

## Results of Lake Powell, Virginia, Creel Census from 1970 to 1983

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*Abstract:* Creel census data for a 14-year period (1970–1983) from Lake Powell show a high quality fishery for this 25.1-ha lake. Fishing pressure averaged 203.8 hours/ha/year, and the total fish harvest averaged 191.8 kg/ha/year. Average annual harvests of the major game species were: 62.4 kg/ha, bluegill (*Lepomis macrochirus*); 11.6 kg/ha, redear sunfish, (*L. microlophus*); 11.9 kg/ha, black crappie (*Pomoxis nigromaculatus*); 10.5 kg/ha, largemouth bass (*Micropterus salmoides*); and 4.8 kg/ha, chain pickerel (*Esox niger*). Average weights of the creeled panfishes were well above normal. Catch rates were exceptionally high and averaged 2.1 fish/hour and 0.56 kg/hour. Catch rates were directly correlated with relative abundance of panfishes in the total creel. Individual species harvest and total fish harvest were not strongly correlated with fishing pressure. It is speculated that high turbidity during some years adversely affected fishing pressure, catch rates, and harvest.

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A creel census was initiated on Lake Powell in 1970 as part of the Va-DJ-F-24 Project. The objective of the creel census was to provide baseline fisheries management data for the lake. When the DJ-F-24 Project terminated in 1975, the creel census was continued on state funds until 1981 when another DJ-Project (F-39-R) was initiated on Lake Powell. The census has been carried out every year since 1970, providing a 14-year continuous data base. Such long-term creel data has been published from relatively few small lakes. These include Byrd and Crance (1965), Thompson and Hutson (1950), McHugh and Steinkoenig (1980), Bennett et al. (1969) and Norman (1977).

The Lake Powell creel data is of special interest for several reasons. First, the long duration of the creel shows trends and changes over time. Second, the creel data is precise since it represents a 100% census of fishermen rather than a partial survey with expansion. Also, for the point of accurate data, the creel clerk was always conscientious about interviewing all fishing parties and

weighing their catch. Third, the creel data show a very high quality fishery. The objective of this paper is to document this high quality fishery at Lake Powell from 1970 through 1983.

Interest of the Virginia Commission of Game and Inland Fisheries in Lake Powell was first aroused by the large number of citation (1 pound minimum) sunfish caught by anglers. This small lake generally produces more citation sunfishes each year than any water in Virginia. Since the initiation of the Virginia fish citation program in 1963, a total of 244 citations for sunfish has been issued for Lake Powell. This figure is the second highest in the state and is an impressive record, especially considering the small size of Lake Powell. Several citation black crappie, chain pickerel, and largemouth bass (including the unofficial state record) have also been taken from Lake Powell.

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## Methods

An access point survey was selected to interview the Lake Powell fishermen due to the lake's suitability for this type of creel. Persons desiring to fish in Lake Powell are required to pay a daily fee to the resident lake owner. Boating access and rental boats are limited to a single access area located at the owner's residence. Shore fishing is not permitted. Thus, all anglers who fish Lake Powell are required to check in and out at the owner's residence.

Upon completion of their fishing trip, all anglers were interviewed and their catch enumerated and weighed by species (or group of species). Additional information obtained was date, fishing type (boat only), residence of the party, number of fishermen in the party, and party hours fished. From 1970 through 1972, data were recorded on specially prepared mark-sense, computer cards which limited the numeric code for the species creeled to only 1 digit. This limitation of only 9 numbers for species required the grouping of several closely related species into a single category. For example, all catfish (which included white catfish, *Ictalurus catus*; yellow bullhead, *I. natalis*; and brown bullhead, *I. nebulosus*) were grouped together. This system was improved in 1973 when a Port-A-Punch<sup>1</sup> IBM card was developed for fisheries use (Zuboy et al. 1973). The format of this card allowed a 2-digit numeric code for the species creeled. With the option of identifying 99 different species, each species in the Lake Powell creel was counted, weighed, and

<sup>1</sup> Port-A-Punch is a registered trademark of International Business Machines Corp.

recorded individually. The creel cards were computer processed to determine harvest, fishing pressure, catch rates, and related creel statistics. The mark-sense cards were computer processed at NCSU, Raleigh, North Carolina, by the Southeastern Cooperative Fish and Game Statistics Unit. The Port-A-Punch cards were processed at ODU, Norfolk, Virginia, with a computer program developed by the author (Norman 1978).

### Description of Study Area

Lake Powell is a privately-owned lake located south of Williamsburg in James City County, Virginia. The lake was impounded about 1830 on Mill Creek, a tributary of the James River. The lake is relatively shallow, with a maximum depth of 4 m. Surface area is 25.1 ha, and the watershed-to-lake area ratio is 44.8:1. Shore development is 4.2, with 2.8 km of shoreline. Normal pool elevation is 3.3 m. Average annual rainfall for the area is 112 cm. The agricultural growing season is approximately 200 days.

