An Assessment
of

Pleasant Valley Branch

and

Kittleson Valley Creek

Stream Rehabilitation Projects

Dane County, WI

Kittleson Valley Creek upstream of Truman Road

A proposal for delisting **Pleasant Valley Branch**
from the state's 303(d) list of impaired waters.

In fulfillment of Water Resources Special Projects
SCR_02_09 and SCR_18_CMP13

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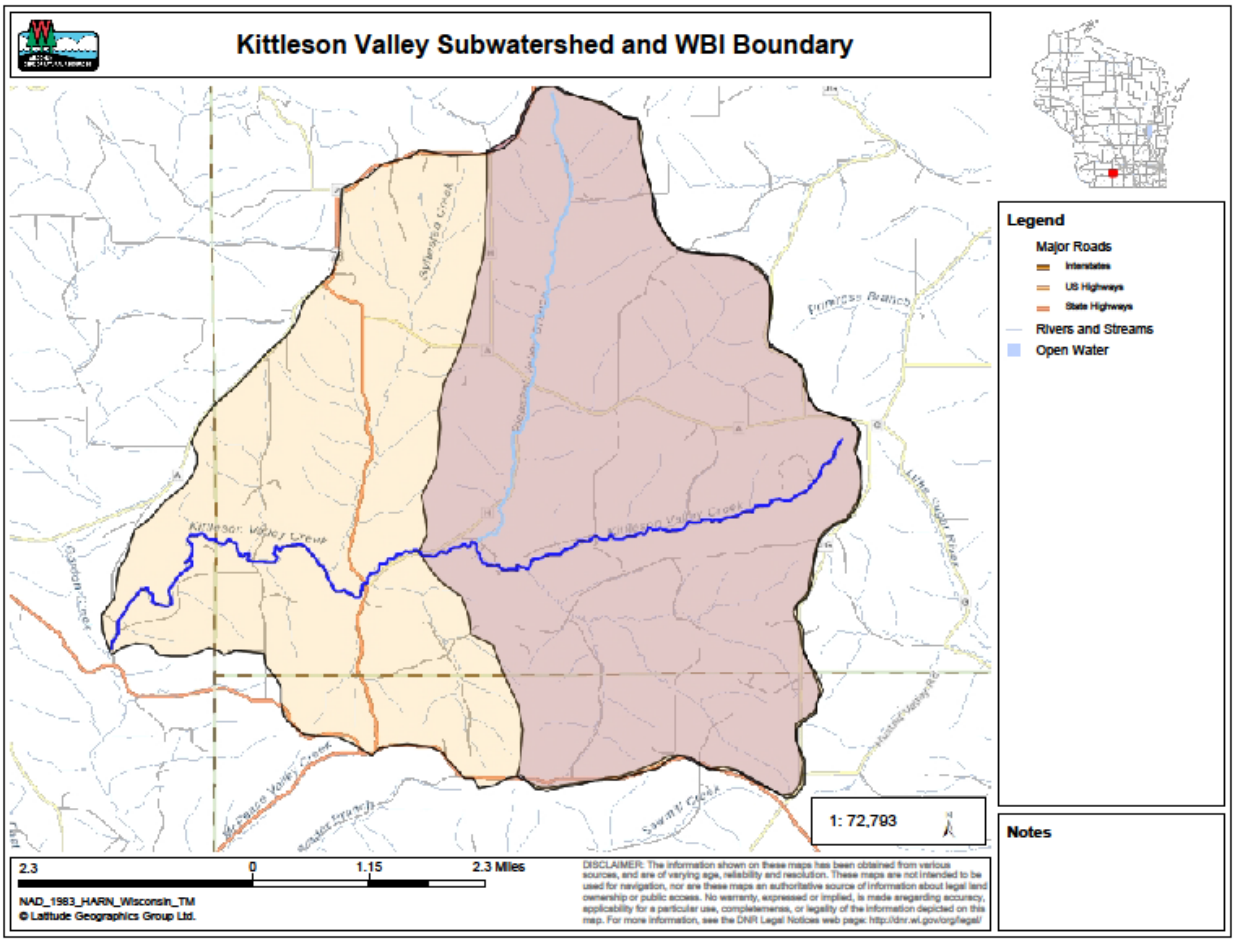
Introduction

Kittleson Valley Creek (WBIC = 907900) is a 9 mile long stream that flows through the far southwest corner of Dane County and joins Gordon Creek in southeastern Iowa County. It is a classified trout stream. Pleasant Valley Branch (WBIC = 908500) is a 5 mile long tributary that joins Kittleson Valley Creek about midway through its length. Pleasant Valley is on the state's 303(d) list of impaired waters due to degraded habitat caused by excessive sedimentation. Although Kittleson Valley was not listed as impaired, it also shared similar habitat characteristics (WDNR, 2004).

The upper third of the 42,000 acre subwatershed that encompasses these two streams has been part of a multifaceted effort to improve the riparian corridor and habitat of the two streams while also addressing nonpoint source issues in the watershed as a whole (Figure 1). This was part of an alternative project proposed in the Wisconsin Buffer Initiative (WBI) report (University of Wisconsin, 2005).

Work on a 12,000 acre portion of the Pleasant and Kittleson Valley subwatershed project began in 2006 with monitoring of baseline conditions in the watershed and at a USGS gauge on Kittleson Valley Creek at CTH H. However, work on the riparian corridor of Pleasant Valley Branch began earlier.

Figure 1: Pleasant Valley Branch and Kittleson Valley Creek Sub-watershed



Kittleson Valley Sub-watershed in orange and pink; WBI boundary in pink only

In 2003, the department had already begun working with the Dane County Land Conservation Department (LCD) to improve the riparian corridor of Pleasant Valley Branch. The Dane County LCD implemented a demonstration project in a section of the stream that flowed through an area that was heavily row cropped to near the stream edge or pastured. The county, in conjunction with the landowner, worked to improve the health of the riparian corridor by narrowing the stream; sloping, seeding and stabilizing the banks; creation of a buffer from agriculture; and incorporation of artificial structures to enhance habitat for fish. As part of this stream rehabilitation program, the department began monitoring of Pleasant and Kittleson Valley branches prior to, and after, implementation of practices meant to improve the health of the riparian stream corridor and the watershed. Water quality biologists used a fish index of biotic integrity (IBI) for coldwater systems (Lyons, 1996) and catch-per-unit effort (WDNR, 1991) to determine the biological response to the effort. They also used a quantitative habitat index (Simonson, et. al., 1994) to gauge the effectiveness of the work.

