RICHARD J. NEVES
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1984

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES
1825-B VIRGINIA STREET
ANNAPOLIS, MARYLAND 21401

March 9, 1984

Colonel John W. Devens
District Engineer
Huntington District, Corps of Engineers
502 Eighth Street
Huntington, West Virginia 25701

Dear Colonel Devens:

This is a planning aid report of the U.S. Fish and Wildlife Service regarding a mussel survey on the New River, Indian Creek, and Bluestone River above Bluestone Dam to (1) provide a qualitative survey of the freshwater mussel populations, (2) expand, correct, or confirm the results of a previous survey conducted in the area (Stauffer et al. 1980), and (3) provide a general impact assessment on these mussel populations resulting from a pool raise in Bluestone reservoir to 1,450 feet mean sea level, an approximately 40-foot permanent pool raise. This report is submitted in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

ACKNOWLEDGEMENTS

The Service wishes to thank the following personnel for their enthusiasm and expertise in participation in data collection:

Mike Zeto - West Virginia Division of Water Resources
Jack Moomaw - West Virginia Division of Water Resources
James Richmond - Corps of Engineers, Permits Section
John Wright - Corps of Engineers, Environmental Planning Section
Thomas O'Neil - Corps of Engineers, Environmental Planning Section
Barry Passmore - Corps of Engineers, Environmental Planning Section

LITERATURE REVIEW

Only one investigation regarding mussels is known from the study area. Stauffer et al. (1980) reports five species of freshwater mussels from the mainstem of the New River. This report was prepared under contract to the Division of Ecological Services, U.S. Fish and Wildlife Service, Elkins, West Virginia, to attain baseline information for the proposed hydropower project, Location "G", of the Kanawha River Authorization Study, Corps of Engineers, Huntington District. With the exception of the four pumped storage alternatives that were being studied at that time, the project alternative regarding modification of Bluestone Dam is the present main hydropower alternative. The present mussel study was conducted to confirm

or correct the low species diversity found in the 1980 survey and to include the Bluestone River. No other surveys in our specific study area are known to have been conducted (David Stansbery, Ohio State University; Dick Neves, U.S. Fish and Wildlife Service, Virginia Polytechnical Institute, personal communications). John Schmidt and Mike Zeto, West Virginia Department of Natural Resources, Division of Water Resources (unpublished) conducted a survey on Indian Creek above the project area and reported seven species including Corbicula.

METHODS

Approximately 8.4 miles of New River from just above the Wylie Islands complex to the mouth of Indian Creek were floated by canoe. The reach was broken down into three sections: Head of Wylie Islands to Shanklin's Ferry (Station 1); Shanklin's Ferry to just above Indian Creek (Station 2), and Justica islets just above Indian Creek to the mouth of Indian Creek (Station 3).

A thorough search of the area at each station was made by handpicking, water scoping, and snorkeling. During the time of survey the water was extremely clear and low, and enabled unusual visibility and we feel a thorough job was accomplished. Not all of the chutes through the Wylie Island complex were searched.

Two stations, each 0.6 of a mile long, were surveyed from slackwater to the mouth of the Little Bluestone River. Although an additional 2.1 miles would be impacted by raising Bluestone Reservoir 40 feet, it was felt that the two stations surveyed were sufficient to qualify the mussel fauna of this area of the lower Bluestone River. Each 0.6 mile was slowly walked upstream using water scopes (Photo 1). The river was low and clear and we had exceptional visibility. The same methodology was used on Indian Creek.

All dead shells on the Bluestone River and Indian Creek were collected and counted periodically as was necessary. All living specimens were identified, tallied, and placed directly back in the depression in the substrate from which they were removed. One specimen representing each species was sacrificed from each stream. Many good dead shells were also kept. Identification of the representative collections was confirmed by Dr. David H. Stansbery and placed in the Ohio State University Museum of Zoology.

RESULTS

A total of eight species of freshwater mussels were collected (Table 1, Photo Plates 1-8). Stauffer et al. (1980) surveyed the mainstem New River above and below Bluestone Dam. Their collections did not include the Bluestone River and Indian Creek. Their efforts revealed the presence of six species, including the abundant Corbicula. Although our results were very similar for the mainstem we collected good numbers of Lampsilis fasciola, not reported by their effort, and failed to discover any evidence of Actinonaias ligamentina carinata above the dam in the mainstem. Their survey showed, however, that A. l. carinata was very abundant below the dam and dominant in the Sandstone Falls area. One species, Lasmigona subviridis, had been historically reported in this area of the New River (Stauffer et al. 1980). This species was not encountered in their or our

Table 1. Mussels collected in the New and Bluestone Rivers in study area.

SPECIES	BLUESTONE RIVER 1/	NEW RIVER 2/	INDIAN CREEK 3/
Alasmidonta marginata	X		
Tritogonia verrucosa	X	X	X
Cyclonaias tuberculata	X	X (D)	X
Elliptio dilatata	X	X	X (D)
Actinonaias ligamentina carinata	X		
Villosa iris iris	X		
Lampsilis ventricosa	X (D)	X	
Lampsilis fasciola	X	X	X
Corbicula	X	X	
TOTAL NO. SPECIES (MINUS CORBICULA)	8	5	4
8 SPECIES COLLECTED IN THE STUDY AREA			

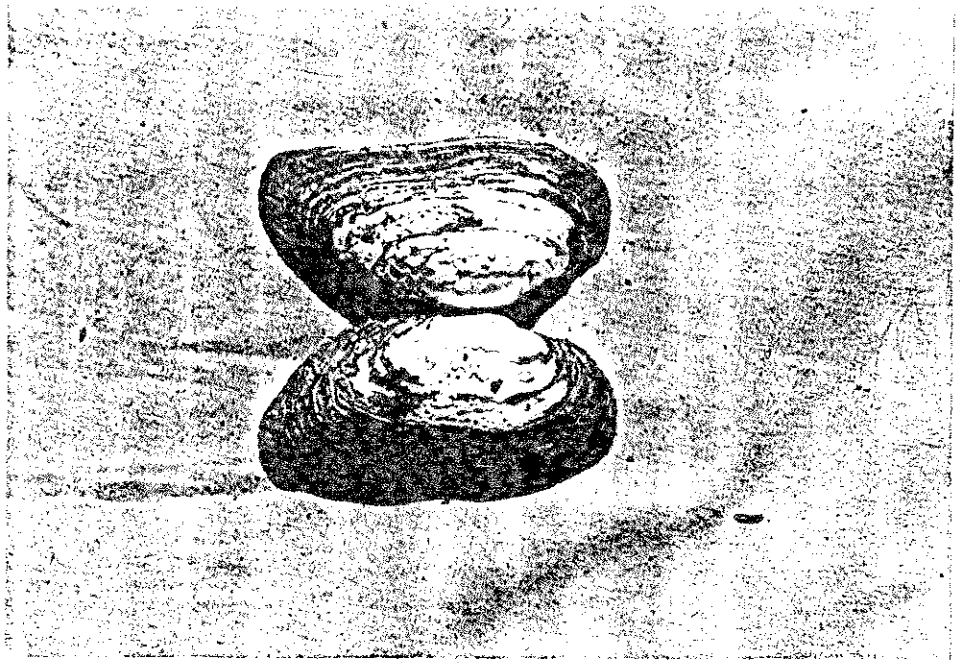
1/ Surveyed upstream to just above confluence of Little Bluestone River.

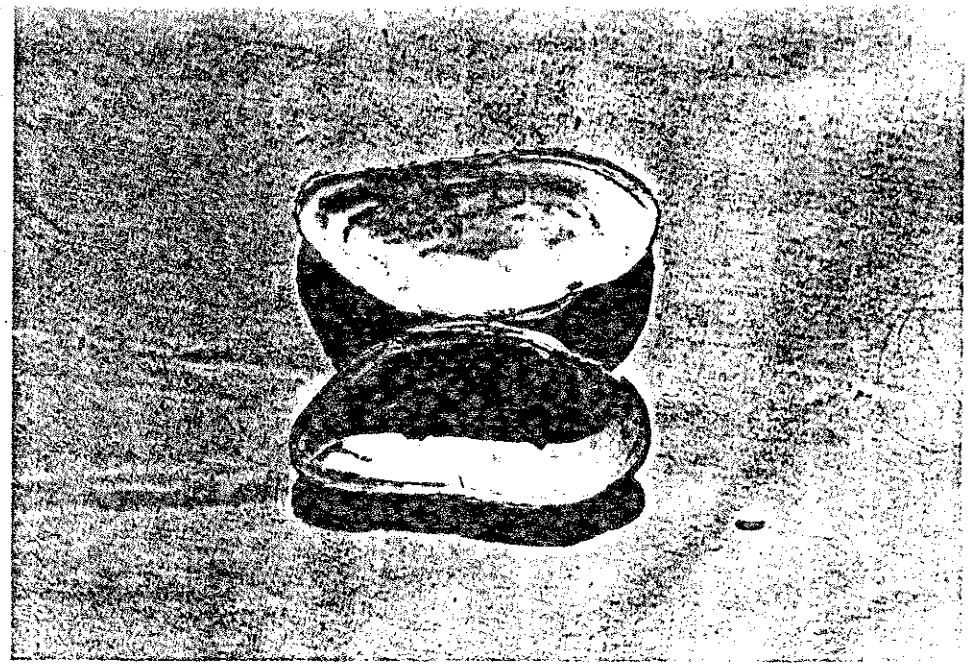
2/ Surveyed approximately 8.4 miles upriver of slackwater of Bluestone Lake to above Wylie Islands.

3/ Surveyed 0.6 mile above confluence of New River.

D = Dominant

Photo 1. Waterscoping and note taking, Bluestone River, Station 1.





