Church
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Don Gowan
The Nature Conservancy
164 Valley Street, NE
Abingdon, Virginia 24210

Dear Don:

Please find enclosed the Cleveland Islands Report I promised you a few weeks ago. I hope you will excuse me for taking this long, but I've been absolutely swamped. I hope the report provides you with some useful information.

I have been spending as much time as possible developing the proposal which I have briefly discussed with you . I have received some preliminary input from Dr. Neves and plan to have the draft proposal ready for his review by the first of the week. I am incorporating a brief pilot study using some of my preliminary data to illustrate the conceptual basis of the proposal, as well as substantiate some of the trends I am observing. Some very interesting patterns are already apparent from analysis of these site data. I will send you a copy of the draft proposal as soon as I incorporate Dr. Neves' comments.

I would appreciate the opportunity to meet with you and Chuck Williams to discuss the implications of the proposed research, once you have had a chance to look over the draft. Dr. Neves feels that Virginia Tech may be able to provide all but 14 percent of University overhead as matching grant funds. Additionally, Sue Bruenderman has indicated that Virginia Game and Fish Commission may be able to provide some level of funding. I plan to do everything possible to make this a viable project of at least one year. I would appreciate any suggestions you may have which might increase the chances of funding by The Nature Conservancy, as well as other sources of funding. As I indicated to you earlier, I am committed to this idea and feel the database I have amassed is a valuable resource which can be used to elucidate the relative health of mussel populations, and consequently identify stressed reaches of the Clinch. I believe this information can augment and provide focus for current and future biomonitoring efforts in the Clinch River.

I appreciate the input and information which you and Bill have provided me over the past two years. I feel you are addressing an enormously complex suite of problems in a very effective manner. Please don't hesitate to contact me if I can provide assistance in any way.

Sincerely,

Gregory W. Church

AN ASSESSMENT OF THE MUSSEL FAUNA AT CLEVELAND ISLANDS, RUSSELL COUNTY, VIRGINIA

Gregory W. Church, February, 1992

Location and Physical Features of Site

The site is located 0.6 river miles (1.0 km) downstream of the Route 82 bridge at Cleveland, Virginia at Clinch River Mile (CRM) 271. This shallow reach of the river, which is approximately 400 meters in length, consists of a braided channel in which three forested islands split the river into four distinct channels (see attached map). Each channel is characterized by perennial streamflow (even during the record drought years of 1987-1988) with minimal streambed exposure during low discharge periods. Channel locations and streambanks appear relatively stable, as evidenced by the many large, old-aged trees which occur on the streambanks bordering the channels. Gradient is low to moderate throughout this reach, with very few depositional pool areas and only two short high-gradient turbulent areas. Virtually all the streambed area is composed of gravel-cobble substratum of a particle-size range which is habitable by most mussel species. The shaded areas on the attached map represent optimal riverine mussel habitat. These are the areas in which I observed greatest mussel density, species diversity, and most individuals of rare and endangered species. Unshaded areas are not necessarily poor habitat, but represent areas in which mussel density and diversity appeared somewhat lower than in the shaded areas. I would estimate that approximately 90 percent of the streambed area at the Cleveland site is potentially habitable by mussels at some level of density.

Research Conducted at Site

My research activities at this site fall into three areas:

1.) Development of a non-disruptive method to monitor mussel fauna (1988): This method employed visual sampling (without excavation) 100 m^2 contiguous grid blocks, which were then subsampled with 0.25 m^2 excavated quadrats to determine actual in-situ mussel densities. Grid block locations were located via triangulation from two relatively permanent streambank objects (tree trunks) to facilitate comparative future surveys of the same area of streambed. These studies were conducted in the upstream portion of channel A (see map). These data are not included in the attached table, but are available on request.

2.) Habitat Characterization Studies (1990-91): Mussel sampling was conducted throughout the braided reach in order to correlate mussel density, species composition and size-class structure with measurable physical attributes of riverine habitat. At each channel cross-section selected for study, three 1 m^2 quadrats were excavated to a depth of approximately 15 cm (15 minute sampling effort). All mussels found were identified to species, measured, and returned to the substratum. The numerical values indicated on the map represent the number of live mussels recovered from each 1 m^2 sample. The total number of individuals of each mussel species recorded during this sampling effort are included in the "Live Data" column of the attached table. Some additional non-quantitative sampling (74 individuals) was conducted in Channels A and D. These live data have been combined with the quantitative live data in the table.

3.) Collection of Mussel Shell Middens (1990-91): During pursuit of my dissertation objectives, shell middens from muskrat foraging activity were collected whenever they were encountered. Locations of the greatest aggregations of these shells are indicated with circles on the attached map. The total number of fresh-dead individuals (shells) of each species are reported in the "Midden Data" column of the attached table. Relic (weathered) shells are indicated by superscript "R".

Mussel Fauna Data

Twenty-one mussel species were identified from the live and midden data combined (eighteen species from each). These include the Federal Endangered Species, *Fusconaia cor* (12 individuals), *Fusconaia cuneolus* (20 individuals), and *Lemiox rimosus* (2 relic shell valves). *Actinonaias pectorosa* was the most abundant species in middens and live data. Mussel densities in the 36 1 m^2 quadrat samples ranged from zero mussels per m^2 (4 samples) to 25 mussels per m^2. The mean density for all quadrat samples combined was 6.9 mussels per m^2 This mean density value is greater than the mean densities recorded at either Pendleton Island (3.6 mussels per m^2) or Slant (2.7 mussels per m^2) using the same sampling methodology during the same years.

