MINOR SPORTFISH MANAGEMENT PLAN

DEPARTMENT OF INLAND FISHERIES AND WILDLIFE
DIVISION OF FISHERIES AND HATCHERIES

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BLACK CRAPPIE LIFE HISTORY

Black crappie (*Pomoxis nigromaculatus*) inhabits small ponds, quiet areas of large lakes, and slow moving water of streams and rivers; this species is almost always associated with abundant stands of aquatic vegetation. Although the crappie's habitat has sand or mud bottom it prefers clear undisturbed water.

The spawning process begins in spring when water temperatures approach 60^{o} F. Male black crappies migrate, slightly earlier than the females, from deeper water to the shallows establishing territories and constructing nests among the vegetation. Locating the nest in heavy cover, such as provided by dense cattails or a fallen tree, is important, because wind and wave action can severely impact egg survival. These nests are built by clearing a shallow circular depression (8-15 inches diameter) in sand or mud substrate. The nests are formed in loose colonies with nests 5-6 feet apart. Female crappies soon move towards the colony where the male then lures her to the nest and spawning occurs. Females deposit on average between 20,000 and 60,000 eggs and may mate with more that one male; therefore each nest may contain eggs from different pairings. This behavior is thought to be a mechanism to help ensure the survival of the female's offspring and possibly to maintain genetic diversity. The female leaves the area soon after spawning, but the male remains to guard the eggs and fry until they disperse. The fry from many nests school together and remain among the vegetation for protection. Largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), chain pickerel (*Esox niger*), and sunfish species, including black crappie, prey heavily on the fry.

During the first 2 or 3 years, crappies grow rapidly on a diet consisting primarily of zooplankton. As the size of the fish increases, they become more piscivorous feeding on various minnow species, yellow perch (*Perca flavescens*), and even bass. Adult crappies feed more actively in open water during the early morning hours and again after dark**.** They can reach sizes in excess of 3 pounds, although in Maine the usual size is much smaller.

BLACK CRAPPIE MANAGEMENT HISTORY

The black crappie is native to freshwater lakes and streams from the Great Lakes south to the Gulf of Mexico; the eastern range was the southern Atlantic states. Because of the popularity of this sportfish, it has been widely spread outside this range. In Maine, the black crappie was stocked in the headwaters of the Sebago drainage at Virginia Lake in 1921. The species spread downstream to Sebago Lake, where they were first observed in 1952, and hence to other waters in the drainage. They have since spread throughout the Sebasticook drainage, when in 1969; they were accidental introduced into Sebasticook Lake. Their spread into the Little Ossipee drainage probably occurred in the 1960's as a result of an illegal introduction in New Hampshire.

Black crappies are expanding their range, in Maine, at an alarming rate most likely due to illegal intentional introductions and accidental introductions via the bait pail. Lakes and ponds of both the Penobscot and Kennebec drainages now harbor large self-sustaining populations.

Because the black crappie may compete with the more favored native sportfish, the Department has maintained no regulations to restrict the harvest and has discouraged the spread of this species to other waters.

BLACK CRAPPIE PAST MANAGEMENT GOALS

I. Limit populations to present abundance and distribution: increase use.
II. Decrease distribution.

Unfortunately, the goals to decrease and limit the spread of black crappies were not achieved; in fact, the distribution has expanded. Insufficient use data collected during the previous planning period limits conclusive evidence as to whether the goal to increase angler use was achieved but it is believed a substantial increase has occurred. Data from the 1994 to 1999 Open Water Fishing Survey indicates a 25% increase in the number of days spent fishing for black crappie. Speculation is that there were even fewer black crappie anglers in 1985 when these goals were developed than during the 1994 survey.

The 1985 plan update listed black crappie in only 13 lakes (36,458 acres), all within the two southern management regions. Currently, black crappies have spread into two additional Regions (C and D) occupying 64 waters (70,403 acres) (Figure 1). The two most probable causes of this expansion are natural migration throughout the drainages and intentional illegal introductions. This recent expansion of the crappie's range has mirrored the growing popularity of fishing for black crappie. Anglers find them to be scrappy fighters and good tasting.

BLACK CRAPPIE OPPORTUNITY

Since the last planning period, the number of waters having fishable populations of black crappie has increased by 385%, dramatically improving fishing opportunities for anglers. Principal fisheries are still limited to the two southern most Fishery Management Regions and are now found in 37 lakes and ponds with a combined acreage of 57,212 (Figure 2). Sebago Lake, located in Region A, is the largest of the lakes with a principal fishery for black crappie (28,771 acres). The Belgrade Lakes chain with a combined acreage of 19,713 provides the bulk of central Maine's fishery. These waters account for only 14% of the water bodies but 70% of the acreage in Region B.

TABLE 1. The Distribution of Black Crappie Populations by Fishery Management Region

	TOTAL OCCURRENCE		PRINCIPAL FISHERIES	
REGION	NUMBER OF LAKES	ACRES	NUMBER OF LAKES	ACRES
A	31	35,601	17	32,877
B	29	32,968	20	24,335
C	2	812	0	0
D	2	1,022	0	0
E	0	0	0	0
F	0	0	0	0
G	0	0	0	0
STATE	64	70,403	37	57,212

Black crappies are found in 41 waters that are managed for coldwater species and 21 combination coldwater- warmwater management waters. One small 9-acre pond is under no management strategy. Crappies can also be found in rivers and streams. Little information is available on the status of these riverine fisheries but opportunities for anglers abound. Sixty-three of the 64 waters are open to winter fishing, with the one exception being Long Pond which is closed in an effort to protect landlocked salmon (*Salmo salar*). To provide additional winter recreational opportunities for black crappie, five waters are open under a special regulation allowing night fishing. All waters that have a population of black crappie are open to summer fishing; many of these have special fishing regulations but none of those regulations apply to black crappie. Currently, black crappie have no general law bag or length limits. In Maine until recently this highly prolific species has generally been regarded as a nuisance by anglers rather than a sport fish and regulations for protection were not warranted.

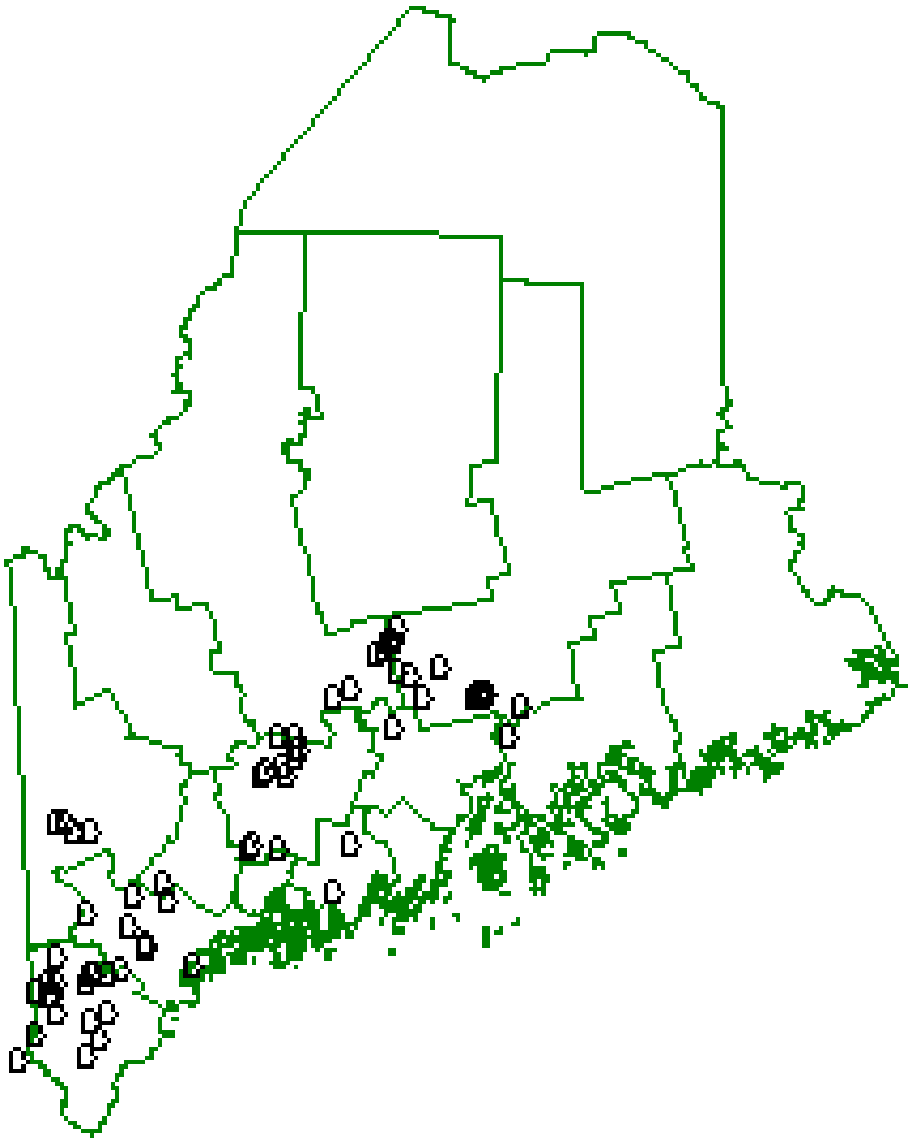

Figure 1. Distribution of Black Crappie *(Pomoxis nigromaculatus*) in Lakes and Ponds

