



Wadeable Stream Suitability Assessment for Long-Term Monitoring

Horseshoe Bend National Military Park

Natural Resource Data Series NPS/SECN/NRDS—2019/1234



ON THE COVER

Looking downstream on 'Two Gully' Creek in Horseshoe Bend National Military Park. NPS photo / J.M. McDonald.

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August 2019
U. S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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Please cite this publication as:

McDonald, J. M. 2019. Wadeable stream suitability assessment for long-term monitoring: Horseshoe Bend National Military Park. Natural Resource Data Series NPS/SECN/NRDS—2019/1234. National Park Service, Fort Collins, Colorado.

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Executive Summary

The Southeast Coast Network *Monitoring Wadeable Stream Habitat Conditions in Southeast Coast Network Parks: Protocol Narrative* (McDonald 2018a) was developed to provide insight into the status of, and trends in, stream and near-channel habitat conditions in wadeable streams at national parks, recreation areas, battle fields, and monuments in Alabama, Georgia, and South Carolina. These parks include Chattahoochee River National Recreation Area (CHAT), Kennesaw Mountain National Battlefield Park (KEMO), Congaree National Park (CONG), Horseshoe Bend National Military Park (HOBE), and Ocmulgee National Monument (OCMU).

The number of reaches surveyed at each park is dependent on the size of the park and the number of wadeable streams within park boundaries. Reaches selected for monitoring (1) are representative of the processes influencing the streams in each park; (2) can address current and anticipated management concerns, and (3) offer the most utility for future complementary studies. The habitat assessment methods outlined in the protocol rely on standard data collection methods and standard operating procedures currently in use by the U.S. Geological Survey, U.S. Environmental Protection Agency, and U.S. Forest Service, modified to meet the needs of National Park Service (NPS) managers.

This report documents the stream suitability assessment conducted at Horseshoe Bend National Military Park to determine which streams should be chosen for long-term monitoring. On April 10, 2019, nine stream segments were assessed. Stream segment suitability was based on whether the stream (1) could be safely accessed, (2) was part of a single channel, wadeable stream system, and (3) was not greatly influenced by upstream impoundments. Of the nine stream segments identified in GIS or in consultation with park staff, two were determined to be suitable for long-term monitoring, three were classified as potentially suitable (listed as “maybe”), and four were determined to not be suitable for long-term monitoring.

Of the two streams determined to be suitable for monitoring, one was chosen for the initial round of monitoring (pH05—‘Claybed Creek’). This stream was chosen because it was the only stream in the park classified in the high definition National Hydrography Dataset (NHD) as perennial. If additional resources are available during the next round of monitoring, it is suggested that the other suitable stream (pH01—‘Salamander Creek’) be added to the monitoring program.

The following report provides an overview of the methods used to assess the suitability of each stream segment and provides a description of the assessed streams.

Introduction

This report documents the stream suitability assessment conducted at Horseshoe Bend National Military Park (HOBE) to determine which stream(s) are suitable for long-term monitoring (McDonald et al. 2018a). On April 10, 2019, Southeast Coast Network (SECN) staff met with HOBE staff to determine whether there were any management concerns related to the wadeable streams in the park. Each stream was then assessed to select a monitoring reach within the park. Though Horseshoe Bend NMP only has one stream designated as perennial by the high-definition National Hydrography Dataset (NHDhd), HOBE staff identified additional, potentially perennial streams within the park. The stream assessments in this report include those non-NHDhd drainages in the park and provide an assessment of suitability for future monitoring. Stream segment suitability was based on whether the stream: (1) could be safely accessed, (2) was part of a single channel, wadeable stream system and, (3) was not greatly influenced by upstream impoundments.

