UPPER PEACE RIVER
SYSTEM FOR ENVIRONMENTAL FLOWS (SEFA)
FIELD WORK PLAN
TWA NO: 20TW0003469

PREPARED FOR:

Southwest Florida Water Management District

PREPARED BY:

HSW

1. INTRODUCTION

The Southwest Florida Water Management District (SWFWMD) is required to establish minimum flows and levels (MFLs) for surface waterbodies to protect the water resources and ecology of the region. The Upper Peace River, which flows through Hardee and Polk counties, is scheduled for MFLs development by 2025. This report briefs the field data collection activities required for using the System for Environmental Flows (SEFA) modeling approach to develop MFLs for the Upper Peace River.

The Field Work Plan includes the following components:

- Selected sites
- Identification of three seasonal periods of low, medium, and high flow using flow statistics that will be targeted for data collection
- Site access
- Project team contact information
- Data collection methods, Standard Operating Protocols (SOPs), and Data Quality Assurance (QA) procedures
- Equipment list
- Field form template for field data collection

1.1 Project Team and Roles

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1.2 Study Area

The SEFA data collection on the Upper Peace River will focus on the river reach between two USGS stream gauges (02294650 at Bartow and 02295637 at Zolfo Springs) (Figure 1). Two other gauges (02294898 at Ft. Meade and 02295194 at Bowling Green) are located between Bartow and Zolfo Springs gauges. In this study, the reach is divided into three sections (02294650 at Bartow to 02294898 at Ft. Meade, 02294898 at Ft. Meade to 02295194 at Bowling Green, 02295194 at Bowling Green to 02295637 at Zolfo Springs). Three sections were selected for data collection within each river section (Figure 1) and are described further in Section 2. The site maps for the selected sites are included in Attachment B.

1.3 Target Flows

The objective of the SEFA data collection effort is to collect the physical habitat data (depth, velocity, and substrate/cover) used for habitat modeling. Data are collected during three different flow conditions (low, medium, and high) and used for model calibration over a range of flows. The approximate flow ranges targeted for data collection are based on the tentative Block 1 (low), Block 2 (medium) and Block 3 (high) flow ranges provided by the District at the four USGS gauges (Table 1).

Table 1. Target flow ranges at gauges on the Upper Peace River based on historical flow records*.

Flow Description	Flow Non-Exceedance	02294650 Bartow Flow Target (cfs)	02294898 Ft. Meade Flow Target (cfs)	02295194 Bowling Green Flow Target (cfs)	02295637 Zolfo Springs Flow Target (cfs)
Low	25%	≤ 34	≤ 42	≤ 76	≤ 146
Medium	25% - 50%	34-85	42-106	76-183	146-285
High	50% -100%	85-4,010	106-2,450	183-5,530	285-10,300

* The target flow ranges for the Bowling Green gage were based on a period of record from 2010 through 2020 while for the other three were based on a period of record from 1975 through 2020.

Based on the flow-duration hydrographs that show current flow relative to historical flow near Bartow and Zolfo Springs, low flows are typically observed during May and June, high flows during August - October and medium flows during the remaining months (Figure 2).

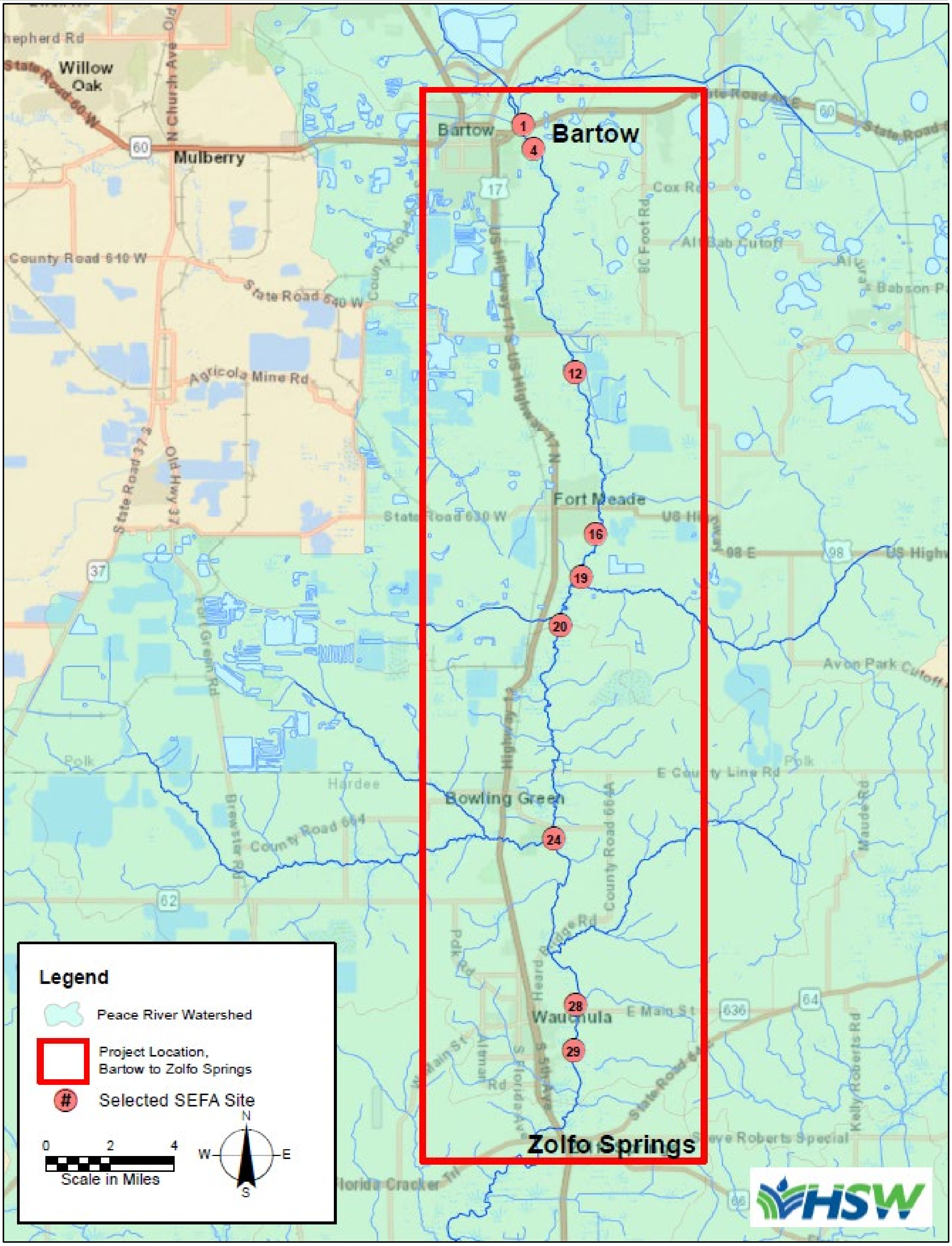


Figure 1. Upper Peace River Project Location Map

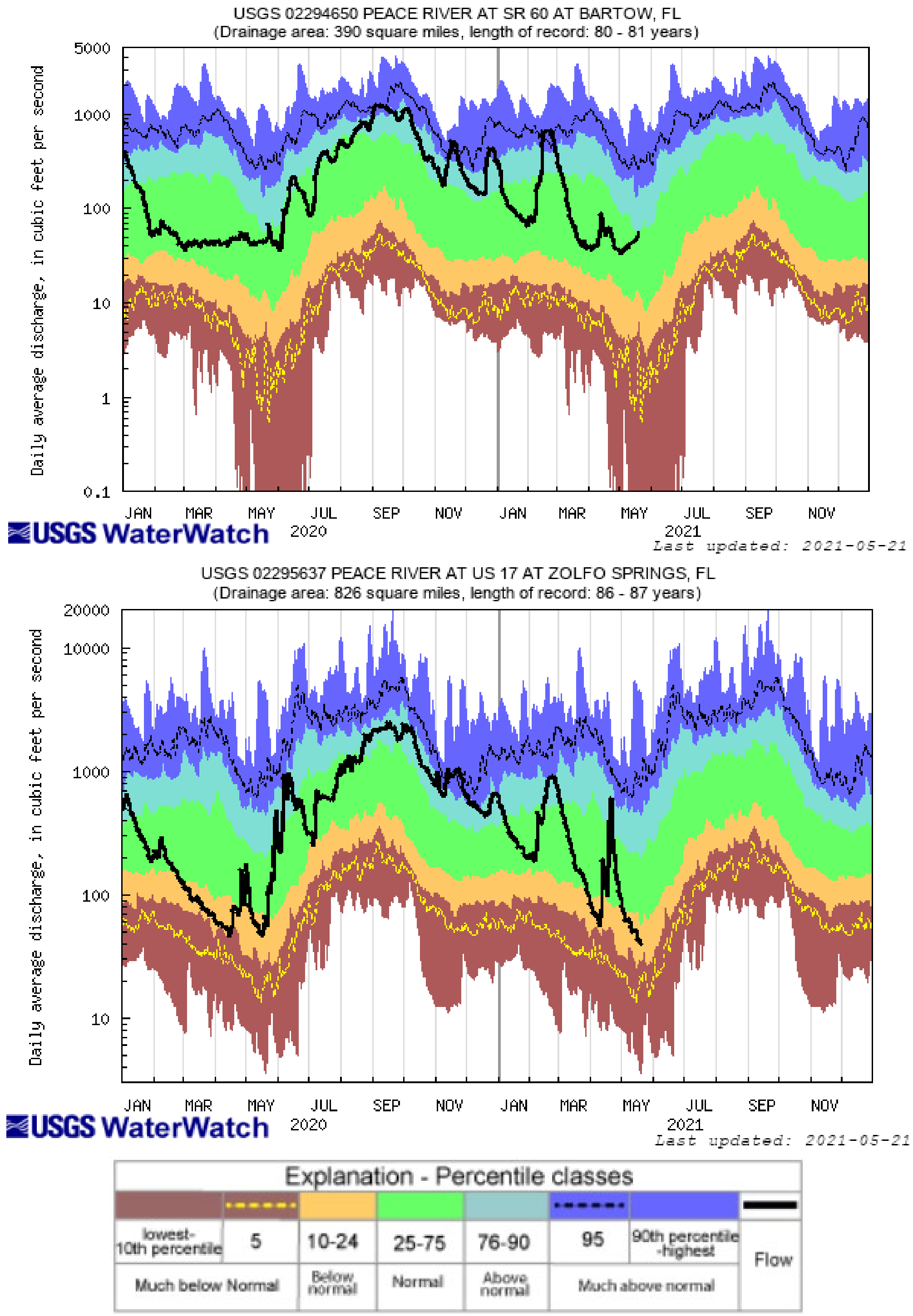


Figure 2. Flow-Duration Hydrographs for the Upper Peace River at Bartow (top) and Zolfo Springs (bottom)

2. SELECTED SEFA SITE LOCATIONS

To the extent possible, site selection was conducted in accordance with the criteria described in SWFWMD guidance (Hood, 2006). These are guidelines, and each site may not have the full set of these ideal criteria. These criteria are:

- Representative of the river reach for which MFLs are to be developed
- Reasonable accessibility
- Located between USGS river gauging stations
- Sites should show no evidence of braiding during high flow
- Sites should typically include a pool and a run upstream of a shoal
- Sites, if possible, should not include significant bends in the river channel

Most of the Upper Peace River study reach is in conservation land owned and managed by the State of Florida. Some sections of the study area overlap boundaries with private landowners. Property owners were contacted to gain access where possible.

Reconnaissance of the Upper Peace River was conducted during high flows in February 2021 and during low flows in April 2021. The selected locations for SEFA data collection (Table 2) are representative of the sections of the Upper Peace River between the four USGS gauges in the study area.

Table 2. Selected SEFA Data Collection Sites.

Site No.	Selected Site	Latitude/Longitude
*Bartow to Ft. Meade (*Figure 3*)*		
1	Site 1	27.899072/-81.81572
2	Site 4 (Bartow PHAB)	27.894444/-81.811028
3	Site 12	27.805658/-81.791195
*Ft. Meade to Bowling Green (*Figure *7)*		
4	Site 16	27.741000/-81.783083
5	Site 19 (Ft. Meade PHAB)	27.723779/-81.789653
6	Site 20	27.704472/-81.798972
*Bowling Green to Zolfo Springs (*Figure *11)*		
7	Site 24 (Bowling Green PHAB)	27.619555/-81.801789
8	Site 28	27.55351 /-81.79206
9	Site 29 (O’Neill PHAB)	27.535078/-81.792942

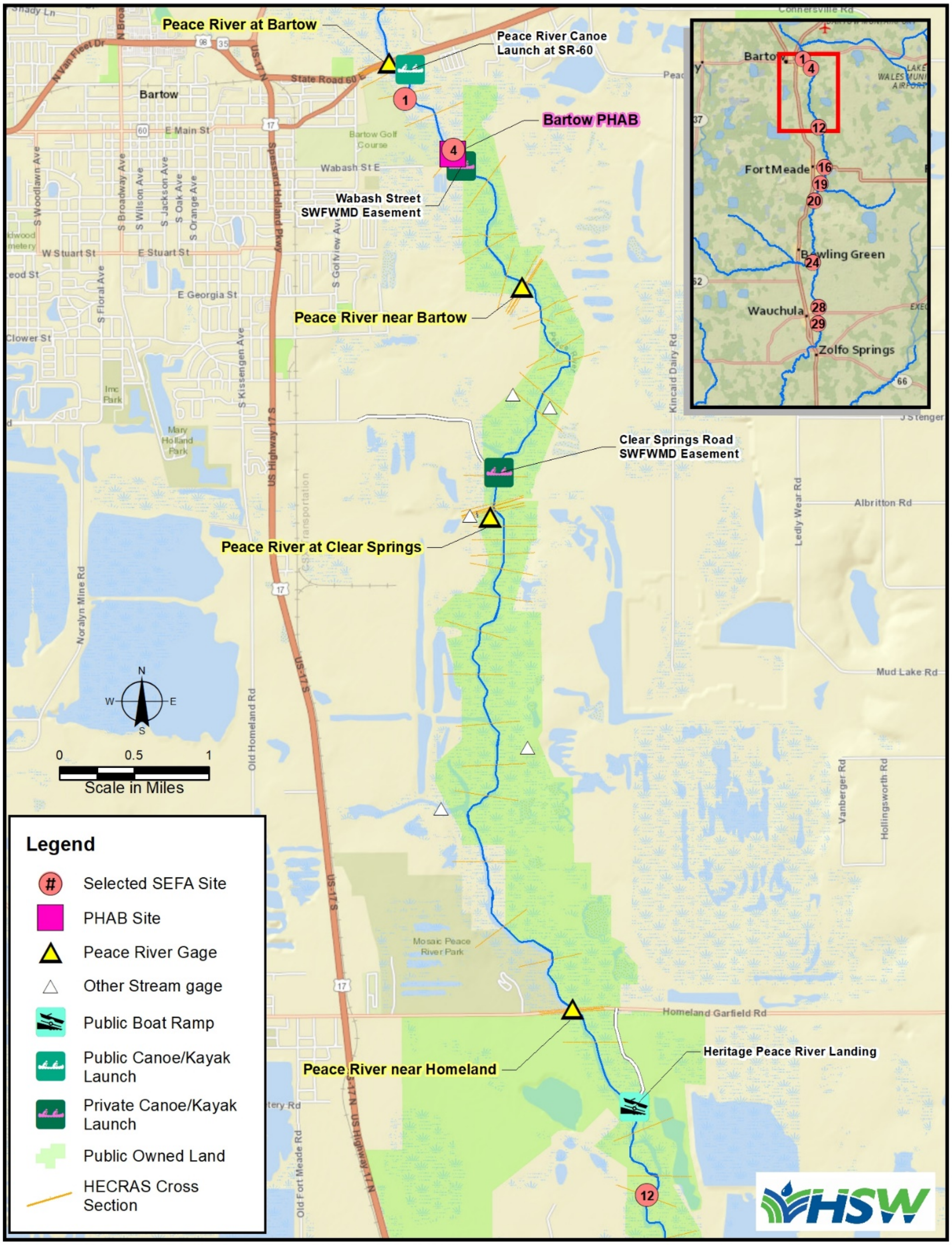


Figure 3. Section 1 – Bartow to Ft. Meade

2.1 Section 1: Bartow to Ft. Meade

Three sites (Site 1, Site 4, and Site 12) were selected within the Bartow to Ft. Meade section (Figure 3).

