# Aquatic Habitat Characterization

See also the following sections:

###### FA 1000 Administrative Procedures

###### FC 1000 Cleaning/Decontamination Procedures

###### FD 1000 Documentation Procedures

###### FM 1000 Field Planning and Mobilization

###### FQ 1000 Field Quality Control Requirements

###### FS 1000 General Sampling Procedures

###### FT 1000 General Field Testing and Measurement

###### LD 7000 Documentation of Biological Laboratory Procedures

###### LQ 7000 Quality Control for Biological Community Analysis

###### LT 7000 Determination of Biological Indices

##### Introduction and Scope: The purpose behind habitat assessment is to collect key physical data components that can assist in interpreting biological community results. For example, if biological community health is impaired in a water body, is habitat disturbance or water quality degradation responsible?

#### Stream and River Physical/Chemical Characterization

This sampling procedure requires specific training and demonstration of competency due to the expert judgment exercised during field sampling. It is recommended that individuals conducting this procedure train with DEP staff (via workshops and/or participating in field sampling).

##### Equipment and Supplies

###### Physical/Chemical Characterization Field Sheet (FD 9000-3) or other datasheet to capture documentation required in FD 5311

###### Stream/River Habitat Sketch Sheet (FD 9000-4) or other datasheet to capture documentation required in FD 5312, or site map

###### Pencil and pen

###### Watch or stopwatch

###### Flow Meter (optional)

###### D-frame dip net or other measuring stick marked in 0.1-m increments

###### Secchi disk with at least three meters of 0.1 m sections marked on its rope

###### Tape measure (100 m)

###### Flagging tape

###### Camera (optional)

###### GPS tool (optional)

###### Multi-probe meter or separate pH, dissolved oxygen, temperature and specific conductance meters

##### Methods

##### Record sampling event information, including the WIN station number, sampling date, sampling location, field identification and receiving body of water. Much of this information can be recorded prior to field sampling. Record the time when the water quality samples are first taken or when the assessment begins. If available, use a GPS tool to identify the latitude and longitude of the sampling location and record them.

##### Measure and record values for standard water quality parameters, including temperature, pH, dissolved oxygen, specific conductance or salinity and Secchi depth (see FT 1000). Document field meter identification codes and applicable data qualifiers.

##### Measure the 100 m length of the sampling area and mark the beginning, end and each 10 meter section with flagging tape.

##### Start at the downstream end of the reach and draw a sketch of the site on the Stream/River Habitat Sketch Sheet (FD 9000-4) or other media. In your sketch, show the observable (by sight or touch) location and amount of each productive substrate type in the 100 m reach. Do not map habitats that are completely smothered by sand, silt, or algae; some smothering will still allow habitat use, but complete smothering will preclude use. Do not map leaf mats that are anaerobic. On the map, note pools in the 100 m reach and note areas of smothering. Using the grid on the map form, count the number of grid spaces for each substrate type. Divide each of these substrate numbers by the total number of grid spaces contained within the site sketch. Use the full area of the stretch for the habitat availability calculation, regardless of your ability to observe all of the habitat due to dark color or depth. Record this percent coverage value for each substrate type.

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##### Rate the potential for erosion as none, slight, moderate or heavy within the portion of the watershed that affects your site. Record this information.

##### “Local watershed pollution” refers to contamination introduced by stormwater runoff. Rate this input as none, slight, moderate or heavy and record this information.

##### When sampling a 100 m section of a river or stream, measure or estimate the width of the system, from shore to shore, at a “typical” transect. A “typical” transect is where the width/depth profile is most representative of the stream. In most cases, this will not be in deep pools or bends.

##### Take three measurements of water depth across this transect using the ruled dip net handle or ruled rope of the Secchi disk and record this information.

##### Take three measurements of water velocity (one at each of the locations where water depth was measured) using either a flow meter or the ruled dip net handle, watch/stopwatch, and a floating leaf or other floating object. For example, measure the length of time in seconds it takes for a submerged leaf or other detritus to travel 1 meter. Then, divide 1 by the number of seconds it took the leaf to travel the meter. Record this information on the data sheet.