The relatively shallow depth of Lake Powell contributes to an aquatic vegetation problem in the lake. Dense stands of curly-leaf pondweed, *Potamogeton crispus*, cover almost the entire lake from early spring to mid-June. Stems of the pondweed reach to the surface of the water even in places of maximum depth and seriously hamper fishing and boating. Around mid-June, the curly-leaf pondweeds undergo a gradual "die-off" until most of the lake is open water. Waterlilies (*Nymphaea*) and arrowheads (*Sagittaria*) are also found along portions of the shoreline.

The productivity of Lake Powell is greatly influenced by a fossiliferous seam, St. Mary's Formation, through which the lake was impounded. As a result of the dissolution of calcium carbonate from this geologic seam, the total hardness of Lake Powell is greatly increased. Total hardness of the surface water is approximately 80 ppm, while that of most lakes in the Tidewater area of Virginia is <40 ppm.

Most of the watershed of Lake Powell is protected by a mixed coniferous-deciduous forest. However, considerable urbanization along with some agricultural areas are interspersed in the drainage. Construction for municipal sewer and water lines has been a major source of turbidity pollution. Some organic seepage into the lake from privately-owned septic tanks bordering the lake and fertilizer run-off from lawns and agricultural fields within the drainage contribute to the nutrient levels in the lake. However, the nutrient levels are not high enough to classify Lake Powell as eutrophic.

### Results and Discussion

During the 14-year study period, fishing pressure at Lake Powell ranged from 163.3 to 285.8 hours/ha/year (Table 1). The average annual pressure was 203.8 hours/ha (SD = 35.4). Compared with other lakes in southeast Virginia, Lake Powell is heavily fished. In a study of 8 southeast Virginia lakes

**Table 1.** Creel census data for Lake Powell, Virginia, from 1970 through 1983.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	Mean
Total fishermen	917	1,094	930	1,030	1,467	1,402	1,083	784	889	877	792	759	1,004	801	988.
Total parties	509	594	524	574	867	842	660	493	607	598	570	488	654	518	607
Total hours	4,694	5,717	4,733	5,113	7,173	6,531	5,031	4,567	5,040	4,890	4,120	4,101	5,612	4,289	5,115
N hours/ha	187.0	227.7	188.5	203.8	285.8	260.1	200.3	182.0	200.8	194.9	164.0	163.3	223.5	170.0	203.8
N trips/ha	36.5	43.6	37.0	41.0	58.4	55.9	43.1	31.2	35.4	34.9	31.6	30.2	40.0	31.9	39.4
Avg. party size	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.4	1.6	1.6	1.5	1.6	1.6
Avg. trip lt.	5.1	5.2	5.1	5.0	4.9	4.7	4.6	5.8	5.7	5.6	5.2	5.4	5.6	5.4	5.2
N fish caught	6,660	7,155	6,671	6,276	9,981	15,756	12,096	7,027	12,052	13,933	11,125	12,112	17,743	14,638	10,945
Wt. (kg) fish caught	1,332	1,654	1,709	1,643	2,630	4,034	3,254	2,059	3,082	3,648	3,410	3,626	4,812	3,167	2,861
N fish/ha	265.3	285.1	265.8	250.0	397.6	627.7	481.9	280.0	480.2	555.1	443.2	482.5	706.9	583.2	436.0
Wt. (kg) fish/ha	53.1	65.9	68.1	65.4	104.8	160.7	129.7	82.0	122.8	145.3	135.9	144.4	191.7	126.2	114.0
N fish/hour	1.4	1.3	1.4	1.2	1.4	2.4	2.4	1.5	2.4	2.8	2.7	2.9	3.2	3.4	2.1
Wt. (kg) fish/hour	0.27	0.27	0.36	0.32	0.36	0.64	0.64	0.45	0.59	0.73	0.82	0.86	0.86	0.73	0.56
N fish/trip	7.2	6.5	7.2	6.2	6.8	11.3	11.2	9.0	13.6	15.9	14.0	16.0	17.7	18.3	11.5
Wt. (kg) fish/trip	1.45	1.51	1.84	1.59	1.79	2.88	3.00	2.63	3.47	4.16	4.31	4.78	4.79	3.95	3.0

**Table 2.** Comparison of Lake Powell, Virginia, creel data with other lakes.

Name of lake	State	Area (ha)	N years of creel data	Avg. N hours fished/ha	Average annual harvest (kg/ha)				Citation
					Total	Large-mouth bass	Bluegill	Crappie	
Powell	Va.	25	14	204	114.1	10.5	62.4	11.9	Norman 1984
Southeast Va. lakes <sup>a</sup>	Va.	191	6	155	31.8	6.8	17.1	2.0	Norman 1977
Burke	Va.	88	10	1,648	87.7	5.3	27.0	39.0	McHugh and Steinkoenig 1980
Brittle	Va.	31	16	1,281	108.4	4.3	41.1	29.4	McHugh and Steinkoenig 1980
Ridge Pawhuska	Ill. Okla.	7 38	23 10	516 61 <sup>c</sup>	43.7 23.7	17.0 7.1	19.4 2.4	6.5	Bennett et al. 1969 Thompson and Hutson 1950
Alabama's public fishing lakes <sup>b</sup>	Ala.	35	9	333 <sup>c</sup>	194.4	32.6	154.0 <sup>d</sup>	6.7	Byrd and Crance 1965

<sup>a</sup> Average of 7 lakes with 6 years creel data./lake.

