

**DISTRIBUTIONAL SURVEYS OF
FRESHWATER BIVALVES IN TEXAS:
PROGRESS REPORT FOR 1998**

by
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ABSTRACT

During 1998, over 1,200 unionid specimens were documented from 118 locations (136 sample sites) statewide in Texas where specimens were either directly surveyed by the Heart of the Hills Research Station (HOH) staff or were sent to HOH by volunteers. Living specimens to relatively-recently-dead shells were found at 42% of the locations, 9% yielded only long-dead or subfossil shells, and 48% produced no unionids or their remains.

In conjunction with previous field-survey work 1992-1997, unionids appear completely or almost completely extirpated from the Pedernales, Blanco, San Marcos, Llano, Medina, upper Guadalupe, upper Sulphur, areas of the San Jacinto, and much of the San Saba rivers. Sections of other river systems and many tributaries have also experienced major unionid population losses in recent years. A drought which began in 1995 and continued through 1996 caused water-level declines statewide with subsequent negative impacts on freshwater mussel populations. Heavy rains in late October and early November 1996 and again January-February and May-June 1997 and August and October 1998 caused extensive flooding statewide. Many water bodies experienced dramatic increases in water levels in 1997 and 1998 after being severely dewatered in late 1995 and most of 1996. This seriously confounded sampling efforts at most sites in both 1997 and 1998. Additionally, travel restrictions ordered by the Texas legislature and other research projects served to direct effort away from field survey activities.

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INTRODUCTION

Beginning in January 1992, Texas Parks and Wildlife Department's (TPWD) Heart of the Hills Research Station (HOH) began surveys of freshwater mussel populations within the state to better understand this resource and manage the fishery for them. A questionnaire survey of mussel license holders in 1992 was reported by Howells (1993). Field surveys of unionid populations also began in 1992 and have continued through the present. These have been reported on an annual basis (Howells 1994, 1995, 1996a, 1996b, 1997a, 1997b, 1998a). These data were ultimately used to compile *Freshwater Mussels of Texas* (Howells et al. 1996). Discussed here are findings from continuing surveys conducted in 1998.

MATERIALS AND METHODS

Various habitats were sampled at each collection site examined. Collection methods and sampling effort varied between sites depending upon personnel, equipment, and time available as well as field conditions at the time of sampling. Minimal sampling efforts involved visual examination of shoreline and shallow-water habitats with hand collection. Where possible, sites were sampled by wading and snorkeling with hand collection. On several occasions, SCUBA or hookah-pump diving were used to sample deeper waters. Previous annual reports discuss details of these methods (Howells 1994, 1995, 1996a, 1996b).

Results are presented in numbers collected (retained or released) and percent composition of the collection. Caution should be used in considering percentages calculated from small sample sizes, where mussel abundance and species composition may have been altered (e.g., after harvest by musselers), or where collection efforts focused on obtaining selected species (e.g., for laboratory work or reference specimens). Where a species at a given locality was represented only by fragments or numbers were not documented, it may have been excluded from percent-composition calculations.

Mussels taken were identified to species whenever possible. Some subfossil or badly weathered specimens could not be identified to species. Ill-defined taxonomic status of some "species" also sometimes precluded assigning specific identifications at this time. Other non-unionid bivalves were also documented when encountered. Where "no bivalves" including Asian clams (*Corbicula*) were found, this was indicated, but where unionids were absent and Asian clams were not documented as either present or absent at a particular site, it was reported as "no unionids present." Common and scientific names used generally follow Turgeon et al. (1988), Williams et al. (1993), and Howells et al. (1996), and are presented in Howells (1995, 1996a, 1996b).

Varying environmental conditions can confound attempts to accurately define how long a given specimen has been dead; however, a number of terms have been used herein to convey an approximation of this. While inherently inaccurate, these attempts to characterize time since death are useful in distinguishing between shells which have been dead for many years or decades from others which clearly died only days or weeks before collection. Terminology relating to specimen condition was summarized in Howells (1996a, 1996b).

RESULTS AND DISCUSSION

Canadian River

Medipark Lake, Amarillo, Potter and Randall counties, Texas, 5 July 1998:

Volunteers examined exposed bottom areas during very low-water conditions but found no bivalves or their shells.

Red River

Lake Texoma, Grayson County, Texas, October 1998:

Local TPWD Inland Fisheries personnel found a large, very-recently dead white heelsplitter on exposed bottom after water levels had receded.

Red River Oxbow Lake, 33°53.206'N, 97°19.491'W, Love County, Oklahoma (opposite Cooke County, Texas), 16 July 1998:

During gill net sets at this site by U.S. Fish and Wildlife personnel, the following specimens were found:

Red River Oxbow Lake Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Pink papershell	0	1.0+0.5x1	relatively-recently dead - relatively-long dead	25.0
Giant floater	0	1.0+0.5x4	relatively-recently dead - relatively- long dead	62.5
Paper pondshell	0	0.5x1	relatively-recently dead	12.5

Big Cypress Bayou

The first major sampling effort by HOH on Big Cypress Bayou took place in July 1996 when the research station staff joined TPWD Inland Fisheries Management and Resource Protection personnel during an extensive survey of the upper reaches of this system (Howells 1997a). During this survey, mussels were found (listed upstream to downstream) in Cypress Springs and Bob Sandlin reservoirs and Big Cypress Bayou immediately downstream of Bob Sandlin Reservoir. However, no unionids were found from U.S. 271 (just downstream of Tankersley Creek), through S.H. 11, and down river nearly to Lake O'the Pines (Howells 1997a). After these data were released, local interested parties requested additional collection efforts between U.S. 271 and S.H. 11 because of alleged "multiple mussel beds...along the entire reach." Ultimately in June 1998, TPWD personnel and Pilgrim's Pride Representatives examined Big Cypress Bayou between U.S. 271 and S.H. 11. Specimens collected were subsequently sent to HOH for examination and analysis. Except for a limited number of "duplicate" shells, all specimens located were retained.

Big Cypress Bayou between U.S. 271 and the first pipeline downstream, Camp and Titus counties, Texas, 18 June 1998:

Big Cypress Bayou between U.S. 271 and first pipeline downstream (Station 1)				
Species	N live	N shells	Condition	Percentage
Yellow sandshell	4	0.0	recently dead	44.4
Giant floater	1	2.0	relatively -long dead - very long dead	33.3
Pistolgrip	1	0.0	-	11.1
Pondhorn sp.	0	1.0	relatively-long dead	11.1
Asian clam - present				

Big Cypress Bayou between the first and second pipelines downstream of U.S. 271 (Station 2), Camp and Titus counties, Texas, 18 June 1998:

Big Cypress Bayou between the first and second pipelines downstream of U.S. 271 (Station 2)				
Species	N live	N shells	Condition	Percentage
Giant floater	1	0.0	-	50.0
Southern mapleleaf	-	0.5x1	very-long dead	50.0

Big Cypress Bayou between the second pipeline downstream of U.S. 271 and S.H. 11 (Stations 3-5, combined), Titus County, Texas, 18 June 1998:

Big Cypress Bayou between the second pipeline downstream of U.S. 271 and S.H. 11 (Stations 3-5, combined)				
Species	N live	N shells	Condition	Percentage
Threeridge	0	0.5x2	very-long dead	5.0
Louisiana fatmucket	0	1.0	long dead	2.5
Yellow sandshell	11	4.0+0.5x1	very-recently dead - very-long dead	40.0
Washboard	0	2.0	long dead - very long dead	5.0
Bankclimber	0	1.0+0.5x1	very-long dead	5.0
Giant floater	2	4.0	relatively-recently dead - very-long dead	15.0
Mapleleaf sp.	0	1.0	very-long dead	2.5
Pistolgrip	0	3.0+0.5x1	long dead - very-long dead	10.0
Texas lilliput	2	1.0	relatively-recently dead	7.5
Tapered pondhorn	0	2.0	very-recently dead - relatively- recently dead	5.0
Pondhorn sp.	2	1.0	very-recently dead	2.5
Asian clam - present				

The section of Big Cypress Bayou from U.S. 271 to S.H. 11, was found to contain a small number of living mussels, but no large, established populations or beds were located. Indeed, except for a single pistolgrip (which does persist upriver below the Bob Sandlin Reservoir dam), all living specimens and recently dead shells were those of thin-shelled, fast-growing species which are more mobile and often the first to invade new areas. Even among these species, no were extremely large and none appeared to be old (based on small size, few growth-rest lines, and limited shell erosion). Large, heavy-shelled, slow-growing species were represented only by shells and valves which had been dead for extended periods of time (years, if not decades). No small juveniles of any unionids were found to suggest recent, successful reproduction.

It seems likely the original unionid assemblage was largely eliminated years ago in this portion of Big Cypress Bayou. Some thin-shelled, fast-growing unionids periodically reinvade the area from up- or down-stream, but even they do not remain long enough to become large, old adults. These individuals are eventually lost, only to be replaced again by new specimens.

Although HOH collections in 1996 failed to find bivalves at either the U.S. 271 or S.H. 11 locations, sampling efforts by TPWD in 1998 between these locations found only the 51 specimens and several Asian clams listed above and a small number of other unionid shells not retained. Reports of mussel beds along the entire reach could not be confirmed. Shortly after the 1998 collections, a staff writer for a local newspaper released an undated article reporting "Cypress Creek has an excess of mussels" and that the 18 June 1998 survey "gathered gallons of mussels to take back for further investigation" of "all life stages." None of these statements is correct.

Neches River

Lake Athens (Neches River drainage), boat ramp embayment area adjacent to the Texas Freshwater Fisheries Center (TFFC), Henderson County, Texas:

15 January 1998:

Casual shoreline examination produced a single relatively recent valve of Texas lilliput and several Asian clams.

21 May 1998: Wading and snorkeling this embayment produced:

Lake Athens, TFFC embayment				
Species	N live	N shells	Condition	Percentage
Pond mussel	4	1.0	recently dead	26.3
Giant floater	1	0.0	-	5.3
Texas lilliput	1	0.0	-	5.3
Paper pondshell	12	0.0	-	63.2
Asian clam - abundant				

Lake Athens, embayment at S.H. 317, Henderson County, Texas, 21 May 1998:

Wading and snorkeling this site produced only a small number of Asian clam shells and valves.

Trinity River

In 1998, the TPWD Inland Fisheries Management staff Fort Worth office examined a number of reservoirs in the Dallas-Fort Worth area and subsequently transported specimens collected to HOH for examination. Additionally, a volunteer from the Dallas area also examined four water bodies and also reported the results to HOH.

Lake Arlington, Tarrant County, Texas:

Lake Arlington, Site 1, mud bank at Arlington Lane Ramp, northeast corner of the reservoir, 16 September 1998; TPWD collection.

Species	N live	N shells	Condition	Percentage
Giant floater	0	1.0+0.5x2	recently dead	42.9
Southern mapleleaf	0	3.0+0.5x1	recently dead	57.1
Asian clam - present				

Lake Arlington, Site 2, northwest corner of the dam, 17 September 1998, TPWD collection.				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Bleufer	0	1.0	relatively-recently dead	5.9
Southern mapleleaf	0	8.0+0.5x5	very recently-dead - relatively-recently dead	76.4
Giant floater	0	1.0+0.5x2	very recently dead - recently dead	17.6
Asian clam - present				

Lake Arlington, Site 3, east shore north of the upper ramp at Pleasant Ridge Road, 17 September 1998, TPWD collection.				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Southern mapleleaf	0	3.0+0.5x9	recently dead - relatively long dead	100.0
Asian clam - present				

Lake Arlington was only examined once by HOH in 1993. Southern mapleleaves had been reported there by University of Texas-Arlington, but HOH found only Asian clams (the survey team sent could not dive). All unionids listed above are new records for this water body.

Benbrook Lake, Tarrant County, Texas:

Benbrook Lake, Site 1, Holiday Park near the Clear Fork Trinity River input, 16 September 1998, TPWD collection.				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Bleufer	0	0.5x1	recently dead	16.7
Southern mapleleaf	0	3.0+0.5x1	recently dead	66.7
Giant floater	0	0.5x1	recently dead	16.7

Benbrook Lake, Site 2, Benbrook Marina northeast corner of the reservoir, 16 September 1998, TPWD collection.				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Bleufer	0	1.0+0.5x1	relatively-recently dead	25.0
Southern mapleleaf	0	3.0+0.5x3	very-recently dead - relatively-recently dead	75.0
Asian clam - present				

Benbrook Lake, Site 3, rocky shore east side of the reservoir near boat ramps, 16 September 1998, TPWD collection.				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Southern mapleleaf	0	1.0	recently dead	50.0
Giant floater	0	1.0	recently dead	50.0
Asian clam - present				

This reservoir had not been sampled by HOH.

Eagle Mountain Reservoir, Tarrant County, Texas:

Eagle Mountain Reservoir, Site 1, south side of the reservoir east of Ten Mile Bridge Road, 16 September 1998, TPWD collection.

Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	0	0.5x8	very-long dead	38.1
Yellow sandshell	0	0.5x3	subfossil	14.3
Fragile papershell	0	1.0	very-recently dead	4.8
Bleufer	0	0.5x1	relatively-long dead	4.8
Giant floater	0	2.0	recently dead - long dead	9.5
Pimpleback sp.	0	1.0+0.5x5	relatively-recently dead - very-long dead	28.6

Eagle Mountain Lake, Site 2, Old Ranch Slough eastcentral side of the reservoir, 16 September 1998, TPWD collection.

Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	0	2.0+0.5x17	recently dead - subfossil	51.4
Yellow sandshell	0	0.5x11	relatively-recently dead - subfossil	29.7
Bleufer	0	0.5x1	relatively-recently dead	2.7
Giant floater	0	2.0+0.5x1	recently dead	8.1
Pimpleback sp.	0	2.0	recently dead	5.4
Deertoe	0	0.5x1	very-long dead	2.7

Eagle Mountain Lake, Site 3, Indian Creek northeast corner of the reservoir, 16 September 1998, TPWD collection.

Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	0	0.5x2	very-long dead	28.6
Yellow sandshell	0	0.5x2	long dead	28.6
Bleufer	0	0.5x1	very-long dead	14.3
Giant floater	0	1.0	very-long dead	14.3
Paper pondshell	0	1.0	recently dead	14.3

Eagle Mountain Reservoir was examined briefly in 1992, 1993, and 1994 by HOH. Similar species composition was found. The pimplebacks in the upper Trinity River Drainage are taxonomically problematic and will require additional genetic analysis to fully understand their identity.

Lake Grapevine, Tarrant County, Texas:

Lake Grapevine, Site 1, Dove Road boat ramp southeast corner of the reservoir, 17 September 1998, TPWD collection.

Species	N live	N shells	Condition	Percentage
Louisiana fatmucket	0	0.5x1	relatively-recently dead	50.0
Pimpleback sp.	0	1.0	recently dead	50.0
Asian clam - present				

Lake Grapevine, Site 2, south shore of the reservoir north of S.H. 26 and west of Location 1, 17 September 1998, TPWD collection.

Species	N live	N shells	Condition	Percentage
Threeridge	0	1.0	recently dead	2.9
Louisiana fatmucket	0	2.0+0.5x2	relatively- recently dead - long dead	11.8
Texas heelsplitter?	1	1.0	recently dead	2.9
Giant floater	0	3.0	recently dead	8.8
Southern mapleleaf	0	20.0+0.5x4	recently dead - relatively-recently dead	70.6
Paper pondshell	0	1.0	recently dead	2.9
Asian clam - present				

Lake Grapevine, Site 3, Marshall Park southwest corner of the reservoir near Denton Creek input, 17 September 1998, TPWD collection.

Species	N live	N shells	Condition	Percentage
Fragile papershell	0	2.0+0.5x1	very-recently dead	33.3
Giant floater	0	6.0	very-recently dead - very-long dead	66.7

Lake Grapevine was only examined once by HOH in 1994. Species composition was similar then but did not include fragile papershell or the two specimens which may be rare, endemic Texas heelsplitters (pink papershell can be confused with this species and is known from Eagle Mountain Reservoir and elsewhere in the area); only about 250 specimens have been documented since 1898 when it was described.

Lake Ray Hubbard, Rockwall County, Texas:

Lake Ray Hubbard, Site 1, east bank of the reservoir midway between S.H. 66 and U.S. 30 bridges, 10 October 1998, TPWD collection.

Species	N live	N shells	Condition	Percentage
Fragile papershell	0	1.0+0.5x2	relatively-recently dead	27.3
Giant floater	0	0.5x1	relatively-recently dead	9.1
Southern mapleleaf	0	2.0+0.5x5	relatively-recently dead	63.6
Asian clam - present				

Lake Ray Hubbard, Site 2, southwest corner of the reservoir between the power plant and the dam, 10 October 1998, TPWD collection.

Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threehorn wartyback	0	0.5x5	very-recently dead - relatively-recently dead	55.6
Southern mapleleaf	0	0.5x4	very-recently dead - relatively-recently dead	44.4
Asian clam - present				

This reservoir had not been sampled by HOH.

Mountain Creek Lake, boat ramp area east-central side of the reservoir, Trinity River Drainage, Dallas County, Texas, 16 September 1998, TPWD collection:

Examination of this reservoir produced only Asian clams..

North Lake, Dallas County, Texas:

North Lake, Site 1, mud flat near power plant northwest corner of the reservoir, 15 September 1998, TPWD collection.

Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Louisiana fatmucket	0	1.0	relatively-recently dead	12.5
Threehorn wartyback	0	1.0	recently dead	12.5
Bleufer	0	3.0+0.5x1	very-recently dead	50.0
Southern mapleleaf	0	2.0	very-recently dead	25.0

North Lake, Site 2, sandbar near boat ramp west side of the reservoir, 15 September 1998, TPWD collection.

Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Louisiana fatmucket	0	5.0+0.5x8	recently dead - very long dead	72.2
Threehorn wartyback	0	1.0	recently dead	5.6
Bleufer	0	2.0+0.5x1	recently dead - relatively-long dead	16.7
Giant floater	0	0.5x1	relatively-long dead	5.6
Asian clam - present				

North Lake, Site 3, far end of the dam near Pavilion, 15 September 1998, TPWD collection.

Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Rock-pocketbook	0	0.5x1	very-recently dead	12.5
Louisiana fatmucket	0	1.0	very-recently dead	12.5
Threehorn wartyback	0	2.0	very-recently dead	25.0
Bleufer	0	3.0	relatively-long dead	37.5
Giant floater	0	0.5x1	relatively-recently dead	12.5
Asian clam - present				

A single brief shoreline examination here in 1995 produced only Asian clams. All specimens above are new waterbody records. Rock-pocketbook has not been reported in Dallas County since before 1931 and

not from the general area in over 25 years. Threehorn wartyback likewise has not been reported from the area since before 1931.

Joe Pool Lake, (1) Lynn Creek Park area, (2) Britton Park near Mountain Creek input, and (3) Cedar Hill State Park area (samples combined), Tarrant and Ellis counties, Texas, 16 September 1998, TPWD collection:

Joe Pool Lake (exact site not stated)				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Giant floater	1	0.0	-	100.0
Asian clam - present at all three locations				

This reservoir has not been previously surveyed by HOH.

Lake Worth, Tarrant County, Texas:

Lake Worth, Site 1, mid-reservoir island shoreline, 16 September 1998, TPWD collection.				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	0	3.0+0.5x8	recently dead - long dead	91.7
Giant floater	0	1.0	recently dead	8.3

Lake Worth, Site 2, southeast shoreline off Joint Reserve Base Runway, 16 September 1998, TPWD collection.				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	0	0.5x2	long dead	50.0
Unidentified	0	0.5x2	recently dead	50.0
Asian clam - present				

Lake Worth was only examined once by HOH in 1994 when a similar species composition was found. The two unidentified specimens may be atypical yellow sandshells or Texas lilliputs, but will require closer examination.

White Rock Lake, north shore between creek and sailing club, Dallas County, Texas, 5 August 1998, volunteer collection (random area search over 2 hours):

White Rock Lake				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	0	38.0	recently dead	16.5
Louisiana fatmucket	2	9.0	very-recently dead	4.8
Fragile papershell	1	21.0	very-recently dead	9.5
Giant floater	4	63.0	very-recently dead	29.0
Southern mapleleaf	0	67.0	recently dead	29.0
Texas lilliput	4	10.0	very-recently dead	4.3
Paper pondshell	0	16.0	very-recently dead	6.9
Asian clam - present in limited numbers only				

Lake Lewisville at Lake Dallas boat ramp near U.S. 35, Denton County, Texas, 21 September 1998, volunteer collection:
 A random area search of 274 m produced the following specimens during a drought-related low-water period:

Lake Lewisville at Lake Dallas boat ramp				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	2	23.0	recently dead	22.3
Louisiana fatmucket	2	3.0+0.5x1	recently dead	5.4
Yellow sandshell	2	3.0	recently dead	4.5
Fragile papershell	1	7.0	recently dead	7.1
Pink papershell	0	1.0	relatively-recently dead	0.9
Bleufer	0	2.0+0.5x1	long dead	2.7
Giant floater	5	many	-	5.4
Southern mapleleaf	6	32.0	recently dead	33.9
Pimpleback spp.	0	7.0	recently dead	6.3
Lilliput	2	0.0	-	1.8
Deertoe	0	0.5x1	recently dead	0.9
Paper pondshell	1	5.0	recently dead	5.4
Asian clam - present (common)				

Juvenile specimens were included among the living specimens of threeridge and southern mapleleaf observed.