The NHDhd identifies one perennial stream (an unnamed second order stream; pH05) in the park (Figure 1). While meeting with park staff, additional (potentially perennial) streams were identified that were not part of the NHDhd coverage and were of potential management concern (see Identification of Potential Stream Segments in Methods section). After evaluating the stream segments in the field, two of the segments (pH01—‘Salamander Creek’ and pH05—‘Claybed Creek’) were determined to be suitable for long-term monitoring (see Identification of Potential Stream Segments in Methods section). Three additional segments were classified as potentially (‘Maybe’) suitable for long-term monitoring. These stream segments were only classified as potentially suitable because flow in these channels may only be due to the wet winter and spring of 2019. Though their channels were well defined and there was a significant amount of flow in all of them, these stream segments should be visited again at the end of summer during an extended dry period to determine whether they are perennial and fit the criteria outlined in McDonald et al. (2018a).

The following report provides an overview of the methods that were used to assess the suitability of each stream segment. Appendix A provides a detailed description of each assessed segment and identifies the potential management concerns associated with each segment.

Horseshoe Bend National Military Park

Horseshoe Bend National Military Park is located in eastern Alabama and is made up of 2,040 acres (825 hectares) of mixed hardwood forest (Figure 1). Most of the park is upland forest, and a portion of the area along the southern bank of the Tallapoosa River is covered by successional forest on historical farmland. Approximately 10% of the area (mostly in depressional areas on the floodplain) is classified as wetlands. The remainder of the park is open areas and fields that commemorate historic battlefronts. Surface-water resources at Horseshoe Bend NMP include the flow-regulated Tallapoosa River, its relatively narrow flood plain, small intermittent streams along the northern boundary of the Tallapoosa, and a small, unnamed perennial stream on the south side of the Tallapoosa River. Reconnaissance surveys, conducted in 2012, indicated that under the drought conditions that existed during fall 2012, most of the park’s ephemeral streams ceased to flow (M. B. Gregory, SECN program manager, personal observation).

Methods and Results

Stream segments were chosen for long-term monitoring based on GIS analyses of relevant, reliable, and accurate data layers, their relevance to management concerns, and based on field assessments of their safety and accessibility. Field evaluations are necessary because the resolution of available geospatial data is often too imprecise for a determination of the suitability of any given sample reach. In order to provide the most relevant information for management, stream reaches are either: (1) paired (based on drainage area and stream type) to determine the influence of different upstream watershed characteristics and land use/land cover; or (2) chosen to represent conditions or processes affecting similar-sized streams within the park. A probabilistic approach to reach selection was not used due to the limited number of stream segments within the park.

Stream segments were selected for long-term monitoring in five stages:

1. identification of potential stream segments in GIS;
2. consultation with park staff;
3. field suitability evaluation;
4. basin-scale assessment in GIS; and
5. final decision (with park staff input).

Each of these stages is discussed in detail in McDonald et al. (2018a) and step-by-step instructions are provided in SOP 1.2.14 *Wadeable Stream Reach Selection and Location of Sampling Points—Version 1.0* (McDonald et al. 2018b). A brief description of each stage and the results of the each analysis is provided below.

Identification of Potential Stream Segments

Potential stream segments were identified in a GIS using the high definition National Hydrography Dataset (NHDhd) and the park ownership boundaries. A point coverage was created to represent the potential stream segments within the park. This point coverage was used to discuss potential survey reaches with park staff as well as locate the stream segments in the field. All stream segments were classified as perennial, were within park ownership boundaries, and each segment was at least 400 feet (122 meters) in length. One stream segment (pH05) was identified from the NHDhd within the boundaries of HOBE (Table 1 and Figure 1). An

additional eight potentially perennial stream segments were identified from a digital elevation model (DEM)-derived stream network.

Consultation with Park Staff

Once the segments were identified in GIS, SECN staff met with HOBE staff to identify reaches with current or potential management concerns, determine issues that may prevent accessing segments, and determine the long-term applicability of monitoring each stream segment. During the meeting, HOBE staff expressed interest in all of the identified stream segments but identified the probability that many of the flow paths were likely ephemeral. After the brief meeting, SECN staff and HOBE staff assessed the nine stream segments.