<sup>b</sup> Average of 20 lakes with 1 to 14 years creel data./lake.

<sup>c</sup> Fishermen trips/ha.

<sup>d</sup> Bluegill and redear sunfish combined.

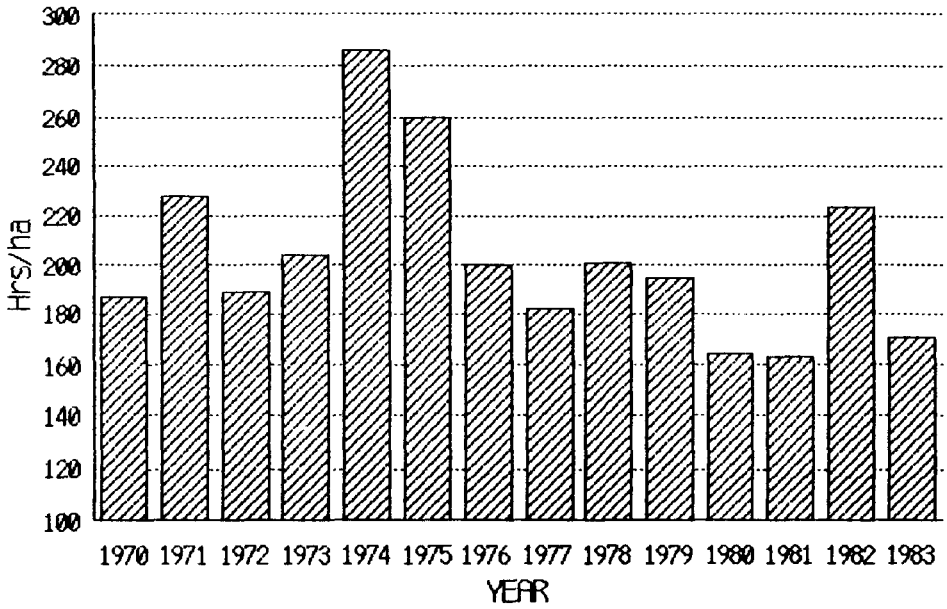
(including Powell) from 1970 through 1975, Norman (1977) found that the average fishing pressure for each lake ranged from 86.9 to 215.4 hours/ha/year; the mean for all lakes (excluding Powell) was 155.1 hours/ha/year (Table 2). However, the fishing pressure at Lake Powell is light compared with some state-owned lakes in northern Virginia. McHugh and Steinkoenig (1980) reported that fishing pressure averaged 1,648.5 hours/ha/year during a 10-year period at Lake Burke, an 88-ha public fishing lake. These authors also reported that fishing pressure averaged 1,280.9 hours/ha/year during a 16-year period at Lake Brittle, a 31.2-ha public fishing lake. The fishing pressure at Lake Powell is also light compared with small public lakes in Alabama (Byrd and Crance 1965), Missouri (Rasmussen and Michaelson 1974), and Illinois (Bennett et al. 1969).

Fishing pressure at Lake Powell was relatively stable during the study except for a peak period in 1974–75 (Fig. 1). Explanations for the relatively high fishing pressure in 1974–75 are speculative. Publicity which the lake received from the DJ-F-24 Project and also from the large number of citation fishes creelred there probably induced some anglers to fish in Lake Powell. An explanation for the decline in fishing pressure from 1975 through 1977 is more discernible. Due primarily to sewer line construction work within the watershed, a turbidity problem developed in Lake Powell during the 1975–76 winter. The water was extremely turbid for intermittent, yet prolonged, periods for the next 3 years. Many anglers were discouraged from fishing Lake Powell under those conditions.

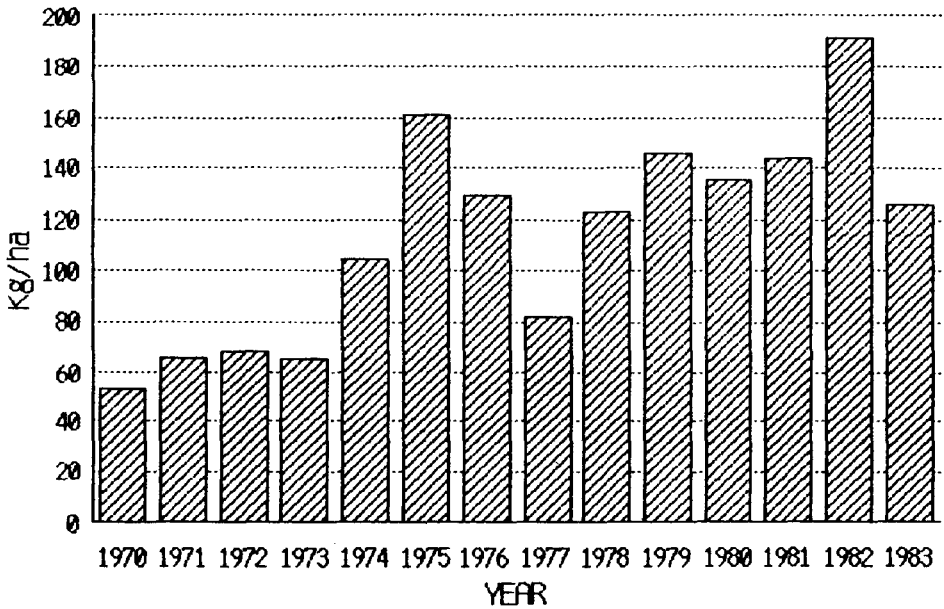
Total harvest was highly variable and ranged from a low of 53.1 kg/ha in 1970 to a high of 191.7 kg/ha in 1982 (Table 1). The average harvest was 114.0 kg/ha/year ( $SD = 41.8$ ). This harvest figure is considerably higher than other lakes in southeast Virginia but only slightly higher than lakes Burke and Brittle in northern Virginia (Table 2). However, the Lake Powell harvest is low compared with Alabama's public fishing lakes. This difference was probably due to the considerably higher fishing pressure on the Alabama lakes.

