the first pH buffer for calibration (pH 7). The display will then return to the data display screen, with the option "calibrate" highlighted. Record the displayed pH value as the initial reading in the YSI calibration logbook. Then select enter, the calibration will stabilize and be completed. Record the new displayed value in the YSI calibration logbook as the calibrated value. Select the highlighted option "continue" by pressing enter.

5.6.3 Repeat for both pH 10 and pH 4.

5.6.4 After use in the field conduct the post-calibration procedure by repeating 5.6.1 for all three-pH solutions. The displayed values should be recorded as the after use value in the YSI calibration logbook. The difference between the "after use" value and the "calibrated" value is the drift.

5.7 Dissolved Oxygen (DO) calibration

5.7.1 Start the vacuum pump attached to the air stones. The air stones are in two 10L glass bottles, one refrigerated or containing an ice water mix and one at room temperature. Let the vacuum pump run at least one half hour to completely saturate the water.

5.7.2 Place sonde (with attached weighted probe guard) into five-gallon DI water bucket in lab. Allow the unit to stabilize in bucket for 10 minutes.

5.7.3 Obtain the current barometric pressure from weather station, read in inches (in.) of Hg. Convert this value to millimeters (mm) of Hg through a multiplication factor of 25.4. Record the mm of Hg value in YSI calibration logbook.

5.7.4 Select "Sonde Menu", then "Calibrate", then "DO%" on the display unit. Enter the calculated barometric pressure "mm/Hg". The display will return to the data display screen, with the option "calibrate" highlighted. Press enter and the calibration will stabilize and be completed.

5.7.5 Place the sonde into the refrigerated 10L glass bottles from 5.7.1 which are now saturated with oxygen. Let the 650 unit stabilize approximately 90 seconds. Record the value for DO% and DO mg/L. Repeat this procedure for the 10L glass bottle at room temperature. Compare these readings to the Oxygen Saturation at Temperature spreadsheet posted on the side of the refrigerator. The 650 DO mg/L readings should be within the hundredth. If they are not, consult the YSI Operations Manual for proper recalibration procedures.

5.7.6 After use in the field, conduct the post-calibration procedure repeating 5.7.1 through 5.7.5 as listed above. The difference between the displayed DO value recorded in the logbook and the post-calibration reading is the drift, which should be recorded in the logbook.

6. MAINTENANCE

6.1 After use the YSI 650 MDS and 600R sonde should be cleaned and stored in the lab.

6.2 The cable should be cleaned and recoiled. Clean and lubricate the rubber connectors. Store the sonde unit with ~ ½ inch of tap water in storage cup.

6.3 Replace Dissolved Oxygen (DO) membrane every 30 days. Avoid over stretching the membrane, invert sonde unit several times; check for trapped air bubbles under the membrane.

6.4 Rinse pH bulb with tap water to remove any film or debris. If good readings are not established, soak the probe in a dishwashing liquid 10-15 minutes. A cotton swab can be used gently to clean the bulb if needed.

6.5 Clean the conductivity block and electrodes with dishwashing liquid solution every four months.

6.6 The temperature sensor is factory set and requires no maintenance.

6.7 The function of the Redox (ORP) sensor should be checked quarterly against a standard Zobell's solution.

Author:
Aaron Switzer 2003
Revised:
Aaron Switzer September 22, 2016

STANDARD OPERATING PROCEDURES
COLLECTION AND PRESERVATION OF ZOOPLANKTON SAMPLES

1. SCOPE/ PURPOSE

1.1 A zooplankton tow net is used to collect zooplankton in Platte Lake. The samples are preserved and sent to the lab for analysis.

2. DEFINITIONS

2.1 The zooplankton net is conical in shape and has a metal frame at the large opening and a male plastic connection at the small opening.

2.2 The plankton bucket attaches to the male plastic connection at the smaller opening on the zooplankton net.

3. MATERIALS

3.1 Zooplankton net and plankton bucket.
3.2 Calibrated line.

4. PROCEDURES

4.1 Connect the calibrated line to the frame at the large end of the zooplankton net.

4.2 Lower the zooplankton net slowly into the water. Make sure there are no air bubbles trapped in the net. Continue to lower the net until the 85' mark is reached. The 85' mark is bright red edged with black.

4.3 Once the 85' mark is reached allow the line to become taut and begin retrieving the net. The average rate of retrieval is 60 seconds.

4.4 When the net reaches the surface hold vertically above the water surface and splash surface water onto the sides of the net to wash down any zooplankton stuck to the inside of the net.

4.5 Remove the plankton bucket form the net and pour its contents into a 250ml sample bottle, be sure to record the bottle number on the Laboratory Data Form.

4.6 Spray down the inside of the plankton bucket with a squeeze bottle filled with tap water from the hatchery. Repeat.

4.7 Add formalin to the sample bottle to preserve the zooplankton. The amount of formalin should be approximately 20% of the total sample volume.

5. STORAGE

5.1 Following sampling the net is rinsed and hung in the lab to dry. The plankton bucket is removed, rinsed and inverted for drying.

5.2 Once dry the plankton bucket is placed back on the net. A sock is used to cover the bucket to prevent damage to the net. The net is carefully folded up in a towel and put into storage.

Author:
Aaron Switzer 2003
Revised:

STANDARD OPERATING PROCEDURES
Hatchery Database Documentation and Code - Version 2.9.2

Input Tablet Workbook documentation - Version 2.9.2

General Comments

The EXCEL database uses regular spreadsheet functions where possible and Visual Basic (VBA) code when necessary. The EXCEL database and VBA code are relatively easy to understand, are well documented, the calculations are transparent, and produce one relatively small sized file. However, the spreadsheet does not track individual bottles compared to the ACCESS database and the layout of the spreadsheet is rigid and less adaptable and modifications may be a major task. Also casual modifications or insertions by multiple users will likely result in errors and misleading results, so it is recommended that a single individual (Laboratory Technician) be responsible for maintenance and modifications.

The EXCEL database does not allocate dedicated columns for routine comments. However, comments are recorded on the Lab and Tablet spreadsheets that are available for inspection. In a few cases the user may find it convenient to manually insert comments on a single spreadsheet cell to indicate corrections or interpolated values.

The EXCEL spreadsheet does not screen for suspect measurements. Measurements deemed unreliable should be documented on the Lab and Tablet spreadsheet.

Only valid measurements should be imported into the EXCEL database. For example if one of the three typical phosphorus measurements is an obvious outlier, then the user should disregard this value, make a note on the Lab spreadsheet, and import the average of the two remaining values.

Tablet Flow Data Documentation - Version 2.9.2

The database sheet on the Tablet spreadsheet has been modified to accommodate the new Hatchery EXCEL Database. Other elements of the Tablet spreadsheet remain unchanged. Data from the Tablet spreadsheet should be copied and pasted SPECIAL as VALUES into cells F8 to J11 on the Input Tablet Data sheet. The Date format should be mm/dd/yyyy.

Note that the tablet data import sheet (blue) does not assume that data are entered in ascending order or that interpolations on previous days have been completed. The program looks back 30 days for new data imports or hand-entered corrections. This gives the operator time to review previous entries and make corrections.

The Brundage 5 and Brundage 6 hertz (Hz) readings can have only one entry per day. If either pump is off for a few hours during the day and then re-started on the same day then the average flow for the day must be calculated by hand. This is done by calculating an effective Hz value for the day. For example, the Brundage 5 flow operating at 44 Hz is described by:

Flow (via linear regression) = 88.1 slope (44Hz) - 2,246 intercept = 1,630.4 gallons per minute (GPM).

This is converted to million gallons per day (MGD) by multiplying GPM by 60 minutes (min) * 24 hours (hr) /1,000,000 gallons (gal) = 2.35 MGD.

If the pump is down for maintenance for three hours and otherwise operating at 44 Hz, the flow for the day is given by:

Flow = 1630.4 GPM * 60 min * 21 hr /1,000,000 gal = 2.054 MGD.

The average GPM for entire day is given by:

2.054 MGD * 1,000,000 gal / (24 hr * 60 min) = 1,426.6 GPM

Neither the EXCEL nor ACCESS database can handle all these details. However, the database user can enter an equivalent Hz to create the actual flow of 2.054 MGD.

Flow = 88.1 slope (X) - 2,246 intercept = 1,426.6 GPM

Solving, X = 41.69Hz. Thus the database user enters an artificial Hz value of 41.69 that accounts for the three hours down time.

Also note that it is appropriate to interpolate the filter, waste, and spring flow readings between missing days. However similar interpolation of creek readings is not appropriate. For example suppose at noon on Monday the Hz is 40. The Hz at noon on Tuesday is 0. Obviously, the Hz at midnight is not 20, rather the Hz remains 40 until it is changed. The database assumes that the Hz from the proceeding day is operative until it changes. If the Hz changes from the value the previous day, the tablet should enter the change in Hz.

Example Flow Calculation

Note that the daily average flow at any site requires three tablet readings: one for the day before, one for the day during, and one for the following day. Example calculations are shown below.

The following example shows how daily average flows are calculated for the Spring to Building on Monday November 16, 2015. The meter volume reading (totalizer) on Friday November 13, 2015 at 8:45 AM was 8,377,574. The meter volume reading on Monday November 16, 2015 at 10:02 AM was

8,385,502. The meter volume reading on Tuesday November 17, 2015 at 3:35 PM was 8,388,695. Note volume readings are per 1000 gallons (gal).

Step 1 is to calculate the flow between Friday and Monday, Q_3.

Input Tablet Code - Version 2.9.2

```
Private Sub CommandButton2_Click()
Dim TopDate As Date
Dim Skips As Integer, DatabaseCount As Integer
Dim ImportDate As Date, ImportTime As Date, ImportReading1 As Double, ImportReading2 As Double,
ImportReading3 As Double
Dim DeltaReading As Variant, DeltaDay As Double, FirstReading As Double
Dim InsertRow As Integer, FirstRow As Integer, LastRow As Integer, TopRow As Integer, BackDays As
Integer
Dim DataBaseDate(10000) As Double, DataBaseTime(10000) As Date, DataBaseReading(10000) As
Variant
Dim Column1 As String, Column2 As String, Column3 As String, Column4 As String
Dim i As Integer, j As Integer, k As Integer

Application.ScreenUpdating = False

TopDate = DateSerial(2015, 12, 30)
TopRow = 17

Sheets("Input Tablet Data").Range("f8").Select  'get Spring import date, time, and reading
ImportDate = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportTime = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading1 = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading2 = ActiveCell.Value

InsertRow = DateDiff("d", TopDate, ImportDate) + TopRow

Sheets("Input Tablet Data").Range("b" + CStr(InsertRow)).Select 'insert Spring date, time, and reading
ActiveCell.Value = ImportDate
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = ImportTime
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = ImportReading1
ActiveCell.Offset(0, 3).Select
ActiveCell.Value = ImportReading2

Sheets("Input Tablet Data").Range("f9").Select  'get Creek import date, time, and reading
ImportDate = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportTime = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading1 = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading2 = ActiveCell.Value

Sheets("Input Tablet Data").Range("L" + CStr(InsertRow)).Select 'insert Creek date, time, and reading
ActiveCell.Value = TimeValue(ImportTime)
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = ImportReading1
ActiveCell.Offset(0, 3).Select
ActiveCell.Value = ImportReading2
```

```
Sheets("Input Tablet Data").Range("f10").Select  'get Filters import date, time, and reading
ImportDate = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportTime = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading1 = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading2 = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading3 = ActiveCell.Value

Sheets("Input Tablet Data").Range("u" + CStr(InsertRow)).Select 'insert Filters date, time, and reading
ActiveCell.Value = ImportTime
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = ImportReading1
ActiveCell.Offset(0, 3).Select
ActiveCell.Value = ImportReading2
ActiveCell.Offset(0, 3).Select
ActiveCell.Value = ImportReading3

Sheets("Input Tablet Data").Range("f11").Select  'get Waste import date, time, and reading
ImportDate = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportTime = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading1 = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading2 = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
ImportReading3 = ActiveCell.Value

Sheets("Input Tablet Data").Range("ag" + CStr(InsertRow)).Select 'insert Waste date, time, and reading
ActiveCell.Value = ImportTime
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = ImportReading1
ActiveCell.Offset(0, 3).Select
ActiveCell.Value = ImportReading2
ActiveCell.Offset(0, 3).Select
ActiveCell.Value = ImportReading3

BackDays = 30                           'find last row
Sheets("Input Tablet Data").Range("b15").Select  'get total count after insert
DatabaseCount = ActiveCell.Value
LastRow = DatabaseCount + 16
If InsertRow >= LastRow Then LastRow = InsertRow

For j = 30 To 30 + BackDays                 'find first row
   FirstRow = LastRow - j
   If FirstRow < TopRow Then
      FirstRow = TopRow
      Exit For
   End If
   Sheets("Input Tablet Data").Range("d" + CStr(FirstRow)).Select
   FirstReading = ActiveCell.Value
   If FirstReading <> 0 Then
```

```
      FirstRow = LastRow - j
      Exit For
   End If
Next j

Sheets("Input Tablet Data").Range("b" + CStr(FirstRow)).Select 'get all dates between first and last
For i = FirstRow To LastRow
   DataBaseDate(i) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

'SPRING LOOP
Column1 = "c"   'Spring time column
Sheets("Input Tablet Data").Range(Column1 + CStr(FirstRow)).Select  'get all times between first and last
For i = FirstRow To LastRow
   DataBaseTime(i) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

For k = 1 To 2
   If k = 1 Then Column2 = "d"
   If k = 1 Then Column3 = "e"
   If k = 2 Then Column2 = "g"
   If k = 2 Then Column3 = "h"

   Sheets("Input Tablet Data").Range(Column2 + CStr(FirstRow)).Select  'get values between first and
last
   For i = FirstRow To LastRow
      DataBaseReading(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
   Next i

   Skips = 0

   For i = FirstRow + 1 To LastRow

      If DataBaseReading(i) = 0 Then Skips = Skips + 1


      If DataBaseReading(i) <> 0 Then

         DeltaDay = (DataBaseDate(i) + DataBaseTime(i)) - (DataBaseDate(i - 1 - Skips) +
DataBaseTime(i - 1 - Skips))
         DeltaReading = DataBaseReading(i) - DataBaseReading(i - 1 - Skips)

         For j = i To i - Skips Step -1
            Sheets("Input Tablet Data").Range(Column3 + CStr(j)).Select
            ActiveCell.Value = DeltaReading / DeltaDay
         Next j
         Skips = 0
       End If
   Next i
Next k
```

```
'CREEK LOOP
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
For k = 1 To 2
   If k = 1 Then Column1 = "m"
   If k = 1 Then Column2 = "be"
   If k = 1 Then Column3 = "bf"
   If k = 2 Then Column1 = "p"
   If k = 2 Then Column2 = "bg"
   If k = 2 Then Column3 = "bh"

   Sheets("Input Tablet Data").Range(Column1 + CStr(FirstRow)).Select  'get values between first and
last
   For i = FirstRow To LastRow
      DataBaseReading(i) = ActiveCell.Value
      If IsEmpty(DataBaseReading(i)) = True Then DataBaseReading(i) = "NR"
      ActiveCell.Offset(1, 0).Select
   Next i

   Sheets("Input Tablet Data").Range(Column2 + CStr(FirstRow)).Select  'print values between first and
last
   For i = FirstRow To LastRow
        If DataBaseReading(i) = "NR" Then ActiveCell.Value = DataBaseReading(i)
        If DataBaseReading(i) <> "NR" Then ActiveCell.Value = Val(DataBaseReading(i))
        ActiveCell.Offset(1, 0).Select
   Next i


'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
   Skips = 0

   For i = FirstRow + 1 To LastRow

      If DataBaseReading(i) = "NR" Then Skips = Skips + 1

      If IsNumeric(DataBaseReading(i)) Then

           Sheets("Input Tablet Data").Range(Column3 + CStr(i)).Select
           ActiveCell.Value = Val(DataBaseReading(i))

           For j = i - 1 To i - Skips Step -1
              Sheets("Input Tablet Data").Range(Column3 + CStr(j)).Select
              ActiveCell.Value = Val(DataBaseReading(i - Skips - 1))
           Next j

           Skips = 0
       End If

    Next i

Next k

'FILTER LOOP
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

```
Column1 = "u"   'Filter time column
Sheets("Input Tablet Data").Range(Column1 + CStr(FirstRow)).Select  'get all times between first and last
For i = FirstRow To LastRow
   DataBaseTime(i) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

For k = 1 To 3
   If k = 1 Then Column2 = "v"
   If k = 1 Then Column3 = "w"
   If k = 2 Then Column2 = "y"
   If k = 2 Then Column3 = "z"
   If k = 3 Then Column2 = "ab"
   If k = 3 Then Column3 = "ac"

