

Warm Springs Run Stream Corridor Assessment



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**Commissioned by the
Morgan County Purple Loosestrife Task Force**

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Cover photo: This rarely seen section of Warm Springs Run north of the Sand Mine is surprisingly beautiful.

Acknowledgement

The Warm Springs Run Stream Corridor Assessment was completed by Kieran O'Malley under the guidance of the Purple Loosestrife Task Force of Morgan County. Funding for the assessment was provided through a National Fish and Wildlife Foundation grant.

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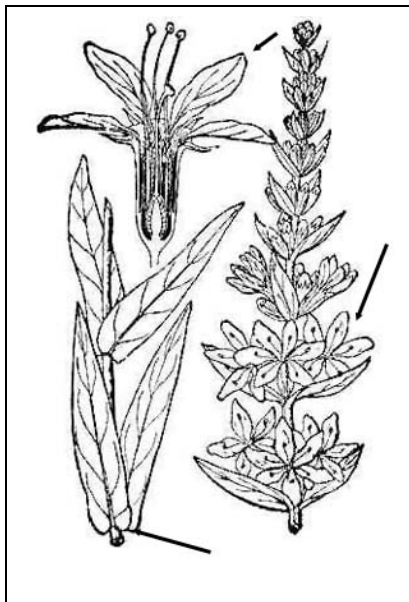


Figure 1. Purple loosestrife (*Lysimachia salicaria*) is being held in check in Morgan County by the efforts of the Purple Loosestrife Task Force. The volunteer groups' mission is to protect Harperella, an endangered plant found in the county.

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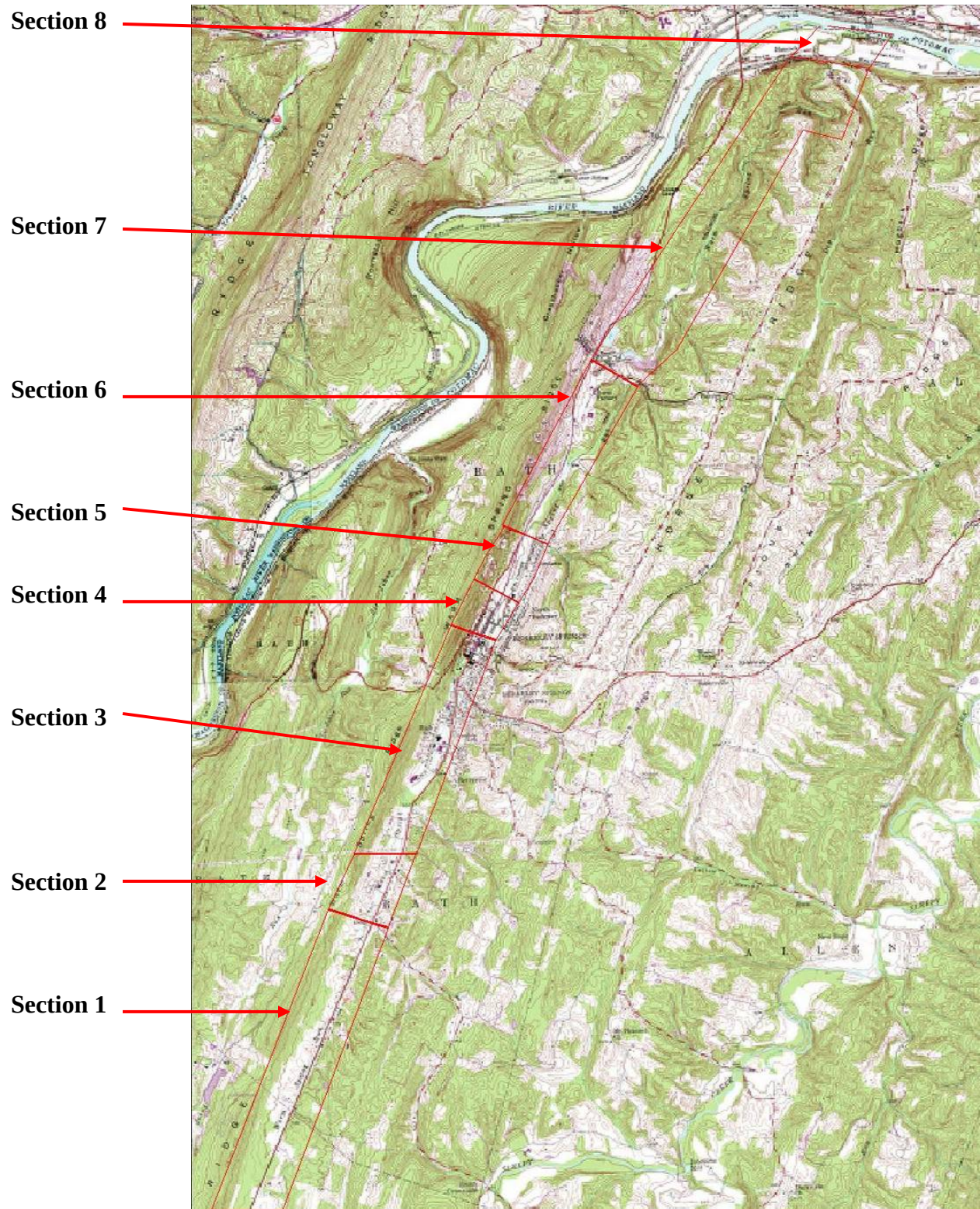


Figure 2. Map of the Warm Springs Run Stream with Sections 1 through 8 shown.

Introduction

Warm Springs Run flows for 11.8 miles through the heart of Morgan County to the Potomac River. The stream flows through low density residential, urban residential, industrial, commercial, and relatively natural areas. Diverse land use patterns have varied impacts on water quality in Warm Springs Run and ultimately in the Potomac River. This stream corridor assessment documents the impacts to the run and the riparian buffer.