2.1.1 Section 1: Site 1

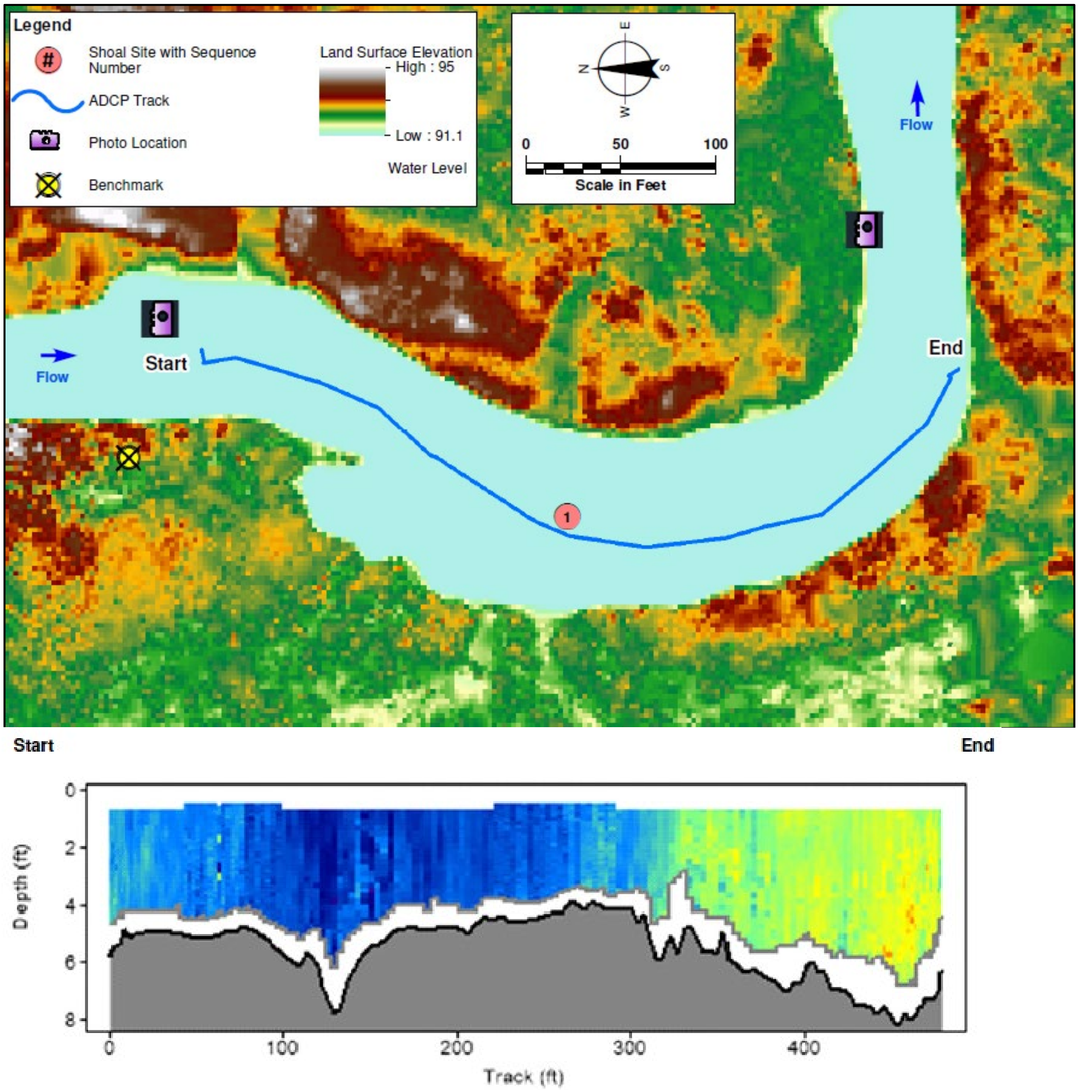


Figure 4. Site 1 plan view and bathymetry

Site Description: Site 1 is in a narrow section of the river with a shoal located near a bend (Figure 4). There is a pool area downstream of the shoal. The site has sand substrate with some cover near the banks. XS 136:Dist_178 (27.899713, -81.815622) is the nearest benchmark and is located on the right bank about 235 ft upstream of the site (Appendix B).

Access: Site 1 is located about 0.3 miles downstream of the Peace River canoe launch at SR 60 and is accessible by kayak from the Peace River canoe launch during all flow conditions. State owned properties are present on both sides of the site.

2.1.2 Section 1: Site 4 (Bartow PHAB)

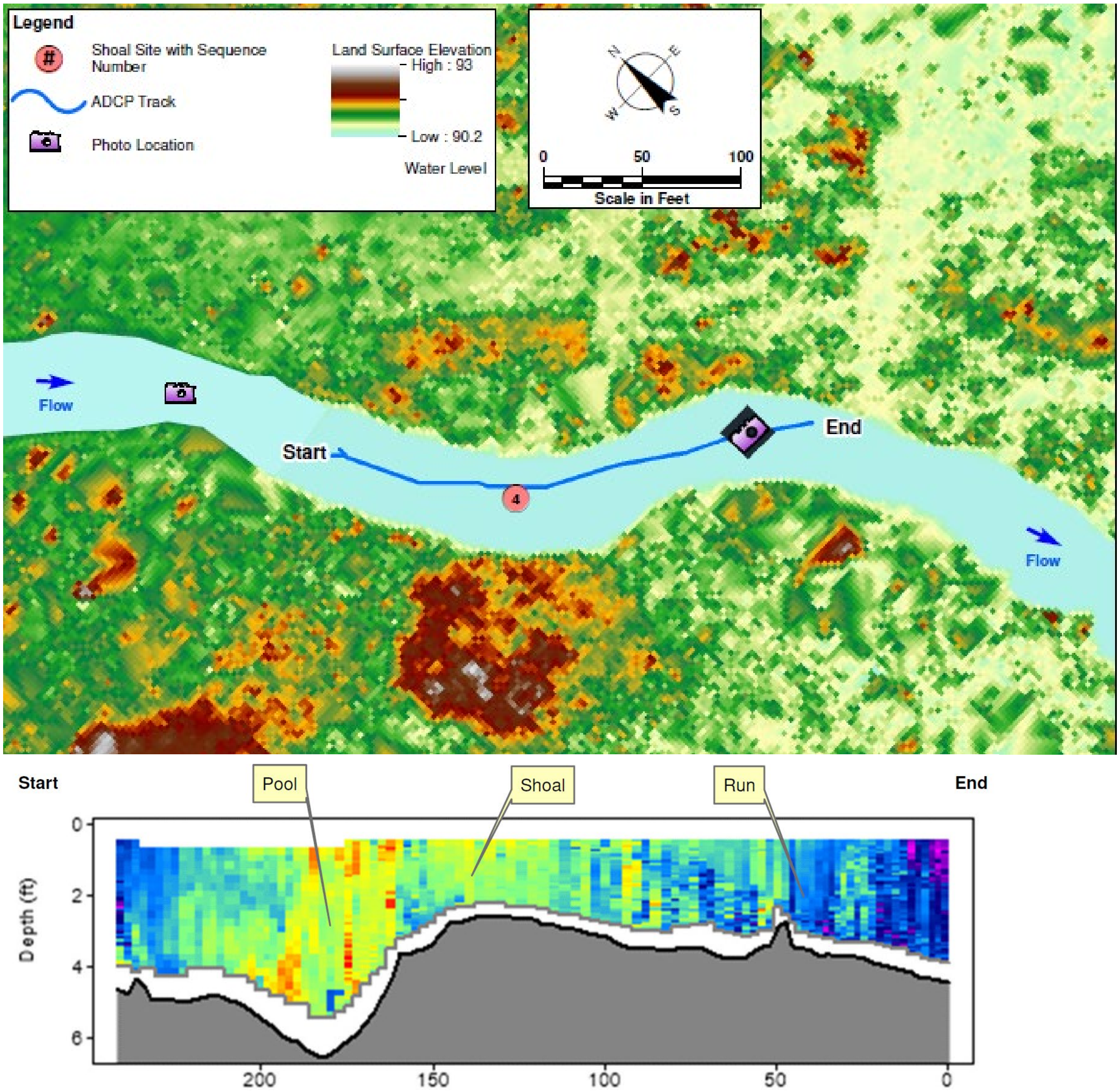


Figure 5. Site 4 (Bartow PHAB) plan view and bathymetry

Site Description: Site 4 is in a narrow section of the river with a shoal located downstream of the pool area. The site has sand substrate with some cover near the banks. The site has a well defined sandy shoal and an upstream pool area. XS 135:Dist_492 (27.897395, -81.812535) is the nearest benchmark and is located on the left bank about 1,235 ft upstream of the site (Appendix B).

Access: Site 4 is located about 0.9 miles downstream of the Peace River canoe launch at SR 60 and is accessible by kayak from the Peace River canoe launch during all flow conditions. City of Bartow owned properties are present on both sides of the site.

2.1.3 Section 1: Site 12

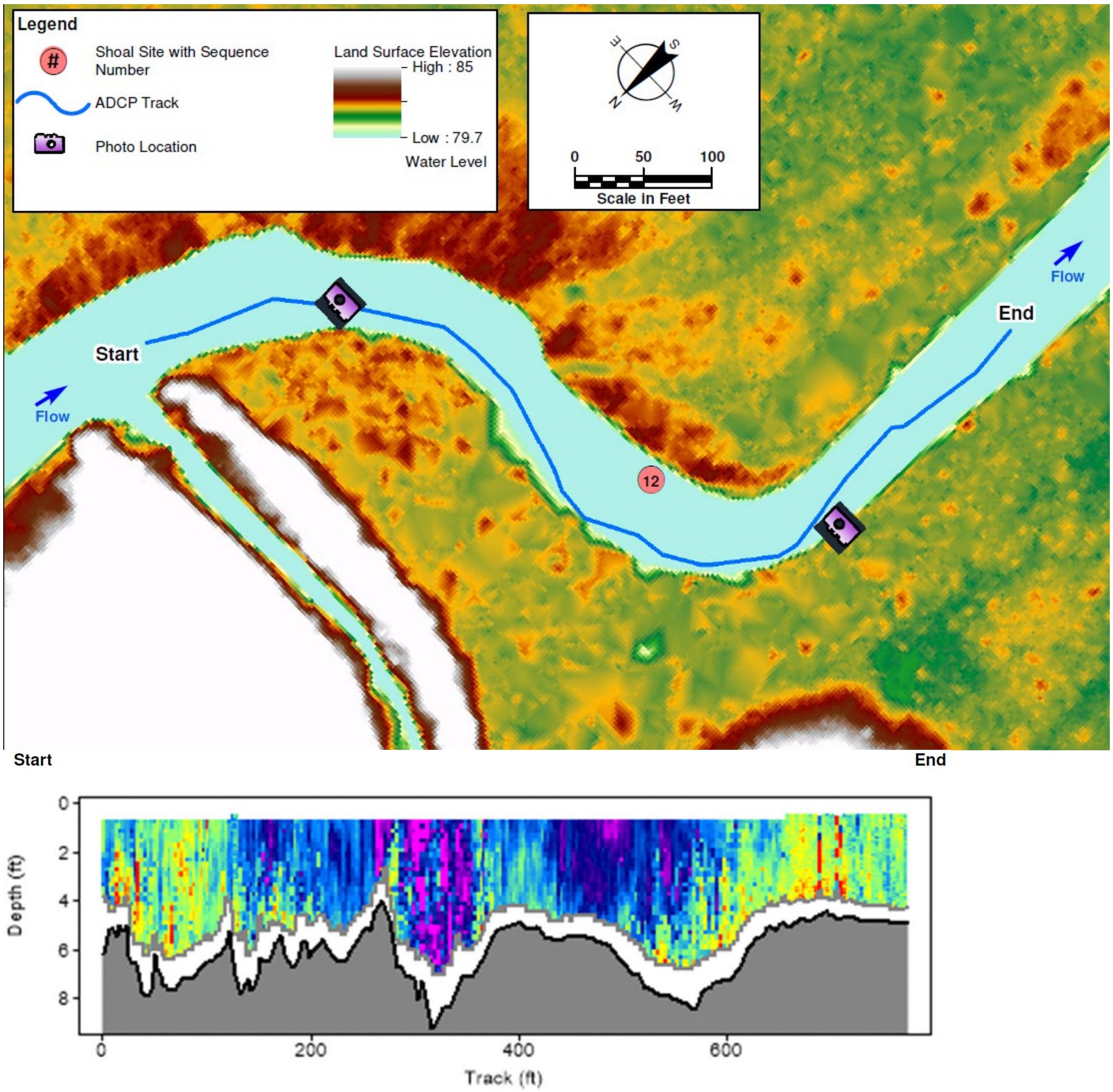
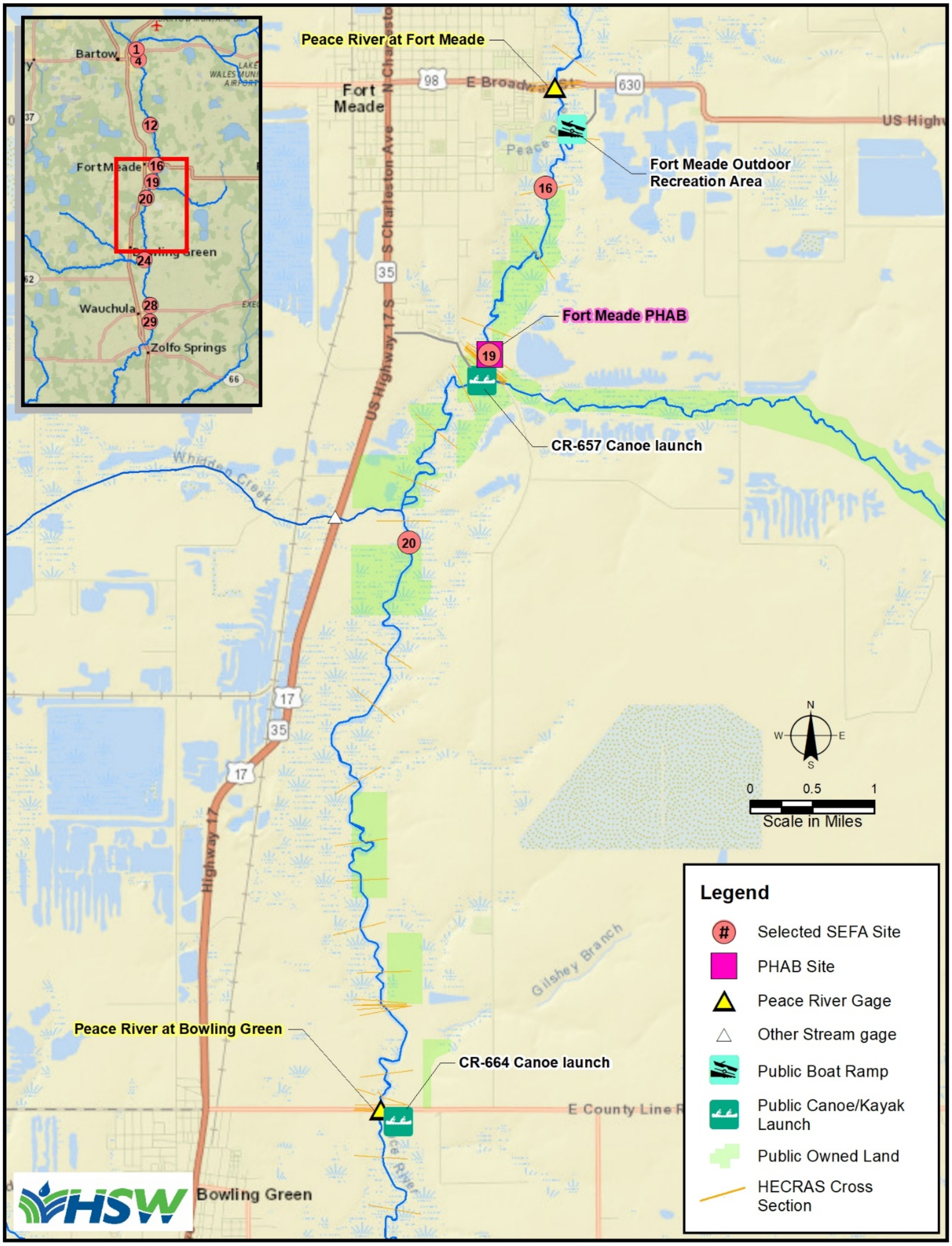


Figure 6. Site 12 plan view and bathymetry

Site Description: Site 12 is in a relatively wide section of the river (~50 feet). The site has relatively high banks and well-defined moderate floodplain slopes. The mesohabitats are not well-defined but a pool area (depth about 8 ft) was observed during field recon. The site has sand substrate with cover across the transect. XS 93:USGS_436 (27.806771, -81.790841) is the nearest benchmark and is located on the left bank about 420 ft upstream of the site (Appendix B).

Access: Site 12 is located about 0.6 miles downstream of the Heritage Peace River boat ramp and is accessible by kayak from the Heritage Peace River boat ramp during all flow conditions. State owned properties are present on both sides of the site.



O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 4 - Ft Meade to Bowling Green (KCB 7-8-2021).mxd|User: KBadgley

Figure 7. Section 2 – Ft. Meade to Bowling Green

2.2 Section 2: Ft. Meade to Bowling Green

Three sites (Site 16, Site 19, and Site 20) were selected within the Ft. Meade to Bowling Green section (Figure 7).