Field Suitability Evaluation

Field surveys were conducted to determine whether each stream segment was suitable for long-term monitoring and to locate a representative reach within the candidate segment suitable for data collection. The width, water depth, bank height, and an interpretation of the geomorphic conditions that characterize the segment were recorded. Additionally, any conditions that made the stream unsuitable for sampling were also recorded. Conditions include (but are not limited to): presence of beaver dams or ponds; lack of a defined channel; or hazardous conditions such as treacherous wading conditions or difficult access to the stream (e.g., high undercut banks).

The field suitability evaluations determined that two of the nine stream segments (pH01 and pH05) were suitable for long-term monitoring (Table 1). Three stream segments (pH04, pH06, and pH08) were classified as potentially ('Maybe') suitable for monitoring. These three stream segments were classified as 'Maybe' because it could not be determined if the streams were perennial. Based on the well-defined banks and well-developed geomorphic channel units within these stream, there is a high possibility that they are perennial and may be suitable for monitoring. If any of these streams are determined to be of management concern, they should be revisited at the end of summer or during a prolonged dry period to determine whether they are perennial and suitable for monitoring. The remaining stream segments were classified as not suitable for monitoring because of their small size and the high potential that they were ephemeral drainages.

Basin-Scale Assessment

A basin analysis was conducted to characterize the watershed characteristics (e.g., geomorphic basin characteristics and land cover conditions) of the three stream segments classified as suitable for long-term monitoring (Table 2). This stage of segment selection determines whether basin-scale similarities between segments exist so representative segments can be chosen that provide an understanding of similar streams in the park or network. The measures used to determine the geomorphic characteristics and land cover conditions of each stream segment's watershed are described in McDonald et al. (2018a) and a detailed description of the methods used to calculate these measures can be found in SOP 1.2.15 *Wadeable Stream Basin- and Segment-Scale Data Summary—Version 1.0* (McDonald et al. 2018c).

Final Decision

The basin-scale assessment results were used to assist in the final selection of stream segments. Final stream segment selection was done by SECN personnel who could provide the best professional judgment required to adequately assess reach utility, safety, and suitability issues. Chosen

stream segments struck a balance between being relevant to management goals, complementary to future studies, and representative of conditions within the park.

Of the two suitable stream segments, 'Claybed Creek' (pH05) was chosen for long-term monitoring. This segment was chosen because it was on the only perennial stream identified in the park by NHDhd and the backwater effects of the Tallapoosa River do not influence the segment. The segment on 'Salamander Creek' (pH01) was not chosen for monitoring because during the initial assessment in 2012 the segment at pH01 was dry. While the stream may run dry during a high magnitude drought, the large number of in-channel fauna observed during the 2019 assessment suggests this stream is an important habitat for macroinvertebrates and amphibians in the park. Depending on management concerns, this segment may be included in future survey cycles.

Table 1. List of all the potential wadeable stream segments at Horseshoe Bend NMP assessed in 2017–2018 ("pSite" indicates potential sites).

pSite	Suitable	Stream Name	NHDhd Perennial	Latitude	Longitude	Drainage Area (km ²)	Stream Order
pH01	Yes	'Salamander Creek'	No	32.980	-85.747	1.00	1
pH02	No	'Backwater Creek'	No	32.982	-85.742	0.28	1
pH03	No	'Two Gully Creek'	No	32.980	-85.730	0.36	1
pH04	Maybe	'Bowser Creek'	No	32.983	-85.728	0.65	1
pH05	Yes	'Claybed Creek'	Yes	32.962	-85.744	3.46	2
pH06	Maybe	'Small Step Creek'	No	32.964	-85.737	1.19	1
pH07	No	'Pipeflow Creek'	No	32.969	-85.731	0.60	1
pH08	Maybe	'Sandy Creek'	No	32.977	-85.721	0.50	1
pH09	No	'Ditch Creek'	No	32.978	-85.719	0.67	1

