BIOTIC COMMUNITY

Stream Fish Distribution and Abundance

Historical records of fish community collections within the Big Piney Watershed date back to 1930 (MDC 1998a and MoRAP 2003a). From 1930 to 2002, 73 fish species (not including hybrids or larval lamprey) in 24 families have been collected within the watershed (Table Bc01) (MDC Ozark Regional Fish Community Collections and Sport Fish Sample Files; MDC 1998a; Sternberg et al. 1998; MoRAP 2003a). Fish community sampling sites are presented in Figure Bc01.

Analysis of temporal distribution of species within the watershed was accomplished by dividing the examined Period of record for fish community collections into three periods: Period One (1930-1954), Period Two (1955-1979), and Period Three (1980-2002). This analysis revealed that 68 fish species were sampled within the watershed in Period One, while 60 species each were sampled in Periods Two and Three (MDC Ozark Regional Fish Community Collections, Sport Fish Sample Files, and Creel Survey Files; MDC 1998a; and MoRAP 2003a). Three species found within the watershed in Period Three had not been found in previous periods. These species include mottled sculpin (Cottus bairdi), western mosquitofish (*Gambusia affinis)*, and striped shiner *(Luxilis chrysocephalus).*

Thirteen fish species found within the watershed in Periods One and/or Two were not found in Period Three. These include Goldfish (*Carassius auratus)*, river carpsucker (*Carpoides carpio)* quillback (*Carpoides cyprinus)*, highfin carpsucker (*Carpoides velifer)*, northern brook lamprey *(Ichthyomyzon fossor)*, smallmouth buffalo *(Ictiobus bubalus)*, shortnose gar *(Lepisosteus platostomus)*, orangespotted sunfish *(Lepomis humilis)*, silver redhorse *(Moxostoma anisurum)*, river redhorse *(Moxostoma carinatum)*, shorthead redhorse *(Moxostoma macrolepidotum)*, slenderhead darter *(Percina phoxocephala)*, and walleye *(Stizostedion vitreum*). Six species, including river carpsucker, highfin carpsucker, smallmouth buffalo, shortnose gar, slenderhead darter, and walleye do not appear to have solid records of being common to the watershed. This is illustrated by the fact that only a maximum of 8 individuals per species are recorded as having been found in the watershed. In addition, each species was found only at a single site within the watershed with no additional individuals observed after Period One.

Two species absent from Period Three collections, the quillback and the northern brook lamprey, each had 6 individuals recorded from 2 locations and 4 locations respectively during the previous time period(s). However, due to the combining of collections from two locations with samples spanning Periods One and Two, it is difficult to determine if these species were present in one or both periods.

Three species which appear to have been relatively well established within the watershed during Periods One and Two are absent from Period Three collections. The shorthead redhorse was previously reported from 5 sites within the watershed with 208 individuals recorded. The river redhorse was previously reported from 6 sites within the watershed with 50 individuals recorded. Over 11 individuals of the orange spotted sunfish were also reported during Periods One and Two from 6 sites.

Two species of fish have been collected in fish community samples of Period Three which were not recorded in fish community collections from the previous two periods within the watershed. These include the striped shiner, and western mosquitofish. Prior to 1995, the striped shiner had not been recorded in the Big Piney Watershed since before 1905. Since 1995, this species has been recorded from 9 sites within the watershed. Pflieger (1997) notes the historic decline and reappearance of the striped shiner within the Gasconade River System (which includes the Big Piney Watershed) and states that the "reestablishment of the striped shiner in the Gasconade system suggests an undocumented reintroduction of the species into the Gasconade headwaters".

The western mosquitofish had not been observed within the watershed prior to 1980. Since 1980, the western mosquitofish has been recorded at 10 sites within the watershed. A survey in the 1940s indicated that its distribution in Missouri included the "Lowland Faunal Region and northward along the Mississippi River to Ramsey Creek in Pike County" (Pflieger 1997). Today the mosquito fish can be found in all of the faunal regions of the state.

Many variables, including differences in sampling methodology and effort could be an explanation for the absence from recent collections of some species which were previously known to occur in the watershed. For other previously recorded species, the limited distribution as well as the absence of substantial numbers of individuals suggests that some species have never been common in the watershed. The exact cause or causes of the appearance of some species and apparent disappearance of others in the watershed is difficult to ascertain given the many different variables one might need to take into account among these of which are differences in sampling effort and gear between the three time periods. Such an analysis not only goes beyond the scope of this document but could comprise a fairly lengthy report by itself.

Game Fish

The Big Piney River and its tributaries offer a variety of angling opportunities. A total of 8 species of gamefish (as defined in MDC 2004a) are known to occur within the watershed (MDC Ozark Regional Fish Collection Files; MoRAP 2003a; MDC 1998a). Smallmouth bass, largemouth bass and rock bass are common. At the time of this writing, the Big Piney River from Slabtown Access to Ross Access is a Smallmouth Bass Special Management Area (MDC 2003d). In this area, "all smallmouth bass less than fifteen inches in total length must be returned to the water unharmed immediately after being caught" and the "daily limit may include no more than one smallmouth bass" (MDC 2004a). In addition, the Big Piney River, from highway 17 to the Gasconade River, has an eight inch minimum length limit for Rock Bass. In this area, "all rock bass less than eight inches in total length must be returned to the water unharmed immediately after being caught" (MDC 2004a).

Other game fish species found in the watershed include channel catfish (probably more common in farm ponds of the watershed than streams), rainbow trout, white crappie, black crappie, and flathead catfish. Walleye are known to have been found in a few pre-1955 fish community samples, however they have not been found in samples since.

Two significant rainbow trout fisheries occur within the watershed. These are located on Spring Creek in Phelps County and Stone Mill Spring Branch in Pulaski County. Spring Creek, from

Relfe Spring to its junction with the Big Piney River (6.2 miles) is currently managed as a Wild Trout Management Area; while the entire Stone Mill Spring Branch (0.3 miles), is currently managed as a Trout Management Area. Special regulations apply for both areas. For additional information please refer to current copy of the Missouri Wildlife Code. It should also be noted that in addition to a Missouri fishing license, an FLW sportsmen's permit and stamp is required to fish in the Stone Mill Spring Trout Management Area (MDC 2004b).

Regulations governing hunting and fishing activities are subject to change. Before engaging in these activities one should consult the most current copy of the Missouri Wildlife Code.