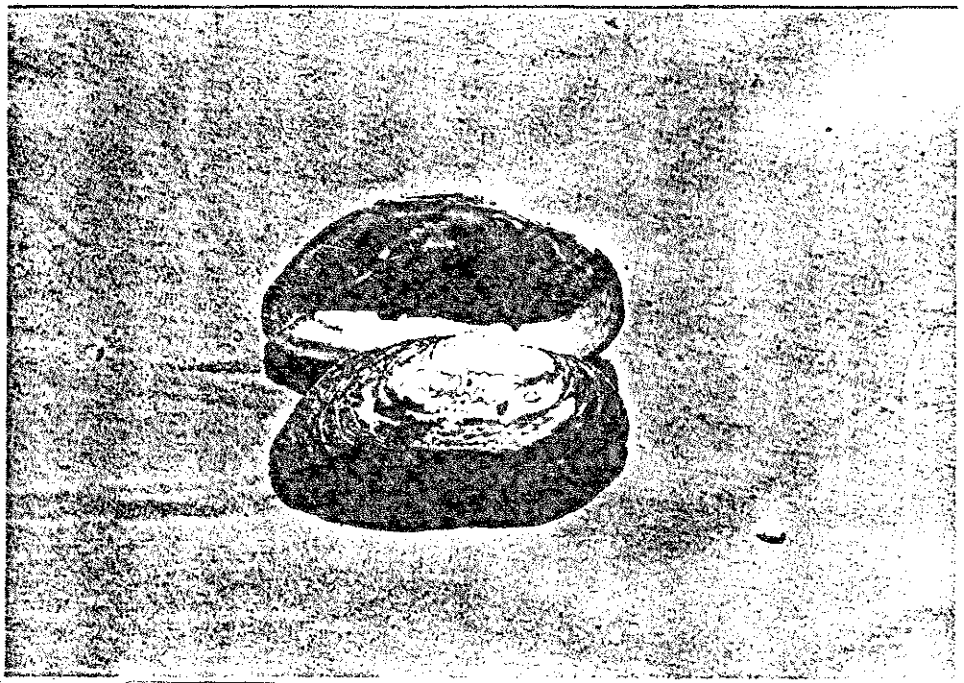
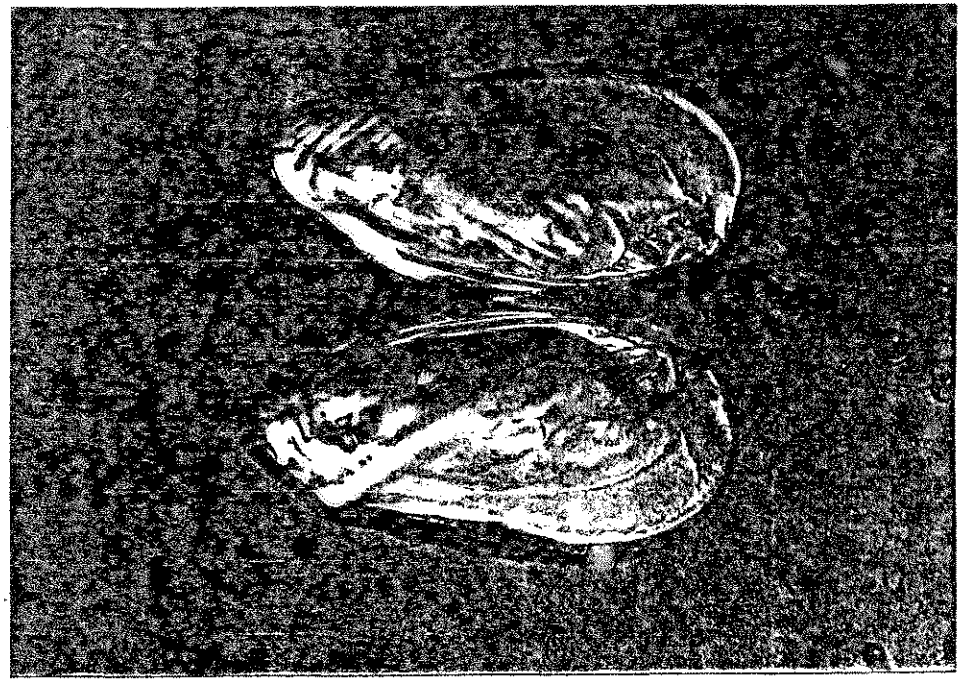


Photo Plate 1. Alasmidonta marginata - Elktoe



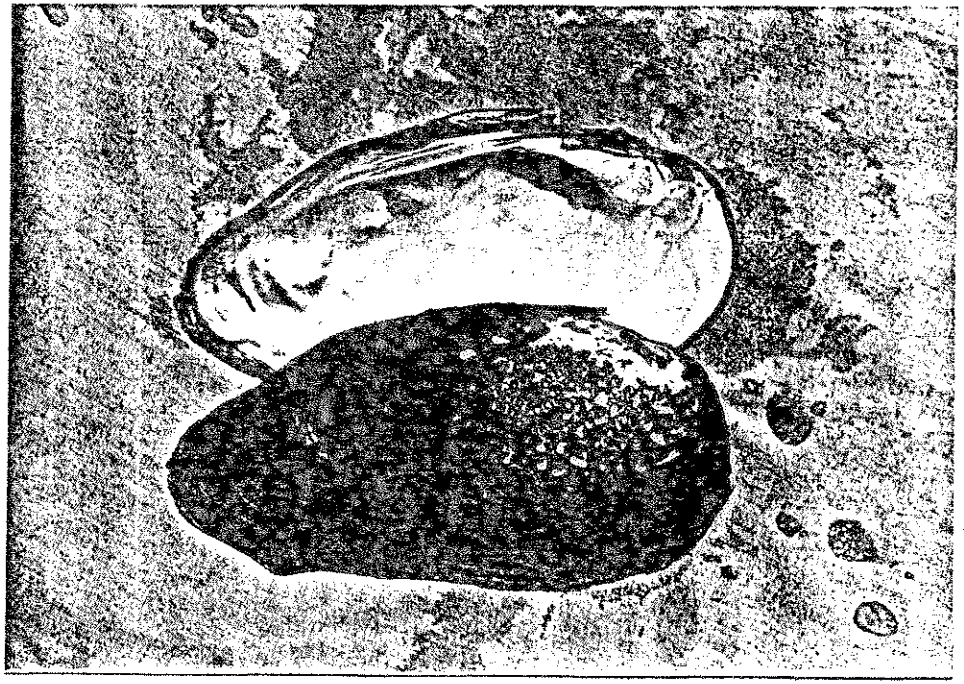


Photo Plate 2. Tritogonia verrucosa -.
Buckhorn

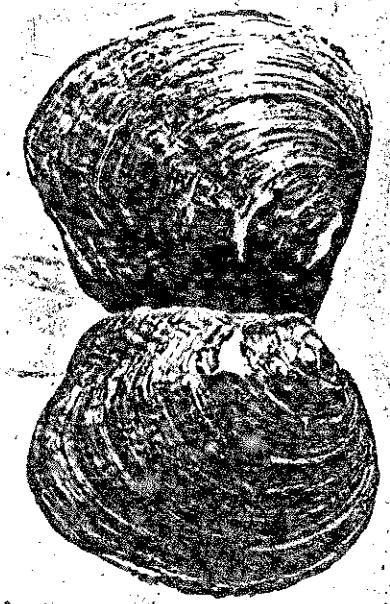
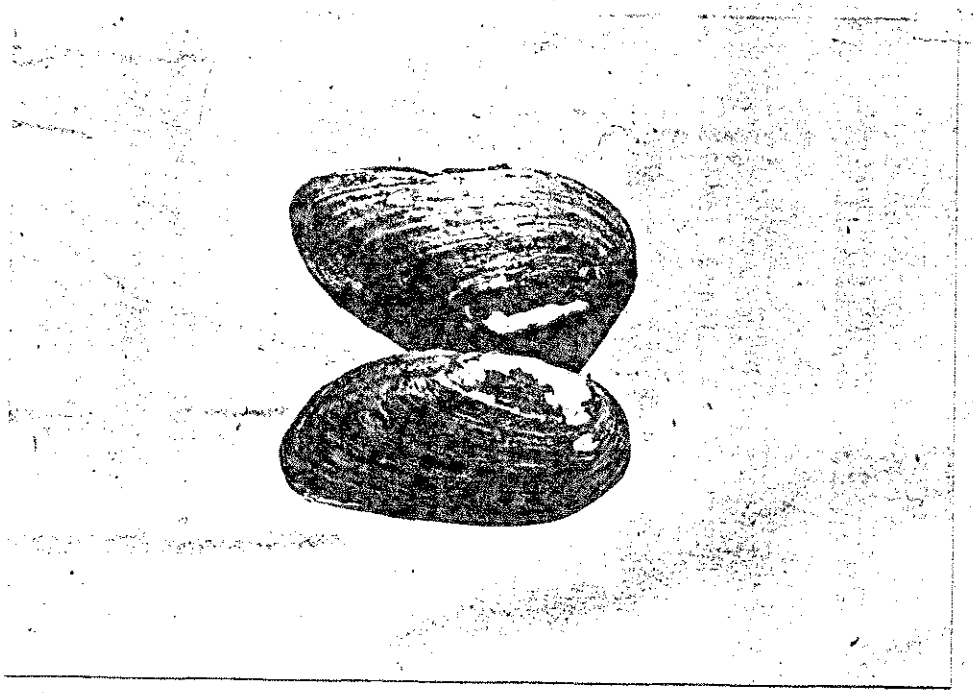
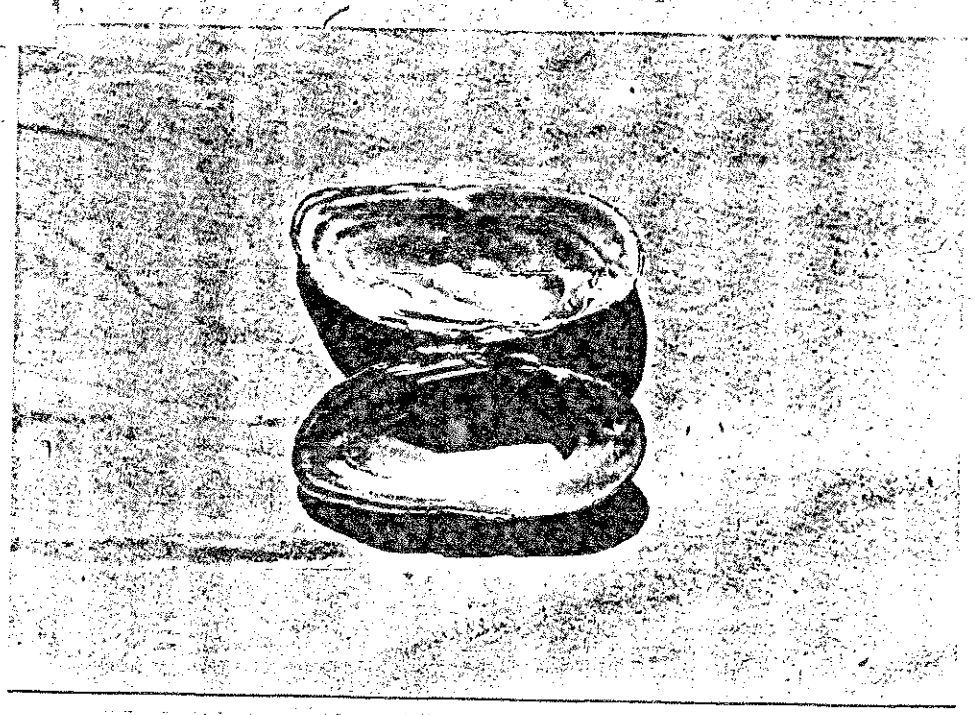