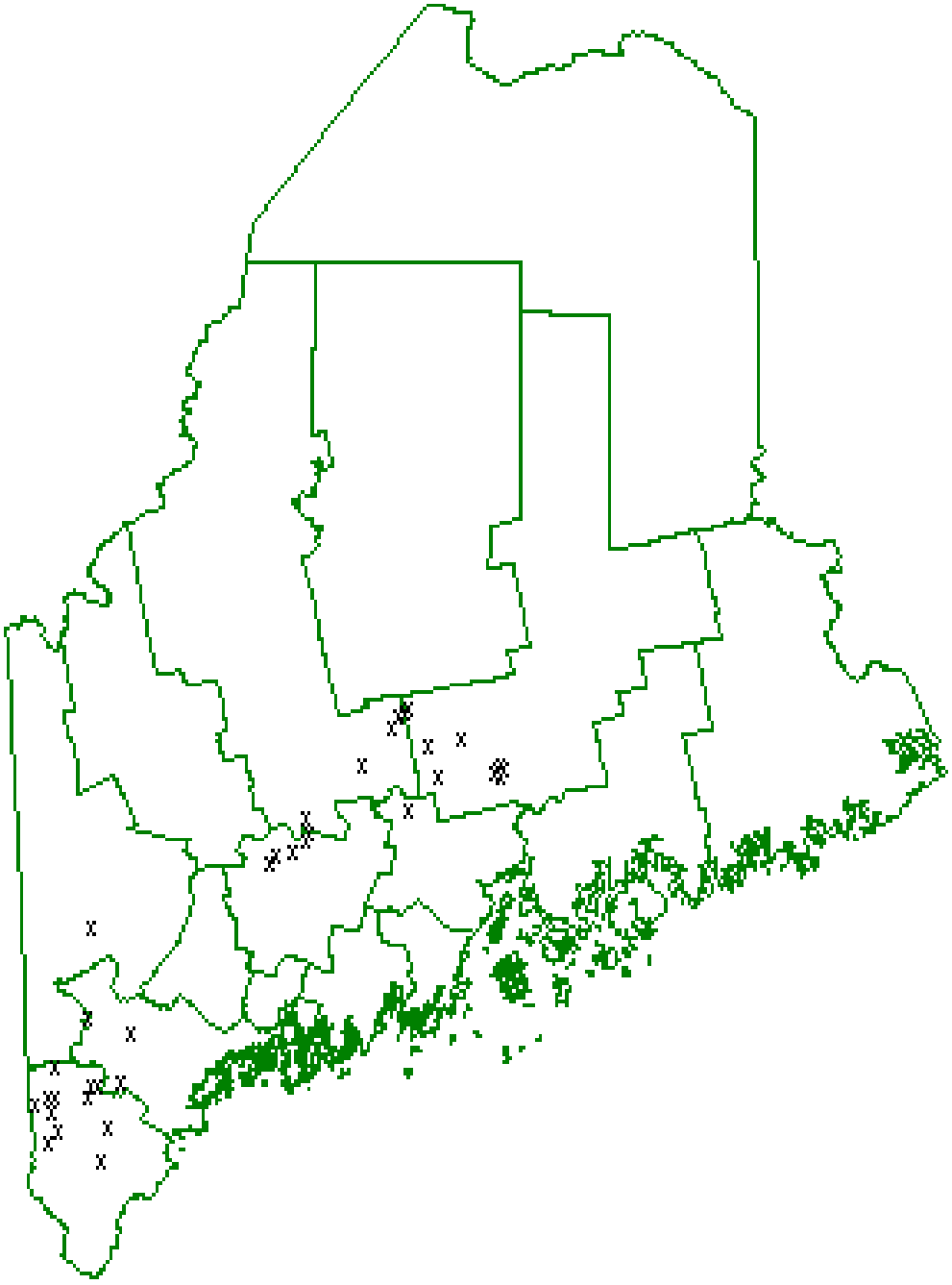

Figure 2. Lakes with principal fisheries for black crappie *Pomoxis nigromaculatus*

BLACK CRAPPIE DEMAND

Although ancillary information suggests a substantial interest in fishing for black crappie, hard scientific data is lacking for this increasingly more popular sport fishery. As with the other 'minor' sport fish, the primary source of data come from various angler questionnaires. Results from the 1999 Open Water Fishing Survey compared with results of the 1994 Open Water Survey shows only an 8% increase in the number of black crappie anglers but an increase of 25 % in the number of days fished. This may indicate that once an angler discovers this type of fishing they become 'hooked', spending more time actively fishing for them.

Fishing effort on waters having principal fisheries for black crappies placed these waters 9th in terms of open water fishing effort expended. Brook trout, landlocked salmon and bass principal fishery waters were the first, second and third most heavily fished lakes and ponds. However, on the basis of targeting, i.e. actively fished for, black crappie were ranked 13th most targeted in a list of 16 species rated. Surprisingly, black crappie has the highest catch rate of all those 16 species with a reported catch of 2.4 fish/angler. The harvest of crappie appears to be important to anglers since it ranks third for number of fish kept per angler day. The harvest rate of 0.96 fish/angler is nearly twice that for Maine's most popular coldwater species, the brook trout (0.39 fish/angler day).

The importance of black crappie as a sport fish is demonstrated by the number of days anglers pursuit this species. An estimated 48,731 anglers spent 430,864 summer days fishing for crappie. This translates to 6.2 angler days/acre, again this compares to 2.1 angler day/acre for brook trout, although this is somewhat misleading because of the limited acreage available to the black crappie angler. Furthermore, most of the state's black crappie populations are located in Regions A and B, the two Regions having the highest human populations and the highest level of fishing effort, thus much of this fishing effort may be incidental to angler effort directed toward other sport fisheries.

Unfortunately, extensive information on Maine's black crappie winter fishery is also lacking. The most recent winter surveys were conducted at Shaker Pond; a small pond managed for warmwater species, which was surveyed during the winters of 1999 and 2000. Catch rates for black crappie varied from 1.8 fish/angler in 1999 to approximately half that rate during the 2000 season to 0.95 fish/angler. The average size of black crappie during those 2 years was at 9.6 inches and 7 ounces.

Recent winter clerk surveys on the Belgrade Chain of Lakes revealed that most black crappie were caught while fishing for other species. Survey clerks interviewed 5,511 anglers, during three winters on four lakes, and found only 19 successful anglers, and they caught just 21 crappie. Mean size of those fish was 11.3 inches with a weight of 12 ounces.

Turtle Cove on Sebago Lake and Hermon Pond in Hermon are known to be very popular sites and attracts many winter anglers. Although Sebago Lake is intensively surveyed on a regular basis, these surveys are conducted on the coldwater sport fish; therefore little black crappie data is available. Hermon Pond has yet to be surveyed during the winter. Discussions with anglers who actively fish for black crappie at these two locations indicate experienced anglers had much better fishing, sometimes catching a dozen fish or more during some trips.

BROWN BULLHEAD ASSESSMENT

BROWN BULLHEAD LIFE HISTORY

The brown bullhead's (*Ameiurus nebulosus*) preferred habitat is sluggish waters with a mud bottom. In large lakes and rivers, the bullhead seeks out sheltered bays and coves. The bullhead is an extremely hardy species that can survive under very poor habitat conditions when most other fishes would perish. It can survive in water temperatures up to 90^0 F and with dissolved oxygen below 1 part per million. The bullhead survives under these stressful conditions by gulping air from the surface through its air bladder which functions like a 'lung'. It has been documented that bullheads can survive for weeks even when a pond dries-up by borrowing into the mud and lying dormant.

In the spring when water temperatures rise above 65^0 F, male and female bullheads prepare for spawning by constructing a nest. The nest is a shallow circular depression located near a submerged structure such as a log or boulder usually in water less than two feet deep. Upon completion of the nest spawning occurs, the female deposits an adhesive egg mass, which is then fertilized by the male. A small female may lay 2,000 eggs while a large fish may have up to 13,000 eggs. Both parents then guard the nest from predators and aerate the eggs through the incubation period. The young hatch in 5-10 days and rise from the nest in about a week. Young bullheads remained in large schools throughout the first summer usually in shallow weedy areas.

Bullheads are bottom scavengers feeding primarily at night on a wide variety of foods. The bullhead uses whisker-like barbels, which are equipped with taste buds, to brush along the bottom to locate food items. These omnivores will eat algae, plant material, aquatic insects, crayfish, and fish. In Maine, lakes where bullheads and lake trout are both present, bullheads are known to feed on lake trout eggs. Fifty-one percent of the bullheads examined during the lake trout spawning season in one Maine lake contain lake trout eggs in their stomachs. Whether this predation represents a significant impact on lake trout populations is unknown.

BROWN BULLHEAD MANAGEMENT HISTORY

The native range of the brown bullhead extends along the east coast of North America from the Canadian Maritimes south to Florida, west to Texas and north to the Province of Saskatchewan. In Maine, this species was indigenous to many of the coastal drainages including the Androscoggin, Kennebec, Penobscot, and St. John River drainages. The species was introduced to the Rangeley's at the head of the Androscoggin River drainage, about 1900. Early surveys of the waters in the Moosehead Lake area yielded only one specimen, and it is unknown whether they were native to the area or had been introduced.

