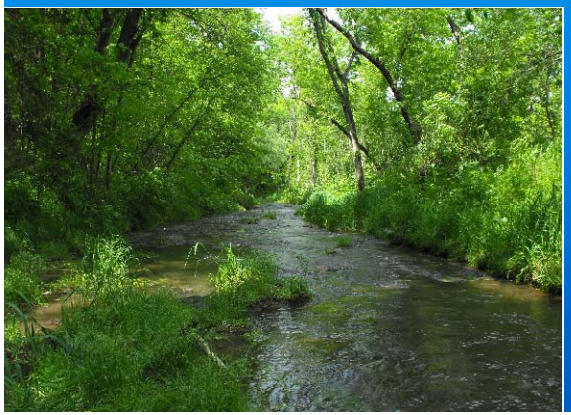
Elm Creek Watershed TMDL
E. coli TMDL

Elm Creek Watershed Management Commission

Technical Advisory Committee Meeting

October 9. 2013



Outline of Presentation

- Review of *E. coli* Standards
- Overview of monitoring data
- Review of revised allocations for all listed reaches (including Elm Creek mainstem)
- Review of source identification findings

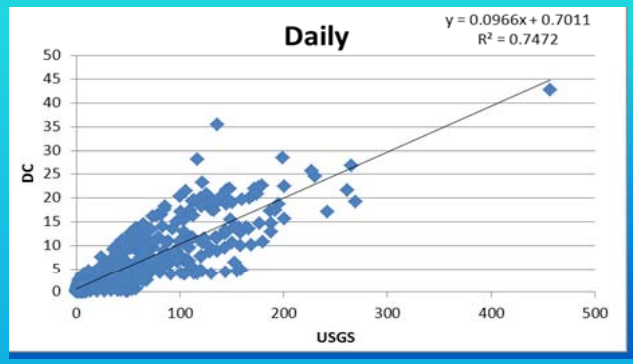
E. Coli Bacteria Standard

- Standard applies between April 1 and October 1
- Reach impaired if one or more monthly geomean values exceed 126 organisms/100 ml *OR*
- More than 10% of all samples during a month can exceed 1260 organisms /100 ml

Overview of Bacteria Data by Impaired Reach

E. coli Monthly Geomeans (cfu/100mL)							
	April	May	June	July	August	September	October
Diamond Creek - Headwaters/French Lake to Un-named Lake (AUID 07010206-525)							
DCZ	125	125	89	225	374	136	149
SD		106	182	134	175	219	113
DC	10	40	46	94	213	201	166
Rush Creek -Headwatwers to Elm Creek (AUID 07010206-528)							
RCTH	9	28	113	185	295	85	110
RC116	10	39	151	239	202	105	51
RT	25	30	43	52	51	47	94
Rush Creek, South Fork - Un-named lake to Rush Creek (AUID 07010206-732)							
RCSL	53	79	129	150	141	308	342
Elm Creek-Headaters/Lake Medina to Miss. R. (AUID 07010206-508)							
Hamel	74	141	263	165	180	85	129
ECER	31	117	185	135	220	174	165
EC77	33	56	157	249	207	235	125
ECW	6	25	36	22	44	83	24
EC81	15	70	132	143	182	197	99
USGS	30	58	91	61	109	98	60
ECHO	12	25	65	56	78	114	126

Steps in Developing Load Duration Curve (LDC)



- Develop flow duration curve (FDC)
  for 10-year period of record
  at bottom of impaired reach
- Multiply flows in FDC by standard of
  126 cfu/100 ml to get load duration curve
- Use median value in each of 5 flow regimes to develop allowable load ("loading capacity" or LC)
- Subtract 5% of LC as explicit Margin of Safety (MOS)

Developing Allocations

- Allocate remaining load (after MOS) among:
  - Permitted wastewater dischargers
  - Construction and Industrial stormwater
  - Municipal Separate Storm Sewer Systems (MS4s)
  - Non-permitted sources (i.e. all areas not expected to drain through a permitted MS4 stormwater conveyance system)

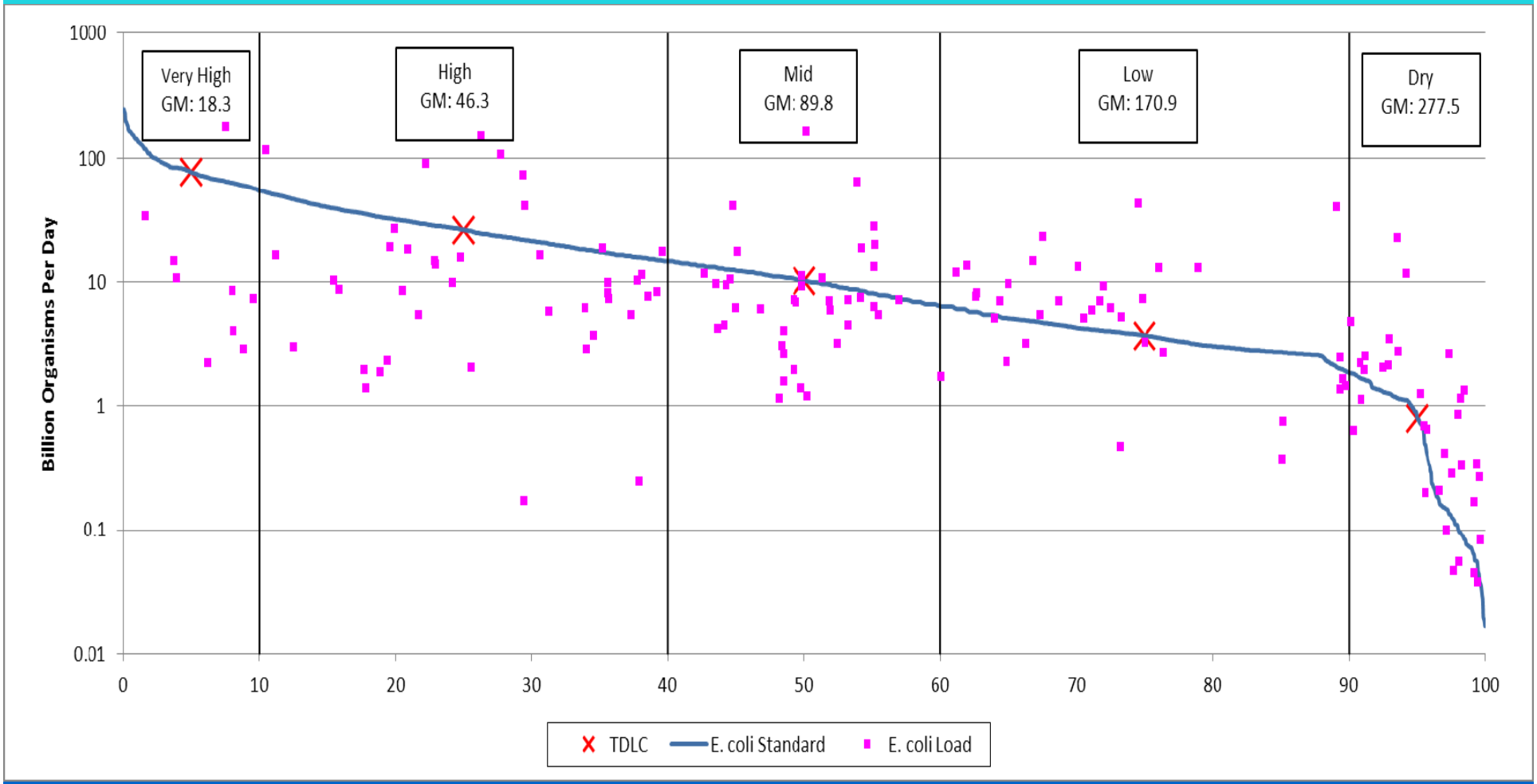
Developing Allocations (con't)

