

The Development Process and Methods for the Blue River Report Card

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October 2019

Community Connections

Category Description

Community Connections reflects the community's knowledge of the river and the benefits of a healthy watershed. This category also assesses the community's engagement with restorative environmental efforts.

Indicators in the Category

Two indicators were selected to best represent Community Connections. The two indicators are: 1) Behavior and 2) Awareness. The Behaviors indicator reflects individual behaviors that directly impact the watershed. The Awareness indicator reflects the community's awareness of local stormwater, rainwater, and river health knowledge.

Category Score

50% of the category score is the *Behaviors* score and 50% of the category score is the *Awareness* score. For the Community Connections grade, the following percentages received the following letter grades:

90-100% = A 89-80 = B 79-70% = C 69-60% = D 59 and below = F

This year the Community Connections Category scores and grade results were as follows:

Watershed	Behavior %	Behavior Grade	Awareness %	Awareness Grade	Total %	Total Grade
Upper	72.76	C	67.85%	D	70.95%	C
Middle	72.64	C	61.05%	D	68.39%	D
Lower	73.33	C	65.57%	D	70.48%	C
Entire	72.74	C	64.45%	D	69.69%	D

All Indicators

For both indicators, we used a selection of survey questions from the 2018 MARC Community Planning Survey. The survey is a biennial effort started in 2003. The survey is part of an ongoing effort to measure the impact that water quality education efforts in the region are having on the public's overall awareness and behavior. The survey provides a benchmark for objectively evaluating water quality education initiatives overtime.

MARC's survey was designed to measure the entire metro area. For the Blue River Report Card, we used zip codes to isolate the survey respondents from the Upper, Middle, and Lower Blue River. Due to narrowing the scope of the original survey, these results do not meet the high level of accuracy the entire survey holds. This will hopefully be corrected in future years.

Partnering with MARC and with ETC Institute's permission, we were able to obtain all of the answers to the five survey questions for those that lived in the Blue River Watershed. In order to isolate just those survey respondents that live in the watershed, we relied on zip codes. Because each zip code is not fully in the watershed, we weighted each zip code to the percentage of that zip code being in the watershed. Below are the zip codes we used for each section of the watershed as well as how many survey respondents in each zip code.

Lower: 64123,64124,64125,64126, 64127, 62128, 64129, 64130, 64133

Middle: 64109,64110,64111,64112, 64113, 64114, 64128, 64129, 64130, 64131, 64132, 64133, 64314, 64137, 64138, 64192, 66202,66204, 66205, 66208

Upper: 64114,64131, 64137, 64145, 64146, 64030, 64012, 66215, 66214, 66212, 66206, 66207, 66208, 66209, 66210, 66211, 66213, 66221, 66223, 66224, 66805, 66062, 66013, 66083

Watershed	Upper	Middle	Lower	Total
Number of Survey Respondents	116	125	21	262

Behaviors Indicator

Indicator Selection

The five questions from the MARC survey used in the Behavior Indicator are below.

Question 9. Have you or other members of your household disposed of yard waste (including grass clippings) in the street, a stormwater drain, or a lake/stream during the past year?

___ (1) Yes ___ (2) No ___ (9) Don't know

Question 10. Have you or other members of your household dumped paint, motor oil, or other household waste into the street, a stormwater drain, or a lake/stream during the past year?

___ (1) Yes ___ (2) No ___ (9) Don't know

Question 11. Have you or other members of your household littered or dumped debris along or in a lake or stream during the past year?

___ (1) Yes ___ (2) No ___ (9) Don't know

Question 14. Please indicate if you currently participate in the behavior listed below by circling YES or NO. ... 2. Pick up trash in your community [Yes] [No]

Question 15. Have you or other members of your household done anything to help clean-up lakes or streams in the Kansas City area during the past year?

___ (1) Yes [Answer 15a-b.] ___ (2) No [Skip to Q16.] ___ (9) Don't know [Skip to Q16.]

Indicator Thresholds and Scoring

For all questions, the answers that promote watershed health were given one point and the incorrect answers or unknowns given 0 points. All of the correct answers for the five questions were then totaled up and divided by the total number of answers to produce the percentage of total correct answers.

Question 9. Have you or other members of your household disposed of yard waste (including grass clippings) in the street, a stormwater drain, or a lake/stream during the past year?

___ (1) Yes ___ (2) No ___ (9) Don't know

Answers that promote watershed health: No

Question 10. Have you or other members of your household dumped paint, motor oil, or other household waste into the street, a stormwater drain, or a lake/stream during the past year?

___ (1) Yes ___ (2) No ___ (9) Don't know

Answers that promote watershed health: No

Question 11. Have you or other members of your household littered or dumped debris along or in a lake or stream during the past year?

___(1) Yes ___(2) No ___(9) Don't know

Answers that promote watershed health: No

Question 14. Please indicate if you currently participate in the behavior listed below by circling YES or NO. ... 2. Pick up trash in your community [Yes] [No]

Answers that promote watershed health: Yes

Question 15. Have you or other members of your household done anything to help clean-up lakes or streams in the Kansas City area during the past year?

___(1) Yes [Answer 15a-b.] ___(2) No [Skip to Q16.] ___(9) Don't know [Skip to Q16.]

Answers that promote watershed health: Yes

The following graph is the number of answers that promote watershed health as well as total answers and the Indicator score for each watershed section.

	Upper Watershed	Middle Watershed	Lower Watershed	Total Watershed
Question 9	110	119	18	247
Question 10	114	125	19	258
Question 11	115	125	21	261
Question 14	65	72	14	151
Question 15	18	13	5	36
Total Watershed Positive Answers	422	454	77	953
Total Answers	580	625	105	1310
Indicator Scores (Positive answers/Total answers)	72.58	72.64	73.33	72.75

Awareness Indicator

Indicator Selection

The three questions from the MARC survey used in this indicator are below.

Question 13. Do you think you can personally do anything to help improve water quality in lakes, streams and other waterways in the Kansas City area?

___ (1) Yes ___ (2) No ___ (9) Don't know

Question 18. Where does stormwater (rain water) go after it enters a storm drain in your community?

___ (1) Directly to lakes and streams without treatment
___ (2) To lakes and streams after receiving some treatment
___ (3) To a wastewater treatment plant
___ (9) Don't know

Question 19. Compared to two years ago, would you say you...

___ (1) Are more aware of the water quality of lakes and streams in the Kansas City area
___ (2) Have about the same level of awareness about water quality issues
___ (3) Are less aware of the water quality of lakes and streams in the Kansas City area
___ (4) Not applicable (did not live in Kansas City two years ago)

Indicator Thresholds and Scoring

For all questions, the answers that promote watershed health were given one point and the incorrect answers or unknowns given 0 points. All of the correct answers for the five questions were then totaled up and divided by the total number of answers to produce the percentage of total correct answers.