2.2.1 Section 2: Site 16

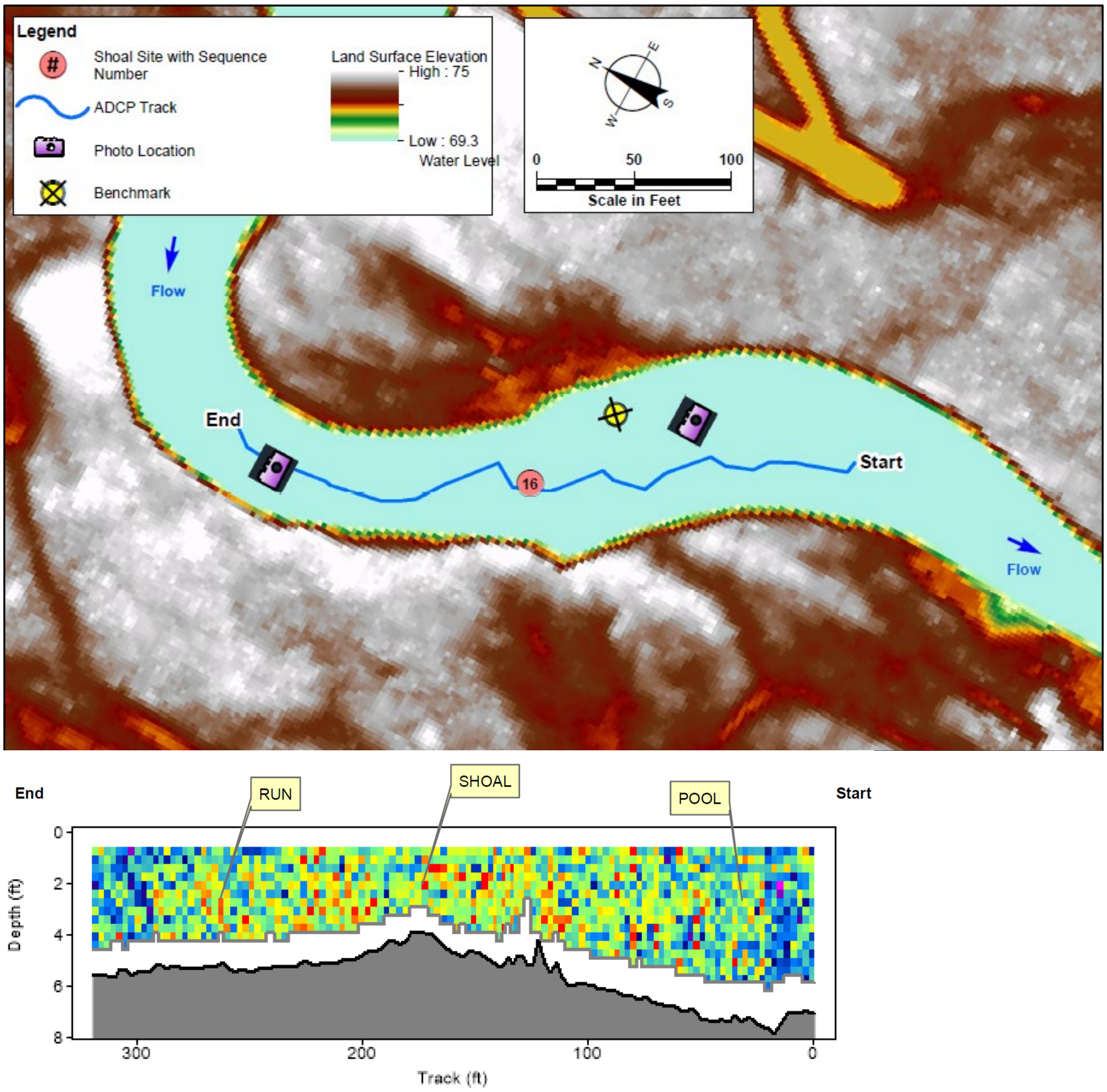


Figure 8. Site 16 plan view and bathymetry

Site Description: Site 16 has a moderately defined shoal/run/pool with flat sandy floodplains on both sides. The shoal is about 4 ft deep and the pool is about 8 ft deep. The site has sand substrate with cover near the banks. XS 75:Shoal_16 (27.740949, -81.782922) is the nearest benchmark and is located on the left bank at the site (Appendix B).

Access: Site 16 is about 0.8 miles downstream of the Ft. Meade Outdoor Recreation Area boat ramp and is accessible by kayak during all flow conditions.

2.2.2 Section 2: Site 19 (Ft. Meade PHAB)

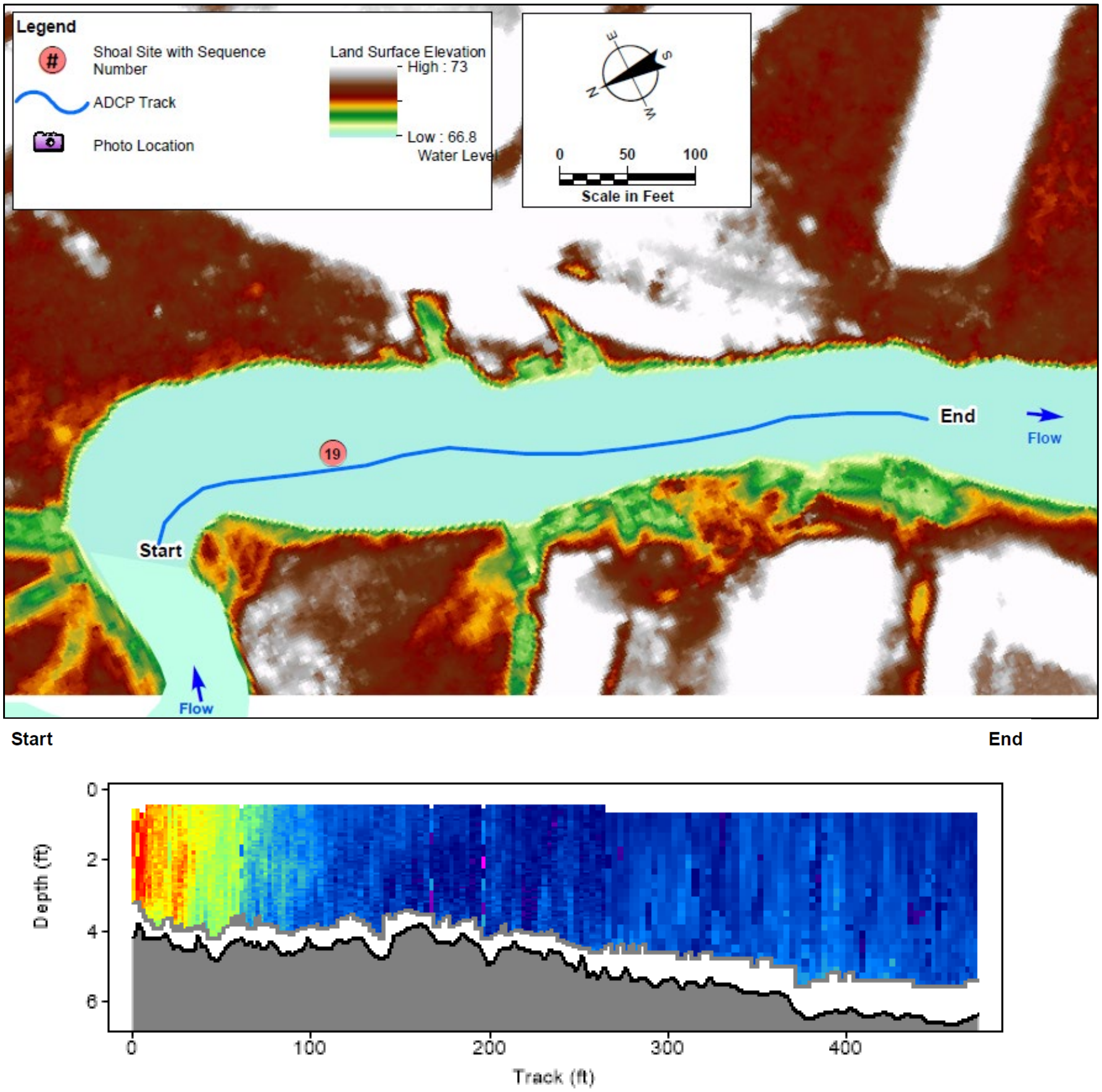


Figure 9. Site 19 plan view and bathymetry

Site Description: Site 19 (Ft. Meade PHAB) is in a wider (75-100 feet) section of the river with a rocky shoal and a riffle habitat was observed during the April 2021 field recon. The channel edges are defined by wide floodplain areas and non-discernible banks. XS 73:USGS_396 (27.726688, -81.789741) is the nearest benchmark and is located on the left bank about 1,283 ft upstream of the site (Appendix B).

Access: The site is located at the CR-657 public canoe launch (27.722662, -81.789931).

2.2.3 Section 2: Site 20

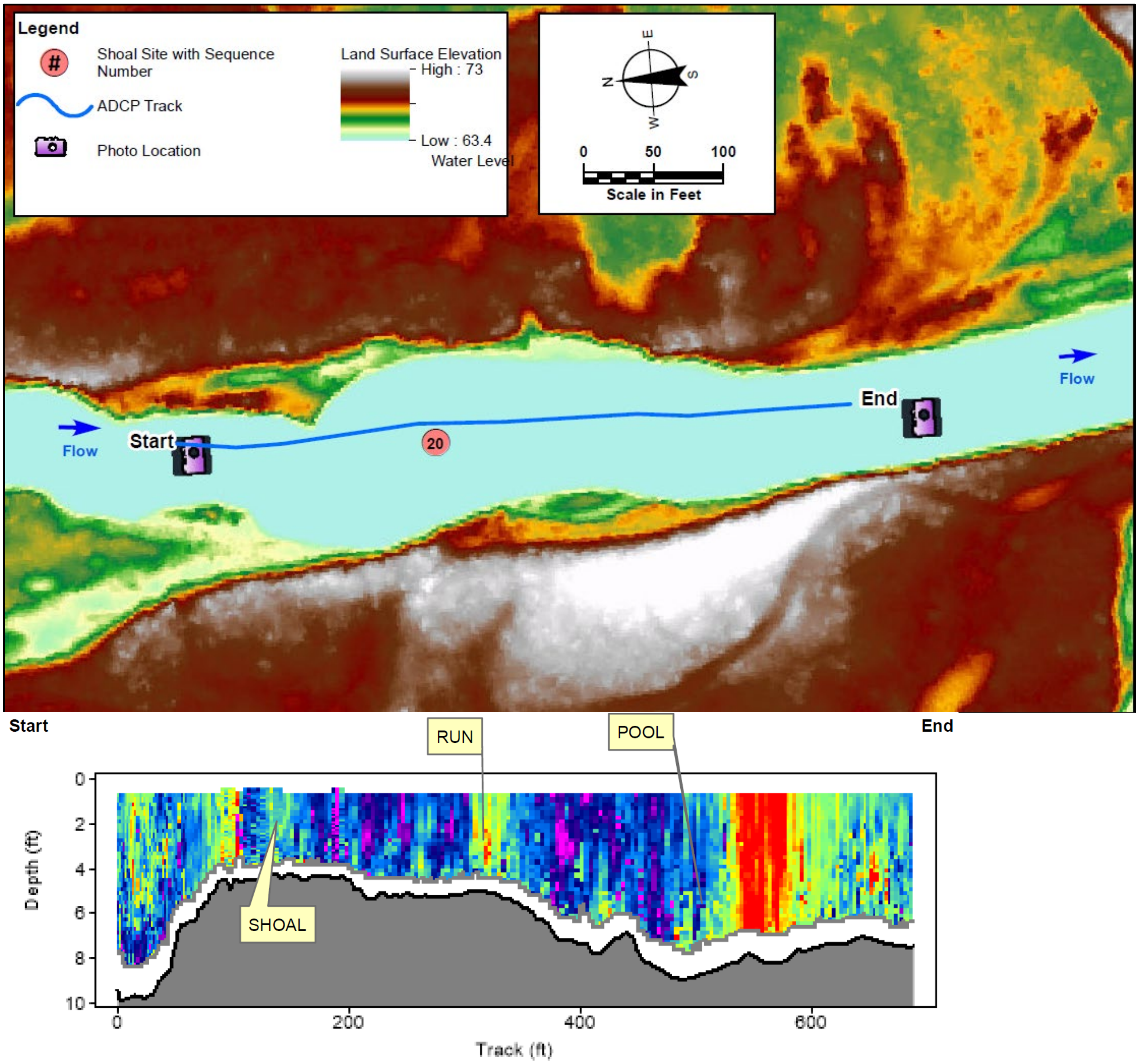
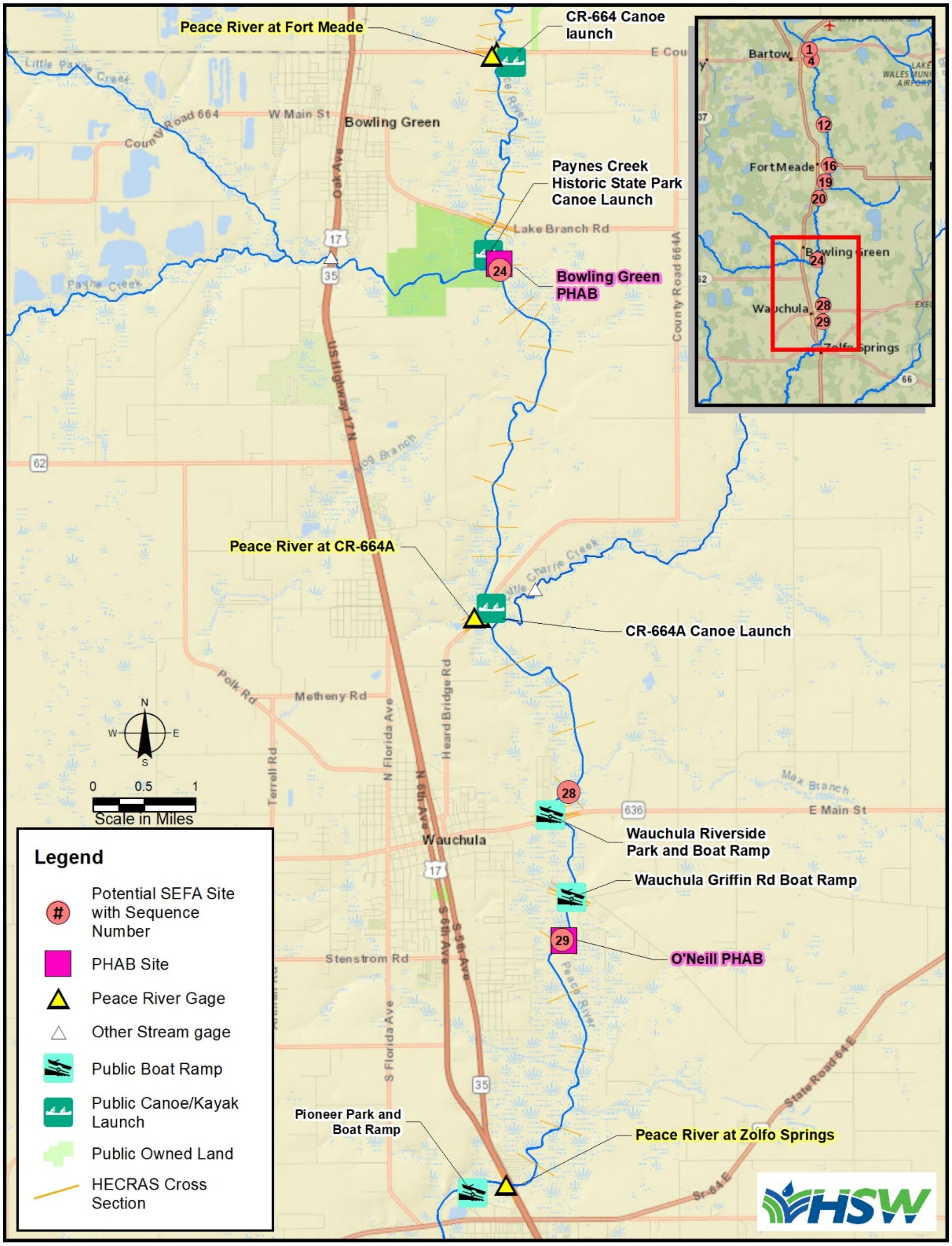


Figure 10. Site 20 plan view and bathymetry

Site Description: Site 20 is in a wider (75-100 feet) section of the river with a relatively well-defined shoal/pool mesohabitats. XS 60: Dist_91 (27.707156, -81.799829) is the nearest benchmark and is located on the right bank about 1,080 ft upstream of the site (Appendix B).

Access: Site 20 is about 2.3 miles downstream of the CR-657 public canoe launch (27.722662, -81.789931) and will be accessed by canoe/kayak from the CR-657 launch area.



O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 5 - Bowling Green to Zolfo Springs (KCB 7-8-2021).mxd|User: KBadgley

Figure 11. Section 3 – Bowling Green to Zolfo Springs

2.3 Section 3: Bowling Green to Zolfo Springs

Three sites (Site 24, Site 28, and Site 29) were selected within the Bowling Green to Zolfo Springs section (Figure 11).

