Final July 31, 2015

Ohio Environmental Protection Agency

Surface Water Field Sampling Manual - Appendix II

for water quality parameters and flows

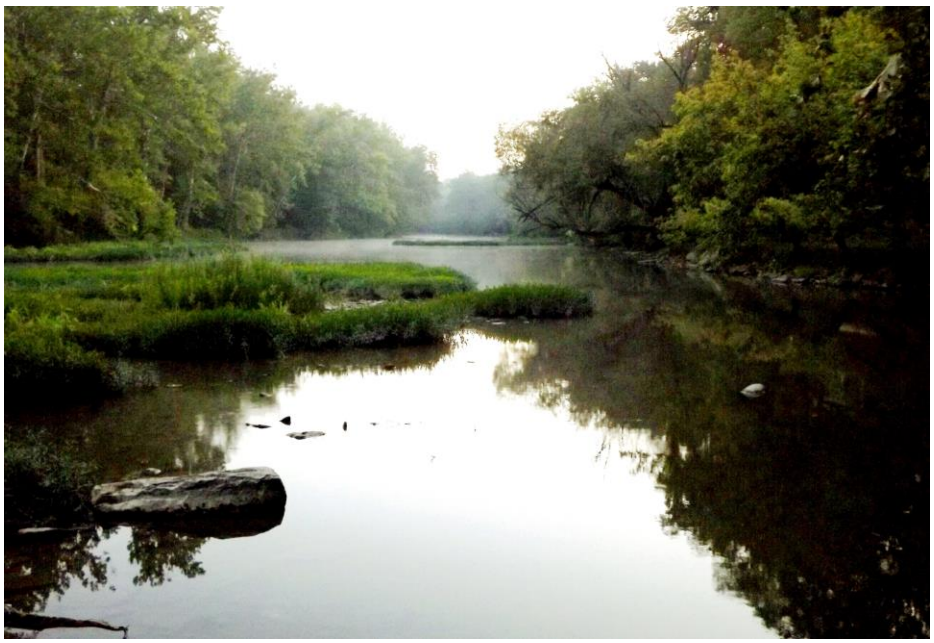

Photo Courtesy of Russ Gibson, Ohio EPA, DSW

Final Manual
July 31, 2015

Next Revision Due: July 31, 2017

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Surface Water Field Sampling Manual

Appendix II

Appendix II – Section A

Chlorophyll-*a* Sampling Procedure

Subsection A1: Sestonic Sampling

A1.a - Equipment List

____ Sharpie
____ Tweezers
____ Paper Towels (large stack)
____ Filters (at least 25)
____ Baggies (at least ½ a box)
____ Rubber Bands (at least 20)
____ Hand Pump
____ Filter Tower
____ Flask with Tubing
____ Aluminum Foil (at least ¼ roll)
____ Graduated Cylinder (100 mL)
____ Distilled H_2O in vacuum pump (bottle with spout)
____ 10% HCl in vacuum pump (bottle with spout)
____ Bottle of $MgCO_3$

A1. b - Completing the Field Sheet

The following information should be recorded for each site: description of the site, sample collector(s), sample processer(s), the time of collection and the time of filtration of each sample. The comments area and/or the back of the field sheet can be used to write in depth observations, if needed.

A1. c - Equipment Cleaning

Care must be taken that all required equipment is properly cleaned prior to the preparation of equipment blanks and collection of samples. Clean with dilute HCl acid rinse all non-metal equipment. If possible, soap (non-phosphate) and tap water should be used on all equipment followed by a distilled water rinse. In the field, where such cleaning is impossible, a generous distilled water rinse will suffice and must be done before each site.

A1. d - Sestonic Equipment Blank

i) Pour distilled water into the cleaned container that will be used to collect river water for filtration. Cap the container, if the lid will be used in the sample collection, and shake.

ii) Assemble the filtration unit. Note that tweezers MUST be used whenever samples or filters are being handled to prevent contamination.

iii) Measure out 100 mL of the distilled water and run it through the filter.

iv) Carefully fold the filter in half and wrap it in aluminum foil. Place the foil into a plastic baggie with the appropriate CyberIntern label affixed to it. Wrap this baggie up in an ice pack (or sandwich between two ice packs) with elastic bands and place it into the cooler.

A1. e - Collection of the Sample

The sample collector must first wade out to a representative portion of the stream or river being studied. Water should be collected upstream of the collector to prevent any contamination. Allow any disturbed sediment to settle prior to the collection of the sample to ensure that the water collected is indeed representative of the stretch.

A1. f - Filtering the Sample

i) Filtering should be performed in subdued light as soon as possible after sampling to avoid errors resulting from changes in the algal pigments in the sample after collection. If the water sample cannot be filtered immediately, it is to be stored on ice in darkness. Filtration is to occur within 24 hours of water sample collection.

ii) Gloves should be worn during all parts of this procedure. Do not use the same pair of gloves as those used to acquire the sample in the river.

iii) Measure out 100 mL of the collected water (or however much the sampler feels is necessary for the lab to detect Chlorophyll_*a*, without too much water to prevent clogging the filter) and filter. As little as 60 ml can be enough for the lab, just be sure to document the amount filtered. Always use a pair of tweezers when handling the filters.

iv) Pour the subsample into the filter tower/funnel of the filtration apparatus and apply a vacuum (remember not to exceed a pressure of 15 cm Hg). Rinse the sides of the filter tower/funnel with DI water. Do not draw the filter dry with the vacuum; instead slowly release the vacuum as the final volume approaches the level of the filter. Add 1 ml of $MgCO_3$ (supernatant from a supersaturated container - prepared by dissolving 1 gram of $MgCO_3$ in 100 ml distilled water) to the sample and gently rotate the filter apparatus to distribute the $MgCO_3$ before completely releasing the vacuum to drain the rest of the buffered water through the filter. (Note: $MgCO_3$ preserves the chlorophyll and is especially important to be used when the sample is collected from an acidic waterbody. However $MgCO_3$ will be used for every chlorophyll-a sample collected regardless of pH conditions).Filtration time should not exceed 10 minutes.

iii) Carefully fold the filter in half and wrap it in aluminum foil.

iv) Place the foil into a plastic baggie with the appropriate CyberIntern label affixed to it. Wrap this baggie up in an ice pack (or sandwich between two ice packs) with elastic bands and place it into the cooler. The filter may be kept on ice or sandwiched between two ice packs for up to 48 hours – as long the ice in the cooler is refreshed often to keep from thawing significantly. Freeze the sample immediately upon return to an Ohio EPA facility with a deep freeze, and before shipping to the laboratory. Then send the filter to the laboratory between two freezer packs. If the laboratory will not process the filter immediately upon receipt, the laboratory should store the sample at - 20^{o} C.

Subsection A2: Benthic Sampling

A2. a - Equipment List

____ Sharpie
____ Tweezers
____ Paper Towels (large stack)
____ Filters (at least 25)
____ Baggies (at least ½ a box)
____ Rubber Bands (at least 20)
____ Hand Pump
____ Filter Tower
____ Flask with Tubing
____ Aluminum Foil (at least ¼ roll)
____ Metal Tray (for collecting slurry)
____ Circles (tops of OrthoP syringes; at least 2)
____ 3 Scrapers (Exacto knives with at least 3 extra blades)
____ Scribe
____ Brush
____ Immersion Blender
____ Stainless Steel Blending Cup
____ Auto Pipette (with at least 25 plastic tips)
____ Kim Wipes (at least ½ large box)
____ Graduated Cylinder (100 mL and 1,000 mL)
____ Ruler
____ Distilled H_2O in vacuum pump (at least 2, with at least 1 large bottle per box)
____ 10% HCl in vacuum pump (1)
____ Full 1 L screw top bottles of Distilled H_2O and 10% HCl (1 each in sealed gallon bag)
____ Extension Cord

A2. b - Completing the Field Sheet

Ideally, data will be recorded on a "periphyton sample for chlorophyll-a field sheet" found on page 10 of this document. The following information should be recorded for each site: description of the site, sample collector(s), sample processer(s), the time of collection and the time of filtration of each sample. It is the responsibility of the sample collector(s) to measure and note the length of the stream reach sampled as well as stream flow and turbidity, sky, canopy, riparian and channel characteristics. The comments area and/or the back of the field sheet can be used to write in depth observations, if needed.

After processing the sample, the volume of filtered slurry must be recorded. Sum the volume of filtered slurry and the volume of slurry remaining in blending cup to determine the total volume of slurry processed. Record the total volume of slurry. Use a ruler to measure the minimum and maximum diameter of each scraped area. It is best to have the person who scraped the rock measure the area scraped. If the sampler who is measuring the scrape cannot delineate between the area that was scraped and area that was not scraped, the sampler should make a note on the field sheet that the diameter of the 60 mL B-D syringe that is used as a pattern is used as the diameter of the scrape

instead of direct measurements of the minimum and maximum diameters of the scrape. Calculate the average diameter of each individual scrape. Use the diameter to area conversion table (on field sheet) to determine the area of each individual scrape. Sum the areas of the individual scrapes to determine the total area scraped.

A2. c - Equipment Cleaning

Care must be taken that all required equipment is properly cleaned prior to the preparation of equipment blanks and collection of samples. Clean with dilute HCl acid rinse all non-metal equipment. If possible, soap (non-phosphate) and tap water should be used on all equipment followed by a distilled water rinse. In the field, where such cleaning is impossible, a generous distilled water rinse will suffice and must be done before each site.

A2. d - Rock Scraping Equipment Blank

i) Pour distilled water into one of the trays that will be used to collect the rock scrapings.

ii) All instruments (or portions of instrument, i.e. not the handles) that will be used in the collection of the periphyton samples, such as knives, brushes, and stirrers, must contact this distilled water so that the equipment blank will accurately reflect any potential for contamination. Then pour the water into the blending cup and allow the blender to come into contact with the water.

iii) Assemble the filtration unit. Note that tweezers MUST be used whenever samples or filters are being handled to prevent contamination.

iv) Use the pipette to collect 5 mL of water of the distilled water in the tray. Run this sample through the filter. Note that each pipette tip can only be used with the preparation of one blank or one sample.

v) Carefully fold the filter in half and wrap it in aluminum foil. Place the foil into a plastic baggie with the appropriate CyberIntern label affixed to it. Wrap this baggie up in an ice pack (or sandwich between two ice packs) with elastic bands and place it into the cooler.

A2. e - Collecting the Rocks

i.) Time of day for collection. To afford the greatest opportunity for light penetration into the benthic zone, rocks should be collected between 1000 and 1800 hrs, inclusive[1]. Some excursion (about 0.5 hr) from this time window can be tolerated due to workload and staff resources. It is critical that notes on light penetration to the substrate should be recorded for each site. Factors such as canopy cover, topographic shade, cloudiness, presence of surface scum, and water column turbidity (caused by both suspended sediment and seston) should be described accurately. The transparency of the water column is inversely affected by both color and turbidity.

ii.) Representative reach and minimum number of rocks to be collected. A target of 15 rocks is sought and collected from a representative length of stream. The goal is to collect rocks at a sample length that is representative of the site (reach) and at a minimum of 100 m sampling length.

