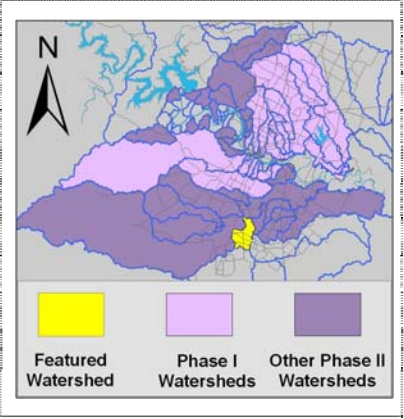


Rinard Creek Watershed

Watershed Overview

Catchment	Total area	8 sq. miles
	Area in recharge	0
	Creek length	7 miles
	Receiving water	Onion Creek
Demographics	2000 population	284
	2030 projected population	6,940
	30 year projected % increase	2,344 %
Land Use	Impervious cover (2003 estimate)	2.8 %
	Impervious cover (2013 estimate)	3.2 %
Overall EII Scores	1999	63
	2002	70
	2005	66
	2008	65
	2010	70
	2012	72
	2014	74
	2016	76



Flow Regime* for Sample Sites on Rinard

Site	2000		2002				2005				2008				2010		2011		2012				2014				2016															
	May	Jun	Jun	Feb	Feb	May	Aug	Nov	Mar	Jun	Jun	Sep	Dec	Feb	May	Jun	Sep	Dec	Mar	May	May	Oct	Dec	Mar	May	Jul	Sep	Jan	Apr	May	Jun	Jul	Sep	Jan	Apr	May	Jul	Sep				
	Bio	WQ	Bio	WQ	Bio	WQ	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	WQ	WQ	WQ	Bio	WQ	WQ	WQ	WQ	Bio	Bio	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ	WQ		
1220				B	B	n	n	B	B	B	n	n	n	n	n	n	n	n	n	n	B	n	B	n	n	n																
1219				B	B	B	B	B	B	B	B	n	B	n	n	n	n	n	B	n	B	n																				
5398																							n	n	n	n	B	B	n		n	n	n	B	B	B	B	B	B	B	B	
233	B	S	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B			B	B	B	B	B	B	B	B	B	B	

* B = baseflow n = no flow S = storm flow blue = Samples were taken light blue = Samples were not taken blank = not visited

Index Scores* for Rinard Watershed Sites by Year

Reach	Site	Site Name	Year	Water Quality	Sediment**	Contact Rec.	Non Contact Recreation	Physical Integrity	Aquatic Life	Benthic subindex	Diatom subindex	Total Site Score
RIN1	233	Rinard Cr @ Bradshaw Road	1999	60	80	93	73	54	56	73	39	69
RIN2	1219	Rinard Cr @ FM1327 and Bradshaw	1999	72	80	98	70	66				64
RIN3	1220	Rinard Cr @ FM1327	1999	64	80	97	63	39				57
RIN1	233	Rinard Cr @ Bradshaw Road	2002	59	81	93	73	63	61	45	76	72
RIN2	1219	Rinard Cr @ FM1327 and Bradshaw	2002	66	81	95	80	29	65	49	80	69
RIN3	1220	Rinard Cr @ FM1327	2002	69	81	99	70	27	59	40	77	68
RIN1	233	Rinard Cr @ Bradshaw Road	2005	69	76	64	73	69	81	68	93	72
RIN2	1219	Rinard Cr @ FM1327 and Bradshaw	2005	69	76	81	79	65	74	80	68	74
RIN3	1220	Rinard Cr @ FM1327	2005	61	76	58	63	48				51
RIN1	233	Rinard Cr @ Bradshaw Road	2008	64	82	72	71	72	52	47	56	69
RIN2	1219	Rinard Cr @ FM1327 and Bradshaw	2008	73	82	98	70	49				62
RIN3	1220	Rinard Cr @ FM1327	2008		82		54	52	41	41		57
RIN1	233	Rinard Cr @ Bradshaw Road	2010	71	82	89	83	71	87	79	94	81
RIN2	1219	Rinard Cr @ FM1327 and Bradshaw	2010	75	82	95						63
RIN3	1220	Rinard Cr @ FM1327	2010	72	82	85	68	26	56	41	70	65
RIN1	233	Rinard Cr @ Bradshaw Road	2012	69	82	51	81	70	82	90	74	73
RIN2	5398	Rinard Creek DS of State Highway 45	2012	78	82	94	68	49	69	70	68	73
RIN3	1220	Rinard Cr @ FM1327	2012	79	82	72	55	48	84	80	87	70
RIN1	233	Rinard Creek @ Bradshaw Road	2014	71	83	63	59	56	80	68	92	69
RIN2	5398	Rinard Creek DS of State Highway 45	2014	85	83	100	71	56	76	78	73	79
RIN1	233	Rinard Creek @ Bradshaw Road	2016	58	83	46	83	74	81	79	83	71
RIN2	5398	Rinard Creek DS of State Highway 45	2016	83	83	83	87	66	82	86	77	81

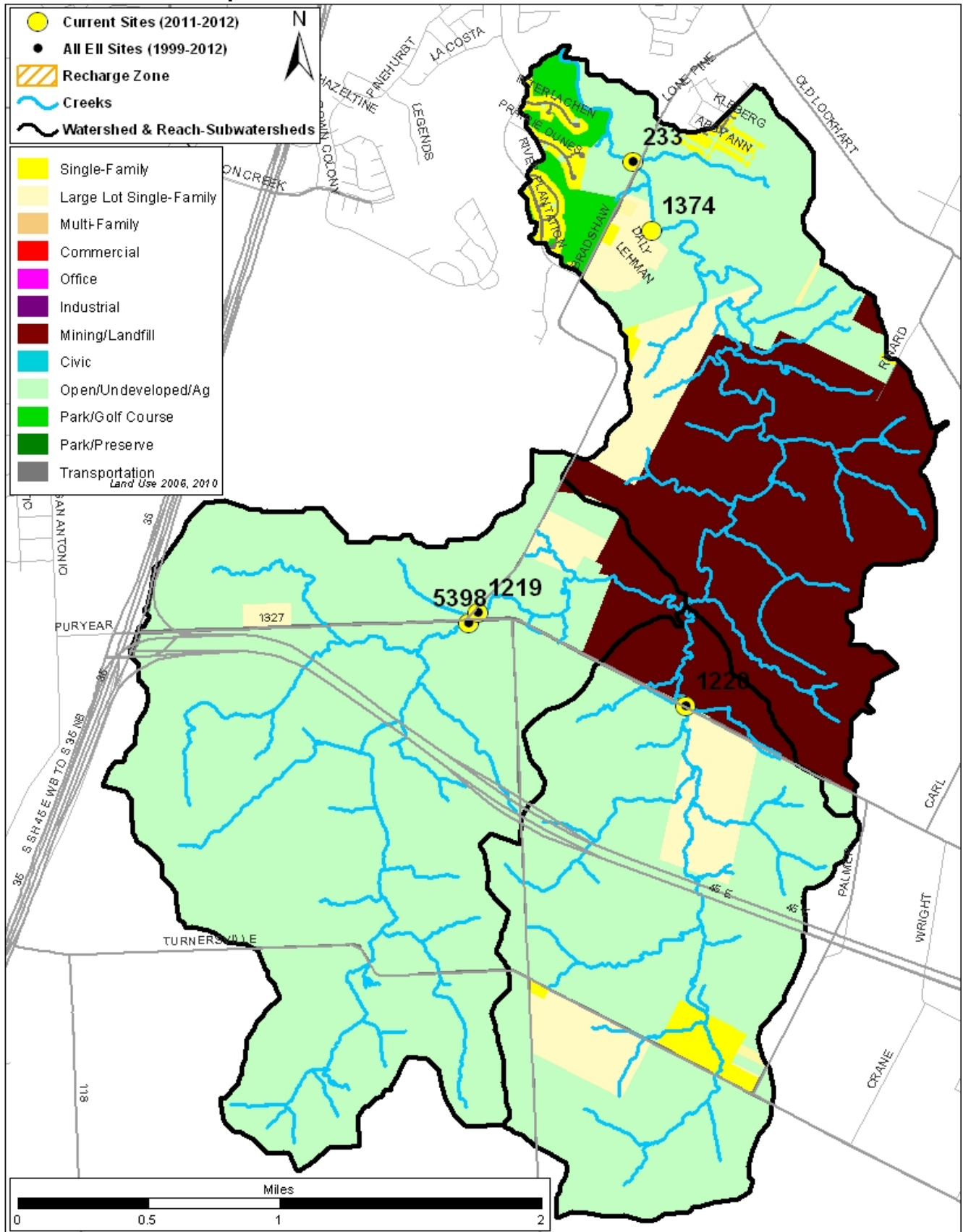
* blank cells indicate parameter was not collected, blank row indicate site was dropped

