The Klickitat Watershed Enhancement Project (KWEP) restores, enhances, and protects watershed function within the Klickitat River subbasin. KWEP and the Klickitat Monitoring and Evaluation Project (M&E) collaboratively engage in habitat enhancement effectiveness monitoring to assess project design, implementation, objectives, and guide future work. Current monitoring samples salmonid populations, shallow groundwater, instream habitat, riparian vegetation, and macroinvertebrates.

Mt. Adams

Upper Klickitat River – Phase 2 The Upper Klickitat River In-Channel and Floodplain Enhancement project constructed 35 LWD jams, excavated 4 mainstem pools, and constructed nearly 3,000' of side channel to increase habitat complexity.



* Habitat units are defined as channel spanning



Pool Riffle Side Channel Perennial

🗖 🗖 Intermittent - Major Roa

250 500 1,000 1 inch = 500 feet

Klickitat & Columbia River Confluence

Habitat Enhancement Effectiveness Monitoring Klickitat River Subbasin

David Lindley, Will Conley, Nicolas Romero Yakama Nation Fisheries Program

RRNW - Stream Restoration Design Symposium February 1-3, 2011





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	Tepee Ck/IXI	Tepee Ck Resto			
The Tepe	e Creek/IXL Meadows	Restoration Project imported gravels to			Tepee Creek Restoration – Phase
aise the l	bed elevation and reco	onstruct pool-riffle se	equences alor	ng 2,000' of	Tepee Ck/IXL Meadows Project ov
previously	y incised reach.	Food V			
	Post-t	 BACI design (before-after-cont 			
Flow Du	uration: perennial pools	 Within-year sampling (Spring, S 			
reatment	(only observed 1 of 4	• Five year study			
High Flo	ow Access: activation of	 1 year pre-treatment sampli 			
Tepee Cre	ek / IXL Meadows Restoration Project:]			1 year of treatment - no san
Pre- and Post-F	Restoration Groundwater Elevations			 3 years post-treatment sam 	
	AN GROUND SUBEACE / / / / ////	Pools: Increased 1' increased	a from 15 to 2		
94 - 2 0			mean residua	i poor deptri	
8 0	anstructio anstructio	• <u>Wetlands</u> :~3100) ft ² of emerge	ent wetland	
92 -	stream Co	created			
8		Highor \//ator Ta	blo: 2' 1'ri	so and loss	Perrestrial
90 -		variation between	and amongst	se anu iess · welle	
- ² 0 ²			and amongs		
1 1	Date				
O NE Well - PreProj ∇ NW Well - PrePro □ SW Well - PrePro	ject NE Well - PostProject oject NW Well - PostProject oject SW Well - PostProject				
	· · · · · · · · · · · · · · · · · · ·				Drift
Steelh	nead Spawning – Tepee	Ck IXL (Treated) and	Tepee Ck (Un	treated)	
	Tepee Ck IXL (Tr	ed)			
	Total Redds (red	ds/mi) Tota	Redds (redds/n	ni)	
200)7 2(5.0)		3 (0.4)		Benthic
200)8 0 (0)		2 (0.2)		
200	99 4 (10.0)		12 (1.5)		
201	L O 3 (7.5)		8 (1.0)		
	<i>O. Mykiss</i> - Tepee Ck IX	L (Treated) and Tepe	e CK (Untreate	d)	
	Те	2009 pee Ck IXL Tepee Creek*	Tepee Ck IXL	2010 Tepee Creek*	
Physical	Distance Sampled (ft) Total Area Sampled (ft²)	1,090 5,740 9,047 47,642	1,090 9,047	5,740 47,642	
	% of Total Area Sampled (ft ²)	16 84	16	84	Groundwater
Density	Total # Tagged % of Total # of Fish Tagged	154 396 28.0% 72.0%	175 40.4%	258 59.6%	
	Fish Abundance per 1000 ft ²	17.0 8.3	19.3	5.4	
Site Fidelity	Total Fish Recaptures % of Total # of Fish Recaptures	12 15 7.8 3.8	-	-	
	Fish Recaptures per 1000 ft ²	1.3 0.3	-	-	
Out-migrants	% of Total # of Fish Detected	3/ /4 24.0 18.7 4.1 1.5	-	-	
onsists of 7 pooled s	ites exclusive of the Tepee IXL treated reach	4.1 1.5	-	-	Surface Water
					Order in Tepee Creek Treatment and White Creek Control Sections
					100%
					90% Image: Constraint of the second
					Q 70% Image: Color box Âq 60% Image: Color box Q Color box Z Embodies
					2 Families 8 Families 40% 1 Family
					Š 30% 1 Family 5 Families 20% 2 Families 10 Families
	e <mark>l el entres de salationes de la contra de La contra de la contra de Contra de la contra de la </mark>	estable for the			Image: Construction of the second
					Stream

