City of Austin
WATERSHED PROTECTION

Action Plan Items Related to EII Site Scores - Fiscal Year 2009

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Abstract

The Environmental Integrity Index (EII) was used to identify creek reaches with at least a 13% decrease in environmental health in using data collected in 2009 compared to initial conditions sampled from 1996-1999. City of Austin programs with the potential to reverse the recent degradation in five problem areas (aquatic life, habitat, nutrients plus bacteria, nutrients alone, and litter) through structural and non-structural BMPs were identified. Primary and secondary problem reach lists are provided for these programs. There was a sharp increase in the number of sites with litter problems. No watershed yielded a significant decline in overall EII score, and three watersheds yielded a significant improvement.

Introduction

As a measure to address developing environmental problems, the Watershed Protection Department (WPD) has initiated a process to identify watersheds with declining environmental health and recommend solutions to stop or reverse the observed degradation. Determination of degrading creeks conditions is based on Environmental Integrity Index (EII) scores, and is assessed EII reaches sampled in 2009 versus initial sampling events completed in 1996 thru 1999. This analysis is an update of previous work (COA 2007), as specified in the Pollution Detection, Tracking and Forecasting activity action plan and complements (but does not replace) the water quality problem scores calculated for use in the departmental master plan (COA 2009). The overall percentage of creeks with less than a 12.5% decrease in watershed EII score is also used as a performance measure in business planning for WPD.

The Development of Action Plans from Changes in EII Scores

In an effort to tie Department action plans to sites and watersheds which are exhibiting declines in environmental integrity as measured by the EII, the Water Resources Evaluation (WRE) section has proposed an annual plan:

- Identify creek reaches with decreasing health using the Environmental Integrity Index (EII) and documentation of the selection process.
- Isolate probable causes by comparing sub-index scores and raw data components.
- Identify opportunities for reversing/mitigating the decrease or partnering with other ongoing efforts to address specific causes of degradation.
- Develop plans for program, regulation, or CIP project to take advantage of opportunities within the watershed(s) of concern.

EII scores have been calculated for the 50 sampled watersheds. The initial EII sampling was conducted during 1996-1999. Following rounds have been completed every three years, although sampling

frequency has been increased to every other year beginning in 2009. Parameter values/scores from the initial EII samples were compared to those from the most recent sampling events completed in 2009 for the sampled watersheds. Only major changes, defined as a decline of > 12.5 points out of a possible 100 and equivalent to a change in EII category, were identified. City of Austin (COA) programs have been designated the responsibility to evaluate the recent degradation and recommend appropriate actions for remediation. The 5 problem areas which are most amenable to change are listed in Table 1. For each problem area, the primary reaches with major declines in all of the listed parameters/scores are identified for referral to the specified program. Secondary problem reaches with major declines in one or more parameters/scores but without major declines in all parameters/scores are also identified.

Table 1. Problem Areas with Recent Declines in EII Parameters/Scores

Problem Area	Parameters/EII components Involved in Determination of Degradation	COA Program to Evaluate and Recommend Solution
Decline in aquatic life scores	Diatom and benthic macroinvertebrate scores	WRE Surface Water Team
Declines in physical integrity and non-contact recreation EII sub-indices	Physical Integrity and Non-Contact Recreation EII sub-indices	Master Plan Committee
Nutrient levels and bacteria increased indicating potential sewer line problems	Nitrate, ammonia, orthophosphorus, and e-coli	Austin Water Utility
Nutrient levels increased but bacteria levels did not indicating potential fertilizer problems	Nitrate, ammonia, orthophosphorus	ERM Community Education Section
Non-contact recreation litter scores decreased	Litter score	Keep Austin Beautiful (KAB)

Initial year data for multiple sites within the same EII reach were averaged to yield a reach score if a matching site was not sampled within the reach. EII reaches citywide were affected by the on-going drought continuing thru the summer of 2009.

