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## INTRODUCTION

Arkansas has a diverse ichthyofauna of over 215 species of fishes distributed in sixty-three genera and twenty-seven families which occupy a myriad of different aquatic habitats within its poltical boundaries (Robison and Buchanan, 1988). Ecologically, the fish fauna of Arkansas is primarily dominated by fluviatile forms because of the absence of natural lakes other than oxbow lakes situated along the larger rivers (Robison and Buchanan, 1988).

While the overall distributions of state fish species are well known, detailed data regarding the abundance and diversity for specific smaller areas within Arkansas are lacking. This study represents an attempt to inventory the fishes of the Pine Bluff Arsenal, Jefferson County, Arkansas (Maps 1 and 2) for The Nature Conservancy and to put into place the necessary baseline data on the ichthyofauna of the arsenal for future monitoring and possible replication of this study.

The specific purposes of this study were (1) to provide an inventory of the fishes inhabiting the various aquatic habitats located on the Pine Bluff Arsenal (PBA) according to season; (2) to search representative areas of the five habitat types occurring on the PBA; (3) to search for any taxa of fishes that are tracked in the database of the Arkansas Natural Heritage Commission known from the PBA or adjoining counties; and (4) to

report any findings for populations of threatened, endangered, or otherwise significant taxa occurring on the PBA.

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Lance Peacock, Ph.D.
Henry W. Robison, Ph.D.

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report any findings for populations of threatened, endangered, or otherwise significant taxa occurring on the PBA.

## MATERIALS AND METHODS

Significant nomenclatural changes in scientific names of Arkansas fishes have occurred since the publication of Robison and Buchanan (1988). Robison and Buchanan (1993) published a list of changes in the nomenclature of Arkansas fishes, thus a combination of Robison and Buchanan (1988) and Robison and Buchanan (1993) will be followed for use of currently accepted scientific names of fishes in Arkansas.

Field work for this project was conducted from February, 1999 through October, 1999. Collecting trips to the Pine Bluff Arsenal were made on February 26, March 13-14, April 9-10, June 28-29, July 1-2, August 13-14, September 10-11, October 8-9, and October 16, 1999 in an attempt to inventory the fishes and to provide some information on the seasonal occurrence and abundance of fishes within the boundaries of the arsenal. A total of nine trips was taken and 16 field days were spent in which 81 collections of fishes were made on the arsenal in attempts to inventory the arsenal ichthyofauna. All collecting localities visited during the study are figured in Map 3 and are enumerated in Table 1.

Collecting was concentrated on the arsenal in streams, ponds, and lakes with some collections made in the mainstream Arkansas River adjacent to the arsenal. A variety of collecting methods was used in the documentation of the ichthyofauna of the arsenal including the use of seines (12 X 4 ft., 20 X 6 ft, and 30 X 8

ft.), aquatic dip nets, and gill nets.

Representative specimens were preserved in 10% formalin in the field and later washed and transferred to 45 percent isopropyl alcohol in Magnolia. Preserved specimens were deposited in the Southern Arkansas University Fish Collection after careful study of individual variation among species.

In addition, all pertinent literature was searched for records of fishes previously collected from Jefferson County, Arkansas.

## DESCRIPTION OF THE AREA

The U. S. Pine Bluff Arsenal (PBA) is a ten mile by four mile government military installation located in Jefferson County, Arkansas on the west bank of the Arkansas River approximately 32 miles southeast of little Rock, AR and three miles northwest of Pine Bluff, AR. The arsenal covers 14,944 acres of which 10,650 acres are in forest (Mr. Charles Becker, personal communication) (Map 1). The remaining 4,294 acres of open land consist of lawns, buildings, roads, railroads, lakes and streams, wildlife plots, and open fields (Becker, 1992). It can be located on the White Hall 7.5 minute quadrangle map with minor areas on the Redfield, Hardin, and Wright 7.5 minute quadrangle maps.

Topographically, the arsenal is generally flat with poor drainage. The eastern portion of the arsenal is about 40 feet lower in elevation, due to an abrupt drop to the river floodplain (Becker, 1992). The northernmost portion of the arsenal is

characterized by rolling hills and numerous streams.

The arsenal is located within the Arkansas River drainage with the Arkansas River flowing along most of the eastern boundary (Campbell, et al. 1997). The arsenal is drained by perennial, intermittent, and ephemeral drainage systems that flow east-southeast to the Arkansas River. The primary streams of the arsenal are Jackson Creek, Eastwood Bayou, Phillips Creek, Tulley Creek, Caney Creek, and White Creek. Numerous artificial impondments, beaver dams, and one modified natural lake, Yellow Lake, occur on the arsenal (Map 2). Yellow Lake is the largest lake on the arsenal with a surface area of 260 acres and a maximum depth of nine feet. It is flooded several times a year by the Arkansas River. Tulley Lake is next in size with a surface area of 30 acres and a maximum depth of 17 feet.

## HISTORICAL REVIEW

Government surveys played an important role in early Arkansas ichthyology and most began at or near Fort Smith, Arkansas on the border with the Indian Territory. Most other early workers collected from the clear streams of the Ozark and Ouachita Mountains.

Black (1940) completed a doctoral dissertation on the fishes of Arkansas, but did little collecting near Pine Bluff. To the south of the arsenal, Thomas (1976) finished a master's thesis on the fishes of Bayou Bartholomew which drains southeast Arkansas and northeast Louisiana. Thomas (1976) made some collections in Jefferson County, but none on the arsenal.

Buchanan (1976) studied the fishes of the Arkansas River navigation sysytem and made collections on the Arkansas River slightly above and slightly below the arsenal boundaries.

The Arkansas Game and Fish Commission has not done any formal fish sampling on the lakes of the arsenal according to Mr. Allen Carter (personal communication). No other ichthyological studies have been documented from within the arsenal boundaries.

## RESULTS AND DISCUSSION

### Fishes of Pine Bluff Arsenal

Arkansas has 197 native fish species inhabiting the state (Robison and Buchanan, 1988). Fifty-nine native species of fishes were collected on the arsenal, thus representing about 29 percent of the total ichthyofauna of Arkansas documented within its geographic boundaries.

A total of 59 species of fishes classified in 17 families and 36 genera was documented from the arsenal during the study (Table 2). A total of 3,396 individual fishes was collected from the arsenal in an effort to document the fish fauna.

### Species Accounts

The following are species accounts of the fishes collected within the boundaries of the arsenal.

#### Sturgeons (Acipenseridae)

Scaphirhynchus platorynchus (Rafinesque) - Shovelnose Sturgeon

The shovelnose sturgeon generally occupies only in the larger

rivers of the state (Robison and Buchanan, 1988). It is especially abundant in the Arkansas River. Typically, this sturgeon occupies shallow areas and deep channels of large rivers, inhabiting sand bars or areas of strong current over sand and gravel substrates. Adults migrate upstream from April to early june to spawn over rock substrates in channels of large rivers.

A single individual was found washed up on the shoreline of the Arkansas River near the boat launch (Map 4).

Sites Collected: **46**

**Gars (Lepisosteidae)**

Lepisosteus oculatus (Winchell) - Spotted Gar

The spotted gar is widely distributed throughout most rivers of the Coastal Plain in Arkansas (Robison and Buchanan, 1988). It is abundant in quiet, clear waters that have much aquatic vegetation or standing timber (Robison and Buchanan, 1988).

Spotted gars live to be 18 years old. This gar spawns in shallow water in the spring over dead vegetation and algal mats in quiet waters (Echelle and Riggs, 1972), when males reach sexual maturity (two or three years of age) and females mature in their third or fourth year (Redmond, 1964).

On the arsenal the spotted gar was found in Yellow Lake and Phillips Creek (Map 5). It seems to be less tolerant of turbidity than other gars; however, the specimen in Phillips Creek was collected on 1 July 1999 when turbidity levels were extremely high due to previous heavy rainfall.

Two specimens of the spotted gar were taken from the arsenal.

Sites Collected: **4, 40**

Lepisosteus osseus (Linnaeus) - Longnose Gar

The longnose gar is the most widespread and abundant gar within the state being found statewide in all river drainages and is common in reservoirs (Robison and Buchanan, 1988). A versatile species, the longnose gar occupies lowland rivers, bayous, oxbow lakes, and swamps as well as upland creeks, rivers and impoundments.

On the arsenal a single longnose gar was collected from Yellow Lake (Map 6).

Sites Collected: **39**

## Bowfins (Amiidae)

Amia calva Linnaeus - Bowfin

The bowfin is a primitive member of the monotypic family Amiidae, an ancient bony fish family known mostly through fossils (Robison and Buchanan, 1988). This primarily lowland species prefers rivers, oxbow lakes, bayous and swamps. Two juveniles were taken from Yellow Lake on 29 June 1999 representing the only time this species was collected; howver, it is probably more common than our samples reveal (Map 7).

This species spawns from early April to June (Pfleiger, 1975) at night over a prepared depression-like nest and the adhesive eggs attach to vegetation, roots, gravel, or other objects on the floor of the nest.

During this study two bowfin individuals were collected.

Sites Collected: **36**

**Mooneyes (Hiodontidae)**

Hiodon alosoides (Rafinesque) - Goldeye

The goldeye was collected once from the arsenal by seine from the Arkansas River (Map 8). This species generally inhabits medium-sized to large rivers in Arkansas (Robison and Buchanan, 1988). Robison and Buchanan (1988) noted that fishermen using minnows often catch goldeyes in the Arkansas River in July and August.

A single specimen was collected during this study.

Sites Collected: **47**

**Herrings (Clupeidae)**

Dorosoma cepedianum (Lesueur) - Gizzard Shad

Robison and Buchanan (1988) reported the gizzard shad to be found statewide in all river drainages, but reaching its greatest abundances and size in large rivers and impoundments. Miller (1960) and Megrey (1980) summarized the extensive literature on the gizzard shad. This shad is one of Arkansas' most versatile species and occupies a wide variety of habitats in the state (Robison and Buchanan, 1988). As a primary pelagic species it travels in large schools in open, deep, and calm water.

The gizzard shad was a common inhabitant of the Arkansas River and lower portions of Eastwood Bayou on the arsenal (Map

9). Thirty-eight specimens were collected during the study.

Young shad provide excellent food for most native gamefishes, but adults are too large for most predators (Robison and Buchanan, 1988). Gizzard shad have a habit of overpopulating manmade reservoirs, sometimes comprising over 80 percent of the biomass.

Sites Collected: **35, 39, 46, 47, 54**

Dorosoma petenense (Gunther) - Threadfin Shad

The threadfin shad is a native fish species of the Coastal Plain lowland streams of the state and throughout the Arkansas River (Robison and Buchanan, 1988). This shad inhabits moderate to large rivers within the state, but is often used as a forage fish for large gamefishes. Because of its small size and desireability as a forage fish, threadfin shad are stocked in reservoirs for that purpose (Burgess, 1980). In reservoirs, it is a pelagic, schooling species usually found in reservoirs in the upper five feet of water (Pflieger, 1975).

Miller (1967) studied the threadfin shad in Lake Chicot, Arkansas and found its diet to be comprised of tiny phytoplankton and zooplankton which it strains from the water with long gill rakers.

The threadfin was quite abundant in Eastwood Bayou when water levels were exceedingly low on 13 August 1999 and occurs commonly in Yellow Lake (Map 10). A total of 1,236 individuals of the threadfin shad were collected from the arsenal making this species the most abundant fish species.

Sites Collected: **39, 46, 47, 54, 55, 56, 67, 76, 77**

**Minnows (Cyprinidae)**

Carassius auratus (Linneaus) - Goldfish

Although originally imported into the United States as an aquarium species in the late 1800s, this native European species is frequently used as a bait fish in Arkansas (Robison and Buchanan, 1988). Two specimens of goldfish were seined from Yellow Lake on 28 June 1999. These specimens are considered herein as bait fish introductions because of the large number of fishermen who regularly use the arsenal to fish, especially Yellow Lake (Map 11).

Sites Collected: **29**

Cyprinella lutrensis (Baird and Girard) - Red Shiner

The red shiner is an inhabitant of the large rivers in Arkansas such as the Red, Arkansas, St. Francis, and Mississippi rivers (Robison and Buchanan, 1988). The red shiner occupies sluggish streams and large rivers over a wide variety of substrates including sand or mixed sand-gravel and is tolerant of high turbidities and siltation. Typically, it inhabits quiet waters as well as those with current, but tends to forego small streams in Arkansas, preferring instead larger rivers. Matthews and Hill (1977) documented the fairly broad ecological tolerances of this species, reporting a tolerance of pH between 5-10, salinity of 10 parts per thousand, dissolved oxygen as low as 1.5 parts per million, and thermal shock of T+10 to T-21 degrees C.

On the arsenal the red shiner was common and abundant only in the Arkansas River segment of the arsenal (Map 12) where 83 specimens were collected.

Sites Collected: **12, 35, 46, 47, 49, 55, 56**

Cyprinella venusta Girard - Blacktail Shiner

The blacktail shiner is common in the Coastal Plain physiographic province of Arkansas. This schooling species inhabits medium to large streams and rivers, sluggish ditches over sand bottoms, and occasionally oxbow lakes which are sparsely vegetated (Robison and Buchanan, 1988).

On the arsenal the blacktail shiner was only found in Eastwood Bayou and the Arkansas River (Map 13). A total of 29 individuals was collected on the arsenal.

Sites Collected: **11, 12, 54**

Cyprinus carpio Linneaus - Common Carp

This Asian species was introduced into the U. S. in 1876 and into Arkansas waters in the 1880s and is now firmly established in our state waterways. In Arkansas, the carp inhabits a variety of aquatic habitats including reservoirs, upland streams, and lowland streams and rivers (Robison and Buchanan, 1988). The carp becomes most abundant in soft-bottomed, weedy pools of streams although it probably adapts to a wider variety of conditions than almost any native North American fish (Becker, 1983). It is tolerant of all bottom types and is found in clear or turbid waters and it eats a variety of foods. Carp are generally considered a nuisance or detrimental species because of

their habit of rooting in the bottom, thereby causing increased turbidity (Robison and Buchanan, 1988). Although many persons believe carp are harmful to the aquatic environment, carp are probably a symptom and not a cause of deteriorating aquatic conditions.

Eight carp were captured during the study from Phillips Creek and Eastwood Bayou (Map 14).

Sites Collected: **40, 54**

Lythrurus umbratilis (Girard) - Redfin Shiner

The redfin shiner is a statewide inhabitant occurring in relatively clear, warm water streams and most often, in sluggish pools (Robison and Buchanan, 1988).

On the arsenal the redfin shiner was collected three times from three localities (Map 15). A total of 46 specimens was collected on the arsenal.

Snelson and Pfleiger (1975) redescribed the redfin shiner and its subspecies in the central Mississippi Basin. They recognized Notropis u. umbratilis and N. u. cyanocephalus in Arkansas. This section of the genus Notropis was later changed to Lythrurus. The form inhabiting the arsenal is L. u. cyanocephalus.

Sites Collected: **20, 41, 54**

Notemigonus crysoleucas (Mitchill) - Golden Shiner

The golden shiner was quite abundant (129 individuals) and commonly collected on the arsenal (27 collections) (Map 16). The primary reason for this is its widespread use as a bait fish in Arkansas. Robison and Buchanan (1988) reported the golden shiner

is the most popular and widely used bait minnow in Arkansas. It is especially used by anglers for crappie and bass fishing. Indeed several crappie and bass fishermen on Yellow Lake were questioned as to what bait fishes they used and visual inspection of their bait proved the bait to be golden shiners.

The golden shiner prefers well-vegetated, standing water of ponds, reservoirs, lakes, sloughs and quiet pools of low-gradient streams and rivers having mud and sand bottoms (Robison and Buchanan, 1988). Because of its tolerance for turbidity and pollution, the golden shiner inhabits a variety of areas not favored by other species (Robison and Buchanan, 1988).

Sites Collected: **3, 4, 5, 15, 16, 23, 26, 27, 28, 29, 37, 38, 39, 41, 51, 54, 59, 62, 63, 64, 65, 68, 69, 70, 73, 78**

Notropis atherinoides Rafinesque - Emerald Shiner

The emerald shiner occurs statewide in appropriate habitats (Robison and Buchanan, 1988). This species seems to prefer medium-sized to large rivers and streams with clear to turbid water flowing over sandy substrates, although it may become locally abundant in impoundments (Robison and Buchanan, 1988).

On the arsenal, the emerald shiner was only found in the Arkansas River (Map 17) where it was fairly abundant in collections. Ninety-six specimens were taken from the arsenal during this study.

Sites Collected: **46, 49, 55, 56**

Notropis blennius (Girard) - River Shiner

The river shiner was collected only once on the arsenal from

the Arkansas River (Map 18) when eight individuals were taken. This shiner is limited to larger rivers in Arkansas and may become locally abundant. As a schooling species, the river shiner prefers sandy bottoms in areas where there is a current and avoids backwaters (Robison and Buchanan, 1988). It seems to be less tolerant of tubidity than the emerald shiner in Illinois (Smith, 1979), but it is commonly found in the large turbid rivers of Arkansas.

