Summary of fisheries assistance project: Horselick Creek mussel project, Daniel Boone National Forest, Kentucky, 2003

United States Department of Agriculture Forest Service
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Background

In June 2003, Kevin Leftwich, Region 8 aquatic ecologist contacted the USFS Southern Research Station Center for Aquatic Technology Transfer (CATT) to request assistance with a mussel survey on Horselick Creek, Daniel Boone National Forest, Kentucky. Horselick Creek contains one of the highest diversities of mussels in the world and is home to two federally listed mussel species. Surveys performed by private organizations and government agencies over the past several years suggest that mussel populations in Horselick Creek are declining, however the wide variety of sample protocols used in past surveys makes it difficult to compare results between surveys or over time. The purpose of the present survey was to attempt to estimate the size of mussel populations in Horselick Creek using a statistically valid and repeatable mussel survey protocol under development by the Southern Research Station Oxford lab. The results of the survey can be compared with past surveys, will provide a baseline against which to compare future surveys, and will ultimately provide the basis for a mussel inventory protocol.

Methods

Horselick Creek was divided into four survey sections (Figure 1). Each section was assigned a two-person habitat survey crew and a multiple person mussel survey crew. The habitat survey crews proceeded up the stream ahead of the mussel crews and marked habitat units (every 5th non-pool, every 10th pool) for the mussel crews to survey. Non-pools included glides, riffles, and runs.

Habitat Survey

A modified version of the two-stage basin-wide visual estimation technique (BVET) (Hankin and Reeves 1988, Dolloff et al. 1993) was used to inventory stream habitat. During the first stage, one crew member identified each habitat unit by type, measured length, and estimated width, average and maximum depth, dominant and subdominant substrates, and percent fines for each habitat unit. Habitat unit types included pools, glides, riffles, and runs (Table 1). The length (0.1 m) of each habitat unit was measured with a hip chain and wetted width was visually estimated. Average depth of each habitat unit was estimated by taking depth measurements at various places across the channel profile with a graduated staff marked in 5 cm increments. Dominant substrate was the substrate size class that covered the greatest amount of surface area in the habitat unit, subdominant substrate covered the 2nd greatest amount. Substrates were assigned to 1 of 9 size classes based on intermediate axis length (Table 2). Percent fines was the total percent of the substrate consisting of sand, silt, or clay.The second crew member recorded data on a Husky fex21 data logger.

The first unit of each habitat type selected for intensive (second stage) sampling (i.e. accurate measurement of surface area) was determined randomly. Additional units were selected systematically (every 5th non-pool and every 10th pool). The width of each systematically selected habitat unit was measured with a 30-m measuring tape at intervals ranging from about 1 m to 15 m. Interval size was

determined by the length and the morphology of the unit (i.e. interval of measured width increased with increasing unit length). In addition, the survey crew hung flags at the upstream and downstream ends of each second stage habitat unit to mark the location of units to be surveyed by the mussel crew. Surveys were terminated at pre-determined locations corresponding to the start of the next survey section or private property boundaries.

Mussel Survey

At designated (flagged) habitat units the mussel crew established survey transects. The number of transects to be sampled was based on the length of the unit as follows: For all units 30 m or less in length, 2 transects were sampled. For units longer than 30 m, one additional transect was added for each additional 20 m of stream length (Table 3). The location of each transect within a habitat unit was determined by drawing a random number between 0 and the length of the unit in meters. The random number specified the distance from the downstream end of the unit to the location of the transect.

Transects were sampled by placing a 0.25 m^2 quadrat next to the shore at the flag, searching the quadrat thoroughly, then flipping the quadrat end-over-end, perpendicular to the thalweg. Every 2nd quadrat (two flips) was searched in non-pools, whereas every 4th quadrat (four flips) was searched in pools. This was continued until the opposite shore was reached. The total number of quadrats searched and the total number of mussels captured per species was recorded separately for each transect. Quadrats that ended up on dry land (gravel bars, etc.) were not searched but were included in the count of total quadrats searched.

Quadrats were first searched by careful visual inspection of the substrate. Next flat rocks, sticks, etc. were removed and leaves and surface sediments were swept away by fanning with hands, and the quadrat was inspected again. The substrate was then disturbed with hands to a depth of about 5 cm, and when the water cleared the transect was inspected again. A combination of mask and snorkel and plexiglas-bottomed view buckets were used to search quadrats.

Results

Habitat Survey

Habitat surveys were completed on four sections of stream totaling nearly 15 km (Table 4).

Mussel Survey

Mussel surveys were completed on four sections of stream totaling 32 non-pools and 5 pools (Table 4).

Discussion

The ultimate success of surveys will be determined by the quality of results obtained from data analysis performed by Wendell Haag and Mel Warren at the Oxford, MS lab. At the very least this project demonstrated a willingness to cooperate between private landowners, state and federal agencies, and non-governmental organization in the protection of imperiled mussel populations.

Literature Cited

Dolloff, C. A., D. G. Hankin, and G. H. Reeves. 1993. Basinwide estimation of habitat and fish populations in streams. U.S. Forest Service General Technical Report SE-83.

Hankin, D. G., and G. H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences 45:834-844.