Question 13. Do you think you can personally do anything to help improve water quality in lakes, streams and other waterways in the Kansas City area?

___ (1) Yes ___ (2) No ___ (9) Don't know

Answer that promotes watershed health: Yes

Question 18. Where does stormwater (rain water) go after it enters a storm drain in your community?

___ (1) Directly to lakes and streams without treatment
___ (2) To lakes and streams after receiving some treatment
___ (3) To a wastewater treatment plant
___ (9) Don't know

Answer that promotes watershed health: 1, 2, and 3. If the respondent knew where their stormwater goes, it was assessed as a correct answer since the watershed has multiple forms of drainage, including combined and separated sewer systems.

Question 19. Compared to two years ago, would you say you...

___ (1) Are more aware of the water quality of lakes and streams in the Kansas City area
___ (2) Have about the same level of awareness about water quality issues
___ (3) Are less aware of the water quality of lakes and streams in the Kansas City area
___ (4) Not applicable (did not live in Kansas City two years ago)

Answer that promotes watershed awareness: 1 and 2. We subtracted the number of respondents that answered "Not Applicable" to the total answers for this question.

The following graph is the number of answers that promote watershed health as well as total answers and the Indicator score for each watershed section.

Indicator Questions	Upper Watershed	Middle Watershed	Lower Watershed	Total Watershed
Question 13	14	56	58	128
Question 18	70	62	9	141
Question 19	102	103	17	222
Total Watershed positive Questions	230	221	40	491
Total Answers	339	362	61	762
Indicator Scores (Positive answers/Total answers)	67.85	61.05	65.58	64.44

Development Category

Category Description

Development is the action of converting land to different uses, primarily altering forests, prairies, and wetlands to create residential and commercial centers. Development plays a critical role in the lives and livelihoods of many people in the Blue River Watershed, that is why it is vitally important to find environmentally friendly development practices to allow our communities to grow through sustainable land use. These environmentally friendly practices include saving existing trees, improving forests around our streams and rivers, as well as protecting green space to improve the health and wellness of our communities. This category uses indicators specifically selected to monitor the progress of environmentally friendly development practices and sustainable land use change.

Indicators in the Category

Three indicators were selected to best represent current and future development practices in the Blue River Watershed: (1) the amount of impervious cover within 1,000ft of streams and rivers (see pg.2), (2) the sum of protected open space (see pg.3), and (3) the amount of tree cover (see pg.4).

Category Score

The final score for the development category is a summation of equal score rankings from the above three indicators (each indicator weighted as 1/3 of total score). The category grades were determined using the following rubric.

Percentage	80 - 100%	60 - <80%	40 - <60%	20 - <40%	0 - <20%
Letter Grade	A	B	C	D	F

The 2019 Development Category scores and grade results are as follows:

Watershed	Indicator 1		Indicator 2		Indicator 3		TOTAL
	Percent of Impervious Cover	Grade	Percentage of Protected Open Space	Grade	Percentage of Tree Cover	Grade	Grade
Upper	27.75%	C	6.23%	C	26.60%	D	C (43.33%)
Middle	30.28%	D	8.37%	A	36.48%	A	B (70.00%)
Lower	32.32%	D	4.18%	F	30.48%	B	D (36.66%)
OVERALL	30.12%	D	6.26%	C	31.31%	B	C (50.00%)

Indicator #1: Impervious Cover

Indicator Selection

For this indicator we evaluated the percentage of impervious cover both near streams and across the entire watershed. It was determined that the best results for good development practices would be to analyze the percentage of impervious cover within 1,000 feet of a stream or river. This was an important distinction for us to make as impervious cover is expected to continue growing as land is developed for residential and commercial land uses. However, areas in the floodplain or in near proximity to streams and rivers should be protected from development and impervious land covers (streets, buildings, roads, etc). As the example results below indicate, watersheds that developed earlier in the region's history (Headwaters Indian Creek) have a higher percentage of impervious cover near streams and rivers, while those that are still developing (Headwaters Blue River) have a lower percentage.

Example Subwatersheds	Total Watershed Impervious Cover	Grade	Impervious Cover within 1,000 ft of stream	Grade
Headwaters Indian Creek	47.70%	F	49.42%	F
Headwaters Blue River	20.11%	C	10.77%	B

The data sets used for this indicator analysis were provided by the Mid America Regional Council as part of the Natural Resource Inventory Landsat data. GIS was then used to further assess the data sets and hone the results to look at small to large watersheds in the Blue River.

Indicator Thresholds and Scoring

The threshold developed for this indicator was created by modifying the Center for Watershed Protection’s watershed protection toolbox. The modification to the previously created scoring system consisted of expanding impervious cover percentages to incorporate the A-F grading rubric required for an Eco Score Card.

Grade	Indicator 1: Impervious Cover w/in 1,000ft of a stream
A (80 - 100%)	0.00 - 10.00%
B (60 - <80%)	10.01 - 20.00%
C (40 - <60%)	20.01 - 30.00%
D (20 - <40%)	30.01 - 40.00%
F (0 - <20%)	>40.00%

Below are the 2019 results for the first indicator, impervious surface within 1,000ft of a stream.

Report Card Watersheds	HUC 12 Subwatersheds	% Impervious Cover (HUC12s)	HUC12 Grade	% Impervious Cover (Report Card Watersheds)	Report Card Grade
Lower	Outlet Blue River	32.32%	D	32.32%	D
Middle	Brush Creek - Blue River	30.28%	D	30.28%	D
Upper	Headwaters Indian Creek	49.05%	F	27.75%	C
	Indian Creek (Tomahawk)	40.40%	F		
	Camp Branch - Blue River	19.81%	B		
	Headwaters Blue River	10.77%	B		

Indicator #2: Protected Open Space

Indicator Selection

For this indicator we evaluated the percentage of protected open space across all watersheds compared to the total area of each watershed. Protected open space is any area with land covered primarily in natural and/or maintained vegetation that is protected from future development through lawful dedication by a local, state or federal government and open to the public or is held under a conservation easement. We determined certain types of dedicated open space to meet these goals as the following: community parks, municipally owned golf courses (certified by the Audubon Society), greenways, greenspace, historical parks, green corridors, neighborhood parks, regional parks and zoos. Though these areas may include aspects of impervious cover or other land uses on their property, the intent of these

areas is to provide the region and local communities with natural, open spaces to improve the well being and health, while also preventing land uses changes that would further degrade the watershed.