One potential concern regarding the game fish population of the headwaters of the Big Piney Watershed, as well as many other Ozark headwater streams, is the success of MDCs river otter reintroduction program. Since the successful reintroduction of the otter, complaints from private land owners and sportsman's groups regarding otter impacts to pond and stream fisheries have been received by the MDC. Efforts have been undertaken by the MDC to determine the otter's role in the decline of game fish populations in headwater streams. Changes in otter trapping regulations have been implemented in order to address problems associated with high otter densities in areas where damage is believed to be the most severe. As a result, many Ozark streams, including the Big Piney and its tributaries, are located in a management zone which has an extended otter trapping season (relative to other zones) and a liberal bag limit (MDC 2003e).

Detailed studies and monitoring of stream gamefish populations have been conducted by the MDC within the watershed. Due to the large amount of information available, a comprehensive summary of these efforts is not practical within the pages of this document. Additional information regarding the gamefish populations within the watershed may be obtained by contacting the Fisheries staff at the Missouri Department of Conservation, West Plains, Missouri 65775; Phone (417)256-7161

Fish Stocking

Fish stocking efforts within the Big Piney Watershed have included the stocking of both cold and warm-water species. Some of the earliest fish stocking known to have occurred in the watershed involved the introduction of Salmonid species. It is speculated that trout may have been stocked as early as 1880 with fish from Brown Spring Station Hatchery at St. Joseph Missouri (Tryon 1990). Also during this time, "California Salmon" were introduced to tributaries of the Missouri River (which may well have included the Gasconade) via the Frisco Railroad which ran from St. Louis to Southwest Missouri (Turner 1979). Several later stockings of other species were also carried out utilizing the rail line. While this rail line did not cross streams of the Big Piney, it did cross the Gasconade down stream of the Big Piney. Whether or not these fish ever made it into the streams of the Big Piney watershed is, for the most part, left to speculation. In 1902, grayling were stocked in Spring Creek (Tryon 1990). The first official record of trout introduction into spring creek is in 1908 with the stocking of brook trout. In 1910, the first official recorded introduction of rainbow trout occurs. Periodic stockings of both brown trout and rainbow trout (including at least one documented case of the stocking of Australian rainbow trout) occurred until 1982 when Spring Creek became managed as a self-sustaining rainbow trout fishery (Turner 1988 and Tryon 1990). Today spring creek continues to have a self-sustaining rainbow trout population and currently receives no stocking.

Stone Mill Spring Branch is another stream which has been stocked with trout. Stone Mill Spring Branch, located east of Fort Leonard Wood Military Reservation, has been managed by Fort Leonard Wood as a "put-and-take" rainbow trout fishery since 1965. This fishery is stocked regularly throughout the year.

Limited availability of historic stocking records for warm water species, the potential of "bait bucket" introductions and the availability of fish from commercial dealers, makes it difficult to address the entire scope of warm water stocking which has or may have occurred in the Big Piney Watershed. However, examination of various sources reveals some past stocking efforts within the watershed. The common carp, a species native to Asia, was widely stocked in Missouri by the Missouri Fish Commission between 1879 and 1895 at which time the program was discontinued (Pflieger 1997). Earliest observations of common carp from MDC fish community collection files are from 1947 (MDC 1998a). While common carp are a component of the commercial fishing industry in Missouri (Barnes and Riggert 2000), common carp can also be a nuisance species. They take space in rivers, streams, and lakes away from native species. They can increase stream and lake turbidity, destroy spawning habitat, while eating the eggs of native species of fish (Barnes and Riggert 2000). MDC annual reports (1937-1942 and 1946-1992) indicate that, historically, warm-water fish stocked or "rescued" (removing fish from intermittent pools of water and redistributing to areas deemed more suitable) by the MDC in the watershed included largemouth bass, smallmouth bass, crappie, bluegill, green sunfish, catfish, shadow bass, and "minnows". The practice of "fish rescue" has been discontinued.

Roby Lake, a USFS impoundment, currently receives supplemental stockings of channel catfish on a semi-annual basis (MDC 2000c). In addition, 5 impoundments on FLW are stocked with channel catfish annually by FLW. Some of these impoundments have also received stockins of hybrid sunfish and bluegill within the last 5 years (Zurbrick, Personal Communication). Undoubtedly, farm ponds within the watershed have been stocked with largemouth bass, bluegill, and channel catfish by private individuals who obtained fish from the MDC, commercial dealers, and/or other water bodies. The availability of grass carp from commercial fish dealers also increases the probability of this species having been stocked in water bodies within the watershed. The potential of these fish being washed into streams exists during major precipitation events.

A lack of historical records, plus the occurrence of undocumented introductions makes it difficult to determine, with any reliability, all species which may have been introduced into the watershed. Effects of introductions vary. While the introduction of species already present in the watershed may have minimal to no effect, the introduction of exotic (non-native) species can, in many instances, have disastrous consequences.

Mussels

A total of 32 species and subspecies of mussels are known to occur within the Big Piney Watershed (Table Bc02 and Figure Bc02) (MDC 1998d, MDC 1998f, Sternberg 1998 et al. 1998, MoRAP 2003b, MNHP 2003b, and). Of these, 1 species, the pink mucket (*Lampsilis abrupta*) is listed as a state and federal endangered species (MNHP 2003a). In addition, the elephant ear (*Elliptio crassidens*) is a state endangered species. Three additional species within the watershed are considered species of conservation concern. These include the elktoe (*Alasmidonta marginata*),

spectaclecase (*Cumberlandia monodonta*), and the Ouachita kidneyshell (*Ptychobranchus occidentalis*). The Asian clam (*Corbicula flumina*) is an exotic (non-native) species of mussel which occurs in the watershed. This mollusk is a native of southern and eastern Asia. The Asian clam can alter lake and stream substrates, compete with native mussels for food and space, and cause biofouling problems in irrigation systems, power plants, and other industrial water systems (USGS 2002b).

Snails

Six species of snails have been identified within the Big Piney Watershed (Wu etal. 1997). These include the highland campeloma (*Campeloma subsolidum*), pyramid elimia (*Elimia potosiensis*), pygmy fossaria (*Lymnaea [Fossaria] parva*), Goodrich's physa (*Physa [Physella] goodrichi*), tadpole physa (*Physa [Physella] gyrina*), and sharp hornsnail (*Pleurocera acuta*).