   Sheets("Input Tablet Data").Range(Column2 + CStr(FirstRow)).Select  'get values between first and
last
   For i = FirstRow To LastRow
      DataBaseReading(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
   Next i

   Skips = 0

   For i = FirstRow + 1 To LastRow
      If DataBaseReading(i) = 0 Then Skips = Skips + 1

      If DataBaseReading(i) <> 0 Then
         DeltaDay = (DataBaseDate(i) + DataBaseTime(i)) - (DataBaseDate(i - 1 - Skips) +
DataBaseTime(i - 1 - Skips))
         For j = i To i - Skips Step -1
            Sheets("Input Tablet Data").Range(Column3 + CStr(j)).Select
            ActiveCell.Value = DataBaseReading(i) / DeltaDay
         Next j
         Skips = 0
       End If
   Next i
Next k

'WASTE LOOP
Column1 = "ag"   'Waste time column
Sheets("Input Tablet Data").Range(Column1 + CStr(FirstRow)).Select  'get all times between first and last
For i = FirstRow To LastRow
   DataBaseTime(i) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

For k = 1 To 3
   If k = 1 Then Column2 = "ah"
   If k = 1 Then Column3 = "ai"
   If k = 2 Then Column2 = "ak"
   If k = 2 Then Column3 = "al"
   If k = 3 Then Column2 = "an"
   If k = 3 Then Column3 = "ao"
```

```
   Sheets("Input Tablet Data").Range(Column2 + CStr(FirstRow)).Select  'get values between first and
last
   For i = FirstRow To LastRow
      DataBaseReading(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
   Next i

   Skips = 0

   For i = FirstRow + 1 To LastRow
      If DataBaseReading(i) = 0 Then Skips = Skips + 1

      If DataBaseReading(i) <> 0 Then
         DeltaDay = (DataBaseDate(i) + DataBaseTime(i)) - (DataBaseDate(i - 1 - Skips) +
DataBaseTime(i - 1 - Skips))
         For j = i To i - Skips Step -1
            Sheets("Input Tablet Data").Range(Column3 + CStr(j)).Select
            ActiveCell.Value = DataBaseReading(i) / DeltaDay
         Next j
         Skips = 0
       End If
   Next i
Next k

Sheets("Input Tablet Data").Range("bf6").Select



End Sub

Private Sub Worksheet_SelectionChange(ByVal Target As Range)

End Sub
```

Input Lab TP Workbook Documentation - Version 2.9.2

Laboratory Phosphorus Data

The PRSFH Lab Data spreadsheet has been modified to accommodate the new Hatchery EXCEL database. The Bottle Import sheet has been eliminated. Instead the user inserts bottle numbers and site locations in the preferred order directly on the TP Results sheet. The Jenway file is imported in the usual manner.

The lab technician must insert the average of multiple measurements in Column L of the lab spreadsheet according to the number of valid measurements. Normally this is the average of three replicated bottles. However, it is recommended that the Trucked Composite have six replicates. The lab technician must insert average value of six replicates. If one of the three normal replicates is missing or not used (DNU) then lab technician must average two or fewer measurements. Only the average value is entered into the database.

The Database Export sheet contains a VBA program that transfers information from the TP Results sheet and alters the format to accommodate the EXCEL database requirements.

The EXCEL database assumes that phosphorus results are available for all six sites on each sample date. If data for a site is missing, the user should insert and import a zero value. Next the user must go to the daily sheet and perform manual interpolation using "Fill" function to replace zero value. This requires the user to wait for next data set. The user can add a Comment to distinguish interpolated value on Daily Data sheet.

Column I asks the user to insert the number of composite days. The program inserts the phosphorus concentrations into the Daily Data sheet on the Sample Date and on Composite Days -1 days prior to the Sample Date. In most cases Composite Days will equal three.

Input Lab TP Code - Version 2.9.2

```
Private Sub CommandButton1_Click()

Dim DatabaseCount As Integer, ImportCount As Integer, CompositeDays As Integer, Skips As Integer
Dim TPData(10) As Double, DeltaTP As Double
Dim i As Integer, j As Integer, k As Integer, kk As Integer, jj As Integer

Dim TopDate As Date
Dim ImportDate As Date, ImportTime As Date, ImportReading1 As Double, ImportReading2 As Double,
ImportReading3 As Double
Dim DeltaReading As Double, DeltaDay As Double, FirstReading As Double
Dim InsertRow As Integer, FirstRow As Integer, LastRow As Integer, TopRow As Integer, BackDays As
Integer
Dim DataBaseDate(5000) As Double, DataBaseTime(5000) As Date, DataBaseReading(5000) As Variant
Dim Column As String

Application.ScreenUpdating = False

TopDate = DateSerial(2016, 1, 1)
TopRow = 17

'LAB TP DATA
Sheets("Input Lab TP").Select
Sheets("Input Lab TP").Range("b14").Select
ImportCount = ActiveCell.Value              'count import records

For kk = 1 To ImportCount

   If kk = 1 Then Sheets("Input Lab TP").Range("b8").Select    'get import date, TP values, and
CompositeDays
   If kk = 2 Then Sheets("Input Lab TP").Range("b9").Select    'get import date, TP values, and
CompositeDays
   If kk = 3 Then Sheets("Input Lab TP").Range("b10").Select   'get import date, TP values, and
CompositeDays
   If kk = 4 Then Sheets("Input Lab TP").Range("b11").Select   'get import date, TP values, and
CompositeDays
   If kk = 5 Then Sheets("Input Lab TP").Range("b12").Select   'get import date, TP values, and
CompositeDays

   ImportDate = ActiveCell.Value

   For k = 1 To 6
      ActiveCell.Offset(0, 1).Select
      TPData(k) = ActiveCell.Value
   Next k
   ActiveCell.Offset(0, 1).Select
   CompositeDays = ActiveCell.Value

   InsertRow = DateDiff("d", TopDate, ImportDate) + TopRow

   For i = 1 To CompositeDays              'backfill composite days
      Sheets("Input Lab TP").Range("c" + CStr(InsertRow + 1 - i)).Select 'insert imports into database at
correct location
      For k = 1 To 6
```

```
        ActiveCell.Value = TPData(k)
        ActiveCell.Offset(0, 1).Select
      Next k
    Next i

Next kk

Sheets("Input Lab TP").Range("b15").Select      'define interpolation range
DatabaseCount = ActiveCell.Value
BackDays = 30
LastRow = DatabaseCount + 16
If InsertRow >= LastRow Then LastRow = InsertRow
FirstRow = LastRow - BackDays

For k = 1 To 6     'interpolate each of 6 columns separately

    If k = 1 Then Column = "c"
    If k = 2 Then Column = "d"
    If k = 3 Then Column = "e"
    If k = 4 Then Column = "f"
    If k = 5 Then Column = "g"
    If k = 6 Then Column = "h"

    Sheets("Input Lab TP").Range(Column + CStr(FirstRow)).Select
    For i = FirstRow To LastRow
      DataBaseReading(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Input Lab TP").Range(Column + CStr(FirstRow)).Select

    For i = FirstRow To LastRow

      Skips = 0

      If DataBaseReading(i) = 0 Or IsEmpty(DataBaseReading(i)) Then

        Skips = 1

        For jj = i + 1 To i + 1 + BackDays
          If DataBaseReading(jj) = 0 Then Skips = Skips + 1
          If DataBaseReading(jj) <> 0 Then Exit For
          ActiveCell.Offset(1, 0).Select
        Next jj

        DeltaDay = 1 + Skips

        DeltaReading = DataBaseReading(i + Skips) - DataBaseReading(i - 1)

        For j = 1 To 1 + Skips - 1
          Sheets("Input Lab TP").Range(Column + CStr(i)).Select
          ActiveCell.Value = DataBaseReading(i - 1) + j * DeltaReading / DeltaDay
          ActiveCell.Offset(1, 0).Select
        Next j

        i = i + Skips - 1
```

```
        End If
    ActiveCell.Offset(1, 0).Select
    Next i
Next k
Sheets("Input Lab TP").Range("k5").Select

End Sub
```

Production Data Documentation - Version 2.9.2

Monthly production data are entered on the Input Production Data sheet. Note that fish weight is added in column D at the END of each month. The application assumes that the fish number at the beginning of each month is the same as the weight at the end of the proceeding month. The lab technician also enters the total amount of food used during the month and the volume weighted phosphorus concentration (column E and F). The total weight of mortality, shipped, and planted losses are entered monthly as well as fry additions in columns G through J. An estimated value for the percent of phosphorus contained in the fish tissue of 0.5% is specified in cell J5. This is used to calculate estimated values for the production by-product phosphorus load.

Two charts are displayed for the selected year.

The left-hand chart compares the weight of fish produced and the amount of food used for the year. These data are used to calculate the annual average Food Conversion Ratio (FCR) as displayed in the left-hand chart title.

The right-hand chart calculates the gross production by-product phosphorus load. This value is the difference between the annual amount of phosphorus provided by the food and the amount of phosphorus associated with the total amount of fish produced (sum of Mortalities, Shipped, Planted, and increase in inventory).

The production by-product load is the phosphorus load that must be reduced by filtration, ferric precipitation, and the pond before discharge to meet the NPDES requirements.

Input Production Data Code - Version 2.9.2

```
Private Sub CommandButton1_Click()

'PRODUCTION DATA AND REPORTS

Dim ProductionYear As Integer
Dim Food As Double, Fry As Double, Inventory As Double, Ship As Double, Plant As Double, Mort As
Double
Dim FishStart As Double, FishEnd As Double
Dim FoodP As Double, TissueP As Double, LoadP As Double, FCR As Double, PercentFoodP As
Double, PercentFishP As Double
Dim AverageFoodPercentP As Double
Dim i As Integer, ReportRow As Integer

Application.ScreenUpdating = False

'find year, tissue P, and calculate row
Sheets("Input Production Data").Select
Sheets("Input Production Data").Range("h5").Select
ProductionYear = ActiveCell.Value
ReportRow = 12 * ProductionYear - 24091
ActiveCell.Offset(0, 2).Select
PercentFishP = ActiveCell.Value

'fry sum
Sheets("Input Production Data").Range("j" + CStr(ReportRow)).Select
Fry = 0
For i = 1 To 12
   Fry = Fry + ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

'ship sum
Sheets("Input Production Data").Range("h" + CStr(ReportRow)).Select
Ship = 0
For i = 1 To 12
   Ship = Ship + ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

'plant sum
Sheets("Input Production Data").Range("i" + CStr(ReportRow)).Select
Plant = 0
For i = 1 To 12
   Plant = Plant + ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

'mort sum
Sheets("Input Production Data").Range("g" + CStr(ReportRow)).Select
Mort = 0
For i = 1 To 12
   Mort = Mort + ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
```

```
Next i

'calc change in inventory
If ProductionYear = 2010 Then
   FishStart = 40253        'from ACCESS database hard wired for 2010 only
  Else
   Sheets("Input Production Data").Range("d" + CStr(ReportRow - 1)).Select 'end of Dec from previous
year
   FishStart = ActiveCell.Value
End If
Sheets("Input Production Data").Range("d" + CStr(ReportRow + 11)).Select    'end of Dec from current
year
FishEnd = ActiveCell.Value
Inventory = FishEnd - FishStart

'sum food P input load Lbs
FoodP = 0
For i = 0 To 11
   Sheets("Input Production Data").Range("e" + CStr(ReportRow + i)).Select
   Food = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
   PercentFoodP = ActiveCell.Value
   FoodP = FoodP + Food * PercentFoodP * 2.2046226 / 100       '2.2046226 converts kg to Lbs
   ActiveCell.Offset(1, -1).Select
Next i

'tissue P and production P load in Lbs
TissueP = 2.2046226 * (Ship + Plant + Mort - Fry + Inventory) * PercentFishP / 100
LoadP = FoodP - TissueP

'average food percent P  (divide by sum Food later)
AverageFoodPercentP = 0
For i = 0 To 11
   Sheets("Input Production Data").Range("e" + CStr(ReportRow + i)).Select
   Food = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
   PercentFoodP = ActiveCell.Value
   AverageFoodPercentP = AverageFoodPercentP + Food * PercentFoodP
   ActiveCell.Offset(1, -1).Select
Next i

'food sum
Sheets("Input Production Data").Range("e" + CStr(ReportRow)).Select
Food = 0
For i = 1 To 12
   Food = Food + ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

'effective annual average FCR
FCR = Food / (Ship + Plant + Mort + Inventory - Fry)

'discplay results
Sheets("Input Production Data").Range("o26").Select
ActiveCell.Value = Food
ActiveCell.Offset(0, 1).Select
```

```
ActiveCell.Value = Fry
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Inventory
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Ship
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Plant
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Mort
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Round(FoodP, 1)
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Round(TissueP, 1)
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Round(LoadP, 1)
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = FCR
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Round(AverageFoodPercentP / Food, 3) 'note division by total food

Sheets("Input Production Data").Range("m5").Select  'move curser

End Sub
```

Tank Data Documentation- Version 2.9.2

The spreadsheet database assumes one trucked event per year. Modifications will be required if more than one trucked event occurs in a single year.

The date of the trucked event is entered for each year in column B. The total trucked volume is entered in column C. It is recommended that a single composite for phosphorus measurement be created by collecting three sub-samples for each truck load. This single composite consisting of about 45 sub-samples (three sub-samples for about 15 truck loads) should be measured six separate times and the average entered in column D.

The left-hand chart shows estimated values for the amount of phosphorus in the tank at the beginning and end of the year as well as the trucked amount. The program extrapolates the accumulation rate for the first part of the year until the end of the year to determine the tank end value. With this approach the mass balance does not change when the tank is cleaned the following year. Note the difference between these gets smaller and smaller when the tank is cleaned later and later during the year.

The right-hand chart shows the trend of tank withdrawals.

Tank Production Data Code - Version 2.9.2

```
Private Sub CommandButton1_Click()

'TANK REPORT

Dim TankYear As Integer
Dim TankStart As Double, Trucked As Double, TankEnd As Double

Application.ScreenUpdating = False

Sheets("Input Tank Data").Select
Sheets("Input Tank Data").Range("i5").Select
TankYear = ActiveCell.Value

'get row corresponding to selected year Integer to String
Sheets("Input Tank Data").Range("g" + CStr(TankYear - 2010 + 31)).Select
Trucked = ActiveCell.Value
ActiveCell.Offset(0, 3).Select
TankStart = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
TankEnd = ActiveCell.Value

Sheets("Input Tank Data").Range("z30").Select
ActiveCell.Value = TankStart
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = Trucked
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = TankEnd

Sheets("Input Tank Data").Range("m5").Select

End Sub
```

Daily Data Documentation - Version 2.9.2

This sheet contains daily average values for the flow, phosphorus concentration, and loading for each of eight sites.

Spreadsheet database interpolates missing flow and phosphorus measurements so that individual loads are available every day for all eight sites. Therefore interpolation of the net load itself is not necessary.

The daily net system loads are displayed with (column AB) and without (column AC) providing credit for negative days.

The spreadsheet formula in column AC is shown below is used when no credit is given for negative loads on a given day.

Cell Value = IF (net load < 0, 0, net load)

The formula can be observed in cell AC2203 starting on January 1, 2016.

This formula is not applied when credit is given for negative days (column AB).

Summary Data Documentation - Version 2.9.2

This sheet contains an annual summary of the average daily flow, phosphorus concentration, and loading data. This allows the user to conveniently review annual trends.

Note that if data are incomplete for the year the average value shown in the table is the average of available values not including zero values for the remainder of the year.

This sheet allows the user to display the phosphorus concentration, flow, daily load, or cumulative load as a function of time. The user can compare two sites for a given year, two years for a given site, or any combination. This sheet is capable of generating 12 separate reports for each year where data are available. The database contains data starting in 2010. Therefore a total of 72 separate comparisons for each parameter or 288 reports are possible through the end of 2015.

Note that data used to generate the charts are shown along with numerical values for the minimum, maximum, and average.

Time Reports Code - Version 2.9.2

```
Private Sub CommandButton1_Click()

'TIME REPORTS

Dim Site As String, Site1 As String, Site2 As String, Parameter As String, Column As String
Dim Year1 As Integer, Year2 As Integer, ReportYear As Integer, StartDay As Integer, TotalDays As
Integer
Dim TestFactor(10000) As Double, LoadSum As Double, Ymax As Double
Dim i As Integer, j As Integer, k As Integer

Sheets("Time Reports").Select
Application.ScreenUpdating = False
Sheets("Time Reports").Range("e42:e407").ClearContents
Sheets("Time Reports").Range("h42:h407").ClearContents

Sheets("Time Reports").Range("d10").Select  'find years
Year1 = ActiveCell.Value
ActiveCell.Offset(3, 0).Select  'move 3 down
Year2 = ActiveCell.Value