The data sets used for this indicator analysis were provided by the Mid America Regional Council as part of the Park Inventory data and information provided by the Nature Conservancy of Kansas and the Conservation Fund. GIS was then used to further assess the data sets and hone the results to look at small to large watersheds in the Blue River.

Indicator Thresholds and Scoring

The threshold developed for this indicator were created through a statistical distribution of 2019 results and thorough assessment of trends and goals in new additions to protected open space across the Blue River Watershed. This scoring rubric takes into account the planned future dedication of parks and conservation easements to best incentivize expanding protected open spaces throughout the Blue River Watershed.

Grade	Indicator 2:Protected Open Space
A (80 - 100%)	>7.50%
B (60 - <80%)	6.51 - 7.50%
C (40 - <60%)	5.51 - 6.50%
D (20 - <40%)	4.51 - 5.50%
F (0 - <20%)	0.00 - 4.50%

Below are the 2019 results for the second indicator, protected open space.

Report Card Watersheds	HUC 12 Subwatersheds	% Protected Open Space (HUC12s)	HUC12 Grade	% Protected Open Space (Report Card Watersheds)	Report Card Grade
Lower	Outlet Blue River	4.18%	F	4.18%	F
Middle	Brush Creek - Blue River	8.37%	A	8.37%	A
Upper	Headwaters Indian Creek	5.17%	D	6.23%	C
	Indian Creek (Tomahawk)	4.38%	F		
	Camp Branch - Blue River	6.69%	B		
	Headwaters Blue River	7.80%	A		

Indicator #3: Tree Cover

Indicator Selection

For this indicator we evaluated the percentage of tree cover across all watersheds compared to watershed areas. Tree cover includes all types of natural tree land covers and urban planted trees which line our streets and shade our homes. Tree cover plays a vitally important role in the health and wellbeing of our communities. Trees provide shade for our homes and streets, they prevent stormwater runoff, and provide habitat in areas devoid of other natural habitats. The original intent of this indicator was to quantify the tree cover that is only occurring in urban/built out areas of the watersheds. Upon further

evaluation, it was determined that all watersheds have significant urban/built out portion that made it statistically significant to compare tree cover across subwatersheds and the entire Blue River.

The data sets used for this indicator analysis were provided by the Mid America Regional Council as part of the Natural Resource Inventory Landsat data. GIS was then used to further assess the data sets and hone the results to look at small to large watersheds in the Blue River.

Indicator Thresholds and Scoring

The threshold developed for this indicator was created through a statistical distribution of 2019 results and thorough assessment of a goal set out for urban tree cover (35%) in the Kansas City Metro. What is important to note in the results is that the more natural, less developed watersheds show lower tree cover results when compared to built out watersheds near the heart of downtown Kansas City, MO. These undeveloped watersheds in the Upper reaches of the Blue River have an agricultural history that has left trees only along streamways and intermittent channels. This indicator shows a good dichotomy between development practices that have increased harmful impervious surfaces, but also increased beneficial tree cover in highly urban environments.

Grade	Indicator 3: Tree Cover
A (80 - 100%)	>35.00%
B (60 - <80%)	30.01 - 35.00%
C (40 - <60%)	27.51 - 30.00%
D (20 - <40%)	20.00 - 27.50%
F (0 - <20%)	0.00 - 20.00%

Below are the 2019 results for the first indicator, impervious surface within 1,000ft of a stream.

Report Card Watersheds	HUC 12 Subwatersheds	% Protected Open Space (HUC12s)	HUC12 Grade	% Protected Open Space (Report Card Watersheds)	Report Card Grade
Lower	Outlet Blue River	30.84%	B	30.84%	B
Middle	Brush Creek - Blue River	36.48%	A	36.48%	A
Upper	Headwaters Indian Creek	25.65%	D	26.60%	D
	Indian Creek (Tomahawk)	29.62%	C		
	Camp Branch - Blue River	31.27%	B		
	Headwaters Blue River	19.92%	F		

Governance Category

Category Description

From its headwaters in Johnson County, Kansas, to its outlet in Kansas City, Missouri, the Blue River and its tributaries flow through two states, five counties, and 20 cities. The laws of these government entities and the entities willingness to collaborate with each other affect the health of

the watershed and, consequently, the health of the people within and downstream of the watershed. This category monitors the entities' adoption of ordinances and collaborative efforts to protect the watershed.

Indicators in the Category

Two indicators make up the Governance Category: (1) the counties' and cities' *Ordinances* that impact watershed health (see page 2) and (2) the status of *collaborative watershed governance* in the watershed (see page 3).

Category Score

50% of the category score is the *Ordinances* score and 50% of the category score is the *Collaborative Watershed Governance* score. For the Governance Category grade, the following percentages received the following letter grades:

80-100% = A 60-79% = B 40-59% = C 20-39% = D 0-19% = F.

This year the Governance Category scores and grade results were as follows:

Watershed	Ordinances %	Ordinance Grade	Collaborative Watershed Governance %	Collaborative Watershed Governance % Grade	Total %	Total Grade
Upper	69.32	B	0	F	34.66	D
Middle	76.09	B	0	F	38.045	D
Lower	76.47	B	0	F	38.235	D
Entire	71.51	B	0	F	35.755	D

Indicator #1: Ordinances

Indicator Selection

We evaluated six ordinances that impact watershed health: (1) adoption of the American Public Works Association (APWA) 5600 manual, (2) adoption of the APWA Best Management Practices (BMP) Manual, (3) stream setback ordinance, (4) pollution prevention ordinance, (5) native plant ordinance, and (6) noxious weed ordinance that makes an exception for native plants.

We gathered data on each of the six above ordinances for the twenty cities four counties with unincorporated land within the watershed. (See the pie charts on pages 4 and 5 for the percentage each city and county controls in the Blue River Watershed and in the Upper, Middle, and Lower subwatersheds according to our GIS data.)

Indicator Thresholds and Scoring

We collected the ordinance data for each of the cities and counties by calling the city/county or by finding the ordinances online. This year we decided to make the scoring for each ordinance binary, receiving either 0 or 1 point for each ordinance. To get one point for each ordinance:

- (1) the APWA 5600 manual had to be adopted in entirety;
- (2) the BMP Manual had to be adopted in entirety;
- (3) the stream setback must prohibit construction closer to the stream than the setback;
- (4) the pollution prevention ordinance had to exceed the CWA’s NPDES standards;
- (5) the native plant ordinance had to encourage planting native plants; and
- (6) if native plants fell within the noxious weed ordinance prohibition, it had to except them.