Crayfish

Three species of crayfish are known to occur within the Big Piney Watershed (MDC 1998e, Sternberg et al. 1998, and MoRAP 2003c). These include the golden crayfish (*Orconectes luteus*), Salem cave crayfish (*Cambarus hubrichti*), and spothanded crayfish (*Orconectes punctimanus*). The Salem cave crayfish, currently (2003) a species of conservation concern, has been found at a single site in the watershed; while the golden crayfish and spothanded crayfish appear to be fairly wide spread within the watershed. It is important to note that it appears no crayfish sampling has been conducted on the Lower Big Piney or its tributaries with the exception of Spring Creek. Crayfish community sampling sites are presented in Figure Bc03.

Benthic Invertebrates

One hundred and ninety-one taxa of aquatic invertebrates (not including mussels and crayfish) have been collected within the Big Piney Watershed and have records within the MDC Benthic Invertebrate Database (MDC 1998f) (Table Bc03). Two species are listed as Missouri species of conservation concern (MDNHP 2003a). These include the Ozark clubtail (*Gomphus ozarkensis*) and westfall's snaketail (*Ophiogomphus westfalli*). MDC (1998f) benthic invertebrate sampling sites are presented in Figure Bc04.

Species of Conservation Concern

Within the Big Piney Watershed, 40 species of conservation concern have been identified (Table Bc04) (MNHP 2003b). These include 15 species of plants (flowering plants, ferns, fern allies, and mosses); 2 species of insects; 1 species of crayfish; 4 species of mussels; 4 species of fish; 2 species of amphibians, 6 species of birds; and 5 species of mammals. Four species within the watershed are federally and state listed as endangered. These include the gray bat, Indiana bat, pink mucket, and running buffalo clover. An additional species, the Bald Eagle, is federally listed as threatened and state listed as endangered. In addition to the aforementioned species, the eastern hellbender is currently proposed for state listing as endangered.

Table bct01. Fish species (and subspecies) whose distributions range includes the Big Piney Watershed in Missouri (MDC Ozark Regional Fish Community and Sport Fish Sample Files; Pflieger 1997; MDC 1998a; MNHP 2003b; MoRap 2003a).

Scientific Name	Common Name	Period 1	Period 2	Period 3
Ambloplites rupestris	Rock Bass	X	X	X
Ameiurus melas	Black Bullhead	X	X	X
Ameiurus natalis	Yellow Bullhead	X	X	X
Anguilla rostrata	American Eel	X	X	X
Aplodinotus grunniens	Freshwater Drum	X		X
Campostoma oligolepis	Largescale Stoneroller	X	X	X
Campostoma pullum	Central Stoneroller	X	X	X
Carassius auratus	Goldfish		X	
Carpiodes carpio	River Carpsucker	X		
Carpiodes cyprinus	Quillback	X	X	
Carpiodes velifer	Highfin Carpsucker	X		
Catostomus commersonni	White Sucker	X	X	X
Cottus bairdi	Mottled Sculpin			X
Cottus carolinae	Banded Sculpin	X	X	X
Cottus hypselurus	Ozark Sculpin	X	X	X
Cyprinella spiloptera	Spotfin Shiner	X	X	X
Cyprinus carpio	Common Carp	X	X	X
Dorosoma cepedianum	Gizzard Shad	X	X	X
Erimystax x-punctatus	Gravel Chub	X	X	X
Etheostoma blennioides	Greenside Darter	X	X	X
Etheostoma caeruleum	Rainbow Darter	X	X	X
Etheostoma f. lineolatum	Striped Fantail	X	X	X
Etheostoma punctulatum	Stippled Darter	X	X	X
Etheostoma s. spectabile	Northern Orangethroat Darter	X	X	X
Etheostoma tetrazonum	Missouri Saddled Darter	X	X	X
Etheostoma zonale	Banded Darter	X	X	X
Fundulus catenatus	Northern Studfish	X	X	X
Fundulus olivaceous	Blackspotted Topminnow	X	X	X
Fundulus sciadicus	Plains Topminnow	X	X	X
Gambusia affinis	Western Mosquitofish			X
Hiodon tergisus	Mooneye	X		X
Hypentelium nigricans	Northern Hog Sucker	X	X	X
Ichthyomyzon fossor	Northern Brook Lamprey	X	X	
Ictalurus punctatus	Channel Catfish	X		X
Ictiobus bubalus	Smallmouth Buffalo	X		
Labidesthes sicculus	Brook Silverside	X	X	X
Lepisosteus osseus	Longnose Gar	X	X	X
Lepisosteus platostomus	Shortnose Gar	X		

Scientific Name	Common Name	Period 1	Period 2	Period 3
Lepomis cyanellus	Green Sunfish	X	X	X
Lepomis humilis	Orangespotted Sunfish	X	X	
Lepomis macrochirus	Bluegill	X	X	X
Lepomis megalotis	Longear Sunfish	X	X	X
Luxilus chrysocephalus	Striped Shiner			X
Luxilus zonatus	Bleeding Shiner	X	X	X
Lythrurus U. Umbratilis	Western Redfin Shiner	X	X	X
Micropterus dolomieu	Smallmouth Bass	X	X	X
Micropterus salmoides	Largemouth Bass	X	X	X
Moxostoma anisurum	Silver Redhorse	X	X	
Moxostoma carinatum	River Redhorse	X	X	
Moxostoma duquesnei	Black Redhorse	X	X	X
Moxostoma erythrurum	Golden Redhorse	X	X	X
Moxostoma macrolepidotum	Shorthead Redhorse	X	X	
Nocomis biguttatus	Hornyhead Chub	X	X	X
Notemigonus crysoleucas	Golden Shiner	X	X	X
Notropis boops	Bigeye Shiner		X	X
Notropis greenei	Wedgespot Shiner	X	X	X
Notropis heterolepis	Blacknose Shiner	X	X	X
Notropis nubilus	Ozark Minnow	X	X	X
Notropis rubellus	Rosyface Shiner	X	X	X
Noturus exilis	Slender Madtom	X	X	X
Noturus flavus	Stonecat	X	X	X
Oncorhynchus mykiss	Rainbow Trout	X		X
Percina C. Fulvitaenia	Ozark Logperch	X	X	X
Percina cymatotaenia	Bluestripe Darter	X	X	X
Percina evides	Gilt Darter	X	X	X
Percina phoxocephala	Slenderhead Darter	X		
Phoxinus erythrogaster	Southern Redbelly Dace	X	X	X
Pimephales notatus	Bluntnose Minnow	X	X	X
Pomoxis annularis	White Crappie	X	X	X
Pomoxis nigromaculatus	Black Crappie	X		X
Pylodictis olivaris	Flathead Catfish	X	X	X
Semotilus atromaculatus	Creek Chub	X	X	X
Stizostedion vitreum	Walleye	X		

Period 1 = collected 1930 to 1954; **Period 2** = collected 1955 to 1979; **Period 3** = collected 1980-2002

Table Bc02. Mussel species found historically within the Big Piney Watershed. (MDC 1998d, MDC 1998f, Sternberg et al. 1998, MoRAP 2003b, MNHP 2003a, and MNHP 2003b).

