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# Stoner Creek Watershed Health Report

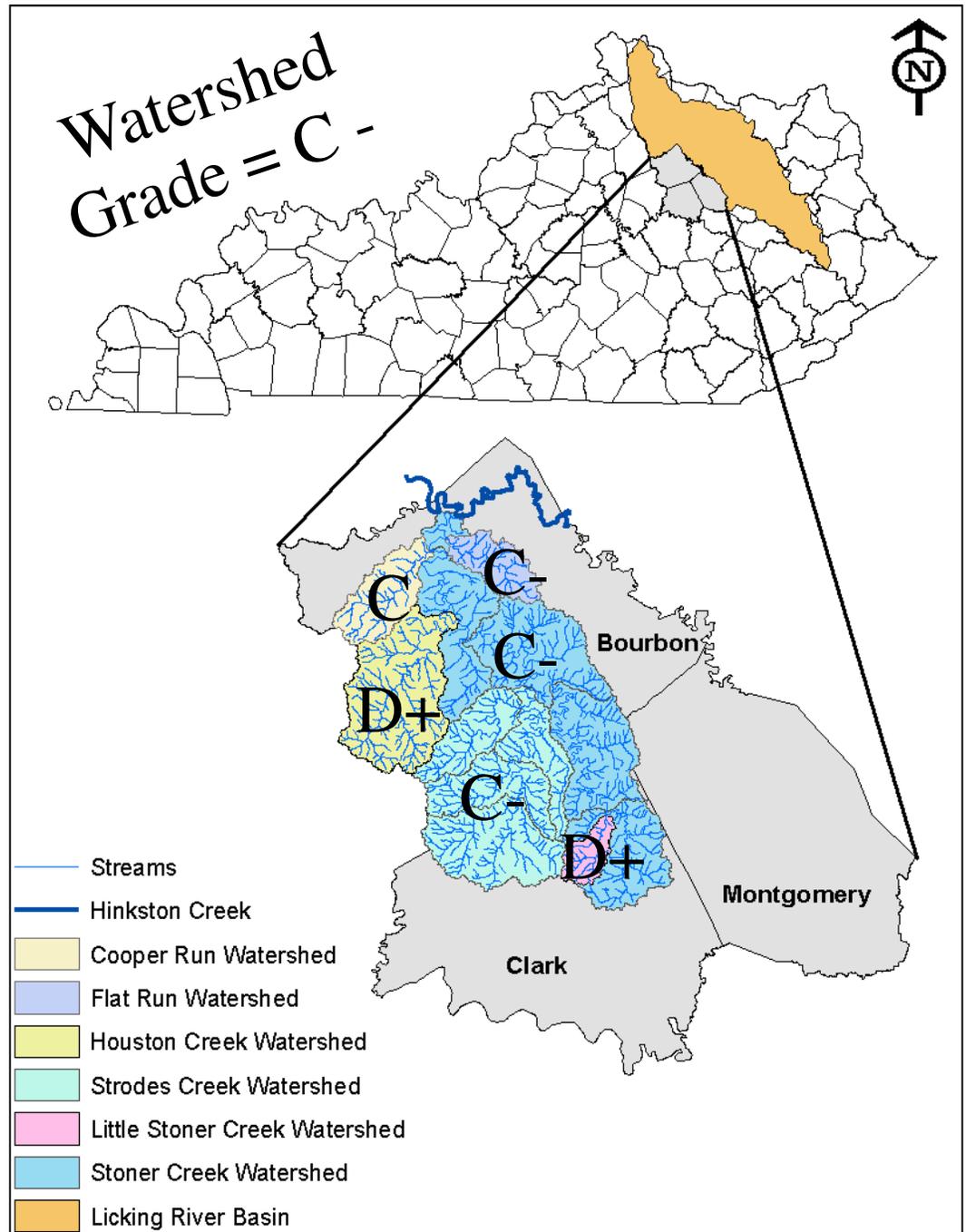
Department for Environmental Protection - Division of Water

The Kentucky Division of Water (DOW) is the state agency responsible for carrying out the requirements of the Clean Water Act to reach the goal of making all waters in Kentucky safe for swimming and fishing (called **designated uses**).

DOW has developed this health report to inform the residents of Clark and Bourbon counties of efforts to examine the health of the Stoner Creek Watershed. A **watershed** is an area of land where runoff flows to a common stream. When streams come together, the two streams' watersheds combine to make a larger watershed. In this report Stoner Creek, Little Stoner Creek, Houston Creek, Strodes Creek, Cooper Run and Flat Run, all of which combine to form the Stoner Creek Watershed, will be discussed.

Upon initial evaluation, it was determined that many stream segments within the Stoner Creek Watershed do not support the **uses** required by the Clean Water Act.

The U.S. Environmental Protection Agency (EPA) requires that states conduct watershed studies on all such waters to calculate the maximum amount of pollution a creek can receive and still be healthy. This amount is known as a **Total Maximum Daily Load**, or TMDL.



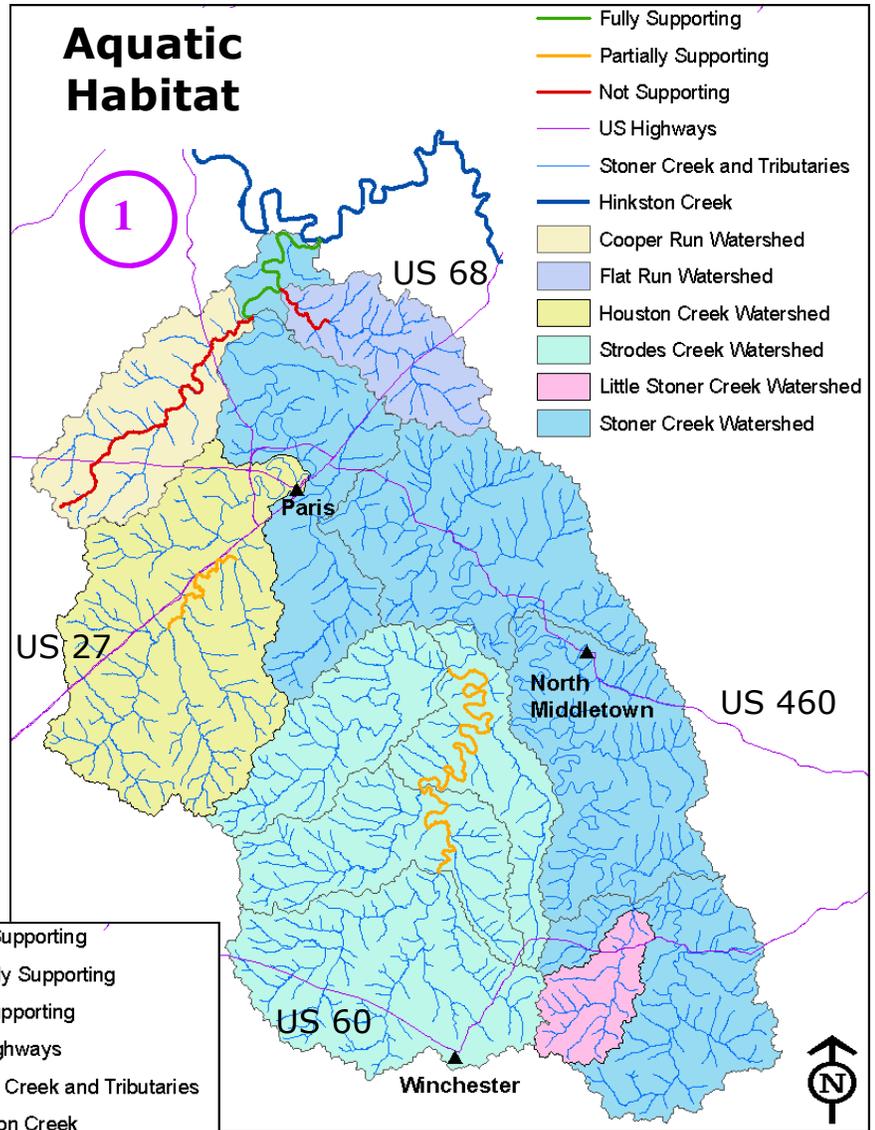
From 2004 through 2010, DOW biologists conducted year-long studies in each of the watersheds shown in the map above to gather scientific information. Based on this information, the division has given a "report card grade" of a **C-** to **Stoner Creek**, a **D+** to **Little Stoner Creek**, a **C-** to **Strodes Creek**, a **D+** to **Houston Creek**, a **C** to **Cooper Run**, a **C-** to **Flat Run** and a **C-** to the entire **Stoner Creek Watershed**. This health report explains where the impaired segments are located, describes the signs of health that went into assigning the grades for each watershed and provides information on how the grades can be improved.

