

Hangman Creek TMDL Total Phosphorus TMDL

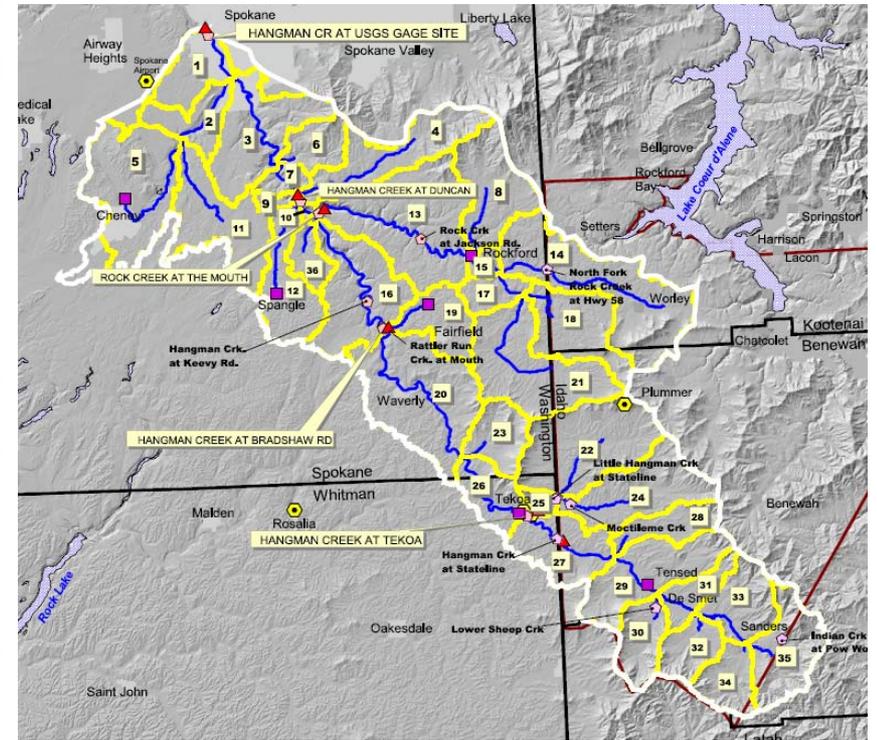
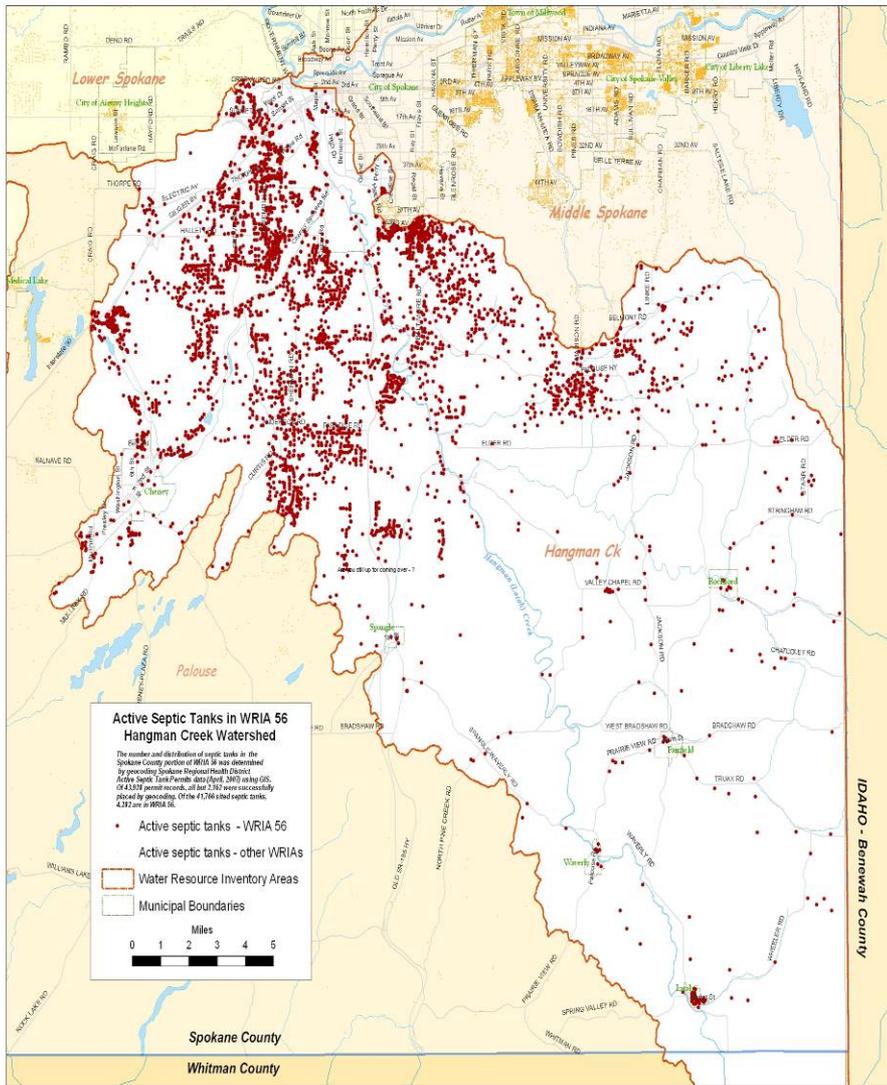
- Adjustments to the WARMF model since April meeting
- Annual Loading: Comparing Current to Reference Conditions
- April, May, June Seasonal Loading Evaluation
- Discussion