The points each entity received was divided by six for a percentage. The grading rubric is:

80-100% = A	60-79% = B	40-59% = C	20-39% = D	0-19% = F
5-6 points = A	4 points = B	3points = C	2 points = D	0-1 point = F

The cities and counties in the watershed received the following scores:

Belton 4	Fairway 2	Grandview 2	Independence 1	KCK 4	KCMO 5
Leawood 4	Lenexa 6	Loch Lloyd 0	Mission 4	Mission Hills 1	Mission Woods 0
Olathe 4	Overland Park 5	Prairie Village 2	Raytown 1	Roeland Park 6	Spring Hill 2
Westwood 3	Westwood Hills 3	Cass Co. 2	Jackson Co. 4	Johnson Co. 3	Miami Co 2

With these scores, we calculated the entire Blue River Watershed score and each subwatershed score based on the cities and counties in each watershed and the percentage of the watershed that each city and county’s land mass makes up (see pages 4 and 5). The scores for this year are:

Indicator Grade		
Watershed	Ordinances %	Ordinance Grade
Upper Blue River	69.32	B
Middle Blue River	76.09	B
Lower Blue River	76.47	B
Entire Blue River	71.51	B

Indicator #2: Collaborative Watershed Governance

Indicator Selection

We focused on three components essential to the existence of collaborative watershed governance: (1) a collaborative watershed resolution; (2) a watershed master plan; and (3) a watershed master plan that is integrated. Each is described in more detail below.

- (1) The collaborative watershed resolution should be adopted watershed wide. The resolution should define a healthy Blue River watershed, agree to standardized watershed wide water quality monitoring, and forms an agreement with other signatories to work collaboratively to achieve a healthy Blue River Watershed as defined.
- (2) A watershed master plan should be a comprehensive plan for developing the watershed to maintain the watershed health as defined in the collaborative watershed resolution. Each entity should sign on to the master plan and adopt it within their code to give it legal effect.
- (3) a watershed master plan should be integrated; accounting for stormwater and wastewater.

Indicator Thresholds and Scoring

The indicator score is weighted as follows: 50% collaborative watershed resolution, 50% watershed master plan. Of the 50% allocated to watershed master plan, half (25% of the indicator score) is awarded to a watershed master plan that is not integrated, while the full 50% is awarded to an integrated watershed master plan.

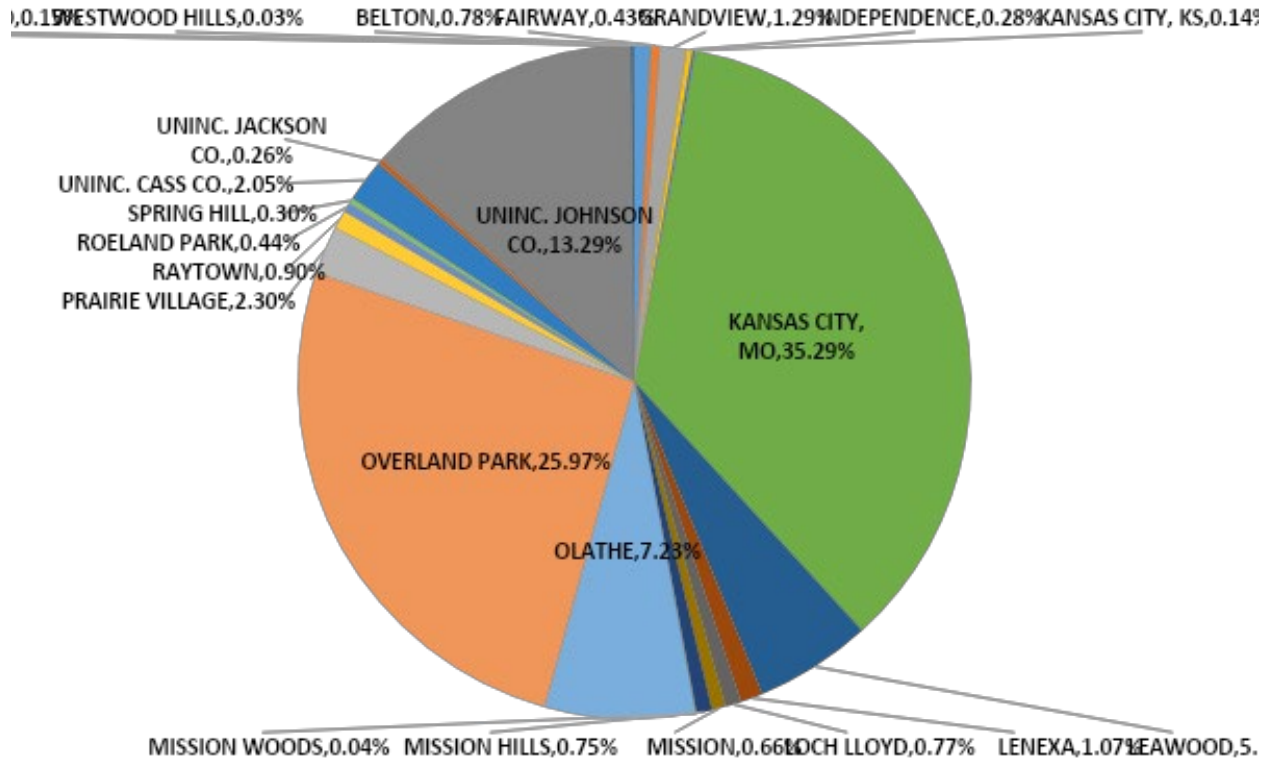
The components grade is then weighted based on the percentage of the watershed (entire, upper, middle, and lower) that has adopted the components. Since cities and counties should adopt these components, the watershed score is weighted based on the percentage of the watershed that cities and counties that have adopted land mass makes up, similar to the Ordinances indicator. (see also pages 4 and 5). The components grade multiplied by the percentage of watershed that has adopted is the total grade for the indicator. The grading rubric is:

80-100% = A 60-79% = B 40-59% = C 20-39% = D 0-19% = F.