# Impaired Waters

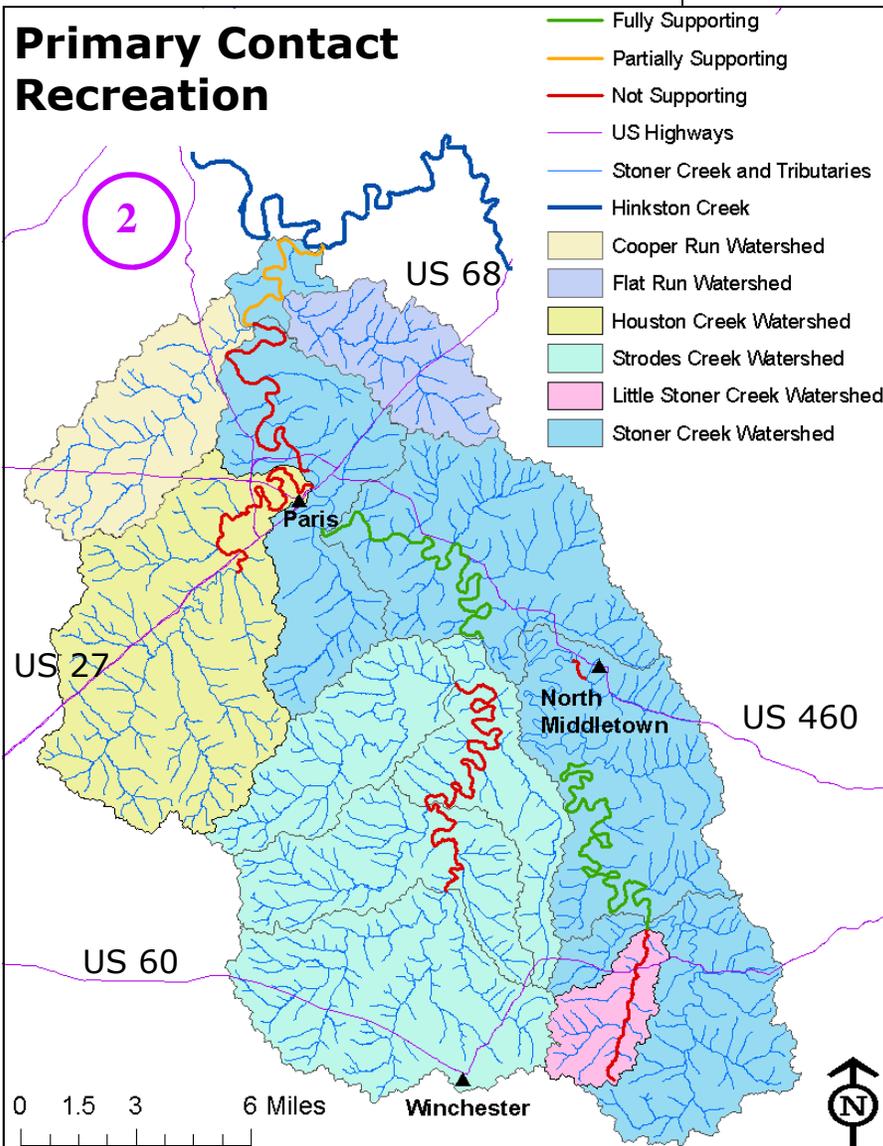
**Designated Uses** for Stoner Creek Watershed are **Aquatic Habitat (map 1)** - water quality promotes a healthy population of plants and animals that live in the water and **Primary Contact Recreation (map 2)** - water is safe for human swimming. In the maps on this page, segments that have been assessed are highlighted in **(1) green** if the water quality is good and the use is supported, **(2) orange** if the water quality is fair and the use is only partially supported and **(3) red** if the water quality is poor and the use is not supported. If a segment is blue, its uses have not yet been assessed.

**Impaired** waters are those that are highlighted in **orange** or **red** since the **designated use** is not fully supported. To be impaired for Aquatic Habitat, the fish and aquatic bug populations have reduced numbers or types. To be impaired for Primary Contact Recreation, bacteria concentrations exceeded the level considered safe for swimming at least 20 percent of the time from May through October.

## Aquatic Habitat



## Primary Contact Recreation



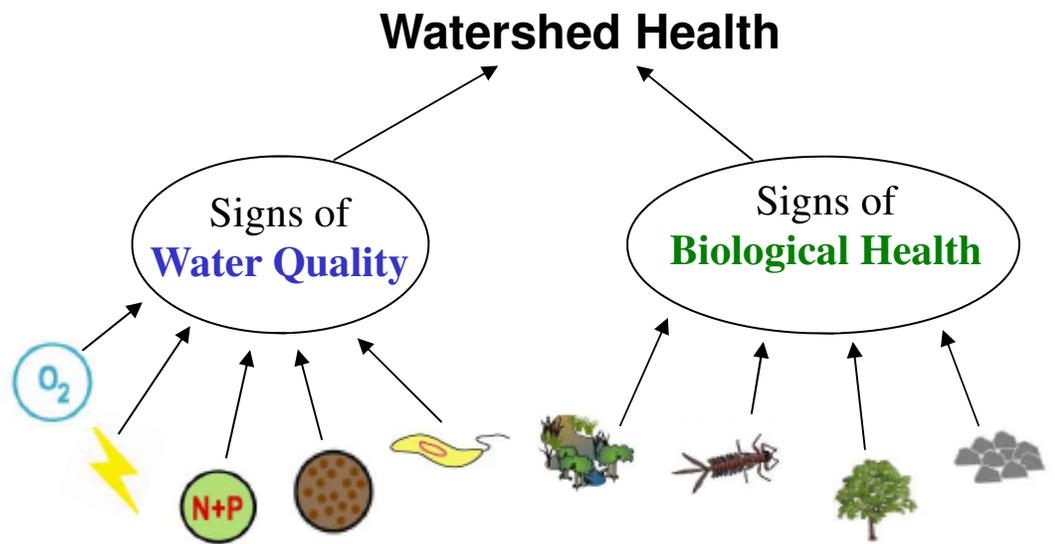
When it is determined that a waterbody is impaired, the pollutant that is causing the impairment is identified. Impaired waters are required to have a **Total Maximum Daily Load (TMDL)** calculated for each pollutant identified. A TMDL calculation is the total amount of pollutant (s) a waterbody can receive and still meet its **designated use(s)**.