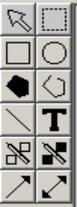


Adjustments to WARMF

- Adjusted current land use to reflect 10% direct seed agriculture
- Cropping Factor
 - Set to within suggested limits (0.1-0.9)
 - Seasonally varied for vegetation growth
- Snow melt and Sediment Particle Size
 - Trying to find why so little bank erosion across the border
 - No satisfactory alternative to original
- Septic Tank Density
 - Okay on Coeur d'Alene Reservation
 - Needs adjustment as indicated by Spokane County GIS database





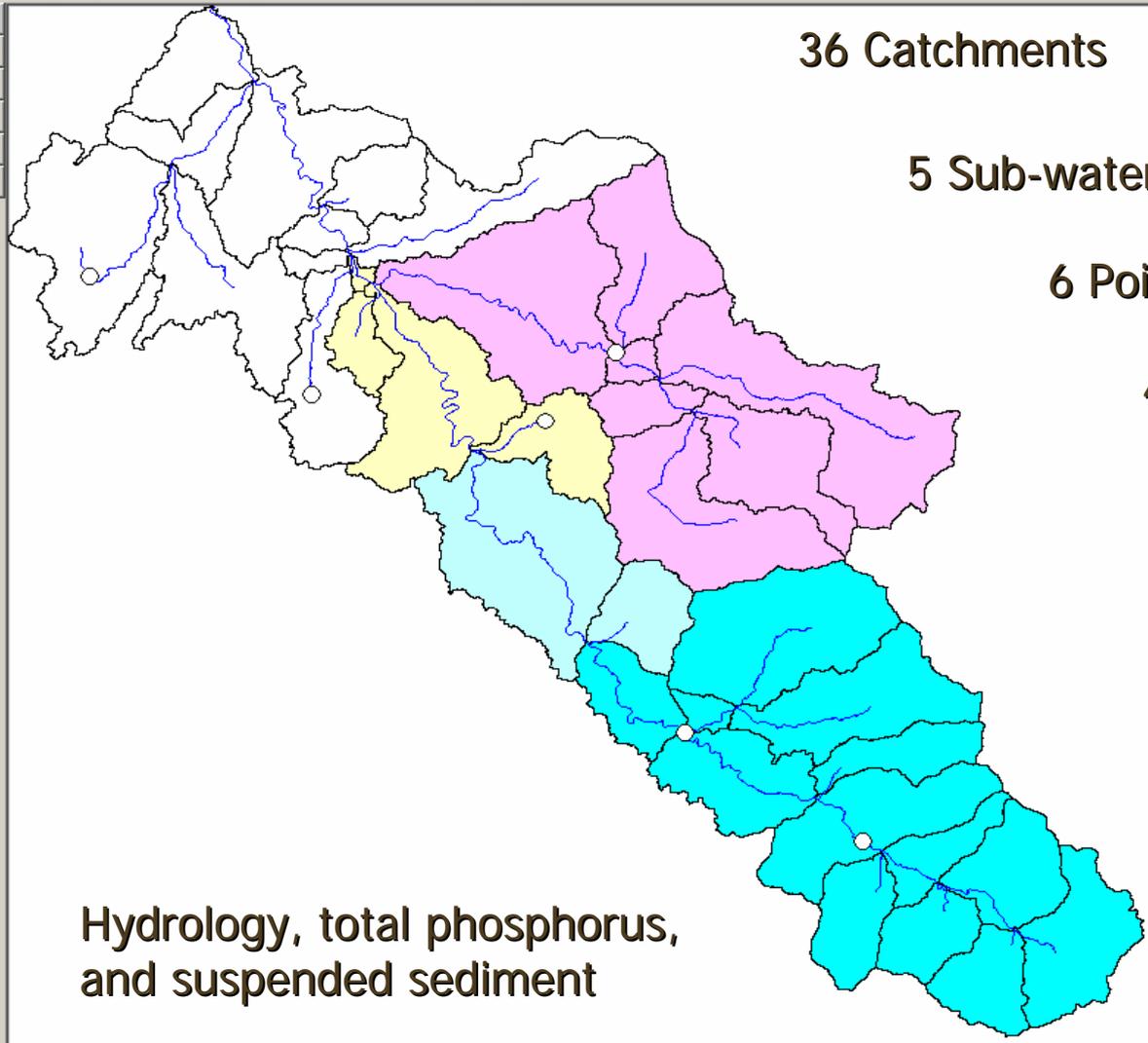


36 Catchments

5 Sub-watersheds

6 Point sources

4 Weather Stations



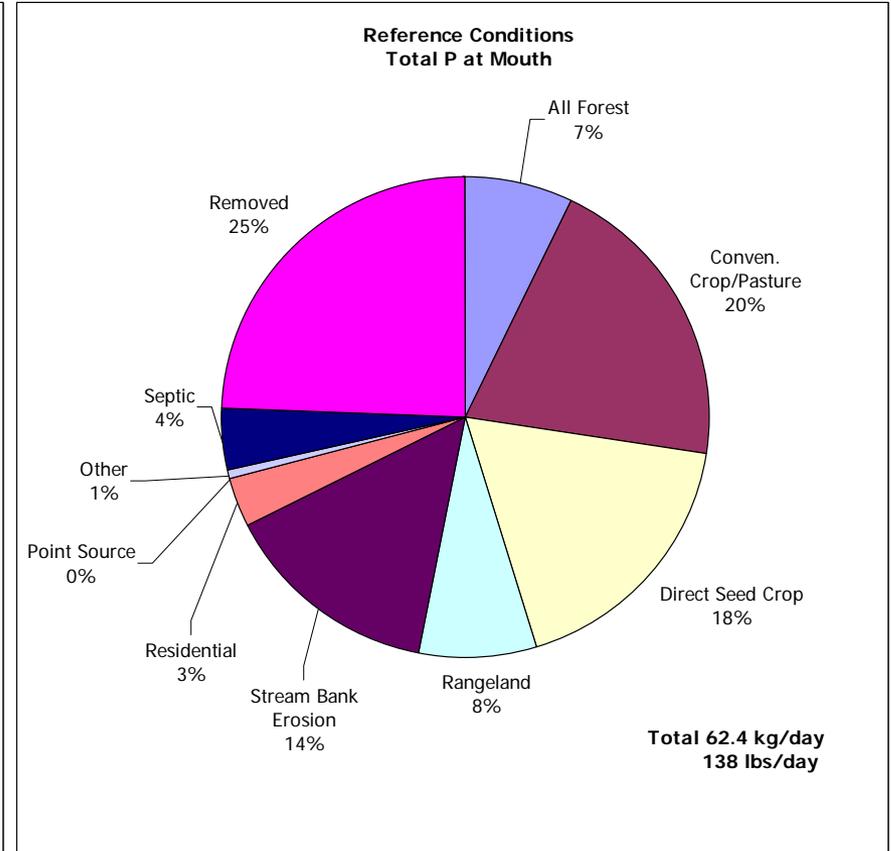
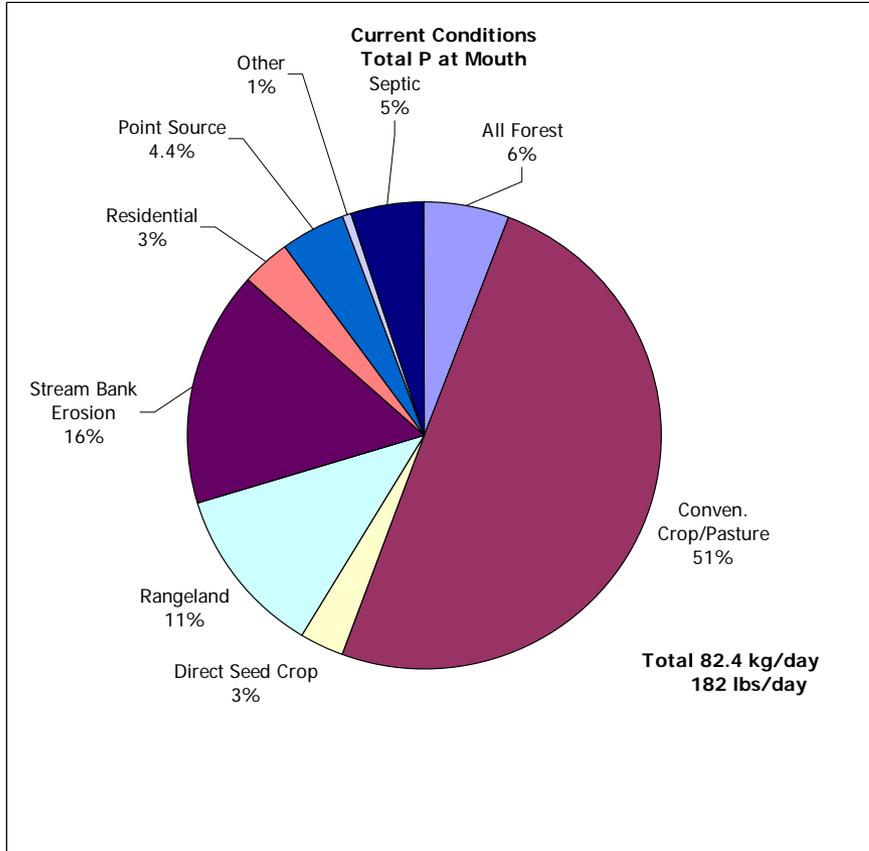
**Hydrology, total phosphorus,
and suspended sediment**