Sites Collected: **47**

Pimephales promelas Rafinesque - Fathead Minnow

The fathead minnow is probably native to Arkansas only in the headwaters of the Illinois and White rivers in northwestern Arkansas (Lee and Shute, 1980); however, it is widely introduced and sporadically collected over the rest of Arkansas (Robison and Buchanan, 1988).

On the arsenal the fathead minnow has been previously introduced into Dilly Pond, Tulley Lake, Little Bomb Storage Pond, Horseshoe Pond, Clear Pond, Upper Duck Pond, Lower Duck Pond, Dexter Pond, and Big Area 3 Pond to serve as a forage species for gamefishes (Charles Becker, personal communication). The fathead minnow was collected five times in this study (Map 19).

Thirty-five specimens were collected from arsenal waters.

Sites collected: **3, 7, 11, 12, 77**

Pimephales vigilax (Baird and Girard) - Bullhead Minnow

The bullhead minnow is widespread and abundant in large

sluggish streams and rivers with sand and mud bottoms throughout the Coastal Plain because of its tolerance of turbidity and pollution (Robison and Buchanan, 1988). This schooling cyprinid was collected from Yellow Lake and the Arkansas River on the arsenal (Map 20).

Sites Collected: **36, 76**

Semotilus atromaculatus (Mitchill) - Creek Chub

The creek chub typically frequents the smallest clear, gravel-bottomed headwater streams throughout the Ozarks and Coastal Plain (Robison and Buchanan, 1988). Ecologically, this species inhabits streams which usually have few other fishes. Smith (1979) noted that it had increased in abundance in Illinois and attributed that increase to extensive habitat alteration, especially increased siltation and the elimination of competing species by human modification of streams.

Creek chubs tend to avoid larger streams having a continuous strong flow and a variety of competing fishes. Two individuals were taken on 14 August 1999 from Station 51 which consisted of a series of isolated shallow pools with high turbidity (Map 21).

Sites Collected: **51**

**Suckers (Catostomidae)**

Carpiodes carpio (Rafinesque) - River Carpsucker

This schooling sucker occurs throughout the state in moderate to large-size streams, rivers, and reservoirs (Robison and Buchanan, 1988). Its preferred habitat is quiet, sand or

silt-bottomed pools, backwaters and oxbows of large streams having moderate to low gradient (Pflieger, 1975).

The river carpsucker was collected only once from the Arkansas River during this study of the arsenal (Map 22). Two juvenile specimens were taken from Station 35 in a backwater area of the Arkansas River.

Sites collected: **35**

Erimyzon oblongus (Mitchill) - Creek Chubsucker

In Arkansas, the creek chubsucker is widespread occurring in all major drainages. This species prefers small creeks and streams of moderate gradient where it lives in quiet waters in vegetation over sand, gravel-bottomed, or debris-laden substrates (Robison and Buchanan, 1988).

The creek chubsucker was uncommonly encountered on the arsenal as only five specimens were taken from two locations (Map 23).

Sites collected: **52, 60**

Ictiobus bubalus (Rafinesque) - Smallmouth Buffalo

The smallmouth buffalo occurs statewide in Arkansas (Robison and Buchanan, 1988). It is generally found in large streams and rivers and prefers slightly clearer water than the bigmouth buffalo (Pflieger, 1975).

During this study three specimens of the smallmouth buffalo were taken on 29 June 1999 from a backwater area of the Arkansas River on the arsenal (Map 24).

Sites Collected: **24**

Ictiobus cyprinellus (Rafinesque) - Largemouth Buffalo

The largemouth buffalo occurs throuhout Arkansas (Robison and Buchanan, 1988). It is generally found in large streams and rivers and tolerates slightly more turbid water than the smallmouth buffalo (Pflieger, 1975).

Only one juvenile specimen of the largemouth buffalo was taken from the arsenal on 1 July 1999 from Tulley Creek on the arsenal (Map 25).

Sites Collected: **41**

Minytrema melanops (Rafinesque) - Spotted Sucker

The spotted sucker inhabits the Coastal Plain of Arkansas primarily (Robison and Buchanan, 1988). Preferred habitat is streams and creeks.

Two juvenile specimens of this sucker were taken from the Eastwood Bayou on the arsenal on 1 July 1999 and 14 August 1999 (Map 26).

Sites Collected: **40, 52**

## Bullhead Catfishes (Ictaluridae)

Ameiurus melas (Rafinesque) - Black Bullhead

The black bullhead is found statewide in appropriate habitats (Robison and Buchanan, 1988). Black bullheads are common inhabitants of oxbow lakes, quiet mud-bottomed backwater areas, and pools of small streams away from strong currents (Robison and Buchanan, 1988).

Nine specimens of the black bullhead were collected on the arsenal from five localities (Map 27).

Sites collected: **6, 26, 38, 39, 57**

Ameiurus natalis (Lesueur) - Yellow Bullhead

After the channel catfish, the yellow bullhead is the next most widely distributed catfish in Arkansas (Robison and Buchanan, 1988). Typically, the yellow bullhead inhabits clear, gravel- or rocky-bottomed, permanent streams more so than the black bullhead. However, because it avoids strong current, it is often found in state reservoirs.

On the arsenal, 16 individuals of the yellow bullhead were taken from seven localities (Map 28).

Sites Collected: **20, 26, 36, 50, 53, 69, 70**

Ictalurus furcatus (Lesueur) - Blue Catfish

The blue catfish originally inhabited the larger rivers of the state and their associated oxbow lakes; however, this species has been stocked by the Arkansas Game and Fish Commission in the larger reservoirs throughout the state (Robison and Buchanan, 1988). The blue catfsh inhabits sandy-bottomed areas of large rivers where it is most abundant in swift current. Young individuals may be captured over sandy shore areas where they are searching for food.

Young juveniles of the blue catfish were captured in the Arkansas River over the sandy bottomed shore areas (Map 29)

Sites Collected: **35, 46, 47, 55, 56**

Ictalurus punctatus (Rafinesque) - Channel Catfish

The channel catfish is the most widely distributed catfish in Arkansas. Because this species is extremely adaptable, it may be found in streams, rivers, lakes, and farm ponds in Arkansas (Robison and Buchanan, 1988). While basically a stream fish, this catfish seems to do equally well in farm ponds, reservoirs, streams, and rivers.

The channel catfish has been stocked extensively on the arsenal in Dilly Pond, Clear Pond, Tulley Lake, and Yellow Lake (Charles Becker, personal communication) by the Arkansas Game and Fish Commission. In this study the channel catfish was collected from 13 sites on the arsenal (Map 30). Interestingly, it was collected from four of the five habitat types on the arsenal including the Arkansas River (big river habitat), Yellow Lake (lake habitat), Dilly Pond (pond habitat) and Eastwood Bayou (sluggish bayou habitat).

Sites Collected: **3, 15, 16, 24, 26, 27, 35, 41, 54, 55, 56, 65, 70**

Noturus gyrinus (Mitchill) - Tadpole madtom

The tadpole madtom is one of the most widely distributed and common madtoms in Arkansas and occurs primarily below the Fall Line in the state (Robison and Buchanan, 1988). This madtom prefers clear to moderately turbid quiet water areas of small streams, oxbow lakes, and sluggish rivers where organic debris has accumulated, or in thick growths of aquatic vegetation over mud and sand bottoms.

The tadpole madtom was found in abundance only in Yellow Lake on the arsenal. A total of 13 specimens was taken during the study (Map 31).

Sites Collected: **39, 68**

Pylodictis olivaris (Rafinesque) - Flathead Catfish

This large slender catfish is commonly found statewide in Arkansas in a variety of habitats, ranging from quiet to flowing waters (Robison and Buchanan, 1988). It is most abundant in the large sandy-bottomed, turbid rivers of the state where it inhabits deep pools adjacent to strong current. Buchanan (1976) reported P. olivaris to be common in all parts of the Arkansas River and second only in abundance among catfishes to the channel catfish. Two specimens were seen in the creel of a fisherman on the Arkansas River (Map 32).

Sites Collected: **46**

## Pikes (Esocidae)

Esox americanus Gmelin - Grass Pickerel

The grass pickerel occurs statewide except the extreme Ozark Highlands (Robison and Buchanan, 1988). It is most often found in quiet waters of small streams having heavy aquatic vegetation, although it occurs in swamps, bayous, sloughs, and ditches (Robison and Buchanan, 1988).

Six specimens of the grass pickerel were collected on the arsenal from two localities (Map 33).

Sites Collected: **36, 51**

## Pirate Perches (Aphredoderidae)

Aphredoderus sayanus (Gilliams) - Pirate Perch

The pirate perch was very common on the arsenal as it was taken ten times during the inventory (Map 35). A total of 14 specimens was collected. This species typically prefers quiet ponds, oxbow lakes, swamps, ditches, and sand-bottomed streams and rivers (Robison and Buchanan, 1988).

Sites Collected: **36, 39, 42, 45, 51, 62, 69, 71, 72, 81**

## Killifishes (Fundulidae)

Fundulus chrysotus (Gunther) - Golden Topminnow

In Arkansas, the golden topminnow is an uncommon lowland species inhabiting oxbow lakes, sluggish areas of creeks, and swampy backwater overflows of rivers (Robison and Buchanan, 1988). Robison and Buchanan (1988) reported that it is usually found in quiet, shallow water in or near aquatic vegetation over a soft mud and detritus bottom.

Seven specimens of this lowland species were collected from two localities on the arsenal, both areas of thick vegetation at the edges of Yellow Lake (Map 35). Fundulus chrysotus is a relatively uncommon species in Arkansas due to the devastation of the Coastal Plain habitat in eastern Arkansas. The healthy population on the arsenal is good news for this species in

Arkansas.

Sites Collected: **39, 69**

Fundulus notatus (Rafinesque) - Blackstripe Topminnow

The blackstripe topminnow is a common inhabitant of Coastal Plain streams of south and eastern Arkansas (Robison and Buchanan, 1988). It prefers small to large low-gradient streams of moderate to high turbidity. Becker (1983) noted it was rarely found in lakes.

This surface feeding topminnow was collected twice (five total specimens) on the arsenal (Map 36). Both collections of this species came from Eastwood Bayou.

Sites Collected: **52, 54**

Fundulus olivaceus (Storer) - Blackspotted Topminnow

The blackspotted topminnow prefers less turbid waters than the blackstriped topminnow. The blackspotted topminnow is one of the most widespread and common fishes in Arkansas occurring in all major drainages (Robison and Buchanan, 1988). This topminnow is found in a variety of habitats including small headwater creeks to large rivers, impoundments, and oxbow lakes in both mountains and lowlands (Robison and Buchanan, 1988). This species can generally be found in quiet backwaters and pools where it often occurs along the margins of the stream near emergent vegetation such as water willow.

On the arsenal the blackspotted topminnow was common having been collected 28 times (Map 37). A total of 48 specimens was taken in the 28 collections.

Sites Collected: **1, 2, 3, 4, 13, 14, 17, 20, 22, 22, 25, 26, 29, 33, 40, 41, 42, 51, 52, 60, 61, 62, 65, 66, 67, 68, 70, 71**

**Livebearers (Poeciliidae)**

Gambusia affinis (Baird and Girard) - Western Mosquitofish

The western mosquitofish or simply "mosquitofish," occurs throughout the state in a wide variety of habitats including swamps, ditches, farm ponds, streams, rivers, and lakes in Arkansas (Robison and Buchanan, 1988). It has been introduced worldwide as a mosquito control agent.

Because females store sperm in their reproductive tracts for up to several months and give birth to live young (Robison and Buchanan, 1988), this species is easily spread by a single fertilized female gaining entrance into a body of water. Females may produce three or four broods during a single summer. The mosquitofish has broad ecological tolerances, surviving temperatures ranging from 42.8-95 degrees F (6-35 degrees C) up to 107.6 degrees F (42 degrees C) for brief periods, a dissolved oxygen content as low as 0.18 ppm and, given time to adapt, may survive salinities more than twice that of seawater (Ahuja, 1964). Temperature selection and heat resistance in Arkansas mosquitofish were studied by Bacon et al. (1968).

The western mosquitofish was the most common fish species found on the arsenal (Map 38). This species was taken in 55 of 81 collections or 68 percent of the collections made during the inventory. A total of 831 specimens was collected, most being

released alive after identification and counting.

Sites Collected: **1, 2, 3, 4, 5, 7, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 28, 29, 30, 31, 32, 33, 34, 37, 38, 39, 41, 43, 44, 45, 48, 51, 52, 53, 57, 58, 59, 60, 62, 63, 64, 66, 70, 71, 72, 74, 75, 77, 78, 79, 81**

## Silversides (Atherinidae)

Labidesthes sicculus (Cope) - Brook Silverside

The brook silverside is a surface-dwelling fish, occurring in streams, lakes and small rivers in Arkansas (Robison and Buchanan, 1988). This schooling species prefers quiet backwater regions where it is often observed making short jumps out of the water. Most individuals complete their entire life cycles in one year, however in Arkansas, Fogle (1959) found several males with two annuli indicating they survived two years.

The brook silverside was captured six times on the arsenal (Map 39). A total of 167 individuals was collected from the six sites.

Sites Collected: **36, 41, 52, 61, 66, 71**

Menidia beryllina (Cope) - Inland Silverside

The inland silverside inhabits the large rivers of the state, although it has been stocked in some reservoirs (Robison and Buchanan, 1988). Robison and Buchanan (1988) reported the inland silverside to be one of the most abundant fishes in the Arkansas River based on Buchanan's (1976) study of Arkansas River fishes.

Sixty-three inland silversides were collected six times from the Arkansas River sandbars on the arsenal (Map 40).

Sites Collected: **49, 55, 56, 67, 76, 77**

## Temperate Basses (Moronidae)

Morone chrysops (Rafinesque) - White Bass

The white bass occurs in all major drainages in Arkansas (Robison and Buchanan, 1988). It attains its largest abundance in large rivers and large impoundments. This species occurs in both current and backwater areas in clear water over a firm sand or rock bottom (Robison and Buchanan, 1988). White bass are mobile, active, open-water fish that travel in large schools in search of food. Olmsted and Kilambi (1971) studied food habits of the white bass in Beaver Reservoir in Arkansas and found the dominant food item was shad, followed by centrachids and cyprinids.

Typically white bass migrate up into smaller tributary streams in late winter and early spring; however, on the arsenal, white bass may spawn in shallow water over wind-swept shoals as tributary streams are possibly too shallow for long migrations to occur.

The white bass was collected infrequently in Yellow Lake (Map 41) as only two specimens were taken, one in spring sampling and one during the summer.

Sites Collected: **5, 36**

Morone mississippiensis Jordan and Eigenmann - Yellow Bass

The yellow bass is found only in the Coastal Plain lowlands in Arkansas (Robison and Buchanan, 1988). This bass is an open water, schooling species found primarily in clear to turbid water in the backwaters of large rivers and especially in their associated oxbow lakes.

Two juvenile yellow bass were collected in Yellow Lake near the boat launch (Map 42) on 1 July 1999. The long second anal spine of this species is diagnostic for differentiation of this species and other members of this genus.

Sites Collected: **39**

## Sunfishes (Centrarchidae)

Centrarchus macropterus (Lacepede) - Flier

The flier is a lowland species which inhabits lakes, bayous, creeks, and swampy backwaters of large rivers (Robison and Buchanan, 1988). This centrachid prefers quiet, clear, heavily vegetated waters having a mud and detritus bottom. In Arkansas, it is not widely utilized as a gamefish because of its small size, sporadic distribution, and generally small populations (Robison and Buchanan, 1988).

The flier was found only in Yellow Lake, but probably occurs in other impounded bodies of water on the arsenal also (Map 43). Only eight specimens of the flier were taken during the study.

Sites Collected: **36, 39**

Lepomis cyanellus Rafinesque - Green Sunfish

This highly adaptable species can be found in almost every aquatic habitat type in Arkansas (Robison and Buchanan, 1988). Pflieger (1975) noted its tolerance of a wide range of ecological conditions, particularly to extremes of turbidity, dissolved oxygen, temperature, and flow. Because of those wide tolerances, the green sunfish readily repopulates new bodies of water and is among the first fishes to repopulate streams after droughts (Pflieger, 1975; Smith, 1979). Carlander (1977) provided a summary of extensive literature on the biology and life history of the green sunfish.

The green sunfish was quite common on the arsenal as it was collected 24 times (Map 44). Fifty-seven specimens were taken during the study.

Sites Collected: **1, 3, 9, 11, 12, 15, 16, 18, 20, 23, 27, 32, 40, 43, 44, 51, 57, 58, 63, 66, 70, 71, 75, 81**

Lepomis gulosus (Cuvier) - Warmouth

Primarily a lowland species, the warmouth inhabits quiet waters of bayous and rivers, lakes, and swamps of the Coastal Plain primarily (Robison and Buchanan, 1988). This centrarchid shows a decided preference for clear water of bayous and rivers, and swamps having mud and detritus bottom; however it will tolerate moderate levels of turbidity (Robison and Buchanan, 1988). Carlander (1977) summarized published information on the warmouth.