Harvest was relatively low and stable from 1970 through 1973 and then increased significantly with increased fishing pressure during each of the following 2 years (Fig. 2). For example, the 1975 harvest was 145% higher than that of 1973. The harvest then plummeted from 160.7 kg/ha in 1975 to 82.0 kg/ha in 1977. High turbidity levels during those years adversely affected fishing pressure and catch rates, resulting in the drastic drop in harvest. In response to improved water clarity by 1978, the total harvest increased that year and again in 1979, after which harvest tapered off for the duration of the study except for the "big surge" in 1982 when the harvest reached a 14-year high. The 1982 increase in harvest was probably due primarily to increased fishing pressure which was higher in 1982 than any year since 1975.

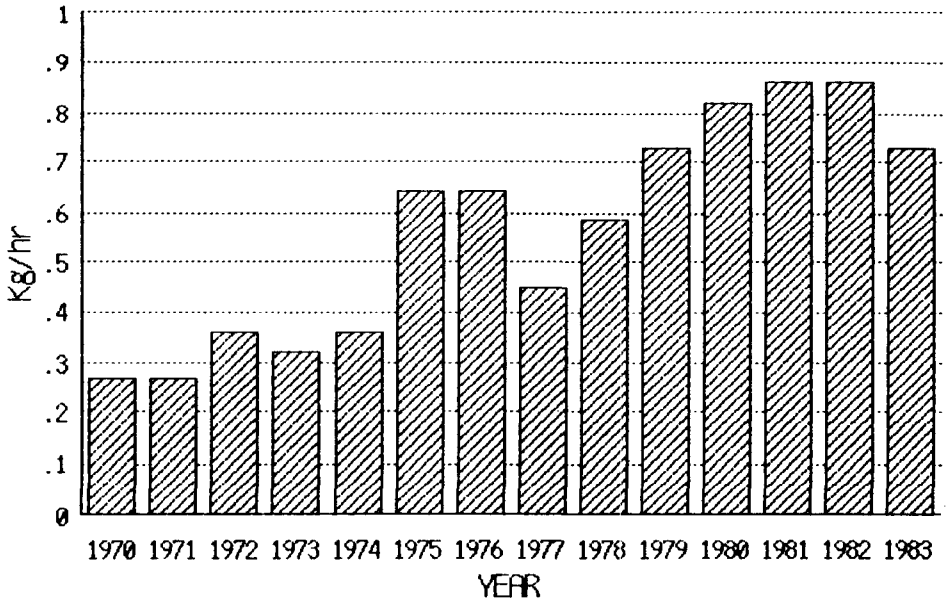
Catch rates generally increased each year of the study. The lowest catch rate was 0.27 kg/hour in 1970 and 1971; the highest was 0.86 kg/hour in 1981 and 1982 (Table 1). Catch rate for the entire study averaged 0.56 kg/



**Figure 1.** Fishing pressure (hour/ha) at Lake Powell, Virginia, from 1970 through 1983.



**Figure 2.** Total fish harvest (kg/ha) at Lake Powell, Virginia, from 1970 through 1983.



**Figure 3.** Angling success rate (kg/hour) at Lake Powell, Virginia, from 1970 through 1983.

hour, a figure considerably higher than that of most creel surveys. Factors influencing the high catch rate at Lake Powell include the biological and chemical productivity of the lake to support high density fish populations and an efficient angling clientele that frequents the lake. A large portion (and perhaps most) of the fishing pressure at Lake Powell is exerted by a very few individuals. These people are very successful anglers who catch considerably more fish/hour than the average angler. Since these "expert" anglers constitute such a large portion of the total fishing pressure, the catch rate for the entire creel is high due to their influence.