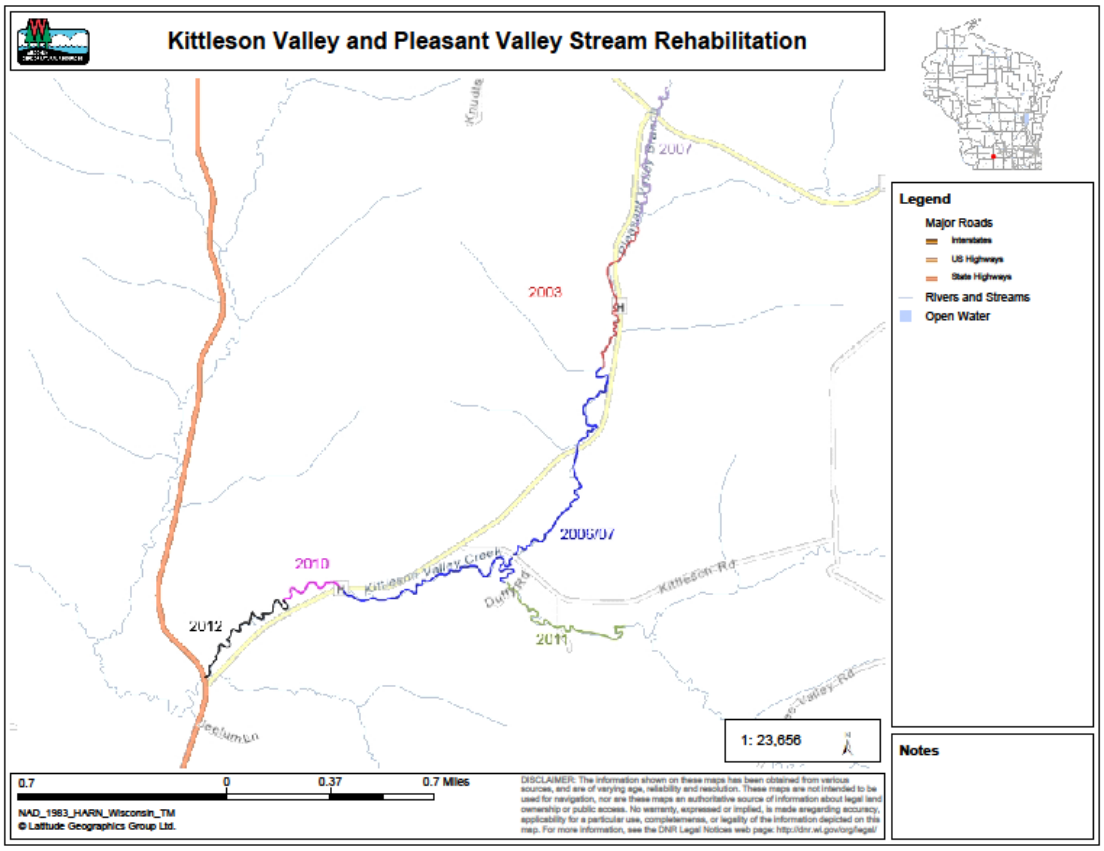
The effects were immediate. The following year, the habitat score went from 45 (fair) to 70 (excellent). The coldwater index of biotic integrity (IBI) went from 20 (poor) to 50 (fair). Over the next 9 years, the county LCD continued to work with landowners on various segments of both Pleasant Valley Branch and Kittleson Valley Creek (Figure 2). WDNR conducted both fishery and habitat assessments on each respective segment. Almost $500,000 of state, county, federal and private funds was spent on these two streams. In all, almost 5 miles of stream were rehabilitated and another 4 miles of tributaries protected by creation of buffers (fencing).

Concurrently, a consortium of public and private partners was working with landowners in the watershed to reduce the amount of sediment and nutrient runoff from agricultural lands and pastures, and improve barnyards. The first phase of the project looked to improve on lands that contributed the most phosphorus to the streams. Nutrient management plans, conservation tillage, cover crops and crop rotation were emphasized. The second phase involved fencing and stream crossings that were put in place to reduce unfettered cattle access to streams. The third phase of the project included installation of barnyard runoff catch systems. From 2010 to 2014, the project converted 1465 acres of cropland to no-till, installed 8 barnyard runoff systems, nutrient management plans were written covering 1520 acres, fenced livestock from more than 4 miles of streams, and added 14 cattle crossings to the streams (TNC, 2013).

Methods

Fisheries surveys were conducted at various sites on both Pleasant Valley Branch and Kittleson Valley Creek. The fisheries assemblage was determined by electroshocking a section of stream with a minimum station length of 35 times the mean stream width (Lyons, 1992). A stream tow barge with a generator and two probes was used at most sites. A backpack shocker with a single probe was used at sites generally less than 2 meters wide. All fish were collected, identified, and counted. All gamefish were measured. At each site, qualitative notes on average stream width and depth, riparian buffers and land use, evidence of sedimentation, fish cover and potential management options were also recorded. A summary of the fisheries data is found in Table 1.

Figure 2: Pleasant Valley Branch and Kittleson Valley Creek Rehabilitation Projects



Quantitative habitat surveys (Simonson et. al., 1994) were also conducted prior to and after rehabilitation. Measurements of stream width, bank erosion, width-to-depth ratio, riffle and/or pool ratio, percent soft sediment, and fish cover are incorporated into this metric. The habitat surveys are summarized in Table 2.

Macroinvertebrate samples were obtained by kick sampling and collecting using a D-frame net at various sites on both streams throughout the rehabilitation period and sent to the University of Wisconsin-Stevens Point for analysis.