Table 2. Sites that were suitable for monitoring. Final site numbers were determined after consultation with park staff. "pSite" indicates potential sites. "Site Name" indicates a site's identifier if selected for long-term monitoring.

pSite	Site Name	Stream Name	Stream Order	Drainage Area (km ²)	Entire Stream Gradient (%)	Average Basin Slope (°)	Basin Relief (km)	Developed (%)	Forested (%)	Grass/Pasture (%)
pH01	—	'Salamander Creek'	1	1.00	0.0174	5.23	0.200	7	92	1
pH04	—	'Bowser Creek'	1	0.65	0.0292	5.66	0.044	0	82	18
pH05	HOBE001	'Claybed Creek'	2	3.46	0.0235	7.99	0.085	4	68	16
pH06	—	'Small Step Creek'	1	1.19	0.0439	11.34	0.085	4	81	14
pH08	—	'Sandy Creek'	1	0.50	0.0518	7.06	0.077	5	77	7

Horseshoe Bend National Military Park - Potential Stream Monitoring Sites

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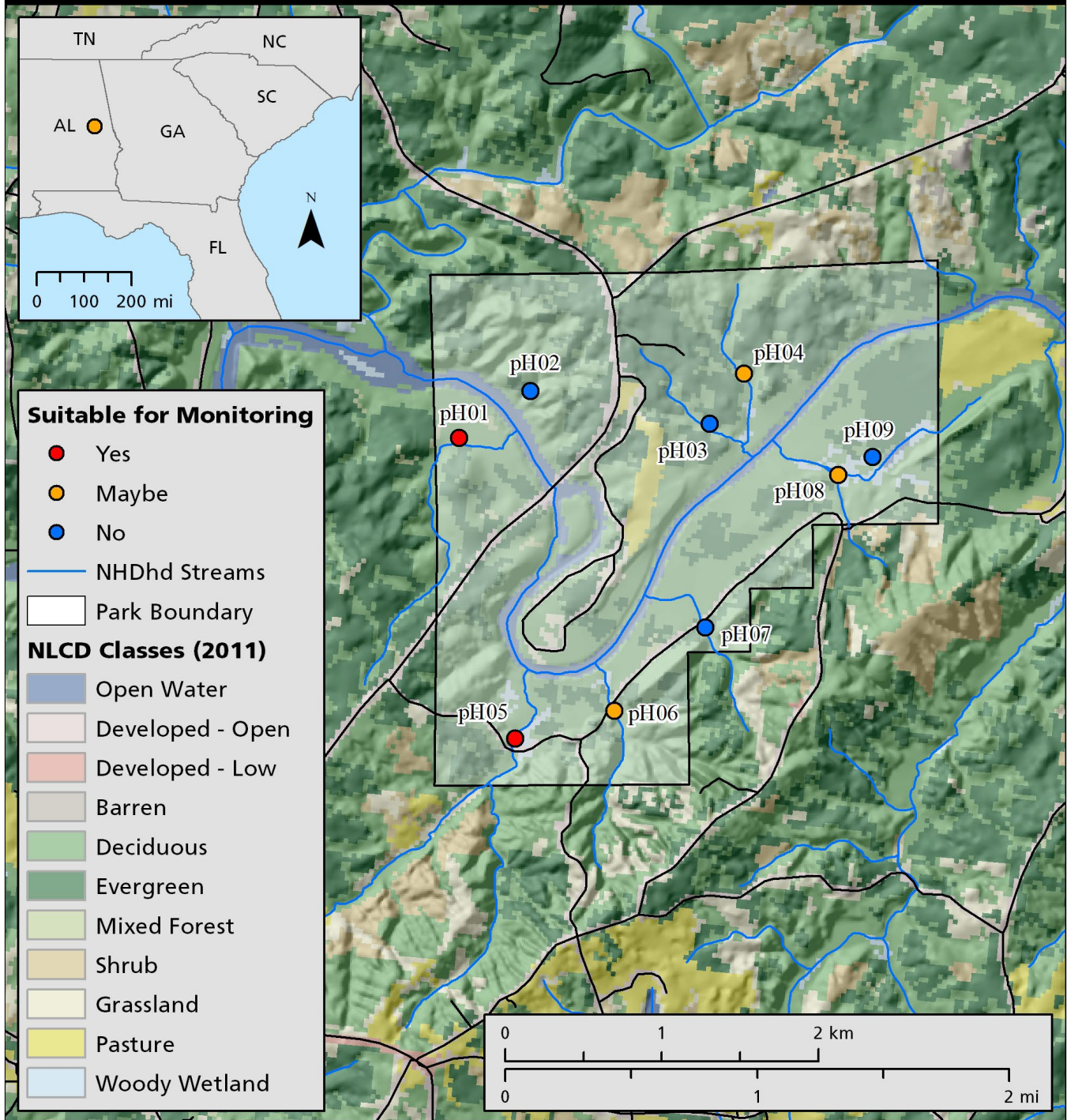