##### Measure the vegetated riparian buffer zone width on each side of the stream, river, ; this is the distance from the edge of the water to where clearing or other human activities begin. Record the distance for the least buffered side or point of the system on FD 9000-3. If the vegetated buffer zone width for the least buffered side or point is greater than 18 m, record “>18 m.”

##### Indicate whether or not the area in the vicinity of the sampling station has been artificially channelized and to what extent the system has recovered on FD 9000-3. Options include none, some recovery, mostly recovered or recent/severe.

##### Indicate the presence or absence of impoundments in the area of the sampling station that alter the natural flow regime or the movement of biota.

##### Where applicable, estimate and record the vertical distance from the current water level to the peak overflow level. Peak overflow level is indicated by debris caught in trees or debris above the bank, floodplain vegetation, or deposition of silt or soil. (When bank overflow is rare, a high-water mark may not be apparent.) Add this distance to the current water depth (see section 2.9 above) to determine the distance of the high-water mark above the streambed and record this value.

##### Check the box for the percentage range that best describes the degree of shading in the sampling area as open, lightly shaded (11-45%), moderately shaded (46-80%) or heavily shaded (>80%). This percentage should be an integration over the entire 100 m reach.

##### Note any odors associated with the bottom sediments and check the appropriate box indicating whether odors are normal, anaerobic, chemical, petroleum or sewage. Note the presence or absence of oils in the sediment; for this step, observe the extent of sheen on the water after the substrate has been disturbed. Finally, note any deposits in the area, including the degree of smothering by sand, silt or algae. Rate the degree of smothering as none, slight, moderate or severe.

##### Indicate the type of aquatic system being sampled.

##### Note the presence and types of any noticeable water odors and check the appropriate box indicating whether odors are normal, chemical, petroleum or sewage. Note the term that best describes the relative coverage of any oil on the water surface as normal, glob, sheen or slick.

##### Based on visual observation, check the term that best describes the water clarity before it was disturbed by sampling as clear, slightly turbid, turbid or opaque.

##### Check box for the term that best describes the color of the water, indicating whether the water is tannic, green, clear or other. (If “other” is checked, indicate what the color is.)

##### Describe the weather conditions during the time of sampling, particularly the relative amount of sunshine/cloud cover, temperature, and wind speed and direction. Record any other conditions/observations that are helpful in characterizing the site, including adjacent land-uses that potentially affect water quality or habitat.

##### Estimate and record the relative abundances of the following: periphyton, fish, aquatic macrophytes and iron/sulfur bacteria. Rate the abundance as not observed, rare, common or abundant.

##### Assess the hydrologic modification characterization within the vicinity and watershed of the stream per FT 3101. This assessment includes analysis of maps and aerial photographs, as well as observations of the watershed.

##### Sign and date the records (Form FD 9000-3 or other datasheet to capture documentation required in FD 5311).

#### Lake Observation (Physical/Chemical Characterization)

This sampling procedure requires training, knowledge of aquatic systems, and awareness of the range of conditions exhibited by Florida lakes. It is recommended that individuals conducting this procedure train with DEP staff (via workshops and/or participating in field sampling).

##### Equipment and Supplies

###### Lake Observation Field Sheet (FD 9000-31) or other datasheet to capture documentation required in FD 5311

###### Aerial imagery of the site showing land use features adjacent to the lake

###### Pencil and pen

###### Binoculars to observe lakeside conditions or other features in the distance (optional)

###### Secchi disk with at least three meters of 0.1 m sections marked on its rope

###### Frotus, dredge, or other device with which to observe sediment characteristics

###### Camera (optional)

###### GPS tool (optional)

###### Multi-probe meter or separate pH, dissolved oxygen, temperature and conductivity meters

##### Methods

##### Record sampling event information, including the sampling location and WIN station number, sampling date and time, sampling team information, and survey/project. Much of this information can be recorded prior to field sampling. Record the time when the water quality samples are first taken or when the assessment begins. If available, use a GPS tool to identify the latitude and longitude of the sampling location and record them.