Results and Discussion

As shown in Table 1, the health of the fishery, as measured by the coldwater IBI and catch-per-unit effort (extrapolated number of trout per mile), showed immediate improvement even in the absence of stocking. The tolerant fishery assemblage, made up predominantly of white suckers, creek chubs, and brook stickleback was replaced with a community of sensitive coldwater species consisting of brown trout, mottled sculpin, and brook lamprey. The coldwater IBI increased at all sites from “poor” and “fair” to “fair” and “good” after the rehabilitation. The total coldwater IBI scores were even inhibited to some extent by the shear abundance of mottled sculpin, which depressed the “percent top level predator” metric in the overall score.

Table 1: Fisheries Data for Pleasant Valley Branch and Kittleson Valley Creeks Pre and Post Rehabilitation

Year	Station Name	Species	Number of Fish	Length IN	Coldwater IBI	CPE Trout/Mile
2002	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	MOTTLED SCULPIN	81		30 (Fair)	0
2002	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	BROOK STICKLEBACK	44			
2007						
2008	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	BROWN TROUT	8	8.0 - 15.4	50 (Fair)	49
2008	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	MOTTLED SCULPIN	400			
2008	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	BROOK STICKLEBACK	3			
2013	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	BROWN TROUT	24	6.5 - 17.1	70 (Good)	165
2013	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	BROOK TROUT	3	3.0 -10.2		18
2013	PLEASANT VALLEY BR - PLEASANT VALLEY BRANCH UPSTREAM FROM CTY A	MOTTLED SCULPIN	1000			
2003	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROOK STICKLEBACK	17		30 (Fair)	0
2003	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	MOTTLED SCULPIN	10			
2003						
2004	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROWN TROUT	19	2.5 - 13.5	60 (Good)	92
2004	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROOK TROUT	3	10.5 - 10.9		14
2004	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	MOTTLED SCULPIN	85			
2004	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROOK STICKLEBACK	9			
2004	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	WHITE SUCKER	17			
2004	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	CREEK CHUB	4			
2008	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROWN TROUT	38	2.4 - 15.1	50 (Fair)	295
2008	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	MOTTLED SCULPIN	258			
2008	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROOK STICKLEBACK	2			
2009	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROWN TROUT	48	5.9 - 15.5	50 (Fair)	360
2009	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	MOTTLED SCULPIN	316			
2013	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	MOTTLED SCULPIN	618		50 (Fair)	
2013	PLEASANT VALLEY BR - CTH H (UPPER CROSSING)	BROWN TROUT	70	3.0 - 15.2		519
2003	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROOK STICKLEBACK	9		20 (Poor)	0
2003	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	MOTTLED SCULPIN	2			
2003	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	FATHEAD MINNOW	1			
2003	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	CREEK CHUB	1			
2003						
2004	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROWN TROUT	15	2.5 - 13.9	50 (Fair)	138
2004	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	WHITE SUCKER	6			
2004	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	MOTTLED SCULPIN	28			
2004	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROOK STICKLEBACK	1			
2009	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROWN TROUT	(75)	6.4 - 18.5	60 (Good)	387
2009	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	MOTTLED SCULPIN	1105			
2009	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROOK TROUT	(3)	7.6 - 8.1		15
2013	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROWN TROUT	40 (92)	5.5 - 19.0	60 (Good)	468
2013	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROOK TROUT	(2)	3.6 - 9.0		9
2013	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	MOTTLED SCULPIN	90			
2013	PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	BROOK STICKLEBACK	2			
2003	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	BROWN TROUT	29	6.2 - 13.7	40 (Fair)	305
2003	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	CREEK CHUB	8			
2003	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	WHITE SUCKER	16			
2003	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	MOTTLED SCULPIN	5			
2003	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	FANTAIL DARTER	4			
2003	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	BROOK STICKLEBACK	5			
2006						
2008	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	BROWN TROUT	31	2.0 - 13.5	50 (Fair)	308
2008	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	WHITE SUCKER	2			
2008	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	FANTAIL DARTER	1			
2008	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	MOTTLED SCULPIN	227			
2009	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	BROWN TROUT	18	6.3 - 14.1	70 (Good)	168
2009	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	BROOK TROUT	1	8.20		9
2009	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	MOTTLED SCULPIN	472			
2009	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	WHITE SUCKER	1			
2009	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	CREEK CHUB	1			
2013	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	BROWN TROUT	61	2.8 - 15.2	70 (Good)	621
2013	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	BROOK TROUT	2	3.4 - 3.5		20
2013	PLEASANT VALLEY BR - PLEASANT VALLEY CREEK AT CTH "H" (DOWNSTREAM SITE)	MOTTLED SCULPIN	200			
2002	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	BROWN TROUT	16	3.5 - 10.2	60 (Good)	150
2002	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	MOTTLED SCULPIN	55			
2007						
2009	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	BROWN TROUT	35	7.0 - 14.6	50 (Fair)	370
2009	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	MOTTLED SCULPIN	210			
2009	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	WHITE SUCKER	1			
2013	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	BROWN TROUT	40	2.2 - 16.8	60 (Good)	387
2013	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	MOTTLED SCULPIN	342			
2013	PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	AMERICAN BROOK LAMPREY	2			

Gray shading indicates period between which the stream rehabilitation occurred. ***Year*** indicates the actual year the work took place

Table 1: (continued)