- Allocations made proportionate to area in contributing watershed
- No waste load allocation = not permitted to discharge
- MnDOT and Hennepin County road ROW
  - Assigned as part of WLA if within 2010 urbanized area
  - Assigned as part of LA if outside 2010 urbanized area

Refinements To Establishing Allocations From 9/11/13 TAC Meeting

- Wasteload allocation (WLA) should include loads from future urban land use footprint
- Future urban footprint defined using land use and/or orderly annexation plans
- MS4 permittee only responsible for discharges when future urban areas are incorporated into MS4's regulated conveyance system

Load Duration Curve (LDC) for Diamond Creek *E. coli*



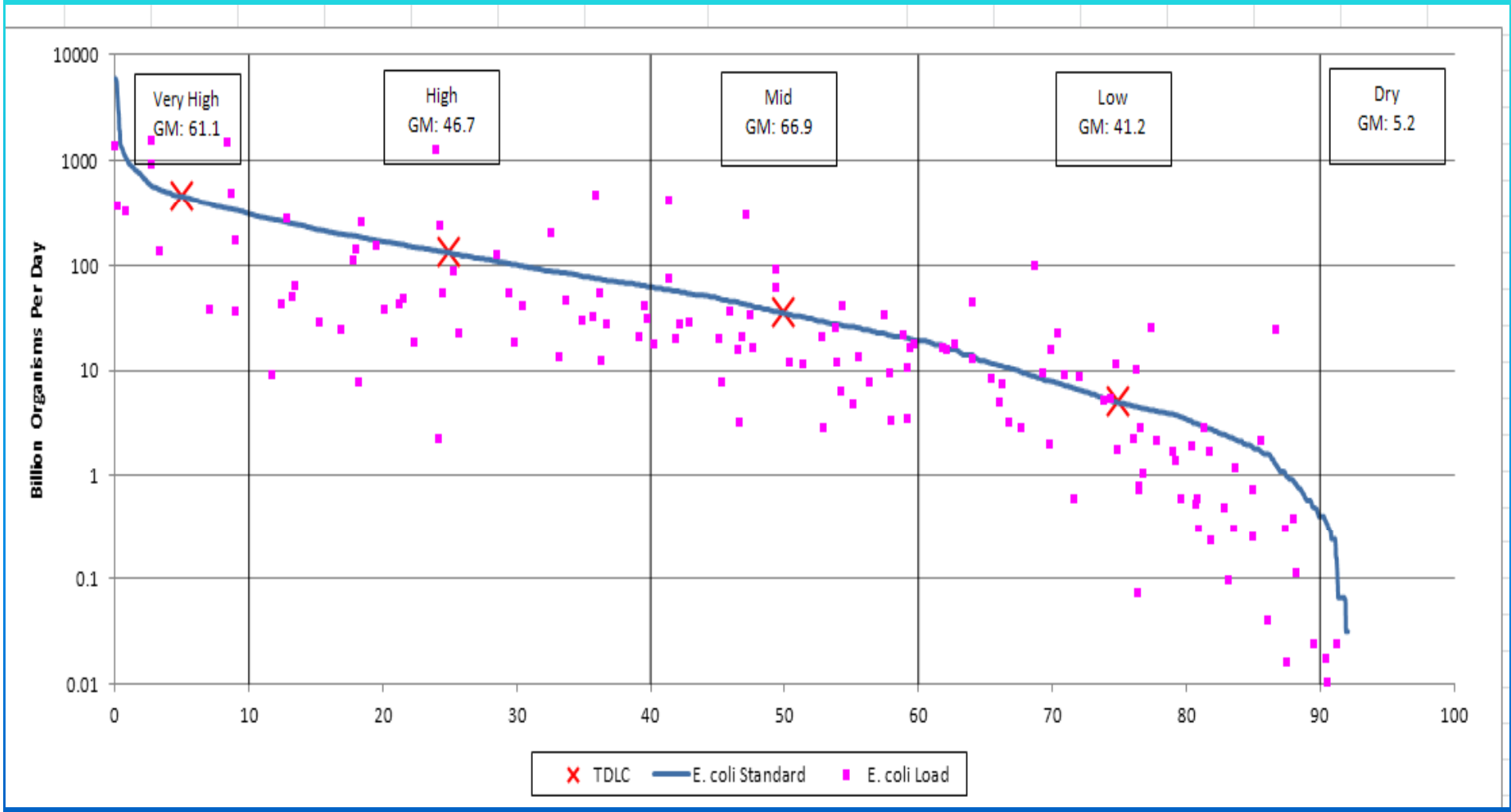
Diamond Creek Allocation Table (*E. coli*)

Diamond Creek: AUID 07010206-525 (10/7/13)		Flow Zones				
		Very High	High	Mid	Low	Dry
		E. coli Load (Billions of Organisms/Day)				
Total Daily Loading Capacity		77.00	26.70	10.40	3.80	0.80
5% Explicit Margin of Safety (MOS)		3.85	1.34	0.52	0.19	0.04
Wasteload Allocations	Permitted Point Source Dischargers	0	0	0	0	0
	Construction Stormwater (1% of LC)	0.770	0.267	0.104	0.038	0.008
	Industrial Stormwater (0.5% of LC)	0.385	0.134	0.052	0.019	0.004
	MS4 - Dayton	35.711	12.383	4.823	1.762	0.371
Load Allocations	Non-MS4 runoff	36.284	12.582	4.901	1.791	0.377

Percent Reductions Needed To Reach Standard-Diamond Creek

E. coli Monthly Geomeans (cfu/100mL) - % Reductions to Meet Chronic Standard							
	April	May	June	July	August	September	October
Diamond Creek - Headwaters/French Lake to Un-named Lake (AUID 07010206-525)							
DCZ	0	0	0	44%	66%	7%	15%
SD		0	31%	6%	28%	42%	0
DC	0	0	0	0	41%	37%	24%