Lake Lewisville at Little Elm Reservoir, Denton County, Texas 30 September 1998, volunteer collection:
 A random area search of 366 m over 2 hours during a drought-related low-water period produced the following specimens:

Lake Lewisville at Little Elm Reservoir				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Yellow sandshell	1	1.0	long dead	4.7
Bleufer	4	1.0	recently dead	11.6
Giant floater	5+	12.0+	recently dead	16.3
Southern mapleleaf	3+	3.0+	recently dead	14.0
Paper pondshell	3	4.0	recently dead	16.3
Lilliput	6	0.0	-	14.0

No Asian clams were noted at this location.

Cedar Creek Reservoir at Payne Springs, Henderson County, Texas 16 October 1998, volunteer collection:
 A random area search of one hour produced the following specimens:

Cedar Creek Reservoir at Payne Springs				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Yellow sandshell	0	1.0+0.5x2	long dead	5.1
Giant floater	0	15.0	recently dead	25.4
Southern mapleleaf	0	22.0+0.5x19	recently dead	69.5
Asian clam - abundant				

Trinity River upstream of Lake Livingston, Trinity County, Texas, 28 January 1998:

The following specimens were found during other fisheries research in the area:

Trinity River upstream of Lake Livingston				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Threeridge	0	0.5x1	long dead	33.3
Pink papershell	0	0.5x1	long dead	33.3
Texas lilliput	0	0.5x1	long dead	33.3

Brazos River

Nelson Park Lake adjacent to the Abilene Zoo (Brazos River drainage), Taylor County, Texas, 8 July 1998:

Texas Natural Resources Conservation Commission (TNRCC) obtained five living giant floaters and observed dead specimens at this site during their investigation of a mussel kill which had been ongoing for about 30 days. These specimens were sent to HOH for examination.

Lake Abilene, Taylor County, Texas, 29 July 1998:

Volunteers examined shoreline areas and shallow waters but found only Asian clams at this site.

Fort Phantom Hill Reservoir, Jones County, Texas, 29 July 1998:

Volunteers found living specimens of Tampico pearlymussel, southern mapleleaf, giant floater, pistolgrip, and Asian clams when shoreline and shallow-water areas were examined. This pistolgrip population, which was previously unknown, included juveniles and is much further upstream than this species had been documented (Howells 1998b).

Squaw Creek Reservoir, Squaw Creek Park, 2300 Coats Road, Hood and Somervell counties, Texas, 2 November 1998:

Volunteers using SCUBA examined depths of 3.0-12.7 m and reported the following specimens:

Squaw Creek Reservoir				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Fragile papershell	0	0.5x1	-	100.0
Asian clam - abundant				

An earlier attempt by HOH to survey this nuclear power plant cooling water reservoir was thwarted when a gate clerk refused to allow TPWD personnel access to the reservoir. This current data is our first information on bivalves in Squaw Creek Reservoir.

Lake Granbury, west bank at the dam at the Brazos River Authority office, 32°20'16.25"N, 97°41'15.47"W, Hood County, Texas, 25 August 1997:

Random area searches by Brazos River Authority (BRA) personnel produced only an abundance of Asian clam shells.

Brazos River at S.H. 174 (Kimble Bend Park) upstream of Lake Whitney, Bosque County, Texas, 27 August 1998:

A random shoreline search by BRA personnel found the following specimens:

Brazos River at S.H. 174				
Species	N live	N shells	Condition	Percentage
Yellow sandshell	0	1.0	very-recently dead	25.0
Fragile papershell	0	1.0	recently dead	25.0
Pink papershell	0	1.0	very-recently dead	25.0
Lilliput	0	1.0	relatively recent	25.0

Lake Whitney, Bosque County, Texas, two dates:

9 August 1998:

A volunteer using SCUBA to examine waters to depths of 24 m found only Asian clams, both living and shells, at 3-12 m, but found none at 24 m..

15 August 1998:

Volunteers using SCUBA examined areas at depths of 3.0-11 m at SCUBA Park and found:

Lake Whitney, SCUBA Park				
Species	N live	N shells	Condition	Percentage
Fragile papershell	0	3.0	recently dead - long dead	100.0
Asian clam - shells abundant				

Tehuacana Creek just downstream of the Union Pacific Railroad crossing south of S.H. 6 east-southeast of Waco, 31°31.64'N, 92° 01.91'W, McLennan County, Texas, 1 September 1998:

Random shoreline searches by BRA personnel located only an abundance of Asian clam shells.

Brazos River at Loop 340 southeast of Waco, 31°32.37'N, 97°4.67'W, Falls County, Texas, 1 September 1998:

Random area searches by BRA personnel found no bivalves.

Brazos River at S.H. 7 west of Marlin, 31°17.29'N, 96°58.13'W, Falls County, Texas, 1 September 1998:

Random area searches by BRA personnel found no bivalves.

Deer Creek at S.H. 320, 31°16'43.2"N, 96°58'41.4"W, west of Marlin and upstream of the confluence with the Brazos River, Falls County, Texas, 3 September 1998:

Random shoreline searches by personnel with the BRA produced:

Deer Creek at S.H. 320				
Species	N live	N shells	Condition	Percentage
Yellow sandshell	0	3.0	relatively-recently dead	50.0
Bleufer	0	0.5x3	long dead - very-long dead	50.0
Asian clam - abundant				

Brazos River at S.H. 413, 31°08.03'N, 96°49.67'W, east of Rosebud, Falls County, Texas, 1 September 1998:

Random shoreline searches by personnel with the BRA produced:

Deer Creek at S.H. 320				
Species	N live	N shells	Condition	Percentage
Yellow sandshell	0	0.5x1	relatively-recently dead	50.0
Bluefer	0	0.5x1	very-long dead	50.0

Hubbard City Lake 1, Hill County, Texas, two dates:

22 April 1998:

A single relatively-recently dead Texas lilliput was found during other research at this site.

18 August 1998:

A single relatively long dead paper pondshell was found during other research at this site.

Hubbard City Lake 2, Hill County, Texas, 22 April 1998:

A single recently dead giant floater was found during other research at this site.

Hubbard City Lake 3, Hill County, Texas, 22 April 1998:

The following specimens were found following a recent dam breach at this site:

Hubbard City Lake 3				
Species	N live	N shells	Condition	Percentage
Texas lilliput	0	2.0	relatively-recently dead	16.7
Paper pondshell	2	8.0	very-recently dead - relatively-recently dead	83.3

Fryers Creek at U.S. 190, 31°04.23'N, 97°21.36'W, Temple, Bell County, Texas, 17 August 1998:

A shoreline search of this highly-developed area by BRA personnel found dense weed growths; no bivalves were found.