[1] Chlorophyll-*a* production from algal biomass will stabilize after a certain amount of light incidence occurs of the course of the day (Matheson et al. 2012, p. 1627). Whether this saturating amount is achieved in a given sampling event depends on the time of day, season of year, and the stream conditions identified above. Sampling within the 1000-1800 hr time window affords the best opportunity to achieve light saturation.

a. Sample anywhere rock substrate is available with a target to sample various hydrological flow structures (i.e. riffle, run, pool, and glide)[2].
b. When rock substrate is not as prevalent, such as at sites that experience heavy sedimentation or have natural bedrock slabs, the target rock count may not be realized. In these situations less than 15 rocks may be collected. However, an effort to sample the equivalent area should be made (i.e., scrape 15 or nearly 15 circles from the rocks which are collected). Document the uniqueness of the situation in the Periphyton Sampling Field Sheet (p. 10) and, most importantly, in the "Field Comments" section of the DES laboratory submission sheet [form EPA 4709 (1/10)]. While atypical, this type of sampling approach should be undertaken to understand the trophic status of the sampling reach (site).
c. If less than 15 rocks are collected and they are sampled from non-representative areas of the stream (e.g., only 4 rocks were collected and all were sampled from the edge of water), then the benthic algae analysis should be discontinued. Document the uniqueness of the situation in the Periphyton Sampling Field Sheet (p. 10) and/or field reconnaissance sheet.

iii.) How to collect. The collection procedure involves wading to a given portion of the site, reaching down, and selecting a representative rock to be sampled. A gentle swirling of the rock in the water will help to remove any sediment that has settled on the surface, and dislodge macroinvertebrates. Also, gently brushing the underside of the rock by hand will help to dislodge caddisfly cases. Rocks selected should clearly show signs of having been undisturbed; such rocks have a distinct bi-colored appearance due to algae growing only on the exposed surface. If two or more samplers participate in the collection, disturbance of downstream sampling sites should be avoided or minimized. One sampling method that minimizes disturbance by two samplers is to align a sampler on each edge of water and progress upstream in a zig-zag pattern, with each sampler responsible for one-half of the stream width**.** It should be noted that the portion of the stream closest to the edge tends to be grazed and have less algae. Typically a green swath can be seen nearer the middle of the stream. Rocks should be collected from that greener area as that is more representative of the stream segments productivity. Rocks in the clearer areas along the edges should be avoided, as well as any rocks that are not submerged.

iv.) Number of days following a storm (runoff) event before collection. High streamflow velocity and corresponding particle movement has great potential in scouring benthic algae. Community composition tends to change as flow velocity changes (Biggs 2000). For example, filamentous forms dominate at low velocity (<< 1.6 m/s) whereas mucilaginous mats dominate at high velocity (> 3 fps).

a. Following a moderate to low storm event, sampling is typically scheduled in the following week. Benthic surveys usually begin on Tuesday of a given week and in association with a dissolved oxygen survey using multi-parameter sensor devices. Hence, if a moderate to low storm event occurred anytime in the preceding week (up to the Saturday evening prior), the survey would not be cancelled. For moderate to high storm events, benthic sampling for the following week should be postponed one week or longer and scheduled when flows return to normal (specific to the time of year) during the interim week (or weeks).
b. Flow hydrographs should be monitored from US Geological Survey gauges at or near a given site with attention paid to existing flow versus (long-term) normal flow. Flow conditions for benthic sampling are

[2] Sampling different microhabitats allows for collection of a large number of co-existing species (Wetzel 2001, pp. 594-599). In streams with moderate to high enrichment, runs typically produce the highest biomass because the lower velocities (compared to riffles) prevent sloughing of periphyton (Biggs and Kilroy 2002, p. 28). In streams with moderate to low enrichment, riffles produce the highest biomass because higher mass (nutrient) transfer occurs in higher velocity areas (also p. 28).

considered ideal if existing flow has been at base level for 10 or more days without interruption by a moderate or high storm event.

c. When a study watershed is prone to frequent high flow events, sample as late after the previous high flow event as is sensibly possible (Biggs and Stokseth 1996).

v.) Time between collection and scraping. After collection the rocks should be stored in a shaded area, and submerged in ample stream water to mitigate temperature changes. The rocks can be transported to the scraping location with these precautions taken. The rocks should be processed at a location that is less than 30 minutes of total transport time from the collection area.

A2. f - Scraping the Rocks

i) When deciding what area on the rock to scrape, bear in mind that the goal is to acquire a representative sample of the algal growth on the rock wherever such growth is possible. As such, avoid areas on the rock where the rock was buried and areas where the growth is extreme. Choosing an area to scrape that is near an edge of the rock is recommended to limit how much material may get stuck on other parts of the rock, as well as material from other parts of the rock that could get into the final sample. And again, keep in mind that the time between collecting and scraping rocks should be minimized.

ii) Perhaps the most important aspect of the whole procedure is making sure that the area scraped is known. Therefore, the collector should inscribe a circular boundary onto the surface of the rock. Care must be taken to make sure that any material removed from the rock by the process is collected into the pan.

iii) If large plant fibers are present within the sample site, collect these first. Use best professional judgment to decide which portions of the algae belong within the sample area and which are outside the boundary. Large fibers should be diced up within the pan as much as possible.

iv) Use a knife (flat edge knife best at this phase) and brush to remove material from the area being sampled. All such material should be collected in the pan used to prepare the blank. A squirt bottle filled with distilled water is often useful here, especially when removing algal material from the brushes.

v) Use care when rinsing the cleaned sample surface with the squirt bottle to avoid contaminating the sample with material outside the boundary. If the surrounding surface is covered with loose sediment, such a rinse may prove impossible.

vi) Use best professional judgment to determine when a given rock sample has been sufficiently scraped.

vii) Measure and record the diameter of the area scraped. If this region ends up exceeding the original bounds, make several “diameter” measurements and average.

A2. g - Filtering the Sample and Duplicate Sample

i) Filtering should be performed in subdued light as soon as possible after sampling to avoid errors resulting from changes in the algal pigments in the sample after collection. If the water sample cannot be filtered immediately, it is to be stored on ice in darkness. Filtration is to occur within 24 hours of water sample collection.

ii) Transfer all material collected in the pan into a blending container. Use the spray bottle to rinse the pan into the container to make sure that nothing is left behind.

iii) Use an immersion blender to thoroughly mix the sample and prevent sediment from settling to the bottom.

iv) Use the pipette to acquire a 5 mL (or however much the sampler feels is necessary for the lab to detect Chlorophyll_*a*, without too much water to prevent clogging the filter) aliquot of the sample from the blending cup. Continue to mix the sample while using the pipette.

v) Filter the aliquot, rinse the sides and inside of the pipette then rinse the sides of the filtering funnel if necessary. Carefully fold the filter in half, and wrap it in aluminum foil. Always use tweezers when handling the filters. NOTE: If making a duplicate repeat steps iv and v and submit as a separate filter.

vi) Place the foil into a plastic baggie with the appropriate CyberIntern label affixed to it. Wrap this baggie up in an ice pack (or sandwich between two ice packs) with elastic bands and place it into the cooler. The filter may be kept on ice or sandwiched between two ice packs for up to 48 hours – as long the ice in the cooler is refreshed often to keep from thawing significantly. Freeze the sample immediately upon return to an Ohio EPA facility with a deep freeze, and before shipping to the laboratory. Then send the filter to the laboratory between two freezer packs. If the laboratory will not process the filter immediately upon receipt, the laboratory should store the sample at - 20^{o} C.

vii) Measure the total volume of scrapings collected and record. Remember to account for the volume of filtered sample.

Subsection A3: Sample Storage, Labeling, and the Lab

The wrapped filters must be kept on ice until their release to the lab. The water column filters and the rock scraping filters should be stored as two distinct groups as described above. The container used to hold them could be as simple as a zip-lock bag as long as it is, or can be made, water proof. If zip lock bags are used, double bagging is recommended to ensure water proofing.

References Cited:

Biggs, B.J.F. (2000). Eutrophication of streams and rivers: Dissolved nutrient-chlorophyll relationships for periphyton. *Journal of North American Benthological Society,* 19, 17–31.

Biggs, B.J.F. & Kilroy, C. (2002). *Stream Periphyton Monitoring Manual.* Hamilton, New Zealand: National Institute of Water & Atmospheric Research.

Biggs, B.J.F. & Stokseth, S. (1996). Hydraulic habitat preferences for periphyton in rivers. *Regulated Rivers: Research and Management*, 12, 251-261.

Matheson, F.E., Quinn HM, & Martin ML. (2012). Effects of irradiance on diel and seasonal patterns of nutrient uptake by stream periphyton. *Freshwater Biology,* 57, 1617-1630.

Wetzel, R. (2001). *Limnology: Lake and River Ecosystems* (3rd ed.). San Diego CA: Academic Press.

Chlorophyll-*a* Sample Submission Form

Sample Submission Date: _____ Name/District/Division: _____

One sheet can be used for each batch of samples submitted to the lab regardless of when they were collected. Use the sheet for both water and rock scrape samples. Fill out the appropriate spaces for that particular sample you are collecting. Duplicate filters should be noted in the location. Field blanks should be labeled as such. Field blank should be submitted every 10 samples.
****REMINDER**** - All filters must be filtered in the field, placed in foil, labeled and frozen.

Location	Sample # (for lab use)	Collection Date	Time	Area Scraped (cm^2)	Slurry Volume (ml)	Volume Filtered (ml)

Field Comments: _____

Periphyton Sample for Chlorophyll-*a* Field Sheet

Station ID_____ Date_____

Site Name_____ Collected by_____

River Mile_____ Scraped by _____

Composite Number of Rocks_____ Filtered by_____

Total Area Scraped_____cm^2

Diameter of individual scrape	**Area of individual scrape**
1 (____ + ____)/2 =_____	1 _____
2 (____ + ____)/2 =_____	2 _____
3 (____ + ____)/2 =_____	3 _____
4 (____ + ____)/2 =_____	4 _____
5 (____ + ____)/2 =_____	5 _____
6 (____ + ____)/2 =_____	6 _____
7 (____ + ____)/2 =_____	7 _____
8 (____ + ____)/2 =_____	8 _____
9 (____ + ____)/2 =_____	9 _____
10 (____ + ____)/2 =_____	10 _____
11 (____ + ____)/2 =_____	11 _____
12 (____ + ____)/2 =_____	12 _____
13 (____ + ____)/2 =_____	13 _____
14 (____ + ____)/2 =_____	14 _____
15 (____ + ____)/2 =_____	15 _____
16 (____ + ____)/2 =_____	16 _____
17 (____ + ____)/2 =_____	17 _____
18 (____ + ____)/2 =_____	18 _____
19 (____ + ____)/2 =_____	19 _____
20 (____ + ____)/2 =_____	20 _____
Total _____	

Diameter to Area Conversion

Diameter (cm)	Area (cm^2)
2.3	4.155
2.35	4.337
2.4	4.524
2.45	4.714
2.5	4.909
2.55	5.107
2.6	5.309
2.65	5.515
2.7	5.725
2.75	5.939
2.8	6.157
2.85	6.379
2.9	6.605
2.95	6.835
3.0	7.068
3.05	7.306
3.1	7.548
3.15	7.793
3.2	8.042

Total Slurry Volume_____mL

Comments:

Collected/Filtered

CI #___ Water Vol_____mL Time _____ _____

CI #___ Rock Vol_____mL Time _____ _____

CI #___ _____ Vol_____mL Time _____ _____

CI #___ _____ Vol_____mL Time _____ _____

Length of reach sampled _____ ft / yd/ m

Flow	None	Low	Normal	Elevated	High
Turbidity	Clear	Low	Moderate*	High*	

*Explain _____

Sky	Overcast	M. Cloudy	P. Cloudy	M. Clear	Clear
Canopy[+]	Open	25% Closed	50% Closed	75% Closed	Closed

Riparian[+] None L R Very Narrow (<5 m) L R Narrow (5-10 m) L R Moderate (10-50 m) L R Wide (>50 m) L R

Channel[+] ___ % Riffle ___ % Run ___ % Glide ___ % Pool

[+] Describe stream reach where rocks were collected. Riparian must have a woody component to be considered.

Appendix II - Section B

Critical Cleaning Procedure For Orthophosphate Sampling Syringes*

Critical cleaning procedure for ortho-P syringes:

1. Fill a warm water bath with enough water to cover a batch of syringes.

2. Add "Liqui-Nox" (or other **non-Phosphorous** detergent) per directions on package.

3. Pull plungers out of syringes and add both to bath.

4. Use small brush to scrub out the inside of all syringes, 5-10 sec apiece. Suck up detergent solution with syringes and squirt out.

5. Rinse once with DI water (or out-of-date nanopure) to remove detergent.

6. Rinse inside of syringes 1x thoroughly with squirt bottle of 10% HCl.

7. Triple rinse with DI.

8. Lay on clean drying rack and cover with clean paper towels until dry.

9. After about one day place the clean, dried syringes in labeled Ziploc gallon bags.

Clean and re-use up to a maximum of **three** times.

*DO NOT USE THIS PROCEDURE WHEN DOING LOW-LEVEL ORTHO-PHOSPHORUS TESTING – ONLY NEW, CLEAN SYRINGES SHALL BE USED FOR LOW LEVEL TESTING.