Load Duration Curve (LDC) for Rush Creek Mainstem *E. coli*



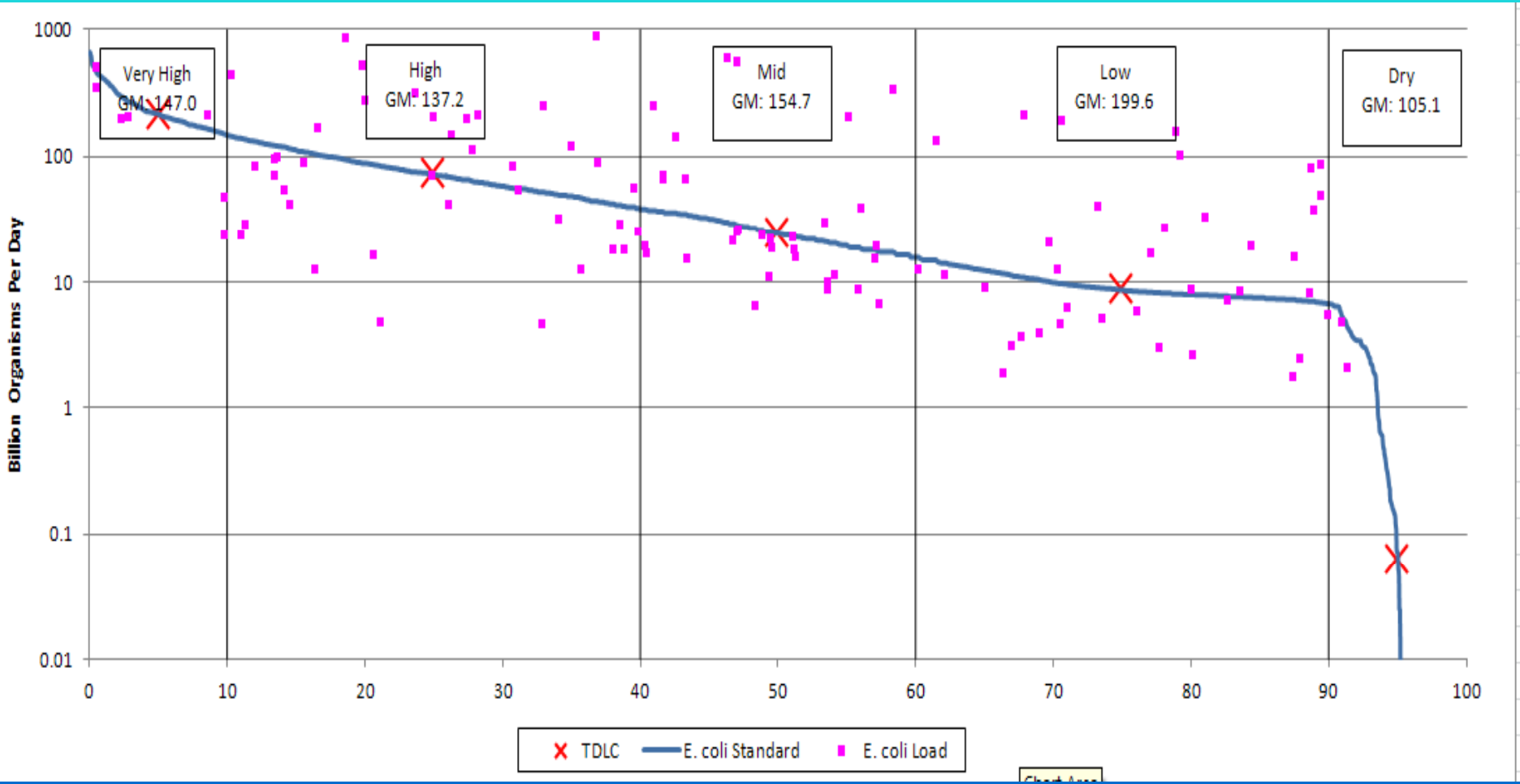
Rush Creek Mainstem Allocation Table (*E. coli*)

Rush Creek Mainstem: AUID 07010206-528 (10/7/13)		Flow Zones				
		Very High	High	Mid	Low	Dry
		E. coli Load (Billions of Organisms/Day)				
Total Daily Loading Capacity		456.96	131.94	35.01	4.96	0.00
5% Explicit Margin of Safety (MOS)		22.85	6.60	1.75	0.25	0.00
Wasteload Allocations	Permitted Point Source Dischargers	0.00	0.00	0.00	0.00	0.00
	Construction Stormwater (1% of LC)	4.57	1.32	0.35	0.05	0.00
	Industrial Stormwater (0.5% of LC)	2.28	0.66	0.18	0.02	0.00
	MS4 - Corcoran	42.66	12.32	3.27	0.46	0.00
	MS4 - Dayton	42.26	12.20	3.24	0.46	0.00
	MS4 - Maple Grove	28.83	8.32	2.21	0.31	0.00
	MS4 - Rogers	46.92	13.55	3.60	0.51	0.00
	MS4 - Hennepin County	0.42	0.12	0.03	0.00	0.00
	MS4 - MnDOT	1.09	0.31	0.08	0.01	0.00
Load Allocations	Non-MS4 runoff	265.08	76.54	20.31	2.88	0.00

Percent Reductions Needed To Reach Standard-Rush Cr. Mainstem

E. coli Monthly Geomeans (cfu/100mL) - % Reductions to Meet Chronic Standard							
	April	May	June	July	August	September	October
Rush Creek -Headwatwers to Elm Creek (AUID 07010206-528)							
RCTH	0	0	0	32%	57%	0	0
RC116	0	0	17%	47%	38%	0	0
RT	0	0	0	0	0	0	0

Load Duration Curve (LDC) for Rush Creek-South Fk. *E. coli*



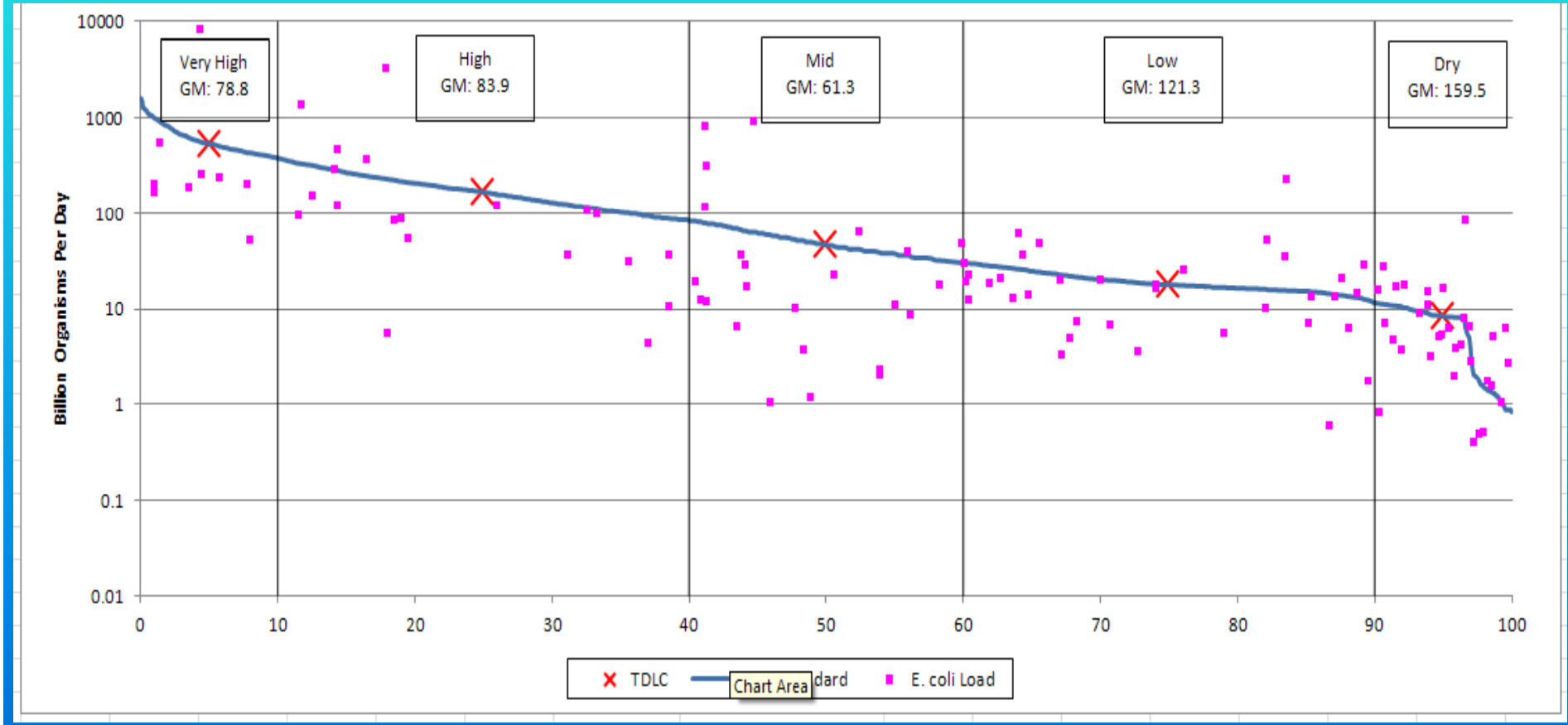
Rush Creek-South Fk. Allocation Table (*E. coli*)