##### Measure and record values for standard water quality parameters, including temperature, pH, dissolved oxygen, specific conductance and Secchi depth (see FT 1000). Document field meter identification codes and applicable data qualifiers.

##### Estimate the degree of **Stormwater Inputs** by assigning a score from one to 20 based on how stormwater enters the lake. When scoring this parameter, consider best management practices (BMPs). For example, ditching with good BMPs (swales, retention areas, etc.) should score higher than ditching directly into the lake. Sheet flow over an uncultivated vegetated buffer zone is considered optimal. Some direct stormwater inputs from ditches, discharge pipes and cultivated vegetation (<10%), but with good BMPs in place is considered suboptimal. Moderate direct inputs of stormwater (11%-50%) with few BMPs in place is considered Marginal. Lastly, much direct input of stormwater (>51%) and no or ineffective BMPs in place is considered poor.

##### Estimate the degree of **Lakeside Adverse Human Alterations** by assigning a score from one to 20 based on visual observations of the entire perimeter of the lake for human-made structures such as houses and roads. Less than 10% development of the shoreline is considered optimal. If 10%-49% of the lakeside is affected, then it is considered suboptimal. If 50%-70% of the lakeside is affected, then it is considered marginal. Lastly, if more than 70% of the lakeside is affected, then it is considered poor. The greater the percentage of development, the lower the score for this category.

##### Estimate the width and quality of the **Upland Buffer Zone** by determining the width of the vegetated zone, percentage of vegetated shoreline, and whether the vegetation is native or exotic. Assign a score from one to 20. A buffer zone of >18 m of expected native vegetation is considered optimal. 89%-51% of shoreline with >18m buffer or >75% with 10m to 18m buffer is considered suboptimal. 50%-30% of shoreline with >18m buffer or 50%-74% with 10m to 18m buffer is considered marginal. Lastly, < 29% of shoreline with >18m buffer is considered poor.

##### Observe and record lakeside land use types that drain to the site, including all that potentially affect water quality.

##### Rate the potential for erosion as none, slight, moderate or heavy within the portion of the watershed that you can observe. Record this information.

##### “Local watershed pollution” refers to contamination introduced by stormwater runoff. Rate this input as none, slight, moderate or heavy and record this information.

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##### Measure total water depth using the ruled rope of the Secchi disk, verified depth sensor, or other measurement tool, and record this information.

##### Indicate whether water levels are controlled for the waterbody by dams, control structures, weirs, pumps, or other means that alter the natural water level regime.

##### Note the sediment type as organic fibrous, organic smooth, sand/silt, sandy or vegetated. Note any odors associated with the bottom sediments and check the appropriate box indicating whether odors are normal, anaerobic, chemical, petroleum or sewage. Note the presence or absence of oils in the sediment as normal, glob, sheen or slick and observe the extent of sheen on the water after the substrate has been disturbed.

##### Note the presence and types of any noticeable water odors and check the appropriate box indicating whether odors are normal, chemical, petroleum or sewage.

##### Note the term that best describes the relative coverage of any oil on the water surface as normal, glob, sheen or slick.

##### Based on visual observation, check the term that best describes the water clarity before it was disturbed by sampling as clear, slightly turbid, turbid or opaque.

##### Check box for the term that best describes the color of the water, indicating whether the water is clear, green (algae) or tannic.

##### Describe the weather conditions during the time of sampling, particularly the relative amount of sunshine/cloud cover, temperature, and wind speed and direction.

##### Record any other conditions/observations that are helpful in characterizing the site, including adjacent land-uses that potentially affect water quality or habitat.

##### Estimate and record the relative abundances of the following: periphyton/algal mat, nuisance plants, submersed plants and non-native apple snails. Rate the abundance as absent, rare, common or abundant.