Year	Station Name	Species	Number of Fish	Length IN	Coldwater IBI	CPE Trout/mile
2006	KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	BROWN TROUT	42	3.5 - 5.1	50 (Fair)	452
2006	KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	MOTTLED SCULPIN	132			
2006	KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	BROOK STICKLEBACK	28			
2012	*(Fencing Only)*					
2013	KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	BROWN TROUT	33	2.2 - 15.0	60 (Good)	331
2013	KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	MOTTLED SCULPIN	70			
2013	KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	BROOK STICKLEBACK	2			
2013	KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	GREEN SUNFISH	1			
2006	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	BROWN TROUT	63	3.8 - 17.0	60 (Good)	307
2006	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	MOTTLED SCULPIN	236			
2006	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	WHITE SUCKER	14			
2006	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	BROOK STICKLEBACK	20			
2006	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	BLACK BULLHEAD	1			
2006	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	GREEN SUNFISH	1			
2006	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	AMERICAN BROOK LAMPREY	2			
2007	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	BROWN TROUT	36	3.1-19.8	60 (Good)	322
2007	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	MOTTLED SCULPIN	47			
2007	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	WHITE SUCKER	3			
2007	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	BROOK STICKLEBACK	1			
2011						
2012	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	BROWN TROUT	148	2.2 - 13.3	80 (Good)	1199
2012	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	MOTTLED SCULPIN	158			
2012	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	GREEN SUNFISH	2			
2012	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	AMERICAN BROOK LAMPREY	1			
2013	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	BROWN TROUT	103	3.3 - 17.7	60 (Good)	847
2013	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	MOTTLED SCULPIN	178			
2013	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	WHITE SUCKER	4			
2013	KITTLESON VALLEY CREEK- UPSTREAM TRUMAN RD	GREEN SUNFISH	3			
2002	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	BROWN TROUT	28	5.6 - 15.4	60 (Good)	187
2002	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	MOTTLED SCULPIN	121			
2002	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	WHITE SUCKER	13			
2002	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	AMERICAN BROOK LAMPREY	2			
2002	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	CREEK CHUB	1			
2002	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	BROOK STICKLEBACK	5			
2007						
2013	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	BROWN TROUT	50	3.2 - 17.1	60 (Good)	349
2013	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	WHITE SUCKER	10			
2013	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	MOTTLED SCULPIN	80			
2013	KITTLESON VALLEY UPSTREAM HWY H BRIDGE	AMERICAN BROOK LAMPREY	1			
2006	KITTLESON VALLEY CREEK - UPSTREAM STH 78	BROWN TROUT	10	4.6 - 19.3	30 (Fair)	91
2006	KITTLESON VALLEY CREEK - UPSTREAM STH 78	WHITE SUCKER	47			
2006	KITTLESON VALLEY CREEK - UPSTREAM STH 78	MOTTLED SCULPIN	172			
2006	KITTLESON VALLEY CREEK - UPSTREAM STH 78	BROOK STICKLEBACK	2			
2006	KITTLESON VALLEY CREEK - UPSTREAM STH 78	CREEK CHUB	3			
2012						
2013	KITTLESON VALLEY CREEK - UPSTREAM STH 78	BROWN TROUT	27	4.0 - 18.2	50 (Fair)	156
2013	KITTLESON VALLEY CREEK - UPSTREAM STH 78	MOTTLED SCULPIN	77			
2013	KITTLESON VALLEY CREEK - UPSTREAM STH 78	WHITE SUCKER	17			
2013	KITTLESON VALLEY CREEK - UPSTREAM STH 78	COMMON CARP X GOLDFISH	1			

Gray shading indicates period between which the stream rehabilitation occurred. ***Year*** indicates the actual year the work took place

Station Name	Survey Year	Mean Stream Width	Mean Buf Width	Mean Buf Width Score	Mean Bank Eros	Mean Bank Eros Score	Perc Pool	Perc Pool Score	Width Depth Ratio	Width Depth Ratio Score	Riffle Riffle Ratio	Riff Riff Ratio Ss Score	Bend Bend Ratio	Bend Bend Ratio Ss Score	Perc Fine Sed	Perc Fine Sed Score	Perc Fish Cover	Perc Fish Cover Ss Score	Habitat Score Small Streams	Habitat Rating Small Streams
PLEASANT VALLEY BR - PLEASANT VALLEY CREEK - CTH H (UPPER)	2004	3.6	0.15	0	0.63	5	0.00	0	10.20	10	6.88	15	8.16	15	56.83	5	10.25	10	45	Fair
	2008	3.8	10.00	15	0.00	15	4.07	0	6.75	10	0.00	0	7.20	15	53.96	5	54.70	15	75	Excellent
	2009	3.3	10.00	15	0.09	15	3.41	0	8.10	10	0.00	0	5.97	15	47.71	5	17.09	15	75	Excellent
	2013	2.8	10.00	15	0.00	15	3.92	0	7.34	10	10.06	10	6.69	15	29.58	5	17.88	15	75	Excellent
PLEASANT VALLEY BR - ALONG CTH H (COUNTY DEMONSTRATION SITE)	2003	3.2	10.00	15	0.83	5	0.00	0	13.17	10	9.16	15	8.93	15	75.31	0	0.00	0	45	Fair
	2004	3.2	9.92	10	0.06	15	6.19	0	4.84	10	0.00	0	9.86	15	40.94	5	79.46	15	70	Good
	2013	3.1	10.00	15	0.13	15	10.68	3	5.19	10	0.00	0	9.68	15	46.25	5	38.19	15	78	Excellent
PLEASANT VALLEY BR - AT CTH H (DOWNSTREAM SITE)	2003	2.5	9.83	10	0.87	5	4.58	0	11.72	10	11.63	10	6.56	15	70.94	0	6.37	5	45	Fair
	2008	4.1	10.00	15	0.00	15	0.00	0	5.34	10	0.00	0	7.62	15	44.79	5	61.65	15	75	Excellent
	2009	2.7	10.00	15	0.01	15	0.00	0	5.24	10	0.00	0	11.68	10	38.75	5	20.99	15	70	Good
	2013	2.9	10.00	15	0.00	15	5.11	0	4.79	10	0.00	0	7.67	15	20.00	10	26.13	15	80	Excellent
PLEASANT VALLEY CREEK UPSTREAM KITTLESON RD	2006	3.8	9.25	10	0.68	5	0.00	0	10.94	10	15.54	5	8.33	15	73.75	0	19.43	15	55	Good
	2008	3.6	10.00	15	0.00	15	12.02	3	5.49	10	0.00	0	5.66	15	47.50	5	20.79	15	78	Excellent
	2009	3.0	10.00	15	0.00	15	5.00	0	5.71	10	0.00	0	0.53	15	52.08	5	21.84	15	75	Excellent
	2013	2.9	10.00	15	0.03	15	6.31	0	5.38	10	0.00	0	6.67	15	30.63	5	16.89	15	75	Excellent
KITTLESON VALLEY CREEK-UPSTREAM PERRY CENTER RD	2007	2.1	0.00	0	0.37	10	7.53	0	5.73	10	2.87	15	11.15	10	49.58	5	14.69	10	50	Good
	2013	2.1	10.00	15	0.12	15	0.00	0	6.84	10	12.28	10	10.78	10	65.63	0	15.08	15	65	Good
KITTLESON VALLEY UPSTREAM HWY H BRIDGE (GAUGE STATION)	2007	4.9	10.00	15	0.40	10	0.00	0	6.39	10	0.00	0	0.00	0	81.46	0	22.46	15	50	Good
	2013	3.6	10.00	15	0.02	15	0.00	0	4.40	10	0.00	0	0.00	0	23.75	5	56.93	15	60	Good
KITTLESON VALLEY CREEK - UPSTREAM STH 78	2007	5.0	10.00	15	0.68	5	0.00	0	5.32	10	0.00	0	36.20	0	92.29	0	19.16	15	45	Fair
	2013	5.4	10.00	15	0.05	15	0.00	0	6.79	10	0.00	0	12.89	10	91.67	0	48.72	15	65	Good
KITTLESON VALLEY CK - Downtream of Lee Valley Creek	2007	4.4	0.00	0	0.47	10	0.00	0	8.49	10	0.00	0	19.94	5	89.17	0	5.85	5	30	Fair
KITTLESON VALLEY CREEK - DRUMON VALLEY RD. BRIDGE	2002	6.8	10.00	15	0.58	5	10.00	3	11.61	10	0.00	0	13.00	10	88.02	0	14.60	10	53	Good