Requested Scenarios

- **Reference condition (best future)**
 - No point sources
 - 10' riparian buffers
 - Increased forest cover above Rockford and Tensed
 - Limited residential growth in lower watershed
 - 60% of agriculture in direct seed type



Base to Reference: Hangman at Mouth



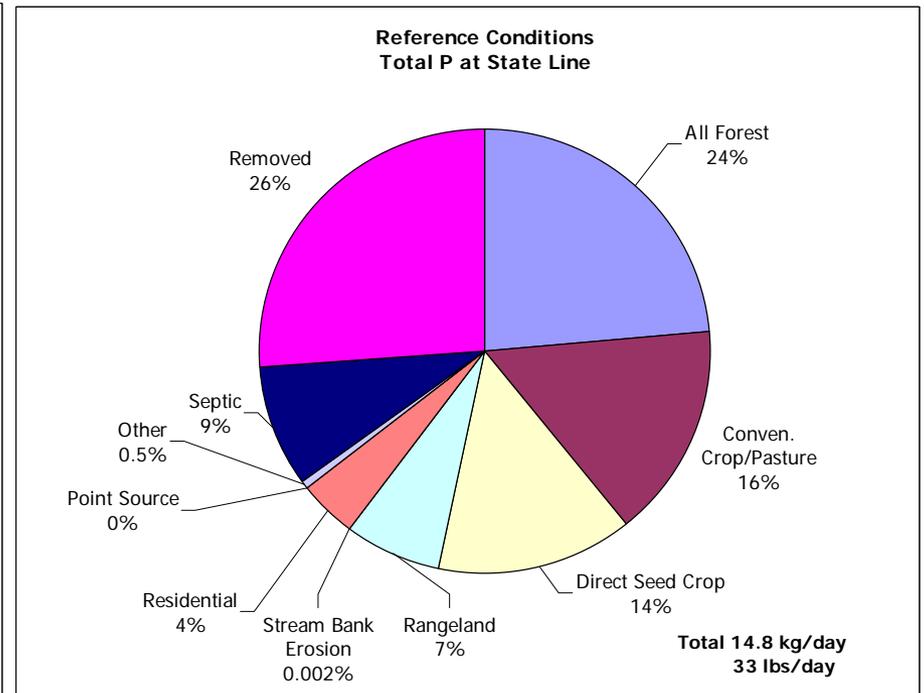
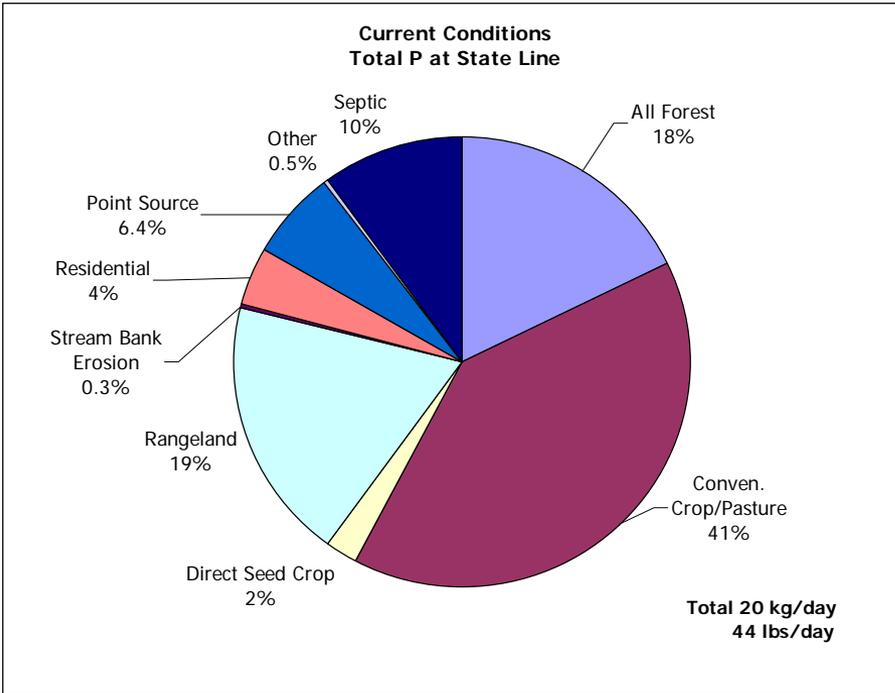
Hangman Creek at the Mouth

	Reference Condition		Current Condition	
	lbs/day	kg/day	lbs/day	kg/day
All Forest	13.1	6.0	10.6	4.8
Conven. Crop/Pasture	36.8	16.7	90.4	41
Direct Seed Crop	32.2	14.6	5.7	2.6
Rangeland	14.2	6.5	20.8	9.5
Stream Bank Erosion	26.2	11.9	30.0	13.6
Residential	6.0	2.7	5.9	2.67
Point Source	0.0	0.0	8.1	3.7
Other	1.0	0.4	1.0	0.5
Septic	7.9	3.6	9.3	4.2
Removed	-44.2	-20.1		
TOTAL	138	62	182	82