**sediment samples only collected at the downstream site

100-87.5 Excellent 87.5-75 V. Good 75-62.5 Good 62.5-50 Fair 50-37.5 Marginal 37.5-25 Poor 25-12.5 Bad 12.5-0 V. Bad

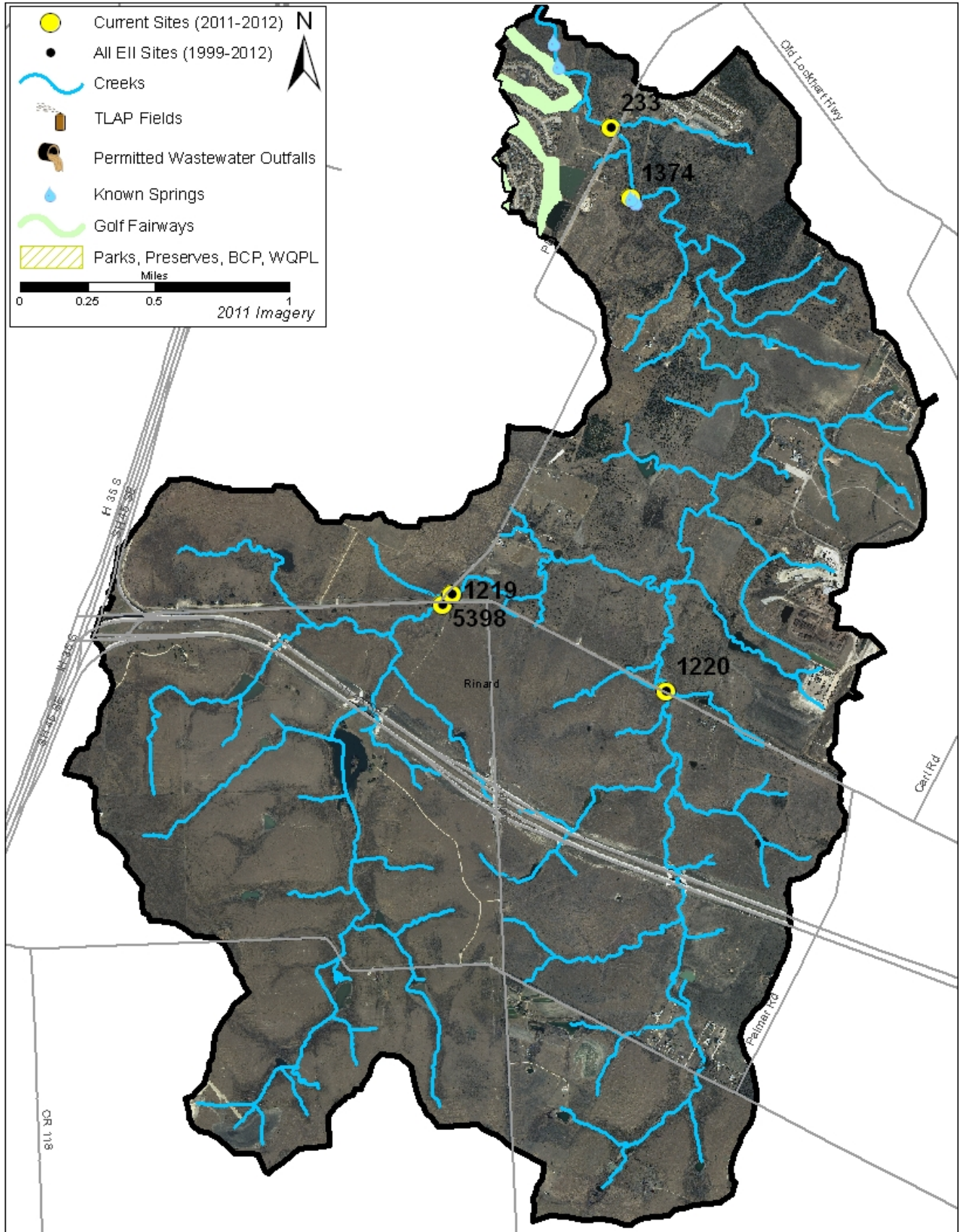
Rinard Creek Watershed

Land Use Map



Rinard Creek Watershed

Aerial Map



Rinard Creek Watershed

Water Quality Data – Temperature, Conductivity, pH, Dissolved Oxygen & *E. coli* for 2016 Sample Sites (Downstream to Upstream)

Qualifiers to the left of the value	>	Greater than	Qualifiers to the right of the value	(blank)	Useable
	<	Less than		S	Exceeds standard range
	<J	Less than detected limit		R	Rejected, failed QC
	J	Estimated			