Appendix II - Section C

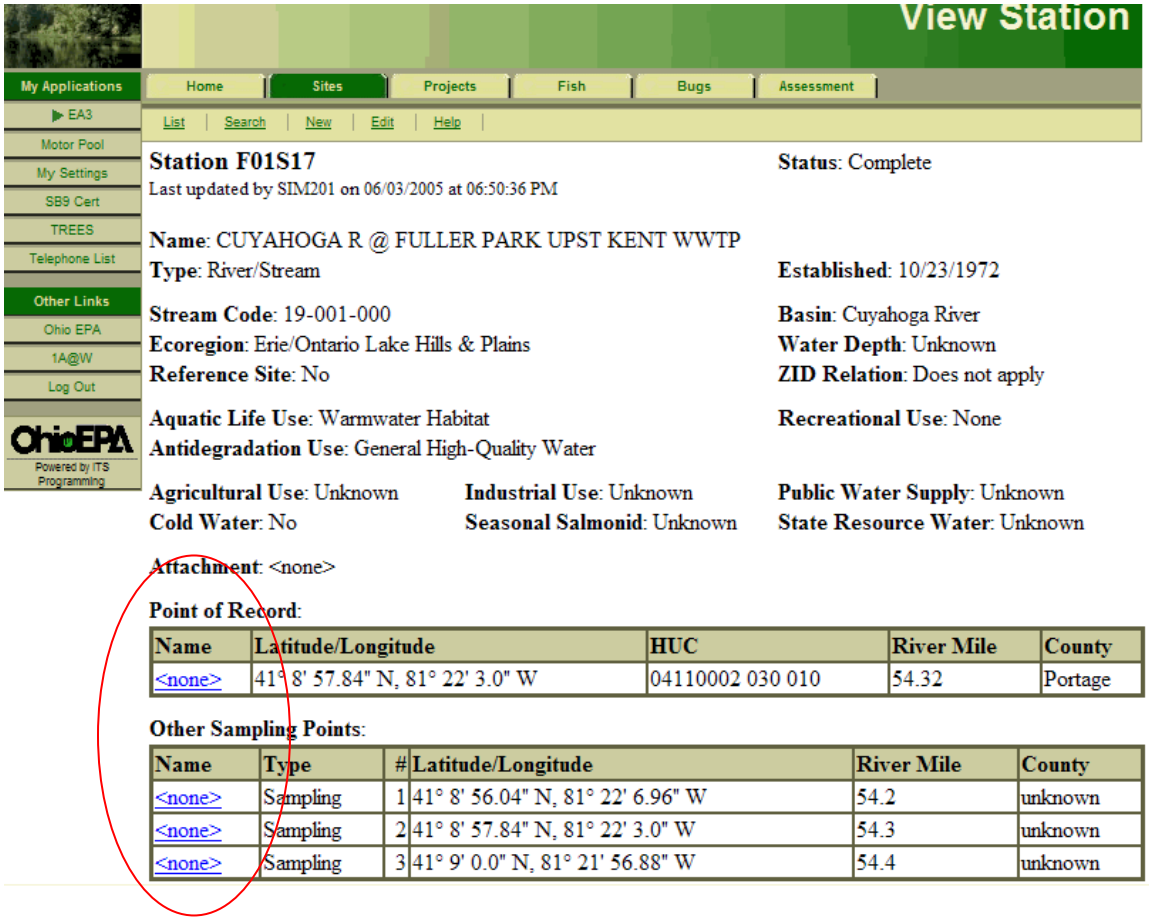
EA3 Station Module Manual

Table of Contents

OVERVIEW OF "STATIONS" in EA3

Stations describe sampling locations. Sometimes stations represent sampling at a single location, while other times two or more nearby sampling locations are linked together to form a station. Stations are displayed in EA3 on 2 types of screens, one containing basic station information referred to as the "main" station screen, and one "detail" screen for each sampling point linked together in the station.

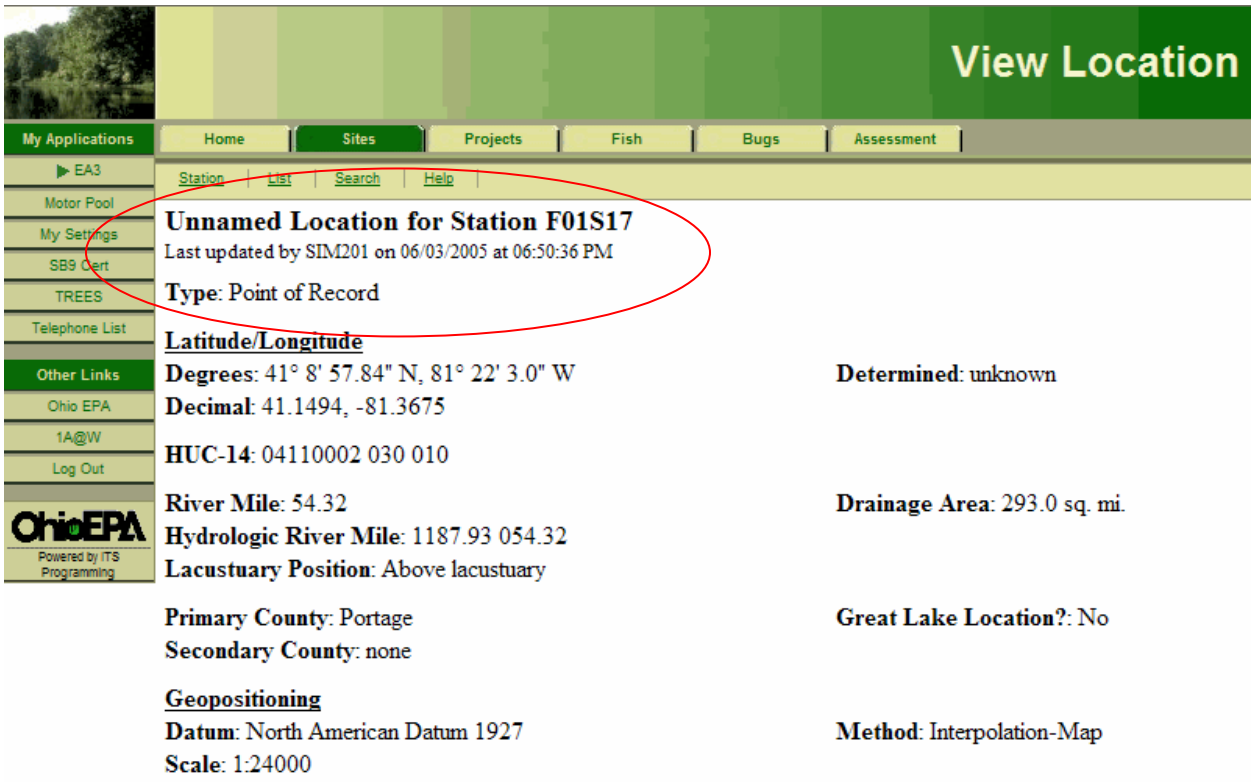
One screen required for each station is the "main" screen. The upper portion shows basic station information:



Near the bottom of this screen, note in the red circle the hyperlinks to the "detail" screens for all sampling points linked to this station. Every station must have one detail screen for its "Point of Record" sampling point. Detail screens for "Other Sampling Points" are optional and exist only if additional sampling has occurred nearby and is to be considered part of the same station. All sampling points that have ever been sampled for chemistry, bugs, fish, sediment, tissue, and QHEI are listed, though at first we'll be entering data into EA3 for results from only our bugs,

fish, and chemistry sampling. To see the detail screen for the Point of Record or one of the Other Sampling Points, click on the associated "<none>" in the Name column at the left.

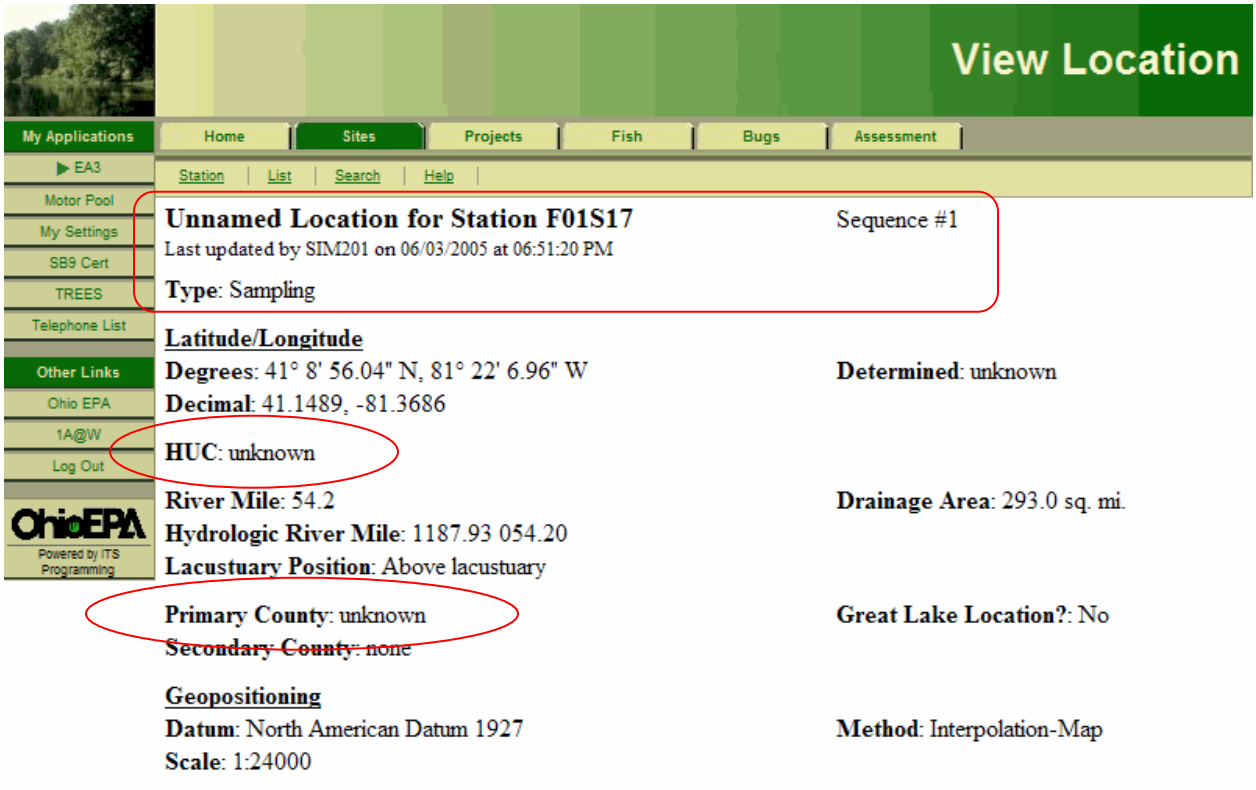
Here's an example of the detail screen for a Point of Record – this is the other screen required for each station:



Note in the red circle near the top that this screen displays the Point of Record for station F01S17.

This screen displays the lat/long and river mile for this particular sampling location (RM 54.32), but also contains a couple of fields that really describe the station in general rather than this point in specific, such as HUC-14 and County. HUC-14 and County are listed only once for each station, but are recorded and displayed here on the Point of Record screen instead of the "main" station screen.

Here's an example of the detail screen for an "Other Sampling Point." These are optional and will not occur for every station:



Note in red near the top that this screen displays a Sampling point for station F01S17, and that it is "Sequence #1." This means it is Sampling point #1 for F01S17. There can be up to 99 sampling points for a single station. We could have chosen to use the Name field to distinguish between these sampling points, such as "Bug Location for F01S17" or "Chemistry Location for F01S17". But because we can store any type(s) of results at a sampling point (including a mixture of sampling types, sometimes from various years), we've chosen not to name them. So they are all called "Unnamed Location" and are distinguished only by their Sequence number and, more importantly to us, by their River Mile. By the way, while not actually displayed on any of these screens, the Point of Record is always assigned Sequence #0 – you will see this in some of the station lists and utilize it as a search criterion in station queries.

Since HUC and County are displayed on the Point of Record screen only, you'll see they display here as "unknown."