Scientific Name	Common Name	State Status	Federal Status
Actinonaias ligamentina	Mucket		
*Alasmidonta marginata**	Elktoe*		
Alasmidonta viridis	Slippershell mussel		
Amblema plicata	Threeridge		
Corbicula fluminea (I)	Asiatic Clam (I)		
*Cumberlandia monodonta**	Spectaclecase*		
Cyclonaias tuberculata	Purple Wartyback		
*Elliptio crassidens**	Elephant Ear*	Endangered	
Elliptio dilatata	Spike		
Fusconaia flava	Wabash Pigtoe		
Fusconaia ozarkensis	Ozark Pigtoe		
*Lampsilis abrupta**	Pink Mucket*	Endangered	Endangered
Lampsilis cardium	Plain Pocketbook		
Lampsilis r. brevicula	Ozark Broken-ray		
Lampsilis r. brittsi	Northern Broken-ray		
Lampsilis siliquoidea	Fatmucket		
Lampsilis teres	Yellow Sandshell		
Lasmigona costata	Fluted Shell		
Leptodea fragilis	Fragile Papershell		
*Ligumia recta**	Black Sandshell*		
Ligumia subrostrata	Pond Mussel		
Pleurobema sintoxia	Round Pigtoe		
*Ptychobranchus occidentalis**	Ouachita Kidneyshell*		
Potamilus alatus	Pink Heelsplitter		
Pyganodon grandis grandis	Giant Floater		
Quadrula metanevra	Monkeyface		
Quadrula pustulosa	Pimpleback		
Strophitus undulates	Creeper		
Utterbackia imbecillis	Paper Pondshell		
Tritogonia verrucosa	Pistolgrip		
Venustaconcha ellipsiformis	Ellipse		
Venustaconcha pleasi	Bleedingtooth Mussel		

*Species of Conservation Concern

Table bct03. Benthic invertebrates taxa of the Big Piney Watershed (MDC 1998f and MNHP 2003b). List does not include mussels or crayfish.

Order	Family	Species
Amphipoda	Crangonyctidae	Crangonyx minor (Bousfield)
Amphipoda	Gammaridae	Gammarus pseudolimnaeus (Bousfield)
Amphipoda	Talitridae	Hyalella azteca (Saussure)
Coleoptera	Curculionidae	Onychylis sp.
Coleoptera	Dryopidae	
Coleoptera	Dryopidae	Helichus lithophilus (Germar)
Coleoptera	Dytiscidae	
Coleoptera	Dytiscidae	Copelatus glyphicus (Say)
Coleoptera	Dytiscidae	Cybister fimbriolatus (Say)
Coleoptera	Dytiscidae	Cybister sp.
Coleoptera	Dytiscidae	Dytiscus sp.
Coleoptera	Dytiscidae	Hydroporus undulatus (Say)
Coleoptera	Dytiscidae	Laccophilus fasciatus (Aube)
Coleoptera	Elmidae	Ancyronyx variegata (Germar)
Coleoptera	Elmidae	Dubiraphia sp.
Coleoptera	Elmidae	Macronychus glabratus (Say)
Coleoptera	Elmidae	Microcylloepus pusillus pusillus (LeConte)
Coleoptera	Elmidae	Optioservus sandersoni (Collier)
Coleoptera	Elmidae	Stenelmis sp.
Coleoptera	Gyrinidae	Dineutus sp.
Coleoptera	Haliplidae	
Coleoptera	Haliplidae	Haliplus sp.
Coleoptera	Haliplidae	Peltodytes edentulus (LeConte)
Coleoptera	Haliplidae	Peltodytes tortulosus (Roberts)
Coleoptera	Hydrophilidae	
Coleoptera	Hydrophilidae	Berosus sp.
Coleoptera	Hydrophilidae	Enochrus sp.
Coleoptera	Hydrophilidae	Tropisternus sp.
Coleoptera	Limnicidae	Lutrochus laticeps (Casey)
Coleoptera	Psephinidae	Ectopria nervosa (Melsheimer)
Coleoptera	Psephinidae	Psephenus herricki (DeKay)
Coleoptera	Ptilodactylidae	
Diptera	Athericidae	Atherix lantha (Webb)
Diptera	Ceratopogonidae	
Diptera	Ceratopogonidae	Alluaudomyia sp.
Diptera	Ceratopogonidae	Atrichopogon sp.
Diptera	Ceratopogonidae	Bezzia/Probezzia...
Diptera	Ceratopogonidae	Forcipomyia sp.
Diptera	Chaoboridae	
Diptera	Chironomidae	