Rush Creek - South Fork: AUID 07010206-732 (10/7/13)		Flow Zones				
		Very High	High	Mid	Low	Dry
		E. coli Load (Billions of Organisms/Day)				
Total Daily Loading Capacity		215.43	72.70	24.59	8.63	0.02
5% Explicit Margin of Safety (MOS)		10.77	3.64	1.23	0.43	0.00
Wasteload Allocations	Permitted Point Source Dischargers	0.14	0.14	0.14	0.14	0.14
	Construction Stormwater (1% of LC)	2.15	0.73	0.25	0.09	0.00
	Industrial Stormwater (0.5% of LC)	1.08	0.36	0.12	0.04	0.00
	MS4 - Corcoran	69.98	23.58	7.94	2.76	0.00
	MS4 - Maple Grove	22.83	7.69	2.59	0.90	0.00
	MS4 - Medina	12.95	4.37	1.47	0.51	0.00
	MS4 - Hennepin County	0.35	0.12	0.04	0.01	0.00
Load Allocations	Non MS4 runoff	95.17	32.07	10.80	3.75	0.00

Percent Reductions Needed To Reach Standard-Rush Cr. –South Fk.

E. coli Monthly Geomeans (cfu/100mL) - % Reductions to Meet Chronic Standard							
	April	May	June	July	August	September	October
Rush Creek, South Fork - Un-named lake to Rush Creek (AUID 07010206-732)							
RCSL	0	0	2%	16%	11%	59%	63%

Load Duration Curve (LDC) for Elm Creek mainstem



Elm Creek mainstem Allocation Table (*E. coli*)

Elm Creek: AUID 07010206-508 (10/7/13)		Very High	High	Mid	Low	Dry
		E. coli Load (Billions of Organisms/Day)				
Total Daily Loading Capacity		541.59	169.32	46.54	18.03	8.41
5% Explicit Margin of Safety (MOS)		27.08	8.47	2.33	0.90	0.42
Wasteload Allocations	Permitted Point Source Dischargers	0	0	0	0	0
	Construction Stormwater (1% of LC)	5.42	1.69	0.47	0.18	0.08
	Industrial Stormwater (0.5% of LC)	2.71	0.85	0.23	0.09	0.04
	MS4 - Champlin	24.52	7.66	2.11	0.82	0.38
	MS4 - Corcoran	20.59	6.44	1.77	0.69	0.32
	MS4 - Dayton	73.34	22.93	6.30	2.44	1.14
	MS4 - Maple Grove	190.85	59.67	16.40	6.35	2.96
	MS4 - Medina	44.33	13.86	3.81	1.48	0.69
	MS4 - Plymouth	43.25	13.52	3.72	1.44	0.67
	MS4 - Hennepin County	4.73	1.48	0.41	0.16	0.07
	MS4 - MnDOT	8.69	2.72	0.75	0.29	0.13
Load Allocations	Non MS4 runoff	96.10	30.04	8.26	3.20	1.49

Percent Reductions Needed To Reach Standard-Elm Creek mainstem

E. coli Monthly Geomeans (cfu/100mL) - % Reductions to Meet Chronic Standard							
	April	May	June	July	August	September	October
Elm Creek-Headaters/Lake Medina to Miss. R. (AUID 07010206-508)							
Hamel	0%	11%	52%	24%	30%	0%	2%
ECER	0%	0%	32%	7%	43%	28%	24%
EC77	0%	0%	20%	49%	39%	46%	0%
ECW	0%	0%	0%	0%	0%	0%	0%
EC81	0%	0%	5%	12%	31%	36%	0%
USGS	0%	0%	0%	0%	0%	0%	0%
ECHO	0%	0%	0%	0%	0%	0%	0%
MP	0%	0%	0%	0%	0%	0%	0%

Source Assessment

- Purpose – To identify potential sources of elevated bacteria concentrations
  - Detailed monitoring data provides basis for identifying priority areas of watershed
- Components
  - Exceedances patterns by flow regime/season
  - Estimate of Bacteria Produced by Major Source

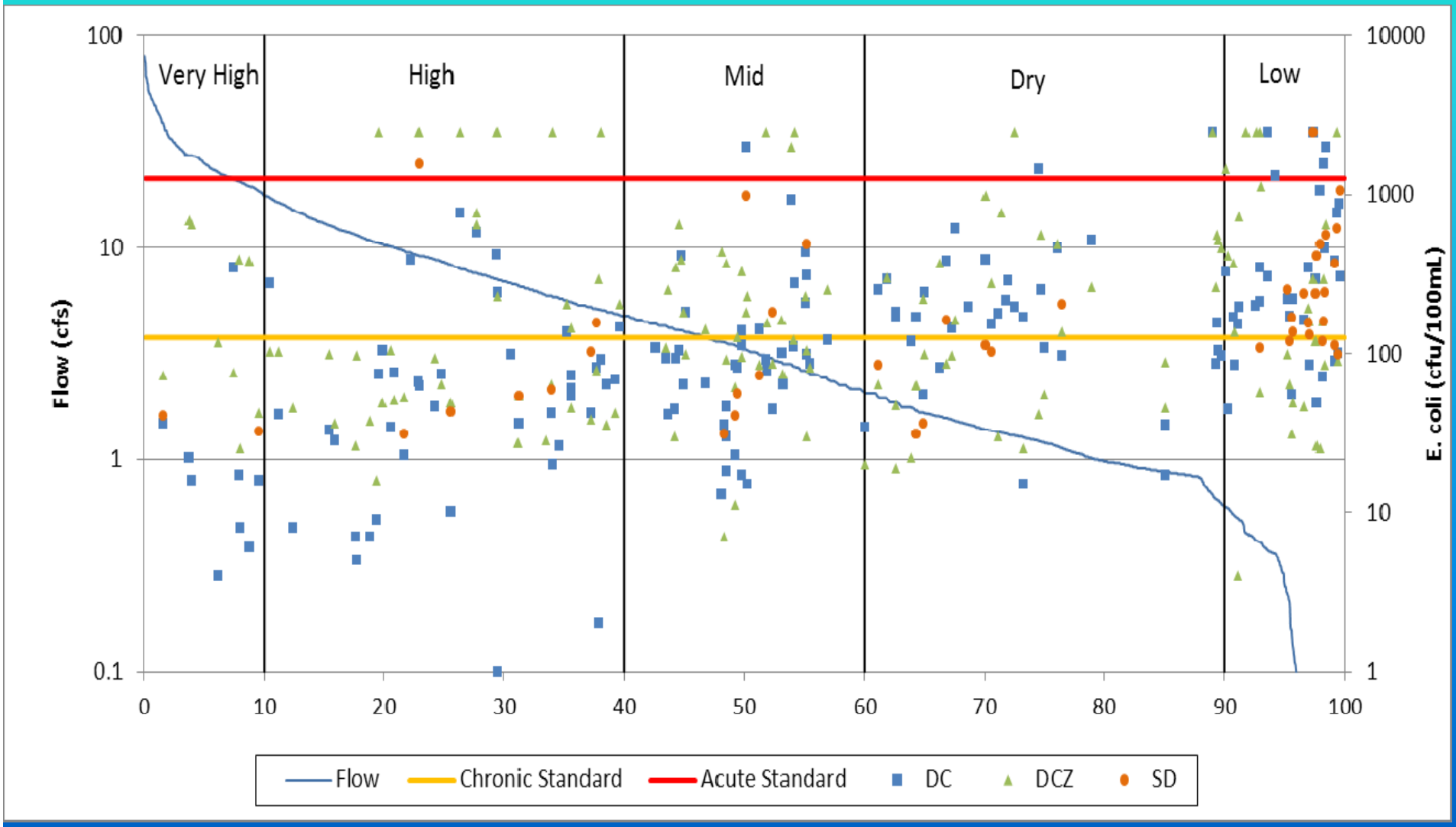
Potential Sources By Flow Regime

Contributing Source Area	Duration Curve Zone				
	High flow	Moist	Mid-Range	Low Flow	Dry
Point Sources				*M*	*H*
Septic Systems w/ "Straight Pipe" connection				*M*	*H*
Livestock in receiving water				*M*	*H*
Sub-surface treatment systems			*H*	*M*	
Stormwater Runoff - Impervious Areas		*H*	*H*	*H*	
Combined Sewer Overflows	*H*	*H*	*H*		
Stormwater Runoff - Pervious Areas	*H*	*H*	*M*		
Bank Erosion	*H*	*M*			

