Site Descriptions associated with the report:

Eastern Rivers and Mountains Network Stream Fish Monitoring Program: Summary of 2013-2014 Pilot Sampling

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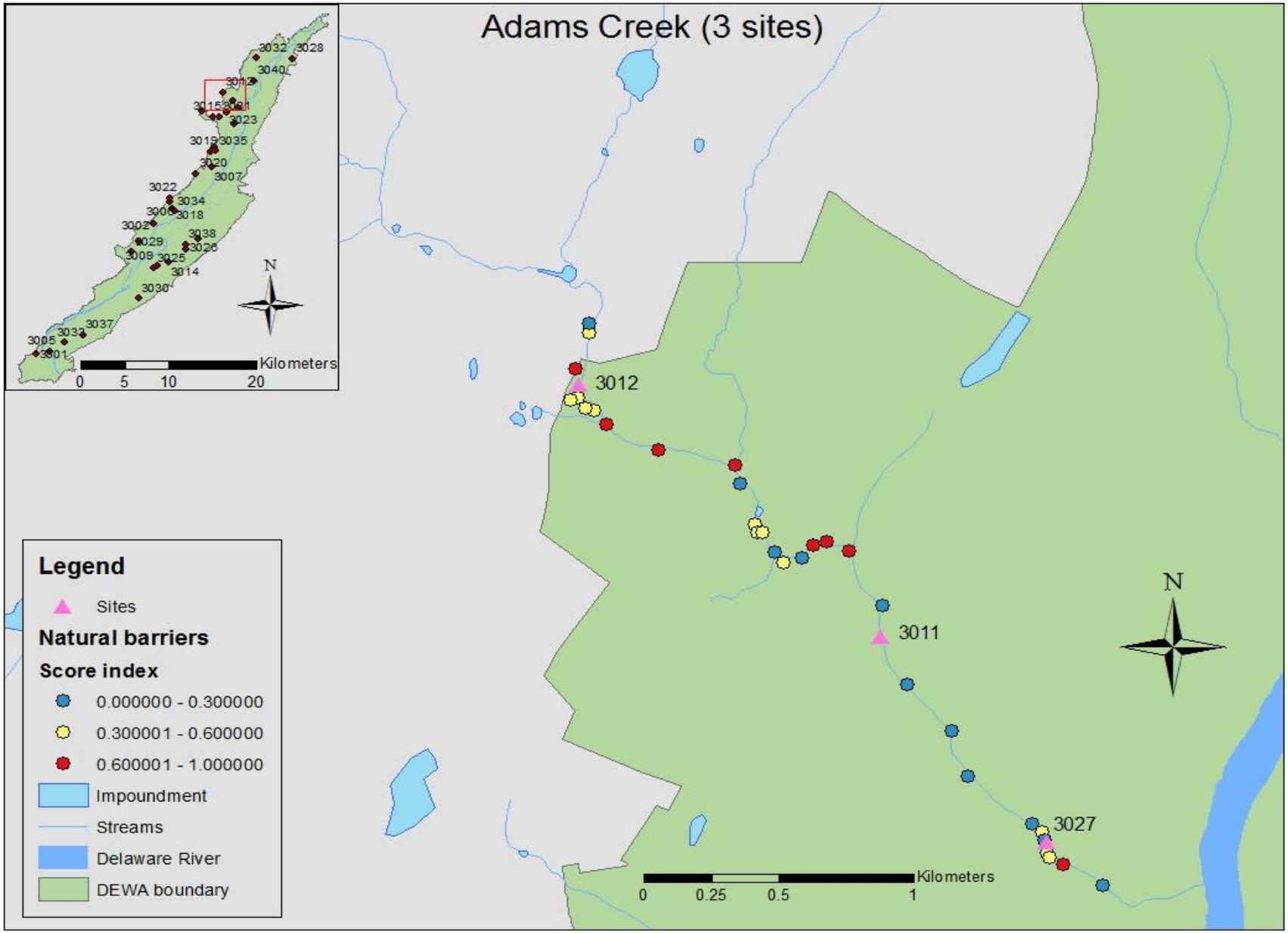
Table 1. Summary of changes that were made from Faulk (2015) by ASW and included in this report.

Faulk 2015		This Report	
page	original	page	revision
157	Blacknose Dace included	15	Blacknose Dace removed to be consistent with database and field sheets
157	Total: 5 Native: 4 Introduced: 1	15	Total: 4 Native: 3 Introduced: 1
174, 175	Dunnfield Creek 56	32, 33	Dunnfield Creek 53
175	Total: 5 Native: 3 Introduced: 2	33	Total: 2 Native: 2 Introduced: 0
301	NERI.3043: Total: 6 Native: 6 Introduced: 0	142	NERI.3043: Total: 8 Native: 6 Introduced: 2 (changed to be consistent with database and field sheets)
301	Brown Trout and Rainbow Trout not included	142	Brown Trout and Rainbow Trout included (changed to be consistent with database and field sheets)
306	Arbuckle Creek 2	147	Meadow Fork 01
313	Total: 2 Native: 0 Introduced: 0	154	Total: 2 Native: 2 Introduced: 0
313	NERI.3080	154	NERI.3048

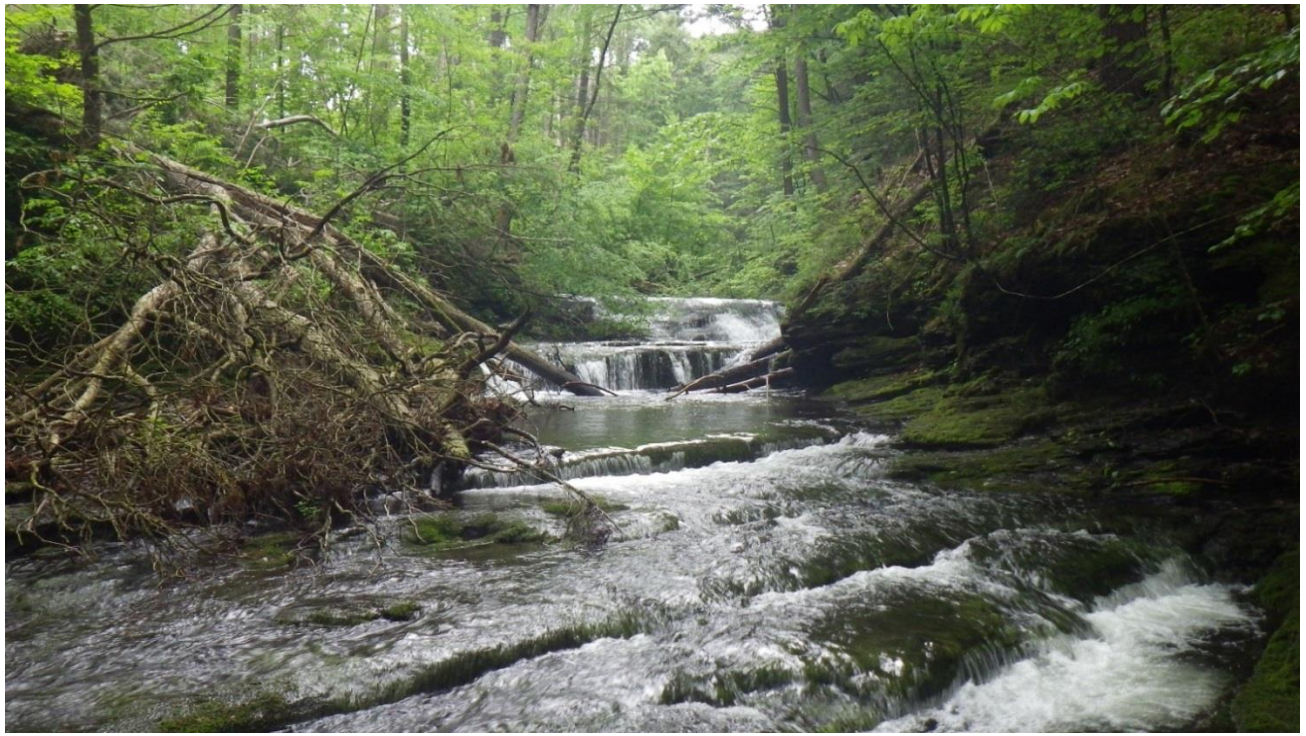
Delaware Water Gap National Recreation Area: Site Descriptions

The following is a summary of fish species and habitat characteristics observed at DEWA sampling sites. Included are maps of all sites on each stream, measured and derived habitat characteristics, location of natural barriers, fish species captured, pictures of sites, and a general discussion containing observations of the field crew during sampling and potential sources of fishes inhabiting each site. The appendix proceeds in alphabetical order by stream name and from downstream to upstream within each watershed. Natural barriers to fish movement and difficulty of passage (Score Index) in DEWA streams are based on Andrew (2012). Score Index is a value between 0 and 1 and estimates the passability of a natural barrier for Brook Trout, where 0 is least difficult and 1 is most difficult (see Andrew [2012] for more details). See Faulk (2015; pages 7, 8, 20, and 21) for an explanation of the methods for habitat sampling and landscape-level habitat characterization. See also the table below for the source of data for each parameter.

Parameter	**Data source**
Link magnitude	National Hydrography Dataset Plus
Percent riparian cover	2011 National Land Cover Database
Upstream catchment area	2011 National Land Cover Database
Percentage agriculture	2011 National Land Cover Database
Percentage developed	2011 National Land Cover Database
Percentage forest	2011 National Land Cover Database
Reach slope	USGS National Elevation Dataset digital elevation model
Distance to Delaware River	National Hydrography Dataset Plus
Reach area	Measured by EAF
Large woody debris density	Measured by EAF
Elevation	USGS National Elevation Dataset digital elevation model
Mean depth	Measured by EAF
Mean water temperature	Measured by EAF
Mean conductivity	Measured by EAF
Riparian vegetation	Measured by field crew as trees, shrubs, grasses, or herbaceous
Canopy cover	Measured by field crew as open, partly-shaded, or shaded
Dominant substrate	Measured by field crew as boulder, cobble, gravel, fine, or bedrock
Barrier Index	Calculated by EAF based on Andrew 2012
Impoundment	U.S. Fish and Wildlife Service National Wetlands Inventory 2014
Downstream barrier	Andrew 2012


Adams Creek (3 sites)
3012
3011
3027
N
Kilometers
0 0.25 0.5 1
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
Kilometers
0 5 10 20

DEWA.3027 – Adams Creek 03



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
50	58.80	19.21	0.08	9.85	85.14	0.12	0.81	652.50	0.03

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
1.90	128.69	0.38	18.49	80.00	Trees	Partly shaded	Bedrock	Yes	Yes

Species

American Eel (N) Blacknose Dace (N) Bluegill (I) Brook Trout (N) Brown Trout (I) Largemouth Bass (I)	

Total: 6
Native: 3
Introduced: 3

DEWA.3027 (Adams Creek 03) was the most downstream site on Adams Creek. It was heavily forested and characterized by bedrock substrate, steep banks, large woody debris accumulations, and many small waterfalls with deep plunge pools. Plunge pools and large woody debris accumulations made capturing fish difficult in some situations.

Brown Trout were most abundant in the reach, including many large adults and yoy. American Eel were also relatively abundant. Brook Trout were relatively uncommon (3 individuals). Bluegill and Largemouth Bass adults were both present and typically occupied plunge pools and large woody debris accumulations (e.g., see picture).

There are many impoundments in headwaters of Adams Creek, which may have contributed Bluegill and Largemouth Bass. The deep pools provide ideal habitat for these two species. Many barriers exist downstream of the reach, including some with high index scores, which makes it unlikely these two species moved up from the river. However, American Eel were able to navigate over the barriers to occupy this site.



Large woody debris accumulation at upstream end of reach (looking downstream).

DEWA.3011 – Adams Creek 14



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
45	56.36	17.75	0.08	10.58	83.98	0.10	1.86	678.75	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
1.29	158.61	0.16	18.14	81.33	Trees	Partly shaded	Boulder	Yes	Yes

Species

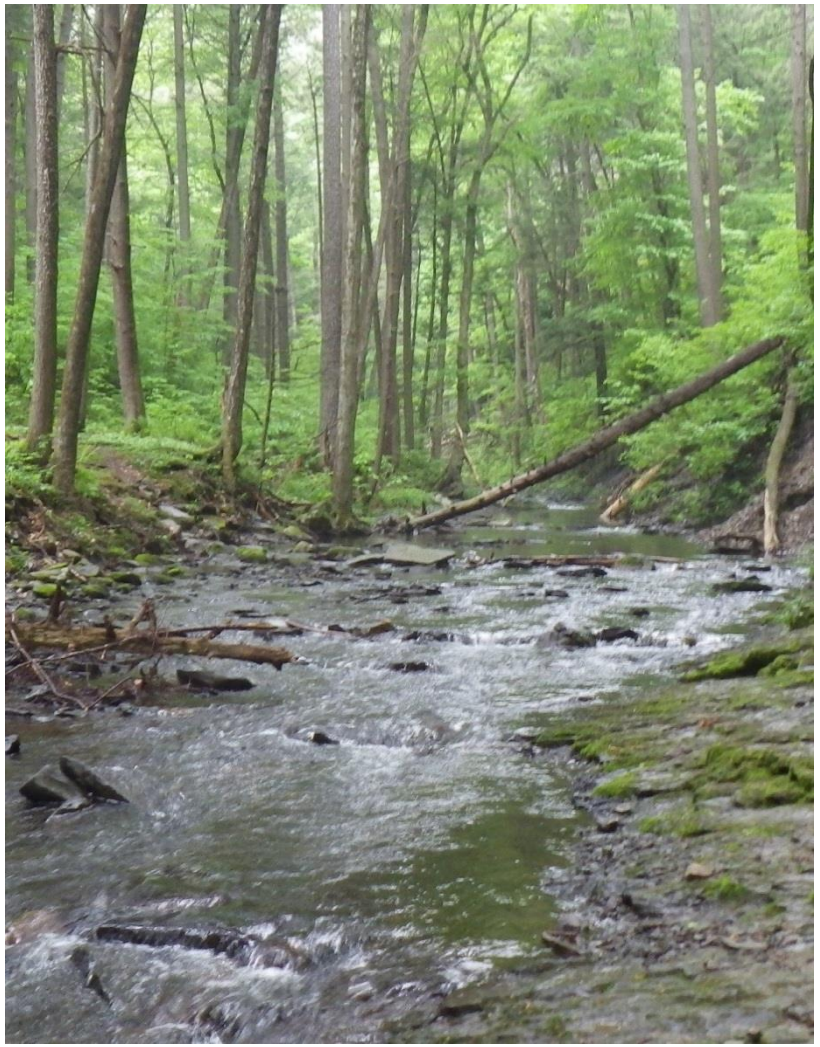
American Eel (N) Blacknose Dace (N) Bluegill (I) Brook Trout (N) Brown Trout (I)	

Total: 5
Native: 3
Introduced: 2

DEWA.3011 (Adams Creek 14) was the middle site on Adams Creek. It was heavily forested and characterized by cobble and boulder substrate, steep banks, and riffle/run habitat. Very few deeper pools existed. A very popular hiking trail follows the reach and crosses Adams Creek near the upstream end of the reach. Water temperature was the coolest at DEWA.3011 out of all three Adams Creek sites.

Blacknose Dace and American Eel made up the majority of the fish community at DEWA.3011. Brown Trout were also prevalent, and Brook Trout were uncommon (5 individuals). A few Bluegill were present (4 individuals) and were mostly captured from one small pool with woody debris.

Conditions for this site were similar to the most downstream site on Adams Creek (DEWA.3027), and it was reflected in species diversity. No Largemouth Bass were encountered at this point in the stream, but there was mostly shallow, swift habitat and relatively few pools they could occupy. No significant barriers exist downstream, which opens this section of stream for American Eel.



Upstream end of reach near where trail crosses stream.

DEWA.3012 – Adams Creek 33



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
33	57.18	13.09	0.11	12.44	80.36	0.16	3.66	700.00	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
2.92	271.14	0.30	18.39	78.33	Trees	Shaded	Bedrock	Yes	Yes

Species

Blacknose Dace (N)	
Bluegill (I)	
Brook Trout (N)	
Creek Chub (N)	
Largemouth Bass (I)	

Total: 5
Native: 3
Introduced: 2

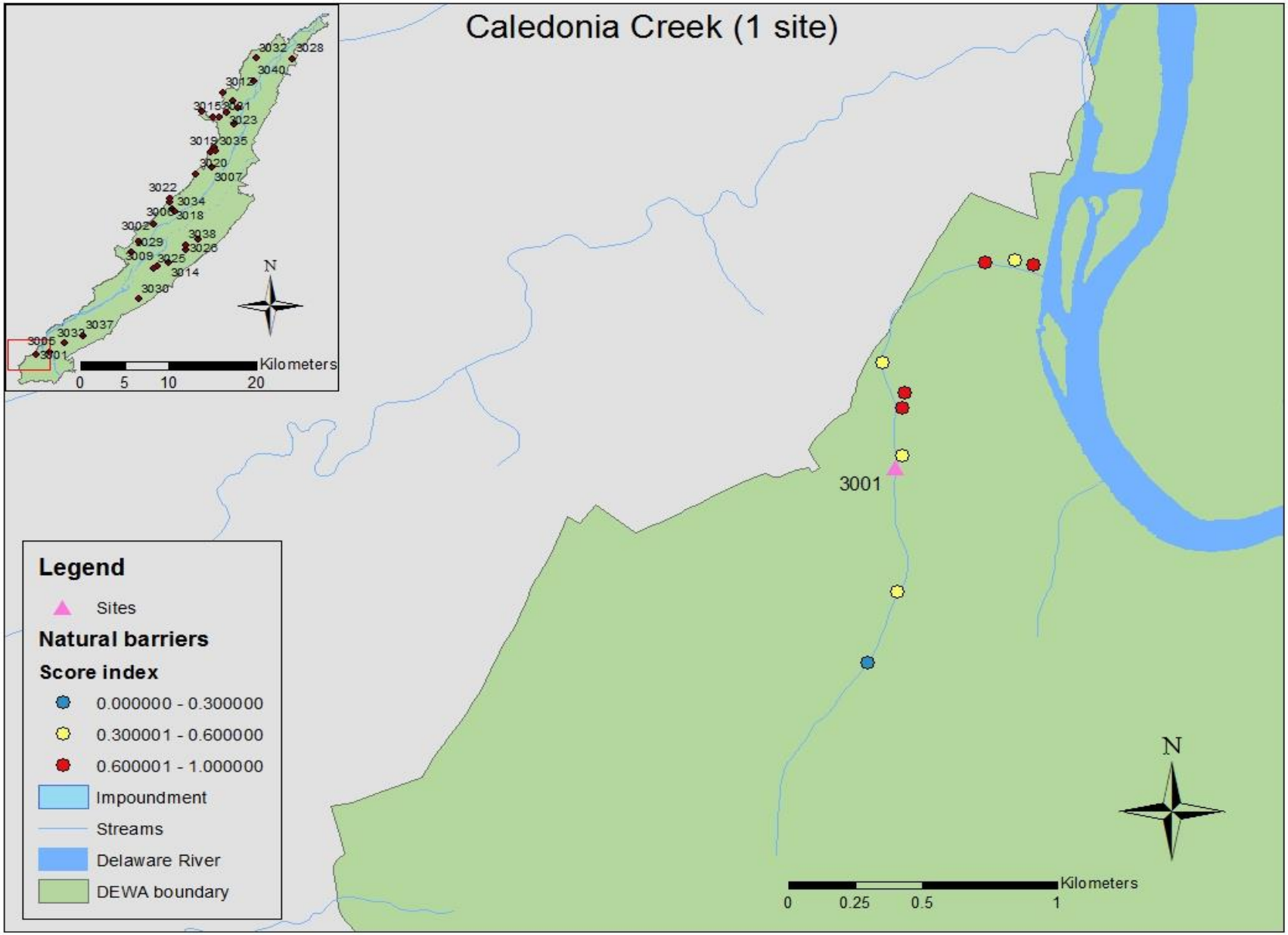
DEWA.3012 (Adams Creek 33) was the uppermost site on Adams Creek. It was settled between a large waterfall at the downstream end and a large pool that was too deep to shock effectively at the upstream end, resulting in an 80 m reach. Habitat was characterized by fast, shallow riffles over bedrock, and deeper runs or pools. The reach was directly adjacent to Milford Road. There were many signs that it was an active area for hiking and swimming.

Blacknose Dace was the most prevalent species (>200 individuals). Three species that were detected at downstream sites (Brook Trout, Bluegill, and Largemouth Bass) were also detected here, but in low numbers. Bluegill were only detected on the third visit. This was the only site on Adams Creek where Creek Chub were detected.

Although we were unable to shock the large pool at the upstream end, there were many Largemouth Bass adults that were visually identified by crew members occupying the pool. This could be a source of the Largemouth Bass encountered in downstream reaches. Many large barriers exist downstream of this site, including one waterfall estimated at roughly 50ft high, which likely made these upper reaches unavailable to American Eel.



Waterfall and large pool where adult Largemouth Bass were present at upstream end of reach.


Caledonia Creek (1 site)
3001
N
Kilometers
0 0.25 0.5 1
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
Kilometers
0 5 10 20

DEWA.3001 – Caledonia Creek 13



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
5	55.36	2.13	0.00	0.00	99.79	0.11	1.29	341.25	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
3.74	196.99	0.12	13.39	36.00	Shrubs	Shaded	Cobble	No	Yes

Species

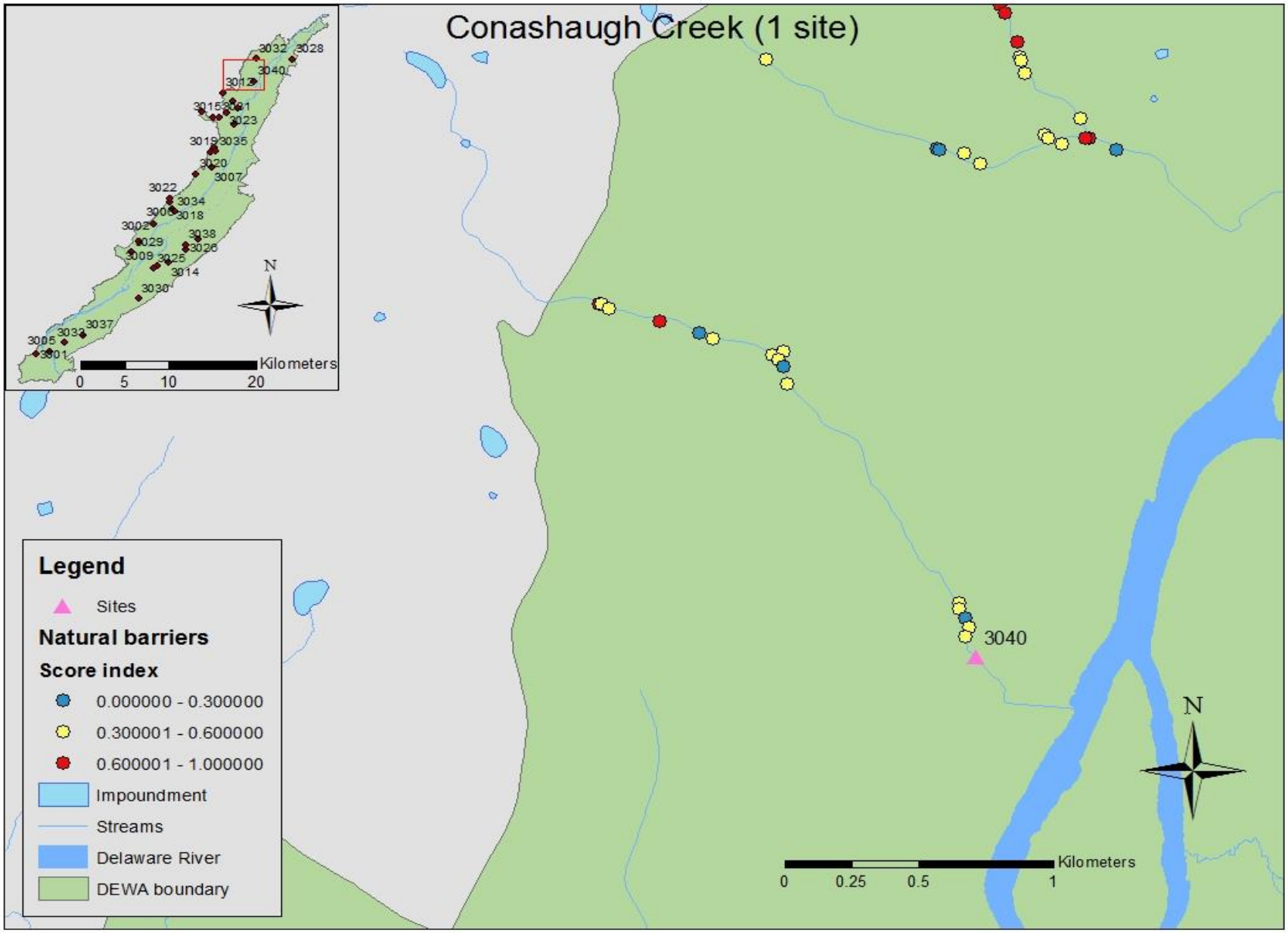
Brook Trout (N)	

Total: 1
Native: 1
Introduced: 0

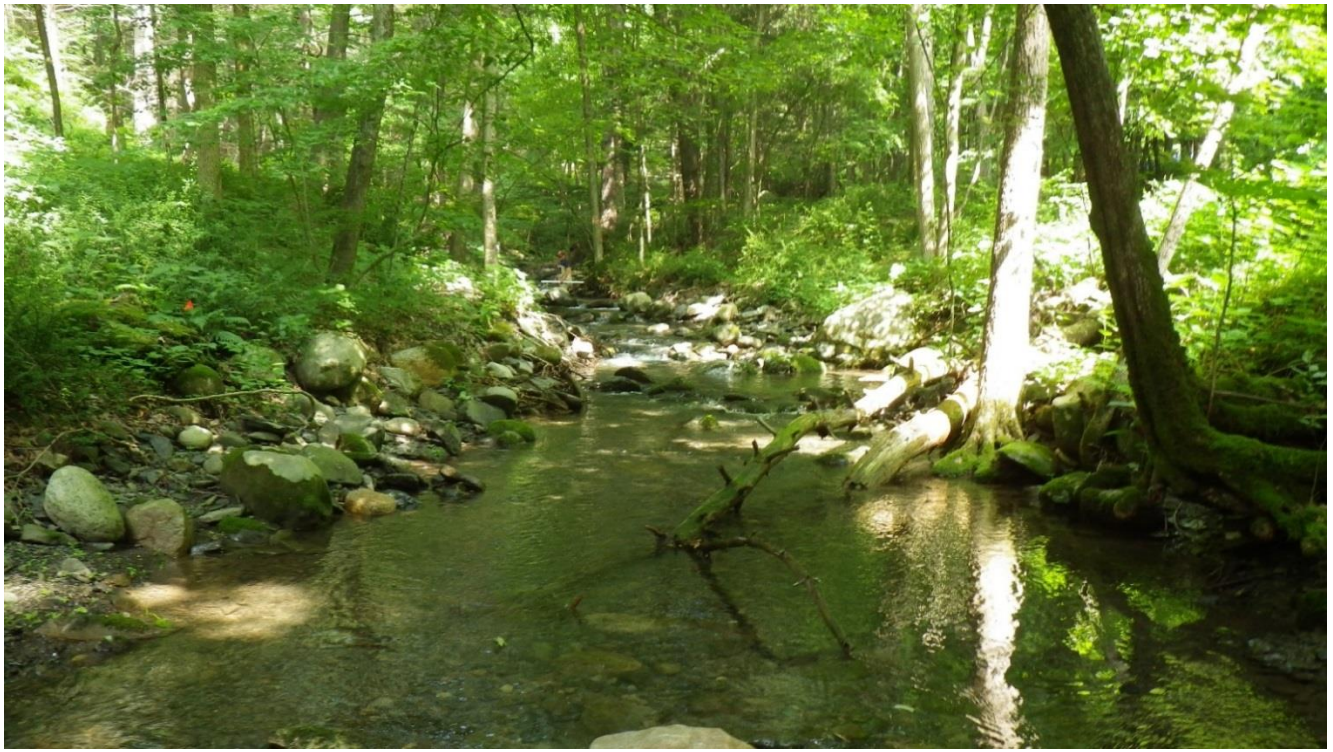
DEWA.3001 (Caledonia Creek 13) was a small, heavily-forested stream reach characterized by cobble and bedrock substrate, dense rhododendron riparian vegetation, and mostly riffle/pool habitat. This site had the coldest water temperature, on average, out of all sites.

Only Brook Trout were detected at DEWA.3001, both as adults and yoy. They typically occupied plunge pools. This was one of only two sites where Brook Trout were the only species present, and of those two sites, more were captured at this site (176 compared to 22 at DEWA.3010 – Vancampens Brook 95).

Small, heavily-forested, and cold, Caledonia Creek appears to be an ideal Brook Trout stream. There are no upstream impoundments that could potentially alter downstream habitat, and there are downstream barriers that prevent invasions of introduced species. The stream also exists entirely within park boundaries. However, there is a small impoundment downstream of the site with what appeared to be sunfish occupying its waters. This could potentially be removed to add more downstream Brook Trout habitat.


Conashaugh Creek (1 site)
3040
N
Kilometers
0 0.25 0.5 1
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
Kilometers
0 5 10 20

DEWA.3040 – Conashaugh Creek 02



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
15	55.31	5.59	0.34	5.54	92.74	0.14	0.55	346.25	0.02

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.00	127.04	0.21	13.61	67.33	Trees	Shaded	Boulder	Yes	No

Species

American Eel (N) Brook Trout (N) Brown Trout (I) – yoy only Longnose Dace (N)	

Total: 4
Native: 3
Introduced: 1

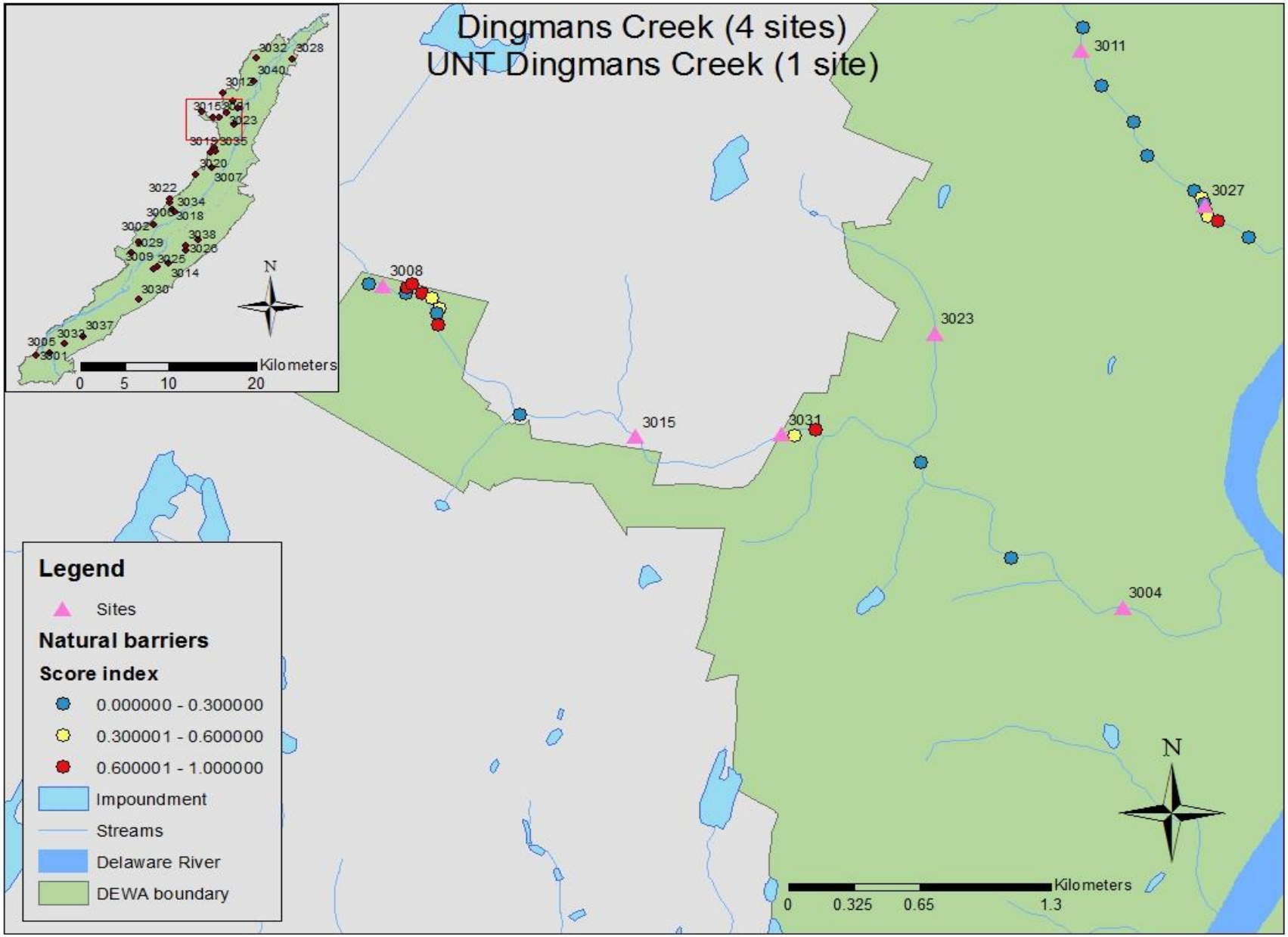
DEWA.3040 (Conashaugh Creek 02) was a small, heavily-forested stream reach characterized by large boulders, woody debris, and riffle/pool habitat. Water temperature was second coldest, on average, out of all sites. There was nothing unusual about the reach, except for a road crossing approximately 40m above the upstream end of the reach.

DEWA.3040 had the greatest amount of captured Brook Trout out of all sites (433 individuals across three visits) and all life stages were represented. Only Brook Trout and Longnose Dace were detected during the first visit, but many Brown Trout yoy appeared for the second and third visits, although no adults were captured. It is possible Brown Trout exist in upper reaches or adult Brown Trout in the Delaware River use Conashaugh Creek to spawn. Additionally, one American Eel was detected on the third visit.

An impoundment exists in the headwaters of Conashaugh, but no effects were seen at the study reach. No "pond" fish were found and water temperature was relatively cold. No barriers exist between the study reach and the Delaware River, but no "river" species were found. The cold water may have acted as a thermal barrier. With the exception of the presence of Brown Trout, this portion of Conashaugh Creek seems like a perfect candidate for "reference condition" of all small wadeable streams in DEWA.



Road and bridge at upstream end of reach.


Dingmans Creek (4 sites)
UNT Dingmans Creek (1 site)
3011
3027
3008
3023
3015
3031
3004
N
Kilometers
0 0.325 0.65 1.3
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
Kilometers
0 5 10 20

DEWA.3004 – Dingmans Creek 05



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
94	67.56	43.26	0.08	18.27	69.13	0.05	1.19	1178.13	0.02

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.00	126.53	0.35	19.31	83.67	Trees	Partly shaded	Cobble	Yes	No

Species

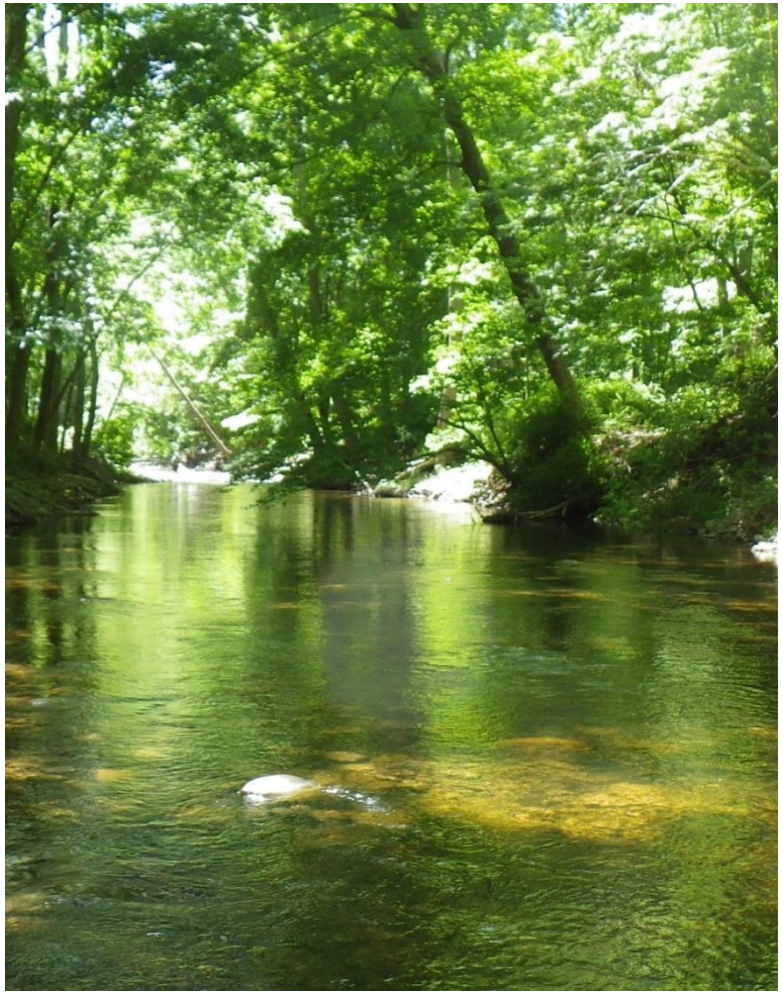
American Eel (N)	Margined Madtom (N)
Blacknose Dace (N)	Northern Hogsucker (N)
Bluegill (I)	Pumpkinseed (N)
Brown Bullhead (N)	Rainbow Trout (I)
Brown Trout (I)	Redbreast Sunfish (N)
Cutlips Minnow (N)	Shield Darter (N)
Fallfish (N)	Smallmouth Bass (I)
Green Sunfish (I)	White Sucker (N)
Largemouth Bass (I) - yoy	Yellow Perch (N) - yoy
Longnose Dace (N)	

Total: 19
Native: 13
Introduced: 6

DEWA.3004 (Dingmans Creek 05) was the most downstream site on Dingmans Creek. It was fairly open for the first 25 m, then heavily forested from 25 – 100 m. It was mostly a uniform, slow run with occasional side pools and some riffles. The top of the reach had a much deeper pool and long undercut bank.

Blacknose Dace and Longnose Dace made up the majority of fishes. Brown Trout, American Eel, Margined Madtom, and White Sucker were also prevalent. YOY from Largemouth Bass and Yellow Perch were present. The large pool at the top of the reach held Brown Bullhead and most of the sunfishes. Fallfish were only detected on the third visit. This was one of the few sites where Northern Hogsucker, Cutlips Minnow, and Green Sunfish were found.

High species diversity was likely the result of close proximity to the Delaware River and no barrier in between. Fallfish appeared to migrate into the reach in late summer. Some species may have washed down from impoundments, such as Largemouth Bass and Yellow Perch that were also found in upstream reaches.



The 25 – 100 m section of the study reach.

DEWA.3031 – Dingmans Creek 30



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
77	69.18	36.62	0.03	18.92	66.61	0.12	3.55	1008.75	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.52	197.27	0.30	19.65	75.33	Trees	Shaded	Bedrock	Yes	Yes

Species

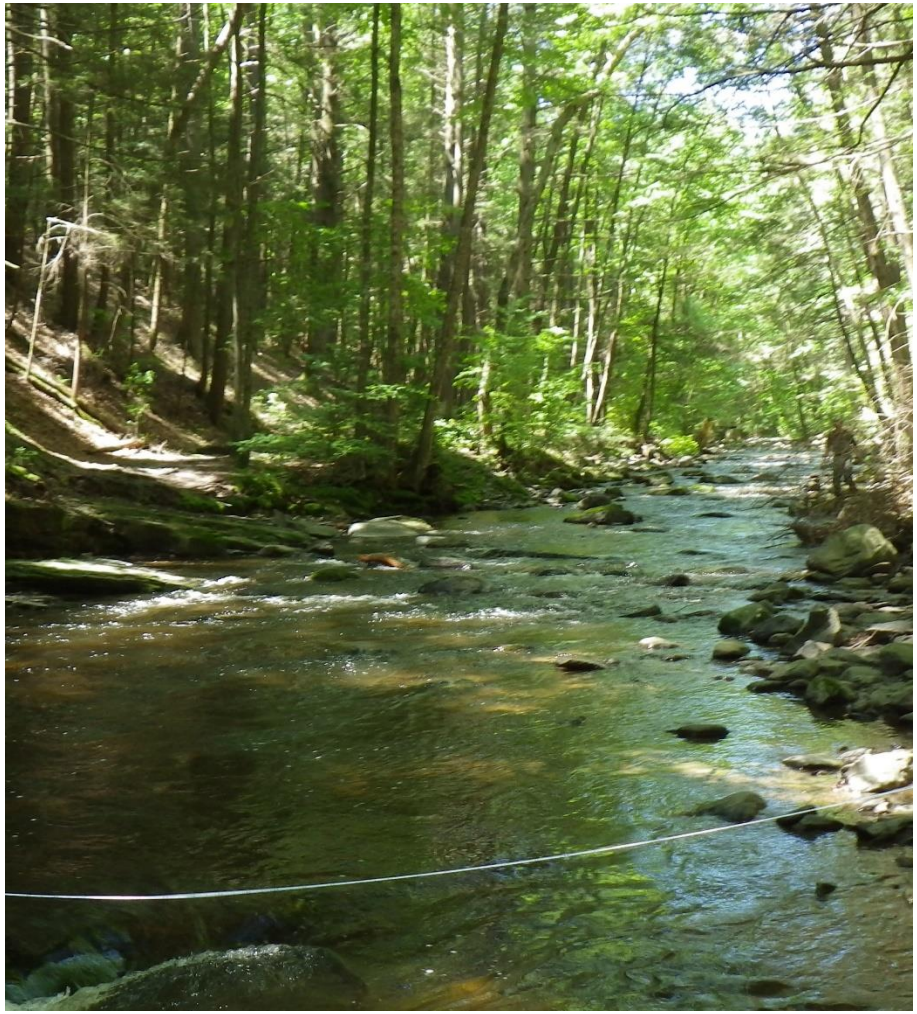
Blacknose Dace (N)	Largemouth Bass (I) – yoy only
Bluegill (I)	Margined Madtom (N)
Brown Bullhead (N)	Pumpkinseed (N)
Brown Trout (I)	Rainbow Trout (I)
Creek Chub (N)	White Sucker (N)
Golden Shiner (N)	Yellow Perch (N)

Total: 12
Native: 8
Introduced: 4

DEWA.3031 (Dingmans Creek 30) was the second most downstream site on Dingmans Creek. It was heavily forested and characterized by bedrock and riffle/run habitat, with some small pools. The reach was directly downstream of a very popular fishing area.

Blacknose Dace, Brown Trout, and Bluegill made up the majority of the fish community at DEWA.3031. Although there were nine other species present, they were captured in very few numbers (less than 15 individuals). Golden Shiner was the only species caught at DEWA.3031 that was not also caught at the site immediately downstream (DEWA.3004). Yellow Perch adults were captured for the only time during the study. Largemouth Bass only occurred as yoy.