Sheets("Time Reports").Range("f10").Select  'find sites
Site1 = ActiveCell.Value
ActiveCell.Offset(3, 0).Select  'move 3 down
Site2 = ActiveCell.Value

Sheets("Time Reports").Range("h12").Select  'find parameter
Parameter = ActiveCell.Value

For j = 1 To 2

   If j = 1 Then
      ReportYear = Year1
      Site = Site1
   End If

   If j = 2 Then
      ReportYear = Year2
      Site = Site2
   End If

   'These are Load Data lines, concentrations, flows, and loads files.
   'If the setup of the data files changes these start and end values must also change.
   If ReportYear = 2010 Then StartDay = 12: TotalDays = 365
   If ReportYear = 2011 Then StartDay = 377: TotalDays = 365
   If ReportYear = 2012 Then StartDay = 742: TotalDays = 366
   If ReportYear = 2013 Then StartDay = 1108: TotalDays = 365
   If ReportYear = 2014 Then StartDay = 1473: TotalDays = 365
   If ReportYear = 2015 Then StartDay = 1838: TotalDays = 365
   If ReportYear = 2016 Then StartDay = 2203: TotalDays = 366
   If ReportYear = 2017 Then StartDay = 2569: TotalDays = 365
   If ReportYear = 2018 Then StartDay = 2934: TotalDays = 365
   If ReportYear = 2019 Then StartDay = 3299: TotalDays = 365
   If ReportYear = 2020 Then StartDay = 3664: TotalDays = 366
   If ReportYear = 2021 Then StartDay = 4030: TotalDays = 365
```

```
If ReportYear = 2022 Then StartDay = 4395: TotalDays = 365
If ReportYear = 2023 Then StartDay = 4760: TotalDays = 365
If ReportYear = 2024 Then StartDay = 5125: TotalDays = 366
If ReportYear = 2025 Then StartDay = 5491: TotalDays = 365

If Site = "Spring" And Parameter = "Total P" Then Column = "C"
If Site = "Spring" And Parameter = "Flow" Then Column = "L"
If Site = "Spring" And Parameter = "Daily Load" Then Column = "s"
If Site = "Spring" And Parameter = "Cum Load" Then Column = "s"
If Site = "Creek" And Parameter = "Total P" Then Column = "D"
If Site = "Creek" And Parameter = "Flow" Then Column = "M"
If Site = "Creek" And Parameter = "Daily Load" Then Column = "t"
If Site = "Creek" And Parameter = "Cum Load" Then Column = "t"
If Site = "After Filters" And Parameter = "Total P" Then Column = "E"
If Site = "After Filters" And Parameter = "Flow" Then Column = "N"
If Site = "After Filters" And Parameter = "Daily Load" Then Column = "u"
If Site = "After Filters" And Parameter = "Cum Load" Then Column = "u"
If Site = "Discharge" And Parameter = "Total P" Then Column = "F"
If Site = "Discharge" And Parameter = "Flow" Then Column = "O"
If Site = "Discharge" And Parameter = "Daily Load" Then Column = "v"
If Site = "Discharge" And Parameter = "Cum Load" Then Column = "v"
If Site = "Waste" And Parameter = "Total P" Then Column = "j"
If Site = "Waste" And Parameter = "Flow" Then Column = "q"
If Site = "Waste" And Parameter = "Daily Load" Then Column = "z"
If Site = "Waste" And Parameter = "Cum Load" Then Column = "z"
If Site = "Backwash" And Parameter = "Total P" Then Column = "H"
If Site = "Backwash" And Parameter = "Flow" Then Column = "P"
If Site = "Backwash" And Parameter = "Daily Load" Then Column = "x"
If Site = "Backwash" And Parameter = "Cum Load" Then Column = "x"
If Site = "After Clarifier" And Parameter = "Total P" Then Column = "g"
If Site = "After Clarifier" And Parameter = "Flow" Then Column = "P"
If Site = "After Clarifier" And Parameter = "Daily Load" Then Column = "w"
If Site = "After Clarifier" And Parameter = "Cum Load" Then Column = "w"



Sheets("Daily Data").Select
Sheets("Daily Data").Range(Column + CStr(StartDay)).Select

For i = StartDay To StartDay + TotalDays - 1
   TestFactor(i) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Time Reports").Select
If j = 1 Then Sheets("Time Reports").Range("e42").Select
If j = 2 Then Sheets("Time Reports").Range("h42").Select
If Parameter <> "Cum Load" Then
   For i = StartDay To StartDay + TotalDays - 1
      ActiveCell.Value = TestFactor(i)
      ActiveCell.Offset(1, 0).Select
   Next i
End If

If Parameter = "Cum Load" Then
```

```
        LoadSum = 0
        For i = StartDay To StartDay + TotalDays - 1
           LoadSum = LoadSum + TestFactor(i)
           ActiveCell.Value = LoadSum
           ActiveCell.Offset(1, 0).Select
        Next i
     End If
Next j

'find Y max and adjust vertical scale
Sheets("Time Reports").Range("e37").Select
Ymax = ActiveCell.Value
ActiveSheet.ChartObjects("Chart 1").Activate
ActiveChart.Axes(xlValue).Select
     If Ymax < 0.001 Then
           Selection.TickLabels.NumberFormat = "0.00000"
        ElseIf Ymax < 0.01 Then
           Selection.TickLabels.NumberFormat = "0.0000"
        ElseIf Ymax < 0.1 Then
           Selection.TickLabels.NumberFormat = "0.000"
        ElseIf Ymax < 1 Then
           Selection.TickLabels.NumberFormat = "0.00"
        ElseIf Ymax < 10 Then
           Selection.TickLabels.NumberFormat = "0.0"
        Else
           Selection.TickLabels.NumberFormat = "0"
     End If

Sheets("Time Reports").Range("k12").Select  'move curser

End Sub
```

Performance Reports Documentation - Version 2.9.2

This sheet contains system performance reports. There are five single year reports and 42 multiple year reports or a total of 282 combinations through 2015.

Note that data used to generate the charts are shown along with numerical values for the minimum, maximum, and average.

Note that a bar chart is used to show one and three month loads and line charts are used for other displays.

Performance Reports Code - Version 2.9.2

```
Private Sub CommandButton1_Click()

'SINGLE YEAR REPORTS

Dim ReportName As String
Dim i As Integer, j As Integer, k As Integer, BackDays As Integer
Dim ReportYear As Integer, StartDay As Integer, TotalDays As Integer, DaysinMonth As Integer,
StartLoop As Integer, EndLoop As Integer
Dim TestFactor1(10000) As Double, TestFactor2(10000) As Double, TestFactor3(10000) As Double,
TestFactor4(10000) As Double
Dim LoadSum As Double, Ymax As Double, MonthSum As Double, MonthTotal(24) As Double
Application.ScreenUpdating = False

Sheets("Performance Reports").Select
Sheets("Performance Reports").Range("D10").Select
ReportName = ActiveCell.Value
ActiveCell.Offset(0, 2).Select  'move 2 right
ReportYear = ActiveCell.Value
Sheets("Performance Reports").Range("d42:e407").ClearContents  'clear plot data
Sheets("Performance Reports").Range("h42:i53").ClearContents

'These are the lines for concentrations, flows, and loads on Daily Data sheet.
If ReportYear = 2010 Then StartDay = 12: TotalDays = 365
If ReportYear = 2011 Then StartDay = 377: TotalDays = 365
If ReportYear = 2012 Then StartDay = 742: TotalDays = 366   'leap year
If ReportYear = 2013 Then StartDay = 1108: TotalDays = 365
If ReportYear = 2014 Then StartDay = 1473: TotalDays = 365
If ReportYear = 2015 Then StartDay = 1838: TotalDays = 365
If ReportYear = 2016 Then StartDay = 2203: TotalDays = 366  'leap year
If ReportYear = 2017 Then StartDay = 2569: TotalDays = 365
If ReportYear = 2018 Then StartDay = 2934: TotalDays = 365
If ReportYear = 2019 Then StartDay = 3299: TotalDays = 365
If ReportYear = 2020 Then StartDay = 3664: TotalDays = 366  'leap year
If ReportYear = 2021 Then StartDay = 4030: TotalDays = 365
If ReportYear = 2022 Then StartDay = 4395: TotalDays = 365
If ReportYear = 2023 Then StartDay = 4760: TotalDays = 365
If ReportYear = 2024 Then StartDay = 5125: TotalDays = 366  'leap year
If ReportYear = 2025 Then StartDay = 5491: TotalDays = 365

If ReportName = "Cum Load credit vs no credit" Then
   Shapes("Chart 1").Visible = True    'line chart
   Shapes("Chart 3").Visible = False   'bar chart
   Sheets("Performance Reports").Range("q6").Select
   ActiveCell.Value = "Year = " + CStr(ReportYear) + "      Cum Load    Red = no credit    Black = credit"
   ActiveCell.Offset(1, 0).Select  'move 1 down
   ActiveCell.Value = "Pounds P"

   Sheets("Daily Data").Select
   Sheets("Daily Data").Range("ab" + CStr(StartDay)).Select    'daily load with credit
   For i = StartDay To StartDay + TotalDays - 1
      TestFactor1(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
   Next i
```

```
    Sheets("Performance Reports").Select
    Sheets("Performance Reports").Range("d42").Select
       LoadSum = 0
       For i = StartDay To StartDay + TotalDays - 1
          LoadSum = LoadSum + TestFactor1(i)
          ActiveCell.Value = LoadSum
          ActiveCell.Offset(1, 0).Select
       Next i

    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("ac" + CStr(StartDay)).Select    'daily load no credit
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor1(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Performance Reports").Select
    Sheets("Performance Reports").Range("e42").Select
       LoadSum = 0
       For i = StartDay To StartDay + TotalDays - 1
          LoadSum = LoadSum + TestFactor1(i)
          ActiveCell.Value = LoadSum
          ActiveCell.Offset(1, 0).Select
       Next i
End If

If ReportName = "Daily Load credit vs no credit" Then   'same as above but no sum
    Shapes("Chart 1").Visible = True
    Shapes("Chart 3").Visible = False
    Sheets("Performance Reports").Range("q6").Select
    ActiveCell.Value = "Year = " + CStr(ReportYear) + "      Daily Load    Red = no credit    Black =
credit"
    ActiveCell.Offset(1, 0).Select  'move 1 down
    ActiveCell.Value = "Pounds P"

Sheets("Daily Data").Select
    Sheets("Daily Data").Range("ab" + CStr(StartDay)).Select
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor1(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Performance Reports").Select
    Sheets("Performance Reports").Range("d42").Select
       For i = StartDay To StartDay + TotalDays - 1
          ActiveCell.Value = TestFactor1(i)
          ActiveCell.Offset(1, 0).Select
       Next i

 Sheets("Daily Data").Select
    Sheets("Daily Data").Range("ac" + CStr(StartDay)).Select
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor1(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i
```

```
   Sheets("Performance Reports").Select
   Sheets("Performance Reports").Range("e42").Select
      For i = StartDay To StartDay + TotalDays - 1
         ActiveCell.Value = TestFactor1(i)
         ActiveCell.Offset(1, 0).Select
      Next i
End If

If ReportName = "1 & 3 Month Loads with credit" Or ReportName = "1 & 3 Month Loads no credit"
Then

   If ReportYear = 2010 Then
      response% = MsgBox("1 & 3 Month Report Unavailable for 2010", 64)   'no data for Nov and Dec
2009
      Exit Sub
   End If

   Shapes("Chart 1").Visible = False   'Hide line Chart 1
   Shapes("Chart 3").Visible = True    'Show bar Chart 3
   Sheets("Performance Reports").Range("q6").Select
   ActiveCell.Value = "Year = " + CStr(ReportYear) + "         " + ReportName
   ActiveCell.Offset(1, 0).Select  'move 1 down
   ActiveCell.Value = "Pounds P"

   BackDays = 61   'Dec = 31  Nov = 30

   Sheets("Daily Data").Select

   If ReportName = "1 & 3 Month Loads with credit" Then Sheets("Daily Data").Range("ab" +
CStr(StartDay - BackDays)).Select
   If ReportName = "1 & 3 Month Loads no credit" Then Sheets("Daily Data").Range("ac" +
CStr(StartDay - BackDays)).Select
   For i = StartDay - BackDays To StartDay + TotalDays - 1
      TestFactor1(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
   Next i

   DaysinMonth = 30    'preceeding nov
   StartLoop = StartDay - BackDays
   EndLoop = StartLoop + DaysinMonth - 1
   MonthSum = 0
   For k = StartLoop To EndLoop
      MonthSum = MonthSum + TestFactor1(k)
   Next k
   MonthTotal(1) = MonthSum

   DaysinMonth = 31  'preceeding dec
   StartLoop = EndLoop + 1
   EndLoop = StartLoop + DaysinMonth - 1
   MonthSum = 0
   For k = StartLoop To EndLoop
       MonthSum = MonthSum + TestFactor1(k)
   Next k
   MonthTotal(2) = MonthSum

   DaysinMonth = 31  'jan
```

```
StartLoop = StartDay                    'same as EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(3) = MonthSum

If ReportYear = 2012 Or ReportYear = 2016 Or ReportYear = 2020 Or ReportYear = 2024 Then
   DaysinMonth = 29 'feb
  Else
   DaysinMonth = 28 'feb
End If
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(4) = MonthSum

DaysinMonth = 31  'mar
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(5) = MonthSum

DaysinMonth = 30  'apr
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(6) = MonthSum

DaysinMonth = 31  'may
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(7) = MonthSum

DaysinMonth = 30  'jun
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(8) = MonthSum
```

```
DaysinMonth = 31  'jul
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(9) = MonthSum

DaysinMonth = 31  'aug
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(10) = MonthSum

DaysinMonth = 30  'sep
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(11) = MonthSum

DaysinMonth = 31  'oct
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(12) = MonthSum

DaysinMonth = 30  'nov
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(13) = MonthSum

DaysinMonth = 31  'dec
StartLoop = EndLoop + 1
EndLoop = StartLoop + DaysinMonth - 1
MonthSum = 0
For k = StartLoop To EndLoop
   MonthSum = MonthSum + TestFactor1(k)
Next k
MonthTotal(14) = MonthSum
```

```
    Sheets("Performance Reports").Select
    Sheets("Performance Reports").Range("h42").Select
      For i = 3 To 14                          'i = 3 is January
        ActiveCell.Value = MonthTotal(i)
        ActiveCell.Offset(1, 0).Select
      Next i

    Sheets("Performance Reports").Range("i42").Select
      For i = 3 To 14
        ActiveCell.Value = MonthTotal(i - 2) + MonthTotal(i - 1) + MonthTotal(i)
        ActiveCell.Offset(1, 0).Select
      Next i

End If

If ReportName = "Pond Retention" Then
    Shapes("Chart 1").Visible = True   'Hide Chart 1
    Shapes("Chart 3").Visible = False  'Show Chart 3
    Sheets("Performance Reports").Range("q6").Select
    ActiveCell.Value = "Year = " + CStr(ReportYear) + "   Pond Retention   Black = Inlet    Red = Outlet"
    ActiveCell.Offset(1, 0).Select  'move 1 down
    ActiveCell.Value = "Pounds P"

    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("u" + CStr(StartDay)).Select 'after filter
    For i = StartDay To StartDay + TotalDays - 1
      TestFactor1(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
    Next i
    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("w" + CStr(StartDay)).Select 'after clarifier
    For i = StartDay To StartDay + TotalDays - 1
      TestFactor2(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
    Next i
    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("v" + CStr(StartDay)).Select 'discharge
    For i = StartDay To StartDay + TotalDays - 1
      TestFactor3(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Performance Reports").Select
    Sheets("Performance Reports").Range("d42").Select
      LoadSum = 0
      For i = StartDay To StartDay + TotalDays - 1
        LoadSum = LoadSum + TestFactor1(i) + TestFactor2(i) 'pond in #14 + 28
        ActiveCell.Value = LoadSum
        ActiveCell.Offset(1, 0).Select
      Next i

      Sheets("Performance Reports").Select
      Sheets("Performance Reports").Range("e42").Select
      LoadSum = 0
      For i = StartDay To StartDay + TotalDays - 1
        LoadSum = LoadSum + TestFactor3(i)              'pond out #15
```

```
            ActiveCell.Value = LoadSum
            ActiveCell.Offset(1, 0).Select
        Next i
End If