A year-long water quality study is performed to collect the data required to calculate a TMDL. The water quality study focuses on collecting information that relates to signs of water quality and signs of biological health, which are described on the next page.

Stoner Creek, Cooper Run, Flat Run, Houston Creek, Strodes Creek and Little Stoner Creek are listed as impaired and were therefore studied from 2004 through 2010. A TMDL report for each watershed will be written as a result of these studies, which will be made available to the public with the goal of improving water quality.

## Grading System

1. Information collected was divided into signs of **water quality** or signs of **biological health**.
2. Each sign received a grade, A through F, according to the results of our study, which were compared to health and science requirements and DOW scientific information.
3. The grades from each biological health sign were averaged to achieve a biological health score.
4. Similarly, each sign of water quality was averaged to achieve a water quality score.
5. These two scores were averaged to achieve a **watershed health grade**.



The grades can also be used to compare **sites** or **signs**. For example, one site within a watershed may receive a higher grade than the other sites in that watershed, demonstrating its quality. Or, one sign may receive a higher grade than the other signs, demonstrating that aspect of watershed health is doing well.

## Signs of Water Quality



**Dissolved Oxygen (DO):** Concentration of oxygen dissolved in water and readily available to fish and other aquatic organisms.



**Specific Conductivity:** A measure of the ability of water to conduct an electrical current, which is used for approximating the total dissolved solids content of water. Low specific conductivity is desired, and increasing specific conductivity negatively impacts fish and aquatic bugs.



**Nitrogen and Phosphorus (Nutrients):** Although natural sources of nutrients exist, major sources of nutrient pollution are typically caused by man's activities and include municipal sewage-treatment plants, industrial outflows, commercial fertilizers and animal waste.



**E. Coli:** A type of bacteria that lives in the intestinal tract of man and other warm-blooded animals. For a site to receive an F, the *E. coli* concentration was above the level considered safe for swimming 80 to 100 percent of the time. Elevated concentrations of *E. coli* increase the risk of gastrointestinal illness if the water is swallowed or infection if contact is made with an open sore or wound.



**Total Suspended Solids (TSS):** A measure of the suspended solids in waterbodies. Suspended solids are small particles of solid pollutants that float on the surface of, or are suspended in, water. As TSS increase, fish and aquatic bugs experience stress and alter behavior.

## Signs of Biological Health



**Total Habitat:** Stream habitat is assessed by scoring 10 habitat signs, which are both living and nonliving parts of the surroundings that support an organism, population or community.



**Aquatic Macroinvertebrates (bugs):** An animal without a backbone, large enough to be seen with the naked eye. They are often the immature forms of insects that live on land as adults and are an important food source for fish. Different species prefer different habitats, and some are more tolerant of pollution than others.



**Riparian Zone:** A component of total habitat that is defined by the land adjacent to a stream that has distinct soil types and plant communities, which aid in absorbing water and shading the stream. To receive an A, the riparian zone must be at least 18 yards wide on each side of the stream.



**Available Cover:** A component of total habitat, which looks at the quantity and variety of structures in the creek that provide fish and bugs a place to hide, feed, reproduce and raise young. Examples include cobble and boulders, fallen trees, logs, branches, root mats, undercut banks and aquatic vegetation.

# Little Stoner Creek

Site #	Creek Name									Site Grade
1	Little Stoner Creek	D+	C		F					D
2	Tributary to Little Stoner Creek	D	B		D					C-
3	Little Stoner Creek	C+	C		F					D+
	<b>Sign Grade</b>	<b>C-</b>	<b>C+</b>		<b>F+</b>					

## Positives

At site 2, specific conductivity received a B, the best grade received. Along this tributary, there are fewer dissolved solids in the water, which contributes to good water quality.

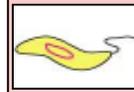
## Gray Area



DO and specific conductivity levels were outside their optimal ranges, which could negatively impact fish and aquatic bug communities.



## Negatives



*E. coli* levels were above the standard considered safe for swimming 80 to 100% of the time if the grade was an F, or 60 to 80% of the time if the grade was a D.