Overall watershed scores declined or remained the same in 2009 versus initial sampling in 1996 to 1999 in only 5 of 21 watersheds (24%). The maximum negative change was -6 points in the Barton and Fort Branch creek watersheds. The decline in Barton Creek was driven by a decline in contact recreation scores at the majority of sites sampled, including upstream reference sites. The decline in Fort Branch scores was driven by non-contact recreation declines. No watershed yielded a significant decline (<-12.5 points) in overall watershed scores. Three watersheds (Elm, Johnson and Country Club East creeks) yielded a significant (>12.5 points) improvements.

Primary degradation sites with designated evaluation program

A. EII sites with major (>12.5 points) decreases in both benthic macroinvertebrate and diatom scores for evaluation by the WRE surface water team (excluding sites dry in 2008).

Table 2. EII sites with major decreases in both benthic macroinvertebrate (bug) and diatom scores.

There were no flowing sites in 2009 with major decreases in both benthic macroinvertebrate and diatom sub-index values.

B. EII Sites with major decreases in both physical integrity and non-contact recreation scores for recommendation to the WPD master plan committee.

Table 3. EII sites with major decreases in both physical integrity (PI) and non-contact recreation (NCR) scores

Reach	Site #	Name	Change in PI	Change in NCR
EBO3	121	East Bouldin Creek Downstream of W. Alpine Rd	-23	-50

C. EII Sites where nutrient component scores decreased and bacteria scores decreased for recommendation to the AWU.

Table 4. EII sites where nutrient scores decreased and bacteria scores decreased.

There were no sites in 2009 with major decreases in both nutrient and bacteria component scores.

D. EII sites where both NO_3 and orthophosphorus scores decreased without substantial decrease in bacteria (potential fertilizer application problems) for evaluation by the ERM education group.

Table 5. EII sites where both NO_3 and orthophosphorus scores decreased without substantial decrease in bacteria scores.

Reach	Site #	Site	ΔBacT	ΔNO3	ΔOP
LWA4	838	Little Walnut Creek @ Golden Meadow Rd	3	-17	-19

E. EII sites with major decreases in non-contact recreation litter scores for KAB.

Table 6. EII sites that have degrading (by more than one EII category) non-contact recreation litter scores

Reach	Site #	Site	Change in Litter
BMK3	3861	Buttermilk Creek @ Victory Christian Center	-35
BOG2	837	North Boggy Creek @ Nile Street	-45
DKR1	1974	Decker Creek @ Gilbert Rd	-85
EBO3	121	East Bouldin Creek Downstream of W. Alpine Rd	-20
ELM1	3614	Elm Creek @ Austins Colony	-20
FOR4	126	Fort Branch Creek @ Glencrest Drive	-15
HRP1	844	Harpers Branch Creek @ Woodland Ave	-30
HRS1	1201	Harris Branch Creek @ Boyce Lane	-45
LWA4	838	Little Walnut Creek @ Golden Meadow Rd	-40
SHL3	117	Shoal Creek @ Shoal Edge Court (EII)	-30
SHL4	118	Shoal Creek Downstream of Crosscreek Drive	-20
WBO1	2794	West Bouldin @ Post Oak	-35

Table 6. EII sites that have degrading (by more than one EII category) non-contact recreation litter scores (continued)

Reach	Site #	Site	Change in Litter
WLN1	503	Walnut Creek Above SP Railroad Bridge	-20
WLN3	464	Walnut Creek Below IH35	-15
WLR1	38	Waller Creek Below Cesar Chavez	-25
WLR2	624	Waller Creek Upstream of 23rd Street	-40
WLR3	780	Waller Creek @ 51st Street	-20
WMS2	491	Williamson Creek @ IH35 (EII)	-25
WMS3	490	Williamson Creek @ Hwy 71 (EII)	-25

Secondary Problem Sites

AA. EII sites with major decreases in either benthic macroinvertebrate or diatom scores

Table 7. EII sites with major decreases in either benthic macroinvertebrate (bug) or diatom scores

Reach	Site #	Site	Change in BM	Change in Diatom
BMK2	782	Walnut Creek Above SP Railroad Bridge	-12	-29
EBO1	1338	Gilleland Creek @ West Parsons St	-18	-6
GIL3	1191	Buttermilk Creek @ Providence Ave	0	-29
WLN1	503	East Bouldin Creek @ Post Oak	-13	30

BB. EII Sites with major decreases in either physical integrity or non-contact recreation scores for recommendation to the masterplan committee.