2.3.1 Section 3: Site 24 (Bowling Green PHAB)

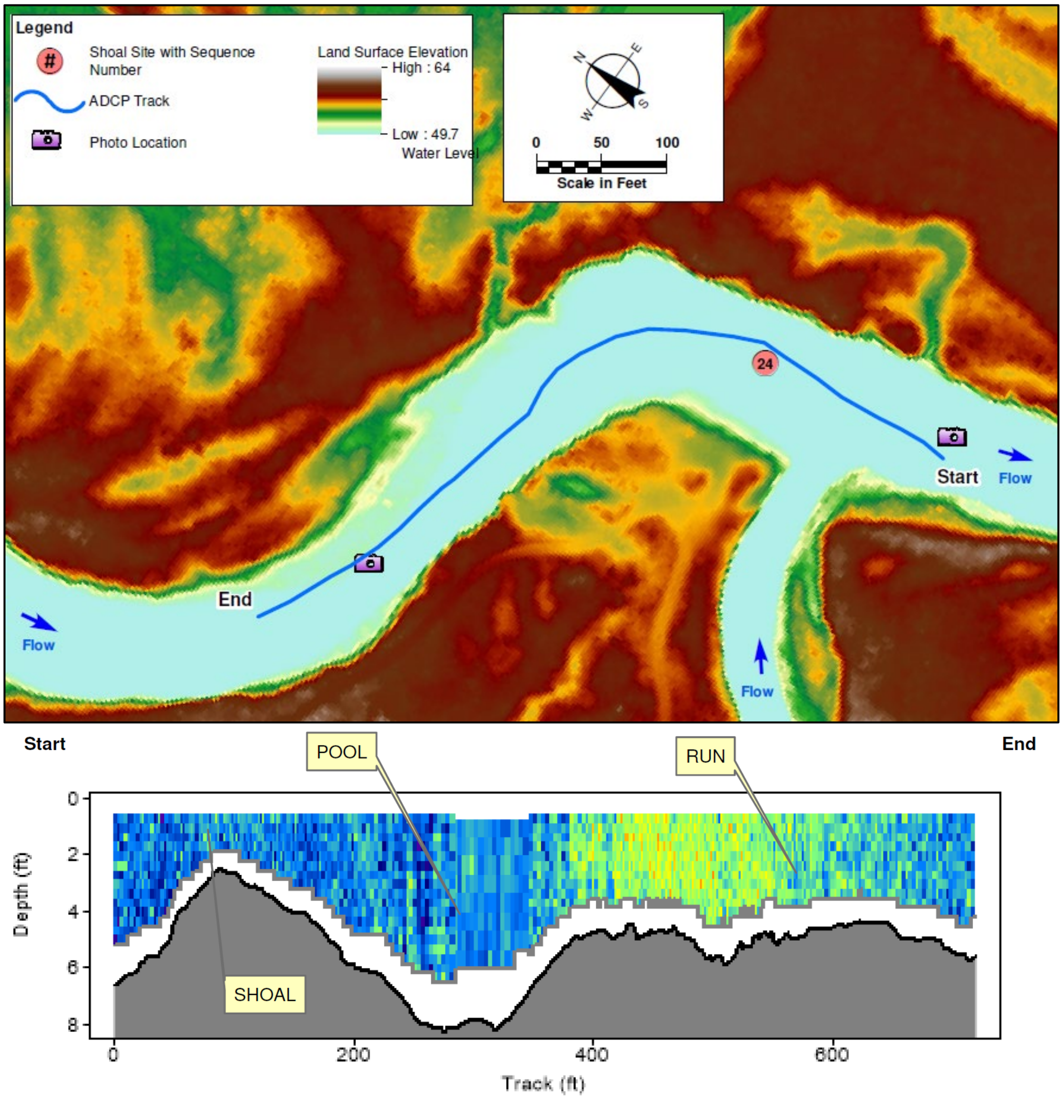


Figure 12. Site 24 plan view and bathymetry

Site Description: Site 24 has well-defined shoal/run/pool areas with a rocky shoal and sandy run/pool. The river is about 100 ft wide with sandy floodplain slopes. XS 33:USGS_52 (27.621228, -81.803068) is the nearest benchmark and is located on the left bank about 930 ft upstream of the site (Appendix B).

Access: The site is located at the Paynes Creek Historic State Park canoe launch (27.619429, -81.801870). A shoal is located near the canoe access of the state park.

2.3.2 Section 3: Site 28

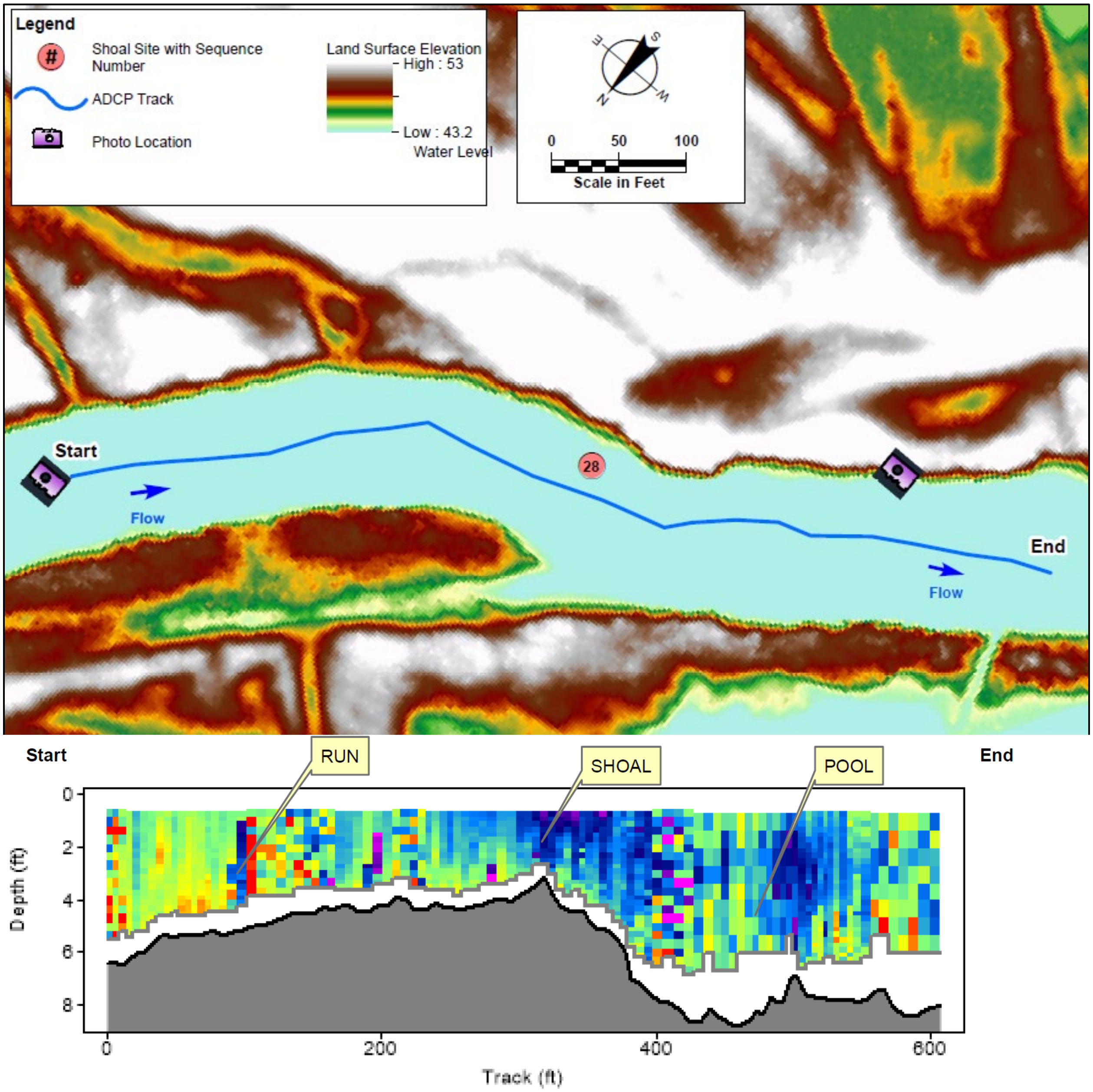


Figure 13. Site 28 plan view and bathymetry

Site Description: Site 28 is located about 1,350 ft upstream of Wauchula Riverside Park and Boatramp. The site has well-defined mesohabitats and moderate sandy slopes are present on both the banks. The width of the river is about 100 ft. ADD 3 (27.558089, -81.789893) is the nearest benchmark and is located on the left bank about 1,290 ft upstream of the site (Appendix B).

Access: Site 28 is located about 1,350 ft upstream of Wauchula Riverside Park and Boatramp (27.550919, -81.794338). Site 28 will be accessed from the boat ramp using kayaks/Jon boat.

2.3.3 Section 3: Site 29 (O'Neill PHAB)

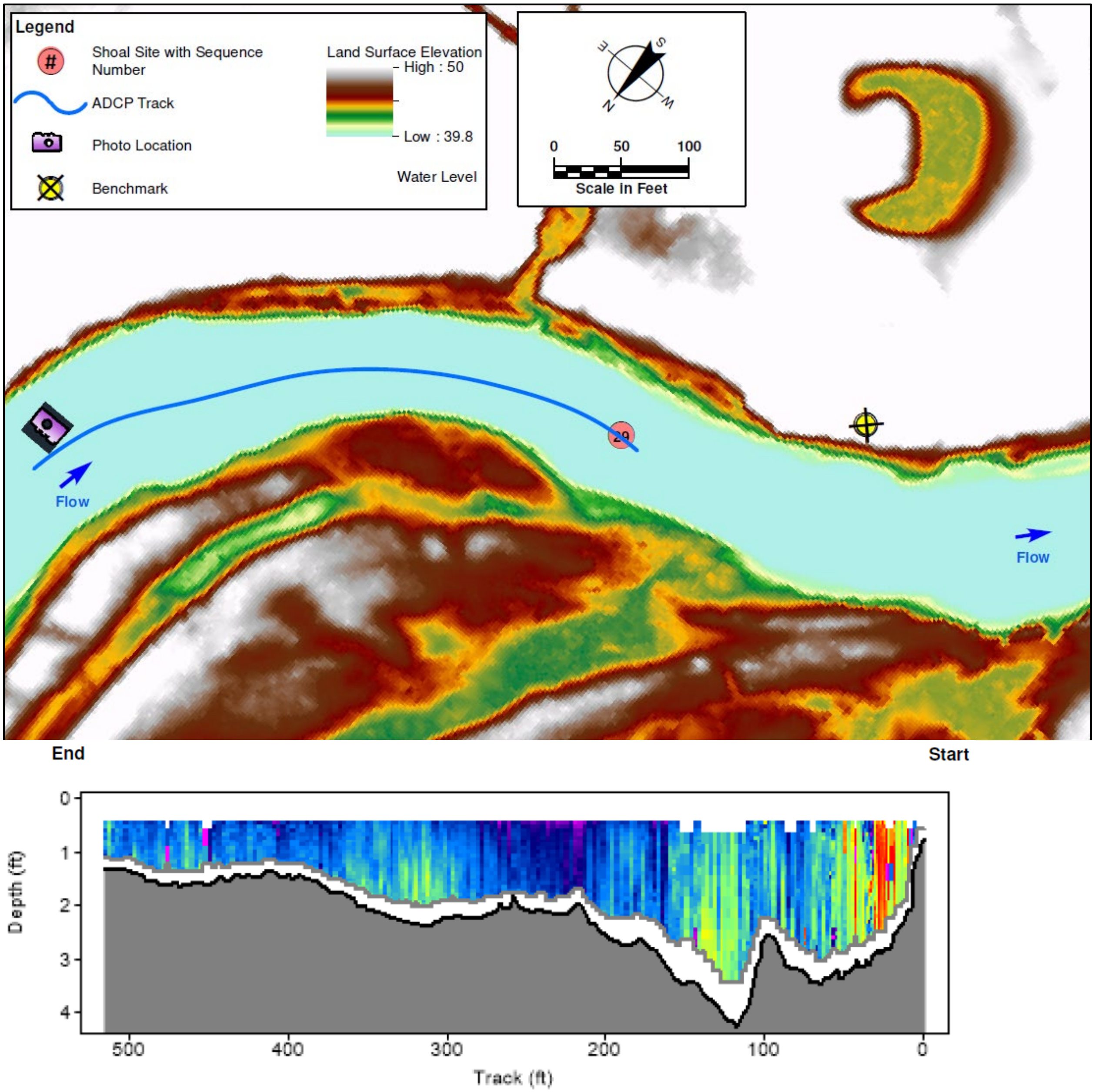


Figure 14. Site 29 plan view and bathymetry

Site Description: Site 29 has a well-defined rocky shoal and a riffle habitat was observed during the April 2021 field recon. The river is about 100 ft wide and has steep sandy slopes on both sides. XS 6: Dist_15 (27.534747, -81.793357) is the nearest benchmark and is located on the left bank at the site (Appendix B).

Access: Site 29 is about 0.4 miles downstream of the Wauchula Griffin Road public boat ramp (27.5404753, -81.7917366). Site will be accessed from the boat ramp using kayaks/Jon boat. Private properties are present on both sides of the site.

3. DATA COLLECTION PROCEDURES

Field data collection procedures will be in accordance with SWFWMD PHABSIM (Physical Habitat Simulation) data collection guidance document (Hood, 2006). A team of three or four HSW personnel will complete the data collection for each site. Data collection will occur during the flow ranges for each of the three seasonal intervals (low, medium, and high flow) (Table 1). Before each collection event, the USGS gauges which define the study area will be checked to confirm data collection will occur at flows representative of the seasonal intervals.

3.1 Transect and Temporary Benchmark Locations

Three instream transects will be established at each site:

- The transects shall include a riffle (shoal), a run, and a pool to be representative of habitats present at the selected sites. The downstream-most transect will be placed at a hydraulic control point (shoal), if possible.
- The distance between adjacent transects should be sufficient to provide for a measurable fall in the water surface between the transects.
- Rebar/Wooden stakes shall be placed at the top of left and right banks of each cross-section. Rebar/Wooden stakes shall be installed at similar elevations to ensure the measuring tape used between them is level and at an elevation high enough to be visible/usable during high flows.

After the three transects are selected, a primary Temporary Benchmark (TBM) shall be placed at each site. The HSW field team will place the TBM (eyebolt nailed to a tree) in a location visible (line of sight) from all three site transects of a site. If line of sight is restricted due to site conditions, additional secondary benchmarks will be installed. The primary and secondary TBMs shall be marked with colored flagging tape and GPS coordinates recorded. A survey instrument shall be set up in a location visible to the TBM and all transects following the transect selection and benchmark installation. Vegetation may have to be removed to increase visibility near transects.

When the survey equipment is stationed, an initial survey reading of the TBM shall be recorded on the field data sheets. A reading is completed when one person holds the level rod at the desired reading location (i.e., TBM eyebolt) and another person reads and records the value observed on the level rod. This TBM reading is referred to as the backsight (BS) reading. A check backsight reading will be made and recorded after collecting data or before the survey equipment is moved. Differences between the "before" and "after" BS readings exceeding 0.02 ft will be reconciled before moving the survey equipment.

Each TBM will be assigned a temporary elevation of 100.00 ft. The Instrument Height (IH) will be established for each instrument setup relative to the TBM (i.e., 100.00 ft + BS reading). All transect elevations will be calculated relative to the TBM elevation.

After the first data collection event, a professional land surveyor will complete the survey of the TBMs at each site to establish their North American Vertical Datum 1988 (NAVD 88) elevations. The surveyor will use the existing nearest benchmarks at each site to survey the TBMs.

3.2 Instream Data Collection

HSW will use OTT MF Pro Flow Meter/FlowTracker2 (flow meter) and/or Sontek River Surveyor (ADCP) for data collection. The flow meter will be used for shallow transects and the kayak/boat-mounted ADCP will be used for deep transects.

3.2.1 OTT MF Pro Flow Meter (Manual Flow Measurement)

The flow meter setup includes a top setting wading rod specifically used to measure flow in small streams or rivers that are wadable (Figure 6). The process of data collection is described below.

1. Assemble the flow meter.
2. Select the stream transect.
    a. Flow should be relatively uniform and free from eddies and excessive turbulence.
    b. The streambed should be stable and free from obstruction (weeds, fallen trees) that cause turbulence.
    c. A minimum depth of > 0.2 ft is required to keep water above the flow meter sensor
3. Set the tagline tightly and at a right angle to flow (Rantz, 1982).
4. Determine interval distance (or station width). A minimum of 20 stations should be selected for flow measurement at each transect (Hood, 2006). To determine the interval distance, the total stream width will be divided by 20. Stations within the cross section should not be spaced less than 0.2 ft apart. Smaller intervals will be used at high flow areas within transects with non-uniform flow. Intervals should be spaced such that flow within an interval does not exceed 10% of the total flow.
5. Measure velocities and depth at each station along the transect starting from left edge of water (LEOW) and ending at right edge of water (REOW) looking downstream.