'find Y max and adjust number of decimal places on vertical scale
Sheets("Performance Reports").Range("d37").Select
Ymax = ActiveCell.Value
ActiveSheet.ChartObjects("Chart 1").Activate
ActiveChart.Axes(xlValue).Select
    If Ymax < 0.001 Then
        Selection.TickLabels.NumberFormat = "0.00000"
    ElseIf Ymax < 0.01 Then
        Selection.TickLabels.NumberFormat = "0.0000"
    ElseIf Ymax < 0.1 Then
        Selection.TickLabels.NumberFormat = "0.000"
    ElseIf Ymax < 1 Then
        Selection.TickLabels.NumberFormat = "0.00"
    ElseIf Ymax < 10 Then
        Selection.TickLabels.NumberFormat = "0.0"
    Else
        Selection.TickLabels.NumberFormat = "0"
    End If

Sheets("Performance Reports").Range("j10").Select  'move curser

End Sub

Private Sub CommandButton2_Click()

'MULTI YEAR REPORTS

Dim Year1 As Integer, Year2 As Integer, TestYear As Integer, ReportName As String
Dim i As Integer, j As Integer, k As Integer
Dim ReportYear As Integer, StartDay As Integer, TotalDays As Integer
Dim LoadSum As Double, Ymax As Double
Dim TestFactor1(10000) As Double, TestFactor2(10000) As Double, TestFactor3(10000) As Double,
TestFactor4(10000) As Double, TestFactor5(10000) As Double
Application.ScreenUpdating = False
Sheets("Performance Reports").Range("d42:e407").ClearContents
Sheets("Performance Reports").Range("h42:i53").ClearContents

Sheets("Performance Reports").Select
Sheets("Performance Reports").Range("D13").Select
ReportName = ActiveCell.Value
ActiveCell.Offset(0, 2).Select  'move 2 right
Year1 = ActiveCell.Value
ActiveCell.Offset(0, 2).Select  'move 2 right
Year2 = ActiveCell.Value

Shapes("Chart 1").Visible = True    'Show Chart 1
Shapes("Chart 3").Visible = False   'Hide Chart 3

For j = 1 To 2

    If j = 1 Then TestYear = Year1
```

```
If j = 2 Then TestYear = Year2

'These are lines for concentrations, flows, and loads on Daily Data sheet.
'If the setup of the data files changes these start and end values must also change.
If TestYear = 2010 Then StartDay = 12: TotalDays = 365
If TestYear = 2011 Then StartDay = 377: TotalDays = 365
If TestYear = 2012 Then StartDay = 742: TotalDays = 366
If TestYear = 2013 Then StartDay = 1108: TotalDays = 365
If TestYear = 2014 Then StartDay = 1473: TotalDays = 365
If TestYear = 2015 Then StartDay = 1838: TotalDays = 365
If TestYear = 2016 Then StartDay = 2203: TotalDays = 366
If TestYear = 2017 Then StartDay = 2569: TotalDays = 365
If TestYear = 2018 Then StartDay = 2934: TotalDays = 365
If TestYear = 2019 Then StartDay = 3299: TotalDays = 365
If TestYear = 2020 Then StartDay = 3664: TotalDays = 366
If TestYear = 2021 Then StartDay = 4030: TotalDays = 365
If TestYear = 2022 Then StartDay = 4395: TotalDays = 365
If TestYear = 2023 Then StartDay = 4760: TotalDays = 365
If TestYear = 2024 Then StartDay = 5125: TotalDays = 366
If TestYear = 2025 Then StartDay = 5491: TotalDays = 365


If ReportName = "Cum Load with credit" Then

   Sheets("Performance Reports").Range("q6").Select
   ActiveCell.Value = ReportName + "     " + CStr(Year1) + " (Black)       " + CStr(Year2) + " (Red)
"
   ActiveCell.Offset(1, 0).Select  'move 1 down
   ActiveCell.Value = "Pounds P"


   Sheets("Daily Data").Select
   Sheets("Daily Data").Range("ab" + CStr(StartDay)).Select
   For i = StartDay To StartDay + TotalDays - 1
      TestFactor1(i) = ActiveCell.Value
      ActiveCell.Offset(1, 0).Select
   Next i

   Sheets("Performance Reports").Select
   If j = 1 Then Sheets("Performance Reports").Range("d42").Select
   If j = 2 Then Sheets("Performance Reports").Range("e42").Select
      LoadSum = 0
      For i = StartDay To StartDay + TotalDays - 1
         LoadSum = LoadSum + TestFactor1(i)
         ActiveCell.Value = LoadSum
         ActiveCell.Offset(1, 0).Select
      Next i

End If

If ReportName = "Cum Load no credit" Then

   Sheets("Performance Reports").Range("q6").Select
   ActiveCell.Value = ReportName + "     " + CStr(Year1) + " (Black)       " + CStr(Year2) + " (Red)
"
   ActiveCell.Offset(1, 0).Select  'move 1 down
```

```
    ActiveCell.Value = "Pounds P"


    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("ac" + CStr(StartDay)).Select
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor1(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Performance Reports").Select
    If j = 1 Then Sheets("Performance Reports").Range("d42").Select
    If j = 2 Then Sheets("Performance Reports").Range("e42").Select
       LoadSum = 0
       For i = StartDay To StartDay + TotalDays - 1
          LoadSum = LoadSum + TestFactor1(i)
          ActiveCell.Value = LoadSum
          ActiveCell.Offset(1, 0).Select
       Next i

End If


If ReportName = "Daily Load with credit" Then

    Sheets("Performance Reports").Range("q6").Select
    ActiveCell.Value = ReportName + "     " + CStr(Year1) + " (Black)       " + CStr(Year2) + " (Red)
"
    ActiveCell.Offset(1, 0).Select  'move 1 down
    ActiveCell.Value = "Pounds P"

    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("ab" + CStr(StartDay)).Select
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor1(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Performance Reports").Select
    If j = 1 Then Sheets("Performance Reports").Range("d42").Select
    If j = 2 Then Sheets("Performance Reports").Range("e42").Select
    For i = StartDay To StartDay + TotalDays - 1
       ActiveCell.Value = TestFactor1(i)
       ActiveCell.Offset(1, 0).Select
    Next i

End If

If ReportName = "Daily Load no credit" Then

    Sheets("Performance Reports").Range("q6").Select
    ActiveCell.Value = ReportName + "     " + CStr(Year1) + " (Black)       " + CStr(Year2) + " (Red)
"
    ActiveCell.Offset(1, 0).Select  'move 1 down
    ActiveCell.Value = "Pounds P"
```

```
    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("ac" + CStr(StartDay)).Select
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor1(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Performance Reports").Select
    If j = 1 Then Sheets("Performance Reports").Range("d42").Select
    If j = 2 Then Sheets("Performance Reports").Range("e42").Select
       For i = StartDay To StartDay + TotalDays - 1
       ActiveCell.Value = TestFactor1(i)
       ActiveCell.Offset(1, 0).Select
    Next i

  End If

  If ReportName = "Filter Efficiency" Then
    Sheets("Performance Reports").Range("q6").Select
    ActiveCell.Value = ReportName + "     " + CStr(Year1) + " (Black)       " + CStr(Year2) + " (Red)
"
    ActiveCell.Offset(1, 0).Select  'move 1 down
    ActiveCell.Value = "Fraction Removed"

    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("x" + CStr(StartDay)).Select 'backwash
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor1(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("y" + CStr(StartDay)).Select 'service
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor2(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("u" + CStr(StartDay)).Select 'after filter
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor3(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Daily Data").Select
    Sheets("Daily Data").Range("z" + CStr(StartDay)).Select 'waste
    For i = StartDay To StartDay + TotalDays - 1
       TestFactor4(i) = ActiveCell.Value
       ActiveCell.Offset(1, 0).Select
    Next i

    Sheets("Performance Reports").Select
    If j = 1 Then Sheets("Performance Reports").Range("d42").Select
    If j = 2 Then Sheets("Performance Reports").Range("e42").Select
    For i = StartDay To StartDay + TotalDays - 1
```

```
        If TestFactor1(i) = 0 And TestFactor2(i) = 0 And TestFactor3(i) = 0 And TestFactor4(i) = 0 Then
Exit For

        If (TestFactor1(i) - TestFactor2(i)) / (TestFactor1(i) - TestFactor2(i) + TestFactor3(i) -
TestFactor4(i)) > 0 Then
            ActiveCell.Value = (TestFactor1(i) - TestFactor2(i)) / (TestFactor1(i) - TestFactor2(i) +
TestFactor3(i) - TestFactor4(i))
        Else
            ActiveCell.Value = 0    'don't plot negative values
        End If
      ActiveCell.Offset(1, 0).Select
      Next i

   End If

   If ReportName = "Clarifier Efficiency" Then
      Sheets("Performance Reports").Range("q6").Select
      ActiveCell.Value = ReportName + "     " + CStr(Year1) + " (Black)       " + CStr(Year2) + " (Red)
"
      ActiveCell.Offset(1, 0).Select  'move 1 down
      ActiveCell.Value = "Fraction Removed"

      Sheets("Daily Data").Select
      Sheets("Daily Data").Range("w" + CStr(StartDay)).Select 'after clarifier
      For i = StartDay To StartDay + TotalDays - 1
         TestFactor1(i) = ActiveCell.Value
         ActiveCell.Offset(1, 0).Select
      Next i

      Sheets("Daily Data").Select
      Sheets("Daily Data").Range("x" + CStr(StartDay)).Select 'backwash
      For i = StartDay To StartDay + TotalDays - 1
         TestFactor2(i) = ActiveCell.Value
         ActiveCell.Offset(1, 0).Select
      Next i

      Sheets("Performance Reports").Select
      If j = 1 Then Sheets("Performance Reports").Range("d42").Select
      If j = 2 Then Sheets("Performance Reports").Range("e42").Select
      For i = StartDay To StartDay + TotalDays - 1

         If TestFactor1(i) = 0 And TestFactor2(i) = 0 Then ActiveCell.Value = 0 'Exit For

         If TestFactor2(i) <> 0 Then
            If 1 - TestFactor1(i) / TestFactor2(i) > 0 Then
               ActiveCell.Value = 1 - TestFactor1(i) / TestFactor2(i)
            Else
               ActiveCell.Value = 0    'don't plot negative values
            End If
         End If

      ActiveCell.Offset(1, 0).Select
      Next i

   End If
```

```
   If ReportName = "Pond Efficiency" Then
      Sheets("Performance Reports").Range("q6").Select
      ActiveCell.Value = ReportName + "     " + CStr(Year1) + " (Black)       " + CStr(Year2) + " (Red)
"
      ActiveCell.Offset(1, 0).Select  'move 1 down
      ActiveCell.Value = "Fraction Removed"

      Sheets("Daily Data").Select
      Sheets("Daily Data").Range("v" + CStr(StartDay)).Select 'discharge
      For i = StartDay To StartDay + TotalDays - 1
         TestFactor1(i) = ActiveCell.Value
         ActiveCell.Offset(1, 0).Select
      Next i

      Sheets("Daily Data").Select
      Sheets("Daily Data").Range("w" + CStr(StartDay)).Select 'after clarifier
      For i = StartDay To StartDay + TotalDays - 1
         TestFactor2(i) = ActiveCell.Value
         ActiveCell.Offset(1, 0).Select
      Next i

      Sheets("Daily Data").Select
      Sheets("Daily Data").Range("u" + CStr(StartDay)).Select 'after filter
      For i = StartDay To StartDay + TotalDays - 1
         TestFactor2(i) = ActiveCell.Value
         ActiveCell.Offset(1, 0).Select
      Next i


      Sheets("Performance Reports").Select
      If j = 1 Then Sheets("Performance Reports").Range("d42").Select
      If j = 2 Then Sheets("Performance Reports").Range("e42").Select
      For i = StartDay To StartDay + TotalDays - 1

         If TestFactor1(i) = 0 And TestFactor2(i) = 0 And TestFactor3(i) = 0 Then Exit For

         ActiveCell.Value = 1 - TestFactor1(i) / (TestFactor2(i) + TestFactor3(i))
         ActiveCell.Offset(1, 0).Select
      Next i

   End If
Next j

'find Y max and adjust vertical scale
Sheets("Performance Reports").Range("d37").Select
Ymax = ActiveCell.Value
ActiveSheet.ChartObjects("Chart 1").Activate
ActiveChart.Axes(xlValue).Select
   If Ymax < 0.001 Then
         Selection.TickLabels.NumberFormat = "0.00000"
      ElseIf Ymax < 0.01 Then
         Selection.TickLabels.NumberFormat = "0.0000"
      ElseIf Ymax < 0.1 Then
         Selection.TickLabels.NumberFormat = "0.000"
      ElseIf Ymax < 1 Then
```

```
        Selection.TickLabels.NumberFormat = "0.00"
    ElseIf Ymax < 10 Then
        Selection.TickLabels.NumberFormat = "0.0"
    Else
        Selection.TickLabels.NumberFormat = "0"
  End If

End Sub
```

Mass Balance Report Documentation - Version 2.9.2

This report summarizes the annual performance of the hatchery. The input phosphorus loads from Brundage Creek, Brundage Spring, the Service water, and the Waste are shown in cell S23, S28, J31, and G26. The gross discharge load is shown in cell J14. The net annual load based on mass balance gives credit for negative loads and is shown in Cell M13. The production by-product load is shown in cell P28. The pond sediment and trucked phosphorus losses are shown in cells F16 and C33.

Overall system mass balance as well as the mass balance for the filters, clarifier, and pond are shown in cells O35 to P38. Removal efficiencies of the filters, clarifier, and pond are shown in cells N35 to N37.

Note that average flow times average concentration at each site may not equal to the displayed load because the displayed load is flow weighted total based on daily measurements rather than annual average values.

Mass Balance Report Code - Version 2.9.2

```
Private Sub Update_Click()

'MASS BALANCE REPORT

Dim ReportYear As Integer, ReportRow As Integer
Dim Conc(500) As Double, Flow(500) As Double, Load(500) As Double, Tank(500) As Double

Application.ScreenUpdating = False

Sheets("Mass Balance Report").Select
Sheets("Mass Balance Report").Range("o13").Select
ReportYear = ActiveCell.Value

ReportRow = ReportYear - 1998   'row on summary data sheet for TP, flow, load
Sheets("Summary Data").Select
Sheets("Summary Data").Range("c" + CStr(ReportRow)).Select
For i = 1 To 8
   Conc(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
Next i
ActiveCell.Offset(0, 1).Select
For i = 1 To 6
   Flow(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
Next i
ActiveCell.Offset(0, 1).Select
For i = 1 To 8
   Load(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
Next i

Sheets("Mass Balance Report").Select
Sheets("Mass Balance Report").Range("s26").Select
ActiveCell.Value = Flow(1)
Sheets("Mass Balance Report").Range("s21").Select
ActiveCell.Value = Flow(2)
Sheets("Mass Balance Report").Range("i18").Select
ActiveCell.Value = Flow(3)
Sheets("Mass Balance Report").Range("j12").Select
ActiveCell.Value = Flow(4)
Sheets("Mass Balance Report").Range("d22").Select
ActiveCell.Value = Flow(5)
Sheets("Mass Balance Report").Range("h35").Select
ActiveCell.Value = Flow(5)
Sheets("Mass Balance Report").Range("j29").Select
ActiveCell.Value = Flow(5)
Sheets("Mass Balance Report").Range("g24").Select
ActiveCell.Value = Flow(6)

Sheets("Mass Balance Report").Range("s27").Select
ActiveCell.Value = Conc(1)
Sheets("Mass Balance Report").Range("s22").Select
ActiveCell.Value = Conc(2)
```

```
Sheets("Mass Balance Report").Range("i19").Select
ActiveCell.Value = Conc(3)
Sheets("Mass Balance Report").Range("j13").Select
ActiveCell.Value = Conc(4)
Sheets("Mass Balance Report").Range("d23").Select
ActiveCell.Value = Conc(5)
Sheets("Mass Balance Report").Range("h36").Select
ActiveCell.Value = Conc(6)
Sheets("Mass Balance Report").Range("j30").Select
ActiveCell.Value = Conc(7)
Sheets("Mass Balance Report").Range("g25").Select
ActiveCell.Value = Conc(8)

Sheets("Mass Balance Report").Range("s28").Select
ActiveCell.Value = Load(1)
Sheets("Mass Balance Report").Range("s23").Select
ActiveCell.Value = Load(2)
Sheets("Mass Balance Report").Range("i20").Select
ActiveCell.Value = Load(3)
Sheets("Mass Balance Report").Range("j14").Select
ActiveCell.Value = Load(4)
Sheets("Mass Balance Report").Range("d24").Select
ActiveCell.Value = Load(5)
Sheets("Mass Balance Report").Range("h37").Select
ActiveCell.Value = Load(6)
Sheets("Mass Balance Report").Range("j31").Select
ActiveCell.Value = Load(7)
Sheets("Mass Balance Report").Range("g26").Select
ActiveCell.Value = Load(8)