Conditions that effect water quality or inhibit natural stream processes were documented and categorized according the Maryland Stream Corridor Assessment Survey Protocols (Appendix A). Additional categories were created to better identify conditions such as in-stream debris, invasive plants, and stream inputs. The Morgan County Purple Loosestrife Task Force is particularly interested in the status of invasive plants on Warm Springs Run, so each invasive plant occurrence was recorded as a separate stream impact.

Methods

Field work for the assessment occurred between October 2 and October 12, 2007. The stream was surveyed in logical and/or physically distinct sections (e.g. Jimstown Road to Sand Mine Road, Sand Mine Road to River Road, etc.). Beginning in the headwaters the sections are numbered 1 through 8 (Table 1). Data was collected and organized according to the numbered stream section. Site data for a stream impact included a location description (River Right, River Center, and River Left), written description, photographs, and global positioning system (GPS) coordinates.

A stream impact site was identified by its GPS waypoint number. Frequently several impacts were noted at one waypoint. Although information was recorded collectively in the field, site data for each impact was entered separately in a spreadsheet. Survey data was thus organized by the type of stream impact, by geographic location, and by stream section. Photographs of stream impacts are labeled with the waypoint number and type of impact (fish barrier, exposed pipe, etc.) and are grouped according to stream section. The data set is not part of this published report, but is available upon request from the Sleepy Creek Watershed Association (info@sleepycreekwatershedassociation.org).

Results

At the time of the field survey Morgan County was experiencing a mild drought and Warm Springs Run was at base flow level. The upper headwater section, which is intermittent, and most tributaries were dry. Drought conditions inhibited the ability to identify sediment inputs from tributaries and possible sources or functions of pipe outfalls. Physical impacts are organized in eleven categories (Table 2).

In addition to the drought, the timing of the field survey precluded a more comprehensive inventory of exotic invasive plants. Many annual and early blooming plants are not visible in October (e.g. garlic mustard). Therefore this assessment is somewhat biased toward woody plants, perennials and long lived annuals.

Table 1. Stream segment descriptions.	
Stream Segment	Description
Section 1	Headwaters of the watershed to Winchester Grade Road
Section 2	Winchester Grade Road to Morgan Square Shopping Center
Section 3	Morgan Square to Fairfax Street
Section 4	Fairfax Street to Williams Street
Section 5	Williams Street to Jimstown Road
Section 6	Jimstown Road to Sand Mine Road
Section 7	Sand Mine Road to River Road
Section 8	River Road to confluence with the Potomac River



Figure 3. Numerous pipes empty into Warm Springs Run, a highly impaired stream.

Table 2. Physical impacts (by section) documented on Warm Springs Run.									
Impact	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Total # Occurrences
Channel alteration	2	4	11	3	5	3	17	2	47
Erosion site					2	2	6	2	12
Exposed pipes			4	1			1	1	7
Fish barrier					2		8	1	11
In/Near stream construction			2		7	3			12
Inadequate buffer	5		9		1	1	7		23
In-stream debris			3		6	3	9		21
Pipe outfall			5	8	1	2*	1	1	18
Stream input		1	3		4	9	11		28
Trash dump				1	1	1	6		9
Unusual condition			2		2	3	12	1	20
* Berkeley Springs sewage treatment plant discharge pipes.									

Eighteen invasive species were documented growing along the Warm Springs Run corridor (Table 3). Several plant species were only observed once or twice but nine species occurred repeatedly throughout the watershed (Table 4).

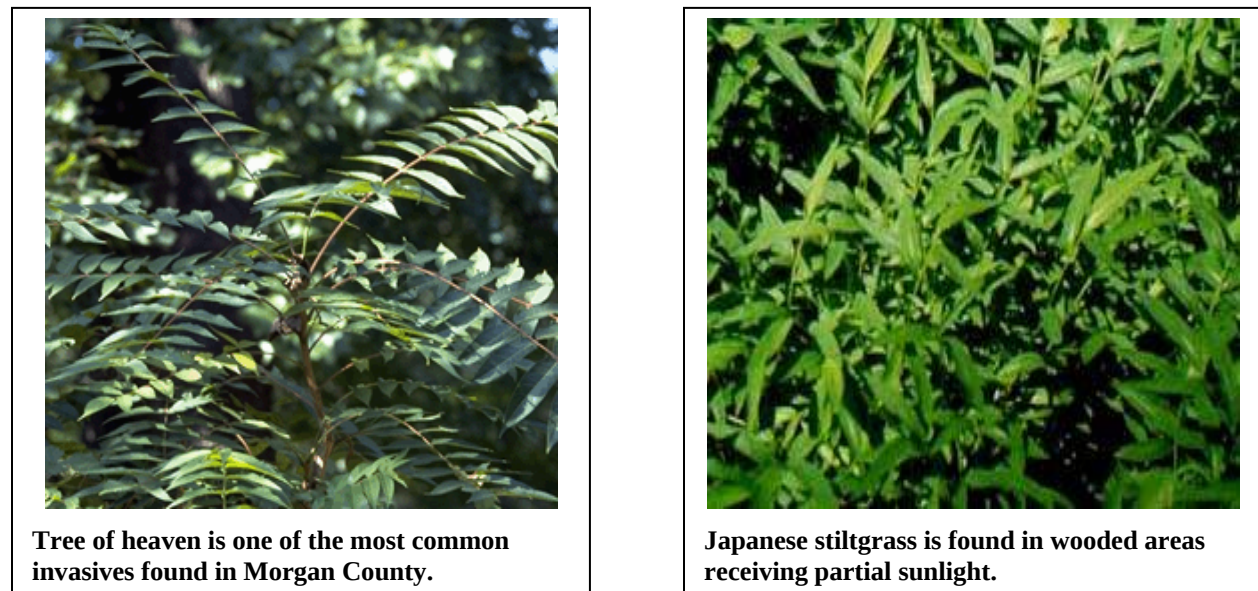


Figure 4. Examples of common invasive plants found in the Warm Springs Run Watershed.