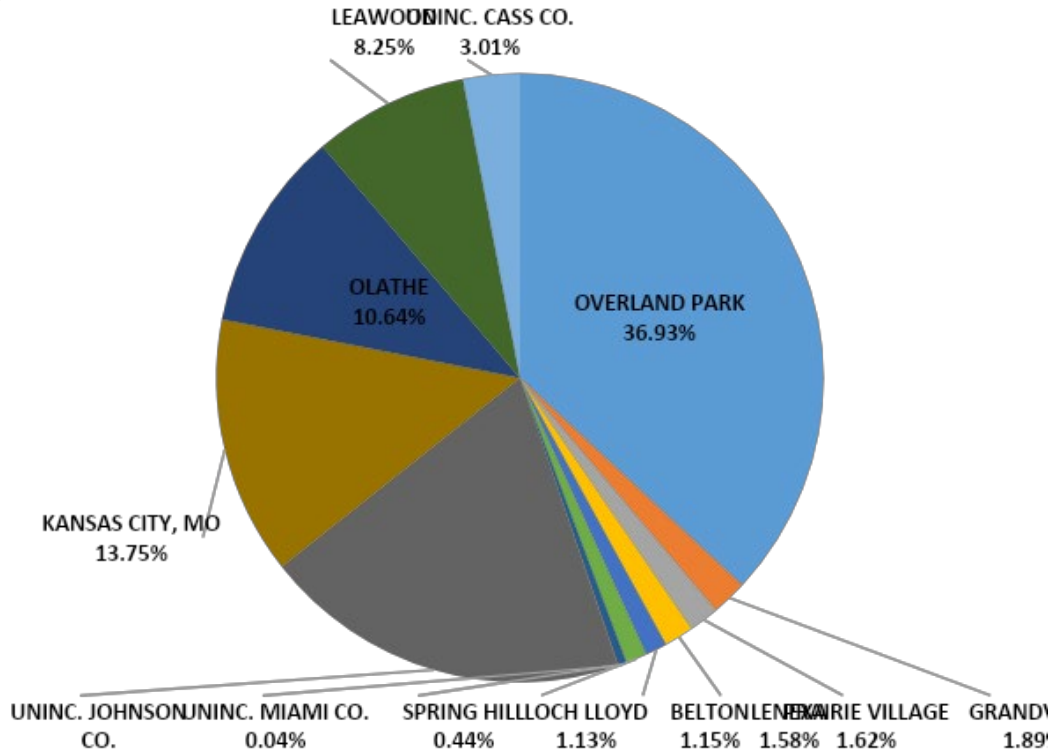
Currently, no cities or counties in the Blue River Watershed have adopted a collaborative watershed resolution nor have any adopted a watershed master plan. Therefore, the scores for this year are as follows:

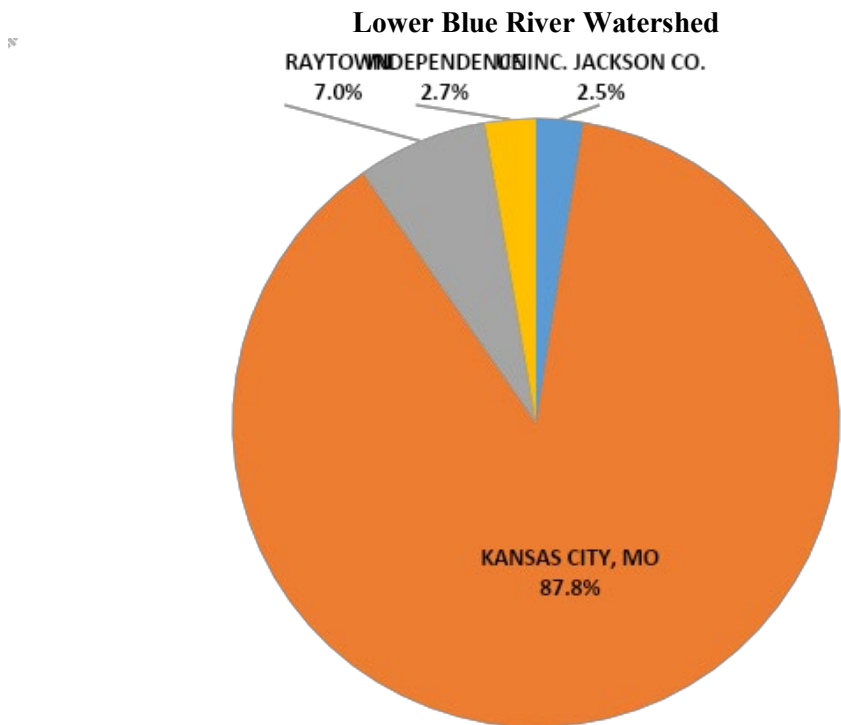
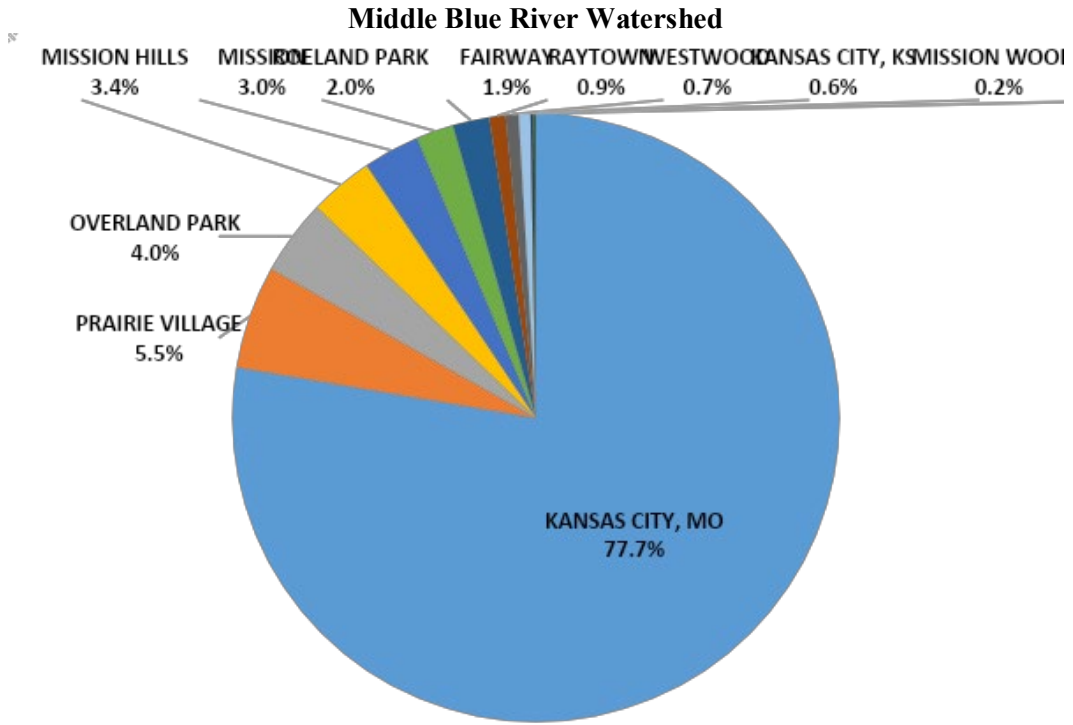
Indicator Grade		
Watershed	Collaborative Watershed Governance %	Collaborative Grade
Upper Blue River	0	F
Middle Blue River	0	F
Lower Blue River	0	F
Entire Blue River	0	F

Entire Blue River Watershed



Upper Blue River Watershed





Habitat Category

Category Description

The Blue River provides critical habitat (food and shelter) for a variety of wildlife. Protecting and managing healthy vegetative (plant) communities is key to the success of retaining diverse wildlife species within the Blue River Watershed. Key indicators that will be used to measure the quantity and quality of habitat within the watershed include: riparian cover (native vegetation adjacent to the river), and native habitats (woodlands, grasslands, and prairies) protected within the watershed.