Figure 1. Overview map of the stream segments that were assessed to determine their suitability for long-term monitoring according to the criteria outlined in the SECN wadeable stream monitoring protocol (McDonald et al. 2018a).

Literature Cited

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Appendix A. Stream Segment Assessments



Park Unit: HOBE
Proposed Site Number: pH01
Stream Name: 'Salamander Creek'
Date: 4.10.2019
Time: 9:30 a.m.
Assessed by: JMM (Jacob McDonald)
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes
Recommend for Monitoring: Yes

Best Point of Access/Parking: Park next to creek near "Wilson's Rock."

Directions from Parking to Site: Walk to stream (right next to parking area at end of gravel road).

Management Issues Noted: None.

Safety Concerns: None.

Site Summary—'Salamander Creek' (unnamed first order) is a small sandy gravel bedded stream. Wetted width was approximately 2.5 meters (8.2 feet) and bankfull width was around 3.25 meters (10.7 feet). Water depth was approximately 0.15 meter (0.5 feet). Bank heights were approximately 0.4 meter (1.3 feet). Initial assessment of the creek classified the entrenchment of the segment as low. Floodplains have developed within the slightly entrenched channel. These floodplains appear to have developed due to rotational slumping of the bank (low area on river left in example photo). The banks were sparsely vegetated (approximately 30–60%) with grasses and ferns covering the banks where present. Large woody debris (LWD) is present and is serving a variety of purposes. A variety of geomorphic channel units were observed within the reach. Crayfish and a salamander were also observed within the assessed reach. This stream alternates between being on park and Alabama Power lands. Just downstream from this reach, the channel is much more entrenched. In this higher entrenchment area, slumping as well as lateral migration are working to develop areas of floodplain.

Monitoring Recommendation—This site is recommended for monitoring because, though it has a slightly smaller watershed than pH05, it would be a good pair for the stream previously chosen for monitoring (pH05). One potential negative for this reach is that it was dry in 2008, during the drought, when Brian Gregory (SECN) and Jeffery Riley (USGS) conducted the initial suitability assessment.



Park Unit: HOBE
Proposed Site Number: pH02
Stream Name: 'Backwater Creek'
Date: 4.10.2019
Time: 7:56 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes/No (Behind Maintenance Building)
Wadeable: Yes
Recommend for Monitoring: No
Best Point of Access/Parking: Park at end of UTV trail.
Directions from Parking to Site: Walk to stream.
Management Issues Noted: None.
Safety Concerns: None.