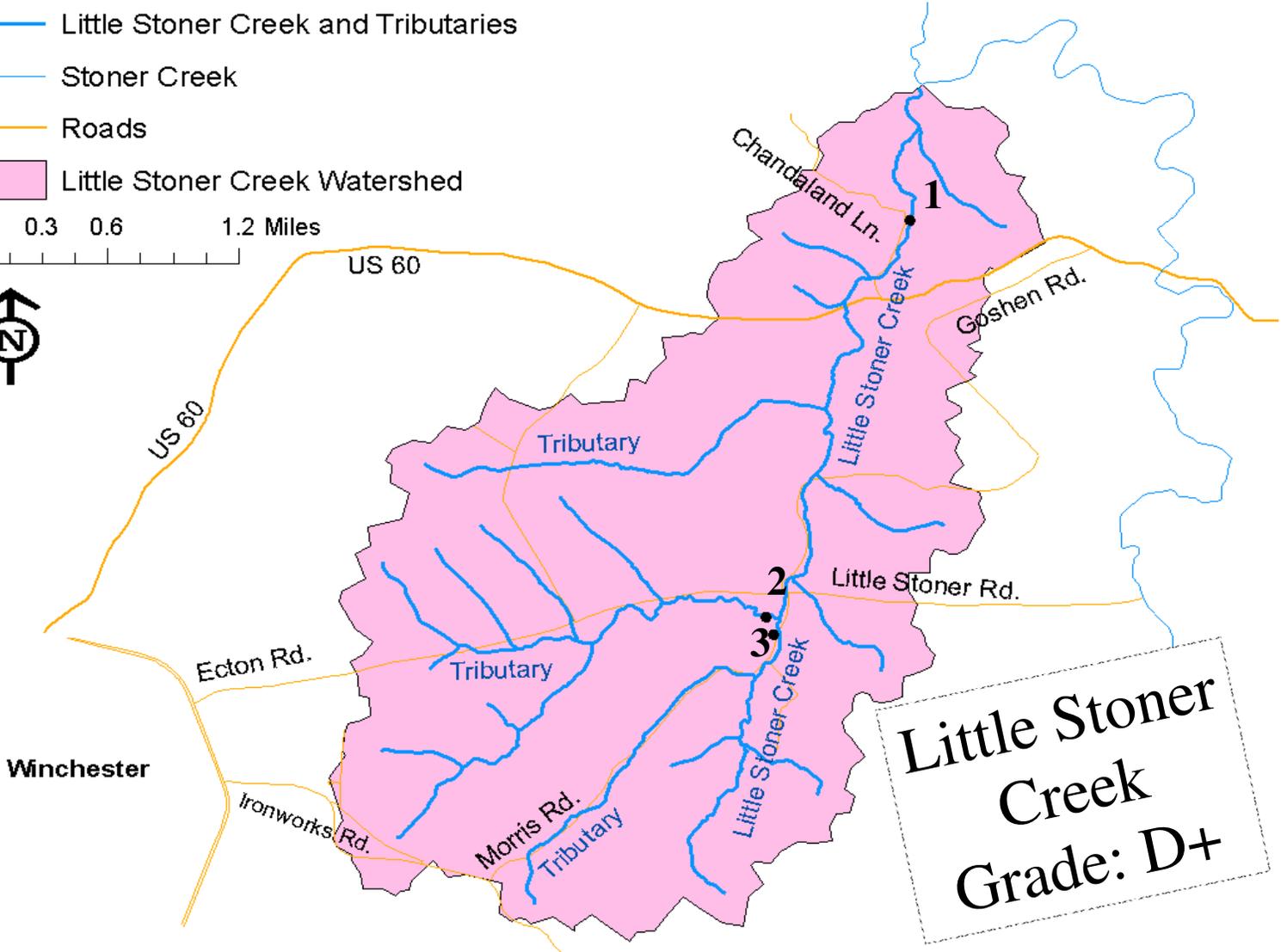
— Little Stoner Creek and Tributaries

— Stoner Creek

— Roads

Little Stoner Creek Watershed

0 0.3 0.6 1.2 Miles



# Strodes Creek

Site #	Creek Name									Site Grade
1	Strodes Creek	B	C	B-	D	F	D	F	D	D
2	Tributary to Strodes Creek	C	D	C+	C+	F	F	F	D	D
3	Tributary to Hancock Creek	B	B-	C	D+	F	D	C	D	D+
4	Hancock Creek	B	C	C-	C	F	D	B	C	D+
5	Hoods Creek	B-	D+	B-	C	F	D	F	F	D
6	Woodruff Creek	C	B	C+	C	F	D	F	D	D+
7	Pretty Run	C	B	C	D+	F	C	F	D	D
8	Green Creek					F	B	F	C	D+
9	Strodes Creek	B-	F+	D-	C-					D+
10	Hancock Creek	B	C+	C	C+					B-
11	Johnson Creek	B-	B+	C	D+	F	B	F	C	C-
12	Strodes Creek	C	D+	D	D+					D+
13	Strodes Creek	C-	D+	D+	B-	A	C	D	B	C
14	Green Creek	C-	B+	C+	C-	F	B	F	D	C
	<b>Sign Grade</b>	<b>C+</b>	<b>C</b>	<b>C</b>	<b>C</b>	<b>F+</b>	<b>C-</b>	<b>F+</b>	<b>D+</b>	

## Positives



DO levels, for the most part, were suitable for fish and bugs. Lower DO grades at a few sites (2, 6, 7, 12, 13, and 14) probably resulted from over growth of algae that occurs when loss of tree cover reduces stream shading and nutrients runoff into streams.

## Gray Area



For the most part, nitrogen and phosphorous levels were reasonable but rose following rain events due to pollution entering the stream with runoff, failing septic systems or wastewater treatment bypasses.

## Gray Area continued



Similarly, TSS levels rose following rain events due to a lack of vegetation and streamside grazing, which destabilizes stream banks, and development, which exposes sediment that can then be washed away.



Specific conductivity levels were outside their optimal ranges, which could negatively impact fish and bug communities since dissolved solids can interfere with normal behavior.



Bug communities averaged a C- throughout the Strodes Creek Watershed. A combination of increased nutrients, specific conductivity and TSS levels with reduced habitat, riparian zones and available cover is negatively impacting bug communities of Strodes Creek.

## Negatives



Available cover is greatly reduced throughout the watershed. Not only is available cover an important place for fish and bugs to live, feed, hide from predators and mate, it also provides habitat for beneficial bacteria, which are eaten by the bugs that are then eaten by the fish.



The width of the riparian zone was usually less than 6 yards. When trees are cut and banks are cleared algal communities bloom and water temperatures increase due to a lack of shade, banks become less stable, which increases erosion, and habitat for fish and bugs is reduced.



Habitat, which provides the building blocks for diverse groups of fish and bugs, was almost entirely absent, with every site receiving an F except for site 13, which received an A and was one of the best sites within the watershed.

## Habitat 101 Corner

- Compare the amount of instream material for aquatic bugs and fish to utilize for colonization, hiding and feeding.
- Compare the amount of food sources.
- Compare the amount of stream shading.
- Compare the number of stream bends, which slow water and reduce its energy, thereby reducing flood potential.
- Compare the stability of the banks.
- Compare the potential for sediment from the banks to erode when vegetative protection is lacking.

\*Photos from Barbour et al. 1999

## Optimal Range



## Poor Range

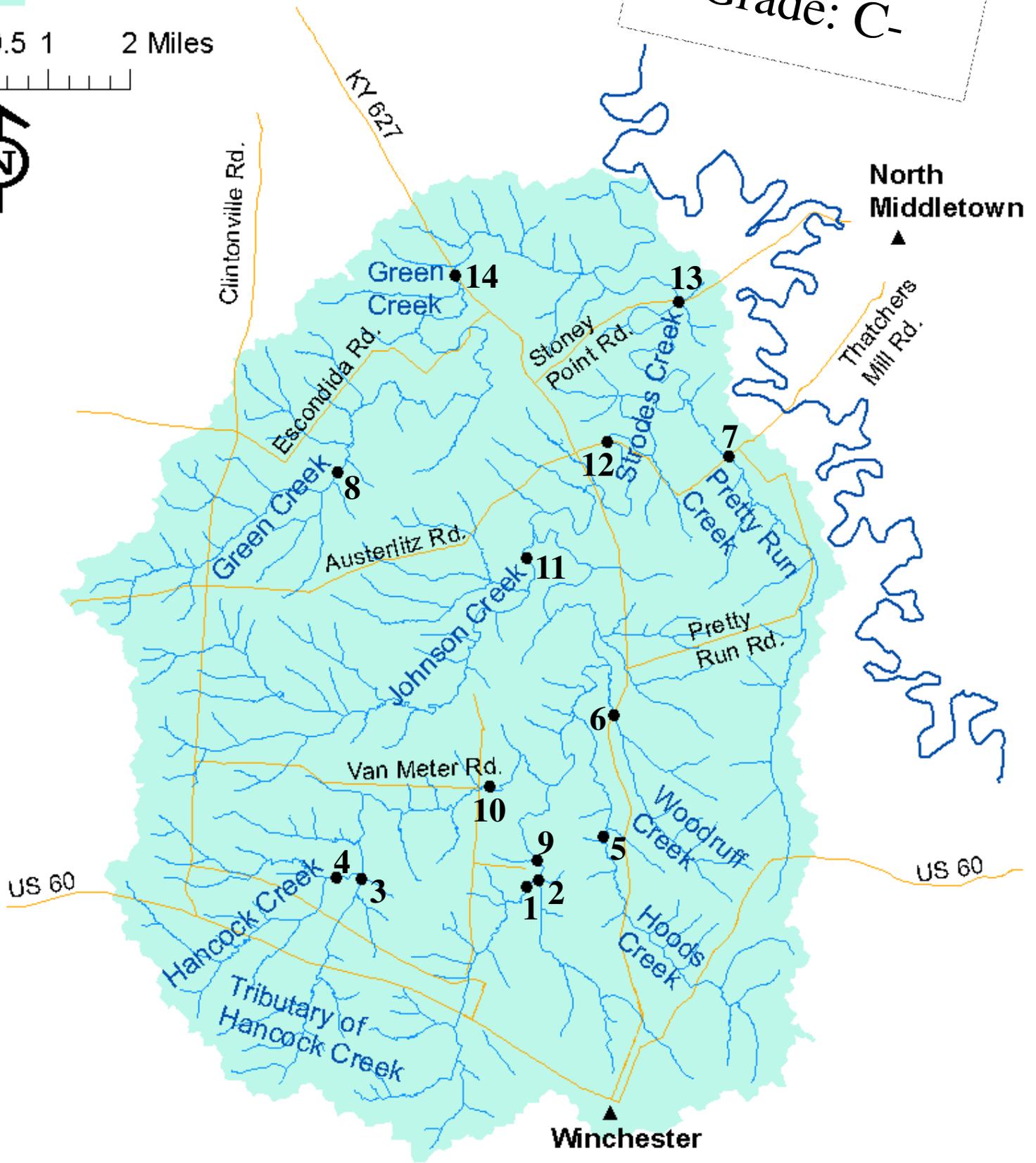


-  Roads
-  Stoner Creek
-  Strodes Creek and Tributaries
-  Strodes Creek Watershed

