
Appendix B

Qualitative Habitat Evaluation Index Analysis

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B.1 Description of the QHEI

The QHEI is a quantitative expression of a qualitative, visual assessment of habitat in free flowing streams and was developed by the Ohio EPA to assess available habitat for fish communities (Rankin, 1989, 1995, 2006). The QHEI is a composite score of six physical habitat categories: 1) substrate, 2) in-stream cover, 3) channel morphology, 4) riparian zone and bank erosion, 5) pool/glide and riffle/run quality, and 6) gradient. Each of these categories are subdivided into specific attributes that are assigned a point value reflective of the attribute's impact on the aquatic life. Highest scores are assigned to the attributes correlated to streams with high biological diversity and integrity and lower scores are progressively assigned to less desirable habitat features.

A QHEI evaluation form is used by a trained evaluator while in the stream itself. Each of the components are evaluated on-site, recorded on the form, the score totaled, and the data later analyzed in an electronic database. The evaluation form is available online at <http://www.epa.ohio.gov/portals/35/documents/QHEIFieldSheet061606.pdf>.

The QHEI is a macro-scale approach that measures the emergent properties of habitat (sinuosity, pool/riffle development) rather than the individual factors that shape these properties (current velocity, depth, substrate size). The QHEI is used to evaluate the characteristics of a short stream segment, as opposed to the characteristics of a single sampling site. As such, individual sites may have poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. However, QHEI evaluations are segment specific and do not give a strong indication of the quality of the habitat in other stream segments.

The maximum possible QHEI score is 100. Appropriate QHEI target scores were determined by statistical analysis of Ohio's statewide database of paired QHEI and IBI scores. Simple linear and exponential regressions and frequency analyses of combined and individual components of QHEI metrics in relation to the IBI were examined. The regressions indicated that the QHEI is significantly correlated with the IBI. Scores greater than 75 indicate excellent stream habitat, scores between 60 and 75 indicate good habitat quality, and scores less than 45 demonstrate habitat not conducive to WWH. Scores between 45 and 60 need separate evaluation by trained field staff to determine the potential aquatic life use for the stream.

Two stream classifications are found within the Salt Creek basin. The majority of the existing stream classifications are for Warmwater Habitat (WWH). The remainder are for Exceptional Warmwater Habitat (EWH). QHEI targets are 60 for WWH sites and 75 for EWH sites (Ohio EPA, 1999).

The empirical nature of the QHEI and the data that underlie it provide measurable targets that are parallel concepts to a loading capacity for a pollutant. The components provide a way to evaluate whether habitat is a limiting factor for the fish community and which attributes are the likely stressors. The QHEI can assess both the source of the sediment (riparian corridor, bank stability) and the effects on the stream itself (i.e., the historic sediment deposition) and thus, has aspects of both a loading model and a receiving stream model. When used with biological indices, the numeric measurability of the index provides a means to monitor progress when implementing a TMDL and to validate that a target has been reached.

Current attainment levels of Salt Creek River segments, along with QHEI scores and causes and sources of impairment, are presented in Appendix A of this report.

Figures B.1 through B.4 show the QHEI scores for all sites in the watershed grouped by attainment status for WWH and EWH sites. For WWH sites, the majority of sites that are impaired have QHEI scores less than 60. There does not appear to be a significant difference in median QHEI scores between fully and partially attaining sites. For EWH, median QHEI scores decrease from fully to partially- and non-attaining sites. However, very few of the attaining sites have scores greater than 75, the EWH QHEI target.

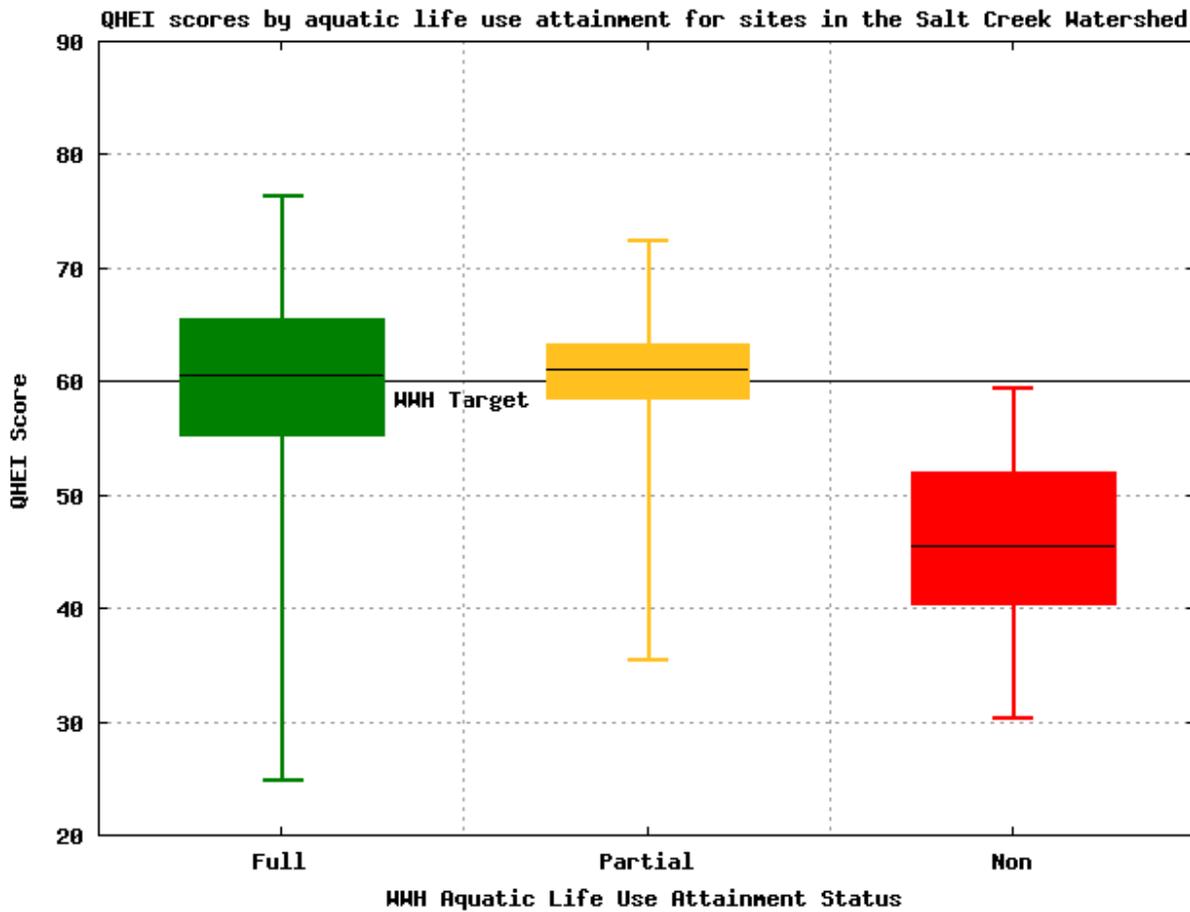


Figure B.1. Box-whisker plots of WWH QHEI scores and attainment.