Summary

The Cleveland Islands site is a comparatively large, contiguous area of good mussel habitat. Twenty-one mussel species were identified from the site, which represents very high diversity for a single site this far upstream. For comparison, only 23 species were identified during my 1990 survey of 27 sites on the Little River and Clinch River upstream of Nash Ford (CRM 279.7). Three Federal Endangered Species were detected at this site (Cleveland), two of which, *Fusconaia cor* and *Fusconaia cuneolus* appear to be recruiting relatively well. Most of the more common species occurring at the site appear to be recruiting well, as evidenced by a fairly even distribution of individuals across size/age-classes. This was observed for individuals comprising well-represented species in live and midden data sets. The Cleveland site, if not the most diverse mussel site, is certainly one of the frontrunners among all Clinch River sites upstream of Carbo (CRM 268). Additionally, the mussel species assemblage at the site currently exhibits greater biotic integrity, in terms of demographic attributes (i.e. density, age-class structure), than the more diverse sites I have studied downstream.

CLEVELAND ISLANDS SITE

(Clinch River Mile 270.7 - 270.9)

1990-1991

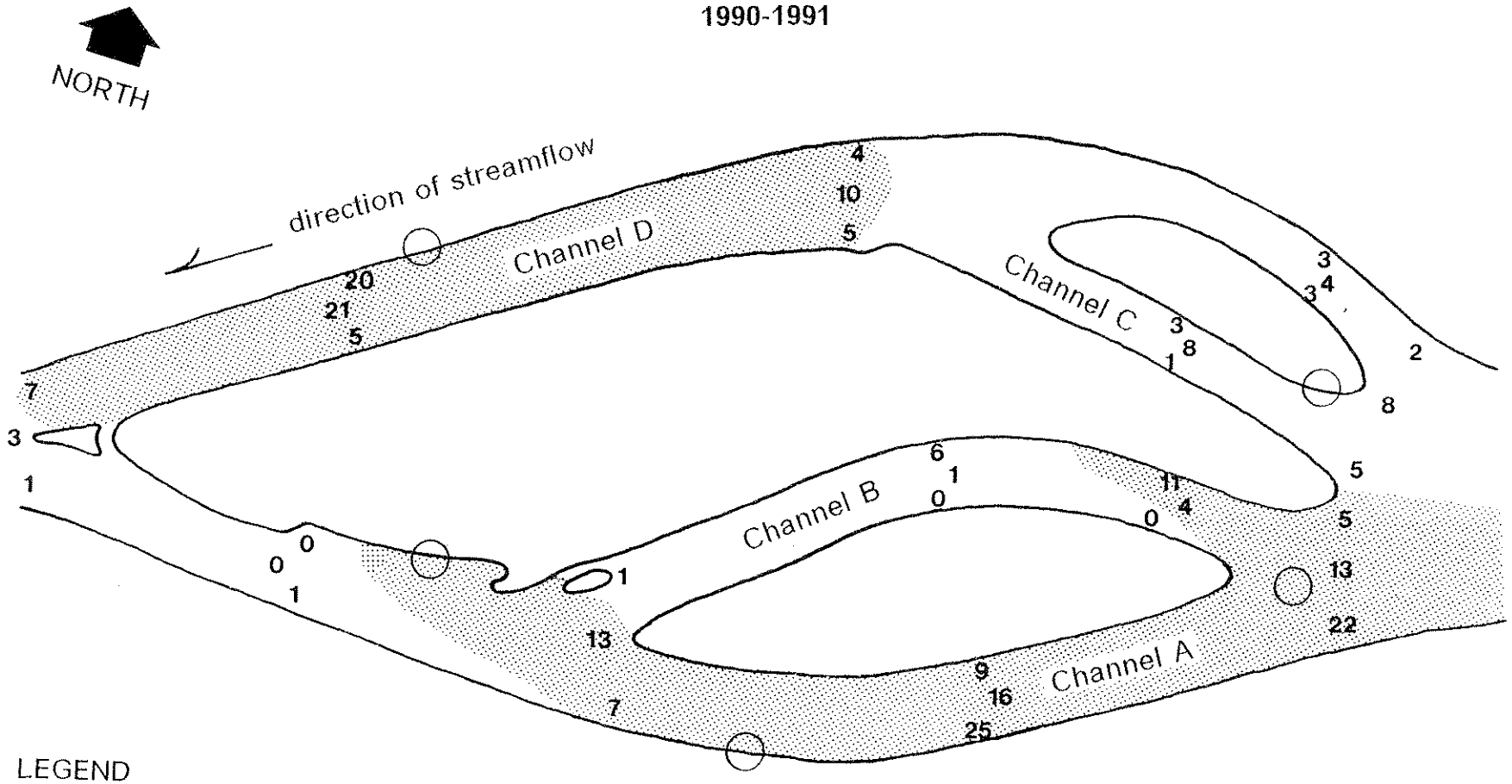

TABLE 1. CLEVELAND ISLANDS MUSSEL DATA

SPECIES	LIVE DATA	MIDDEN DATA
Actinonaias ligamentina	13	1
Actinonaias pectorosa	107	76
Alasmidonta marginata	2	5
Cyclonaias tuberculata	1	-
Elliptio dilatata	50	57
Fusconaia barnesiana	24	44
Fusconaia cor	7	5
Fusconaia cuneolus	14	6
Lampsilis fasciola	19	56
Lampsilis ovata	10	2
Lasmigona costata	19	17
Lemiox rimosus	0	2^{R}
Medionidus conradicus	20	65
Pleurobema oviforme	3	7
Potamilus alatus	1	2
Ptychobranchus fasciolaris	10	15
Ptychobranchus subtentum	7	17
Quadrula cylindrica strigillata	6	-
Villosa iris	8	22
Villosa vanuxemi	-	3
Villosa perpurpurea	-	1
Total Number of Mussels	321	403
Number of Mussel Species	(18)	(18)

Superscript ^{R} indicates relic shell material