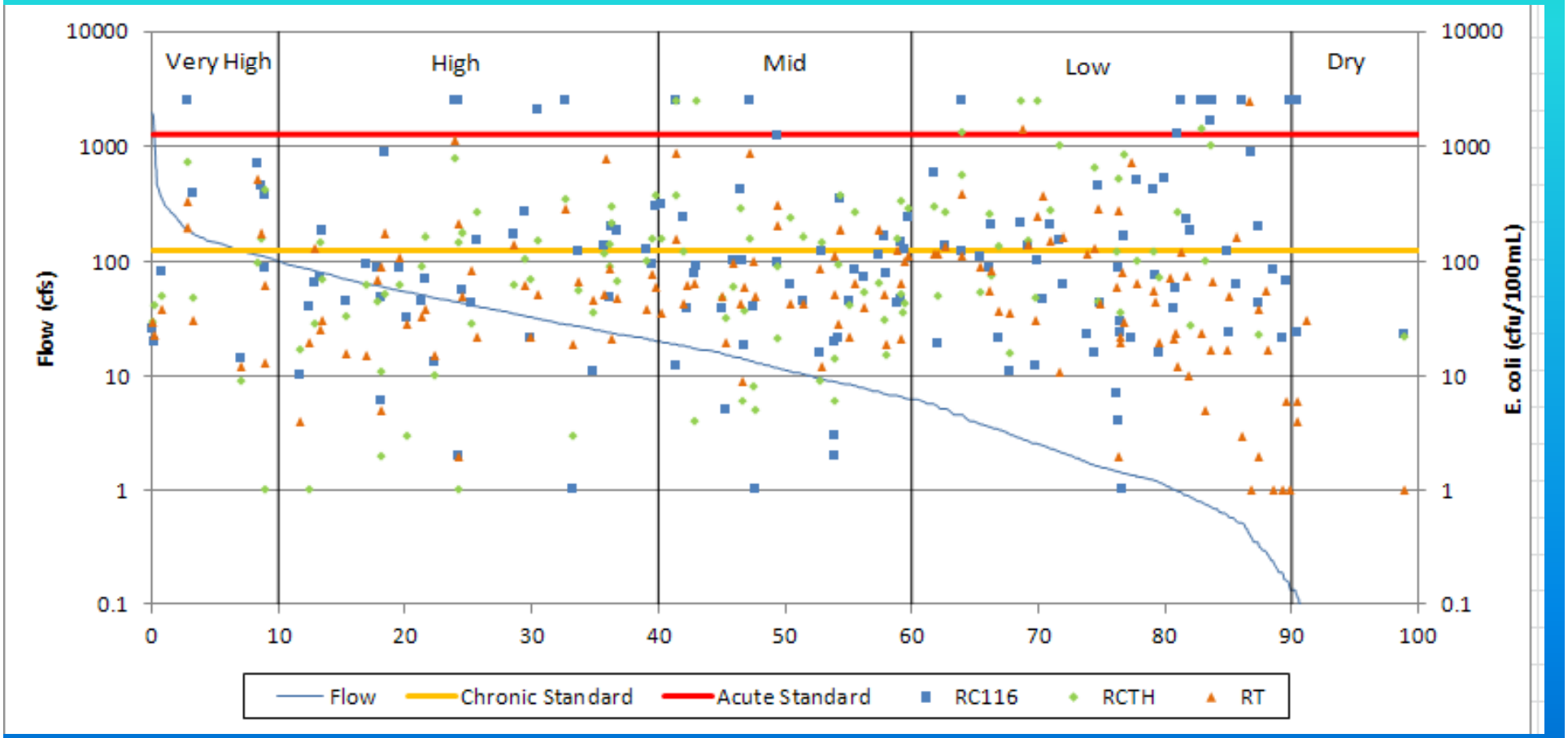
Note: Potential relative importance of source area to contribute loads under given hydrologic condition (*H: High; M: Medium)*

Based on USEPA Doc 841-B-07-006

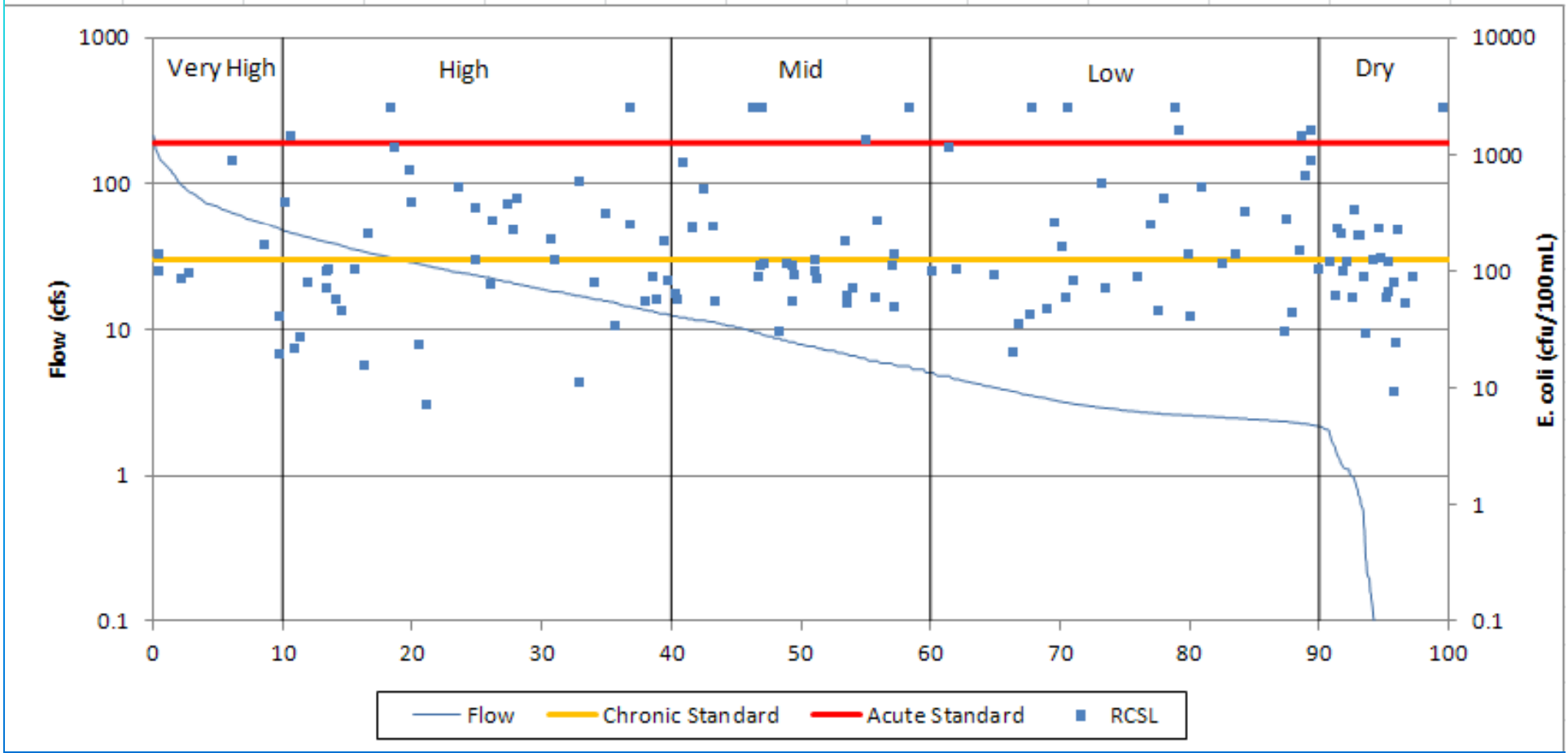
Exceedances by Flow Regime (Diamond Creek)