It was surprising to see so many species in this reach. There are two significant barriers just downstream large enough to prevent American Eel from colonizing this area, yet Margined Madtom and Brown Bullhead somehow colonized. It is likely many of these fish came from upstream impoundments. Golden Shiner and Creek Chub may have been bait bucket transfers, since only one individual each was detected. Rainbow Trout were probably stocked for fishing. A reproducing population of Yellow Perch likely exists given yoy and adults were captured.



Upstream end of reach.

DEWA.3015 – Dingmans Creek 39



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
76	63.20	36.11	0.04	19.09	66.23	0.05	4.4	838.75	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.42	213.26	0.29	19.27	77.00	Trees	Shaded	Cobble	Yes	Yes

Species

Blacknose Dace (N)	Margined Madtom (N)
Bluegill (I)	Rainbow Trout (I)
Brown Trout (I)	White Sucker (N)
Creek Chub (N)	

Total: 7
Native: 4
Introduced: 3

DEWA.3015 (Dingmans Creek 39) was the second uppermost site on Dingmans Creek. It was in close proximity and very similar the next downstream site (DEWA.3031), although the reach appeared to have more deep pools. This site had the coolest water temperature, on average, out of all sites on Dingmans Creek.

It was the least speciose site on Dingmans Creek, but the fish community was very similar to DEWA.3031, with Blacknose Dace and Brown Trout being most prevalent. Margined Madtom were more abundant and only one Rainbow Trout was detected. There were much less Bluegill relative to DEWA.3031. Again, only one Creek Chub was observed.

It is unclear why, but many species were not encountered at this site that were encountered at DEWA.3031, which was relatively close in proximity. There were no known barriers between the two sites.



Upstream portion of reach.

DEWA.3008 – Dingmans Creek 57



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
68	60.50	32.16	0.00	17.94	65.80	0.07	6.1	886.25	0.04

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.99	280.66	0.32	20.16	69.33	Trees	Shaded	Boulder	Yes	Yes

Species

Blacknose Dace (N)	Pumpkinseed (N)
Bluegill (I)	Rainbow Trout (I)
Brown Trout (I)	White Sucker (N)
Creek Chub (N)	Yellow Bullhead (N)
Largemouth Bass (I) – yoy	Yellow Perch (N) – yoy
Margined Madtom (N)	

Total: 11
Native: 7
Introduced: 4

DEWA.3008 (Dingmans Creek 57) was the uppermost site on Dingmans Creek. There was obvious development going on near the stream. This site had the warmest water temperature, on average, out of all sites on Dingmans Creek.

The fish community was similar to the other sites on Dingmans Creek. Blacknose Dace were abundant, but Brown Trout were less common in this reach (10 individuals), possibly due to warmer water temperature. Margined Madtom were also more prevalent than downstream reaches. The most Yellow Perch and Largemouth Bass yoy were caught in this reach. One Yellow Bullhead was captured, and only on the third visit.

There are many large waterfalls upstream of the visitor's center that should prevent fishes from colonizing this area, but this reach was still relatively speciose. Given the close proximity to development and high amounts of human traffic, I would guess many of these species were introduced. There are also two relatively large impoundments present outside park boundaries roughly 1 km upstream.



Upstream portion of reach.

DEWA.3023 – UNT to Dingmans Creek 07



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
7	54.50	2.24	0.00	24.58	72.89	0.06	3.48	283.75	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.14	218.45	0.09	17.46	158.00	Trees	Shaded	Cobble	Yes	No

Species

Blacknose Dace (N) Brook Trout (N) Largemouth Bass (I) - yoy Pumpkinseed (N) - yoy	

Total: 4
Native: 3
Introduced: 1

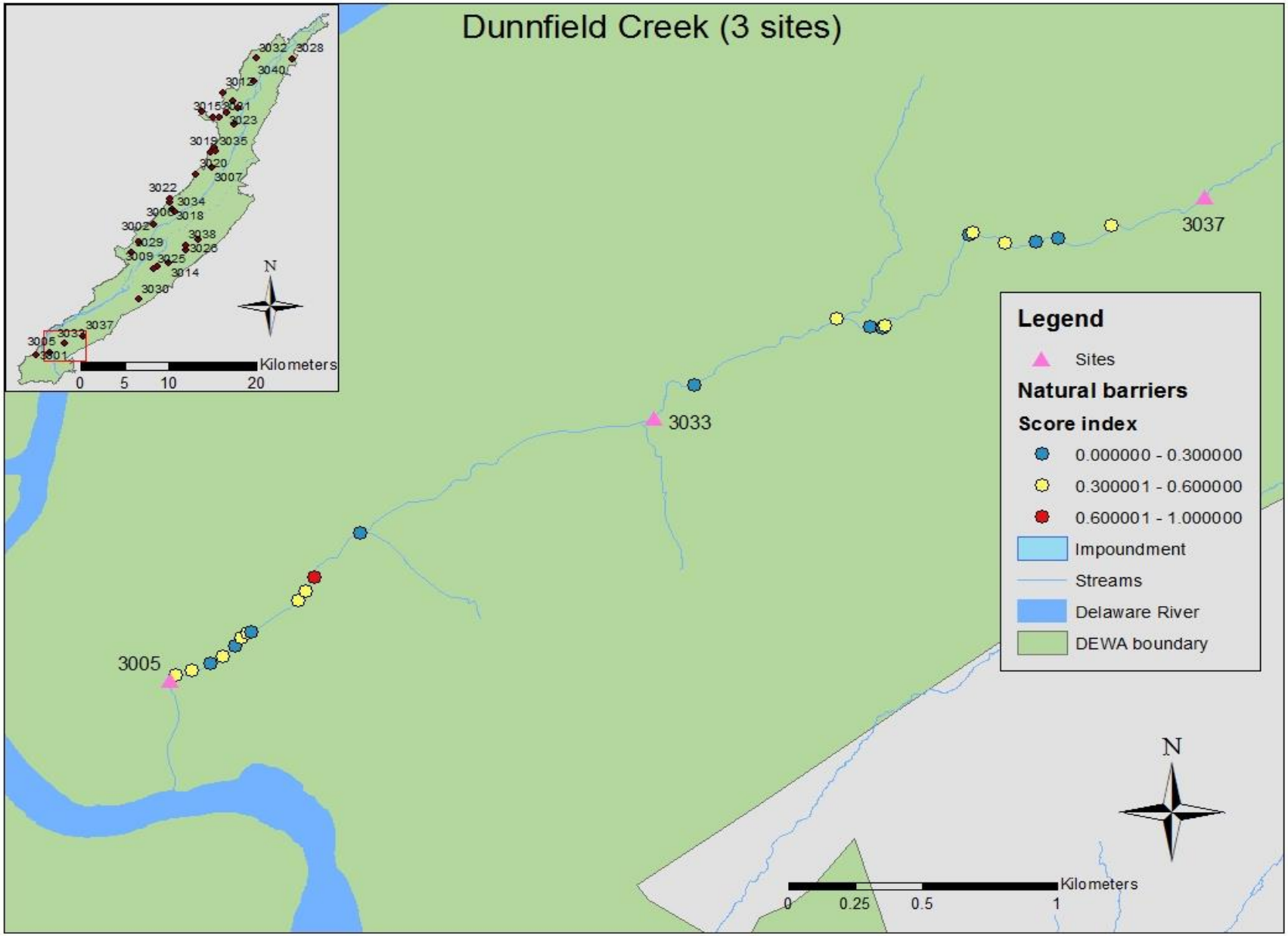
DEWA.3023 (UNT to Dingmans Creek 07) was a reach on a small tributary that flows into Dingmans Creek between the two lowermost sites (DEWA.3004 and DEWA.3031). It was heavily shaded with riffles, runs, and small pools. Water temperature was relatively cool. This portion of the creek runs alongside PA route 739. In late summer, there was very little water.

The fish community was mostly dominated by Brook Trout and Blacknose Dace. Many Brook Trout yoy were present. Adults mostly occupied small pools near undercut banks and overhanging trees. Juvenile Pumpkinseed were detected on the second and third visit, and a juvenile Largemouth Bass was detected on the third visit.

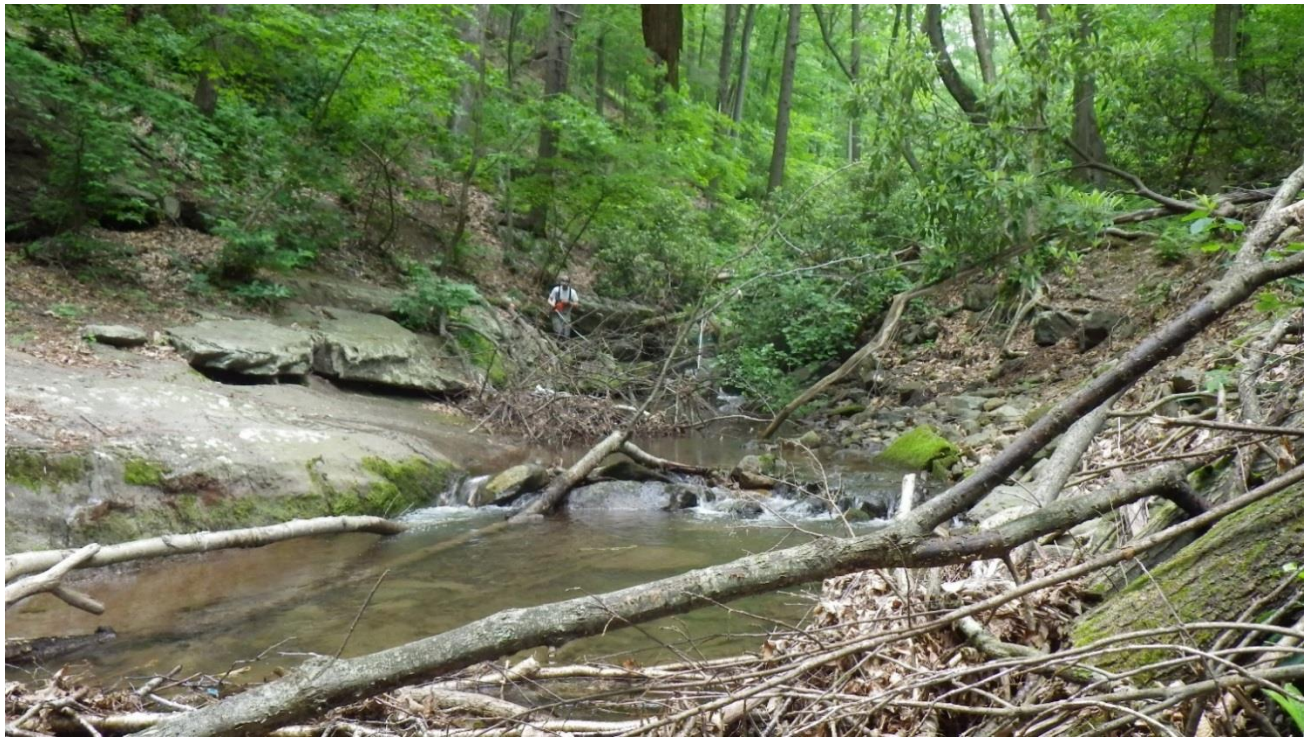
DEWA.3023 was one of the more prolific Brook Trout reaches. A small impoundment on private property exists near its headwaters that may have contributed the Largemouth Bass and Pumpkinseed. There are two downstream barriers, but they do not meet the >0.3 score index threshold, so this reach could potentially be available to migratory and colonizing species.



Upstream portion of reach.


Dunnfield Creek (3 sites)
3037
3033
3005
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
N
Kilometers
0
0.25
0.5
1
0
5
10
20

DEWA.3005 – Dunnfield Creek 03



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
22	54.62	9.37	0.13	0.03	97.64	0.21	0.52	432.50	0.05

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.00	108.63	0.24	16.24	32.00	Trees	Partly shaded	Bedrock	No	No

Species

American Eel (N) Brook Trout (N) Brown Trout (I) Tiger Trout (I/N) - hybrid	

Total: 4
Native: 2
Introduced: 2

DEWA.3005 (Dunnfield Creek 03) was the most downstream site on Dunnfield Creek. It was heavily forested and characterized by bedrock substrate, steep banks, large woody debris accumulations, and some small waterfalls with deep pools. The reach consisted mostly of large pools with very little run or riffle habitat. The middle of the reach had a large open area with a continuously long and deep pool. The site is alongside a portion of the Appalachian Trail and is popular for visitors. Dunnfield Creek lies within Worthington State Forest.

Brown Trout were most abundant in the reach, including many large adults and yoy. American Eel were also relatively abundant. Brook Trout were relatively uncommon (6 individuals), but a few large adults were present and mostly occupied the long deep pool previously mentioned. One Brook Trout x Brown Trout hybrid was captured on the third visit. These fish are infertile and relatively uncommon in the wild.

DEWA.3005 was the only reach sampled in DEWA without an upstream impoundment or a downstream barrier. Although the reach was available to species colonizing from the river, only American Eel took advantage. This might be due to the relatively cool water temperature and somewhat lack of habitat variability.



Large open area with deep pools. Waterfall in background defines upstream boundary of reach.

DEWA.3033 – Dunnfield Creek 26



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
17	63.69	6.52	0.18	0.04	97.20	0.30	5.3	552.50	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.93	222.12	0.19	16.04	27.00	Trees	Shaded	Cobble	No	Yes

Species

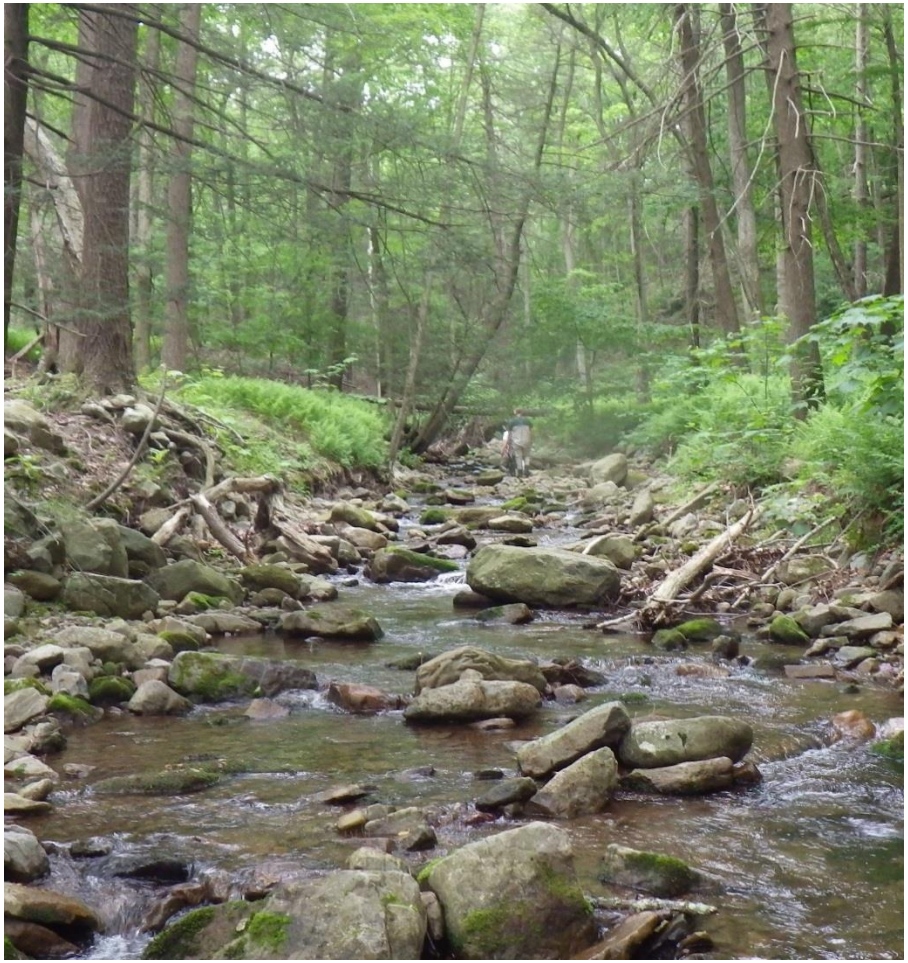
Brook Trout (N) Brown Trout (I)	

Total: 2
Native: 1
Introduced: 1

DEWA.3033 (Dunnfield Creek 26) was the middle site on Dunnfield Creek. It was heavily forested and characterized by cobble and boulder substrate with mostly riffles and small pools. Very few deeper pools existed.

The only two species detected were Brook Trout and Brown Trout. Brown Trout were much more common than Brook Trout (134 and 26 individuals, respectively).

There was not much unique about this site. There were some pretty significant waterfalls downstream that likely inhibited American Eel from making it this far upstream.



A look at the upstream portion of the reach.

DEWA.3037– Dunnfield Creek 53



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
33	57.18	13.09	0.11	12.44	80.36	0.16	3.66	700.00	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
2.92	271.14	0.30	18.39	78.33	Trees	Shaded	Bedrock	Yes	Yes

Species

American Eel (N) Brook Trout (N)	

Total: 2
Native: 2
Introduced: 0

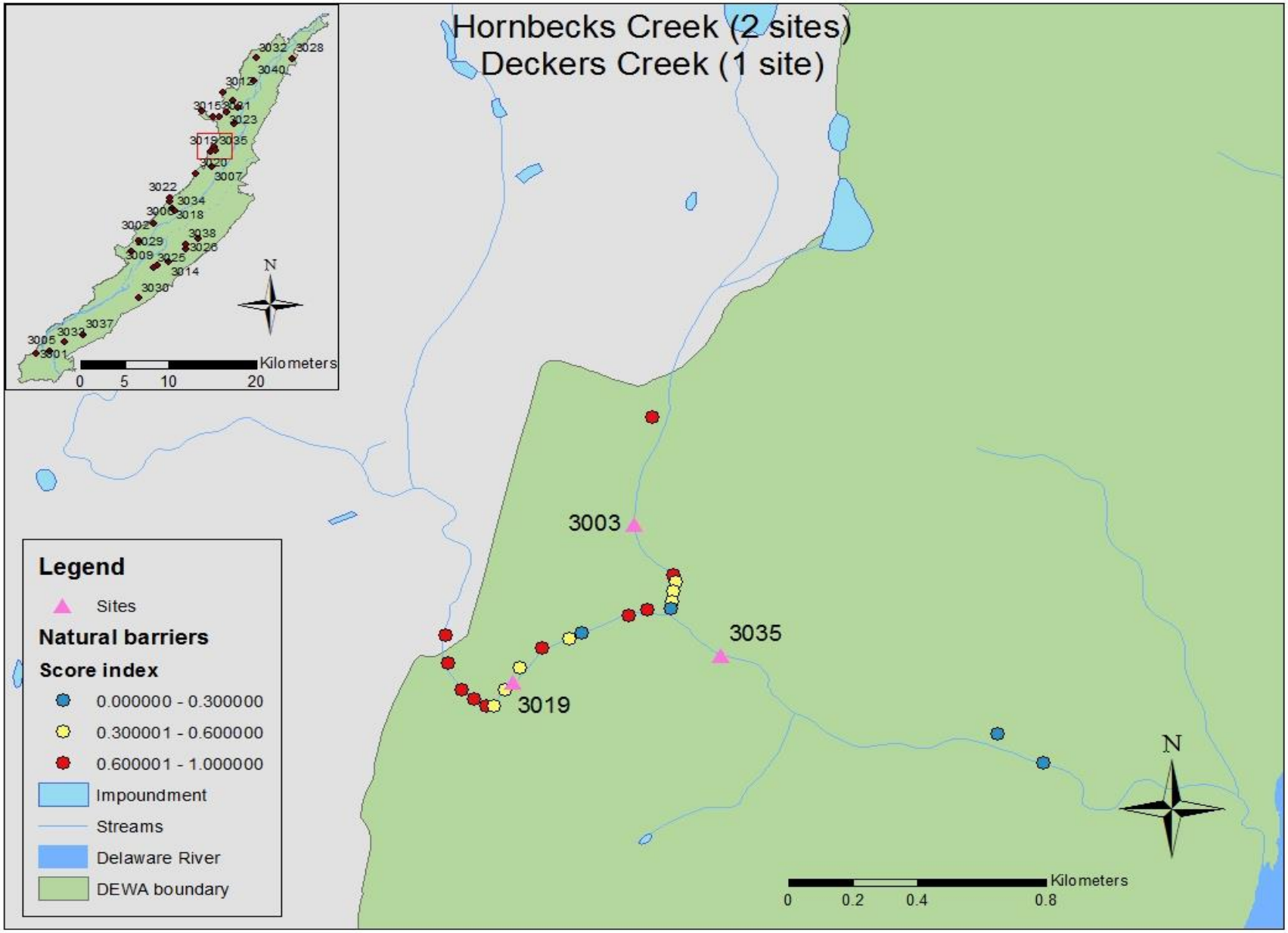
DEWA.3037 (Dunnfield Creek 53) was the uppermost site on Dunnfield Creek. This section of Dunnfield Creek is basically an emergent wetland. It is an open area with shrubs, grasses, and very few trees, and the ground is soggy. The stream resembles a ditch about waist deep with a soft bottom, some aquatic vegetation, and very little habitat variability. Water temperature was relatively warm, but there was very little shade. The stream appeared to be intermittent or have very little water upstream of the reach in the trees.

Brook Trout were the most abundant species (54 individuals over three visits, adults and yoy both present), and, surprisingly, we detected large American Eel (two on the first two visits, only one on the last visit). These were by far the largest and possibly oldest eels captured throughout the whole study. Salamanders were also very common in the reach.

Contrary to expectations, the downstream barriers may not have blocked upstream migration by eels. It was obvious these two eels benefited from being the only predator with ample prey sources. It is likely these individuals were nearing an age where they would migrate back towards the Delaware River and out to sea to spawn, so there is a possibility eels may not be found in this reach during future sampling occasions.



Dense vegetation surrounding the reach.


Hornbecks Creek (2 sites)
Deckers Creek (1 site)
3003
3035
3019
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
N
Kilometers
0 0.2 0.4 0.8
Kilometers
0 5 10 20

DEWA.3035 – Hornbecks Creek 15



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
52	54.55	20.42	1.13	14.24	75.31	0.05	2.37	643.75	0.08

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.24	143.75	0.19	17.51	124.00	Trees	Shaded	Cobble	Yes	No

Species

American Eel (N)	Longnose Dace (N)
Blacknose Dace (N)	Margined Madtom (N)
Bluegill (I)	Northern Hogsucker (N)
Brown Trout (I)	Redbreast Sunfish (N)
Common Shiner (N)	Shield Darter (N)
Cutlips Minnow (N)	White Sucker (N)
Fallfish (N)	

Total: 13
Native: 11
Introduced: 2

DEWA.3035 (Hornbecks Creek 15) was the most downstream site on Hornbecks Creek. It was a reach in a heavily forested area that somewhat resembled a small gorge. It was characterized by cobble and boulder substrate with some deep pools near two big large woody debris accumulations. A somewhat popular hiking trail runs along the banks of the reach.

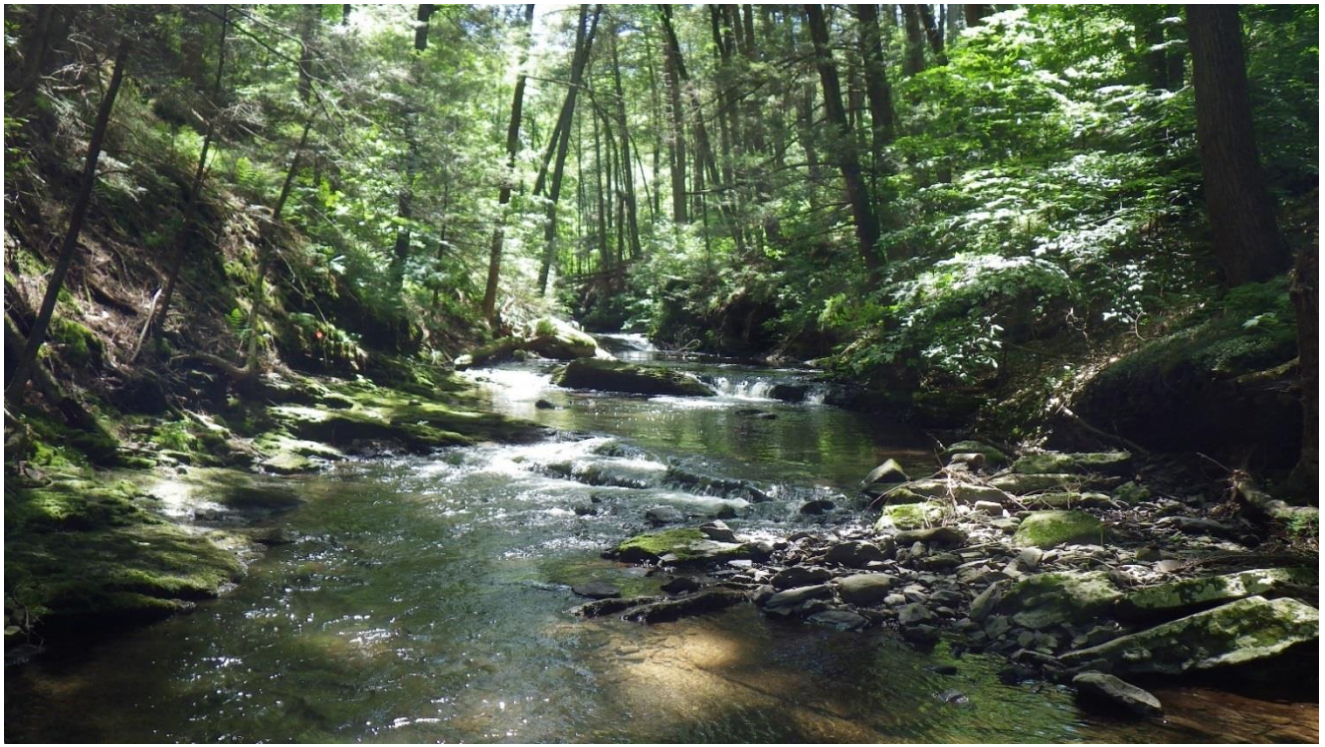
Margined Madtom, Fallfish, and Brown Trout were most abundant in the reach, including the largest adult Brown Trout we captured all summer. Fallfish were relatively sparse the first and second visits (1 and 4 individuals, respectively), but were the most abundant species the third visit (42 individuals). This one of only three reaches where Common Shiner were detected, and one of only two where both Common Shiner and Northern Hogsucker were present.

Although a relatively long distance from the Delaware River, many species that were typically only found at low elevations near the river were found in this portion of Hornbecks Creek. There are many large and small impoundments that exist in the headwaters of Hornbecks and its tributaries that may have contributed species like Bluegill, but given the high diversity of native species, I think most of this reach was colonized by species from the river.



One of the big large woody debris accumulations near the middle of the reach.

DEWA.3019 – Hornbecks Creek 23



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
46	56.11	17.53	1.07	14.87	73.67	0.15	3.14	577.50	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
1.49	202.28	0.31	18.49	128.00	Trees	Shaded	Bedrock	Yes	Yes

Species

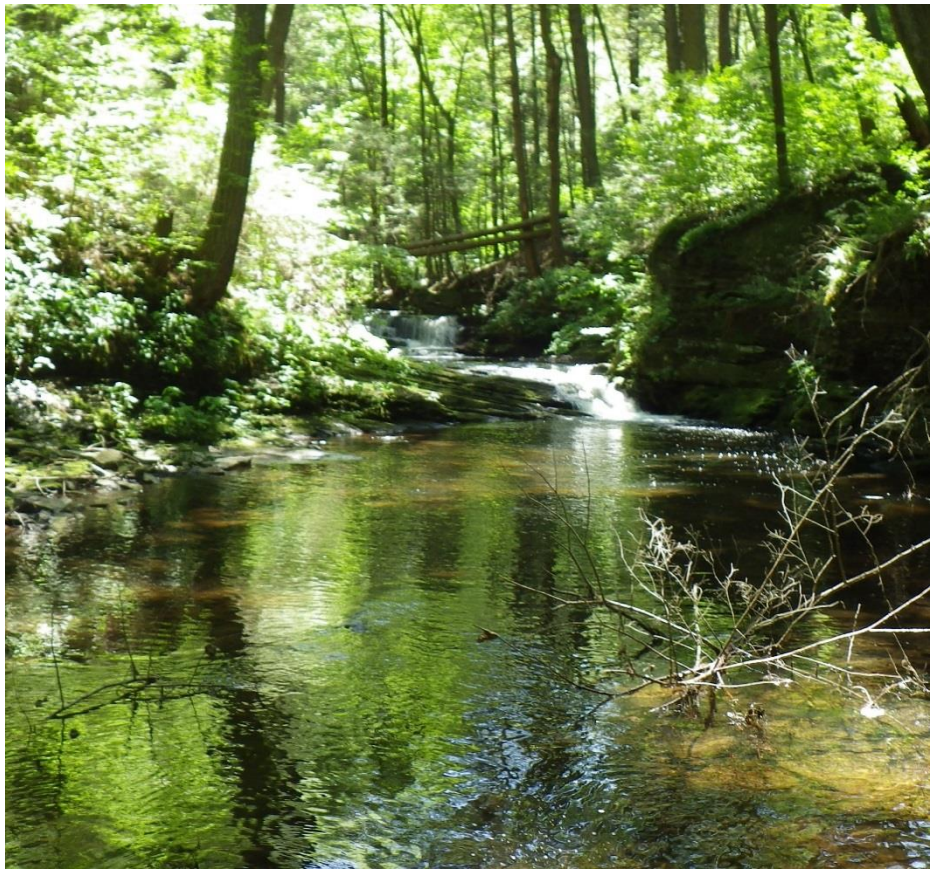
American Eel (N)	Fallfish (N)
Blacknose Dace (N)	Golden Shiner (N)
Bluegill (I)	Largemouth Bass (I)
Brown Bullhead (N)	Pumpkinseed (N)
Chain Pickerel (N)	Redbreast Sunfish (N)

Total: 10
Native: 8
Introduced: 2

DEWA.3019 (Hornbecks Creek 23) was the top site on Hornbecks Creek. It was characterized by bedrock substrate, steep banks, and long, deep pools. There were multiple small cascades in the reach. Water temperature was warmer, on average, than the downstream site.

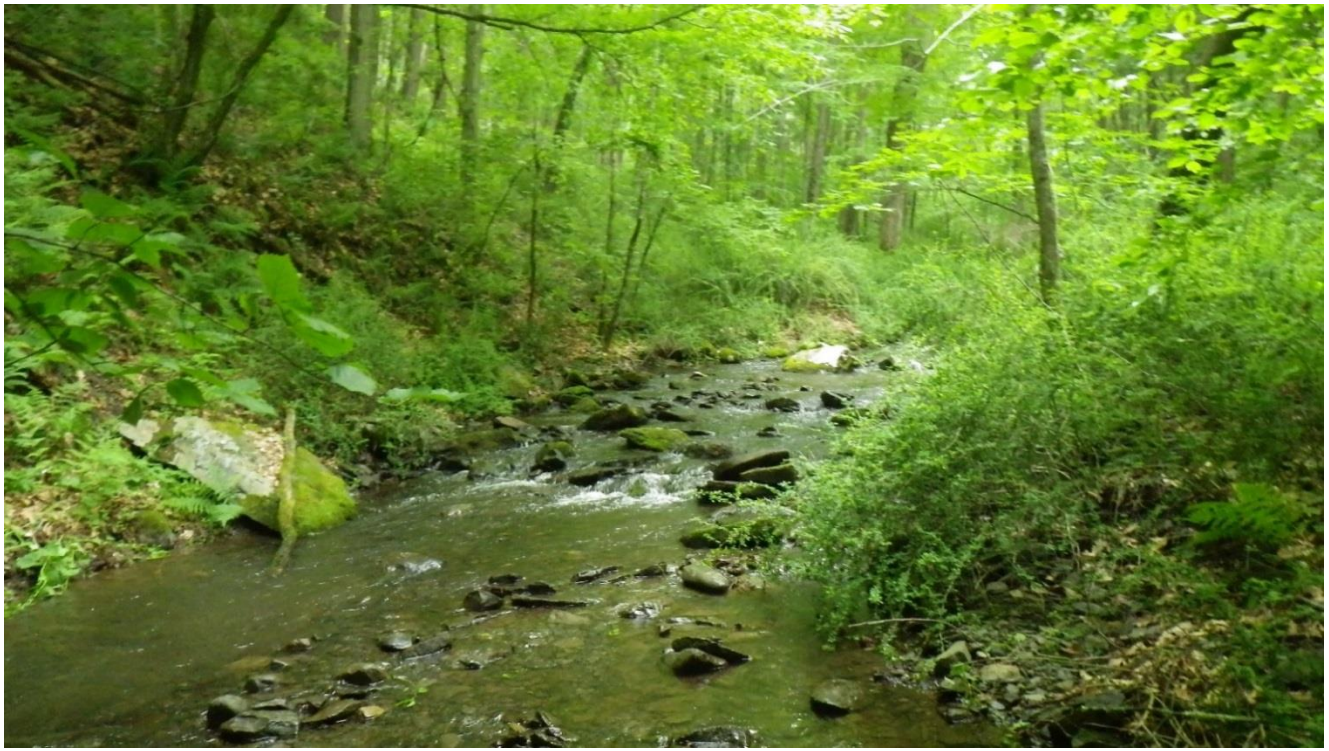
Blacknose Dace were the most abundant species and the rest were relatively sparse. Most species occupied the long, deep pools, including the sunfishes, Chain Pickerel, Largemouth Bass, and Brown Bullhead. A large Golden Shiner adult was captured.

Despite the presence of many barriers between this reach and the DEWA.3035 (Hornbecks Creek 15), species richness did not drop very much. Species composition changed from mostly stream-dwellers to pond species, including Brown Bullhead, Chain Pickerel, Golden Shiner, Largemouth Bass, and sunfishes. Water temperature was much warmer, which may have helped them occupy this reach. Impoundments may be a culprit, but also there was a large waterfall with a big open pool just upstream of this site that could potentially raise stream temperature.



One of the long, deep pools with bedrock substrate and high banks.

DEWA.3003 – Deckers Creek 03



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
6	55.00	2.47	1.71	12.19	82.75	0.08	2.94	521.25	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.85	173.50	0.11	14.66	118.00	Trees	Shaded	Cobble	Yes	Yes

Species

American Eel (N)	Yellow Bullhead (N)
Blacknose Dace (N)	Yellow Perch (N)
Bluegill (I)	
Golden Shiner (N)	
Pumpkinseed (N)	

Total: 7
Native: 6
Introduced: 1

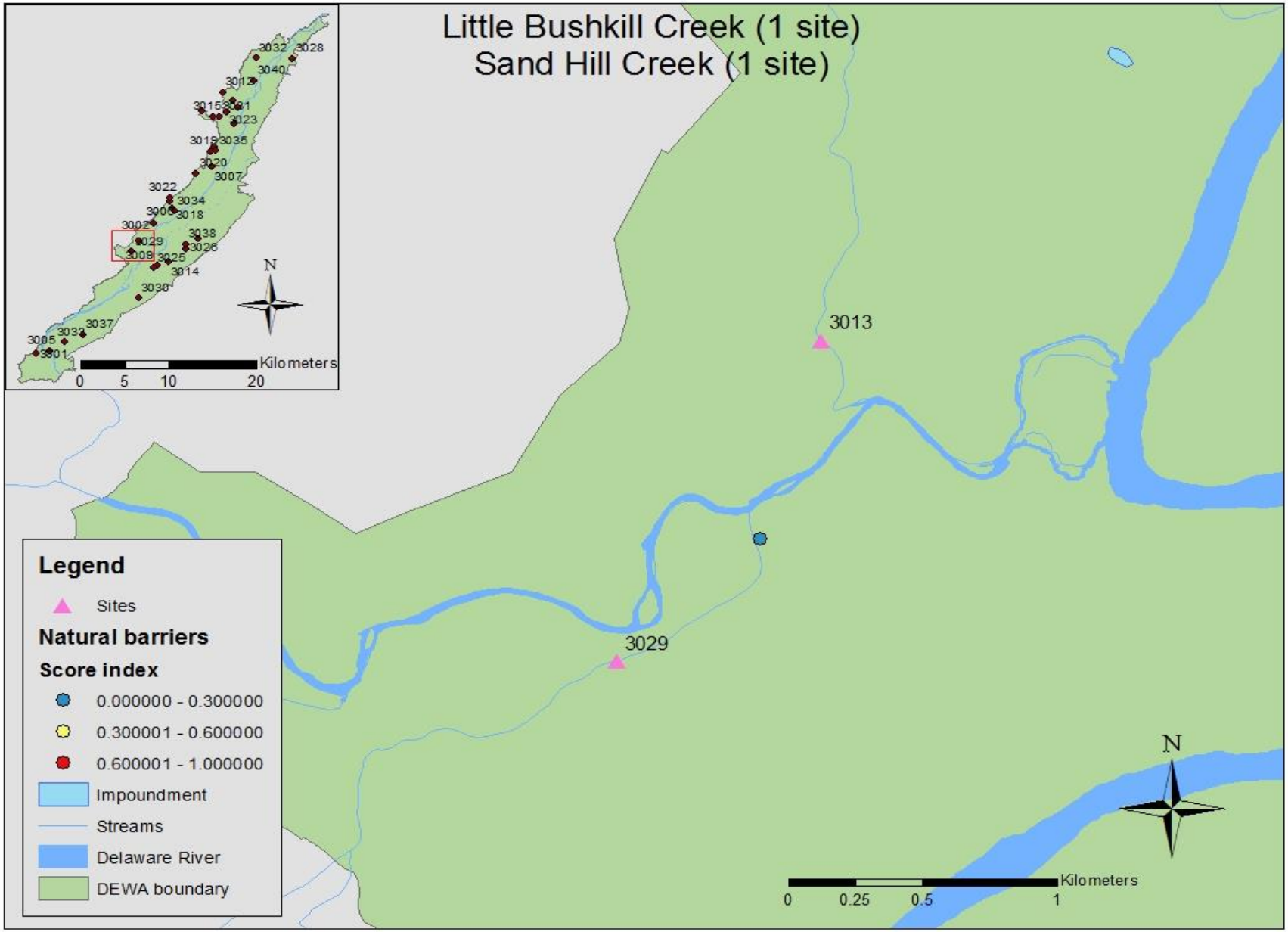
DEWA.3003 (Deckers Creek 03) was a small tributary that enters Hornbecks Creek between the two Hornbecks sites. It was shaded and had mostly cobble substrate. There was very little water in some spots at the end of summer. Stream temperature was, on average, pretty cool.

Bluegill were the most prevalent species (>100 individuals) and typically occupied pools near large woody debris accumulations (e.g., see picture). Blacknose Dace and American Eel were equally prevalent (~15-30 individuals each). Only one individual each were detected from Golden Shiner and Yellow Bullhead. This is only one of two sites where Yellow Bullhead were detected.

Species diversity was surprising in Deckers Creek, especially given the cool stream temperature and size of the stream. Multiple impoundments exist upstream that likely contributed species other than American Eel and Blacknose Dace. Despite the presence of multiple barriers near the confluence of Deckers and Hornbecks, American Eel managed to migrate into the reach.



Midpoint of the reach.


Little Bushkill Creek (1 site)
Sand Hill Creek (1 site)
3013
3029
N
Kilometers
0 0.25 0.5 1
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
Kilometers
0 5 10 20

DEWA.3013 – Little Bushkill Creek 01



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
185	66.38	85.36	0.00	6.32	72.58	0.03	1.69	791.25	0.02

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.00	110.83	0.32	17.62	53.33	Shrubs	Open	Cobble	Yes	No

Species

American Eel (N)	Northern Hogsucker (N)
Blacknose Dace (N)	Pumpkinseed (N)
Bluegill (I)	Rainbow Trout (I)
Brown Trout (I)	Sea Lamprey (N)
Common Shiner (N)	Shield Darter (N)
Cutlips Minnow (N)	Smallmouth Bass (I)
Fallfish (N)	Tessellated Darter (N)
Largemouth Bass (I)	White Sucker (N)
Longnose Dace (N)	Yellow Perch (N)
Margined Madtom (N)	

Total: 19
Native: 14
Introduced: 5

DEWA.3013 (Little Bushkill Creek 01) was one the largest reaches sampled. It had lots of variable habitat including deep pools (some too deep to shock), riffle, and shallow runs. Substrate varied considerably from find sand to cobble and boulder. It was very open with little to no shade. Most of the riparian vegetation was blackberry bushes.

DEWA.3013 had the most speciose fish community (tied with DEWA.3004 – Dingmans Creek 05) at DEWA. Blacknose Dace were most abundant. This site had the most American Eel, Common Shiner, Fallfish, Pumpkinseed, Shield Darter, Tessellated Darter and Longnose Dace detected out of all sites. This was the only site where Sea Lamprey were detected. One adult was found on the first visit, and many ammocoetes were taken on all visits. The lamprey may have preferred this reach over others because there was sandy substrate for ammocoetes to burrow in. Introduced species were, in general, uncommon with the most abundant species being Brown Trout (24 individuals over three visits).



Large woody debris mass near upstream end of reach.

Given the proximity to the Delaware River, lack of a barrier, and variety of habitat available at this reach, it is understandable the fish community would be so diverse. That said, there are many impoundments upstream that could have contributed some species, such as Largemouth Bass and Yellow Perch. Additionally, Rainbow Trout must have been stocked in or nearby the reach as they were mostly all the same size. However, introduced species were generally lacking in numbers, which is an encouraging sign. Also, the presence of Sea Lamprey and the high numbers of American Eel make this an important reach to monitor.	 A large, deep pool near the middle of the reach.