0 0.5 1 2 Miles



Strodes Creek  
 Grade: C-



# Houston Creek

Site #	Creek Name									Site Grade
1	Houston Creek	F	D	C	B	D	C	D	C	C-
2	Houston Creek	D	C	C	B					C
3	Houston Creek	B	B	C+	B	D	D	D	D	C
4	Houston Creek	F	B	C+	C	F	D	F	D	D
5	Hutchinson Creek	D	B	C	C	F	D	F	F	D
6	Tributary to Houston Creek	F	C+	C	C					C-
7	Tributary to Houston Creek	F	B	C+	D					C-
	<b>Sign Grade</b>	<b>D-</b>	<b>B-</b>	<b>C</b>	<b>C+</b>	<b>D-</b>	<b>D+</b>	<b>D-</b>	<b>D</b>	

## Positives



Specific conductivity was fairly good, indicating reasonably low dissolved solids throughout Houston Creek. However, a few sites (1, 2, and 6) had elevated levels of specific conductivity, indicating some type of discharge is increasing the dissolved solid content.

## Gray Area



For the most part, nitrogen and phosphorous levels were reasonable but rose following rain events due to pollution entering the stream with runoff or failing septic systems.



Similarly, TSS levels rose following rain events due to a lack of vegetation and streamside grazing, which destabilizes stream banks, and development, which exposes sediment that can then be washed away.

## Negatives



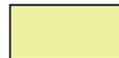
*E. coli* levels were above the standard considered safe for swimming 80 to 100% of the time if the grade was an F or 60 to 80% of the time if the grade was a D.



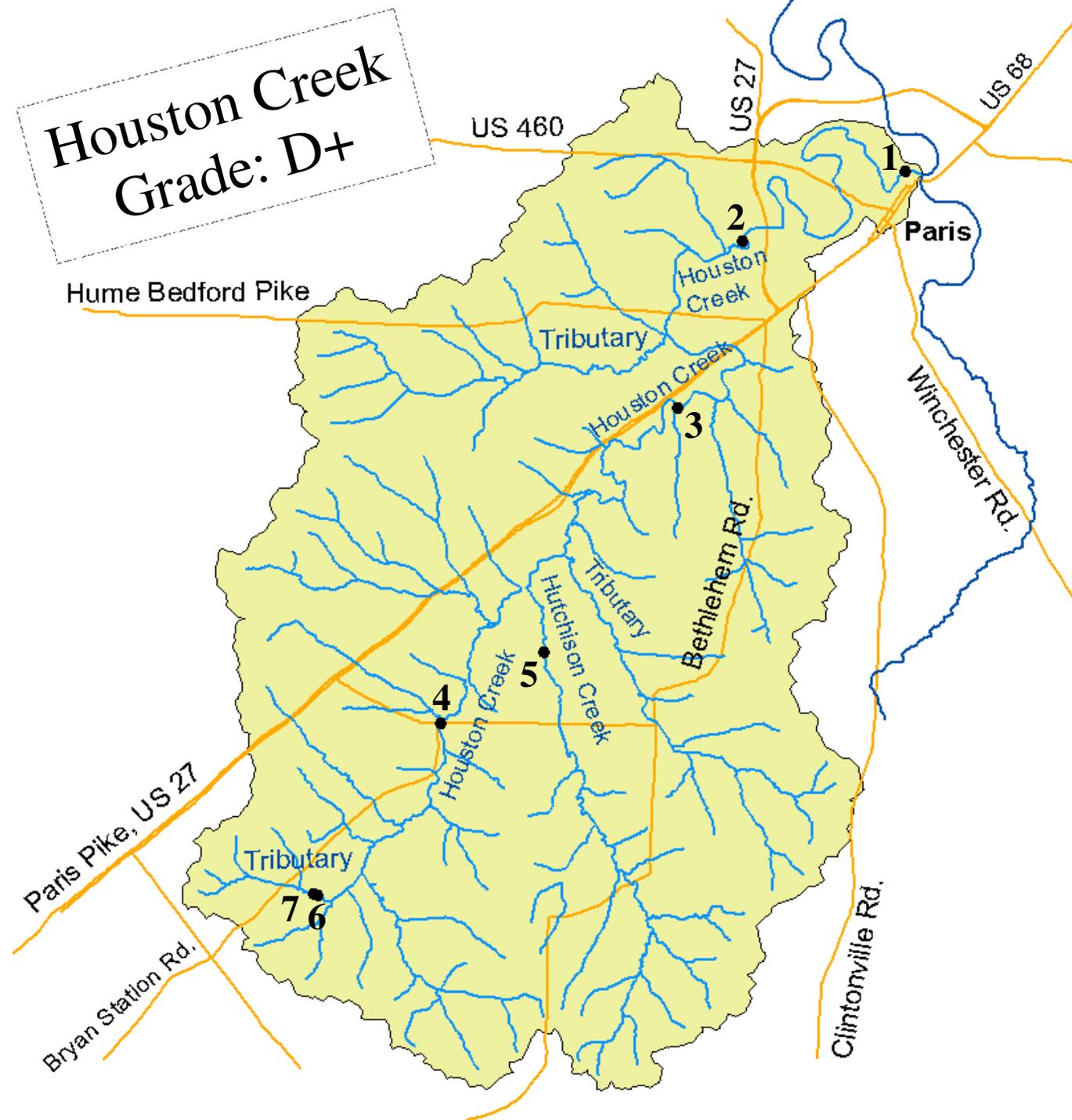
Available cover is greatly reduced throughout the watershed. Not only is available cover an important place for fish and bugs to live, feed, hide from predators and mate, it also provides habitat for beneficial bacteria, which are eaten by the bugs that are then eaten by the fish.



The width of the riparian zone was less than 6 yards if the site received an F or between 6 and 12 yards if the site received a D. When trees are cut and banks are cleared algal communities bloom and water temperatures increase due to a lack of shade, banks become less stable, which increases erosion, and habitat for fish and bugs is reduced.

-  Stoner Creek
-  Houston Creek and Tributaries
-  Roads
-  Houston Creek Watershed

0 0.5 1 2 Miles



**Negatives continued**



Habitat, which provides the building blocks for diverse groups of fish and bugs, was almost entirely absent. All sites received Ds and Fs in the Houston Creek Watershed.



Consequently, the bug communities were also poor throughout the watershed, receiving one C and three Ds. Without bugs to eat, many fish will leave the stream in search of food elsewhere.

# Cooper Run

Site #	Creek Name										Site Grade
1	Cooper Run	B-	B	C	F	B	B	B	C+	B	B-
2	Cooper Run	C	B	C	F	C+					C
3	Cooper Run	B	C+	C-	F	B-					C
4	Tributary to Cooper Run	D	B	C+	B	B					B-
5	Tributary to Cooper Run	C	C+	C	F	B-	F	C	F	D	D+
6	Tributary to Cooper Run	C	B	C	F	C					C
7	Cooper Run	B	B		D		A		D	B	C+
	<b>Sign Grade</b>	<b>C</b>	<b>B-</b>	<b>C</b>	<b>D-</b>	<b>B-</b>	<b>C+</b>	<b>C+</b>	<b>D</b>	<b>C+</b>	

## Positives

 Specific conductivity was fairly good, indicating reasonably low dissolved solids throughout Cooper Run. However, a couple sites (3 and 5) had elevated levels of specific conductivity, indicating poor land management.

