Action Plan Items Related to EII Site Scores - Fiscal Year 2010

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Abstract

The Environmental Integrity Index (EII) was used to identify creek reaches with at least a 12.5% decrease in environmental health using data collected in 2010 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 decrease in the number of problematic litter reaches, although the number of reaches with potential nutrient enrichment from fertilizer use increased over previous years.

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 creek degradation is based on Environmental Integrity Index (EII) scores, and is assessed by comparing results from EII reaches sampled in 2010 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 due to TCEQ Clean Water Program data requirements. 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.

Overall watershed scores declined or remained the same in 2010 versus initial sampling in 1996 to 1999 in 5 of 29 watersheds (38%). The maximum negative change was -11 points in the Little Bee Creek watershed, driven by a lack of flow during the biological sample collection thereby receiving a zero aquatic life score. No watershed yielded a significant decline (<-12.5 points) in overall watershed scores. Two watersheds (Cottonmouth and South Fork Dry) yielded significant (>12.5 points) improvements of plus 15 points. The average change in score was plus 2.65 points.

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 2010).

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

There were no flowing reaches in 2010 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

There were no flowing reaches in 2010 with major decreases in both benthic macroinvertebrate and diatom sub-index values.

Common Ford and Cuernavaca tributaries to Lake Austin were identified for potential CIP projects based on FY2008 data but FY2010 data did not indicate this need.

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 2010 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
CMF1	1048	Common Ford Trib. in Common Ford Metro Park	-7	-18	-30
RDR1	316	Unnamed Trib. @ Running Deer Trail (AST)	-6	-47	-20
BRW1	1224	Bear Creek (West) @ Fritz Hughes Park Rd.	-5	-50	-14
BER3	4112	Bear Creek @ Bear Creek Pass	7	-20	-18
PAN1	1223	Panther Hollow Creek @ Big View Road	12	-43	-25
TRK1	1221	Turkey Creek @ City Park Road	17	-50	-25
BER2	3935	Bear Creek @ Escondido	21	-26	-15

Panther Hollow and Bear Creek West are repeated due to potential fertilizer problems identified from fiscal year 2008 data.

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
CTM1	1206	Cottonmouth Creek @ Dee Gabriel-Collins Rd.	-40
LKC3	1100	Lake Creek Below Meadowheath Drive	-40
BER1	1087	Bear Creek @ Twin Creeks Road	-35
CAR1	1094	Carson Creek @ Shady Spring Subdivision	-30
BRW1	1224	Bear Creek (West) @ Fritz Hughes Park Rd.	-25
SFD1	1216	South Fork Dry Creek @ FM 812	-25
DRE2	1211	Dry Creek (South) @ Pearce Rd.	-15
NFD1	1217	North Fork Dry Creek @ FM 812	-15

Rinard Creek and Harris Branch were previously listed in FY2008 as litter problems but are not listed in FY2010. South Fork Dry, North Fork Dry and Dry Creek were previously listed as litter problems in FY2008 and remain on the list in FY2010.

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
CAR1	1094	Carson Creek @ Shady Spring Subdivision	-20	15

Rinard Creek was previously listed for secondary aquatic life problems in FY2008.

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
BER1	1087	Bear Creek @ Twin Creeks Road	0	-24
CMF1	1048	Common Ford Trib. in Common Ford Metro Park	-20	-12
LKC3	1100	Lake Creek Below Meadowheath Drive	-28	-5
RIN3	1220	Rinard Creek @ FM 1327	-13	5
RDR1	316	Unnamed Trib. @ Running Deer Trail (AST)	-18	6
CRN1	1222	Cuernavaca Creek @ River Hills Road	-14	14

Rinard was previously listed for secondary CIP problems.

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	ΔNH3	ΔNO3	ΔOP
BER1	1087	Bear Creek @ Twin Creeks Road	-30	37	-18	-6
ONI3	241	Onion Creek Above Footbridge (OC3)	-28	0	-39	33
LKC3	1100	Lake Creek Below Meadowheath Drive	-20	4	-27	-1
DRE1	1210	Dry Creek (South) @ Wolf Lane	-19	67	32	23
RAT2	1009	Rattan Creek Above Parmer Lane	-17	12	-44	-13
CAR1	1094	Carson Creek @ Shady Spring Subdivision	-17	-2	-5	14
DRN2	1109	Dry Creek (North) @ FM 2222	-16	25	-13	-3
TYN1	3969	Taylor Slough North @ Mayfield Park	-16	17	35	18
SFD2	1215	South Fork Dry Creek @ US 183	-14	25	28	31
BUL1	350	Bull Creek at Loop 360	-13	0	-32	31

No site listed in FY2008 for secondary wastewater concerns appears on the FY2010 list.

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 one of the nutrient scores without a major decrease in bacteria scores as potential fertilizer application problems.

Reach	Site #	Site	ΔNO3	ΔOP	ΔBacT
MAR1	231	Marble Creek above Onion Creek (M1)	-14	13	-12
BEE1	319	Bee Creek @ Lake Austin	-34	12	2
BEE2	322	Bee Creek @ Road Runner Road	-22	19	22
BEE3	1104	Bee Creek @ Loop 360	-27	11	8
BUL2	920	Bull Creek @ St. Edwards Park above dam	-50	25	39
CRN1	1222	Cuernavaca Creek @ River Hills Road	-7	-25	-6
DRE2	1211	Dry Creek (South) @ Pearce Rd.	-21	6	-4
EAN2	1106	Eanes Creek @ Camp Craft Road	-16	23	-3
NFD1	1217	North Fork Dry Creek @ FM 812	27	-29	-12
ONI1	1366	Onion Creek @ South Austin Regional WWTP	-43	42	4
ONI5	612	Onion Creek near Driftwood (Hwy 150)	-24	28	12
RIN3	1220	Rinard Creek @ FM 1327	0	-17	4
SLA3	623	Slaughter Creek @ FM 1826 (USGS)	8	-22	12

Dry Creek was previously listed in FY2008 for secondary fertilizer concerns.

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 problem sites were targeted; however, no major trends were identified. Several of the Lake Austin contributing watersheds appeared to show degradation where none was

expected. There was a decrease in the number of sites with litter problems from previous years. There was an increase in elevated nutrients from potential fertilizer application over previous years.

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.

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.