'get PRODUCTION DATA AND REPORTS
Dim Food As Double, Fry As Double, Inventory As Double, Ship As Double, Plant As Double, Mort As
Double
Dim FishStart As Double, FishEnd As Double
Dim FoodP As Double, TissueP As Double, LoadP As Double, FCR As Double, PercentFoodP As
Double, PercentFishP As Double
Dim AverageFoodPercentP As Double

'find tissue P and calculate row
Sheets("Input Production Data").Select
Sheets("Input Production Data").Range("j5").Select
PercentFishP = ActiveCell.Value
ReportRow = 12 * ReportYear - 24091

'fry sum
Sheets("Input Production Data").Range("j" + CStr(ReportRow)).Select
Fry = 0
For i = 1 To 12
    Fry = Fry + ActiveCell.Value
    ActiveCell.Offset(1, 0).Select
Next i

'ship sum
Sheets("Input Production Data").Range("h" + CStr(ReportRow)).Select
Ship = 0
For i = 1 To 12
```

```
    Ship = Ship + ActiveCell.Value
    ActiveCell.Offset(1, 0).Select
Next i

'plant sum
Sheets("Input Production Data").Range("i" + CStr(ReportRow)).Select
Plant = 0
For i = 1 To 12
    Plant = Plant + ActiveCell.Value
    ActiveCell.Offset(1, 0).Select
Next i

'mort sum
Sheets("Input Production Data").Range("g" + CStr(ReportRow)).Select
Mort = 0
For i = 1 To 12
    Mort = Mort + ActiveCell.Value
    ActiveCell.Offset(1, 0).Select
Next i

'calc change in inventory
If ReportYear = 2010 Then
    FishStart = 40253       'from ACCESS database hard wired for 2010 only
  Else
    Sheets("Input Production Data").Range("d" + CStr(ReportRow - 1)).Select
    FishStart = ActiveCell.Value
End If
Sheets("Input Production Data").Range("d" + CStr(ReportRow + 11)).Select
FishEnd = ActiveCell.Value
Inventory = FishEnd - FishStart

'sum food P input load Lbs
FoodP = 0
For i = 0 To 11
    Sheets("Input Production Data").Range("e" + CStr(ReportRow + i)).Select
    Food = ActiveCell.Value
    ActiveCell.Offset(0, 1).Select
    PercentFoodP = ActiveCell.Value
    FoodP = FoodP + Food * PercentFoodP * 2.2046226 / 100
    ActiveCell.Offset(1, -1).Select
Next i

'tissue P and production P load in Lbs
TissueP = 2.2046226 * (Ship + Plant + Mort - Fry + Inventory) * PercentFishP / 100
LoadP = FoodP - TissueP

'average food percent P  (divide by sum Food later)
AverageFoodPercentP = 0
For i = 0 To 11
    Sheets("Input Production Data").Range("e" + CStr(ReportRow + i)).Select
    Food = ActiveCell.Value
    ActiveCell.Offset(0, 1).Select
    PercentFoodP = ActiveCell.Value
    AverageFoodPercentP = AverageFoodPercentP + Food * PercentFoodP
    ActiveCell.Offset(1, -1).Select
Next i
```

```
'food sum
Sheets("Input Production Data").Range("e" + CStr(ReportRow)).Select
Food = 0
For i = 1 To 12
   Food = Food + ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

'display production
Sheets("Mass Balance Report").Select
Sheets("Mass Balance Report").Range("n20").Select
ActiveCell.Value = Food
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = Fry
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = Inventory
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = Ship
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = Plant
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = Mort
ActiveCell.Offset(1, 0).Select
Sheets("Mass Balance Report").Range("o20").Select
ActiveCell.Value = AverageFoodPercentP / Food      'note division by total food
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = FoodP

'get tank data
Dim TankStart As Double, Trucked As Double, TankEnd As Double
Sheets("Input Tank Data").Select
Sheets("Input Tank Data").Range("g" + CStr(ReportYear - 2010 + 31)).Select
Trucked = ActiveCell.Value
ActiveCell.Offset(0, 3).Select
TankStart = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
TankEnd = ActiveCell.Value

'display tank
Sheets("Mass Balance Report").Select
Sheets("Mass Balance Report").Range("c32").Select
ActiveCell.Value = TankStart
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = Trucked
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = TankEnd

Sheets("Mass Balance Report").Range("r12").Select

End Sub
```

Custom Chart Documentation - Version 2.9.2

This report allows you to create a custom chart report for up to four parameters.

Copy your x data (horizontal) into column B.

Copy your y data (vertical) into columns C, D, E, and F.

Your selection for the Chart Title, horizontal label, vertical label, and series labels are entered in column I.

STANDARD OPERATING PROCEDURES
Lake Total Phosphorus Documentation – Version 17.63 - 9/24/2016

Input the measure date and the median of 3 total phosphorus measurements for the lake surface, the 7.5 to 60 foot depth, and the 75 to 90 foot depth in Columns B, C, D, and E.

These data should be appended at the end of the current data lists with no line skips.

A missing measurement for any depth must inserted using interpolation.

The fraction of total volume lake volumes shown in Row 29 are weighting factors used to calculate the volume weighted average concentration as shown in Column F.

The charts can be updated for any year (Cell N6) when new data are entered or if previous values are changed by clicking the Run Report button.

The chart on the left shows the measurements for the selected year along with the 3-layer volume weighted average. The chart on the right shows the trend of the annual average volume weight total phosphorus concentration.

Linear interpolation is used between the first day of the year and the date of the first measurement using the last measurement of the proceeding year. Linear interpolation is also used between the last measurement and the last day of the year using the first measurement of the following year.

The program counts the number of days that the total phosphorus concentration is 8 mg/m^3 or less and displays the result in the title of the left hand chart.

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above. Also, do not change the contents of a cell that
contains a formula or reference to another cell. This applies to all sheets. Failure to adhere to the constraints could result in a considerable effort to restore the database functionality.

Lake TP Workbook Code Version 17.63 – 9/24/2016

```
Private Sub CommandButton1_Click()

Dim MeasureDate(5000) As Date, SelectedDate(5000) As Date, BaseDate As Date
Dim SelectedTP(5000) As Double, BackSlope(5000) As Double, VWTP(5000) As Double
Dim SurTP(5000) As Double, MidTP(5000) As Double, BotTP(5000) As Double
Dim AverageVWTP As Double
Dim TotalCount As Integer, SelectedYear As Integer, SelectedYearCount As Integer
Dim i As Integer, j As Integer, Blanks As Integer

Application.ScreenUpdating = False

Sheets("Lake TP").Select
Sheets("Lake TP").Range("n6").Select  'get Selected year
SelectedYear = ActiveCell.Value

Sheets("Lake TP").Range("f31").Select
TotalCount = ActiveCell.Value 'get total number of measurements for all years

Sheets("Lake TP").Range("b33").Select
For i = 1 To TotalCount               'get all dtates and all 4 TP values
   MeasureDate(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
   SurTP(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
   MidTP(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
   BotTP(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
   VWTP(i) = ActiveCell.Value
   ActiveCell.Offset(1, -4).Select
Next i

If SelectedYear > Year(MeasureDate(TotalCount)) Then           'check that data are available for selected
range
   response% = MsgBox("No data for selected year", 64)
   Exit Sub
End If

Sheets("Lake TP").Range("ag2").Select          'define chart labels
ActiveCell.Value = "Lake TP     " + CStr(SelectedYear)

Sheets("Lake TP").Range("ap33:at1000").ClearContents    'clear measured dates and values for all 3
depths
Sheets("Lake TP").Range("ap33").Select
For i = 1 To TotalCount               'print dates and all 4 TP values for selected year
  If Year(MeasureDate(i)) = SelectedYear Then
       ActiveCell.Value = MeasureDate(i)
       ActiveCell.Offset(0, 1).Select
       ActiveCell.Value = SurTP(i)
       ActiveCell.Offset(0, 1).Select
```

```
        ActiveCell.Value = MidTP(i)
        ActiveCell.Offset(0, 1).Select
        ActiveCell.Value = BotTP(i)
        ActiveCell.Offset(0, 1).Select
        ActiveCell.Value = VWTP(i)
        ActiveCell.Offset(1, -4).Select
    End If
Next i

SelectedYearCount = 0
For i = 1 To TotalCount
       If Year(MeasureDate(i)) = SelectedYear Then
          SelectedYearCount = SelectedYearCount + 1          'number of dates for Select year
          SelectedDate(SelectedYearCount) = MeasureDate(i)
          SelectedTP(SelectedYearCount) = VWTP(i)
          BackSlope(SelectedYearCount) = (VWTP(i) - VWTP(i - 1)) / (MeasureDate(i) - MeasureDate(i -
1))   'picks up last measurement from previous year to calc first slope
       End If

       If Year(MeasureDate(i)) > SelectedYear Then
          SelectedYearCount = SelectedYearCount + 1
          SelectedTP(SelectedYearCount) = VWTP(i)
          SelectedDate(SelectedYearCount) = MeasureDate(i)
          BackSlope(SelectedYearCount) = (VWTP(i) - VWTP(i - 1)) / (MeasureDate(i) - MeasureDate(i -
1))   'uses first value from next year to calc last slope
          Exit For
       End If
Next i

'*************************************************************************
BaseDate = DateSerial(SelectedYear, 1, 1)              'basedate is Jan 1 of selected year
Sheets("Lake TP").Range("ah33:ah1000").ClearContents    'clear daily values of volume weighted values
For j = 1 To SelectedYearCount                         'display values for interpolation includes first value of
next year
   Row = DateDiff("d", BaseDate, SelectedDate(j)) + 33     'find the appropriate row during the year
   Sheets("Lake TP").Range("ah" + CStr(Row)).Select
   ActiveCell.Value = SelectedTP(j)
Next j
'********************************************************** Interpolation
SelectedYearCount = 1

For i = 1 To 366 + 365                         'make sure you go far enough into next year to pick up first
measured value

   Sheets("Lake TP").Range("ah" + CStr(i + 32)).Select

   If ActiveCell.Value > 0 Then                    'note measured values have already been inserted on the
appropriate day
       Blanks = 1
       For j = i - 1 To 1 Step -1
          ActiveCell.Offset(-1, 0).Select
          If ActiveCell.Value = 0 Then
             ActiveCell.Value = SelectedTP(SelectedYearCount) - BackSlope(SelectedYearCount) * Blanks
          End If

          Blanks = Blanks + 1
```

```
        Next j

        SelectedYearCount = SelectedYearCount + 1

    End If

 Next i
'********************************************** get average value and insert into column aa
Sheets("Lake TP").Range("ah31").Select
AverageVWTP = ActiveCell.Value

Sheets("Lake TP").Range("aa" + CStr(SelectedYear - 2010 + 9)).Select
ActiveCell.Value = AverageVWTP


Sheets("Lake TP").Range("p4").Select

End Sub
```

Secchi Depth Documentation – Version 17.63 - 9/24/2016

Input the measure date and the Secchi depth (in feet) Columns C and D.

These data should be appended at the end of the current data list with no line skips.

The chart on the left compares measurements for any 2 selected years. The charts can be updated for any 2 years (Cell N6 and P6) when new data are entered or if previous values are changed by clicking the Run Report button.

The squares on the chart on the right shows the trend of the annual average Secchi depth. The maximum and minimum values are denote using a vertical line.

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above.

Secchi Depth Workbook Code – Version 17.63 - 9/24/2016

```
Private Sub CommandButton1_Click()

Dim Year1 As Integer, Year2 As Integer, SelectYear As Integer
Dim TotalCount As Integer, YearCount As Integer
Dim MeasureDate(2000) As Date, SelectDate(100) As Date
Dim Secchi(100) As Double, AvgSecchi As Double, MinSecchi As Double, MaxSecchi As Double
Dim i As Integer, j As Integer, kk As Integer

Application.ScreenUpdating = False

Sheets("Secchi Depth").Range("ab33:ac1000").ClearContents
Sheets("Secchi Depth").Range("af33:ag1000").ClearContents

Sheets("Secchi Depth").Range("d31").Select
TotalCount = ActiveCell.Value
Sheets("Secchi Depth").Range("n6").Select
Year1 = ActiveCell.Value
ActiveCell.Offset(0, 2).Select
Year2 = ActiveCell.Value


For kk = 1 To 2

   If kk = 1 Then SelectYear = Year1
   If kk = 2 Then SelectYear = Year2



   YearCount = 0     'number of dates for Selected year

   Sheets("Secchi Depth").Range("c33").Select
   For i = 1 To TotalCount      'check all measuremets, get date and secchi for Select year

         MeasureDate(i) = ActiveCell.Value


         If Year(MeasureDate(i)) = SelectYear Then
            YearCount = YearCount + 1          'number of dates for Select year
            SelectDate(YearCount) = MeasureDate(i)
            ActiveCell.Offset(0, 1).Select
            Secchi(YearCount) = ActiveCell.Value
            ActiveCell.Offset(0, -1).Select
         End If

         ActiveCell.Offset(1, 0).Select
   Next i

   If SelectYear > Year(MeasureDate(TotalCount)) Then          'check that data are available for selected
range
      response% = MsgBox("No data for selected year", 64)
      Exit Sub
```

```
    End If


    If kk = 1 Then Sheets("Secchi Depth").Range("ab33").Select
    If kk = 2 Then Sheets("Secchi Depth").Range("af33").Select

    For j = 1 To YearCount
        ActiveCell.Value = SelectDate(j)
        ActiveCell.Offset(0, 1).Select
        ActiveCell.Value = Secchi(j)
        ActiveCell.Offset(1, -1).Select
    Next j

Next kk

Sheets("Secchi Depth").Range("ac30").Select
MinSecchi = ActiveCell.Value
ActiveCell.Offset(1, 0).Select
MaxSecchi = ActiveCell.Value
ActiveCell.Offset(1, 0).Select
AvgSecchi = ActiveCell.Value

Sheets("Secchi Depth").Range("y" + CStr(Year1 - 2010 + 9)).Select
ActiveCell.Value = AvgSecchi
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = MinSecchi
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = MaxSecchi

Sheets("Secchi Depth").Range("l3").Select

End Sub
```

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Input the measure date and measurements for dissolved oxygen (DO), conductivity (cond), pH, and temperature (Temp) for 8 depths in Columns B through AT. These data are appended at the end of the current data lists with no line skips. The program assumes that dissolved oxygen data are provided for all 8 depths on each measure date. Missing data must be provided by the user using the Fill Series tool provided by EXCEL or by some other means. The program can accommodate missing data for the other measurements.

Two charts are displayed for various years and measurements as selected by the user in Cells Q4, Q6, S4, and S6. The charts can be updated when new data are entered or if previous values are changed by clicking the Run Report button.

Column AI contains calculated values for the total pounds of phosphorus released into the Lake from bottom sediments during periods of low oxygen concentration. The program counts the number of days the dissolved oxygen concentration is less than 2 mg/L for each depth and multiplies by the appropriate area and release rate (see Watershed Data sheet and documentation). This calculation is performed for the selected year when Chart 1 is run for dissolved oxygen

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above.

