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JOB COMPLETION REPORT

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FEDERAL AID IN FISHERIES RESTORATION ACT

TEXAS

Federal Aid Project No. F-5-R-10

FISHERIES INVESTIGATIONS AND SURVEYS OF THE WATERS OF REGION 1-B

Job No. B-33 A Preimpoundment Survey of Twin Buttes  
Reservoir and Its Included Watershed

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## ABSTRACT

Fish populations of Twin Buttes watershed were surveyed by making 81 gill net collections and 18 seining collections. Investigations also determined plans for structures and the operational procedures for the project. Essential ecological data for streams was also obtained, and watershed usage and development determined.

All four major tributaries of the watershed are dominated by problematic fish. None of the tributaries have less than 93 per cent problematic species by number or less than 88 per cent problematic species by weight. The lack of productivity in usable game fish is primarily the result of excessive withdrawals from streams and from sub-surface aquifers for irrigation purposes. This exploitation of area waters results in extreme fluctuations in stream volume and flow, and native fish are no longer controlled through natural phenomena. The fishery problem is further complicated by excessive reproduction and stunting of some game fish, by insufficient or failure in reproduction by primary control species such as largemouth bass and channel catfish, and by the inadvertent introduction of many exotic or invader species. The only practical means of reducing the problem, and improving game fish production, is by drastically reducing existing fish populations through the use of chemicals and subsequent restocking with fish desired. The completion of this work is urgent, since treatment costs will probably be greatly increased within the next few weeks. If the required renovation work is completed for Twin Buttes, future reconnaissance investigations should include a detailed study of downstream waters with the view of continuing the watershed renovation program to its logical conclusion.

## JOB COMPLETION REPORT

State of Texas

Project No. F-5-R-10

Name: Fisheries Investigations and Surveys of the Waters of Region 1-B.

Job No. B-33

Title: A Preimpoundment Survey of Twin Buttes Reservoir and Its Included Watershed

Period Covered: March 1, 1962 - February 28, 1963

### Objectives:

To inventory fish populations of the included watershed that have not been previously surveyed and to resurvey impounded portions of the Middle and South Concho Rivers. To examine plans and structures to determine if such construction can be used to provide the means of evolvement of a watershed development program. To obtain basic data on hydrology, water usage, proposed recreational facilities, and other conditions or circumstances that may materially affect the fishery resource or its harvest by the public.

### Techniques Used:

1. Eighteen seining collections and 81 netting collections were made at suitable locations on tributaries of the Middle and South Concho Rivers above impoundments that will create Twin Buttes Reservoir.
2. Routine data recorded for fish captured by gill nets included relative abundance, distribution, stomach contents, and coefficients of condition. Where determined, spawning success and other functions of propagation were also noted.
3. Other investigations to provide basic data for stream areas included a study of water quality. Turbidity, dissolved oxygen, dissolved carbon dioxide, pH, temperature, hardness, chloride content, flow and bottom types were examined.
4. An examination was made of the topography of the watershed and of the reservoir basin. Principal types of aquatic and shoreline vegetation and other aquatic life were noted.
5. Responsible authorities were contacted, and information was obtained on public access, planned recreational facilities and on other circumstances or conditions that will ultimately influence the degree of public utilization. This work included determining suitable locations for fish attractors of brush construction.
6. In the course of survey work endemic and/or rare fish were captured and relocated to assure their survival.
7. Plans were made for a chemical treatment of the watershed to effectuate reduction of problematic fish.

Results:

Basic and Background Information

Watershed and Climate

The South and Middle Concho Rivers are two of three principal tributaries for the Concho River, of the Colorado River System in Texas. The 2,687 square miles of contributing watershed begins in the Edwards Plateau to the south and extends into the Osage Plains on the northern and western extremities. Topographically, the area is rolling hills, plains, and river valleys. Vegetative cover is mesquite-grassland association for upland areas, and Pecan-Oak timberland along streams. Grazing is the primary land usage, but fertile loam soils of the plains are highly productive farm lands when sufficient moisture is available.

The climate for the Concho River watershed is semi-arid. Annual rainfall, based upon records for 41 years, is 21.99 inches. Heavy rainfall is usually spasmodic and, as a result, stream flow is subject to great fluctuations. Precipitation of .54 inches or less does not result in run-off, and during drouth periods 1.54 inches of rainfall may occur within 24 hours without significant increase in stream flow resulting. Evaporation averages 72 inches per year. Flooding occurs on an average of once in each six year period. This usually happens in the late spring or early fall. In the past flood damage to the city of San Angelo, located at the confluence of the three principal tributaries, has been extensive. A U. S. Corps of Engineers flood control structure, San Angelo Reservoir of 650,000 acre-feet capacity, was completed in 1952 to contain flood waters from the North Concho River. Lake Nasworthy, completed in 1930, is a 12,500 acre-foot reservoir and is located .3 miles below the confluence of the South and Middle Concho Rivers. This latter reservoir was designed and is operated solely for municipal water storage, and does not provide adequate protection from flood waters. This history of damaging floods, the most recent occuring in 1957 and 1959, resulted in federal approval and congressional appropriation of funds for the construction of additional facilities to control flow from the South and Middle Concho River watersheds.