The warmouth was uncommon on the arsenal as only 10 specimens

were taken in five collections (Map 45).

Sites Collected: **4, 7, 39, 52, 80**

Lepomis humilis (Girard) - Orangespotted Sunfish

The orangespotted sunfish was relatively common in Yellow Lake and the big river habitat (Map 46). This more western species has a wide ecological tolerance. In Arkansas, it typically inhabits turbid or clear lowland streams over a mud and detritus bottom (Robison and Buchanan, 1988).

Twenty-one specimens were collected from the arsenal waters.

Sites Collected: **36, 39, 73, 76, 79**

Lepomis macrochirus Rafinesque - Bluegill

The bluegill is probably the most popular gamefish in Arkansas (Robison and Buchanan, 1988) and is distributed statewide in a variety of habitats as well as being stocked in farm ponds and reservoirs throughout Arkansas. Largest populations of bluegill are found in clear, quiet, warm waters having at least some aquatic vegetation (Carlander, 1977).

This gregarious species was found at 27 locations on the arsenal (Map 47).

Sites Collected: **3, 4, 5. 7. 15, 16, 22, 23, 26, 27, 28, 36, 38, 39, 40, 41, 51, 52, 57, 59, 61, 62, 63, 64, 68, 69, 70**

Lepomis marginatus (Holbrook) - Dollar Sunfish

The dollar sunfish is a lowland species found in swamps and small sluggish creeks and bayous having clear water, usually moderate to heavy vegetation, and mud and detritus bottoms (Robison and Buchanan, 1988).

The Pine Bluff Arsenal had both dollar sunfish and longear sunfish occurring within its prescribed boundaries. The dollar sunfish is often confused with the longear sunfish but differs in having cheek scales in three or four rows versus five to seven and the pectoral fin with 12 rays versus 13-15 rays.

Dollar sunfish were especially abundant in Yellow Lake, but occurred in many other areas of the arsenal (Map 48). One hundred and six specimens were taken during the study.

Sites Collected: **35, 36, 37, 38, 39, 41, 46, 47, 48, 51, 52, 66, 68, 69, 70, 73, 75, 78, 80**

Lepomis megalotis (Rafinesque) - Longear Sunfish

The longear sunfish is a moderately small sunfish which is generally considered a game species. It occurs widely in Arkansas being found statewide in appropriate habitats (Robison and Buchanan, 1988). Although most abundant in clear, upland streams with rocky bottoms, this species may also be found in farm ponds, reservoirs, and both large and small streams and rivers throughout the state.

Eight individuals of the longear sunfish were collected in the Arkansas River (Map 49).

Sites Collected: **49, 55, 56**

Lepomis microlophus (Gunther) - Redear Sunfish

The redear sunfish is native to all major drainages of Arkansas, but has been widely stocked in ponds and reservoirs throughout the state (Robison and Buchanan, 1988). It prefers oxbow lakes and quiet backwaters where it inhabits warm, clear

waters with an abundance of stumps, logs, brush, and other aquatic vegetation over mud and detritus bottoms (Robison and Buchanan, 1988).

During the study the redear sunfish was collected nine times from Yellow Lake and once from Tully Lake (Map 50). A total of 14 specimens was taken on the arsenal.

Sites Collected: **4, 5, 7, 26, 27, 36, 39, 68, 69, 80**

Lepomis miniatus (Jordan) - Redspotted Sunfish

The redspotted sunfish is a common inhabitant of the Coastal Plain in Arkansas (Robison and Buchanan, 1988). This species is found in streams, rivers, and oxbow lakes in the lowlands where it is found in quiet or sluggish clear waters usually with much aquatic vegetation and other cover and with mud and detritus substrates.

Three individuals of the redspotted sunfish were found on the arsenal in Yellow Lake (Map 51).

Sites Collected: **36, 39**

Micropterus salmoides (Lacepede) - Largemouth Bass

The largemouth bass occurs statewide in Arkansas in all drainages (Robison and Buchanan, 1988). It is arguably the most important freshwater gamefish in the United States. The largemouth bass is most commonly found in clear, quiet waters in natural and manmade lakes and ponds, and in backwaters and pools of streams and rivers (Robison and Buchanan, 1988). During the day it spends most of its time near logs or other cover in deep water.

Surprisingly, the largemouth bass was one of the most commonly collected fishes on the arsenal (Map 52). This bass was found in 19 collections or 23 percent of all collections made. A total of 62 individuals was taken in arsenal collections. Most were young-of-the-year specimens or juveniles.

Sites Collected: **4, 7, 9, 11, 12, 26, 28, 29, 36, 39, 41, 51, 52, 62, 68, 71, 78, 80, 81**

Pomoxis annularis Rafinesque - White Crappie

Another statewide inhabitant, the white crappie is found in natural and manmade lakes, ponds, streams, and rivers (Robison and Buchanan, 1988). Robison and Buchanan (1988) reported this species has wide ecological tolerances but prefers quiet waters and is almost always found near brush piles, the tops of fallen trees, or standing timber. Although not a strongly schooling species, it tends to congregate in loose aggregations near suitable cover in lakes and reservoirs.

The white crappie was commonly taken by fishermen in Yellow Lake as seen in their creels (Map 53).

Sites Collected: **4, 36, 39, 73**

Pomoxis nigromaculatus (Lesueur) - Black Crappie

Black crappie occupy essentially the same habitat as the white crappie; however, it seems to dominate in clear, vegetated, more acid waters, while the white crappie dominates in richer (more eutrophic) more turbid, alkaline waters (Robison and Buchanan, 1988). The black crappie prefers quiet backwaters of large rivers where submerged structure is present and becomes

abundant in natural lowland lakes and large reservoirs.

Black crappie were also documented on the arsenal in Yellow Lake on two occasions (three specimens) by local fishermen (Map 54).

Sites Collected: **36, 39**

**Perches (Percidae)**

Etheostoma chlorosoma (Hay) - Bluntnose Darter

The bluntnose darter occurs in streams of the Coastal Plain lowlands in eastern and southern Arkansas and throughout the Arkansas River Valley (Robison and Buchanan, 1988). This darter occurs in quiet water in sluggish streams, bayous, and oxbow lakes over a mud, sand or detritus substrate.

On the arsenal, the bluntnose darter is rare as only two specimens were collected during the study (Map 55).

Sites Collected: **52**

Etheostoma fusiforme (Girard) - Swamp Darter

The swamp darter is rare in Arkansas (Robison and Buchanan, 1988). This small darter inhabits swamps, bayous, and oxbow lakes in areas of little or no current over a mud and detritus bottom.

The swamp darter was collected only once on the arsenal from Yellow Lake at the boat launch (Map 56) when five specimens were seined up near the boat launch area.

Sites Collected: **39**

Etheostoma gracile (Girard) - Slough Darter

The slough darter is widespread throughout the Coastal Plain lowlands of eastern and southern Arkansas (Robison and Buchanan, 1988). This small darter inhabits bayous, sloughs, oxbow lakes, and creeks in areas with sluggish or no current and prefers a bottom of mud or sand, covered with plant debris and some aquatic vegetation (Robison and Buchanan, 1988).

On the arsenal, the slough darter was collected only once. Two specimens of this darter were taken from Tully Creek on 1 July 1999 (Map 57)

Sites Collected: **41**

Etheostoma proeliare (Hay) - Cypress Darter

The cypress darter is the second smallest Arkansas darter. It is widely distributed throughout the Coastal Plain lowlands and prefers bayous, oxbow lakes, swamps, and streams in little or no current over a soft mud and detritus bottom (Robison and Buchanan, 1988). Generally, this darter can be found near aquatic vegetation.

This darter was the most abundant darter collected on the arsenal as 42 specimens were taken from five localities (Map 58).

Sites Collected: **39, 41, 52, 75, 80**

Etheostoma whipplei (Girard) - Redfin Darter

The redfin darter occurs in tributaries of the Arkansas, Illinois, Middle White, Ouachita and Red rivers (Robison and Buchanan, 1988). It tends to inhabit small to medium-sized streams of high gradient where it is found in gravel-bottomed riffles. This darter is quite adaptable to a wide range of

habitats in Arkansas.

During the study the redfin darter was collected only once. A single specimen was taken from Eastwood Bayou on 14 August 1999 (Map 59).

Sites Collected: **52**

Percina caprodes (Rafinesque) - Logperch

The loperch is widespread in Arkansas and is one of the most adaptable darters occurring in a variety of habitats in the state including mountain streams, moderate and large-sized rivers of medium to low gradient, oxbow lakes, and impoundments (Robison and Buchanan, 1988). Excessive turbidity and siltation seem to be the main factors excluding this species from some lowland waters in eastern and southern Arkansas (Robison and Buchanan, 1988).

Surprisingly, two specimens of logperch were unexpectedly collected in Yellow Lake at the boat launch area (Map 60) on 1 July 1999. This darter is most often taken in high gradient clear streams in deep riffles over gravel bottoms; however, it has been taken from the Coastal Plain lowlands as well and is known from Arkansas reservoirs (Robison and Buchanan, 1988). No other specimens of this darter were taken in sampling of the arsenal.

Sites Collected: **39**

Stizostedion canadense (Smith) - Sauger

The sauger is strictly a fish of moderate to large rivers in Arkansas (Robisona and Buchanan, 1988). Robison and Buchanan

(1988) reported it was most widespread and abundant in the Arkansas River. Buchanan (1976) found its numbers increased substantially during the 1970's after the construction of the Arkansas River Navigation System.

Three specimens of the sauger were collected from the Arkansas River during this inventory (Map 61).

Sites Collected: **46, 49**

**Drums (Sciaenidae)**

Aplodinotus grunniens Rafinesque - Freshwater Drum

The freshwater drum occurs throughout Arkansas, but primarily in the larger rivers and lakes (Robison and Buchanan, 1988). This species typically inhabits deep pools of such riverine systems. A single specimen was documented from the Arkansas River when a fisherman caught a specimen near the boat launch area (Map 62).

Sites Collected: **46**

**Abundance of Fishes on Pine Bluff Arsenal**

A total of 3,396 individual fish was collected during the study period. These 3,396 individuals comprise 59 species in 17 families and 36 genera (Table 2). Tables 3 and 4 indicate the abundance of the fishes collected from the Pine Bluff Arsenal. Table 3 provides the actual number of each species collected on the arsenal, plus the relative abundance of each species.

The most abundant species on the arsenal was the threadfin shad (Dorosoma petenense) (1,234 individuals) which comprised

36.34 percent of the total fishes collected on the arsenal. The second most abundant species collected on the arsenal was the western mosquitofish (Gambusia affinis) with 24.47 percent (831 individuals) while the third most abundant species was the brook silverside (Labidesthes sicculus)(167 individuals) with 4.92 percent of the total number of fishes collected. Other abundant species taken on the arsenal included the golden shiner (Notemigonus crysoleucas)(129 individuals) with 3.80 percent and dollar sunfish (Lepomis marginatus)(106) with 3.12 percent of the total.

Table 4 designates each fish species collected on the arsenal according to a scheme of four categories: abundant, common, uncommon, and rare. These terms are defined thusly: rare = 0-2 individuals; uncommon = 3-10 individuals; common = 11-50 individuals, and adundant = over 50 individuals.

With the above definitions in mind, 10 species were categorized as being abundant on the arsenal including the threadfin shad (Dorosoma petenense), red shiner (Cyprinella lutrensis), golden shiner (Notemigonus crysoleucas), emerald shiner (Notropis atherinoides), mosquitofish (Gambusia affinis), brook silverside (Labidesthes sicculus), inland silverside (Menidia beryllina), green sunfish (Lepomis cyanellus), dollar sunfish (Lepomis marginatus), and largemouth bass (Micropterus salmoides).

Common species (16 species) were the gizzard shad (Dorosoma cepedianum), blacktail shiner (Cyprinella venusta), redfin shiner

(Lythrurus umbratilus), fathead minnow (Pimephales promelas), bullhead minnow (Pimephales vigilax), yellow bullhead (Ameiurus natalis), blue catfish (Ictalurus furcatus), channel catfish (Ictalurus punctatus), tadpole madtom (Noturus gyrinus), pirate perch (Aphredoderus sayanus), blackspotted topminnow (Fundulus olivaceus), orangespotted sunfish (Lepomis humilis), bluegill (Lepomis macrochirus), redear sunfish (Lepomis microlophus), white crappie (Pomoxis annularis), and cypress darter (Etheostoma proeliare).

The 16 uncommon fish species collected on the arsenal included the common carp (Cyprinus carpio), river shiner (Notropis blennius), creek chubsucker (Erimyzon oblongus), smallmouth buffalo (Ictiobus bubalus), black bullhead (Ameiurus melas), grass pickerel (Esox americanus), golden topminnow (Fundulus chrysotus), blackstripe topminnow (Fundulus notatus), white bass (Morone chrysops), flier (Centrachus macropterus), warmouth (Lepomis gulosus), longear sunfish (Lepomis megalotis), redspotted sunfish (Lepomis miniatus), black crappie (Pomoxis nigromaculatus), swamp darter (Etheostoma fusiforme), and sauger (Stizostedion canadense).

Rare species on the arsenal with only one or two individuals collected were represented by 17 species including the shovelnose sturgeon (Scaphirhynchus platorynchus), spotted gar (Lepisosteus oculatus), longnose gar (Lepisosteus osseus), bowfin (Amia calva), goldeye (Hiodon alosoides), goldfish (Carassius auratus), creek chub (Semotilus atromaculatus), river carpsucker (Carpiodes

carpio), bigmouth buffalo (Ictiobus cyprinellus), spotted sucker (Minytrema melanops), flathead catfish (Pylodictis olivaris), yellow bass (Morone mississippiensis), bluntnose darter (Etheostoma chlorosoma), slough darter (Etheostoma gracile), redfin darter (Etheostoma whipplei), logperch (Percina caprodes), and freshwater drum (Aplodinotus grunniens).

Both lotic and lentic habitat is abundant on the arsenal. Lotic or running water habitat is widely distributed on the arsenal. In addition to lotic habitat, lentic or standing water habitat occurs widely on the arsenal as a result of both natural and man-made sources. Man-made ponds, man-made lakes, and even small pools caused by water below culverts contained numerous fishes.

**Distribution of Pine Bluff Arsenal Fishes by Habitat**

Five distinct aquatic habitat types were identified on the Pine Bluff Arsenal including (1) small woodland streams, (2) sluggish bayou sections, (3) big river (Arkansas River mainstem), (4) ponds, and (5) lakes. Table 5 depicts the fishes collected on the PBA by habitat type.

Thirty-four species of fishes were collected from the lake habitat type while 24 species were found in the big river habitat (Arkansas River) and 23 fish species were taken in the sluggish bayou sections of the arsenal. Ponds, as expected, yielded the fewest number of species (eight species) because their fish faunas consist of "stocked" species like channel catfish (Ictalurus punctatus) and fathead minnows (Pimephales promelas)

for the most part.

Only two species including the western mosquitofish (Gambusia affinis) and largemouth bass (Micropterus salmoides) were collected from each of the five habitat types. The golden shiner (Notemigonus crysoleucas), yellow bullhead (Ameiurus natalis), channel catfish (Ictalurus punctatus), green sunfish (Lepomis cyanellus), and bluegill (Lepomis macrochirus), and dollar sunfish (Lepomis marginatus) were each found in four of the five habitat types.

The following is a discussion of individual habitat types and fish species inhabiting each.

Small Woodland Streams

Small woodland streams are fairly abundant on the arsenal. Such aquatic systems are relatively clear, tannin stained, shallow bodies of water with mud and sand substrates. Little aquatic vegetation occurs at the stream margins.

Nineteen species of fishes were taken from the small woodland stream habitat (Table 5). Fishes collected from this habitat type included the redfin shiner (Lythrurus umbratilis), golden shiner (Notemigonus crysoleucas), creek chub (Semotilus atromaculatus), creek chubsucker (Erimyzon oblongus), black bullhead (Ameiurus melas), yellow bullhead (Ameiurus natalis), grass pickerel (Esox americanus), pirate perch (Aphredoderus sayanus), blackstriped topminnow (Fundulus olivaceus), mosquitofish (Gambusia affinis), brook silverside (Labidesthes sicculus), green sunfish (Lepomis cyanellus), bluegill (Lepomis

macrochirus), dollar sunfish (Lepomis marginatus), largemouth bass (Micropterus salmoides), bluntnose darter (Etheostoma chlorosoma), slough darter (Ethesotoma gracile), cypress darter (Etheostoma proeliare), and redfin darter (Etheostoma whipplei).

Sluggish Bayou Sections

In several areas of the arsenal larger sluggish bayou sections of Eastwood and Caney bayous served as habitat for 23 species of fishes. These areas were typically deeper, devoid of vegetation, and more turbid than the smaller streams of the arsenal. Substrates were generally mud and sand. Fishes found in this habitat type included the spotted gar (Lepisosteus oculatus), gizzard shad (Dorosoma cepedianum), threadfin shad (Dorosoma petenense), blacktail shiner (Cyprinella venusta), golden shiner (Notemigonus crysoleucas), creek chubsucker (Erimyzon oblongus), smallmouth buffalo (Ictiobus bubalus), spotted sucker (Minytrema melanops), black bullhead (Ameiurus melas), yellow bullhead (Ameiurus natalis), channel catfish (Ictalurus punctatus), pirate perch (Aphredoderus sayanus), blackstripe topminnow (Fundulus notatus), blackstriped topminnow (Fundulus olivaceus), mosquitofish (Gambusia affinis), brook silverside (Labidesthes sicculus), green sunfish (Lepomis cyanellus), bluegill (Lepomis macrochirus), dollar sunfish (Lepomis marginatus), largemouth bass (Micropterus salmoides), and cypress darter (Etheostoma proeliare).