From 1970 through 1974 catch rates were fairly stable and low relative to the following years (Fig. 3). During this 5-year period, catch rates ranged from 0.27 to 0.36 kg/hour. Catch rates increased appreciably in 1975 and 1976 to 0.64 kg/hour. After a drop in 1977, the fishing success rate increased each year until it peaked at 0.86 kg/hour in 1981 and 1982. This dramatic increase in catch rates over the years is atypical. The factor which probably contributed most to this increasing catch rate was a change in species composition of the creel. From 1970 through 1974, panfishes (including bluegill, *Lepomis macrochirus*; pumpkinseed, *L. gibbosus*; redbreast, *L. microlophus*; and warmouth, *L. gulosus*) averaged 67.4% of the total harvest by weight. In 1975 and 1976, the figure increased to 82.2% and 84.5%, respectively. Since panfishes are generally more readily captured by anglers than other fishes, it is



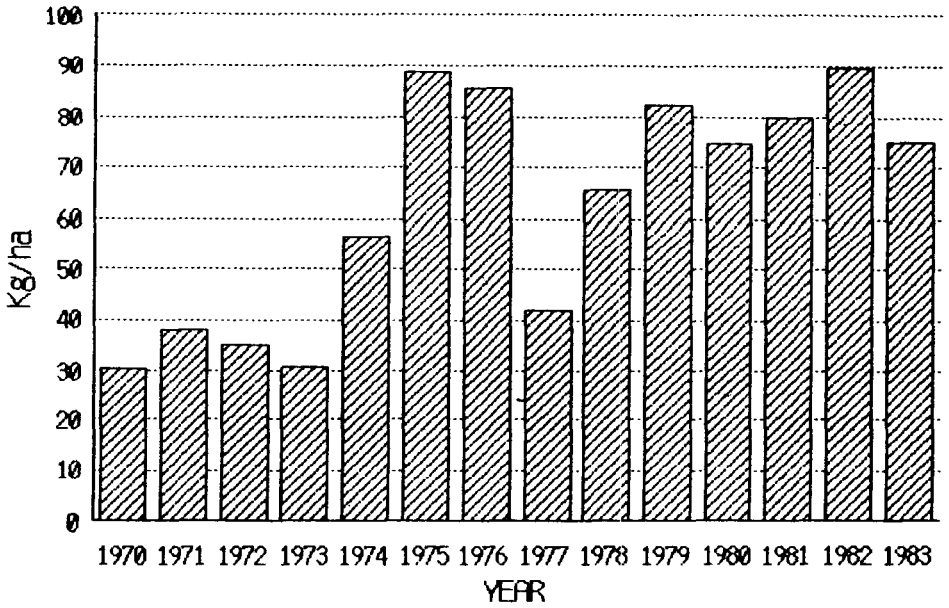
Table 3. Numbers of fishes creeded at Lake Powell, Virginia, from 1970 through 1983.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	Mean
Largemouth bass	273	311	307	279	214	232	235	394	345	301	348	269	228	219	283
Bluegill	4,618	5,067	4,463	3,875	6,958	10,278	9,197	4,975	8,126	9,829	7,957	8,226	10,413	11,207	7,514
Redear sunfish	135	142	277	310	741	1,434	1,144	613	1,392	1,459	1,122	1,413	1,682	917	913
Pumpkinseed <sup>a</sup>	627	768	821	516	520	965	372	181	282	556	153	283	258	265	395
Warmouth <sup>a</sup>				288	361	430	441	193	283	219	201	254	185	392	295
Redbreast sunfish	235	185		221	8	1,236	236	2	20	4			1,619	360	295
Black crappie	383	336	368	211	595	748	133	304	1,136	1,172	856	1,162	3,023	998	816
Chain pickerel	206	177	313	279	402	197	138	203	156	166	105	77	196	54	191
Catfish <sup>b</sup>	64	89	91	79	71	106	107	100	222	166	221	281	108	133	131
Others <sup>c</sup>	119	80	31	218	111	130	93	62	90	61	162	147	31	93	102

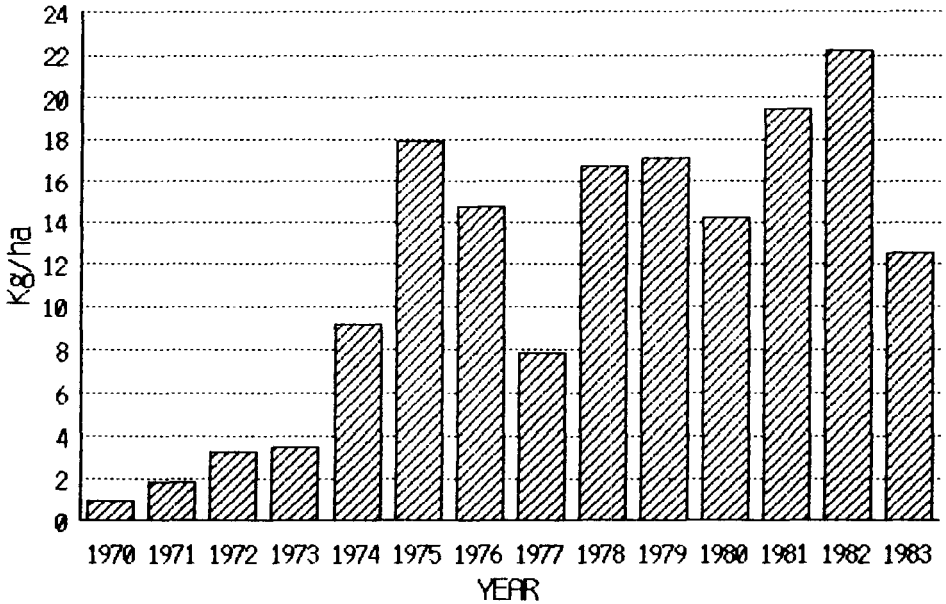
<sup>a</sup> Pumpkinseed and warmouth grouped together as other bream in 1970-72. Means reflect years 1973-83 only.