Table 3. Invasive plant species documented on Warm Springs Run. Species origin and status were determined according to Harmon et al 2006.

Common Name	Scientific Name	Origin	Status
Autumn olive	<i>Elaeagnus umbellata</i>	Exotic	Invasive
Barberry	<i>Berberis thunbergii</i>	Exotic	Invasive
Catalpa ¹	<i>Catalpa sp.</i>	Exotic	?
Crownvetch	<i>Coronilla varia</i>	Exotic	Invasive
Day lily	<i>Hemerocallis fulva</i>	Exotic	Invasive
Forsythia	<i>Forsythia sp.</i>	Exotic	?
Johnsongrass	<i>Sorghum halepense</i>	Exotic	Invasive
Japanese honeysuckle	<i>Lonicera japonica</i>	Exotic	Invasive
Japanese knotweed	<i>Polygonum cuspidatum</i>	Exotic	Invasive
Japanese stiltgrass	<i>Microstegium vimineum</i>	Exotic	Invasive
Mile-a-minute weed	<i>Polygonum perfoliata</i>	Exotic	Invasive
Mimosa	<i>Albizia julibrissin</i>	Exotic	Invasive
Multiflora rose	<i>Rosa multiflora</i>	Exotic	Invasive
Plume poppy ²	<i>Macleaya cordata</i>	Exotic	?
Purple loosestrife	<i>Lysimachia salicaria</i>	Exotic	Invasive
Rose of Sharon	<i>Hibiscus syriacus</i>	Exotic	Invasive
Tree of heaven	<i>Ailanthus altissima</i>	Exotic	Invasive
Yellow iris	<i>Iris pseudacorus</i>	Exotic	Invasive

1 Catalpa trees were not identified to species. Three species are known to occur in WV. All three are exotic and one species is considered invasive.

2 The plume poppy population is a new occurrence and only the second occurrence documented in WV. Not enough information is available to determine its status.

Table 4. Number of occurrences by section of the most frequently observed invasive species.

Species	Sect. 1	Sect. 2	Sect. 3	Sect. 4	Sect. 5	Sect. 6	Sect. 7	Sect. 8	Total Occurrences
Autumn olive		3	2	2			29	1	37
Japanese honeysuckle	3	2	1	1	3	2	7	1	20
Japanese knotweed	3	7	25	7	17	13	14	11	97
Japanese stiltgrass			2	1	11	7	5	1	27
Mimosa			3	3	8	1	3		18
Multiflora rose		3	9	2	9	8	26	2	59
Purple loosestrife		1	6	5			6	4	22
Tartarian honeysuckle	2		6			2	22	1	33
Tree of heaven	2	3	16	6	8	18	20	3	76

Discussion of Each Stream Section

Section 1

Section 1 is in the upper reaches of the watershed running from the concrete plant to Winchester Grade Road. Warm Springs Run is intermittent in this section.

Channel Alteration

In this section the stream channel passes through or under 15 culverts or bridges. There is at least one area where the bank is armored with gabions and some sections where the stream is channelized by the US 522 road bed.



Figure 5. Inadequate riparian buffer in the headwaters of Warm Springs Run.

All bridges occur on private property as single spans. Many do not have substantial abutments and constrict the streambed. The stream crosses under US 522 in a box culvert while the rest of the culverts are on private property and may or may not be sized appropriately.

Warm Springs Run parallels US 522 for the last mile of this section. In locations where the stream bank approaches the US 522 right of way, rip rap and gabions have been placed on one or both banks.

Inadequate Buffer

The riparian buffer is impaired to non-existent throughout most of this section. There are three distinct areas where a buffer was present (and could be restored) but has been mowed down (Figure 5). At least one mile of this section is adjacent to the US 522 right of way and receives runoff directly from the road.

Invasive Plants

Four species were documented in this section (Table 5). Japanese honeysuckle, Tartarian honeysuckle, and tree of heaven were recorded where they occurred along the stream corridor. However, all three species are common around field edges, disturbed areas, and power lines along US 522. Japanese knotweed was observed along stream banks that are either disturbed sites or contain fill material.

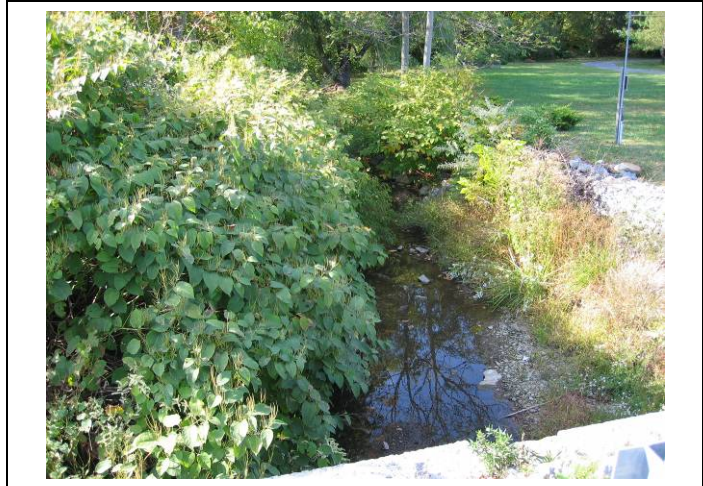
Table 5. Invasive plant species documented in Section 1.

Species	Number of Occurrences
Japanese honeysuckle	2
Japanese knotweed	3
Tartarian honeysuckle	2
Tree of heaven	3

Stream Inputs

A large tributary enters Warm Springs Run on river right along Winchester Grade Road.

Figure 6. Japanese knotweed stand upstream near the intersection of US 522 and Winchester Grade Road.



Section 2

Warm Springs Run becomes a perennial stream from this point downstream in Section 2, which runs from Winchester Grade Road to Morgan Square.

Channel Alteration

Warm Springs Run is constricted by four culverts in this section. The stream crosses US 522 in two box culverts and a private driveway in a single culvert. The stream is then contained in two large pipe culverts that carry it under Largent's Trucking, the WVDOH access road, and Blue Flame Gas Co. (approximately 200'). The stream finally flows through a single pipe culvert under the Morgan Square access road.