While sought after as fine table fare in some Southern states, the bullhead, locally known as hornpout, is one of two members of the catfish family found in Maine, neither of which are managed intensively as a sportfish. On the contrary, bullheads are often targeted for chemical eradication because they severely compete with brook trout where the two co-inhabit. Two small

ponds included in a study to compare strains of wild brook trout had to be eliminated from the study plan when brook trout failed to survive in any substantial numbers. The high density of bullheads in these ponds contributed to this failure, population estimates of bullheads in these two ponds were 237 and 954 fish per acre.

Even though the brown bullhead provide excellent table fare and are easily caught, special regulations were not necessary, because they haven't been highly sought after by most Maine anglers.

BROWN BULLHEAD PAST MANAGEMENT GOALS

I. Limit populations to present abundance and distribution.
II. Limit populations to present abundance and distribution; increase use.
III. Decrease distribution.

The above goals, for the most part, were achieved during the past planning period. Although a small number of individual waters were chemically reclaimed to eliminate brown bullheads to provide better coldwater sport fisheries, overall the number of waters with populations of bullheads actually increased statewide during the past planning period. Better inventories and additional waters surveyed is the reason for this increase.

BROWN BULLHEAD OPPORTUNITY

Brown bullhead are distributed throughout the state occurring 851 lakes and ponds comprising 756,604 acres (Figure 1); these totals represent a 47-water (24,144 acres) increase since the 1985 planning update. Principal fisheries for bullheads are found in four of the Management Regions (Table 1) with a total of 38 waters (Figure 2).

Bullhead can be found in a multitude of water types from large oligotrophic lakes to small warmwater ponds and everything in between. Sport fishery opportunities exist for bullhead in most all Maine's major river systems but evaluations of these populations have not been completed and therefore, will not be discussed.

Table 1. Brown Bullhead Occurrence and Principal Fisheries in Lakes by Management Region.

MANAGEMENT REGION	TOTAL OCCURENCE		PRINCIPAL FISHERIES	
	NUMBER OF LAKES	ACRES	NUMBER OF LAKES	ACRES
A	224	87,570	16	2,624
B	215	96,356	16	18,159
C	115	101,750	0	0
D	53	74,958	4	297
E	66	162,344	0	0
F	111	160,869	2	135
G	67	72,757	0	0
STATE	**851**	**756,604**	**38**	**21,215**

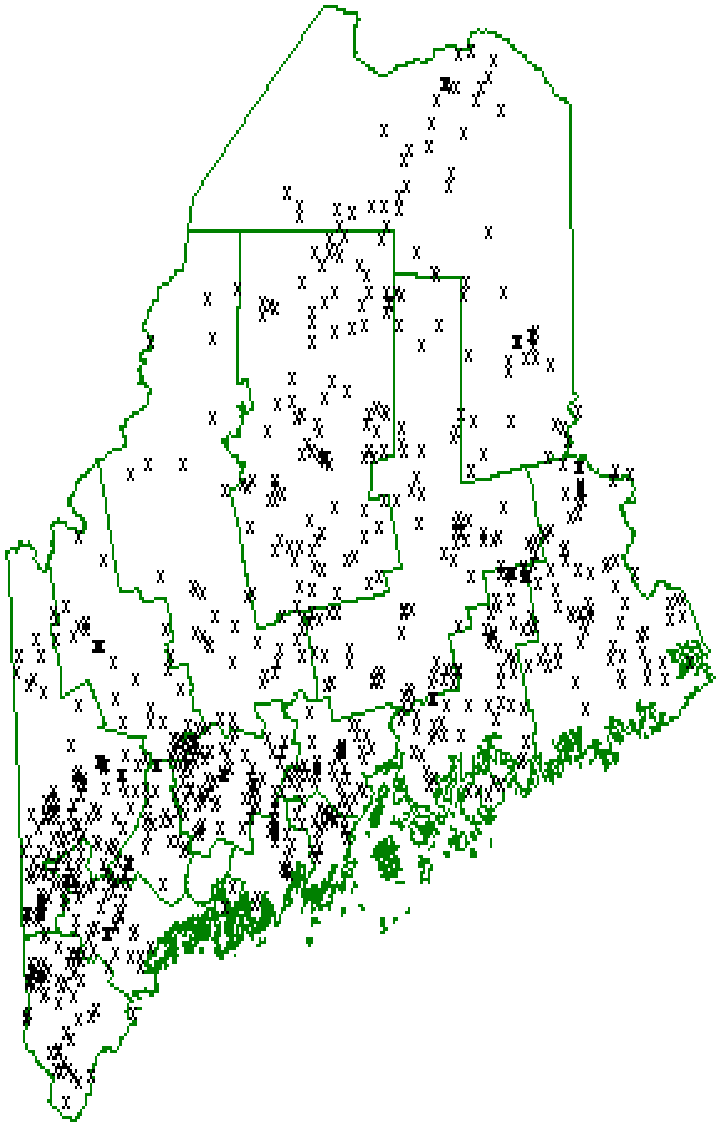

Figure 1. Distribution of Brown Bullhead (*Ameiurus nebulosus*) in Lakes and Ponds, 2000.

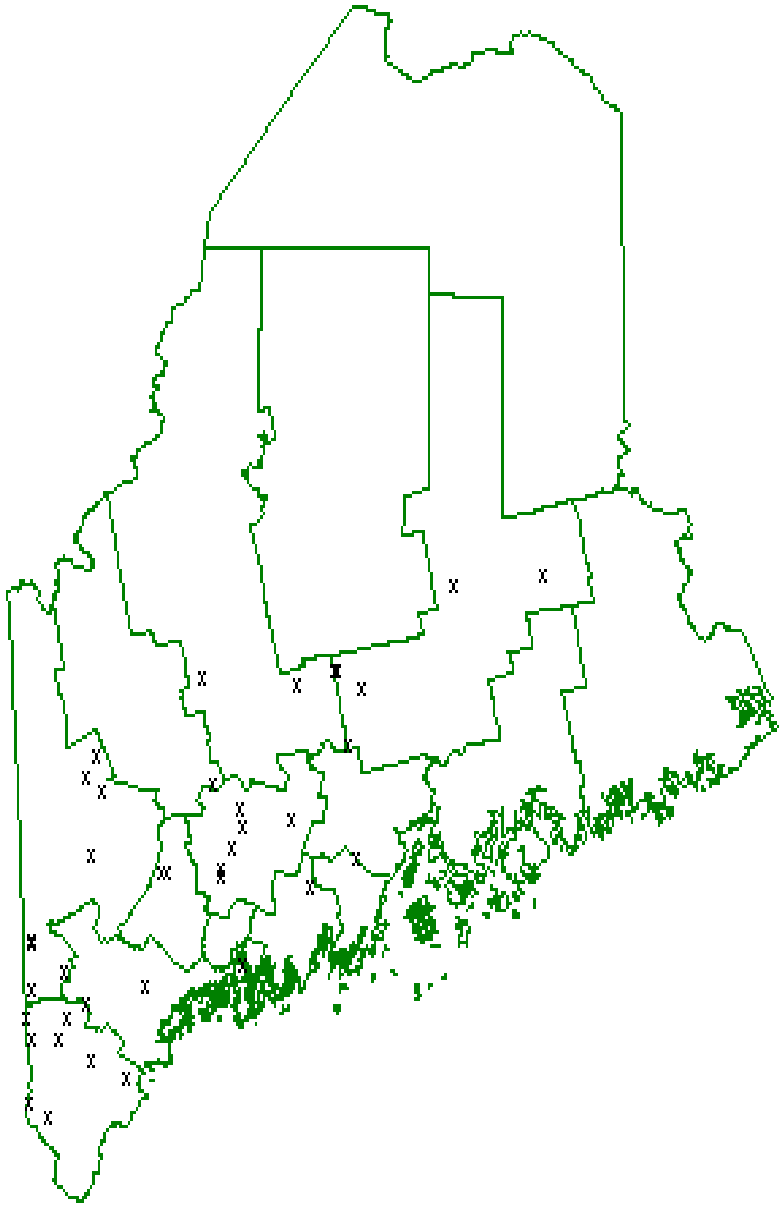

Figure 2. Lakes and Ponds with Brown Bullhead (*Ameiurus nebulosus*) as principal fisheries, 2000.

Regulations for bullheads have not been warranted due to the lack of angling interest. Although, when an artificial lures only regulation was promulgated on the lower Aroostook River, to protect the brook trout population, a number of local anglers protested because it virtually eliminated their night fishing for bullheads.

BROWN BULLHEAD DEMAND

The 1999 open water fishing survey indicates a total of 21,373 (± 2,654) anglers actively targeted brown bullhead and expended approximately 189,275 (± 39,909) days fishing for bullheads (Table 2).

Table 2 Estimated angler days and catch rates for brown bullhead listed by Management Region.