Site Summary—'Backwater Creek' (unnamed first order) is a small sand bedded stream that is frequently affected by the backwater effects of the Tallapoosa. Wetted width was approximately 1.5 meters (4.9 feet) and bankfull width was around 2.25 meters (7.4 feet). Water depth was approximately 0.15 meter (0.5 feet). Bank heights were approximately 0.75 meter (2.5 feet). Initial assessment of the creek classified the entrenchment of the segment as medium to high. Floodplains have not developed within the assessed reach though some semi-stable point bars were observed. Many of the side bars within the reach were organic bars. Bank slumping and undercutting were observed. The banks were sparsely vegetated (approximately 20–40%) with grasses and ferns covering the banks where present. Some river cane was observed growing along a portion of the reach. Large woody debris is present and many pieces were seen bridging the channel. In the upstream portions of the reach, the rocky hillslope encroaches on the stream.

Monitoring Recommendation—This site not recommended for monitoring because backwater effects of the Tallapoosa River affect the area that is not being encroached on by the hillslope. Additionally, this stream is very small and it is likely not perennial and was only flowing because of the wet winter and spring of 2019.



Park Unit: HOBE
Proposed Site Number: pH03
Stream Name: 'Two Gully Creek'
Date: 4.10.2019
Time: 9:00 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes
Recommend for Monitoring: No
Best Point of Access/Parking: Park on trail.
Directions from Parking to Site: Walk down to stream.
Management Issues Noted: None.
Safety Concerns: Steep banks.

Site Summary—“Two Gully Creek” (unnamed first order) is a small sandy gravel bedded (likely ephemeral) stream. The reach that was assessed is just downstream from the confluence of two gullies. Wetted width was approximately 1.0 meter (3.3 feet) and bankfull width was around 2.5 meters (8.2 feet). Water depth was approximately 0.05 meter (0.2 feet). Bank heights were approximately 1 to 1.5 meters (3.3 to 4.9 feet). Initial assessment of the creek classified the entrenchment of the segment as medium to high. Floodplains have developed within the assessed reach (an example can be seen on river left in example picture [picture looks downstream]). Bank slumping and undercutting were observed. The banks were sparsely vegetated (approximately 20–40%) with grasses and ferns covering the banks where present. Large woody debris is present and many pieces were bridging the channel. A large plunge pool (greater than 2 meters [6.6 feet] high) was observed in the river right upstream gully.

Monitoring Recommendation—This site is not recommended for monitoring because it is likely ephemeral and was only flowing because of the wet winter and spring of 2019. Though this stream is not suitable for long-term monitoring following the methods outlined by McDonald et al. (2018), the gully systems that feed into this channel are very well developed and may be of interest for studies into the long-term development of these systems.



Park Unit: HOBE
Proposed Site Number: pH04
Stream Name: 'Bowser Creek'
Date: 4.10.2019
Time: 8:45 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes
Recommend for Monitoring: Maybe

Best Point of Access/Parking: Along stream on logging road.

Directions from Parking to Site: Stream is visible from the logging road.

Management Issues Noted: None.

Safety Concerns: None.

Site Summary—'Bowser Creek' is a medium sized sandy gravel bedded stream that is heavily influenced by large woody debris. A newly cutoff meander was observed just upstream from the reach that was assessed (on river left in example picture [picture looks upstream]). Wetted width was approximately 2.5 meters (8.2 feet) and bankfull width was around 3.5 meters (11.5 feet). Water depth was approximately 0.12 meter (0.4 feet). Bank heights were approximately 0.5 meter (1.6 feet). Initial assessment of the creek classified the entrenchment of the segment as low. Floodplains have developed throughout the reach. Further downstream (below the small bridge), the creek is undercutting the banks on both sides of the creek for a series of meanders. The banks were sparsely to moderately vegetated (approximately 20–70%) with grasses and ferns covering the banks where present. Large woody debris is present and has caused a large number of LWD steps throughout the assessed reach. A good variety of geomorphic channel units were observed.

