



Kentucky Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601

Phone: 502-564-3410
Website: <http://water.ky.gov/waterquality/Pages/TMDLHealthReports.aspx>

Sulphur Creek Watershed Health Report

This watershed health report is an educational tool to relay scientific information to a general audience; it does not represent, and should not replace, assessments for the Integrated Report (IR). For assessment specific information, please refer to the IR at <http://water.ky.gov/waterquality/Pages/IntegratedReport.aspx>

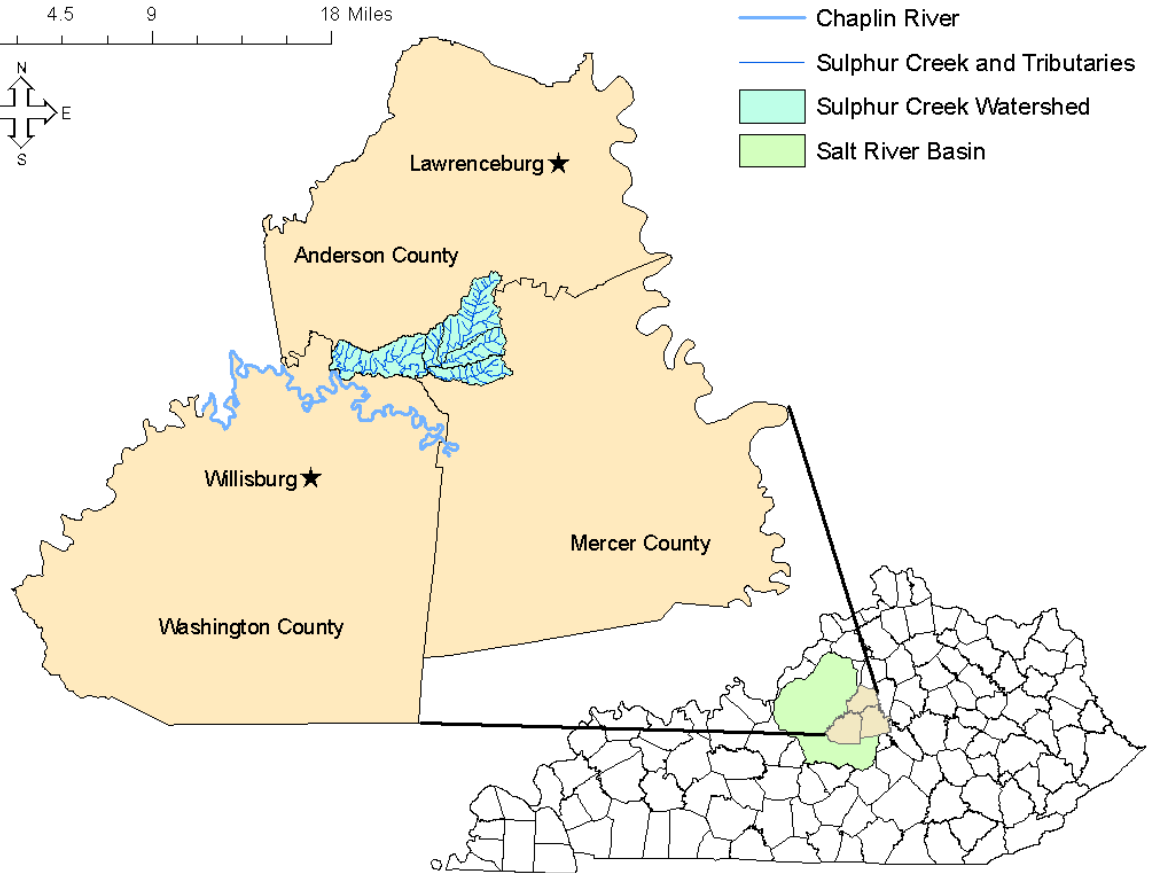
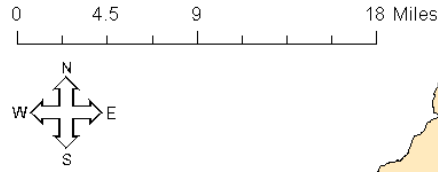
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In the 1960s government officials started to realize how polluted streams, rivers and lakes of the U.S. had become. In 1972, Congress passed laws, known as **The Clean Water Act (CWA)**, to protect surface water. The goal of the CWA is for all waters in the U.S. to be safe for swimming, fishing and drinking (called **uses**).