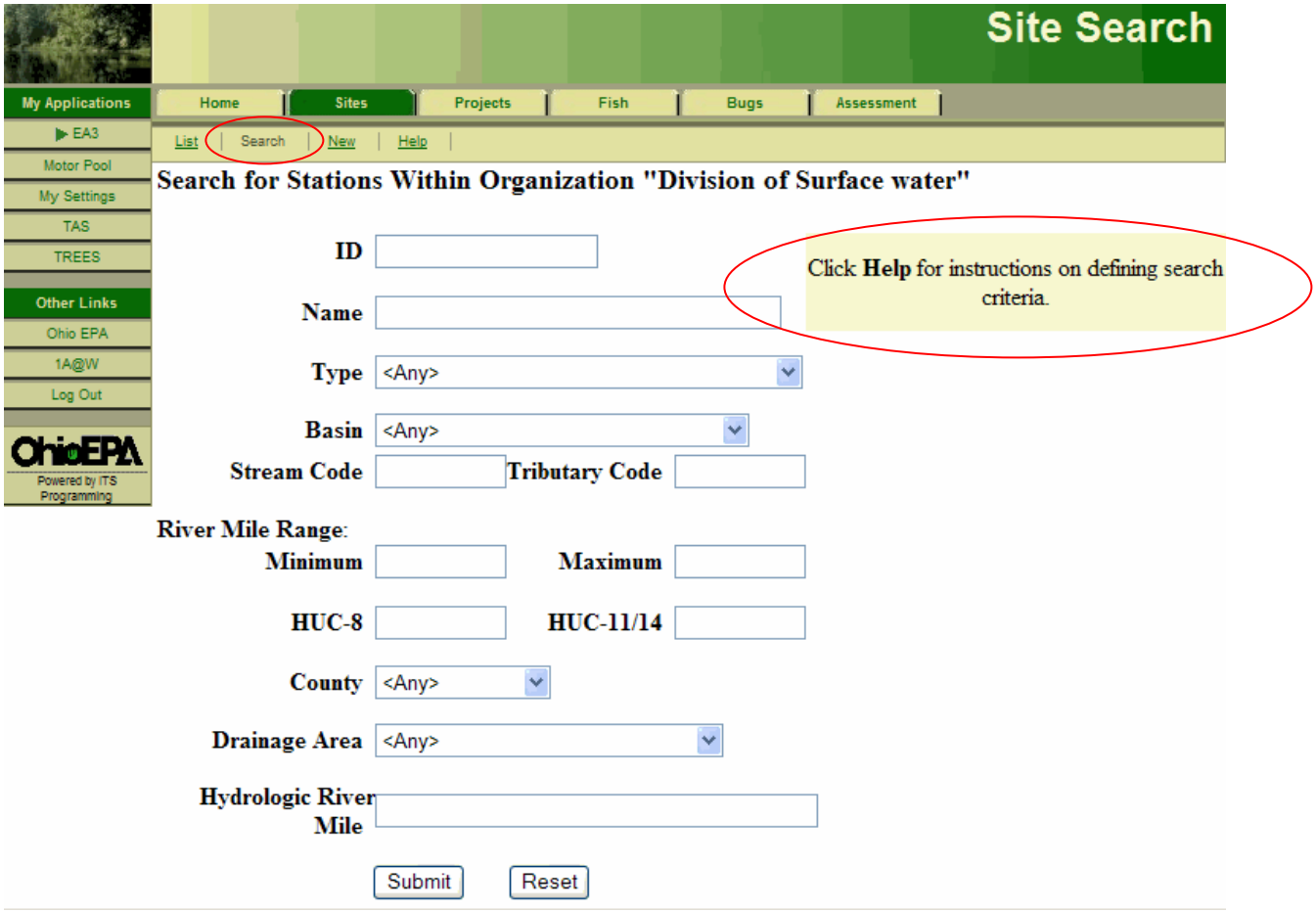
DO I REALLY NEED A NEW STATION?

Creating new stations completely and correctly is very important – it will affect all subsequent data users in many ways. But one of the most important hurdles to cross first is to decide if you really need a new station at all.

Because of the relational database structure in which we are storing our station information, creating one new station prompts the addition of bits of information to many fields in many linked tables. Deleting a station is therefore also not a simple matter – records must be deleted back out of many tables carefully without orphaning any of the other related pieces. Furthermore, after results for biology or chemistry are added to a station, the station cannot be deleted without orphaning the results. These many complex linkages of data enable valuable flexibility and versatility in utilizing the data, but they also constitute a wealth of supporting evidence for one primary rule regarding station creation:

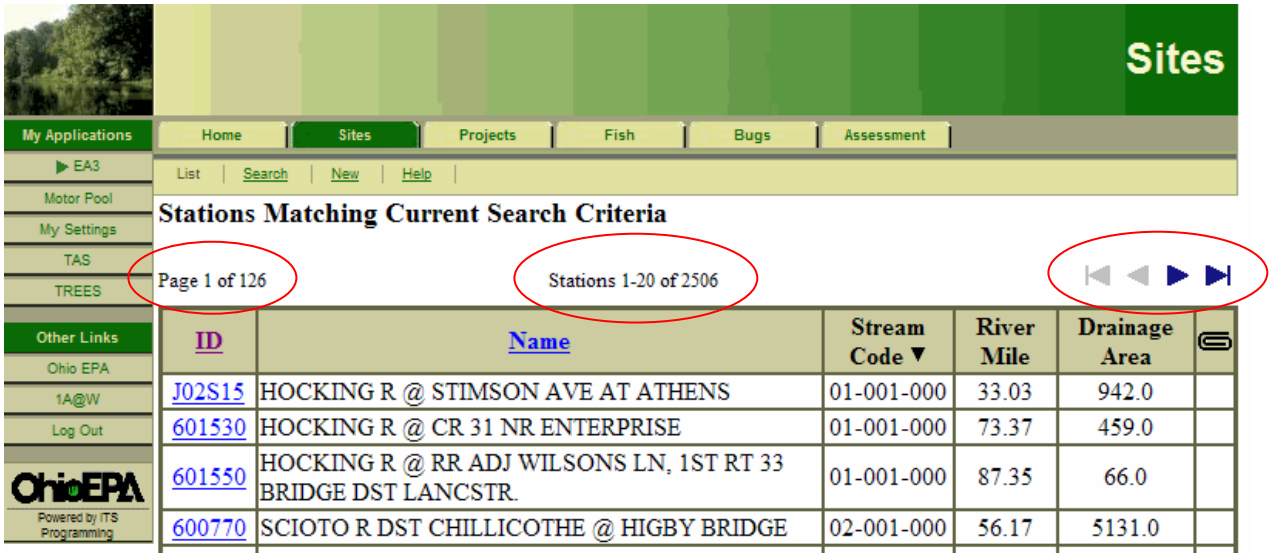
THOU SHALT NOT CREATE DUPLICATE STATIONS!

No one in DSW can delete a duplicate station. Only a DBA in ITS can delete a station, and then only *if* no results are attached to it, *and* an official request is made to follow a very specific procedure (which, it so happens, is not even developed yet)… So, here are some tips for ways to search for existing stations for each of your sampling locations BEFORE you attempt to create a new station.



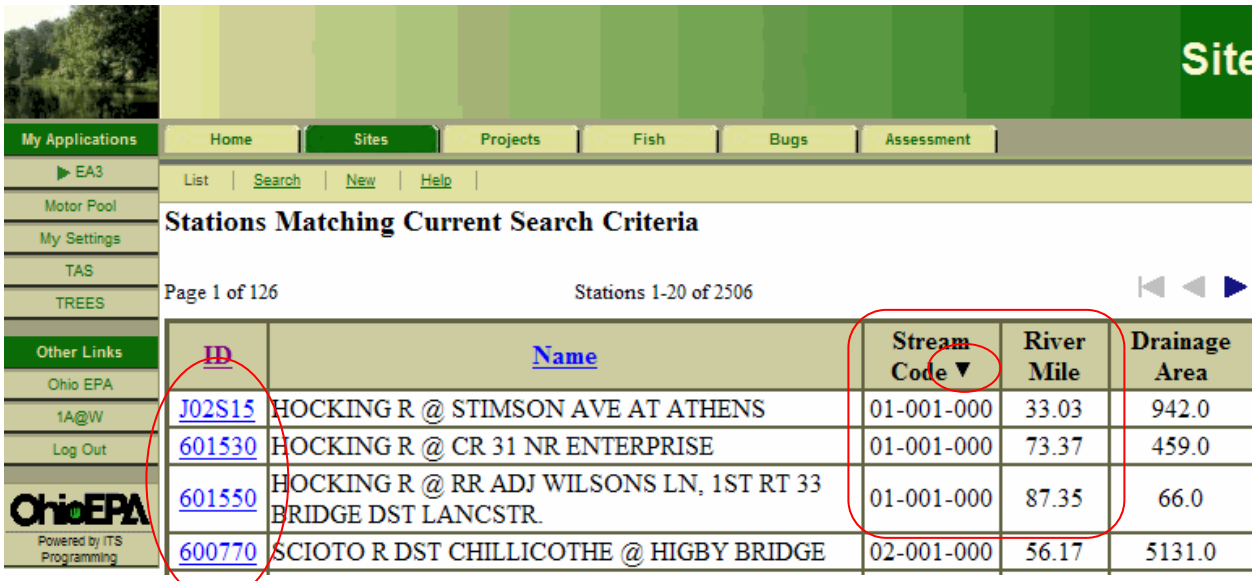
The above screen shows the various fields provided on EA3's station Search tab. You can specify criteria to narrow your search for stations in EA3 by using any of these fields, singly or in combination. As the yellow box suggests, you can click HELP to get more information about defining your search criteria. Keep in mind that you can make your search as specific or general as you desire – it may take a little practice to become efficient.

For example, at one extreme you could hit the Submit button at the bottom without entering any criteria at all and the query will return a list of ALL existing stations.



The above screen shot is from the Test database, which contains only 2506 stations. There are many more stations in EA3-Production now. But this gives you an idea of the most general search possible. You can use the left and right arrows just above and to the right of the results to page through the results when they won't fit on one screen, such as in this case when they would fill 126 screens.

Note that you can change the sorting of the search results by clicking on any of the column headings that are bolded and underlined like a hyperlink – ID, Name, or Stream Code. The downward arrow in the Stream Code column header indicates that the stations are currently sorted by Stream Code. (Sorting by Stream Code triggers an automatic secondary sort by ascending River Mile.) If you want to view or edit a station, click on its bolded and underlined ID in the left column:



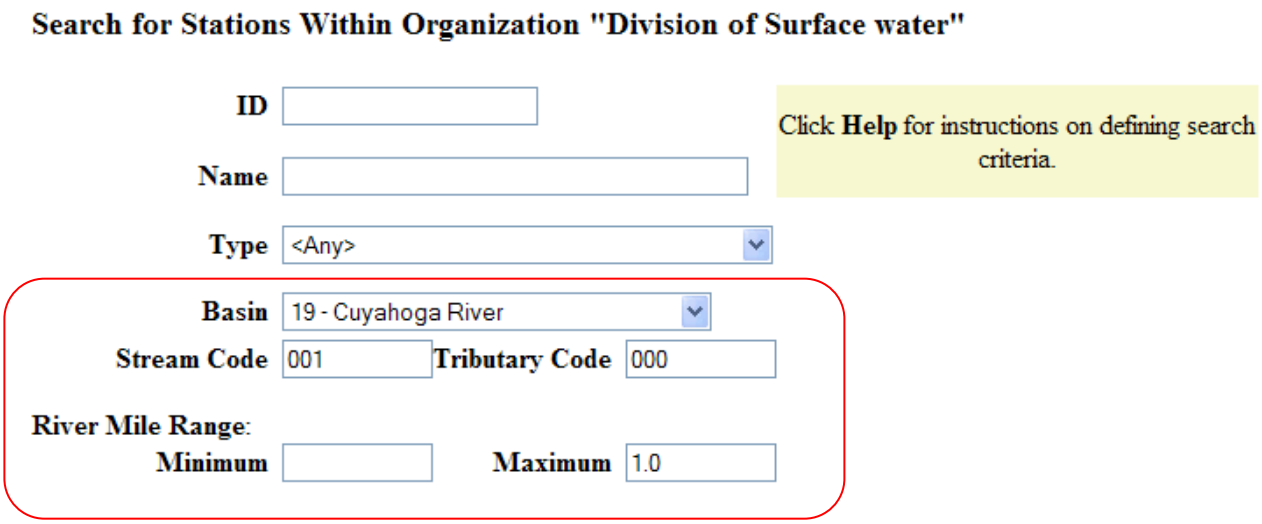
To reduce the search results to a smaller and more useful grouping, try adding other criteria. If you know the basin and stream code for your location, try adding them. For example, the Cuyahoga River mainstem is 19-001-000. If we select "19" from the Basin drop-down list on the search screen and enter "001" and "000" for the Stream and Tributary codes respectively, we will see the following results on the first page.