 TSS levels were lower in the Cooper Run Watershed when compared to other tributaries of Stoner Creek, although higher levels were present at sites 2 and 5.

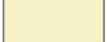
## Gray Area

 For the most part, nitrogen and phosphorous levels were reasonable but rose following rain events due to pollution entering the stream with runoff or failing septic systems.

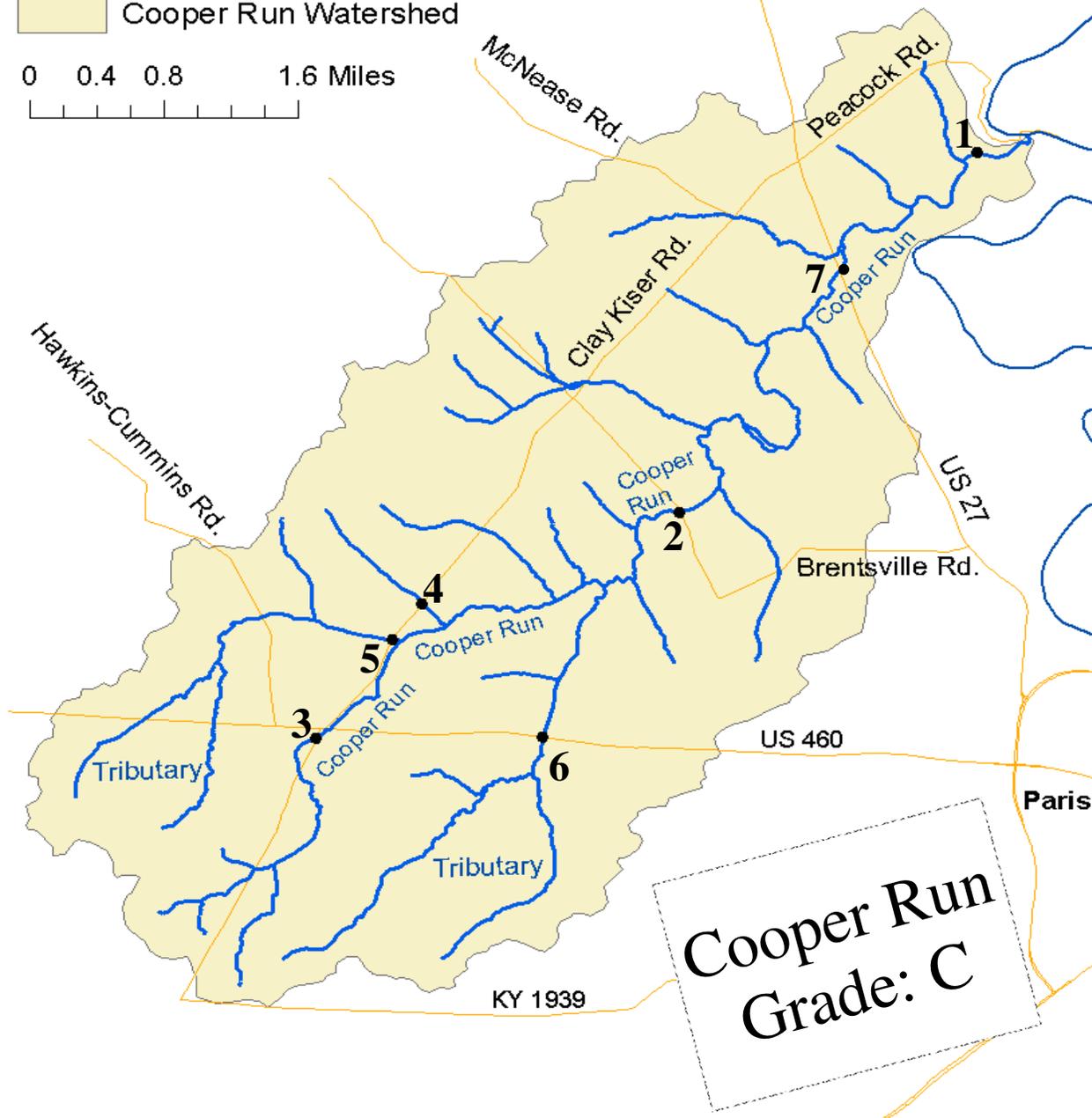
 DO levels at sites 1, 3 and 7 were suitable for fish and aquatic bugs. At the remaining sites, oxygen levels were less stable, indicating that an overgrowth of algae is causing extreme highs and lows in DO levels.

 Habitat was only measured at sites 1, 5 and 7 where they received a B, F and A. Habitat changed quickly in the Cooper Run Watershed. Sometimes it was suitable, while other times it was lacking or absent. The available cover and bug grades reflect these shifting levels of habitat, indicating the importance of habitat in biological health.

 As discussed above, available cover followed the same pattern as habitat. Available cover is especially important because it provides habitat for beneficial bacteria, which are eaten by the bugs that are then eaten by the fish.

-  Stoner Creek
-  Cooper Run and Tributaries
-  Roads
-  Cooper Run Watershed

0 0.4 0.8 1.6 Miles

### Gray Area continued



Aquatic bugs were only identified at sites 1 and 5 where they received a B and C. Degraded water quality and shifting habitat probably account for these mid-level grades.

### Negatives



*E. coli* levels were above the standard considered safe for swimming 80 to 100% of the time if the grade was an F or 60 to 80% of the time if the grade was a D.



The width of the riparian zone was less than half of what is considered ideal. When trees are cut and banks are cleared algal communities bloom and water temperatures increase due to a lack of shade, banks become less stable, which increases erosion, and habitat for fish and bugs is reduced.

# Flat Run

Site #	Creek Name										Site Grade
1	Flat Run	B	B	C+	F	B-					C+
2	Flat Run	B-	B	C+	D	B-	F	D+	F	D	C-
3	Flat Run	B	B-	C+	D	C	F	D	F	D	D+
4	Tributary to Flat Run	C+	C+	B-	F	C	F	C	F	F	D
5	Flat Run	B	C+	B-	F	C	F	C	F	C	C-
	<b>Sign Grade</b>	<b>B</b>	<b>B-</b>	<b>C+</b>	<b>F+</b>	<b>C+</b>	<b>F</b>	<b>C-</b>	<b>F</b>	<b>D</b>	

## Positives

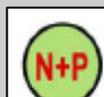


DO levels, for the most part, were suitable for fish and bugs. Lower DO grades at a few sites probably resulted from over growth of algae that occurs when loss of tree cover reduces stream shading and nutrients runoff into streams.



Specific conductivity was fairly good, indicating reasonably low dissolved solids throughout Flat Creek. However, a few sites (4 and 5) had elevated levels of specific conductivity, indicating poor land management.

## Gray Area



For the most part, nitrogen and phosphorous levels were reasonable but rose following rain events due to pollution entering the stream with runoff or failing septic systems.



Similarly, TSS levels rose following rain events due to a lack of vegetation and streamside grazing, which destabilizes stream banks, and development, which exposes sediment that can then be washed away.



Bug communities averaged a C- throughout the Flat Run Watershed. A combination of increased nutrients and TSS levels with reduced habitat, riparian zones, and available cover is negatively impacting bug communities of Flat Run.