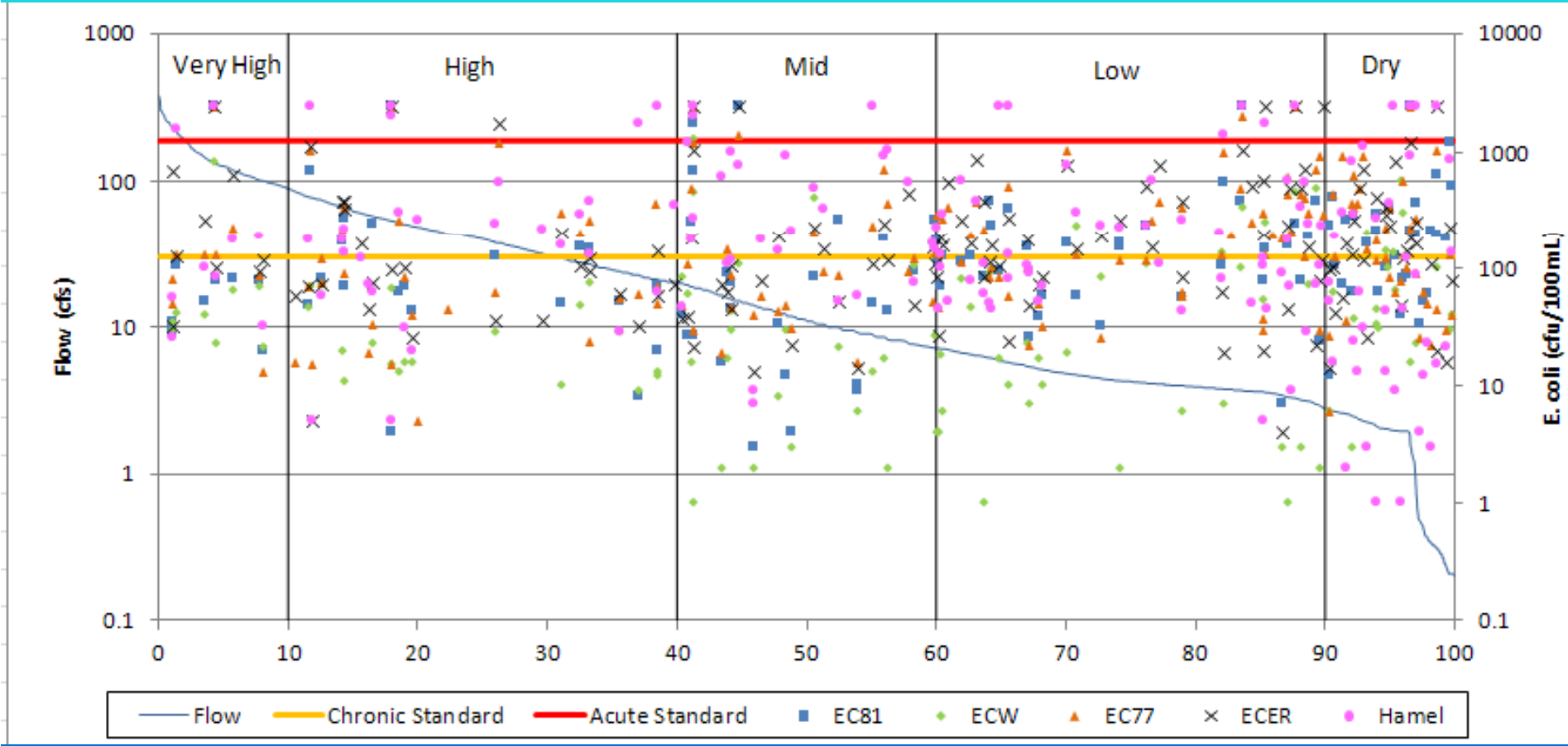
Exceedances by Flow Regime (Rush Creek-Mainstem)



Exceedances by Flow Regime (Rush Creek-S. Fk.)



Exceedances by Flow Regime (Elm Creek Mainstem)



Source Inventory

- Basic approach developed for Southeast MN bacteria TMDL (MPCA 2002)
- Purpose: To compare number of bacteria generated by major known sources in the project area
- Known sources include:
  - Livestock (horses, cattle, "other")
  - Human sources (mainly failing septic systems)
  - Wildlife
  - Domestic Animals

Source Inventory Approach/Key Assumptions

- Livestock
  - GIS analysis to determine number/type of livestock in pastures/feedlots in the designated subwatershed for each impaired reach
- Humans
  - Only 1 permitted WWTP discharging to Rush Creek-S. Fk. subwatershed - estimate loading based on discharge monitoring records
  - Septic Systems- Use 2010 population estimates based for un-sewered areas to estimate # of systems, assume 25% failure rate based on failure rate for Hennepin County (MPCA, 2004)

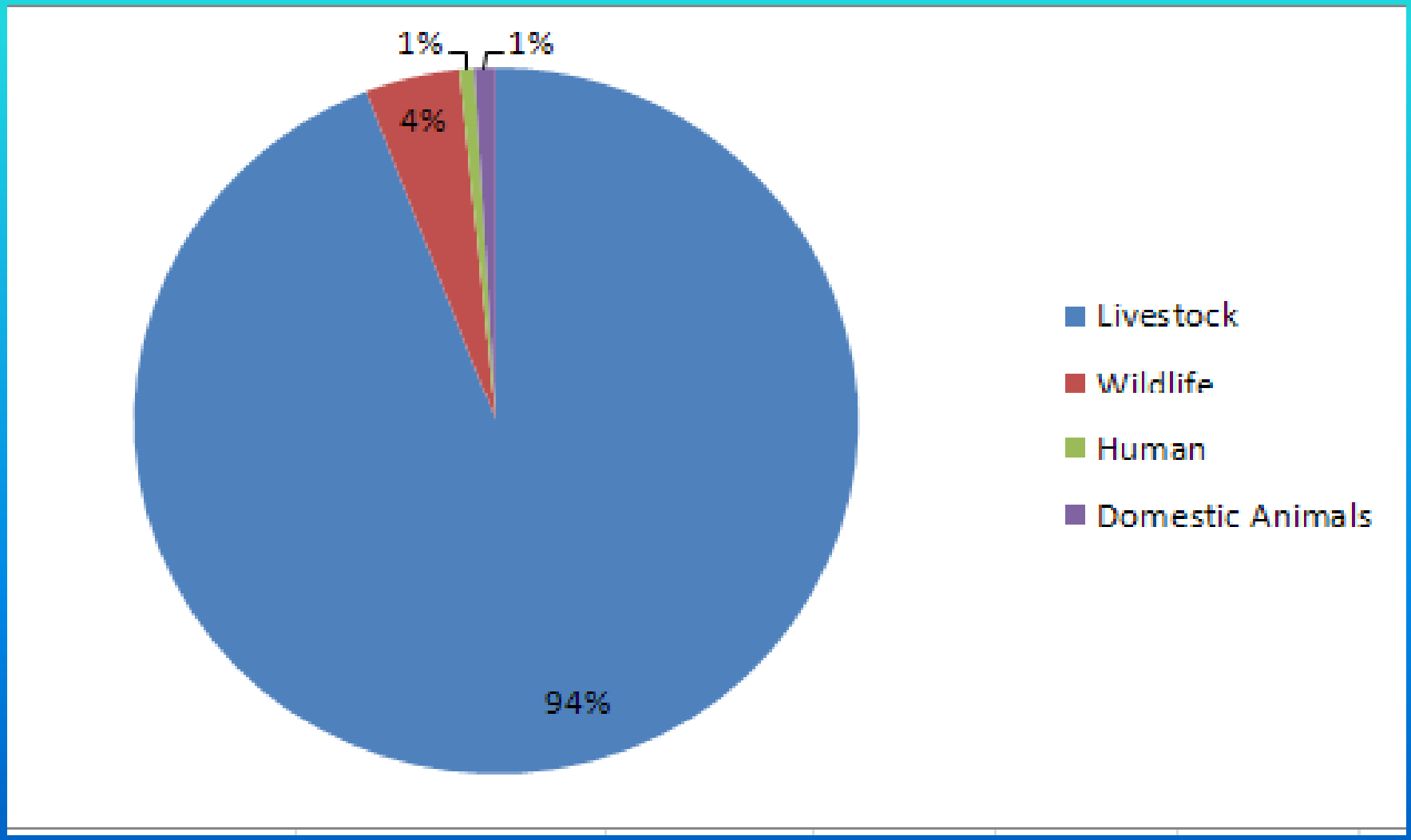
Key assumptions (Source Inventory) (con't)