Stations Matching Current Search Criteria

Page 1 of 9 Stations 1-20 of 163

ID	Name	Stream Code	River Mile	Drainage Area	
F01S06	CUYAHOGA R @ MOUTH	19-001-000	0.01	809.0	
F01A64	CUYAHOGA R @ 1ST BRIDGE NR MOUTH	19-001-000	0.29	809.0	
F01S07	CUYAHOGA R @ SR 2	19-001-000	0.55	808.0	
F01W47	CUYAHOGA R @ CENTER ST	19-001-000	0.92	808.0	
200004	CUYAHOGA R. AT CLEVELAND, 0.25 MI. DST. UNION TERMINAL	19-001-000	1.2	808.0	
200002	CUYAHOGA R. AT CLEVELAND, 0.15 MI. DST. UNION TERMINAL	19-001-000	1.3	808.0	
F01A20	CUYAHOGA R @ UNION TERMINAL	19-001-000	1.46	807.0	
F01W46	CUYAHOGA R @ TWIN RR BRIDGES	19-001-000	1.95	806.0	
200003	CUYAHOGA R. AT CLEVELAND, 0.4 MI. DST. LORAIN AVE. BRIDGE	19-001-000	2.3	806.0	
200005	CUYAHOGA R. AT CLEVELAND @ MOUTH OF WALWORTH RUN	19-001-000	2.74	806.0	
200008	CUYAHOGA R. AT CLEVELAND, NEAR WALWORTH RUN	19-001-000	2.8	805.0	

We can refine this further by adding a Minimum and/or Maximum River Mile Range on the search screen to get only the 4 stations listed above that are downstream of RM 1.0:



You can use any combination of fields on the search screen to narrow or widen your search – just be careful you don't enter conflicting information. It is particularly easy to ask for conflicting searches when changing from one search to the next – be sure to delete previous search criteria. For example, a search for "Maumee *" in the name field while you still have "19" selected in the basin field will yield no results – be sure to change the "19" back to "<Any>" in the Basin drop-down list first.

Search for a station in an Access station lists

The EA3 Search function can be a quick way to find an existing station, especially if you know the river code and river mile or other easily identifiable criteria. But it is much more thorough to go further if you fail to find a station in EA3, especially on an unnamed tributary or a lesser known stream. A more thorough search would be to use one of the EA3 station lists sent out periodically. These are currently arranged in 2 different orders, and other sorting options would be easy to provide. They are read-only Access tables, such as this:

stn list by basin_stream code and rm : Table

BAS	STRI	TRIBU	RIVER_MILE	IDENTIFICATIOI	SEQUE	NAME
02	500	000	85.2	200434	0	PAINT CREEK UPST. ST. RT. 734
02	500	000	88.5	V10W19	1	PAINT CK @ HIDY RD NE OF JEFFERSON
02	500	000	88.57	V10W19	0	PAINT CK @ HIDY RD NE OF JEFFERSON
02	500	000	88.6	V10W19	2	PAINT CK @ HIDY RD NE OF JEFFERSON
02	500	000	96	V10W18	1	PAINT CK @ SR 323 N OF JEFFERSONVILLE
02	500	000	96.03	V10W18	0	PAINT CK @ SR 323 N OF JEFFERSONVILLE
02	500	001	1.3	V10K11	0	TAYLOR RUN @ POTTS HILL RD
02	500	002	0.1	V10K28	0	TRIB TO PAINT CK (31.26) @ NR BAINBRIDGE
02	500	003	3.07	V10K45	0	PLUM RUN @ BEAVER RD
02	500	005	2.6	300136	0	PONE CREEK S OF WASHINGTON C.H., UPST. ST. RT. 41
02	510	000	2.28	300047	0	N FK PAINT CK @ POKE HOLLOW RD
02	510	000	3.8	V10K01	1	N FK PAINT CK @ US RT 50
02	510	000	3.9	V10K01	0	N FK PAINT CK @ US RT 50
02	510	000	4	V10K30	0	PLEASANT VALLEY REG SEWER DISTRICT OUTFALL TO N FK PAINT CK
02	510	000	10.5	V10S18	0	N FK PAINT CK @ MUSSELMAN HILL RD DST FRANKFORT
02	510	000	14.1	V10K23	0	N FK PAINT CK DST FRANKFORT WWTP
02	510	000	14.26	V10S19	0	FRANKFORT WWTP OUTFALL TO N FK PAINT CK
02	510	000	14.34	V10S20	0	N FK PAINT CK @ WESTFALL RD UPST FRANKFORT
02	510	000	17.5	V10S01	0	N FK PAINT CK @ DEXTER RD
02	510	000	17.6	V10S01	1	N FK PAINT CK @ DEXTER RD
02	510	000	20.06	V10S44	0	N FK PAINT CK ADJ PLANO RD NW OF FRANKFORT

This shows a portion of the list that is ordered by River Code and River Mile. Note the Sequence # column – this shows a mixture of single digits, mostly zeroes. The records with a zero in the Sequence # column represent the Point of Record. This is the "main" location for the station, but all locations linked to a particular Station ID are considered part of the station and can be used for sampling. (Note that at this time CyberIntern will show the RM for the Point of Record only, though choosing a station ID and its specific location is a possible improvement slated for the future.)

In looking at the locations represented above for station ID V10W19, you'll see sampling has occurred in the past at RM 88.50, 88.57, and 88.60. If you want to sample at or between any of these points, V10W19 is the station to use. In fact, if you want to sample just upstream of 88.60 or just downstream of 88.50, and you believe no other impacts occur to the stream between your location and V10W19's RM range, you could use V10W19. You would simply add an additional sampling point to represent your location. (See "Editing a station – Adding Sampling Locations.") In rural areas, the river mile range representing a station can often be much larger than in urban areas. Usually it's a judgment call based on factors such as other tributaries nearby which could alter the stream quality and/or significantly affect the Drainage Area, or any discharges (point or non-point) that could alter the water quality.

However, if you want to sample Paint Creek at RM 92 or 93, according to this list you are out of luck – you'll have to create a new station.

One other list you can use is ordered by the "Hydrological River Mile." Since this river mile lists all the confluences of the streams below a certain point in the stream network, you can see where tributaries are "nested" along a mainstem. Though this has been used in the past mostly by the Modelers, it has the advantage of showing if any tributaries are present in a certain reach. This can be particularly helpful if you don't know the name or river code of a smaller trib, or if it's unnamed. For example:

1158.63 050.59 002.00	200621	0	ROCK CREEK DST. LAKE ROAMING ROCK @ RR
1158.63 050.59 002.72	G01W04	0	ROAMING SHORES WWTP OUTFALL TO ROCK CK ON SPILLWAY DST DA
1158.63 050.59 002.73	G01W03	0	LAKE ROAMING ROCK DST DAM ON SPILLWAY TO ROCK CK, UPST WWT
1158.63 050.59 009.61 005.16	G01P04	0	LEBANON CK DST NEW LYME LANDFILL
1158.63 050.59 009.61 006.12	G01P03	0	LEBANON CK @ HUNTER RD AT NEW LYME LANDFILL
1158.63 050.59 009.68	G01W02	0	ROCK CK @ DODGEVILLE RD UPST RESERVOIR
1158.63 050.59 012.86 000.15 002.60	G01P02	0	TRIB TO ROCK CK TRIB (12.86/0.15) @ WINDSOR RD ENE OF ORWELL
1158.63 050.59 012.86 000.15 003.11	G01P01	0	TRIB TO ROCK CK TRIB (12.86/0.15) ENE ORWELL

The last 2 stations listed above are on a trib to a trib to Rock Ck. If you don't know its River Code but you know it's upstream of Lebanon Ck, this list can help you see if any tribs are represented in that reach.

In conclusion, there are many ways to search for stations, each with its own pros and cons. It's important to take all precautions possible to be sure a station doesn't already exist before you create one. In fact, consider it a time-savings to find an existing station – you've saved yourself the time and effort of creating a new one. If all fails, however, and you find you have indeed created a duplicate station by mistake, let me know ASAP so, if possible, we can mark it "inactive" before it gets used for any results. Then we have the best chance of being able to delete it.

REQUIRED FIELDS TO CREATE A NEW STATION

Gather this information (especially lat/long) for each sampling point before you log in – EA3 has a "time-out" period so if you leave the application unused for too long you will have to log in again and will lose the station you had started. I think the time-out is approximately 15-30 minutes.

1) **Station Name** – 60 characters free text, usually stream name and road crossing, or facility name and receiving stream.
2) **Station Type** – drop-down list.
3) Stream Code – composed of the old "River Code" (basin + stream code), plus a relatively new 3-digit Tributary code. You should fill in the **Basin Code** from the drop-down list. You should fill in the Stream and Trib codes ONLY if Dennis has provided them on a recent study plan, or if you know them very certainly from another station in EA3. Otherwise please leave them blank for Dennis or me to populate later. These codes frequently get changed or rearranged during the station upload and merger process, so do NOT rely on any historical listings.
4) **Ecoregion** – drop-down list.
5) **Latitude** and **Longitude,** including metadata such as the **Datum**, determination **Method**, and **Scale**.
6) **HUC code** – at least HUC-8, preferably also HUC-12 or HUC-14.
7) **River Mile.**
8) **County** (including both county names if station is on a county line).

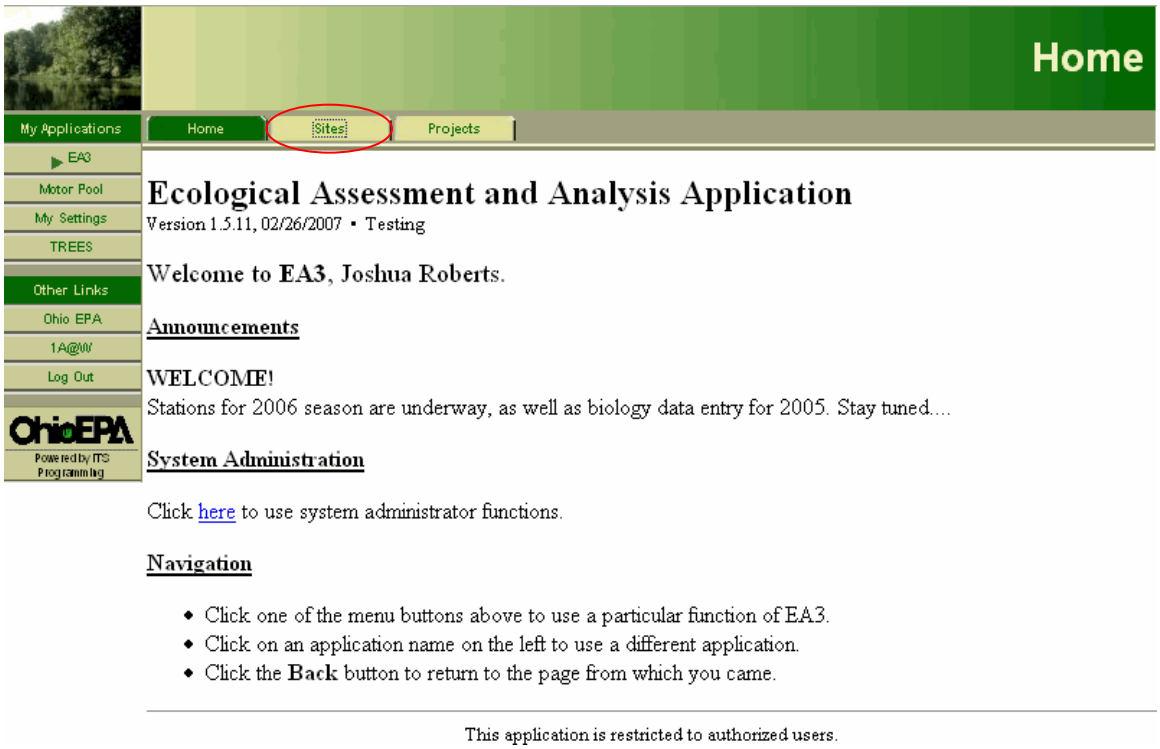
CREATING A NEW STATION, BRIEF OUTLINE OF STEPS