Watershed	Site	EII Reach	Date	Temp. flag	Cond. flag	pH flag	D.O. flag	E. Coli flag
Rinard	233	RIN1	01/12/2016	8.8	618	7.76	9.6 R	156.5
Rinard	233	RIN1	04/12/2016	20.9	680	7.64	8.0	121.1
Rinard	233	RIN1	05/13/2016	26.1	535	7.90	10.8	
Rinard	233	RIN1	07/12/2016	24.7	655	7.70	6.8 R	206.4
Rinard	233	RIN1	09/13/2016	25.1	628	7.68	6.5	83.6
RIN1 Mean				21.1	623	7.74	8.3	141.9
Rinard	5398	RIN2	01/12/2016	10.4	216	7.98		8.6
Rinard	5398	RIN2	04/12/2016	21.4	553	7.97	7.5	75.9
Rinard	5398	RIN2	05/13/2016	25.4	314	8.13	10.0	
Rinard	5398	RIN2	07/12/2016	30.2	544	8.26	7.6	1.0
Rinard	5398	RIN2	09/13/2016	30.1	320	7.95	7.3	20.6
RIN2 Mean				23.5	409	8.06	8.1	26.5
Rinard Mean				22.3	516	7.90	8.2	84.2

Gray highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

Summary Statistics for all 2015-2016 E.I.I. Sites Combined					
Parameter	2015-2016 Average	2015-2016 Minimum	2015-2016 Maximum	1 Standard Deviation Above	1 Standard Deviation Below
Temperature (C°)	20.7	5.8	34.2	27.5	
Conductivity (uS/cm)	722	160	3549	955	
pH (Standard units)	7.86	5.85	10.25	8.24	7.47
D.O. (mg/l)	7.9	0.1	18.7	10.4	5.5
<i>E. Coli</i> (col/100ml)	316.1	1.0	2420.0	883.7	

Rinard Creek Watershed

Water Quality Data – Ammonia, Nitrate / Nitrite, Ortho-Phosphorus, Total Suspended Solids & Turbidity for 2016 Sample Sites (Downstream to Upstream)

Qualifiers to the left of the value	>	Greater than	Qualifiers to the right of the value	(blank)	Useable
	<	Less than		S	Exceeds standard range
	<J	Less than detected limit		R	Rejected, failed QC
	J	Estimated			

Watershed	Site	EII Reach	Date	NH3-N		NO3/NO2		Ortho-P		T.S.S		Turb.		
				<	flag	<>	flag	<>	flag	<>	flag			
Rinard	233	RIN1	01/12/2016	<J	0.008	<>	0.60	<J	0.004	<>	3.8	<>	7.2	R
Rinard	233	RIN1	04/12/2016	<J	0.008	<>	0.28	<J	0.004	<>	2.1	<>	3.4	
Rinard	233	RIN1	05/13/2016											
Rinard	233	RIN1	07/12/2016		0.112		0.35	<J	0.004		4.0		12.8	R
Rinard	233	RIN1	09/13/2016	<J	0.008	<>	0.21	<J	0.004	<>	1.2	<>	3.0	
RIN1 Mean					0.034		0.36		0.004		2.8		6.6	
Rinard	5398	RIN2	01/12/2016	<J	0.008	<J	0.01	<J	0.004	<>	1.6	<>	3.1	R
Rinard	5398	RIN2	04/12/2016	<J	0.008	<J	0.01	<J	0.004	<>	5.1	<>	8.6	
Rinard	5398	RIN2	05/13/2016											
Rinard	5398	RIN2	07/12/2016	<J	0.008	<J	0.01	<J	0.004	<>	2.1	<>	3.8	R
Rinard	5398	RIN2	09/13/2016	<J	0.008	<J	0.01	<J	0.004	<>	1.0	<>	2.4	
RIN2 Mean					0.008		0.01		0.004		2.5		4.5	
Rinard Mean					0.021		0.18		0.004		2.6		5.5	

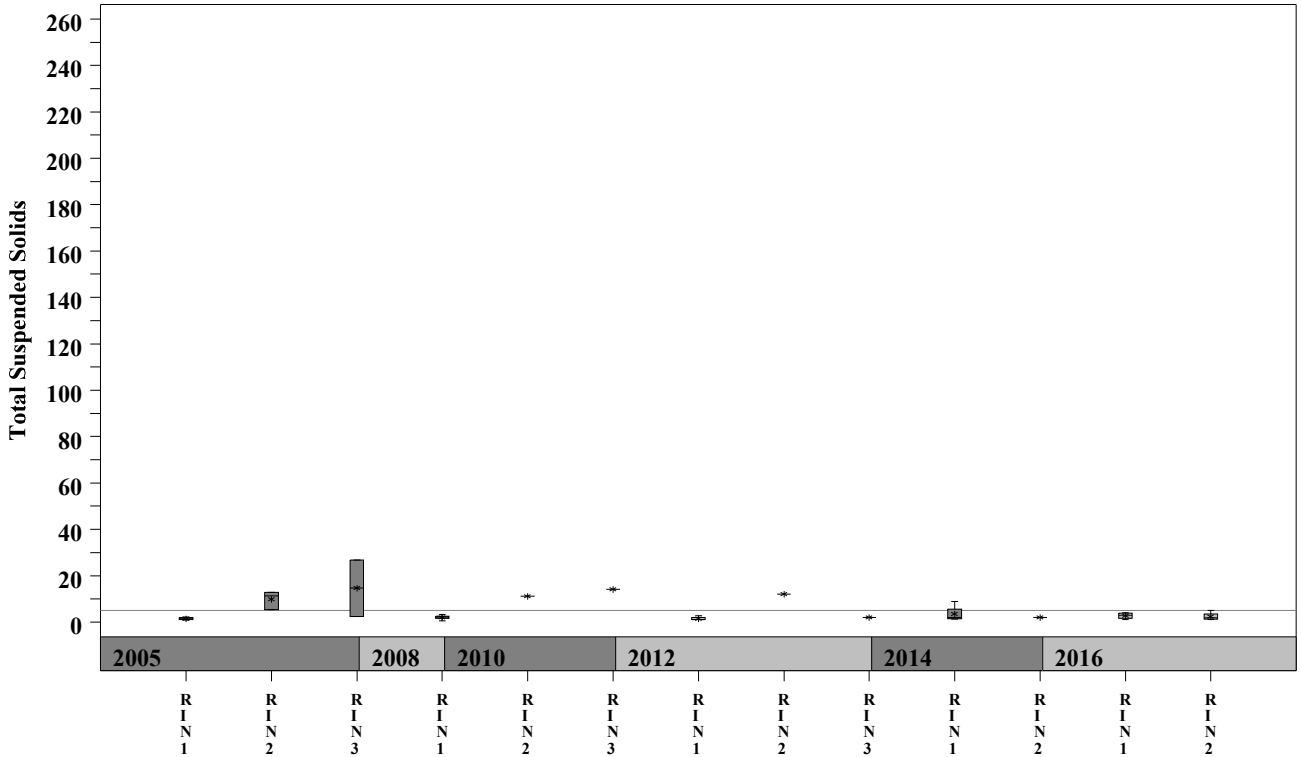
Gray highlighting indicates that the value exceeds one standard deviation from the mean of all E.I.I. sites combined.