- Wildlife – Assume 30 deer/sq. mile, 20 geese/sq. mi. based on TRPD and MDNR wildlife manager estimates, then double to account for other wildlife
- Domestic Animals – Assume 0.58 dogs per household, 0.73 cats per household across entire watershed

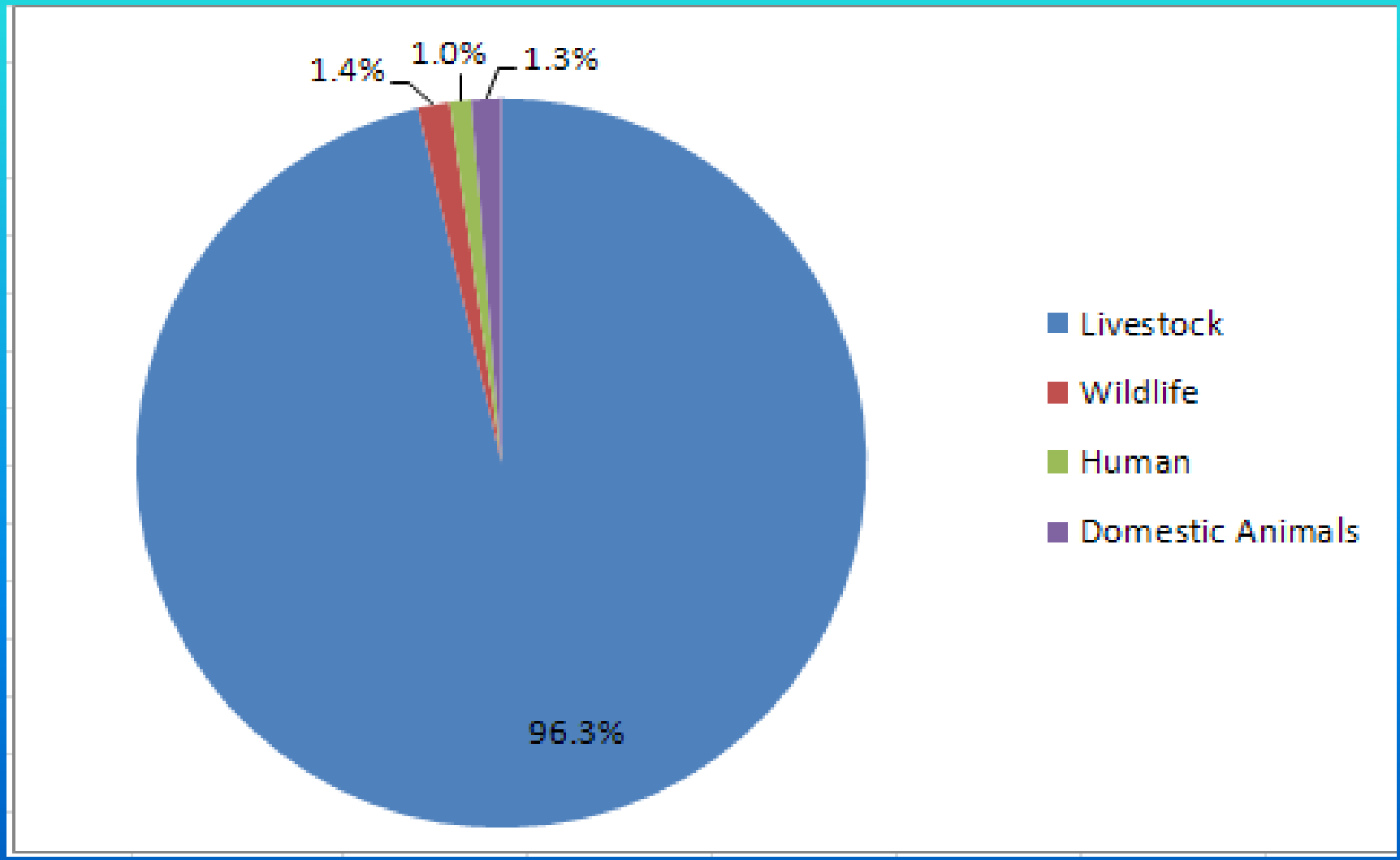
Example tables from Rush Creek-South Fork Subwatershed

Category	Source	Animal Units or Individuals in Subwatershed	E. coli Organisms Produced Per Unit Per Month (Billions of Org.)	Total E.coliProduced Per Month (Billions of Org.)	Total E. coli Produced Per Month by Category (Billions of Org.)	Total E. coli Available Per Month by Category (Billions of Org.)	Percent by Category
Livestock (Surface Applied Manure)	Horses (Animal Units)	288	8	2,304	1,135,224	1,135,224	95.7%
	Cattle (Animal Units)	596	1,900	1,132,400			
	Other (Elk, Sheep, Hogs)	52	10	520			
Wildlife	Deer	590	10	5,902	12,348	12,348	1.0%
	Waterfowl	424	0.2	85			
	Other Wildlife	636	10	6,362			
Human	Failing Septic Systems	200	40	8,000	8,000	8,000	0.7%
	NPDES Permit	1	0.2	0			
Domestic Animals	Improperly Managed Pet Waste	3,055	100	305,500	305,500	30,550	2.6%
					Total	1,186,122	100%