Bird Creek north of S.H. 36, 31°05.28'N, 97°23.14'W, Temple, Bell County, Texas, 17 August 1998:

A shoreline search of this highly-developed area by BRA personnel found dense weed growths; no bivalves were found.

Bird Creek south of S.H. 36, 31°04.42'N, 97°22.69'W, Temple, Bell County, Texas, 17 August 1998:

A shoreline search of this highly-developed area by BRA personnel found dense weed growths; no bivalves were found.

Walnut Creek at S.H. 6 (Little Brazos River drainage), 31°00.59'N, 96°42.14'W, north of Hearne, Robertson County, Texas, 1 September 1998:

Random shoreline searches by personnel with the BRA found no bivalves.

Mud Creek at S.H. 6 (Little Brazos River drainage), 96°38.8'W, 30°56.81'N, north of Hearne, Robertson County, Texas, 1 September 1998:

Random shoreline searches by personnel with the BRA found no bivalves.

Brazos River at U.S. 79, 30°49.59'N, 96°39.08'W, west of Hearne, Robertson County, Texas, Texas, 1 September 1998:

Random shoreline searches by personnel with the BRA found no bivalves.

Little Brazos River at S.H. 21, 30°33'47.4"N, 96°31'13.8"W), just upstream of the confluence with the Brazos River, Brazos County, Texas, 17 September 1998:

Only Asian clams were observed during a shoreline examination by BRA personnel.

Sulphur Creek (Lampasas River tributary) at C.R. 8 and east of Lampasas, 31°05'03.96"N, 98°02'58.2"W, Lampasas County, Texas, 10 August 1998:

Random shoreline searches by BRA personnel found only abundant Asian clam shell.

Lampasas River at C.R. 2313, 31°07'06.0"N, 98°03'24.6"W, Lampasas County, Texas, 10 August 1998:

Random shoreline searches by BRA personnel found only abundant Asian clam shell.

Rocky Creek at S.H. 963 northeast of Burnet, 31°07'06.0"N, 97°55'36.6"W, Burnet County, Texas, 10 August 1998:

Random shoreline searches by BRA personnel produced no bivalves or their shells.

Yeagua Creek at S.H. 50, 30°22'06.6"N, 96°20'31.02"W, Burleson County, Texas, 20 August 1998:

Random shoreline searches by personnel with the BRA produced:

Yeagua Creek at S.H. 50				
Species	N live	N shells	Condition	Percentage
Yellow sandshell	0	0.5x1	relatively-recently dead	20.0
Fragile papershell	0	0.5x3	relatively-recently dead	60.0
Southern mapleleaf	0	1.0	recently dead	20.0
Asian clam - present				

Tesch's Branch, 29°38'22.2"N, 96°4'56.4"W, Austin County, Texas, 30 July 1998:

A random area search by BRA personnel produced:

Tesch's Branch				
Species	N live	N shells	Condition	Percentage
Texas lilliput	0	0.5x3	very-long dead	75.0
Tapered pondhorn	0	1.0	long dead	25.0

Beason Creek southeast of Courteny and east of the Brazos River, 30°15.31', 96°03.13', Grimes County, Texas, 23 July 1998:

A random area search by BRA personnel produced:

Beason Creek				
Species	N live	N shells	Condition	Percentage
Threeridge	0	0.5x1	relatively-recently dead	50.0
Southern mapleleaf	0	1.0	recently dead	50.0

Harris Reservoir (Brazos River drainage), Brazoria County, Texas, 3 February 1998:

A volunteer found the following specimens at this impoundment:

Harris Reservoir Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Round pearlshell	20	present	relatively-recently dead - long dead	45.6
Texas lilliput	12	present	relatively-recently dead - long dead	27.9
Paper pondshell	11	present	relatively-recently dead - long dead	25.6
Asian Clam - present				

Colorado River

Twin Buttes Reservoir (Concho River drainage), South Pool, Tom Green County, Texas, 16 August 1998:
Brief examination of exposed bottom areas during a partial drawdown produced two relatively recently dead Tampico pearlymussels.

Twin Buttes Reservoir (Concho River drainage), North Pool (two sites combined), Tom Green County, Texas, 12 August 1998:
Examination of exposed bottom areas from both west- and east-side access points produced only two living Tampico pearlymussels.

Concho River at S.H. 381 south-southwest of Lowake and upstream (west) of Paint Rock, Concho County, Texas, 11 August 1998:
Examination of shallow waters, gravel bars, and exposed bedrock runs following flood conditions 1-2 weeks earlier produced:

Concho River at S.H. 381 Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Bleufer	8	2.0	very-recently dead	16.7
Southern mapleleaf	0	2.0	very-recently dead	3.3
Texas pimpleback	15	33.0	very-recently dead	80.0
Asian clam - present				

Concho River, low-water crossing downstream from Paint Rock to about 2 km downstream, Concho County, Texas, 11 August 1998:
Examination of shallow waters, gravel bars, and exposed bedrock runs following flood conditions 1-2 weeks earlier produced:

Concho River downstream from Paint Rock Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Tampico pearlymussel	1	4.0	very-recently dead	8.7
Fragile papershell	4	12.0+0.5x1	very-recently dead	37.0
Bleufer	2	8.0+0.5x1	very-recently dead	23.9
Southern mapleleaf	0	4.0+0.5x1	very-recently dead	10.9

Texas pimpleback	0	6.0+0.5x2	very-recently dead	17.4
Pondhorn sp.	0	1.0	relatively-recently dead	2.2
Asian clams - abundant				

Colorado City Reservoir (Colorado River drainage), Mitchell County, Texas, 29 July 1998:

Volunteers examining shorezone and shallow-water areas found only giant floaters and Asian clams.

Champion Creek Reservoir (Colorado River drainage), Mitchell County, Texas, 29 July 1998:

Volunteers examining shorezone and shallow-water areas found only giant floaters and Asian clams.

Oak Creek Reservoir (Colorado River drainage), Coke County, 19 June 1998:

Volunteers examining shoreline and shallow-water areas found only a single Asian clam valve; however, local residents reported the reservoir had been completely dry several months earlier.

Inks Lake (Colorado River drainage), east shore adjacent to the golf course, Burnet County, Texas, 13 February 1998:

Examination of exposed bottoms and shallow waters during a partial drawdown produced:

Inks Lake				
Species	N live	N shells	Condition	Percentage
Threeridge	3	13.0	very-recently dead - long dead	32.0
Tampico pearlymussel	7	1.0+	relatively-long dead - long dead	16.0
Bleufer	0	1.0+	long dead	0.2
Giant floater	1	2.0	very recently dead - long dead	0.2
Southern mapleleaf	10	5.0+0.5x2	recently dead - long dead	34.0
Smooth pimpleback	0	3.0+0.5x2	long dead	10.0
Asian clam - relatively abundant				

Pedernales River, Fredericksberg-Tivvydale Road 12.7 km southeast of Harper, Gillespie County, Texas, 16 May 1998:

HOH staff found four subfossil valve fragments of Texas fatmucket at this site. This is the farthest upstream this species has been documented in this river (where the species has not been seen alive since at least 1978).