Summary Statistics for all 2015-2016 E.I.I. Sites Combined				
Parameter	2015-2016 Average	2015-2016 Minimum	2015-2016 Maximum	1 Standard Deviation Above
NH3-N (mg/l)	0.018	0.008	0.881	0.085
NO3-N (mg/l)	1.14	0.01	12.0	3.16
Ortho-P (mg/l)	0.016	0.004	0.661	0.08
T.S.S. (mg/l)	3.7	1.0	58.2	9.7
Turbidity (NTU)	4.4	0.2	98.6	11.7

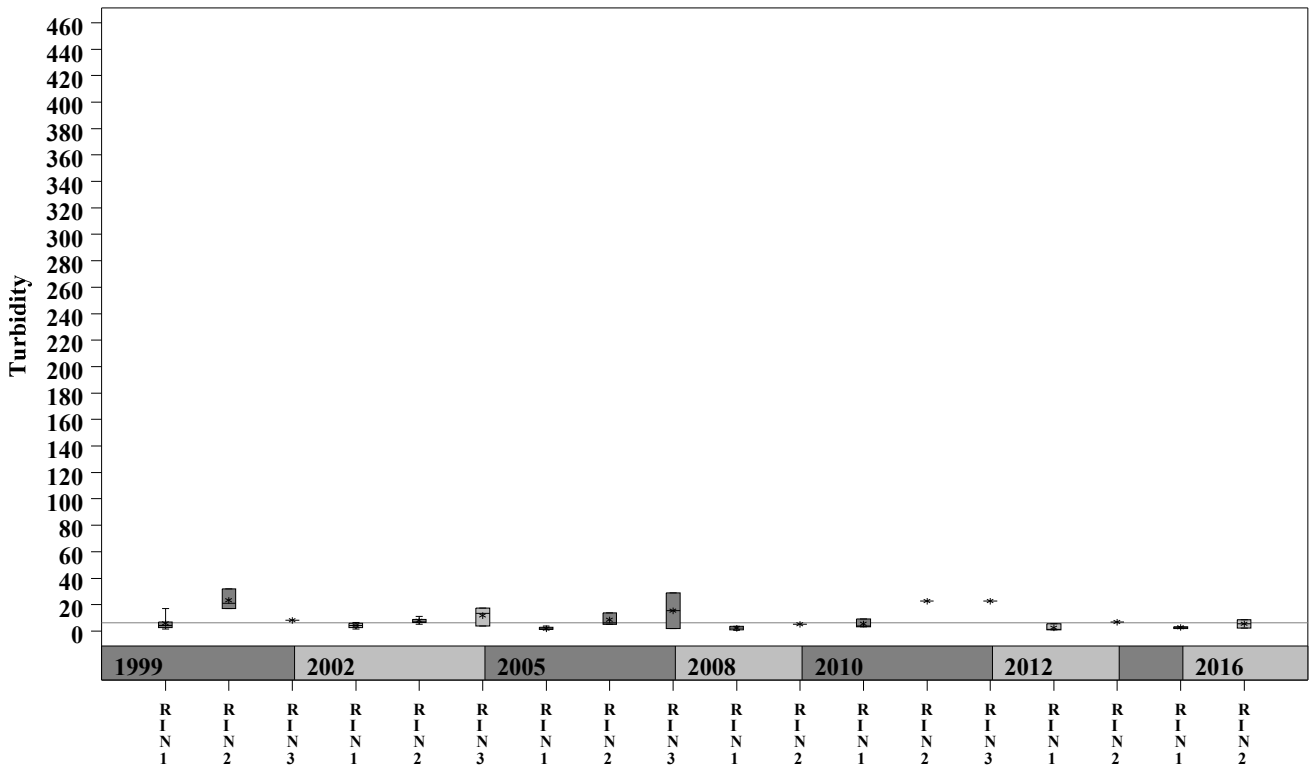
Rinard Creek Watershed

Data Summary Graphs – Total Suspended Solids and Turbidity (Downstream to Upstream by Year)

Parameter = TOTAL SUSPENDED SOLIDS Unit = mg/L Watershed = Rinard



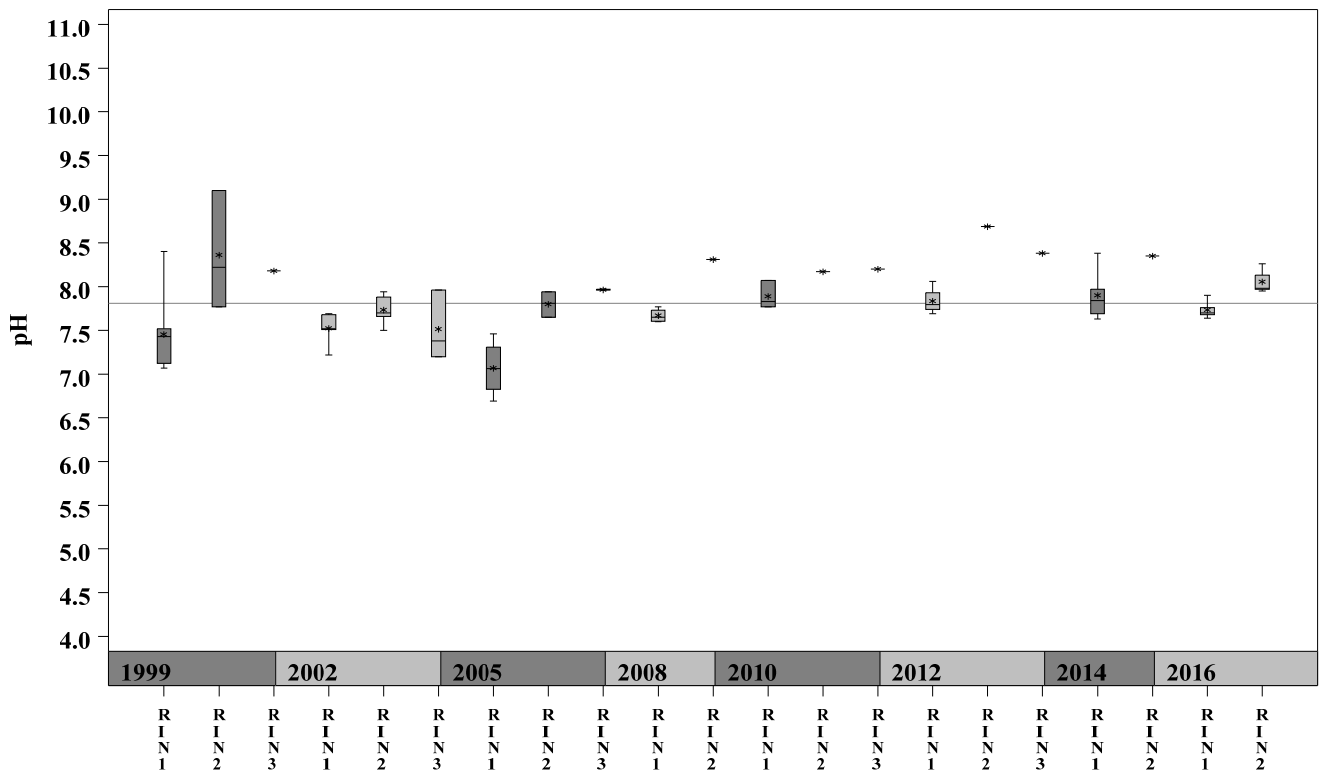
Parameter = TURBIDITY Unit = NTU Watershed = Rinard