Indicators in the Category

Two indicators make up the Habitat Category: (1) *Riparian Cover* measuring the percentage of streams with woody vegetative cover on both banks (see page 2) and (2) *Native Habitat* measuring the percentage of the watershed that is in a natural state (see page 3).

Category Score

50% of the category score is the *Riparian Cover* score and 50% of the category score is the *Native Habitat* score. For the Habitat Category grade, the following percentages received the following letter grades:

Percentage	80-100	60-79	40-59	20-49	0-19
Letter Grade	A	B	C	D	F

However, across the watershed, *Native Habitat* make up substantially less than 10% of the landmass, so a conversion is necessary to put *Parks* on a 100-point scale. The Native habitat percentage was multiplied by 10 to put it on a 100-point scale, with a cap at 100.

The Habitat Category scores and grade results for 2019 are as follows:

Watershed	Riparian Cover %	Riparian Cover Grade	Native Habitat %	Native Habitat Grade	Category %	Category Grade
Upper	34.99	D	1.58	F	25.395	D
Middle	27.82	D	4.89	C	38.36	D
Lower	3.88	F	0.54	F	4.64	F
Entire	30.54	D	2.2	D	26.27	D

Indicator #1: Riparian Cover

Indicator Selection

The riparian corridors provide critical habitat for both aquatic and terrestrial species. We chose to monitor tree cover along the banks of the streams and river. Trees along the stream and river banks provide terrestrial habitat and also cool the water for aquatic species. We chose to measure 100 feet from the water's edge perpendicular to the water's flow. If there is a least a 100-foot band of wooded vegetation on both sides of the stream, then the we counted that as adequate riparian cover and we measured the length of stream that had this adequate riparian cover. If it was less than 100 feet of wooded vegetation, then it was counted as inadequate riparian cover. Appropriate native vegetation would be the best measurement, but since we used a satellite imaging mapping tool to determine and measure the riparian cover, wooded vegetation was what we used.

The mapping tool we utilized was Google Maps updated 2019 satellite imaging. We measured whether there was 100 feet of riparian cover on the stream banks and the stream lengths with and without adequate riparian cover with the distance measuring function of Google Maps. We measured the lengths of the streams that were visible from satellite imaging, so smaller tributaries and ephemeral streams were not included in the measurements.

Indicator Thresholds and Scoring

In the lower Blue River, a 54,331-foot stretch of the Blue River Mainstem was measured for riparian corridor. In the Middle Blue River, 88,439 feet of streams were measured that consisted of the Blue River Mainstem and Brush Creek. In the Upper Blue River, 379,104 feet of streams were measured which consisted of the Blue River Mainstem, Indian Creek, Tomahawk Creek, Camp Branch, Wolf Creek, and Coffee Creek. The results of these measurements are below.

Ideally 100% of the length of each stream would have at least 100' of riparian cover on both sides of the bank. The grading rubric for the *Riparian Cover* indicator is as follows:

% of Trail Completed	80-100	60-79	40-59	20-49	0-19
Letter Grade	A	B	C	D	F

The total stream feet that were measured, the stream feet with 100 feet of riparian cover on both banks, the percentages, and the letter grades for 2019 are as follows:

Watershed	Total Stream Feet	Stream Feet with 100' Riparian Cover	% of Stream Feet with 100' Riparian Cover	Letter Grade
Upper	379,104	132,661	34.99	D
Middle	88,493	24,615	27.82	D
Lower	54,331	2,107	3.88	F
Entire	521,928	159,383	30.54	D

Indicator #2: Native Habitat

Indicator Selection

Native Habitat in the Blue River Watershed are areas with flora that is native to the region. We originally intended to track all acres that are being actively managed for native habitat. The administrative burden for doing this we found prohibitive. What we decided to measure is the number of acres that are being left in a relatively natural state. This year we measured the acres that are in parks in the watershed that are in a relatively natural state. The majority of those acres are wooded, however, the Overland Park Arboretum in the Upper Watershed and Shumacher Park in the Middle Watershed are two examples of prairie acres that are in a “natural state” that were counted in our scoring. We expect for this score to increase in subsequent years when we measure native habitat that is outside of parks.

We measured the park acreage that is in a natural state using Google Maps updated 2019 satellite imaging and measuring tool, along with relying on what the parks and arboretums claimed to have in a natural state.

Indicator Thresholds and Scoring

The data we gathered for “Acres in a Natural State” (below) came from the following:

- Upper watershed: Minor Park, Saeger Woods, Jerry Smith Park, Indian Creek Greenway, Overland Park Arboretum, and Blue River Parkway (part);
- Middle Watershed: Blue River Parkway (part), Swope Park, and Shumacher Park;
- Lower Watershed: Blue Banks Park and Blue Valley Park.

We then divided this acreage by watershed acres to get a percentage of the watershed that is in a natural state.

We next identified thresholds. Research suggests that greater than 10% of a watershed should be kept or returned to habitat. We decided, for our urban watershed, on the following:

% Native Habitat (Natural State)	8% or greater	6 - < 8%	4 - < 6%	2 - < 4%	0 - < 2%
Letter Grade	A	B	C	D	F

Using the above grading rubric, the letter grades for 2019 for Parks are as follows:

Watershed	Acres in Natural State	Watershed Acres	% of Watershed Acres in Natural State	Letter Grade
Upper	1855.32	117,620	1.58	F
Middle	1852.36	37,866	4.89	C
Lower	95.2	17,676	0.54	F
Entire	3802.88	173,162	2.2	D

Recreation Category

Category Description

The Blue River provides a natural corridor for people to recreate. This category assesses the opportunities that are available in the form of miles of trails available for hiking and biking and the parkland that is available in the watershed for recreation.

Indicators in the Category

Two indicators make up the Recreation Category: (1) the percentage of progress on the paved Metrogreen *Trails* (see page 2) and (2) the percentage of *Parks* in the watershed (see page 3).