DEWA.3029 – Sand Hill Creek 08



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
21	16.00	9.49	0.46	27.73	58.98	0.03	2.77	335.00	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.00	126.36	0.14	20.27	271.67	Shrubs	Shaded	Cobble	Yes	No

Species

American Eel (N)	Fallfish (N)
Blacknose Dace (N)	Golden Shiner (N)
Brook Trout (N)	Largemouth Bass (I)
Brown Trout (I)	Margined Madtom (N)
Cutlips Minnow (N)	White Sucker (N)

Total: 10
Native: 8
Introduced: 2

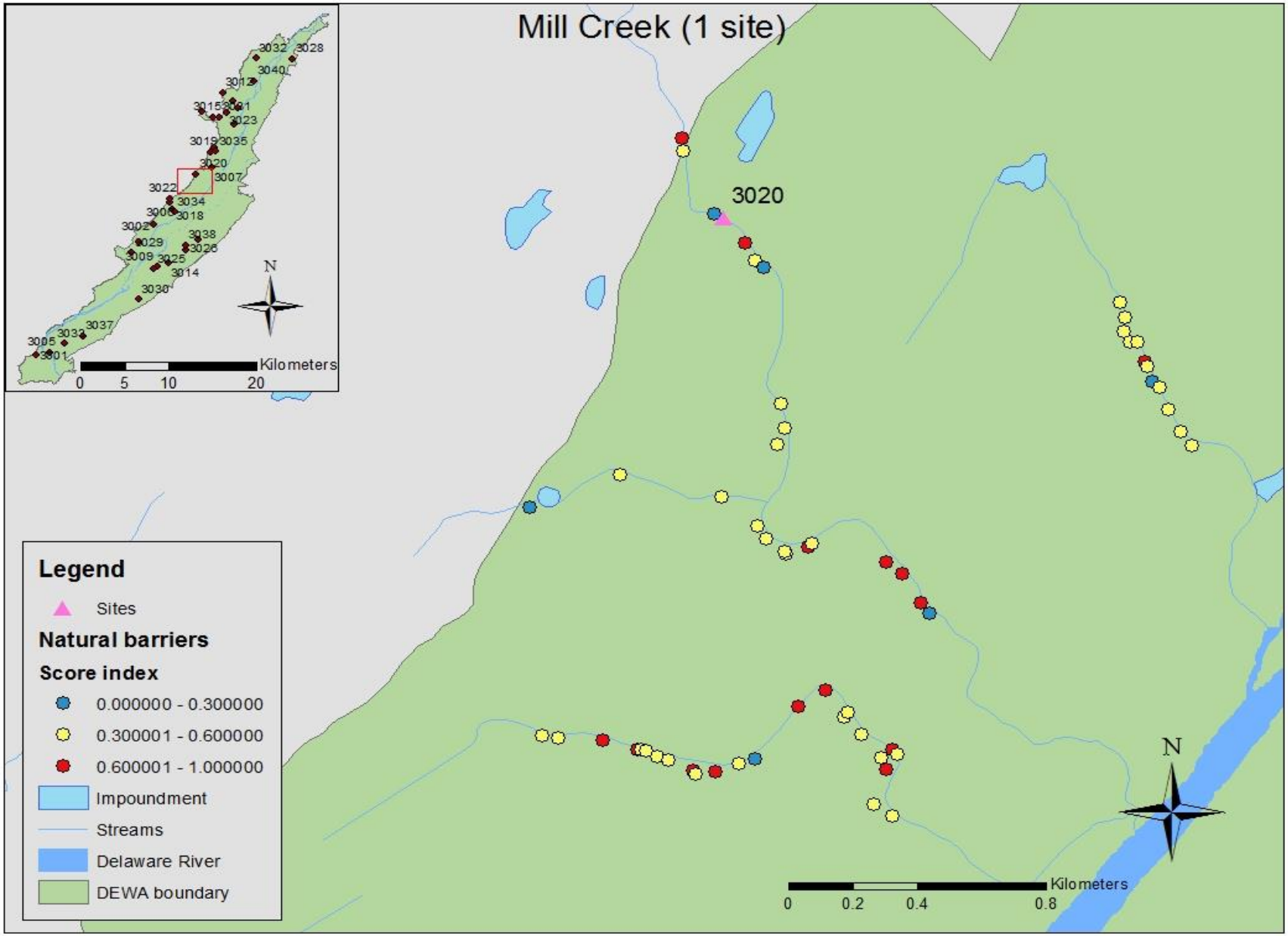
DEWA.3029 (Sand Hill Creek 08) was a reach on a small stream near a large, open area off of Route 209. Sand Hill Creek runs through a golf course upstream and its effects were apparent. Water temperature was fairly high, and conductivity was very high. Although the downstream 75m of the reach was shaded with cobble substrate, the upstream 25m was mostly open with riparian shrubs and a soft, sandy bottom.

Blacknose Dace and American Eel were relatively common (227 and 66 individuals over three visits, respectively), but the rest of the species were uncommon. Thirteen Margined Madtom and 23 Brown Trout were detected. Less than 10 individuals were encountered for the rest of the species, including only one Brook Trout.

The fish community of this reach was typical of a stream with poor water quality. Although fairly speciose, numbers were generally few for most species, with the exception being Blacknose Dace who are generally tolerant of poor conditions. The high water temperature likely made it difficult for many species to flourish, which may be why only one Brook Trout was detected. Impoundments upstream likely contributed the Largemouth Bass and possibly Golden Shiner. The upstream portion of Sand Hill Creek within DEWA may benefit from riparian restoration to potentially offset the effects of upstream development. Note: there was a Common Shiner reported at DEWA.3029 in the field notes but not added to the database or thesis; it appears to have been a possible misidentification so it was not included here either.



Upstream portion of reach with dense riparian shrubs and soft, sandy bottom.


Mill Creek (1 site)
3020
3032
3028
3040
3012
3015
3021
3023
3019
3035
3020
3007
3022
3034
3006
3018
3002
3038
3029
3026
3009
3025
3014
3030
3037
3033
3005
3001
N
Kilometers
0 5 10 20
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
N
Kilometers
0 0.2 0.4 0.8

DEWA.3020 – Mill Creek 25



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
26	42.38	7.63	0.39	12.70	78.91	0.09	3.2	493.75	0.02

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
2.84	240.95	0.26	19.48	74.33	Trees	Partly shaded	Cobble	Yes	Yes

Species

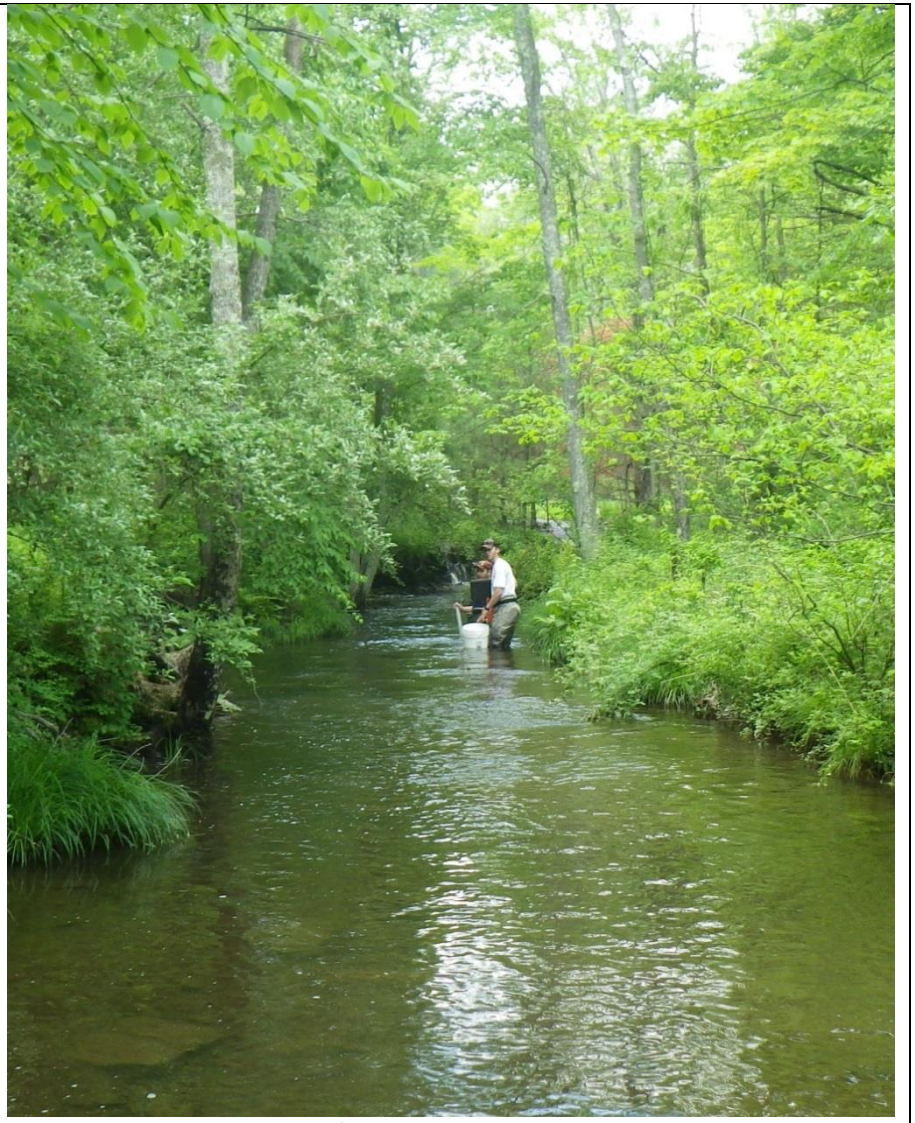
Blacknose Dace (N)	Golden Shiner (N)
Bluegill (I)	Green Sunfish (I)
Brown Bullhead (N)	Largemouth Bass (I)
Chain Pickerel (N)	Pumpkinseed (N)
Creek Chub (N)	Yellow Perch (N) - yoy

Total: 10
Native: 7
Introduced: 3

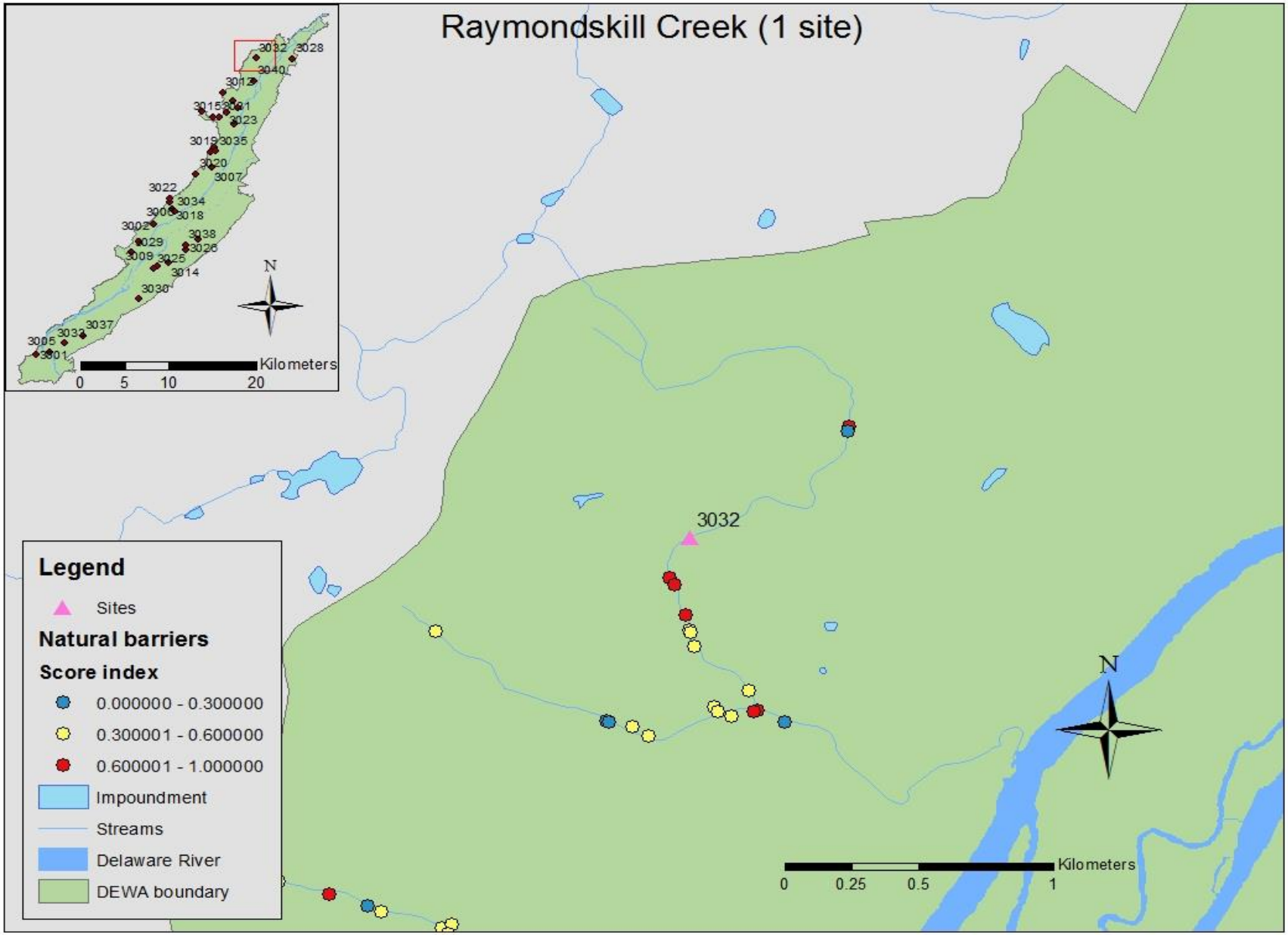
DEWA.3020 (Mill Creek 25) was a medium-sized stream that was heavily-forested on one side and next to a road on the other. At this point, the stream flows across the plateau. Water temperature was relatively cool on average. It was mostly riffle/pool habitat, but there was one long run/pool flowing over bedrock near the midpoint of the reach, which was waist-deep at some points.

Blacknose Dace and Creek Chub were the most abundant species. This reach also had the most Brown Bullhead out of any reach (40 individuals over three visits, 20 on the first visit). Green Sunfish and Pumpkinseed were equally prevalent (~20 individuals). Only one Bluegill, Largemouth Bass, and Golden Shiner were captured, and one Chain Pickerel was captured on every visit. Yellow Perch juveniles were present.

Most of the Brown Bullhead and sunfish species came from the long pool. There are multiple impoundments in the area, including Sunset Lake that appears to be the headwaters of Mill Creek that was drained in 2012. Fish may have escaped during this process, or came from other sources. There are many barriers downstream once the stream drops off the plateau, which likely prevent other species from colonizing this area.



Long, deep run/pool near the middle of the reach.


Raymondskill Creek (1 site)
3032
3028
3040
3012
3015
3021
3023
3019
3035
3020
3007
3022
3034
3006
3018
3002
3029
3038
3009
3025
3026
3014
3030
3037
3033
3005
3001
N
Kilometers
0 5 10 20
3032
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
N
Kilometers
0 0.25 0.5 1

DEWA.3032 – Raymondskill Creek 13



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
126	36.00	58.94	0.88	15.15	69.49	0.05	2.23	1281.25	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
2.51	214.87	0.35	22.98	120.67	Trees	Partly shaded	Cobble	Yes	Yes

Species

Blacknose Dace (N)	Longnose Dace (N)
Bluespotted Sunfish (N)	Margined Madtom (N)
Brown Bullhead (N)	Pumpkinseed (N)
Chain Pickerel (N)	Redfin Pickerel (N)
Comely Shiner (N)	Shield Darter (N)
Common Shiner (N)	Tessellated Darter (N)
Fallfish (N)	White Sucker (N)

Total: 14
Native: 14
Introduced: 0

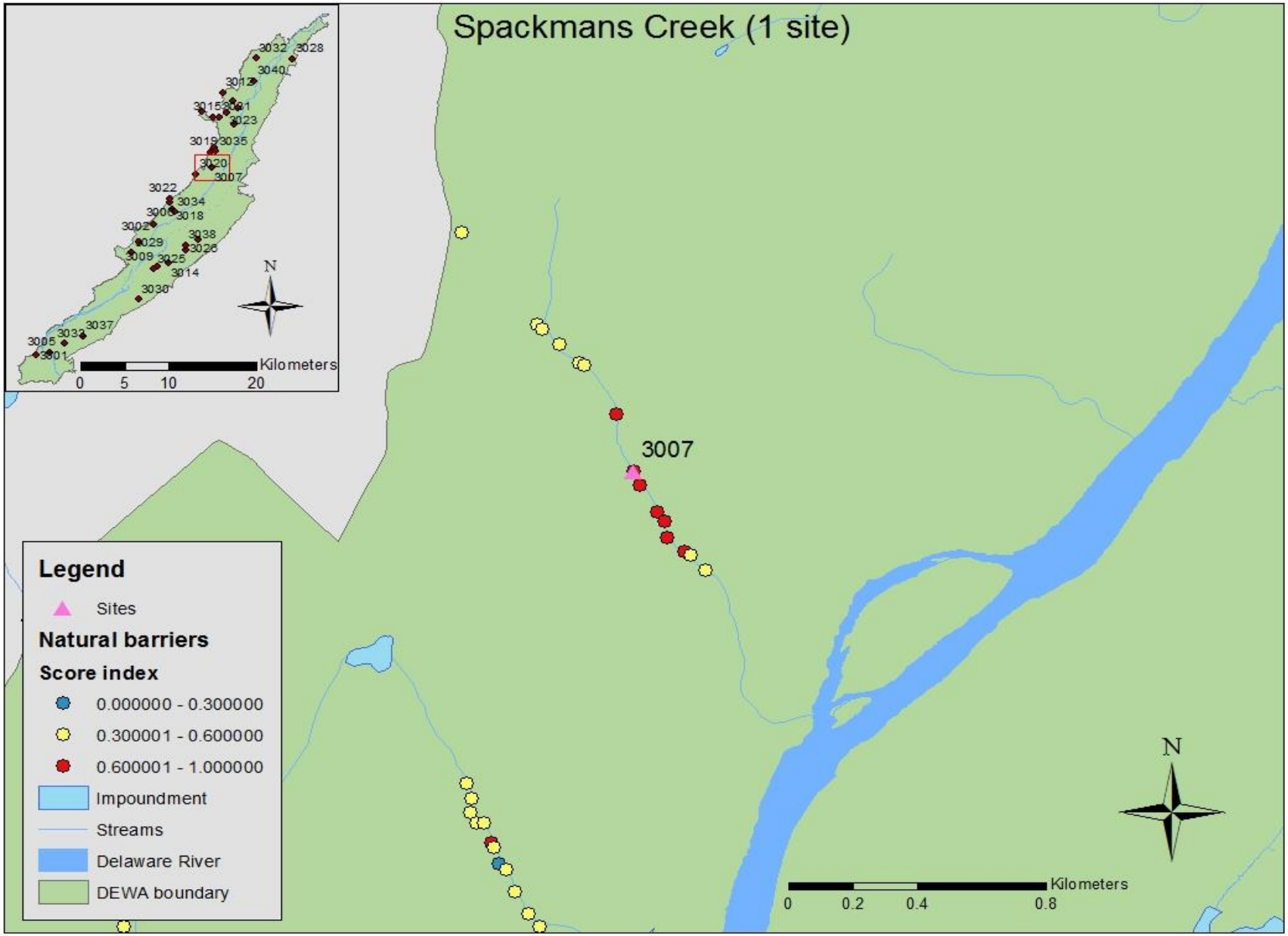
DEWA.3032 (Raymondskill Creek 13) was a large, open stream reach surrounded by grasses, shrubs, and trees. The highest water temperature, on average, was recorded at this site. The first ~75m was a slow run with uniform depth and gravel/cobble substrate and the last ~25m featured a short riffle, which then split into two deeper pools at the head of the reach.

Blacknose Dace, Longnose Dace, and Margined Madtom were abundant. This site was the only site where Bluespotted Sunfish and Redfin Pickerel were encountered, although only one individual each was detected. Every species captured was native to the Delaware River drainage.

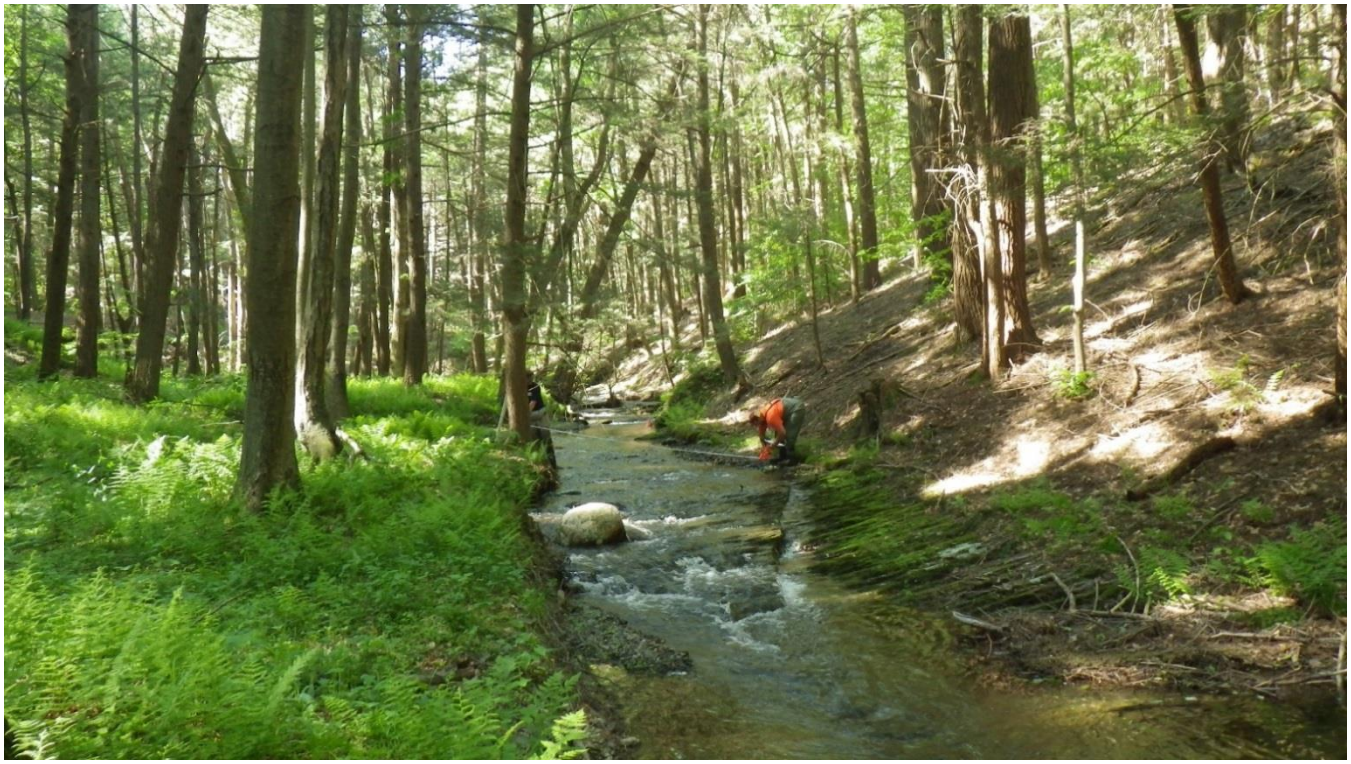
Many barriers exist downstream of the site, including some with score index of 1 and a major waterfall roughly 50m downstream of the downstream end of the reach. There are many upstream impoundments, and a few species that may be better characterized by those habitats, but all of them were native and are also known to exist in larger streams. No cold water species (Salmonids) were detected, which may have been due to the relatively warm stream temperature.



Riffle and split at upstream end of reach.


Spackmans Creek (1 site)
3007
N
Kilometers
0 0.2 0.4 0.8
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
3032 3028 3040 3012 3015 3001 3023 3019 3035 3020 3007 3022 3034 3006 3018 3002 3029 3038 3009 3025 3026 3014 3030 3037 3033 3005 3001
N
Kilometers
0 5 10 20

DEWA.3007 – Spackmans Creek 08



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
9	61.50	2.39	0.00	4.36	94.59	0.21	1.27	411.25	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
4.72	193.14	0.18	15.39	71.67	Trees	Shaded	Bedrock	No	Yes

Species

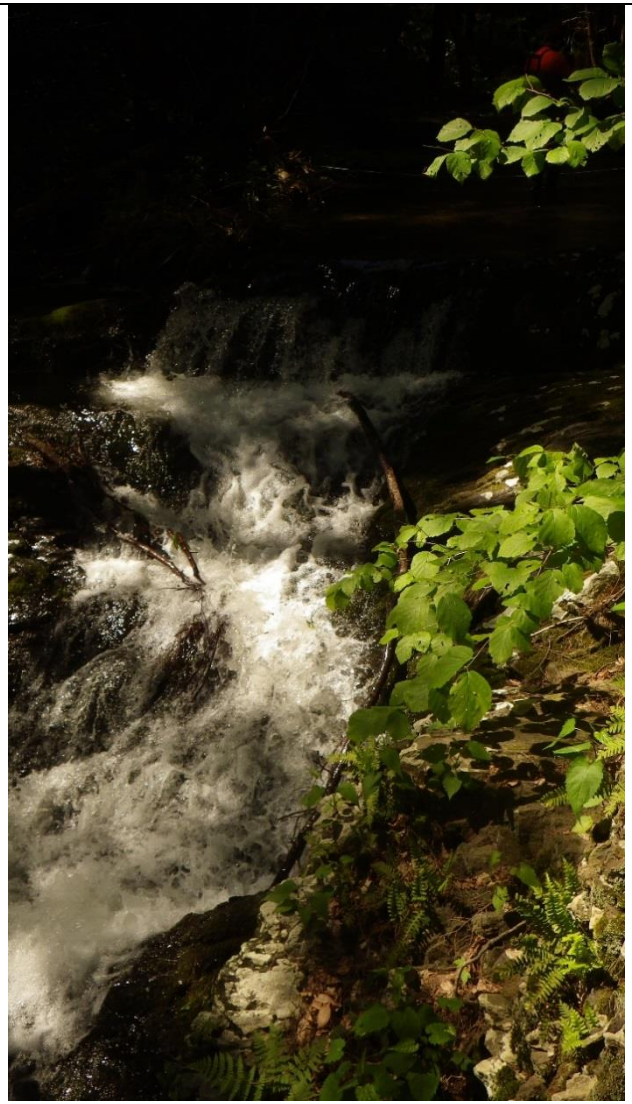
Blacknose Dace (N) Bluegill (I) Pumpkinseed (N)	

Total: 3
Native: 2
Introduced: 1

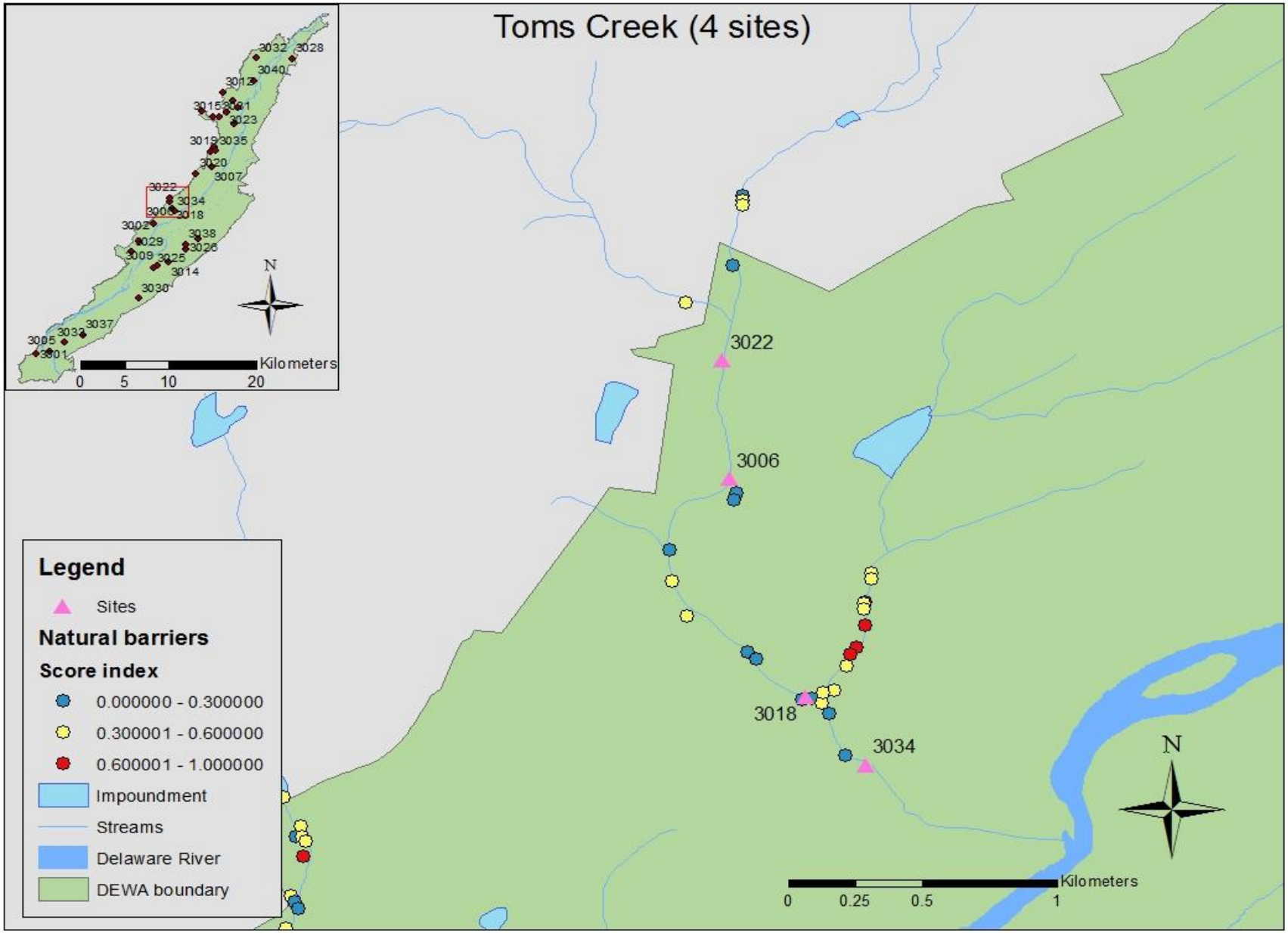
DEWA.3007 (Spackmans Creek 08) was a small, heavily-forested stream flowing mostly over bedrock. Water temperature was relatively cool on average. Very few pools existed in the reach. There was a large chute/waterfall that defined the downstream point of the reach.

This reach was the most prolific producer of Blacknose Dace, where 656 individuals over captured over three visits, including a maximum of 347 individuals on the third visit. Pumpkinseed and Bluegill were also present and were mostly in small pools, but in few numbers (12 individuals and 5 individuals, respectively).

DEWA.3007 appeared to be a prime example of how barriers influence fish communities in DEWA. Many large barriers exist downstream that prevented any predatory species, including American Eel from colonizing this reach, which allowed Blacknose Dace to proliferate. Despite the absence of an upstream impoundment, sunfishes managed to colonize the reach. However, the USFWS Wetlands Inventory shows a natural wetland in the headwaters of Spackmans Creek that may hold these species.



Waterfall defining downstream end of reach.


Toms Creek (4 sites)
3022
3006
3018
3034
N
Kilometers
0
0.25
0.5
1
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
Kilometers
0
5
10
20

DEWA.3034 – Toms Creek 03



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
52	60.92	24.01	0.01	17.28	79.95	0.04	0.98	993.75	0.04

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.00	114.54	0.22	15.49	105.00	Trees	Partly shaded	Cobble	Yes	No

Species

American Eel (N)	Cutlips Minnow (N)
Bluegill (I)	Fallfish (N)
Brook Trout (N)	Longnose Dace (N)
Brown Bullhead (N)	Margined Madtom (N)
Brown Trout (I)	Pumpkinseed (N)
Comely Shiner (N)	Shield Darter (N)

Total: 12
Native: 10
Introduced: 2

DEWA.3034 (Toms Creek 03) was the most downstream site on Toms Creek. It was heavily forested and characterized by riffle/pool habitat with cobble substrate. At the downstream end of the reach, there was a breached impoundment with a large pool that was too deep to shock effectively. At the midpoint, the stream split into two sections.

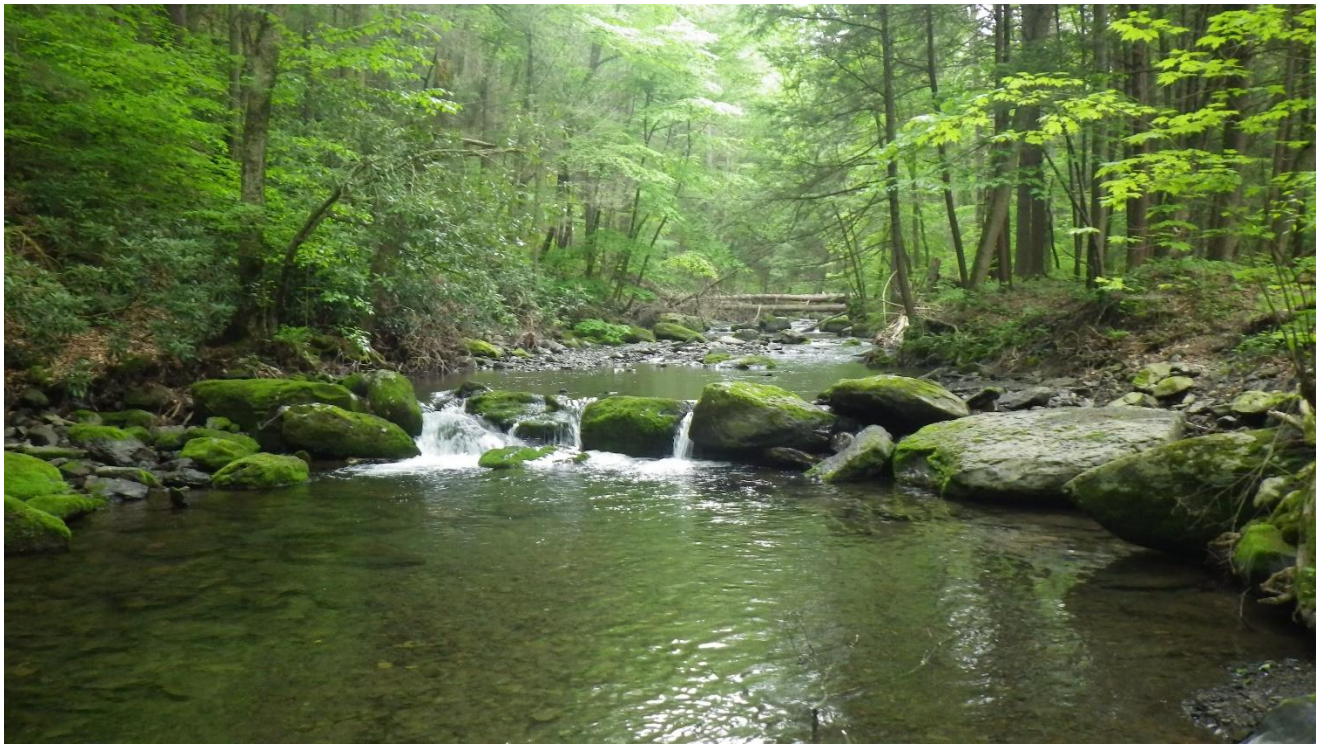
Brown Trout were the most prevalent species with more than 200 individuals captured over three visits. American Eel were also prevalent. Longnose Dace and Margined Madtom were equally prevalent. Six Brown Bullhead and only two Shield Darter were captured. Only one Brook Trout was detected and only on the first visit. It was an adult.

Although impoundments exist in the headwaters of Toms Creek, this site was very near to the river without barriers, so many species could have colonized. However, the large pool beneath the breached impoundment provides ideal habitat for pond species.



Split at midpoint of reach.

DEWA.3018 – Toms Creek 07



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
48	67.23	21.28	0.00	19.12	78.28	0.14	1.37	867.50	0.02

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.89	123.16	0.19	14.72	74.10	Trees	Shaded	Cobble	Yes	Yes

Species

American Eel (N)	Cutlips Minnow (N)
Blacknose Dace (N)	Green Sunfish (I)
Brook Trout (N)	Longnose Dace (N)
Brown Trout (I)	Margined Madtom (N)
Creek Chub (N)	Pumpkinseed (N)

Total:10
Native: 8
Introduced: 2

Just upstream of DEWA.3034 (Toms Creek 03), DEWA.3018 (Toms Creek 07) was characterized by larger pools at the bases of some small waterfalls and run and riffle habitat in between, making the stream much wider. The stream continued to be heavily forested and shaded. Water temperature was, on average, the coldest out of all Toms Creek sites.

Brown Trout were still the most abundant species. American Eel were in similar numbers to the site immediately downstream. Blacknose Dace and Creek Chub made an appearance, but in low numbers (10 and 1, respectively). More Brook Trout were present in this reach (6 individuals), but were only detected on the first visit. Only one Green Sunfish was detected and only on the first visit.

Although a relatively difficult barrier exists downstream (score = 0.357), the fish community did not change much from the downstream site. Shield Darter were lost, but Blacknose Dace and Creek Chub were gained. The only species that were detected that might be considered pond species were Pumpkinseed and Green Sunfish, but they were in low numbers.



One of the small waterfalls made of large boulders that created wide and deep downstream pools.

DEWA.3006 – Toms Creek 20

Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
43	64.69	19.22	0.00	19.54	77.69	0.04	2.6	652.50	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
1.36	155.79	0.21	15.45	110.33	Trees	Partly shaded	Gravel	Yes	Yes

Species

American Eel (N) Blacknose Dace (N) Brown Bullhead (N) Brown Trout (I)	

Total: 4
Native: 3
Introduced: 1

DEWA.3006 (Toms Creek 20) was the second uppermost site on Toms Creek. It was heavily forested and shaded. It was dominated by cobble and gravel substrate and mostly riffle habitat with some deeper pools near undercut banks and root wads. Water temperature was warmer, on average, than the two downstream sites. This site was fairly close to a road and housing developments.

Brown Trout were still the most abundant species present (238 individuals over three visits). American Eel were in similar numbers as the two downstream sites. Blacknose Dace were found in seven or less per visit. One Brown Bullhead individual was found on the second and third visit only.

There were more barriers downstream, but not great enough to prevent American Eel from migrating into the reach. Brook Trout were lost from the previous site, but water temperatures were still fairly cool. Give that Brown Trout were so prevalent, there may be competition issues. Brown Bullhead could have colonized this reach from downstream reaches, but given the linear stream distance to the river and number of barriers, it is unlikely.

DEWA.3022 – Toms Creek 25



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
43	68.64	18.85	0.00	19.92	77.26	0.04	3.08	512.50	0.33

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
1.15	166.21	0.21	16.37	77.17	Trees	Shaded	Cobble	Yes	Yes

Species

American Eel (N) Blacknose Dace (N) Brook Trout (N) Brown Trout (I) Pumpkinseed (N)	

Total: 5
Native: 4
Introduced: 1

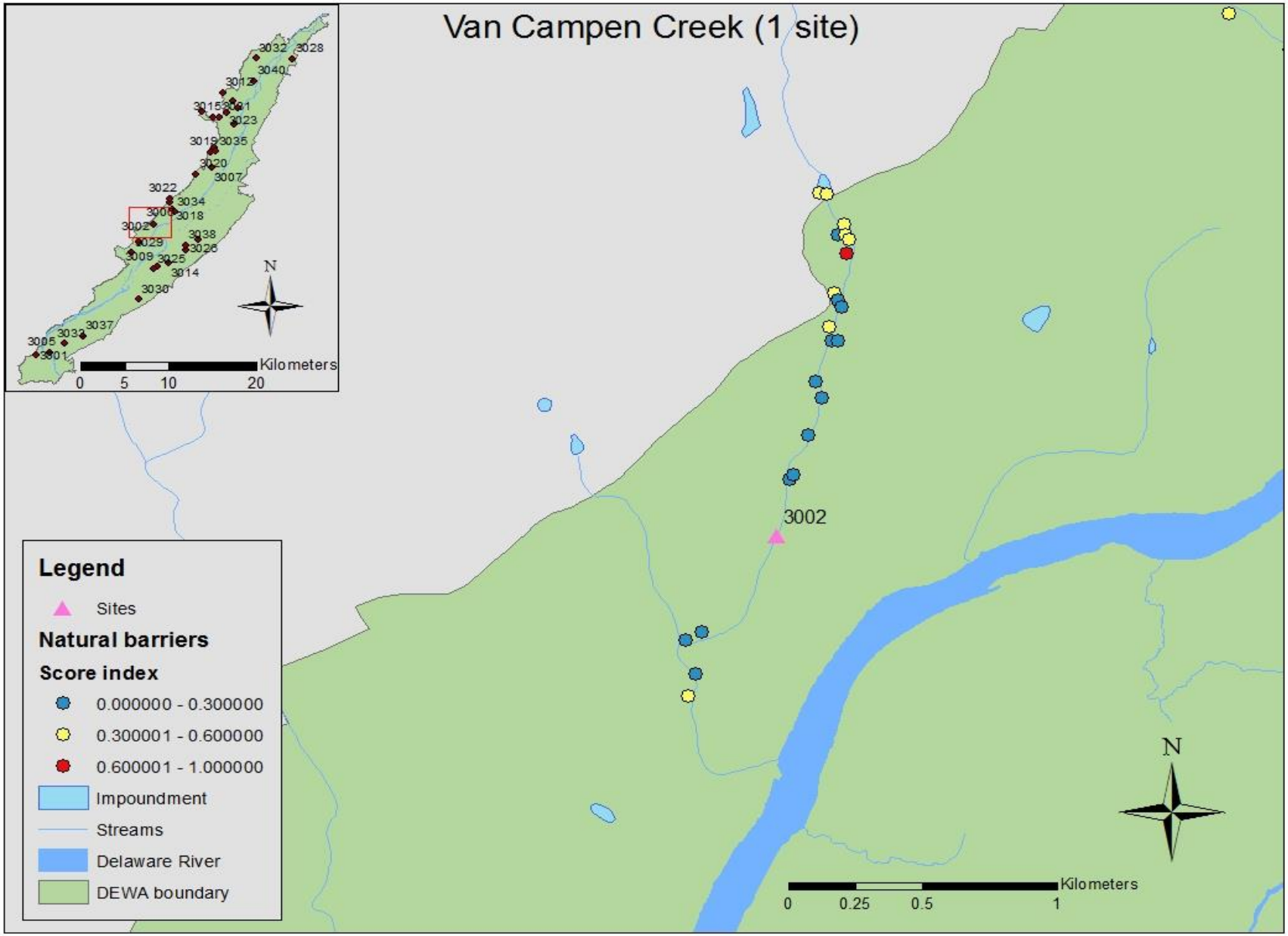
DEWA.3022 (Toms Creek 25) was the uppermost site on Toms Creek. It was characterized by two major large woody debris accumulations that made roughly 1/3 of the reach difficult to shock. Water temperature was the highest at this site out of all Toms Creek sites.

Brown Trout remained the most abundant species. American Eel were still prevalent and in similar numbers to other Toms Creek sites. Blacknose Dace were also found in similar numbers to other sites. Brown Trout adults seemed to prefer the pools created by the large woody debris accumulations. Only one adult Brook Trout was found, and only on the first visit. Similarly, only one Pumpkinseed was found on the first visit.