<sup>b</sup> Catfish includes white catfish, yellow bullhead, and brown bullhead.

<sup>c</sup> Others include filer, yellow perch, gizzard shad, bowfin, longnose gar, and golden shiner.



**Figure 4.** Bluegill harvest (kg/ha) at Lake Powell, Virginia, from 1970 through 1983.



**Figure 5.** Redear sunfish harvest (kg/ha) at Lake Powell, Virginia, from 1970 through 1983.

Table 4. Average weights (g) of major game fishes creelred at Lake Powell, Virginia, from 1970 through 1983.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	Mean
Largemouth bass	609	658	786	858	968	1,031	923	954	966	1,036	1,166	1,011	1,090	1,084	939
Chain pickerel	271	576	469	626	727	478	765	704	647	710	930	860	823	915	679
Bluegill	165	188	196	198	204	217	232	213	203	211	236	244	216	168	207
Redear sunfish	193	311	290	291	311	312	326	323	304	294	317	347	332	343	307
Black crappie	331	331	356	387	341	403	541	360	262	510	475	398	349	378	387

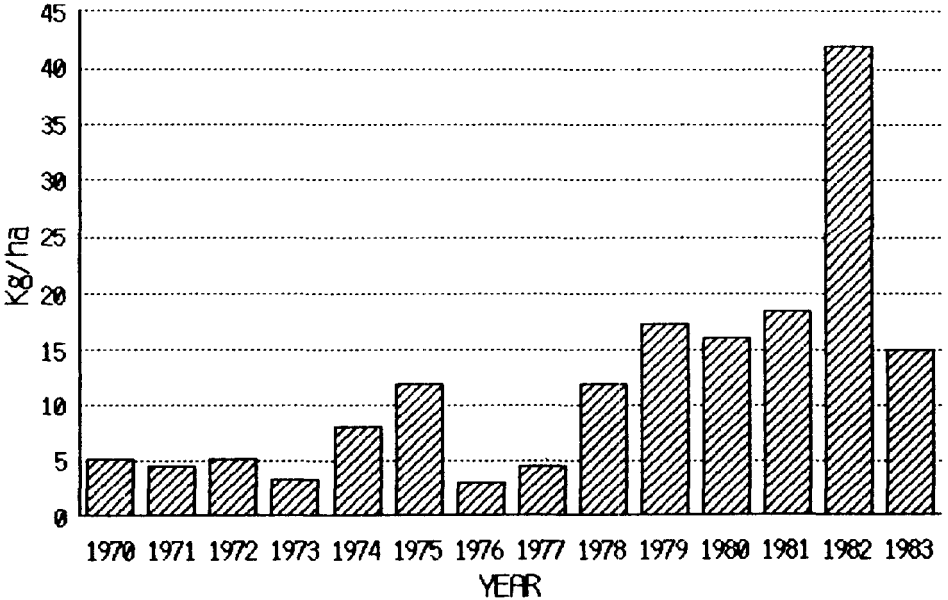


Figure 6. Black crappie harvest (kg/ha) at Lake Powell, Virginia, from 1970 through 1983.

understandable that the overall catch rate would increase with increased abundance of panfishes in the creel. In 1977, the panfish contribution to the total creel by weight dropped to 64.7% and the catch rate dropped to 0.45 kg/hour. The high turbidity in 1977 would have reduced the overall catch rate also. Panfish contribution to the creel increased each year (except 1980) from 1978 through 1982, and the overall catch rate increased progressively each year of this period. Correlation analysis between catch rate (kg/hour) and panfish composition of total harvest (% weight) was almost significant ( $r = 0.5110$ ). Another reason for the increasing catch rates since 1975 is the fishing pressure exerted by a few highly successful panfish anglers. Some of these anglers did not fish Lake Powell until the mid-1970s. Since they fished the lake often and were very successful in catching panfishes, the overall catch rate and panfish composition of creel increased.

Principal panfishes in the Lake Powell creel were bluegill (*Lepomis macrochirus*), redear (*L. microlophus*), black crappie (*Pomoxis nigromaculatus*) and pumpkinseed (*L. gibbosus*). Less frequently caught panfishes included redbreast sunfish (*L. auritus*), warmouth (*L. gulosus*), and flier (*Centrarchus macropterus*).