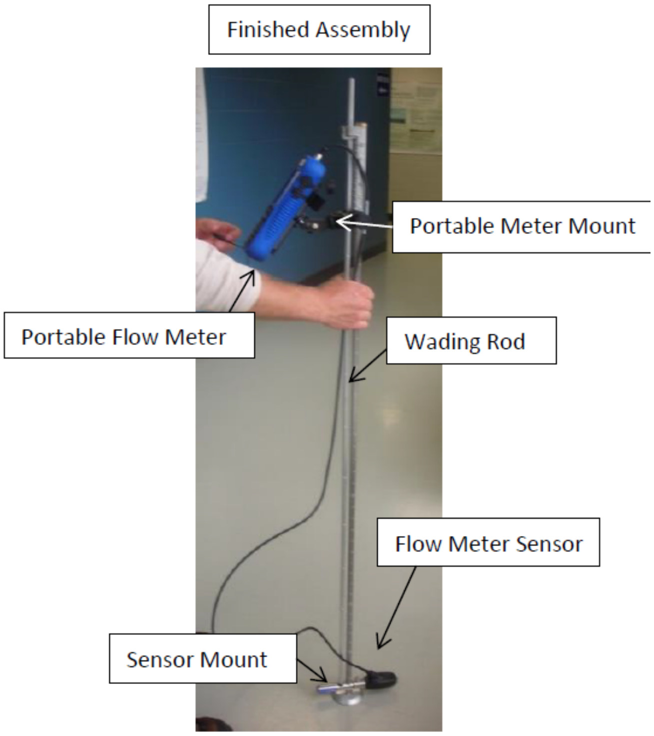


Figure 15. Flow Meter

3.2.1.1 Velocity and Depth Measurements

The objective of manual velocity measurements is to obtain a representative average velocity in each vertical (or sub-section) across a transect (Figure 16). Velocities are measured at 0.6 times the depth when depths are less than 1.5 ft. For depths more than 1.5 ft, velocity is measured at 0.2 and 0.8 times the depth. These two velocities are averaged to represent the average velocity in the vertical.

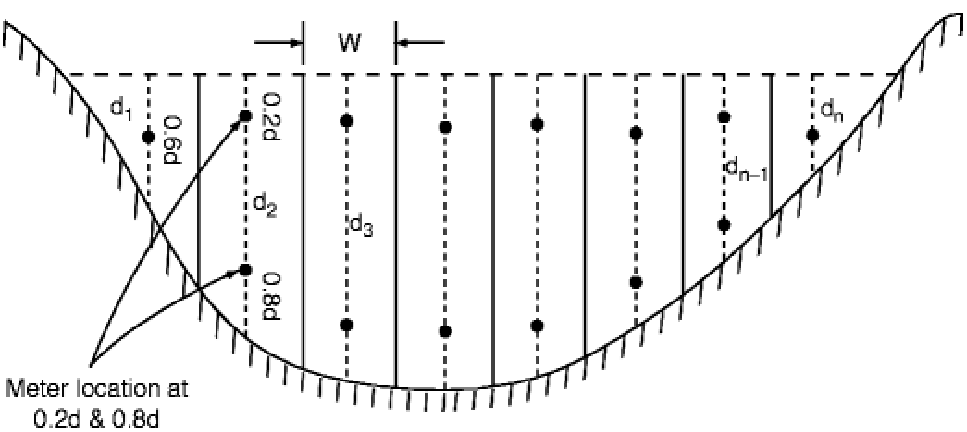


Figure 16. Measurement points at the transect verticals

The use of 0.6 and 0.2/0.8 methods assume that the velocity profile is logarithmic. Velocities closer to the river bottom are expected to be less than velocities farther from the river bottom due to increased friction near the river bottom. If the velocity at 0.8 depth is greater than the velocity at 0.2 depth or if the velocity at 0.2 depth is greater than or equal to twice the velocity at 0.8 depth, then the velocity profile is considered abnormal, and the three-point method will be used. The three-point method is computed by averaging the velocity measured at 0.2 and 0.8 depths and then averaging that result with a third velocity measured at 0.6 depth.

- Smaller intervals will be used at high flow areas within transects with non-uniform flow. Intervals should be spaced so that no sub-section has more than 10% of the total discharge. This will be verified during QAQC of the collected data.
- Measurements should contain at least 20 sub-sections.
- The spacing between the intervals should be closer in those parts of the cross-section with greater depths and velocities.
- The velocity should be measured for at least 40 seconds. Twenty (20) seconds is acceptable during periods of rapidly changing stage.

The depths and widths are used to calculate the cross-sectional area associated with each vertical (depth × width). The calculated area and the average velocity within that interval are multiplied to determine the flow through that interval. The flows through the intervals are added to calculate the total flow through the transect (Figure 17).

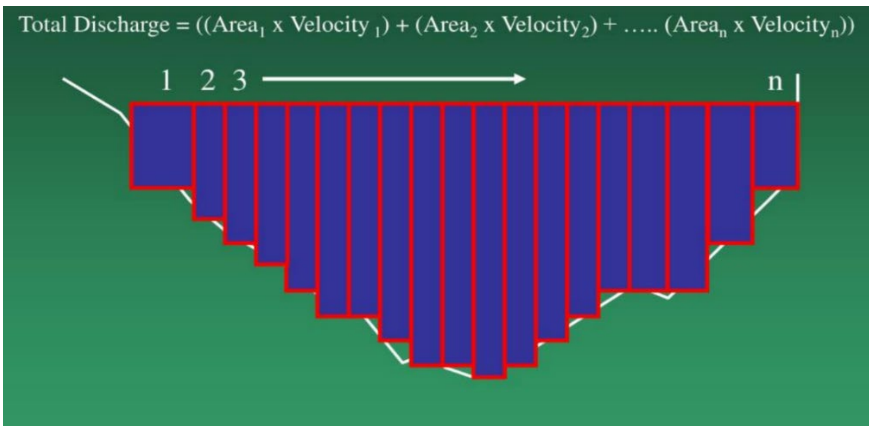


Figure 17. Total discharge calculation

3.2.2 Acoustic Doppler Current Profiler

The objective of ADCP measurements is to obtain representative average velocity and depths at uniform intervals along the cross-section. Moving-boat measurements will be performed using the SonTek M9 ADCP and Hydroboard units (Figure 18). The instrument must be setup and calibrated prior to the measurement. The basic components of the SonTek M9 ADCP system are:

- M9 Sensor
- Power and Communications Module (PCM) box
- GPS (optional)
- Connector cables
- Radio antenna (2)
- Hydroboard

Before beginning instrument checks, attach the M9 and PCM to the Hydroboard and make sure all cables are securely connected between the PCM box, M9 unit, radio (and GPS) antenna. Battery packs shall be charged and inserted into the PCM box. Power on the field laptop or tablet and connect the antenna and USB dongle to communicate with ADCP system for measurement.

Figure 18. Acoustic Doppler Current Profiler and Hydroboard

3.2.2.1 Compass Calibration

After system setup and configuration, the *Compass Calibration* is performed to adjust for magnetic interference near the instrument. The calibration shall be completed either in the water or on land in conditions similar to the measurement. If a Jon boat is used during the moving-boat measurement, the compass calibration shall be performed with the ADCP unit attached to the boat. Metal items near the instrument can affect the compass either during the calibration or during the moving-boat measurement, therefore, all metal shall be secured or in place prior to the calibration. The calibration process occurs by rotating the instrument (and boat, if applicable) in two complete circles in both clockwise and counter-clockwise directions. Each rotation shall be completed for at least a minute or more. After the calibration movement, the dialog box will indicate if the magnetic influence is acceptable or not. A secondary calibration will be performed if the magnetic influence is not acceptable. An additional calibration may be performed if significant changes to potential magnetic influences has occurred between measurement locations.

3.2.2.2 Moving-Boat Method

Velocity and depth data will be collected using the moving-boat discharge method. A single moving-boat measurement of discharge can be broken into three key components: the Start Edge, the Transect, and the End Edge (Figure 19).

Measurements are collected separately at the edges due to limitations in operating depth of ADCP sensor. An estimate is calculated at each edge by the RiverSurveyor Live software which communicates with the ADCP M9 sensor.

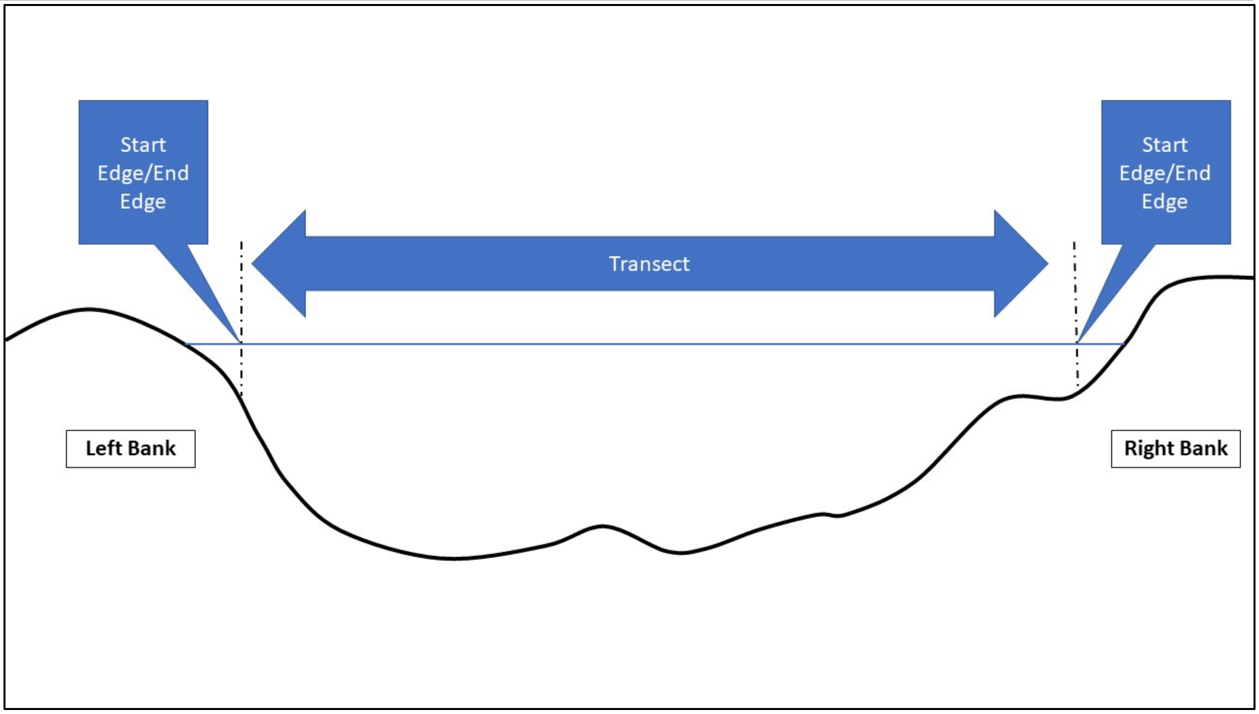


Figure 19. Transect data collection using ADCP. Left and right banks are defined by looking downstream

Discharge measurements made from a moving boat under approximately steady flow conditions will consist of reciprocal passes (at least four passes) having a total exposure time of 720 seconds (s) or greater. Exposure time refers to the total amount of time spent sampling (or measuring) the flow during a discharge measurement and does not include time between passes nor time spent doing moving bed tests or other tasks. An even number of passes with reciprocal courses is required to minimize directional biases in measured discharges. Directional biases occur when the discharges measured for transects traveling from the left bank to the right bank are consistently either greater than or less than discharges measured for transects made traveling from the right bank to the left bank. The minimum exposure time for the discharge measurement should be at least 720 seconds (12 minutes), even if that requires more than four passes (USGS, 2011). The data should be collected using a reasonably uniform boat speed across the cross section and consistent boat speeds along the transects.

- Data will be collected until an even number of passes have been completed that meet the quality control criteria.
- An equal number of left-to-right and right-to-left passes shall be selected to avoid directional biases.
- The average flow from four, minimum 3-minute passes or six, minimum 2-minute passes (12-minutes total) will be used to calculate the final cross-section flow.

3.2.3 Water Level Measurements and Habitat Data

Water surface elevations will be measured on both banks and at the center of each transect relative to the transect TBM. The average of the three measurements will be the water level at the transect. Water surface elevation measurements will be obtained by placing the bottom of the stadia rod at the water surface until a meniscus formed at the base or selecting a stable area next to the water's edge. This procedure will be performed immediately before and after measuring the flow at the transect to characterize the change in water-surface elevation during unsteady flow conditions.

Along with the depth and velocity data, habitat information will be recorded at the same intervals in the field data sheet (Attachment A). The habitat data includes:

- Substrate material
- Leafy/woody habitat
- Rooted plants
- Cover that provides shade, either directly above or proximal to the position on the transect
- PHABSIM/SEFA Substrate Code (Attachment A)

3.2.4 Other Considerations

For transects with high depths in the channel and shallow depths near the banks, the ADCP will be used to collect water velocity and depth data from stations along each transect where wading is dangerous or not possible. The flow meter will be used to collect velocities of shallower, edge cell velocity data.

Each transect measurement length and discharge calculation will be compared to the gauged data or to repetitive measurements to ensure accurate bottom tracking and flow measurements. Real-time graphic depictions of depth and velocity will be examined during data collection for inconsistencies and errors.

3.2.5 ADCP2RHBX

ADCP2RHBX is a software program typically used to generate a SEFA input file from ADCP data. An ADCP continuously measures water depth and velocities as the unit moves across a river or stream. The raw ADCP files contain information on the quality of the information recorded as well as details on the course followed across the river and the vertical velocity profile (Figure 20). River Surveyor Live software is used to generate an excel file of cross-section samples. The raw ADCP files (.rivr) contain data related to the course followed across the river and the depth/velocity information. Some of the relevant parameters measured by ADCP are DMG (Distance Measured Good, ft), Depth, Depth averaged water speed, and other information (Table 3).

Table 3. ADCP output parameters.

Parameter	Description
DMG (Distance Measured Good, ft)	DMG is the straight line distance traveled by ADCP from the starting location as measured by bottom tracking
Depth (ft)	Water depth measured by ADCP
Mean Speed (Depth, ft/sec)	Depth-averaged water speed
Direction (deg)	Direction of depth-averaged water velocity vector
Boat Direction (deg)	Direction of boat movement (Direction of transect tagline)
Heading or Orientation of the Instrument (deg)	Direction of the instrument

The mean speed (Table 3) does not account for direction and will be projected perpendicular to the cross-section to generate a depth-average streamwise velocity. The following equation will be used to estimate the streamwise velocity for each ADCP pass.

Streamwise velocity = Mean Speed (ft/sec) × $\sin\,(\,\theta_{WT} - \theta_{BT})$

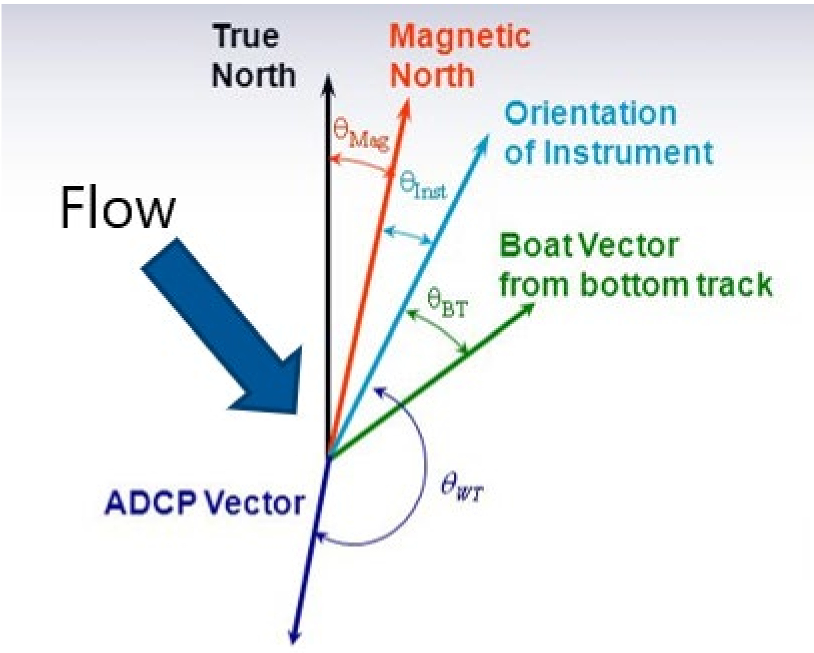


Figure 20. ADCP velocity vector projection

Using ADCP2RHBX and multi pass ADCP data, depths and velocities from each ADCP pass at a transect will be averaged to generate the multi pass average depths and average velocities at equally spaced intervals. The input parameters used to generate SEFA input file are described below. (Figure 22).

- *Import ADCP file(s)* - Import the River Surveyor files or excel files using menus *Data>>Import ADCP file(s)*. User can import either one file or multiple files.
- *Number of bottom point*s – Three options are available for generating the number of bottom points for a transect
    - *Match ADCP*: This option gives one RHBX measurement point for each valid ADCP depth/velocity measurement. This option would generate an unnecessarily large number of points and is not recommended.
    - *Specify number of points*: this option is used to extract the specified number of points from the ADCP file. When the number of points is specified, the RHBX points are spaced at equal distances (intervals) based on a Step distance (Step distance = Distance Made Good/(Number of points-1)).
    - *Step distance*: This option specifies the distance between the RHBX points.