Monitoring Recommendation— This site is recommended for monitoring because it is representative of the streams in the northern portion of the park. This stream was classified as 'Maybe' recommended because it may be ephemeral. If there are enough resources to add an additional monitoring site, this stream should be visited in the late summer after an extended dry period to determine if it is perennial.



Park Unit: HOBE
Proposed Site Number: pH05
Stream Name: 'Claybed Creek'
Date: 4.10.2019
Time: 11:23 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes
Recommend for Monitoring: Yes

Best Point of Access/Parking: Just before or after first bridge on fire road.

Directions from Parking to Site: Walk along hillslope before bridge to stream (heavy vegetation along stream after bridge).

Management Issues Noted: None.

Safety Concerns: None.

Site Summary—'Claybed Creek' is a medium sized sandy gravel bedded stream that has a slightly sandier bed than the rest of the streams in this portion of the park. Cobble and gravel bars were observed throughout the assessed reach. Additionally, in some areas, the stream has incised down to clay. Wetted width was estimated to be approximately 2 meters (6.6 feet) and bankfull width around 6 meters (19.7 feet). Water depth was approximately 0.12 meter (0.4 feet). Bank heights were approximately 0.5 meter (1.6 feet) where floodplain has developed and 1.1 meters (3.6 feet) where they have not. Initial assessment of the creek classified the entrenchment of the stream as medium to high. Some floodplains have developed within the reach. Some undercutting was observed. The banks were moderately vegetated (approximately 50–70%) with grasses and ferns covering the banks where present. Large woody debris is present but not prevalent. A variety of geomorphic channel units were observed within the reach.

Monitoring Recommendation—This site recommended for monitoring because it is the only stream within the park that was classified as perennial by the high definition National Hydrography Dataset (NHDhd). Additionally, this reach is a good example of a Piedmont stream that is slowly developing/equilibrating to modern conditions (of discharge and sediment yield).



Park Unit: HOBE
Proposed Site Number: pH06
Stream Name: 'Small Step Creek'
Date: 4.10.2019
Time: 10:00 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes
Recommend for Monitoring: No

Best Point of Access/Parking: Along backroad near second bridge.

Directions from Parking to Site: Walk into stream.

Management Issues Noted: Fine sediment draping bed.

Safety Concerns: None.

Site Summary—'Small Step Creek' is a small sized sandy gravel bedded stream that has a relatively high concentration of fines draping the bed of the stream. Wetted width was approximately 1.5 meters (4.9 feet) and bankfull width was around 2.5 meters (8.2 feet). Water depth was approximately 0.10 meter (0.3 feet). Bank heights were approximately 0.8 meter (2.6 feet). Initial assessment of the creek classified the entrenchment of the stream as medium. Longitudinally extensive floodplains were not observed within the reach but some discontinuous slump benches were observed. Some of the banks were undercut. The banks were moderately to heavily vegetated (approximately 70–85%) with grasses and ferns covering the banks where present. Large woody debris is present and serving a variety of functions. A series of small LWD steps were observed within the assessed reach. The out-of-channel area was interpreted to be a low terrace. A higher terrace was observed on river left at the back of the low terrace. Upstream from the bridge, the stream bifurcates (though the river right bifurcation may be ephemeral). A variety of geomorphic channel units were observed within the reach.

Monitoring Recommendation—This site is classified as 'Maybe' recommended for monitoring due to its small size and because the NHDhd did not classify it as perennial. If additional sites are added to the monitoring program, this reach is of low priority.



Park Unit: HOBE
Proposed Site Number: pH07
Stream Name: 'Pipeflow Creek'
Date: 4.10.2019
Time: 10:15 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes
Recommend for Monitoring: No

Best Point of Access/Parking: Before or after third bridge on fire road.

Directions from Parking to Site: Walk into reach.

Management Issues Noted: None.

Safety Concerns: None.