REGION	ESTIMATED ANGLER DAYS (95% C.I.)		FISH PER ANGLER DAY	
			CAUGHT	KEPT
A	43,448	(23,451)	1.93	0.77
B	140,806	(32,402)	1.00	0.06
C	N/A		N/A	N/A
D	1,425	(1,341)	0.93	N/A
E	N/A		N/A	N/A
F	1,330	(2,414)	0.36	0.36
G	N/A		N/A	N/A

BROWN BULLHEAD FISHING QUALITY

This same open water survey indicates a statewide catch rate of 1.76-fish/angler day with the total harvest of 135,363 (0.72 fish/angler day) bullheads (Table 2). The above rates are based on all fishing activity and not just anglers targeting bullheads, it is believed those actively pursuing this species probably have much better fishing. Anecdotal information suggest that fishing at night for bullheads can be much more productive than daytime angling. Statistics for individual waters are unavailable although it is apparent that the Southern Regions provide the best fishing based on catch rates.

Very little data are available regarding the average size of bullhead caught by anglers. A handful of fish reported through the voluntary angler program reveals an average size of 10.5 (± 0.4) inches with the largest reported at 11.5 inches. Combining all length data collected, primarily from Central Maine, during the past 5 years indicate an average size of 8.1 (±0.3) inches.

CARP MANAGEMENT ASSESSMENT

CARP LIFE HISTORY

In Maine, carp (*Cyprinus carpio)* spawn in spring and early summer with water temperatures between 63^0 F and 78^0 F. As the waters warm in the spring, large numbers of carp concentrate in shallow weedy areas, where amid much commotion spawning takes place. Often 1-3 females along with 3-15 males thrash and splash wildly among the vegetation. Eggs, of this highly prolific species, are randomly broadcast and adhere onto submerged vegetation. The number of eggs varies based on the size of the female. A typical one-pound carp may yield 100,000 eggs while a 15-pound fish can be expected to produce over 2 million eggs. It is understandable how this species could over populate a pond in just a short time. There is no parental care and the eggs hatch in 4 to 10 days depending on water temperature.

Young carp remain in the shallow weedy areas where they grow quickly. During the first few weeks of hatching, young carp are heavily preyed upon by a variety of fish and fish-eating birds. By the end of the first growing season, carp may reach a size of one pound and up to three pounds within the third year. It is not uncommon for carp to grow up to 30 or 40 pounds in the southern part of its range but in Maine it would be more typical for carp to reach 10-15 pounds.

Carp feed primarily by sucking in a mouthful of bottom sediment; then expelling nonfood items while at the same time retaining forage. The latter may include fish, insects, crustaceans, mollusks, and plant material such as algae, seeds, and wild rice. Carp have even been spotted feeding directly at the surface gulping algae and insects.

CARP MANAGEMENT HISTORY

Carp were first introduced into the Unites States in 1877 from Europe where they were raised in small ponds and harvested for food. Many immigrants were familiar with the cultivation of carp and were eager to bring them to the “New World”. The United States Fish Commission initiated a program to cultivate carp in the U.S. Private citizens made application to the Commission for these fish where carp were then distributed to those applicants throughout the Eastern States.

Carp were first introduced in to Maine in 1879. Several dozen stockings into privately owned ponds occurred between 1879 and 1896. Historical records indicate that between the years of 1886 and 1887, 1,250 carp were distributed to 61 applicants in 15 of Maine’s 16 counties. The populations of carp in the tidal waters of the Scarborough River and the Kennebec River are probably a result of escapes from these small private ponds. Little information is available on introductions of carp into the State’s great ponds. It is known that Green Lake in Hancock County was stocked, and is believed that Halfmoon Pond in Waldo County was also stocked. These stockings failed to establish self-sustaining populations.

Thankfully, most carp introductions in Maine were unsuccessful. The reasons for these failures are speculative. The U.S. Fish Commission evaluated the stocking program and reported that in many instances only small percentage of fish actually reached the ponds alive. Only a couple of dozen carp were allocated to each individual, and even though carp are a very hardy

species, transportation methods of the time took their toll. The fish were transported in milk cans and few fish survived the long train rides and bumpy travels by horse and buggy to the stocking sites.

The spread of carp throughout the drainages where they now occur has been restricted by impassable dams. Carp have the ability to leap, reportedly jumping as high as 5 to 6 feet and they also use fishways to gain access to upstream waters. The recent removal of the Edwards Dam on the Kennebec River in Augusta has now opened approximately 17 addition miles of river. Within just one summer season carp have moved to the next upstream barrier at Waterville. Fortunately, most of the many feeder streams to that section of the Kennebec River have natural barriers or are not associated with lakes or ponds. The exception is Sevenmile Stream, the outlet of Webber Pond in Vassalboro. Webber Pond is currently managed for brown trout (*Salmon trutta*) and bass (*Micropterus spp*) and has some ideal habitat for carp should they migrate into the pond. To prevent this migration the Maine Department of Fish and Wildlife obtained a grant from the Maine Outdoor Heritage Fund to construct a barrier dam on Sevenmile Stream.

The Federal re-licensing process of dams on the Kennebec River will be occurring within the next few years and it will be very important for the Department to be involved during that process to ensure that carp are not allowed to gain further access upstream.

Carp may be one of the most highly sought-after sportfish by the European angler. Furthermore, the popularity of the species is growing in the southern United States. Unfortunately, carp are considered detrimental to Maine's native fish species, as well as popular non-native sport fish species, such as bass, primarily by degrading water quality. The preferred habitat of carp is shallow, weedy, warm water areas where they scavenge bottom sediments for food, thereby uprooting vegetation and increasing water turbidity. Many of our warmwater species depend on aquatic vegetation for spawning and nursery habitat; the young of those species utilize this vegetation for feeding and protection from predation. Additionally, the increased turbidity can interfere with sight predators, such as the chain pickerel (*Esox niger*).

CARP PAST MANAGEMENT GOALS

GOAL: No goals were developed for carp during the last planning period.

CARP OPPORTUNITY

Carp are currently restricted to flowing waters primarily within the tidal water of the Kennebec River drainage, Regions A and B (Figure 1). The most popular fishing area is the 'flats' of Merrymeeting Bay. The Department has no fishing regulations to protect carp, but the Maine Department of Marine Resources has special terminal tackle regulations on the Kennebec River to protect marine sport fish species.

CARP DEMAND

No data are available on the current carp sport fishery.

CARP FISHING QUALITY

No data are available on the current carp sport fishery.

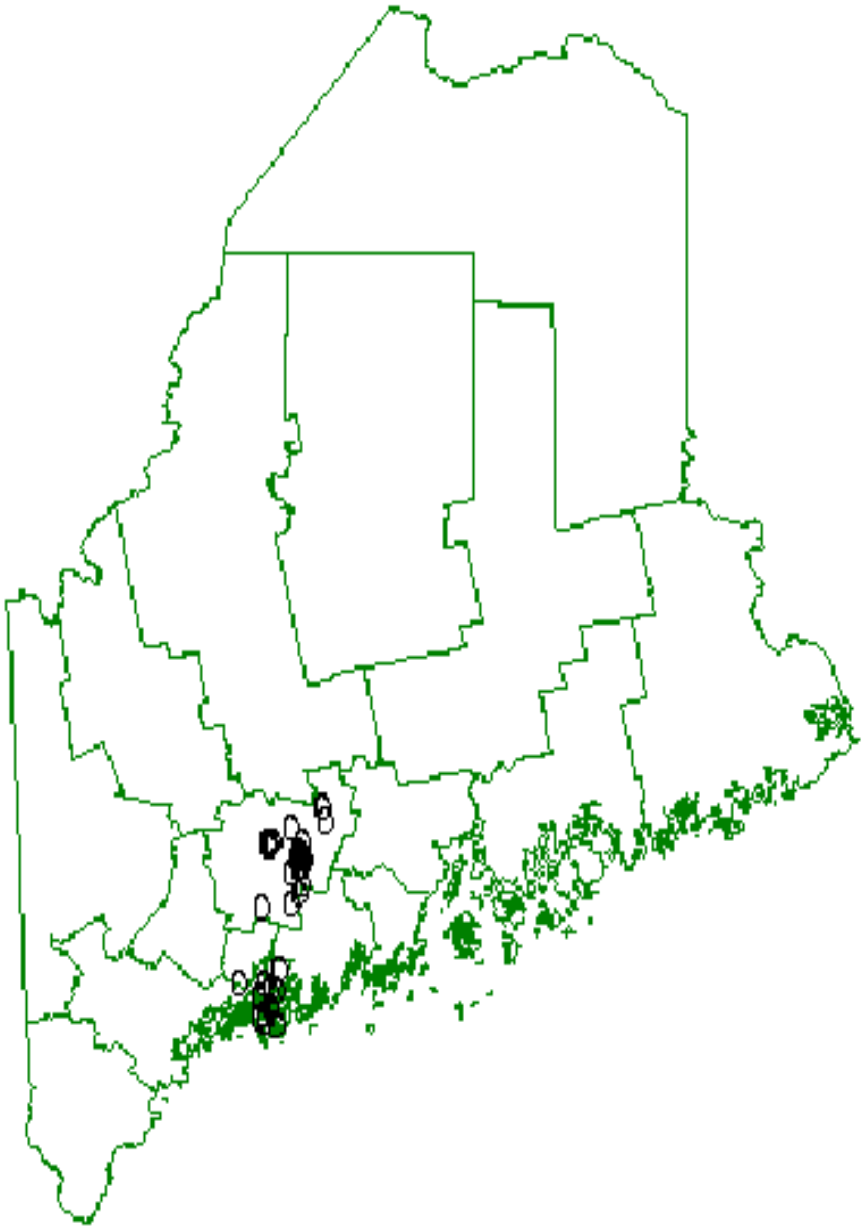

Figure 1. 2000 Distribution of Carp (Cyprinus carpio) in Maine. Circles Represent Towns in Which Carp Occur.