Big River

The Arkansas River forms the northeastern border of the Pine

Bluff Arsenal. This "big river" habitat created by the Arkansas River adds an additional component of the fish fauna not generally found when surveying the fishes of other lowland delta regions. A total of 24 species of fishes (Table 5) was taken from the big river habitat including the shovelnose sturgeon (Scaphirhynchus platorynchus), goldeye (Hiodon alosoides), gizzard shad (Dorosoma cepedianum), threadfin shad (Dorosoma petenense), red shiner (Cyprinella lutrensis), blacktail shiner (Cyprinella venusta), emerald shiner (Notropis atherinoides), river shiner (Notropis blennius), fathead minnow (Pimephales promelas), bullhead minnow (Pimephales vigilax), river carpsucker (Carpiodes carpio), smallmouth buffalo (Ictiobus bubalus), bigmouth buffalo (Ictiobus cyprinellus), blue catfish (Ictalurus furcatus), channel catfish (Ictalurus punctatus), flathead catfish (Pylodictis olivaris), mosquitofish (Gambusia affinis), inland silverside (Menidia beryllina), orangespotted sunfish Lepomis humilis), dollar sunfish (Lepomis marginatus), longear sunfish (Lepomis megalotis), largemouth bass (Micropterus salmoides), sauger (Stizostedion vitreum), and freshwater drum (Aplodinotus grunniens).

Ponds

There are a number of artificial ponds created by arsenal personnel over the years as recreational areas for both base and other personnel. Such ponds are depauperate in species composition generally being primarily stocked for fishing recreation. The pond habitat type yielded only eight fish

species including the golden shiner (Notemigonus crysoleucas), fathead minnow (Pimephales promelas), yellow bullhead (Ameiurus natalis), channel catfish (Ictalurus punctatus), mosquitofish (Gambusia affinis), green sunfish (Lepomis cyanellus), bluegill (Lepomis macrochirus), and largemouth bass (Micropterus salmoides).

Lakes

Arsenal lakes include Yellow Lake, Tulley Lake, Upper Duck Pond and Lower Duck Pond. Yellow Lake is by far the largest lake on the arsenal and supports the largest and most diverse fish population.

Thirty-four species of fishes were documented from Yellow Lake (Table 5). Yellow Lake fishes included the spotted gar (Lepisosteus oculatus),longnose gar (Lepisosteus osseus), bowfin (Amia calva), gizzard shad (Dorosoma cepedianum), threadfin shad (Dorosoma petenense), goldfish (Carassius auratus), golden shiner (Notemigonus crysoleucas), fathead minnow (Pimephales promelas), bullhead minnow (Pimephales vigilax), black bullhead (Ameiurus melas), yellow bullhead (Ameiurus natalis), channel catfish (Ictalurus punctatus), tadpole madtom (Noturus gyrinus), grass pickerel (Esox americanus), golden topminnow (Fundulus chrysotus), blackspotted topminnow (Fundulus olivaceus), mosquitofish (Gambusia affinis), brook silverside (Labidesthes sicculus), white bass (Morone chrysops), yellow bass (Morone mississippiensis), flier (Centrarchus macropterus), green sunfish (Lepomis cyanellus), warmouth (Lepomis gulosus), orangespotted

sunfish (Lepomis humilus), bluegill (Lepomis macrochirus), dollar sunfish (Lepomis marginatus), redear sunfish (Lepomis microlophus), redspotted sunfish (Lepomis miniatus), largemouth bass (Micropterus salmoides), white crappie (Pomoxis annularis), black crappie (Pomoxis nigromaculatus), swamp darter (Etheostoma fusiforme), cypress darter (Etheostoma gracile), and logperch (Percina caprodes).

**Seasonality of Pine Bluff Arsenal Fishes**

Fishes were collected from the arsenal in every month of the inventory from 26 February through October (Table 3). The summer proved to be the best season for collecting as 57 fish species were taken during the summer months (June, July and August). It should be noted that the summer of 1999 was one of the driest on record and thus collecting was made easier in many cases where water depths were greater in the spring and fall. In addition, access was made easier with dry roads and trails into every area of the arsenal.

Less than half the number of fish species were collected in the fall as compared to the summer effort. Reasons for this disparity are not readily apparent. Summer is a wonderful time to collect fishes. The fall of 1999 was even drier than the summer months and water was difficult to find to sample in the upper areas of streams on the arsenal.

Spring sampling revealed only 18 species of fishes on the arsenal. High water during sampling efforts in the spring made sampling difficult, but not impossible in several areas of the

arsenal. Late spring and early summer is typically a time of reproduction of many fishes, thus more species and individuals are generally seen at those times.

**Conservation Status of Pine Bluff Arsenal Fishes**

The Arkansas Natural Heritage Commission lists the following six fish species as species of "special concern" from Jefferson and Grant counties, Arkansas: goldeye (Hiodon alosoides), goldstripe darter (Etheostoma parvipinne), shorthead redhorse (Moxostoma macrolepidotum), bluehead shiner (Notropis hubbsi), taillight shiner (Notropis perpallidus), and the peppered shiner (Notropis perpallidus).

A single specimen of the goldeye (Hiodon alosoides) was collected on the arsenal from the Arkansas River (Station 47). The goldeye, although considered a species of "special concern" by the ANHC, is a big river fish species which has relatively few records in state fish collections; however, its scarcity probably results more from the lack of collecting the big river habitats in Arkansas have experienced in the past than to actual scarcity in fact. On-going and future collecting in the big river habitat in Arkansas will no doubt reveal many additional collecting sites for this species. Robison and Buchanan (1988) did not consider the goldeye as having any conservation status in Arkansas and did not include it among the 15 fish species they listed as being of "Special Concern" for Arkansas. In fact, it is fairly common in the Arkansas River near Fort Smith and was documented from 15 locations in the Arkansas River by Buchanan (1976; 1977) and

Robison and Buchanan (1988).

From nearby Prairie and Arkansas counties, the Commission lists as "special concern" fishes the lake chubsucker (Erimyzon succetta), swamp darter (Etheostoma fusiforme), American brook lamprey (Lampetra appendix), taillight shiner (Notropis perpallidus), striped mullet (Mugil cephalus), sabine shiner (Notropis sabinae), and paddlefish (Polyodon spathula). The only species collected on the arsenal from the above group is the swamp darter (Etheostoma fusiforme). Seven specimens of the swamp darter were taken from Yellow Lake. With as much habitat as exists on the arsenal, this species is probably more abundant than our collecting indicated.

**Management Recommendations**

The total of 59 species of fishes in 36 genera representing 17 families which was documented as occurring on the Pine Bluff Arsenal during this inventory reflects a diverse and healthy ichthyofauna. The abundance and diversity of aquatic habitat including creeks, streams, bayous, large river, ponds, and lakes provides a wide range of niches available to both game and non-game fish species.

Recommendations for future management of fishes on the arsenal are as follows:

**1.** First as a management recommendation would be for the arsenal to continue to maintain the diversity of aquatic habitats presently available on the arsenal. Careful limitation of timber cuts in certain areas with a high diversity of fishes should be

encouraged. At certain times during the study the turbidity levels in certain streams was amazingly high and certainly deleterious to the fish fauna. Much of this may have been due to on-going construction of buildings and road construction. Clearcutting of large forested tracts should be discouraged. The GIS system which the arsenal now has in place will provide an important management tool in ascertaining proper timber rotation through the coming years and thus aid in protecting the fish fauna.

**2.** With regard to the aquatic environment of the arsenal, fortunately the arsenal has an abundance of such habitat types. Yellow Lake is a wonderfully diverse sanctuary for both game and non-game fish species on the arsenal. Fully 34 species or 58 percent of the fish fauna by species of the arsenal resides in Yellow Lake. Periodic flooding of Yellow Lake by the Arkansas River insures flushing of the lake and recruitment of river fishes thus maintaining the health of the lake ecosystem. A recommendation would be to work more closely with the Arkansas Game and Fish Commission to insure the proper balance in Yellow Lake between non-game and game fishes. Periodic sampling by Arkansas Game and Fish Commission biologists would provide important management data to the arsenal biologist who could receive recommendations from the Commission biologists as to future needs and plan of action.

**3.** The number of man-made ponds on the arsenal seems adequate and thus construction of new ponds is not recommended at this time.

These ponds could also be monitored by the Arkansas Game and Fish Commission to determine fish population and predator-prey relationships.

**4.** Finally, it is recommended that a similar inventory be repeated again in five years to determine if trends are apparent in fish populations generally, or specifically, if certain species are increasing or declining (e.g. swamp darter, redfin darter).

In summary, the arsenal seems to be doing a very good job in maintaining the aquatic habitats necessary to sustain a wide diversity and abundance of fishes. Continuation of the present arsenal policies toward multiple use of land and aquatic resources needs to be encouraged.

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Special thanks are owed Mr. Charles Becker who aided this study immeasureably by sharing his wide knowledge of the history of the arsenal, its aquatic habitats, and its general biological elements. In addition to acquainting the Principal Investigator with the geographic layout of the arsenal, Mr. Becker also provided maps and facilitated the identification badge process enabling collecting of fishes on the arsenal by myself and assistants.

Mr. Lance Peacock, The Nature Conservancy, greatly facilitated the portion of this study dealing with possible threatened fish species through his contacts with the Arkansas

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Appreciation is also expressed to the Arkansas Game and Fish Commission for providing a collecting permit to the Principal Investigator and checking collection records for possible past collections on the arsenal.

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Table 1. Collecting Localities of Fishes on Pine Bluff Arsenal, Jefferson County, Arkansas, February - October, 1999.

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1. PBA, unnamed tributary to Yellow Lake at Siebert Road (Sec. 3, T5S, R10W). 26 February 1999.
2. PBA, unnamed tributary to Yellow Lake at gravel road (Sec. 3, T5S, R10W). 26 February 1999.
3. PBA, Dilly Pond at Conference Center (Sec. 2, T5S, R10W). 26 February 1999.
4. PBA, Yellow Lake at Boat Launch (Sec. 2, T5S, R10W). 13 March 1999.
5. PBA, Yellow Lake at east side (Sec. 35, T4S, R10W). 13 March 1999.
6. PBA, Caney Bayou at Siebert Road (Sec. 13, T5S, R10W). 13 March 1999.
7. PBA, Tulley Lake (Sec. 33, T4S, R10W). 13 March 1999.
8. PBA, Tulley Creek at McCoy Road (Sec. 28, T4S, R10W). 13 March 1999.
9. PBA, Phillips Creek at McCoy Road (Sec. 27, T4S, R10W). 13 March 1999.
10. PBA, Phillips Creek at Webster Road (Sec. 21, T4S, R10W). 14 March 1999.
11. PBA, Eastwood Bayou at end of Webster Road (Sec. 15, T4S, R10W). 14 March 1999.

12. PBA, Arkansas River at end of Webster Road (Sec. 15, T4S, R10W). 14 March 1999.

13. PBA, Eastwood Bayou at gravel road (Sec. 15, T4S, R10W). 14 March 1999.
14. PBA, Unnamed tributary to lake at gravel road (Sec. 16, T4S, R10W). 14 March 1999.
15. PBA, Upper Duck Pond (Sec. 16, T4S, R10W). 14 March 1999.
16. PBA, Lower Duck Pond (Sec. 16, T4S, R10W). 14 March 1999.
17. PBA, Upper Phillips Creek (Sec. 20, T4S, R10W). 9 April 1999.
18. PBA, Unnamed tributary to Phillips Creek at gaved road (Sec. 20, T4S, R10W). 9 April 1999.
19. PBA, Unnamed tributary to Phillips Creek at Atkisson Road (Sec. 28, T4S, R10W). 9 April 1999.
20. PBA, Tulley Creek at Atkisson Road (Sec. 28, T4S, R10W). 10 April 1999.
21. PBA, Unnamed tributary at Atkisson Road (Sec. 28, T4S, R10W). 10 April 1999.
22. PBA, Clear Pond off Atkisson Road (Sec. 28, T4S, R10W). 10 April 1999.
23. PBA, Horseshoe Pond (Sec. 28, T4S, R10W). 10 April 1999.
24. PBA, Arkansas River at end of trail off Doolittle Road (Sec. 26, T4S, R10W). 10 April 1999.
25. PBA, Phillips Creek, ca. 1/4 mile west of confluence with Arkansas River (Sec. 26 and 27, T4S, R10W). 10 April 1999.

26. PBA, Yellow Lake (Sec. 35, T4S, R10W). 10 April 1999.
27. PBA, Yellow Lake (Sec. 35, T4S, R10W). 28 June 1999.
28. PBA, Yellow Lake, west side (Sec. 34, T4S, R10W). 28 June 1999.
29. PBA, Yellow Lake, west side (Sec. 3, T4S, R10W). 28 June 1999.
30. PBA, Unnamed tributary to Yellow Lake on gravel road (Sec. 34, T4S, R10W). 28 June 1999.
31. PBA, Unnamed tributary to Yellow Lake on gravel road (Sec. 34, T4S, R10W). 29 June 1999.
32. PBA, Unnamed tributary to Tulley Creek at gravel road (Sec. 34, T4S, R10W). 29 June 1999.
33. PBA, Caney Creek, 1/4 mile south of Siebert Road (Sec. 13, T5S, R10W). 29 June 1999.
34. PBA, Unnamed tributary north of Warbritton gate (Sec. 12, T5S, R10W). 29 June 1999.
35. PBA, Arkansas River cutoff (Sec. 1, T5S, R10W). 29 June 1999.
36. PBA, Yellow Lake at boat launch (Sec. 2, T5S, R10W). 29 June 1999.
37. PBA, Yellow Lake drainage stream (Sec. 2, T5S, R10W). 29 June 1999.
38. PBA, Yellow Lake drainage stream (Sec. 2, T5S, R10W). 1 July 1999.
39. PBA, Yellow Lake at boat launch (Sec. 2, T5S, R10W). 1 July 1999.

40. PBA, Phillips Creek at McCoy Road (Sec. 27, T4S, R10W). 1 July 1999.
41. PBA, Tulley Creek at McCoy Road (Sec. 28, T4S, R10W). 1 July 1999.
42. PBA, Phillips Creek at Webster Road (Sec. 21, T4S, R10W). 1 July 1999.
43. PBA, Caney Creek near fence at ? ponds (Sec. 14, T5S, R10W). 2 July 1999.
44. PBA, Unnamed tributary to Caney Creek (Sec. 13, T5S, R10W). 2 July 1999.
45. PBA, Roadside ditch off Siebert Road (Sec. 15, T5S, R10W). 13 August 1999.
46. PBA, Arkansas River at end of gravel road, NE of Yellow Lake (Sec. 35, T4S, R10W). 13 August 1999.
47. PBA, Arkansas River north of Yellow Lake (Sec. 26, T4S, R10W). 13 August 1999.
48. PBA, Slough of Arkansas River (Sec. 35, T4S, R10W). 13 August 1999.
49. PBA, Arkansas River (Sec. 6, T4S, R10W). 13 August 1999.
50. PBA, Eastwood Bayou (Sec. 12, T4S, R10W). 14 August 1999.
51. PBA, Jackson Creek (Sec. 12, T4S, R10W). 14 August 1999.
52. PBA, Eastwood Bayou (Sec. 9, T4S, R10W). 14 August 1999.
53. PBA, Unnamed tributary to Yellow Lake (Sec. 3, T5S, R10W). 14 August 1999.
54. PBA, Eastwood Bayou near confluence with Arkansas River (Sec. 15, T4S, R10W). 14 August 1999.

55. PBA, Arkansas River (Sec. 15, T4S, R10W). 14 August 1999.
56. PBA, Arkansas River (Sec. 23, T4S, R10W). 14 August 1999.
57. PBA, Tulley Creek just south of Stark Gate (Sec. 30, T4S, R10W). 14 August 1999.
58. PBA, Unnamed tributary to Tulley Creek (Sec. 19, T4S, R10W). 10 September 1999.
59. PBA, Pond southeast of Stark Gate (Sec. 30, T4S, R10W). 10 September 1999.
60. PBA, Unnamed creek to Yellow Lake at Siebert Road (Sec. 33, T4S, R10W). 10 September 1999.
61. PBA, Phillips Creek at end of road off Webster Road (Sec. 21, T4S, R10W). 11 September 1999.
62. PBA, Eastwood Bayou (Sec. 16, T4S, R10W). 11 September 1999.
63. PBA, Staff Row Pond, 1/2 mile SW of Dexter Gate (Sec. 4, T5S, R10W). 11 September 1999.
64. PBA, Dexter Pond, just north of Dexter Gate (Sec. 32, T4S, R10W). 11 September 1999.
65. PBA, Eastwood Bayou at trail (Sec. 17, T4S, R10W). 11 September 1999.
66. PBA, Phillips Creek (Sec. 22, T4S, R10W). 8 October 1999.
67. PBA, Arkansas River NE of Yellow Lake (Sec. 35, T4S, R10W). 8 October 1999.
68. PBA, Yellow Lake at boat launch (Sec. 2, T5S, R10W). 8 October 1999.
69. PBA, Yellow Lake, east side (Sec. 35, T4S, R10W). 8 October 1999.