```
Private Sub CommandButton1_MouseDown(ByVal Button As Integer, ByVal Shift As Integer, ByVal X
As Single, ByVal Y As Single)

End Sub

Private Sub CommandButton1_Click()

Dim Year1 As Integer, Year2 As Integer
Dim YColumn1 As String, YColumn2 As String, YColumn3 As String, YColumn4 As String, YColumn5
As String, YColumn6 As String, YColumn7 As String, YColumn8 As String
Dim YAxisLabel As String, YColumn As String
Dim RowStart As String, RowEnd As String
Dim Parameter1 As String, Parameter2 As String, Parameter As String
Dim TotalCount As Integer, k As Integer

Dim MeasureDate(5000) As Date, MeasureDO(5000) As Variant, MeasureParm(5000, 8) As Variant
Dim BackSlope(5000) As Double, SedRelease As Double
Dim SelectedDO(5000) As Double
Dim SelectDate(5000) As Date, BaseDate As Date
Dim SelectedYear As Integer, SelectedYearCount As Integer
Dim i As Integer, j As Integer, Blanks As Integer, Row As Integer

Application.ScreenUpdating = False

Sheets("Lake Probe Data").Select
Sheets("Lake Probe Data").Range("q5").Select  'get year1
Year1 = ActiveCell.Value
ActiveCell.Offset(1, 0).Select
Parameter1 = ActiveCell.Value
ActiveCell.Offset(-1, 2).Select
Year2 = ActiveCell.Value              'get year 2
ActiveCell.Offset(1, 0).Select
Parameter2 = ActiveCell.Value

Sheets("Lake Probe Data").Range("ba4").Select          'define chart labels
ActiveCell.Value = Parameter1 + "    " + CStr(Year1)
ActiveCell.Offset(0, 2).Select
ActiveCell.Value = Parameter2 + "    " + CStr(Year2)

Sheets("Lake Probe Data").Range("b31").Select
TotalCount = ActiveCell.Value 'get total number of total measurements for all years
ActiveCell.Offset(2, 0).Select

For Row = 33 To 33 + TotalCount    'get all measure dates
   MeasureDate(Row) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next Row


'***********************************************
For k = 1 To 2
```

```
    If k = 1 Then SelectedYear = Year1: Parameter = Parameter1
    If k = 2 Then SelectedYear = Year2: Parameter = Parameter2

    If SelectedYear > Year(MeasureDate(TotalCount + 32)) Then          'check that data are available for
selected range
        response% = MsgBox("No data for selected year", 64)
        If k = 1 Then Sheets("Lake Probe Data").Range("ba33:bi1000").ClearContents
        If k = 2 Then Sheets("Lake Probe Data").Range("ca33:ci1000").ClearContents
        Exit Sub
    End If


    If Parameter = "DO" Then YAxisLabel = "mg/L"
    If Parameter = "Temperature" Then YAxisLabel = "degrees F"
    If Parameter = "pH" Then YAxisLabel = "pH"
    If Parameter = "ORP" Then YAxisLabel = "mV"
    If Parameter = "Conductivity" Then YAxisLabel = "S/cm"

    If k = 1 Then Sheets("Lake Probe Data").Range("ba5").Select: ActiveCell.Value = YAxisLabel
    If k = 2 Then Sheets("Lake Probe Data").Range("bc5").Select: ActiveCell.Value = YAxisLabel

    For Row = 33 To 33 + TotalCount 'find rowstart
        If Year(MeasureDate(Row)) = SelectedYear Then
            RowStart = CStr(Row)
            Exit For
        End If
    Next Row

    For Row = CInt(RowStart) To 33 + TotalCount  'find rowend
        If Year(MeasureDate(Row)) = SelectedYear + 1 Then
            RowEnd = CStr(Row - 1)
            Exit For
        End If

        If Row = 32 + TotalCount Then
            RowEnd = Row
            Exit For
        End If
    Next Row

    If Parameter = "DO" Then YColumn = "c"
    If Parameter = "Temperature" Then YColumn = "am"
    If Parameter = "pH" Then YColumn = "ad"
    If Parameter = "ORP" Then YColumn = "u"
    If Parameter = "Conductivity" Then YColumn = "L"

    Sheets("Lake Probe Data").Range(YColumn + CStr(RowStart)).Select  """""""""""""""
    For i = RowStart To RowEnd
        For j = 1 To 8
            MeasureParm(i, j) = ActiveCell.Value
            ActiveCell.Offset(0, 1).Select
        Next j

        ActiveCell.Offset(1, -8).Select
    Next i
```

```
If k = 1 Then ActiveSheet.ChartObjects("Chart 28").Activate
If k = 2 Then ActiveSheet.ChartObjects("Chart 6").Activate

ActiveChart.ChartArea.Select

If Parameter = "Temperature" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 20
      .MaximumScale = 90
      .MajorUnit = 10
   End With
End If

If Parameter = "DO" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 0
      .MaximumScale = 16
      .MajorUnit = 2
   End With
End If

If Parameter = "pH" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 5
      .MaximumScale = 10
      .MajorUnit = 1
   End With
End If

If Parameter = "ORP" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = -100
      .MaximumScale = 500
      .MajorUnit = 100
   End With
End If

If Parameter = "Conductivity" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 0
      .MaximumScale = 500
      .MajorUnit = 100
   End With
End If

'Chart Data
If k = 1 Then
   Sheets("Lake Probe Data").Range("ba33:bi1000").ClearContents
   Sheets("Lake Probe Data").Range("ba33").Select
End If

If k = 2 Then
   Sheets("Lake Probe Data").Range("ca33:ci1000").ClearContents
   Sheets("Lake Probe Data").Range("ca33").Select
End If
```

```
   For i = RowStart To RowEnd

      For j = 1 To 9
         If j = 1 Then ActiveCell.Value = MeasureDate(i)
         If j > 1 Then ActiveCell.Value = MeasureParm(i, j - 1)
         ActiveCell.Offset(0, 1).Select
      Next j

      ActiveCell.Offset(1, -9).Select
   Next i

Next k

'XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

If Parameter1 = "DO" Then

'45
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
SSSSSSSSSSSSSSSSSSSSSS
   SelectedYear = Year1
   SelectedYearCount = 0                    'number of dates for Select year
   Sheets("Lake Probe Data").Range("b33").Select
   For i = 1 To TotalCount                  'check all measuremets, get date and measurement for Select
year
         MeasureDate(i) = ActiveCell.Value
         ActiveCell.Offset(0, 5).Select
         MeasureDO(i) = ActiveCell.Value
         If Year(MeasureDate(i)) = SelectedYear Then
            SelectedYearCount = SelectedYearCount + 1          'number of dates for Select year
            SelectedDO(SelectedYearCount) = MeasureDO(i)
            SelectDate(SelectedYearCount) = MeasureDate(i)
            If SelectedYearCount = 1 Then BackSlope(SelectedYearCount) = 0
            If SelectedYearCount > 1 Then BackSlope(SelectedYearCount) = (MeasureDO(i) -
MeasureDO(i - 1)) / (MeasureDate(i) - MeasureDate(i - 1))
         End If

         If Year(MeasureDate(i)) > SelectedYear Then
            SelectedYearCount = SelectedYearCount + 1
            SelectedDO(SelectedYearCount) = MeasureDO(i)
            SelectDate(SelectedYearCount) = MeasureDate(i)
            BackSlope(SelectedYearCount) = (MeasureDO(i) - MeasureDO(i - 1)) / (MeasureDate(i) -
MeasureDate(i - 1))
            Exit For
         End If
         ActiveCell.Offset(1, -5).Select
   Next i
   '*****************
   BaseDate = DateSerial(SelectedYear, 1, 1)
   Sheets("Lake Probe Data").Range("bL33:bl1000").ClearContents

   For j = 1 To SelectedYearCount                  'display measured values for interpolation includes
first value of next year
      Row = DateDiff("d", BaseDate, SelectDate(j)) + 33       'find the appropriate row
```

```
      Sheets("Lake Probe Data").Range("bL" + CStr(Row)).Select
      ActiveCell.Value = SelectedDO(j)
   Next j
   '**********************************************Interpolation
   SelectedYearCount = 1
   For i = 1 To 366
      Sheets("Lake Probe Data").Range("bL" + CStr(i + 32)).Select
      If ActiveCell.Value > 0 Then
         Blanks = 1
         For j = i - 1 To 1 Step -1
            ActiveCell.Offset(-1, 0).Select
            If ActiveCell.Value = 0 Then
               ActiveCell.Value = SelectedDO(SelectedYearCount) - BackSlope(SelectedYearCount) *
Blanks
            End If
            Blanks = Blanks + 1
         Next j
         SelectedYearCount = SelectedYearCount + 1
      End If
    Next i
'45 EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE

'60
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
SSSSSSSSSSSSSSSSSSSSSSSSS
   SelectedYear = Year1
   SelectedYearCount = 0                          'number of dates for Select year
   Sheets("Lake Probe Data").Range("b33").Select
   For i = 1 To TotalCount                         'check all measuremets, get date and measurement for Select
year
         MeasureDate(i) = ActiveCell.Value
         ActiveCell.Offset(0, 6).Select
         MeasureDO(i) = ActiveCell.Value
         If Year(MeasureDate(i)) = SelectedYear Then
            SelectedYearCount = SelectedYearCount + 1          'number of dates for Select year
            SelectedDO(SelectedYearCount) = MeasureDO(i)
            SelectDate(SelectedYearCount) = MeasureDate(i)
            If SelectedYearCount = 1 Then BackSlope(SelectedYearCount) = 0
            If SelectedYearCount > 1 Then BackSlope(SelectedYearCount) = (MeasureDO(i) -
MeasureDO(i - 1)) / (MeasureDate(i) - MeasureDate(i - 1))
         End If

         If Year(MeasureDate(i)) > SelectedYear Then
            SelectedYearCount = SelectedYearCount + 1
            SelectedDO(SelectedYearCount) = MeasureDO(i)
            SelectDate(SelectedYearCount) = MeasureDate(i)
            BackSlope(SelectedYearCount) = (MeasureDO(i) - MeasureDO(i - 1)) / (MeasureDate(i) -
MeasureDate(i - 1))
            Exit For
         End If
         ActiveCell.Offset(1, -6).Select
   Next i
   '****************
   BaseDate = DateSerial(SelectedYear, 1, 1)
   Sheets("Lake Probe Data").Range("bm33:bm1000").ClearContents
```

```
   For j = 1 To SelectedYearCount                         'display measured values for interpolation includes
first value of next year
      Row = DateDiff("d", BaseDate, SelectDate(j)) + 33       'find the appropriate row
      Sheets("Lake Probe Data").Range("bm" + CStr(Row)).Select
      ActiveCell.Value = SelectedDO(j)
   Next j
   '**********************************************Interpolation
   SelectedYearCount = 1
   For i = 1 To 366
      Sheets("Lake Probe Data").Range("bm" + CStr(i + 32)).Select
      If ActiveCell.Value > 0 Then
         Blanks = 1
         For j = i - 1 To 1 Step -1
            ActiveCell.Offset(-1, 0).Select
            If ActiveCell.Value = 0 Then
               ActiveCell.Value = SelectedDO(SelectedYearCount) - BackSlope(SelectedYearCount) *
Blanks
            End If
            Blanks = Blanks + 1
         Next j
         SelectedYearCount = SelectedYearCount + 1
      End If
    Next i
'60 EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE

'75
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
SSSSSSSSSSSSSSSSSSSSSSSSSS
   SelectedYear = Year1
   SelectedYearCount = 0                          'number of dates for Select year
   Sheets("Lake Probe Data").Range("b33").Select
   For i = 1 To TotalCount                        'check all measuremets, get date and measurement for Select
year
         MeasureDate(i) = ActiveCell.Value
         ActiveCell.Offset(0, 7).Select
         MeasureDO(i) = ActiveCell.Value
         If Year(MeasureDate(i)) = SelectedYear Then
            SelectedYearCount = SelectedYearCount + 1          'number of dates for Select year
            SelectedDO(SelectedYearCount) = MeasureDO(i)
            SelectDate(SelectedYearCount) = MeasureDate(i)
            If SelectedYearCount = 1 Then BackSlope(SelectedYearCount) = 0
            If SelectedYearCount > 1 Then BackSlope(SelectedYearCount) = (MeasureDO(i) -
MeasureDO(i - 1)) / (MeasureDate(i) - MeasureDate(i - 1))
         End If

         If Year(MeasureDate(i)) > SelectedYear Then
            SelectedYearCount = SelectedYearCount + 1
            SelectedDO(SelectedYearCount) = MeasureDO(i)
            SelectDate(SelectedYearCount) = MeasureDate(i)
            BackSlope(SelectedYearCount) = (MeasureDO(i) - MeasureDO(i - 1)) / (MeasureDate(i) -
MeasureDate(i - 1))
            Exit For
         End If
         ActiveCell.Offset(1, -7).Select
   Next i
```

```
   BaseDate = DateSerial(SelectedYear, 1, 1)
   Sheets("Lake Probe Data").Range("bn33:bn1000").ClearContents

   For j = 1 To SelectedYearCount                      'display measured values for interpolation includes
first value of next year
       Row = DateDiff("d", BaseDate, SelectDate(j)) + 33       'find the appropriate row
       Sheets("Lake Probe Data").Range("bn" + CStr(Row)).Select
       ActiveCell.Value = SelectedDO(j)
   Next j
   '*********************************************Interpolation
   SelectedYearCount = 1
   For i = 1 To 366
       Sheets("Lake Probe Data").Range("bn" + CStr(i + 32)).Select
       If ActiveCell.Value > 0 Then
           Blanks = 1
           For j = i - 1 To 1 Step -1
               ActiveCell.Offset(-1, 0).Select
               If ActiveCell.Value = 0 Then
                   ActiveCell.Value = SelectedDO(SelectedYearCount) - BackSlope(SelectedYearCount) *
Blanks
               End If
               Blanks = Blanks + 1
           Next j
           SelectedYearCount = SelectedYearCount + 1
       End If
    Next i
'75 EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE

'90
SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
SSSSSSSSSSSSSSSSSSSSSSSSS
   SelectedYear = Year1
   SelectedYearCount = 0                    'number of dates for Select year
   Sheets("Lake Probe Data").Range("b33").Select
   For i = 1 To TotalCount                  'check all measuremets, get date and measurement for Select
year
           MeasureDate(i) = ActiveCell.Value
           ActiveCell.Offset(0, 8).Select
           MeasureDO(i) = ActiveCell.Value
           If Year(MeasureDate(i)) = SelectedYear Then
               SelectedYearCount = SelectedYearCount + 1          'number of dates for Select year
               SelectedDO(SelectedYearCount) = MeasureDO(i)
               SelectDate(SelectedYearCount) = MeasureDate(i)
               If SelectedYearCount = 1 Then BackSlope(SelectedYearCount) = 0
               If SelectedYearCount > 1 Then BackSlope(SelectedYearCount) = (MeasureDO(i) -
MeasureDO(i - 1)) / (MeasureDate(i) - MeasureDate(i - 1))
           End If

           If Year(MeasureDate(i)) > SelectedYear Then
               SelectedYearCount = SelectedYearCount + 1
               SelectedDO(SelectedYearCount) = MeasureDO(i)
               SelectDate(SelectedYearCount) = MeasureDate(i)
               BackSlope(SelectedYearCount) = (MeasureDO(i) - MeasureDO(i - 1)) / (MeasureDate(i) -
MeasureDate(i - 1))
               'a = 1 / 0
               Exit For
```

```
         End If
         ActiveCell.Offset(1, -8).Select
   Next i
   '****************
   BaseDate = DateSerial(SelectedYear, 1, 1)
   Sheets("Lake Probe Data").Range("bo33:bo1000").ClearContents

   For j = 1 To SelectedYearCount                          'display measured values for interpolation includes
first value of next year
      Row = DateDiff("d", BaseDate, SelectDate(j)) + 33      'find the appropriate row
      Sheets("Lake Probe Data").Range("bo" + CStr(Row)).Select
      ActiveCell.Value = SelectedDO(j)
   Next j
   '**********************************************Interpolation
   SelectedYearCount = 1
   For i = 1 To 366
      Sheets("Lake Probe Data").Range("bo" + CStr(i + 32)).Select
      If ActiveCell.Value > 0 Then
         Blanks = 1
         For j = i - 1 To 1 Step -1
            ActiveCell.Offset(-1, 0).Select
            If ActiveCell.Value = 0 Then
               ActiveCell.Value = SelectedDO(SelectedYearCount) - BackSlope(SelectedYearCount) *
Blanks
            End If
            Blanks = Blanks + 1
         Next j
         SelectedYearCount = SelectedYearCount + 1
      End If
    Next i
'90 EEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE

End If

Sheets("Lake Probe Data").Range("bs28").Select
SedRelease = ActiveCell.Value

Sheets("Lake Probe Data").Range("ai" + CStr(SelectedYear - 2010 + 8)).Select
ActiveCell.Value = SedRelease

Range("v4").Select

End Sub

Private Sub CommandButton1_MouseDown(ByVal Button As Integer, ByVal Shift As Integer, ByVal X
As Single, ByVal Y As Single)

End Sub
```

Rain Data Documentation Version 17.63 – 9/24/2016

Daily rain data are obtained by clicking the Get NOAA Rain Data box. This link takes you to the NOAA weather web site. Select Location, Calendar of day summaries, Year range, Precipitation, and Mean. Locate the daily rainfall data for Beulah. Copy and paste in cell C13. Locate the daily rainfall data for Frankfort. Copy and paste in cell C49. Locate the daily rainfall data for Traverse City Cherry Capitol Airport. Copy and paste in cell C85.

Enter the year in cell K10.

Click the Run Report button. The program changes the "T" and "M" text values into zero, averages the rainfall from all 3 sites, and displays the results as a single column starting in cell P13.

The user should copy this column of daily values into the appropriate column on the USGS Flow and Rain Sheet.

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above.

Rain Data Workbook Code Version 17.63 – 9/24/2016

```
Private Sub CommandButton1_Click()

Dim i As Integer, SelectYear As Integer, FebDays As Integer, DayCount As Integer
Dim Beulah(400) As Double, Frankfort(400) As Double, Traverse(400) As Double, Rain(2000, 2000) As
Double
Dim Row As String
Dim k As Integer

Application.ScreenUpdating = False

Sheets("Rain Data").Range("p12:p1000").ClearContents

Sheets("Rain Data").Range("m8").Select
SelectYear = ActiveCell.Value

For k = 1 To 3

   If k = 1 Then Row = "13"
   If k = 2 Then Row = "49"
   If k = 3 Then Row = "85"