SUNFISH ASSESSMENT [1]

SUNFISH LIFE HISTORY

Life histories of both the pumpkinseed sunfish (*Lepomis gibbosus*) and the redbreast sunfish (*Lepomis auritus*) are very similar and will be discussed together. These two species are so closely relative that they often hybridize in the wild and the hybrids are hard to distinguish from the parental stocks. As water temperature raises through the 50's into the lower 60's sunfish, leave their deep-water wintering schools to seek shallow water for spawning. Although the majority of spawning occurs in late June, sunfish have been known to spawn as late as August. The male sunfish seeks flat sand or gravel areas in water usually 1-3 feet deep. He clears a shallow saucier shaped depression by fanning the bottom. The nest of sunfish may be clustered in small colonies. The male chases a receptive female into the nest. The female lays 600-3,000 eggs; after the male fertilizes the eggs, he chases the female off the nest. The male hovers over the nest fanning the eggs to provide constant water flow. He jealously guards the eggs rushing and attacking potential predators. The young sunfish hatch in 3-10 days depending on water temperature. The fry remain in the nest and under the protection of the male for several more days.

In good habitat, young sunfish grow rapidly and may reach three inches by the end of the first growing season. Adults may reach a length of 10 inches and weigh nearly one pound. In small ponds without many predators sunfish are known become stunted; under this condition adults may only reach a maximum size of 3 or 4 inches. During the summer months, sunfish prefer shallow, well-vegetated areas of large lakes, small ponds, and backwaters of slow moving rivers and streams. These areas provide an abundant supply of aquatic insects, the majority of their diet, although fish, worms, and snails are also eaten. With the decreasing water temperatures, in the fall, sunfish begin to school up and become less active in deeper water where they remain throughout the winter.

Small sunfish are preyed upon by nearly all of Maine's larger fish species and may even be cannibalized by larger sunfish. Sunfish are most important as forage for warmwater species such as, bass, northern pike, and yellow perch.

SUNFISH MANAGEMENT HISTORY

The pumpkinseed, or common sunfish is the more abundant of the two sunfish species found in Maine. The pumpkinseed is indigenous to many of the Atlantic drainages and parts of the Androscoggin, Kennebec, Penobscot, St. Croix, and St. John River drainages. Pumpkinseeds are also found in many isolated areas throughout the state suggesting that they may have been introduced to these waters, but no records are available to indicate this.

[1] For the purposes of this species plan sunfish species include pumpkinseed (*Lepomis gibbosus*) and redbreast (*Lepomis auritus*).

The redbreast sunfish, or longeared sunfish has a smaller range in Maine than the pumpkinseed. Early surveys indicated the redbreast sunfish to be established in the Androscoggin, Kennebec, Penobscot, St. Croix, and Aroostook River drainages.

The present range of sunfish in Maine is presented in Figure 1 and 2.

Because sunfish are known to compete with other more favorable sportfish species for food and space, they have been targeted for eradication by chemical pond reclamation. In a sample of 20 ponds studied, complete kills of sunfish were obtained in 75% of them.

Sunfish are not cultivated within the state's hatchery system and are not routinely stocked as a sportfish but in a few instances, primarily in Central Maine; pumpkinseed sunfish have been introduced into a small number of waters. Currently, there is an on-going introduction of pumpkinseed sunfish, as a forage species, into Lilly Pond (Rockport). Largemouth bass were stocked into the pond in response to a public request to create a sport fishery. The lack of an ample forage base necessitated this introduction.

In the Southern United States, sunfish are highly prized and are actively sought out because they provide excellent table fare. In Maine, with the more preferred coldwater species, the sunfish is often neglected. Children fishing with a bobber and worm from docks are probably the most avid anglers for this species. Even though sunfish are easy to catch, length and bag limit regulations have not been warranted due to the high productivity of the species and low angler interest.

SUNFISH PAST MANAGEMENT GOALS

I. Limit populations to present abundance and distribution.
II. Limit populations to present abundance and distribution; increase use.
III. Decrease distribution.

The number of waters with a population of sunfish has slightly increased since the 1985 Species Plan update. Completion of additional lake surveys, intentional introductions of sunfish as a forage species, and unintentional introductions via the bait pail are the primary sources for the additional populations.

Angler use estimates for sunfish were not available for the 1985 species plan therefore; it is unknown whether the goal to increase use was achieved.

SUNFISH OPPORTUNITY

Abundant populations of sunfish exist within all the State's Fisheries Management Regions (Table 1) but there are no waters where sunfish are considered as a principal fishery. Populations of sunfish can be found in all types of waters from large oligotrophic lakes managed primarily for coldwater sportfish to small shallow eutrophic ponds with no management strategy. Considering sunfish are found in 907 lakes and many miles of rivers and streams, the Maine angler never needs to travel far for the opportunity to catch sunfish.

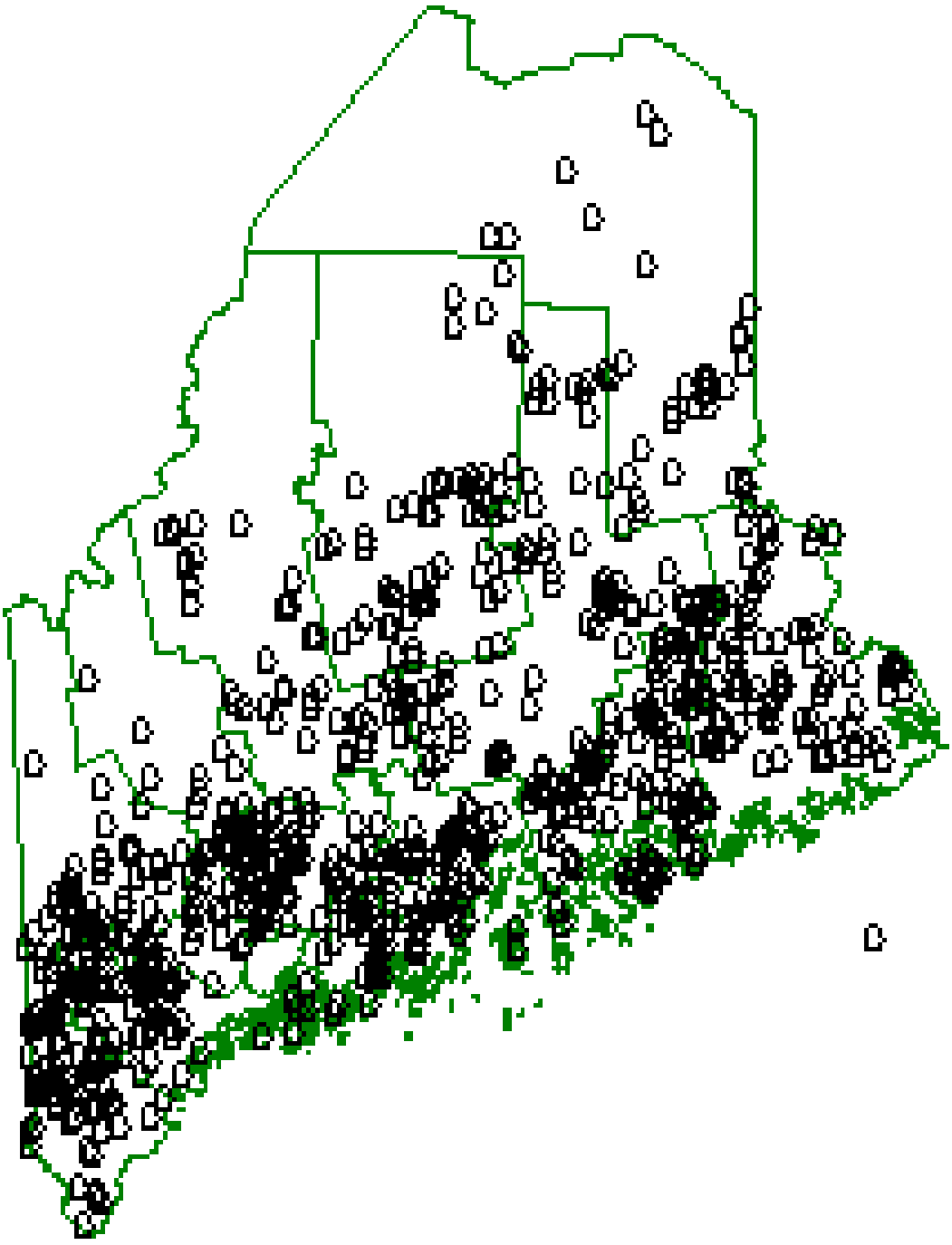

Figure 1. 2000 Distribution of Pumpkinseed Sunfish (Lepomis gibbosus) in Maine.