E		and the second second	A STREET STREET		and the second second	Distance and		
		Tepee Ck/I)	N.	Tepee Ck Resto				
The Tepee Creek/IXL Meadows Restoration Project imported gravels to raise the bed elevation and reconstruct pool-riffle sequences along 2,000' of previously incised reach.							1 mg	Tepee Creek Restoration – Phase Tepee Ck/IXL Meadows Project ov Food V
	Iow Dura atment (igh Flov Tepee Creek / and Post-Res	Access: activation Access: activation IXL Meadows Restoration Project: Access: activation IXL Meadows Restoration Project: Access: activation Access: activation IXL Meadows Restoration Project: Access: activation Access:	years following totaling 835 linear feet from 15 to 23 (53%) and hean residual pool depth ft^2 of emergent wetland <u>ole:</u> 2' – 4' rise and less and amongst wells			 BACI design (before-after-cont Within-year sampling (Spring, S Five year study 1 year pre-treatment sampli 1 year of treatment - no san 3 years post-treatment sam 		
	Steelhe	ad Spawning – Tepe Tepee Ck IXL (' Total Redds (re	e Ck IXL Freated)	L (Treated) and Tepee Ck (Untreated) Tepee Creek (Untreated)			The second second	Drift
	2007	2(5.0)	uus/iii)	TOLAT	3 (0.4)	,		
	2008	0 (0)			2 (0.2)		-	Benthic
	2009	4 (10.0)		12 (1.5)		1 E	
	2010	3 (7.5)	,		8 (1.0)		-	
	О.	Mykiss - Tepee Ck I	XL (Treat	ed) and Tepee	Ck (Untreate	ed)	1	
	Physical	Distance Sampled (ft) Total Area Sampled (ft²) % of Total Area Sampled (ft²)	Tepee Ck IXL 1,090 9,047 16	2009 Tepee Creek* 5,740 47,642 84	Tepee Ck IXL 1,090 9,047 16	2010 Tepee Creek* 5,740 47,642 84		Groupdwater
	Density	Total # Tagged % of Total # of Fish Tagged Fish Abundance per 1000 ft²	154 28.0% 17.0	396 72.0% 8.3	175 40.4% 19.3	258 59.6% 5.4	100	
Si	te Fidelity	Total Fish Recaptures % of Total # of Fish Recaptures Fish Recaptures per 1000 ft²	12 7.8 1.3	15 3.8 0.3	- - -	- - -	N. Chi	
OL Consists	i t-migrants s of 7 pooled sites	Total Fish Detections (WC Array) % of Total # of Fish Detected Fish Detections per 1000 ft ² exclusive of the Tepee IXL treated reach	37 24.0 4.1	74 18.7 1.5	- - -	- - -	11	Surface Water
							The second se	Fall 2009 Benthic Invertebrate Abundance Composition I Order in Tepee Creek Treatment and White Creek Contro Sections 100% 90% 90% 90% 90% 90% 90% 90% 90% 90%





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