##### Sign and date the records (Form FD 9000-31 or other datasheet to capture documentation required in FD 5311).

## Stream and River Habitat Assessment

This sampling procedure requires specific training and a demonstration of competency due to the expert judgment exercised during field sampling. Individuals conducting this procedure must train with trainers who are currently in “pass” status per FA 5720 (it is recommended to train with DEP staff via workshops and/or participating in field sampling). It is required that samplers complete the training (see Form FD 9000-34 Stream Habitat Assessment Training Checklist and Event Log) and testing requirements listed in FA 5720 to submit data to FDEP.

##### Equipment and Supplies

###### Completed Physical/Chemical Characterization Field Sheet (FD 9000-3) or other datasheet to capture documentation required in FD 5211; see FT 3001, section 2

###### Completed Stream/River Habitat Sketch Sheet (FD 9000-4) or other datasheet to capture documentation required in FD 5312; see FT 3001, section 2.4

###### Stream/River Habitat Assessment Field Sheet (required DEP Form FD 9000-5)

###### Pen or pencil

###### D-frame dip net or other measuring stick marked in 0.1-m increments

##### Methods

##### Fill in the information requested at the top of the Stream/River Habitat Assessment Field Sheet (FD 9000-5), including the WIN station number, sampling date, sampling location, field identification and receiving body of water. Record the time of sampling as described in FT 3001, section 2.1.

##### Follow the criteria given on the data sheet (FD 9000-5) within each category to determine the appropriate score for that category.

##### Score the **Substrate Diversity** by evaluating the number of different kinds of productive substrates present. Refer to the documentation obtained from conducting the Physical/Chemical Characterization per FT 3001. The following substrates are considered productive: snags (woody debris or logs larger than thumb diameter); roots (less than thumb diameter, with finer roots usually being more productive); aquatic vegetation (in contact with the water); leaf packs/mats in association with flow (leaves must be partially decomposed rather than freshly fallen to be good habitat; leaf mats at the bottom may be productive if sufficient oxygen is present, but anaerobic leaf mats are not considered productive habitat); rocky substrate (usually limestone outcrops or rocks with diameters greater than 5 cm). Sample submersed aquatic mosses (e.g., *Fontinalis*) as aquatic vegetation if the predominant length is 15 cm or greater (approximately the length of your hand). If the moss is shorter and more mat-like, it should be included as part of the substrate to which it is attached (typically snag). A minimum occurrence of two square meters of a particular substrate (habitat) in the reach is necessary to count that habitat as being “major;” those productive habitats with less than two square meters shall be considered “minor.” Once the number of major habitats has been determined, assign a score for substrate diversity in the appropriate category on the sheet. The quality of the substrates present should then be given consideration in the scoring process. For example, partially decomposed leaf packs and “old” snags are better than fresh substrates and should be given higher scores within the same category. See SOP SCI 1100 for more descriptions of habitat quality and selection.

##### **Substrate Availability** is the relative spatial abundance of major productive habitats present. Refer to documentation obtained from completing FD 9000-4, the Stream/River Habitat Assessment Sketch Sheet. A minimum occurrence of two square meters of a particular substrate in the reach is necessary to count that substrate as being “major.” Include only major productive habitats in the scoring process, even if your map included productive habitats that had less than two square meters coverage. Score substrate availability on the data sheet based on the sum of the percentages of major productive habitats in the stream reach.

##### Using the ranges given on the data sheet (FD 9000-5), assign a **Water Velocity** score based on the maximum velocity observed at the typical cross-section of stream or river as determined during the Physical/Chemical Characterization (FT 3001 section 2.10). Avoid areas immediately before or after snags or other material that restrict or enhance the velocity unless this is typical of the 100 meter reach. Note that in the majority of Florida streams, velocities over 1 m/s are considered unusually high, and should be included in the “poor” category. An exception to this policy would be in narrow or shallow areas of streams with natural limestone bottoms, where velocities approaching 1 m/s may be normal and, thus, would be scored in the “optimal” category. Velocities 0.33 m/s or greater but less than 1 m/s shall receive a 20.