1) Sign in, select Sites tab at top of screen.
2) Select New tab from top of screen.
3) Be sure screen is entitled "Creating Station" – for a while during development and even after deployment, a pesky bug in the application caused it to misdirect itself occasionally. This would cause the station information to be added or edited incorrectly. If you ever see a malfunction of any sort in the application, notify ITS immediately with a description (as detailed as possible) of the malfunction, the time it occurred, and a screen capture to document the problem if possible.
4) Scroll to bottom of screen and click on "None" next to "Point of Record" to create the Point of Record first. The Point of Record must be created before any information can be added to the main station screen.
   A. Be sure screen is entitled "Creating Point Of Record for New Station."
   B. Skip "Name" field.
   C. Choose format you prefer for lat/long entry – "Degrees/Minutes/Seconds" or "Decimal Degrees."
   D. Enter lat and long. If using Decimal Degrees, enter at least 4 decimal places.
   E. Choose HUC-8 from drop-down list. Also choose HUC-11/HUC-14 if possible.
   F. Enter River Mile.
   G. Enter Drainage Area if supplied on plan of study – otherwise, leave blank.
   H. Leave Hydrologic River Mile blank.
   I. Choose Primary County from drop-down list. Choose Secondary County if station is on the county line (for example, if sample is from the bridge on "County Line Road").
   J. Choose Geopositioning – Datum from drop-down list. Usually this will be either NAD83 or WGS84 for new coordinates. All historical lat/longs from paper topos are NAD27.
   K. Choose Geopositioning – Method from drop-down list.
      i) "GPS Code (Pseudo Range) Differential" for WAAS-enabled GPS units.
      ii) "GPS Code (Pseudo Range) Standard Position (SA Off)" for GPS units without WAAS or with WAAS not functioning.
      iii) "GPS – Unspecified" if you do not know if the unit was WAAS-enabled.
      iv) "Interpolation – Map" for any mapping software.
   L. Enter Scale for any lat/longs whose method is "Interpolation – Map." Leave Scale blank for GPS methods.
   M. Click on Submit button to create the Point of Reference.
5) Now you can fill in the main station screen.
   A. Be sure screen is entitled "Creating Station."
   B. Enter station name, 60 characters free text (avoid slashes, double quotes, and pipe characters "|"). Examples: "Dry Run @ Green River Rd", or "Whoville WWTP outfall to Crumpit River."
   C. Choose Station Type from drop-down list.
   D. Choose Basin Code from drop-down list.
   E. Enter Stream and Trib codes (3 numeric characters each) if you know them certainly; otherwise leave them blank.
   F. Choose Ecoregion from drop-down list.
   G. If the site is within a mixing zone, select Within ZID. Otherwise leave the default "Does not apply."
   H. Choose any stream Use Designations of which you are certain from their drop-down lists; otherwise do not change defaults.
   I. Do not use Attachment section – it currently does not work.
   J. Click on Submit button to create the new station.
6) New station ID is assigned and displayed – it will be a 6-digit numeric string beginning with a "3".
7) If you need to Edit a station or add more Sampling Locations, click on the Edit tab at the top.

A. To Edit a station, simply navigate to and edit fields desired. REMEMBER, however, just as when you create a new station, you should first make changes to the Point of Record or Other Sampling Points detail screens and click Submit before editing the fields on the main station screen. Then click Submit at the bottom of the main station page to finalize the Edit.
B. To add another Sampling Location to a station, scroll to the bottom of the screen and click on New Sampling Point.
   i) Be sure screen is entitled "Creating Sampling Point for 3XXXXX."
   ii) Enter lat/long, River Mile, Drainage Area if known, and lat/long metadata (Datum, Method, and Scale) as per instruction 4 in adding the Point of Record above.
   iii) Click on Submit button on sampling point screen to create new sampling point.
   iv) Click on Submit button on main station screen to complete the station edit.

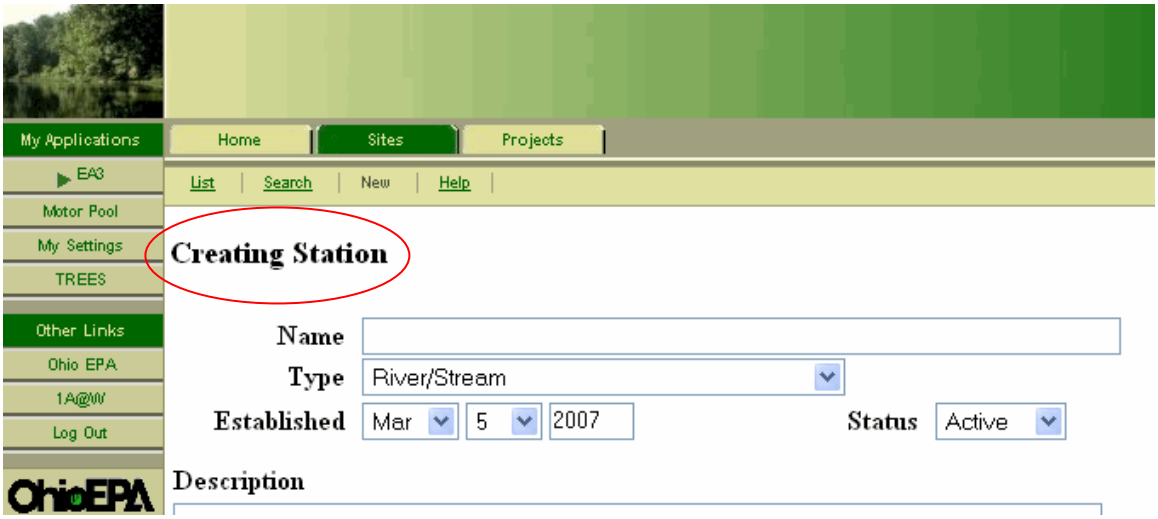
CREATING A NEW STATION – ALL THE GORY DETAILS

1. Sign in as usual to EA3 and select the “Sites” tab.



2. Select ‘New’ from the navigation choices at the top of the screen.

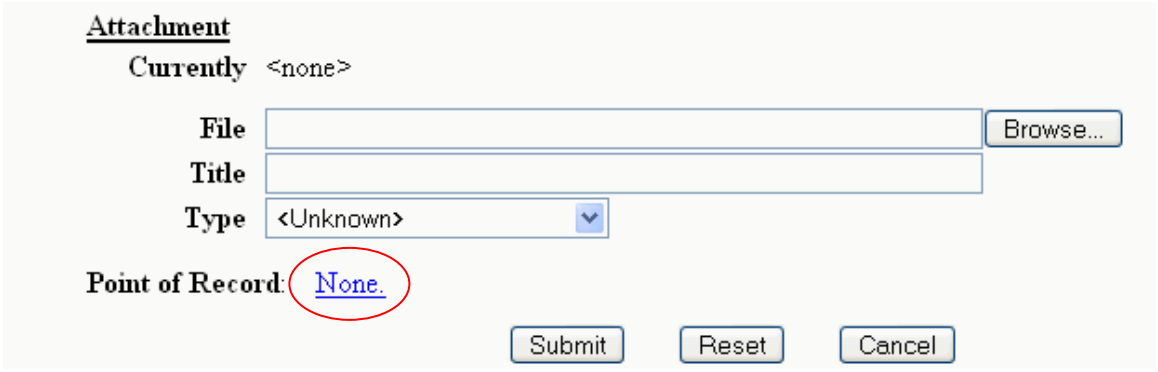
3. Check screen header: “Creating Station” should appear at the top of the screen. This is the “main” station screen.



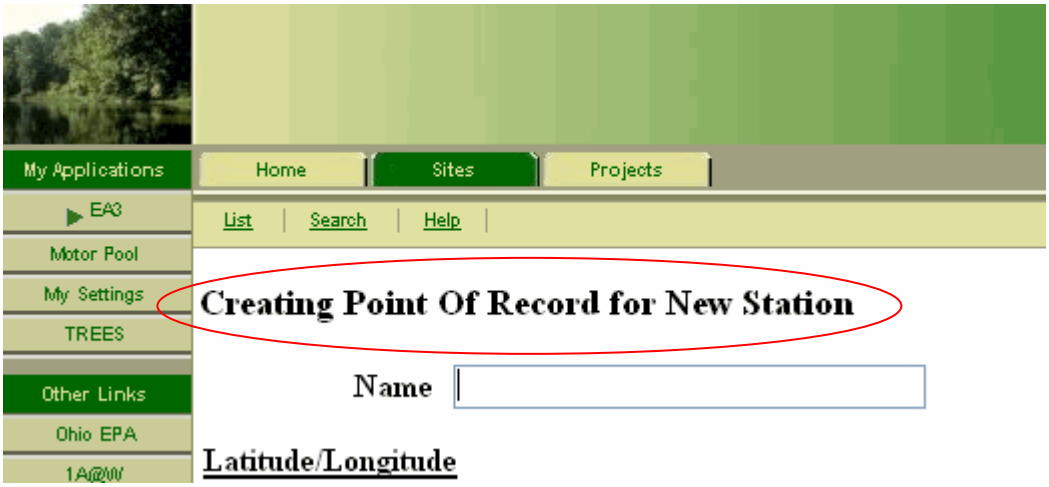
Creating Point of Record

IMPORTANT NOTE: You must create the Point of Record for a new station before filling in any other fields. No information you add on the first screen will be saved if the Point of Record does not already exist. You’ll probably have to learn this the hard way (like I did), but don’t say I didn’t warn you…

4. To create the Point of Record, click the blue ‘None’ hyperlink at the bottom of the main station screen.

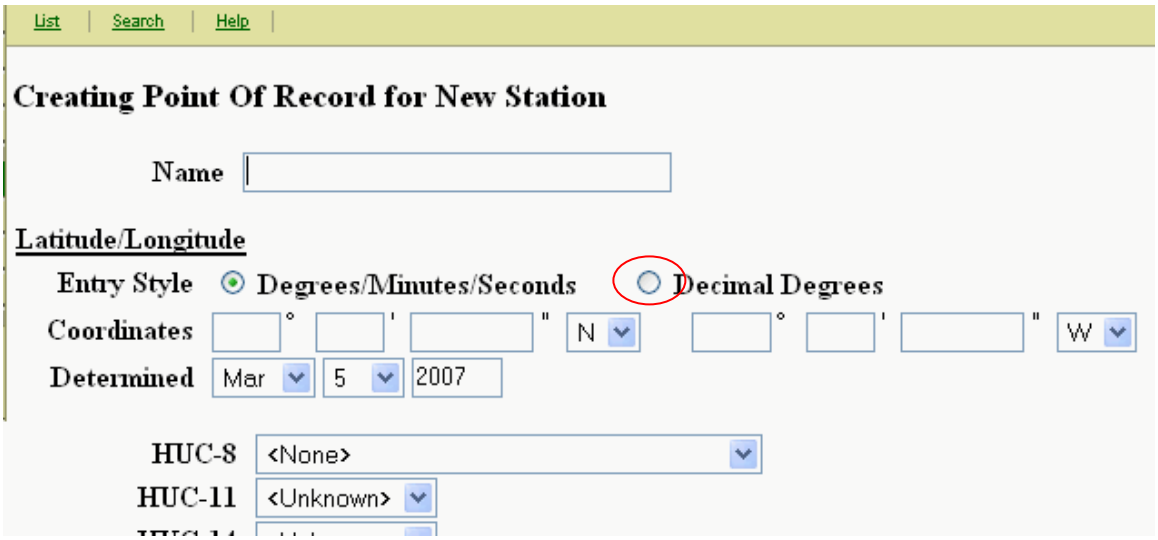


4A. Check screen header again, it should now read “Creating Point of Record for New Station” at the top of the screen.