Hangman Creek at Mouth

Source Category	± Kg/day	% of Total
All Forest	-1.2	-6%
Conventional Crop/Pasture	24.3	121%
Direct Seed Crop	-12.0	-60%
Rangeland	3.0	15%
Stream Bank Erosion	1.7	8%
Residential	-0.03	0%
Point Source	3.6	18%
Other	0.01	0%
Septic	0.6	3%
Total	20.1	100%

Base to Reference: Hangman at State Line



Hangman Creek at the Idaho Border

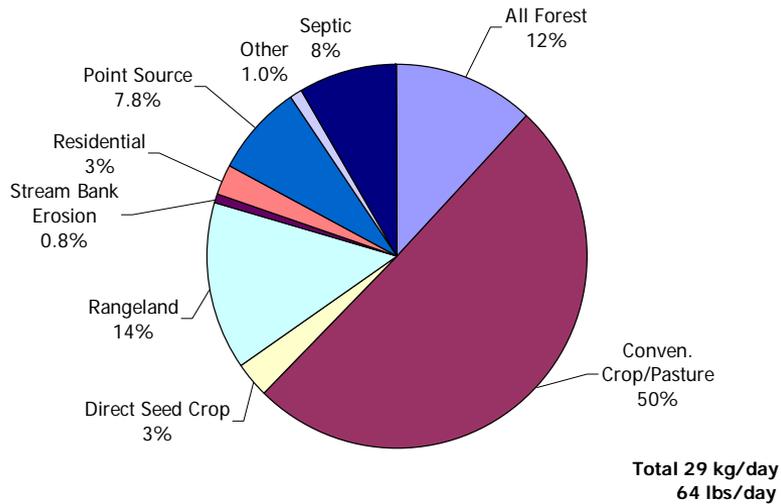
	Reference Condition		Current Condition	
	lbs/day	kg/day	lbs/day	kg/day
All Forest	10.5	4.7	7.8	3.5
Conven. Crop/Pasture	6.9	3.1	17.8	8.1
Direct Seed Crop	6.2	2.8	0.9	0.4
Rangeland	3.0	1.4	8.4	3.8
Stream Bank Erosion	0.0	0.0003	0.1	0.1
Residential	1.9	0.9	1.8	0.8
Point Source	0.0	0.0	2.8	1.3
Other	0.2	0.1	0.2	0.1
Septic	3.9	1.8	4.4	2.0
Removed	-11.6	-5.2		
TOTAL	33	15	44	20

Hangman Creek at State Line

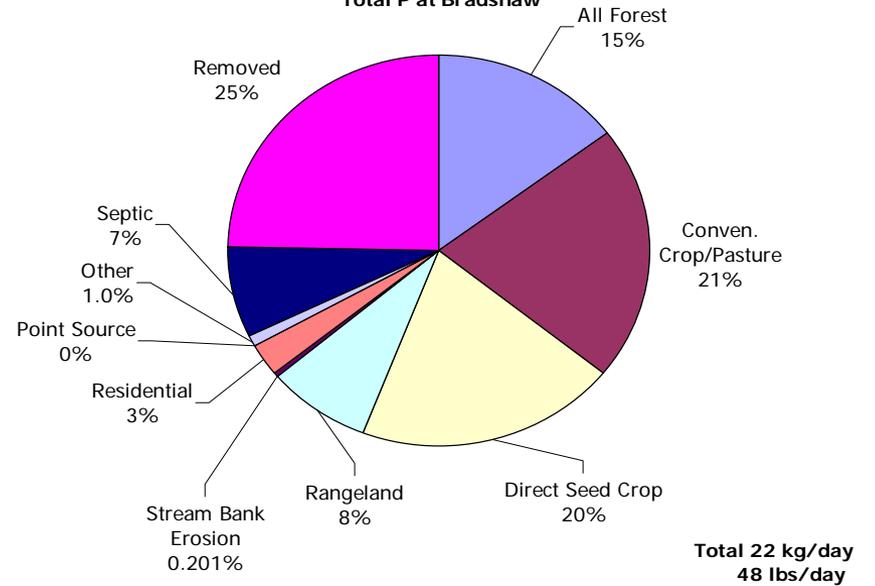
Source Category	± Kg/day	% of Total
All Forest	-1.2	-23%
Conventional Crop/Pasture	4.9	94%
Direct Seed Crop	-2.4	-46%
Rangeland	2.4	46%
Stream Bank Erosion	0.1	1%
Residential	-0.05	-1%
Point Source	1.3	24%
Other	0.003	0%
Septic	0.2	4%
Total	5.2	100%