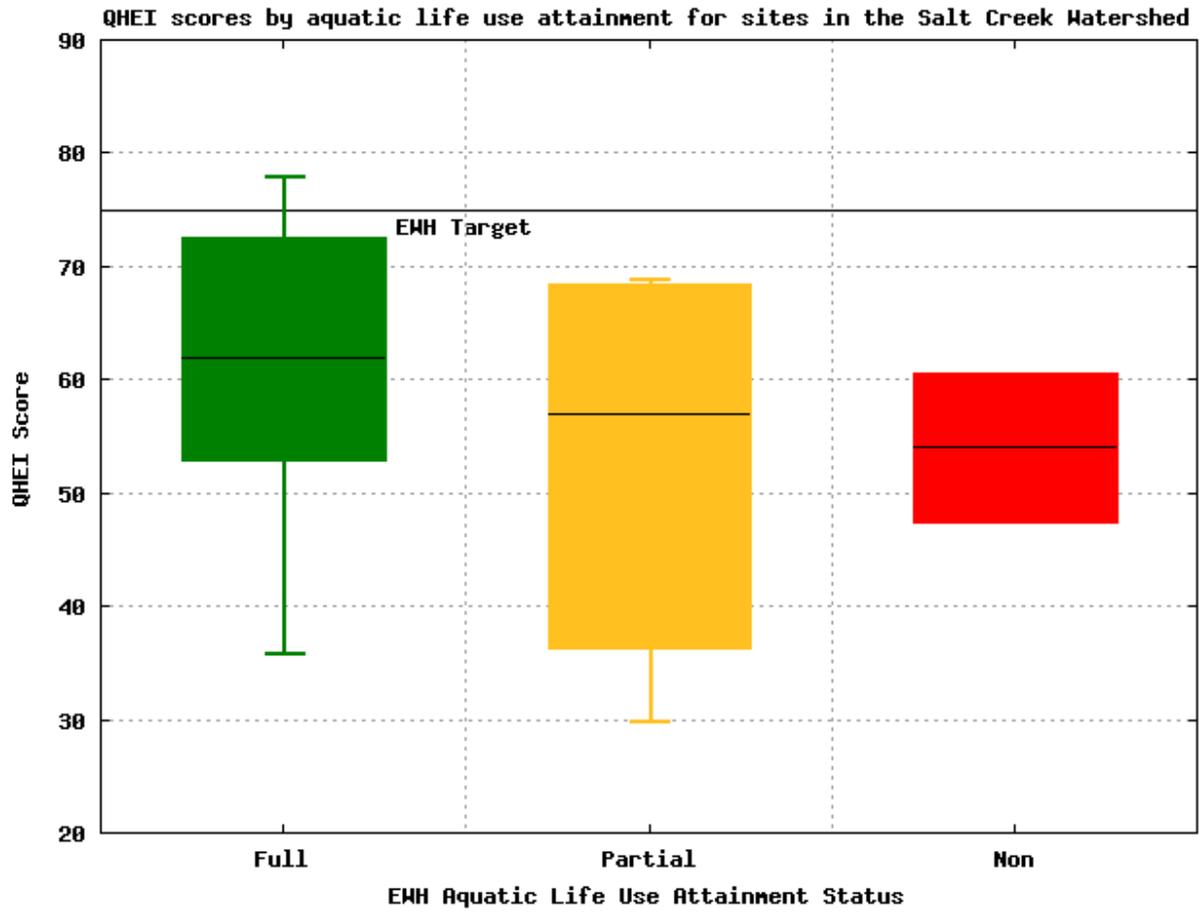


Figure B.2. Box-whisker plots of EWH QHEI scores and attainment.

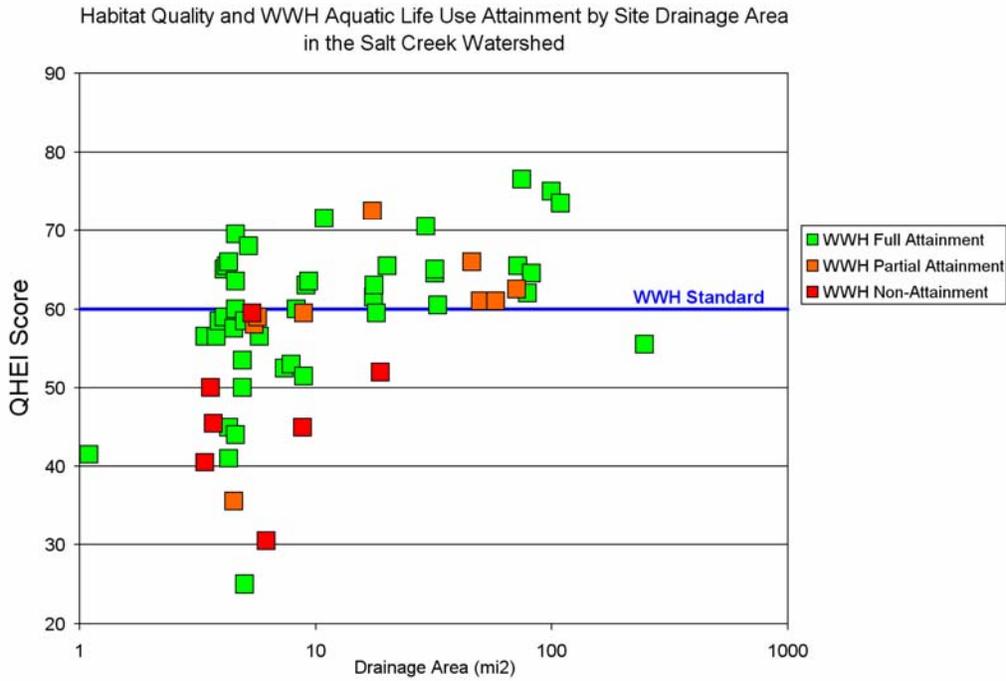


Figure B.3. WWH QHEI scores and attainment plotted by drainage area.

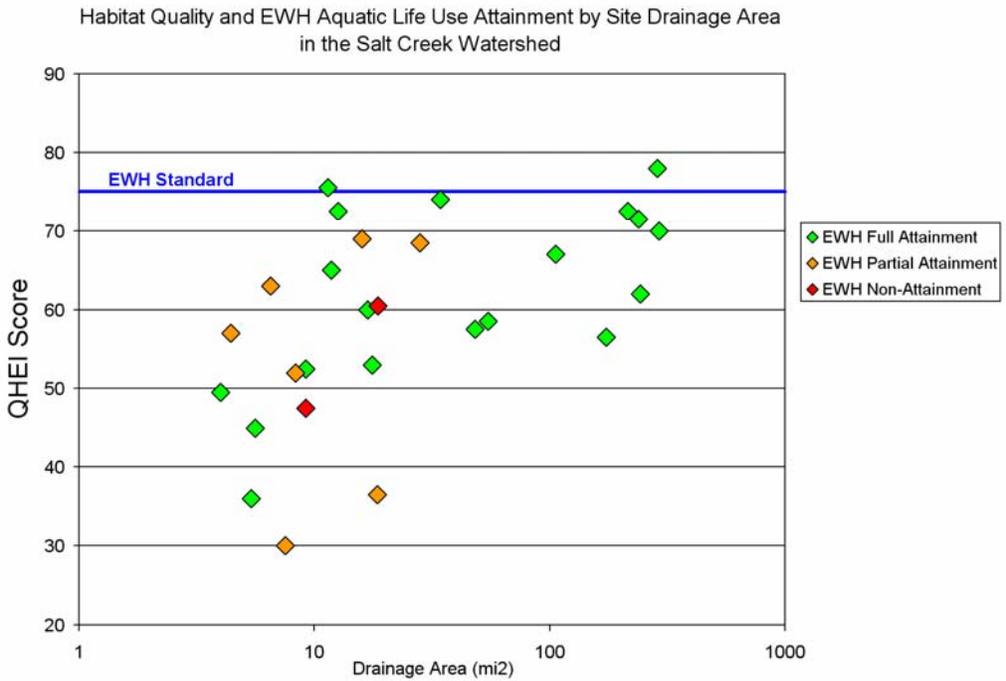


Figure B.4. EWH QHEI scores and attainment plotted by drainage area.

B.2 QHEI Habitat TMDL

The analysis of the QHEI components as they relate to IBI scores led to the development of a list of attributes that are associated with degraded communities. These attributes are modifications of natural habitat and are listed in Table B.1. These modified attributes were further divided into high influence or moderate influence attributes based on the statistical strength of the relationships. Habitat scores for these attributes are organized by 11-digit HUC and are given in tables B.2 through B.5.

Table B.1 Bedload and Habitat TMDL Targets

Bedload TMDL Targets			Habitat TMDL Targets			
QHEI Category	Target		QHEI Category	Target		Score
	WWH	EWH		WWH	EWH	
Substrate	≥ 13	≥ 15	QHEI Score	≥ 60	≥ 75	+ 1
Channel	≥ 14	≥ 15	High Influence #	< 2	0	+ 1
Riparian	≥ 5	≥ 5	Total # Modified	< 5	< 3	+ 1
Bedload TMDL ►			Habitat TMDL ►		+ 3	
	≥ 32	≥ 35				

"Modified Attributes" (for the Habitat TMDL)		
High Influence	Moderate Influence	
<ul style="list-style-type: none"> Recent Channelization or No Recovery Silt or Muck Substrate Low or No Sinuosity and Drainage Area ≤ 20 sq. mi. Sparse or Nearly Absent Cover < 40 cm Max. Pool Depth (wadeable or headwater sites) 	<ul style="list-style-type: none"> Recovering Channelization Silt Heavy or Silt Moderate Sand Substrate (boat sites) Hardpan Substrate Origin Fair or Poor Development Low or No Sinuosity and Drainage Area > 20 sq. mi. Two or Less Cover Types 	<ul style="list-style-type: none"> Intermittent Pools and Max. Pool Depth < 40 cm No Fast Current Velocity Extensive or Moderate Substrate Embeddedness Extensive or Moderate Riffle Embeddedness No Riffle

The presence of these attributes can strongly influence the aquatic biology and the QHEI score itself may not reflect this effect. This explains why habitat can be impaired even with a QHEI score above 60 (because other less influential habitat components are in place).

These three factors (QHEI score, number of high-influence attributes, and total number of modified attributes) appear to have about an equal weight. An accumulation of four modified attributes corresponds to fewer than 50% of sites achieving a WWH target IBI score of 40. High influence modified attributes are particularly detrimental given that the presence of one is likely to result in impairment, and two will likely preclude a site from achieving an IBI of 40 (OEPA, 1999). The QHEI score of 60 or greater is correlated with IBIs of 40 or greater. A complete habitat TMDL needs to reflect both a good QHEI score and the relative presence of these modified attributes.