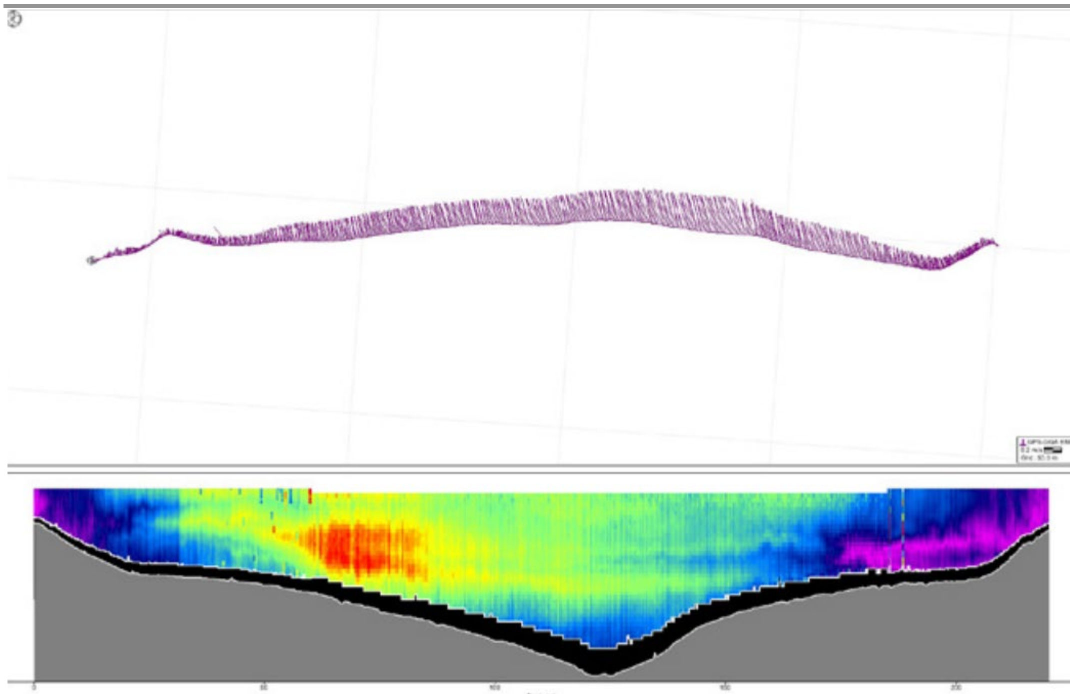


Figure 21. ADCP output (Top: Velocity vectors across the transect in plan view, Bottom: Measured velocities (color coded) across the transect looking downstream).

- *Depth/Y coordinate and velocity options* – Depths and velocities can be averages or interpolated in different ways
    - *Assign nearest ensemble*: RHBX points are generated across the cross-section at equally spaced intervals and the depth at each point is estimated from the nearest valid ensemble (ADCP measurement point).
    - *Average nearby ensembles*: If the *Distance to average* is set to zero, then the values is interpolated from the ensembles on either side of the RHBX point. If a *Distance to average* is specified, in the average is calculated from ensembles half the distance on either side of the RHBX point. For example, if *Distance to average of 2 ft* is specified, values 1 foot either side of the measurement point are averaged.
- Discard non-ascending x coordinates – The x coordinates (the distance across the river) in an ADCP text file do not necessarily increase and sometimes ADCP can move backwards, particularly at the start or end of a cross-section. These measurements can either be sorted in order of increasing distance or any measurements where the distance across the river decreases are ignored.
- Include all valid depths – Some ADCP point measurements contain valid depth measurements but no valid measurement of water velocity, possibly due to high turbulence. If this option is checked, a RHBX point generated using the depth measurement and a velocity specified as "na". SEFA will accept the "na" and interpolate the velocity. Thus, if this option is checked, any zero velocities in the RHBX are likely to be locations where the ADCP was unable to measure velocity. The user should enter estimated velocities or delete the whole column of velocities for that cross-section before importing the Excel file into SEFA.

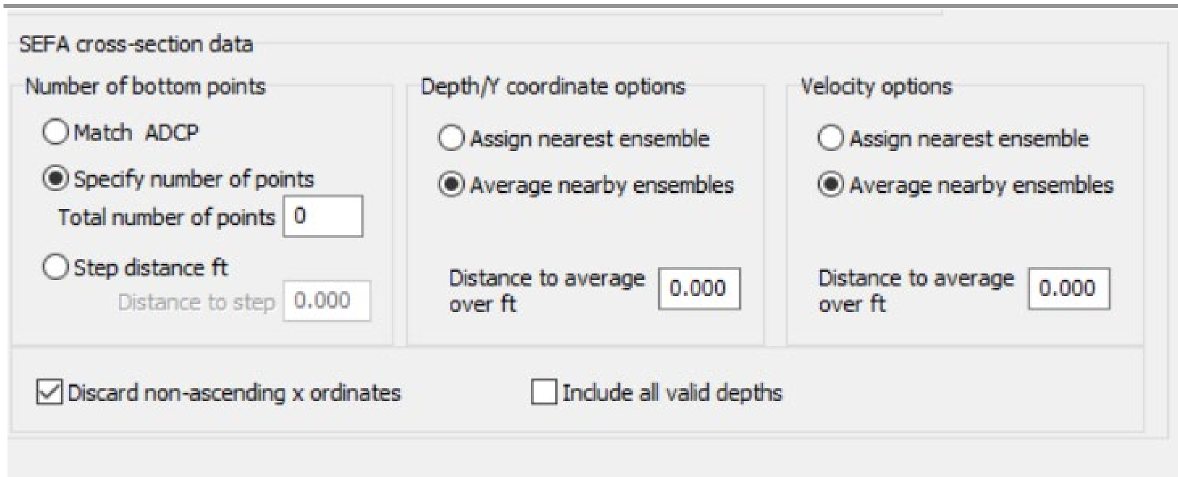


Figure 22. ADCP2RHBX program options.

3.3 Quality Assurance/Quality Control Procedures

Quality Assurance/Quality Control for all field data collection activities will be conducted in accordance with the procedures outlined in the SWFWMD guidance document (Hood, 2006). Specific procedures include:

- The computed discharge from each transect will be compared between all three transects and nearest USGS discharge estimate. Additional flow measurements may be collected if there is an obvious inconsistency or if flow at a single transect deviates from average flow at three transects by greater than 20%.
- Close-out procedures will be completed before the team leaves each site and will include:
  - Site discharge estimate
  - Check intervals are spaced so that no sub-section has more than 10% of the total discharge
  - Survey close-out, including TBM backsight checks
  - Data sheet completeness confirmation
  - Photo of each completed data collection sheet
  - Photo and documentation of noteworthy flora, fauna, or site conditions
- Field data collection sheets will be converted to electronic format using Excel. Hard copy field sheets will be compared to electronic data sheets by personnel other than the team member who entered the data to identify transposition errors.
- Site photos will be labeled and uploaded to the appropriate electronic folders (by site) following each site visit.

3.4 Equipment List

Field Work Plan
Field forms and maps
Site Safety Plan Worksheet
First aid kit
SonTek M9 (ADCP unit), batteries and charger, user manual, and Hydroboard
OTT MF Pro Meter and Wading Rod
Camera
GPS and batteries
Eyebolts
Toolbox/Dry bag
Spray paint
Flags/Flagging tape
Rope

Tape measure/Rangefinder
Survey rod
Survey instrument
Survey Tripod
Folding ruler – 6'
Water boots
Raingear (lightweight)
Kayaks (3)
Paddles
Personal Flotation Devices (PFD)

4. REFERENCES

Hood, J. (2006). *Standardized Methods Utilized by the Ecologic Evaluation Section for Collection and Management of Physical Habitat Simulation Model and Instream Habitat Data.* Brooksville, Florida: Southwest Florida Water Management District.

Rantz, S. E. (1982). *Meausrement and Calculation of Streamflow: Volume 1. Measurement of Stage and Discharge.* Reston, VA: U.S. Geological Survey, Water Supply Paper 2175.

USGS. (2011). *Exposure time for ADCP moving-boat discharge measurements made during steady flow conditions.* United States Geological Survey, Office of Surface Water.

5. ATTACHMENTS

- Example Field Data Sheet and Substrate Coding
- Selected Sites Location Maps

ATTACHMENT A

Field Form Template

HSW Engineering, Inc.

IM Field Data

Date: 3/27/2020
Time: 10:30
Habitat Type: Run
Transect: Hog Heaven

WS: RB 9.9 @ST 38 MID 9.86 @ST29 LB 9.85 @ST20 @11:45
Slope: WS up
WS dn
Distance to next upstream transect

Comments: Orange paint/flag for Left and Right Pins

Project: Charlie Creek

TBM: Eyebolt- green flag
TBM: near Cypress tree
TBM Elev. 100 ft
Eq. Elev.: 103.16 ft (relative to TBM elev. Of 100 ft)
Staff: RN, NL, KB, SE
Survey Flow 3.1 cfs
SZF 92.76 ft
WS avg 9.86 ft
WS Elev. 93.30 ft

Green flag TBM GPS:
27.38233 N
-81.78153 W

			Substrate						Leaves/Wood				Vegetation						Cover		Substrate	DEPTH	Elevation	VELOCITY (ft/sec)		WIDTH (ft)	AVG VEL.	AREA (Sq. ft)	Survey
INTERVAL(ft)	Comments	F.S. (ft)	S	M	CL	R	GR	SH	LL	LP	ER	WD	TV	WV	SAV	FAV	AL	EV	OHC	PROX	Code	(ft)	TBM	Bottom	Top		(ft/sec)		Flow (cfs)
0	Left Pin	4.66	x						x										x		17	-5.19	98.50	0			0		0
1		5.15	x						x										x		17	-4.70	98.01	0		1	0		0
2		5.67	x						x										x		17	-4.18	97.49	0		1	0		0
3		6.45	x						x										x		17	-3.40	96.71	0		1	0		0
4		7	x						x				x						x		17	-2.85	96.16	0		1	0		0
5		7.74	x						x				x						x		17	-2.11	95.42	0		1	0		0
6		8.27	x						x										x		17	-1.58	94.89	0		1	0		0
7		8.68	x						x										x		17	-1.17	94.48	0		1	0		0
8		9.19	x						x										x		17	-0.66	93.97	0		1	0		0
9		9.22	x																x		17	-0.63	93.94	0		1	0		0
10		9.05	x																x		17	-0.80	94.11	0		1	0		0
11		8.91	x																x		17	-0.94	94.25	0		1	0		0
12		8.79	x																x		17	-1.06	94.37	0		1	0		0
13		8.81	x																x		17	-1.04	94.35	0		1	0		0
14		8.86	x																		2	-0.99	94.30	0		1	0		0
15		9.01	x																		2	-0.84	94.15	0		1	0		0
16		9.19	x																		2	-0.66	93.97	0		1	0		0
17		9.4	x																		2	-0.45	93.76	0		1	0		0
18		9.61	x																		2	-0.24	93.55	0		1	0		0
19	LEOW	9.85	x																		2	0.0	93.31	0		1	0	0	0
20		9.95	x																		2	0.1	93.21	0.09		1	0.09	0.1	0.009
21		10.05	x																		2	0.2	93.11	0.23		1	0.23	0.2	0.046
22		10.25	x																		2	0.4	92.91	0.18		1	0.18	0.4	0.072
23		10.15	x																		2	0.3	93.01	0.12		1	0.12	0.3	0.036
24		10.3	x																		2	0.45	92.86	0.27		1	0.27	0.45	0.1215
25		10.4					x														3	0.55	92.76	0.52		1	0.52	0.55	0.286
26		10.35	x																		2	0.5	92.81	0.67		1	0.67	0.5	0.335
27		10.35	x									x									2	0.5	92.81	0.55		1	0.55	0.5	0.275
28		10.25	x									x									2	0.4	92.91	0.49		1	0.49	0.4	0.196
29		10.3	x																		2	0.45	92.86	0.45		1	0.45	0.45	0.2025
30		10.35	x																		2	0.5	92.81	0.41		1	0.41	0.5	0.205
31		10.35	x																		2	0.5	92.81	0.41		1	0.41	0.5	0.205
32		10.35	x																		2	0.5	92.81	0.35		1	0.35	0.5	0.175
33		10.3	x																		2	0.45	92.86	0.36		1	0.36	0.45	0.162
34		10.35	x																		2	0.5	92.81	0.33		1	0.33	0.5	0.165
35		10.25	x																		2	0.4	92.91	0.39		1	0.39	0.4	0.156
36		10.25	x																		2	0.4	92.91	0.41		1	0.41	0.4	0.164
37		10.2	x																		2	0.35	92.96	0.38		1	0.38	0.35	0.133
38		10.15	x																		2	0.3	93.01	0.32		1	0.32	0.3	0.096
39		10	x																x		17	0.15	93.16	0.19		1	0.19	0.15	0.0285

40	REOW	9.85	x																x		17	0	93.31	0		0.75	0	0	0
40.5		9.85	x																x		17	0	93.31	0		0.5	0		0
41		9.81	x																x		17	-0.04	93.35	0		0.75	0		0
42		9.75	x																x		17	-0.1	93.41	0		1	0		0
43		9.62	x																x		17	-0.23	93.54	0		1	0		0
44		9.54	x																x		17	-0.31	93.62	0		1	0		0
45		9.48	x																x		17	-0.37	93.68	0		1	0		0
46		9.4	x																x		17	-0.45	93.76	0		1	0		0
47		9.34	x																x		17	-0.51	93.82	0		1	0		0
48		9.32	x																x		17	-0.53	93.84	0		1	0		0
49		9.3	x																x		17	-0.55	93.86	0		1	0		0
50		9.23	x																x		17	-0.62	93.93	0		1	0		0
51		9.16	x																x		17	-0.69	94.00	0		1	0		0
52		9.18	x																x		17	-0.67	93.98	0		1	0		0
53		9.17	x																x		17	-0.68	93.99	0		1	0		0
54		9.3	x																x		17	-0.55	93.86	0		1	0		0
55		9.53	x																x		17	-0.32	93.63	0		1	0		0
56		9.35	x						x										x		17	-0.5	93.81	0		1	0		0
57		9.01	x								x								x		17	-0.84	94.15	0		1	0		0
58		6.75	x								x								x		17	-3.1	96.41	0		1	0		0
59		6.01	x								x								x		17	-3.84	97.15	0		1	0		0
60		4.68	x								x								x		17	-5.17	98.48	0		1	0		0
61	Right Pin	4.18	x								x								x		17	-5.67	98.98	0			0		0
																												Total (cfs)	3.1

S=sand **M**=mud/muck **CL**=clay **R**=rock **GR**=gravel **SH**=shell **LL**=leaf litter **LP**=leaf pack **ER**=exposed roots **WD**=woody debris **TV**=terrestrial vegetation **WV**=wetland vegetation **SAV**=submerged aquatic vegetation **FAV**=floating aquatic vegetation **AL**=algae **EV**=emergent vegetation **OHC**=overhead cover **PROX**=proximal cover