Base to Reference: Hangman at Bradshaw

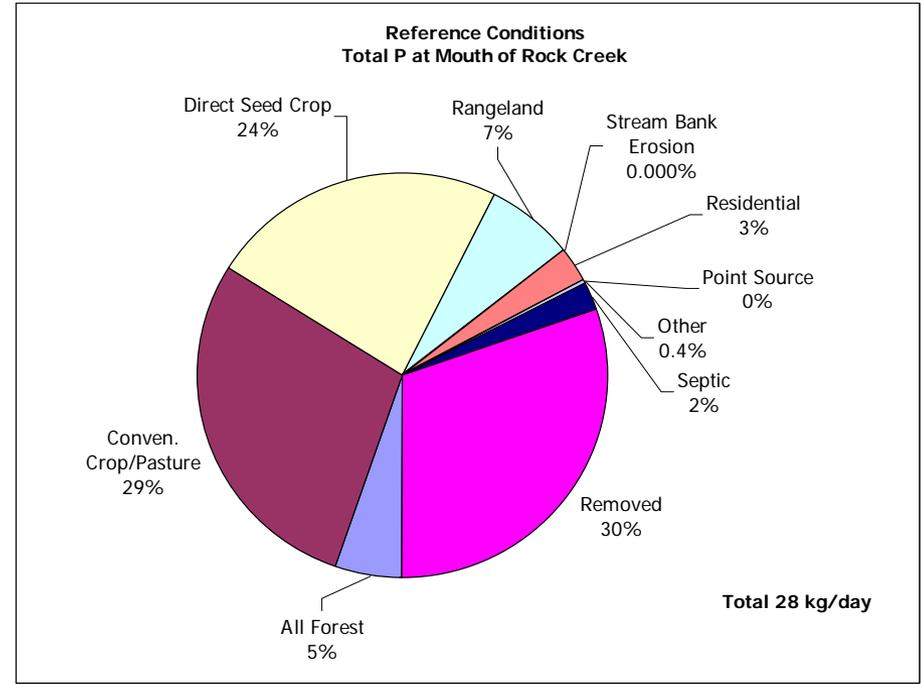
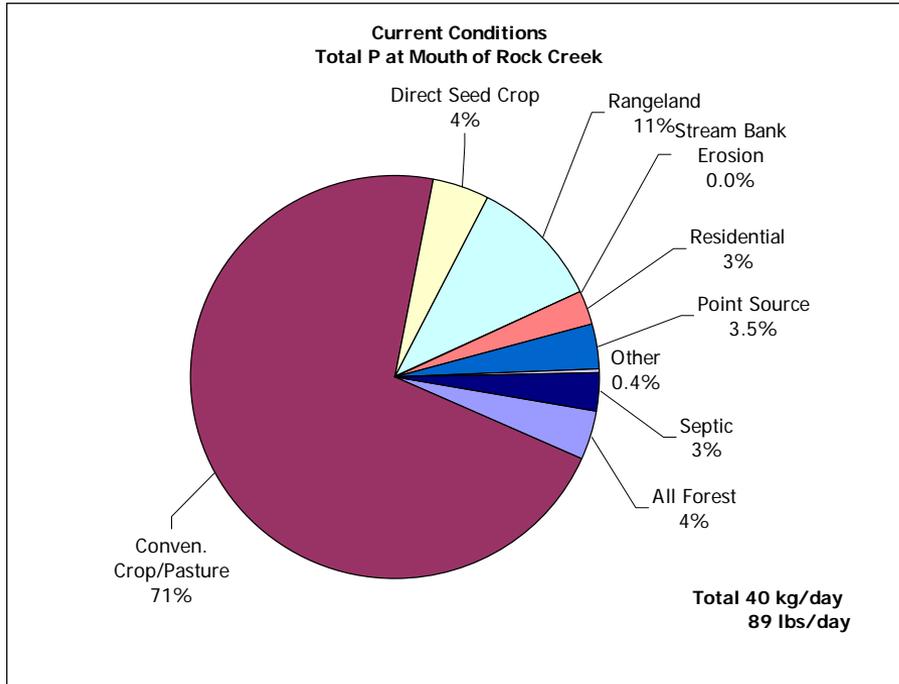
**Current Conditions
Total P at Bradshaw**