The habitat TMDL equation presented below and in Table B.1 reflects the relationship between the QHEI score, modified attributes, and aquatic community performance. It is based upon a total score of three (3), and is the sum of three component scores each worth one point.

$$\begin{aligned} \text{Habitat TMDL} &= (\text{QHEI Score} \geq \text{Target}) + (\text{High Influence Attribute Score}) + (\text{Modified Attribute Score}) \\ &= 1 + 1 + 1 \\ &= 3 \end{aligned}$$

Table B.5 (con't) Habitat Assessment Results for WAU 05060002 100: Salt Creek (above Queer Cr. to Scioto R. [except Salt Lick Creek and Middle Fork])

River Mile	QHEI	WWH Attributes		MWH Attributes																Total Moderate-Influence MWH Attributes	Current Use Attainment Status (● = full, ▲ = partial, ■ = non)														
		High Influence										Moderate Influence																							
		No Channelization or Recovered Boulder or Cobble or Gravel Substrate	Silt Free Substrate	Excellent or Good Development	Moderate or High Sinuosity	Extensive or Moderate Cover	Fast Velocity or Eddies	Normal or No Substrate Embeddedness	Maximum Pool Depth > 40 cm	Low or No Riffle/Run Embeddedness	Total WWH Attributes	Recent Channelization or No Recovery	Silt or Muck Substrate	Low or No Sinuosity and Drainage Area <= 20 sq. mi.	Sparse or Nearly Absent Cover	< 40 cm Max. Pool Depth and Wadeable or Headwater Silt	Total High-Influence MWH Attributes	Recovering Channelization	Silt Heavy or Silt Moderate	Sand Substrate and Boat Site	Hardpan Substrate Origin	Fair or Poor Development	Low or No Sinuosity and Drainage Area > 20 sq. mi.	Two or Less Cover Types	Intermittent Pools and Max. Pool Depth < 40 cm	No Fast Current Velocity	Extensive or Moderate Substrate Embeddedness	Extensive or Moderate Riffle Embeddedness	No Riffle						
05060002-100-070 - Pike Run below Tar Hollow Cr. to Salt Cr.																																			
<u>Pike Run</u>																																			
5.7	63	■	■							4							1		■														6	●	
4.5	63	■								6	■						1		■															3	●
<u>East Fork Pike Run</u>																																			
0.2	58.5	■	■							5	■		■				2		■														5	●	
05060002-100-080 - Salt Creek below Pike Run to above Salt Lick Cr. [except Poe Run]																																			
<u>Salt Creek</u>																																			
9.9	78	■	■							8							0																1	●	
5.9	70	■								8							0		■															2	●
<u>Mulgee Run</u>																																			
0.1	68	■	■							9							0																	1	●
<u>Goose Creek</u>																																			
0.4	69.5	■	■							8							0		■															3	●
05060002-100-100 - Salt Creek below Salt Lick Cr. to Scioto River																																			
<u>Salt Creek</u>																																			
1.5	72	■	■							6							0	■																4	●

B.3 QHEI Bedload TMDL

The QHEI can also be used to evaluate the degree of bedload and the quality of the substrate at a particular site. The substrate, riparian characteristic, and channel metrics all evaluate stream attributes related to bedload. The substrate metric includes an assessment of streambed sediment quality, quantity, and origin. The riparian metric evaluates riparian width, quality, and bank erosion. The channel metric describes stream physical morphology including sinuosity and extent of development. Each of these factors influences the degree to which siltation affects a stream, and cumulatively serves as its numeric target.

The bedload TMDL equation which follows is a subset of those factors of the QHEI most directly related to sediment type, quality, build up, and source origin. The target is a score of 32 for WWH sites and 35 for EWH sites. The individual components of the bedload TMDL (QHEI scores for substrate, channel, and riparian) are allocated as described below and in Table B.1.

$$\begin{array}{lcl} \text{Bedload TMDL} & = & (\text{Substrate}) + (\text{Channel Morphology}) + (\text{Riparian} \\ & & \text{Zone/Bank Erosion}) \\ \\ \text{For WWH} & \geq & 13 + 14 + 5 \\ & \geq & 32 \\ \\ \text{For EWH} & \geq & 15 + 15 + 5 \\ & \geq & 35 \end{array}$$

B.4 Results

The bedload and habitat TMDL results are summarized in tables B.6 through B.9. These are organized by the four HUC11s. The allocations are site specific, and all sites with a habitat assessment within the major watershed are presented in the tables. It is important to note that a site's attributes may contribute to downstream impairment (especially bedload) without the site itself being impaired.

The tables show the applicable targets per component in the header row of the table. The information presented in the body of the table is sub-grouped by each of the 14-digit HUC subwatersheds in sequential order, and is organized by stream and site river mile.

The percent deviation of the actual bedload score from the allowable bedload score is shown in the tables followed by the main impaired QHEI category of the three used in determining the bedload score. The existing total habitat score per site can be compared to the allowable habitat score to make the same deviation determination.

The tables show what components of the habitat need improvement and to what degree, and can be used to guide management decisions and implementation activities.

The HUC maps in figures B.5 through B.12 present relative bedload and habitat TMDL deficits for the QHEI sites. The worse the deficit, the more likely the bedload or habitat is a contributing factor to a non/partial attainment status.

Table B.6 Bedload and Habitat TMDLs for WAU† 05060002 070: Salt Creek (headwaters to above Queer Creek)														
TMDL Targets ▶	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL		Allocations			Subscore			TMDL	
		≥15	≥15	≥5	35		≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts	
≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt		<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-070-010 - Salt Creek headwaters down to Tarlton at St. Rt. 159														
Salt Creek (EWH)	42.6	12.5	7.5	4	24	31%	channel	52	1	8	0	0	0	0
05060002-070-020 - Salt Creek below Tarlton at St. Rt. 159 to above Beech Fork														
Salt Creek (EWH)	38.2	10.5	10	3.5	24	31%	channel	53	0	5	0	1	0	1
Plum Run (EWH)	0.3	6	6.5	1.5	14	60%	riparian	36	3	8	0	0	0	0
05060002-070-030 - Beech Fork Salt Creek headwaters to Salt Creek														
Bull Creek (WWH)	0.8	14	12.5	5	31.5	1.6%	channel	58.5	2	7	0	0	0	0
Beech Fork (EWH)	2.3	9.5	7	2.5	19	46%	channel	30	3	12	0	0	0	0
	1.1	10.5	7	2.5	20	43	channel	36.5	4	12	0	0	0	0

† Watershed Assessment Unit

Table B.6 Bedload and Habitat TMDLs for WAU 05060002 070: Salt Creek (headwaters to above Queer Creek) (con't)

TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL	Allocations			Subscore			TMDL		
		≥15	≥15	≥5	35	≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts		
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-070-040 - Salt Creek below Beech Fork to above Queer Cr. [except Laurel Run & Pine Cr.]														
Sams Creek (WWH)	0.3	11	8	4	23	28%	channel	45	3	9	0	0	0	0
Salt Creek (EWH)	33.4	10	12	6.5	28.5	19%	substrate	57.5	0	5	0	1	0	1
	32.3	12	12	4	28	20%	riparian	67	0	3	0	1	0	1
	25.9	12	6.5	6	24.5	30%	channel	56.5	2	7	0	0	0	0
Brimstone Creek (WWH)	0.4	12.5	13.5	6.5	32.5	—	substrate	65.5	0	6	1	1	0	2
	0.1	10.5	6	4.5	21	34%	channel	41	4	9	0	0	0	0

Table B.6 Bedload and Habitat TMDLs for WAU 05060002 070: Salt Creek (headwaters to above Queer Creek) (con't)

TMDL Targets ▶	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL		Allocations			Subscore			TMDL	
		≥15	≥15	≥5	35		≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts	
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-070-050 - Laurel Run [except Middle Fork & Moccasin Cr.]														
Laurel Run (EWH)	10.1	10	11	5	26	26%	substrate	63	0	5	0	1	0	1
	7.8	14	15.5	7	36.5	—	substrate	69	1	5	0	0	0	0
	3.6	16	8	4.5	28.5	19%	channel	68.5	1	5	0	0	0	0
	0.1	16	6	4	26	26%	channel	58.5	1	5	0	0	0	0
Cola Creek (WWH)	0.1	11	5	5	21	34%	channel	44	4	8	0	0	0	0
05060002-070-060 - Middle Fork														
Middle Fork Laurel Run (EWH)	4.1	11.5	8	6.5	26	26%	channel	57	0	4	0	1	0	1
	0.1	15.5	16	4	35.5	—	riparian	75.5	0	2	1	1	1	3

Table B.6 Bedload and Habitat TMDLs for WAU 05060002 070: Salt Creek (headwaters to above Queer Creek) (con't)