Photo Plate 3. Cyclonaias tuberculata - Purple pimpleback





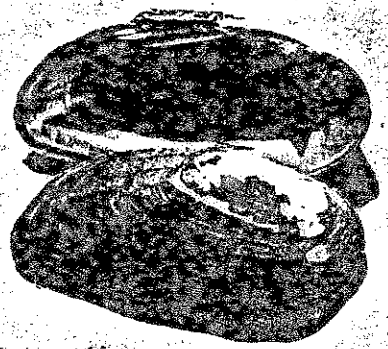
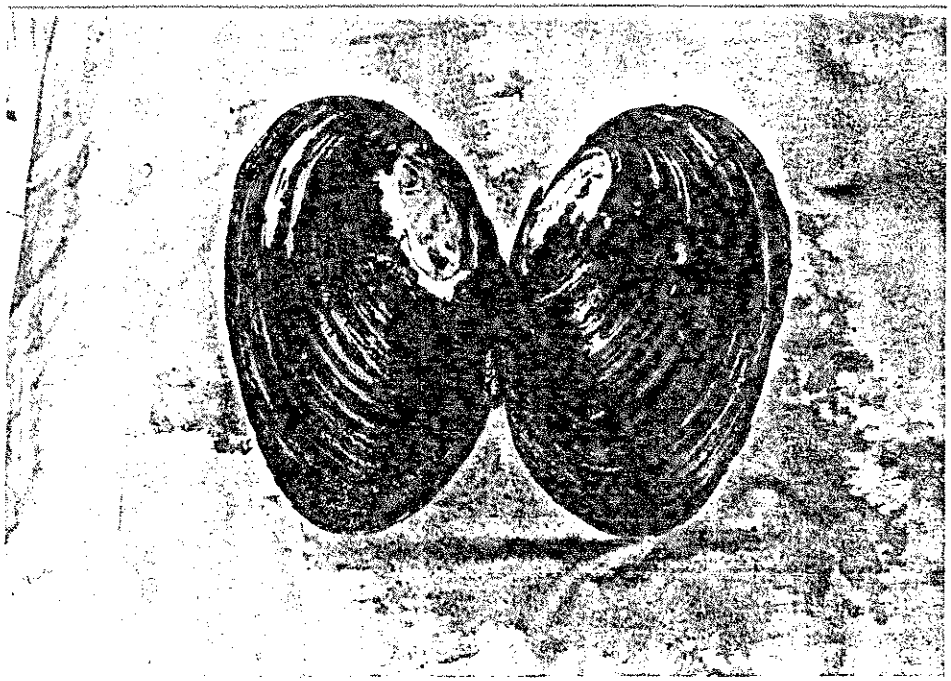


Photo Plate 4. Elliptio dilatata - Spike



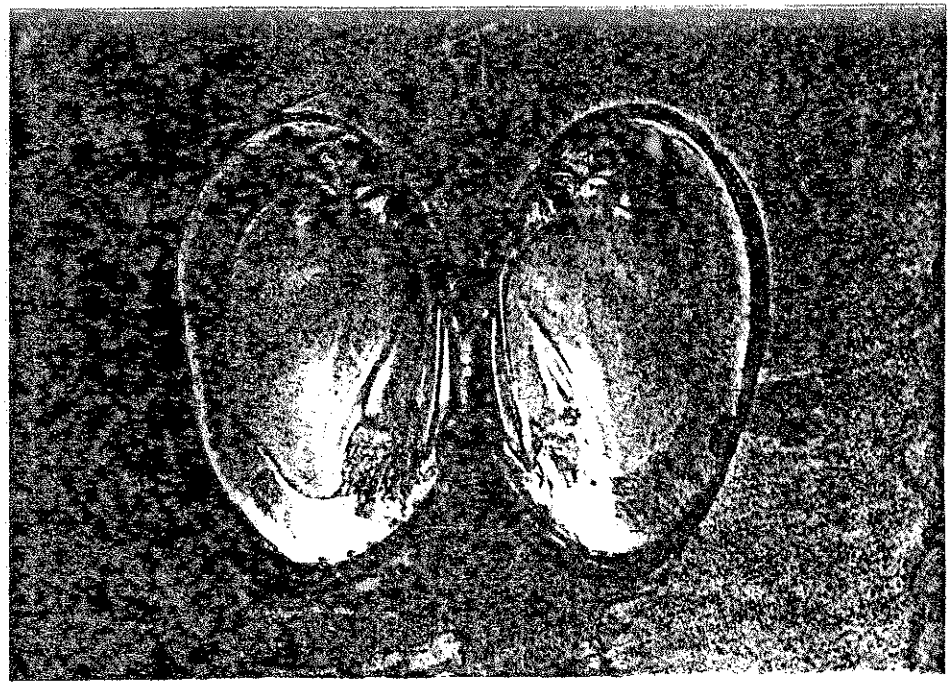
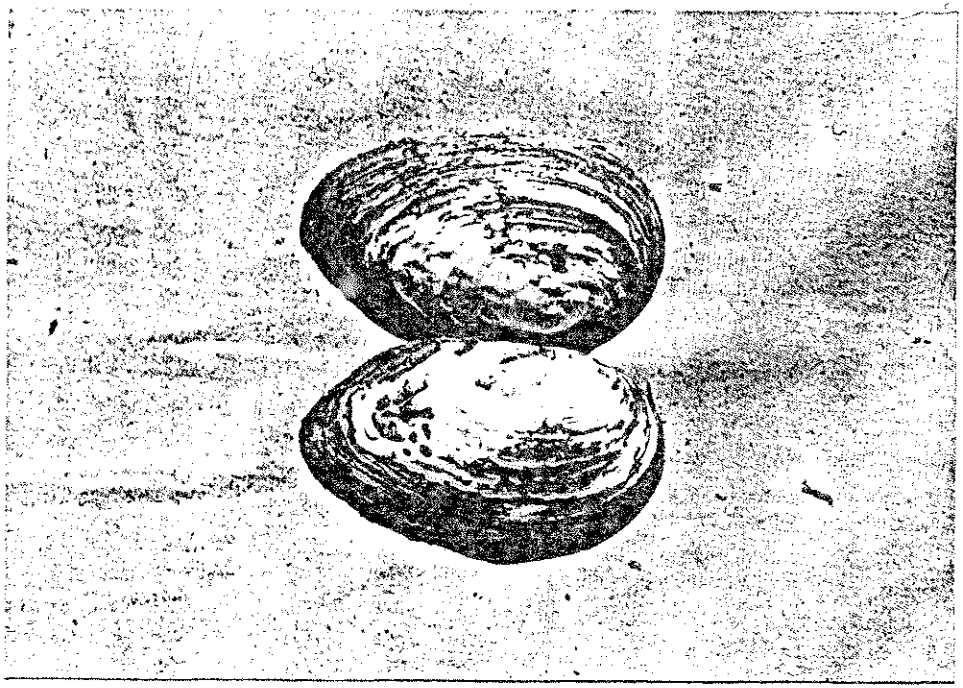
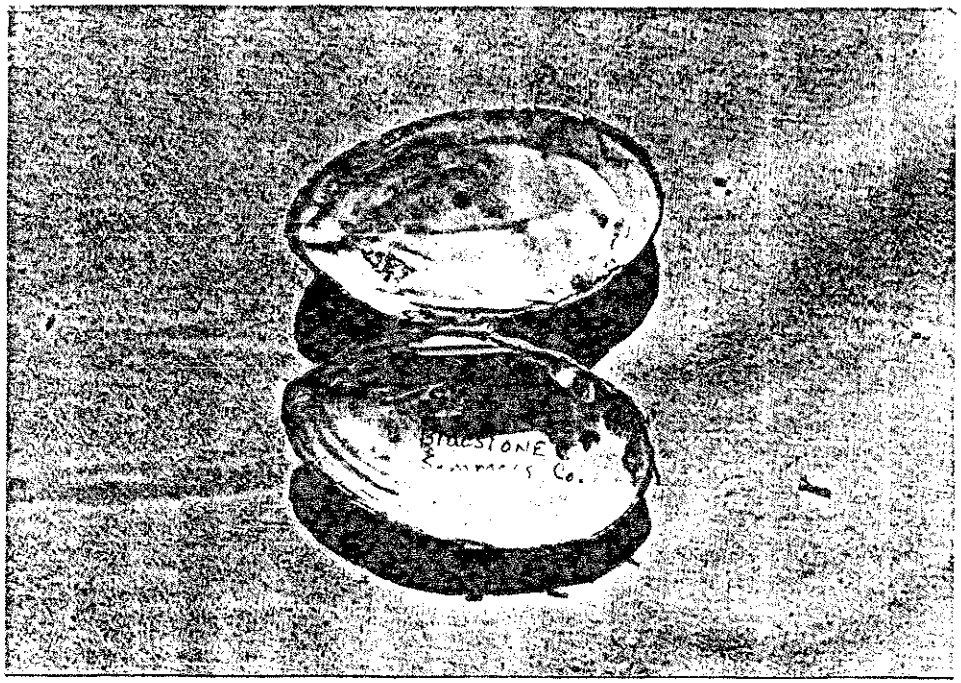