Invasive Plants

Six species were documented in this section (Table 6). Japanese knotweed forms monotypic stands along more than 90% of this section (Figure 6). autumn olive, multiflora rose, and tree of heaven were found growing in small gaps in the Japanese

knotweed or between the knotweed and mowed areas. Four purple loosestrife plants were observed at an active treatment site behind a vacant truck repair business (no purple loosestrife was found along the stream in this section).

Table 6. Invasive plant species documented in Section 2.

Species	Number of Occurrences
Autumn olive	3
Japanese honeysuckle	2
Japanese knotweed	7
Multiflora rose	3
Purple loosestrife	1
Tree of heaven	3

Stream Input

A large tributary enters Warm Springs Run at the intersection of Winchester Grade Road and US 522. The tributary introduces water and runoff from Winchester Grade Road into Warm Springs Run.

Section 3

This section runs from Morgan Square to the confluence with Yellow Run, which is the intersection of US 522 and State Route 9 East.

Channel Alteration

This section of Warm Springs Run is contained or restricted by five bridges and six culverts. At seven locations the stream is separated from the floodplain by rip rap or retaining walls on one or both banks.

One partially washed out beaver dam was documented that is affecting the stream channel. This beaver dam should be considered a temporary condition since it will likely wash away with a large storm.

Exposed Pipes

Standpipes/manholes were frequently noted in the streambed in this section which indicates the Berkley Springs sewer system follows at least part of the run.

Inadequate Buffer

In this section Warm Springs Run flows through an urban area with commercial and residential development. The riparian zone is eliminated in intensively developed areas (e.g. neighborhoods). Where a floodplain is present, nine properties were identified that had impaired or inadequate buffer zones. Extreme examples of inadequate riparian buffers include Widmyer Elementary School and Berkeley Springs High School (Figure 7).

In/Near Stream Construction

In-stream tractor activity was observed upstream from the Caldwell Banker office. The river right bank (containing a Japanese knotweed stand) has been graded all the way to the water to allow a farm tractor to enter

the creek, travel ten yards downstream, and climb up the river left bank.

A small rock dam and stone sculptures have been erected in the streambed behind the antique shop on Fairfax Street (in the short section between Fairfax Street and US 522).

In stream Debris

Three old beaver dams were observed that, although partially washed out, are collecting large amounts of trash and debris carried by storm water.

Invasive Plants

Thirteen species were documented in this section (Table 7). Japanese knotweed, tree of heaven, and multiflora rose dominate the riparian vegetation in most locations. In the wooded area south of Widmyer Elementary School, Japanese knotweed occupies areas up to one half acre in size and several hundred feet of stream bank.

The creek flows through yards and neighborhoods and many documented species are ornamentals that were planted or have escaped cultivation and formed small local populations (e.g. forsythia, day lily, Rose of Sharon, etc.). Six purple loosestrife locations were documented, none of which appear to be new locations (several plants have been treated with herbicide). It should be noted that Japanese stiltgrass, mimosa, and yellow iris were first documented in this section.

Pipe Outfalls

At every bridge crossing, drain pipes entered the stream carrying storm water from US 522 or the adjacent surface streets. Four pipe outfalls were observed coming from residences and one pipe originated at a business.

Representative Site

The only example of an intact riparian zone in this section is the woodlot south of the Widmyer Elementary School field. The

Table 7. Invasive species documented in Section 3.	
Species	Number of Occurrences
Autumn olive	2
Day lily	1
Forsythia	2
Japanese honeysuckle	1
Japanese knotweed	25
Japanese stiltgrass	2
Mimosa	3
Multiflora rose	9
Purple loosestrife	6
Rose of Sharon	4
Tartarian honeysuckle	6
Tree of heaven	16
Yellow iris	1

forest extends east all the way to US 522 and west to the top of the first ridge (at least). Although two dense stands of Japanese knotweed occur in the understory, evidence of a small beaver colony was observed and a four year old wood turtle was found in the stream.

Stream Inputs

Two tributaries enter the stream on river right. One tributary may be carrying runoff from US 522. Yellow Run, the second tributary enters Berkeley Springs along Route 9, crosses under US 522 next to Sheetz, and enters Warm Springs Run next the Caldwell Banker office.

Unusual Condition

Blue-green algae were observed in a pool of slack water in the “representative site” woodlot south of the elementary school.



Figure 7. Inadequate riparian buffer at Widmyer Elementary where the stream divides the school property.

Section 4

Section 4 runs from Yellow Run at State Route 9 to Williams Street within the Town of Bath.

Channel Alteration

This section of Warm Springs Run is constricted by four bridges and one large culvert (under US 522). Three segments (US 522 – Congress Street, Congress Street – Mercer Street, Mercer Street – Independence Street) are channelized by rip rap or retaining walls on one or both banks.

Exposed Pipes

A sewer standpipe/manhole is in the streambed between US 522 and Congress Street. One 18inch pipe crosses the streambed at the Williams Street bridge.

Invasive Plants

Thirteen invasive species were documented in this section (Table 8). Japanese knotweed and tree of heaven were the most frequently observed and affect the largest riparian area. The five purple loosestrife occurrences were observed in previously documented locations although none of the plants had been treated with herbicide. Several dead mimosa trees and one live purple loosestrife plant were observed on grounds of the power company substation (not along the creek).

Trash Dump

A large pile of industrial waste (some type of slag pile) was observed about ten feet from the river left bank behind “The Factory”.

Pipe Outfalls

Eight pipe outfalls were observed originating from commercial, residential, and unknown sources. Some pipes appeared to be storm water drains while others did not have an obvious purpose.

Table 8. Invasive species documented in Section 4.