TMDL Targets ▶	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL	Allocations			Subscore			TMDL		
		≥15	≥15	≥5	35	≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts		
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-070-070 - Moccasin Creek														
Moccasin Creek (WWH)	4.6	17	15.5	7.5	40	—	—	65	0	4	1	1	1	3
	2.5	15	14	6.5	35.5	—	—	60	3	9	1	0	0	1
05060002-070-080 - Pine Creek														
Pine Creek (WWH)	12.5	13	14	9	36	—	—	66	1	6	1	1	0	2
	11.2	11	15.5	8	34.5	—	substrate	71.5	0	5	1	1	0	2
	8.8	10	15	9.5	34.5	—	substrate	72.5	0	3	1	1	1	3
	2	9.5	13.5	6	29	9.4%	substrate	64.5	0	6	1	1	0	2
Little Pine Creek (WWH)	1.9	10	14	5.5	29.5	7.8%	substrate	60	0	4	1	1	1	3
	0.6	11.5	10	2	23.5	27%	riparian	53	2	7	0	0	0	0

Table B.7 Bedload and Habitat TMDLs for WAU 05060002 080: Middle Fork of Salt Creek

TMDL Targets ▶	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL	Allocations			Subscore			TMDL		
		≥15	≥15	≥5	35	≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts		
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-080-010 - Middle Fork Salt Creek [except Pigeon Cr.]														
Middle Fork Salt Creek (WWH)	22.1	14	5	6	25	22%	channel	50	4	6	0	0	0	0
	19.7	15	10.5	7	32.5	—	channel	63.5	2	5	1	0	0	1
	18	11	9.5	5	25.5	20%	channel	65.5	1	5	1	1	0	2
	14.9	13	14	5	32	—	—	65	0	3	1	1	1	3
	4.7	7	12.5	5.5	25	22%	substrate	61	2	5	1	0	0	1
	0.3	13	14	7.5	34.5	—	—	73.5	0	5	1	1	0	2
Trib. to M. Fk. Salt Creek (RM 20.60) (WWH)	0.1	14	5	4.5	23.5	27%	channel	41.5	3	8	0	0	0	0
Trib. to M. Fk. Salt Creek (13.00) (WWH)	0.6	4	4	2	10	69%	channel	25	5	12	0	0	0	0
Riley Run (WWH)	0.1	13	13	4.5	30.5	4.7%	riparian	59.5	0	3	0	1	1	2

Table B.7 Bedload and Habitat TMDLs for WAU 05060002 080: Middle Fork of Salt Creek (con't)														
TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL			Allocations			Subscore			TMDL
		≥15	≥15	≥5	35			≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts
WWH	≥13	≥14	≥5	32	≥60 = 1			<2 = 1 pt	<5 = 1 pt	3 pts				
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-080-010 - Middle Fork Salt Creek [except Pigeon Cr.] (con't)														
Kelly Branch (WWH)	1.5	17	12	6.5	35.5	—	channel	57.5	3	7	0	0	0	0
05060002-080-020 - Pigeon Creek														
Pigeon Creek (WWH)	13.1	10	5	1	16	50%	riparian	35.5	3	8	0	0	0	0
	12.3	12	9.5	5.5	27	16%	channel	51.5	0	5	0	1	0	1
	8	10.5	9.5	5.5	25.5	20%	channel	61.5	0	6	1	1	0	2
	4.7	11.5	14	6	31.5	1.6%	substrate	60.5	0	4	1	1	1	3
Trib. to Pigeon Creek (7.32) (WWH)	2.4	15	12	10	37	—	channel	58	1	4	0	1	1	2
	0.1	5	7	5	17	47%	substrate	45	2	9	0	0	0	0
Trib. to Pigeon Creek (6.66) (WWH)	0.1	12	12	5.5	29.5	7.8%	channel	63.5	1	3	1	1	1	3
Long Branch (WWH)	0.1	10	12	5.5	27.5	14%	substrate	59	0	5	0	1	0	1

Table B.8 Bedload and Habitat TMDLs for WAU 05060002 090: Salt Lick Creek [except Middle Fork Salt Creek] (Salt Lick Creek is also known as "Little Salt Creek")														
TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL	Allocations			Subscore			TMDL		
		≥15	≥15	≥5	35	≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts		
≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts							
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-090-010 - Salt Lick Creek headwaters to below Four Mile Cr.														
Salt Lick Creek (WWH)	27.9	0	6.5	4	10.5	67%	substrate	30.5	4	10	0	0	0	0
Fourmile Creek (WWH)	3.1	6	13.5	5	24.5	23%	substrate	50	4	9	0	0	0	0
05060002-090-020 - Salt Lick Cr. below Four Mile Cr. to US 35 at Jackson														
Salt Lick Creek (WWH)	26.8	8	11	5.5	24.5	23%	substrate	52	1	8	0	1	0	1

Table B.8 Bedload and Habitat TMDLs for WAU 05060002 090: Salt Lick Creek [except Middle Fork Salt Creek] (Salt Lick Creek is also known as "Little Salt Creek") (con't)

TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL	Allocations			Subscore			TMDL		
		EWH	≥15	≥15	≥5	35	≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts	
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use)	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
<i>blue = partial attainment red = non-attainment</i>		Substrate	Channel	Riparian										
05060002-090-030 - Salt Lick Cr. below US 35 at Jackson to Salt Lick Cr. near Jackson [except Buckeye Cr.]														
Salt Lick Creek (WWH)	22.6	11	12	7	30	6.3%	substrate	66	0	5	1	1	0	2
	22.1	10.5	12.5	6.5	29.5	7.8%	substrate	61	0	5	1	1	0	2
	20.6	6	15	9.5	30.5	4.7%	substrate	62.5	0	5	1	1	0	2
	20.4	6	15	9.5	30.5	4.7%	substrate	62.5	0	5	1	1	0	2
	19.5	6	15	9.5	30.5	4.7%	substrate	65.5	0	5	1	1	0	2
	18.2	17.5	16	8	41.5	—	—	76.5	0	2	1	1	1	3
Sugar Run (WWH)	0.42	4	10	4.5	18.5	42%	substrate	40.5	3	9	0	0	0	0
Trib. to Salt Lick Creek (RM 22.50) (EWH)	0.8	7	12.5	5.5	25	29%	substrate	49.5	3	8	0	0	0	0
Horse Run (WWH)	2.3	5	13	5.5	23.5	27%	substrate	45.5	3	8	0	0	0	0

Table B.8 Bedload and Habitat TMDLs for WAU 05060002 090: Salt Lick Creek [except Middle Fork Salt Creek] (Salt Lick Creek is also known as "Little Salt Creek") (con't)

TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL			Allocations			Subscore		TMDL	
		≥15	≥15	≥5	35			≥75 = 1	0 = 1 pt	<3 = 1 pt				3 pts
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-090-040 - Buckeye Creek														
Buckeye Creek (EWH)	3.8	11	13	4	28	20%	substrate	47.5	2	7	0	0	0	0
	0.42	8	13.5	7	28.5	19%	substrate	60.5	3	8	0	0	0	0
05060002-090-050 - Salt Lick Cr. below Jackson to Salt Cr. [except Pigeon Cr. & Middle Fork Salt Lick Cr.]														
Salt Lick Creek (WWH)	16.7	7	15	6	28	13%	substrate	62	1	4	1	1	1	3
	14.7	7	16	8.5	31.5	1.6%	substrate	64.5	0	7	1	1	0	2
	7.2	13	16	8	37	—	—	75	0	4	1	1	1	3
	1	7	11.5	5	23.5	27%	substrate	55.5	0	8	0	1	0	1
Sour Run (WWH)	0.2	12.5	13	5	30.5	4.7%	channel	56.5	2	7	0	0	0	0

Table B.8 Bedload and Habitat TMDLs for WAU 05060002 090: Salt Lick Creek [except Middle Fork Salt Creek] (Salt Lick Creek is also known as "Little Salt Creek") (con't)

TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL	Allocations			Subscore			TMDL		
		EWH	≥15	≥15	≥5	35	≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts	
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-090-060 - Pigeon Creek (Trib. to Salt Lick Cr.)														
Pigeon Creek (WWH)	6.5	14	10.5	4.5	29	9.4%	channel	52.5	4	5	0	0	0	0
	6.4	13	13	3.5	29.5	7.8%	riparian	59.5	0	3	0	1	1	2
	0.9	15	13	6	34	—	channel	70.5	0	3	1	1	1	3
Big Run (WWH)	2.1	11	13.5	6	30.5	4.7%	substrate	59	1	6	0	1	0	1
	2	10	13.5	3.5	27	16%	riparian	59.5	1	6	0	1	0	1
Poplar Run (WWH)	0.2	12	14	5	31	3.1%	substrate	56.5	2	7	0	0	0	0

Table B.9 Bedload and Habitat TMDLs for WAU 05060002 100: Salt Creek (above Queer Cr. to Scioto R. [except Salt Lick Creek and Middle Fork])