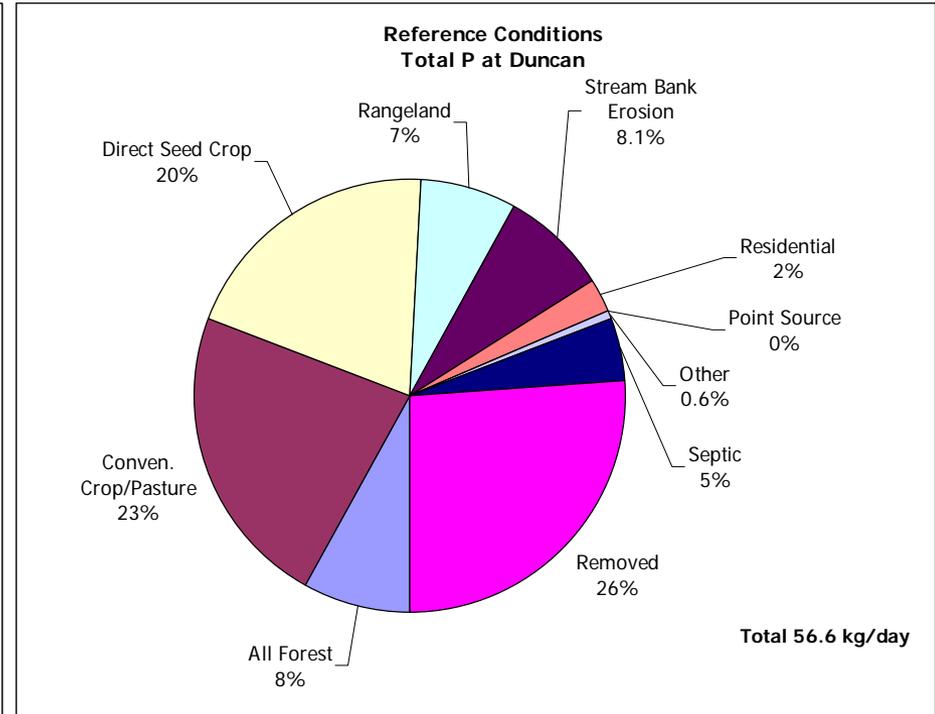
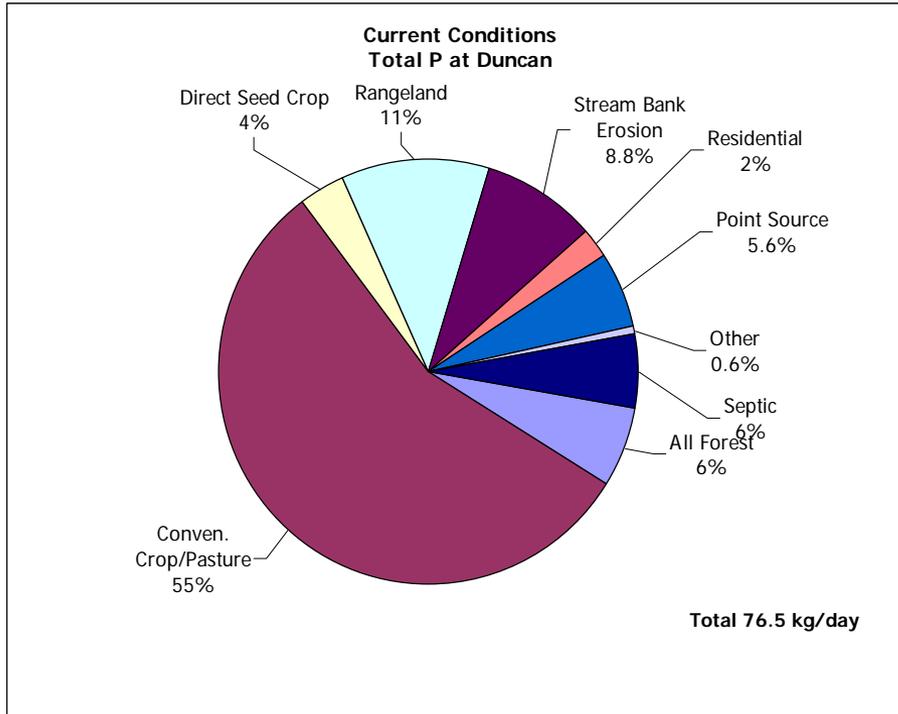
**Reference Conditions
Total P at Bradshaw**