##### The **Habitat Smothering** parameter is an assessment of sand, silt, and/or algal deposition onto what would otherwise be productive habitats. Scoring is a two-step process. Assign a habitat smothering score as determined by the following two steps:

##### First, determine if adequate stable pools are present. For large, wide rivers it may be more appropriate to base the estimate on the actual amount of smothering on the habitats rather than the number of pools. A pool is defined as an area where the depth is at least 2 times the prevailing depth and is expected to maintain that depth during variable water levels. A pool formed by a scouring during a high energy rain event would not be considered a stable pool. Figure showing cross section of a stream with the prevailing depth and a pool which is 2 times the prevailing depth.

##### A natural system should have 1 to 2 pools every 12 times the width of the stream. For example, a 3 meter wide stream should have at least 1 pool every 36 meters or a total of 3-6 pools per 100 meter reach (100m/36m = 2.8 segments). If there are no stable pools (i.e., the stream depth is nearly the same throughout the 100m reach), assign the score in the “poor” category. If there are minimal (less than 1 pool every 12 times the width) or shallow pools (a shallow pool is any pool where the depth is much less than 2 times the prevailing depth), score the stream in the “marginal” category.

##### Cross section of stream identifying shallow pool and prevailing depth. A pool is defined as an area where the depth is at least 2 times the prevailing depth and is expected to maintain that depth through rain events.

##### Pools should occur on the outside of curves in the stream and on the downstream side of large, woody debris. A score in the “suboptimal” or “optimal” categories should be assigned to a stream with adequate pools based on the percent smothering as described in 2.6.2 below.

##### Second, check for deposition of sand, silt, or excessive growth of algae on visible habitats. While a light dusting of sand or silt and some algal growth is normal, excessively thick coatings will reduce habitability of the substrate. Smothering on visible habitats is indicated if sand, silt, or algae is present on a substrate in an amount greater than typically expected (3-6 mm). Other signs of habitat smothering include recently buried habitats (discovered by probing substrate), excessively shifting sand, or a substantial silt turbidity plume from agitating the substrate. Determine a percentage value for habitats that are not habitable due to sand and/or silt and/or algal smothering. If less than 25% of habitats are smothered and adequate stable pools are present, score in the optimal category, and score in the suboptimal if more than 25% of habitats are smothered, for any kind of smothering (including algal). If there is a high degree (> 50%) of algal smothering but adequate stable pools are present, score in the suboptimal, and use the rapid periphyton survey (DEP SOP FS 7230) for further investigation of algal coverage.

##### Add the scores for the primary habitat components (see sections 2.3-2.6 above) and record this primary score on the form. The primary habitat components refer to in-stream features.

##### Observe whether or not the reach of stream or river in the sampling area is artificially channelized. Assign a score for **Artificial Channelization** using the following guide:

##### Poor- A highly physically altered system with ALL of the following; straightened stream channel (there may be human engineered “bends” but not natural sinuosity), a trapezoidal or box-cut cross-section, and a lack of the required pools as described in 2.6 above (generally a monotypic depth). Spoil banks or other indications of dredging may be visible.

##### Marginal- A physically altered, channelized system with a trapezoidal cross section, but with either a small degree of sinuosity, often developed within the old dredged area. Spoil banks may be visible.

##### Suboptimal- Good sinuosity has developed within and outside of the old channelized area. Spoil banks may be visible, but generally have established vegetation growing on them.

##### Optimal- A system with expected stream channel sinuosity given the width and slope of the stream; a stream should have as many bends as pools, as described in 2.6.1, unless the pools were formed solely by scouring behind trees or snags. No evidence of dredging or artificial straightening.

##### Refer to FD 9000-4 for areas along the bank that have eroded or have the potential for bank sloughing. Score artificially stable banks such as concrete based on the stability of the bank , not according to natural vs. artificial stability. Determine the extent of erosion potential for the site and assign a **Bank Stability** score for each bank (The “left bank” is on your left when you are looking upstream).