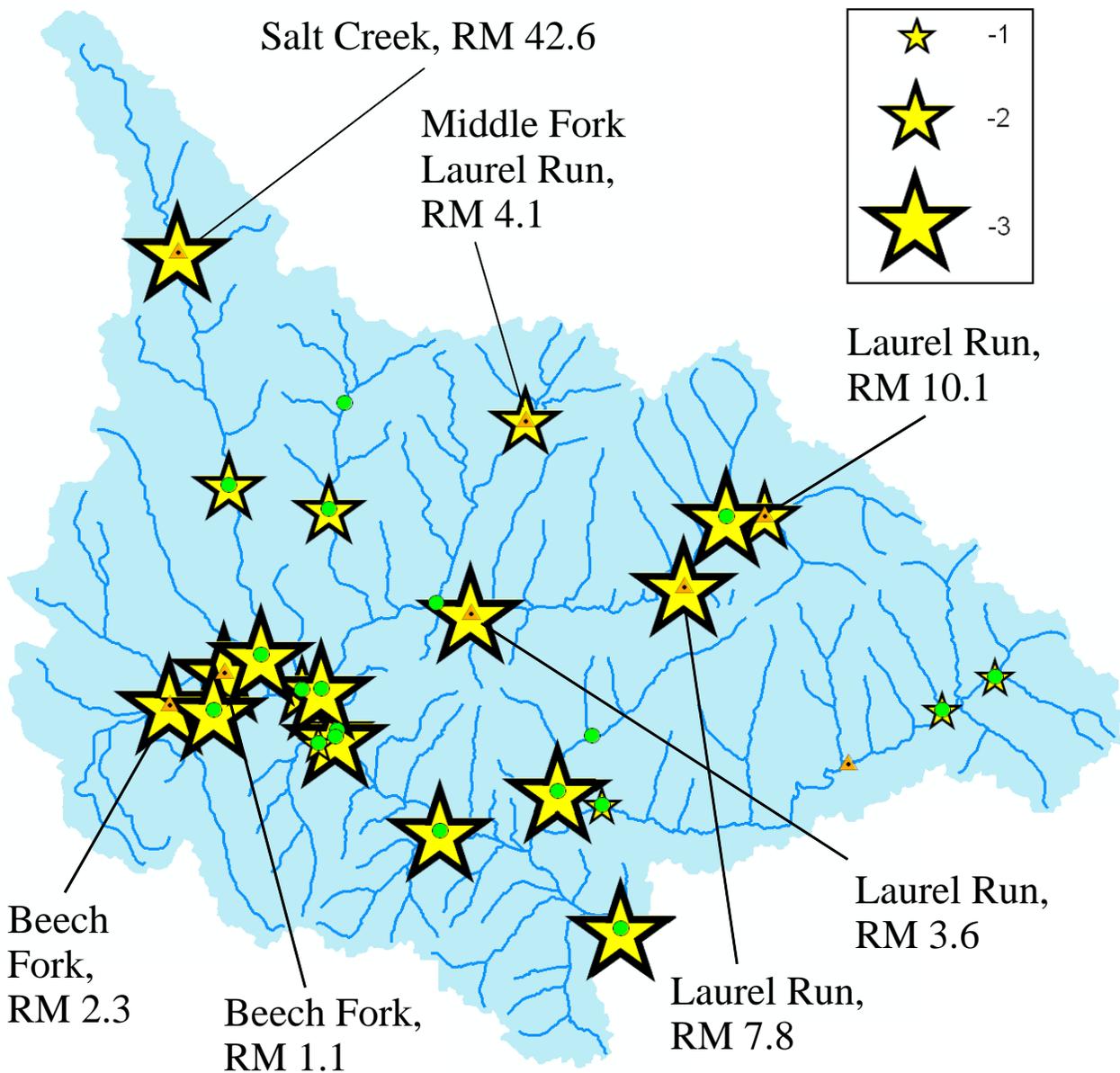
TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL			Allocations			Subscore			TMDL
		≥15	≥15	≥5	35			≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts
WWH	≥13	≥14	≥5	32	≥60 = 1			<2 = 1 pt	<5 = 1 pt	3 pts				
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-100-010 – Queer Creek above East Fork Queer Cr.														
Queer Creek (EWH)	4.4	11.5	11.5	7.5	30.5	13%	channel	65	1	4	0	0	0	0
05060002-100-020 - East Fork Queer Creek														
East Fork Queer Creek (EWH)	3.9	14	10	6.5	30.5	13%	channel	52.5	1	6	0	0	0	0
	1.7	12.5	14.5	9	36	—	substrate	72.5	1	2	0	0	1	1
Trib. to E. Fk. Queer Creek (RM 3.95) (WWH)	0.9	12.5	8	7	27.5	14%	channel	53.5	2	8	0	0	0	0
05060002-100-030 - Queer Creek below East Fork Queer Cr. to Salt Creek														
Queer Creek (EWH)	0.8	12	13.5	6	31.5	10%	substrate	74	1	2	0	0	1	1

Table B.9 Bedload and Habitat TMDLs for WAU 05060002 100: Salt Creek (above Queer Cr. to Scioto R. [except Salt Lick Creek and Middle Fork]) (con't)														
TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL			Allocations			Subscore			TMDL
		≥15	≥15	≥5	35			≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts
WWH	≥13	≥14	≥5	32	≥60 = 1			<2 = 1 pt	<5 = 1 pt	3 pts				
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-100-040 - Salt Creek below Queer Cr. To above Pike Run [except Pretty Run]														
Salt Creek (EWH)	23	14.5	11	8	33.5	4.3%	channel	72.5	0	3	0	1	0	1
	17.4	14	13.5	8	35.5	—	channel	71.5	0	2	0	1	1	2
	15.2	16	6	5.5	27.5	21%	channel	62	2	3	0	0	0	0
05060002-100-050 - Pretty Run														
Pretty Run (EWH)	3.5	14	5	7	26	26%	channel	45	3	5	0	0	0	0
	0.7	16	8	4	28	20%	channel	60	3	7	0	0	0	0
North Branch Pretty Run (WWH)	0.4	6	12	7.5	25.5	20%	substrate	56.5	2	8	0	0	0	0

Table B.9 Bedload and Habitat TMDLs for WAU 05060002 100: Salt Creek (above Queer Cr. to Scioto R. [except Salt Lick Creek and Middle Fork]) (con't)

TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL	Allocations			Subscore			TMDL		
		EWH	≥15	≥15	≥5	35	≥75 = 1	0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts	
WWH	≥13	≥14	≥5	32	≥60 = 1	<2 = 1 pt	<5 = 1 pt	3 pts						
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-100-070 - Pike Run below Tar Hollow Cr. to Salt Cr.														
Pike Run (WWH)	5.7	11.5	12	6.5	30	6.3%	channel	63	1	7	1	1	0	2
	4.5	10	12.5	4.5	27	16%	substrate	63	1	4	1	1	1	3
East Fork Pike Run (WWH)	0.2	11	9	3.5	23.5	27%	channel	58.5	2	7	0	0	0	0
05060002-100-080 - Salt Creek below Pike Run to above Salt Lick Cr. [except Poe Run]														
Salt Creek (EWH)	9.9	13	15	6	34	2.9%	substrate	78	0	1	1	1	1	3
	5.9	11.5	13	6.5	31	11%	substrate	70	0	2	0	1	1	2
Mulgee Run (WWH)	0.1	14	14	5	33	—	—	68	0	1	1	1	1	3
Goose Creek (WWH)	0.4	14.5	15	6.5	36	—	—	69.5	0	3	1	1	1	3