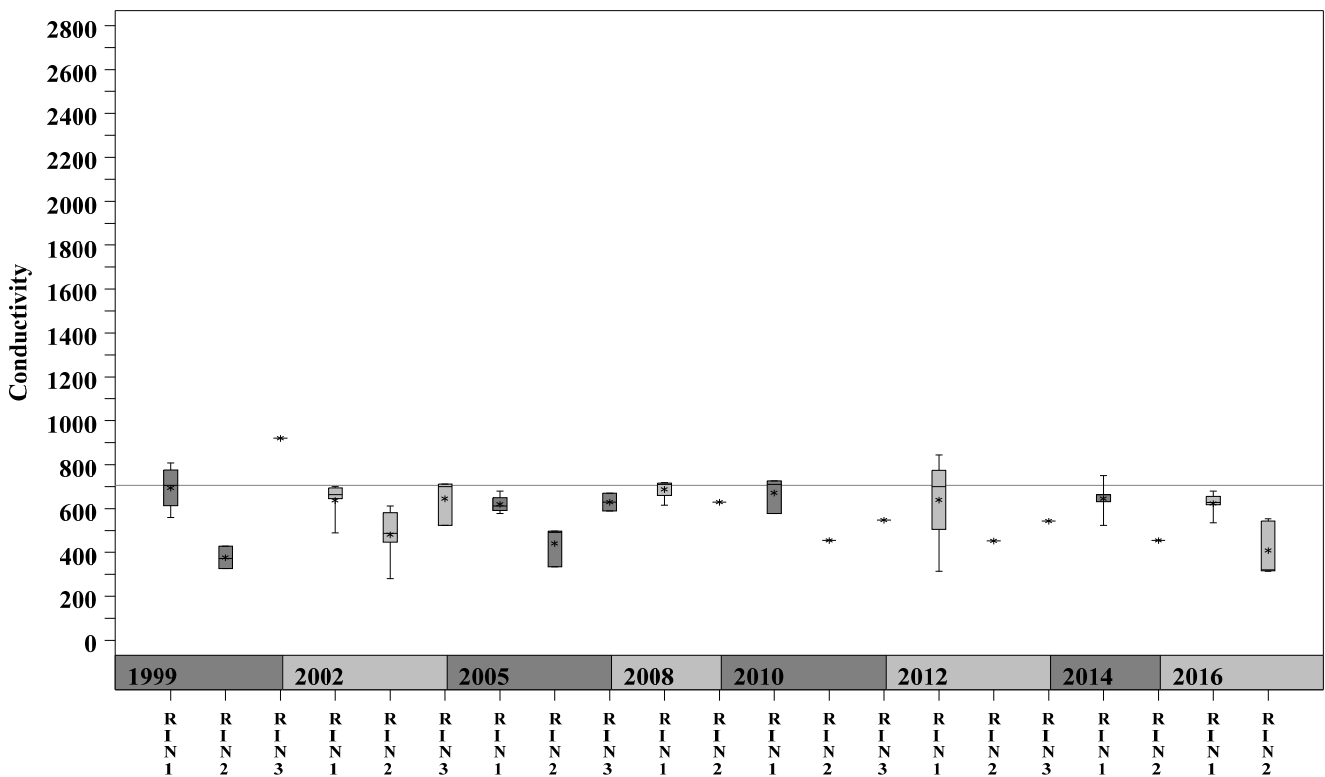
Rinard Creek Watershed

Data Summary Graphs – pH and Conductivity (Downstream to Upstream by Year)

Parameter = pH Unit = Standard Units Watershed = Rinard



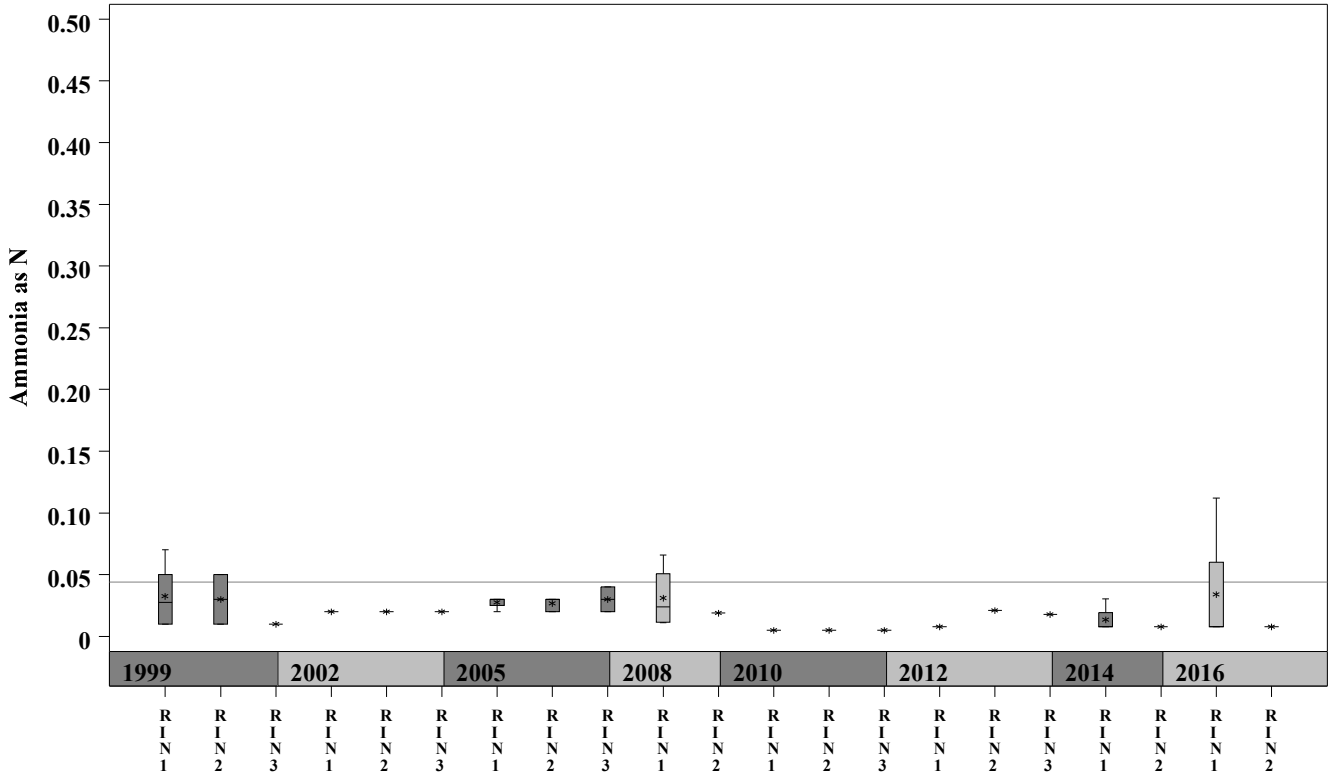
Parameter = CONDUCTIVITY Unit = uS/cm Watershed = Rinard