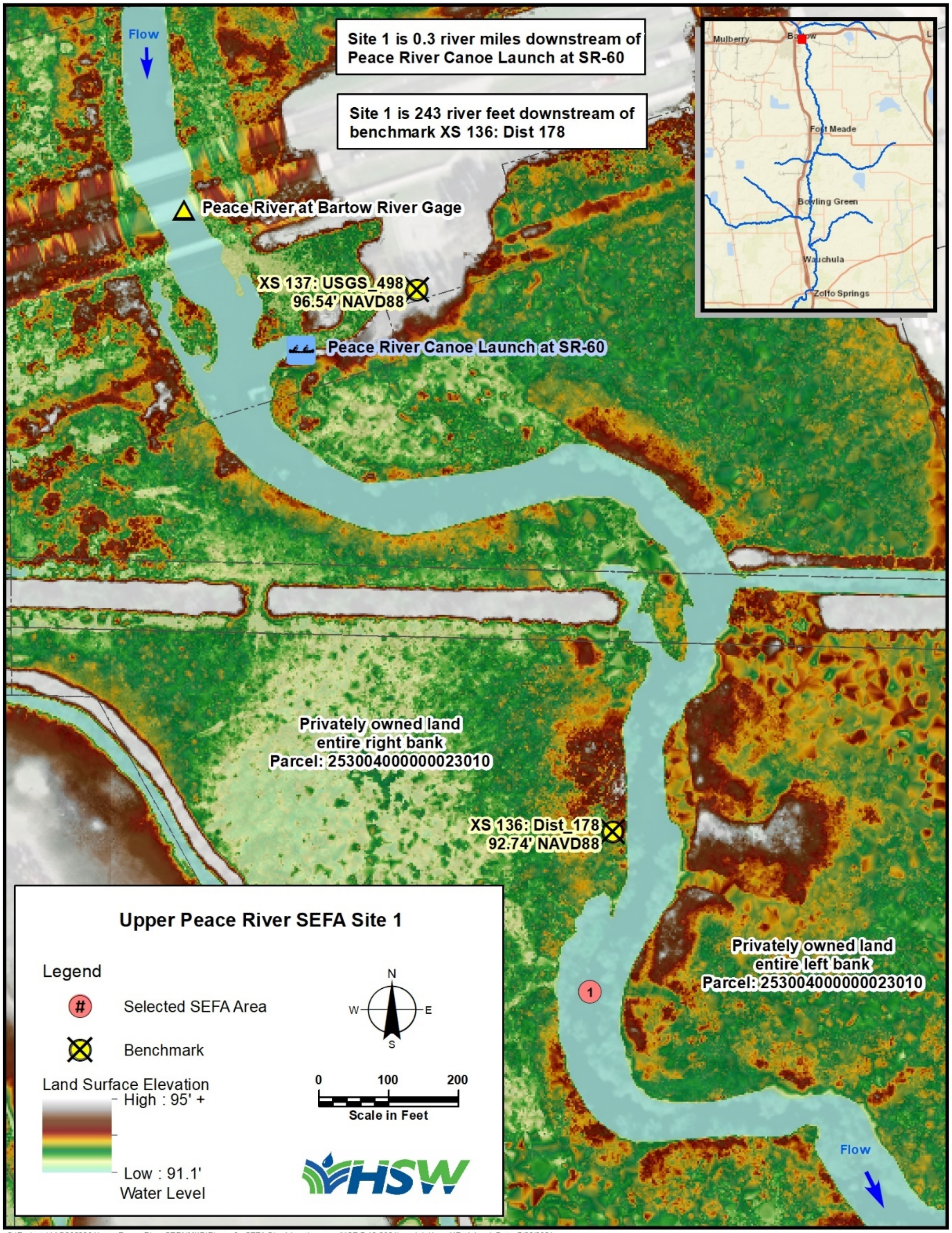
LP - Left Pin (looking downstream)
RP- Right Pin (looking downstream)
LOEW- Left Edge of Water (looking downstream)
ROEW- Right Edge of Water (looking downstream)
ST- Station (or offset)
IH- Instrument Height
LB- Left Bank, RB- Right Bank

SWFWMD PHABSIM/SEFA Substrate Codes

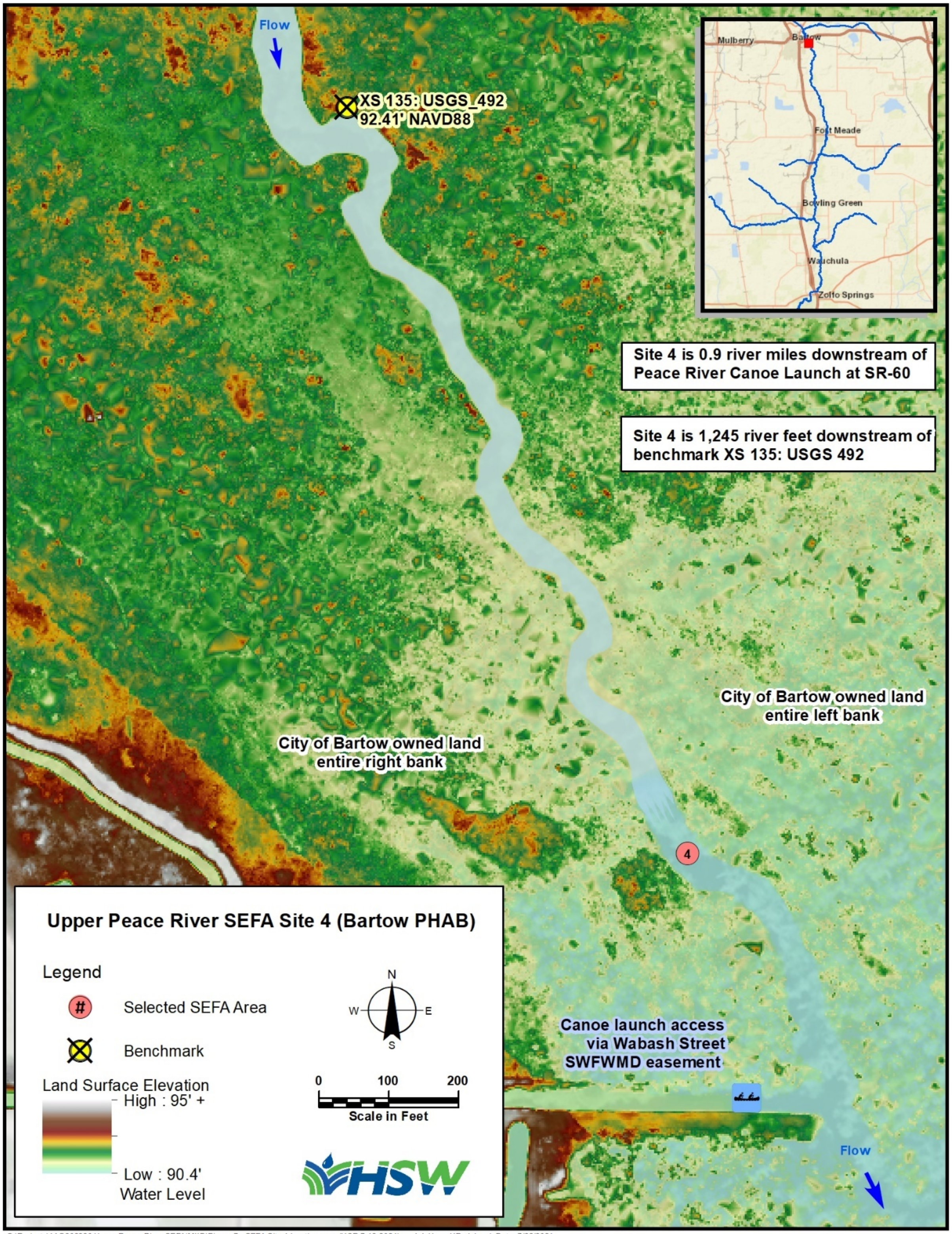
1	No cover and silt or terrestrial vegetation
2	No cover and sand
3	No cover and gravel
4	No cover and cobble
5	No cover and small boulder
6	No cover and boulder, angled bedrock or woody debris
7	No cover and mud or flat bedrock
8	Overhead vegetation and terrestrial vegetation
9	Overhead vegetation and gravel
10	Overhead vegetation and cobble
11	Overhead vegetation and small boulder, boulder, angled bedrock, or woody debris
12	Instream cover and cobble
13	Instream cover and small boulder, boulder, angled bedrock, or woody debris
14	Proximal instream cover and cobble
15	Proximal instream cover and small boulder, boulder, angled bedrock, or woody debris
16	Instream cover or proximal instream cover and gravel
17	Overhead vegetation or instream cover or proximal instream cover and silt or sand
18	Aquatic Vegetation – macrophytes

ATTACHMENT B

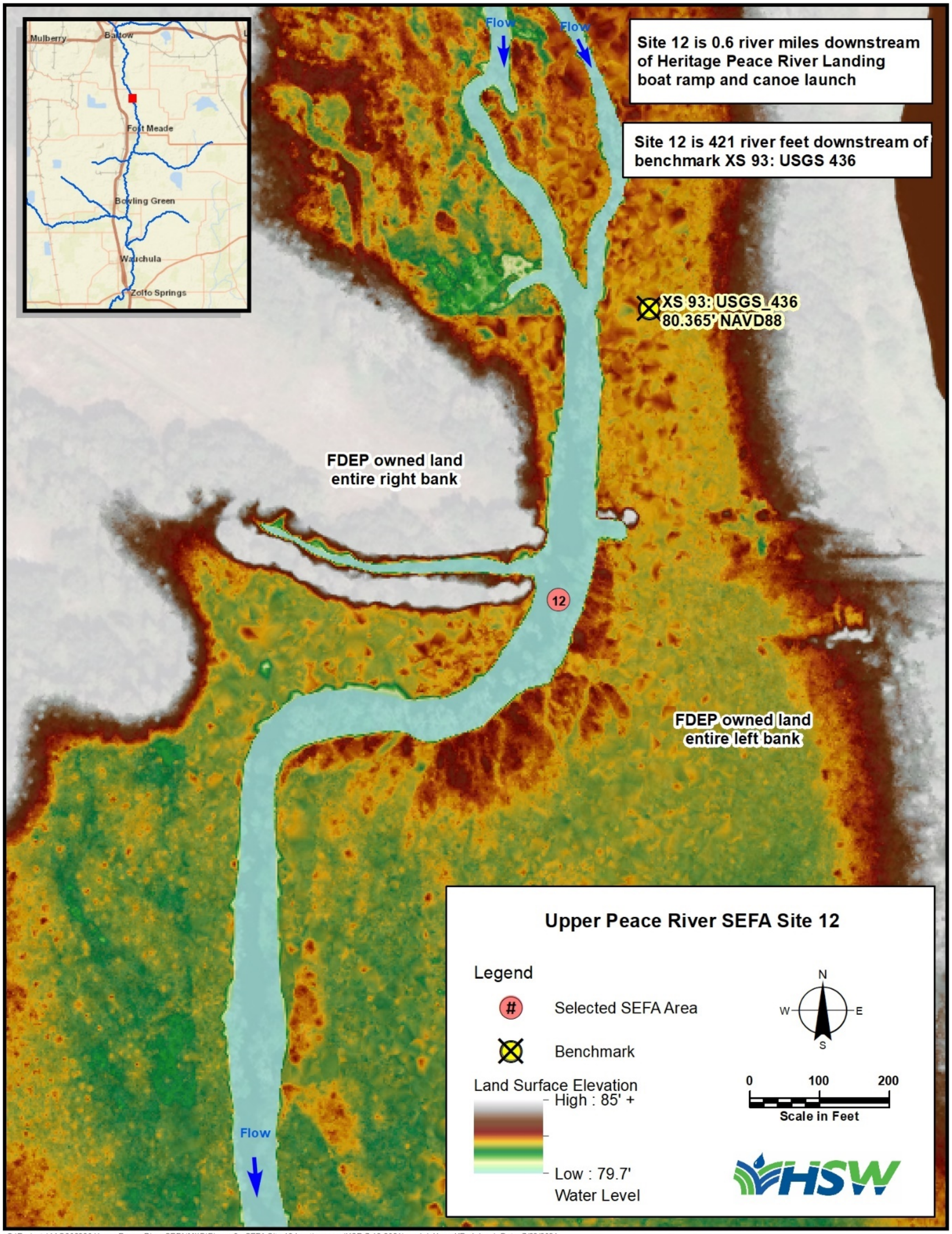
Site Location Maps



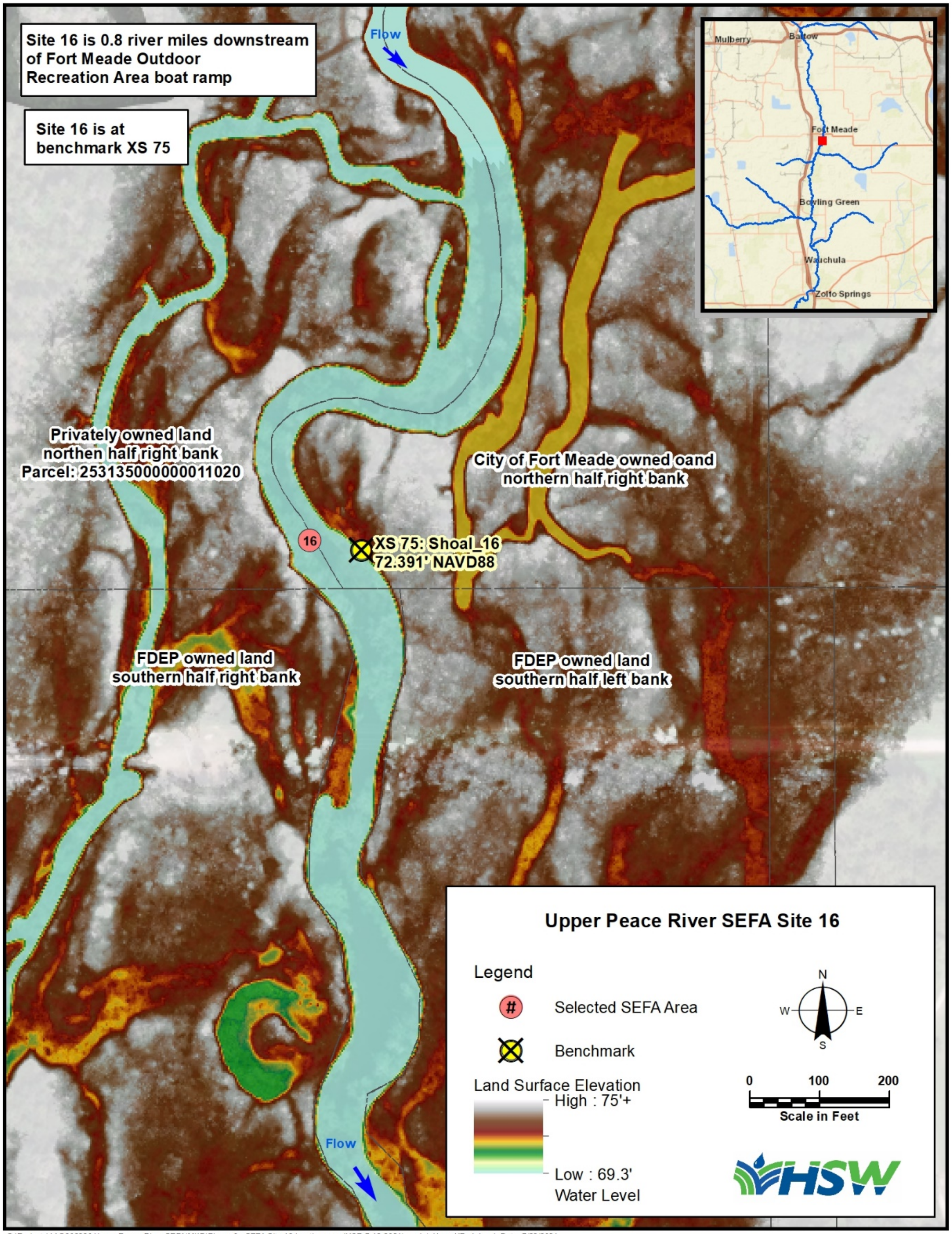
O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 6 - SEFA Site 1 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021



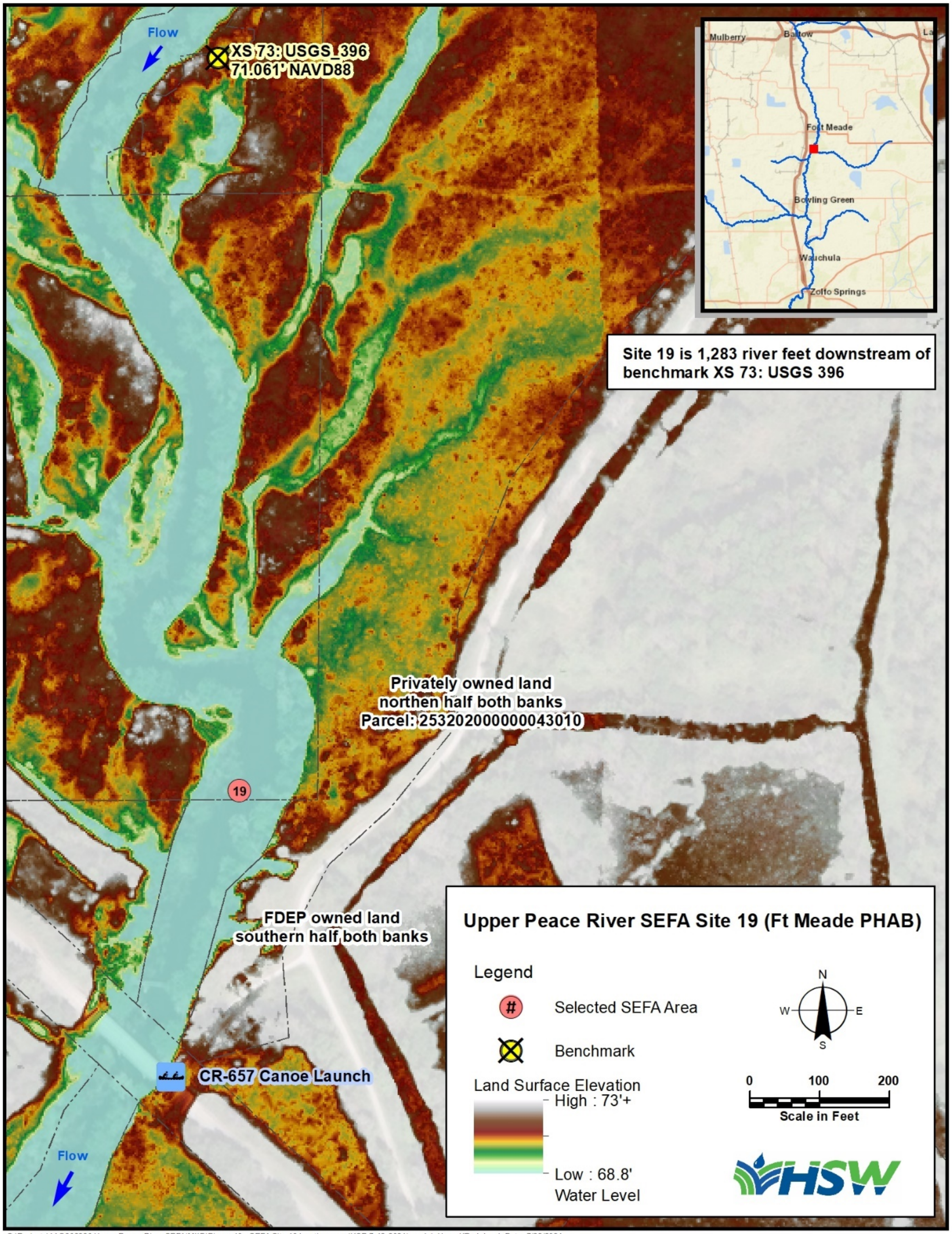
O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 7 - SEFA Site 4 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021