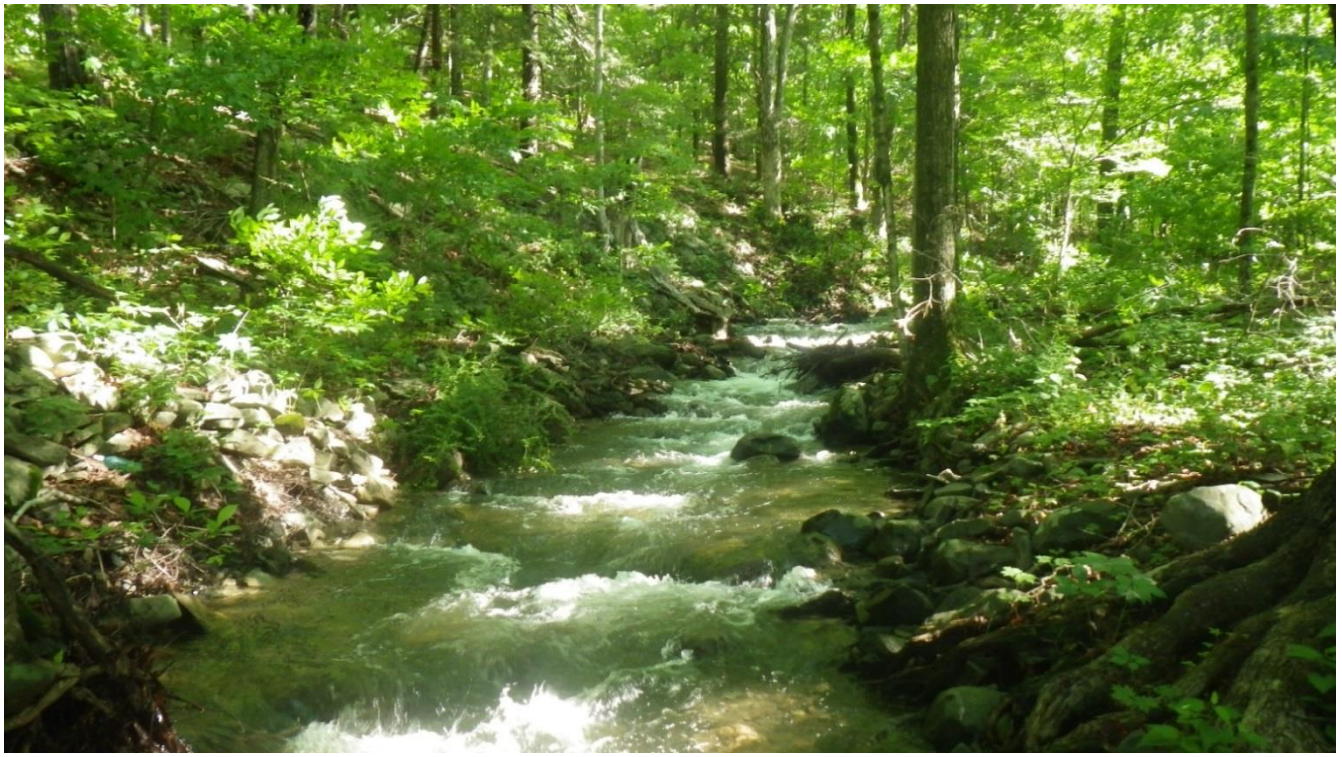
No major barriers preventing dispersal exist between this site and the site downstream, which allowed the community to be similar to downstream sites. The effects of impoundments may be more pronounced at this site given the closer proximity to impoundments in the headwaters and the warmer stream temperature.



One of two major large woody debris accumulations caused by blowdowns (and possibly bank erosion) at the downstream end of the reach.


Van Campen Creek (1 site)
3002
N
Kilometers
0 0.25 0.5 1
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
3032 3028 3040 3012 3015 3001 3023 3019 3035 3020 3007 3022 3034 3006 3018 3002 3029 3038 3026 3009 3025 3014 3030 3037 3033 3005 3001
N
Kilometers
0 5 10 20

DEWA.3002 – Van Campen Creek 12



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
9	56.27	3.77	0.00	30.75	67.07	0.10	1.52	338.75	0.00

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.68	160.99	0.12	16.37	176.00	Trees	Shaded	Boulder	Yes	Yes

Species

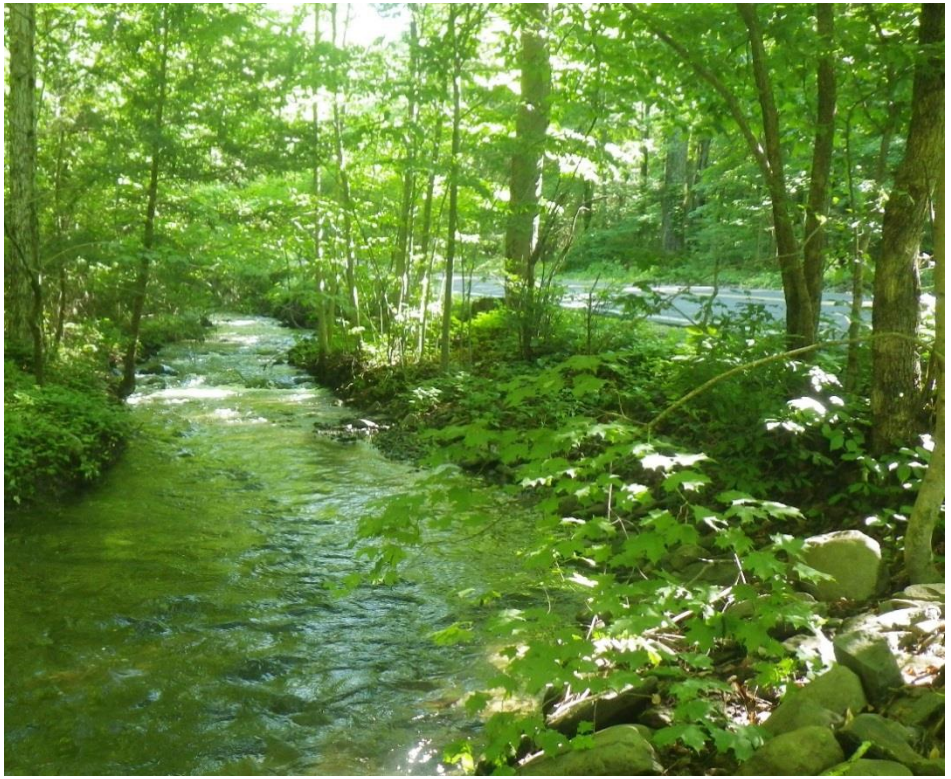
American Eel (N) Blacknose Dace (N) Brown Trout (I)	

Total: 3
Native: 2
Introduced: 1

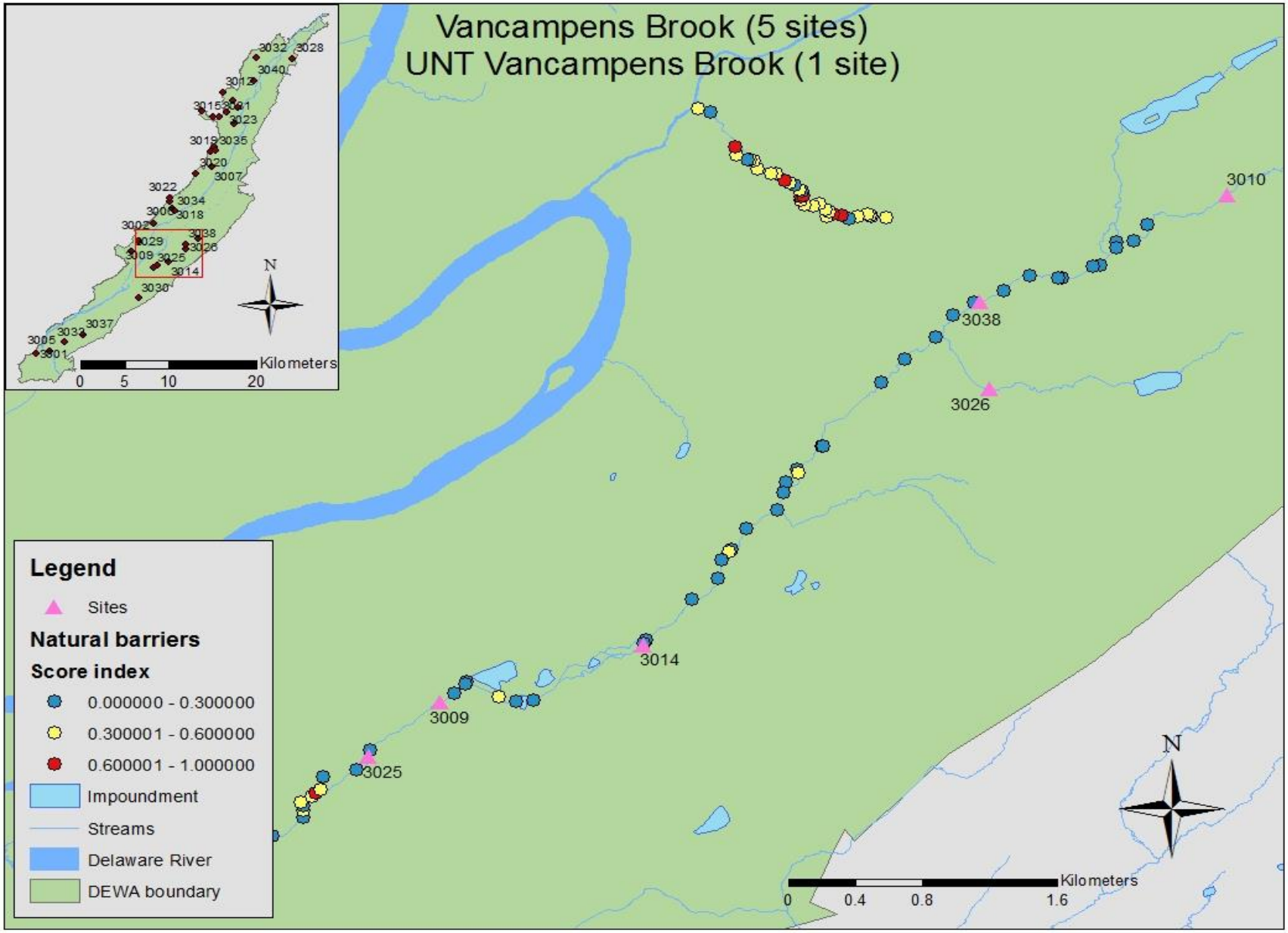
DEWA.3002 (Van Campen Creek 12) was a reach on a small stream following Brodhead Road. It was shaded with mostly boulder substrate and very little woody debris. Conductivity was high for such a small stream. This was also the only site where there were issues with turbidity, but only on one sampling occasion following heavy rain. Close proximity to the road may have caused these conditions.

Stream fishes were relatively depauperate at DEWA.3002. Brown Trout were the most abundant species with roughly 20-30 individuals caught per visit. Thirty-three Blacknose Dace were detected in total, but very few on the second and third visit. Only one American Eel was detected and only on the third visit. A Brown Bullhead was captured in a pool downstream of the site while setting up the shocker.

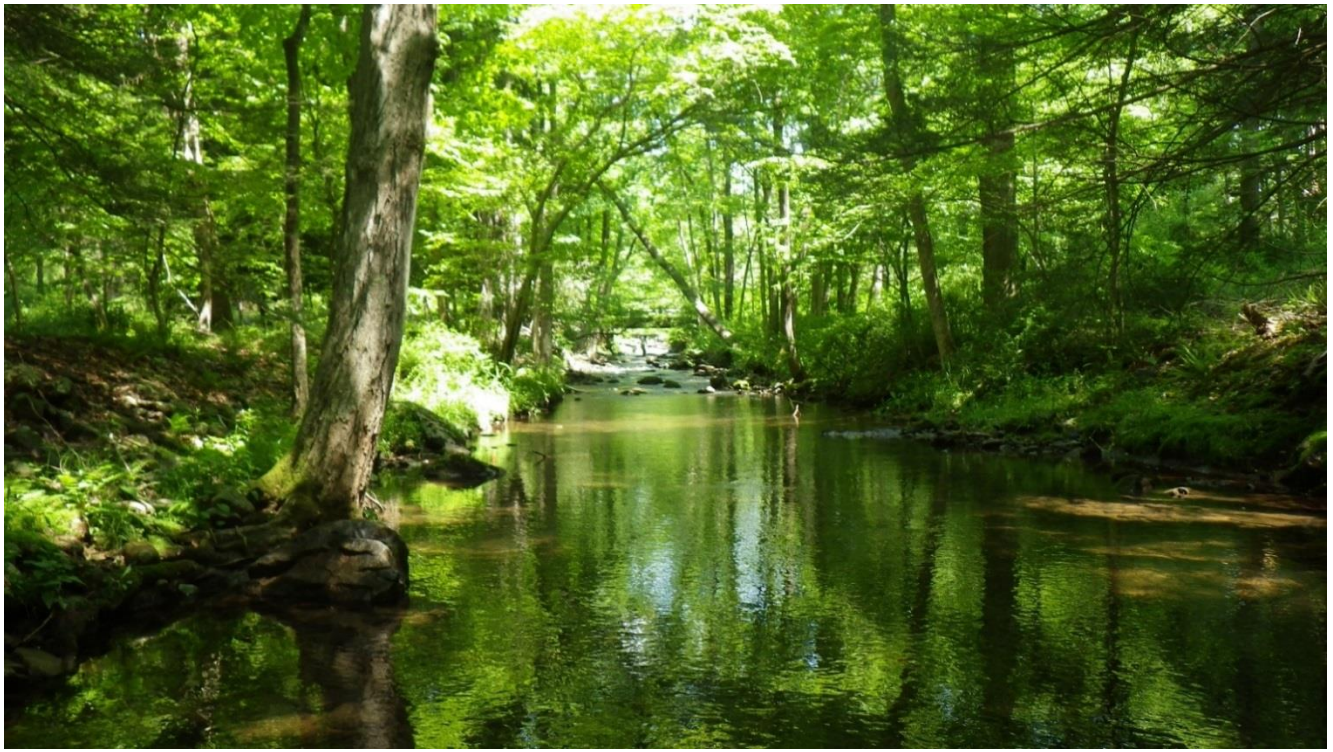
Given the presence of a barrier downstream, it is understandable the fish community may be small. There is also an impoundment upstream, but its effects on the fish community were unseen outside of possibly the lone Brown Bullhead. The high conductivity may suggest water quality issues, which could have also affected fish presence.



Upstream portion of reach showing proximity to road.


Vancampens Brook (5 sites)
UNT Vancampens Brook (1 site)
3010
3038
3026
3014
3009
3025
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
N
Kilometers
0 0.4 0.8 1.6
Kilometers
0 5 10 20

DEWA.3025 – Vancampens Brook 22



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
39	65.27	16.65	0.07	1.57	93.91	0.05	5.44	690.00	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.62	158.79	0.33	17.04	56.00	Trees	Shaded	Cobble	Yes	Yes

Species

Black Crappie (I)	Largemouth Bass (I) - yoy
Blacknose Dace (N)	Pumpkinseed (N)
Bluegill (I)	Rainbow Trout (I)
Brook Trout (N)	Redbreast Sunfish (N)
Brown Trout (I)	White Sucker (N)
Creek Chub (N)	Yellow Perch (N) - yoy

Total: 12
Native: 7
Introduced: 5

DEWA.3025 (Vancampens Brook 22) was the most downstream site on Vancampens Brook. It was shaded with average to slightly warm stream temperature. Most habitat was either deep run or pool with only a few sections of faster water.

Blacknose Dace were the most abundant species with more than 300 individuals captured over three visits. Rainbow Trout were captured most often out of the three Salmonids, and all three Salmonids showed natural reproduction with yoy present. Largemouth Bass and Yellow Perch were only captured as juveniles. Juvenile White Sucker were also present. This was the only site where Black Crappie was detected, and only one individual was detected. This reach had the second most introduced species out of all sites and the highest proportion of introduced species out of sites with greater than 10 species total.

Upstream impoundments likely had a profound effect on this reach. Many downstream barriers exist downstream to prevent colonization of most species, including American Eel, yet species diversity was high, and many species are more typically pond species. Black Crappie, Largemouth Bass, Yellow Perch, and the sunfishes all likely moved downstream from impoundments, and the amount of deep, slow-moving water likely provided them suitable habitat.



At the 75m point of the reach. Top of the reach is just above the bridge. This was one of only two riffles in the reach.

DEWA.3009 – Vancampens Brook 28



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
39	61.00	16.25	0.07	1.30	94.15	0.05	6.01	455.00	0.00

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.56	166.41	0.33	16.63	56.00	Trees	Shaded	Bedrock	Yes	Yes

Species

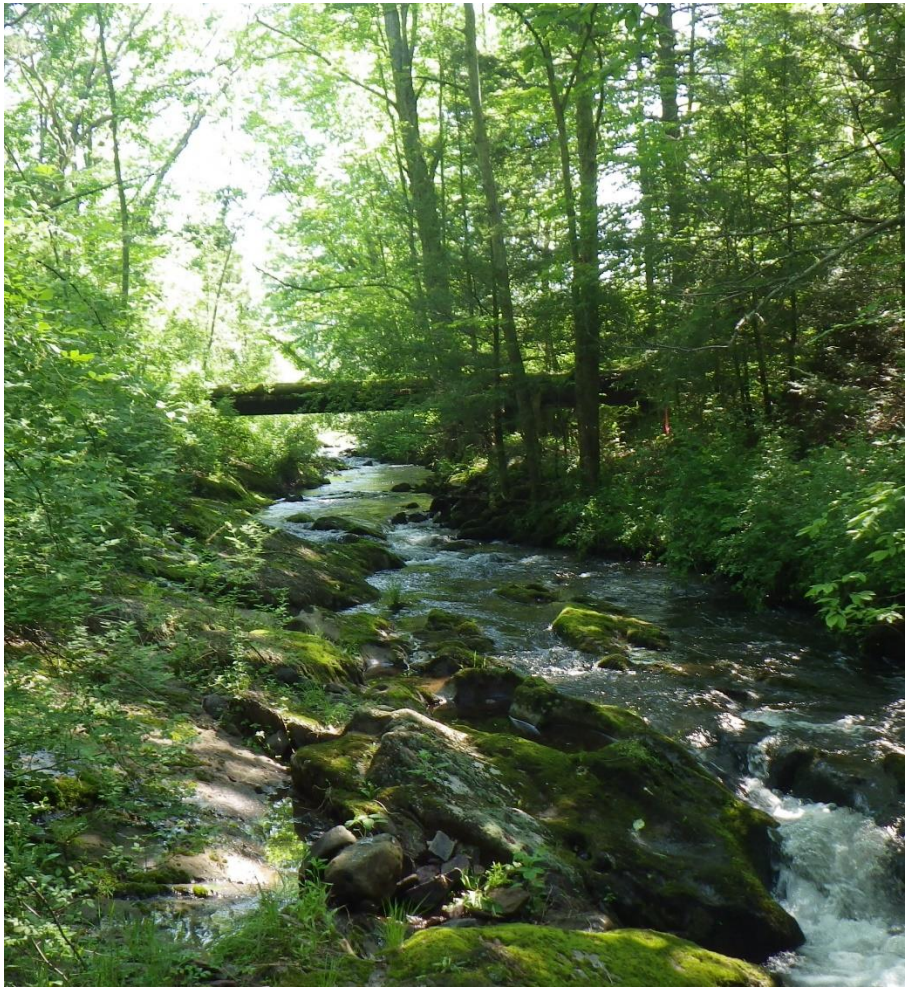
Blacknose Dace (N)	Pumpkinseed (N)
Brook Trout (N)	Rainbow Trout (I)
Brown Trout (I)	Redbreast Sunfish (N)
Creek Chub (N)	White Sucker (N)
Largemouth Bass (I) – yoy only	

Total: 9
Native: 6
Introduced: 3

DEWA.3009 (Vancampens Brook 28) was the second most downstream site on Vancampens Brook. It was forested and fairly cool. The first 25m was characterized by a long, deep pool while the rest of the reach was mostly pool and riffle habitat flowing over bedrock. The reach was directly below an impoundment.

Blacknose Dace were again the most common species. Brook Trout, Brown Trout, and Rainbow Trout were similarly prevalent and all showed natural reproduction (i.e., yoy were present). White Sucker were prevalent relative to other sites where they were present. Only one large adult Redbreast Sunfish was detected and only on the first visit (it was retained, so could not be captured at subsequent visits). Only one Largemouth Bass yoy and two Pumpkinseed were detected.

Although directly below an impoundment, the fish community was relatively consistent with unimpounded streams outside of a couple species and not nearly as impacted as the site immediately downstream (DEWA.3025). This may have been the result of more faster-moving water that created unsuitable habitat for pond species. This was the farthest upstream point where Brown Trout were detected on Vancampens Brook.



Upstream end of reach. The impoundment starts near the bright area about the bridge.

DEWA.3014 – Vancampens Brook 43



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
31	62.57	13.86	0.00	0.60	94.99	0.05	7.46	632.50	0.05

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.68	192.74	0.48	15.43	43.33	Shrubs	Partly shaded	Cobble	Yes	Yes

Species

Blacknose Dace (N)	
Bluegill (I) - yoy	
Brook Trout (N)	
Creek Chub (N)	
Rainbow Trout (I)	

Total: 5
Native: 3
Introduced: 2

DEWA.3014 (Vancampens Brook 43) was the middle site on Vancampens Brook near Millbrook Village. It was shaded and had relatively cool water, on average. The first half of the reach meandered and had a narrow channel, but the second half opened up into riffle habitat with pools near each bank. Overhanging shrubs provided cover for some of the pools.

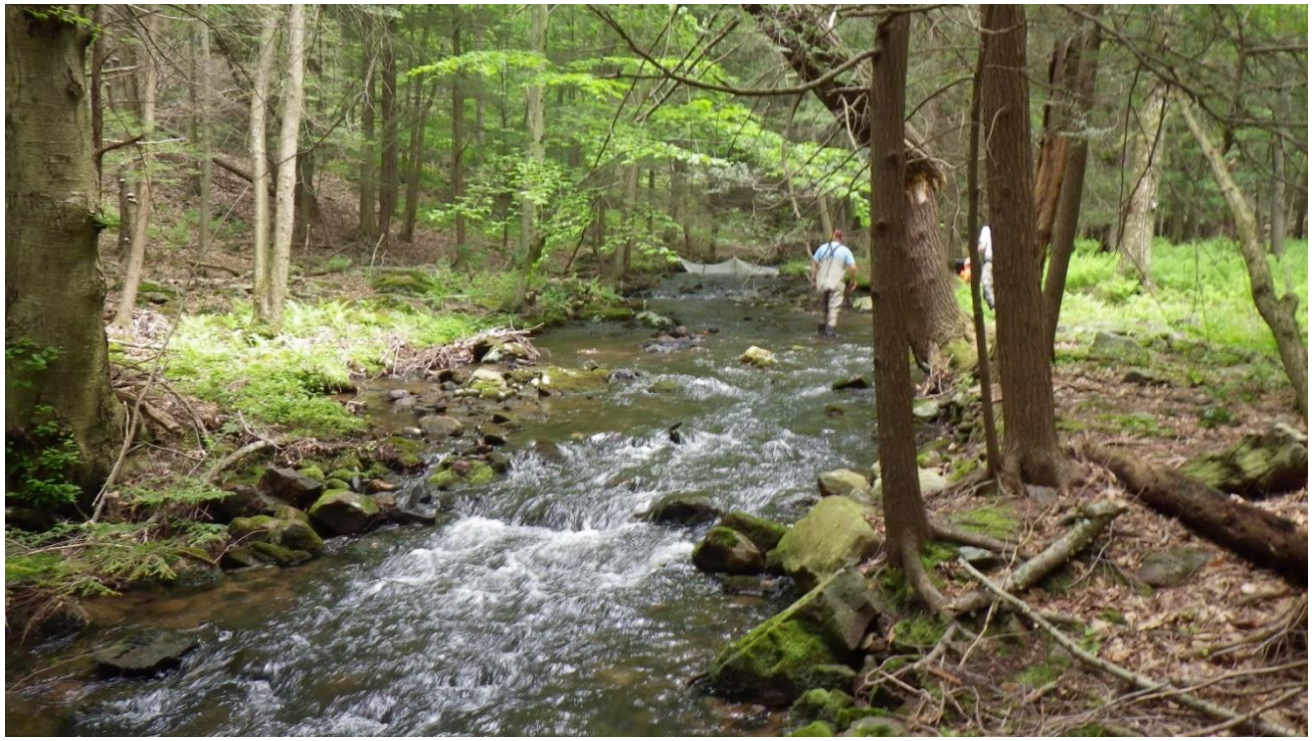
Blacknose Dace and Brook Trout were present in great numbers (262 and 260 individuals over three visits, respectively). Both Salmonids had lots of juveniles present. Rainbow Trout yoy showed up later in summer, while Brook Trout yoy were present during all three visits. One juvenile Bluegill was detected, and only on the second visit. Creek Chub numbers were consistent with the two sites downstream.

Although the next nearest impoundment is quite a distance upstream, a lone Bluegill was still detected, but it is unlikely they can persist with the cool water temperatures and abundant Salmonids. Without Brown Trout present, Brook Trout were able to flourish even in the presence of Rainbow Trout. It is possible Rainbow Trout do not compete as heavily with Brook Trout as Brown Trout do, especially with Rainbow Trout yoy hatching later than Brook Trout.



Upstream portion of reach.

DEWA.3038 – Vancampens Brook 76



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
10	69.17	5.95	0.00	0.47	91.14	0.05	10.61	578.75	0.00

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.69	267.08	0.24	16.27	34.33	Trees	Partly shaded	Cobble	Yes	Yes

Species

Blacknose Dace (N)	Green Sunfish (I)
Bluegill (I)	Pumpkinseed (N)
Brook Trout (N)	Rainbow Trout (I)
Brown Bullhead (N)	Redbreast Sunfish (N)
Chain Pickerel (N)	White Sucker (N)
Creek Chub (N)	Yellow Bullhead (N)

Total: 12
Native: 9
Introduced: 3

DEWA.3038 (Vancampens Brook 76) was the second uppermost site on Vancampens Brook. It was forested fairly cool, but warmer, on average, than the next site downstream (DEWA.3014). The majority of habitat was riffle/pool, but one long, deep pool (>1 m deep in places) existed in the middle of the reach that was difficult to shock.

Brook Trout were by far the most prevalent species (304 individuals over three visits). Blacknose Dace were also common (54 individuals over three visits). The rest of the species were uncommon. Only one individual of Bluegill, Brown Bullhead, Green Sunfish, and White Sucker were detected. Across three visits, five Yellow Bullhead were detected, which was the most Yellow Bullhead detected at any site. Only four Rainbow Trout were detected and no yoy.

Given that two impoundments exist upstream (Upper and Lower Blue Mountain Lakes), and few species were found at the next site downstream, it is likely the upstream impoundments affected the stream fish community at DEWA.3038. This is a headwater stream where species diversity should be low. The long, deep pool provided ideal habitat for pond species. They still only exist in small numbers, and Brook Trout are relatively prevalent, which is a good sign. Fishing reports show the Blue Mountain Lakes have at least Chain Pickerel, Largemouth Bass, and Yellow Perch. Trout are also stocked by New Jersey Fish and Game.



Deep pool in background where most of the pond species were captured from.

DEWA.3010 – Vancampens Brook 95



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
5	68.92	2.47	0.00	0.18	87.09	0.13	12.38	526.25	0.02

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.71	328.85	0.15	16.51	19.67	Shrubs	Shaded	Cobble	Yes	Yes

Species

Brook Trout (N)	

Total: 1
Native: 1
Introduced: 0

DEWA.3010 (Vancampens Brook 95) was the uppermost site in the headwaters of Vancampens Brook. It was densely vegetated with rhododendron and had lots of large woody debris. Water temperature was, on average, relatively cool. There was very little water in the reach throughout summer in general. Habitat mostly consisted of riffles with small pools.

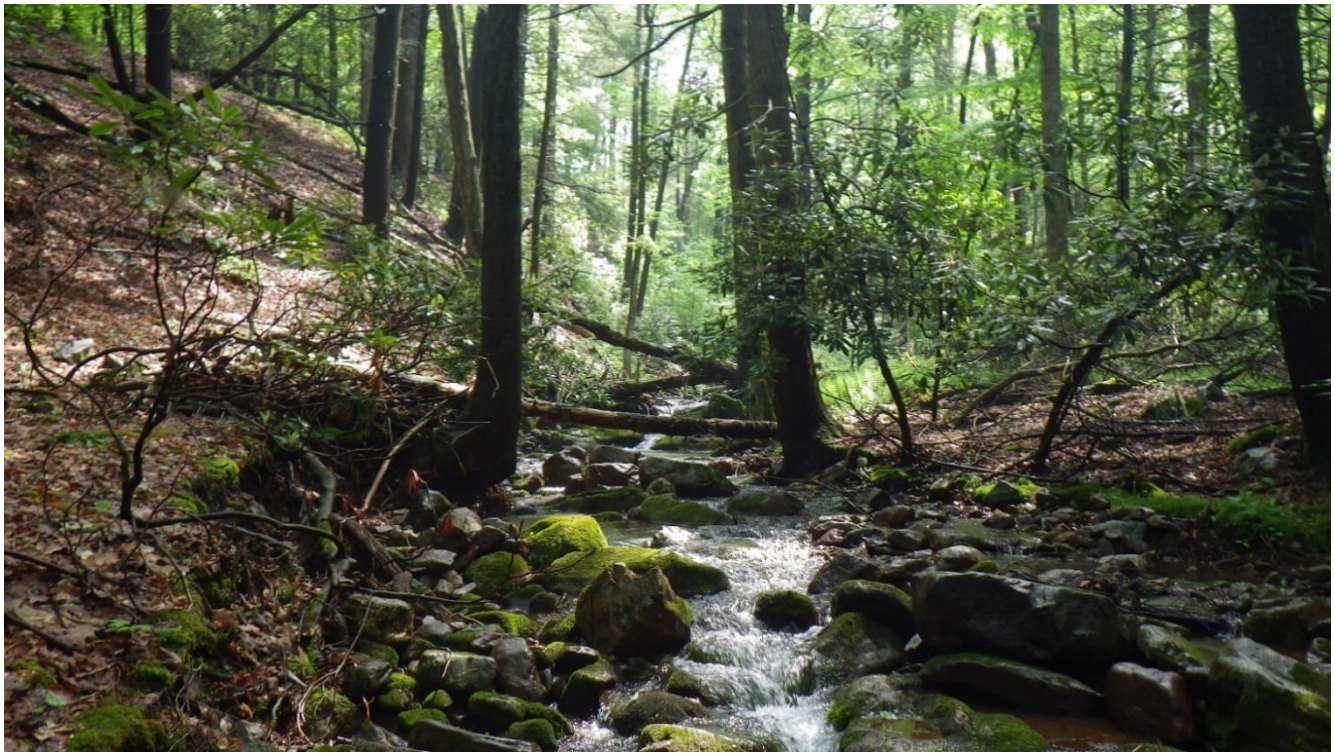
Brook Trout was the only species detected, and only 22 individuals were captured across all three visits, including three yoy on the last visit.

Although an impoundment (Long Pine Pond) exists in the headwaters of Vancampens Brook, it did not appear to affect the fish community at DEWA.3010. No pond species were detected like at other sites downstream, but shocking was difficult, so they may have been missed. Similarly, it was surprising to see such low numbers of Brook Trout, but they may also have been missed occasionally, and enough habitat was lacking in general. It is also possible no or very few fish exist in Long Pine Pond. New Jersey Fish and Game describes fishing in Long Pine Pond as “poor” for all species.



Downstream end of reach.

DEWA.3026 – UNT to Vancampens Brook 05



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
6	65.42	2.11	0.00	0.00	97.27	0.14	7.6	367.50	0.01

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.97	286.77	0.16	14.86	31.33	Trees	Shaded	Cobble	Yes	Yes

Species

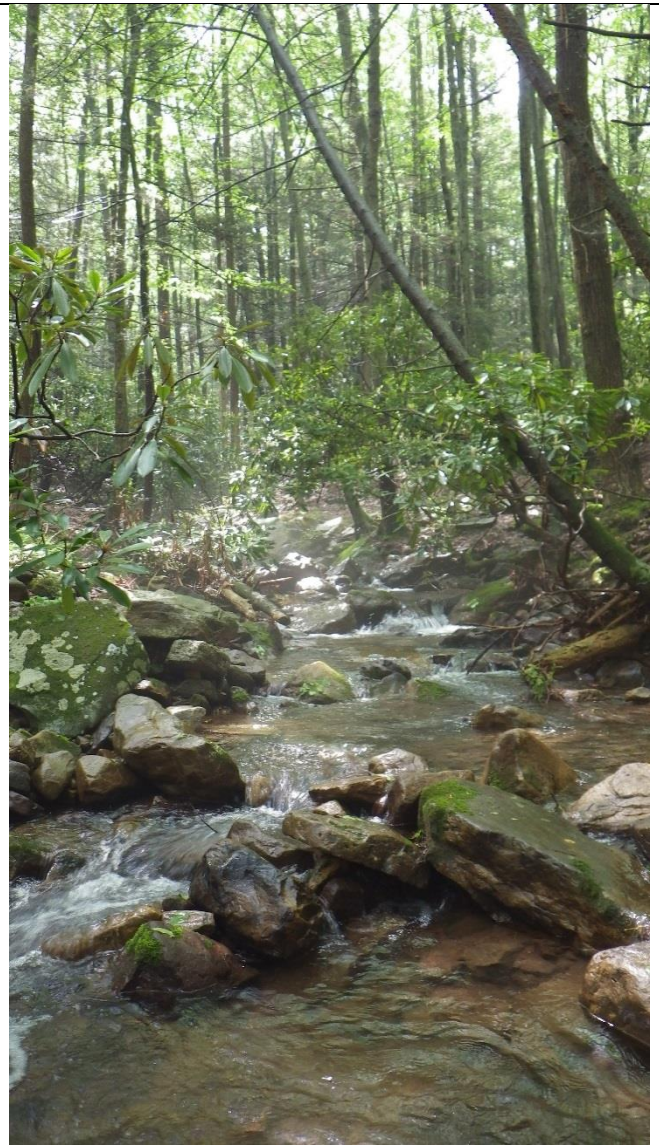
Brook Trout (N) Pumpkinseed (N) Rainbow Trout (I)	

Total: 3
Native: 2
Introduced: 1

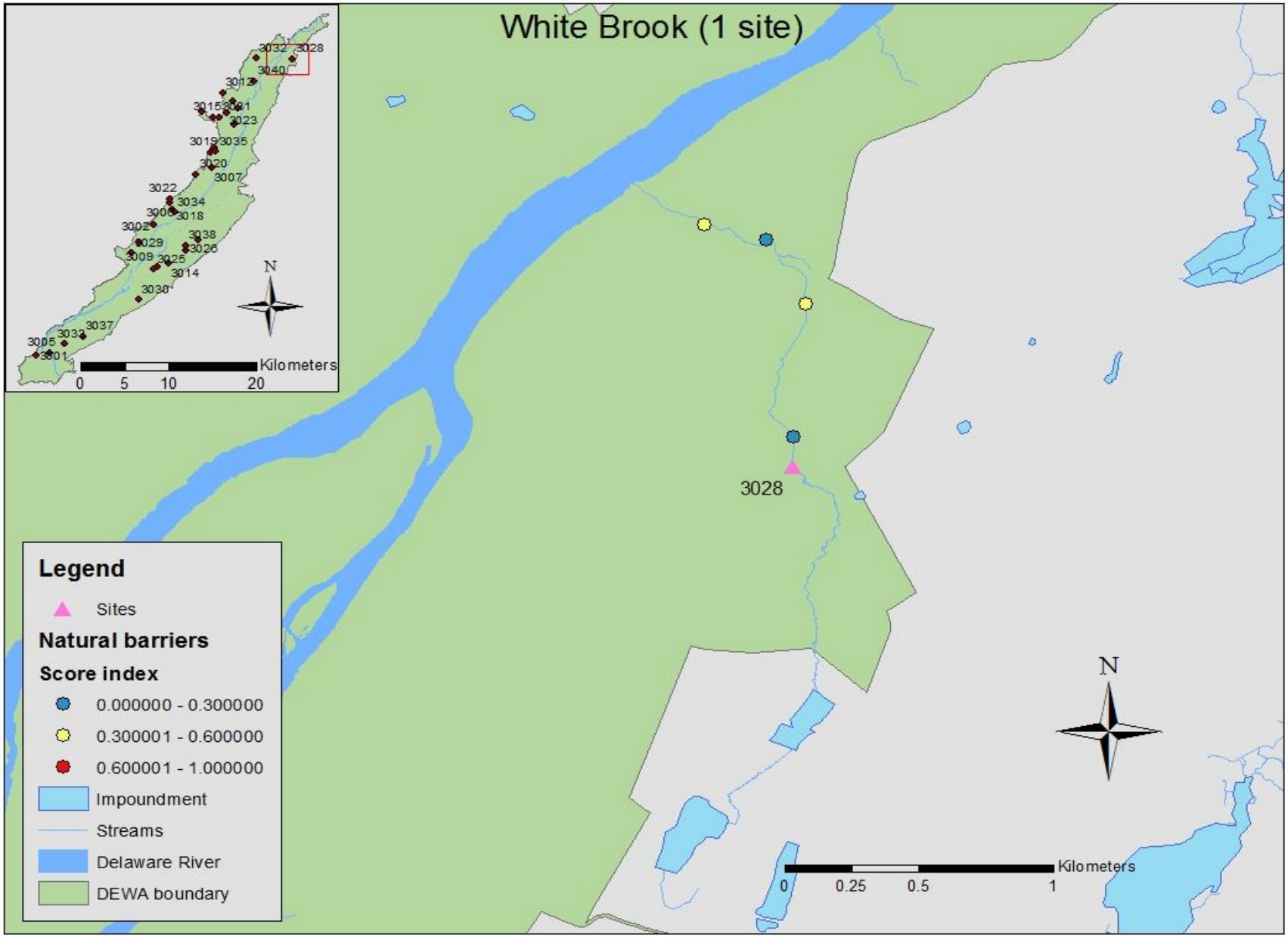
DEWA.3026 (UNT to Vancampens Brook 05) was a reach on a small tributary to Vancampens Brook that flowed into Vancampens just downstream of DEWA.3038 (Vancampens Brook 76). It was a highly-forested catchment with cold water temperatures and a steep gradient. Habitat was mostly plunge pools and riffles.

Only three species were detected at DEWA.3026. Brook Trout were the most common with 164 individuals collected over three visits including many yoy. Pumpkinseed were few (8 individuals) and only captured on the second and third visits. One Rainbow Trout adult was captured, and only on the second visit.

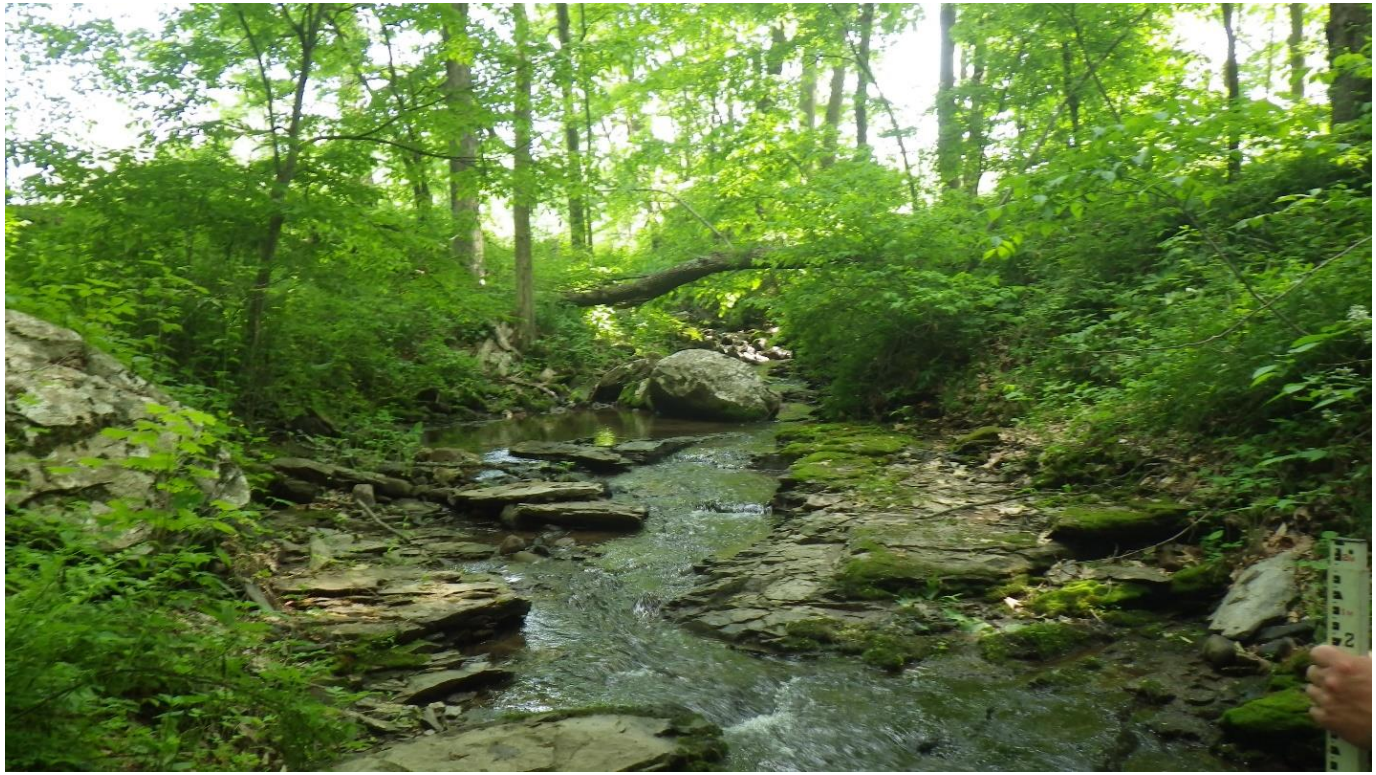
An impoundment (Mountain Ridge Lake) exists upstream of this reach, which could have produced the Pumpkinseed. The Rainbow Trout may have also come from the lake, or colonized from downstream reaches. There is no indication that natural barriers exist downstream that would limit dispersal.



Downstream end of reach.


White Brook (1 site)
3028
N
0 0.25 0.5 1
Kilometers
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
0 5 10 20
Kilometers

DEWA.3028 – White Brook 15



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
8	25.67	3.31	19.54	14.11	52.0	0.06	1.7	170	0

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
0.76	192.7	0.15	21.35	310.33	Grasses	Partly shaded	Cobble	Yes	Yes

Species

American Eel (N) Blacknose Dace (N) Bluegill (I) Brook Trout (N) Comely Shiner (N)	

Total: 5
Native: 4
Introduced: 1

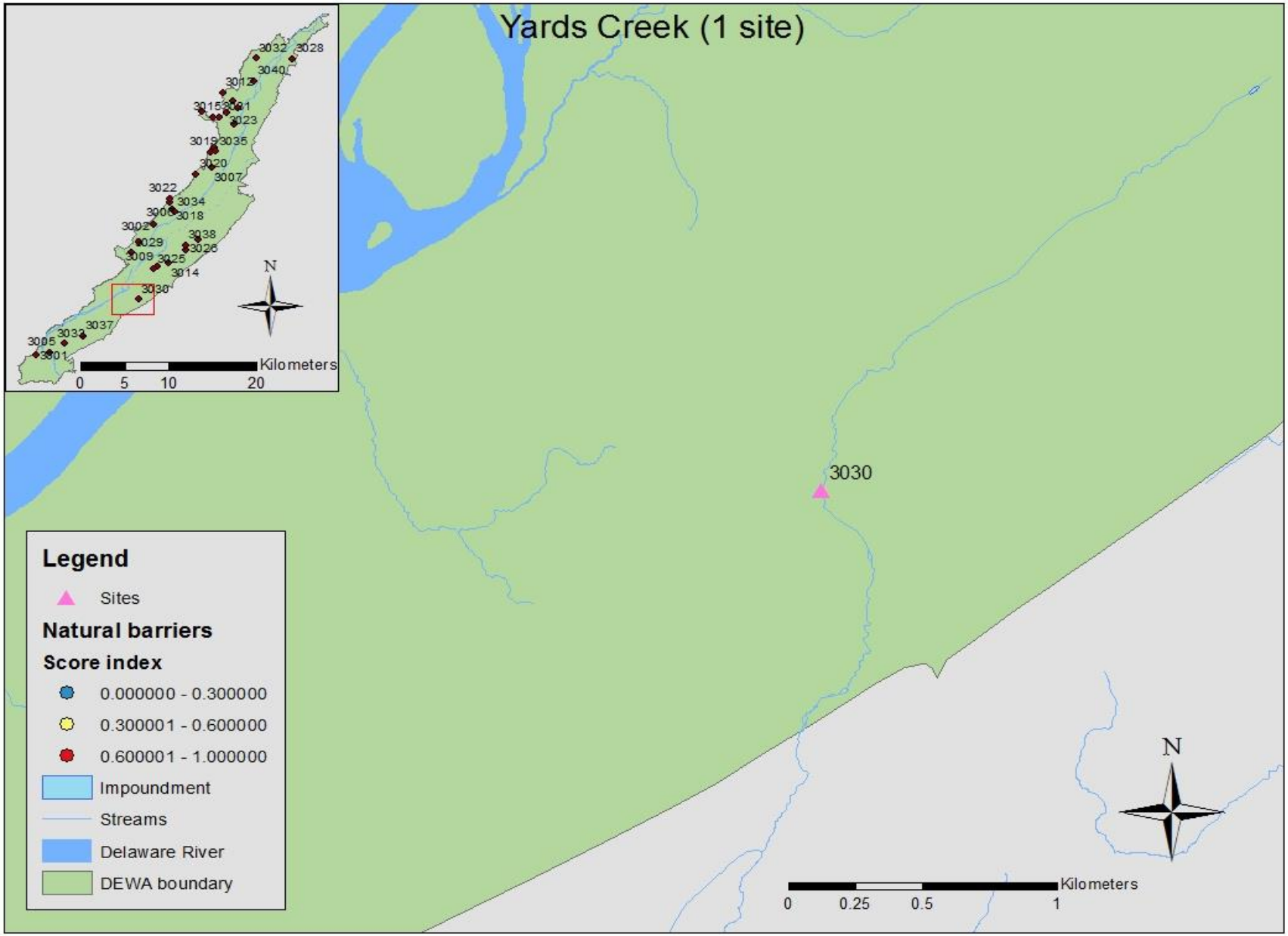
DEWA.3028 (White Brook 15) was unique in that it was characterized by completely different habitats above and below the site midpoint. Below the site midpoint (0-50 m), White Brook was shaded, surrounded by trees and rhododendron, and consisted of mostly bedrock and cobble substrate. Above the site midpoint (50-100 m), White Brook meandered through a grassy field with virtually no overhead cover and a soft, sandy bottom. This open area likely contributed to the relatively warm stream temperature.