   DayCount = 0

   Sheets("Rain Data").Range("c" + Row).Select


   For i = 1 To 31 'j
      DayCount = DayCount + 1
      If IsNumeric(ActiveCell.Value) Then
            Rain(k, DayCount) = ActiveCell.Value
         Else
            Rain(k, DayCount) = 0
      End If
      ActiveCell.Offset(1, 0).Select
   Next i

   If SelectYear Mod 4 = 0 Then
         FebDays = 29
      Else
         FebDays = 28
   End If

   Sheets("Rain Data").Range("d" + Row).Select
   For i = 1 To FebDays 'f
      DayCount = DayCount + 1
      If IsNumeric(ActiveCell.Value) Then
            Rain(k, DayCount) = ActiveCell.Value
         Else
            Rain(k, DayCount) = 0
      End If
      ActiveCell.Offset(1, 0).Select
```

```
Next i

Sheets("Rain Data").Range("e" + Row).Select
For i = 1 To 31 'm
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("f" + Row).Select
For i = 1 To 30 'a
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("g" + Row).Select
For i = 1 To 31 'm
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("h" + Row).Select
For i = 1 To 30 'j
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("i" + Row).Select
For i = 1 To 31 'j
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i
```

```
Sheets("Rain Data").Range("j" + Row).Select
For i = 1 To 31 'a
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("k" + Row).Select
For i = 1 To 30 's
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("l" + Row).Select
For i = 1 To 31 'o
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("m" + Row).Select
For i = 1 To 30 'n
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Rain Data").Range("n" + Row).Select
For i = 1 To 31 'd
   DayCount = DayCount + 1
   If IsNumeric(ActiveCell.Value) Then
         Rain(k, DayCount) = ActiveCell.Value
      Else
         Rain(k, DayCount) = 0
   End If
   ActiveCell.Offset(1, 0).Select
Next i
```

```
Next k

Sheets("Rain Data").Range("p13").Select
For j = 1 To DayCount
   ActiveCell.Value = (Rain(1, j) + Rain(2, j) + Rain(3, j)) / 3
   ActiveCell.Offset(1, 0).Select
Next j


Sheets("Rain Data").Range("p10").Select

End Sub
```

USGS Flow and Rain Documentation Version 17.63 – 9/24/2016

Import Flow Data from USGS

Click on the Get USGS Flow Data button to the link to the USGS website that contains the Platte River flow data. Find the Data for this Site dropdown list and Select Time-Series Daily Data. Click on Tab-separated option, enter appropriate date range then copy the flow data into separate spreadsheet. Use the Text to Columns capability of EXCEL to isolate the flow data into a single column that can be pasted into the appropriate column on the USGS Flow and Rain sheet. Note that data marked "p" means provisional and could change at a future date.

Estimate the Number of Strom Events

Select year for analysis and insert a trial value for the factor in Column AC. The flow on a given date is characterized as a wet event flow if it exceeds the average of the flow of the proceeding four 4 days multiplied by (1+factor). The factor is chosen by trial-and-error and facilitated by visual inspection of the daily flow and rainfall charts. The average base and event flow are calculated and listed in column AF and AG.

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above.

USGS Flow and Rain Workbook Code Version 17.63 – 9/24/2016

```
Private Sub CommandButton1_Click()
Dim Flow(500) As Double, WeightedFlow(500) As Double, WetFlow(500) As Double, Rain(500) As
Double
Dim EventFactor As Double, SumWetflow As Double, AverageDryFlow As Double, AverageFlow As
Double, TotalRain As Double, AverageWetFlow
Dim i As Integer, Spikes As Integer, WetFlowCount As Integer, FlowYear As Integer
Dim FlowColumn As String

Application.ScreenUpdating = False

Sheets("USGS Flow and Rain").Select
Sheets("USGS Flow and Rain").Range("t6").Select
FlowYear = ActiveCell.Value

Sheets("USGS Flow and Rain").Range("bb3").Select          'define chart labels
ActiveCell.Value = "USGS Flow     " + CStr(FlowYear)
ActiveCell.Offset(0, 1).Select
ActiveCell.Value = "Rainfall    " + CStr(FlowYear)

If FlowYear = 2010 Then FlowColumn = "d"
If FlowYear = 2011 Then FlowColumn = "g"
If FlowYear = 2012 Then FlowColumn = "j"
If FlowYear = 2013 Then FlowColumn = "m"
If FlowYear = 2014 Then FlowColumn = "p"
If FlowYear = 2015 Then FlowColumn = "s"
If FlowYear = 2016 Then FlowColumn = "v"
If FlowYear = 2017 Then FlowColumn = "y"
If FlowYear = 2018 Then FlowColumn = "ab"
If FlowYear = 2019 Then FlowColumn = "ae"
If FlowYear = 2020 Then FlowColumn = "ah"
If FlowYear = 2021 Then FlowColumn = "ak"
If FlowYear = 2022 Then FlowColumn = "an"
If FlowYear = 2023 Then FlowColumn = "aq"
If FlowYear = 2024 Then FlowColumn = "at"

Sheets("USGS Flow and Rain").Range("bz1:cc1000").ClearContents

Sheets("USGS Flow and Rain").Range("ac" + CStr(FlowYear - 2010 + 6)).Select
EventFactor = ActiveCell.Value
ActiveCell.Offset(0, 4).Select
AverageFlow = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
TotalRain = ActiveCell.Value

Sheets("USGS Flow and Rain").Range(FlowColumn + CStr(40)).Select
For i = 1 To 365
   Flow(i) = ActiveCell.Value
   ActiveCell.Offset(0, 1).Select
   Rain(i) = ActiveCell.Value
   ActiveCell.Offset(1, -1).Select
Next i
```

```
Sheets("USGS Flow and Rain").Range(FlowColumn + "409").Select
If ActiveCell.Value = 0 Then            'check that data are available for selected range
   response% = MsgBox("USGS flow data has not been entered for selected year", 64)
   Exit Sub
End If

WeightedFlow(1) = Flow(1)
WeightedFlow(2) = Flow(2)
WeightedFlow(3) = (Flow(1) + Flow(2)) / 2
WeightedFlow(4) = (Flow(1) + Flow(2) + Flow(3)) / 3

For i = 5 To 365
   WeightedFlow(i) = (Flow(i - 4) + Flow(i - 3) + Flow(i - 2) + Flow(i - 1)) / 4
Next i

Spikes = 0
SumWetflow = 0
WetFlowCount = 0

For i = 1 To 365
   If Flow(i) > WeightedFlow(i) * (1 + EventFactor) Then

      WetFlowCount = WetFlowCount + 1
      Spikes = Spikes + 1
      SumWetflow = SumWetflow + Flow(i)
      WetFlow(i) = Flow(i)

   End If
Next i

Sheets("USGS Flow and Rain").Range("bz40").Select
For i = 1 To 365
   ActiveCell.Value = Flow(i)
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("USGS Flow and Rain").Range("ca40").Select
For i = 1 To 365
   If WetFlow(i) <> 0 Then ActiveCell.Value = WetFlow(i)
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("USGS Flow and Rain").Range("cb40").Select
For i = 1 To 365
   ActiveCell.Value = Rain(i)
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("USGS Flow and Rain").Range("ad" + CStr(FlowYear - 2010 + 6)).Select
ActiveCell.Value = Spikes
ActiveCell.Offset(0, 1).Select

AverageWetFlow = SumWetflow / Spikes
ActiveCell.Value = AverageWetFlow
ActiveCell.Offset(0, 1).Select
```

```
AverageDryFlow = (365 * AverageFlow - AverageWetFlow * Spikes) / (365 - Spikes)
ActiveCell.Value = AverageDryFlow

Sheets("USGS Flow and Rain").Range("t5").Select

End Sub
```

Tributary Total Phosphorus Documentation Version 17.63 – 9/24/2016

Input the measure date and the median of 3 total phosphorus measurements for each tributary in Columns B, C, D, and E.

These data are appended at the end of the current data lists with no line skips.
A missing measurement must inserted using interpolation.

The year is selected in Cell M5 and the site in O5.
The left hand chart shows individual measurements for the selected year. The right hand chart show the trend of the annual average concentrations for each site.

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above.

Tributary TP Workbook Code Version 17.63 – 9/24/2016

```
Private Sub CommandButton1_Click()
Dim SelectYear As Integer
Dim TotalCount As Integer, YearCount As Integer
Dim MeasureDate(2000) As Date, SelectDate(2000) As Date
Dim TribTP(2000) As Variant, AverageTP As Double
Dim Site As String
Dim i As Integer, j As Integer

Application.ScreenUpdating = False
Sheets("Tributary TP").Range("ab33:ac1000").ClearContents       'clear average column

Sheets("Tributary TP").Range("l6").Select
SelectYear = ActiveCell.Value
ActiveCell.Offset(0, 2).Select
Site = ActiveCell.Value

Sheets("Tributary TP").Range("al3").Select
ActiveCell.Value = "Tributary TP" & "   " & Site & "   " & CStr(SelectYear)


Sheets("Tributary TP").Range("b30").Select      'find max count and measure dates
TotalCount = ActiveCell.Value
ActiveCell.Offset(3, 0).Select
For i = 1 To TotalCount
   MeasureDate(i) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

If SelectYear > Year(MeasureDate(TotalCount)) Then           'check that data are available for selected
range
   response% = MsgBox("No data for selected year", 64)
   Exit Sub
End If


Sheets("Tributary TP").Range("c32").Select  'move to column to match selected site
For j = 1 To 12
 If ActiveCell.Value = Site Then Exit For
 ActiveCell.Offset(0, 1).Select
Next j

ActiveCell.Offset(1, 0).Select

YearCount = 0     'number of measurements for Selected year only

For i = 1 To TotalCount      'check all measuremets, get date and TribTP for Selected year
       If Year(MeasureDate(i)) = SelectYear Then
          YearCount = YearCount + 1          'number of dates for Selected year
          SelectDate(YearCount) = MeasureDate(i)
          TribTP(YearCount) = ActiveCell.Value
       End If
```

```
      ActiveCell.Offset(1, 0).Select
Next i

Sheets("Tributary TP").Range("z33").Select
For j = 1 To YearCount
   ActiveCell.Value = SelectDate(j)
   ActiveCell.Offset(0, 2).Select
   ActiveCell.Value = TribTP(j)
   ActiveCell.Offset(1, -2).Select
Next j



Sheets("Tributary TP").Range("ab32").Select
If IsNumeric(ActiveCell.Value) Then AverageTP = ActiveCell.Value

If Site = "PR at Stone" Then
   Sheets("Tributary TP").Range("z" + CStr(SelectYear - 2010 + 9)).Select
   ActiveCell.Value = AverageTP
End If

If Site = "NB at Dead" Then
   Sheets("Tributary TP").Range("aa" + CStr(SelectYear - 2010 + 9)).Select
   ActiveCell.Value = AverageTP
End If

If Site = "PR at USGS" Then
   Sheets("Tributary TP").Range("ab" + CStr(SelectYear - 2010 + 9)).Select
   ActiveCell.Value = AverageTP
End If

Sheets("Tributary TP").Range("q3").Select

End Sub
```

Tributary Probe Data Documentation Version 17.63 – 9/24/2016

Input the measure date and measurements for dissolved oxygen (DO), dissolved oxygen saturation (DO Sat), temperature (Temp), conductivity (Cond), pH, and gauge height in the appropriate label columns. These data must be appended at the end of the current data lists with no line skips.

The chart can be used to compare the data for a single parameter at 3 sites for a selected year. The chart can be updated when new data are entered or if previous values are changed by clicking the Run Report button.

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above.

Tributary Probe Workbook Code Version 17.63 – 9/17/2016

```
Private Sub CommandButton1_Click()
Dim Year1 As Integer
Dim YColumn1 As String, YColumn2 As String, YColumn3 As String, YColumn4 As String, YColumn5
As String, YColumn6 As String, YColumn7 As String, YColumn8 As String
Dim YAxisLabel As String, YColumn As String
Dim RowStart As Integer, RowEnd As Integer
Dim Parameter As String, Site(3) As String, SiteList(12) As String
Dim TotalCount As Integer, k As Integer

Dim MeasureDate(5000) As Date, MeasureParm(5000) As Variant
Dim BackSlope(5000) As Double, SedRelease As Double
Dim SelectedDO(5000) As Double
Dim SelectDate(5000) As Date, BaseDate As Date
Dim SelectedYear As Integer, SelectedYearCount As Integer
Dim i As Integer, j As Integer, Blanks As Integer, Row As Integer

Application.ScreenUpdating = False
Sheets("Tributary Probe Data").Range("dh33:dk1000").ClearContents

Sheets("Watershed Data").Select                'get site list
Sheets("Watershed Data").Range("h10").Select
For i = 1 To 12
   SiteList(i) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next i

Sheets("Tributary Probe Data").Select
Sheets("Tributary Probe Data").Range("s11").Select  'get Year1
SelectedYear = ActiveCell.Value
ActiveCell.Offset(0, 2).Select
Parameter = ActiveCell.Value        'get parameter

Sheets("Tributary Probe Data").Range("q10").Select  'get selected sites
Site(1) = ActiveCell.Value
ActiveCell.Offset(1, 0).Select
Site(2) = ActiveCell.Value
ActiveCell.Offset(1, 0).Select
Site(3) = ActiveCell.Value

Sheets("Tributary Probe Data").Range("bb4").Select          'define chart 4 labels
ActiveCell.Value = Parameter + "    " + CStr(SelectedYear)

If Parameter = "DO" Then YAxisLabel = "mg/L"
If Parameter = "Temperature" Then YAxisLabel = "degrees F"
If Parameter = "pH" Then YAxisLabel = "pH"
If Parameter = "ORP" Then YAxisLabel = "mV"
If Parameter = "Conductivity" Then YAxisLabel = "S/cm"
If Parameter = "DO sat" Then YAxisLabel = "Percent"

Sheets("Tributary Probe Data").Range("bb5").Select: ActiveCell.Value = YAxisLabel
```

```
ActiveSheet.ChartObjects("Chart 4").Activate          'define chart 4 vertical scale
ActiveChart.ChartArea.Select

If Parameter = "Temperature" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 20
      .MaximumScale = 90
      .MajorUnit = 10
   End With
End If

If Parameter = "DO" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 0
      .MaximumScale = 16
      .MajorUnit = 2
   End With
End If

If Parameter = "DO sat" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 0
      .MaximumScale = 125
      .MajorUnit = 25
   End With
End If

If Parameter = "pH" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 5
      .MaximumScale = 10
      .MajorUnit = 1
   End With
End If

If Parameter = "ORP" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = -100
      .MaximumScale = 500
      .MajorUnit = 100
   End With
End If

If Parameter = "Conductivity" Then
   With ActiveChart.Axes(xlValue)
      .MinimumScale = 0
      .MaximumScale = 500
      .MajorUnit = 100
   End With
End If

'*********************************************
Sheets("Tributary Probe Data").Range("b31").Select
TotalCount = ActiveCell.Value                 'get total number of total measurements for all years
ActiveCell.Offset(2, 0).Select
```

```
For Row = 33 To 33 + TotalCount    'get all measure dates
   MeasureDate(Row) = ActiveCell.Value
   ActiveCell.Offset(1, 0).Select
Next Row

If SelectedYear > Year(MeasureDate(TotalCount + 32)) Then          'check that data are available for
selected range
      response% = MsgBox("No data for selected year", 64)
      Exit Sub
   End If

For Row = 33 To 33 + TotalCount 'find rowstart
      If Year(MeasureDate(Row)) = SelectedYear Then
         RowStart = CStr(Row)
         Exit For
      End If
   Next Row

   For Row = CInt(RowStart) To 33 + TotalCount  'find rowend
      If Year(MeasureDate(Row)) = SelectedYear + 1 Then
         RowEnd = CStr(Row - 1)
         Exit For
      End If

      If Row = 32 + TotalCount Then
         RowEnd = Row
         Exit For
      End If
   Next Row

For k = 1 To 3      'various sites

   If Site(k) = SiteList(1) Then
      If Parameter = "DO" Then Column = "d"
      If Parameter = "DO sat" Then Column = "e"
      If Parameter = "Temperature" Then Column = "f"
      If Parameter = "pH" Then Column = "g"
      If Parameter = "Conductivity" Then Column = "h"
      If Parameter = "ORP" Then Column = "i"
      If Parameter = "Guage" Then Column = "j"
   End If

   If Site(k) = SiteList(2) Then
      If Parameter = "DO" Then Column = "m"
      If Parameter = "DO sat" Then Column = "n"
      If Parameter = "Temperature" Then Column = "o"
      If Parameter = "pH" Then Column = "p"
      If Parameter = "Conductivity" Then Column = "q"
      If Parameter = "ORP" Then Column = "r"
      If Parameter = "Guage" Then Column = "s"
   End If