##### First, determine where “bankfull” is in relation to the height of each bank. Bankfull is defined as the stage at which channel maintenance is most effective and occurs on average every 1-2 years. For most natural Florida streams, bankfull is the height of the lowest bank, where the stream is connected to the floodplain. For stream sites with a wetland floodplain, bankfull is usually the elevation of the flat floodplain. For stream sites with an upland floodplain, bankfull is usually the first inflection point on the bank.

##### Cross section of stream identifying bankfull in relation to the height of each bank. Bankfull is defined as the stage at which channel maintenance is most effective and occurs on average every 1-2 years. For most natural Florida streams, bankfull is the height of the lowest bank, where the stream is connected to the floodplain.

##### Other indicators of bankfull (especially in larger systems) are the tops of point bars, staining and vegetation lines. If the substrate at bankfull is limestone, pipe clay or concrete, then automatically score the bank in the “optimal” category and skip 2.9.2 and 2.9.3 below. Ideally, bankfull should be greater than 60% of the bank height or above the woody root zone. If this is the case, the bank gets a “plus” for this subcomponent. Otherwise, bankfull is less than 60% of bank height and below the woody root zone and it should receive a “minus.”

##### Second, determine the slope of the portion of bank above bankfull. The more gentle the slope the more stable the bank. Score a bank with a slope less than 60° with a plus for this subcomponent. A bank with a slope of greater than 60° warrants a minus.

##### Third, determine if bankfull is above or below the root zone. If bankfull is above the root zone and there are few raw or eroded areas, score this subcomponent a plus. Otherwise, score it a minus. Woody vegetation/roots are more stable than herbaceous and should be scored accordingly.

##### Lastly, count up the number of pluses from each subcomponent (a total of 3 possible) and score within each category as described below:

##### Poor- 0 pluses

##### Marginal- 1 plus

##### Suboptimal- 2 pluses

##### Optimal- 3 pluses

##### Assign a score for the **Riparian Buffer Zone Width** that best characterizes the width of vegetation on each side of the channel. This zone is measured from the edge of the stream bank to where clearing or other adverse human activity begins. Take into account the intensity of the disturbance, natural or anthropogenic, and score accordingly. For example, a footpath that runs along one bank for 20 meters is a less intense interruption of the buffer zone than a paved road that runs along the same 20 meter stretch. A native vegetated buffer zone of greater than 18 m (approximately 60 feet) is considered optimal. A riparian zone that is vegetated but regularly maintained or disturbed is considered poor.

##### Identify the plants in the riparian zone, (up to 18 m adjacent to the stream, with emphasis on the area immediately adjacent to the stream), determining the extent of coverage and whether the vegetation is native or nonnative. Look for the expected intact plant community structure: canopy trees, understory shrubs, and herbaceous macrophytes, but keep in mind that there is variation in degree of openness, or the presence of all layers, depending on the natural community type. Mesic flatwoods, for example, may have a very open canopy of pines, and a low but dense saw palmetto and/or wiregrass layer. An alluvial hardwood forest, however, may have a closed canopy of deciduous hardwoods and very little understory. Assign a **Riparian Zone Vegetation Quality** score based on the classes of plants present, the degree of bank vegetative cover, and how closely the plant community at the site approaches that of an undisturbed community in the region. If there is obvious riparian disruption by nonnative animals, humans, or natural disasters (e.g. hurricanes), these disturbances should be considered during the scoring process.

##### Add the scores for the secondary habitat components (see sections 2.8-2.11) and record this secondary score on the form. The secondary habitat components refer to morphological and riparian zone features.

##### Add the primary score (see section 2.7) and the secondary score (see section 2.12) to get the habitat assessment total score. Record the habitat assessment total score on the form.

##### Sign and date the form (FD 9000-5).

##### *Hydrologic Modification Characterization*

##### Assess the hydrologic modification within the vicinity and watershed of the stream. This assessment may include analysis of maps and aerial photographs, and general field observations of the watershed. This method is intended to be a rapid characterization of the degree of hydrologic modification to a stream.

##### Equipment and Supplies

###### Recent aerial photographs of region of interest.

###### Maps of region of interest, that include waterways, consumptive use wells, impervious surfaces, if available.

##### Methods

##### Using maps, estimate the watershed extent for the site of interest, i.e., land that feeds that point on that stream.