Twin Buttes Reservoir

Twin Buttes project is constructed under the auspices of the Bureau of Reclamation. The reservoir will serve to provide flood control and as a source of water for municipal, industrial and irrigation purposes. The impacted earth dam that will create the reservoir is eight miles long. Two basins are connected by an equalization channel. The lesser basin is located on the South Concho River and is capable of impounding 6,200 acre-feet of water before flow, through the equalization channel, effects a union with waters of the larger basin on the Spring Creek-Middle Concho River watershed. No outlet structures are included in portions of the dam that divert flow from the South Concho watershed. Four concrete conduits, equipped with suitable release facilities, are installed in the dam where it severs the old stream bed of the Middle Concho River and creates the larger reservoir basin. Water released through these outlet

structures enters Lake Nasworthy, the control reservoir, and is redirected by additional structures into the irrigation canal system or to facilities associated with the city water supply. Due to basin topography and excavations created in obtaining earthen materials for the construction of the dam, the Middle Concho-Spring Creek basin is capable of impounding 4,800 acre-feet of water before flow can be released through outlet structures into Lake Nasworthy. The canal system is made up of 16 miles of primary canals with 39 miles of laterals and will supply water for irrigation of 10,000 acres located in the Lipan Flat area, 10 miles east of the city of San Angelo. Twin Buttes will contain 51,000 acre-feet at dead storage, 164,900 acre-feet at conservation pool level, and is capable of impounding 600,000 acre-feet. The maximum area of the reservoir is 23,000 acres. San Angelo Water Supply Corporation will control water releases and will ultimately purchase the structures. However, releases may not be made prior to the impoundment of 40,000 acre-feet. The average quantity of water that will annually be contributed to storage is 43,000 acre-feet. Of this quantity 25,000 acre-feet will be allocated for irrigation. Twin Buttes is also a secondary water supply for the city of San Angelo. In compliance with existing city ordinances, Twin Buttes will not contribute to industrial or municipal usages unless or until San Angelo Reservoir is virtually depleted.

#### Recreational Potential and Plans

Twin Buttes Dam is within nine miles of the center of San Angelo, a municipality of 64,630. Within 50 miles of the reservoir are six additional counties, predominantly rural, whose combined population is 27,428. According to a public use plan, prepared by the National Parks Service for Twin Buttes, approximately 92,058 people reside less than 20 miles from the reservoir. The estimated day-use for Twin Buttes should be approximately 63,406. Sixteen additional counties are near enough to the new reservoir to contribute normal weekend and overnight visitation as well as occasional trips completed in one day. The combined 23 county population exceeds one-third million. Tom Green County is expected to have a population of 100,000 by 1975. By the year 2010 the corresponding population projection is 145,000. The seven county area referred to above as within day-use proximity of Twin Buttes, according to the same estimates, will have a 1975 population of 126,300. Projected totals of the other neighboring counties, whose people will add to Twin Buttes visitation, show comparable increases.

A detailed basic recreation development plan has been drawn up by the National Parks Service, and required contracts between the Bureau of Reclamation and the City of San Angelo are awaiting ratification. Funds to permit the completion of this program are expected to be approved by Congress. Facilities to be constructed include launching ramps, toilet buildings, access roads, picnic areas, camping areas, organized camps, a marina, a beach shore area, lodge developments, play fields, a golf course, and the supplying of utilities and services. An area is also set aside for residential development. In all, \$1,698,600 is allocated and approved for recreational development.

## Ecology of the Watershed

The great variation of stream conditions makes general discussion of tributaries difficult. For that reason the four principal tributaries are discussed separately.

### The South Concho River

The southern watershed is primarily fed by springs that flow from crevices in Cretaceous limestone. The primary springs, called Anson Springs, are located on the Ford Boulware ranch. These are the most stable springs on the Conchos. Flow varied slightly from 12.2 c.f.s. to 13.2 c.f.s. during the study period. The water from these springs is semi-hard having a hardness of 220 p.p.m., but is much "softer" than for most of the other stream areas. Findings indicated that pH was 8.2, chloride content was 27 p.p.m., and that water temperature was relatively constant near 73° F. The upper stream areas are clear, of unrecordable turbidity, and a variety of aquatic plants and microscopic bottom fauna abound. This relatively stable stream condition continues for a distance of approximately four miles until flow enters the county park at Christoval. Here turbidity increases to 38 inches and flow has been increased by the discharge of minor springs to 16 c.f.s. Christoval Dam creates a public reservoir and also serves to divert flow for irrigation. From immediately below this dam to Twin Buttes Dam, a distance of 16 stream miles, flow and water level are disrupted due to seasonal withdrawals for irrigation. The area irrigated by this means is about 400 acres. Additional springs tend to rebuild the stream, and the South Concho more nearly represents a native spring fed clear water association than does any stream in Region 1-B. Four major diversion dams that range in height from 3 feet to 12 feet normally provide barriers to upstream movement of fish.