Species	Number of Occurrences
Autumn olive	2
Barberry	2
Crownvetch	1
Forsythia	1
Japanese honeysuckle	1
Japanese knotweed	7
Japanese stiltgrass	1
Mimosa	3
Multiflora rose	2
Purple loosestrife	5
Rose of Sharon	1
Tree of heaven	6
Yellow iris	1

Section 5

Section 5 is Williams Street north to Jimstown Road at the northern edge of the Town of Bath.

Channel Alteration

This section contains channelized stream bank, two flood sluices (weirs?), and the Jimstown Road bridge (Williams Street bridge was described in the previous section). At the Williams Street bridge, both banks are rip rapped for about 200 feet. The two flood sluices or weirs are about 200-300' apart (Figure 8). They appear to direct the current towards the center of the stream channel and cause the creek to become entrenched immediately downstream. Jimstown Road crosses the creek on a single bridge span and constriction is relatively minor.

Erosion Site

About 450 feet south of the Williams Street bridge, a power line right of way briefly

follows the stream corridor. Woody vegetation under the line has been treated with herbicide and the lack of stabilizing root systems is allowing the right bank to collapse in the stream.

Fish Barrier

Two beaver dams were observed in this section. Both dams are effective fish barriers but may only be temporary conditions that could change after a major storm event.

Inadequate Buffer

Two areas with inadequate riparian buffer were noted. The riprapped area at the Williams Street bridge is actually a large yard mowed to the waters edge. The second location is behind a warehouse truck parking lot. The parking lot is paved to the top of the river right bank.

In/Near Stream Construction

Seven occurrences of construction or human activity were noted in this section. In two locations, the stream passes within 200 feet of the new sewer/water line right of way under construction. The stream passes approximately 100 feet from commercial property on US 522 where a large spoil pile is visible from the water. Other occurrences include two tree stands, an ATV trail, and a small fort made from scrap lumber.

In stream Debris

There is an auto repair and salvage business that lies between Warm Springs Run and US 522. The streambed and the shoreline behind this business are littered with automotive debris. Most of the material is mufflers and tail pipes but at least one engine block and several tires were observed in the creek.

Tree falls along the creek have caused a number of debris jams. Most debris consists

of plastic bottles and bags but one large jam contains a shopping cart and a 55 gallon drum.

Invasive Plants

Nine invasive species were documented along this stretch (Table 9). Japanese knotweed, multiflora rose, tree of heaven, and Japanese stiltgrass are the most frequent and extensive. Japanese knotweed occurs in extensive stands but does not grow very far outside the stream corridor. Multiflora rose and tree of heaven were recorded where they occurred along the stream corridor. However, in the industrial areas with vacant lots, disturbed soil, and waste piles, their abundance is undoubtedly under represented.

Warm Springs Run enters a relatively intact riparian forest as it flows north from Berkeley Springs. In the filtered sunlight of the forest, Japanese Stiltgrass is well established along all banks, gravel bars, and forest canopy gaps. In places it extends from the stream bank into the forest as much as 40 feet. This condition exists from this point to the mouth. Other species re-appearing in this section include Mimosa, Japanese honeysuckle, and Rose of Sharon.

Pipe Outfalls

One terra cotta pipe enters the stream on river left at one of the flood sluices. The location is remote and pipe source and function are not apparent.

Stream Inputs

Three small drainage systems enter Warm Springs Run on river left. All three streams originate from culverts underneath US 522. These culverts appear to carry runoff from the road in addition to the hillside above US 522. At the Jimstown Road bridge is a sewer pumping station with an NPDES permit. A sign at the pumping station warns

that sewage may be pumped into the stream during emergencies.

Trash Dump

Behind the scrap yard about 30 feet from the stream bank, are ten black plastic bags of household trash.

Table 9. Invasive species documented in Section 5.	
Species	Number of Occurrences
Barberry	1
Catalpa	2
Japanese honeysuckle	3
Japanese knotweed	17
Japanese stiltgrass	11
Mimosa	8
Multiflora rose	9
Rose of Sharon	2
Tree of heaven	8

Unusual Condition

Behind the scrap yard in the same location as the black plastic trash bags is a manhole cover that has obviously overflowed in the past. Debris indicates that the sewer has backed up at this location, flowed out of the manhole and in to the stream. There is a strong sewage smell at this location.

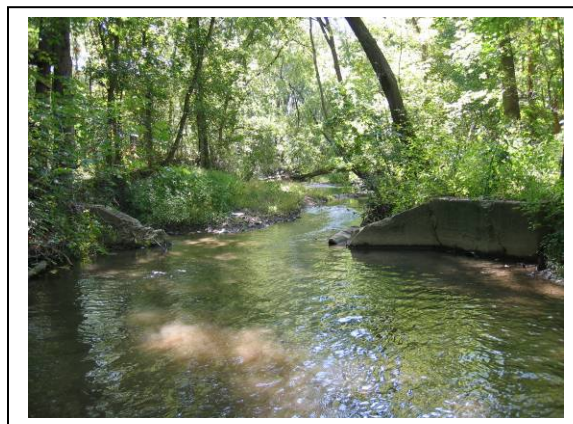


Figure 8. A flood sluice or weir north of Berkeley Springs.



Figure 9. Despite the degraded quality of the stream, Warm Springs Run is utilized by many species of wildlife, like this wood turtle.

Section 6

Section 6 runs from Jimstown Road to Sand Mine Road. The Warm Springs Waste Water Treatment Plant is located along this section of stream

Channel Alteration

This section has the Sand Mine Road bridge (Jimstown Road bridge was described in the previous section), two old beaver dams, and one abandoned railroad bridge that are affecting the stream channel. The bridge on Sand Mine Road is a single span across the creek with a rip rapped bank underneath it. The beaver dams are partially washed out and are redirecting the stream flow. The abutments from an abandoned railroad bridge constrict the channel and separate the stream from its floodplain.

Erosion Sites

Two heavily scoured sites were identified in this section. One site is an undercut bank that may be eroding naturally. The second location is where the stream meanders against the bed of an abandoned railroad grade. The stream can not cut into the railroad bed and the scouring extends along the grade as the stream energy dissipates. This location would be a good candidate for a stream bank reconstruction project.