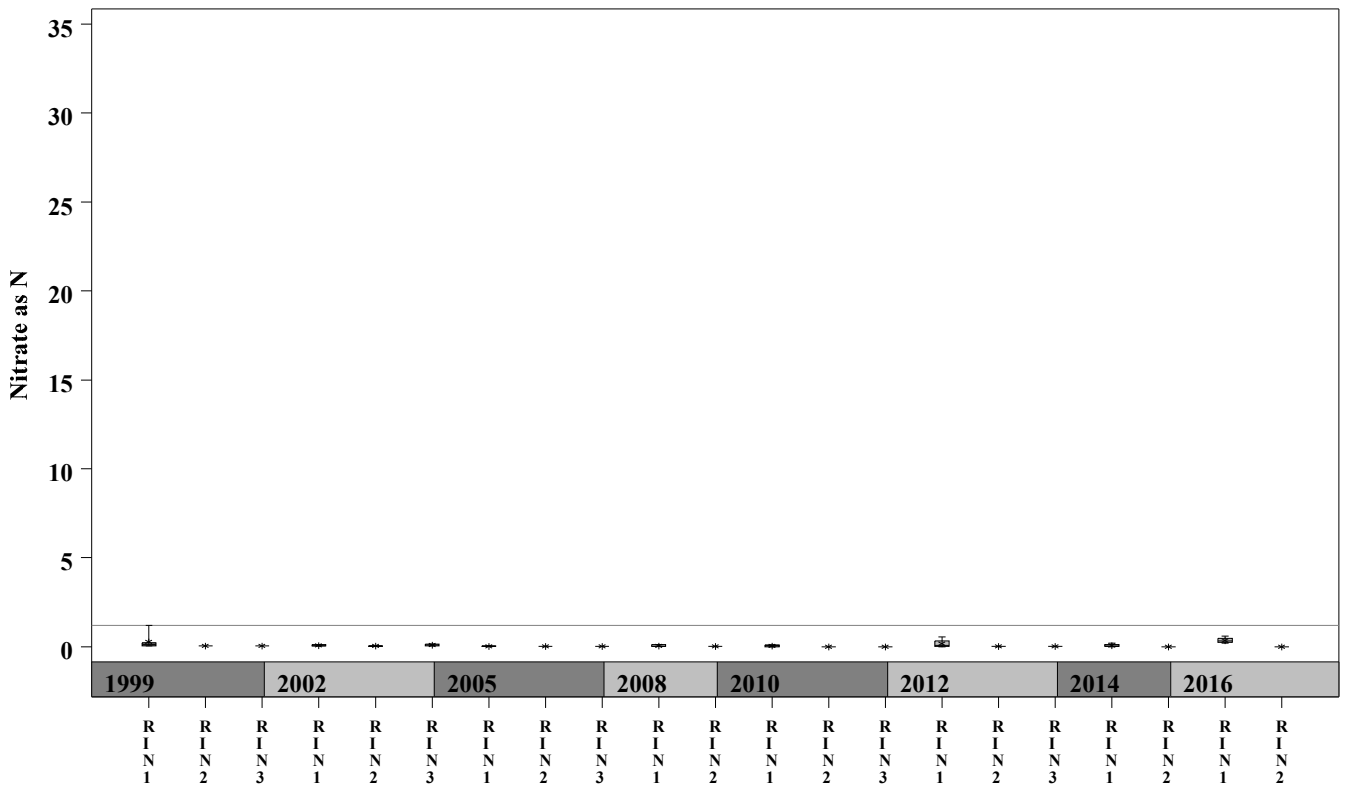
Rinard Creek Watershed

Data Summary Graphs – Ammonia and Nitrate/Nitrite (Downstream to Upstream by Year)

Parameter = AMMONIA AS N Unit = mg/L Watershed = Rinard



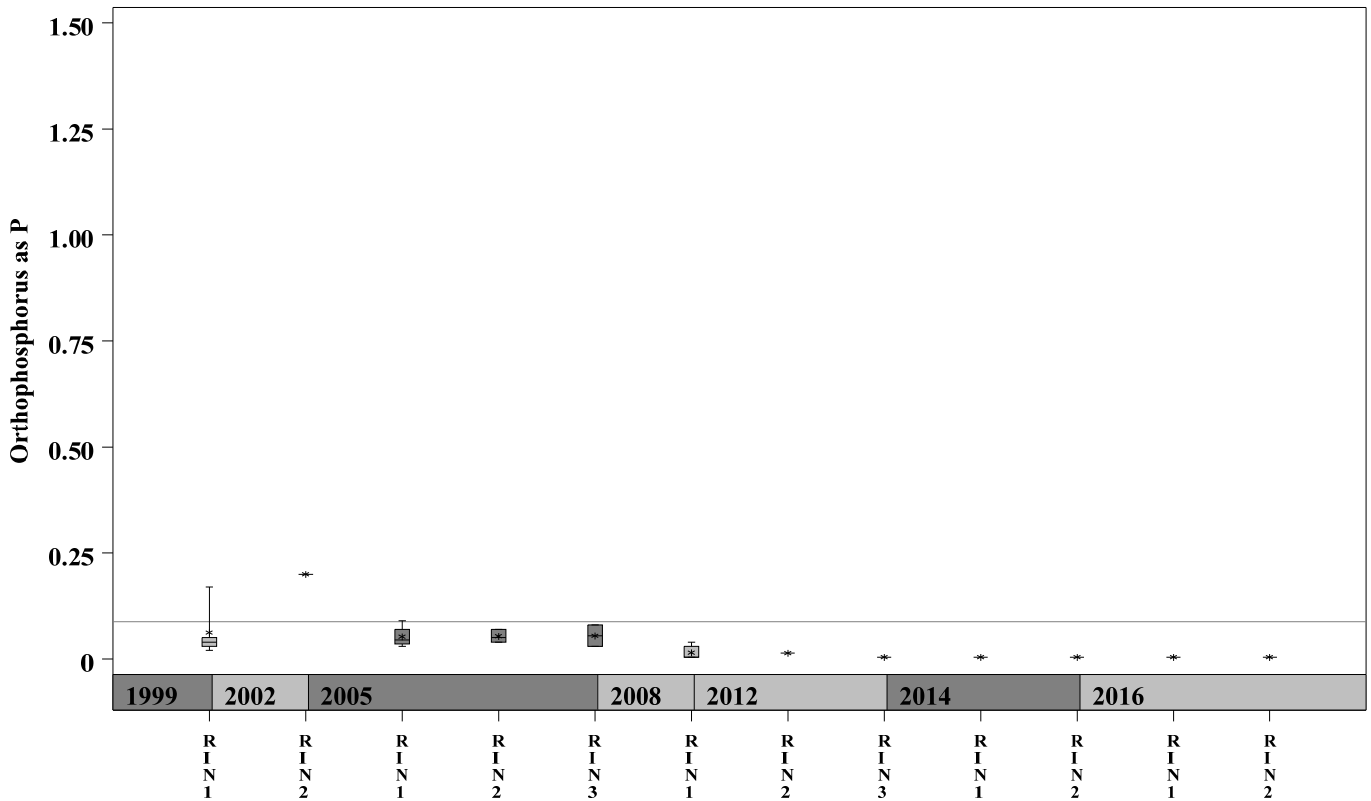
Parameter = NITRATE AS N Unit = mg/L Watershed = Rinard