We all affect the cleanliness of water, known as **water quality**, because we all live in a 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. Many small creeks, such as Cheese Lick and Brush Creek, flow into Sulphur Creek. Eventually, Sulphur Creek flows into the Chaplin River, which flows into the Salt River, and is therefore part of the Salt River Basin Watershed (see map above).

From 2012-13 Kentucky Division of Water (KDOW) biologists conducted a watershed study of Sulphur Creek to gather scientific information. Based on this information, KDOW has given a "report card grade" of **C+** to the **Sulphur Creek Watershed**. This health report 1) describes the indicators of water quality and biological health that went into assigning the grades, 2) demonstrates what the strengths and weaknesses are at each site and on a watershed scale, and 3) provides information on how water quality and biological health can be improved.

In the future, data collected for this project could be used to develop a pollutant reduction strategy to direct water quality improvement efforts. This strategy could be in the form of a Total Maximum Daily Load (TMDL), or an alternative to a TMDL, depending on community interest. If you are interested in working with the KDOW in efforts to improve water quality in Sulphur Creek, please contact the Salt River Basin Coordinator, Emily Hogue, at 502-564-3410, ext. 4936.

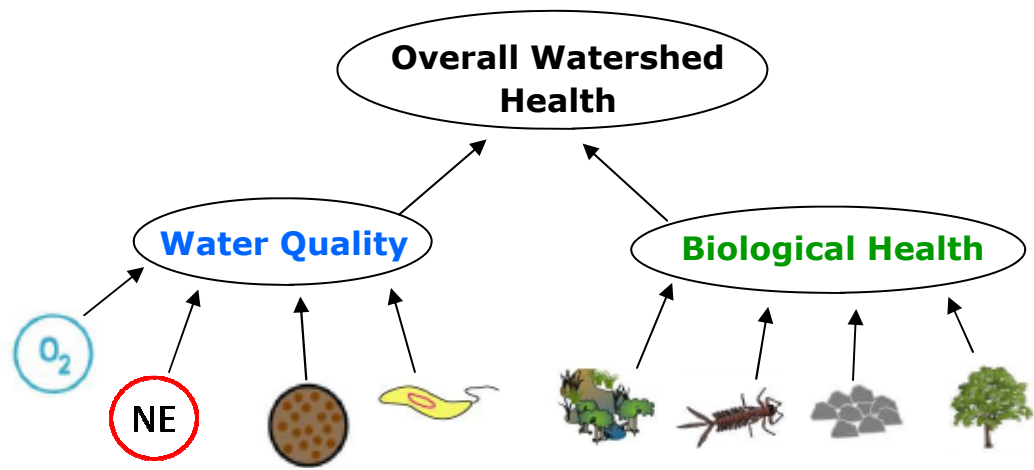


Created by: Katie McKone, KDOW (2/3/2012)

Sulphur Creek Watershed Overall Grade: C+		
	Dissolved Oxygen	A-
	Nutrient Enrichment	C+
	E. Coli	D
	Sediment	B
	Total Habitat	C
	Macroinvertebrates	B-
	Riparian Zone	C
	Available Cover	B

How did Sulphur Creek get these grades?

1. Much like a school report card, information was collected during our study about different "subjects" related to the health of Sulphur Creek. These subjects were separated into two groups that are used as indicators of water health (**Water Quality**) and stream life (**Biological Health**). Each indicator subject and its icon are explained below.
2. The information collected for each indicator was compared to health and science requirements or Division of Water scientific information. Each indicator received a grade, A through F, based on how well it met the requirements.
3. The grades for each water health indicator were combined to get a **Water Quality** grade.
4. The grades for each stream life indicator were combined to get a **Biological Health** grade.
5. The Water Quality grade and the Biological Health grade were then combined to get the **Overall Watershed Health** grade for Sulphur Creek.