Inadequate Buffer

The only streamside development in this section is the Berkeley Springs sewer treatment plant. At the time of the assessment the property was a large construction site with equipment and material parked all the way to top of the left bank. There was no grass or vegetation visible at the site.

In stream Debris

Large in stream debris was observed at four sites. Truck tires were in the streambed at two locations. At one location an iron

guardrail from the abandoned railroad grade was on the stream bottom. A fourth site was a partially washed out beaver dam that was collecting floating trash (plastic bottles, etc).

In/Near Stream Construction

The new Berkeley Springs sewer line right of way crosses Warm Springs Run at three locations. The right of way is about 30 feet wide, seeded with grass (no trees), and the banks are rip rapped. The streambed was disturbed when the sewer line was buried underneath it.

Table 10. Invasive species documented in Section 6.

Species	Number of Occurrences
Barberry	1
Catalpa	1
Japanese honeysuckle	2
Japanese knotweed	13
Japanese stiltgrass	7
Mimosa	1
Multiflora rose	8
Tartarian honeysuckle	2
Tree of heaven	18
Yellow iris	1

Invasive Plants

Ten invasive species were documented in this section (Table 10). Japanese stiltgrass, Japanese knotweed, tree of heaven, and multiflora rose were the most frequently observed. Japanese stiltgrass occurs on every gravel bar (at least at the bank full level), stream bank, and moist partial to full sun canopy gaps in this section.

Mimosa and yellow iris were also observed in this section. Barberry, Tartarian honeysuckle, and Japanese honeysuckle were noted along the stream, however their

occurrence is not limited to the riparian corridor.

Pipe Outfalls

Two pipe outfalls were documented at the Berkeley Springs waste water treatment plant. One pipe appears to be a new discharge pipe for the plant and was not active. The second pipe appeared to be the active discharge pipe (Figure 10). This site was visited twice (to take photographs) and it was discharging into Warm Springs Run on both occasions.

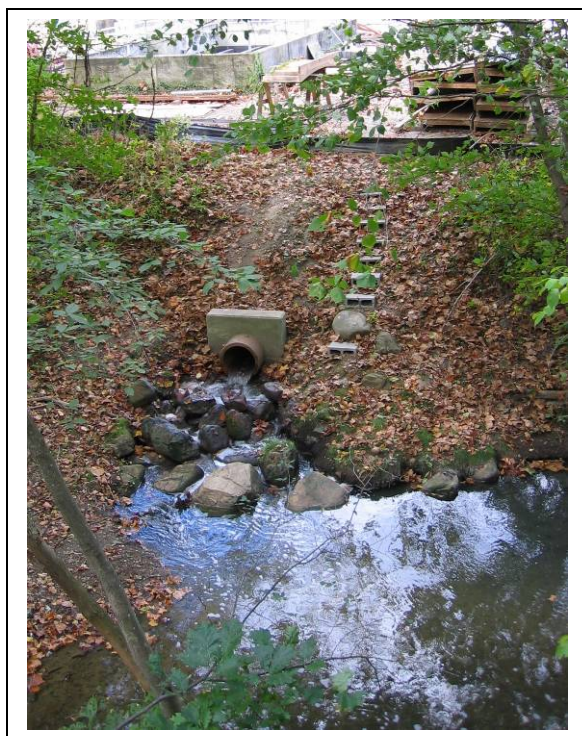


Figure 10. Active discharge from the waste water treatment plant.

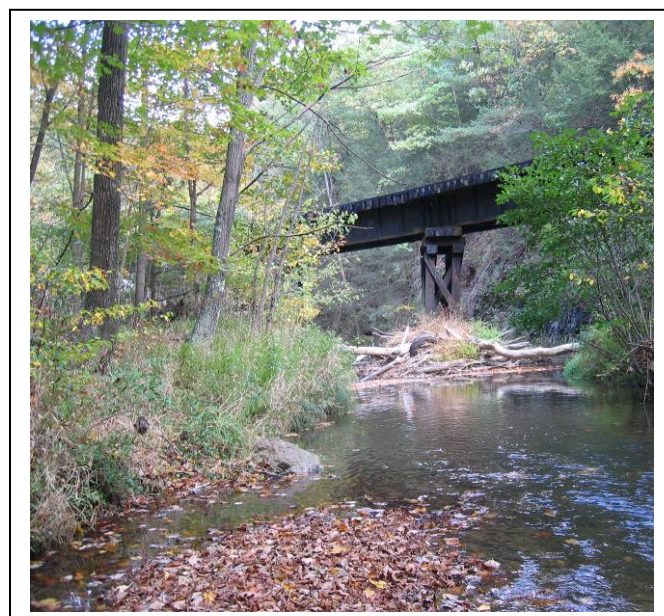
Stream Inputs

Nine stream inputs were recorded in this section. These inputs were drainages or tributaries entering Warm Springs Run. Although some of the drainages entering from the west may be natural, all of them are carrying runoff from US 522. Tributaries entering from the east are natural but are affected by the new sewer line right of way which parallels the stream 100 yards to the east. One natural tributary enters the stream along Sand Mine Road.

Unusual Condition

Beginning at the waste water treatment plant and continuing through this section, pools in the streambed contain pockets of dark sludge that emit a strong sewage smell when disturbed.

Figure 11. Debris jam and channel alteration caused by the railroad bridge in Section 7.



Section 7

Section 7 is located along the least accessible area of the watershed. It runs from Sand Mine Road to River Road. Despite the impact of mining and processing sand in this section this area has the most scenic parts of Warm Springs Run.

Channel Alteration

This section has one automobile bridge, two large box culverts, fourteen railroad bridges, and several rip rapped banks that affect the stream channel. Fairview Drive crosses Warm Springs Run in a single bridge span. Underneath the bridge the stream is contained by cement and rip rap. The stream flows about fifty feet under the sand plant in a single large box culvert. The stream flows about ninety feet under River Road in two large box culverts.