## Negatives



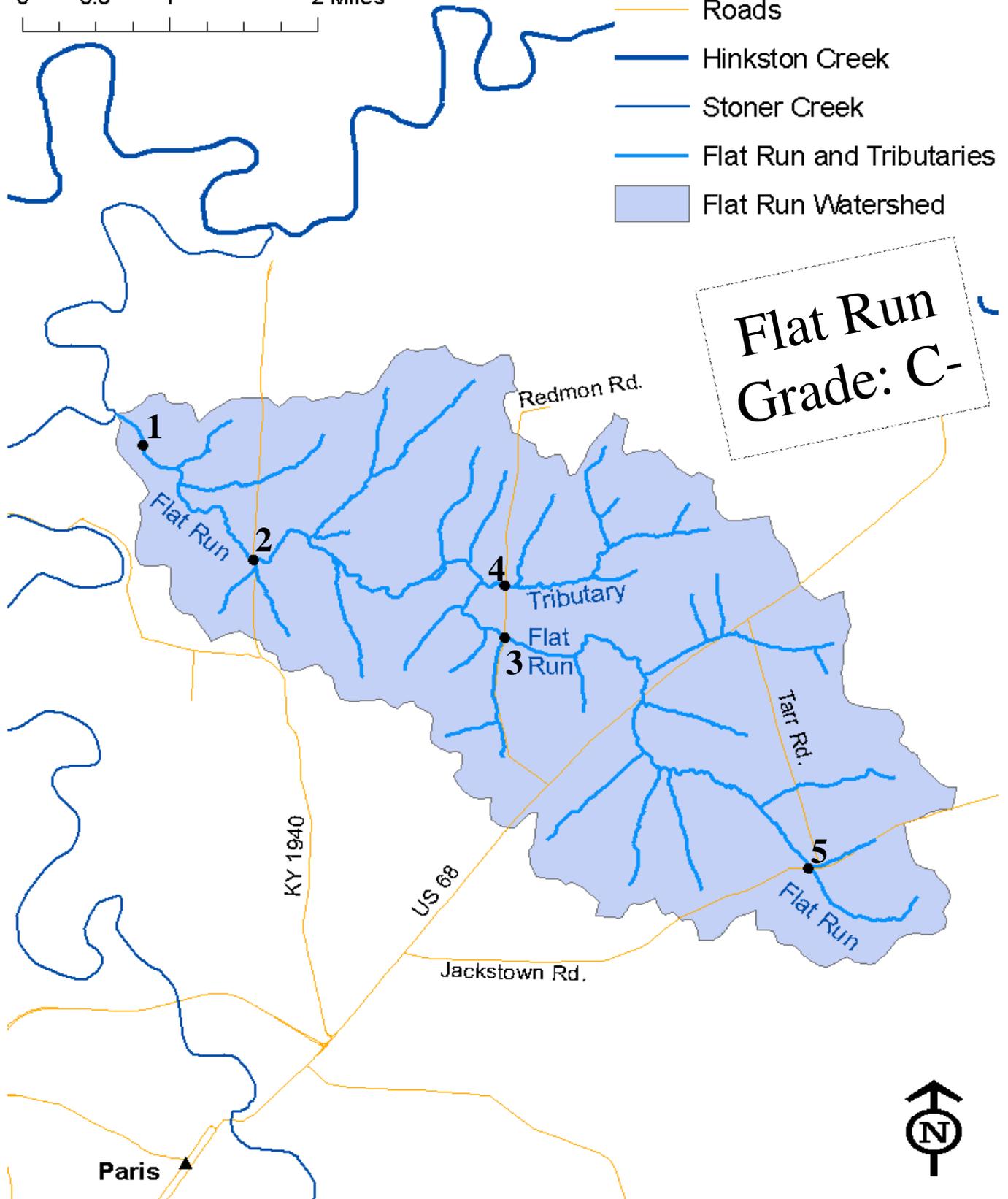
*E. coli* levels were above the standard considered safe for swimming 80 to 100% of the time if the grade was an F or 60 to 80% of the time if the grade was a D.



Available cover is greatly reduced throughout the watershed. Not only is available cover an important place for fish and bugs to live, feed, hide from predators and mate, it also provides habitat for beneficial bacteria, which are eaten by the bugs that are then eaten by the fish.



- Roads
- Hinkston Creek
- Stoner Creek
- Flat Run and Tributaries
- Flat Run Watershed



### Negatives continued



Habitat, which provides the building blocks for diverse groups of fish and bugs, was entirely absent; every site within the Flat Run Watershed received an F.



The riparian zone was also entirely absent within the Flat Run Watershed; every site received an F. When trees are cut and banks are cleared algal communities bloom and water temperatures increase due to a lack of shade, banks become less stable, which increases erosion, and habitat for fish and bugs is reduced.

# Stoner Creek

Site #	Creek Name									Site Grade
1	Stoner Creek	C+	B-		C	C	B	B	C	C+
2	Stoner Creek	C	C+		C	F		D	C	C-
3	Kennedy Creek	C+	B		C	F		F	F	D+
4	Stoner Creek	C	C+		B	F		D	C	C-
5	Stoner Creek	C-	B		D	F		C	D	D+
	<b>Sign Grade</b>	<b>C</b>	<b>B-</b>		<b>C</b>	<b>F+</b>	<b>B</b>	<b>D+</b>	<b>D+</b>	

## Positives



Specific conductivity was fairly good, indicating reasonably low dissolved solids throughout Stoner Creek. However, a few sites (2 and 4) had elevated levels of specific conductivity, indicating some type of discharge or poor land management is increasing the dissolved solid content.

## Gray Area



*E. coli* levels were lower in the Stoner Creek Watershed when compared to its tributaries, although higher levels were present at site 5. *E. coli* levels were above the standard considered safe for swimming 40 to 60% of the time if the grade was a C or 20 to 40% of the time if the grade was a B.



DO levels were consistently at the C grade level throughout the Stoner Creek Watershed. These suboptimal oxygen levels have the potential to negatively affect fish and aquatic bugs.



Aquatic bugs were only collected at Site 1, where they received a B. Site 1 also received the highest site, habitat and riparian zone grades in the watershed. Therefore, it is likely that the aquatic bug communities at the other sites, which had lower site, habitat and riparian zone grades would have also had lower aquatic bug grades.