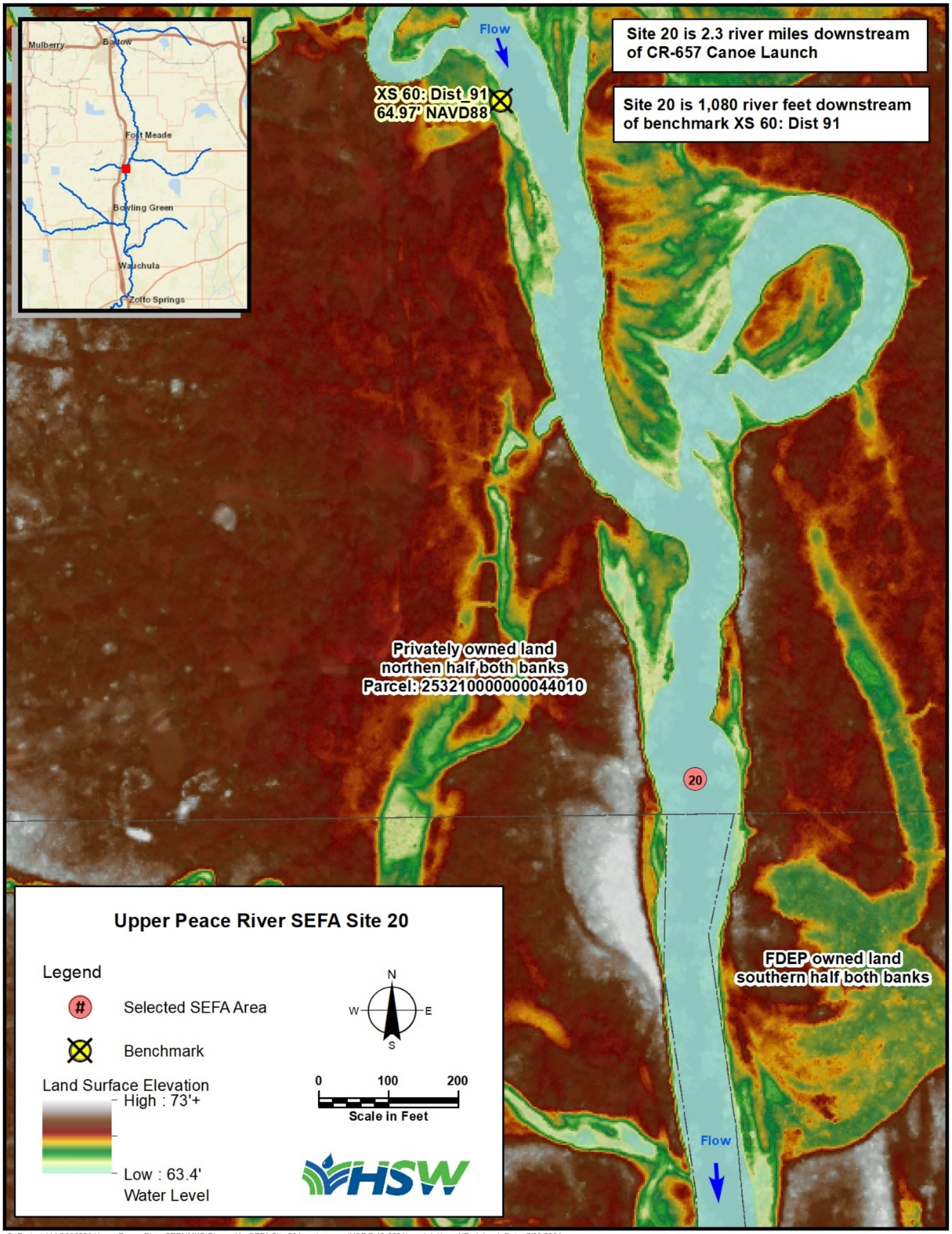
O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 8 - SEFA Site 12 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021



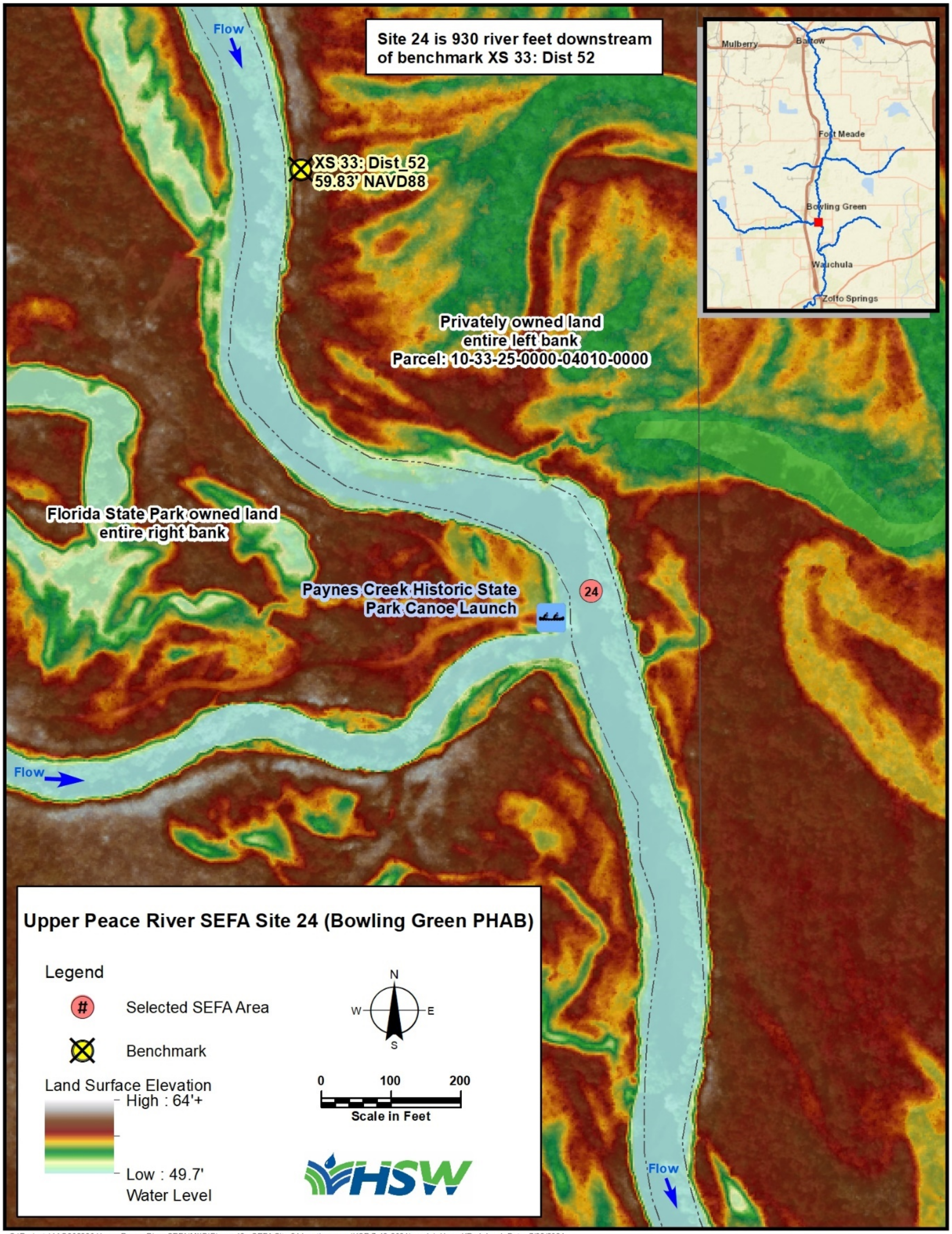
O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 9 - SEFA Site 16 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021



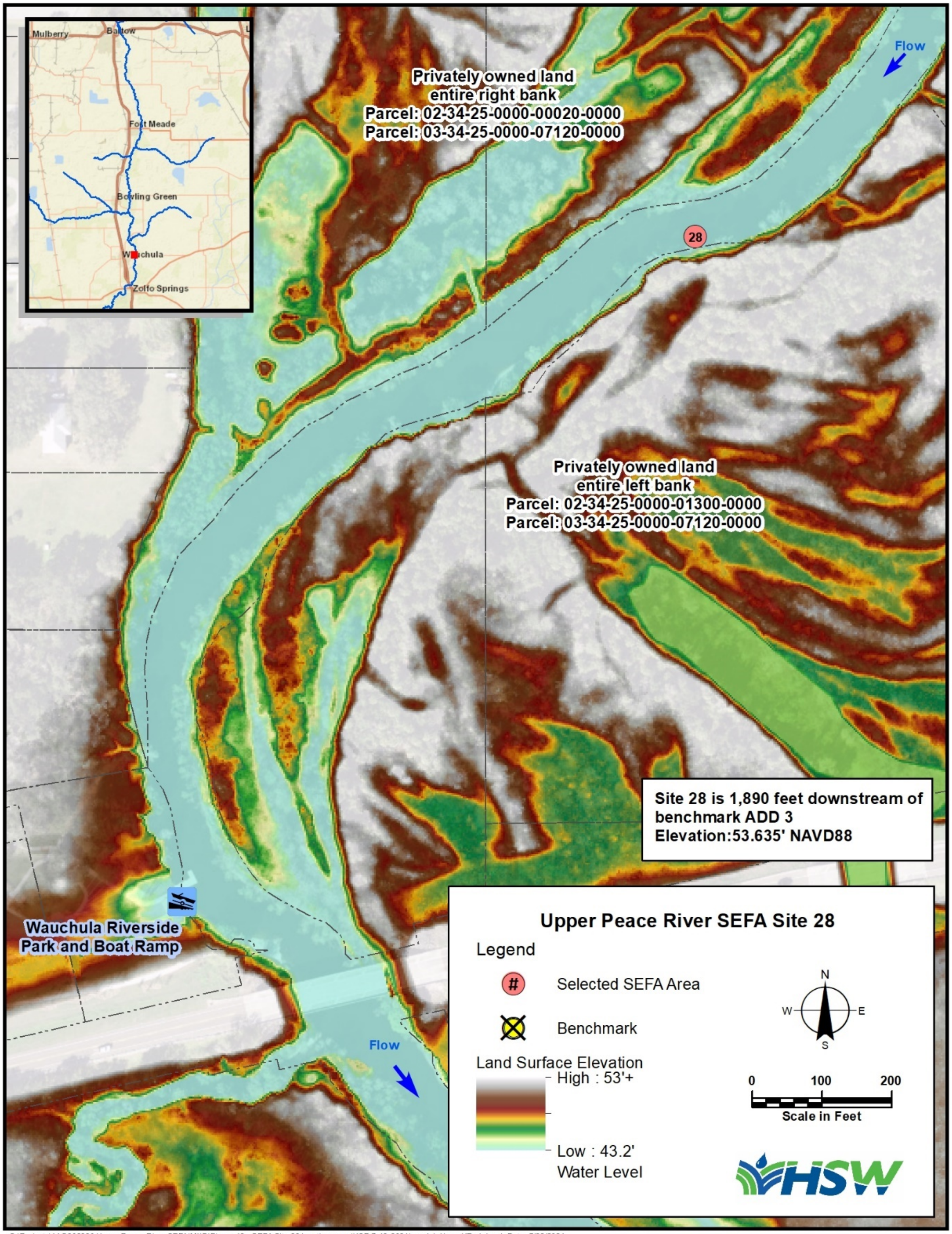
O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 10 - SEFA Site 19 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021

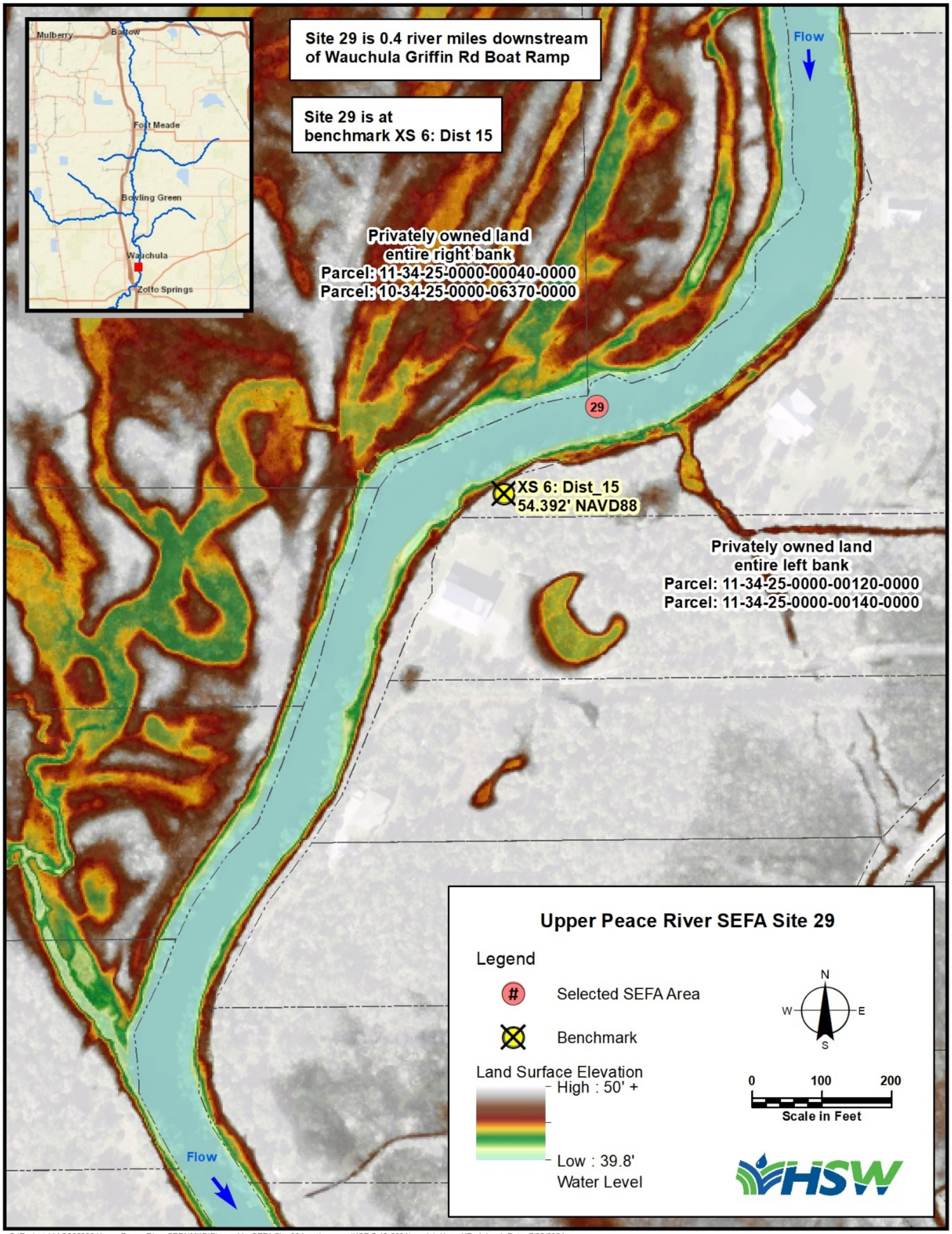


O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 11 - SEFA Site 20 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021



O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 12 - SEFA Site 24 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021


Mulberry
Bartow
Fort Meade
Bowling Green
Wauchula
Zolfo Springs
Flow
Privately owned land
entire right bank
Parcel: 02-34-25-0000-00020-0000
Parcel: 03-34-25-0000-07120-0000
28
Privately owned land
entire left bank
Parcel: 02-34-25-0000-01300-0000
Parcel: 03-34-25-0000-07120-0000
Site 28 is 1,890 feet downstream of benchmark ADD 3
Elevation:53.635' NAVD88
Wauchula Riverside Park and Boat Ramp
Flow
Upper Peace River SEFA Site 28
Legend
Selected SEFA Area
Benchmark
Land Surface Elevation
High : 53'+
Low : 43.2'
Water Level
N
W
E
S
0
100
200
Scale in Feet
O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 13 - SEFA Site 28 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021



O:\Projects\1AG802330 Upper Peace River SEFA\MXD\Figure 14 - SEFA Site 29 location map (KCB 7-13-2021).mxd | User: KBadgley | Date: 7/22/2021