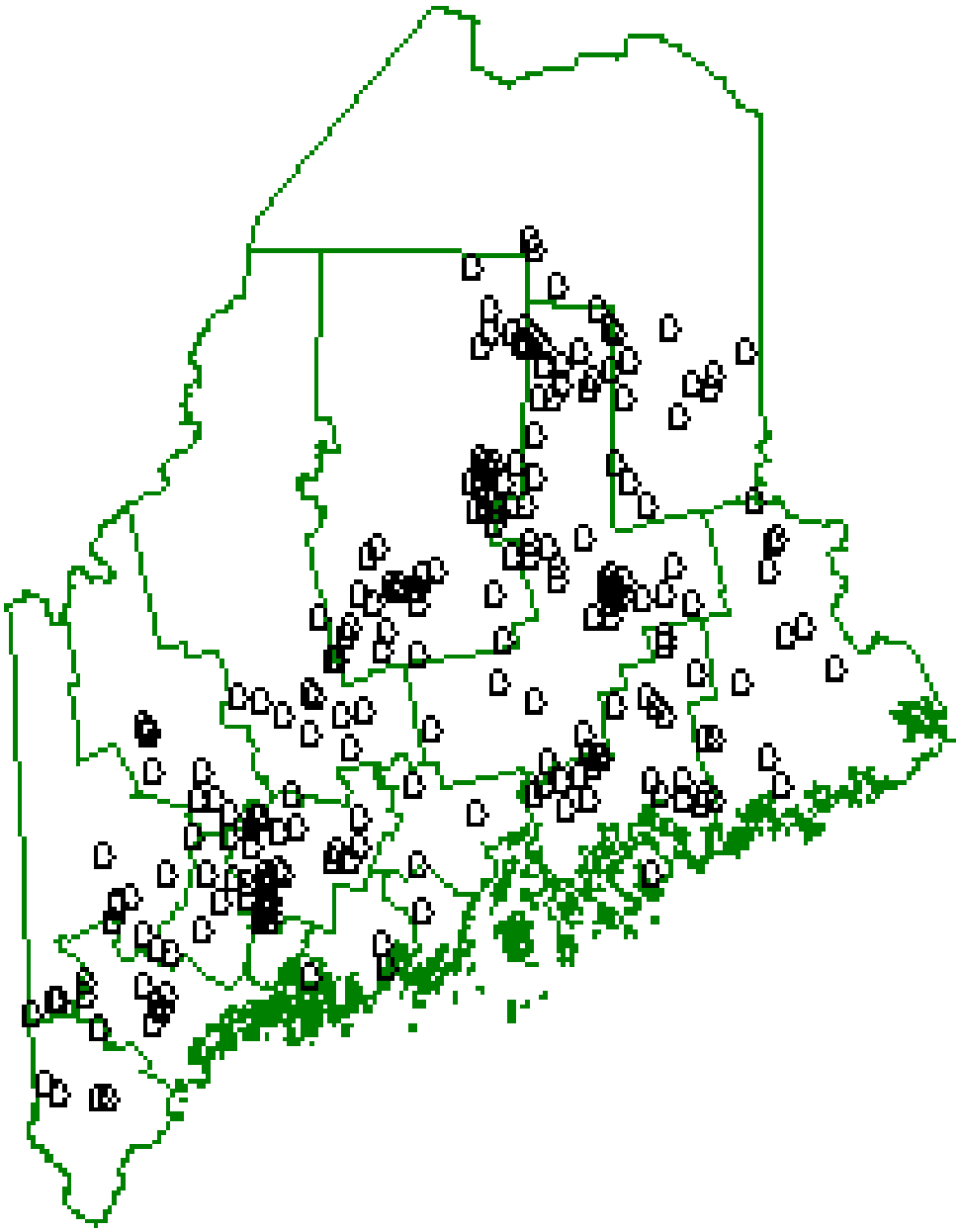

Figure 2. 2000 Distribution of Redbreast Sunfish (Lepomis auritus) in Maine.

Table 1. Occurrence of Sunfish Species in Maine Lakes by Management Regions.

MANAGEMENT REGION	PUMPKINSEED		REDBREAST		UNIDENTIFIED SUNFISH		ALL SUNFISH	
	NUMER OF LAKES	NUMBER OF ACRES	NUMBER OF LAKES	NUMBER OF ACRES	NUMBER OF LAKES	NUMBER OF ACRES	NUMBER OF LAKES	NUMBER OF ACRES
A	196	85,375	28	12,467	3	901	204	86,572
B	203	90,194	40	52,684	15	2,938	223	95,889
C	167	118,223	30	25,878	19	5,691	189	125,421
D	42	19,414	17	6,860	2	1,027	54	22,922
E	42	100,692	20	7,352	4	189	59	106,228
F	112	132,378	70	76,883	6	8,007	138	150,054
G	28	11,908	19	9,670	0	0	40	17,948
State	790	558,213	224	191,794	49	19,023	907	605,034

SUNFISH DEMAND

The 1999 winter angler survey revealed no interest in fishing for sunfish through the ice. The 1999 openwater angler survey shows the ease at which sunfish are caught, with a statewide catch rate of over 1.5 fish/angler. Despite this success, only 2, 660 ($\pm$980) anglers actively fished for sunfish for an estimated 22,608 (+16,262) days. Therefore, sunfish account for less than 0.6% of all the fishing activity during the 1999 openwater season. Angler effort for sunfish was reported from all fishery regions except the far north region (Table 2).

SUNFISH FISHING QUALITY

During the summer, sunfish are relatively easy to catch with catch rates reported as high as 4.46 fish per angler (Table 2). In contrast, catching sunfish through the ice in Maine is almost non-existent, so no data are available on the winter fishery.

Mean size for angled sunfish is unknown due to the lack of surveys conducted on these species. Data collected with a variety of gear, from Central Maine, suggest an average length of 6.5 in ($\pm$ 0.3 in) for redbreast sunfish and 7.4 in ($\pm$ 0.4 in) for pumpkinseed sunfish.

Table 2 Estimated Angler Days and Catch Rates For Sunfish Listed by Management Region.

REGION	ESTIMATED ANGLER DAYS (95% C.I.)		FISH PER ANGLER DAY	
			CAUGHT	KEPT
A	15,674	(16,544)	1.21	0.07
B	2,565	(2,053)	2.19	N/A
C	665	(1,635)	3.71	N/A
D	1,995	(22,932)	1.19	0.05
E	190	(263)	2.40	N/A
F	1,235	(1,590)	4.46	N/A
G	N/A		N/A	N/A
State	22,608	(16,262)	1.59	0.03

YELLOW PERCH MANAGEMENT ASSESSMENT

YELLOW PERCH LIFE HISTORY

Yellow perch (*Perca flavescens)* are a very tolerant species inhabiting large lakes, small ponds, rivers, and to a lesser extent brackish waters, preferably with mud or sand substrate. In all these environments, perch prefer warm weedy shallow areas. Young perch remain in the shallow vegetated areas, while the larger adults will move off shore to deeper rocky areas.

In Maine, yellow perch spawn from mid April to mid May, when water temperatures are between 44^0 and 54^0 F. The adults migrate into the shallows or to tributaries to spawn. Yellow perch inhabiting brackish waters migrate to freshwater prior to spawning. The spawning act occurs at night when a single female is followed by as many as 25 males. The males fertilize the eggs as they are extruded by the female. The eggs are in laid in long strands of a gelatinous matrix. These grayish-white egg masses are inter-woven among brush or submerged vegetation. Because there is no parental care females must lay an incredibly large number eggs to ensure survival. Studies indicate the number of eggs per female increase with size, perch 5.1 in – 10.1 in have 3,000 to 61,000 eggs.

Yellow perch hatch in 2 or 3 weeks. The young are transparent and remain inactive for approximately 1 week while they absorb their yolk sac. Young perch form large schools and remain in shallow weedy areas. These areas are highly productive for growth and provide protection from predators. Small perch are preyed upon by many fish species including yellow perch. Perch are carnivorous; the young start feeding on plankton and small aquatic insects. Adults are more piscivorous feeding primarily on small minnows, but they also prey on crayfish and fish eggs of many species. Ninety-two percent of yellow perch over 10 inches, in Rangeley Lake, were found to be eating smelts.

Yellow perch reach a length of 12 inches in 9 or 10 years, although with good habitat a fast growing female may reach 12 inches in 5 years. Males reach sexual maturity at age three while females generally aren't ready to spawn until age four. In some water bodies, yellow perch become over-populated resulting in a large number of small slow growing individuals. Yellow perch are serious competitors with other game fish especially brook trout.

YELLOW PERCH MANAGEMENT HISTORY

The yellow perch was indigenous along the Atlantic coast drainages of Maine, but through man's activity, it has been spread to all of our major river drainages. Because yellow perch are serious competitors with more desirable coldwater sportfishes, their spread has been discouraged by fisheries managers. They have proliferated because of unintentional introductions via the bait pail or by illegal introductions. Once established within a body of water they will move downstream and upstream at will until their movement is blocked by obstructions or continuous riffles.

Yellow perch were introduced to the headwaters of the Fish River drainage about 1940, apparently from the nearby Lower Allagash River drainage. They eventually spread downstream

into the seven major lakes as well as into the many smaller bodies of water. Today yellow perch are even present above the Upper Fish River Falls.

Yellow perch became established in the headwaters of the Rangeley Lake drainage about 1953, they are now present in many of the waters in the drainage. In the Moosehead drainage, yellow perch appeared in two separate waters about 1958. Efforts to eradicate them failed and they soon spread to Moosehead Lake, the Moose River drainage and to other waters within the drainage.