Photo Plate 5. Actinonaias ligamentina carinata - Mucket





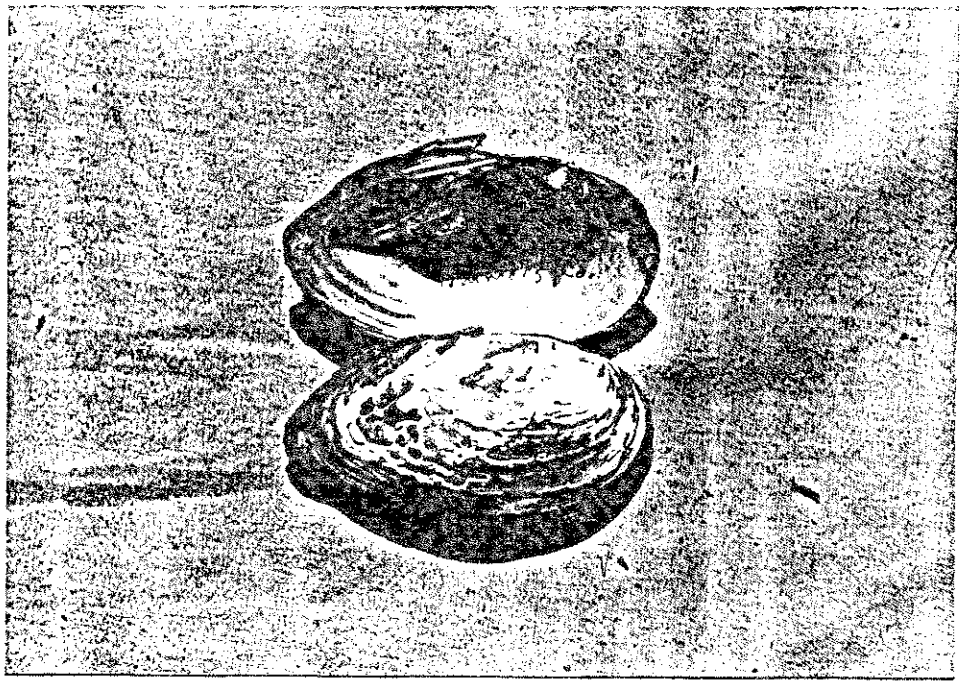
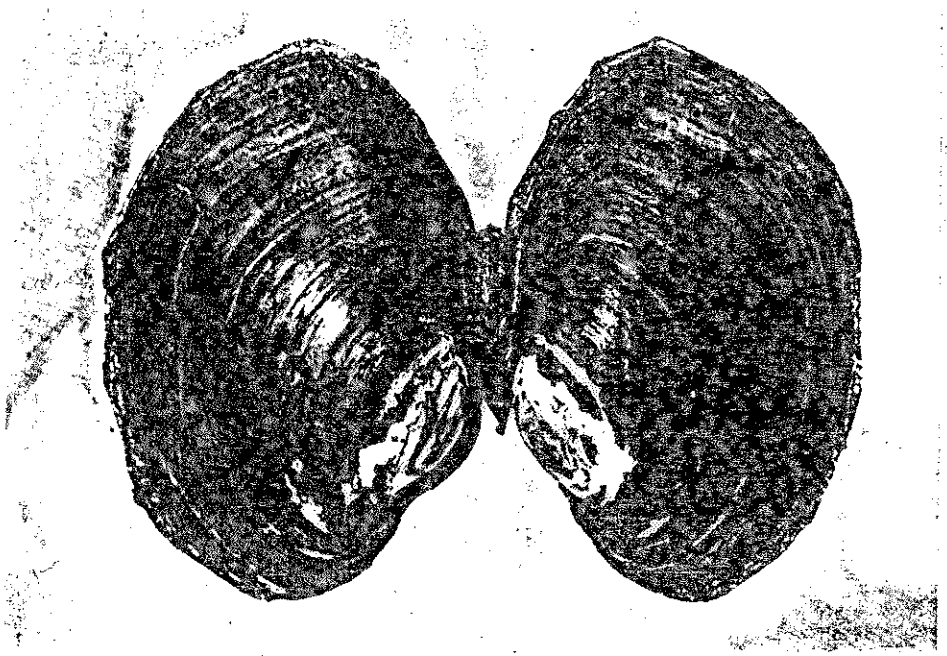
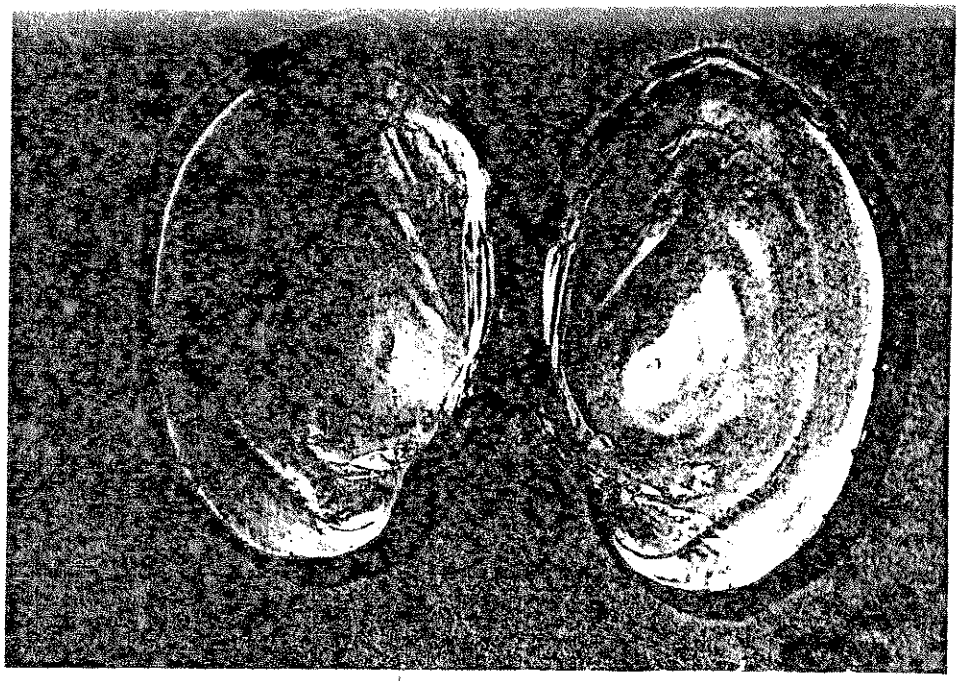


Photo Plate 6. Villosa iris iris - Rainbow shell





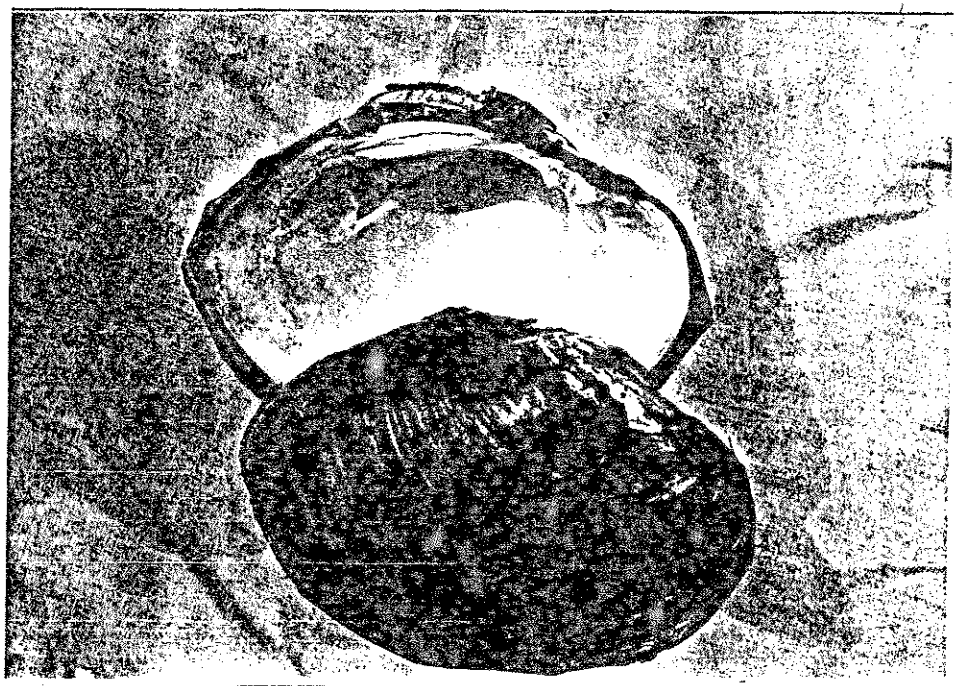
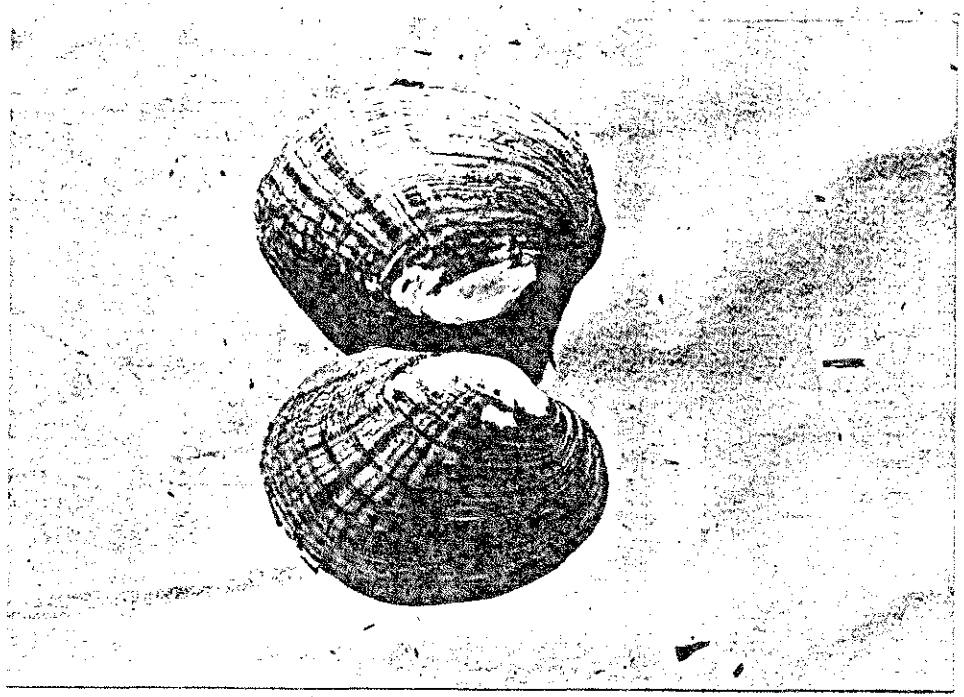
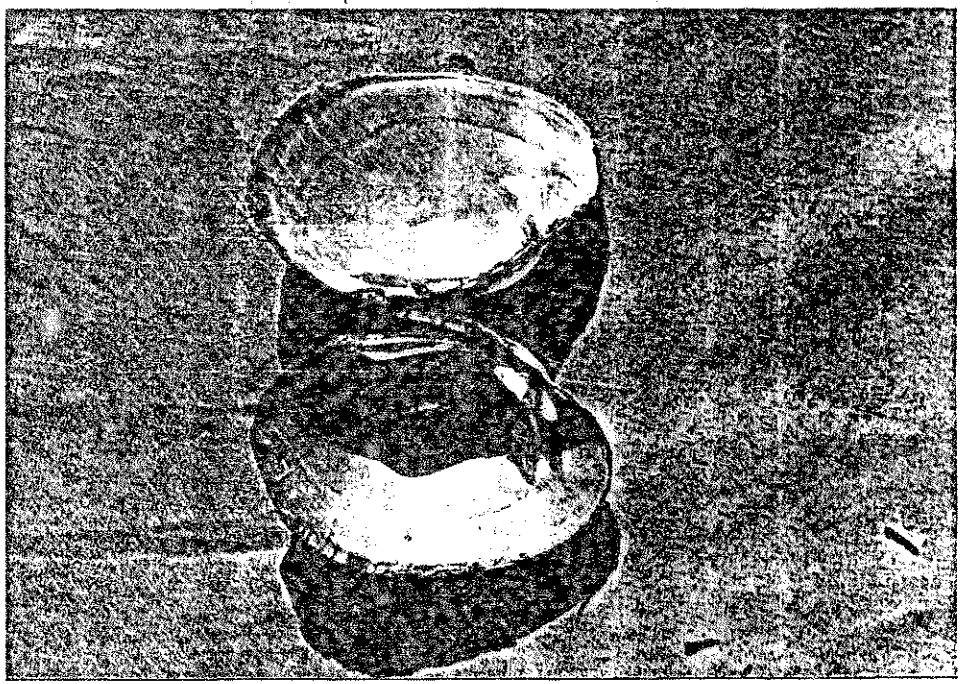