Blacknose Dace and Bluegill were abundant, but occupied different areas of the stream. Blacknose Dace were more common in the downstream forested area, while Bluegill were typically in pools in the open upstream area. All Bluegill were considered young-of-year, because they were very small. Only one individual each of Brook Trout, Comely Shiner, and American Eel were found. The lone Brook Trout was only found on the first and second visit.

Although close to the river, this site has two natural barriers downstream greater than 0.30 score index, which may explain the low species diversity. It also has two upstream impoundments, which may explain the presence of Bluegill and perhaps Comely Shiner. The warm stream temperature may prevent other cool and cold water species from occupying this reach.



Upstream of the site midpoint (50m).


Yards Creek (1 site)
3030
N
Kilometers
0 0.25 0.5 1
Legend
Sites
Natural barriers
Score index
0.000000 - 0.300000
0.300001 - 0.600000
0.600001 - 1.000000
Impoundment
Streams
Delaware River
DEWA boundary
Kilometers
0 5 10 20

DEWA.3030 – Yards Creek 07



Link Magnitude	Percentage riparian cover	Upstream catchment area (km^2)	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to Delaware River (km)	Reach area (m^2)	Large woody debris density
1	70.25	2.29	0.00	0.24	89.26	0.17	17.07	596.25	0.00

Barrier Index (score/km)	Elevation (m)	Mean depth (m)	Mean water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate	Impoundment	Downstream barrier
NA	335.27	0.20	19.45	20.67	Trees	Shaded	Boulder	Yes	Yes

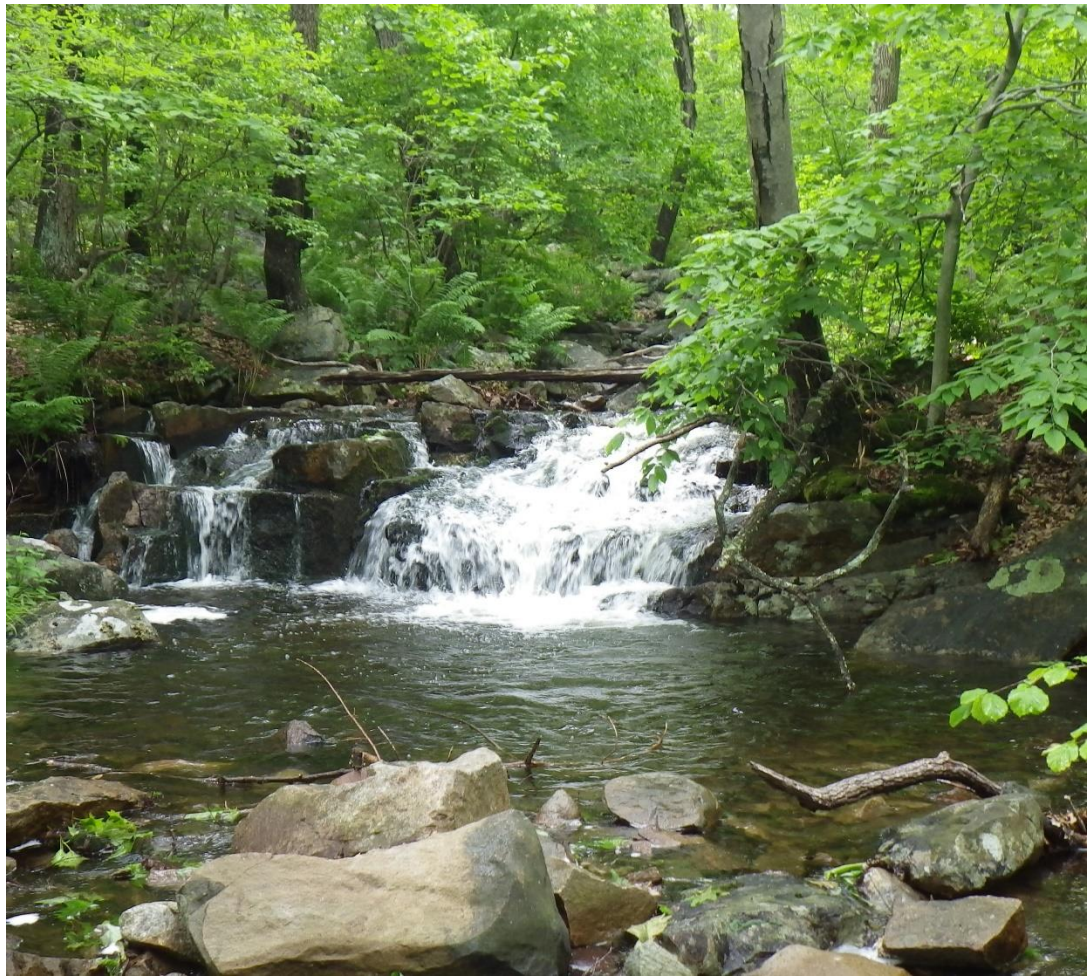
Species

No fish	

Total: 0
Native: 0
Introduced: 0

DEWA.3030 (Yards Creek 07) was the only reach on Yards Creek. The reach was heavily forested, but water temperature was relatively warm. The reach had a steep gradient with boulder substrate, which resulted in most riffle/pool habitat. Water levels were extremely low by the third visit leaving only isolated pools.

No fish were detected at DEWA.3030. Yards Creek starts in DEWA boundaries and flows out, entering the Delaware River south of the southern end of DEWA. As such, it is likely many barriers to dispersal exist along its length, and colonization to this reach would be unlikely. An impoundment exists just upstream, but it appeared that the surface water of Yards Creek may not connect with it. This was apparent in late summer when a major portion of the reach appeared dry and only isolated pools were left. The volatile nature of flows may make this reach an uninhabitable place for stream fishes.

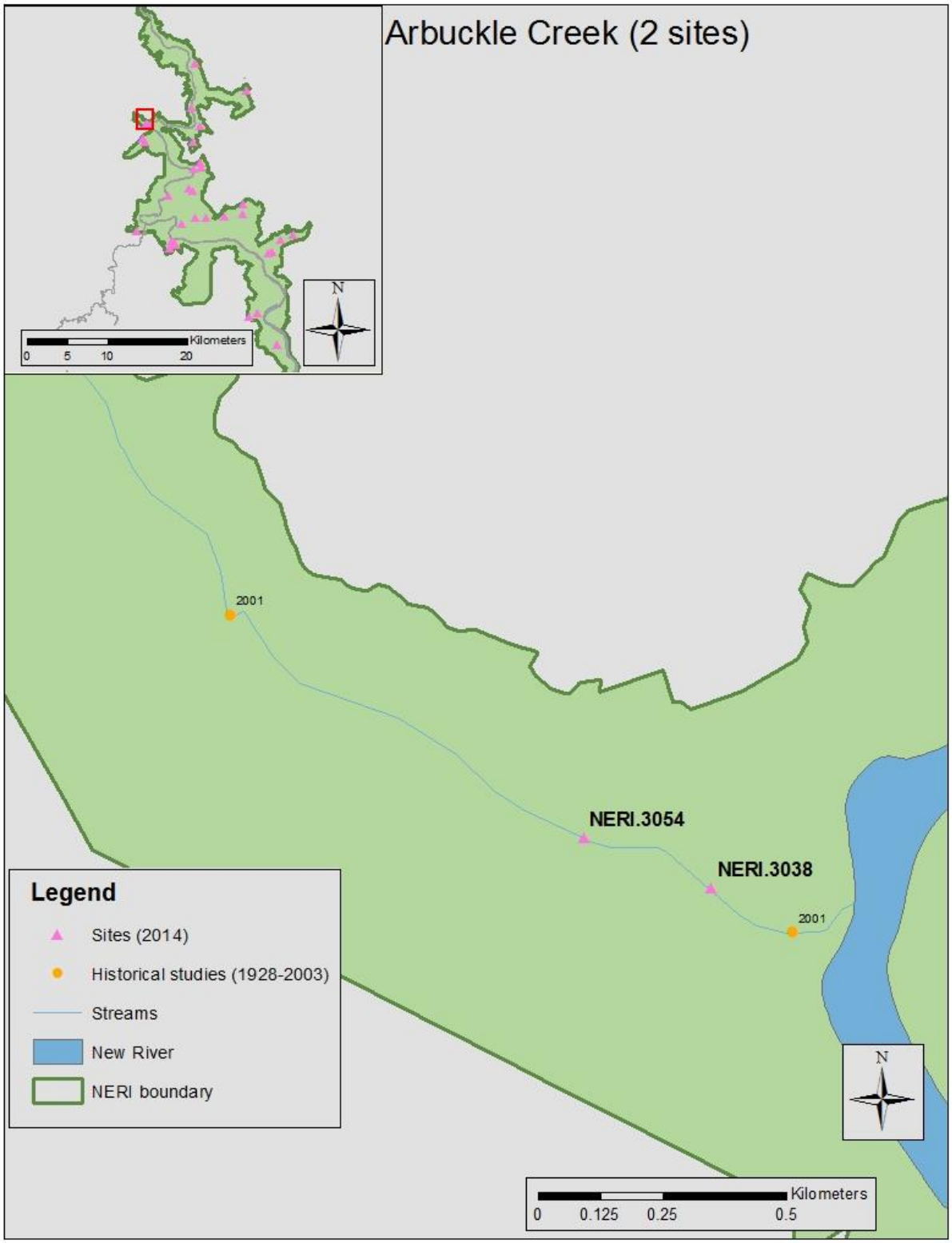


A large pool that was essentially isolated by the third visit.

New River Gorge National River: Site Descriptions

The following is a breakdown of fish species and habitat characteristics observed at NERI study sites. It includes relatively larger-scaled maps to view all sites on each stream, measured and derived habitat characteristics, fish species captured, pictures of sites and fish, locations of historical studies, and a general discussion containing observations of the field crew during sampling and potential sources of fishes inhabiting each site. The narrative proceeds in alphabetical order by stream name and from downstream to upstream within each watershed. This section also includes species lists and locations of previous fish sampling for comparison. See Faulk (2015; pages 7, 8, 78, and 79) for an explanation of the methods for habitat sampling and landscape-level habitat characterization. See also the table below for the source of data for each parameter.

Parameter	**Data source**
Link magnitude	National Hydrology Dataset Plus
Upstream catchment area	2011 National Landcover Database
Percent riparian cover	2011 National Landcover Database
Percentage agriculture	2011 National Landcover Database
Percentage developed	2011 National Landcover Database
Percentage forest	2011 National Landcover Database
Reach slope	USGS National Elevation Dataset digital elevation model
Distance to New River	National Hydrology Dataset Plus
Reach area	Calculated by EAF
Large woody debris density	Calculated by EAF
Average downstream slope	Calculated by EAF
Elevation	USGS National Elevation Dataset digital elevation model
Mean depth	Calculated by EAF
Mean maximum daily water temperature	HOBO logger data
Mean conductivity	Calculated by EAF
Riparian vegetation	observed by field crew as trees, shrubs, grasses, or herbaceous
Canopy cover	observed by field crew as open, partly-shaded, or shaded
Dominant substrate	observed by field crew as boulder, cobble, gravel, fine, or bedrock


Arbuckle Creek (2 sites)
N
Kilometers
0 5 10 20
2001
NERI.3054
NERI.3038
2001
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.125 0.25 0.5

NERI. 3038 – Arbuckle Creek 02

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
119	23.25	88.00	11.65	37.58	46.78	0.02	0.34	735

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.03	325	0.30	15.17	314.00	Trees	Partly shaded	Cobble

Fish

2014	Previous studies (Wellman 2004)	
Blacknose Dace (N) Bluegill (I) Central Stoneroller (N) Creek Chub (N) Rosyside Dace (N) Total: 5 Native: 4 Introduced: 1	2001 (Welsh-downstream): Central Stoneroller (N) White Shiner (N) Bigmouth Chub (N) Spottail Shiner (I) Telescope Shiner (I) Bluntnose Minnow (N) Longnose Dace (N) Northern Hogsucker (N) Rock Bass (I) Smallmouth Bass (I) Roanoke Darter (I)	2001 (Welsh-upstream): Creek Chub (N)

Description

NERI.3038 (Arbuckle Creek 02) was the downstream site on Arbuckle Creek. The stream was heavily-forested and surrounded by steep banks. The bottom end of the reach was characterized by riffles and small pools. The upstream end was mostly long, deep runs and pools. The gradient was fairly moderate. Arbuckle Creek was previously-designated by WVDEP as impaired and has TMDLs developed for biological, fecal coliform, and iron. It was apparent from the high conductivity, which was second highest among all sites.

Central Stoneroller were abundant and all other species were relatively uncommon (five individuals or less). One Bluegill was captured at the downstream end of the reach in a small pool. One Blacknose Dace was captured, and only on the first visit. A previous study downstream captured many more species, but this site was very close to the river. Another study further upstream only captured Creek Chub.

The poor water quality may have been apparent by the presence of many Central Stoneroller, a relatively pollution-tolerant species, and lack of much of anything else. Differences in fish diversity between the previous downstream study and this site could have been due to natural barriers, although downstream slope was low and no major waterfalls were noted by the field crew.

NERI. 3054 – Arbuckle Creek 05

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
116	22.61	85.67	11.73	38.46	45.72	0.08	0.63	940

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.05	344	0.21	15.17	316.67	Trees	Partly shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)	
Blacknose Dace (N) Brown Trout (I) Central Stoneroller (N) Creek Chub (N) Rosyside Dace (N) Total: 5 Native: 4 Introduced: 1	2001 (Welsch-downstream): Central Stoneroller (N) White Shiner (N) Bigmouth Chub (N) Spottail Shiner (I) Telescope Shiner (I) Bluntnose Minnow (N) Longnose Dace (N) Northern Hogsucker (N) Rock Bass (I) Smallmouth Bass (I) Roanoke Darter (I)	2001 (Welsch-upstream): Creek Chub (N)

Description

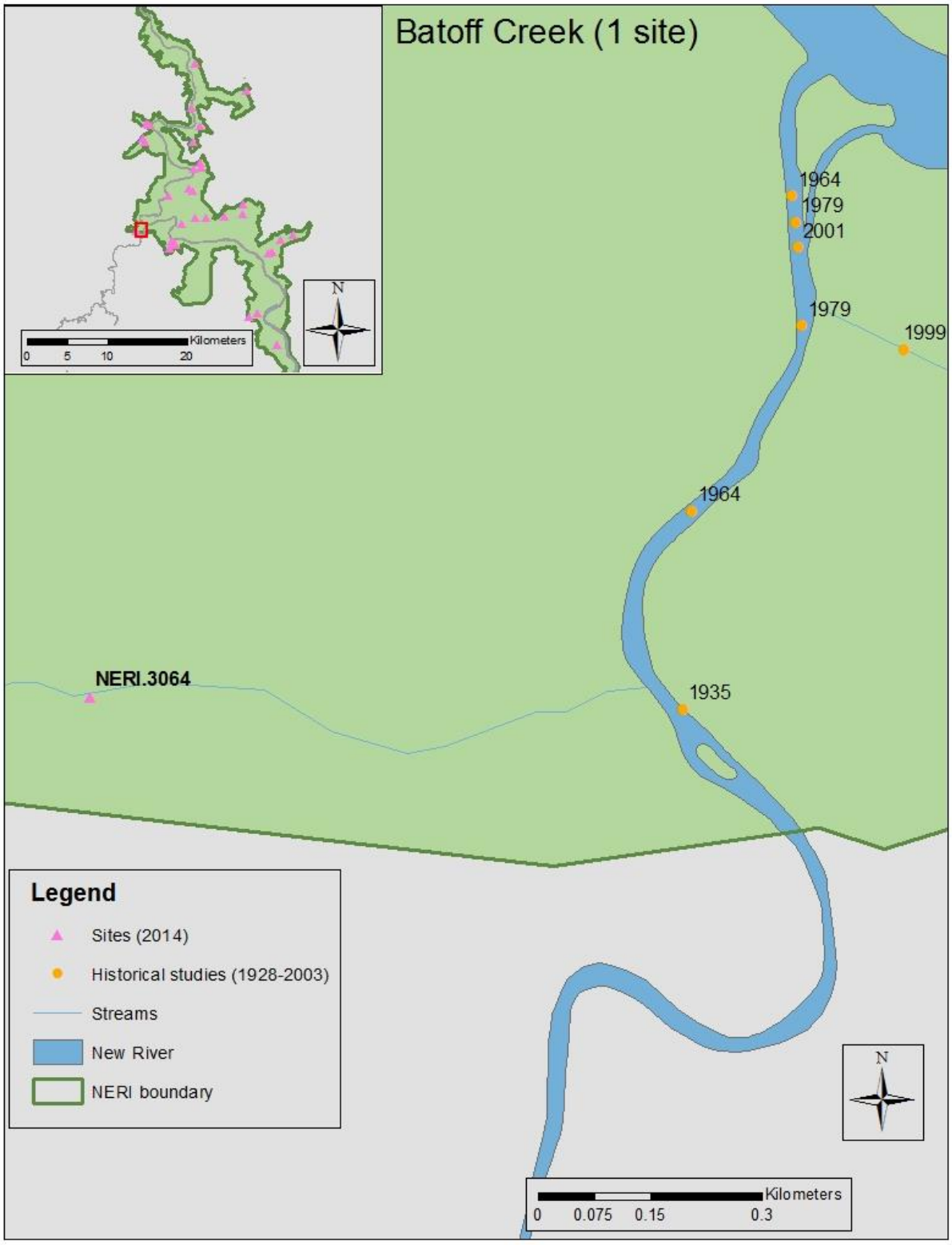
NERI.3054 (Arbuckle Creek 05) was the upstream site on Arbuckle Creek. The reach was very similar to the downstream site, although gradient appeared to increase. Aquatic vegetation was noted on the substrate, and there was a lot of trash in the reach. Arbuckle Creek was previously-designated by WVDEP as impaired and has TMDLs developed for biological, fecal coliform, and iron. It was apparent from the high conductivity, which was highest among all sites (higher than the downstream site).

Four of the same species were found from the downstream site. Central Stoneroller continued to be most common, but Creek Chub also became more common. One Brown Trout adult was captured, but only on the second visit. Only five Rosyside Dace and two Blacknose Dace were captured.

Again, poor water quality may have been evident by the species present. Although Bluegill were no longer encountered, Brown Trout, a relatively pollution-tolerant Salmonid, were present.



A large Central Stoneroller captured in Arbuckle Creek.


Batoff Creek (1 site)
1964
1979
2001
1979
1999
1964
1935
NERI.3064
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.075 0.15 0.3
N
Kilometers
0 5 10 20

NERI. 3064 – Batoff Creek 07

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
52	8.86	87.00	4.59	18.14	76.14	0.07	1.73	694

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.00	0.05	434	0.28	13.68	152.67	Trees	Shaded	Bedrock

Fish

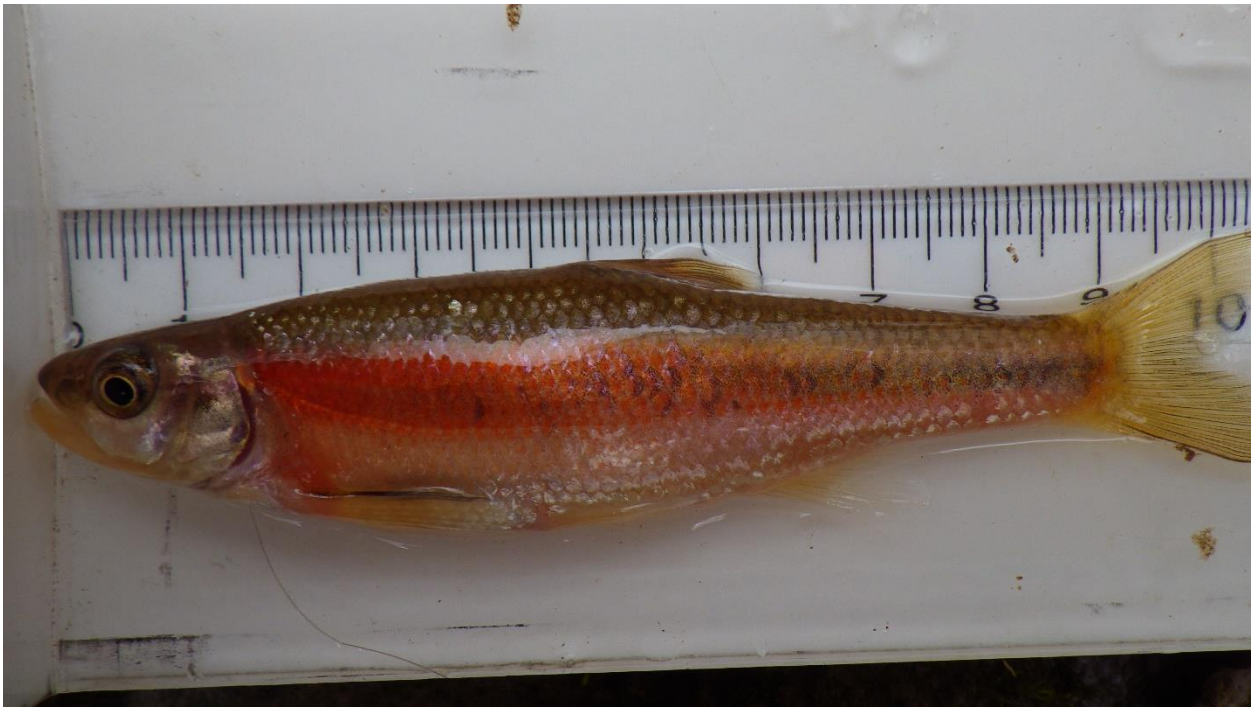
2014	Previous studies (Wellman 2004)
Blacknose Dace (N) Creek Chub (N) Rosyside Dace (N) Total: 3 Native: 3 Introduced: 0	None – only in Piney Creek

Description

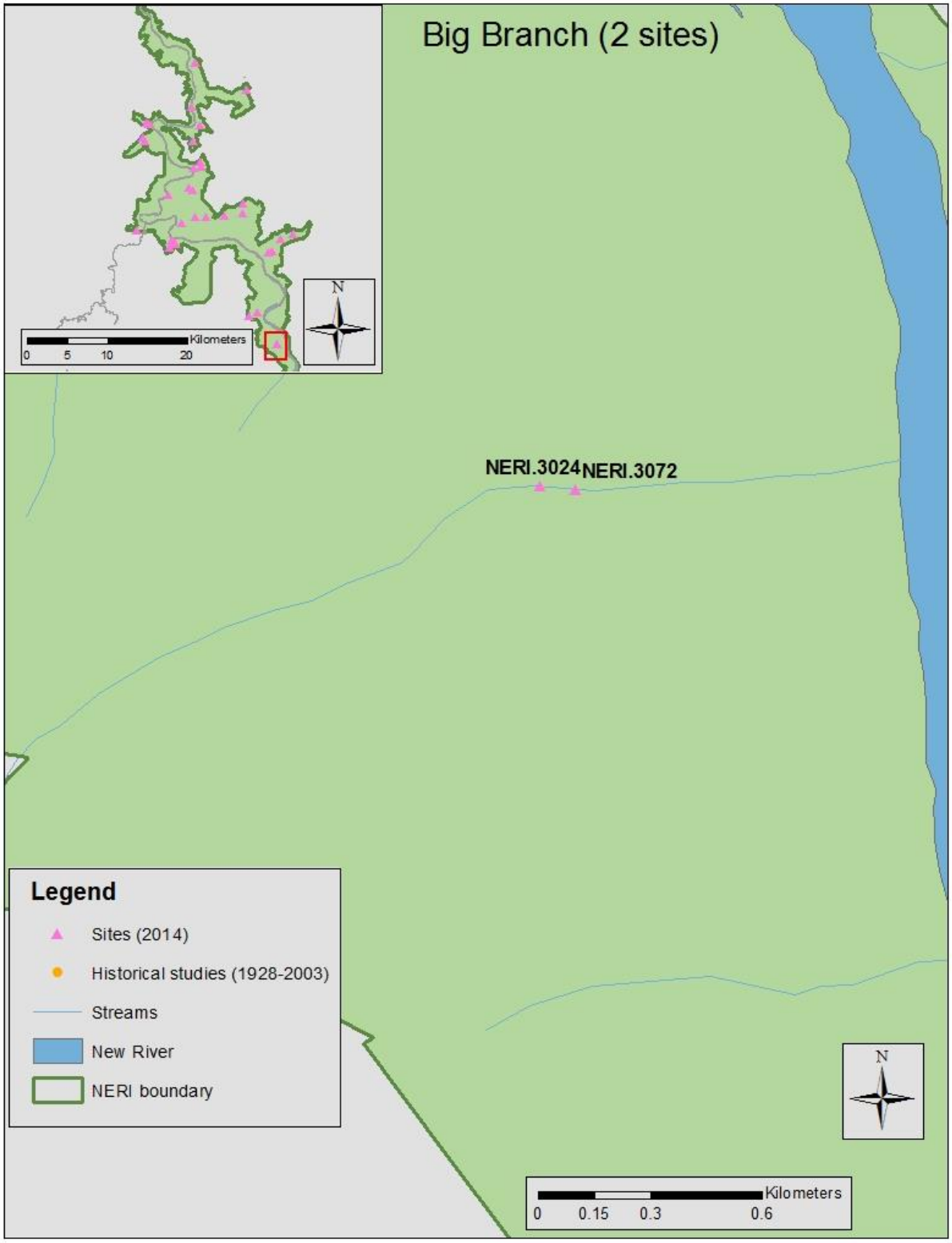
NERI.3064 (Batoff Creek 07) was the only site on Batoff Creek. The stream was in a steep canyon just off Hwy 41 and lies just at the border of the park. The reach was mostly deep pools with shallow runs flowing over bedrock. Downstream, Batoff Creek dumps into a larger tributary, Piney Creek, before entering New River. Upstream, Batoff Creek runs through a highly-developed drainage. This was apparent by the relatively high conductivity.

Blacknose Dace were abundant with 216, 240, and 127 individuals captured at each of the three visits, respectively. Creek Chub and Rosyside Dace were relatively uncommon with fewer than 10 individuals each detected per visit. Blacknose Dace occupied all parts of the stream while Rosyside Dace and Creek Chub were mostly in pools. No previous studies were documented by Wellman in Batoff Creek.

Given that the fish community was dominated by Blacknose Dace, a relatively pollution-tolerant species, and the high stream conductivity, it is likely Batoff Creek suffers from poor water quality. It was listed as impaired by WVDEP and a TMDL was developed for aluminum, iron, and pH in 2008.



Rosyside Dace captured at NERI.3064 – Batoff Creek 07.


Big Branch (2 sites)
NERI.3024
NERI.3072
N
Kilometers
0 5 10 20
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.15 0.3 0.6

NERI. 3052 – Big Branch 09

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
13	2.20	92.29	1.96	3.19	94.48	0.14	0.88	369

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.14	525	0.15	14.21	95.33	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
None	None

Description

NERI.3072 (Big Branch 09) was the downstream site on Big Branch. The stream was fairly small and drained a forested gully. It had a fairly steep gradient and habitat existed mostly as small plunge pools and riffles. Water temperature was relatively cold. There were many large waterfalls downstream (see picture below).

No fish were detected during any visit to NERI.3072. It is likely the presence of many large waterfalls prevented any fish from colonizing the area. There were, however, Blacknose Dace captured below the reach beneath the next closest large waterfall.



One of the many large waterfalls below the reach.

NERI. 3024 – Big Branch 10

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
13	2.17	92.29	1.95	3.24	94.48	0.14	0.98	359

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.05	0.13	536	0.14	12.74	74.00	Trees	Shaded	Boulder

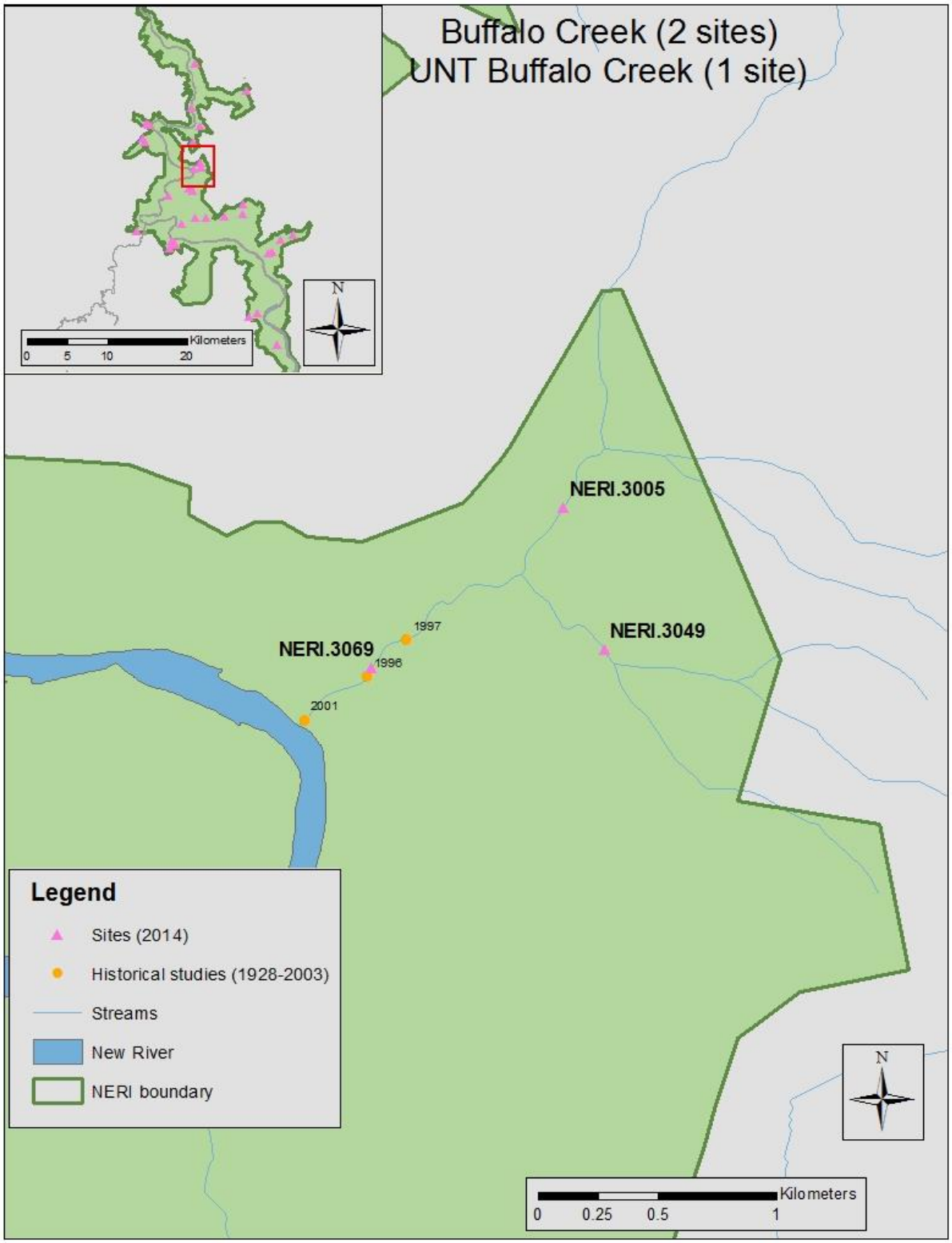
Fish

2014	Previous studies (Wellman 2004)
None	None

Description

NERI.3024 (Big Branch 10) was immediately 100m upstream of NERI.3072. Thus, it was very similar to NERI.3072. However, another large waterfall split the two sites.

No fish were detected during any visit to NERI.3072. It is likely the presence of many large waterfalls prevented any fish from colonizing the area.


Buffalo Creek (2 sites)
UNT Buffalo Creek (1 site)
N
Kilometers
0 5 10 20
NERI.3005
NERI.3049
NERI.3069
1997
1996
2001
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.25 0.5 1

NERI. 3069 – Buffalo Creek 04

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
65	13.82	86.67	0.08	0.97	98.70	0.10	0.41	581

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.00	0.08	359	0.27	13.96	91.67	Shrubs	Partly shaded	Bedrock

Fish

2014	Previous studies (Wellman 2004)		
Brook Trout (N) Total: 1 Native: 1 Introduced: 0	2001 (Wellman): Central Stoneroller (N) Bigmouth Chub (N) Blacknose Dace (N) Creek Chub (N) White Sucker (N) Northern Hogsucker (N) Brown Trout (I) Brook Trout (N) Rock Bass (I) Smallmouth Bass (I) Greenside Darter (N) Rainbow Darter (I) Variegate Darter (I)	1996 (WVDNR): Brook Trout (N)	1997 (WVDNR): Brook Trout (N)

Description

NERI.3069 (Buffalo Creek 04) was the downstream site on Buffalo Creek. The reach meandered over large boulders and bedrock with many deep pools. Canopy cover was mostly open due to one whole side of the stream near the road being mostly herbaceous weeds and shrubs. This also may have led to the general lack of large woody debris in the reach. There were many small waterfalls, and the upstream end of the reach was defined by a larger waterfall (~8ft high).

Brook Trout were the only species observed in this reach; however, only one large adult was detected. It is possible it was a stocked fish given its size, but it showed few signs of being hatchery-raised. From previous studies, Buffalo Creek near the mouth (2001) was very speciose. In 1996 and 1997, WVDNR also only found Brook Trout. These two sites were very close to the 2014 study site and probably better represent the historical fish community at this location in Buffalo Creek.

Towards the late summer, there was very little water, which restricted available habitat to a few deep pools and shallow riffles. Given some of the poor riparian habitat and proximity to the road, this reach probably is prone to flooding and sediment input, which may affect the ability of Brook Trout to proliferate.



Far side bank (in background) where riparian area was mostly cleared. Some erosion was noticeable up near the road.

NERI. 3005 – Buffalo Creek 16

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
46	10.33	93.60	0.11	0.57	99.13	0.18	1.57	620

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.02	0.09	464	0.26	12.99	51.67	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
Brook Trout (N) Total: 1 Native: 1 Introduced: 0	Downstream (see NERI.3069 – Buffalo Creek 4)

Description

NERI.3005 (Buffalo Creek 16) was the upstream site on Buffalo Creek. It was in a very remote, forested area. The reach had a high gradient with many large boulders (see picture below). Stream habitat was mostly small plunge pools and two large, deep pools. Water temperature was relatively cold.

Again, only Brook Trout were detected in the reach, but only four individuals during the first two visits, and no individuals during the last visit. These fish were sub-adults or smaller adults (maybe 1-2 years old), which may suggest natural reproduction occurs. Given the high gradient, this area probably has volatile stream flows, which may make it difficult for fish to persist.



A large pool near the downstream end of the reach where Brook Trout were typically detected. Also note the large boulders and steep gradient. The stream splits to the left and right behind the two large boulders.

NERI. 3049 – UNT to Buffalo Creek 06

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
10	1.96	87.40	0.00	2.89	96.74	0.24	1.75	356

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.13	553	0.15	11.97	108.67	Trees	Shaded	Boulder

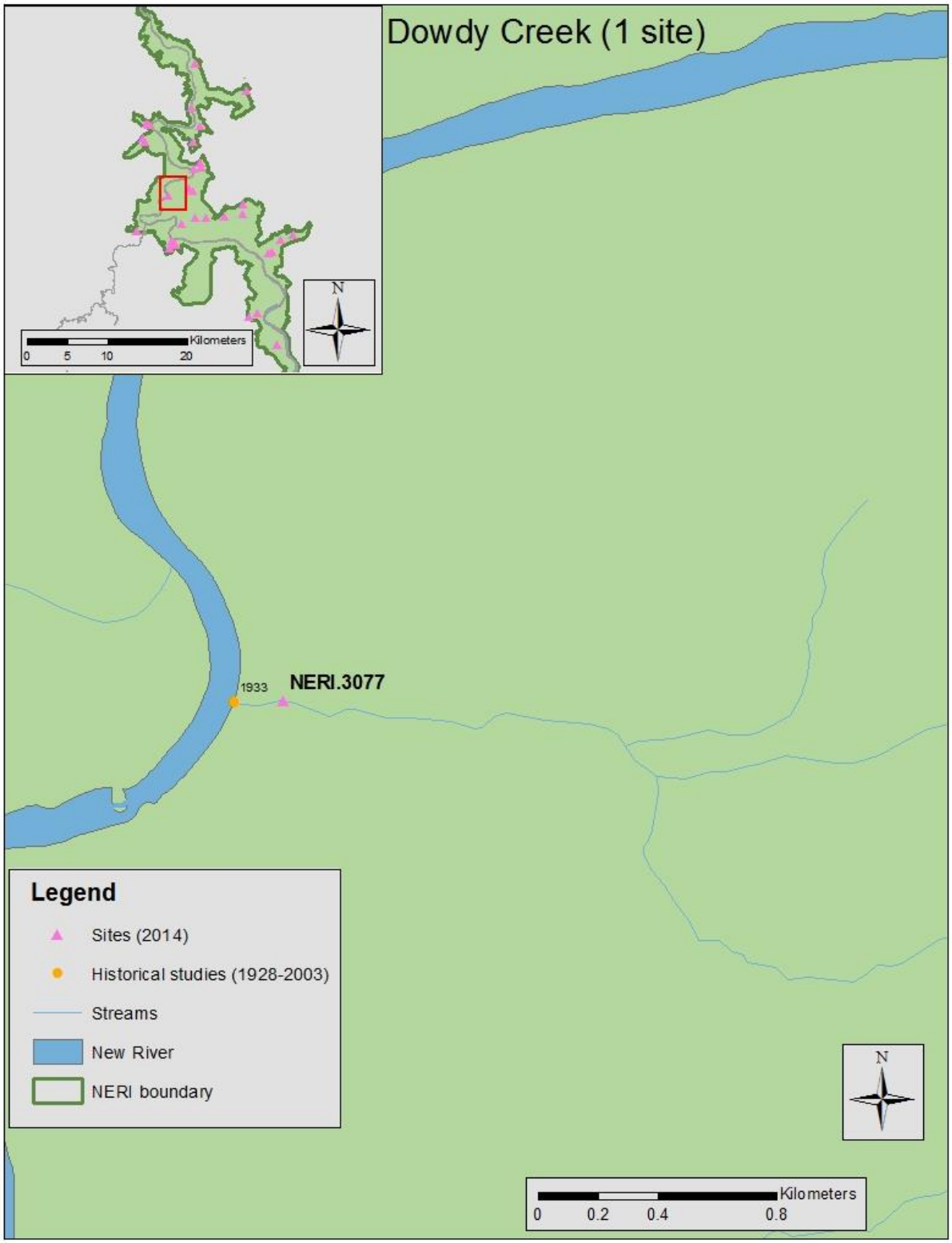
Fish

2014	Previous studies (Wellman 2004)
None	None

Description

NERI.3049 (UNT to Buffalo Creek 06) was a small tributary entering Buffalo Creek just below the upstream site on Buffalo Creek (NERI.3005). The reach had a very high gradient (second highest reach slope) and very cold water temperature (third coldest). It had surprisingly high conductivity for such a small, headwater stream, but there is some development upstream. There were many waterfalls that restricted available habitat mostly to small plunge pools.

No fish were detected during any visit to the reach. The high gradient would likely prevent any fish from naturally colonizing this area. Even then, there was very little habitat available and the steep gradient probably creates volatile stream flows. It may even dry up in late summer. Someone may want to further investigate the source of high conductivity given that it dumps into Buffalo Creek, a stream with an important native species in Brook Trout.