The railroad tracks that serve the sand plant cross Warm Springs Run on fourteen bridges. Bridge abutments and piers alter or constrict the stream channel (Figure 11). In many locations, the stream collides with or runs parallel to the railroad grade. In some locations the grade is rip rapped and other locations it is not.

Exposed Pipes

One 14 inch pipe was located crossing the streambed about one half mile upstream from Fairview Drive. This is a remote area and the source, destination, and function of the pipe is not apparent.

Erosion Site

Soil erosion was observed around equipment at the sand plant and at sites where the stream runs into or along the railroad grade. The bank is eroding around the foundation of a conveyor system that crosses over Warm Springs Run at the sand plant. Severe erosion was observed at three locations where the stream flows into the railroad

grade and is redirected. Scouring at one location is so severe that the ends of the railroad ties are now exposed. Remediation at these sites should not only include armoring the bank but also should redirect the channel before it collides with the railroad grade.

Fish Barrier

One man made dam, several beaver dams, and a number of waterfalls were observed in this section. A low head dam was located at the sand plant about fifty feet downstream from the box culvert. The purpose of the dam may be to create a pool for pumping water in to the settling ponds adjacent to the stream. Five substantial beaver dams were observed in this section. The beavers are using large tree falls as foundations for the dams which may withstand winter storm surges.

Several sandstone ledges or falls were observed in the northern end of this section. Some ledges dropped 8 to 12 inches while others dropped 20 to 30 inches. This assessment occurred during a mild drought and the stream was at base flow level. Some observed ledges may be seasonal barriers (those in the 8to12 inch range) while others are effective barriers at any flow level.

Inadequate Buffer

Seven locations with an inadequate riparian buffer were identified. Several sites along the railroad tracks are also experiencing erosion problems. At locations where the stream and the railroad grade run parallel, the vegetation between the grade and bank has been killed with herbicide.

A narrow buffer exists between Warm Springs Run and the grounds of the sand plant. The stream flows past the plant at the base of a steep slope. The plant "yard" is

paved to the top of the slope. Although the slope has trees, evidence of surface runoff was observed.

In stream Debris

This section had nine occurrences of substantial in stream debris. Most occurrences were debris jams caused by railroad bridges or natural tree falls. Some industrial and automotive waste was also observed in the streambed.

Railroad hardware (spikes, metal plates, ties) was found under several bridges. Large debris jams occurred when bridge piers were located in the streambed. Large trees and logs floating downstream collect at the piers and they subsequently collect more debris.

Most of the stream corridor in this section is forested and tree falls into or across the stream are common. The fallen trees strain and collect floating material. Beavers also use tree falls as foundations for their dams and lodges which increases the amount of debris at these locations.

Invasive Plants

Seventeen invasive species were documented in this section (Table 11). Five species were only observed at the settling pond/spoil site near the sand plant. Japanese stiltgrass, autumn olive, multiflora rose, and Tartarian honeysuckle were the most frequently observed species.

Japanese stiltgrass remains the dominant vegetation on gravel bars, stream bank, and in the understory along the immediate stream corridor. Autumn olive, multiflora rose, and Tartarian honeysuckle were only recorded where they occurred along the stream however, these plants are widely distributed throughout forest understory. Tree of heaven and Japanese knotweed occurred near the sand plant and in canopy

openings created by the railroad tracks. Purple loosestrife occurred mainly at disturbed sites near the sand plant and around the railroad bridge next to Fairview Drive. Mimosa seedlings were again noted on gravel bars in the streambed.

Pipe Outfalls

Two 12 inch pipes enter the stream on river right under the conveyor at the sand plant. They were not discharging during this assessment.

Table 11. Invasive species documented in Section 7.

Species	Number of Occurrences
Autumn olive	29
Barberry	8
Birdsfoot trefoil*	1
Catalpa	1
Coltsfoot*	1
Crownvetch*	1
Japanese honeysuckle	7
Japanese knotweed	14
Japanese stiltgrass	Continuous
Johnsongrass*	1
Mimosa	3
Multiflora rose	26
Plume poppy	1
Purple loosestrife	6
Spotted knapweed	1
Tartarian honeysuckle	22
Tree of heaven	20
* Indicates species that were observed only at the sand mine near the settling pond and spoil pile. Purple loosestrife was observed along the stream and at the spoil pile.	

Unusual Condition

Unusual conditions in this section include a power line right of way and possible inputs from herbicide use and a livestock pen. A power line crosses the stream 30 yards downstream from Sand Mine Road. Trees have been killed along the power line

allowing purple loosestrife and Japanese knotweed to colonize the stream bank.

Vegetation along the railroad right of way is sprayed with herbicide. In locations where the stream parallels the tracks (and at all bridges), the entire riparian buffer has been killed (Figure 12).

The first house upstream from Fairview Drive has small pen containing four pigs. The pen is about thirty feet upslope from the stream bank. This assessment was conducted during a mild drought and no runoff was visible. This location should be monitored during or after a heavy rain event to determine if runoff is occurring.

Stream Input

Eleven stream inputs were noted in this section. All inputs but one were natural tributaries or drainages. One permitted outflow was located coming from the settling pond at the sand plant.

Trash Dump

Six large piles of railroad ties adjacent to the stream bank were noted. Some piles were ten feet tall and extended almost 100 feet.

Section 8

This section is located from River road to the confluence of Warm Springs Run and the Potomac River.

Channel Alteration

Warm Springs Run is contained or constricted by a retaining wall, one culvert, and one bridge. Approximately 300 feet of the left bank is armored with a concrete retaining wall between River Road and the CSX mainline tracks. The stream passes under the tracks in a concrete culvert/tunnel. Fifty yards downstream from the railroad

culvert the stream is again constricted by a small bridge at Airport Road.