For more specific information about the grading process, please visit <http://water.ky.gov/waterquality/Pages/TMDLHealthReports.aspx>

Water Quality



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



Nutrient Enrichment: Although natural sources of nutrients exist, human activity is a major source of nutrient pollution, including municipal sewage treatment plants, industrial outflows, failing septic systems, commercial fertilizers and animal waste. For this report, two forms of organic nutrients, Total Organic Carbon (TOC) and Total Kjeldahl Nitrogen (TKN), were analyzed for indication of nutrient enrichment.

E. coli: A type of bacteria that lives in the intestinal tract of humans and other warm-blooded animals. Sources of bacteria can be from point or non-point sources. Point sources enter the stream directly from a pipe, ditch or other type of conveyance, such as a wastewater treatment plant outfall. Non-point sources enter the stream when rain carries pollutants from the landscape to a waterway.



Sediment: Soil, sand and minerals washed from land or stream banks into water, usually after rain. Sediment can be suspended in the water column, making the water turbid, or it can deposit on the stream bottom when water flow slows and loses energy.

Biological Health



Total Habitat: Stream habitat is assessed by scoring 10 habitat indicators, 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 both sides 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 aquatic 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.

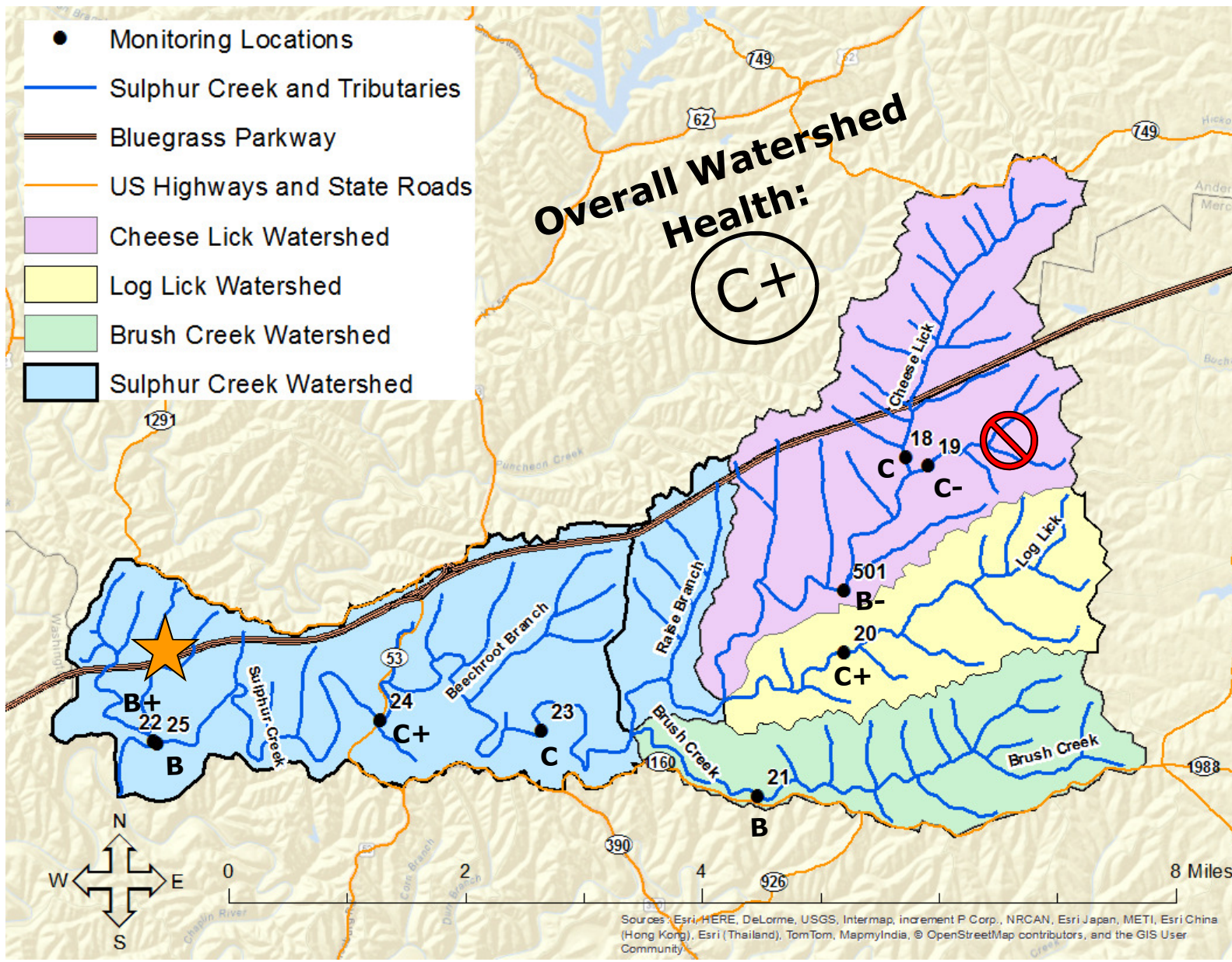


Best in Show: An unnamed tributary to Sulphur Creek, site 22, had the highest overall grade of a B+. All "subjects" received an A or a B, except for *E. coli*, which received a D. Good water quality and habitat are helping support a healthy biological community. However, reducing *E. coli* levels would help this site achieve an A overall.