Dowdy Creek (1 site)
Kilometers
0 5 10 20
N
1933
NERI.3077
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.2 0.4 0.8

NERI. 3077 – Dowdy Creek 02

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
31	6.68	85.40	0.00	0.32	97.21	0.25	0.17	511

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.21	373	0.18	12.34	25.00	Trees	Shaded	Boulder

Fish

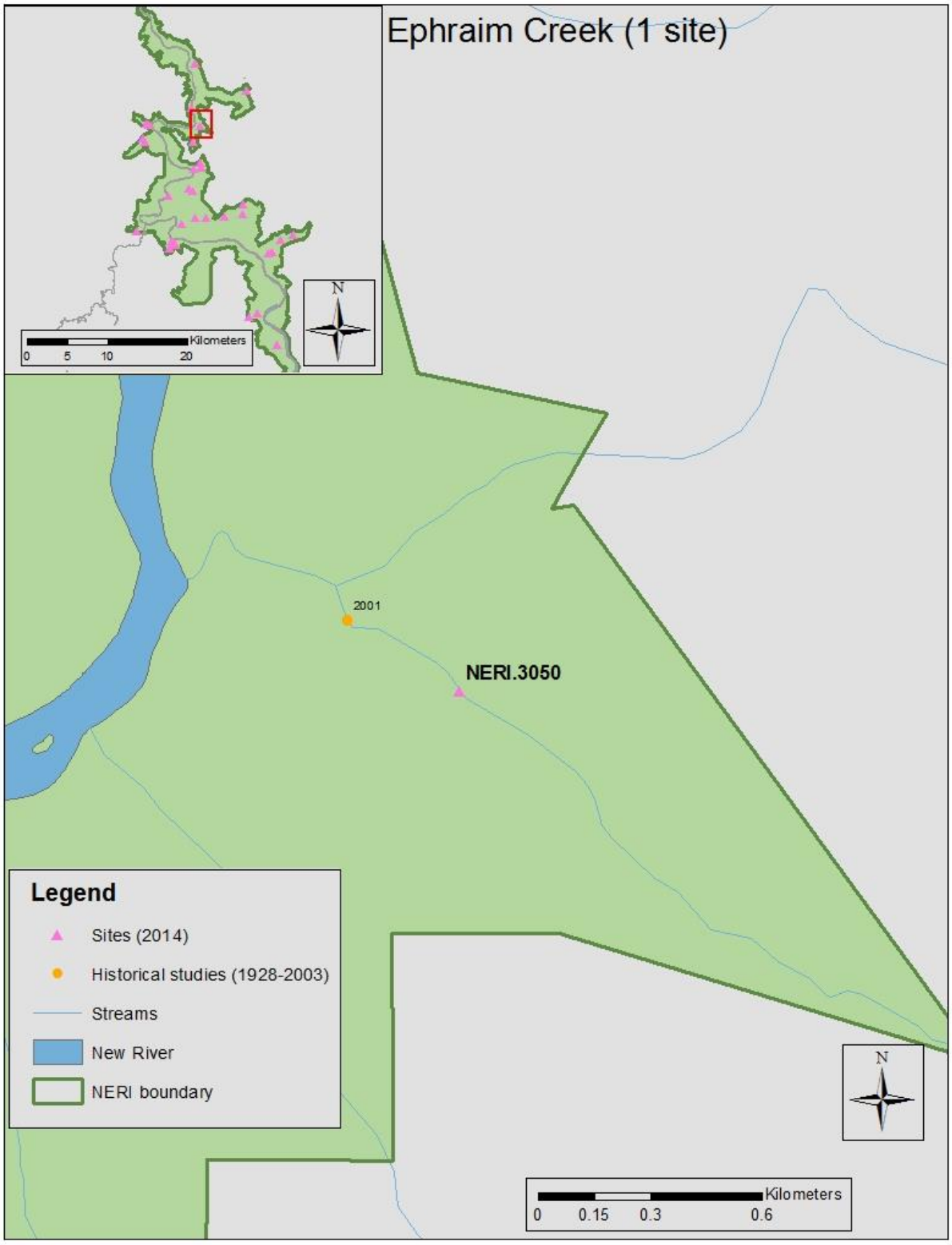
2014	Previous studies (Wellman 2004)
Blacknose Dace (N) Total: 1 Native: 1 Introduced: 0	1933 (Addair [1944])*: Creek Chub (N) Northern Hogsucker (N) Channel Catfish (N) Smallmouth Bass (I) *sampled in New River at mouth of Dowdy Creek

Description

NERI.3077 (Dowdy Creek 02) was the only site on Dowdy Creek. The stream was in heavily-forested area and was very close to New River. The downstream end was defined by a large waterwall (~30ft high). Given the proximity to New River and presence of the large waterfall, this made NERI.3077 have the highest average downstream slope out of all sites (tied with NERI.3009 – Slater Creek 20). Reach slope was also relatively high, but likely not as great as the habitat data suggests (0.25). The large waterfall may have accidently been incorporated in the reach slope estimate.

Blacknose Dace were the only species detected at this site. They were captured in relatively large numbers as well (>70 individuals per visit). The only previous study in the area occurred in 1933 and sampling took place in the New River itself near the mouth of Dowdy Creek. It is unlikely (although possible) that Blacknose Dace colonized this portion of Dowdy Creek

naturally given the presence of a 30ft waterfall. It is more likely they were introduced (possibly as bait bucket transfer) since Dowdy Creek is accessible via road and people live in the area.


Ephraim Creek (1 site)
N
Kilometers
0 5 10 20
2001
NERI.3050
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.15 0.3 0.6

NERI. 3050 – Ephraim Creek 08

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
50	9.47	87.80	0.00	0.64	98.77	0.15	1.00	491

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.08	380	0.22	14.91	30.67	Trees	Shaded	Boulder

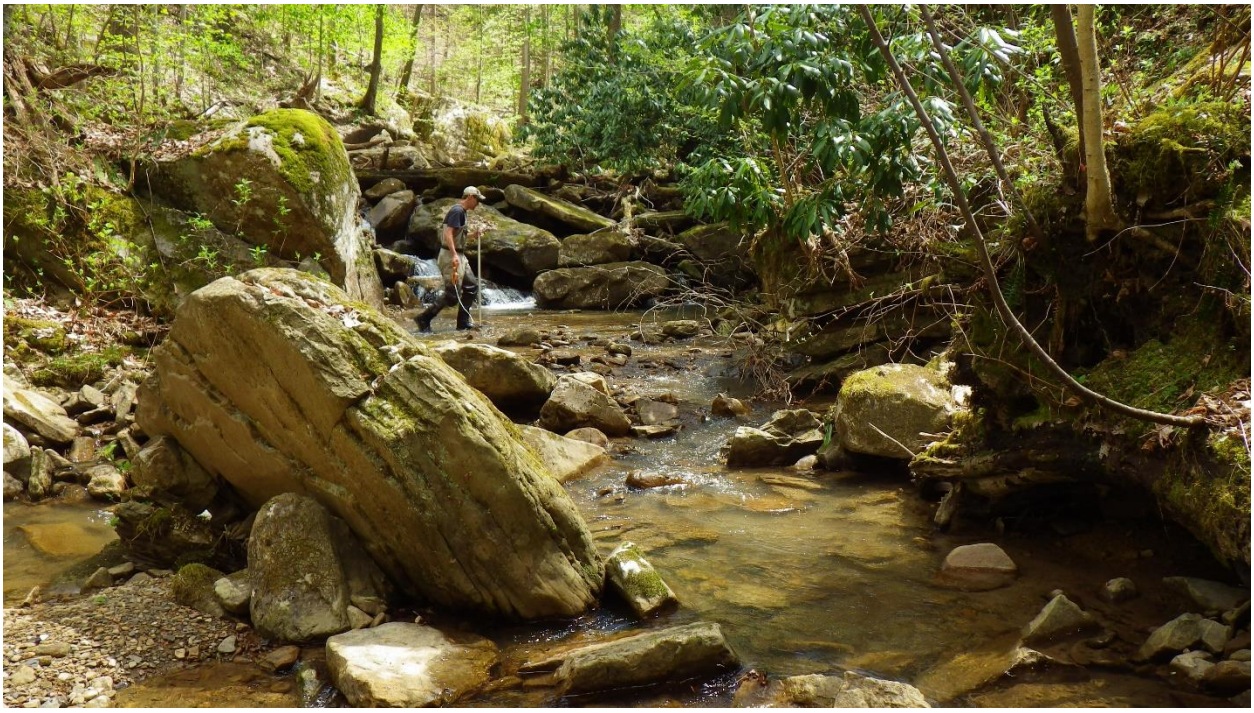
Fish

2014	Previous studies (Wellman 2004)
No fish detected	2001 (Wellman) Central Stoneroller (N) Rosyside Dace (N) Blacknose Dace (N) Creek Chub (N) Smallmouth Bass (I) Rainbow Darter (I) Variegate Darter (I)

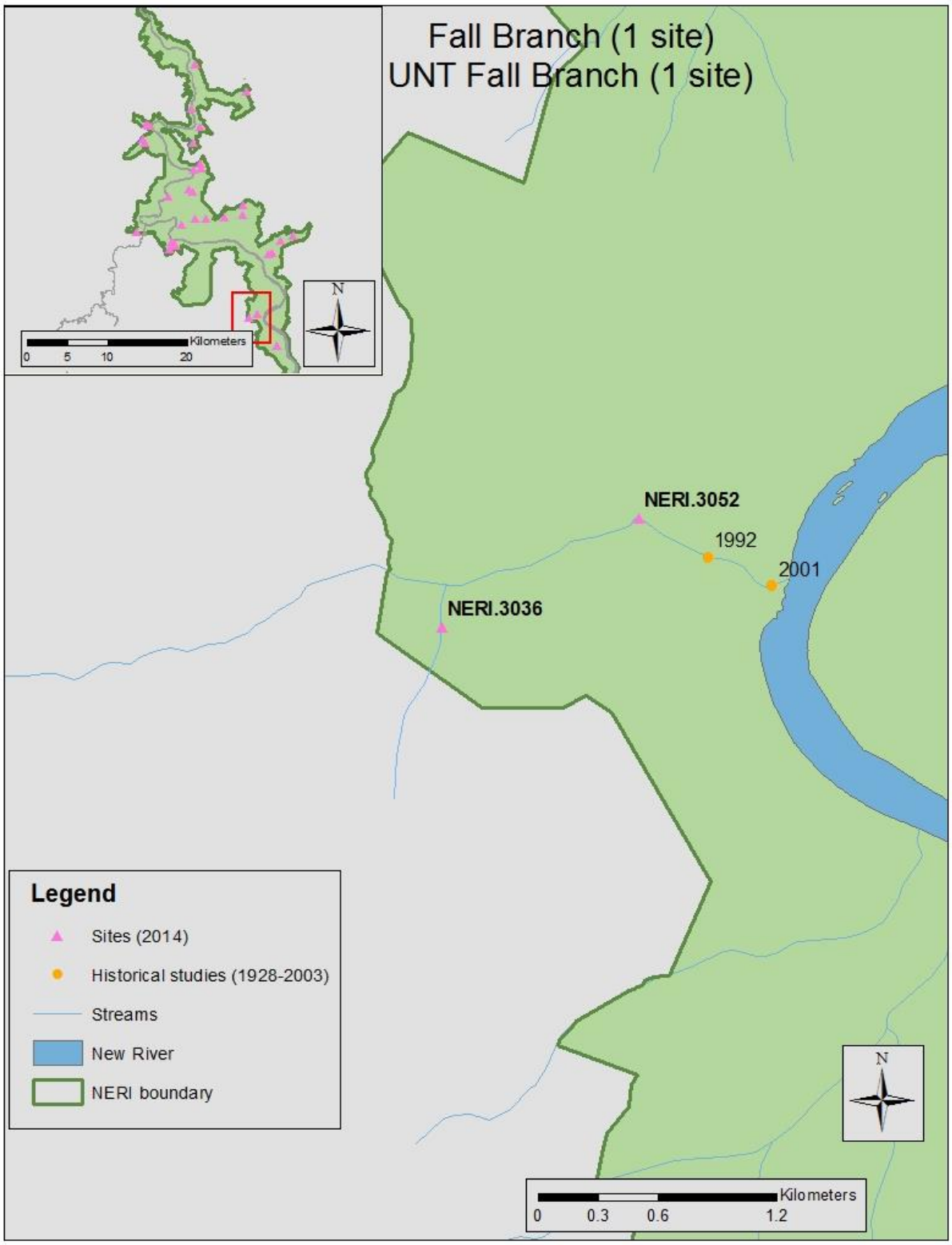
Description

NERI.3050 (Ephraim Creek 08) was the only site on Ephraim Creek. The stream was in a heavily-forested area. It was characterized by many large boulders and deep pools. There was a small waterfall in the reach (~8ft high).

No fish were detected at this site during any visit. Downstream of the reach are many small to medium-sized waterfalls that may act as barriers, especially given the presence of fish from the 2001 study close to the mouth.



Top of the reach.


Fall Branch (1 site)
UNT Fall Branch (1 site)
N
Kilometers
0 5 10 20
NERI.3052
1992
2001
NERI.3036
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.3 0.6 1.2

NERI. 3052 – Fall Branch 07

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
105	19.99	85.20	2.14	1.22	96.02	0.04	0.87	636

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.03	426	0.29	14.24	64.00	Trees	Partly shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)	
Blacknose Dace (N)	2001 (Welsh field notes):	1992 (WVDNR):
Creek Chub (N)	Central Stoneroller (N)	White Shiner (N)
Fantail Darter (N)	Telescope Shiner (I)	Mimic Shiner (N)
	Blacknose Dace (N)	Blacknose Dace (N)
	Creek Chub (N)	Brown Trout (I)
Total: 3	Rock Bass (I)	Spotted Bass (I)
Native: 3	Smallmouth Bass (I)	Fantail Darter (N)
Introduced: 0	Rainbow Darter (I)	

Description

NERI.3052 (Fall Branch 07) was the only site on Fall Branch. It was in a heavily-forested area. Water temperature was relatively cool. It was characterized by a lot of fast, deep water with a few larger pools.

Only three species (all native) were captured at NERI.3052. Blacknose Dace were the most common species, and were captured in greater than 100 individuals during the third visit. Fantail Darter were also common. Creek Chub were uncommon and typically only one or two individuals were captured per visit. At this point in Fall Branch, the fish community appeared much different from previous studies downstream. No shiners, bass, trout, or darter other than Fantail were detected in 2014. There may have been some faster water or small barriers that prevented species from moving this far upstream.

NERI. 3036 – UNT to Fall Branch 02

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
21	3.77	84.17	0.83	0.95	97.90	0.10	2.14	645

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.02	0.03	470	0.19	13.11	70.00	Trees	Shaded	Bedrock

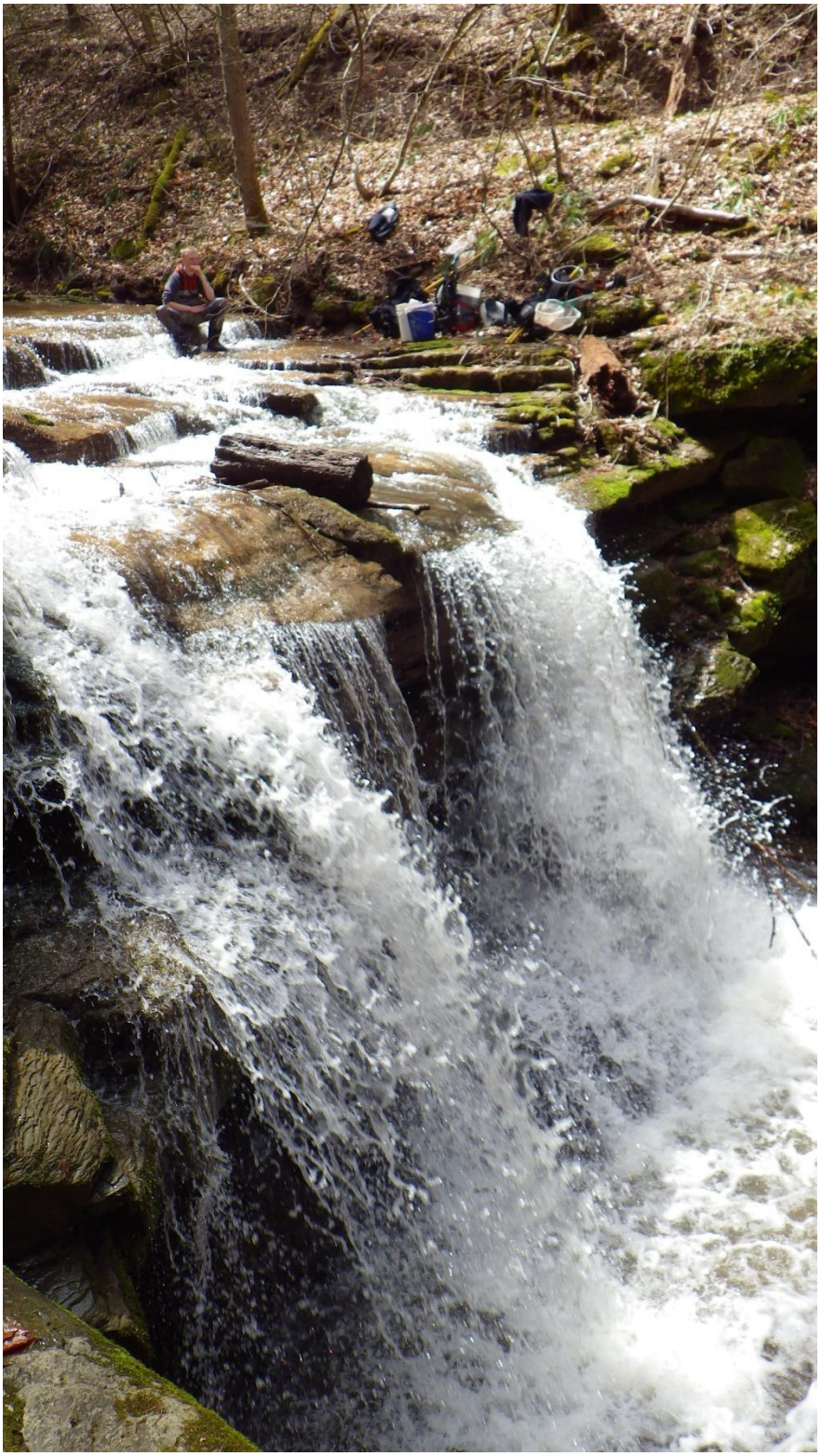
Fish

2014	Previous studies (Wellman 2004)
Blacknose Dace (N) Total: 1 Native: 1 Introduced: 0	Downstream near New River (see above – NERI.3052)

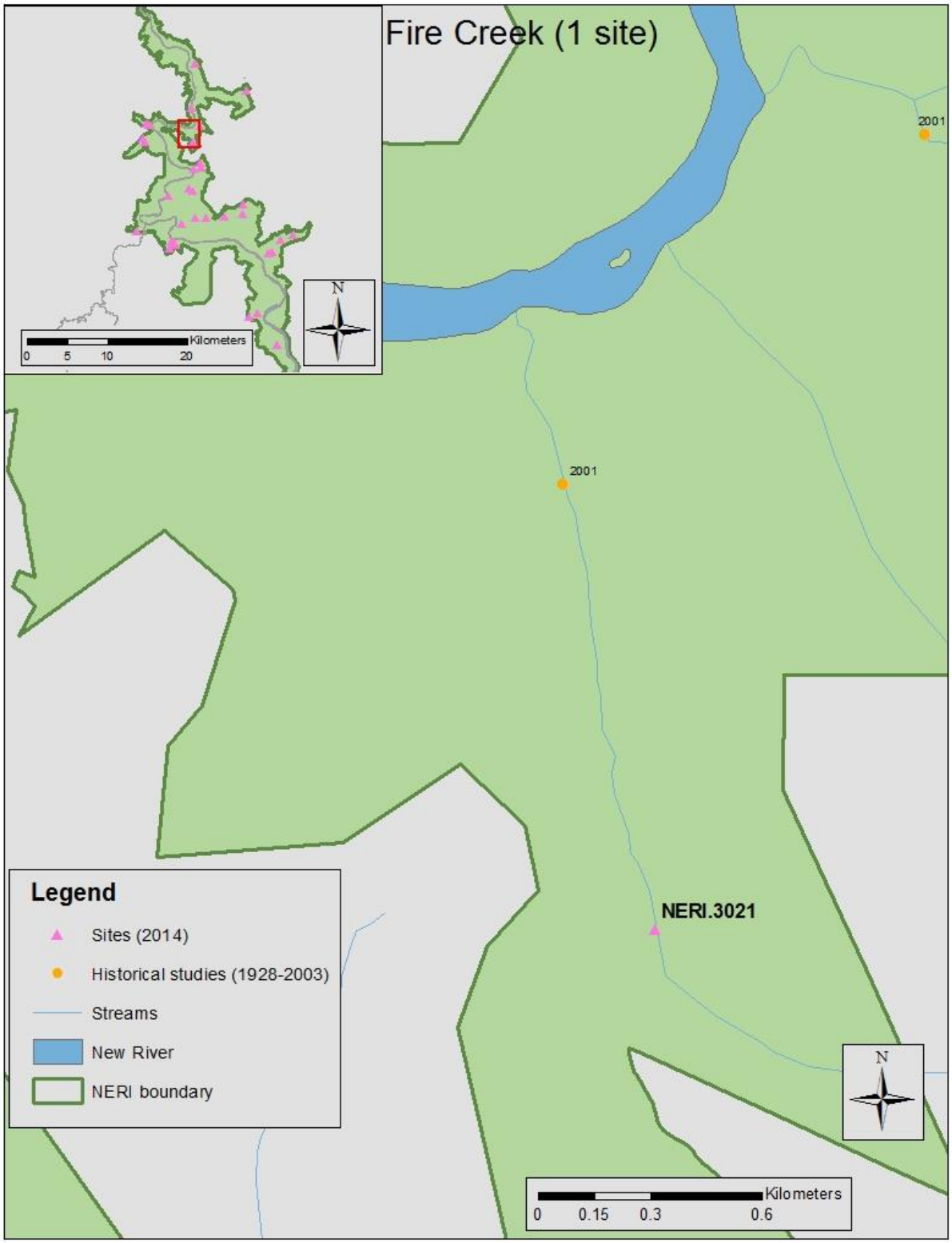
Description

NERI.3036 (UNT to Fall Branch 02) was a reach on a small tributary to Fall Branch. It was relatively small and had cold water temperature. Habitat consisted mostly of shallow runs and pools with one large pool at the top of the reach. The bottom of the reach was defined by a large waterfall approximately 15ft tall (see picture below).

Despite the presence of a large waterfall, Blacknose Dace occurred in the reach. They were also quite abundant and were captured in greater than 100 individuals during the third visit. No previous studies were documented by Wellman on this stream. It is unclear how Blacknose Dace were able to colonize this area given the large barrier.



Waterfall at the downstream end of the reach.


Fire Creek (1 site)
2001
2001
NERI.3021
N
Kilometers
0 5 10 20
N
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
Kilometers
0 0.15 0.3 0.6

NERI. 3021 – Fire Creek 17

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
17	2.64	90.20	0.31	0.58	97.37	0.21	1.76	438

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.16	592	0.33	11.19	54.50	Shrubs	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
No fish detected	2001 (Wellman) Creek Chub (N) Rainbow Darter (I)

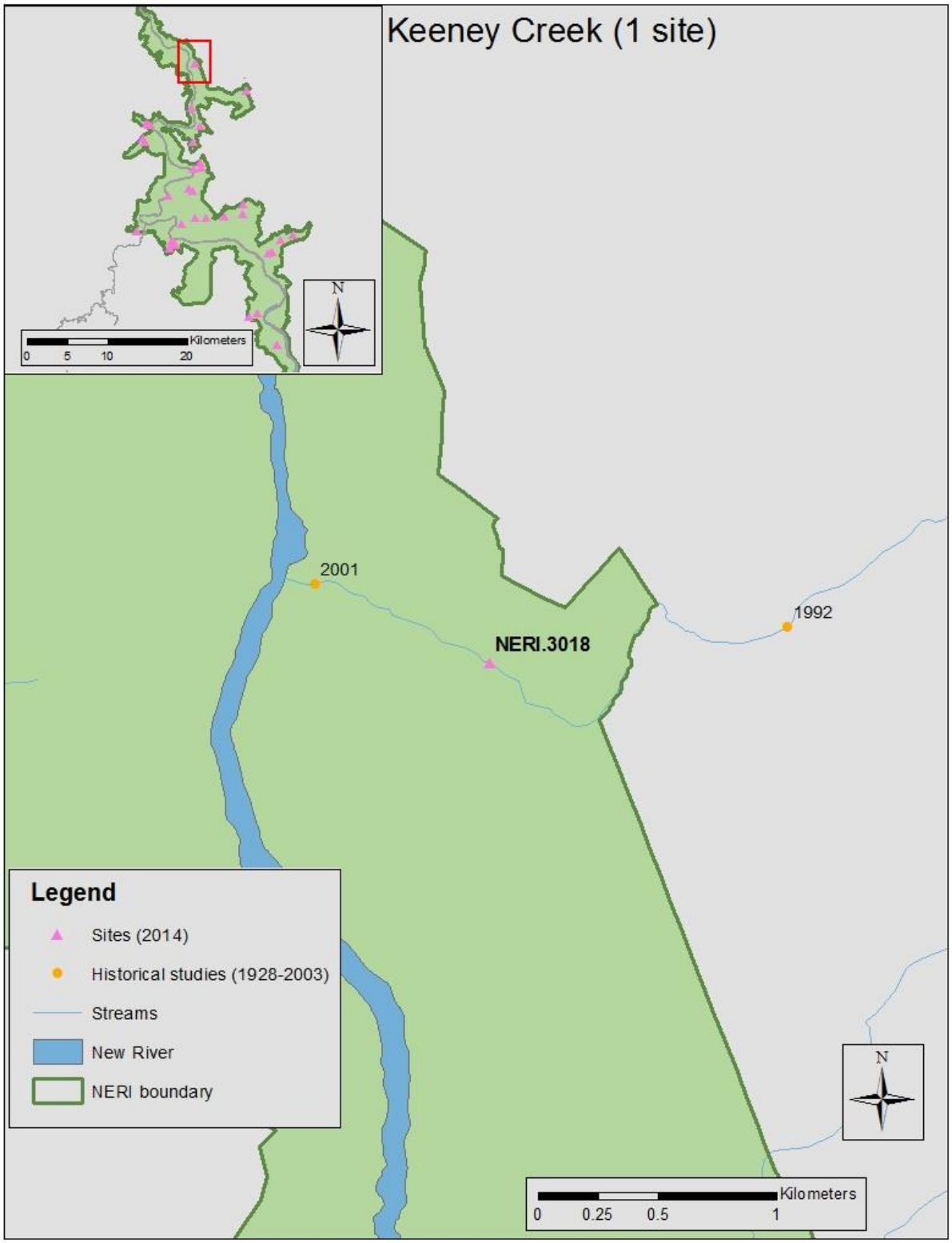
Description

NERI.3021 (Fire Creek 17) was the only site on Fire Creek. The stream was in heavily-forested area. It was characterized by many large boulders and deep pools. It had a very steep gradient, which was reflected in its high reach slope and average downstream slope values. The reach was made up of many large boulders (car-sized) creating tall waterfalls and plunge pools. The reach was completely dry by the third visit (June 1), except for a few isolated pools.

No fish were detected at this site during any visit. Given the high gradient and downstream slope, it would be unlikely for any fish to colonize this area. Stream flows are likely very volatile and may dry up often. A previous study downstream of this reach found very few fish as well.



Pool at the downstream end of the reach as seen during the first visit. This pool was one of the only places holding water during the third visit.


Keeney Creek (1 site)
N
Kilometers
0 5 10 20
2001
1992
NERI.3018
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.25 0.5 1

NERI. 3018 - Keeney Creek 10

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
105	21.65	86.80	2.02	7.23	88.93	0.10	0.98	970

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.12	402	0.25	13.49	113.33	Trees	Shaded	Boulder

Fish

2014	Previous studies	
Blacknose Dace (N) Brown Trout (I) Creek Chub (N) Green Sunfish (N) Rosyside Dace (N) Total: 5 Native: 4 Introduced: 1	1992 (WVDNR): Blacknose Dace (N) Creek Chub (N) Brown Trout (I)	2001 (Welsh field notes): Blacknose Dace (N) Creek Chub (N) Brown Trout (I)

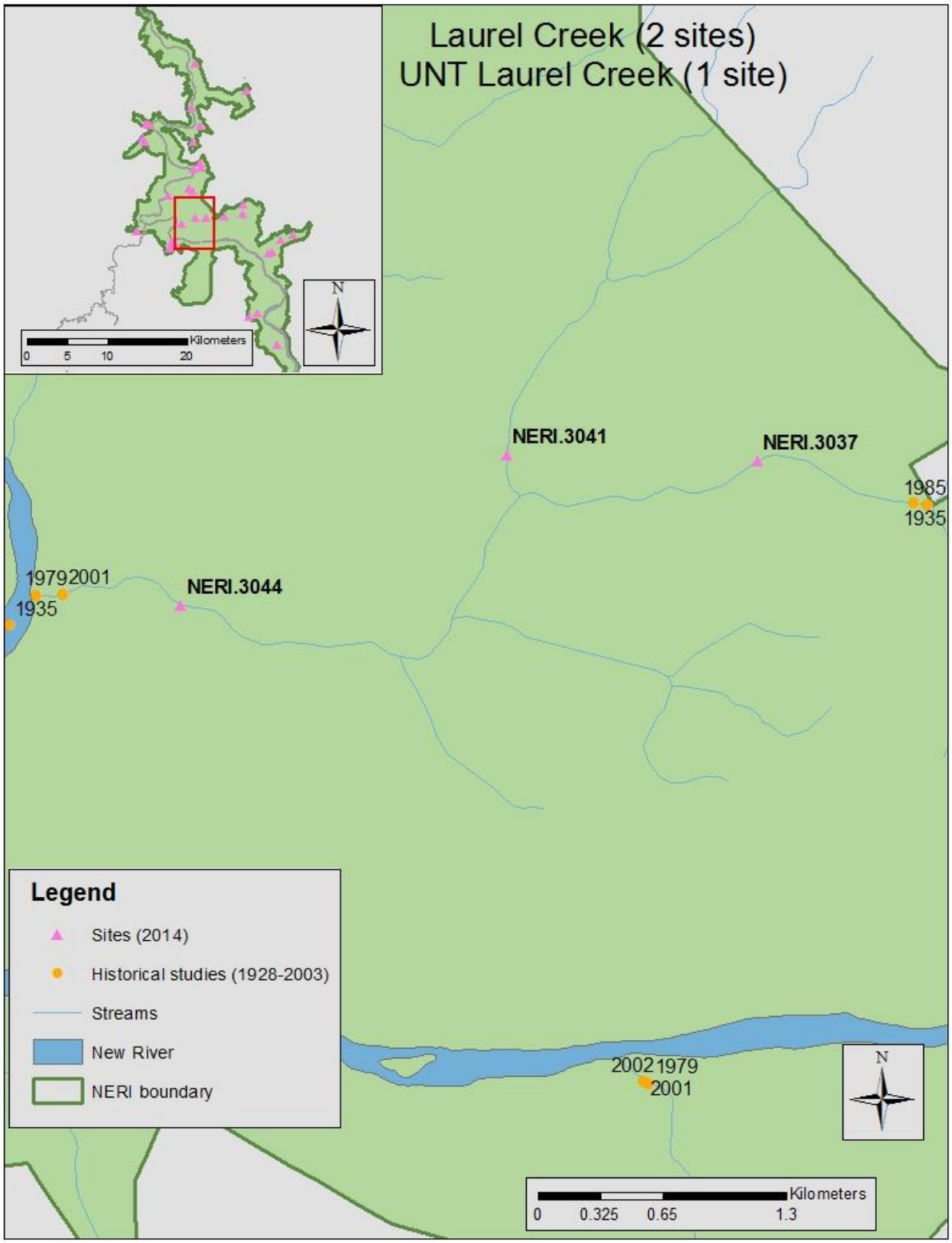
Description

NERI.3018 (Keeney Creek 10) was the only site on Keeney Creek. It was a relatively large stream with many different habitats. The lower section was mostly riffle habitat, which transitioned upstream into a wide, deep pool beneath a large waterfall (~10ft high). Above the waterfall, the stream widened and became a shallow run flowing over bedrock. Upstream, two more large waterfalls and deep pools existed.

Blacknose Dace and Creek Chub were most abundant. Many large adult creek chub occupied deep pools below waterfalls. Rosyside Dace were uncommon. Only two Green Sunfish were captured and occupied small pools near the downstream end of the reach. Only one Brown Trout was captured – a large adult in a deep pool beneath a waterfall. All species were captured from

previous studies in reaches upstream and downstream of the site.

Keeney Creek was previously-designated by WVDNR as an impaired stream. A TMDL was developed in 2008 for Fecal Coliform. Water quality impairment might be indicated by the presence of relatively pollution-tolerant taxa, such as Blacknose Dace, Brown Trout, Creek Chub, and Green Sunfish. Although relatively close to New River, downstream reaches were very steep and natural barriers likely prevent any movement into this reach from the river.


Laurel Creek (2 sites)
UNT Laurel Creek (1 site)
Kilometers
0 5 10 20
N
NERI.3041
NERI.3037
1985
1935
19792001
1935
NERI.3044
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
20021979
2001
N
Kilometers
0 0.325 0.65 1.3

NERI. 3044 – Laurel Creek 08

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
369	70.19	95.17	1.80	3.35	92.17	0.04	0.88	988

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.00	0.03	379	0.41	15.84	99.67	Trees	Partly shaded	Cobble

Fish

2014	Previous studies (Wellman 2004)	
Blacknose Dace (N)	2001 (Welsh field notes):	1979 (Stauffer field notes):
Central Stoneroller (N)	Central Stoneroller (N)	Central Stoneroller (N)
Creek Chub (N)	Whitetail Shiner (I)	White Shiner (N)
Fantail Darter (N)	White Shiner (N)	Longnose Dace (N)
Green Sunfish (N)	Telescope Shiner (I)	Rainbow Darter (I)
Longnose Dace (N)	Bigmouth Chub (N)	Fantail Darter (N)
Northern Hogsucker (N)	Creek Chub (N)	
Rainbow Darter (I)	Northern Hogsucker (N)	
Rock Bass (I)	Brown Trout (I)	
Smallmouth Bass (I)	Rock Bass (I)	
Variegate Darter (I)	Smallmouth Bass (I)	
White Shiner (N)	Green Sunfish (N)	
Whitetail Shiner (I)	Bluegill (I)	
	Rainbow Darter (I)	
Total: 13	Variegate Darter (I)	
Native: 8		
Introduced: 5		

Description

NERI.3044 (Laurel Creek 08) was the downstream site on Laurel Creek. It was relatively close to New River. Highway 44 runs along the majority of Laurel Creek at this point. The reach was

relatively deep in general with many large pools. Water temperature was fairly cool for such a large stream. Gradient was fairly low.

Thirteen species were detected in this reach, including five introduced species, which was the greatest proportion of introduced species out of all sites. All species were relatively uncommon, and not one was overly dominant. Blacknose Dace, Central Stoneroller, and Longnose Dace were captured in the greatest numbers, but fewer than 25 individuals per visit were captured for each of these species. This was the only site at NERI where Variegate Darter, Smallmouth Bass, White Shiner, and Whitetail Shiner were detected. They were all captured in numbers less than seven individuals. Previous studies nearer to New River have shown the presence of additional species in Laurel Creek, including Telescope Shiner, Bigmouth Chub, Brown Trout, and Bluegill. A large, adult Rainbow Trout was seen below the reach in the current study as well.

The relatively deep stream depth and presence of large pools at this site created a great amount of habitat for fish, which was apparent in the diversity of fishes captured. The proximity to New River with lack of downstream barriers may also have allowed more introduced species to invade this reach.



White Shiner captured at NERI.3044.

NERI. 3037 – Laurel Creek 47

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
315	59.44	83.00	2.12	3.44	91.38	0.04	4.60	880

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.03	494	0.52	16.50	99.33	Trees	Partly shaded	Cobble

Fish

2014	Previous studies (Wellman 2004)		
Blacknose Dace (N) Creek Chub (N) Fantail Darter (N) Green Sunfish (N) Longnose Dace (N) Northern Hogsucker (N) Rosyside Dace (N) Total: 7 Native: 0 Introduced: 0	Downstream (see NERI.3044 – Laurel Creek 08)	1935 (Addair [1944]): Central Stoneroller (N) Blacknose Dace (N) Longnose Dace (N) Northern Hogsucker (N)	1985 (WVDNR): Blacknose Dace (N) Longnose Dace (N) Creek Chub (N) Brown Trout (I) Fantail Darter (N)

Description

NERI.3037 (Laurel Creek 47) was the upstream site on Laurel Creek. It was very similar to the downstream site, but had even deeper pools, including one that was so large that it could not be backpack electrofished very effectively (see picture below). Water temperature was actually warmer than the downstream site.

Species richness was much less than the downstream site. Blacknose Dace, Creek Chub, Fantail Darter, and Longnose Dace were the most common species, but were captured in numbers less than 35 individuals per visit. Green Sunfish, Northern Hogsucker, and Rosyside Dace were

uncommon (fewer than 10 individuals each). Previous studies upstream suggest Brown Trout and Central Stoneroller may also occupy these areas.

There was a stark contrast in introduced species richness between the two Laurel Creek sites, given that no introduced species were detected at NERI.3037. I attributed this to it being further from New River, which would make it more difficult for introduced species to colonize from the river.



A large pool near the upstream end of the reach that was too deep to backpack electrofish effectively.

NERI. 3041 – UNT to Laurel Creek 03

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
16	3.75	84.33	0.14	2.85	95.23	0.22	3.50	363

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.04	0.04	485	0.22	NA	65.67	Trees	Shaded	Bedrock

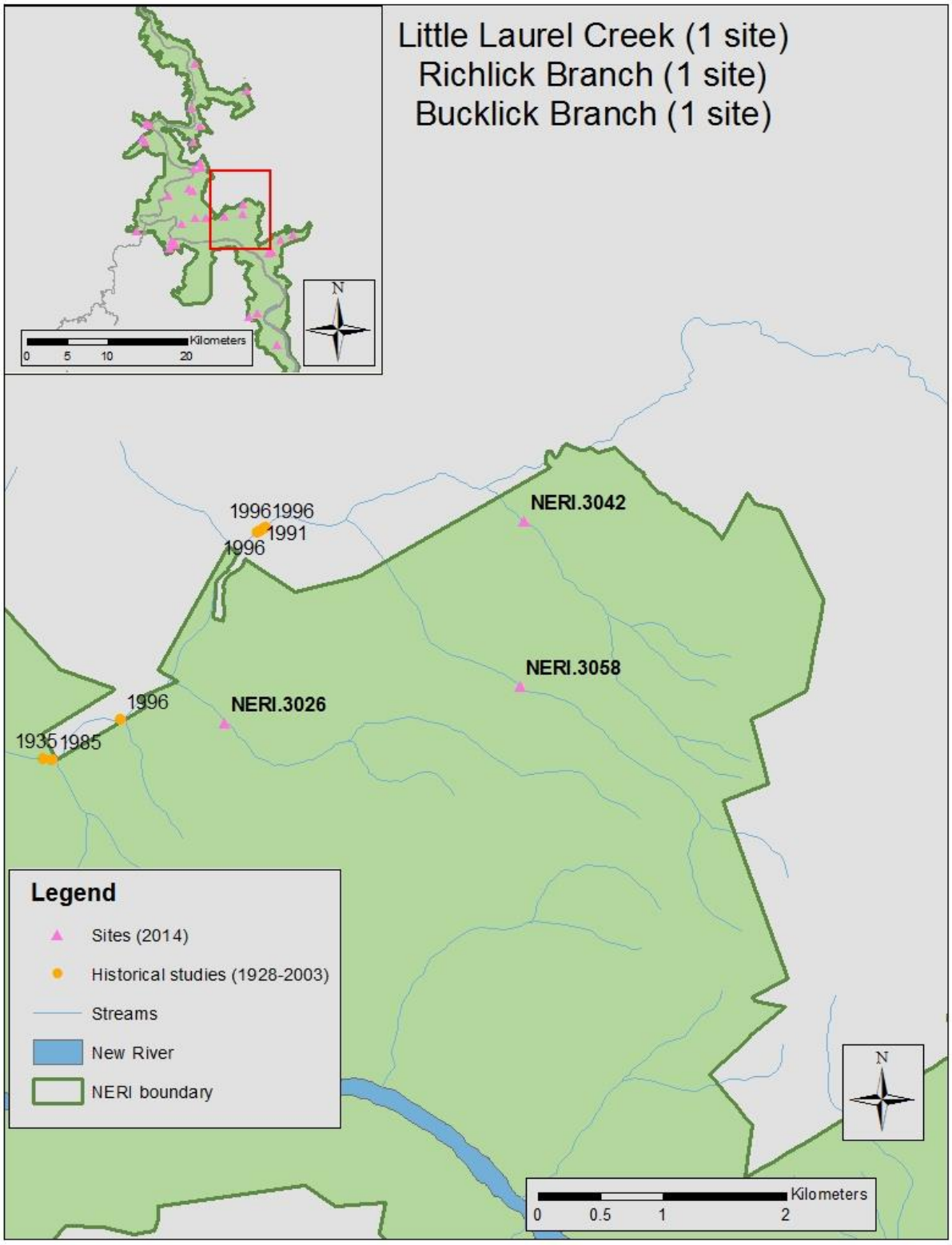
Fish

2014	Previous studies (Wellman 2004)
None	None

Description

NERI.3041 (UNT to Laurel Creek 03) was a small tributary entering Laurel Creek between the two Laurel Creek sites (NERI.3044 and NERI.3037). It crosses under Hwy 44. The stream was one of the smaller streams that were sampled. The reach had a very high gradient (third highest reach slope). There were small cascades, chutes, and waterfalls that restricted available habitat mostly to small plunge pools.

No fish were detected during any visit to the reach. The high gradient would likely prevent any fish from naturally colonizing this area. Additionally, there was a fairly steep gradient on the opposite side of Hwy 44 before it entered Laurel Creek. It may even dry up in late summer.


Little Laurel Creek (1 site)
Richlick Branch (1 site)
Bucklick Branch (1 site)
N
Kilometers
0 5 10 20
1996 1996
1991
1996
NERI.3042
NERI.3058
1996
NERI.3026
1935 1985
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.5 1 2

NERI. 3026 – Little Laurel Creek 06

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
23	3.89	89.40	5.30	1.46	91.25	0.16	7.35	445

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.02	0.04	678	0.19	11.87	52.00	Trees	Shaded	Boulder

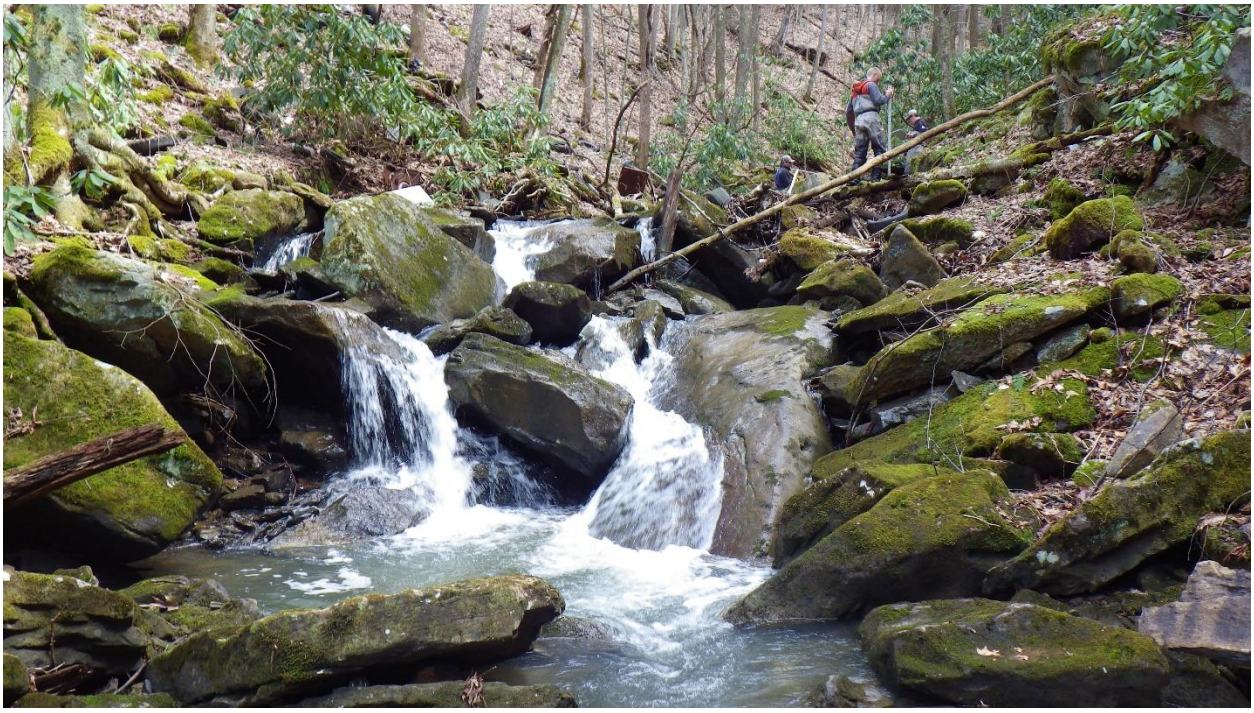
Fish

2014	Previous studies (Wellman 2004)
Blacknose Dace (N) Creek Chub (N) Green Sunfish (N) Total:3 Native: 3 Introduced: 0	Downstream in Laurel Creek (see NERI.3037 – Laurel Creek 47)

Description

NERI.3026 (Little Laurel Creek 06) was on a small tributary that dumps into Laurel Creek above the uppermost Laurel Creek site (NERI.3037 – Laurel Creek 47). It was in a steep gully off of Backus Mountain Road. It appeared to be a popular trash dumping site for the locals. The reach was relatively steep and consisted mostly of deep pools at the bottom of small cascades or chutes. Water temperature was the second coldest out of all sites.