The numbers of trout, normalized for effort, increased 70 - 150% and in some cases well over that by taking areas that held few or no trout to the point where they held 40 – 70 fish over the same station length.

One of the most significant improvements from these projects comes in the habitat measurement of fine sediments in the stream channel shown in Table 2. Pleasant Valley Branch was placed on the state's list of impaired waters in 1998 because of habitat loss due to excessive sedimentation. Prior to rehabilitation, the stream segments were "fair" to "good" in habitat, with fine sediments making up 50 to 90% of the bottom with an average of 71%. After rehabilitation, this percentage decreased by over half and habitat rating rose to "good" and "excellent". Mean bank erosion (measured length of raw, eroding bank) dropped from a mean of 0.64 meters before the projects to a mean of 0.036 meters afterward. This is important as both agricultural lands and bank sediments have been shown to be an important contributor of sediment to these systems (Lamba, 2013).

Kittleson Valley Creek, although not on the state's list of impaired waters, shared similar habitat and sediment characteristics, but did contain some populations of trout and was made up of a community more resembling a cool/cold or cold water community. Many of the rehabilitation projects conducted on Kittleson Valley took place more recently than the Pleasant Valley Projects - after 2010. Still, the fishery of Kittleson Valley likewise responded to the rehabilitation. With regard to habitat, the mean bank erosion scores dropped markedly, but the percent fine sediment has yet to respond in 2 out of the 3 sites measured.

Macroinvertebrate data collected in 2013 (Table 3) show an unexpectedly large variance from site to site. Macroinvertebrate IBI's (Weigel, 2003) vary from poor to good even in the absence of major land use changes or potential pollution inputs. Scores in the lower ranges tended to have higher numbers of diptera, striped blackfly larvae (*Simulium vittatum*) in particular, which are negatively correlated with the IBI (Ibid). By contrast, the Hilsenhoff Biotic Index (HBI) (Hilsenhoff, 1987) scores were consistent and indicate very little organic loading to these streams.

Historic macroinvertebrate data (Appendix 1) was not collected as consistently as the fishery and habitat data, but bear mentioning for the purposes of reporting of data. These inconsistencies in sample collection make comparisons of before and after scenarios difficult. Overall, macroinvertebrate IBIs (MIBIs) for samples collected from Pleasant Valley Creek showed "good" rankings and did not vary much spatially or temporally. Kittleson Valley MIBIs were more variable and ranged from "poor" to "excellent" The HBI, which is a measure of organic loading, was variable for both streams. Overall, the samples taken prior to the project indicated that the water quality and status of the watershed was such that a rehabilitation project would likely be successful.

Putting historic samples in context with the more current ones, biologists have anecdotally noted that the current status of the Pleasant and Kittleson Valley corridor as one of the best in the Sugar-Pecatonica basin. Given improvements in the watershed and riparian corridor that have taken place, it is reasonable to treat the depressed 2013 MIBI scores at some of the sites as an anomaly that may be related to a coincidental hatch of dipterans, and defer instead to biologists observations on the quality of the environmental corridor.

Table 3: 2013 Macroinvertebrate Data for Pleasant Valley Branch and Kittleson Valley Creek

Site	MIBI score (rank)	HBI score (rank)
Pleasant Valley – CTH A	7.42 (Good)	3.65 (Very Good)
Pleasant Valley – CTH H (upper crossing)	2.41 (Poor)	5.07 (Good)
Pleasant Valley – Kittleson Rd	2.73 (Fair)	4.77 (Good)
Kittleson Valley – Perry Center Rd	4.87 (Fair)	4.61 (Good)
Kittleson Valley – CTH H	5.06 (Good)	4.39 (Very Good)
Kittleson Valley – STH 78	1.27 (Poor)	4.41 (Very Good)

Temperature data recorded over the "summer" period – June through August - in 2003 and 2013 at the downstream end of Pleasant Valley at Kittleson Road (Appendix 2a) showed daily mean temperatures to be at or well below the maximum of 20.7^{o}C as defined by Lyons (2008) for coldwater streams. Similarly, temperatures from Kittleson Valley Creek at Perry Center Road and at CTH H in 2013 were likewise below this temperature (Appendix 2b).

Conclusions

Work in the riparian corridor had an obvious and immediate effect on the biota and habitat of these streams. Fishery and habitat metrics greatly improved after implementation of riparian practices devoted to improving the health of the stream corridor including: removal of nuisance trees; narrowing the stream; sloping, seeding and stabilizing the banks; creation of a buffer from agriculture; and incorporation of artificial structures to enhance habitat for fish.