Erosion Site

Two erosion sites were noted in this section. One site is on the river right upstream from the railroad culvert. This bank is not protected and the rail bed and ballast are washing into the stream. The second site is an area of high banks in the floodplain forest near the mouth. Soil at this site is mostly river silt and very unstable. Entire banks are slipping as the channel cuts into them. This site might be a candidate for a natural stream design reconstruction project.

Exposed Pipe

One 8 inch pipe crosses the stream about 80 feet downstream from the Airport Road bridge.

Fish Barrier

A four foot tall beaver dam effectively blocks Warm Springs Run about 50 yards upstream from the mouth. Beavers have added material to a large sycamore tree fall across the stream (Figure 13). Recently cut logs, slide area, and a lodge indicate the dam is relatively new and the beaver colony active.

Invasive Plants

Ten invasive species were documented in this section (Table 12). Japanese knotweed occurred along almost the entire length of this section. At the stream mouth on the Potomac River, Japanese knotweed is the dominant understory vegetation in the floodplain forest. Japanese stiltgrass occupies all gravel bars with full or partial sun exposure. All purple loosestrife plants in this section appear to have been browsed and re-sprouted. Mile-a-minute weed covers all vegetation in areas as large as 0.3 acres.

Unusual Condition

A power line right of way crosses the stream in this section. The right of way is colonized by a pure Japanese knotweed stand at least 100 yards from the stream

Table 12. Invasive species documented in Section 8.	
Species	Number of Occurrences
Autumn olive	1
Japanese honeysuckle	1
Japanese knotweed	11
Japanese stiltgrass	Continuous
Johnsongrass	1
Mile-a-minute weed	3
Multiflora rose	2
Purple loosestrife	4
Tartarian honeysuckle	1
Tree of heaven	3



Figure 12. Herbicide used along the railroad to control riparian vegetation.



Figure 13. Beaver dam near the mouth of Warm Springs Run.

Conclusion

No part of Warm Springs Run escapes the human footprint. From the headwaters to Jimstown Road, the creek is literally a storm drain. The riparian buffer is minimal to nonexistent in these sections. Runoff from lawns, parking lots, and streets flows directly into the stream carrying surface litter along with it. Industrial sites adjacent to the stream are introduce additional waste products. The stream corridor is highly disturbed by mowing, construction, and channelization. This disturbance has enabled invasive plant species to thrive.

From Jimstown Road to the mouth, the stream flows through a perforated riparian forest. The riparian buffer is substantial but is interrupted by Sand Mine Road, fourteen railroad bridges, River Road, and Airport Road. The road crossings and railroad bridges alter the channel and introduce invasive plants to the stream corridor. Disturbance dependent plants (e.g. Japanese knotweed) are concentrated around the roads and bridges. Species that are wind or animal dispersed (e.g. tree of heaven, autumn olive, etc.) are not limited to the stream corridor.

One obvious impact to Warm Springs Run is the discharge from the community waste water treatment plant. Although the stream assumes a very natural character from the treatment plant downstream, the stream emits a strong sewage smell. Pools downstream for some distance are filled with dark sludge. The remedy for this condition is under construction; the Warm Springs Public Service District waste water treatment plant upgrade. Hopefully this upgrade will remedy the problem.

Warm Springs Run suffers from an “out of sight, out of mind” condition. Although the stream is twelve miles long and flows through the heart of Berkeley Springs, it is invisible to most people. Upstream from Berkeley Springs, the stream is a small ditch that runs across yards or alongside US 522. In Berkeley Springs, the creek flows behind houses and businesses and underneath the center of town. Leaving Berkeley Springs, the stream flows past scrap yards, vacant lots, and warehouses. North of Berkeley Springs, the creek enters the forest travels unseen except in scattered locations. Warm Springs Run presents many opportunities for restoration projects. Before any activity is proposed, the community needs to become aware of the stream, its role in the watershed, and the impact the people have on it. It can be a wonderful resource, but it will require a concentrated effort to restore it.

References

Harmon, P.J., D. Ford-Werntz, W. Grafton. 2006. Checklist and Atlas of the Vascular Flora of West Virginia. West Virginia Division of Natural Resources, Wildlife Resources Section, Elkins, WV.

Appendix

Stream Corridor Assessment Descriptions

Channel Alteration – A section of stream that is channelized or contained by concrete, rip-rap, gabion baskets or earthworks. On Warm Springs Run this includes bridge abutments and some culverts.

Erosion Site – An unstable stream bank that is experiencing a significant amount of erosion due at least in part to human activity.

Exposed Pipes – Pipes that are either in the stream or along the stream banks that could be damaged by a high flow event. This does not include pipe outfalls where only the open end of a pipe is exposed. This does include manhole stacks, exposed pipes that run along the stream banks and on the streambed.

Fish Barrier – A structure in the stream that significantly interferes with the upstream movement of fish. A fish barrier can be a manmade structure such as a dam or road culvert or a natural feature such as a waterfall or a beaver dam. A barrier with a water drop greater than one foot is considered a total fish barrier. Some structures may only be barriers during base flow.

Inadequate Buffer – An area with a buffer that is less than 50 feet.

In/Near Stream Construction – Major construction project or disturbance in or near the stream corridor.

In-stream debris- This category addresses trash and debris that has washed into the stream and collected at a site (i.e. flotsam). Beaver dams and railroad bridges commonly collect large amounts of debris.

Invasive Plants – Any species that is exotic, considered invasive, and occupies the stream corridor. Individual species are considered separate impacts.

Pipe Outfalls – Any pipes that discharge into the stream through the stream corridor.

Stream Inputs – A tributary, drainage, or ditch that enters the stream. Most inputs on Warm Springs Run are natural tributaries but are affected by roads or development.

Trash Dump – A site where a large amount of trash or debris has been intentionally placed. On Warm Springs Run, this includes piles of railroad ties.

Unusual Condition – Any condition that is out of the ordinary. On Warm Springs, this condition was frequently used to document herbicide use.

Representative Site – This category was used to document the only section of intact riparian buffer along the McDonalds to US522 section.