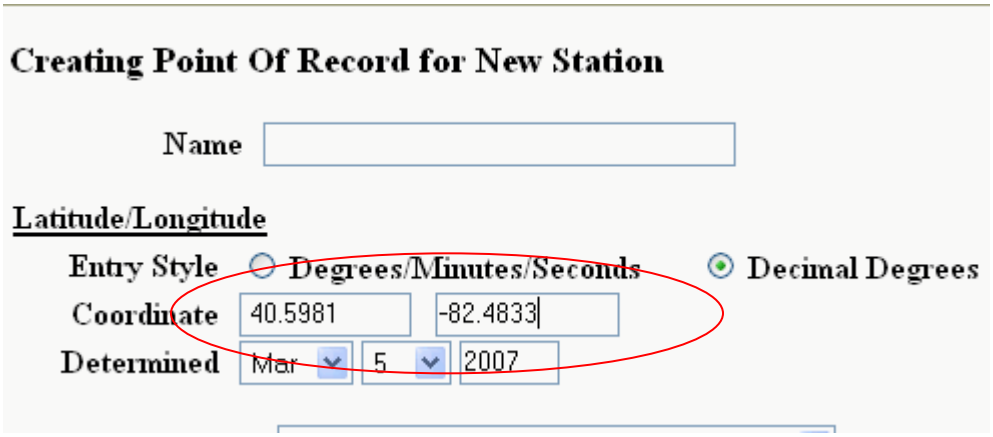


4B. Points of Record do not have a name, so skip to the Latitude/Longitude field.

4C. Select the format in which you prefer to enter lat/long by clicking on either Degrees/Minutes/Seconds or Decimal Degrees. The entry boxes for the Coordinates will change to match the format you choose.

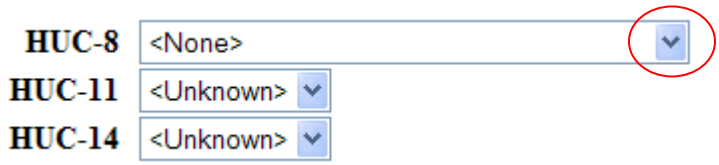


4D. Enter the latitude and longitude, using at least 4 decimal places if entering Decimal Degrees. You do not need to enter the negative sign before the longitude.

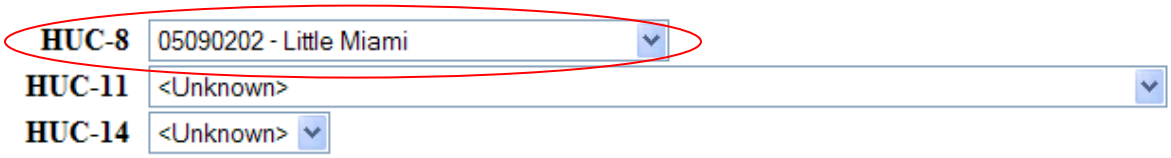


Subsequent detail screens will default to lat/long format of the previous entry.

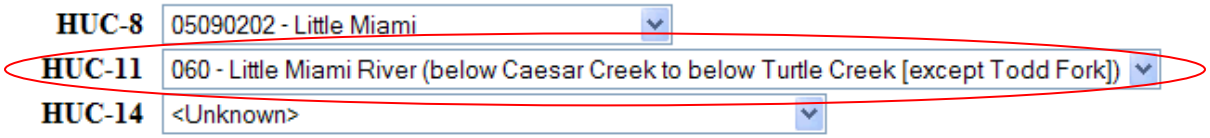
4E. Blue downward arrows at the right end of a field indicate that a drop-down menu of choices is provided for that field.

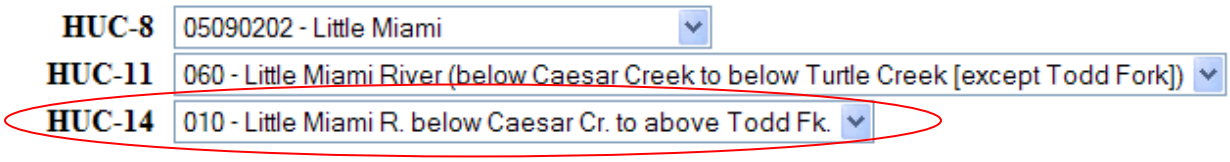


Select the HUC-8 for your station from the drop-down list.

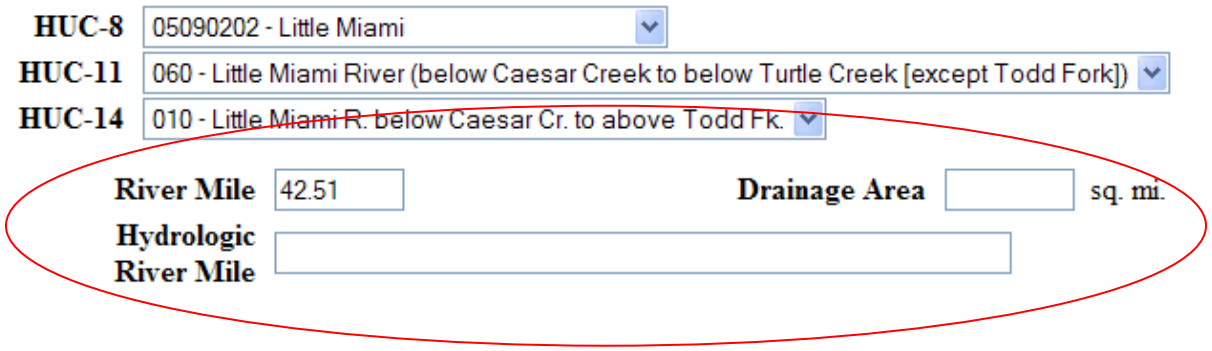


You'll notice the screen "blinks" (refreshes) briefly about a second after you choose HUC-8. This happens because the application populates the HUC-11 drop-down list based on the specific HUC-8 you chose. There is no drop-down list for HUC-11 until a HUC-8 is chosen, and likewise no list for HUC-14 until a HUC-11 is chosen. The HUC codes must be chosen sequentially – HUC-8, then HUC-11, finally HUC-14.





4F-G-H. Enter the River Mile. Enter the Drainage Area in square miles if provided by Dennis on a recent geometric site list – otherwise leave blank for Dennis to calculate later. Leave Hydrologic River Mile blank for Mary Ann to populate later.



4I Choose Primary County from the drop-down list. If station is on a county line (such as a sample from the bridge on County Line Rd), also choose a Secondary County from its drop-down. Note that Primary County displays the first county in the drop-down list (Adams) until you select a different county.

"In Great Lake" is used only for open-water Lake Erie (or other Great Lake) stations.

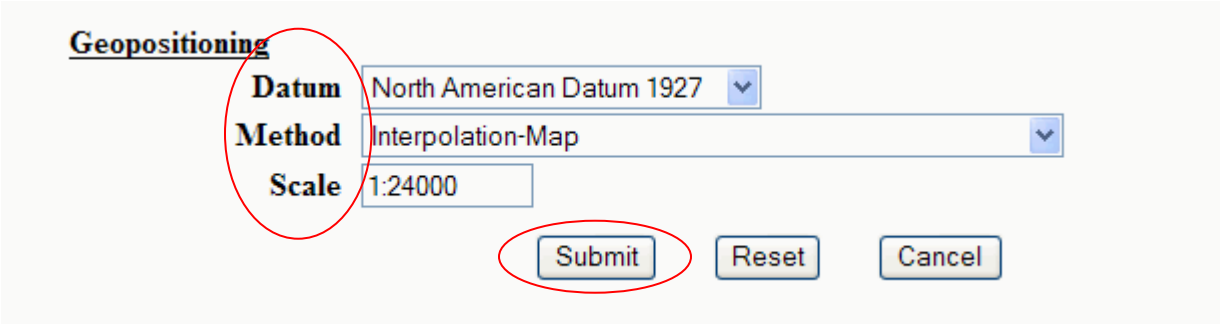
4J-K-L.

J. Choose the correct "Geopositioning – Datum" from drop-down list. For recent calculations this will usually be either NAD83 or WGS84. NAD27 is the default for all historical stations whose lat/long have not been rechecked since the original determination 5 or more years ago from paper USGS topos.

K. Choose the correct "Geopositioning – Method" from drop-down list. Our most common choices are:

i) "GPS Code (Pseudo Range) Differential" for WAAS-enabled GPS units.
ii) "GPS Code (Pseudo Range) Standard Position (SA Off)" for GPS units without WAAS or with WAAS not functioning.
iii) "GPS – Unspecified" if you do not know if unit was WAAS-enabled.
iv) "Interpolation – Map" for any mapping software on a PC or the Internet.

L. Enter Scale for any lat/longs determined by "Interpolation – Map." Leave Scale blank for GPS methods.

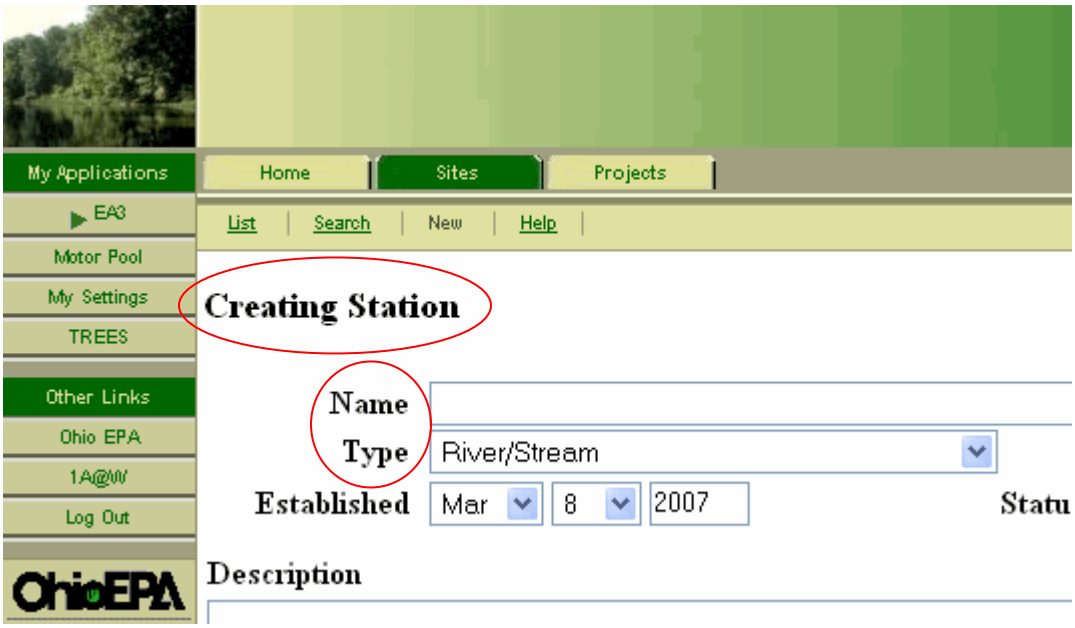


4M. Click on the Submit button at the bottom of the screen to complete the Point of Record and return to the main station screen.

Filling in main station screen

5. NOW! Finally you can populate the first screen.

5A. Recheck the screen header; it should say "Creating Station."



5B. Enter the station name. This field will hold up to 60 characters of text. To simplify searches and retrievals in the future, avoid using double-quotes or pipe characters "|." We usually structure this field by listing the stream name first followed by the sampling location or landmark for river/stream sites. We list the facility name followed by receiving stream for effluent samples. Some examples:

<u>Ambient station examples:</u>

FOURMILE CK @ LANES MILL RD DST OXFORD WWTP

SALT LICK CK @ SECOND US RT 35 BRIDGE DST JACKSON

MILL CK @ MILL CK RD (AKA CALPIN RD)

SWAN CK @ US RT 25 (DETROIT AVE) AT TOLEDO

TRIB TO JAMISON CK (0.09) @ SR 42, 1 MI E OF ASHLAND

<u>Effluent station examples:</u>

JEFFERSON WOODS WWTP EFFLUENT TO SYCAMORE CK

CSC INDUSTRIES INC 002 OUTFALL TO MAHONING R

PEACEFUL ACRES MHP WWTP 001 OUTFALL TO BLUE CK VIA SEWER

STORM SEWER TO PAW PAW CK W OF NAT'L FRUIT/VEG IN BALTIMORE

5C. Choose Station Type from drop-down list. Our most commonly used Types are:

River/Stream

Facility – Industrial

Facility – Municipal Sewage (POTW)

We have used other types also, such as Channelized stream, Canal, Storm sewer and Waste sewer.