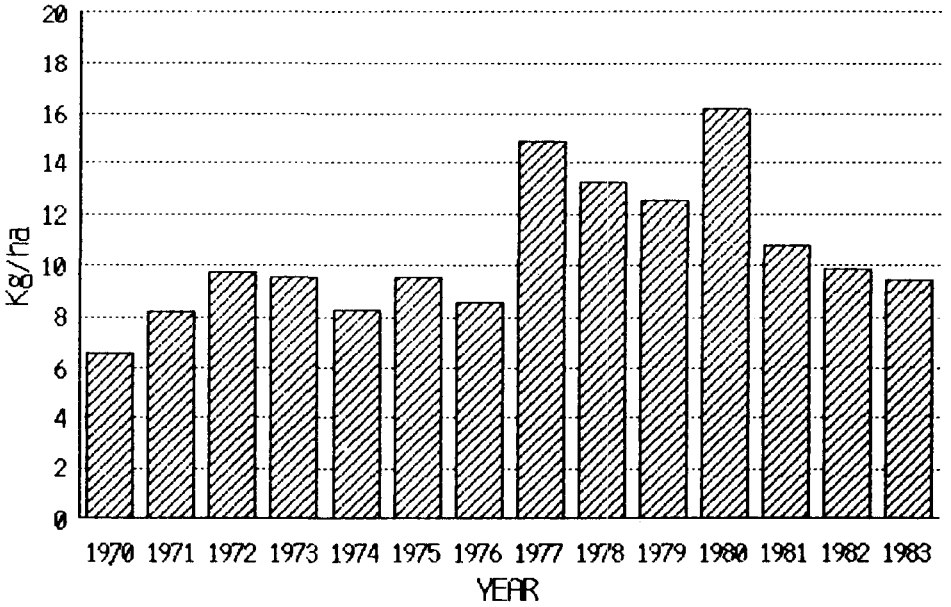
Accounting for at least 47% of the total harvest by weight each year, bluegill was the most important panfish in the creel (Table 3). The annual bluegill harvest showed considerable variation with a range from 30.3 to

89.4 kg/ha (Fig. 4). The mean was 62.4 kg/ha (SD = 22.9). This figure is considerably higher than that for lakes Burke, Brittle, or Ridge (Table 2). The bluegill harvest was stable and relatively low from 1970 through 1973. Concurrent with increased fishing pressure in the mid-1970s, the bluegill harvest increased significantly. The 1975 bluegill harvest was 191% higher than that in 1973. Except for an appreciable drop in 1977, the bluegill harvest remained high for the duration of the study. The harvest decline in 1977 was probably due largely to the high turbidity problem in the lake for most of the year. Bluegill harvest was not significantly correlated with fishing pressure ( $r = 0.0446$ ). Average weight of the creel bluegill was exceptionally high with a mean of 207 g during the study period (Table 4).

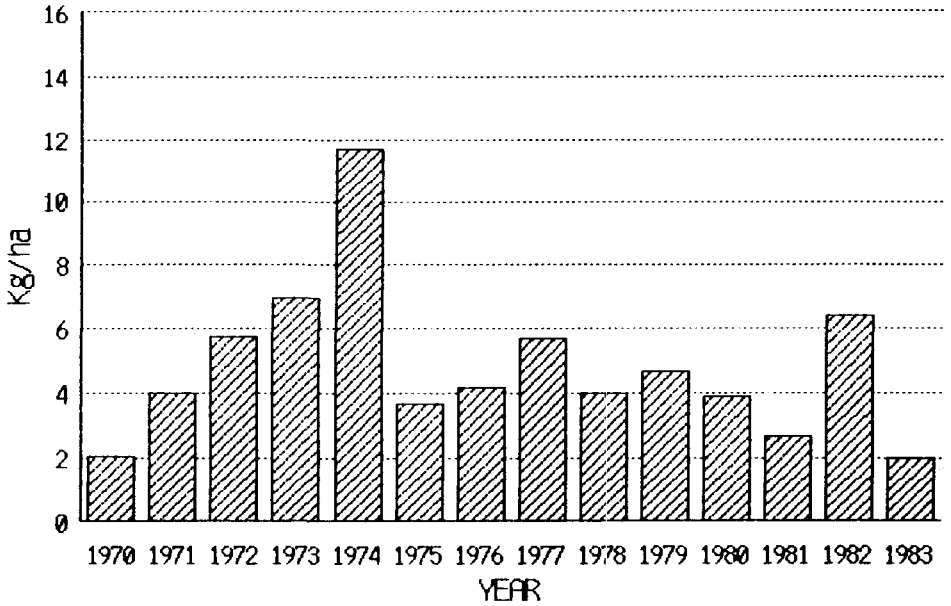
The redear harvest showed a large increase during the course of the study. From a low of 1.0 kg/ha in 1970, the redear harvest increased each year through 1975 when it reached 17.9 kg/ha (Fig. 5). During the next 2 years, the redear harvest made a precipitous drop to only 7.9 kg/ha in 1977. The harvest then recovered and generally increased each year to a study high of 22.2 kg/ha in 1982. The phenomenal improvement in the redear fishery from 1970 to 1975 is attributed to the Game and Fish Commission's stocking program. Redear were stocked annually in Lake Powell from 1970 through 1980 (except 1971 and 1977). Although redear were present in the lake prior to this first stocking, the fish was not abundant. The low population level in the early 1970s is reflected in the low harvest during that period. As the redear population built up through stocking and natural reproduction, the harvest responded with a progressive increase over time. The decline in harvest in 1976 and 1977 was probably due to the high turbidity in the lake at that time. With turbid water conditions, fishing pressure and catch rates declined. With improved water clarity by 1978, the redear harvest recovered and remained high for the duration of the study. As with other panfishes, the average weight of the creel redear was exceptionally high during the entire study. The mean average weight for all years was 307 g (Table 4).