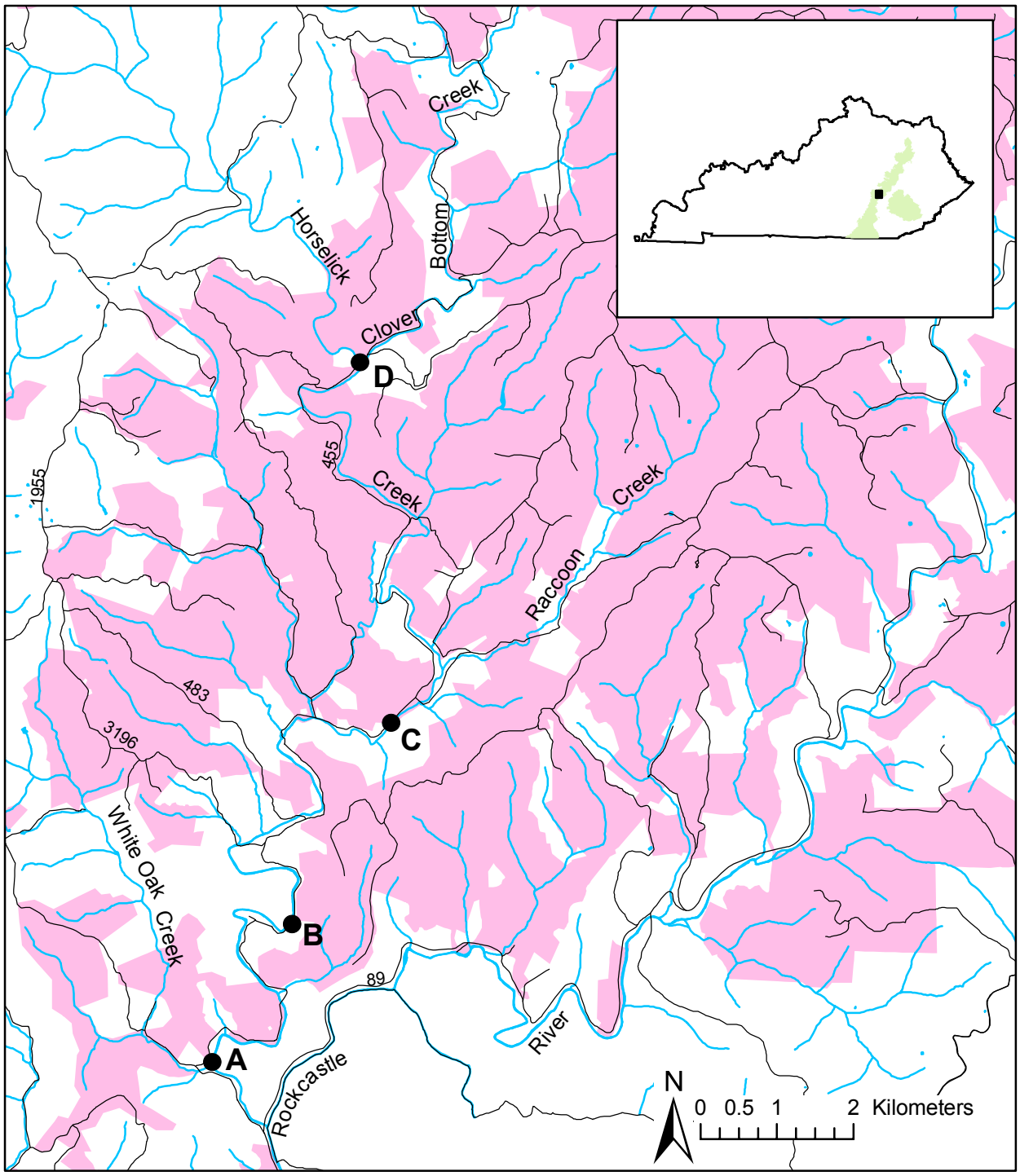

Figure 1. Location of BVET habitat survey starting points on Horselick Creek, July-August 2003. Shaded area indicates Daniel Boone National Forest managed lands.

Table 1. Habitat unit types used during habitat surveys on Horselick Creek, July-August 2003. Riffles, runs, and glides were 'non-pool' habitat unit types.

Habitat Type	Stream Bed Profile	Gradient (%)	Surface Turbulence	Water Velocity
Riffle	convex	>1	moderate to high	high
Run	flat	>1	low to none	high
Glide	flat	<1	none	low
Pool	concave	<1	none	low

Table 2. Substrate size classes used during habitat surveys on Horselick Creek, July-August 2003.

Size Class	Name	Size (mm)	Description
1	Organic	--	Dead organic matter, leaves, detritus, etc.
2	Clay	< 0.00024	Sticky
3	Silt	0.00024-0.0039	Slippery
4	Sand	0.0039-2	Gritty
5	Small Gravel	3-16	Sand to thumbnail
6	Large Gravel	17-64	Thumbnail to fist
7	Cobble	65-256	Fist to head
8	Boulder	>256	Larger than head
9	Bedrock	--	Solid parent material

Table 3. Number of transects per habitat unit used during mussel surveys on Horselick Creek, July-August 2003.

Length of habitat unit (m)	Number of transects
0-30	2
31-50	3
51-70	4
71-90	5

Table 4. Results of habitat surveys on Horselick Creek, July-August 2003.

Section	Date*	Start	End	Length (m)	Non-pools		Pools	
					total	dive	total	dive
A	7/28-7/31	Confluence with White Oak Creek	Start of section B	4670	43	8	9	0
B	7/28-7/30	End of section A	Downstream end of private property boundary	3893	64	9	26	2
C	7/28-7/31	Upstream end of private property boundary	Stream underground	5026	55	9	33	3
D	8/1	Confluence with Clover Bottom Creek	Ended due to time constraints	1369	30	6	0	0

*surveys were delayed 1 day in sections B and C, and 2 days in section A due to high water