Photo Plate 7. Lampsilis ventricosa - Pocketbook





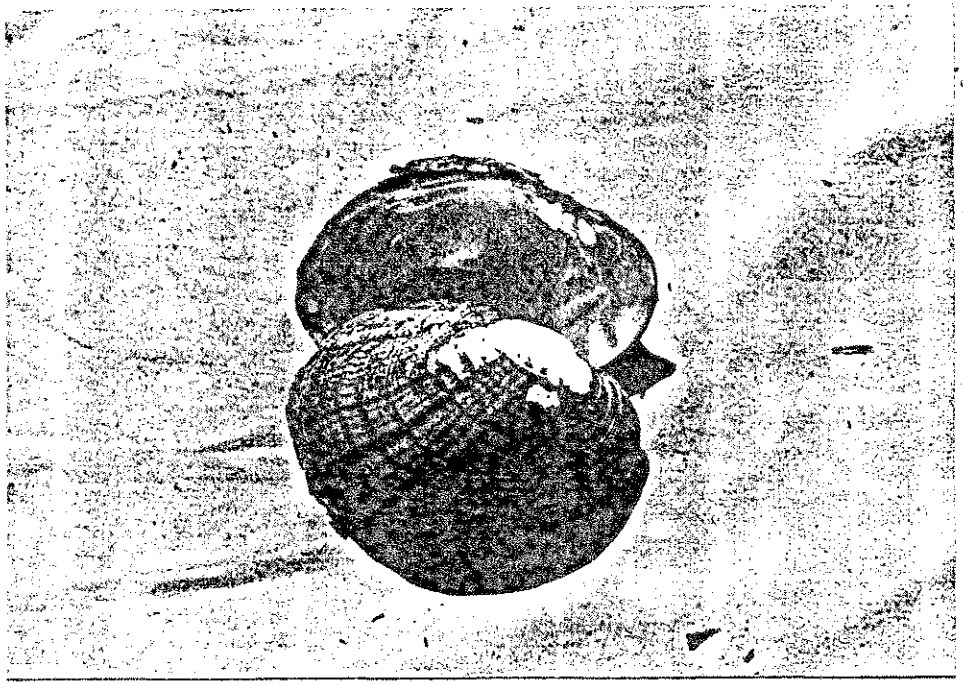


Photo Plate 8. Lampsilis fasciola - Butterfly pocketbook

surveys. Dick Neves (personal communication) reported L Subviridis to be the dominant species in the upper New River in Virginia.

John Schmidt (personal communication) collected six species from Indian Creek farther upstream of our area. Schmidt found three species which we did not collect, Anodonta grandis grandis, Villosa iris iris, and Lampsilis ventricosa; we found one which he did not collect, Tritogonia verrucosa.

Our survey revealed that the New and Bluestone Rivers and Indian Creek contained a viable assemblage of freshwater mussels, low in species diversity but high in abundance. The Bluestone River supported the highest species diversity with eight, the dominant species being Lampsilis ventricosa (Table 2). The New River supported six species dominated by Cyclonaias tuberculata and Indian Creek supported four species with Elliptio dilatata being most abundant. Of the three streams surveyed, Indian Creek had the least amount of suitable habitat due to the prominence of large cobble, boulder, and bedrock substrates in its lower reach (Table 2).

New River Mainstem

Suitable mussel habitat is abundant and diverse along the approximately 8.4 miles of the New River that was surveyed. The survey was conducted between just above the head of the Wylie Island complex to the mouth of Indian Creek.

Substrates ranged from silt, sand, gravel, cobbles, boulders, and ledges in rapid/riffle, run and pool habitat (Photos 2, 3, and 4). Mussels were found in all habitat types but preferred the fine silt, sand, and gravel found between the cobbles, boulders, and ledge fissures in one-foot to eight feet of water.

Only five species of mussels were collected in the survey reach (Table 1). Except for the nearly continuous scattered individuals which utilize the numerous small pockets of suitable habitat, only six sites or areas along the river had significantly higher populations of mussels to be considered beds rather than merely scattered populations. The major areas are the head and right descending (south) side of Wylie Island (mile 20.9 to 21.4) (Photos 5 and 6), above and below the mouth of Lick Creek (miles 18.6 to 17.9) (Photos 7 and 8), and around the Justicia islet, up river of Indian Creek (miles 13.2 to 13.8) (Photos 9 and 10) (Appendix A).

No relative abundance data was calculated for the New River because of time restraints during data collection, the high diversity of habitats, size of the river, and great number of dead shells. Nevertheless, we believe that Cyclonaias tuberculata is the dominant species followed by Lampsilis ventricosa (Appendix B). This reach of New River is low in species diversity and high in abundance considering the great amount of suitable habitat utilized by small scattered populations and individuals.

No evidence, past or present, of A. l. carinata was collected from the mainstem of New River in our survey, but it was collected in the Bluestone River and is a dominant species below Bluestone Dam. Stauffer et al. (1980) collected two specimens of A. l. carinata from the Wylie islands area and three specimens upstream about 1.5 miles at the mouth of Round-

Table 2. Relative abundance of freshwater mussels collected in the Bluestone River and Indian Creek study area.

SPECIES	BLUESTONE RIVER 1/		INDIAN CREEK 2/	
	#	%	#	%
Alasmidonta marginata	6	1.7		
Tritogonia verrucosa	4	1.1	2	4.4
Cyclonaias tuberculata	82	22.6	3	6.7
Elliptio dilatata	41	11.3	29	64.4
Actinonaias ligamentina carinata	7	1.9		
Villosa iris iris	1	0.2		
Lampsilis ventricosa	143	39.4		
Lampsilis fasciola	79	21.8	11	24.4
Corbicula				
TOTAL # SPECIMENS (MINUS CORBICULA)	363		45	

1/ Surveyed upstream to just above confluence of Little Bluestone River.

2/ Surveyed 0.6 mile above confluence with New River.

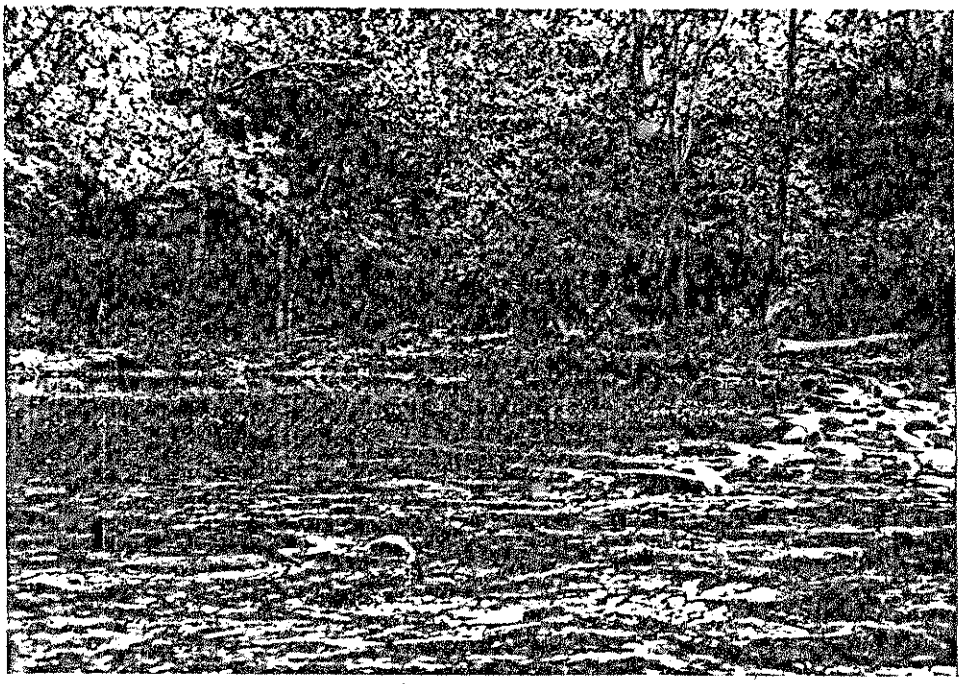


Photo 2. Riffle/pool over sand, gravel, cobbles, just below Shanklin's Ferry. Good population of Cyclonaias tuberculata. Shanklin's Ferry.