70. PBA, Tulley Lake (sec. 28, T4S, R10W). 8 October 1999.

71. PBA, Phillips Creek at Webster Road (Sec. 21, T4S, R10W). 9 October 1999.

72. PBA, Tulley Creek at McCoy Road (Sec. 27, T4S, R10W). 9 October 1999.

73. PBA, Yellow Lake at boat launch (Sec. 2, T5S, R10W). 9 October 1999.

74. PBA, Eastwood Bayou north of Wintergreen Road (Sec. 15, T4S, R10W). 9 October 1999.

75. PBA, Eastwood Bayou at end of Webster Road (Sec. 15, T4S, R10W). 9 October 1999.

76. PBA, Arkansas River off Webster Road (Sec. 22, T4S, R10W). 16 October 1999.

77. PBA, Arkansas River at boat launch NE of Yellow Lake (Sec. 35, T4S, R10W). 16 October 1999.

78. PBA, Upper Yellow Lake (Sec. 34, T4S, R10W). 16 October 1999.

79. PBA, old slough off Arkansas River (Sec. 35, T4S, R10W). 16 October 1999.

80. PBA, Yellow Lake just north of Dilley Pond (Sec. 2, T5S, R10W). 16 October 1999.

81. PBA, Phillips Creek south of McCoy Road (Sec. 27, T4S, R10W). 16 October 1999.

Table 2. Species of Fishes Collected from the Pine Bluff Arsenal, Jefferson County, Arkansas from February - October, 1999.

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Family Acipenseridae - Sturgeons

Scaphirhynchus platorynchus - Shovelnose Sturgeon

Family Lepisosteidae - Gars

Lepisosteus oculatus - Spotted Gar
Lepisosteus osseus - Longnose Gar

Family Amiidae - Bowfins

Amia calva - Bowfin

Family Hiodontidae - Mooneyes

Hiodon alosoides - Goldeye

Family Clupeidae - Herrings

Dorosoma cepedianum - Gizzard Shad
Dorosoma petenense - Threadfin Shad

Family Cyprinidae - Carps and Minnows

Carassius auratus - Goldfish
Cyprinella lutrensis - Red Shiner
Cyprinella venusta - Blacktail Shiner
Cyprinus carpio - Common Carp
Lythrurus umbratilis - Redfin Shiner
Notemigonus crysoleucas - Golden Shiner
Notropis atherinoides - Emerald Shiner
Notropis blennius - River Shiner
Pimephales promelas - Fathead Minnow
Pimephales vigilax - Bullhead minnow
Semotilus atromaculatus - Creek Chub

Family Catostomidae - Suckers

Carpiodes carpio - River Carpsucker
Erimyzon oblongus - Creek Chubsucker
Ictiobus bubalus - Smallmouth Buffalo
Ictiobus cyprinellus - Bigmouth Buffalo
Minytrema melanops - Spotted Sucker

Family Ictaluridae - Bullhead Catfishes

Ameiurus melas - Black Bullhead
Ameiurus natalis - Yellow Bullhead
Ictalurus furcatus - Blue Catfish
Ictalurus punctatus - Channel Catfish
Noturus gyrinus - Tadpole Madtom
Pylodictis olivaris - Flathead Catfish

Family Esocidae - Pikes

Esox americanus - Grass Pickerel

Family Aphredoderidae - Pirate Perches

Aphredoderus sayanus - Pirate Perch

Family Fundulidae - Killifishes

Fundulus chrysotus - Golden Topminnow
Fundulus notatus - Blackstripe Topminnow
Fundulus olivaceus - Blackspotted Topminnow

Family Poeciliidae - Livebearers

Gambusia affinis - Mosquitofish

Family Atherinidae - Silversides

Labidesthes sicculus - Brook Silverside
Menidia beryllina - Inland Silverside

Family Moronidae - Temperate Basses

Morone chrysops - White Bass
Morone mississippiensis - Yellow Bass

Family Centrarchidae -Sunfishes

Centrarchus macropterus - Flier
Lepomis cyanellus - Green Sunfish
Lepomis gulosus - Warmouth
Lepomis humilis - Orangespotted Sunfish
Lepomis macrochirus - Bluegill
Lepomis marginatus - Dollar Sunfish
Lepomis megalotis - Longear Sunfish

Lepomis microlophus - Redear Sunfish
Lepomis miniatus - Redspotted Sunfish
Micropterus salmoides - Largemouth Bass
Pomoxis annularis - White crappie
Pomoxis nigromaculatus - Black Crappie

Family Percidae - Perches

Etheostoma chlorosoma - Bluntnose Darter
Etheostoma fusiforme - Swamp Darter
Etheostoma gracile - Slough darter
Etheostoma proeliare - Cypress Darter
Etheostoma whipplei - Redfin Darter
Percina caprodes - Logperch
Stizostedion canadense - Sauger

Family Sciaenidae - Drums

Aplodinotus grunniens - Freshwater Drum

Table 3. Number and Relative Abundance (Percent of Total Number) of Fish Species Collected from the Pine Bluff Arsenal, Jefferson County, Arkansas from February - October, 1999.

| Species | Pine Bluff Drainages N = 3396 | |
|---|---|---|
| | Number | Percentage |
| Family Acipenseridae - Sturgeons | | |
| Scaphirhynchus platorynchus - Shovelnose Sturgeon | 1 | 0.03 |
| Family Lepisosteidae - Gars | | |
| Lepisosteus oculatus - Spotted Gar | 2 | 0.06 |
| Lepisosteus osseus - Longnose Gar | 1 | 0.03 |
| Family Amiidae - Bowfins | | |
| Amia calva - Bowfin | 2 | 0.06 |
| Family Hiodontidae - Mooneyes | | |
| Hiodon alosoides - Goldeye | 1 | 0.03 |
| Family Clupeidae - Herrings | | |
| Dorosoma cepedianum - Gizzard Shad | 38 | 1.12 |
| Dorosoma petenense - Threadfin Shad | 1,234 | 36.34 |
| Family Cyprinidae - Carps and Minnows | | |
| Carassius auratus - Goldfish | 2 | 0.06 |
| Cyprinella lutrensis - Red Shiner | 83 | 2.44 |
| Cyprinella venusta - Blacktail Shiner | 29 | 0.85 |
| Cyprinus carpio Common Carp | 8 | 0.24 |
| Lythrurus umbratilis - Redfin Shiner | 46 | 1.35 |

| | | |
|---|---|---|
| Notemigonus crysoleucas - Golden Shiner | 129 | 3.80 |
| Notropis atherinoides - Emerald Shiner | 94 | 2.77 |
| Notropis blennius - River Shiner | 8 | 0.24 |
| Pimephales promelas - Fathead Minnow | 35 | 1.03 |
| Pimephales vigilax - Bullhead minnow | 17 | 0.50 |
| Semotilus atromaculatus - Creek Chub | 2 | 0.06 |

| Species | Pine Bluff Drainages N= 3396 | |
|---|---|---|
| | Number | Percentage |
| Family Catostomidae - Suckers | | |
| Carpiodes carpio - River Carpsucker | 2 | 0.06 |
| Erimyzon oblongus - Creek Chubsucker | 5 | 0.15 |
| Ictiobus bubalus - Smallmouth Buffalo | 3 | 0.09 |
| Ictiobus cyprinellus - Bigmouth Buffalo | 1 | 0.03 |
| Minytrema melanops - Spotted Sucker | 2 | 0.06 |
| Family Ictaluridae - Bullhead Catfishes | | |
| Ameiurus melas - Black Bullhead | 9 | 0.27 |
| Ameiurus natalis - Yellow Bullhead | 16 | 0.47 |
| Ictalurus furcatus - Blue Catfish | 11 | 0.32 |
| Ictalurus punctatus - Channel Catfish | 22 | 0.65 |
| Noturus gyrinus - Tadpole Madtom | 13 | 0.38 |
| Pylodictis olivaris - Flathead Catfish | 2 | 0.06 |
| Family Esocidae - Pikes | | |
| Esox americanus - Grass Pickerel | 6 | 0.18 |
| Family Aphredoderidae - Pirate Perches | | |
| Aphredoderus sayanus - Pirate Perch | 14 | 0.41 |
| Family Fundulidae - Killifishes | | |
| Fundulus chrysotus - Golden Topminnow | 7 | 0.21 |
| Fundulus notatus - Blackstripe Topminnow | 5 | 0.15 |
| Fundulus olivaceus - Blackspotted Topminnow | 48 | 1.41 |
| Family Poeciliidae - Livebearers | | |
| Gambusia affinis - Mosquitofish | 831 | 24.47 |
| Family Atherinidae - Silversides | | |

| Species | Pine Bluff Drainages N= 3396 Number | Percentage |
|---|---|---|
| Labidesthes sicculus - Brook Silverside | 167 | 4.92 |
| Menidia beryllina - Inland Silverside | 63 | 1.86 |
| Family Moronidae - Temperate Basses | | |
| Morone chrysops - White Bass | 3 | 0.09 |
| Morone mississippiensis - Yellow Bass | 2 | 0.06 |
| Family Centrarchidae -Sunfishes | | |
| Centrarchus macropterus - Flier | 8 | 0.24 |
| Lepomis cyanellus - Green Sunfish | 57 | 1.68 |
| Lepomis gulosus - Warmouth | 10 | 0.29 |
| Lepomis humilis - Orangespotted Sunfish | 21 | 0.62 |
| Lepomis macrochirus - Bluegill | 39 | 1.15 |
| Lepomis marginatus - Dollar Sunfish | 106 | 3.12 |
| Lepomis megalotis - Longear Sunfish | 8 | 0.24 |
| Lepomis microlophus - Redear Sunfish | 14 | 0.41 |
| Lepomis miniatus - Redspotted Sunfish | 3 | 0.09 |
| Micropterus salmoides - Largemouth Bass | 62 | 1.83 |
| Pomoxis annularis - White Crappie | 41 | 1.21 |
| Pomoxis nigromaculatus - Black Crappie | 3 | 0.09 |
| Family Percidae - Perches | | |
| Etheostoma chlorosoma - Bluntnose Darter | 2 | 0.06 |
| Etheostoma fusiforme - Swamp Darter | 7 | 0.21 |
| Etheostoma gracile - Slough Darter | 2 | 0.06 |
| Etheostoma proeliare - Cypress Darter | 42 | 1.24 |
| Etheostoma whipplei - Redfin Darter | 1 | 0.03 |
| Percina caprodes - Logperch | 2 | 0.06 |
| Stizostedion canadense - Sauger | 3 | 0.09 |
| Family Sciaenidae - Drums | | |
| Aplodinotus grunniens - Freshwater Drum | 1 | 0.03 |

| | | |
|---|---|---|
| Totals | 3,396 | 100.00 |

Table 4. Seasonality of the Fishes Collected from the Pine Bluff Arsenal, Jefferson County, Arkansas from February - October, 1999.

| Species | Season | | |
|---|---|---|---|
| | Spring | Summer | Fall |
| Family Acipenseridae - Sturgeons | | | |
| Scaphirhynchus platorynchus - Shovelnose Sturgeon | - | X | - |
| Family Lepisosteidae - Gars | | | |
| Lepisosteus oculatus - Spotted Gar | X | - | X |
| Lepisosteus osseus - Longnose Gar | - | X | - |
| Family Amiidae - Bowfins | | | |
| Amia calva - Bowfin | - | X | - |
| Family Hiodontidae - Mooneyes | | | |
| Hiodon alosoides - Goldeye | - | X | - |
| Family Clupeidae - Herrings | | | |
| Dorosoma cepedianum - Gizzard Shad | - | X | - |
| Dorosoma petenense - Threadfin Shad | - | X | X |
| Family Cyprinidae - Carps and Minnows | | | |
| Carassius auratus - Goldfish | - | X | - |
| Cyprinella lutrensis - Red Shiner | X | X | - |
| Cyprinella venusta - Blacktail Shiner | X | X | - |
| Cyprinus carpio - Common Carp | - | X | - |
| Lythrurus umbratilis - Redfin Shiner | - | X | X |
| Notemigonus crysoleucas - Golden Shiner | X | X | X |
| Notropis atherinoides - Emerald Shiner | X | X | - |

| | | | |
|---|---|---|---|
| Notropis blennius - River Shiner | - | X | - |
| Pimephales promelas - Fathead Minnow | X | - | X |
| Pimephales vigilax - Bullhead minnow | X | X | - |
| Semotilus atromaculatus - Creek Chub | - | X | - |
| Family Catostomidae - Suckers | | | |
| Carpiodes carpio - River Carpsucker | - | X | - |
| Erimyzon oblongus - Creek Chubsucker | - | X | X |

| Species | Spring | Summer | Fall |
|---|---|---|---|
| Ictiobus bubalus - Smallmouth Buffalo | - | X | - |
| Ictiobus cyprinellus - Bigmouth Buffalo | - | X | - |
| Minytrema melanops - Spotted Sucker | - | X | - |
| Family Ictaluridae - Bullhead Catfishes | | | |
| Ameiurus melas - Black Bullhead | X | X | - |
| Ameiurus natalis - Yellow bullhead | X | X | X |
| Ictalurus furcatus - Blue Catfish | - | X | - |
| Ictalurus punctatus - Channel Catfish | X | X | X |
| Noturus gyrinus - Tadpole Madtom | - | X | - |
| Pylodictis olivaris - Flathead Catfish | - | X | - |
| Family Esocidae - Pikes | | | |
| Esox americanus - Grass Pickerel | - | X | - |
| Family Aphredoderidae - Pirate Perches | | | |
| Aphredoderus sayanus - Pirate Perch | - | X | X |
| Family Fundulidae - Killifishes | | | |
| Fundulus chrysotus - Golden Topminnow | - | X | X |
| Fundulus notatus - Blackstripe Topminnow | - | X | - |
| Fundulus olivaceus - Blackspotted Topminnow | X | X | X |
| Family Poeciliidae - Livebearers | | | |
| Gambusia affinis - Mosquitofish | X | X | X |
| Family Atherinidae - Silversides | | | |
| Labidesthes sicculus - Brook Silverside | - | X | X |
| Menidia beryllina - Inland Silverside | - | X | X |

| Species | Spring | Summer | Spring |
|---|---|---|---|
| Family Moronidae - Temperate Basses | | | |
| Morone chrysops - White Bass | X | X | - |
| Morone mississippiensis - Yellow Bass | - | X | - |
| Family Centrarchidae -Sunfishes | | | |
| Centrarchus macropterus - Flier | - | X | - |
| Lepomis cyanellus - Green Sunfish | X | X | X |
| Lepomis gulosus - Warmouth | X | X | X |
| Lepomis humilis - Orangespotted Sunfish | - | X | X |
| Lepomis macrochirus - Bluegill | X | X | X |
| Lepomis marginatus - Dollar Sunfish | - | X | X |
| Lepomis megalotis - Longear Sunfish | - | X | - |
| Lepomis microlophus - Redear Sunfish | X | X | X |
| Lepomis miniatus - Redspotted Sunfish | - | X | - |
| Micropterus salmoides - Largemouth Bass | X | X | X |
| Pomoxis annularis - White crappie | X | X | X |
| Pomoxis nigromaculatus - Black Crappie | - | X | - |
| Family Percidae - Perches | | | |
| Etheostoma chlorosoma - Bluntnose Darter | - | X | - |
| Etheostoma fusiforme - Swamp Darter | - | X | - |
| Etheostoma gracile - Slough darter | - | X | - |
| Etheostoma proeliare - Cypress Darter | - | X | X |
| Etheostoma whipplei - Redfin Darter | - | X | - |
| Percina caprodes - Logperch | - | X | - |
| Stizostedion canadense - Sauger | - | X | - |
| Family Sciaenidae - Drums | | | |
| Aplodinotus grunniens - Freshwater Drum | - | X | - |
| Totals | 18 | 57 | 23 |