Creek Chub were the most common species, but were detected in less than 20 individuals per visit. Blacknose Dace and Green Sunfish were uncommon. Only one Green Sunfish was captured, and only on the third visit. There were no previous studies documented on Little Laurel Creek, although some occurred downstream in Laurel Creek.



Downstream end of reach.

NERI. 3058 – Richlick Branch 17

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
9	2.06	96.80	0.61	1.75	95.07	0.02	11.05	389

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.05	0.04	781	0.11	15.21	18.33	Trees	Partly shaded	Cobble

Fish

2014	Previous studies (Wellman 2004)
Creek Chub (N) Total: 1 Native: 1 Introduced: 0	Downstream in Laurel Creek (see NERI.3037 – Laurel Creek 47)

Description

NERI.3058 (Richlick Branch 17) was on a small tributary to Laurel Creek. There were many unique properties about this site. Richlick Branch was the second smallest stream that was sampled according to measures of catchment area, and the smallest by link magnitude. It was also at the highest elevation out of all sites. It was in a very remote area of the park. Conductivity was also the lowest out of all sites. It sat at the edge of a forested area that opened up into a small meadow. There was very little water throughout the entire spring and summer. Habitat consisted mostly of small, shallow pools.

Creek Chub were the only species detected at this site. They were fairly abundant and captured in numbers greater than thirty individuals on the first visit. No previous studies were documented in this area. Even with very little water, Creek Chub seemed to flourish at this site. The remoteness of this stream must help maintain water quality that is suitable for fish.

NERI. 3042 – Bucklick Branch 03

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
15	2.42	91.40	0.11	0.00	98.03	0.03	10.73	310

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.03	0.04	750	0.08	13.74	25.67	Trees	Shaded	Gravel

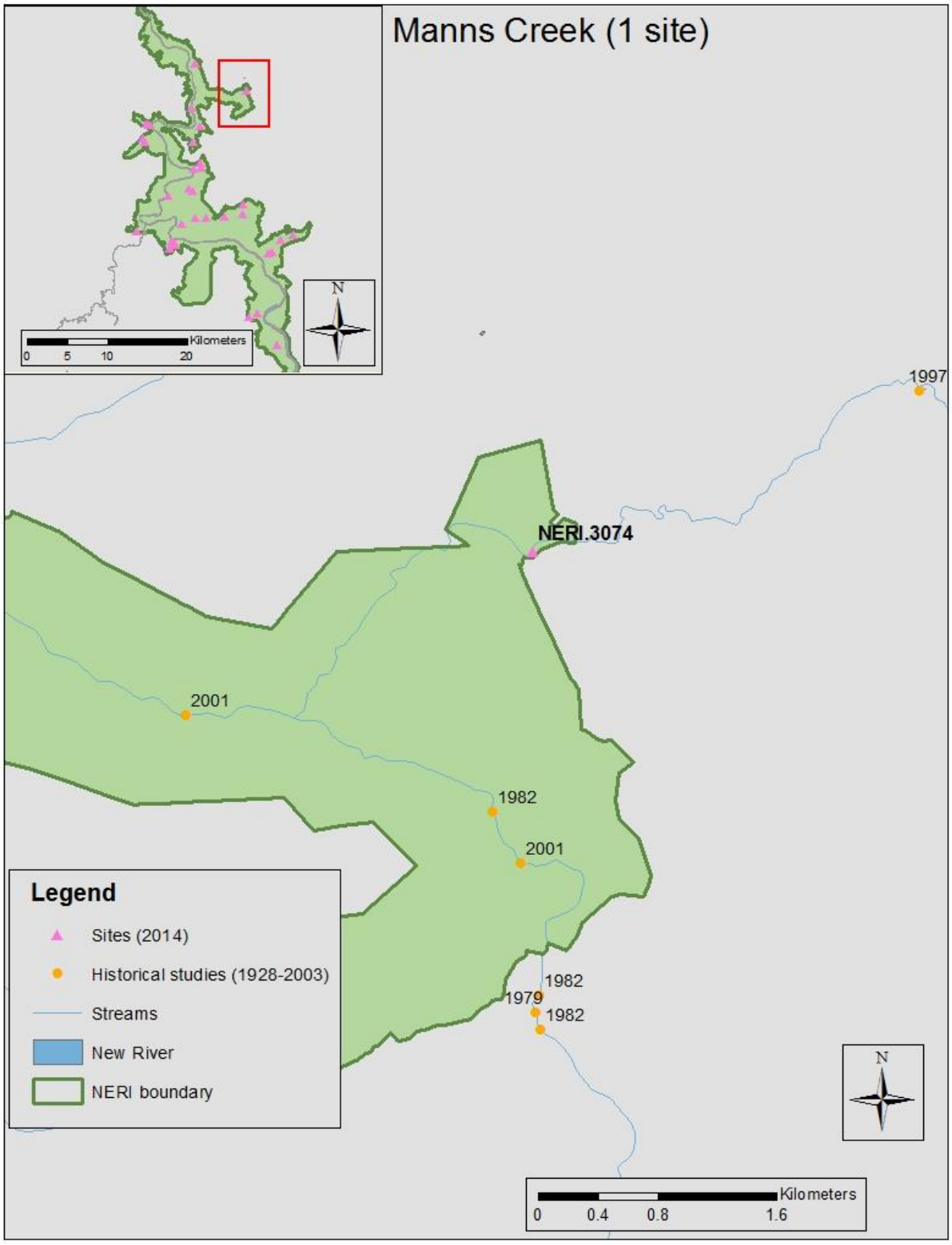
Fish

2014	Previous studies (Wellman 2004)
None	None

Description

NERI.3042 (Bucklick Branch 03) was a small tributary to Laurel Creek. It was the smallest stream sampled when measured by catchment area, and second smallest by link magnitude. It was in a very remote part of the park. There was very little water throughout most of the spring and summer. Habitat was mostly small, shallow pools. Much of the substrate was finer particles.

No fish were detected during any visit to the reach. It is possible there was some sort of barrier to colonization between the reach and Laurel Creek. The stream may also dry up in late summer.


Manns Creek (1 site)
Kilometers
0 5 10 20
N
1997
NERI.3074
2001
1982
2001
1982
1979
1982
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.4 0.8 1.6

NERI. 3074 – Manns Creek 24

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
167	33.19	90.40	1.34	4.72	88.96	0.01	8.11	754

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.03	0.05	698	0.38	15.86	111.00	Trees	Partly shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)	
Creek Chub (N) Green Sunfish (N) Rock Bass (I) Rosyside Dace (N) White Sucker (N) Total: 5 Native: 4 Introduced: 1	1997 (WVDNR): Creek Chub (N) White Sucker (N) Brown Trout (I) Rock Bass (I) Green Sunfish (N) Largemouth Bass (I)	2001 (Welsh): Brown Trout (I)

Description

NERI.3074 (Manns Creek 24) was the only site on Manns Creek. This portion of Manns Creek was on top of the gorge on the plateau, so it had a relatively high elevation and low stream gradient. The stream was surrounded by dense rhododendron. It was mostly one long pool or deep run with a short riffle at the top of the reach. There were two big large woody debris accumulations and lots of overhanging cover.

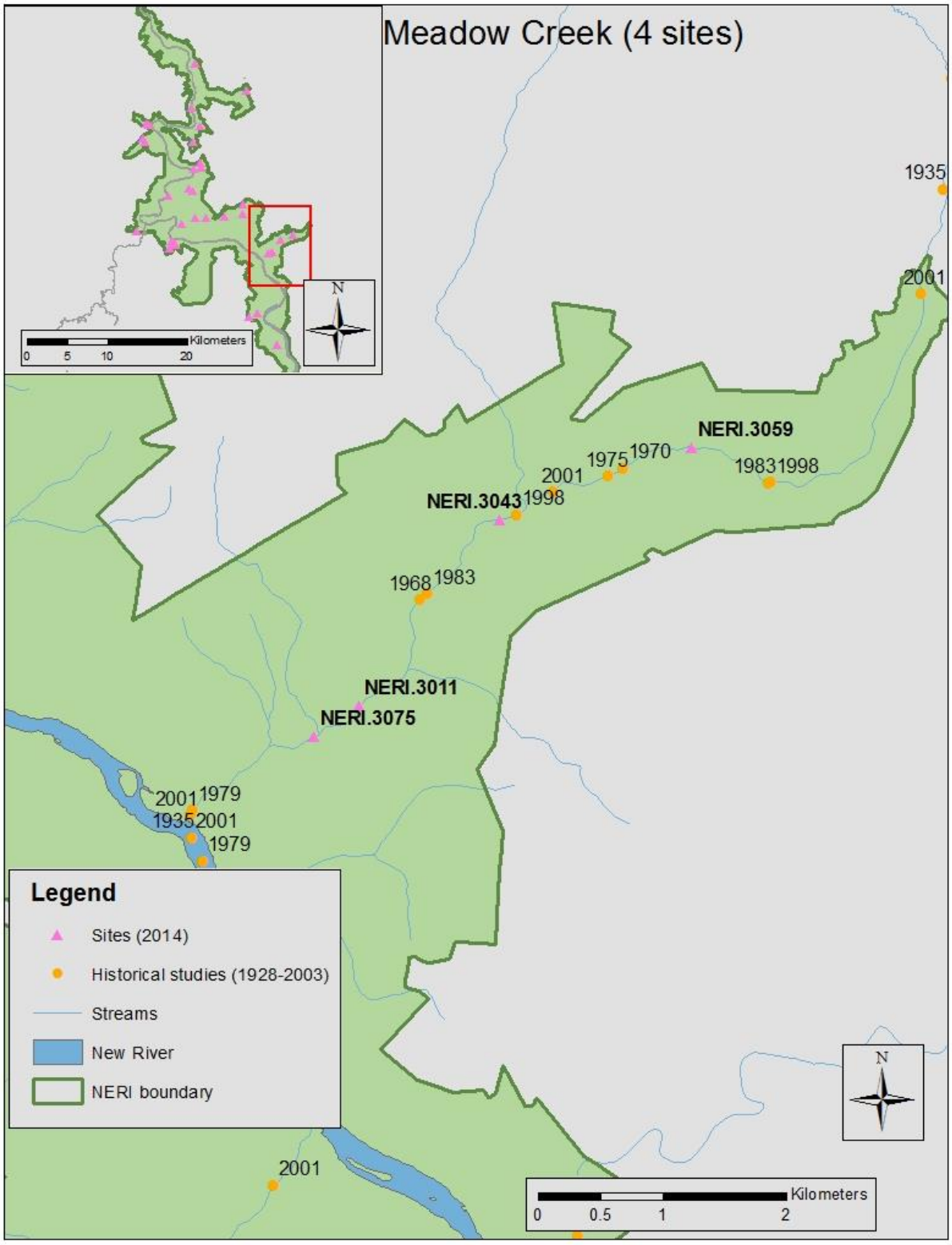
Creek Chub and Rosyside Dace were abundant. Rock Bass were relatively common with both adults and juveniles occurring mostly near large woody debris in deeper pools. Green Sunfish were equally as common. Only one White Sucker was captured. Largemouth Bass and Brown

Trout were the only two species not captured from previous studies; however, sites from the two previous studies were relatively distant from the current study reach.

Manns Creek upstream of the reach followed a highway, and the impacts of being so close to a road were apparent in this area. The upstream areas of Manns Creek were clear cut and open, and sediment was heavily silted. It is likely water quality in the study reach was impacted because of these upstream areas. I also noticed quite a few ponds in the area.



A Rock Bass captured in Manns Creek.


Meadow Creek (4 sites)
1935
2001
NERI.3059
1975
1970
19831998
2001
NERI.3043
1998
1968
1983
NERI.3011
NERI.3075
2001
1979
1935
2001
1979
2001
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.5 1 2
N
Kilometers
0 5 10 20

NERI. 3075 – Meadow Creek 12

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
395	71.96	92.00	4.73	6.76	85.10	0.12	1.31	1151

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.03	415	0.31	17.30	138.00	Trees	Partly shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)	
Bluehead Chub (I)	2001 (Welsh field notes):	1968 (WVDNR):
Blacknose Dace (N)	Central Stoneroller (N)	Central Stoneroller (N)
Central Stoneroller (N)	Whitetail Shiner (I)	Rosyside Dace (N)
Creek Chub (N)	Bigmouth Chub (N)	Blacknose Dace (N)
Fantail Darter (N)	Rosyface Shiner (N)	Creek Chub (N)
Longnose Dace (N)	Telescope Shiner (I)	
Northern Hogsucker (N)	Longnose Dace (N)	
Rosyside Dace (N)	Creek Chub (N)	
White Sucker (N)	Northern Hogsucker (N)	
	Flathead Catfish (N)	
Total: 9	Brown Trout (I)	
Native: 8	Rock Bass (I)	
Introduced: 1	Green Sunfish (N)	
	Smallmouth Bass (I)	
	Greenside Darter (N)	
	Rainbow Darter (I)	
	Variegate Darter (I)	
	Roanoke Darter (I)	

Description

NERI.3075 (Meadow Creek 12) was the most downstream of four sites on Meadow Creek. It was the largest section of stream out of all study reaches when measured by upstream catchment

area and link magnitude. It was wide and low gradient with a variety of habitats. There were many deep pool, runs, and riffles.

Nine species were detected at the site, eight of which were native. Central Stoneroller and Blacknose Dace were most abundant. Rosyside Dace, Longnose Dace, and Fantail Darter were also common. The remaining species were captured in 10 individuals or less per visit. This was the only site at NERI where Bluehead Chub were captured. Only three Bluehead Chub were captured, and they were only detected during the second and third visits.

A 2001 study near the mouth of Meadow Creek showed much greater species diversity and a greater number of introduced species. There may be some species that do not venture this far upstream and only stick to areas near New River. Upstream, fewer species were found in a 1968 study. Despite previous impairment designation and TMDL development for fecal coliform by WVDEP, native species are dominant in this portion of Meadow Creek.



Middle of the reach during the third visit.

NERI. 3011 –Meadow Creek 17

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
383	70.42	91.67	4.84	6.86	84.85	0.10	1.78	1295

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.02	424	0.37	17.62	131.33	Trees	Partly shaded	Cobble

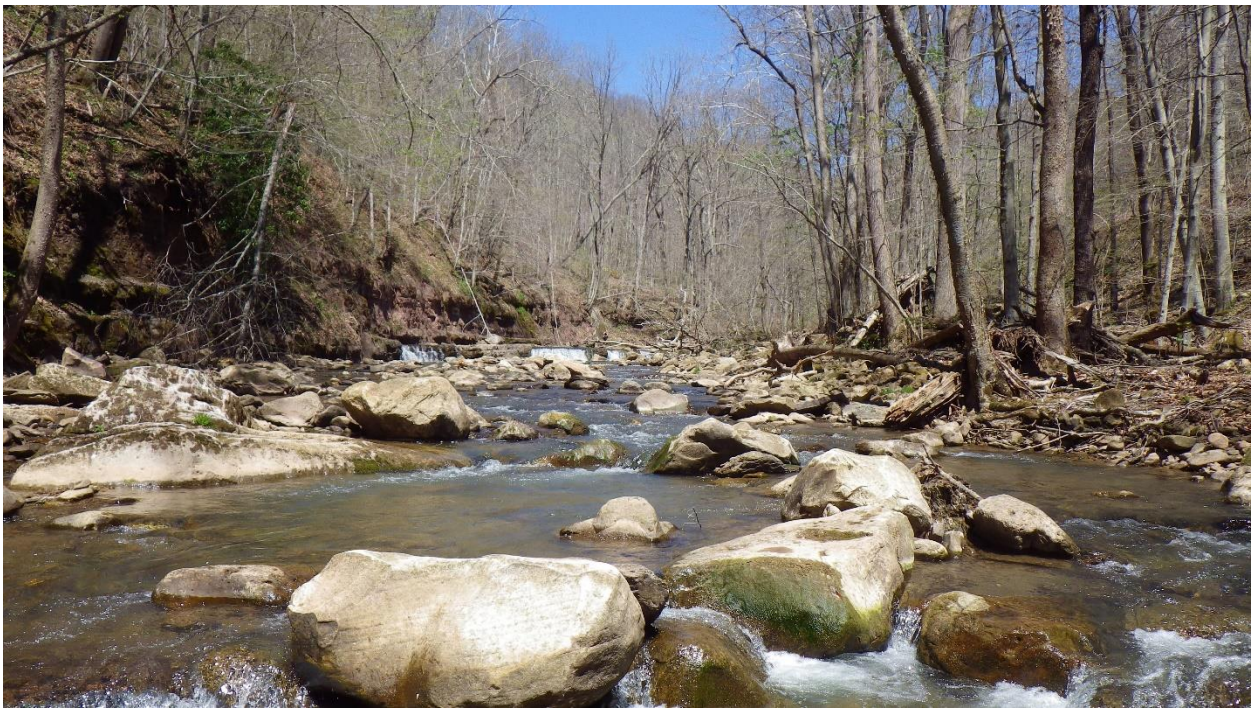
Fish

2014	Previous studies (Wellman 2004)
Blacknose Dace (N) Brown Trout (I) Central Stoneroller (N) Creek Chub (N) Fantail Darter (N) Longnose Dace (N) Northern Hogsucker (N) Rainbow Darter (I) Rosyside Dace (N) White Sucker (N) Total: 10 Native: 8 Introduced: 2	Downstream (2001) and upstream (1968) – see NERI.3075 (Meadow Creek 12).

Description

NERI.3011 (Meadow Creek 17) was the second most downstream site on Meadow Creek. It was very similar to the most downstream site (NERI.3075), but was also characterized by a large pool at the base of a small waterfall that defined the upstream end of the reach. This pool was very difficult to electrofish due to its depth. There were many large boulders in the reach that created small pools and runs.

The fish community was similar to the downstream site (NERI.3075), with the exceptions of the absence of Bluehead Chub and the presence of Brown Trout and Rainbow Darter. The two Brown Trout captured were large adults that were most likely stocked. Blacknose Dace were captured in the greatest numbers at NERI.3011 out of all sites, including over 300 individuals during the first visit. Central Stoneroller, Rosyside Dace, and Fantail Darter were also abundant. The remaining species were relatively uncommon.



Downstream end of the reach. Small waterfall can be seen in the background.

NERI. 3043 – Meadow Creek 39

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
350	63.98	88.83	5.23	7.20	83.83	0.03	3.88	1406

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.03	480	0.26	18.65	133.00	Trees	Partly shaded	Cobble

Fish

2014	Previous studies (Wellman 2004)	
Blacknose Dace (N) Brook Trout (N) Brown Trout (I) Central Stoneroller (N) Creek Chub (N) Fantail Darter (N) Rainbow Trout (I) Rosyside Dace (N) Total: 8 Native: 6 Introduced: 2	1998 (WVDNR): Central Stoneroller (N) Rosyside Dace (N) Blacknose Dace (N) Creek Chub (N) Brown Trout (I) Green Sunfish (N) Fantail Darter (N)	1975 (WVDNR): Blacknose Dace (N) Creek Chub (N) White Sucker (N) Rock Bass (I) Fantail Darter (N)

Description

NERI.3043 (Meadow Creek 39) was the second uppermost site on Meadow Creek. It was similar to other reaches on Meadow Creek, but water temperature was slightly warmer. It was the largest stream reach in terms of surface area (reach area) out of all sites.

Blacknose Dace were again the most abundant species followed by Fantail Darter and Rosyside Dace. Creek Chub were more abundant than the two downstream sites, including 35 individuals captured during the first visit. Few individuals of Brown Trout, Brook Trout, and Rainbow Trout

were captured. These were likely holdovers from stocking. The majority of species detected during previous studies were also detected in 2014 with the exception of White Sucker, Green Sunfish, and Rock Bass.

NERI. 3059 – Meadow Creek 58

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
263	47.95	94.29	6.23	8.81	80.89	0.03	5.67	1053

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.03	0.03	525	0.25	16.62	145.00	Trees	Partly shaded	Cobble

Fish

2014	Previous studies (Wellman 2004)	
Blacknose Dace (N) Central Stoneroller (N) Creek Chub (N) Fantail Darter (N) Rosyside Dace (N) White Sucker (N) Total: 6 Native: 6 Introduced: 0	1998 (WVDNR): Central Stoneroller (N) Rosyside Dace (N) Blacknose Dace (N) Creek Chub (N) White Sucker (N) Brown Trout (I) Green Sunfish (N) Fantail Darter (N)	2001 (Welsh field notes): Central Stoneroller (N) Rosyside Dace (N) Blacknose Dace (N) Creek Chub (N) White Sucker (N) Brown Trout (I) Fantail Darter (N)

Description

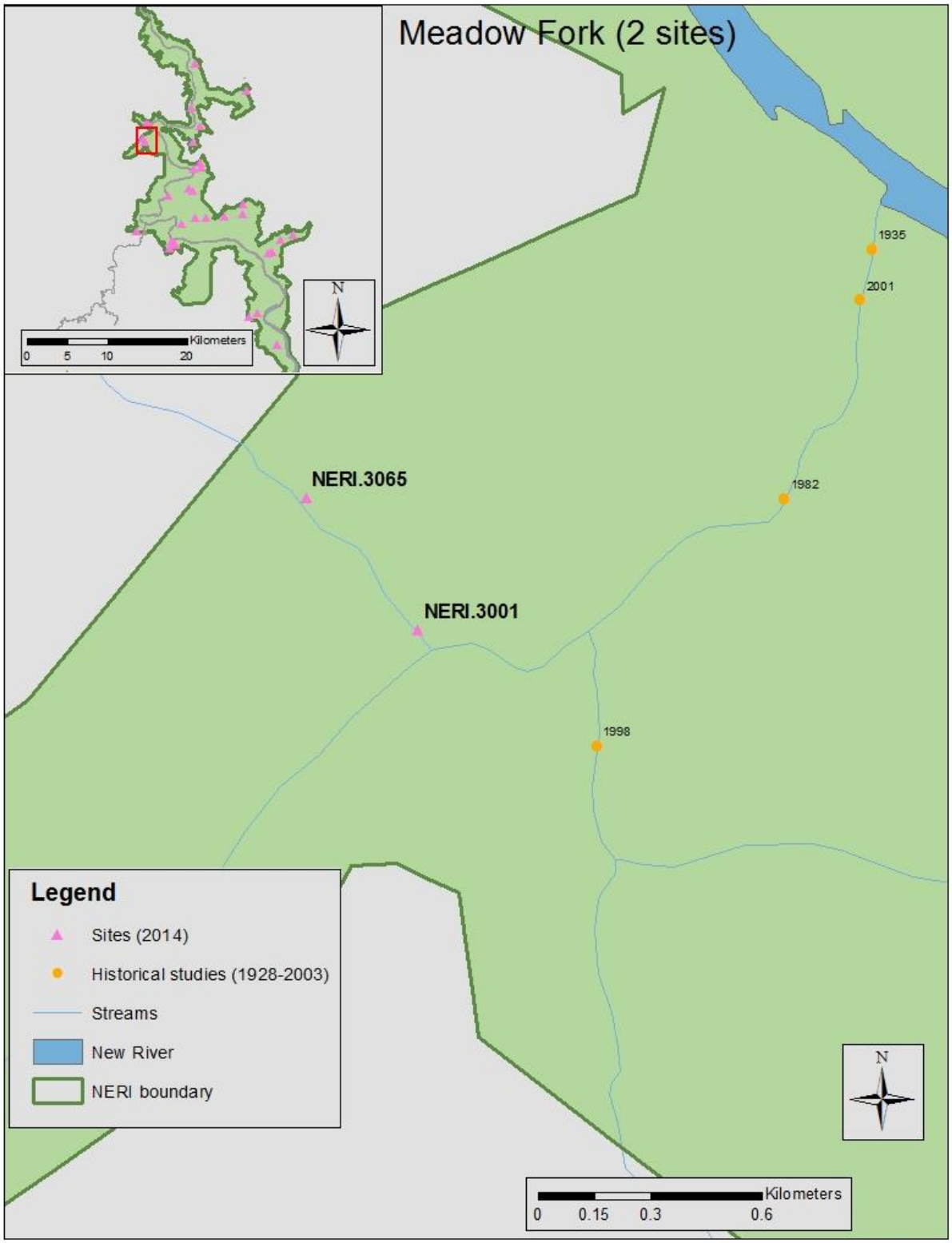
NERI.3059 (Meadow Creek 58) was the uppermost site on Meadow Creek. It was similar to other reaches on Meadow Creek, but also had significant side channel habitat filled with fine sediment and woody debris. The reach also split into two channels at the 75m point. It had cooler water temperature and higher conductivity than the immediate downstream site (NERI.3043).

The fish community was similar to other Meadow Creek sites. Blacknose Dace were again the most abundant species. Rosyside Dace, Creek Chub, and Fantail Darter were also common. Creek Chub were captured in greatest numbers at this site out of all other Meadow Creek sites.

Similarly, Central Stoneroller were least common at this site out of all other Meadow Creek sites. Only three White Suckers were captured over three visits. Most species were detected that were present in previous studies, except for Brown Trout and Green Sunfish.



Looking downstream from the bottom of the reach.


Meadow Fork (2 sites)
Kilometers
0 5 10 20
N
1935
2001
1982
NERI.3065
NERI.3001
1998
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.15 0.3 0.6

NERI. 3001 – Meadow Fork 01

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
54	10.38	85.50	5.69	12.72	74.36	0.06	2.08	513

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.03	0.02	364	0.26	13.34	146.00	Shrubs	Shaded	Boulder

Fish

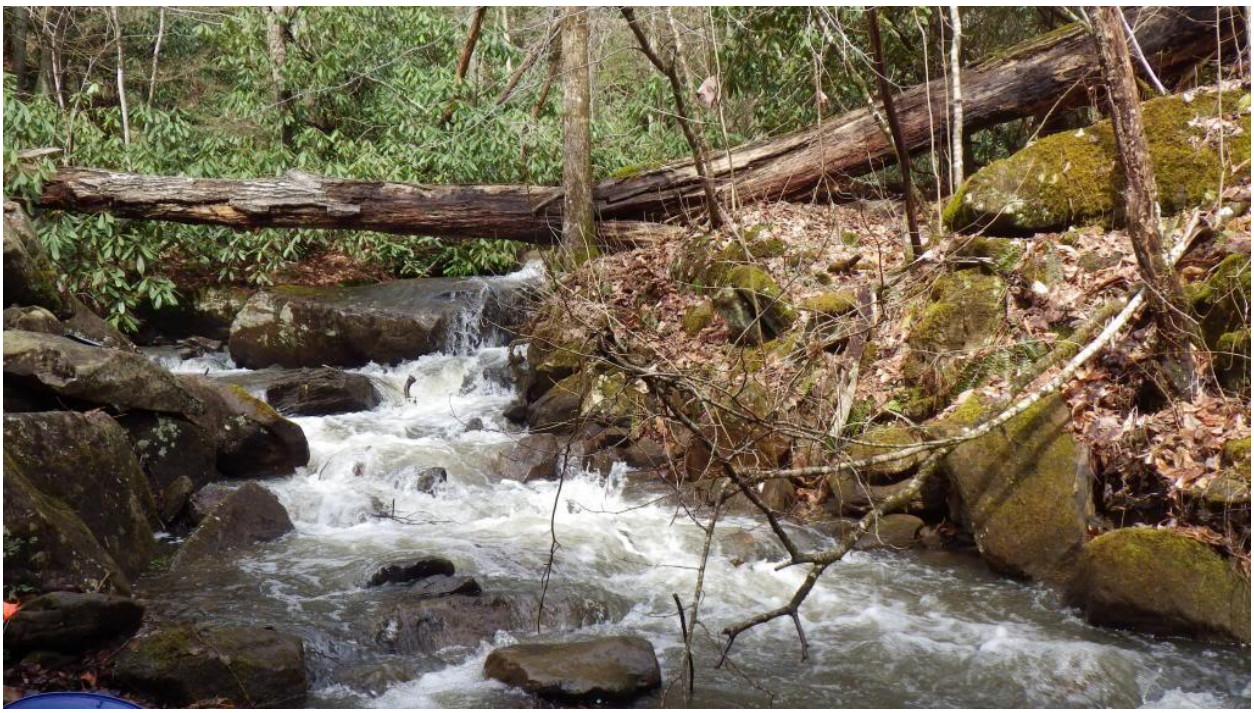
2014	Previous studies (Wellman 2004)
Creek Chub (N) Green Sunfish (N) Total: 2 Native: 2 Introduced: 0	None

Description

NERI.3001 (Meadow Fork 01) was the downstream site on Meadow Fork. The downstream end of the reach was very close to the confluence with Dunloup Creek (~20m). The first 25m cascaded with plunge pools, then it opened up into shallow runs and deep pools. It was surrounded mostly by rhododendron. Meadow Fork was previously-designated by WVDEP as impaired and has TMDLs developed for iron and pH in 2002. It was apparent from the relatively high conductivity for such a small stream.

Few fish were captured from this reach. Green Sunfish were most common and captured in six individuals or less at each visit. Only one Creek Chub was captured, and only on the first visit. There were no documented historical studies on Meadow Fork.

The poor water quality may have been apparent by the detection of relatively few fish. Green Sunfish are fairly tolerant of pollution. It was odd that there were not more fish given the close proximity to a rather large stream.



Downstream end of the reach.

NERI. 3065 – Meadow Fork 06

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
52	10.02	84.80	5.89	13.18	73.43	0.14	2.58	511

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.02	0.04	427	0.14	12.29	188.67	Shrubs	Shaded	Fine

Fish

2014	Previous studies (Wellman 2004)
Bluegill (I) Creek Chub (N) Fathead Minnow (I) Green Sunfish (N) Total: 4 Native: 2 Introduced: 2	None

Description

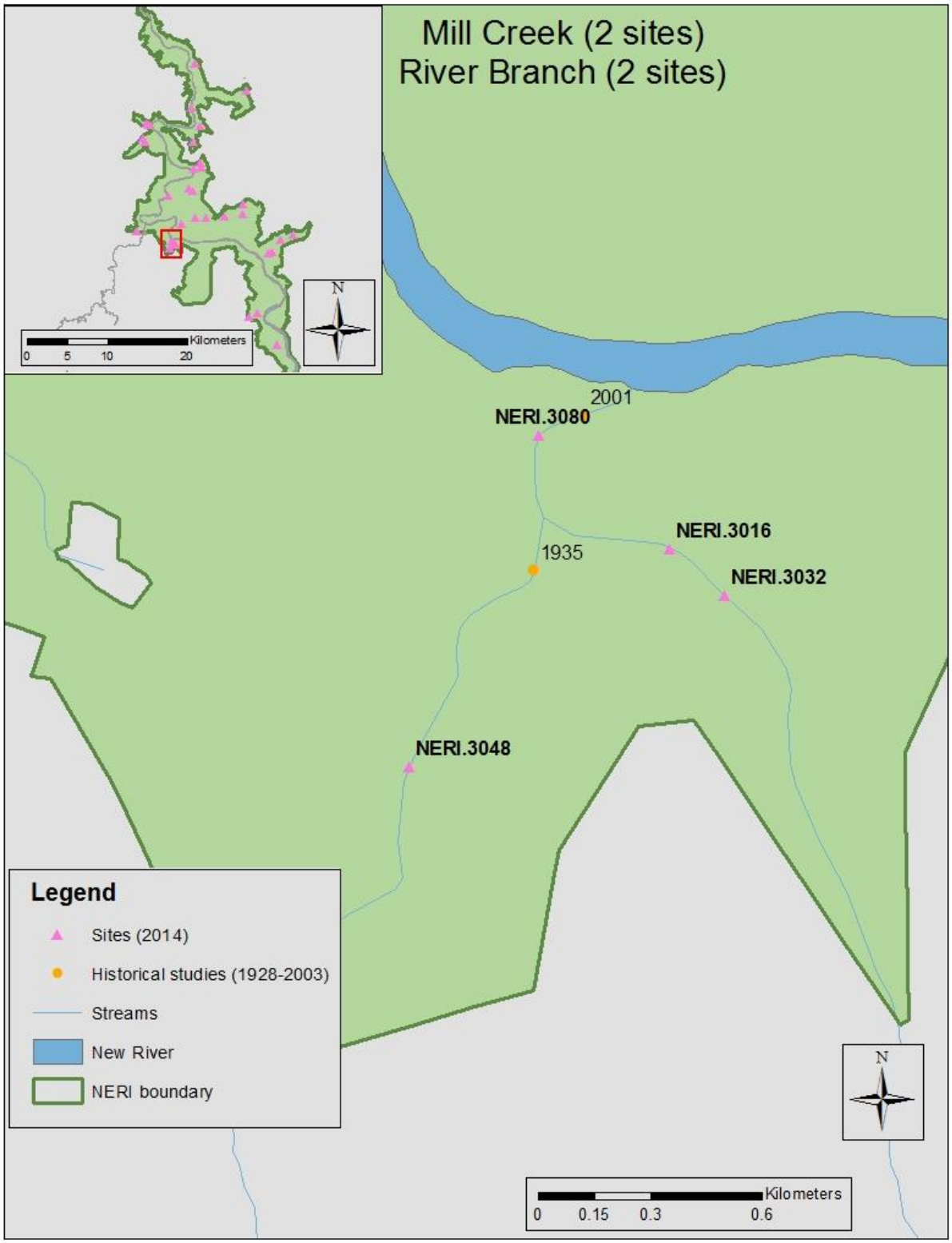
NERI.3065 (Meadow Fork 06) was the upstream site on Meadow Fork. The reach was very different from the downstream site. It was comprised of mostly wide, shallow pools. There were two major large woody debris accumulations as well. Meadow Fork was previously-designated by WVDEP as impaired and has TMDLs developed for iron and pH in 2002. It was apparent from the relatively high conductivity for such a small stream. This was the only site fine sediment was the dominant sediment.

Green Sunfish were relatively abundant. The second most Green Sunfish were found here out of all sites. This was the only site where Fathead Minnow were found, but only one individual was detected. Similarly, only one Bluegill was captured during each the first and second visits.

Poor water quality was again apparent by the species present. It appears there are some residential developments in the headwaters of Meadow Fork with ponds that may have contributed some species, such as Bluegill.



Middle portion of the reach.


Mill Creek (2 sites)
River Branch (2 sites)
Kilometers
0 5 10 20
N
2001
NERI.3080
NERI.3016
1935
NERI.3032
NERI.3048
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.15 0.3 0.6

NERI. 3080 – Mill Creek 01

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
86	16.30	84.50	7.74	5.12	85.66	0.07	0.28	595

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.04	374	0.27	13.41	65.00	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)	
Blacknose Dace (N) Brook Trout (N) Creek Chub (N) Total: 3 Native: 3 Introduced: 0	2001 (Wellman): Central Stoneroller (N) Rosyside Dace (N) Whitetail Shiner (I) White Shiner (N) Bigmouth Chub (N) Telescope Shiner (I) Blacknose Dace (N) Creek Chub (N) Northern Hogsucker (N) Brown Trout (I) Brook Trout (N) Smallmouth Bass (I) Green Sunfish (N) Rainbow Darter (I)	1935 (Addair [1944])*: Spotfin Shiner (N) Rosyface Shiner (N) Mimic Shiner (N) Bluntnose Minnow (N) Blacknose Dace (N) Bluegill (I) Smallmouth Bass (I) Greenside Darter (N) Fantail Darter (N) *site description says near mouth of Mill Creek, but coordinates place the site much further upstream

Description

NERI.3080 (Mill Creek 01) was the downstream site on Mill Creek. It was relatively close to New River. The site was split by a road and bridge. Below the bridge, the stream consisted mostly of small cascades and waterfalls with plunge pools. One deep pool that could not be shocked also existed. Above the bridge, the stream widened and a greater variety of habitats existed. The area was mostly forested, and water temperature was relatively cold.

Only three species were detected and all were relatively uncommon. Blacknose Dace and Brook Trout were most common and were detected in roughly ten individuals each per visit. Only one Creek Chub was captured and only on the second visit. This was the only site where natural Brook Trout reproduction was observed. Many different size classes were captured, including young-of-year.

Previous studies downstream of this reach suggest there is greater species diversity, and possibly a barrier exists between the two areas that limited the community in this reach to just three species. Given the presence of Brook Trout and possibly natural reproduction, this would be a good area to protect.



Road and bridge at approximately the midpoint of the reach.

NERI. 3048 – Mill Creek 12

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
54	10.37	89.00	10.60	7.65	79.56	0.03	1.32	433

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.07	451	0.19	12.00	56.33	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
Blacknose Dace (N) Brook Trout (N) Total: 2 Native: 2 Introduced: 0	Downstream (see NERI.3080 – Mill Creek 01)

Description

NERI.3048 (Mill Creek 12) was the upstream site on Mill Creek. It was a heavily-forested, remote area of Mill Creek. Water temperature was relatively cold. There were a variety of habitats, including riffles and small pools.

The fish community was very similar to the downstream site (NERI.3080), although Blacknose Dace were much more abundant. Greater than 100 individuals were captured during all three visits. Brook Trout were captured in less than 10 individuals during the second and third visits, and none were detected during the first visit (although one was stunned but not netted). One young-of-year was captured during the third visit. The remoteness, cool water temperature, and variety of habitats in this reach make it an ideal Brook Trout stream.

NERI. 3016 – River Branch 04

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
23	4.64	86.40	3.51	0.08	96.14	0.10	0.87	483

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.10	452	0.14	12.68	71.67	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
None	None

Description

NERI.3016 (River Branch 04) was on a small tributary to Mill Creek. River Branch enters Mill Creek between the two Mill Creek sites. The study reach was forested and shaded. The stream was generally shallow with mostly riffles and small pools.

No fish were detected during any visit to the site. The confluence of River Branch and Mill Creek is a series of large cascades and small waterfalls that likely prevent fish from moving into River Branch naturally. No previous studies were documented on River Branch.



Downstream end of site.

NERI. 3032 – River Branch 06

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
23	4.56	87.20	3.57	0.14	96.15	0.17	1.07	596

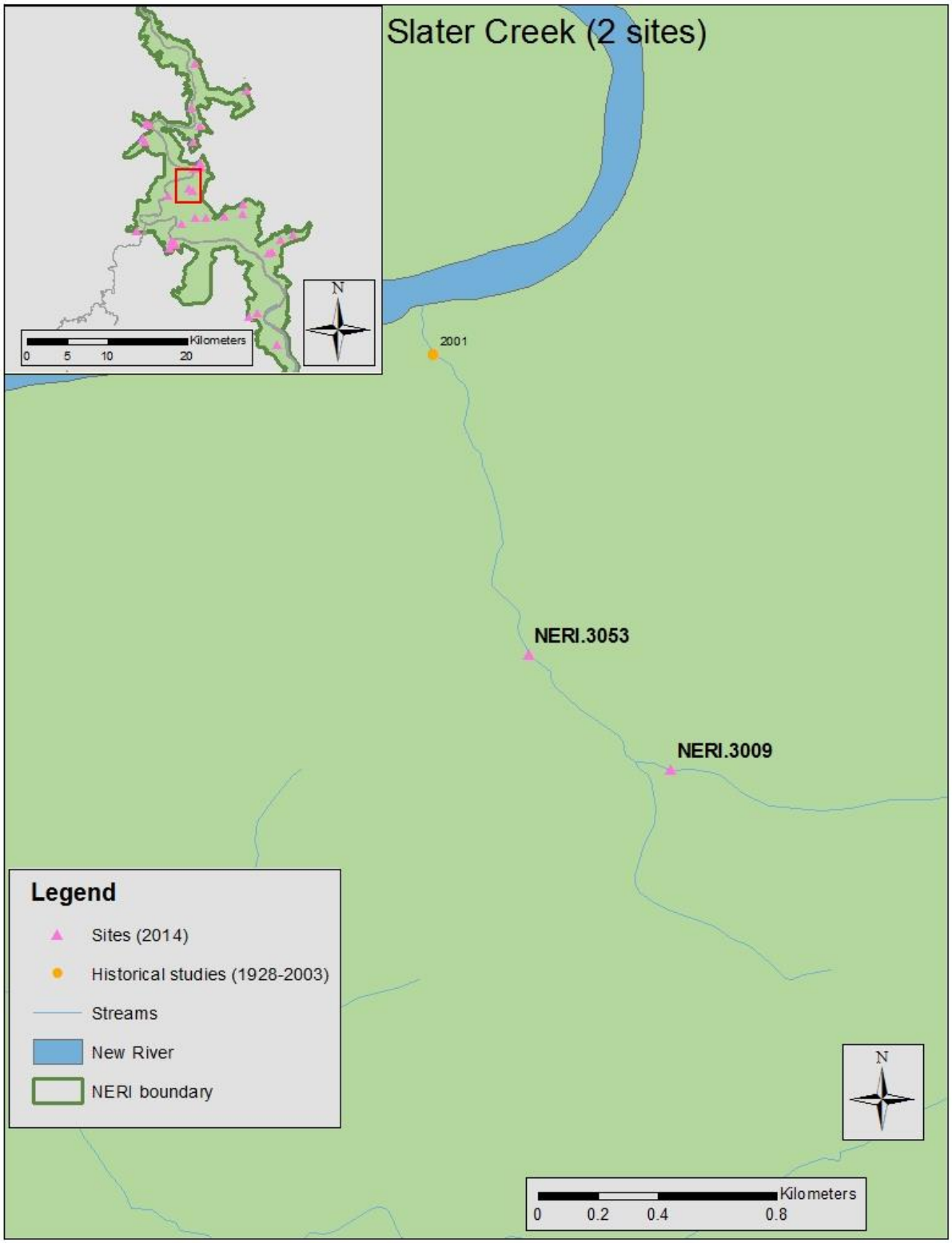
Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.10	474	0.15	12.70	70.67	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
None	None

Description

NERI.3032 (River Branch 06) was just upstream of NERI.3016 (River Branch 04), so it was very similar to NERI.3016. Again, there were no fish detected in the reach during any visit.