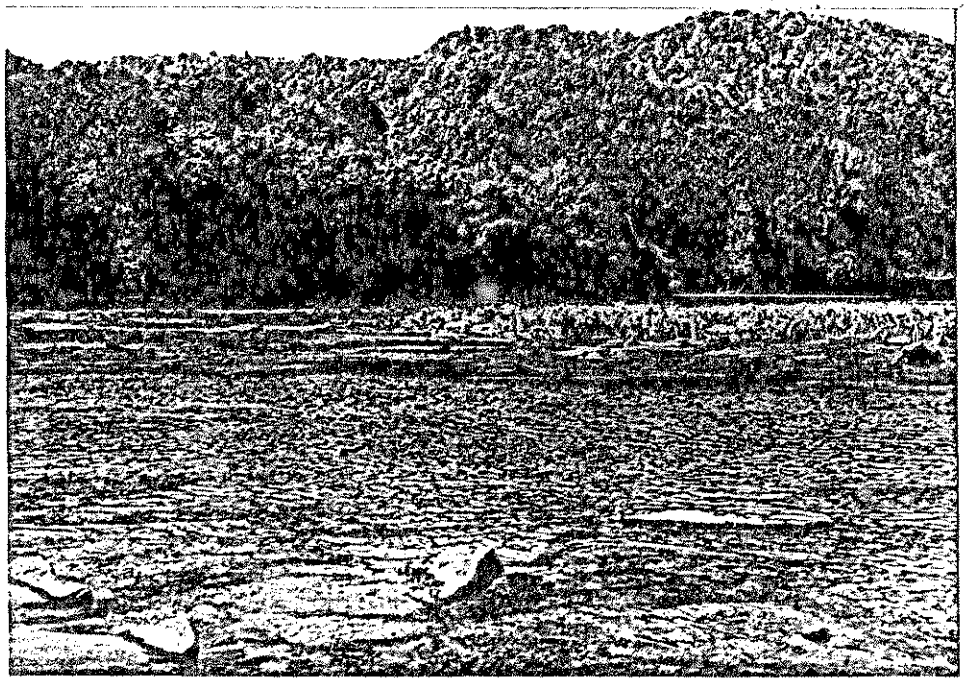


Photo 3. Run/pool/riffle over sand, gravel, broken ledge. C. tuberculata scattered throughout pool and in front of and in Justicia islet. Indian Ck.

Photo 4. Run/pool, silt, sand, gravel, cobbles, Elodea sp. and Potamogeton sp. mussel inhabiting run and edge of Elodea sp.

Photo 5. Head of Wylie Islands Complex, Station 1.

Photo 6. Run and shallow pool. *Elodea* sp. and *Potomogeton* sp. bed. Mussels along edge of run and in sand/silt substrate of aquatic bed.

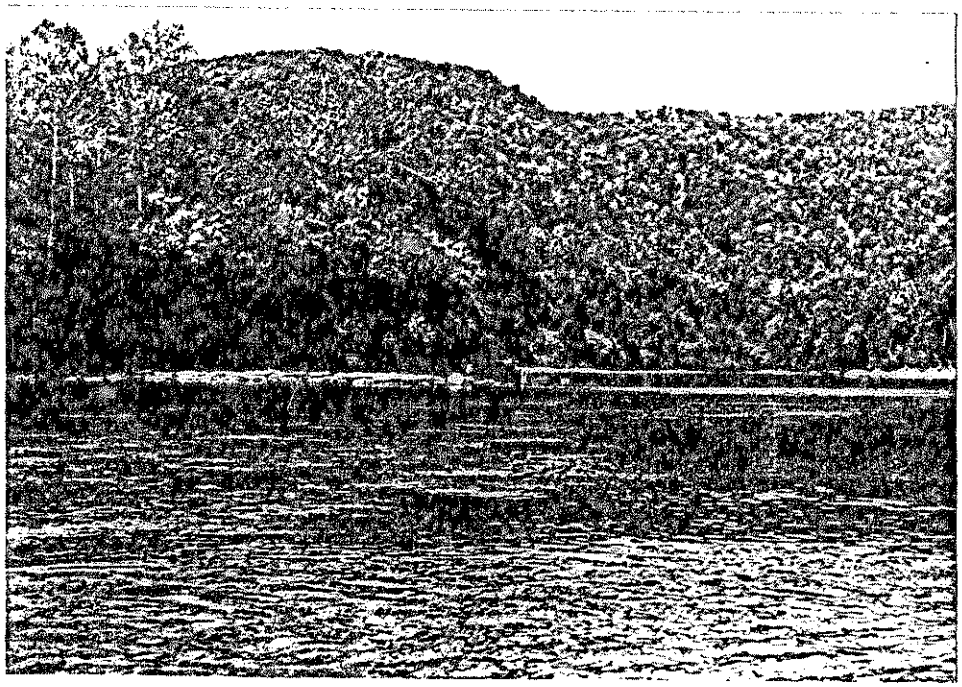


Photo 7. Run/pool below Shanklin's Ferry. Station 2, Site 2. Mussel bed mid-river in background pool. Dominant *C. tuberculata*. Mussels scattered throughout.

Photo 8. Run/pool, silt, sand, gravel, broken ledge. Many C. tuberculata and L. ventricosa Shanklin's Ferry, Station 2, Site 1.

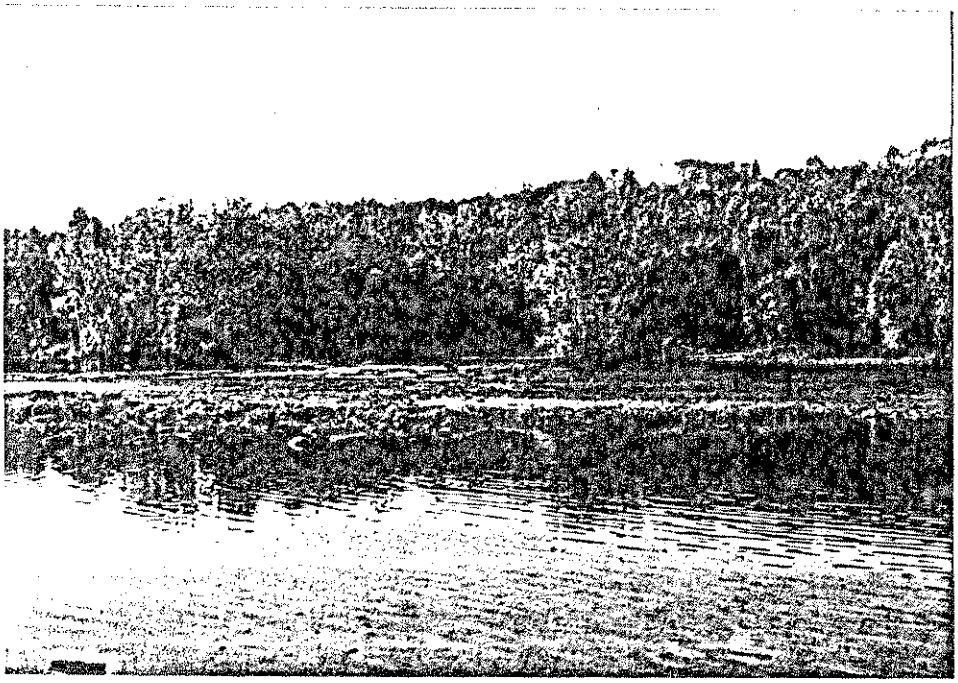


Photo 9. Above Indian Creek, Station 3. Pool/riffle/run, all substrate types.

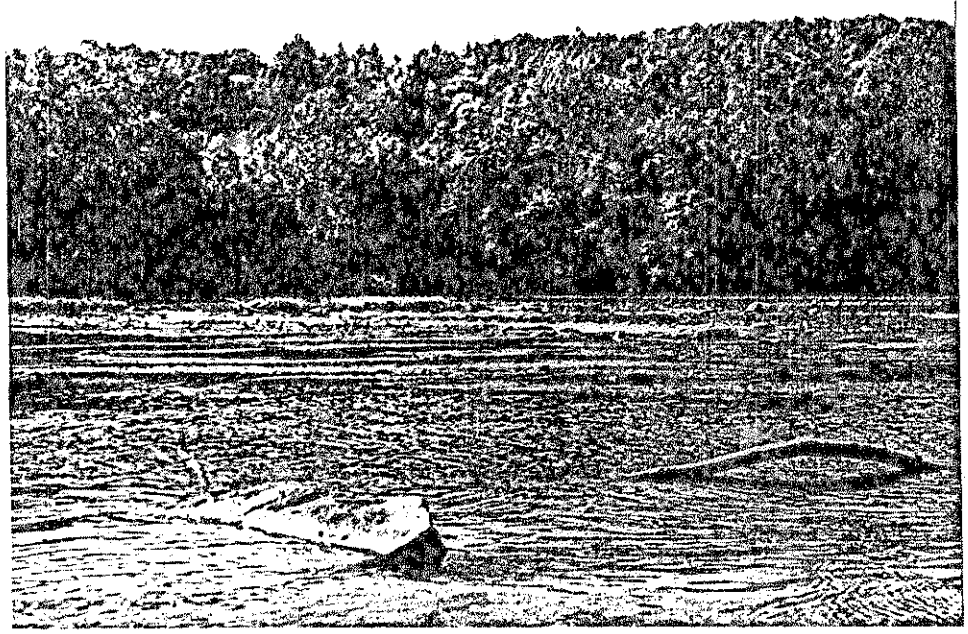


Photo 10. Dense C. tuberculata in pool/run to riffle at Indian Creek, New River Station 3.

bottom Creek (Station 1). Its rarity or disappearance in this part of the New River presents an opportunity to consider the importance of the freshwater mussel as a physical or biological indicator. It can indicate through species composition shifts or other population changes chronic ecological change. Since the physical habitat (currents and substrate) appear the same throughout, chemical factors (water quality), biological factors (fish host composition), or physical barrier (Bluestone Dam) may have caused this species composition difference. This should be studied further since water quality changes are major factors to be considered below Bluestone Dam if in the event hydropower alternatives are pursued. For example, John Schmidt (unpublished) found a drastic reduction of mussel taxa on the Caney Fork of the Cumberland River below Center Hill Reservoir near Smithville, Tennessee. Center Hill Dam is used as a peak hydropower operation with a hypolimnetic release (daily fluctuation 200 cfs - 2,000 cfs). In August of 1980 and 1981 Schmidt collected 33 relic or fossil species below the dam. Presently, eight or nine species live in the river in reduced numbers. Low temperature and flow fluctuation are sited as the cause.