Order	Family	Species
Diptera	Culicidae	
Diptera	Culicidae	Aedes sp.
Diptera	Culicidae	Anopheles sp.
Diptera	Empididae	
Diptera	Ephydridae	
Diptera	Muscidae	
Diptera	Psychodidae	Pericoma sp.
Diptera	Psychodidae	Psychoda sp.
Diptera	Simuliidae	
Diptera	Stratiomyidae	
Diptera	Stratiomyidae	Odontomyia sp.
Diptera	Syrphidae	Chrysogaster sp.
Diptera	Tabanidae	
Diptera	Tanyderidae	Protoplasa fitchii (Osten-Sacken)
Diptera	Tipulidae	Antocha sp.
Diptera	Tipulidae	Erioptera sp.
Diptera	Tipulidae	Hexatoma sp.
Diptera	Tipulidae	Tipula sp.
Ephemeroptera	Baetidae	
Ephemeroptera	Baetidae	Acentrella sp.
Ephemeroptera	Baetidae	Baetis tricaudatus (Dodds)
Ephemeroptera	Baetidae	Callibaetis sp.
Ephemeroptera	Baetidae	Diphetor sp.
Ephemeroptera	Baetiscidae	Baetisca lacustris (McDunnough)
Ephemeroptera	Caenidae	Caenis sp.
Ephemeroptera	Ephemerellidae	Ephemerella (invaria grp.)
Ephemeroptera	Ephemerellidae	Ephemerella sp.
Ephemeroptera	Ephemerellidae	Eurylophella (bicolor grp.)
Ephemeroptera	Ephemerellidae	Serratella deficiens (Morgan)
Ephemeroptera	Ephemeridae	Ephemera simulans (Walker)
Ephemeroptera	Ephemeridae	Hexagenia limbata (Serville)
Ephemeroptera	Heptageniidae	Epeorus namatus (Burks)
Ephemeroptera	Heptageniidae	Heptagenia sp.
Ephemeroptera	Heptageniidae	Rhithrogena pellucida (Daggy)
Ephemeroptera	Heptageniidae	Stenacron (interpunctatum grp.)
Ephemeroptera	Heptageniidae	Stenacron gildersleevei (Traver)
Ephemeroptera	Heptageniidae	Stenonema femoratum (Say)
Ephemeroptera	Heptageniidae	Stenonema mediopunctatum (McDunnough)
Ephemeroptera	Heptageniidae	Stenonema pulchellum (Walsh)
Ephemeroptera	Isonychiidae	Isonychia sp.
Ephemeroptera	Leptophlebiidae	
Ephemeroptera	Leptophlebiidae	Choroterpes basalis (Banks)
Ephemeroptera	Leptophlebiidae	Leptophlebia cupida (Say)

Order	Family	Species
Ephemeroptera	Leptophlebiidae	Paraleptophlebia moerens (McDunnough)
Ephemeroptera	Polymitarcyidae	Ephoron album (Say)
Ephemeroptera	Potamanthidae	Anthopotamus sp.
Ephemeroptera	Siphlonuridae	Siphlonurus sp.
Ephemeroptera	Tricorythidae	Tricorythodes sp.
Gordiida		
Hemiptera	Corixidae	
Hemiptera	Gerridae	
Hemiptera	Gerridae	Trepobates sp.
Hemiptera	Notonectidae	Buenoa sp.
Hemiptera	Veliidae	
Hemiptera	Veliidae	Rhagovelia sp.
Hirudinea[2]		
Hirundinea[2]	Branchiobdellidae[1]	
Hydracarina	Acari	
Isopoda		
Isopoda	Asellidae	Caecidotea sp.
Isopoda	Asellidae	Lirceus sp.
Lepidoptera	Pyralidae	Nymphula sp.
Lepidoptera	Pyralidae	Petrophila sp.
Lymnophila	Ancylidae	
Lymnophila	Ancylidae	Ferrissia fragilis (Tryon)
Lymnophila	Lymnaeidae	
Lymnophila	Physidae	
Lymnophila	Planorbidae	
Megagastropoda	Pleuroceridae	Elimia sp.
Megagastropoda	Viviparidae	
Megaloptera	Corydalidae	Corydalus cornutus (Linnaeus)
Megaloptera	Corydalidae	Nigronia serricornis (Say)
Megaloptera	Sialidae	Sialis sp.
Nemata[3]		
Neuroptera	Sisyridae	Sisyra sp.
Odonata	Aeshnidae	Aeshna sp.
Odonata	Aeshnidae	Epiaeschna heros (Fabricius)
Odonata	Calopterygidae	
Odonata	Calopterygidae	Hetaerina americana (Fabricius)
Odonata	Coenagrionidae	
Odonata	Coenagrionidae	Argia moesta (Hagen)
Odonata	Coenagrionidae	Enallagma praevarum (Hagen)
Odonata	Coenagrionidae	Ischnura sp.
Odonata	Coenagrionidae	Nehalennia gracilis (Morse)
Odonata	Coenagrionidae	Telebasis sp.
Odonata	Corduliidae	Epitheca princeps (Hagen)

Order	Family	Species
Odonata	Gomphidae	
Odonata	Gomphidae	Erpetogomphus designatus (Hagen)
Odonata	Gomphidae	Gomphus ozarkensis
Odonata	Gomphidae	Ophiogomphus westfalli
Odonata	Gomphidae	Stylogomphus albistylus (Hagen)
Odonata	Libellulidae	
Oligochaeta		
Pelecypoda[2]		
Plecoptera	Capniidae	Allocapnia sp.
Plecoptera	Capniidae	Paracapnia sp.
Plecoptera	Chloroperlidae	
Plecoptera	Leuctridae	Leuctra tenuis (Pictet)
Plecoptera	Nemouridae	
Plecoptera	Nemouridae	Amphinemura delosa (Ricker)
Plecoptera	Perlidae	
Plecoptera	Perlidae	Acroneuria sp.
Plecoptera	Perlidae	Neoperla clymene (Newman)
Plecoptera	Perlidae	Neoperla sp.
Plecoptera	Perlidae	Perlesta placida (Hagen)
Plecoptera	Perlidae	Perlinella drymo (Newman)
Plecoptera	Perlodidae	Hydroperla sp.
Plecoptera	Perlodidae	Isoperla bilineata (Say)
Plecoptera	Perlodidae	Isoperla marlynia (Needham & Claassen)
Plecoptera	Perlodidae	Isoperla mohri (Frison)
Plecoptera	Pteronarcyidae	Pteronarcys pictetii (Hagen)
Plecoptera	Taeniopterygidae	
Plecoptera	Taeniopterygidae	Strophopteryx fasciata (Burmeister)
Plecoptera	Taeniopterygidae	Taeniopteryx metequi (Ricker & Ross)
Plecoptera	unknown	unidentified plecoptera
Trichoptera		
Trichoptera	Brachycentridae	Brachycentrus americanus (Banks)
Trichoptera	Glossosomatidae	Agapetus sp.
Trichoptera	Helicopsychidae	Helicopsyche borealis (Hagen)
Trichoptera	Hydropsychidae	Ceratopsyche (morose grp.)
Trichoptera	Hydropsychidae	Ceratopsyche piatrix (Ross)
Trichoptera	Hydropsychidae	Ceratopsyche slossonae (Banks)
Trichoptera	Hydropsychidae	Cheumatopsyche sp.
Trichoptera	Hydropsychidae	Hydropsyche betteni (Ross)
Trichoptera	Hydropsychidae	Hydropsyche cuanis (Ross)
Trichoptera	Hydropsychidae	Hydropsyche simulans/incommoda
Trichoptera	Hydropsychidae	Hydropsyche sp.
Trichoptera	Hydroptilidae	Agraylea multipunctata (Curtis)
Trichoptera	Hydroptilidae	Hydroptila sp.