The black crappie harvest/year was highly variable and ranged from 2.9 to 42.0 kg/ha (Fig. 6). The mean was 11.9 kg/ha (SD = 10.3). This figure is considerably less than that for lakes Burke and Brittle but higher than the average of Alabama's public fishing lakes (Table 2). The trend in the crappie harvest was roughly the same as that for bluegill and redear, e.g. relatively low and stable through 1973, then substantially increased in 1974 and 1975, declined in 1976 and 1977, and finally recovered to harvest levels well above those of the early 1970s. The crappie harvest in 1982 was exceptionally high (42.0 kg/ha). This figure was 253% higher than the mean. No explanation for this high harvest is known. Average weight of the creel crappie was also exceptionally high. For all study years, the mean average weight of crappie was 387 g (Table 4).

Largemouth bass (*Micropterus salmoides*) and chain pickerel (*Esox niger*) were the only predatory sport fishes in the creel. Of these 2, bass was



**Figure 7.** Largemouth bass harvest (kg/ha) at Lake Powell, Virginia, from 1970 through 1983.



**Figure 8.** Chain pickerel harvest (kg/ha) at Lake Powell, Virginia, from 1970 through 1983.

**Table 5. Weights (kg) of fishes creelred at Lake Powell, Virginia, from 1970 through 1983.**

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	Mean
Largemouth bass	166	204	241	240	207	239	217	376	333	312	406	272	249	237	264
Bluegill	761	955	874	766	1,416	2,229	2,135	1,059	1,652	2,070	1,874	2,003	2,244	1,887	1,566
Redear sunfish	26	44	80	90	230	448	373	198	423	430	356	490	558	314	290
Pumpkinseed <sup>a</sup>	94	130	131	90	96	188	83	35	56	109	29	60	43	39	84
Warmouth <sup>a</sup>				58	69	92	85	42	60	40	46	50	30	58	57
Redbreast sunfish	44	39		57	2	352	74	1	7	1			373	70	73
Black crappie	127	111	131	82	203	301	72	109	297	437	407	462	1,054	378	298
Chain pickerel	56	102	147	175	292	94	106	143	101	118	98	66	161	49	122
Catfish <sup>b</sup>	31	39	61	46	51	58	72	50	108	75	132	168	64	65	73
Others <sup>c</sup>	26	29	43	26	60	29	22	48	43	48	53	49	31	56	40

<sup>a</sup> Pumpkinseed and warmouth grouped together as other bream in 1970-72. Means reflect years 1973-83 only.

<sup>b</sup> Catfish includes white catfish, yellow bullhead, and brown bullhead.

<sup>c</sup> Others include flie, yellow perch, gizzard shad, bowfin, longnose gar, and golden shiner.

the most abundant. Bass constituted 5.2% to 18.2% of the total harvest by weight each year. The contribution of chain pickerel to the creel was generally about 3.0% by weight.

Largemouth bass harvest varied from 6.6 to 16.2 kg/ha/year with a mean of 10.5 kg/ha (SD = 2.7) (Fig. 7). An average of 283 bass were creeled each year (Table 3). This harvest is comparable with that of most lakes in southeast Virginia and is about twice that of lakes Burke and Brittle (Table 2). However, the bass harvest at Lake Powell is considerably less than the average for Alabama's public fishing lakes or for Ridge Lake. The bass harvest at Lake Powell was relatively stable from 1970 through 1976 and then increased appreciably in 1977 with a 73% increase by weight over the previous year. The bass harvest then declined progressively for the next 2 years, after which it increased to 16.2 kg/ha in 1980. This was the highest annual bass harvest of the 14-year study. Following this peak, the bass harvest declined each year for the study duration. An explanation for the relatively high bass harvests during the 1977–80 period is not known. Contrary to what one might suspect, fishing pressure was not a significant factor in determining bass harvest. Correlation analysis between bass harvest (kg/ha) and total fishing pressure (hrs/ha) was insignificant and even showed an inverse relationship ( $r = 0.4298$ ).

Unlike the other major game fishes, chain pickerel harvest/year was relatively stable during the entire 14-year period (Fig. 8). The mean annual harvest was 4.8 kg/ha (SD = 2.5). Most year's creel of chain pickerel fell within 1.0 kg of the mean. The only appreciable deviation was 1974 when the pickerel harvest peaked at 11.7 kg/ha. The high harvest in 1974 was probably due to high fishing pressure that year. Over the course of the study, the pickerel harvest correlated very closely with fishing pressure ( $r = 0.6535$ ).

A total of 17 species of fish representing 8 families were recorded in the Lake Powell creel. Other fishes of importance in the creel were pumpkinseed, warmouth, and redbreast sunfish, *L. auritus* (Tables 2, 5). The reported catch of redbreast sunfish was highly variable between years. It is believed that many of these redbreast sunfish were misidentified bluegill.

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