Worst in Show: An unnamed tributary to Cheese Lick, site 19, had the lowest overall grade of a C-. It received an F for *E. coli*, and was the only site to receive a grade in the D range for sediment. Except for oxygen, all subjects received a C+ or lower. Improvement in the water quality and the habitat would help improve biological health.

Creek Name (Site #)	 O ₂	 NE							Site Grade
Cheese Lick (501)	A	C+	D	B	A	D	B	C	B-
Cheese Lick (18)	A	C+	F	C+	C	D	B	C	C
Cheese Lick Tributary (19)	B	C+	F	D+	C	D	C	D	C-
Log Lick (20)	A	B	D	B	B	D	C	D	C+
Brush Creek (21)	A	B	D	A	B	C	B	C	B
Sulphur Creek Tributary (22)	A	B	D	A	B	A	B	A	B+
Sulphur Creek (23)	B	C	D	B	C	D	C	C	C
Sulphur Creek (24)	B	C+	D	C+	C	D	B	B	C+
Sulphur Creek (25)	B	C+	D	B	B	A	A	B	B
Subject Grade	A-	C+	D	B	B-	C	B	C	



Dissolved oxygen (DO) was in the A or B range at every site visited in the Sulphur Creek watershed.

Therefore, dissolved oxygen levels are appropriate to support aquatic communities such as fish and bugs.

Sediment was in the A or B range at 6 of the 9 sites visited in the Sulphur Creek watershed, demonstrating that sediment loads were not negatively impacting these sites. However, 2 sites (18 and 24) received a C+ and 1 site (19) received a D+. A reduction in sediment loads at these sites would probably benefit the aquatic community and overall water quality.

Available Cover was in the A or B range at 6 of the 9 sites visited in the Sulphur Creek watershed, demonstrating that available cover was suitable at a majority of the sites. However, 3 sites (19, 20 and 23) were in the C range and the aquatic communities would probably benefit from improved cover.

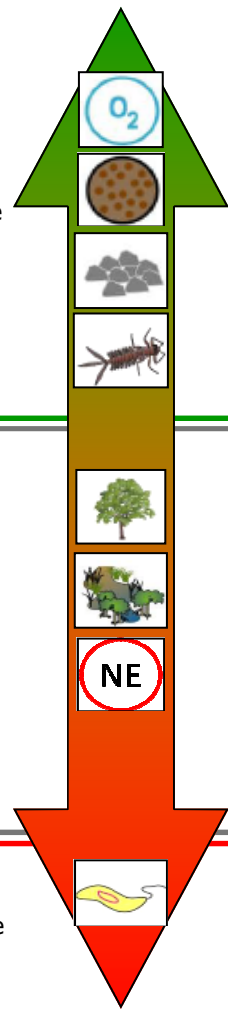
Aquatic macroinvertebrates (bugs) scored 1 A, 4 Bs and 4 Cs. The aquatic macroinvertebrate community seems to be on the cusp between good and fair, tipping toward good during the sampling time frame. However, the macroinvertebrate community seems vulnerable to further water quality degradation and habitat alteration, which should be taken into consideration when determining load reductions, watershed alteration, and development.