Order	Family	Species
Trichoptera	Hydroptilidae	Ithytrichia clavata (Morton)
Trichoptera	Hydroptilidae	Ochrotrichia sp.
Trichoptera	Hydroptilidae	Oxyethira sp.
Trichoptera	Lepidostomatidae	
Trichoptera	Leptoceridae	
Trichoptera	Leptoceridae	Mystacides interjecta (Banks)
Trichoptera	Leptoceridae	Oecetis inconspicua (Walker)
Trichoptera	Leptoceridae	Triaenodes sp.
Trichoptera	Limnephilidae	
Trichoptera	Limnephilidae	Limnephilus sp.
Trichoptera	Limnephilidae	Neophylax fuscus Banks
Trichoptera	Philopotamidae	Chimarra aterrima Hagen
Trichoptera	Philopotamidae	Chimarra obscura (Walker)
Trichoptera	Philopotamidae	Wormaldia moesta (Banks)
Trichoptera	Phryganeidae	
Trichoptera	Phryganeidae	Phryganea sayi Milne
Trichoptera	Polycentropodidae	Neureclipsis crepuscularis (Walker)
Trichoptera	Polycentropodidae	Polycentropus sp.
Trichoptera	Psychomyiidae	Psychomyia flavida (Hagen)
Trichoptera	Rhyacophilidae	
Tricladida	Planariidae	
Veneroida	Sphaeriidae	

[1] Subclass, [2] Class, [3] Phylum

Table Bc04. Species of conservation concern within the Big Piney Watershed in Missouri (MDC 1998f, Sternberg et al. 1998, and MNHP 2003b). Note: Listing does not include records of occurrences listed as historic, destroyed, or introduced (exotic); or records with a location precision that is "General" (mappable to within a 5 mile radius) or unmappable.

Scientific Name	Common Name	F	M	GRank	SRank	Date
Amphibians						
Ambystoma annulatum	Ringed Salamander			G4	S3	1975
Cryptobranchus alleganiensis Alleganiensis	Eastern Hellbender		E*	G3G4T3T4	S1	1998
Birds						
Accipiter cooperii	Cooper's Hawk			G5	S3	1986
Accipiter striatus	Sharp-Shinned Hawk			G5	S2	1986
Buteo lineatus	Red-Shouldered Hawk			G5	S3	1995
Dendroica cerulean	Cerulean Warbler			G4	S2S3	1995
Haliaeetus leucocephalus	Bald Eagle	T	E	G4	S2	2000
Vireo bellii	Bell's Vireo			G5	S3	1995
Fish						
Fundulus sciadicus	Plains Topminnow			G4	S3	1995
Hiodon tergisus	Mooneye			G5	S3	1995
Notropis heterolepis	Blacknose Shiner			G4	S2	1980
Percina cymatotaenia	Bluestripe Darter			G2	S2	1994
Mammals						
Mustela frenata	Long-Tailed Weasel			G5	S2	1992
Myotis grisescens	Gray Bat	E	E	G3	S3	1997
Myotis septentrionalis	Northern Myotis			G4	S3	1997
Myotis sodalist	Indiana Bat	E	E	G2	S1	1994
Ochrotomys nuttalli	Golden Mouse			G5	S3?	1990
Crayfish						
Cambarus hubrichti	Salem Cave Crayfish			G2	S3	1980
Insects						
Gomphus ozarkensis	Ozark Clubtail			G4	S3	2000
Ophiogomphus westfalli	Westfall's Snaketail			G3	S3	1976
Mussels						
Alasmidonta marginata	Elktoe			G4	S2?	1998
Cumberlandia monodonta	Spectaclecase			G2G3	S3	1998
Elliptio crassidens	Elephant Ear		E	G5	S1	1976
Lampsilis abrupta	Pink Mucket	E	E	G2	S2	1976
Ligumia recta	Black Sandshell			G5	S1S2	1993-1995
Ptychobranchus occidentalis	Ouachita Kidneyshell			G3G4	S2S3	1993
Non-Vascular Plants						
Aneura pinguis	A Liverwort			G5	SU	2002

Scientific Name	Common Name	F	M	GRank	SRank	Date
Flavoparmelia rutidota	A Lichen			G?	S?	1986
Vascular Plants						
Aster furcatus	Forked Aster			G3	S2	1990
Heuchera parviflora var. parviflora	Little Leaved Alum Root			G4T4	S1	1992
Pueraria lobata	Kudzu			G?	SE	2001
Sullivantia sullivantii	Sullivantia			G4	S2	1994
Trifolium stoloniferum	Running Buffalo Clover	E	E	G3	S1	1997
Calamagrostis porteri ssp. insperata	Oferhollow Reed Grass			G4T3	S3	1994
Carex comosa	Bristly Sedge			G5	S2	1991
Carex molestiformis	A Sedge			G?	S2	1991
Glyceria acutiflora	Sharp-Scaled Manna Grass			G5	S3	1991
Najas gracillima	Thread-Like Naiad			G5?	S2	1994
Potamogeton pusillus var. pusillus	Slender Pondweed			G5T5	S1	1991
Zannichellia palustris var. major	Horned Pondweed			G5T?	S3?	1994
Dryopteris goldiana	Goldie's Fern			G4	S2	1994

Year=Last year observed in watershed.
F=Federal Status
M=Missouri Status

E=Endangered
T=Threatened

= Former category-2 candidate (In December of 1996, the USFWS discontinued the practice of maintaining a list of species regarded as "category-2 candidates". MDC continues to distinguish these species for information and planning purposes.

SRrank

S1=Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. (typically 5 or fewer occurrences or very few remaining individuals)
S2=Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. (6 to 20 occurrences or few remaining individuals or acres)
S3=Rare and uncommon in the state. (21 to 100 occurrences)

S4=Widespread, abundant, and apparently secure in state, with many occurrences, but the species is of long-term concern. (usually more than 100 occurrences)
S5=Demonstrably widespread, abundant, and secure in the state, and essentially ineradicable under

present conditions.
SU=Unrankable: Possibly in peril in the state, but status uncertain; need more information.
SE=Exotic: An exotic established in the state; may be native in nearby regions.
SH=Historical: Element occurred historically in the state (with expectation that it may be rediscovered). Perhaps having not been verified in the past 20 years, and suspected to be still extant.
SX=Extirpated: Element is believed to be extirpated from the state.