Table 5. Abundance of the Fishes Collected from Pine Bluff Arsenal, Jefferson County, Arkansas from February-October, 1999*

| Species | Abundant | Common | Uncommon | Rare |
|---|---|---|---|---|
| Family Acipenseridae - Sturgeons | | | | |
| Scaphirhynchus platorynchus - Shovelnose Sturgeon | - | - | - | X |
| Family Lepisosteidae - Gars | | | | |
| Lepisosteus oculatus - Spotted Gar | - | - | X | - |
| Lepisosteus osseus - Longnose Gar | - | - | - | X |
| Family Amiidae - Bowfins | | | | |
| Amia calva - Bowfin | - | - | - | X |
| Family Hiodontidae - Mooneyes | | | | |
| Hiodon alosoides - Goldeye | - | - | - | X |
| Clupeidae - Herrings | | | | |
| Dorosoma cepedianum - Gizzard Shad | - | X | - | - |
| Dorosoma petenense - Threadfin Shad | X | - | - | - |
| Family Cyprinidae - Carps and Minnows | | | | |
| Carassius auratus - Goldfish | - | - | - | X |
| Cyprinella lutrensis - Red Shiner | X | - | - | - |
| Cyprinella venusta - Blacktail Shiner | - | X | - | - |
| Cyprinus carpio Common Carp | - | - | X | - |
| Lythrurus umbratilis - Redfin Shiner | - | X | - | - |
| Notemigonus crysoleucas - Golden Shiner | X | - | - | - |
| Notropis atherinoides - Emerald Shiner | X | - | - | - |

| | | | | |
|---|---|---|---|---|
| Notropis blennius - River Shiner | - | - | X | - |
| Pimephales promelas - Fathead Minnow | - | X | - | - |
| Pimephales vigilax - Bullhead minnow | - | X | - | - |
| Semotilus atromaculatus - Creek Chub | - | - | - | X |
| Family Catostomidae - Suckers | | | | |
| Carpiodes carpio - River Carpsucker | - | - | - | X |
| Erimyzon oblongus - Creek Chubsucker | - | - | X | - |
| Ictiobus bubalus - Smallmouth Buffalo | - | - | X | - |
| Ictiobus cyprinellus - Bigmouth Buffalo | - | - | X | - |
| Minytrema melanops - Spotted Sucker | - | - | - | X |

| Species | Abundant | Common | Uncommon | Rare |
|---|---|---|---|---|
| Family Ictaluridae - Bullhead Catfishes | | | | |
| Ameiurus melas - Black Bullhead | - | - | X | - |
| Ameiurus natalis - Yellow bullhead | - | X | - | - |
| Ictalurus furcatus - Blue Catfish | - | X | - | - |
| Ictalurus punctatus - Channel Catfish | - | X | - | - |
| Noturus gyrinus - Tadpole Madtom | - | X | - | - |
| Pylodictis olivaris - Flathead Catfish | - | - | - | X |
| Family Esocidae - Pikes | | | | |
| Esox americanus - Grass Pickerel | - | - | X | - |
| Family Aphredoderidae - Pirate Perches | | | | |
| Aphredoderus sayanus - Pirate Perch | - | X | - | - |
| Family Fundulidae - Killifishes | | | | |
| Fundulus chrysotus - Golden Topminnow | - | - | X | - |
| Fundulus notatus - Blackstripe Topminnow | - | - | X | - |
| Fundulus olivaceus - Blackspotted Topminnow | - | X | - | - |
| Family Poeciliidae - Livebearers | | | | |
| Gambusia affinis - Mosquitofish | X | - | - | - |
| Family Atherinidae - Silversides | | | | |
| Labidesthes sicculus - Brook Silverside | X | - | - | - |
| Menidia beryllina - Inland Silverside | X | - | - | - |
| Family Moronidae - Temperate Basses | | | | |

| | | | | |
|---|---|---|---|---|
| Morone chrysops - White Bass | - | - | X | - |
| Morone mississippiensis - Yellow Bass | - | - | - | X |
| Family Centrarchidae -Sunfishes | | | | |
| Centrarchus macropterus - Flier | - | - | X | - |
| Lepomis cyanellus - Green Sunfish | X | - | - | - |
| Lepomis gulosus - Warmouth | - | - | X | - |
| Lepomis humilis - Orangespotted Sunfish | - | X | - | - |
| Lepomis macrochirus - Bluegill | - | X | - | - |
| Lepomis marginatus - Dollar Sunfish | X | - | - | - |
| Lepomis megalotis - Longear Sunfish | - | - | X | - |
| Lepomis microlophus - Redear Sunfish | - | X | - | - |
| Lepomis miniatus - Redspotted Sunfish | - | - | X | - |
| Micropterus salmoides - Largemouth Bass | X | - | - | - |
| Pomoxis annularis - White crappie | - | X | - | - |
| Pomoxis nigromaculatus - Black Crappie | - | - | X | - |
| Family Percidae - Perches | | | | |
| Etheostoma chlorosoma - Bluntnose Darter | - | - | - | X |
| Etheostoma fusiforme - Swamp Darter | - | - | X | - |
| Etheostoma gracile - Slough darter | - | - | - | X |
| Etheostoma proeliare - Cypress Darter | - | X | - | - |
| Etheostoma whipplei - Redfin Darter | - | - | - | X |
| Percina caprodes - Logperch | - | - | - | X |
| Stizostedion canadense - Sauger | - | - | X | - |
| Stizostedion vitreum - Walleye | | | | |
| Family Sciaenidae - Drums | | | | |
| Aplodinotus grunniens - Freshwater Drum | - | - | - | X |
| TOTALS | 10 | 16 | 17 | 16 |

Table 6. Habitats of Fishes Collected from the Pine Bluff Arsenal, Jefferson County, Arkansas from February - October, 1999.

| Species | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Family Acipenseridae - Sturgeons | | | | | |
| Scaphirhynchus platorynchus - Shovelnose Sturgeon | - | - | X | - | - |
| Family Lepisosteidae - Gars | | | | | |
| Lepisosteus oculatus - Spotted Gar | - | X | - | - | X |
| Lepisosteus osseus - Longnose Gar | - | - | - | - | X |
| Family Amiidae - Bowfins | | | | | |
| Amia calva - Bowfin | - | - | - | - | X |
| Family Hiodontidae - Mooneyes | | | | | |
| Hiodon alosoides - Goldeye | - | - | X | - | - |
| Family Clupeidae - Herrings | | | | | |
| Dorosoma cepedianum - Gizzard Shad | - | X | X | - | X |
| Dorosoma petenense - Threadfin Shad | - | X | X | - | X |
| Family Cyprinidae - Carps and Minnows | | | | | |
| Carassius auratus - Goldfish | - | - | - | - | X |

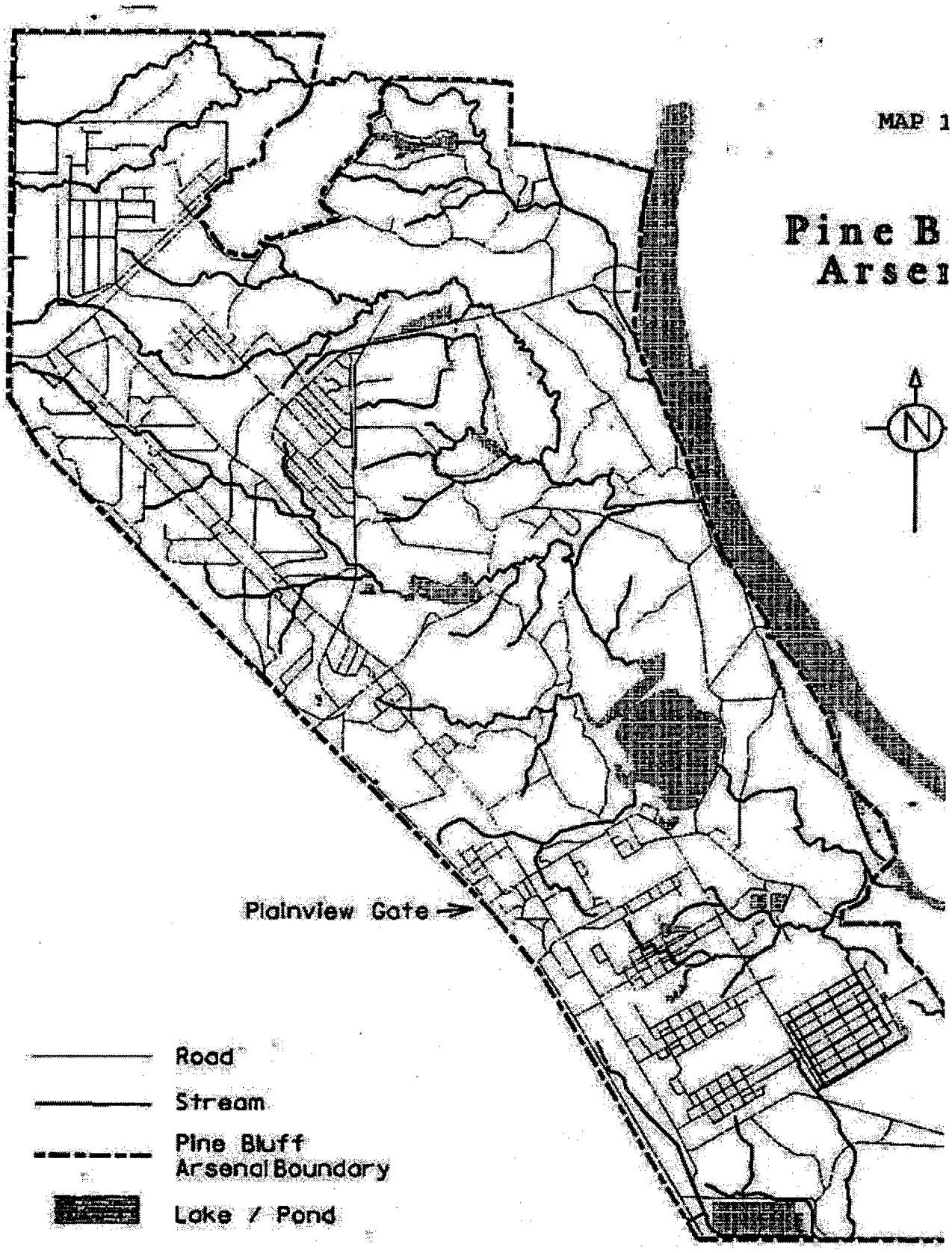
| | | | | | |
|---|---|---|---|---|---|
| Cyprinella lutrensis - Red Shiner | - | - | X | - | - |
| Cyprinella venusta - Blacktail Shiner | - | X | X | - | - |
| Cyprinus carpio - Common Carp | - | X | - | - | - |
| Lythrurus umbratilis - Redfin Shiner | X | X | - | - | - |
| Notemigonus crysoleucas - Golden Shiner | X | X | - | X | X |
| Notropis atherinoides - Emerald Shiner | - | - | X | - | - |
| Notropis blennius - River Shiner | - | - | X | - | - |
| Pimephales promelas - Fathead Minnow | - | - | X | X | X |
| Pimephales vigilax - Bullhead minnow | - | - | X | - | X |
| Semotilus atromaculatus - Creek Chub | X | - | - | - | - |
| Family Catostomidae - Suckers | | | | | |
| Carpiodes carpio - River Carpsucker | - | - | X | - | - |
| Erimyzon oblongus - Creek Chubsucker | X | X | - | - | - |

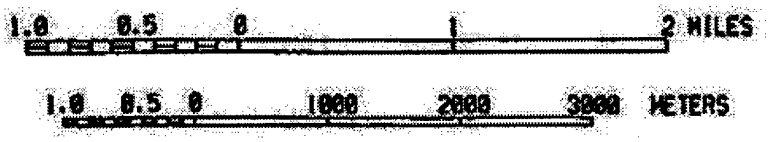
| Species | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Ictiobus bubalus - Smallmouth Buffalo | - | X | X | - | - |
| Ictiobus cyprinellus - Bigmouth Buffalo | - | - | X | - | - |
| Minytrema melanops - Spotted Sucker | - | X | - | - | - |
| Family Ictaluridae - Bullhead Catfishes | | | | | |
| Ameiurus melas - Black Bullhead | X | X | - | - | X |
| Ameiurus natalis - Yellow Bullhead | X | X | - | X | X |
| Ictalurus furcatus - Blue Catfish | - | - | X | - | - |
| Ictalurus punctatus - Channel Catfish | - | X | X | X | X |
| Noturus gyrinus - Tadpole Madtom | - | - | - | - | X |
| Pylodictis olivaris - Flathead Catfish | - | - | X | - | - |
| Family Esocidae - Pikes | | | | | |
| Esox americanus - Grass Pickerel | X | - | - | - | X |
| Family Aphredoderidae - Pirate Perches | | | | | |
| Aphredoderus sayanus - Pirate Perch | X | X | - | - | - |
| Family Fundulidae - Killifishes | | | | | |
| Fundulus chrysotus - Golden Topminnow | - | - | - | - | X |
| Fundulus notatus - Blackstripe Topminnow | - | X | - | - | - |
| Fundulus olivaceus - Blackspotted Topminnow | X | X | - | - | X |
| Family Poeciliidae - Livebearers | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Gambusia affinis - Mosquitofish | X | X | X | X | X |
| Family Atherinidae - Silversides | | | | | |
| Labidesthes sicculus - Brook Silverside | X | X | - | - | X |
| Menidia beryllina - Inland Silverside | - | - | X | - | - |
| Family Moronidae - Temperate Basses | | | | | |
| Morone chrysops - White Bass | - | - | - | - | X |
| Morone mississippiensis - Yellow Bass | - | - | - | - | X |
| Family Centrarchidae -Sunfishes | | | | | |
| Centrarchus macropterus - Flier | - | - | - | - | X |
| Lepomis cyanellus - Green Sunfish | X | X | - | X | X |

| Species | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Lepomis gulosus - Warmouth | - | - | - | - | X |
| Lepomis humilis - Orangespotted Sunfish | - | - | X | - | X |
| Lepomis macrochirus - Bluegill | X | X | - | X | X |
| Lepomis marginatus - Dollar Sunfish | X | X | X | - | X |
| Lepomis megalotis - Longear Sunfish | - | - | X | - | - |
| Lepomis microlophus - Redear Sunfish | - | - | - | - | X |
| Lepomis miniatus - Redspotted Sunfish | - | - | - | - | X |
| Micropterus salmoides - Largemouth Bass | X | X | X | X | X |
| Pomoxis annularis - White crappie | - | - | - | - | X |
| Pomoxis nigromaculatus - Black Crappie | - | - | - | - | X |
| Family Percidae - Perches | | | | | |
| Etheostoma chlorosoma - Bluntnose Darter | X | - | - | - | - |
| Etheostoma fusiforme - Swamp Darter | - | - | - | - | X |
| Etheostoma gracile - Slough Darter | X | - | - | - | - |
| Etheostoma proeliare - Cypress Darter | X | X | - | - | X |
| Etheostoma whipplei - Redfin Darter | X | - | - | - | - |
| Percina caprodes - Logperch | - | - | - | - | X |
| Stizostedion canadense - Sauger | - | - | X | - | - |
| Family Sciaenidae - Drums | | | | | |
| Aplodinotus grunniens - Freshwater Drum | - | - | X | - | - |
| TOTALS | 19 | 23 | 24 | 8 | 34 |

*1 = small woodland streams
 2 = sluggish bayou section
 3 = big river
 4 = ponds
 5 = lakes


MAP 1
Pine B
Arsei
N
Plainview Gate
Road
Stream
Pine Bluff
Arsenal Boundary
Lake / Pond