Bluestone River

Two 0.6 mile reaches of the Bluestone River were surveyed to the mouth of the Little Bluestone River. Eight species of freshwater mussels were collected (Table 1). Lampsilis ventricosa was the most frequently collected mussel and comprised 39.4 percent of the composition. Cyclonaias tuberculata (22.6 percent), Lampsilis fasciola (21.8 percent), and Elliptio dilatata (11.3 percent) were the next most abundant in descending order (Table 2).

The substrate consists of silt, sand, gravel, cobbles, boulders, bedrock and broken ledge with an excellent combination of small to large pools, riffles and runs. Within the two reaches surveyed, one large and two small mussel beds were discovered, (Photos 11-14), Appendix A and C).

Dr. Stansbery (personal communication) has a great interest in the Bluestone River due to its close proximity in its headwaters with the Clinch River system. He believes that it may be possible to find some of the mussel fauna of the Clinch River in the headwaters of the Bluestone River.

One specimen of Villosa iris iris was collected in the bed in Station 1 in a sand, gravel, and cobble substrate in moderately swift current. Alasmidonta marginata was found in the same habitat type.

Indian Creek

Approximately a 0.6 mile reach of Indian Creek was surveyed from the mouth (Appendix A and D). Four species of freshwater mussels were collected (Table 1). Elliptio dilatata was most frequently collected at 64.4 percent and Lampsilis fasciola was codominant with 24.4 percent (Table 2).

Substrates range from silt, gravel, cobble, and boulders; Justicia islets were braided with riffles and runs. A good combination of pool, riffle, and run was present. The reach surveyed was fair to good mussel habitat due to the large amount of continuous bedrock, large cobble and boulders (Photo 15).

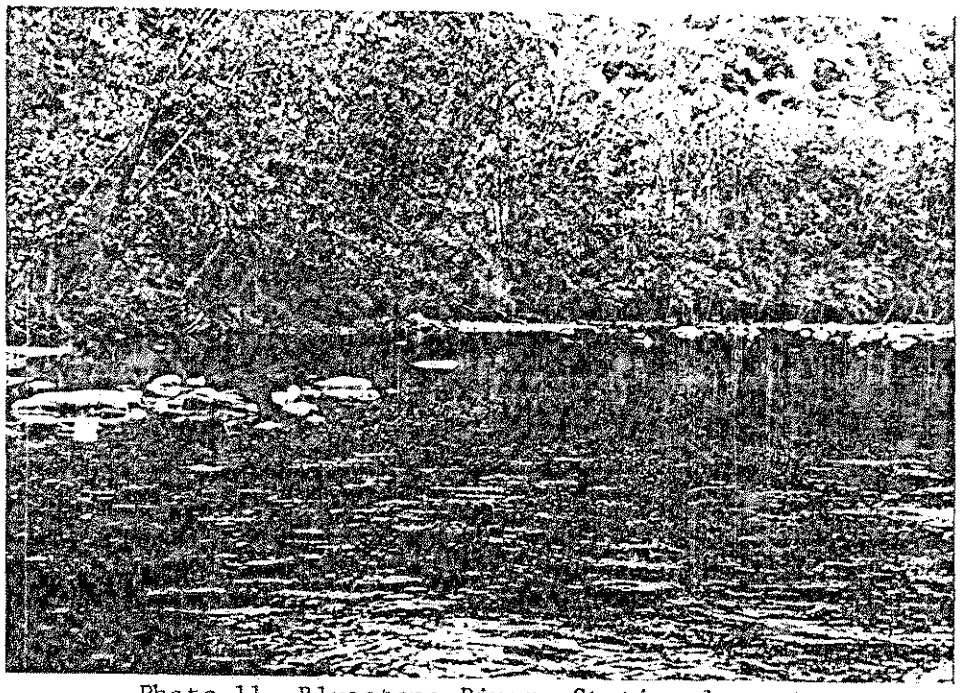


Photo 11. Bluestone River, Station 1, Site 1. Look downstream, run/ pool, sand, gravel, cobbles, dense mussel bed, 8 species.

Photo 12. Bluestone River, Station 1, Site 1, looking upstream. High habitat diversity.

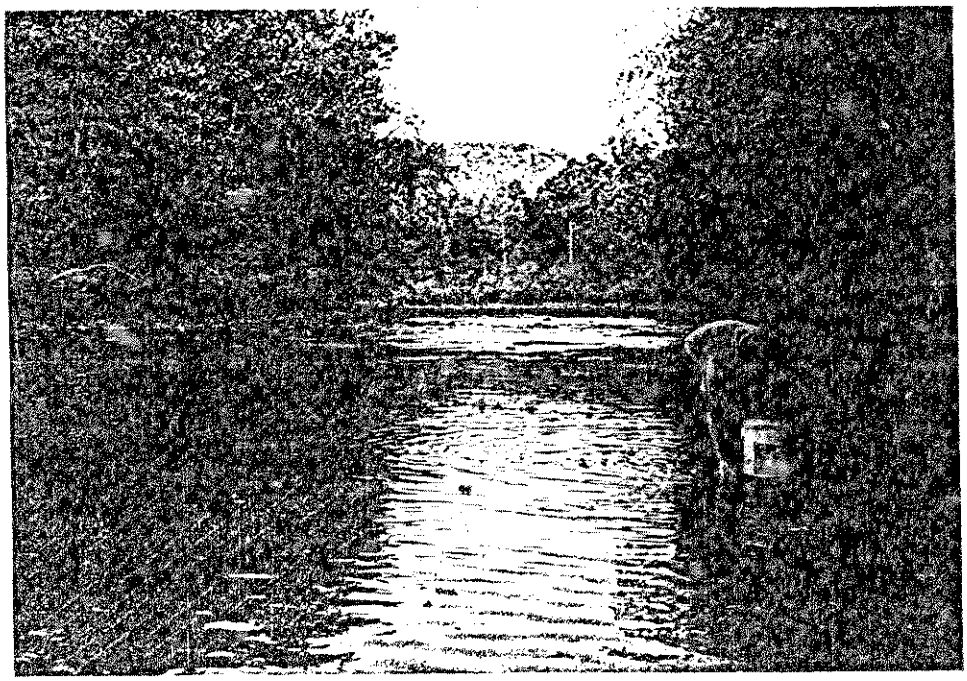


Photo 13. Bluestone River, Station 2, Site 1.

Photo 14. Bluestone River, Station 2, Site 2.

Photo 15. Indian Creek, cobbles, broken ledge, and *Justicia*.

GENERAL IMPACTS OF HYDROPOWER PROJECT

The future of the freshwater mussel fauna of the study area, if a pool raise to elevation 1,450 msl is implemented is easily predicted. Changing these free flowing (lotic) habitats to a lake or slow moving pool (lentic) habitat will eliminate or drastically modify all existing and potential mussel habitat. Dr. Stansbery (1973) detailed the changes and subsequent fate of these animals. He states:

> "What happens when a river is impounded into a reservoir or series of reservoirs? The water which was once generously mixed with the air while bumbling over shallow riffles becomes quiet. The surface is unbroken except immediately below the dam site or perhaps for a short distance downstream. The movement of atmospheric oxygen into the water is greatly reduced. The rate at which carbon dioxide produced by the aquatic organisms escapes to the atmosphere is slowed nearly to a halt. This situation is aggrevated by the fact that suspended solids, many organic in nature, tend to settle to the bottom when the water transporting them becomes quiet. This added load of organics on the bottoms of our artificial lakes utilizes increased amounts of oxygen and, in so doing generates correspondingly increased amounts of carbon dioxide. Other products of decomposition accumulate and toxic conditions for stream organisms are created. Free carbon dioxide combines with the water, forming carbonic acid. This makes the water at and near the bottom more acidic. The ability of these aquatic animals to exchange gases with the water around them depends upon the water having a pH value within a certain range. At a pH too high or too low these animals suffocate. The calcium carbonate shells of these mollusks are frequently dissolved by these acids and the animal may succumb from loss of its protective covering.
>
> "Bivalve mollusks obtain both food and oxygen from a current of water which they draw slowly into the shell, through the gills, and out again into the immediate environment. If the water is not moving, as on the bottom of a reservoir, or even if it is moving very slowly, much of the same water (having had the food and oxygen largely removed) passes through the animal again and again. Making conditions worse, this same stream of water carries fecal material and excreted waste products out of the animal. As the water is recycled this material is recycled also. Thus, these animals are forced to live if they are able, in a mixture which may become mostly their own waste products."

SUMMARY

Our investigation revealed that the New and Bluestone Rivers and lower Indian Creek supported viable mussel populations, low in species diversity and relatively high in abundance. Eight species of freshwater mussels were collected in the survey.

Although several areas in the New River had high concentrations of mussels and are considered beds, the entire river is inhabited by much smaller scattered populations and individuals. Bluestone River populations were

less scattered.

Although the survey was not intended to be quantitative, some relative abundance data was presented. New River had six species, dominated by Cyclonaias tuberculata. Bluestone River had the highest species diversity and was dominated by Lampsilis ventricosa. Indian Creek, found to have the least desirable habitat due to the high amount of large cobble, boulder, and bedrock had four species dominated by Elliptio dilatata.