Base to Reference: Rock Creek

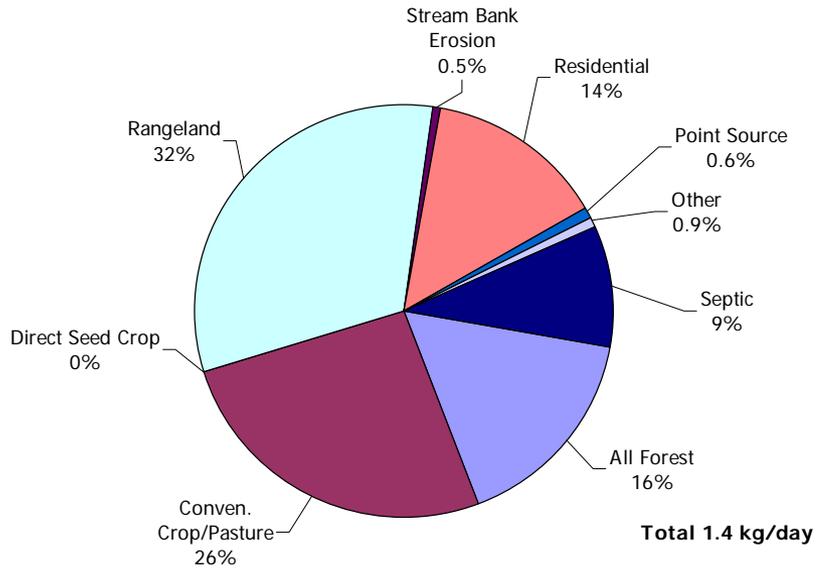


Base to Reference: Hangman at Duncan

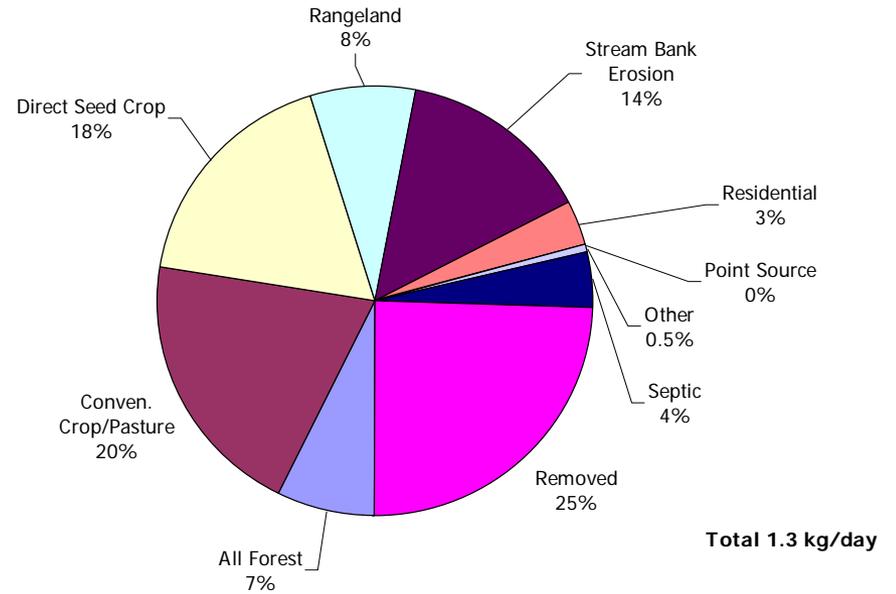


Base to Reference: Marshall Creek

Current Conditions
Total P at Mouth of Marshall Creek



Reference Conditions
Total P at Mouth of Marshall Creek



Seasonal Loading Evaluation

- Hypothesis: The April & May phosphorus loads under reference conditions at the mouth of Hangman Creek can be estimated:
 - Calculate the reductions by running WARMF for current & reference conditions
 - Apply the percent reductions shown in the WARMF runs to the monthly multiple regression loads.

Initial Estimate

TP Load at Mouth

Original LA Revised LA 2	April 16.9 39.2			May 10.9 26.2			Multi-reduce		Multi-reduce		
	Multi-reg	Current	Reference	Multi-reg	Current	Reference	Multi-reg	Current	Reference	Multi-reduce	
1999	138	243	196	19%	111		48	23	14	40%	29
2000	376	225	188	16%	314		85	30	18	40%	51
2001	97	82	76	7%	90		74	73	64	12%	65
2002	265	259	207	20%	211		42	33	18	45%	23
2003	90	161	129	20%	72		37	28	13	54%	17
2004	16	65	46	29%	12		184	39	24	39%	113
2005	40	37	21	43%	23		95	29	11	63%	35

^----- apply----- ^----- =

April and May Average

	Mer&Cus	Traeumer		Multi-reg		Current	Reference	Multi-reduce
	13.87	32.71						
1999		92	131.2	103.7	21%	73		
2000		228	125.9	101.3	20%	184		
2001		85	77.4	69.9	10%	77		
2002		152	144.3	111.2	23%	117		
2003		63	93.3	69.9	25%	47		
2004		102	51.8	34.7	33%	68		
2005		68	33.1	15.8	52%	32		

Most Recent WARMF Configuration

Original LA Revised LA 2	April 16.9 39.2				May 10.9 26.2			
	Multi-reg	Current	Reference	Multi- reduce	Multi-reg	Current	Reference	Multi- reduc
1999	138	672	544	19% 111	48	22	14	36% 30
2000	376	346	309	11% 336	85	28	18	37% 54
2001	97	165	140	15% 83	74	189	142	25% 55
2002	265	569	485	15% 225	42	35	30	15% 36
2003	90	255	254	0% 90	37	19	13	32% 26
2004	16	117	101	13% 14	184	61	45	26% 137
2005	40	36	27	26% 29	95	19	11	42% 55

^----- apply-----^----- =

April and May Average x

	Multi-reg	Current	Reference	Multi- reduce
Mer&Cus		13.87		
Traeumer		32.71		
1999	92	342	275	20% 74
2000	228	184	161	13% 199
2001	85	177	141	21% 68
2002	152	297	253	15% 129
2003	63	135	131	3% 61
2004	102	88	73	17% 84
2005	68	27	19	32% 46

Requested Scenarios

- Idaho meets proportional phosphorus load at border
- Cheney as existing condition vs. fully discharging to Minnie Creek
- Graduated land use conversions
- Graduated streambank improvements
- Graduated reforestation
- Graduated direct seed implementation