Work in both the watershed and riparian corridor is important. The public will see a quicker response by the biology if both are incorporated (See Appendix 3). This makes the public more likely to support management and rehabilitative actions. Implementation of best management practices in the watershed protects the investment in riparian improvements by reducing nutrient loading and sediment losses to the streams as well as mitigating the potential for catastrophic losses of the fishery due to excessive nutrient loading during high runoff events.

The fishery and habitat of these systems will continue to be monitored on a periodic basis with particular emphasis toward determining if sediment distribution changes or reaches a steady state.

The stream classification model (Lyons, 2008) predicts that, based on watershed size (flow) and temperature, Pleasant Valley Branch and Kittleson Valley Creek are cold water systems. Based on actual temperature data and fishery assemblage, the streams are meeting their attainable use as cold water resources. Kittleson Valley Creek was already designated as a trout stream. Both these streams have good survival and carryover of adult trout.

Therefore ***it is recommended that Pleasant Valley Branch be removed from the state's list of impaired waters. It is also recommended that fisheries management consider designating Pleasant Valley as a Class II trout water.***

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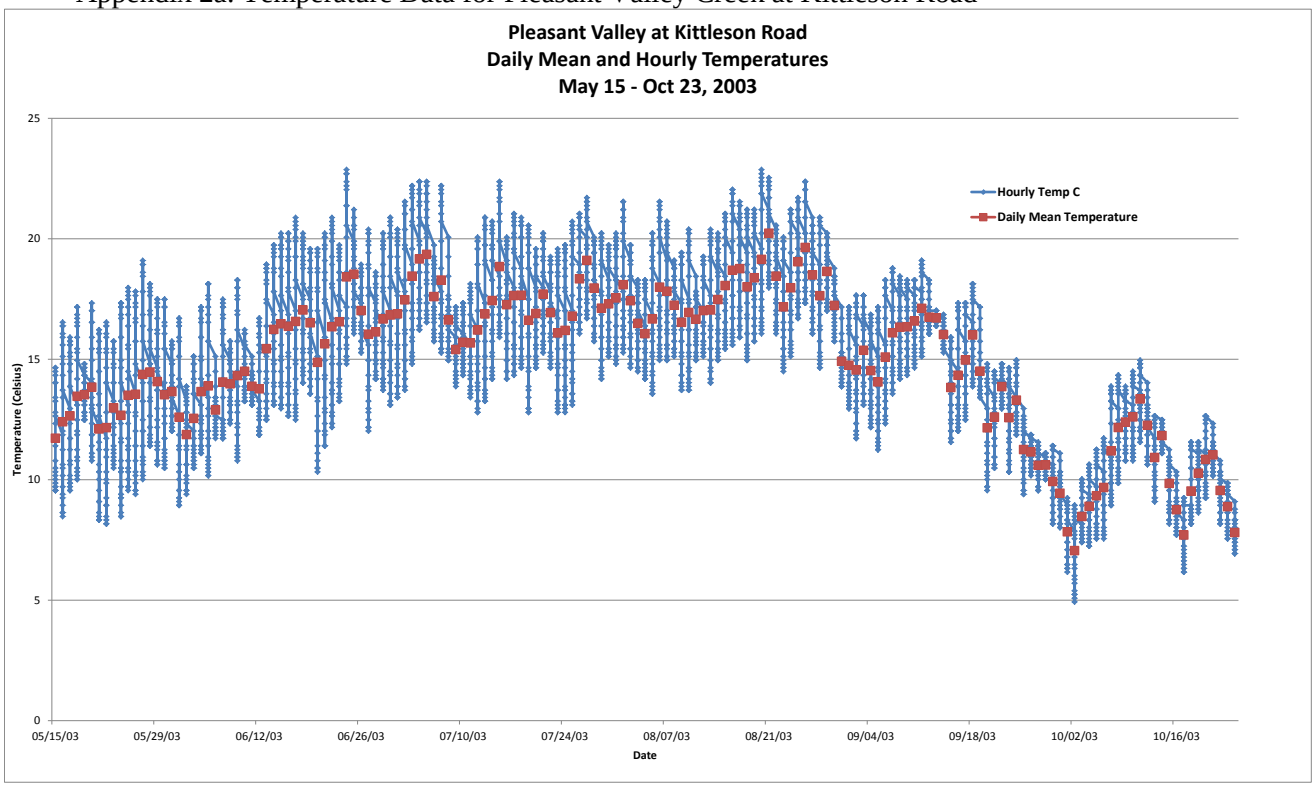
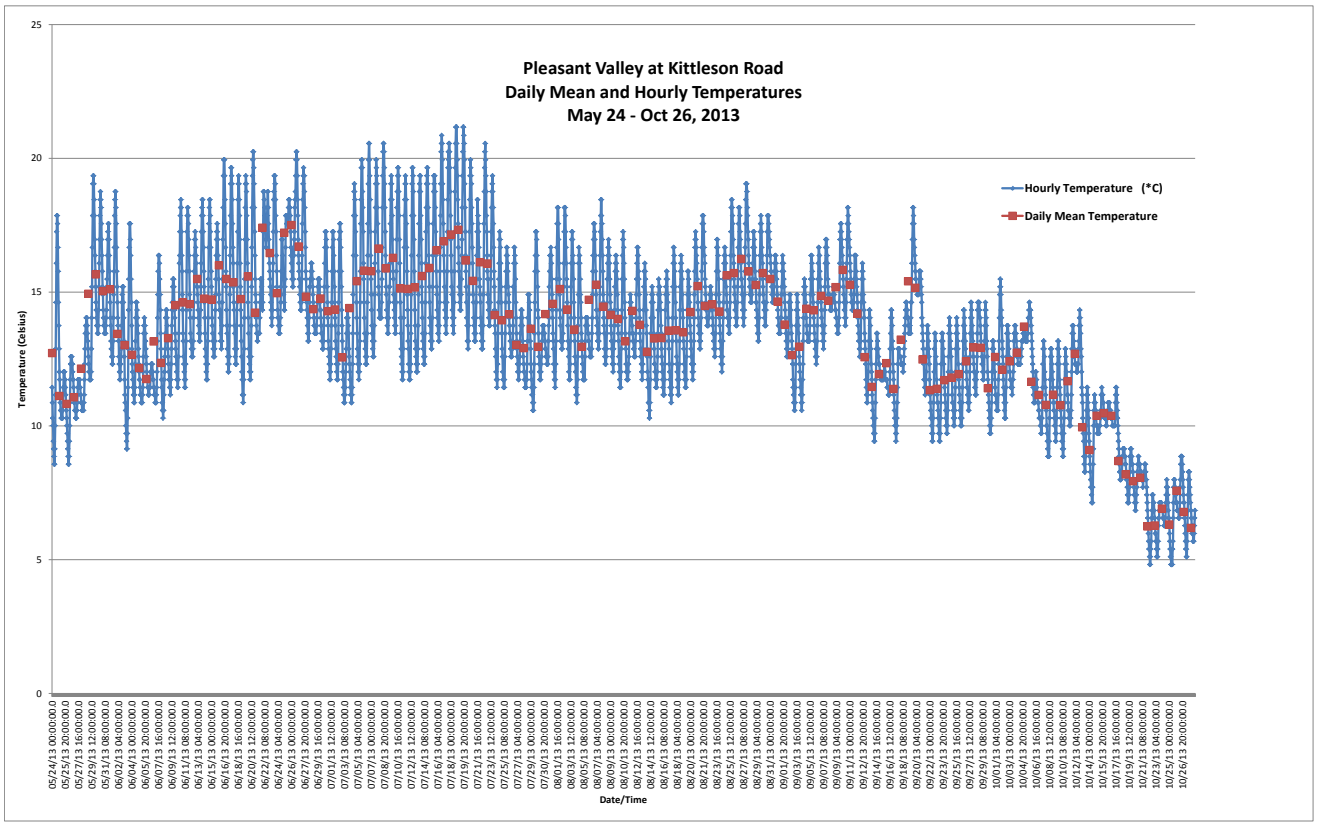
Appendix 1: Historic Macroinvertebrate Data for Kittleson Valley Creek and Pleasant Valley Branch