Lake Travis, the Narrows at the Spicewood boat ramp, Burnet County, Texas, two dates:

9 July 1998:

Exposed bottoms, shorelines, and shallows were examined briefly to evaluate this site for future volunteer training. The following were found:

Lake Travis, the Narrows				
Species	N live	N shells	Condition	Percentage
Tampico pearlymussel	0	0.5x1 (fragment)	subfossil	2.3
Fragile papershell	0	1.0+0.5x1	recently dead	4.7
Bleufer	0	4.0	recently dead	9.3
Giant floater	0	24.0+0.5x11	recently dead - very-recently dead	81.4
Paper pondshell	0	0.5x1	recently dead	2.3
Asian clam - present				

28 July 1998:

A group of Texas Mussel Watch volunteers was taken to this location for field training. A number of living and dead specimens were located and released without being counted. The following numbers represent only those dead specimens which were retained.

Lake Travis, the Narrows Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Tampico pearlymussel	0	3.0+0.5x1	long dead - very-long dead	7.5
Fragile papershell	live	4.0	relatively-recently dead - long dead	7.5
Southern mapleleaf	0	4.0+0.5x4	relatively-recently dead - long dead	15.1
Bleufer	live	9.0+0.5x12	relatively-recently dead - long dead	39.6
Giant floater	live	13.0+0.5x2	very-recently dead - long dead	26.4
Paper pondshell	0	2.0	recently dead	3.8
Asian clams - present				

Lake Travis, Broads Scuba Park on the east side of the lower reservoir, Travis County, Texas, two dates:

2 August 1998

A volunteer examining this site with SCUBA at depths of 3.0-14.6 m found only Asian clams (two living and 32 valves).

30 October 1998:

Four volunteer divers used SCUBA to examine one 2-x 2-m each at 22.5 m depths. One very-long dead Tampico pearlymussel shell and three small Asian clams (also dead) were the only bivalves found.

Lake Austin, Emma Long Park, Travis County, Texas, 9 July 1998:

Shorelines and shallow areas were examined as were bottoms to about 3 m, but only Asian clams were found. Waters here are very cold and clear due to local spring input and releases from Lake Travis upstream. Additionally, algae and macrophytes cover virtually the entire substrate and eliminate most potential mussel habitat.

Giddings State School Lake, Lee County, Texas, two dates:

29 April 1998:

During other research at this site, seven living tapered pondhorns were collected. Shells of giant floater, Texas lilliput, and paper pondshells were observed but not collected.

20 August 1998:

Giddings State School Lake Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Pond mussel	0	3.0	recently dead	16.7
Texas lilliput	0	5.0+0.5x5	recently dead - relatively- long dead	55.6
Tapered pondhorn	0	2.0+0.5x1	recently dead - very long dead	16.7
Paper pondshell	0	1.0+0.5x1	recently dead	11.1

11 June 1998:

Giddings State School Lake				
Species	N live	N shells	Condition	Percentage
Pond mussel	0	1.0	recently dead	14.3
Texas lilliput	0	5.0	recently dead	71.4
Paper pondshell	0	1.0	recently dead	14.3

Unnamed Colorado River tributary southeast of South Bay City, Matagorda County, Texas, 8 April 1998 (Nelson et al. 1998): Personnel from Ecological Specialists, Inc. (an environmental consulting firm), St. Peters, Missouri, examined this area and subsequently sent specimens to HOH for examination.

Unnamed Colorado River tributary, Matagorda County, Texas				
Species	N live	N shells	Condition	Percentage
Tampico pearlymussel	0	0.5x2	subfossil	11.1
Yellow sandshell	0	0.5x3	subfossil	16.7
Fragile papershell	0	0.5x1	very-long dead	5.6
Bleufer	0	0.5x3	subfossil	16.7
Giant floater	0	0.5x1	subfossil	5.6
Texas lilliput	1	5.0+0.5x3	recently dead	44.4
Unidentified fragments	0	fragments	recently dead - subfossil	-
Asian clam - present				

Colorado River, bank south of South Bay City, Matagorda County, Texas, 8 April 1998 (Nelson et al. 1998): Personnel from Ecological Specialists, Inc. (an environmental consulting firm), St. Peters, Missouri, examined this area and subsequently sent specimens to HOH for examination. At this location, one valve from Atlantic rangia *Rangia cuneata* and an unidentified fragment were found.

Guadalupe River

Guadalupe River at the downstream base of the UGRA dam, Kerr County, Texas, 5 June 1998:

Because living Texas fatmuckets and recently-dead golden orbs had been found previously at this site, it was examined again by snorkeling the pool and spillway areas at the base of the dam. However, the entire substrate was found to be either bedrock or scoured cobble with no evidence of habitat for these unionids.

Guadalupe River, Hays Park between Lemos Street and S.H. 16, Kerrville, Texas, several dates:

Lowering of water level in this section of river to facilitate park bridge construction exposed river banks where unionids were subsequently located in random area searches.

5 June 1998:

Only Asian clam was found on exposed bottom and in shallow areas.

17 June 1998:

Guadalupe River, Hays Park, Kerrville				
Species	N live	N shells	Condition	Percentage
Texas fatmucket	0	1.0+0.5x1	very-recently dead	66.7
Golden orb	0	1.0	very-recently dead	33.3
Asian clam - present				

18-19 June 1998:

Guadalupe River, Hays Park, Kerrville				
Species	N live	N shells	Condition	Percentage
Texas fatmucket	0	16.0+0.5x2	very-recently dead	43.9
Texas lilliput	0	27.0+0.5x5	very-recently dead	53.7
Paper pondshell	0	0.5x1	recently dead	2.4
Asian clam - present				

Water levels in this stretch of river were lowered to facilitate construction of a small bridge in Hays Park. Rare endemic Texas fatmuckets and golden orbs, as well as the more common and widely distributed Texas lilliputs and paper pondshells, had been found in previous years just downstream of the UGRA dam about 1 km upstream from this site, but it was not previously apparent that these species extended this far downstream. None of these taxa at this site appeared to survive this drawdown. Hopefully, fish infected with glochidia from these species or survivors upstream will allow this site to be reinvaded when water levels return to normal. Texas fatmuckets at this site were found embedded in steep banks between bald cypress (*Taxodium*) roots adjacent to deep waters (1.5-4 m).

Nueces - Frio Rivers

Comanche Creek at Comanche Lake headwaters (Nueces River drainage) at C.R. 393, Zavala County, Texas, 4 June 1998:

Several yellow sandshells and giant floaters were collected by TPWD Resource Protection staff on exposed bottoms during a low-water period (suggesting these species could persist in Comanche Lake downstream).

Lake Nueces at Cooksey Park, Camp Wood, Real County, Texas, 26 June 1998:

Examination of this impoundment by two divers using SCUBA produced no bivalves despite local residents having reported seeing shells in past years.

Lake Corpus Christi, S.H. 888, Live Oak County, Texas, 2 May 1998:

Examination of this site by wading and snorkeling with the assistance of several volunteers produced only long dead valves of Tampico pearlymussel, bleufer, and Asian clam. Drought conditions at this reservoir in 1996 were so severe that living mussels probably moved toward the river channel in the central portions of the reservoir and high water conditions at the time of this examination had only recently covered areas which had been dry for many months before.