Table 8. EII sites with major decreases in either physical integrity (PI) or non-contact recreation (NCR) scores

Reach	Site #	Site	Change in PI	Change in NCR
BAR2	51	Barton Creek Downstream of Lost Creek Blvd	-13	1.5
BLU2	364	Blunn Creek Above Big Stacy Pool	-23	5
BMK1	851	Buttermilk Creek @ Little Walnut Creek	-28	-5
BMK2	782	Buttermilk Creek @ Providence Ave	-15	-11
BOG2	837	North Boggy Creek @ Nile Street	10	-20
DKR1	1974	Decker Creek @ Gilbert Rd	-3	-13
DKR3	1196	Decker Creek @ Lindell Lane	-13	30
FOR1	123	Fort Branch Creek @ North Boggy Creek	0	-56
FOR2	898	Fort Branch Creek @ Single Shot Circle	-3	-43
LWA2	3857	Little Walnut @ Cameron Rd	-13	5
TAN3	3858	Tannehill Creek @ Berkman Dr	-19	12
WLR3	780	Waller Creek @ 51st Street	-6	-26
WMS3	490	Williamson Creek @ Hwy 71 (EII)	1	-24

CC. EII sites with a major decrease in at least one nutrient component (NO_3, orthophosphorus) and in the water quality bacteria score for recommendation to the AWU.

Table 9. EII sites with a major decrease in at least one nutrient component (NO_3, NH_3, orthophosphorus) and in the water quality bacteria score.

Reach	Site #	Site	ΔBacT	ΔNO3	ΔOP
BAR4	48	Barton Creek @ Hwy 71 Below Little Barton	-25	-30	3
BLU2	364	Blunn Creek Above Big Stacy Pool	-69	-14	27

DD. EII sites with a major decrease in either orthophosphorus or NO_3 component scores without a major decrease in bacteria scores as a list of sites with potential fertilizer application problems.

Table 10. EII sites with a major decrease in nutrient scores with a major decrease in bacteria scores as potential fertilizer application problems.

Reach	Site #	Site	ΔBacT	ΔNO3	ΔOP
BMK2	782	Buttermilk Creek @ Providence Ave	0	-51	17
DKR1	1974	Decker Creek @ Gilbert Rd	13	15	-19
LWA2	3857	Little Walnut @ Cameron Rd	19	20	-25
SHL4	118	Shoal Creek Downstream of Crosscreek Drive	11	11	-33

Conclusions

EII data were used to identify degrading sites in Austin creeks for recommendation to designated programs for remediation. Although potential solutions have been identified for each group (Table 11), solution options must be continually evaluated and developed. Solution implementation must be documented, so that as additional EII data becomes available the effectiveness of solutions can be evaluated effectively. Several problems sites were targeted; however, no major trends were identified. There was a sharp increase in the number of sites with litter problems. This may be a temporary phenomenon potentially due to the extended time period without significant rainfall to wash litter and debris downstream.

Table 11. Potential solution options to identified degradation problems.

Problem	COA Program	Potential Solution
Aquatic Life Impairments	Surface Water Evaluation	Direct short-term monitoring to identify impairment source
Physical Integrity Decline	Stream Restoration Program	CIP structural BMP in problem area
Sewer Leaks	Austin Water Utility	Remove sewer line from creek or retrofit line (e.g., add liner)
Fertilizer Application	Community Education Program – Grow Green	Targeted public education campaign
Litter	Keep Austin Beautiful	Volunteer creek clean-up efforts

References

City of Austin (COA). 2007. Action Plan Items Related to EII Site Scores - Fiscal Year 2006. City of Austin Watershed Protection and Development Review Department, Environmental Resource Management Division, Water Resource Evaluation Section. SR-07-03.

City of Austin (COA). 2009. WPDRD Master Plan Water Quality Problem Score Method Revision. City of Austin Watershed Protection and Development Review Department, Environmental Resource Management Division, Water Resource Evaluation Section. SR-08-09.

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