Permanent or prolonged impoundment of these streams would chemically, physically, and biologically modify the existing habitat necessary to support these mussel populations. These habitats would, therefore, be unable to support these animals and the mussels would be eliminated. In addition, water quality (temperature, dissolved solids, etc.) and drastically fluctuating flows could have deleterious impacts on the existing downstream mussel fauna.

Sincerely yours,

Christopher M. Clower

for Glenn Kinser
Supervisor
Annapolis Field Office

Literature Cited

Stansberry, H. David. 1973. Dams and the extinction of aquatic life. The Garden Club of America Bullet., Vol. 61(1):43-46.

Stauffer, J. R., Jr., C. H. Hocutt, and S. L. Markham. 1980. Aquatic biological survey of the New River, Virginia and West Virginia. A report submitted to the U.S. Fish and Wildlife Service, Elkins, West Virginia.

APPENDIX B: NEW RIVER DATA SHEETS

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/3/83
River Mile: 19.6 - 21.1

Location: New River Station 1 - 3.0 mile reach (just above Wylie Island to Shanklin's Ferry)
County: Monroe Collector(s): Tolin, Schettig, Richmond

Sampling Method(s): handpicking, water scopes Habitat: sand, gravel, cobble, broken ledge

Water Depth(m): _____ Water Temperature (°C): _____ Current (m/sec): _____

D.O. (mg/l): _____ pH (std. units): _____ Conductivity (umhos): _____

	Condition of Specimens				
Species Collected	Alive	Dead	Sub-Fossil	Fossil	Total
Tritogonia verrucosa	1	22 plus			
Cyclonaias tuberculata	58	166 plus			
Elliptio dilatata		10			
Lampsilis ventricosa		25			
Lampsilis fasciola		10			
Corbicula sp.	many				
				TOTAL	

Taxonomist: _____

Remarks: Water extremely clear, aquatic vegetation, riverine aquatic bed (RAB) over silt and sand substrate; Potamogeton crispus, Potamogeton sp., Elodea sp. Habitat is broken ledge, fissures, cobble, gravel, sand. Mussels are in cracks and between cobbles. Muskrats, 13 turkeys at Shanklins Ferry, flew across river.

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/4/83
River Mile: 18.6 - 18.9

Location: New River Station 2, Shanklin's Ferry to Indian Creek Sites 1 and 2, beds below Shanklin's Ferry
County: Summers Collector(s): Zeto, Moomaw, Richmond, Tolin

Sampling Method(s): handpicking, water scope, snorkel Habitat: "see remarks"
Water Depth(m): 6" to 8' Water Temperature (°C): Low 60's Current (m/sec): ____

D.O. (mg/l): ____ pH (std. units): ____ Conductivity (umhos): ____

Species Collected	Condition of Specimens				
	Alive	Dead	Sub-Fossil	Fossil	Total
Tritogonia verrucosa	1	1			2
Cyclonaias tuberculata	60	50			110
Elliptio dilatata	1	6			7
Lampsilis ventricosa	1	10			11
Lampsilis fasciola		1			1
Corbicula	abundant				
				TOTAL	129

Taxonomist: Tolin, Zeto, Stansbery

Remarks: Water very clear, low, and cool. Site 1, quiet area behind and downstream of rockbar. Mussel bed along RDB below first rock bar. Site 2 bed located between first rock bar and two emergent rocks. Most mussels in 6' - 8' water between cracks in bedrock. Bed extends 50' wide and 300' - 400' long. Sixty percent sand, gravel, boulder, cobble. Numerous large carp, channel catfish, spotted bass and smallmouth just above first rapid. Raccoon, beaver, muskrat, black vulture. All of the above species were found on a rock and gravel bar at put in.

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/4/83
River Mile: 17.9

Location: New River Site 3, below mouth of Lick Creek Station 2 to Indian Creek
County: Summers Collector(s): Zeto, Moomaw, Richmond, Tolin

Sampling Method(s): handpicking, water scope, snorkel Habitat: "see remarks"
Water Depth(m): _____ Water Temperature (°C): Low 60's Current (m/sec): _____

D.O. (mg/l): _____ pH (std. units): _____ Conductivity (umhos): _____

	Condition of Specimens				
Species Collected	Alive	Dead	Sub-Fossil	Fossil	Total
Tritogonia verrucosa		x			
Cyclonaias tuberculata	x				
Elliptio dilatata		x			
Lampsilis ventricosa		x			
Lampsilis fasciola		x			
Corbicula	x	x			
				TOTAL	

Taxonomist: Tolin, Zeto, Stansbery

Remarks: Except for C. tuberculata no living specimens were found. A small narrow bed, mostly C. tuberculata, located midstream in run below rapid-bed 20' wide - 50' long, 50 C. tuberculata.

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/4/83
River Mile: 15.7

Location: New River Site 4 - RDB above Harvey Falls Station 2
Shanklin's Ferry to Indian Creek
County: Summers Collector(s): Zeto, Moomaw, Tolin, Richmond

Sampling Method(s): handpicking, water scope, snorkel Habitat: "see remarks"

Water Depth(m): _____ Water Temperature (°C): Low 60's Current (m/sec): _____

D.O. (mg/l): _____ pH (std. units): _____ Conductivity (umhos): _____

Condition of Specimens

Species Collected	Alive	Dead	Sub-Fossil	Fossil	Total
Tritogonia verrucosa		x			
Cyclonaias tuberculata	x				
Elliptio dilatata		x			
Lampsilis ventricosa		x			
Lampsilis fasciola					
Corbicula	x	x			
				TOTAL	

Taxonomist: Tolin, Zeto, Stansbery

Remarks: Numerous dead shells and live C. tuberculata scattered individuals throughout.

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/6/83
River Mile: 13.2 - 13.8

Location: New River Station 3 around Justicia islets just above Indian Creek
County: Summers Collector(s): Zeto, Schettig, Richmond, O'Neil, Passmore Tolin
Sampling Method(s): handpicking, water scope, snorkel Habitat: "see remarks"
Water Depth(m): 0 - 8' Water Temperature (°C): 62 deg.F. Current (m/sec): variab
D.O. (mg/l): _____ pH (std. units): _____ Conductivity (umhos): __

Condition of Specimens

Species Collected	Alive	Dead	Sub-Fossil	Fossil	Total
Tritogonia verrucosa		many			
Cyclonaias tuberculata	200 plus	many			
Elliptio dilatata		1			
Lampsilis ventricosa	1	many			
Lampsilis fasciola		many			
Corbicula	abundant				
				TOTAL	

Taxonomist: Tolin, Zeto, Stansbery

Remarks: Habitat very diverse; run, riffle, rapid, pool over silt, sand, gravel, cobbles, boulder and ledges. C. tuberculata dominant living specimens scattered throughout all habitat types, but most abundant in deep runs up to 8' deep.

APPENDIX C: BLUESTONE RIVER DATA SHEETS

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/5/83
River Mile: _____

Location: Bluestone River Station 1, 0.6 mile reach above normal slackwater
County: Summers Collector(s): Tolin, Schettig, Zeto, Moomaw, O'Neil

Sampling Method(s): handpicking, water scope Habitat: sand, gravel, cobble, boulder, very little silt pool/riffle/run
Water Depth(m): 2" - 2' Water Temperature (°C): _____ Current (m/sec): _____

D.O. (mg/l): _____ pH (std. units): _____ Conductivity (umhos): _____

	Condition of Specimens				
Species Collected	Alive	Dead	Sub-Fossil	Fossil	Total
Alasmidonta marginata	3	1			4
Tritogonia verrucosa		1	1		2
Cyclonaias tuberculata	49	29			78
Elliptio dilatata	17	24			41
Actinonaias ligamentina carinata	4	2			6
Villosa iris iris	1				1
Lampsilis ventricosa	17	97	3		117
Lampsilis fasciola	1	64	6		71
				TOTAL	320

Taxonomist: Tolin, Schettig, Zeto, Stansbery

Remarks: Young-of-year spotted bass abundant, muskrat, crayfish, logperch, kingfisher, natrix. Habitat gets better just above overflow channel and island. Mussel bed found in deeper water through three small pools and runs.

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/5/83
River Mile:

Location: Bluestone River Station 2, 0.6 mile reach downstream of Little Bluestone

County: Summers Collector(s): Tolin, Schettig, Zeto, Moomaw, O'Neil

Sampling Method(s): handpicking, water scope Habitat: some silt, sand, gravel, cobbles boulders

Water Depth(m): 6" to 2' Water Temperature (°C): _____ Current (m/sec): _____

D.O. (mg/l): _____ pH (std. units): _____ Conductivity (umhos): _____

Condition of Specimens

Species Collected	Alive	Dead	Sub-Fossil	Fossil	Total
Alasmidonta marginata		2			2
Tritogonia verrucosa		2			2
Cyclonaias tuberculata	3	1			4
Actinonaias ligamentina carinata	1				1
Lampsilis ventricosa	9	17			26
Lampsilis fasciola	1	7			8
				TOTAL	43

Taxonomist: Tolin, Schettig, Zeto, Stansbery

Remarks: First small bed discovered just above riffle on RDB, second bed along LDB 6" - 12", silt covered cobbles.

APPENDIX D: INDIAN CREEK DATA SHEETS

West Virginia Department of Natural Resources
Division of Water Resources

MUSSEL SURVEY
Date: 10/6/83
River Mile: _____

Location: Indian Creek, 0.6 mile from mouth to above first bridge

County: Summers Collector(s): Tolin, Schettig, Zeto

Sampling Method(s): water scope, handpicking Habitat: sand, gravel, cobbles, pool/riffle/

Water Depth(m): 1" - 2' Water Temperature (°C): _____ Current (m/sec): _____

D.O. (mg/1): _____ pH (std. units): _____ Conductivity (umhos): _____

Species Collected	Condition of Specimens				
	Alive	Dead	Sub-Fossil	Fossil	Total
Tritogonia verrucosa		2			2
Cyclonaias tuberculata	2	1			3
Elliptio dilatata		29			29
Lampsilis fasciola		11			11
Corbicula	many				
				TOTAL	45

Taxonomist: Tolin, Schettig, Zeto, Stansbery

Remarks: Spotted bass, smallmouth bass, (YOY). Good nursery habitat. Darters very abundant. Many small fish and snails stream appears very productive. Too much bedrock and large cobble to provide optimum mussel habitat.