Site Summary—'Pipeflow Creek' is a small sized gravelly sand bedded stream. Wetted width was approximately 1.25 meters (4.1 feet) and bankfull width was around 2 meters (6.6 feet). Water depth was approximately 0.1 meter (0.3 feet). Bank heights were approximately 0.55 meter (1.8 feet). Initial assessment of the creek classified the entrenchment of the stream as medium. No floodplain surfaces were observed in the assessed reach. Lots of undercutting was observed. In one area of the assessed reach, an undercut has merged with the channel and flow is piped through the bank back into the channel downstream (see example picture). The banks were sparsely vegetated (approximately 30–50%) with grasses and ferns covering the banks where present. Only a few pieces of LWD were observed within the assessed reach. The out-of-channel area was interpreted to be a low terrace. A variety of geomorphic channel units were observed within the reach. Downstream from the assessed reach, the stream is just an entrenched chute.

Monitoring Recommendation—This site is not recommended for monitoring because it is likely just an ephemeral stream that is only flowing because of the wet winter and spring of 2019.



Park Unit: HOBE
Proposed Site Number: pH08
Stream Name: 'SandyCreek'
Date: 4.10.2019
Time: 10:20 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes

Recommend for Monitoring: Maybe

Best Point of Access/Parking: Along fire road.

Directions from Parking to Site: Walk into reach.

Management Issues Noted: Potential beaver pond upstream.

Safety Concerns: None.

Site Summary—'Sandy Creek' is a medium sized relatively wide gravelly sand bedded stream. Wetted width was approximately 2.5 meters (8.2 feet) and bankfull width around 3.5 meters (11.5 feet). Water depth was approximately 0.15 meter (0.5 feet). Bank heights were approximately 0.65 meter (2.1 feet). Initial assessment of the creek classified the entrenchment of the stream as low. Some floodplains have developed within the reach (especially where side drainages enter the stream). A few low sandy bars were observed within the assessed reach (see example picture). The banks were moderately vegetated (approximately 50–70%) with grasses and ferns covering the banks where present. Only a few pieces of LWD were observed within the assessed reach. A few riffles were observed within the reach but it was lower energy than expected (runs and pools were observed alongside the riffles). Downstream from the assessed reach, the stream is just an entrenched chute. While there were only a few pieces of LWD in the reach, there were a large number of overhanging trees that may provide LWD to the reach in the future.

Monitoring Recommendation—This site is classified as 'Maybe' recommended for monitoring because it is likely just an intermittent stream that is only flowing because of the wet winter and spring of 2019. The relatively well-developed floodplain areas within the assessed reach suggest that this stream may flow more often than the relatively small drainage area suggests.



Park Unit: HOBE
Proposed Site Number: pH09
Stream Name: 'Ditch Creek'
Date: 4.10.2019
Time: 10:15 a.m.
Assessed by: JMM
Accessible: Yes
Gate Key Required: Yes
Wadeable: Yes
Recommend for Monitoring: No
Best Point of Access/Parking: Use UTV to off road to stream.
Directions from Parking to Site: Walk to stream.
Management Issues Noted: None.
Safety Concerns: None.

Site Summary—'Ditch Creek' is a small sized sand bedded stream. Wetted width was estimated to be approximately 1 meter (3.3 feet) and bankfull width around 1.5 meters (4.9 feet). Water depth was approximately 0.1 meter (0.3 feet). Bank heights were approximately 0.5 meter (1.6 feet). Initial assessment of the creek classified the entrenchment of the stream as medium. No floodplain surfaces have developed within the assessed reach. Based on the morphology of the reach, this stream is ephemeral and is likely just a developed small gully feature. The banks were moderately vegetated (approximately 50–70%) with grasses, ferns, privet, and river cane covering the banks where present. Only a few pieces of LWD were observed within the assessed reach. A variety of geomorphic channel units (riffles, pools, and steps) were observed within the reach. Some bank slumping was also observed.

Monitoring Recommendation—This site is not recommended for monitoring because it is just an ephemeral channel that is flowing because of the wet winter and spring of 2019.

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