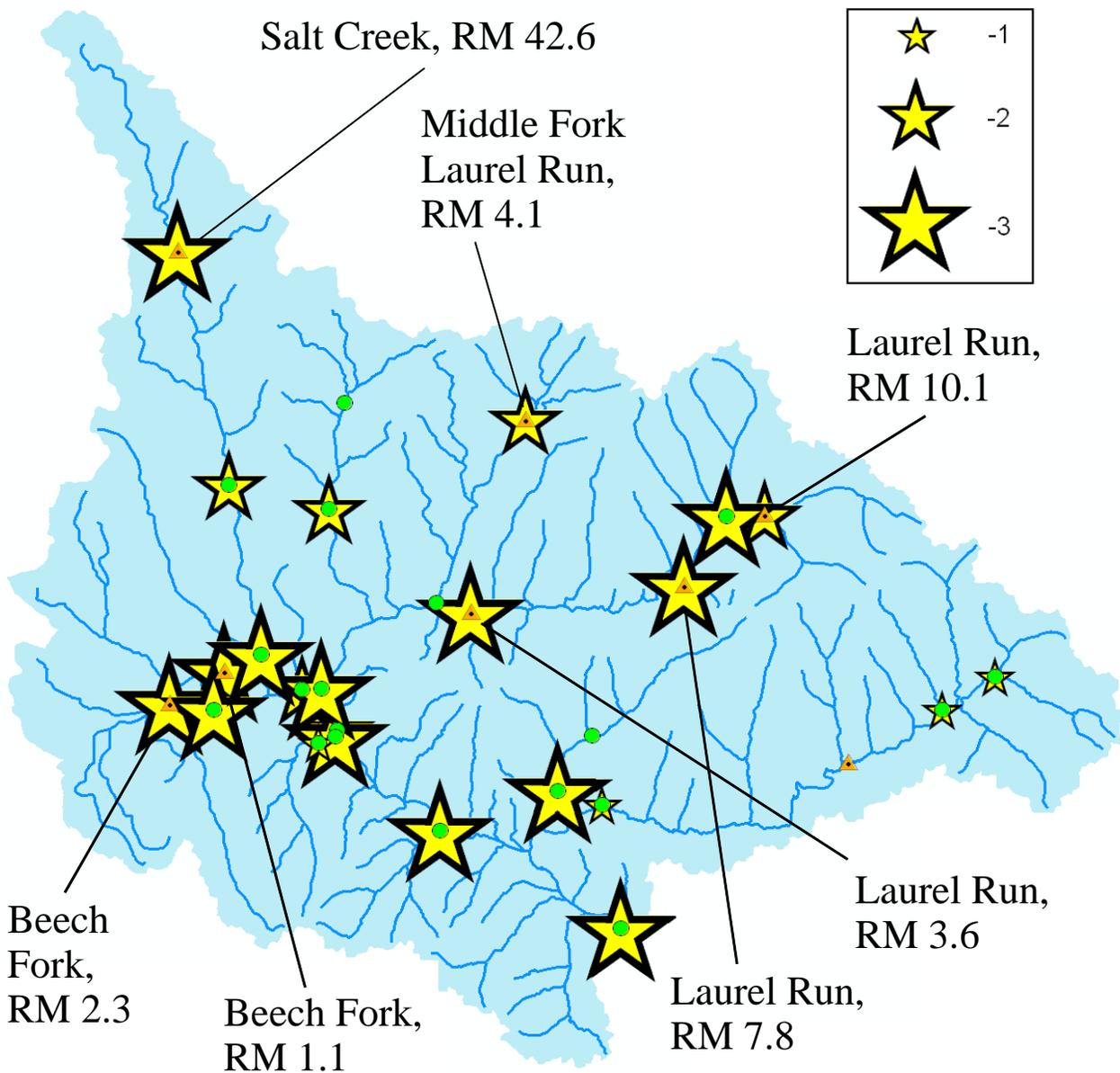
Table B.9 Bedload and Habitat TMDLs for WAU 05060002 100: Salt Creek (above Queer Cr. to Scioto R. except Salt Lick Creek and Middle Fork] (con't)														
TMDL Targets ►	Use	Bedload TMDL						Habitat TMDL						
		Allocations			TMDL		Allocations			Subscore			TMDL	
		EWB	EWB	EWB	EWB = 1		0 = 1 pt	<3 = 1 pt	QHEI	High Influence	# Modified Attributes	3 pts		
WWB	WWB	WWB	WWB = 1	<2 = 1 pt	<5 = 1 pt		3 pts							
Existing Scores Stream/River (Use) <i>blue = partial attainment</i> <i>red = non-attainment</i>	River Mile	QHEI Categories			Total Bedload Score	% Deviation from Target	Main Impaired Category if any	QHEI Score	# of High Influence Attributes	Total # of Modified Attributes	QHEI	High Influence	# Modified Attributes	Total Habitat Score
		Substrate	Channel	Riparian										
05060002-100-100 - Salt Creek below Salt Lick Cr. to Scioto River														
Salt Creek (EWB)	1.5	14	12.5	5.5	32	8.6%	channel	72	0	4	0	1	0	1



- = attaining sites
- ▲ = partially attaining sites
- = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

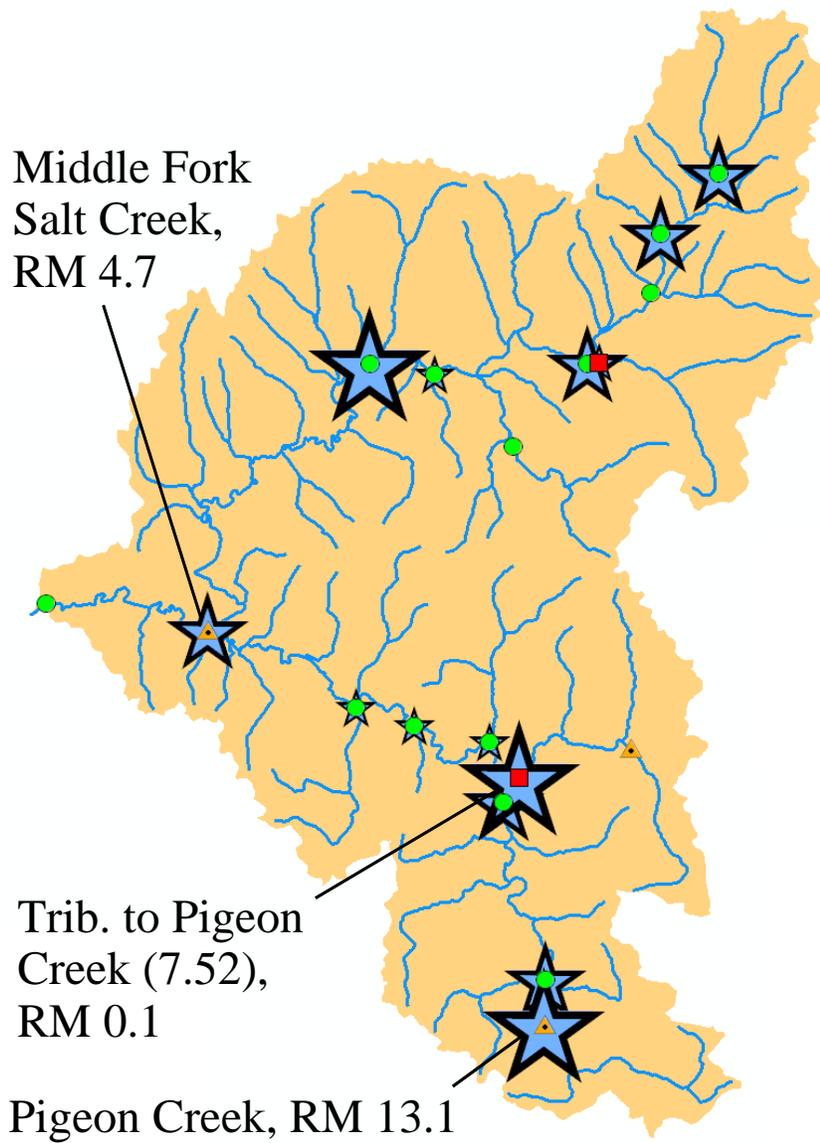
Figure B.5. Bedload TMDL deficits for 05060002-070: Salt Creek (headwaters to above Queer Creek)



- = attaining sites
- ▲ = partially attaining sites
- = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

Figure B.6. Habitat TMDL deficits for 05060002-070: Salt Creek (headwaters to above Queer Creek)