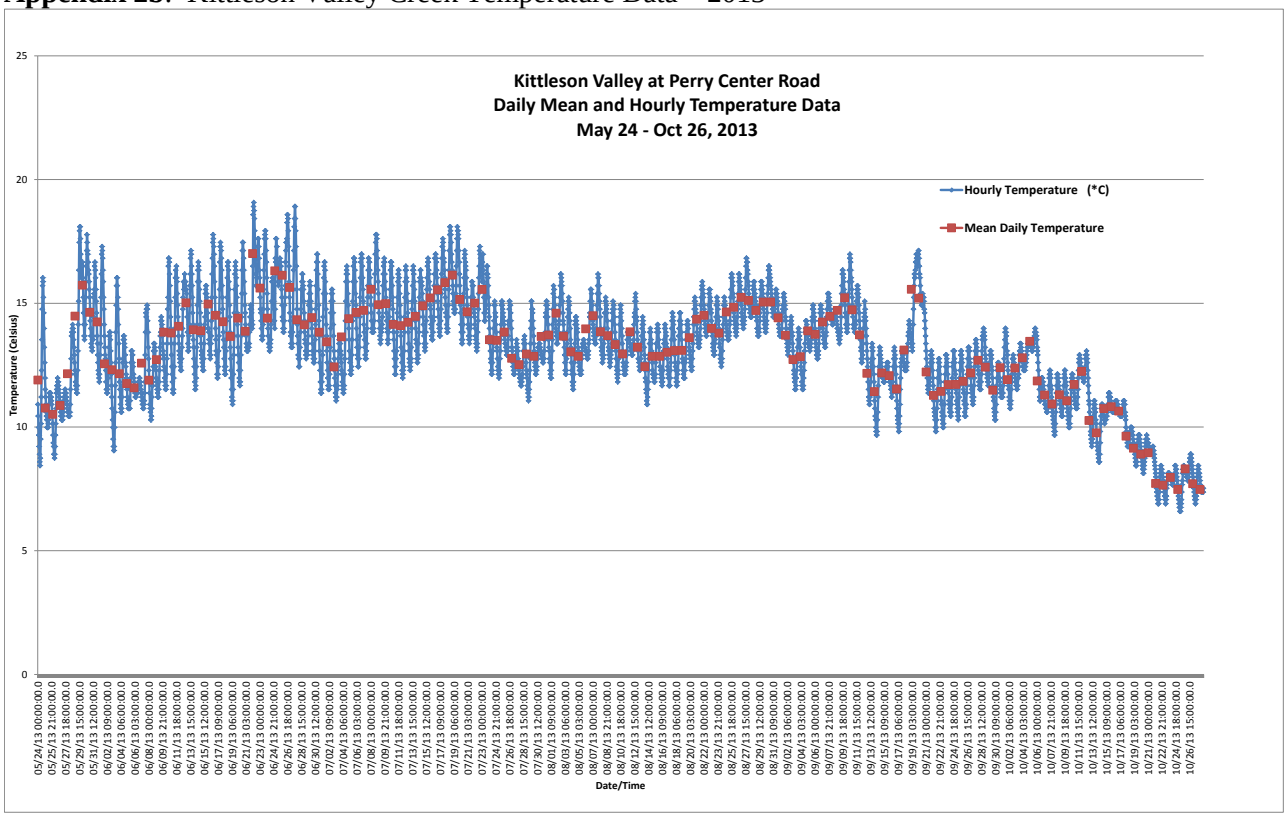
Station Name	Date	MIBI (Rating)	HBI (Rating)
Pleasant Valley Branch - Spring Valley Dr.	1-Nov-2010	5.28 (Good)	4.31 (Very Good)
Pleasant Valley Branch - Pleasant Valley Branch Upstream From Cty A	11-Jun-1986	5.06 (Good)	1.77 (Excellent)
	7-Oct-2009	6.28 (Good)	4.13 (Very Good)
	1-Nov-2010	6.18 (Good)	2.72 (Excellent)
Pleasant Valley Branch - Upstream CTH H (upper crossing)	2-Nov-2004	6.36 (Good)	6.02 (Fair)
	1-Nov-2010	5.70 (Good)	5.89 (Fair)
Pleasant Valley Branch - Along CTH H (County Demonstration Site)	13-Nov-2003	2.94 (Fair)	5.97 (Fair)
	2-Nov-2004	6.31 (Good)	7.46 (Fairly Poor)
Pleasant Valley Branch - CTH H (downstream crossing)	13-Nov-2003	5.40 (Good)	6.37 (Fair)
Pleasant Valley Branch Upstream Kittleson Road	7-Oct-2009	5.85 (Good)	2 (Excellent)
Kittleson Valley Creek-Upstream Perry Center Rd	21-Apr-2008	8.26 (Excellent)	3.15 (Very Good)
	1-Nov-2010	8.62 (Excellent)	3.04 (Very Good)
Kittleson Valley Creek- Upstream Truman Rd	21-Apr-2008	2.80 (Fair)	5.01 (Good)
Kittleson Valley Creek - Upstream Hwy H Bridge	1-Nov-2010	5.49 (Good)	4.02 (Very Good)
Kittleson Valley Creek - Upstream Sth 78	21-Apr-2008	1.84 (Poor)	4.70 (Good)
Kittleson Valley Creek - Drammen Valley Road	11-Nov-2002	4.71 (Fair)	4.73 (Good)
	7-Nov-2003	4.51 (Fair)	4.89 (Good)
	7-Nov-2003	1.46 (Poor)	5.67 (Fair)
	21-Apr-2008	4.34 (Fair)	4.70 (Good)
	1-Nov-2010	5.90 (Good)	4.33 (Very Good)
Pleasant Valley Creek - Upstream of River Fork Road	1-Nov-2010	6.96 (Good)	2.39 (Excellent)