Category Score

50% of the category score is the *Trails* score and 50% of the category score is the *Parks* score. For the Recreation Category grade, the percentages received the letter grades:

Percentage	80-100	60-79	40-59	20-49	0-19
Letter Grade	A	B	C	D	F

However, across the watershed, *Parks* make up substantially less than 10% of the landmass, so a conversion is necessary to put *Parks* on a 100-point scale. The Parks Indicator page further explains the Parks percentages. The following table shows the conversion

Letter Grade	Parks % Conversion	Parks % Conversion	Parks % Conversion	Parks % Conversion
A	10=80*			
B	8=60	8.5=65	9=70	9.5=75
C	6=40	6.5=45	7=50	7.5=55
D	4=20	4.5=25	5=30	5.5=35
F	0=0	1=5	2=10	3=15

*Parks conversion cannot exceed 100%

For 2019, the Recreation Category scores and grade results are as follows:

Watershed	Trails %	Trails Grade	Parks %	Parks Grade	Total %	Total
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Lower	29.47	D	8.06	B	44.96%	C
Middle	54.40	C	6.66	C	50.25%	C
Upper	59.88	C	6.27	C	50.84%	C
Entire	54.78	C	6.54	C	50.03%	C

Indicator #1: Trails

Indicator Selection

Trails, particularly those along natural corridors like creeks and rivers, are important for people to recreate outdoors and connect with their waterways as they recreate. This year, we evaluated the paved trails that have been built along the Metrogreen Greenway Corridor. We did not evaluate the hundreds of trail miles that are not paved within the watershed, nor did we evaluate paved trails that are not in the Greenway Corridor, but both of these are important and may be included in future report cards. Regarding the Metrogreen Greenway Corridor, 648 miles of trail were planned in Mid America Regional Council’s (MARC’s) nine county region, 163.01 of those miles are in the Blue River Watershed.

Using GIS fall 2018 data, we determined the number of miles of trails along the Metrogreen Greenway and the percentage of completion for the entire Blue River Watershed and for the upper, middle, and lower subwatersheds. The miles of trail on the ground do not match exactly the miles of Metrogreen corridor completed because the Metrogreen corridor is painted in broad strokes, following the river, while the trails, in contrast, twist, turn, and branch along the corridor. Thus, we gathered actual miles of trail data, but we then put it into context with the number of miles of Metrogreen corridor and the percentage of that corridor that has been completed.

Indicator Thresholds and Scoring

As stated above, there are 163.01 miles of Metrogreen Corridor – which consists of both existing and planned corridor trails – along the Blue River and its tributaries. 127 miles of paved trails are along the Metrogreen Corridor, but those 127 miles only cover 89.29 miles of Metrogreen Corridor. These are the “Existing Metrogreen Corridor (miles)” below. We used the existing corridor miles covered to get a percentage of completion for the Metrogreen Corridor for the Upper, Middle, Lower and entire Blue River Watershed (shown below).

The grading rubric for the Trails indicator is as follows:

% of Trail Completed	80-100	60-79	40-59	20-49	0-19
Letter Grade	A	B	C	D	F

The percentages of Metrogreen completion and letter grades for 2019 are as follows:

Watershed	Metrogreen Corridor (miles)	Existing Metrogreen Corridor (miles)	Trails %	Trails Grade
Lower Blue River	20.73	6.11	29.47	D
Middle Blue River	36.86	20.05	54.40	C
Upper Blue River	105.42	63.13	59.88	C
Entire Blue River	163.01	89.29	54.78	C

Indicator #2: Parks

Indicator Selection

It is also important that people have access to Parks within the watershed, which are the most obvious place for people to recreate outdoors. The parks also have the added benefits of increasing the watershed’s green space, stormwater retention, and habitat. But, the Recreation category focuses on parks that are suitable for recreating. Using 2018 GIS data from MARC’s Green Region Explorer and isolating it just to the Blue River Watershed we pulled all park and golf course acres. We excluded all cemeteries, which are part of the Green Region Explorer’s Parks GIS layer, since we believe cemeteries unsuitable for recreation. We also separated out the parks GIS data into our Upper, Middle, and Lower delineations.

Indicator Thresholds and Scoring

The parks data we gathered for watershed is as follows.

Watershed	Upper	Middle	Lower	Entire
Parks (acres)	7,371	2,522.53	1,424.00	11,318
Watershed (acres)	117,606	37,866	17,676	173,148
Watershed % that is Parks	6.27	6.66	8.06	6.54

We next identified thresholds. According to a 2015 study by the Trust for Public Land, percentage of a city that is parklands ranges wildly, but generally, high density cities have higher percentages of parkland and lower density cities have lower percentages of parkland. According to the study, the median for all cities is 8.2%. We believe this research on cities is applicable to the watershed and that greater than 10% parkland or warrants an A letter grade. The grading rubric is as follows:

Watershed % that is Parks	Greater 10%	8-10%	6-8%	4-6%	0-4%
Letter Grade	A	B	C	D	F

Using the above grading rubric, the letter grades for 2019 for Parks are as follows:

Watershed	Parks %	Parks Grade
Upper Blue River	6.27	C
Middle Blue River	6.66	C
Lower Blue River	8.06	B
Entire Blue River	6.54	C

Water Quality Category

Category Description

Water quality is important to the health and wellbeing of all living and nonliving elements of the Blue River Watershed. Just as the Blue River and its tributaries are the network of arteries and vessels in a body, the water within the river itself is the lifeblood that sustains the Kansas City region. This category is the most data driven of all the Blue River Report Card. The results of the water quality indicators shows the change, good and bad, that are occurring in all other categories. Water quality data is not scarce in the region, but gathering that data and sifting through years of results gathered for different means and varying intents proved difficult. This category will continue to see development after the 2019 report, which should provide better, more reliable results for conditions of the Blue River every year.

Indicators in the Category

Three indicators were selected to best represent water quality trends in the Blue River Watershed and equally assess the three components of stream health (biological, chemical and physical): (1) a Stream Asset Inventory (see pg.2), (2) the presence of pollution sensitive macroinvertebrates (see pg.3), and (3) a water quality index using multiple parameters (see pg.4).

Category Score

The final score for the water quality category is only accounts for the Stream Visual Assessment in the Lower and Middle watersheds, while macroinvertebrate results along with the Stream Visual Assessment were scored for the Upper watershed. Because of the nature of the Blue River and the local governments with jurisdiction in the watershed, water quality data is not congruent, thus macroinvertebrates were only sampled on the Kansas side of the state line in 2018 and 2019. The water quality index (which will include pH, conductivity and dissolved oxygen) proved again to be difficult to grade in 2019, due to inconsistencies in sampling across state lines which made results unreliable for this report. The scores were graded using the following rubrics developed for each separate indicator.