   If Site(k) = SiteList(3) Then
      If Parameter = "DO" Then Column = "v"
      If Parameter = "DO sat" Then Column = "w"
      If Parameter = "Temperature" Then Column = "x"
```

```
   If Parameter = "pH" Then Column = "y"
   If Parameter = "Conductivity" Then Column = "z"
   If Parameter = "ORP" Then Column = "aa"
   If Parameter = "Guage" Then Column = "ab"
End If

If Site(k) = SiteList(4) Then
   If Parameter = "DO" Then Column = "ae"
   If Parameter = "DO sat" Then Column = "af"
   If Parameter = "Temperature" Then Column = "ag"
   If Parameter = "pH" Then Column = "ah"
   If Parameter = "Conductivity" Then Column = "ai"
   If Parameter = "ORP" Then Column = "aj"
   If Parameter = "Guage" Then Column = "ak"
End If

If Site(k) = SiteList(5) Then
   If Parameter = "DO" Then Column = "an"
   If Parameter = "DO sat" Then Column = "ao"
   If Parameter = "Temperature" Then Column = "ap"
   If Parameter = "pH" Then Column = "aq"
   If Parameter = "Conductivity" Then Column = "ar"
   If Parameter = "ORP" Then Column = "as"
   If Parameter = "Guage" Then Column = "at"
End If

If Site(k) = SiteList(6) Then
   If Parameter = "DO" Then Column = "aw"
   If Parameter = "DO sat" Then Column = "ax"
   If Parameter = "Temperature" Then Column = "ay"
   If Parameter = "pH" Then Column = "az"
   If Parameter = "Conductivity" Then Column = "ba"
   If Parameter = "ORP" Then Column = "bb"
   If Parameter = "Guage" Then Column = "bc"
End If

If Site(k) = SiteList(7) Then
   If Parameter = "DO" Then Column = "bf"
   If Parameter = "DO sat" Then Column = "bg"
   If Parameter = "Temperature" Then Column = "bh"
   If Parameter = "pH" Then Column = "bi"
   If Parameter = "Conductivity" Then Column = "bj"
   If Parameter = "ORP" Then Column = "bk"
   If Parameter = "Guage" Then Column = "bl"
End If

If Site(k) = SiteList(8) Then
   If Parameter = "DO" Then Column = "bo"
   If Parameter = "DO sat" Then Column = "bp"
   If Parameter = "Temperature" Then Column = "bq"
   If Parameter = "pH" Then Column = "br"
   If Parameter = "Conductivity" Then Column = "bs"
   If Parameter = "ORP" Then Column = "bt"
   If Parameter = "Guage" Then Column = "bu"
End If
```

```
    If Site(k) = SiteList(9) Then
       If Parameter = "DO" Then Column = "bx"
       If Parameter = "DO sat" Then Column = "by"
       If Parameter = "Temperature" Then Column = "bz"
       If Parameter = "pH" Then Column = "ca"
       If Parameter = "Conductivity" Then Column = "cb"
       If Parameter = "ORP" Then Column = "cc"
       If Parameter = "Guage" Then Column = "cd"
    End If

    If Site(k) = SiteList(10) Then
       If Parameter = "DO" Then Column = "cg"
       If Parameter = "DO sat" Then Column = "ch"
       If Parameter = "Temperature" Then Column = "ci"
       If Parameter = "pH" Then Column = "cj"
       If Parameter = "Conductivity" Then Column = "ck"
       If Parameter = "ORP" Then Column = "cl"
       If Parameter = "Guage" Then Column = "cm"
    End If

    If Site(k) = SiteList(11) Then
       If Parameter = "DO" Then Column = "cp"
       If Parameter = "DO sat" Then Column = "cq"
       If Parameter = "Temperature" Then Column = "cr"
       If Parameter = "pH" Then Column = "cs"
       If Parameter = "Conductivity" Then Column = "ct"
       If Parameter = "ORP" Then Column = "cu"
       If Parameter = "Guage" Then Column = "cv"
    End If

    If Site(k) = SiteList(12) Then
       If Parameter = "DO" Then Column = "cy"
       If Parameter = "DO sat" Then Column = "cz"
       If Parameter = "Temperature" Then Column = "da"
       If Parameter = "pH" Then Column = "db"
       If Parameter = "Conductivity" Then Column = "dc"
       If Parameter = "ORP" Then Column = "dd"
       If Parameter = "Guage" Then Column = "de"
    End If

    Sheets("Tributary Probe Data").Range(Column + CStr(RowStart)).Select
'XXXXXXXXXXXXXXXXXXread parameter for site
    For i = RowStart To RowEnd
        MeasureParm(i) = ActiveCell.Value
        ActiveCell.Offset(1, 0).Select
    Next i



    'Chart Data
    Sheets("Tributary Probe Data").Range("dh33").Select
    For i = RowStart To RowEnd
          ActiveCell.Value = MeasureDate(i)
          ActiveCell.Offset(1, 0).Select
    Next i
```

```
    If k = 1 Then Sheets("Tributary Probe Data").Range("di33").Select
    If k = 2 Then Sheets("Tributary Probe Data").Range("dj33").Select
    If k = 3 Then Sheets("Tributary Probe Data").Range("dk33").Select

    For i = RowStart To RowEnd
        ActiveCell.Value = MeasureParm(i)
        ActiveCell.Offset(1, 0).Select
    Next i

Next k



End Sub
```

Insert up to 12 tributary names in column H. These names will be automatically into the dropdown lists on the Tributary TP and Probe Data sheets. All name changes are entered here are transferred in order to the Tributary Probe and Tributary TP Data sheets.

Insert the annual average Brundage Creek flow and phosphorus concentration and total annual load in columns K, L, and M. This information is obtained from the Hatchery staff. Insert similar information for the Hatchery Discharge in columns N, O, and P. This information is obtained from the Hatchery staff.

Note that the Brundage Creek and Hatchery flows are reported as mgd. These flows are automatically multiplied by 1.547 to convert to cfs for the Lake and Watershed application.

Insert the pounds of phosphorus associated with Lost Fish for the year in column R. The Lost Fish weight is equal to the weight of fish passing the Lower Weir minus weight of fish collected at the Upper Weir. The weight of fish is the product of the number of fish times the average weight of an individual fish. The Lost Fish weight is multiplied by 0.5% (tissue phosphorus) to convert to phosphorus weight. The weight and size data for the Lower and Upper Weirs is provided by Hatchery staff.

The average phosphorus concentration of the rain is inserted into Cell g12. The total phosphorus concentration is the average of measurements taken at PRSFH. Atmospheric Load is the Rain amount (see USGS Flow and Rain Sheet) multiplied by the Rain Total Phosphorus concentration and the surface area of the Lake.

The annual average flows at Stone Bridge, Brundage Creek at Old Residence, Carter Creek, Collision Creek, North Branch, and M22 are based correlations with the annual average flow at USGS (see columns C and D). Flow correlations are based on direct in-stream measurements by Jerry Heiman and Mark Mitchell.

The Direct Load is also based on correlation with the annual average USGS flow (see row 30). This correlation is based on results from the Limno-Tech BASINS modeling project.

The phosphorus sediment release rates are based on measurements performed by Holmes in the CMU Master's thesis.

The Lake bottom area for various depths is based on the Swiecki spreadsheet.

Event total phosphorus concentrations are based on 2004 to 2007 measurements.

Watershed Balances Documentation Version 17.63 – 9/24/2016

This report requires that the annual average flow and total phosphorus concentration, and annual load and the Lost Fish be inserted into the appropriate cells on the Watershed Data sheet for the selected year. This information is obtained from the Hatchery staff.

Note that the Brundage Creek flow at the Old Residence splits into 2 components.
Some of the flow enters the Hatchery while the remainder empties into the Platte River upstream of the Hatchery outflow. The flow at the Old Residence is based on correlation with the USGS flow. The flow to the Hatchery from Brundage Creek is measured daily.

Sediment release is based on the number of days the dissolved oxygen is less than 2 mg/L, the area of the affected region, and the sediment release rate (as measured by Holmes at CMU on the Watershed Data Sheet).

The Watershed Data sheet also lists storm event total phosphorus concentrations. These results are average values of measured values take during storm event monitoring between 2004 and 2007. The number of storm events and the annual average base and storm flows are calculated on the USGS Flow and Rain Sheet. The event loading is equal to the annual average event flow (see USGS Flow and Rain sheet) times the event total phosphorus concentration (Watershed Data sheet) times the number of events. The base loading is equal to the annual average base flow (see USGS Flow and Rain sheet) times the base total phosphorus concentration (Watershed Data sheet) times (365- number of events).

Note that cells J13, J14, and J15 contain calculated values for the non-point flow, total phosphorus concentration, and load between the Stone Bridge and USGS sites.

The computer code anticipates that data are located in fixed positions. The code cannot accommodate changes in the location of data or the addition or deletion of rows or columns. Therefore, do not add or delete rows or columns to the spreadsheet or change cell entries other than described above.

Watershed Balances Workbook Code Version 17.63 – 9/24/2016

```
Private Sub CommandButton1_Click()

Dim Events As Double, SelectYear As Integer, CurrentYear As Integer, NewYear As Integer, LastYear
As Integer
Dim USGSFlow As Double, EventFlow As Double, BaseFlow As Double, FracEventFlow As Double,
FracBaseFlow As Double
Dim HF As Double, HTP As Double, HL As Double, LostFish As Double
Dim BrF As Double, BrTP As Double, BrL As Double
Dim RainTP As Double, RainAmount As Double, LakeTP As Double
Dim StoneTP As Double, NBTP As Double, USGSTP As Double, CarterTP As Double, CollisionTP As
Double
Dim StoneFlow As Double, NBFlow As Double, CarterFlow As Double, CollisionFlow As Double
Dim EventTP1 As Double, EventTP2 As Double, EventTP3 As Double
Dim SurArea As Double, SedRelease As Double

Application.ScreenUpdating = False

Sheets("Watershed Balances").Select
Sheets("Watershed Balances").Range("r11").Select  'get year of the current display = last year
LastYear = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
NewYear = ActiveCell.Value                    'get the new year to possibly redue the display
Sheets("Watershed Balances").Range("ap2").Select  'get current year based on today's date
CurrentYear = ActiveCell.Value

If NewYear > CurrentYear Then       'check that data are available for selected range
   response% = MsgBox("No data for selected year", 64)
   Exit Sub
End If

If NewYear = CurrentYear Then       'check that data are available for selected range
   response% = MsgBox("Data for the selected year are incomplete", 64)
   Exit Sub
End If

Sheets("Watershed Balances").Range("r11").Select
ActiveCell.Value = NewYear

SelectYear = NewYear


'************************************
Sheets("USGS Flow and Rain").Select
Sheets("USGS Flow and Rain").Range("ad" + CStr(SelectYear - 2010 + 6)).Select
Events = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
EventFlow = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
BaseFlow = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
```

```
USGSFlow = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
RainAmount = ActiveCell.Value

If Events = 0 Or EventFlow = 0 Or BaseFlow = 0 Or USGSFlow = 0 Or RainAmount = 0 Then 'check that
data are available for selected range
   response% = MsgBox("Flow and Rainfall Data for the selected year are incomplete", 64)
   Exit Sub
End If

'************************************
Sheets("Watershed Data").Select
Sheets("Watershed Data").Range("k" + CStr(SelectYear - 2010 + 10)).Select
BrF = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
BrTP = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
BrL = ActiveCell.Value

If BrF = 0 Or BrTP = 0 Or BrL = 0 Then 'check that data are available for selected range
   response% = MsgBox("Brundage Creek flow, TP concentration, or load data for the selected year are
incomplete", 64)
   Exit Sub
End If

ActiveCell.Offset(0, 1).Select
HF = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
HTP = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
HL = ActiveCell.Value

If HF = 0 Or HTP = 0 Or HL = 0 Then 'check that data are available for selected range
   response% = MsgBox("Hatchery discharge flow, TP concentration, or load data for the selected year
are incomplete", 64)
   Exit Sub
End If

ActiveCell.Offset(0, 2).Select
LostFish = ActiveCell.Value

If LostFish = 0 Then 'check that data are available for selected range
   response% = MsgBox("Lost Fish data for the selected year are incomplete", 64)
   Exit Sub
End If

Sheets("Watershed Data").Range("f13").Select
RainTP = ActiveCell.Value
Sheets("Watershed Data").Range("c13").Select
SurArea = ActiveCell.Value / 1000000

Sheets("Watershed Data").Range("f25").Select
CarterTP = ActiveCell.Value
ActiveCell.Offset(1, 0).Select
CollisionTP = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
```

```
EventTP1 = ActiveCell.Value     '67.96  Carter & Collision
ActiveCell.Offset(1, 0).Select
EventTP2 = ActiveCell.Value     '51.07  USGS
ActiveCell.Offset(1, 0).Select
EventTP3 = ActiveCell.Value     '45.35  Stone & North Branch

'*********************************************
Sheets("Tributary TP").Select
Sheets("Tributary TP").Range("z" + CStr(SelectYear - 2010 + 9)).Select
StoneTP = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
NBTP = ActiveCell.Value
ActiveCell.Offset(0, 1).Select
USGSTP = ActiveCell.Value

Sheets("Lake TP").Select
Sheets("Lake TP").Range("aa" + CStr(SelectYear - 2010 + 9)).Select
LakeTP = ActiveCell.Value

Sheets("Lake Probe Data").Select
Sheets("Lake Probe Data").Range("ai" + CStr(SelectYear - 2010 + 8)).Select
SedRelease = ActiveCell.Value

'*************************************************************************
Sheets("Watershed Balances").Select
Sheets("Watershed Balances").Range("j18").Select
ActiveCell.Value = USGSFlow
Sheets("Watershed Balances").Range("f23").Select
ActiveCell.Value = LakeTP
Sheets("Watershed Balances").Range("f10").Select
ActiveCell.Value = LostFish
Sheets("Watershed Balances").Range("f12").Select
ActiveCell.Value = SedRelease


Sheets("Watershed Balances").Range("q30").Select
ActiveCell.Value = HF * 1.547
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = HTP
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = HL

Sheets("Watershed Balances").Range("s30").Select
ActiveCell.Value = BrF * 1.547
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = BrTP
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = BrL

Sheets("Watershed Balances").Range("j25").Select
ActiveCell.Value = Events
ActiveCell.Offset(2, 0).Select
ActiveCell.Value = EventFlow
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = BaseFlow
```

```
Sheets("Watershed Balances").Range("f13").Select
ActiveCell.Value = 2.2046 * RainAmount * 0.0254 * RainTP * SurArea

Sheets("Watershed Balances").Range("w20").Select
ActiveCell.Value = StoneTP
Sheets("Watershed Balances").Range("j19").Select
ActiveCell.Value = USGSTP
Sheets("Watershed Balances").Range("h16").Select
ActiveCell.Value = NBTP

'**********************
FracEventFlow = EventFlow / (EventFlow + BaseFlow)
FracBaseFlow = 1 - FracEventFlow

Sheets("Watershed Balances").Range("w19").Select
StoneFlow = ActiveCell.Value
ActiveCell.Offset(2, 0).Select
ActiveCell.Value = (StoneFlow * StoneTP * (365 - Events) + StoneFlow * EventTP3 * Events) *
0.0053953

Sheets("Watershed Balances").Range("n30").Select
CarterFlow = ActiveCell.Value
ActiveCell.Offset(2, 0).Select
ActiveCell.Value = (CarterFlow * CarterTP * (365 - Events) + CarterFlow * EventTP1 * Events) *
0.0053953

Sheets("Watershed Balances").Range("m15").Select
CollisionFlow = ActiveCell.Value
ActiveCell.Offset(2, 0).Select
ActiveCell.Value = (CollisionFlow * CollisionTP * (365 - Events) + CollisionFlow * EventTP1 * Events)
* 0.0053953

Sheets("Watershed Balances").Range("j20").Select
ActiveCell.Value = (USGSFlow * USGSTP * (365 - Events) + USGSFlow * EventTP2 * Events) *
0.0053953
ActiveCell.Offset(11, 0).Select
ActiveCell.Value = (USGSFlow * EventTP2 * Events) * 0.0053953
ActiveCell.Offset(1, 0).Select
ActiveCell.Value = (USGSFlow * USGSTP * (365 - Events)) * 0.0053953

Sheets("Watershed Balances").Range("h15").Select
NBFlow = ActiveCell.Value
ActiveCell.Offset(2, 0).Select
ActiveCell.Value = (NBFlow * NBTP * (365 - Events) + NBFlow * EventTP3 * Events) * 0.0053953

Sheets("Watershed Balances").Range("t8").Select

End Sub
```