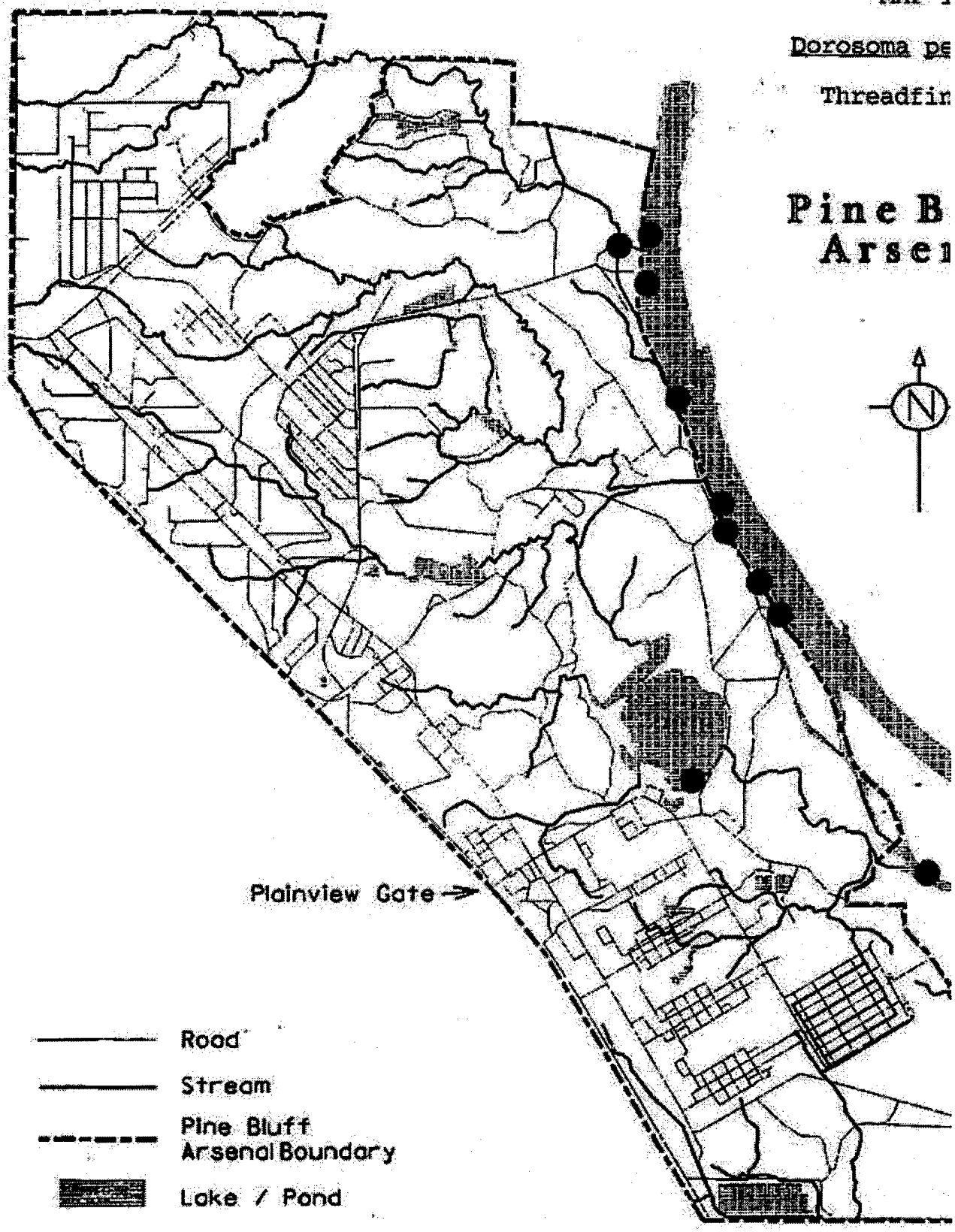

1.0 0.5 0 1 2 MILES
1.0 0.5 0 1000 2000 3000 METERS

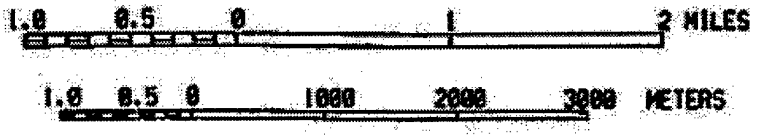
MAP 1

Dorosoma pe

Threadfin

Pine B
Arsen

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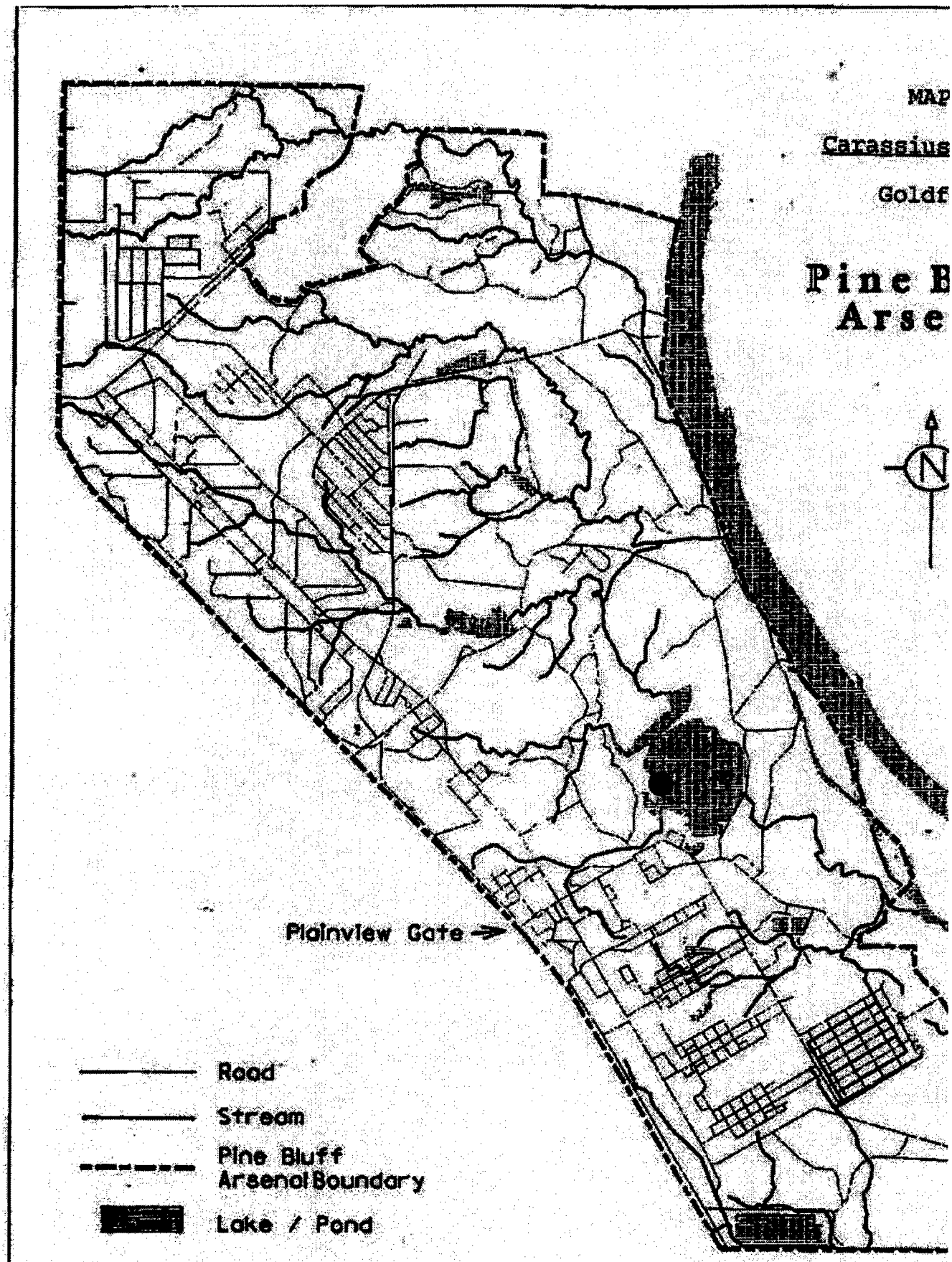
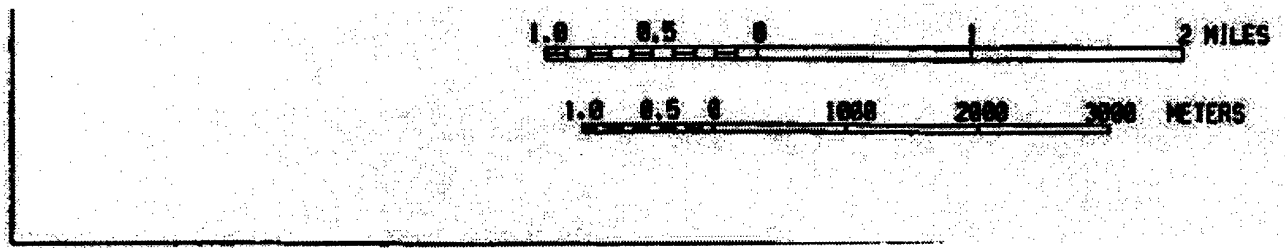
1.0 0.5 0 1000 2000 3000 METERS


MAP
Carassius
Goldf
Pine B
Arse
N
Plainview Gate
Road
Stream
Pine Bluff
Arsenal Boundary
Lake / Pond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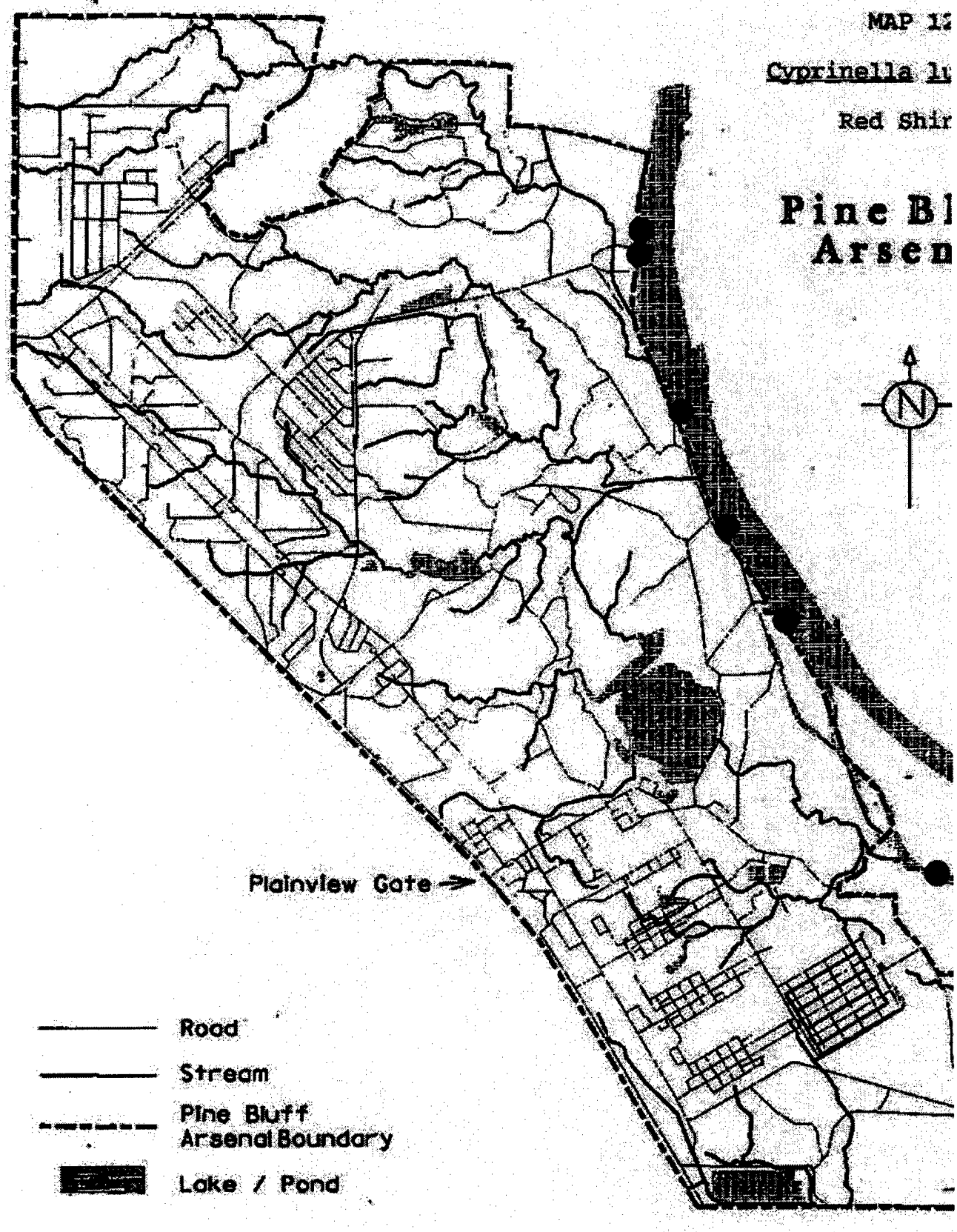
1.0 0.5 0 1000 2000 3000 METERS

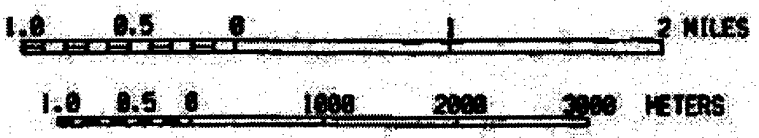
MAP 1

Cyprinella l

Red Shir

Pine Bl
Arsen

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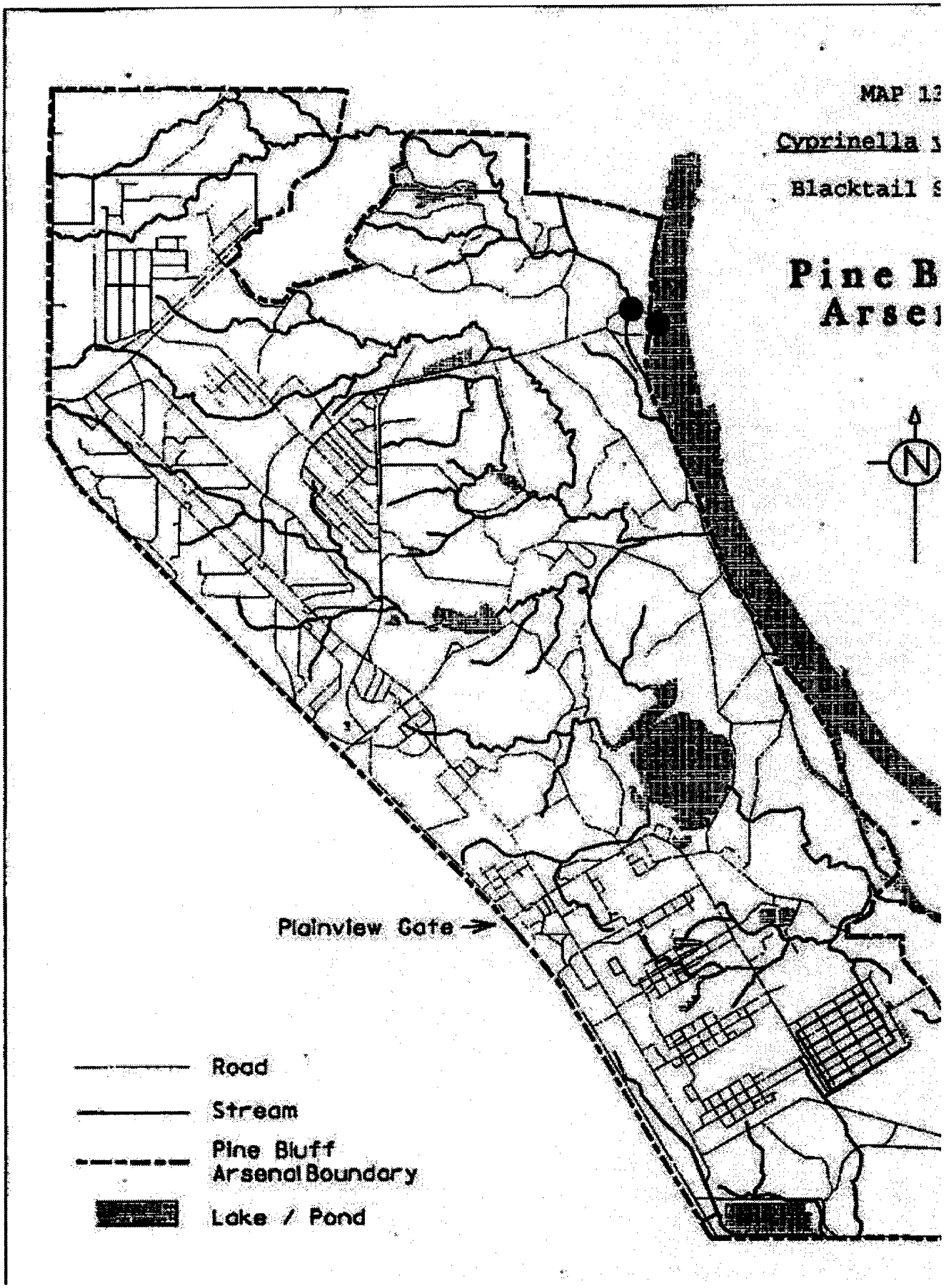
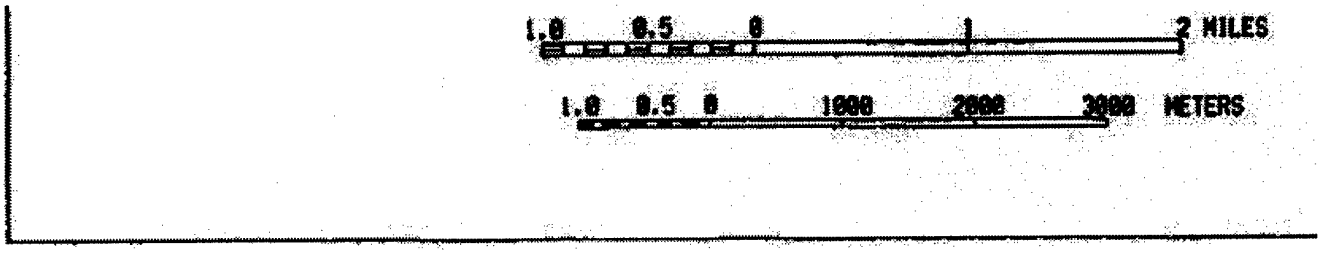

