PRIORITY AREAS

Now that we have examined water quality, in-stream and riparian habitat and macroinvertebrate communities more closely, we can more accurately prioritize potential problem areas within the French Creek watershed (Table 14). With increased stream or habitat degradation, some parameters (e.g. nitrogen, total-dissolved solids, suspended solids, etc.) increase. Other parameters such as dissolved oxygen concentration, decrease with increasing degradation. Table 14 is an adaptation of Tables 5 and 6 from our results. For parameters that as a rule increase with increased degradation, we noted sub-basins with significantly higher mean than the overall mean. For parameters that decrease with increased degradation, we noted sub-basins with significantly lower means than the overall mean. Therefore, check marks in Table 14 indicate that the mean values for that watershed were significantly "of poorer quality" than the mean for all the sampled sites.

From our analyses we are able to reveal four sub-basins that stand out as potential problem areas in the watershed; Le Boeuf, Conneauttee, West Branch French Creek, and Conneaut. Those four sub-basins should be considered as high priority areas for monitoring and restoration efforts.

Le Boeuf Creek

High levels of nitrogen and total dissolved solids during the spring rain event, suggest agricultural practices play a significant role in water quality in the Le Boeuf Creek sub-basin. Le Boeuf Creek has significantly higher than average percent agriculture and significantly lower than average percent forested land. Le Boeuf Creek watershed also has several golf courses within its boundaries, which may also be significant contributors of nutrients into the system. Nutrient levels in Lake Le Boeuf are high (Wellington, personal communication) and may be a contributing factor as well, especially in the spring after lake turnover. A comprehensive watershed assessment for Lake Le Boeuf would benefit restoration efforts in the Le Boeuf sub-basin. Habitat/riparian scores in the Le Boeuf Creek sub-basin were significantly lower than the watershed mean. Trout Run had particularly low scores, showing problems with all aspects of the assessed habitat.

The significance of Le Boeuf Creek as the highest priority area identified through this study is further underscored by the sub-basin's importance for the Endangered clubshell, *Pleurobema clava*. Investigations by WPC scientists have identified the clubshell as having a limited range in the French Creek watershed. From the mainstem of French Creek, it is only common upstream of the confluence with Muddy Creek and extends upstream to the confluence with Le Boeuf Creek. It is also known from Le Boeuf Creek, Muddy Creek, and Conneaut Outlet.

West Branch French Creek

Although West Branch French Creek had an average percentage of agricultural and forested land for the French Creek watershed, it still stood out as a potential problem area. Study sites on the West Branch of French Creek had particularly low in-stream habitat and riparian scores. The West Branch French Creek originates in New York, where pollution and sediment sources may exist, but were beyond the scope of this study. High levels of phosphorus and total dissolved solid concentrations during the spring, for example, may be attributed to agricultural inputs from New York.

Table 14: Potential problem areas within the major sub-basins of French Creek.

		Conneaut	Conneauttee	Cussewago	*French Creek*	Le Boeuf	Little Sugar	Muddy	South Branch	Sugar	West Branch	Woodcock
Land-use	% Agriculture		x			x	x					
	% Forest	x				x						
DEP Habitat/Riparian	Score1					x	x				x	
	Score2	x		x		x					x	
	Total Riparian		x	x		x	x				x	
Macroinvertebrate	% EPT		x			x	x				x	
	% Diptera			x		x	x					x
N, nitrate + nitrite (mg/L)	Spring		x		x		x	x	x			
	Base		x									
	Summer		x						x	x	x	
P, total (mg/L)	Spring						x				x	x
	Base		x									
	Summer	x	x			x	x		x			
N, kjeldahl (mg/L)	Spring											
	Base	x									x	
	Summer	x										
TDS (mg/L)	Spring	x	x		x	x			x		x	
	Base	x	x						x		x	
	Summer		x	x		x			x		x	
SS (mg/L)	Spring							x				x
	Base											
	Summer	x					x	x				x
BOD (mg/L)	Spring											
	Base								x			
	Summer											
N, organic (mg/L)	Spring							x		x		
	Base	x		x		x		x			x	
	Summer	x									x	
Temperature (° C)	Spring	x				x	x			x		
	Base				x				x		x	x
	Summer			x	x							x
Specific Cond. (mS/cm)	Spring		x			x						
	Base	x	x			x					x	
	Summer		x			x					x	
Conductivity (mS/cm)	Spring		x			x					x	
	Base	x	x		x	x			x		x	
	Summer		x			x					x	
Salinity (ppt)	Spring		x			x					x	
	Base	x	x			x					x	
	Summer		x								x	
DO (%)	Spring											
	Base	x		x								
	Summer	x				x						
Total Poor Quality Indicators		16	20	7	5	21	10	5	9	3	21	6

Conneauttee Creek

High nutrient levels and sediment loads, particularly during the spring rain, at sites in Conneauttee Creek suggest agricultural practices play a significant role in water quality in this sub-basin. During the spring rain, sites in the Conneauttee sub-basin had high concentrations of nitrogen and total dissolved solids. Salinity and conductivity were high as well. Conneauttee sub-basin has a significantly higher than average percent agriculture. Total habitat/riparian score in Conneauttee sub-basin was significantly lower than the watershed average. Because the Conneauttee sub-basin is extensively farmed, it has already been targeted by the French Creek Project for agricultural BMP implementation.

Conneaut Outlet

Conneaut sub-basin had significantly lower than average percent forested land. Habitat score 2 was significantly lower than the watershed mean in Conneaut, where thin riparian vegetative zones seen in Watson Creek and Rock Creek in the Conneaut sub-basin contribute to low scores. High nutrient levels in Conneaut Lake may contribute significantly to the Conneaut sub-basin nutrient totals. The Pennsylvania DEP has listed Conneaut Lake as impaired by excessive nutrients. The lake is scheduled for the development of Total Maximum Daily Load (TMDL) restrictions.

Healthy sub-basins

Sugar Creek stood out as the highest quality sub-basin. Sugar Creek was the only sub-basin with significantly lower than average percent agriculture and higher than average percent forested land. Sugar Creek also had higher than average habitat/riparian scores.

Other relatively healthy sub-basins were Muddy Creek, the main-stem of French Creek, and Woodcock Creek. Habitat/riparian scores were significantly higher than the mean in Muddy Creek and Woodcock sub-basins.