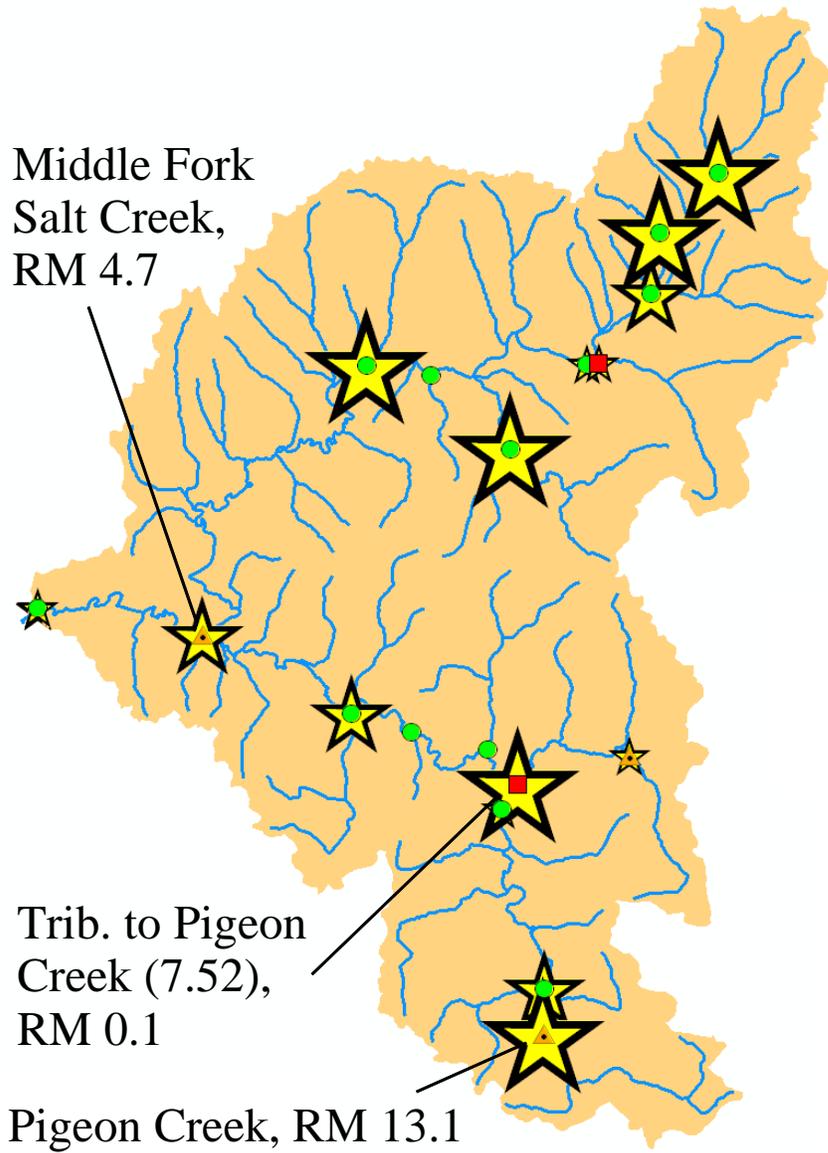
● = attaining sites

▲ = partially attaining sites

■ = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

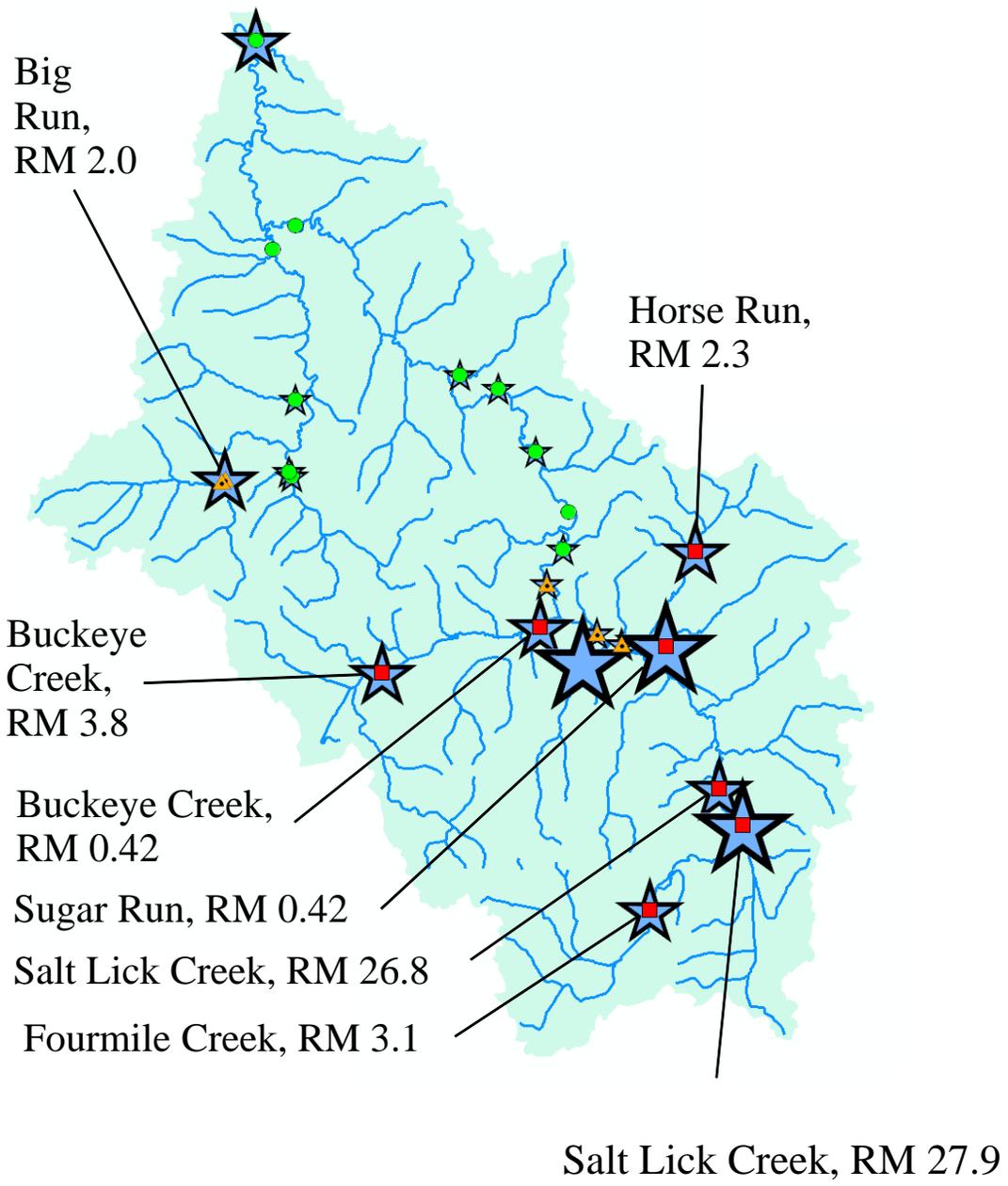
Figure B.7. Bedload TMDL Deficits for 05060002-080: Middle Fork of Salt Creek



- = attaining sites
- ▲ = partially attaining sites
- = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

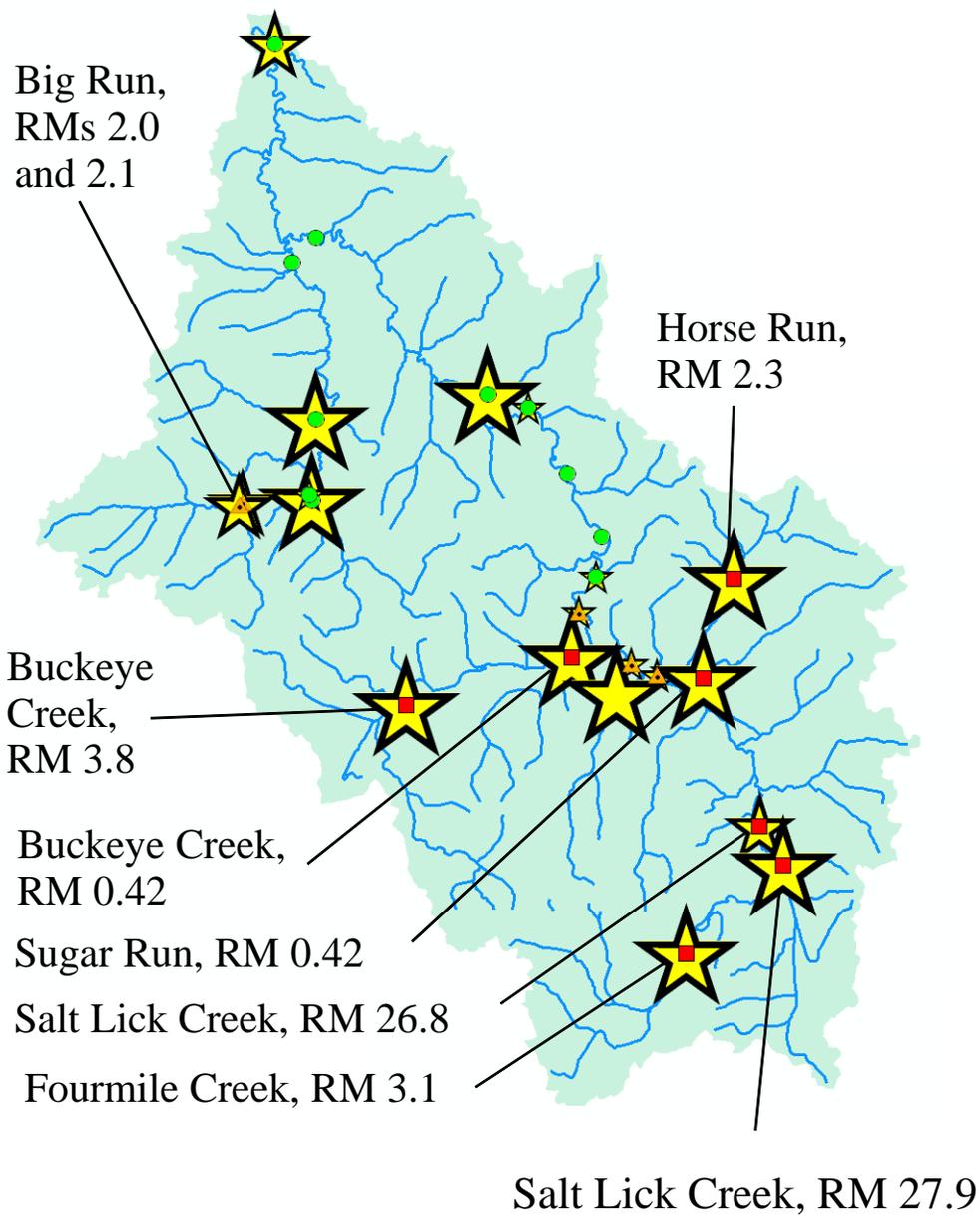
Figure B.8. Habitat TMDL Deficits for 05060002-080: Middle Fork of Salt Creek



- = attaining sites
- ▲ = partially attaining sites
- = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