The Riparian Zone was in the C or D range at 6 of the 9 sites visited in the Sulphur Creek watershed, while 3 sites were in the A to B range. No site received an F, which means that some type of riparian zone is intact at all sites visited. All riparian zones should be protected; a shaded stream has cooler water temperatures and less sunlight to enhance algal growth, while trees and their roots help stabilize banks and provide important habitat for fish and bugs.

Habitat received 6 Ds, 1 C and 2 As. The two sites that received an A (22 and 25) are located in the lower part of the watershed where a wildlife management area has been established. This lower portion of the watershed is the most forested and also coincided with the best overall habitat scores. This area is very important to the overall health of the watershed and should be protected and maintained.

Nutrient Enrichment received 6 C-range grades and 3 Bs. Evidence of nutrient enrichment on a watershed scale is present. Considering the land cover of the Sulphur Creek watershed, the enrichment is likely related to non-point sources and linked to bacterial inputs. Although not in the negative range yet, improving this indicator of water quality would help improve the overall health of the Sulphur Creek watershed.

E. coli levels were above the standard considered safe for swimming between 40% (D) and 90% (F) of the time, depending on the site. The overall score was a D, making this the lowest scoring indicator. The source of *E. coli* is most likely non-point, since *E. coli* levels were highest after rain events. When *E. coli* levels are elevated, there is an increased risk of gastrointestinal illness if the water is swallowed, or an infection if contact is made with an open sore or wound. Therefore, use caution swimming or wading in Sulphur Creek and its tributaries after rain events.



What can you do?

- **Protect the good** that remains. Work with local government and land owners to protect areas that are less degraded. Practice responsible land management and development to minimize further degradation.
- **Trees and other plants protect and restore Water Quality and Biological Health.**
 - ◊ Leave in place or establish trees and other vegetation along streams to provide natural filters that stabilize stream banks, minimize erosion, regulate water flow, provide shade, retain sediment, absorb excess nutrients and provide habitat.
 - ◊ Do not mow to the edge of a stream. Leave a buffer of trees and other vegetation at least 18 yards wide along the stream bank.
 - ◊ Allow fallen trees, logs, leaves, gravel, cobble and boulders to remain in the stream to create habitat for fish and macroinvertebrates to feed, find refuge and reproduce.
 - ◊ Minimize streamside grazing by animals.
- **To reduce sediment and/or nutrient inputs**
 - ◊ Maintain streamside vegetation.
 - ◊ Plant cover crops.
 - ◊ Install settling ponds.
 - ◊ Reduce animal access to streamside grazing.
 - ◊ Guard waterways during construction activities.
 - ◊ Have your soil tested and apply fertilizers according to the results of the soil test. Apply pesticides according to label directions. Check the weather before applying fertilizers and pesticides to be sure they will be absorbed before it rains.
- **To keep water safe for swimming**
 - ◊ Maintain functional septic systems and replace failing septic systems.
 - ◊ Pick up after your pets. Dispose of animal waste properly.
 - ◊ Reduce animal access to streamside grazing.
- **Other Tips**
 - ◊ Keep grass clippings and petroleum products out of storm drains. This material enters the stream directly without treatment.
 - ◊ Dispose of trash and recyclables properly.
- **Volunteer**
 - ◊ Become a citizen water quality monitor by joining Kentucky Watershed Watch. Visit water.ky.gov/wsw/Pages/default.aspx or contact Jo Ann Palmer at 800-928-0045 or JoAnn.Palmer@ky.gov
 - ◊ Organize a creek clean-up to remove litter along and within Sulphur Creek.
- **Education and Resources**
 - ◊ Making decisions with water quality in mind: Bluegrass Greensource at www.bggreensource.org
 - ◊ Kentucky Agricultural Water Quality Act: www.bae.uky.edu/awqpt/background.htm
 - ◊ KY's Nonpoint Source (Runoff) Pollution program: water.ky.gov/nsp/Pages/default.aspx
 - ◊ Like "Kentucky Watershed Health Reports" on Facebook.
 - ◊ Visit our webpage for all watershed health reports: <http://water.ky.gov/waterquality/Pages/HealthReports.aspx>