S?=Unranked: Species is not yet ranked in the state.

Qualifier:
? =Inexact or uncertain: for numeric ranks, denotes inexactness. (The ? qualifies the character immediately preceding it in Srank)

GRank

G1=Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. (typically 5 or fewer occurrences or very few remaining individuals or acres)
G2=Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction throughout its range. (6 to 20 occurrences or few remaining individuals or acres)
G3=Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range. (21 to 100 occurrences)
G4=Widespread, abundant, and apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery. Thus, the element is of long-term concern. (usually more than 100 occurrences)
G5=Demonstrably Widespread, abundant, and secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Subrank:
T=Taxonomic subdivision: rank applies to subspecies or variety.
Qualifier:
? =Inexact: denotes inexact numeric rank.
Q=Questionable taxonomy: taxonomic status is questionable; numeric rank may change with taxonomy.

Note: Data in table subject to revision. This table is not a final authority.

Figure Bc01..

Big Piney Watershed

Fish Community Sample Sites

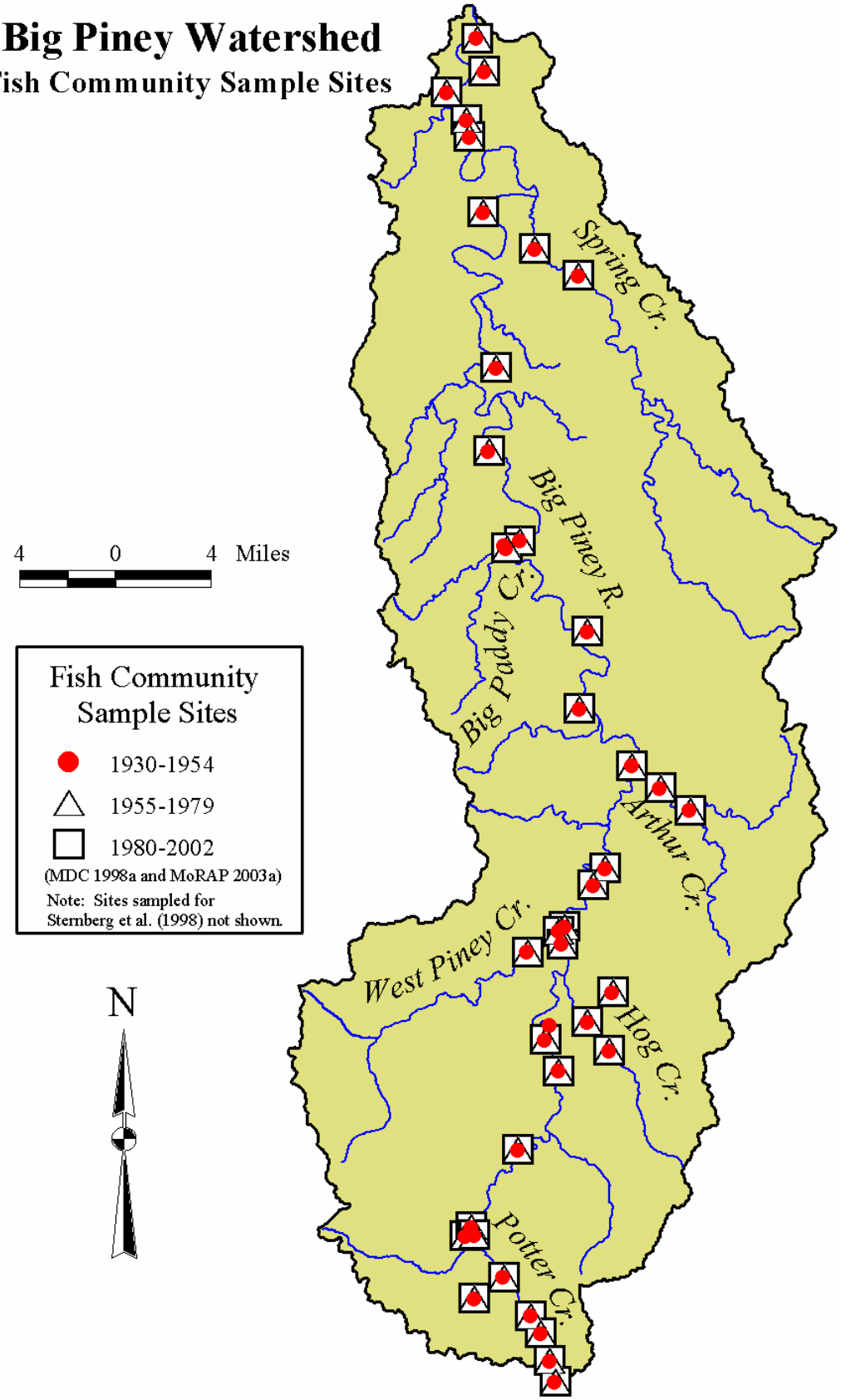

Figure Bc02.