5D. Select the Basin code from the drop-down list.

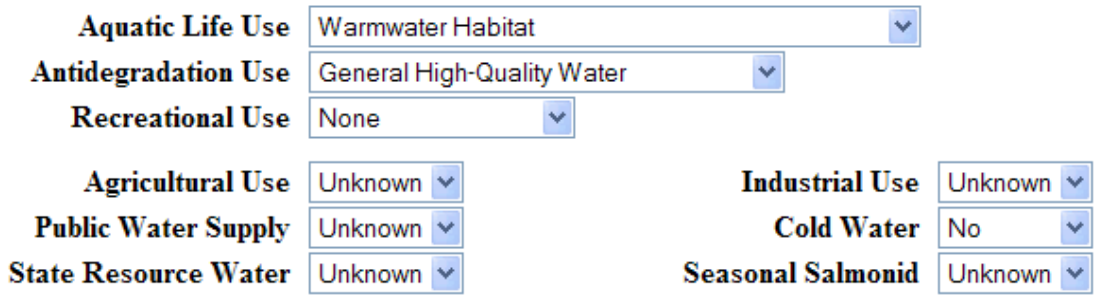
5E. Enter the Stream and Tributary codes if Dennis has assigned them, or you know them certainly from EA3 from another station on the same stream. Otherwise, leave them blank for Dennis to fill in later. Do not use historical sources for Stream or Trib codes – these can change during the basin merge-and-upload process.

5F. Select Ecoregion from the drop down list.

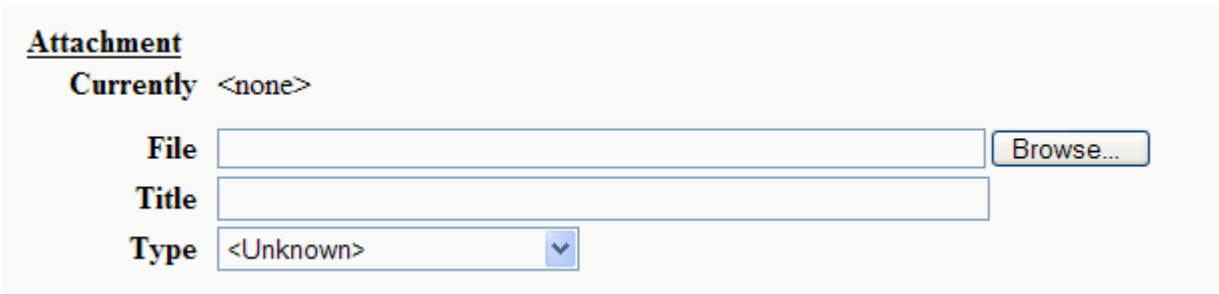
5G. ZID Relation - If the site is in a mixing zone, select "Within ZID" from the drop-down. In these cases, also be sure "mix zone" is stated in the station name so it will be clear to everyone who uses the data. If the station is not in a mixing zone, do not change the default entry for ZID Relation – "Does not apply."

Note – we are generally not using Water Depth for stream stations. It may come in handy for Lake stations…. or maybe not. We are also able to store water depth at the sample level instead of station level, and that may allow us more flexibility. Look for further discussion about this in the future.

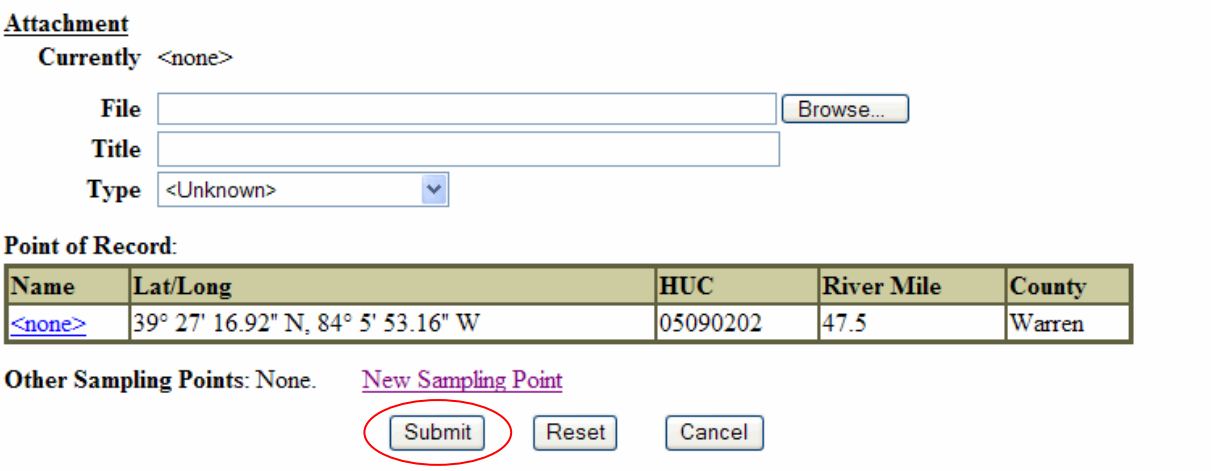
5H. Choose any stream Use Designations of which you are certain from their drop-down lists. Otherwise, do not change the defaults.



5I. Do not use the attachment section – it does not work yet.

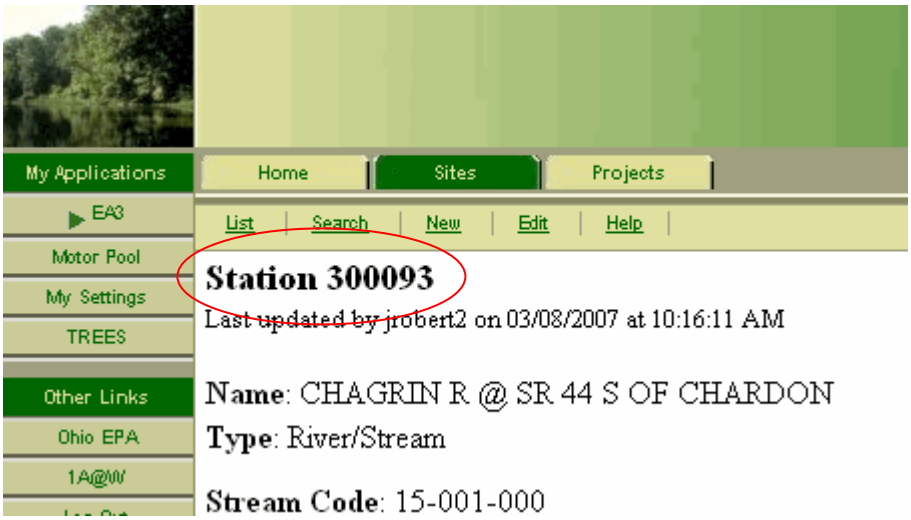


5J. If you are finished with this station, click on the Submit button at the bottom of the main page to complete the new station.



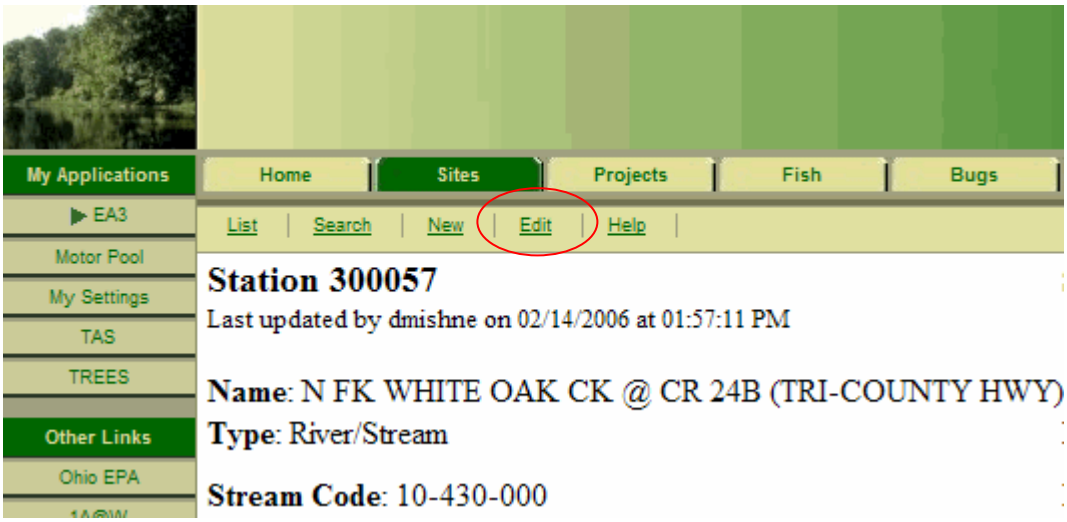
New station ID

6. The station will now have an auto-assigned ID which will be displayed on the final station screen. The ID will be a 6-digit numeric string beginning with a "3."



Editing a station

7. If you need to edit a station or add additional Sampling Points, select the "Edit" tab at the top of the screen.

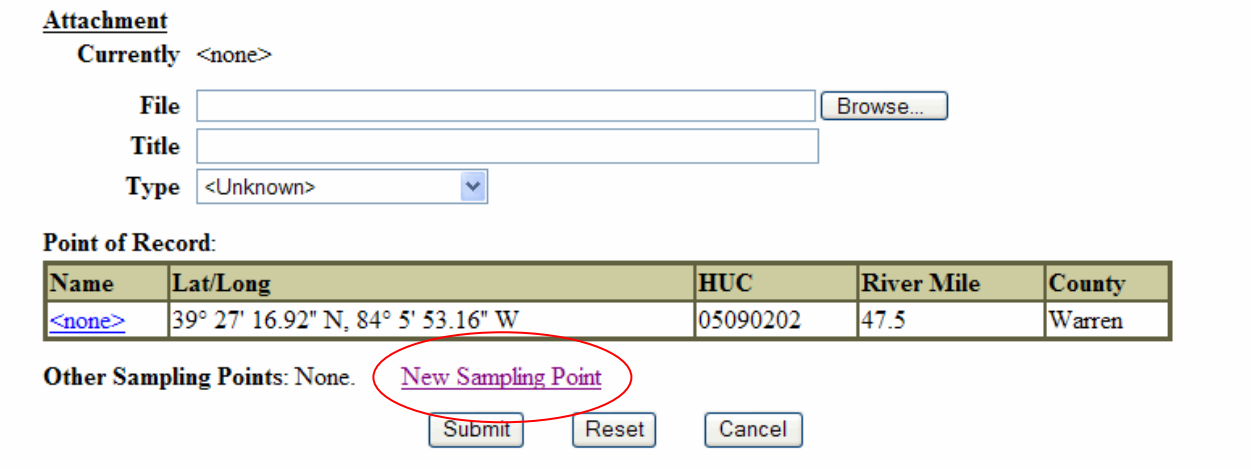


Editing fields

7A. To Edit a station, simply navigate to and edit fields as desired. BUT REMEMBER – the same rule applies to station edits as when a new station is created: you should make changes to the Point of Record or Other Sampling Points detail screens first. Click Submit to complete the detail screen edit before editing fields on the main station screen. Then click Submit at the bottom of the main station screen (even if you made changes to detail screens only and none to the main station screen) to finalize the station Edit.

Adding Sampling Locations

7B. To add another Sampling Location to a station, select the Edit tab, and then scroll to the bottom of the main screen and click on New Sampling Point.



Be sure the next screen is entitled "Creating Sampling Point for 3XXXXX." Enter lat/long, River Mile, Drainage Area if known, and lat/long metadata (Datum, Method, and Scale) as per instruction 4 above (adding the Point of Record). Click the Submit button at the bottom of the sampling point screen to create the new sampling point. And then don't forget to click the Submit button at the bottom of the main station screen to complete the station edit.