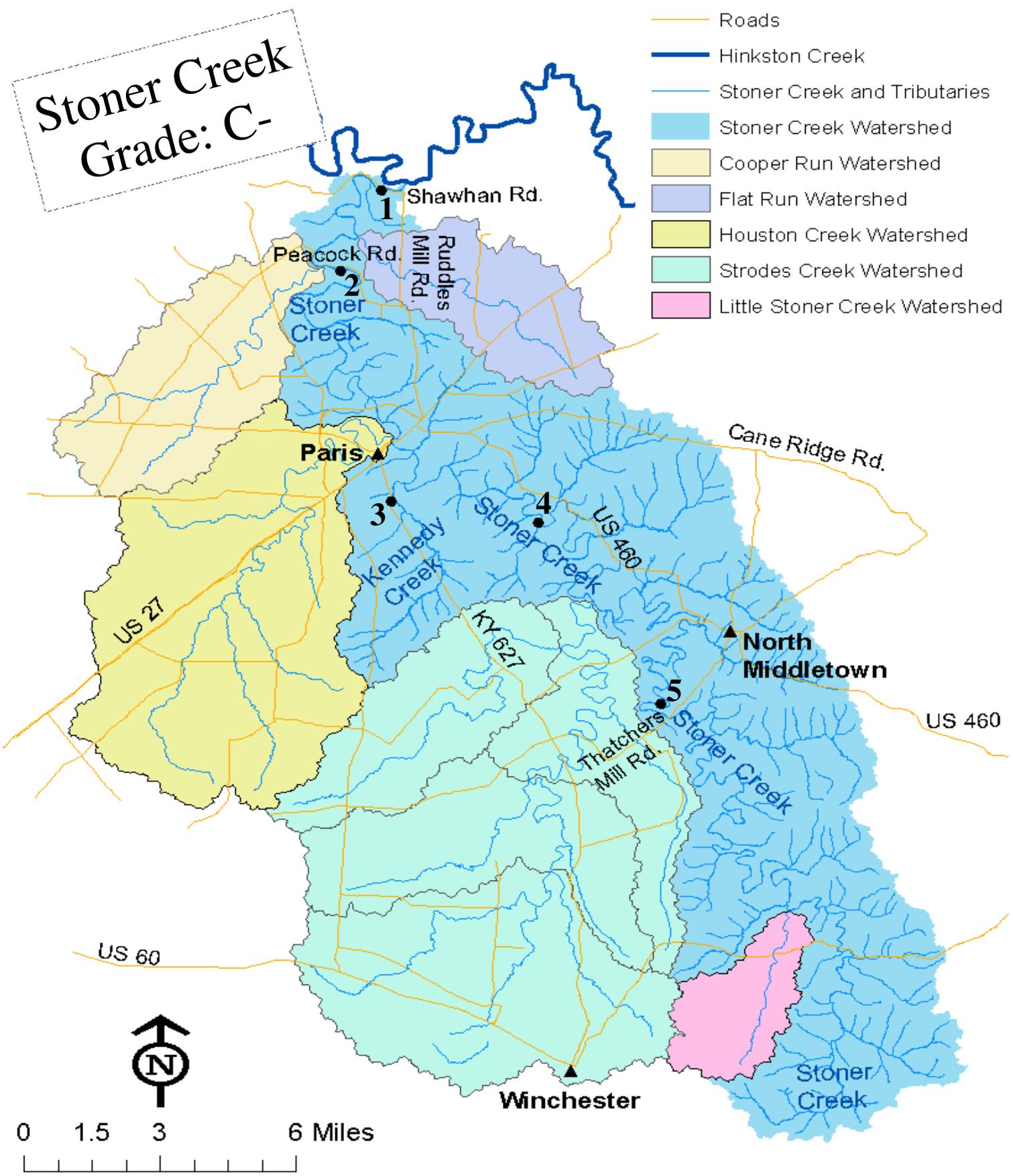
## Negatives



Habitat, which provides the building blocks for diverse groups of fish and bugs, was almost entirely absent. All sites received an F except for site 1, which received a C.



The extent of the riparian zone shifted throughout the Stoner Creek Watershed, receiving grades B through F. On average, the riparian zone was between 6 and 12 yards wide, equating to a D+. When trees are cut and banks are cleared algal communities bloom and water temperatures increase due to a lack of shade, banks become less stable, which increases erosion, and habitat for fish and bugs is reduced.



**Negatives continued**



Available cover is greatly reduced throughout the Stoner Creek Watershed. Not only is available cover an important place for fish and bugs to live, feed, hide from predators and mate, it also provides habitat for beneficial bacteria, which are eaten by the bugs that are then eaten by the fish.

## Summary: Room for improvement, but some have more work to do than others

**Best Site:** Cooper Run site 1, located on Peacock Road, which received Bs in all categories except for *E. coli* (F), Riparian Zone (C+) and nutrients (C).

**Best Watershed:** Cooper Run Watershed was the healthiest watershed, receiving a C. However, Cooper Run has room for improvement, especially when it comes to its *E. coli* and habitat scores.

**Best Sign:** Specific Conductivity was the sign of watershed health that consistently received the highest grade, demonstrating that the dissolved solid content of Stoner Creek's waterways was near normal levels.

**Worst Site:** Tied between Houston Creek's site 5, a tributary called Hutchinson Creek, located off a private drive in Bourbon County, and Strodes Creek site 2, a tributary located off a farm road above the Winchester Wastewater Treatment Plant.

**Worst Watershed:** Houston Creek Watershed, with a majority of its signs of watershed health being listed as negatives.

**Worst Sign:** A tie between Total Habitat and *E. coli*. Stream habitat was consistently lacking, which reduces the types and numbers of fish and bugs that can live there. Additionally, at all sites in all watersheds, *E. coli* levels were consistently above the level considered safe for swimming.

## What can you do?

- Make every effort to **protect the good** that remains. Work with local government and land owners to protect areas that are less degraded and improve land management to minimize further degradation.
- **Trees are the best way to protect and restore water quality and biological health.**
  - ◇ Leave in place or establish vegetation alongside streams to provide natural filters that stabilize stream banks, minimize erosion, regulate water flow, provide shade, retain sediment and absorb excess nutrients.
  - ◇ Plant trees and do not mow within 18 yards of the stream bank.
- **To keep water safe for swimming**, keep animals out of the streams, which will limit the amount of animal waste entering the waterways, reduce excess nutrients and protect habitat.
- **To improve habitat**, allow fallen trees, logs, leaves, gravel, cobble and boulders to remain in the stream to create habitat for fish and bugs to feed, find refuge and reproduce.
- **To reduce TSS**, maintain streamside vegetation, plant cover crops, install settling ponds, reduce animal access to streamside grazing and guard waterways during construction activities.
- **To reduce nutrients**
  - ◇ Use chemicals and pesticides according to labels and fertilizers based on soil test results. Limit uses and store and dispose of properly.
  - ◇ Report failing septic systems.
  - ◇ Reduce runoff by increasing pervious surfaces and by installing filter strips, rain barrels or rain gardens.
  - ◇ Properly dispose of pet waste.
  - ◇ Keep animals out of the stream.
- Keep grass clippings, petroleum products, trash, and litter out of storm drains; this material enters the stream directly without treatment.
- Service your vehicle regularly to prevent oil and antifreeze leaks and reduce noxious emissions.
- Become a certified citizen **volunteer** water quality monitor or establish a program in your local community or watershed.

## Where to go for more information

### Making changes at home and work

- Bluegrass PRIDE at [www.bgpride.org/gallery1.htm](http://www.bgpride.org/gallery1.htm)

### Volunteering

- Watershed Watch in Kentucky at [water.ky.gov/wsw/Pages/default.aspx](http://water.ky.gov/wsw/Pages/default.aspx) or contact Jo Ann Palmer at 800-928-0045 or [JoAnn.Palmer@ky.gov](mailto:JoAnn.Palmer@ky.gov)

### Purchasing or planting native trees and plants

- Division of Forestry: [forestry.ky.gov/Pages/default.aspx](http://forestry.ky.gov/Pages/default.aspx)
- Kentucky Native Plant Society: [www.knps.org/plant\\_resources.html](http://www.knps.org/plant_resources.html)

### Grants and Programs

- KY's Nonpoint Source (Runoff) Pollution program: [water.ky.gov/nsp/Pages/default.aspx](http://water.ky.gov/nsp/Pages/default.aspx)
- KY's Natural Resource Conservation Service: [www.ky.nrcs.usda.gov/](http://www.ky.nrcs.usda.gov/)
- KY's 319 Grant program: [water.ky.gov/Funding/Pages/NonpointSource.aspx](http://water.ky.gov/Funding/Pages/NonpointSource.aspx) or contact James Roe at 502-564-3410 or [James.Roe@ky.gov](mailto:James.Roe@ky.gov)
- Hinkston Creek Watershed Protection Project: <http://www.hinkstoncreek.org/index.html>
- KY's Department of Agriculture **free** farm chemical collections: <http://www.kyagr.com/consumer/envsvs/technical/FarmChemicals.htm>