Grade	Indicator 1: Stream Visual Assessment	Indicator 2: Macroinvertebrates	Indicator 3: Water Quality Index
	(Stream visual assessment score)	(% of pollution sensitive Orders)	(Not Applicable)
A (80 - 100%)	7.51 - 10.00	>48.00%	NA
B (60 - <80%)	6.51 - 7.50	36.01 - 48.00%	
C (40 - <60%)	5.51 - 6.50	24.01 - 36.00%	
D (20 - <40%)	4.51 - 5.50	12.01 - 24.00%	

F (0 - <20%)	0.00 - 4.50	0.00 - 12.00%	
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The 2019 Water Quality Category scores and grade results are as follows:

Watershed	Indicator 1		Indicator 2		Indicator 3		TOTAL
	Stream Visual Assessment	Grade	Macroinvertebrates	Grade	Water Quality Index	Grade	Grade
Upper	6.48	C	33.45%	C	NA	--	C
Middle	5.16	D	No Data	--	NA	--	D
Lower	5.56	C	No Data	--	NA	--	C
OVERALL	6.10	C	NA	--	NA	--	C

Indicator #1: Stream Visual Assessment

Indicator Selection

The Blue River and its tributaries span several miles, reaching across state and municipal lines showing the effects of differing resource and land management activities. One of the quickest and most effective ways to grade stream health is through a visual assessment of the stream itself. Visual assessments allow trained individuals to rate hydrology, habitat, and overall quality of a stream site to determine the general health of a segment of the Blue River. Of the three parts to stream health assessments, this is the physical portion, which when coupled with a biological and chemical indicator, can accurately determine the long term trending health of a stream or river. For this indicator we utilized a stream visual assessment protocol previously developed for rapid assessment of stream health. This protocol includes the following groups: stream stability, aquatic habitat quality, terrestrial habitat quality, and water quality. These groups were ranked based on guidelines that determined their score which would lead to a final score for a stream site between 1 and 10.

The protocol and training were provided by Vireo and data was gathered by trained individuals who worked on the water quality category for this report card. A total of 25 sites were sampled in 2019 throughout the Blue River Watershed.

Indicator Thresholds and Scoring

The threshold developed for this indicator was taken from the provided protocol and modified to incorporate the A-F grading rubric required for an Eco Score Card.

Grade	Indicator 1: Stream Visual Assessment
A (80 - 100%)	7.51 - 10.00
B (60 - <80%)	6.51 - 7.50
C (40 - <60%)	5.51 - 6.50
D (20 - <40%)	4.51 - 5.50
F (0 - <20%)	0.00 - 4.50

Below are the 2019 results for the first indicator, Stream Visual Assessment.

Report Card Watersheds	HUC 12 Subwatersheds	Stream Visual Assessment (HUC12s)	HUC12 Grade	Stream Visual Assessment (Report Card Watersheds)	Report Card Grade
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Lower	Outlet Blue River	5.56	C	5.56	C
Middle	Brush Creek - Blue River	5.16	D	5.16	D
Upper	Headwaters Indian Creek	5.34	D	6.48	C
	Indian Creek (Tomahawk)	5.96	C		
	Camp Branch - Blue River	6.83	B		
	Headwaters Blue River	7.76	A		

Indicator #2: Macroinvertebrates

Indicator Selection

The Blue River and its tributaries expand through many different ecoregions and conditions, from natural woodlands to concrete lined channels, the conditions across the watershed are not singular. One of the best ways to grade long term stream health is by assessing the biology that lives in the streams and rivers. By looking at the aquatic invertebrates that live in the streams, trained individuals can determine overall stream health of the watershed by determining the diversity, complexity and pollution tolerance of the organisms they find. Of the three parts to stream health assessments, this is the biological portion, which when coupled with a physical and chemical indicator, can accurately determine the long term trending health of a stream or river. For this indicator we utilized macroinvertebrate sampling protocols and sites operated by local, state and federal governments to rate streams. This category specifically looks at %EPT, or the percentage of the most pollutant sensitive Orders (Ephemeroptera - mayfly, Plecoptera - stonefly, and Trichoptera - caddisfly).

Only sites on the Kansas side of the state line were assessed in 2019. This was due to programs already in place in Kansas to assess macroinvertebrates and insufficient timing to complete assessments on the Missouri side. Protocols and personnel for sampling were headed by the City of Overland Park, with programs developed from Kansas Department of Health and Environment (KDHE) and EPA protocols. A total of 13 sites were sampled in 2019 throughout the Upper portion of the Blue River Watershed.

Indicator Thresholds and Scoring

The threshold developed for this indicator was created through a statistical distribution of data gathered from 2016-2019 and thorough assessment of aquatic life expectancy standards set by the KDHE and modified to incorporate the A-F grading rubric required for an Eco Score Card.

Grade	Indicator 2: Macroinvertebrates
A (80 - 100%)	>48.00%
B (60 - <80%)	36.01 - 48.00%
C (40 - <60%)	24.01 - 36.00%
D (20 - <40%)	12.01 - 24.00%
F (0 - <20%)	0.00 - 12.00%

Below are the 2019 results for the second indicator, macroinvertebrates (%EPT).

Report Card Watersheds	HUC 12 Subwatersheds	% EPT (HUC12s)	HUC12 Grade	% EPT (Report Card Watersheds)	Report Card Grade
Lower	Outlet Blue River	No Data	--	No Data	--
Middle	Brush Creek - Blue River	No Data	--	No Data	--
Upper	Headwaters Indian Creek	22.48%	D	33.45%	C
	Indian Creek (Tomahawk)	30.58%	C		
	Camp Branch - Blue River	44.25%	B		
	Headwaters Blue River	42.59%	B		

Indicator #3: Water Quality Index

Indicator Selection

The Blue River and its tributaries contain a cocktail of nutrients, heavy metals, pesticides, sediment and bacteria that affect both human and non-human life. These pollutants put communities at risk and impair the streams and rivers from supporting the aquatic and terrestrial life required for a healthy ecosystem. This indicator has not been completed for 2019. Of the three parts to stream health assessments, this would be the chemical portion, which when coupled with a physical and biological indicator, can accurately determine the long term trending health of a stream or river. For this indicator we plan to utilize a water quality index that best represents the effects of chemical pollution and conditions on overall stream health. This will include pH, conductivity and dissolved oxygen as they themselves are indicators of the presence of pollutants and conditions unsafe for human contact and aquatic toxins.

Data has been inconsistently gathered across state lines and local jurisdictions. It is intended that this data will be gathered by the Heartland Conservation Alliance to work across boundaries to formalize and consolidate water quality data in the Blue River watershed.

Indicator Thresholds and Scoring

Indicator thresholds and scoring have not yet been developed. Once data has been gathered and assessed, a threshold for scoring the water quality index will be finalized