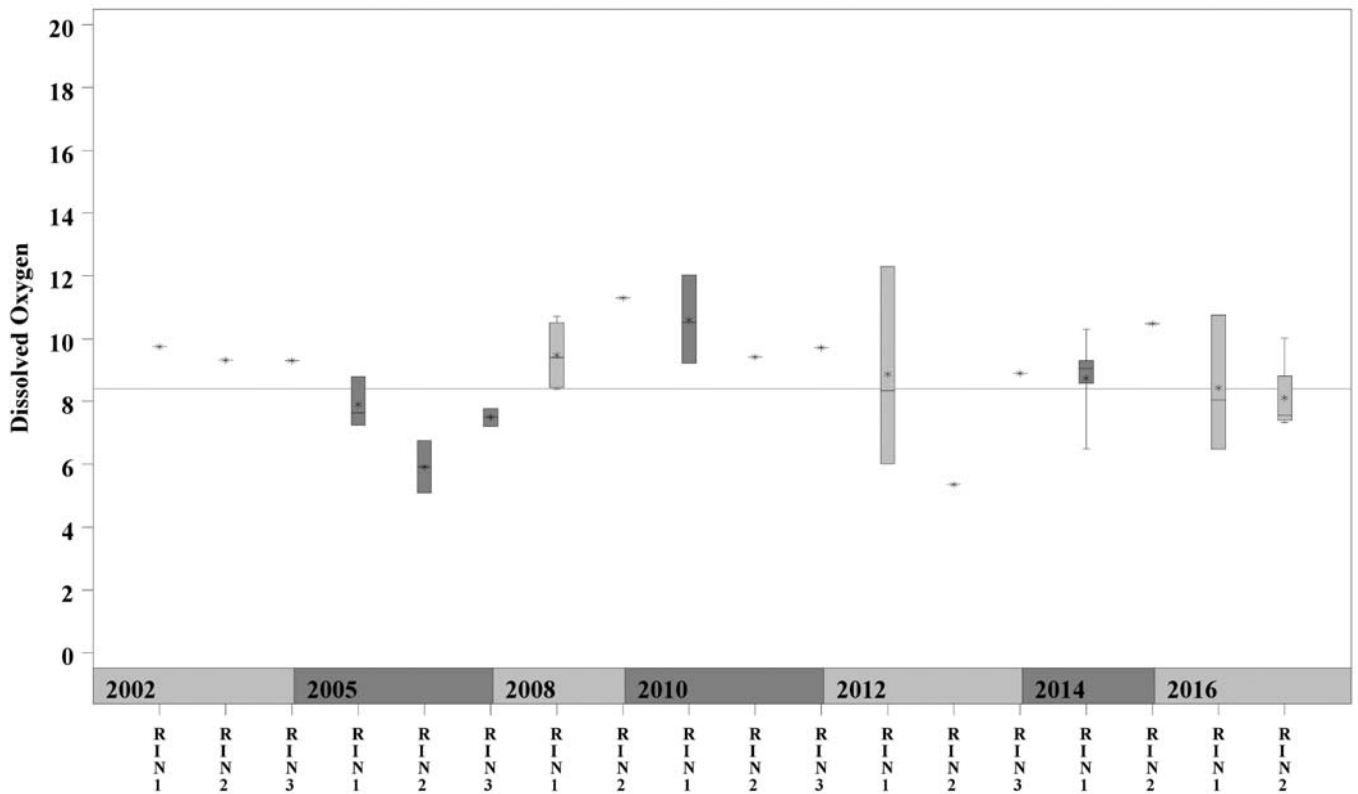
Rinard Creek Watershed

Data Summary Graphs – Orthophosphate and Dissolved Oxygen (Downstream to Upstream by Year)

Parameter = ORTHOPHOSPHORUS AS P Unit = mg/L Watershed = Rinard



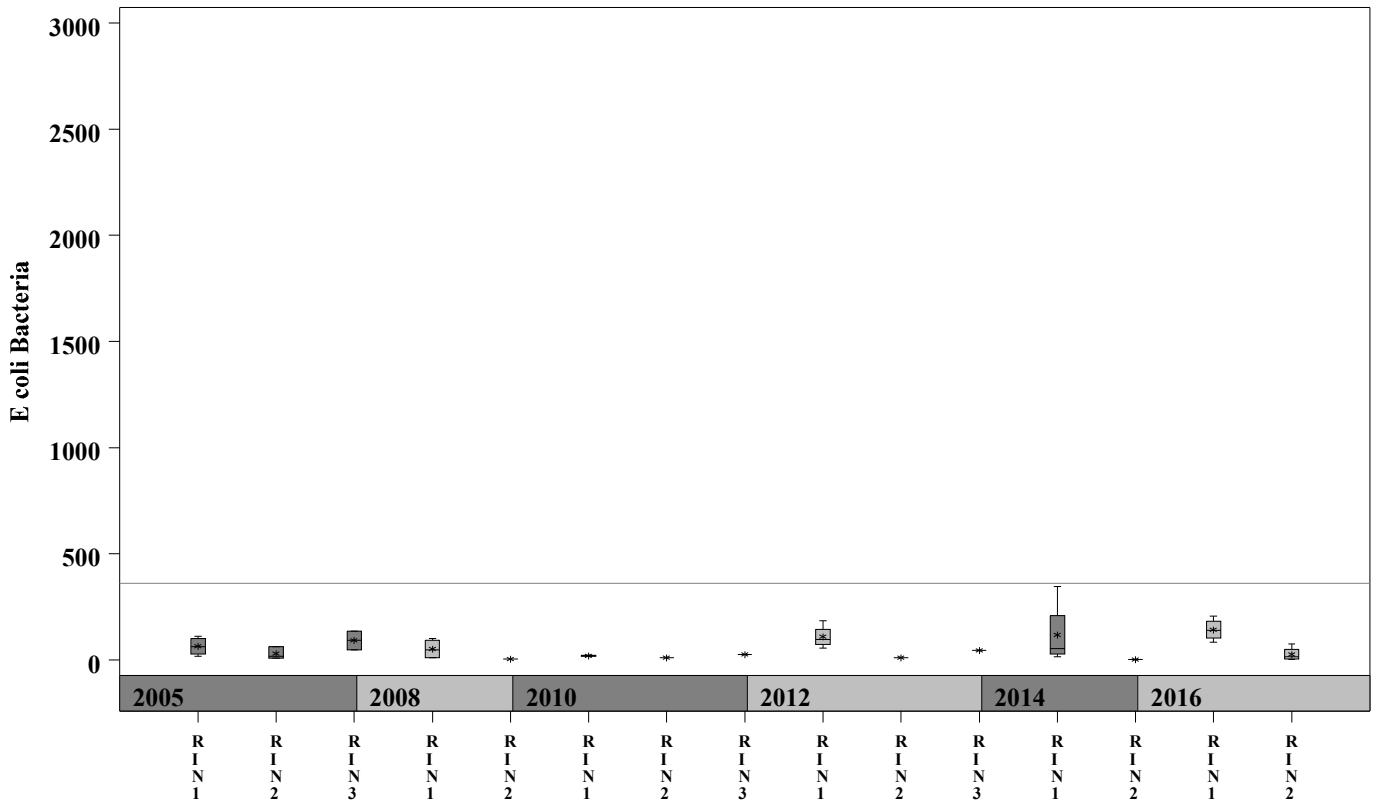
Parameter = DISSOLVED OXYGEN Unit = mg/L Watershed = Rinard