MAP 12
Cyprinella
Blacktail
Pine B
Arse
N
Plainview Gate
Road
Stream
Pine Bluff
Arsenal Boundary
Lake / Pond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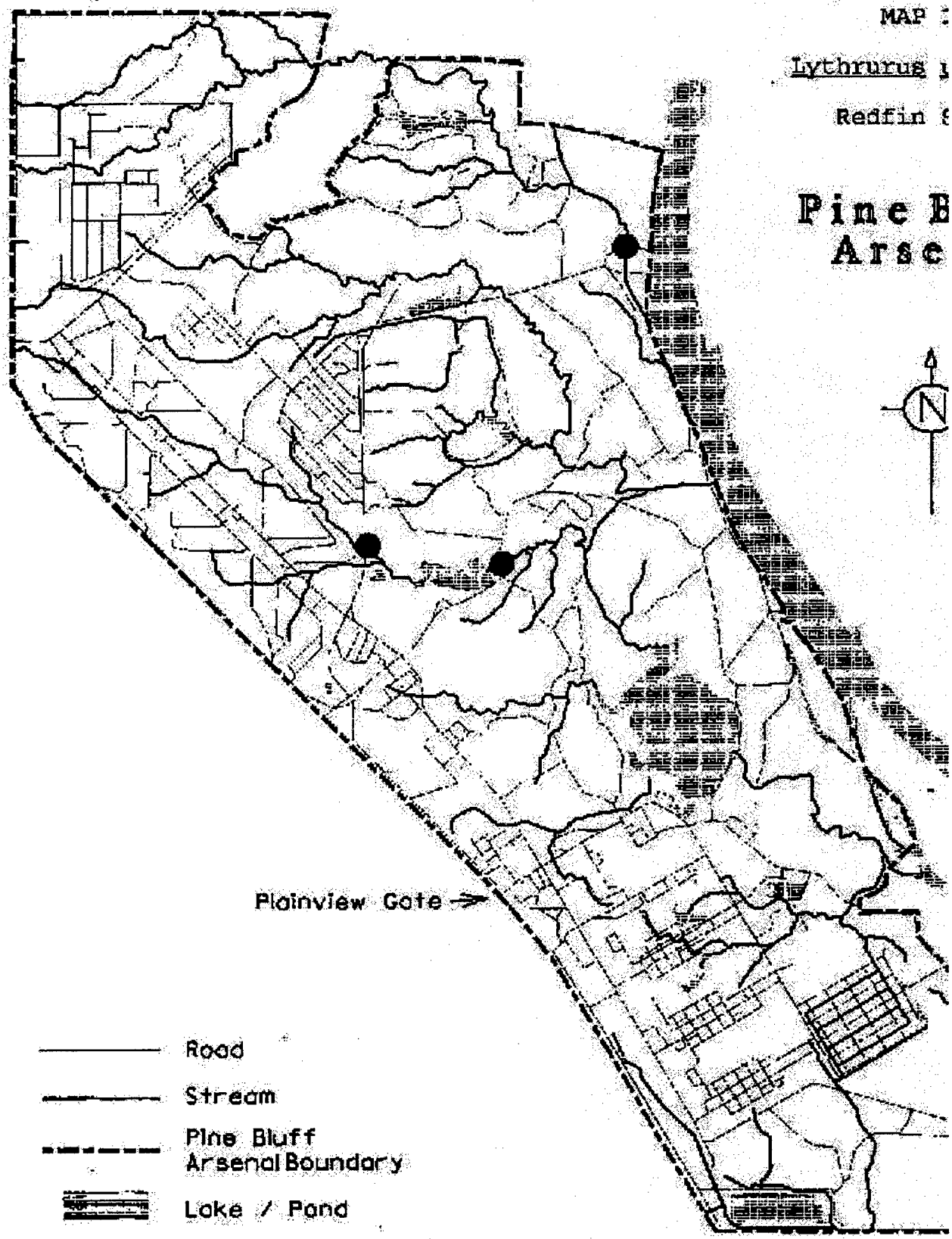
1.0 0.5 0 1000 2000 3000 METERS

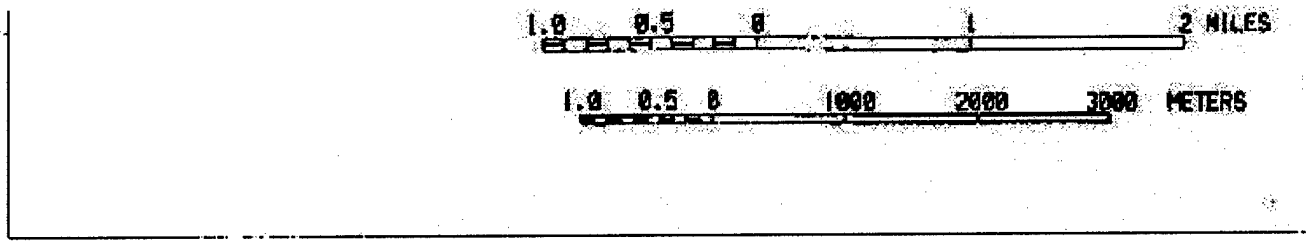
MAP

Lythrurus

Redfin

Pine B
Arse

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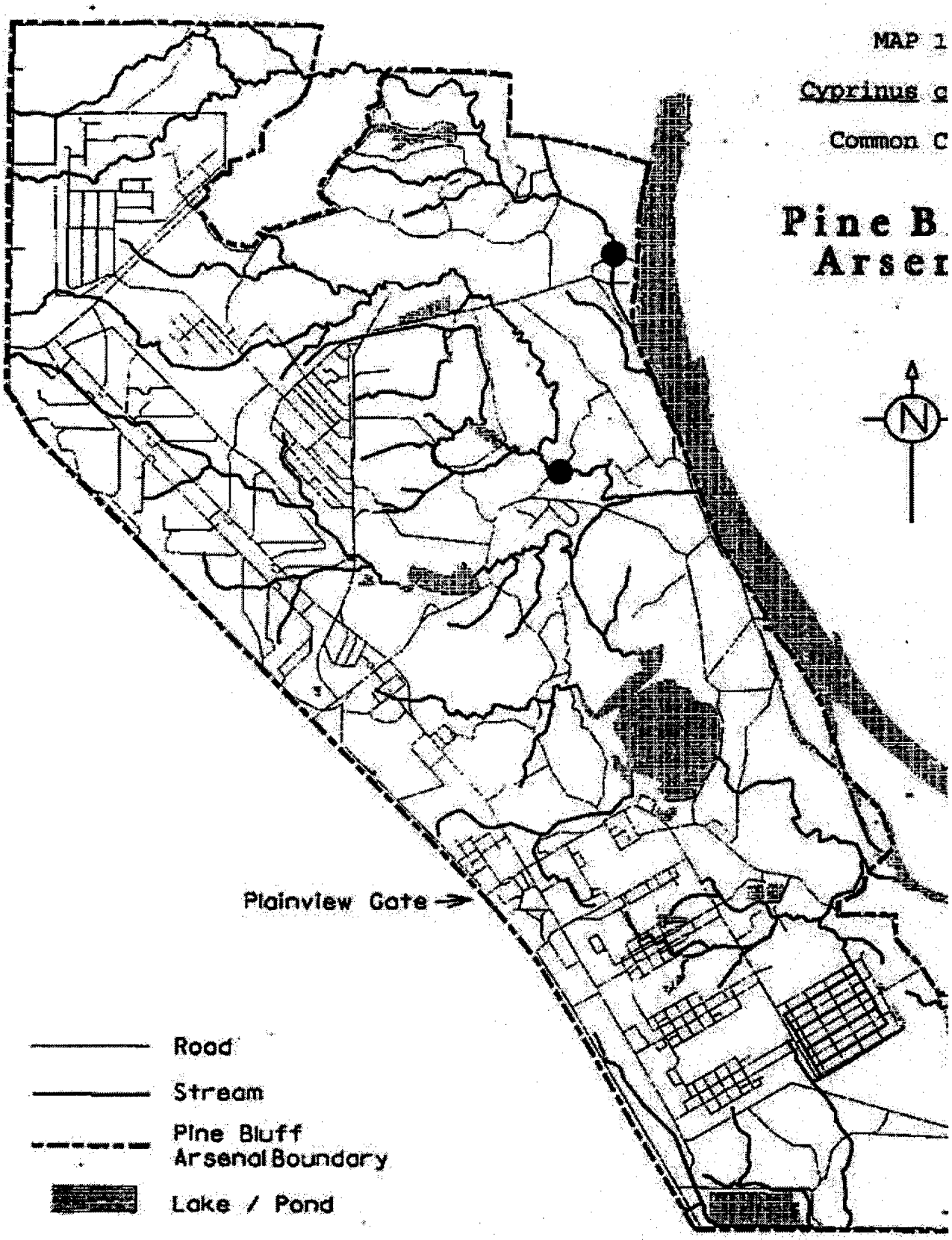
1.0 0.5 0 1000 2000 3000 METERS

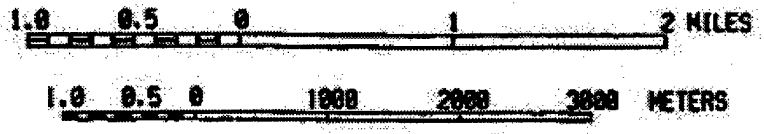
MAP 1

Cyprinus c

Common C

Pine B
Arser

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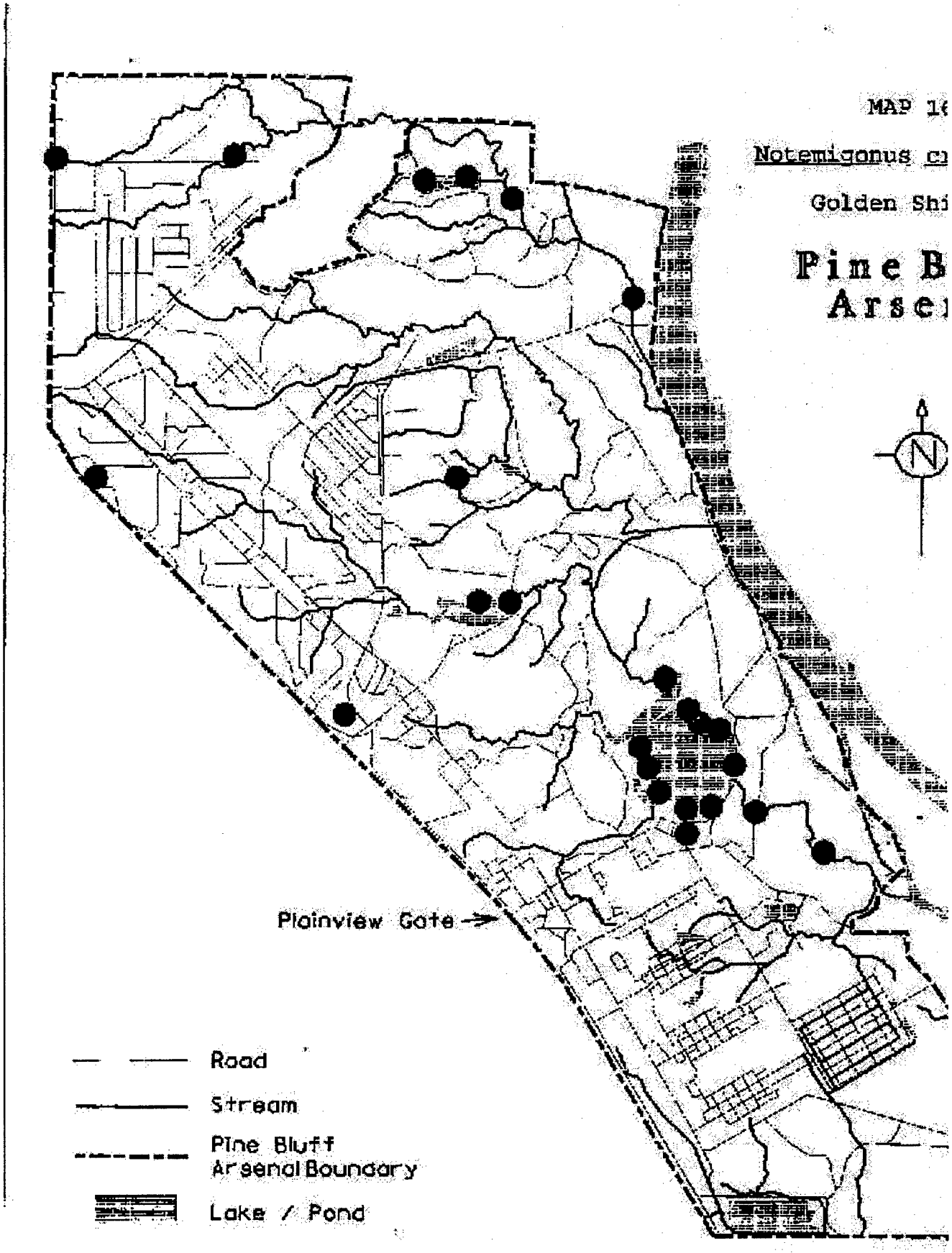
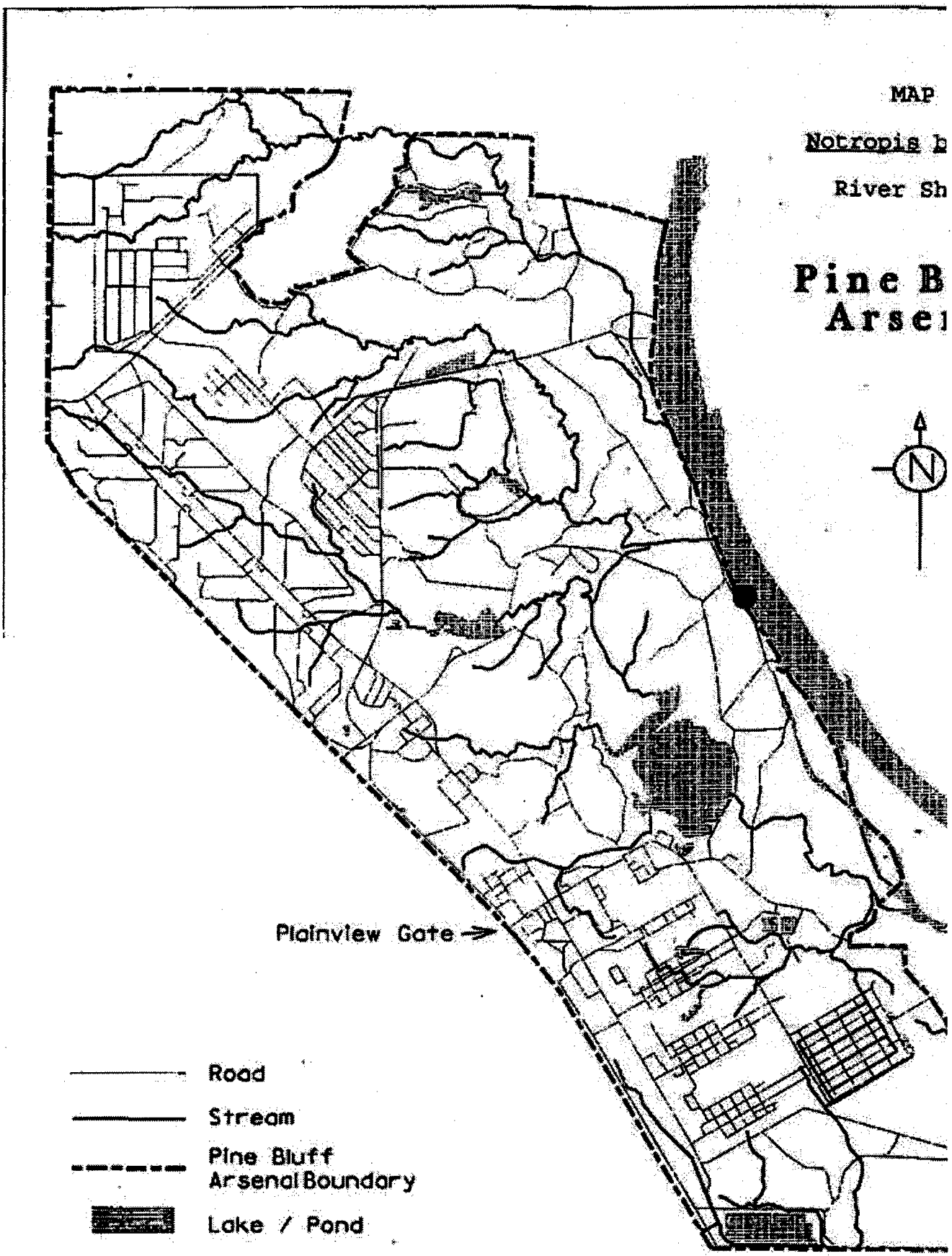
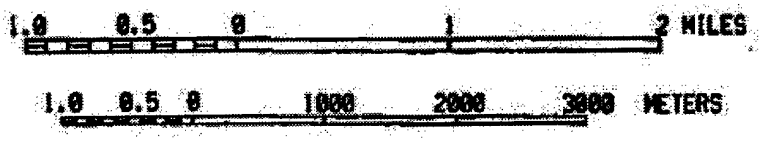
1.0 0.5 0 1000 2000 3000 METERS


MAP 1
Notemigonus c
Golden Shi
Pine B
Arse
N
Plainview Gate
Road
Stream
Pine Bluff
Arsenal Boundary
Lake / Pond


MAP
Notropis b
River Sh
Pine B
Arse
N
Plainview Gate
Road
Stream
Pine Bluff
Arsenal Boundary
Lake / Pond


1.0 0.5 0 1 2 MILES
1.0 0.5 0 1000 2000 3000 METERS