Although yellow perch are considered an important sportfish in other regions of the United States, it is rarely targeted by Maine anglers and is considered a trash fish by many. A common practice of many winter anglers has been to discard unwanted yellow perch on the ice as forage for scavenger species, such as the bald eagle. Because it competes seriously with the major coldwater sportfishes, the yellow perch is often a species targeted by chemical reclamation in Maine. Chemical treatment of 14 ponds resulted in eradication of yellow perch in 13 (92%) of them. In some instances, the spread of yellow perch throughout drainages has been limited by the construction of barrier dams to prevent their upstream movement.

YELLOW PERCH PAST MANAGEMENT GOALS

I. Limit populations to present abundance and distribution.
II. Limit populations to present abundance and distribution; increase use.
III. Decrease distribution.

During the last planning period, the number of waters with viable populations of yellow perch has slightly increased. This increase is believed due to the completion of additional lake surveys and better documentation of this species' distribution. The lack of data regarding angler use makes it impossible to determine if the goal to increase use has been achieved.

YELLOW PERCH OPPORTUNITY

Today yellow perch are found in 858 surveyed lakes and ponds (Figure 1), which is an additional 66 (8%) waters since the 1985 planning period. The total surface area of lakes and ponds with yellow perch populations is 778,801 acres, an increase of 26,933 (4%) acres since 1985. Yellow perch are considered principal fisheries in only 38 waters (41,890 acres).

Table 1. Occurrence of Yellow Perch in Maine Lakes by Mangement Regions.

MANAGEMENT REGION	TOTAL OCCURENCE[2]		PRINCIPAL FISHERIES[3]	
	NUMBER OF LAKES	ACRES	NUMBER OF LAKES	ACRES
A	196	86,943	1	20
B	203	96,942	28	18,989
C	124	117,114	1	51
D	47	75,990	1	20,300
E	71	166,719	1	35
F	138	177,715	6	2,495
G	79	57,378	0	0
STATE	858	778,801	38	41,890

[2] All lakes containing yellow perch.
[3] Only those lakes having principal fisheries for yellow perch.

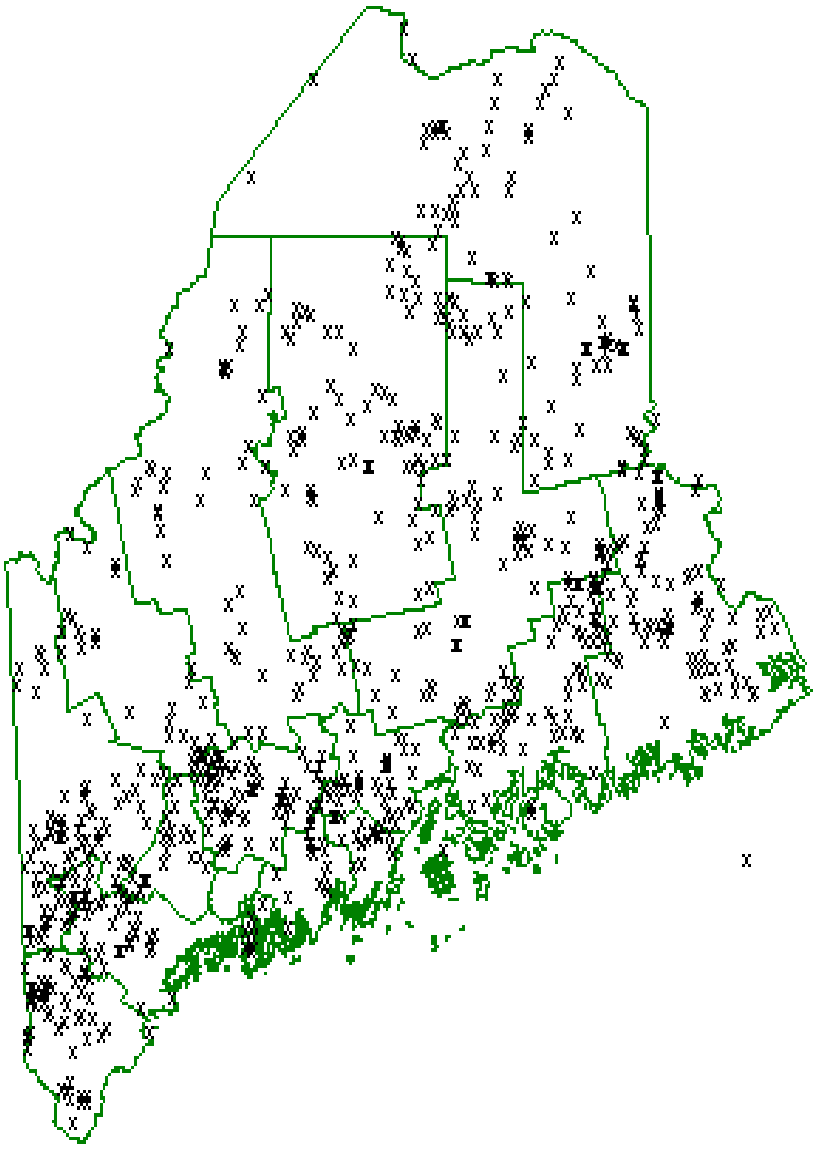

Figure 1. Distribution of Yellow Perch (*Perca flavescens*) in Lakes and Ponds.

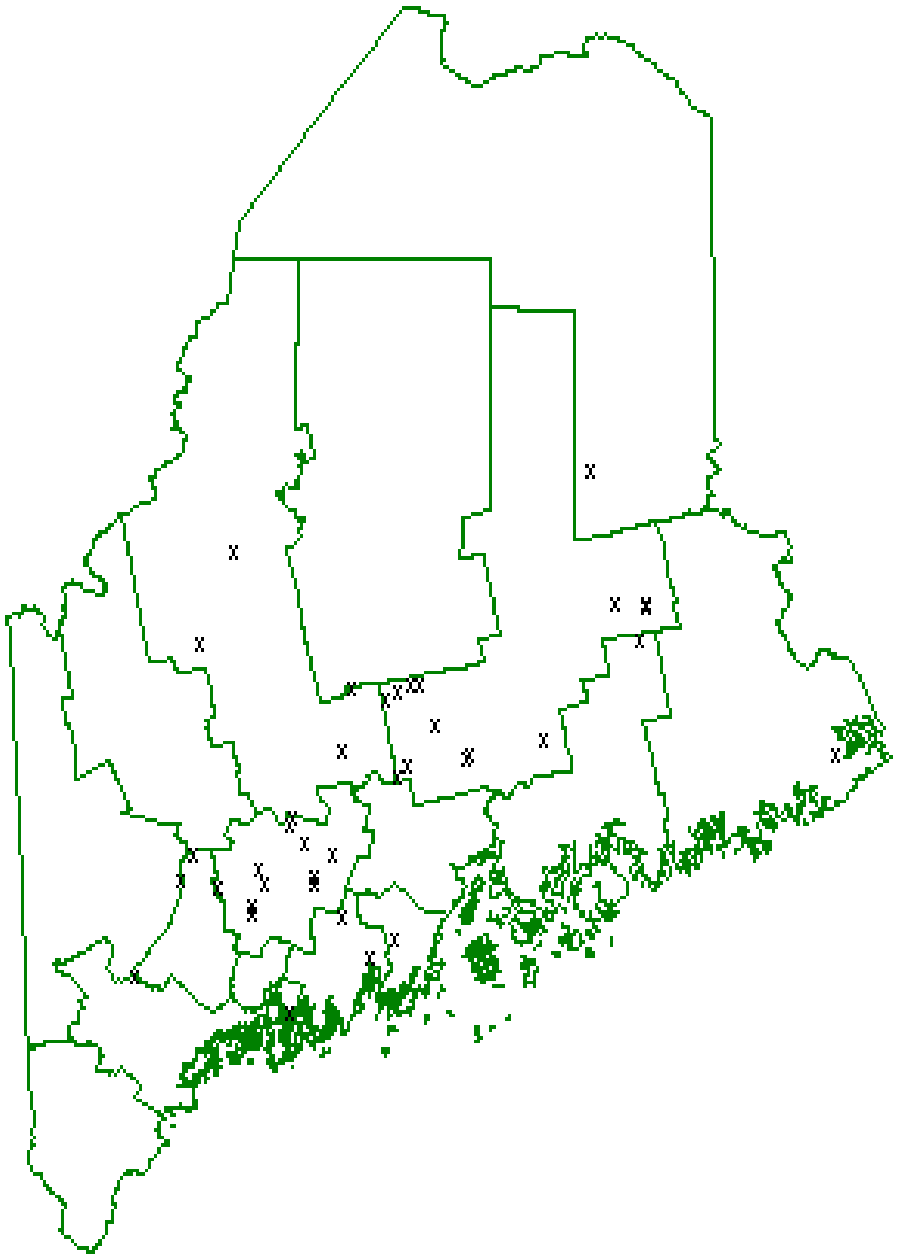

Figure 2. Lakes and Ponds With Principal Fisheries for Yellow Perch (*Perca flavescens*).

Large oligotrophic lakes, small brook trout ponds, shallow warm water ponds, and rivers all harbor populations of yellow perch; yet, perch are not intensively managed as a sport fishery in Maine. Many of these waters are stocked with coldwater fish species and have regulations to protect those species, but currently there are no fishing regulations to limit the method or harvest of yellow perch.