Slater Creek (2 sites)
Kilometers
0 5 10 20
N
2001
NERI.3053
NERI.3009
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.2 0.4 0.8

NERI. 3053 – Slater Creek 13

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
31	7.15	85.25	0.00	1.30	97.77	0.18	1.99	353

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.02	0.08	496	0.27	12.07	46.67	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
Creek Chub (N) Total: 1 Native: 1 Introduced: 0	2001 (Wellman): Central Stoneroller (N) Whitetail Shiner (I) Telescope Shiner (I) Blacknose Dace (N) Creek Chub (N) Northern Hogsucker (N) Brook Trout (N) Rock Bass (I) Green Sunfish (N) Pumpkinseed (I) Bluegill (I) Smallmouth Bass (I) Rainbow Darter (I)

Description

NERI.3053 (Slater Creek 13) was the downstream site on Slater Creek. It was in a very remote area of the park that was heavily forested. Riparian areas were a mixture of rhododendron and trees. The reach was fairly steep consisting mostly of plunge pools with few riffles. There were many small waterfalls noted between the reach and New River. Water temperature was relatively cold.

Creek Chub were the only species encountered, and they were relatively uncommon. Thirteen individuals or less were captured per visit. They mostly occupied pools in the reach. There are no documented fish studies this high on Slater Creek, although a previous study suggests much greater species diversity near New River. Given the stream gradient, it is remarkable Creek Chub were able colonize this area, unless they were introduced by other means.

NERI. 3009 – Slater Creek 20

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
25	5.91	89.50	0.00	2.35	96.69	0.14	1.33	468

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.21	602	0.22	12.34	45.33	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
Creek Chub (N) Total: 1 Native: 1 Introduced: 0	Downstream near New River (see above – NERI.3053)

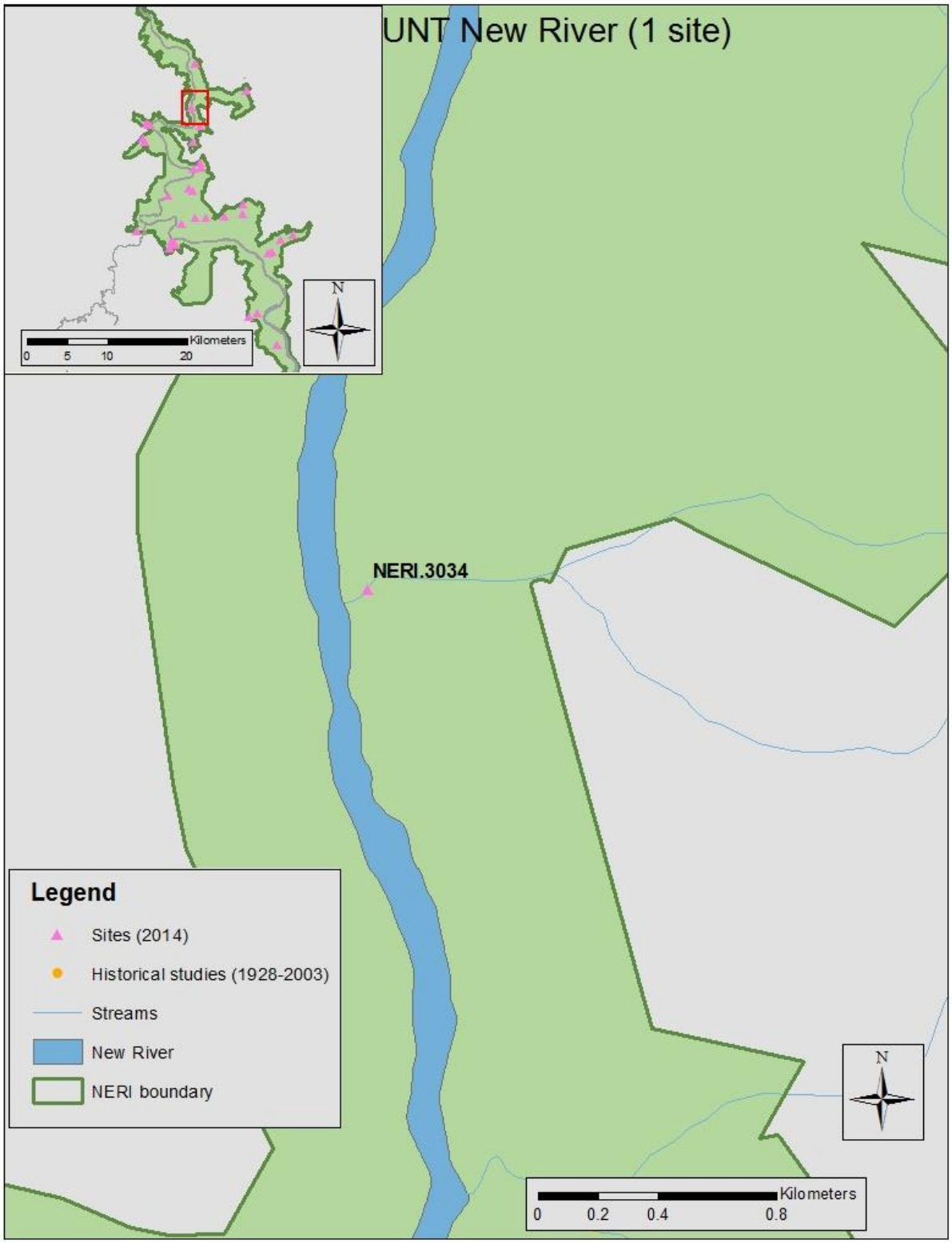
Description

NERI.3009 (Slater Creek 20) was the upstream site on Slater Creek. It was very similar to the downstream site (NERI.3053), the difference being an even greater stream gradient with many waterfalls. One waterfall just downstream of the reach was greater than 15ft high (see picture below). As such, this site had the greatest average downstream slope (tied with NERI.3077 – Dowdy Creek 02).

Again, only Creek Chub were detected and were captured in even fewer numbers than the downstream site. It was even more remarkable that Creek Chub existed even higher in Slater Creek than the downstream site, especially given the large waterfall, although they may have been introduced in upstream reaches where more development exists.



Waterfall and cascades just downstream of NERI.3009.


UNT New River (1 site)
N
Kilometers
0 5 10 20
NERI.3034
Legend
Sites (2014)
Historical studies (1928-2003)
Streams
New River
NERI boundary
N
Kilometers
0 0.2 0.4 0.8

NERI. 3034 – UNT 21 New River 01

Habitat

Link Magnitude	Upstream catchment area (km^2)	Percentage riparian cover	Percentage agriculture	Percentage developed	Percentage forest	Reach slope	Distance to New River (km)	Reach area (m^2)
23	3.15	68.80	0.00	0.03	99.80	0.13	0.10	251

Large woody debris density	Average downstream slope	Elevation (m)	Mean depth (m)	Mean maximum daily water temperature (^oC)	Mean conductivity (µS/cm)	Riparian vegetation	Canopy cover	Dominant substrate
0.01	0.10	307	0.15	13.91	51.00	Trees	Shaded	Boulder

Fish

2014	Previous studies (Wellman 2004)
No fish detected	None

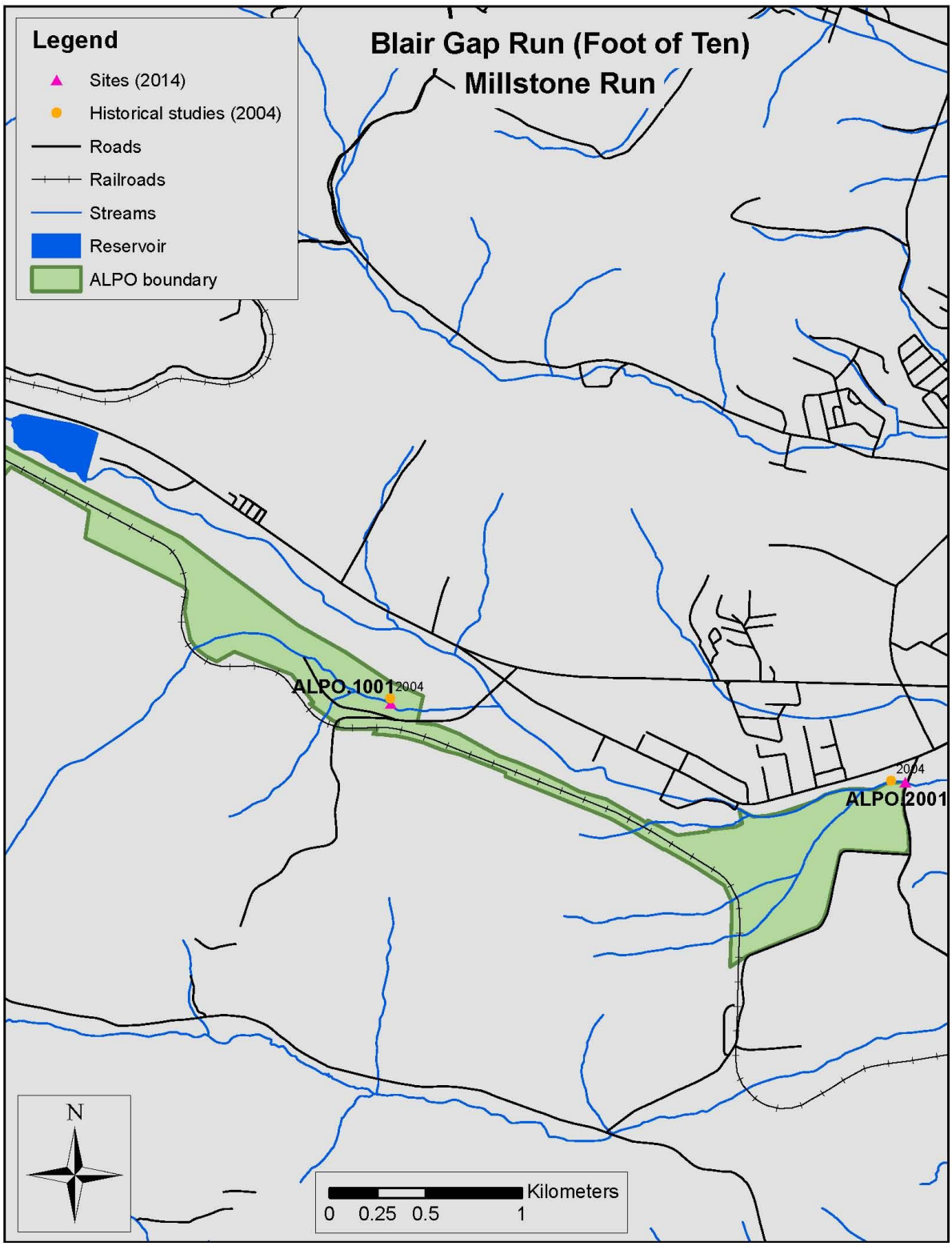
Description

NERI.3034 (UNT 21 New River 01) was the only site on UNT 21 New River. The stream is relatively small and very close to New River. It had a fairly steep gradient with a few small waterfalls (~5ft high). The reach followed the railroad tracks for the most part, then turned up the gorge. There was a large waterfall just upstream (~30ft high). The stream was heavily-forested and vegetated. The downstream end of the reach was defined by a large culvert that passed under the railroad tracks.

No fish were detected at this site during any visit. This was surprising given its close proximity to New River. At one point when the New River flooded after multiple days of heavy rain, water from the New nearly backed up into the reach. Still, no fish were found during this time. It is possible the culvert under the railroad tracks acts as a barrier. Water flowing through the culvert is fast and very shallow (1-2”). Crayfish were abundant in the reach, however. There were no reported historical fish studies on this stream.

Allegheny Portage Railroad National Historic Site: Site Descriptions

The following is a breakdown of fish species observed at ALPO study sites. It includes two relatively larger-scaled maps to view sampling sites on each stream, fish species captured, pictures of sites and fish, locations of historical studies, and a general discussion containing observations of the field crew during sampling and potential sources of fishes inhabiting each site. This section also includes species lists and locations of previous fish sampling for comparison.



Note: Locations of sites sampled by Sheeder and Tzilkowski (2006) were approximated from the map provided in Fig. 1 of that report.

ALPO.2001 – Blair Gap Run (Foot of Ten)

Fish

2014	Previous studies (Sheeder and Tzilkowski 2006)
Blacknose Dace (N) Brown Trout (I) Central Stoneroller (N) Creek Chub (N) Cutlips Minnow (N) Longnose Dace (N) Margined Madtom (N) Northern Hogsucker (N) Pumpkinseed (N) Rainbow Trout (I) Total: 10 Native: 8 Introduced: 2	2004 (Sheeder and Tzilkowski 2006) Blacknose Dace (N) Brown Trout (I) Central Stoneroller (N) Cutlips Minnow (N) Longnose Dace (N) Northern Hogsucker (N)

Description

ALPO.2001 was the downstream site on Blair Gap Run. The downstream end of the reach was close to the Mill Road Bridge that crosses Blair Gap Run. The right ascending side of the stream was adjacent to private property and there were several houses with lawns and driveways that are close to the stream. The left ascending side of the stream is NPS property and was forested with many invasive plants in the understory.

This site had the highest species richness of the three ALPO sites. It was the only site at ALPO where several species (Central Stoneroller, Cutlips Minnow, Longnose Dace, Margined Madtom, Northern Hogsucker, Pumpkinseed, and Rainbow Trout) were encountered. Blacknose Dace were by far the most abundant species here with 710 individuals. All other species were represented by less than 120 individuals.

ALPO.1001 – Millstone Run

Fish

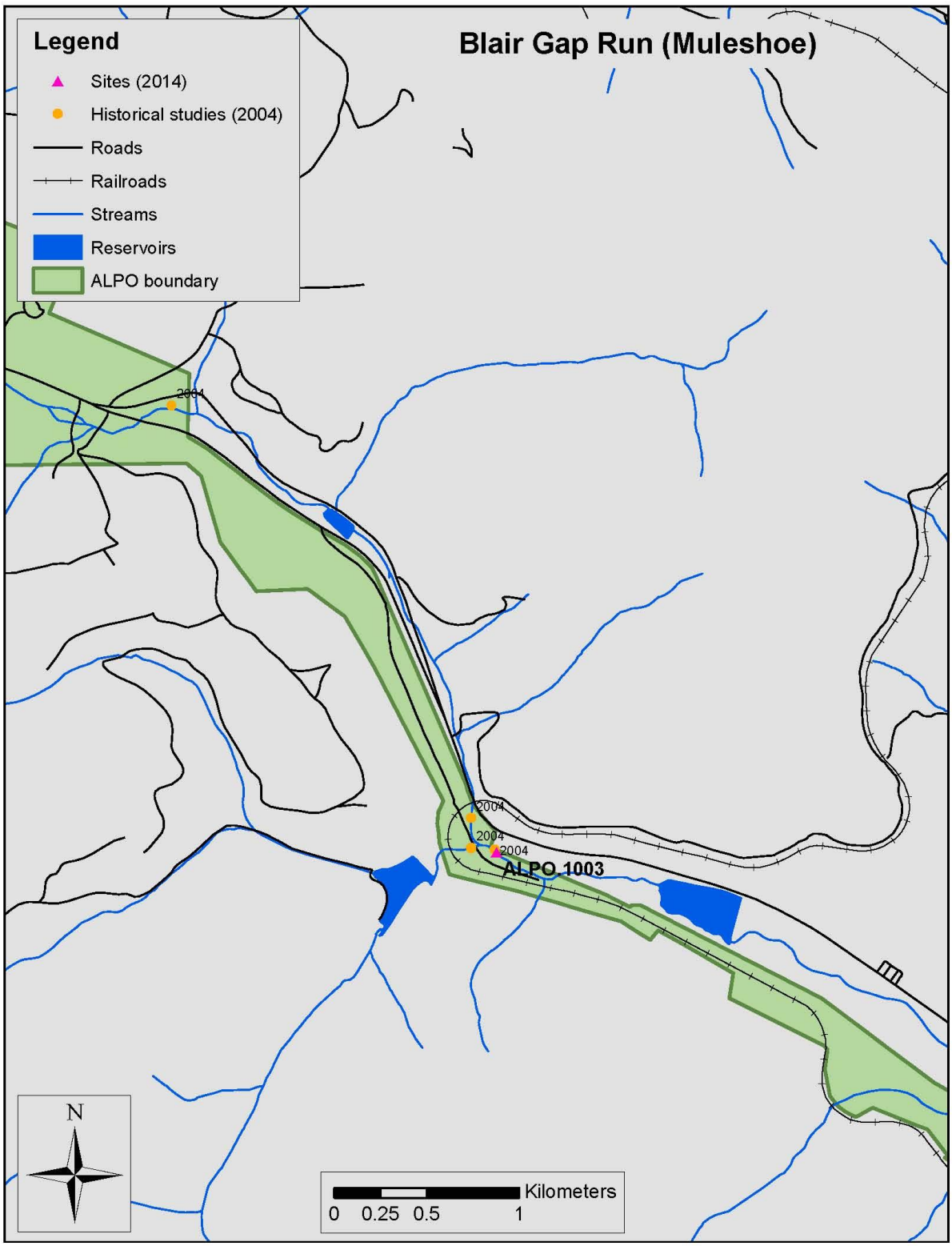
2014	Previous studies (Sheeder and Tzilkowski 2006)
Blacknose Dace (N) Brook Trout (N) Brown Trout (I) Creek Chub (N) Total: 4 Native: 3 Introduced: 1	2004 (Sheeder and Tzilkowski 2006) Blacknose Dace (N) Brook Trout (N) Brown Trout (I)

Note: Location of sites sampled by Sheeder and Tzilkowski (2006) were approximated from the map provided in Fig. 1 of that report.

Description

ALPO.1001 was on a small tributary to Blair Gap Run. It enters Blair Gap Run between ALPO.1002 and ALPO.2001. It was in a forested section of ALPO.

Blacknose Dace were the most abundant species encountered at this site with 318 individuals. All other species were represented by less than 15 individuals. Brook Trout and Brown Trout were found in roughly equal numbers here (13 and 11 individuals, respectively).



Note: Locations of sites sampled by Sheeder and Tzilkowski (2006) were approximated from the map provided in Fig. 1 of that report.

ALPO.1003 - Blair Gap Run (Muleshoe)

Fish

2014	Previous studies (Sheeder and Tzilkowski 2006)		
Blacknose Dace (N) Brook Trout (N) Brown Trout (I) Redbreast Sunfish (N) Slimy Scuplin (N) Total: 5 Native: 4 Introduced: 1	2004 downstream of Blair Run (Sheeder and Tzilkowski 2006) Blacknose Dace (N) Brook Trout (N) Brown Trout (I) Cutlips Minnow (N) Longnose Dace (N) Slimy Sculpin (N) White Sucker (N)	2004 upstream of Blair Run (Sheeder and Tzilkowski 2006) Blacknose Dace (N) Brook Trout (N) Brown Trout (I) Slimy Sculpin (N)	2004 tributary – Blair Run (Sheeder and Tzilkowski 2006) Blacknose Dace (N) Brook Trout (N) Brown Trout (I) Slimy Sculpin (N) White Sucker (N)

Note: The Slimy Sculpin listed under previous studies in the table above were corrected from Sheeder and Tzilkowski (2006) where they were called Mottled Sculpin; these were likely misidentified Slimy Sculpin (Tzilkowski pers. comm.). There was also a site (not included in the table above but included in the map) in the headwaters of Blair Gap Run sampled by Sheeder and Tzilkowski (2006) where only Brook Trout were encountered.

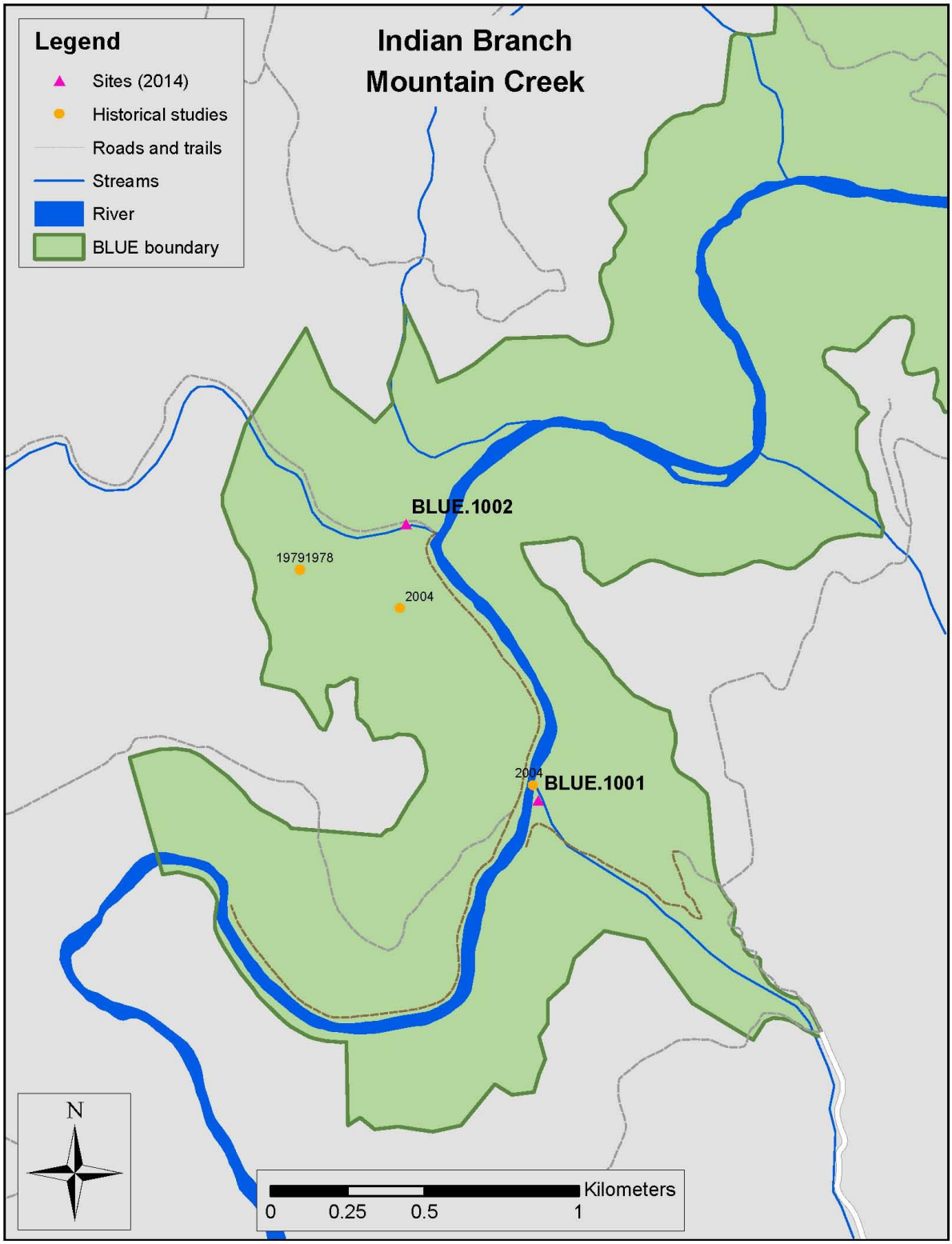
Description

ALPO.1002 was the upstream site on Blair Gap Run. It was in a forested section of ALPO and was much more shaded than ALPO.2001.

This was the only site in the entire study where Slimy Scuplin were encountered and they were represented by higher numbers (144 individuals) than any of the other species at this site. Brook Trout and Brown Trout were found in roughly equal numbers here (63 and 56 individuals, respectively).

Bluestone National Scenic River: Site Descriptions

The following is a breakdown of fish species observed at BLUE study sites. It includes two relatively larger-scaled maps to view sampling sites on each stream, fish species captured, pictures of sites and fish, locations of historical studies, and a general discussion containing observations of the field crew during sampling and potential sources of fishes inhabiting each site. This section also includes species lists and locations of previous fish sampling for comparison.



Note: Many of the coordinates provided for the historic sampling site locations at BLUE do not overlay the streams.

BLUE.1001 – Indian Branch

Fish

2014	Previous studies (Welsh et al. 2006)
Blacknose Dace (N) Creek Chub (N) Green Sunfish (N) Mountain Redbelly Dace (N) Rosyside Dace (N) Total: 5 Native: 5 Introduced: 0	2004 – mouth (Welsh et al. 2006) Blacknose Dace (N) Bigmouth Chub (N) Central Stoneroller (N) Creek Chub (N) Green Sunfish (N) Rosyside Dace (N) Spotfin Shiner (N)

Description

BLUE.1001 was a site on a small stream that emptied directly into the Bluestone River. The downstream end was less than 100m from the river.

Creek Chub were the most abundant of the five species encountered here, but all species were represented by less than 15 individuals.

BLUE.1002 – Mountain Creek

Fish

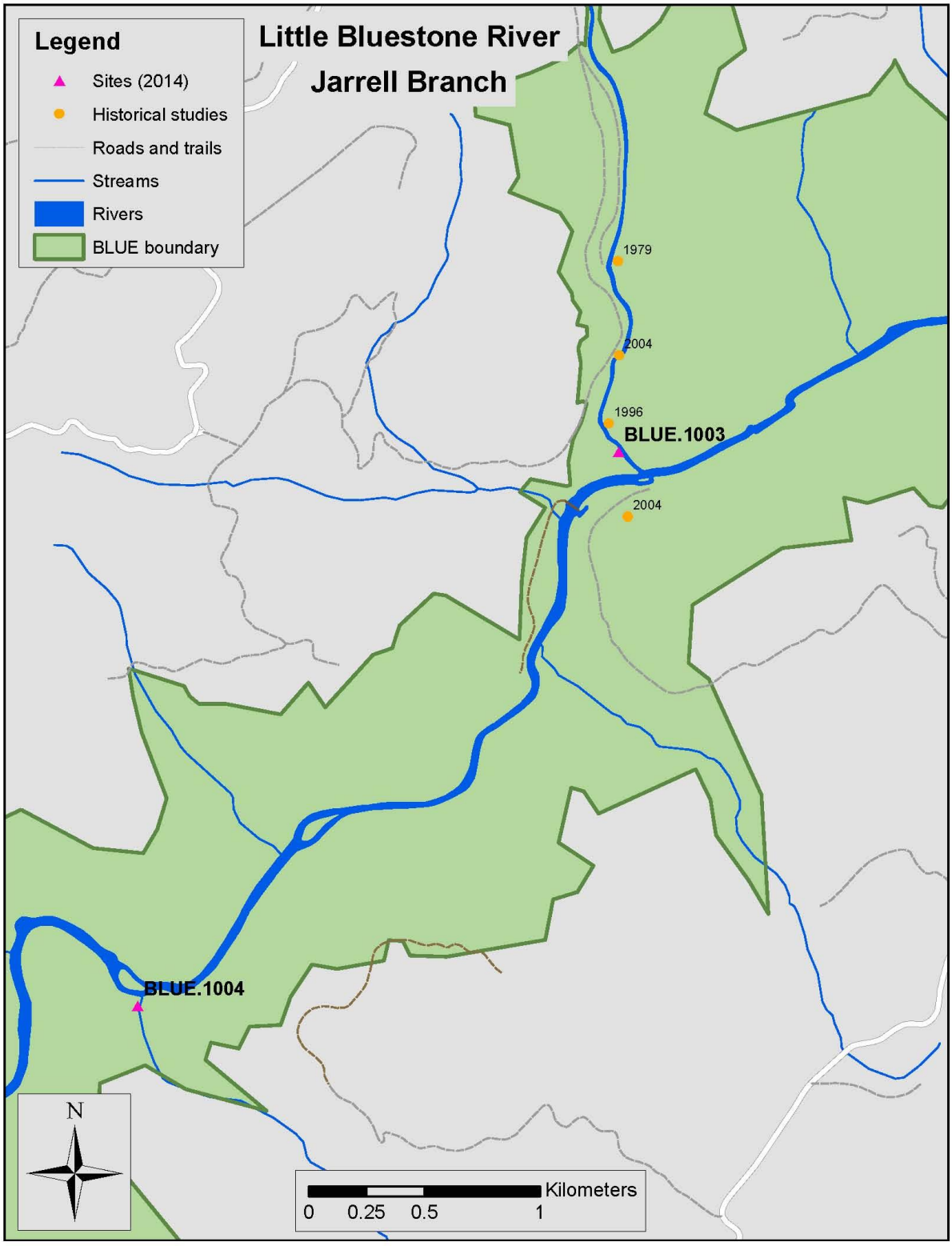
2014		Previous studies (Welsh et al. 2006)[1]	
Blacknose Dace (N)	Northern Hogsucker (N)	2004 (Welsh et al. 2006)	Rainbow Darter (I)
Bluehead Chub (I)	Rainbow Darter (I)	Bigmouth Chub (N)	Rock Bass(I)
Central Stoneroller (N)	Rainbow Trout (I)	Blacknose Dace (N)	Rosyside Dace (N)
Creek Chub (N)	Rock Bass (I)	Bluntnose Minnow (I)	Smallmouth Bass (I)
Fantail Darter (N)	Rosyside Dace (N)	Central Stoneroller (N)	Spotfin Shiner (N)
Green Sunfish (N)	Smallmouth Bass (I)	Creek Chub (N)	Telescope Shiner (I)
Longnose Dace (N)	Snubnose Darter (I)	Fantail Darter (N)	White Shiner (N)
Margined Madtom (I)	Telescope Shiner (I)	Longnose Dace (N)	Whitetail Shiner (I)
Mountain Redbelly Dace (N)	White Sucker (N)	Northern Hogsucker (N)	
Total: 18 Native: 10 Introduced: 8			

[1]Only the most recent previous study is included here, please see Welsh et al. (2006) for more accounts of historical sampling.

Description

BLUE.1002 (Mountain Creek) was a site on a relatively large stream that empties into the Bluestone River not far downstream. It was more forested than BLUE.1003.

This was the only site in the entire study where Snubnose Darter were encountered. The most abundant species here were Rosyside Dace, Creek Chub, Rainbow Darter, and Central Stoneroller (264, 210, 169, and 83 individuals, respectively). All other species encountered were represented by 30 individuals or less.



Note: Many of the coordinates provided for the historic sampling site locations at BLUE do not overlay the streams.

BLUE.1004 – Jarrell Branch

Fish

2014	Previous studies
None	None

Description

BLUE.1004 was similar to BLUE.1001 in that it was on a small stream that emptied directly into the Bluestone River. The downstream end was also less than 100m from the river.
No fish were encountered at this site.

BLUE.1003 - Little Bluestone River

Fish

2014		Previous studies – Welsh et al. (2006)[1]	
Blacknose Dace (N)	Mountain Redbelly Dace (N)	2004 – mouth (Welsh et al. 2006)	2004 – upstream of mouth (Welsh et al. 2004)
Bluehead Chub (I)	Northern Hogsucker (N)	Bigmouth Chub (N)	Bigmouth Chub (N)
Bluntnose Minnow (I)	Rainbow Darter (I)	Bluntnose Minnow (I)	Central Stoneroller (N)
Central Stoneroller (N)	Rainbow Trout (I)	Central Stoneroller (N)	Fantail Darter (N)
Creek Chub (N)	Roanoke Darter (I)	Fantail Darter (N)	Greenside Darter (N)
Fantail Darter (N)	Rock Bass (I)	Green Sunfish (N)	Longnose Dace (N)
Green Sunfish (N)	Rosyside Dace (N)	Greenside Darter (N)	Rainbow Darter (I)
Greenside Darter (N)	Smallmouth Bass (I)	Logperch (N)	Rock Bass (I)
Logperch (N)	Telescope Shiner (I)	Margined Madtom (I)	Smallmouth Bass (I)
Longnose Dace (N)	Whitetail Shiner (I)	Northern Hogsucker (N)	Spotfin Shiner (N)
Margined Madtom (I)		Rainbow Darter (I)	Telescope Shiner (I)
		Redbreast Sunfish (I)	White Shiner (N)
		Roanoke Darter (I)	Whitetail Shiner (I)
		Rock Bass (I)	
		Spotfin Shiner (N)	
Total: 21		Spottail Shiner (I)	
Native: 11		White Sucker (N)	
Introduced: 10		Whitetail Shiner (I)	

[1]Only the two most recent previous studies are included here, please see Welsh et al. (2006) for more accounts of historical sampling.

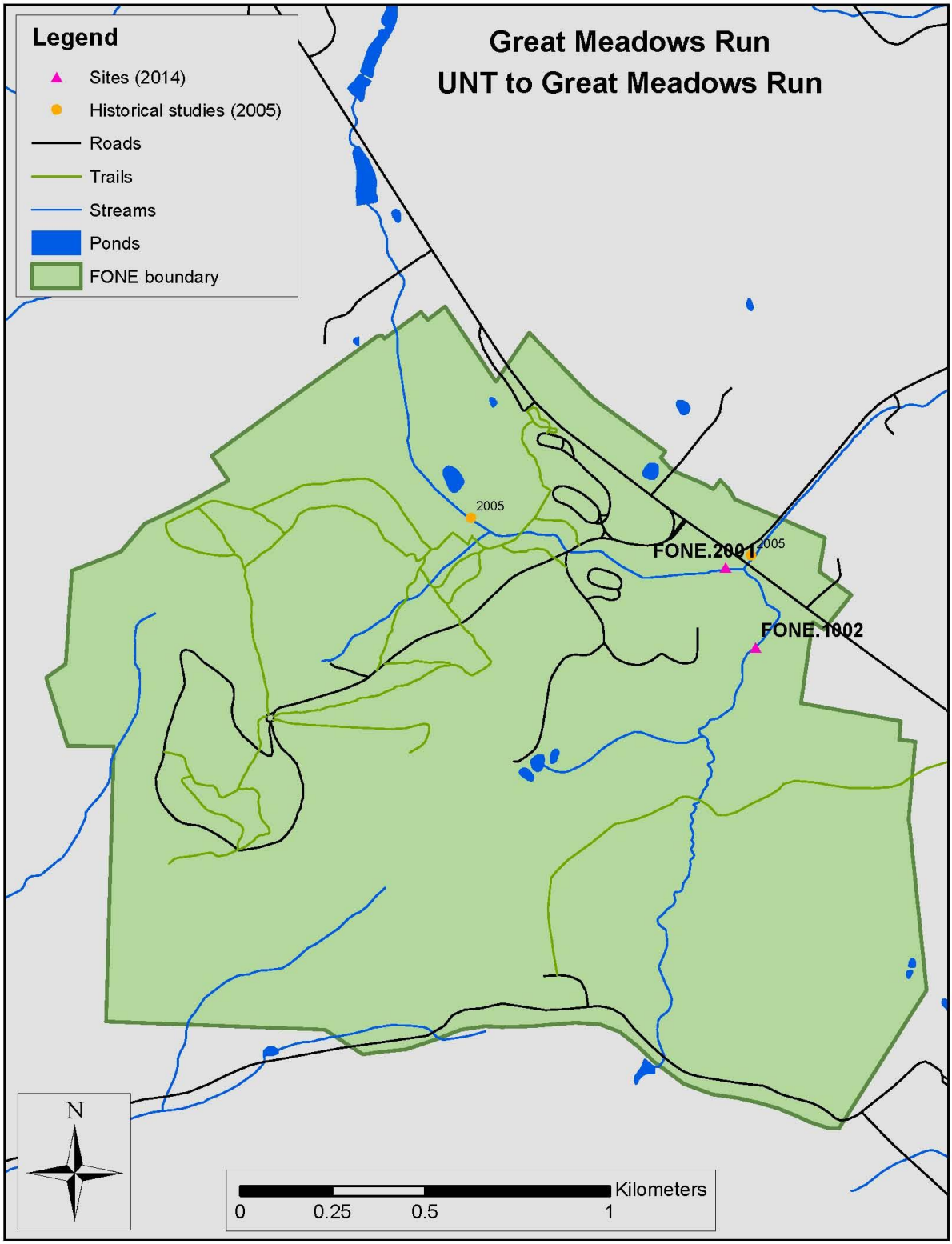
Description

BLUE.1003 (Little Bluestone River) was a site on a relatively large stream that empties into the Bluestone River not far downstream. It was a mix on riffles and pools. Even though both sides of the stream were forested, the stream was big enough that it was most an open canopy above it.

The highest number of species in the entire study were encountered at this site. It had more species than even the largest streams at nearby NERI. This was possibly due in part to its close proximity to the Bluestone River. This was the only site in the entire study where several species (Bluntnose Minnow, Greenside Darter, Logperch, and Roanoke Darter) were encountered. The most abundant species encountered here was the introduced Rainbow Darter followed by the native Central Stoneroller (460 and 339 individuals, respectively). All other species encountered were represented by less than 60 individuals and several by less than 10.

Fort Necessity National Battlefield: Site Descriptions

The following is a breakdown of fish species observed at FONE study sites. It includes a relatively larger-scaled map to view the entire park, sampling sites, fish species captured, pictures of sites and fish, locations of historical studies, and a general discussion containing observations of the field crew during sampling and potential sources of fishes inhabiting each site. The narrative proceeds in alphabetical order by stream name. This section also includes species lists and locations of previous fish sampling for comparison.


Great Meadows Run
UNT to Great Meadows Run
Legend
Sites (2014)
Historical studies (2005)
Roads
Trails
Streams
Ponds
FONE boundary
2005
FONE.2001
2005
FONE.1002
N
0
0.25
0.5
1
Kilometers

FONE.2001 – Great Meadows Run

Fish

2014	Previous studies (Tzilkowski and Sheeder 2006)
Blacknose Dace (N) Creek Chub (N) Johnny Darter (N) Largemouth Bass (N) Mottled Sculpin (N) White Sucker (N) Total: 6 Native: 6 Introduced: 0	2005 at two sites, one upstream and one downstream of current study location the same five species were encountered (Tzilkowski and Sheeder 2006) Blacknose Dace (N) Creek Chub (N) Johnny Darter (N) Mottled Sculpin (N) White Sucker (N)

Description

FONE.2001 was a site on a low gradient stream with mostly sand substrate. The left ascending side of the stream was more forested than the right, which was more open with a meadow relatively close to the stream.

Creek Chub and Johnny Darter were the two most abundant species (176 and 136 individuals, respectively). White Sucker, Largemouth Bass, and Mottled Sculpin were represented by less than 10 individuals each. This was the only site in the entire study where Mottled Sculpin were encountered.

FONE.1002 – UNT to Great Meadows Run

Fish

2014	Previous studies
Creek Chub (N) Johnny Darter (N) Total: 2 Native: 2 Introduced: 0	None but see FONE.2001 for fish species detected by Tzilkowski and Sheeder (2006) in Great Meadows Run.

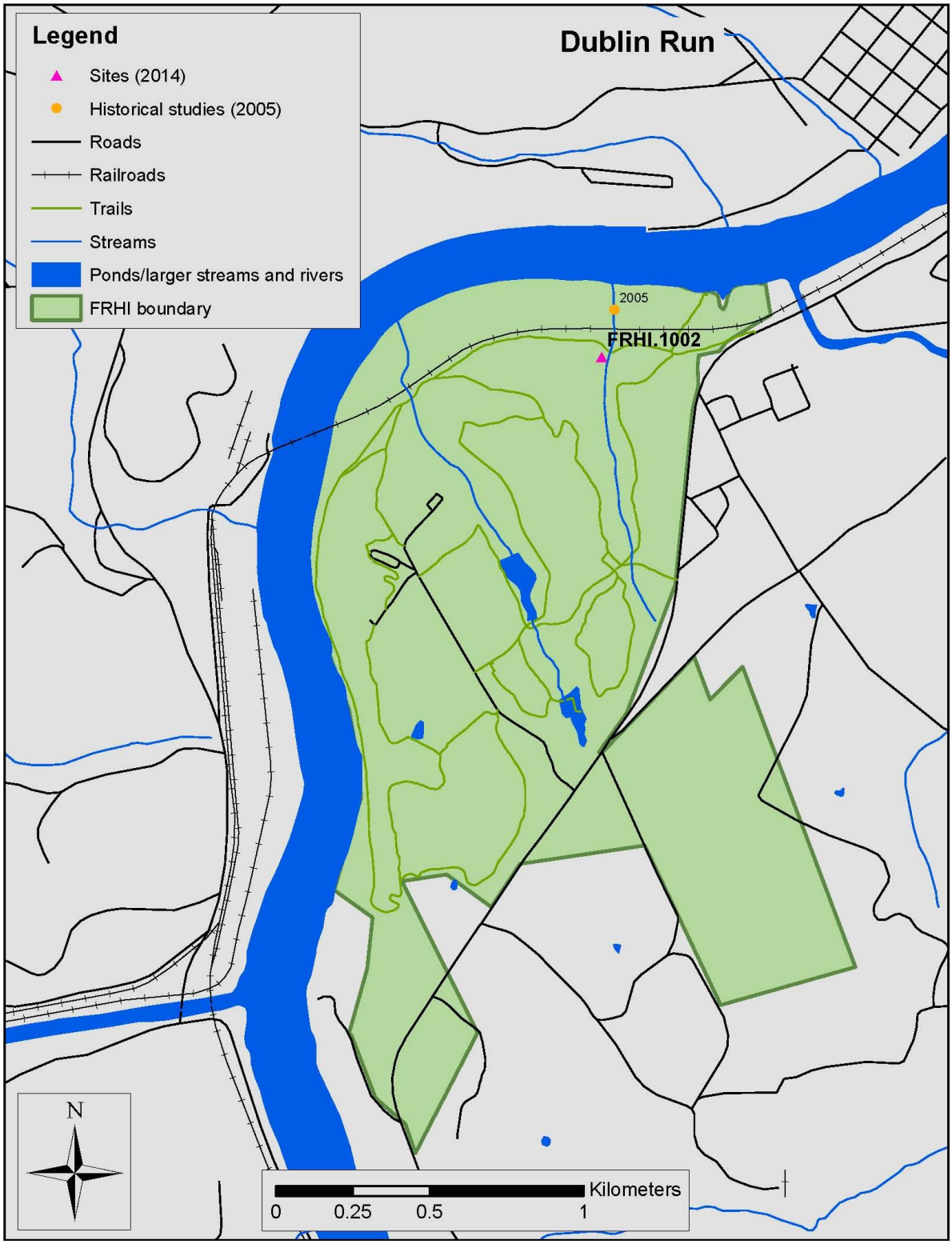
Description

FONE.1002 was a site on a small tributary to Great Meadows Run. It was in a more forested section of FONE. This site usually had very little water which made electrofishing difficult.

Less than 15 individuals of each species were encountered here.

Friendship Hill National Historic Site: Site Descriptions

The following is a breakdown of fish species observed at the FRHI study site. It includes a relatively larger-scaled map to view the entire park, sampling sites, fish species captured, pictures of sites and fish, locations of historical studies, and a general discussion containing observations of the field crew during sampling and potential sources of fishes inhabiting each site. This section also includes species lists and locations of previous fish sampling for comparison.


Legend
Sites (2014)
Historical studies (2005)
Roads
Railroads
Trails
Streams
Ponds/larger streams and rivers
FRHI boundary
Dublin Run
2005
FRHI.1002
N
Kilometers
0
0.25
0.5
1

FRHI.1002 – Dublin Run

Fish

2014	Previous studies (Tzilkowski and Sheeder 2006)
Blacknose Dace (N) Creek Chub (N) Largemouth Bass (N) White Sucker (N) Total: 4 Native: 4 Introduced: 0	2005 (Tzilkowski and Sheeder 2006) Blacknose Dace (N) Creek Chub (N)

Description

FRHI.1002 was a site on a small stream that empties directly into the Monongahela River. The downstream end of the site was just upstream of a trail and small bridge that crosses the stream. It was located in a forested section of FRHI.

Creek Chub were the most abundant species here (167 individuals) with Blacknose Dace also common (58 individuals). White Sucker and Largemouth Bass were represented by less than 10 individuals each. It is interesting to note that Largemouth Bass were represented by only one individual in each of the three samples and it was possibly the same individual young-of-the-year each time.

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