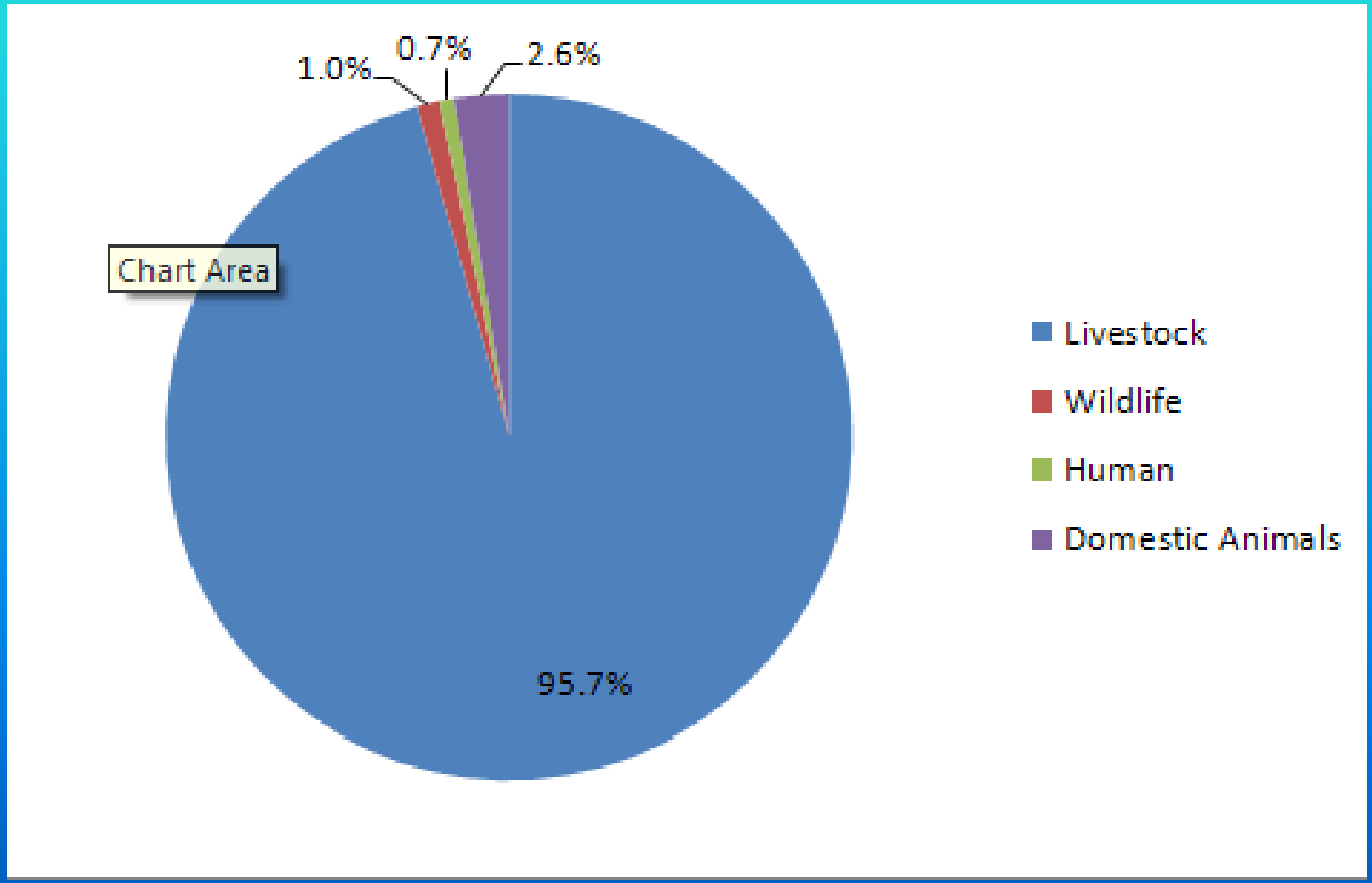
E. Coli Produced and Available (Diamond Creek)



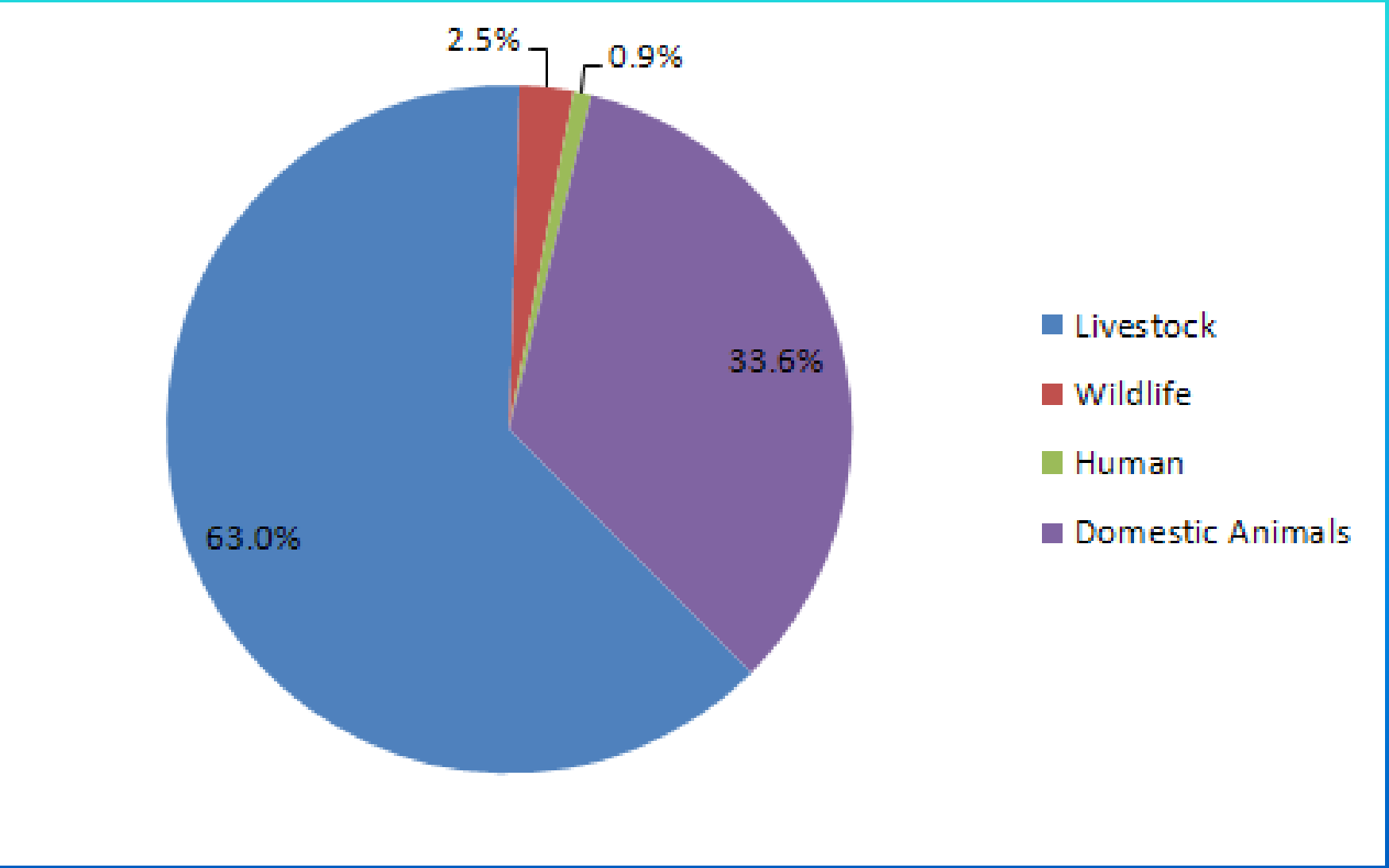
E. Coli Produced and Available (Rush Creek Mainstem)



E. Coli Produced and Available (Rush Creek – South Fork)



E. Coli Produced and Available (Elm Creek Mainstem above ECW)



Summary/Next Steps

- Draft report section with supporting appendix for Source Inventory
- Questions/comments on this information to Rich by 10/25/13
- Next TAC meeting was scheduled for November 13 to present watershed/lake information; propose re-scheduling for December (12/11) instead