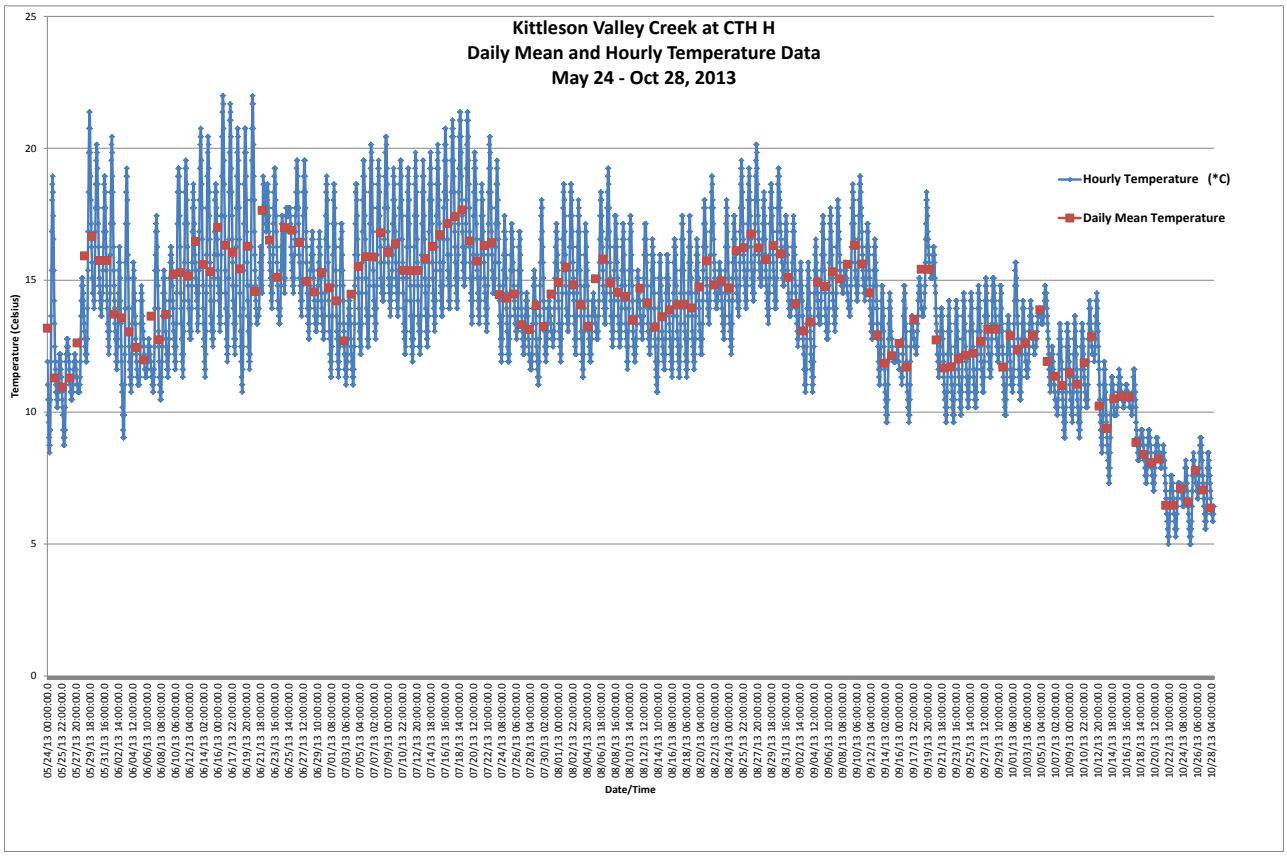
Appendix 2a: Temperature Data for Pleasant Valley Creek at Kittleson Road





Appendix 2b: Kittleson Valley Creek Temperature Data – 2013





Appendix 3: Stream Rehabilitation of Pleasant Valley Creek

Pleasant Valley at Kittleson Road

2006 (Before)

2008 (During)

2013 (After)

Appendix 3: Stream Rehabilitation of Pleasant Valley Creek (continued)

Pleasant Valley at CTH H (upper crossing)

2003 (Before)

2008 (After)

Appendix 3: Stream Rehabilitation of Pleasant Valley Creek (continued)

Pleasant Valley along CTH H (Dane County project area)

2003 (During)

2013 (After)