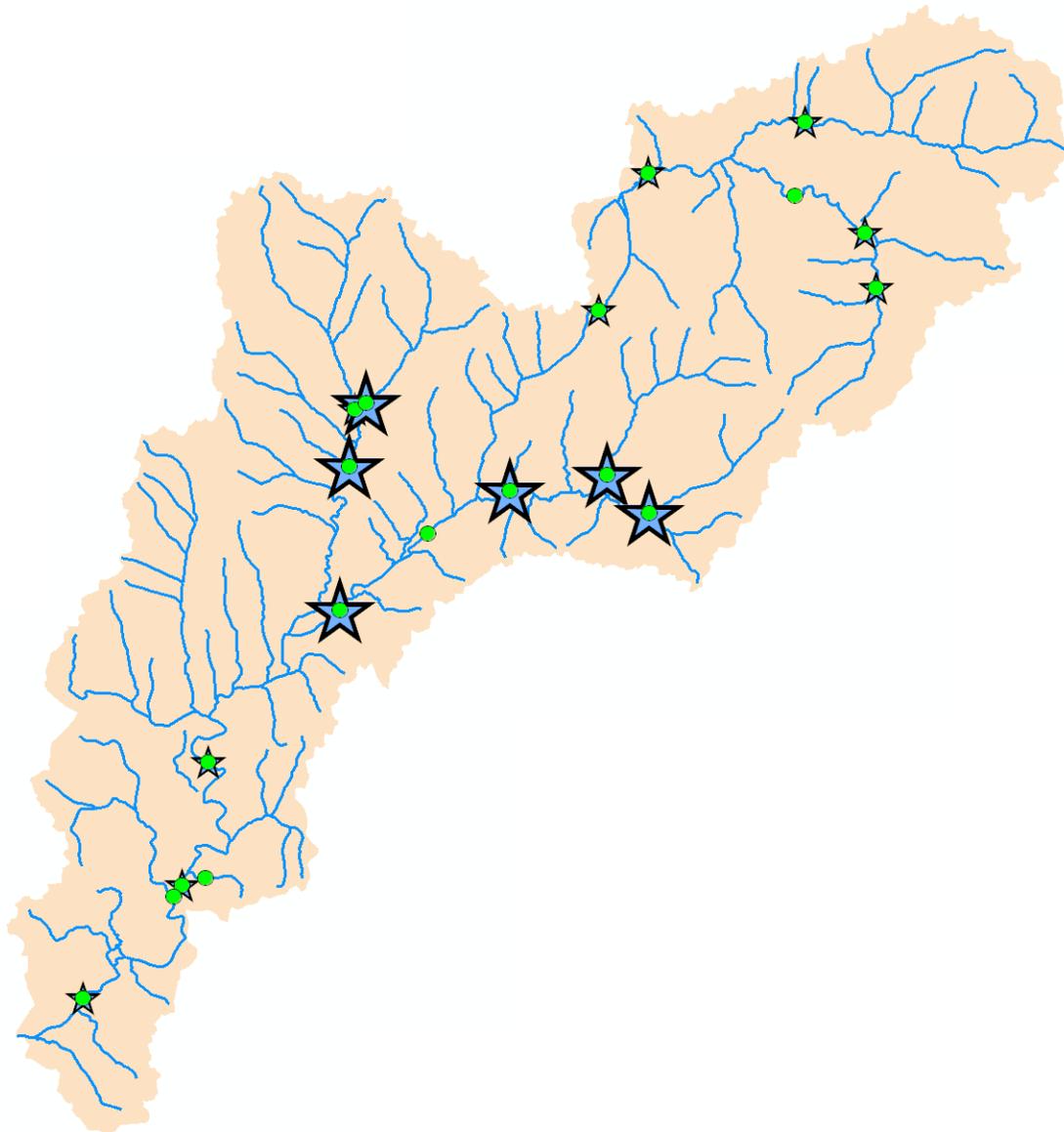
Figure B.9. Bedload TMDL Deficits for 05060002-090: Salt Lick Creek [except Middle Fork Salt Creek]



- = attaining sites
- ▲ = partially attaining sites
- = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

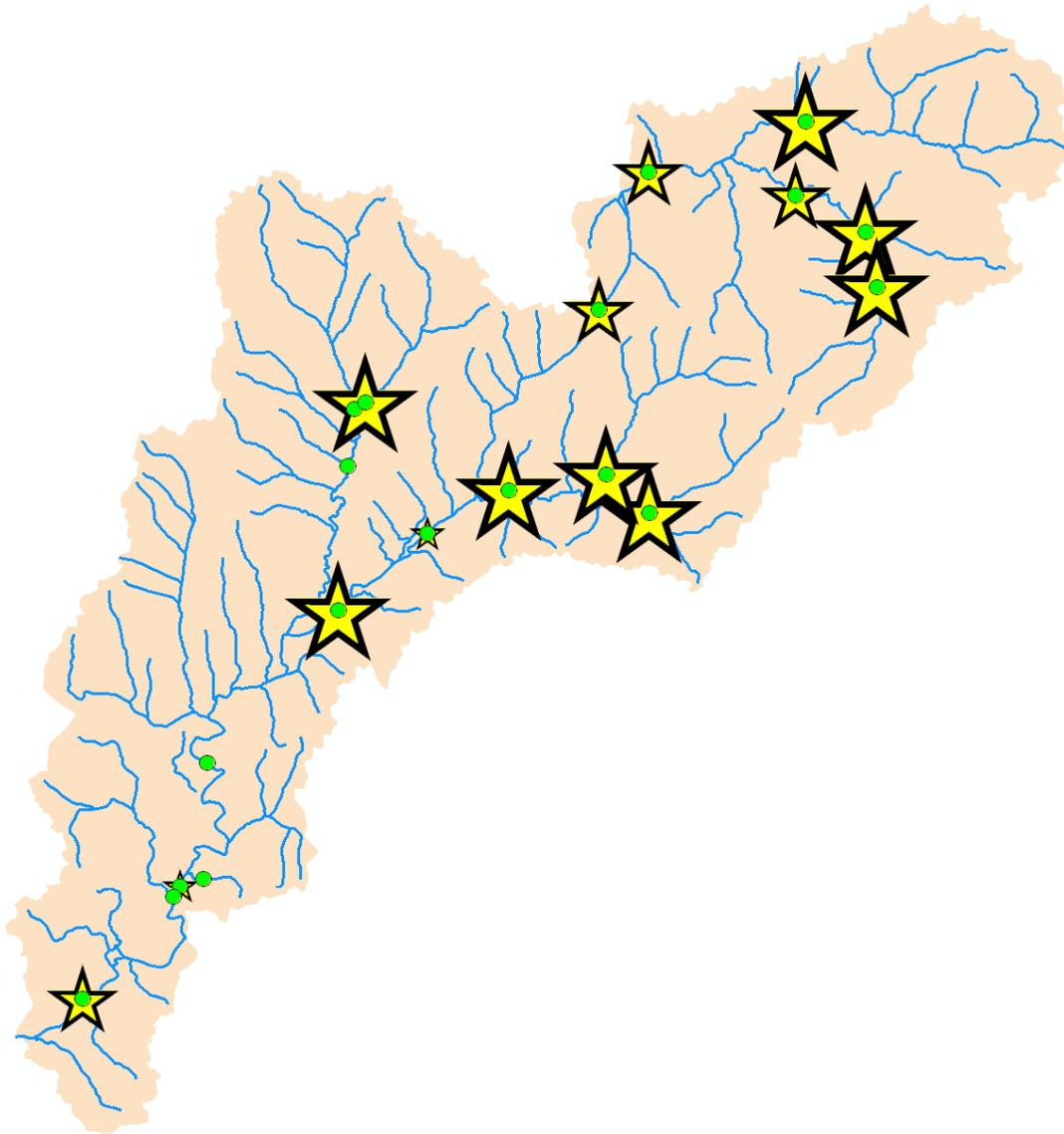
Figure B.10. Habitat TMDL Deficits for 05060002-090: Salt Lick Creek [except Middle Fork Salt Creek]



- = attaining sites
- ▲ = partially attaining sites
- = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

Figure B.11. Bedload TMDL Deficits for 05060002-100: Salt Creek (above Queer Cr. to Scioto R. [except Salt Lick Creek and Middle Fork])



- = attaining sites
- ★ = partially attaining sites
- = non-attaining sites

Partial or non-attaining sites that overlap with large deficits suggest sites where habitat is causing or contributing to non-attainment.

Figure B.12. Habitat TMDL Deficits for 05060002-100: Salt Creek (above Queer Cr. to Scioto R. [except Salt Lick Creek and Middle Fork])

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2. Rankin, E. T. 1995. Habitat indices in water resource quality assessments, pp. 181- 208 in Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Davis, W.S. and Simon, T.P. (eds.), Lewis Publishers, Boca Raton, FL.
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4. Rankin, E.T. 2006. Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI). Ohio EPA Technical Bulletin EAS/2006-06-1, Revised by the Midwest Biodiversity Institute for State of Ohio Environmental Protection Agency, Groveport, Ohio.