Big Piney Watershed

Mussel Community Sample Sites

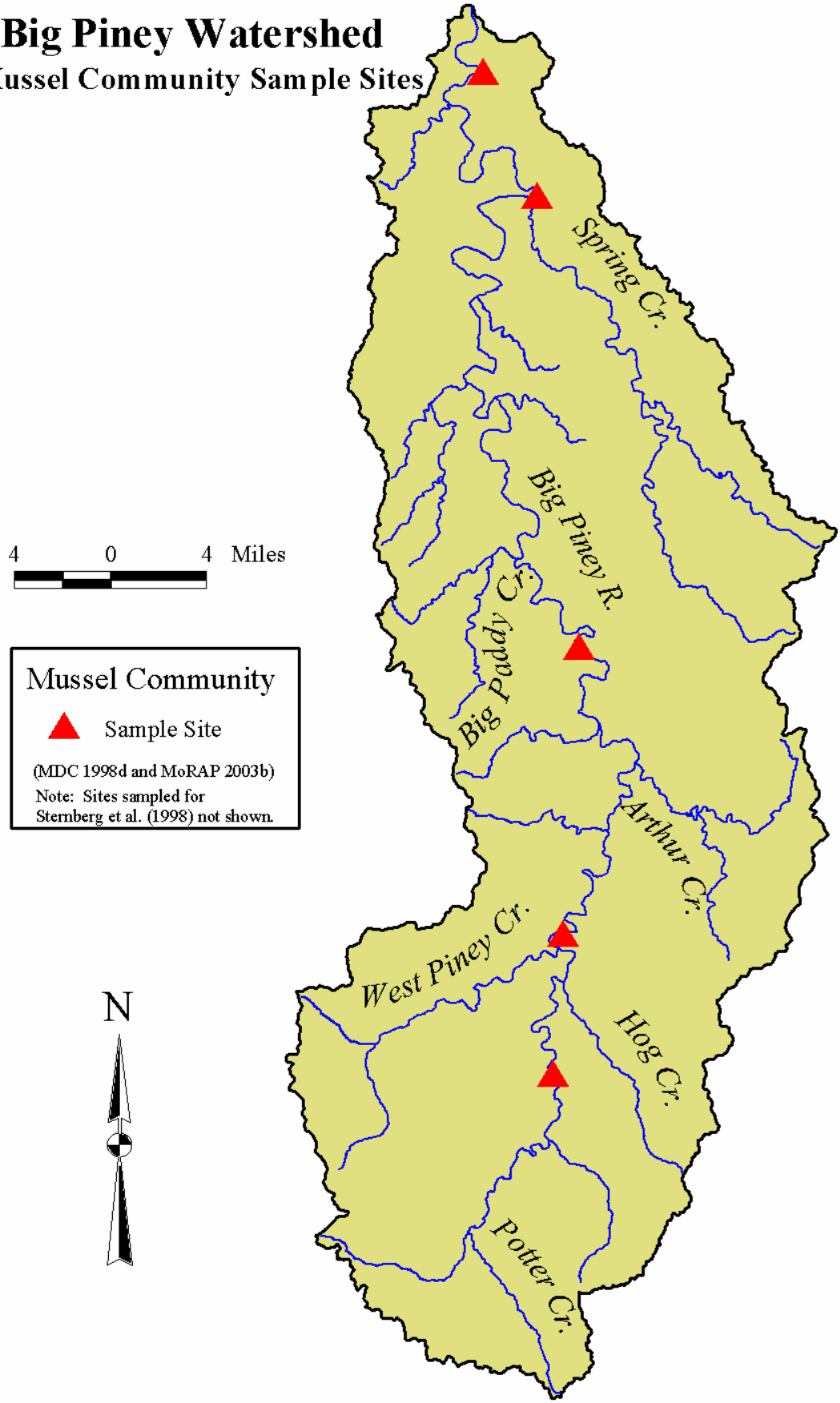

Figure Bc03.

Big Piney Watershed

Crayfish Community Sample Sites

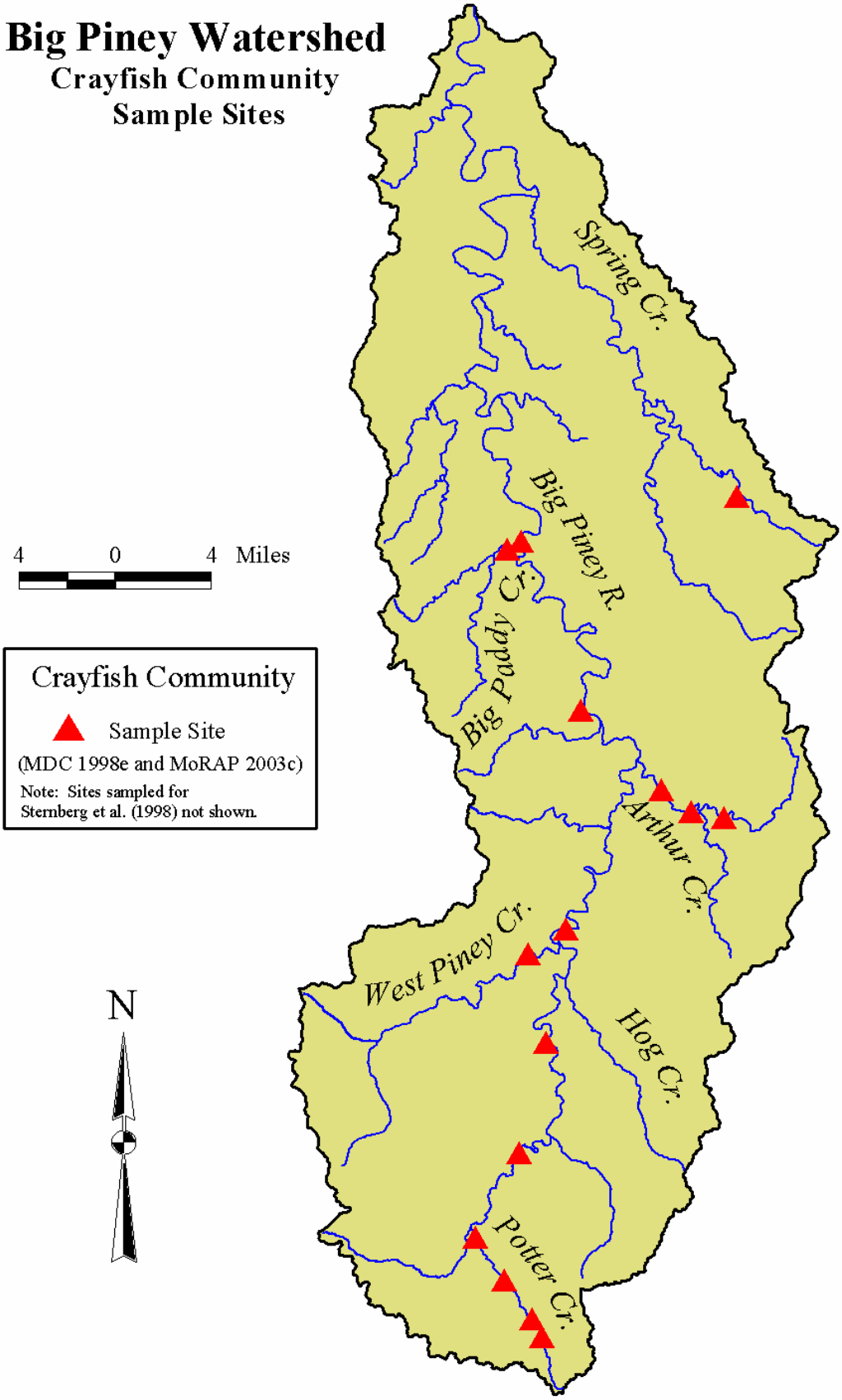

Figure Bc04

Big Piney Watershed

Benthic Invertebrate Community Sample Sites