Baffin Bay Drainage

Lake Alice, Jim Wells County, Texas, 28-29 April 1998:

During other research at this site, fragments of Tampico pearlymussel and Asian clam were found on exposed shorelines. Neck (1987) previously reported this unionid at this impoundment and suggested it may have been an introduced, bait-bucket release.

Rio Grande

Rio Grande, Colorado Canyon access point 37 km upstream of Lajitas, Presidio County, Texas, 15 August 1998:

Shorelines, gravel and sand bars, and shallows were examined by wading and deeper areas were snorkeled. No evidence of any bivalves was found.

Rio Grande, Maderas Canyon Access 17.9 km upstream of Lajitas, Presidio County, Texas, 15 August 1998:

Shorelines, gravel and sand bars, and shallows were examined by wading and deeper areas were snorkeled. No evidence of any bivalves was found.

Rio Grande, Grassy Banks access point 17.4 km upstream of Lajitas, Presidio County, Texas, 15 August 1998:

Shorelines, gravel and sand bars, and shallows were examined by wading and deeper areas were snorkeled. No evidence of any bivalves was found.

Rio Grande at Santa Elena canoe takeout about 12.9 km upstream from Castolon, Big Bend National Park (BBNP) Brewster County, Texas, 14 August 1998:

Shorelines, gravel and sand bars, and shallows were examined, but no evidence of bivalves was found.

Rio Grande at Castolon camp grounds, BBNP, Brewster County, Texas, 14 August 1998:

Shorelines, gravel and sand bars, and shallows were examined, but no evidence of any bivalves was found.

Rio Grande at Santa Elena Crossing, Castolon, BBNP, Brewster County, Texas, 14 August 1998:

Shorelines, gravel and sand bars, and shallows were examined. Only two valves from Asian clams were found.

Areas of the Rio Grande between Colorado Canyon (Big Bend Ranch area) downstream to Santa Elena Crossing (BBNP) show signs of severe scouring. Even areas which appear to be good unionid habitat, generally lack Asian clams and snails as well as unionids, suggesting these substrates are recent in nature and probably replaced or modified with each significant rainfall. Santa Elena Canyon itself was not surveyed, but drift areas immediately below the canyon, contained no evidence of bivalves.

Rio Grande at Rio Grande Village, BBNP, Brewster County, Texas, 31 March and 1 May 1998:

Examination of sand and gravel bars, banks, and shallows as well as snorkeling deeper pools produced only a small number of Asian clam valves.

Rio Grande just upstream of Boquillas Crossing, BBNP, Brewster County, Texas 1 May 1998:

Examination of sand and gravel bars, banks, and shallows as well as snorkeling deeper pools produced only a small number of Asian clam valves.

Rio Grande at La Linda at S.H. 2627, rkm (river kilometer) 1140, 29° 44' 17" N, 102° 57' 16" W, Brewster County, Texas, 28 February 1998:

Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande at Horse Canyon, rkm 1137, Brewster County, Texas, 28 February 1998:

Examination of bars, banks, and shallows produced only Asian clams.

- Rio Grande at Maravillas, rkm 1123, Brewster County, Texas, 28 February 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande at Maravillas Ridge, rkm 1123, Brewster County, Texas, 1 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande at El Sombrero (Castle Buttes), rkm 1115, Brewster County, Texas, 1 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande downstream of El Sombrero, rkm 1115, 29°37'38"N, 102°44'25"W, Brewster County, Texas, 1 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, creek mouth on the Mexican side opposite Black Gap Shelters 19-20, rkm 1112, Brewster County, Texas, 1 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, El Recodo Creek (Mexican side), rkm 1094, Brewster County, Texas, 1 March 1998:
Examination of bars, banks, and shallows produced only Asian clams and one long-dead valve from Tampico pearl mussel.
- Rio Grande, 2.2 km upstream of Oso Canyon, rkm 1092, 29°44'17"N, 102°37'16"W, Brewster County, Texas, 2 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, Oso Canyon (Bear Canyon), rkm 1090, Brewster County, Texas, 2 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, La Yegua Creek (Mexican side), rkm 1089, Brewster County, Texas, 2 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, hot springs (Mexican side) opposite Silber Canyon, rkm 1984, Brewster County, Texas, 2 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, downstream of hot springs, rkm 1081, Brewster County, Texas, 2 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, upstream of Bullis Gap, rkm 1075, 29°45'15"N, 102°32'08"W, Brewster County, Texas, 3 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.
- Rio Grande, Bullis Fold (Dean Canyon), rkm 1075, 29°46'59"N, 102°32'03"W, Brewster County, Texas, 3 March 1998:
Examination of bars, banks, and shallows produced:

Rio Grande, Bullis Fold				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Texas hornshell	0	1.0	recently dead	25.0
Texas hornshell	0	0.5x1	long dead	25.0
Salina mucket	0	1.0	relatively-recently dead	25.0
Salina mucket	0	0.5x1	long dead	25.0
Asian clam - present				

Rio Grande, 2.93 km upstream of Rodeo Rapids, rkm 1069, Brewster County, Texas, 3 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, 1.47 km downstream of Rodeo Rapids, rkm 1065, Brewster County, Texas, 3 March 1998:
Examination of bars, banks, and shallows produced:

Rio Grande, downstream of Rodeo Rapids				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Salina mucket	0	0.5x1	relatively-recently dead	50.0
Salina mucket	0	0.5x1	long dead	50.0
Asian clam - present				

Rio Grande, Mal Paso Creek (Mexican side), rkm 1065, 29°45'57"N, 102°24'41"W, Brewster County, Texas, 4 March 1998:

Rio Grande, Mal Paso Creek				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Texas hornshell	0	1.0	recently dead	100.0
Asian clam - present				

Rio Grande, between Upper and Lower Madison Rapids, rkm 1058, Brewster County, Texas, 4 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, downstream of Lower Madison Rapids, rkm 1055, Brewster County, Texas, 4 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, downstream of Panther Canyon, rkm 1050, Brewster County, Texas, 4 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, 2.93 km upstream of San Francisco Creek, rkm 1047, Brewster County, Texas, 4 March 1998:
Examination of bars, banks, and shallows produced:

Rio Grande, 2.93 km upstream of San Francisco Creek				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Texas hornshell	0	1.0	recently dead	12.5
Salina mucket	0	4.0	recently dead	50.0
Salina mucket	0	0.5x3	long dead	37.5
Asian clam - present				

Rio Grande, Mexican side opposite San Francisco Canyon, rkm 1043, 29°52'45"N, 102°19'13"W, Brewster County, Texas, 4 March 1998:
Examination of bars, banks, and shallows produced:

Rio Grande, Mexican side opposite San Francisco Canyon				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Salina mucket	0	0.5x1	recently dead	100.0
Asian clam - present				

Rio Grande, mouth of San Francisco Canyon, rkm 1043, 29° 52'45"N, 102° 19'13"W, Brewster County, Texas, 5 March 1998:

Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, 2.2 km downstream of San Francisco Creek, rkm 1041, Terrell County, Texas, 5 March 1998:

Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, 4.4 km downstream of San Francisco Creek, rkm 1039, Terrell County, Texas, 5 March 1998:

Examination of bars, banks, and shallows produced:

Rio Grande, 4.4 km downstream of San Francisco Creek				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Salina mucket	0	1.0+0.5x2	recently dead	100.0
Asian clam - present				

Rio Grande, Los Pomas Creek (Mexico), rkm 1036, 29° 52'45"N, 102° 16'41"W, Terrell County, Texas, 5 March 1998:

Examination of bars, banks, and shallows produced:

Rio Grande, Los Pomas Creek				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Salina mucket	0	0.5x1	recently dead	50.0
Salina mucket	0	0.5x1	long dead	50.0
Asian clam - present				

Rio Grande, island adjacent to Los Pomas Creek, rkm 1036, 29° 52'45"N, 102° 15'52"W, Terrell County, Texas 5 March 1998:

Rio Grande, island adjacent to Los Pomas Creek				
Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Salina mucket	0	0.5x1	very long dead	100.0
Asian clam - present				

Rio Grande, downstream of Los Pomas Creek, rkm 1033, 29° 50'52"N, 102° 14'38"W, Terrell County, Texas, 5 March 1998:

Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, Middle Watering Beach (Mexican side), rkm 1030, 29° 50'49"N, 102° 14'28"W, Terrell County, Texas, 6 March 1998:

Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, Paso Colorado (Mexico), rkm 1027, 29°50'23"N, 102°12'12"W, Terrell County, Texas, 6 March 1988:
Examination of bars, banks, and shallows produced:

Rio Grande, Paso Colorado Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Texas hornshell	0	0.5x1	subfossil	100.0
Asian clam - present				

Rio Grande, Dryden Crossing at John's Marina, rkm 1017, Terrell County, Texas, 6 March 1998:
Examination of bars, banks, and shallows produced only Asian clams.

Rio Grande, Mexican side just downstream of the mouth of Sanderson Canyon, Terrell County, Texas, (UTM E 7-72-340, N 33-04-7600), 20 March 1998: Staff from BBNP collected a valve from Texas hornshell which was relatively long dead.

Amistad Reservoir (three locations), Val Verde County, Texas, 6 September 1998:

A volunteer with BRA examined three shoreline locations during very low-water conditions.

(1) Amistad Reservoir at S.H. 277 (29°29'28.2"N, 100°54'14.5"W).

Only abundant Asian clam shells were found.

(2) Amistad Reservoir at S.H. 454 (29°28.82"N, 100°57.06"W), east side of embayment.

Amistad Reservoir at S.H. 454 Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Tampico pearlymussel	0	0.5x1	relatively-recently dead	33.3
Bleufer	0	0.5x2	relatively-recently dead - long dead	66.7
Asian clam - abundant				

(3) Amistad Reservoir at S.H. 454 (29°29'09.6"N, 100°57'07.2"W), west side of embayment.

Only abundant Asian clam shells were found.

Lake Balmorhea, Reeves County, Texas, 2 July 1998:

During other research activities at this site, the following specimens were found:

Lake Balmorhea Species	<i>N</i> live	<i>N</i> shells	Condition	Percentage
Paper pondshell	1	0.0	-	100.0
Asian clam - present (including large specimens)				

Devils River, Baker's Crossing, 29°57'50"N, 101°08'41"W, Val Verde County, Texas, 27-28 May 1998:

During surveys of desert fishes at this site no unionids or their shells were found.

Devils River, Finnegan Springs, Val Verde County, Texas, 27-28 May 1998:

During surveys of desert fishes at this site no unionids or their shells were found.

Dolan Creek, upstream of the Devils River, 29°53'48"N, 100°59'03"W, Val Verde County, Texas, 27-28 May 1998:

During surveys of desert fishes at this site no unionids or their shells were found.

Phillips Creek, upstream of the Devils River and downstream of Baker's Crossing, Val Verde County, Texas 27-28
May 1998:
During surveys of desert fishes at this site no unionids or their shells were found.

Water Body and Species Summary

The number of specimens examined was not documented in 1992, but from 1993 through 1997 was >2,500; >3,000; >1,700; >7,200; and >1,500, respectively, with >1,200 in 1998. The number of locations examined each year from 1992 through 1997 was 56, 162, 202, 179, 232, and 87, respectively, with 118 locations covered in 1998. Although new data collected in 1997 and 1998 were less than in some previous years, there was generally no particular suggestion of dramatic changes in abundance, distribution, or composition at most locations.

Lake Athens was examined for the first time and was found to contain a number of "pond" species typical of many smaller, Piny-Woods impoundments. A number of impoundments in the Dallas-Fort Worth area were examined under low-water conditions. In a number of cases, the only prior surveys had been performed during high-waters and revealed fewer species than found in 1998. Among these reservoirs, a rare Texas heelsplitter was found in Lake Grapevine and a recently-dead rock-pocketbook in North Lake confirmed its continued existence in the area. Locations on Big Cypress Bayou surveyed in 1996 were reexamined in 1998 (see discussion on page 3), but local fauna was generally restricted to a limited number of thin-shelled, fast-growing species.

A series of small streams in the Central Brazos Drainage was examined. Like similar streams in this region surveyed earlier, some contained limited unionid populations, but others had none. On the Concho River, rare Texas pimpleback was confirmed surviving further upstream of the Paint Rock area populations than has been recently documented. A private consultant examined two sites in Matagorda County and provided the only apparent unionid collections from that county. A population of rare Texas fatmuckets known from the Guadalupe River at Kerrville was found to have extended somewhat further downstream than previously known, but the discovery occurred during a drawdown which may have eliminated most or all of this population. A collection of yellow sandshells and giant floaters from the Nueces River drainage of Zavala County is the only recent documentation of either from the area.

Surveys on the Rio Grande from upstream of Big Bend National Park down river to Amistad Reservoir were able to cover many miles of river which have not been examined recently, if at all. Although efforts in this area were able to find recently-dead specimens of Texas hornshell and Salina mucket, other survey results were less encouraging: none of the other rare endemic taxa were found, no living Texas hornshells or Salina muckets were located, and much of this area is so extensively scoured during floods, that the continued existence of extremely large, stable unionid populations is unlikely.

Seasonal Weather Patterns

Years from mid-1995 through late 1998 continued to be an alternating series of drought-caused low-water conditions and devastating floods. Drought conditions in 1995 and 1996 lowered river and reservoir levels nearly statewide. In some areas, low-water situations were still problematic in mid-1998. Some smaller impoundments were completely dewatered. Negative environmental impacts on local unionids were unavoidable. In May and June 1997, severe flooding struck many regions of Texas. This was repeated on the Rio Grande and elsewhere in August 1998 and nearly statewide in October 1998. Again, negative impacts on unionid populations certainly occurred at many locations.

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Figure 1. Locations surveyed for freshwater mussels (Family: Unionidae) in 1998 by Texas Parks and Wildlife Department personnel or by volunteers who subsequently provided data on these sites.