Rinard Creek Watershed

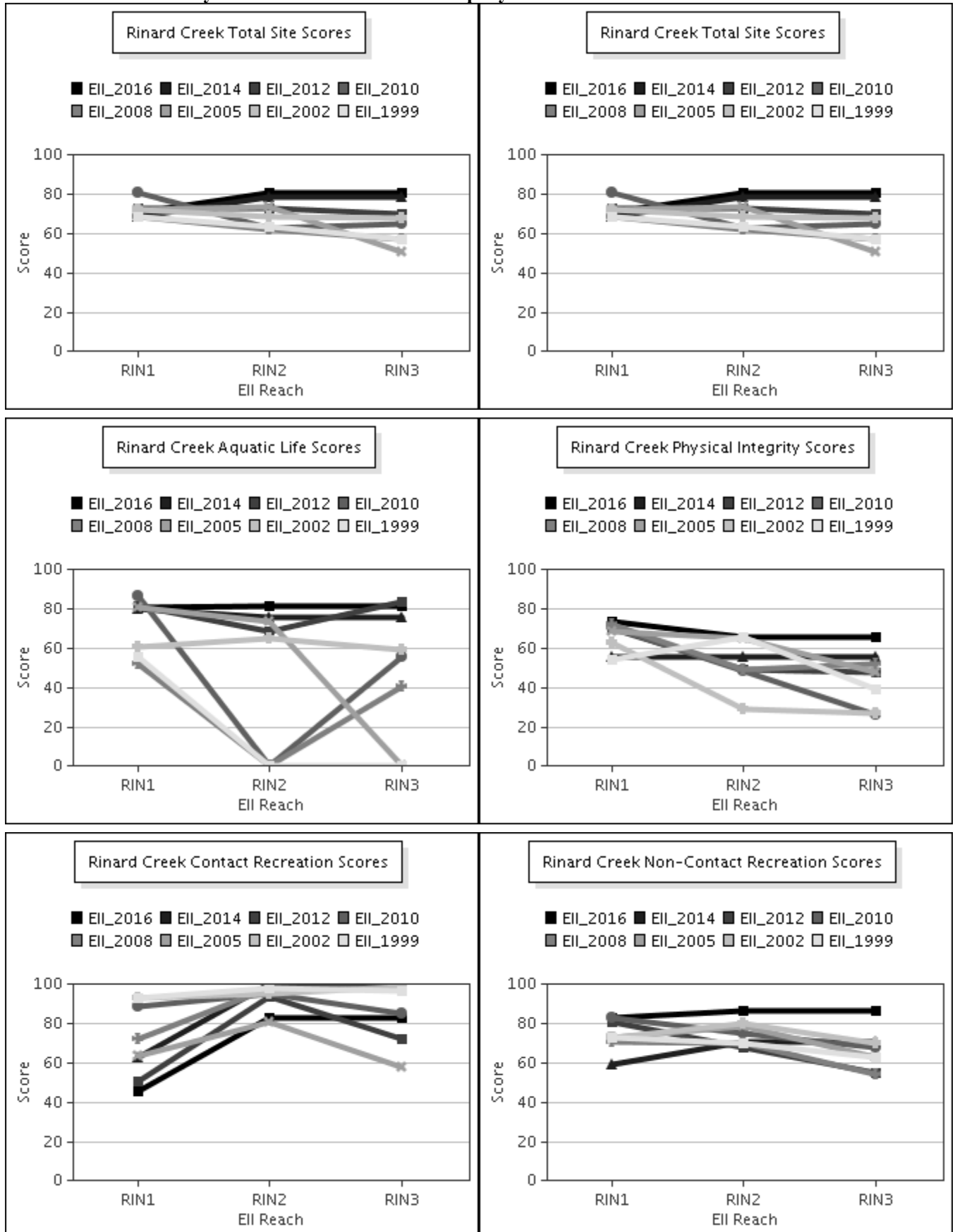
Data Summary Graphs – *E.coli* (Downstream to Upstream by Year)

Parameter = E COLI BACTERIA Unit = MPN/100mL Watershed = Rinard



Rinard Creek Watershed

Score Summary – Reach scores for each sample year



Rinard Creek Watershed

Benthic Macroinvertebrates – Taxa List, Pollution Tolerance Index & Functional Feeding Group for 2016 Sample Sites (Downstream to Upstream)

Benthic Macroinvertebrates - Rinard Creek			RIN ds SH 45 (5398)	RIN @ Bradshaw (233)
Benthic Macroinvertebrate ID	PTI	FFG	05/06/2016 (WRE)	05/13/2016 (WRE)
Chimarra	2	FC	7	23
Camelobaetidium	4	CG		1
Fallceon	4	CG,SC	83	66
Neochoroterpes	4	CG	18	
Simulium	4	FC	346	
Paracymus	5	CG	2	
Tricorythodes	5	CG		1
Sphaerium (Clam)	5	FC		1
Argia	6	P	8	13
Cheumatopsyche	6	FC	116	68
Chironomidae	6	FC,P	18	4
Fossaria	6	SC	3	
Hetaerina	6	P		1
Hydracarina	6		1	
Stenonema Femoratum	6	CG,SC	5	
Tanypodinae	6	P	1	1
Bezzia / Palpomyia	7	CG,P	1	
Caenis	7	CG,SC	11	
Ferrissia	7	SC	1	
Helisoma Anceps	7	SC	1	
Berosus	9	CG	1	
Physella	9	SC	2	
Dugesia		CG,P		21

Rinard Creek Watershed

Site Photographs



233_t00-ds-06_20_2000



233_t00-us-03_28_2002



233_t00-ds-06_15_2005



233_t0-na-06_16_2008



233_00-ds-05_19_2010



233_00-us-05_19_2010

Rinard Creek Watershed

Site Photographs



1219_00-us-05_19_2010



1219_00-ds-05_19_2010



1219_t00-ur-06_15_2005



1220_t00-ur-06_15_2005



1220_00-us-05_19_2010



1220_00-ds-05_19_2010