##### Examine aerial photographs and maps for evidence of draining and ditching, and note the location of these areas. Make observations of ditches and potential impacts of draining while at the site or traveling within the watershed.

##### Note any water control structures present within the watershed; these structures may control flow in ditches or canals, or for impoundments. In a natural unimpacted system, water would enter streams directly from wetlands or floodplains within the watershed, and that flow would occur over time as the ground becomes saturated and water flows over land. Ditching within a watershed causes faster and more targeted delivery of water, while impoundment will prevent the flow of water downstream.

##### Using the most recent available aerial photographs or land use coverages, estimate the percent of impervious surfaces in the watershed. Impervious surfaces include roads, paths, parking lots, and roofs. Commercial, residential, transportation, and industrial land uses typically have a high percentage of impervious surfaces. A higher percentage of impervious surfaces causes greater “spikes” in the hydrograph, especially in the absence of best management practices such as wide stream buffers. A low percentage of impervious surfaces leads to more water percolating through the soil rather than running directly to the stream.

##### If known, estimate the degree of water withdrawals (consumptive use) in the area reduce water to the stream. Consumptive use can be for residential, industrial, or agricultural use, and impacts of water withdrawals on a stream may be seasonal. Using aerials or observations made while traveling to the site, note t

##### 2.6 At the site, look for evidence of high water levels, scouring, and base flow (typical water level).. If water level information is available for the site, examine measured hydrographs that show recovery from rain events. The figures below show how the same rain event could affect the hydrograph for a watershed with no ditching and few impervious surfaces, and for a watershed with a high degree of ditching and impervious surfaces.

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##### Based on the considerations in Section 2, assign a hydrologic modification score using the following categories. Record the score.

##### Best (1-2 points): Flow regime as naturally occurs (slow and fairly continual release of water after rains), little to no impervious surface in watershed (<5%), high connectivity with ground water and surface features delivering water (e.g., sand hills, wetlands; no ditches, berms, other impediments).

##### Minimal Disturbance (3-4 points): Flow regime minimally changed; hydrograph resembles normal hydrologic curve; minimal water withdrawal; minimal wetland drainage, minimal ditching, minimal number of impoundment; small amount of impervious surface in watershed (5-<10%).

##### Moderately altered (5-6 points): Flow regime moderately altered; hydrograph moderately flashy (scouring after rain events with subsequent reductions in flow); groundwater pumping evident; moderate amount of wetland drainage, topographic alterations reduce natural water input; Impervious surfaces 10-<20% in the watershed, dams/control structures change normal water delivery schedule.

##### Poor (7-8 points): Flow regime highly altered; hydrograph very flashy (scouring after rain events with subsequent reductions in flow, leading to stagnant or dry conditions, related to large amount of impervious surface and/or ditching throughout watershed); water withdrawals & impoundments/control structures severely alter flows, Impervious surface (20-<30%).

##### Very Poor (9-10 points): Flow regime entirely human controlled; hydrograph very flashy (scouring after rain events with subsequent reductions in flow, leading to stagnant or dry conditions, related to impervious surfaces and ditching throughout entire watershed); water withdrawals and impoundments fundamentally alter the nature of the ecosystem; impervious surfaces ≥ 30%.

## Lake Habitat Assessment

This sampling procedure requires training, knowledge of aquatic systems, and awareness of the range of conditions exhibited by Florida lakes. It is recommended that individuals conducting this procedure should train with DEP staff (via workshops and/or participating in field sampling).

##### Equipment and Supplies

###### Completed Lake Observation Field Sheet (FD 9000-31) or other datasheet to capture documentation required in FD ; see FT 3002

###### Lake Habitat Assessment Field Sheet (required DEP Form FD 9000-6)

###### Pen

###### Identification keys for aquatic plants

###### Lake map

###### Frotus

###### Petite Ponar or Ekman dredge

###### Plastic bucket

###### Water color standard (20 PCU) in a clear plastic or Teflon bottle

###### Clear plastic or Teflon sample bottles (for water color comparisons)

Secchi Disk

##### Methods

##### Before going into the field, obtain a map of the sampling lake that shows surrounding land use and key hydrologic features.