YELLOW PERCH DEMAND

The most recent estimate of winter angler use for yellow perch, as reported in the Maine Ice Fishing Survey, Winter 1998-1999, was 9,375 (± 1,039) anglers fishing for a total of 48,254 (± 8,283) days. This is an increase of 12,526 angler days (35%) from the winter survey of 1993-1994. Anglers caught an estimated 124,453 (± 75,507) yellow perch but harvested only 41,159 (± 16,873).

The Maine Open Water Fishing Survey Summer, 1999 reports 30,017 (± 3,075) anglers fished for yellow perch for a total of 313,491 (± 54,268) days (Table 1). They report catching 725,300 perch but only harvested 24,084 (± 16,186). This represents a 28% increase in the number of anglers but a dramatic increase of 87% in the number of angler days reported in the 1994 Open Water Survey. It is interesting to note that the catch rate improved nearly three fold from 0.79 to 2.3 fish/angler between these two surveys.

The vast majority of this effort was on lakes and ponds, with just 3% occurring on flowing waters. The lack of interest in yellow perch as a sportfish is demonstrated by the low ranking received from anglers in recent questionnaires. Yellow perch were rated 9th out of 10 species and 14th of 16 species rated for winter and summer, respectively.

Table 1. Angler Effort and Catch Rates for Yellow Perch by Fishery Management Region.

REGION	WINTER		SUMMER	
	ESTIMATED EFFORT	CATCH RATE	ESTIMATED EFFORT	CATCH RATE
A	11,327 (± 3828)	4.65	43,765 (± 21,309)	1.01
B	26,465 (± 4888)	1.70	217,742 (± 46,762)	2.35
C	1,075 (± 807)	4.31	5,320 (± 6,949)	2.32
D	1,011 (± 228)	2.48	18,482 (± 9,278)	1.63
E	6,147 (± 4132)	2.10	16,338 (± 11,635)	3.15
F	1,185 (± 353)	2.62	4,706 (± 2,116)	4.90
G	1,255 (± 870)	2.83	5,129 (± 6,215)	2.09
State	48,254 (± 8,283)	2.58	313,491 (± 54,268)	2.31

YELLOW PERCH FISHING QUALITY

Winter catch rate for yellow perch as reported in the 1998-1999 survey was 2.58 fish per angler compared with a similar rate of 2.31 fish per angler reported for the openwater season. However, it is interesting that a much higher percent (33%) of the perch caught in the winter are harvested compared with the openwater season in which only 3% of the perch are kept. Two factors that may account for this discrepancy are the belief, by anglers, that there are fewer parasites in the flesh of perch during the winter, therefore, this species is better eating in the winter, and as previously mentioned, many anglers leave yellow perch on the ice as forage for other animals.

Data collected from sportfish surveys, winter and summer combined, reveal an average size of 8.8 in (± 0.1 in) and 0.45 lb (± 0.01 lb) for yellow perch caught by anglers. The small sample size of individual surveys prevents any meaningful classification by Management Region.

WHITE CATFISH MANAGEMENT ASSESSMENT

WHITE CATFISH LIFE HISTORY

White catfish (*Ictalurus cattus*) spawn when temperatures approach 70^0 F. This occurs in the Kennebec River in early to mid June. Both the male and female catfish excavate a large nest, usually on sand or fine gravel. Approximately 1,000 to 4,000 adhesive eggs are laid. After the eggs are deposited, the male drives off the female then guards and aerates the nest until the young fish disperse. The juveniles forms large schools along muddy bottom shorelines and then gradually become more solitary as they grow.

Adult white catfish prefer slow moving backwater areas with silt and mud covered bottom. They can tolerate high salinity and favor high water temperatures (80-85^0 F). Little is known of white catfish growth rates in Maine but they are known to grow slowly elsewhere. In southern climates, they mature at ages 3-4 at approximately 7-9 inches. White catfish are one of the smaller species in the catfish family, typically averaging 1\2 to 2 pounds.

Catfish are opportunistic feeders with a highly varied diet although they prefer fish. These omnivores will feed on aquatic plants and seeds, insects, fish eggs, and mollusks. They have poor eyesight but can find food at night and in very turbid water with highly developed taste buds located on their barbells (whiskers).

WHITE CATFISH MANAGEMENT HISTORY

White catfish are native to the eastern coastal streams of the United States from New York to Texas. In 1874, white catfish were introduced to the San Joaquin River in California and are now the most abundant catfish species in the estuary and some of the river's reservoirs. The first documented report of white catfish in Maine was in 1997 when personnel from the Department of Marine Resources (DMR) captured a number of adult fish in the Eastern River. White catfish were first positively identified in the Androscogin River by DMR personnel manning the Brunswick fish trap in 1999. Although, in 1998 the operator of this fish trap reported a large number of large fish he believed to be brown bullhead (*Ameiurus nebulosus*). In retrospect, those fish may have been white catfish and unfortunately, these fish were released above the dam as per established protocol. There are only two more reports of white catfish and both were from the main stem of the Kennebec River. Recently, anglers report fairly good fishing in a short section of river between Richmond and Gardiner. As with carp, the white catfish has taken advantage of the removal of Edwards Dam in Augusta to extend its range. The dam was removed in 1999 and in less then one year an angler caught a white catfish at the confluence of Sevenmile Stream and the Kennebec River approximately 6.5 miles upstream of the dam site.

WHITE CATFISH PAST MANAGEMENT GOALS

GOAL: White catfish were first documented in Maine in 1997; therefore goals for this species were not developed during the last planning period.

WHITE CATFISH OPPORTUNITY

Currently there are no populations of white catfish in Maine lakes or ponds. Limited riverine fisheries exist in the lower sections of the Androscoggin, Eastern, and Kennebec Rivers (Figure 1) located in Regions A and B. Angling for white catfish generally remains unrestricted, but sections of the Kennebec River have special terminal tackle restrictions to protect more favorable sport fishes.

WHITE CATFISH DEMAND

The present demand for the white catfish is unknown but is believed to be extremely low. We have only anecdotal information regarding fishing for white catfish; as stated earlier a small group of anglers has actively pursued catfish in a short section of the Kennebec River in the past few years.

WHITE CATFISH FISHING QUALITY

No data are available on the white catfish sport fishery.

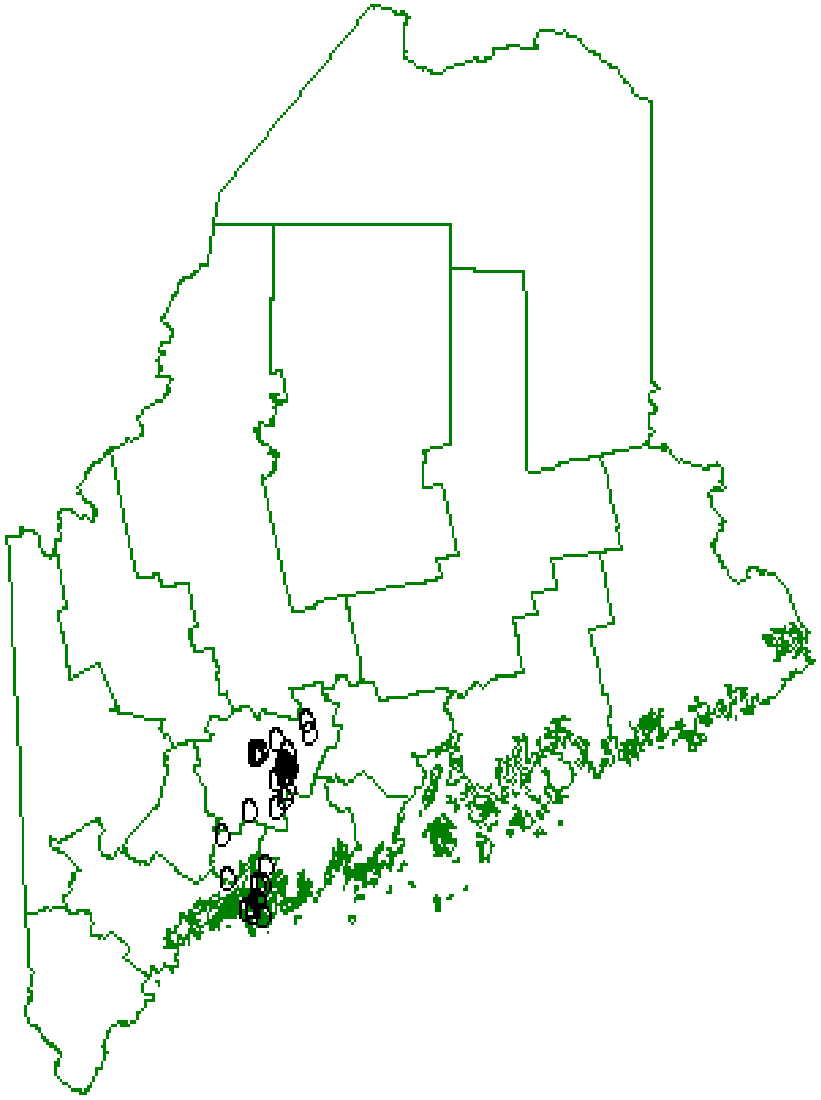

Figure 1. 2000 Distribution of White Catfish (Ictalurus cattus) in Maine.