##### Complete the information requested at the top of the Lake Habitat Assessment Field Sheet (FD 9000-6), including the WIN station number, sampling date, sampling location, field identification, county, and lake size.

##### At the site, make a preliminary survey of the lake to become familiar with features of the shoreline and lake corresponding to the lake map. Mark features observed.

##### Check the box that most adequately describes the **Hydrology** (water residence time) of the system. Lakes characterized by long water residence times and no surface water inflow or outflow are isolated systems dominated by rain events and groundwater seepage. Lakes with some flow or moderate to long water residence times have some surface water inputs but rarely have surface water discharges. Flow-through lakes are characterized by short water residence times.

##### Mark the box that accurately describes the **Color** of the lake. Very clear and moderately colored lakes may be sampled for benthic macroinvertebrates (see FS 7460). Dark and extremely dark lakes may not be appropriate for lake macroinvertebrate sampling. Dark lakes are defined as having a color greater than 20 PCU; make a visual comparison using a 20 PCU standard and a sample of lake water. Alternatively, retrieve recent color data for the lake before the field visit and check the appropriate box.

##### Score the Secchi depth based on DEOP SOP FT 1700. Disk visible on bottom (VOB) gets a score of 20.

##### To score the **Vegetation Quality**, survey each section of the lake and identify the major submerged and emergent vegetation. Note the dominant species. Lakes with less than 5% areal coverage of nuisance vegetation score in the optimal category. Lakes with 6%-20% nuisance vegetation or more than 50% of the surface covered with native, emergent macrophytes score in the suboptimal range. If the maximum depth of the “lake” is two meters or less and the macrophyte coverage is >50%, evaluate the site using wetland methods. The marginal category for this parameter is characterized by lakes with large masses (21%-40%) of nuisance macrophytes (*Hydrilla*, hyacinth, cattail, duckweed, etc.) or algal mats. Lakes rating in the poor category for this parameter have either >40% nuisance vegetation (macrophytes and/or algal mats) or few plants present indicating plant removal.

##### For the **Stormwater Inputs** category, assign an appropriate score based on how stormwater enters the lake. Sheet flow over an uncultivated vegetated buffer zone is considered optimal. Ditches, discharge pipes and streams are other sources for stormwater input. When scoring this parameter, consider best management practices (BMPs). For example, ditching with good BMPs (swales, retention areas, etc.) should score higher than ditching directly into the lake.

##### To determine **Bottom Substrate Quality**, use a Petite Ponar or Ekman dredge to collect bottom samples from at least four separate locations on the lake. Score the lake based on the predominant substrate. A substrate dominated by sand with small amounts of detritus and coarse particulate organic matter (CPOM) is considered optimal. Submerged aquatic vegetation (SAV) may be present as well. Higher percentages of CPOM, hard-packed sand, algae or nuisance macrophytes covering the bottom are lower quality substrates. Thick deposits of fine detritus or anaerobic mud/muck are considered poor.

##### To determine **Lakeside Adverse Human Alterations**, visually scan the entire perimeter of the lake for human-made structures such as houses and roads. Less than 10% development of the shoreline is considered optimal. The greater the percentage of development, the lower the score for this category.

##### Identify plants in the **Buffer Zone**, determining the width of the vegetated zone, percentage of vegetated shoreline, and whether the vegetation is native or nonnative. A buffer zone of >18 m is considered optimal.

##### To determine **Adverse Watershed Land Use**, score the potential effects from adverse human land uses based on a continuum of amounts, density and type as listed on the form.

##### Add the scores from each assessment parameter and record the sum. This value is the site’s habitat assessment total score.

##### Sign and date the form (FD 9000-6).

## Wetland Habitat Assessment, (Reserved)

## FT 3400. Estuary Habitat Assessment, (Reserved)