### Dove Creek

For three miles, from the headwater springs on the Charles Schreiner ranch to Guinn Dam, Dove Creek nearly duplicates the ecology of the upper portions of the South Concho. At the dam, water is diverted for irrigation purposes, and thereafter flow is drastically reduced and expanded as irrigation withdrawals demand. The initial springs discharged from 9.83 c.f.s. to 6.66 c.f.s. during the survey period. Flow was increased to over 11 c.f.s. at Guinn Dam. Water quality for the upper permanent flow stream is similar to that of the South Concho, but turbidity increases more drastically downstream, beginning where large pools are created by impoundments on the XQZ Ranch. Turbidity is 28 inches in these pools and increases to 18 inches as the stream enters the reservoir area. Thereafter the stream is indolent and flow and water temperatures and quality are less favorable to fish production. Five diversion dams ranging in height from 6 to 18 feet are located between the reservoir area and the headwater springs. Except in periods of extreme flooding, these structures are effective barriers to upstream movement of fish. Over 600 acres are irrigated from Dove Creek annually.

### Spring Creek

Beginning on the Reginald Atkinson ranch at "mammoth spring" and terminating six miles downstream at Mertzon Dam, Spring Creek is permanent flow clear water association. Mammoth springs had the greatest discharge recorded for any spring on the watershed, 15.2 c.f.s., but exhibited variation of flow in receding to 9.6 c.f.s. before the end of the study period. The ecology of the upper stream area of Spring Creek is similar to that described for Dove Creek and the South Concho River. At Mertzon Dam withdrawals begin for irrigation of approximately 300 acres. Contributions from lesser springs maintain some permanent flow for over 17 miles to the dam at Boy's Ranch. This flow is subsurface in some locations, traveling through gravel deposits, but even this slight exchange and movement of water prevents stagnation to the degree experienced elsewhere in the lower reaches of the watershed. Nine dams ranging from 10 to 22 feet in height are located on Spring Creek, and except in times of flooding are barriers to upstream migration of fishes.

### Middle Concho River

In times past, the Middle Concho River, like other tributaries of this watershed, was spring fed. However, for many years springs have not been individually significant and only rarely have their collective contributions been sufficient to result in surface flow. Seepage ground waters tend to restore pools during the winter, but these are drastically reduced by irrigation withdrawals during the summer. No flow has been recorded for this tributary since September 1961. During the intervening time pools have been reduced to the lowest levels ever recorded, and much of the stream bed is dry. Fish "die-offs" from oxygen deficiency are common, and for practical purposes the entire Middle Concho River may be regarded as being a series of stagnant mud puddles.

### Basin Areas

The water included in basin areas may be considered to be semi-permanent due to man-made circumstances. Stream pools were often pumped dry in "wetting down" earth materials used in construction of the dam. Most of the game fish had already been "salvaged" by construction workers by the time the study was initiated. The basin areas had been cleared of timber and brush before sites for fish attractors could be selected. However, future arrangements include provisions for adding these facilities.

## Fish Populations

### Seining Collections

The urgency of completing survey work in order that development work could be undertaken prior to impounding significant quantities of water, and the scarcity of suitable seining stations rendered making tally counts of seining collections impractical. The following annotated checklist is believed to be the best expression of findings from 18 seining collections. Thirty-four species of fish of 14 families were captured and identified.

Annotated Checklist of Species of Fish Taken From the Middle  
and South Concho River Watersheds

Family: LEPISOSTEIDAE - Gars

Lepisosteus osseus - longnose gar. Common throughout the watersheds. Most abundant in irrigation reservoirs and below such structures.

Family: CLUPEIDAE - Herrings

Dorosoma cepedianum - gizzard shad. The most common and widely distributed species of the watersheds. Most fish captured were of a large size, and there was a notable absence of spawning evidence.

Family: CHARACIDAE - Tetras

Astyanax mexicanus - banded tetra. Found only in clear water associations. Common but not abundant in the South Concho River. Also taken from Dove Creek below Guinn Dam.

Family: CATOSTOMIDAE - Suckers and buffalofishes

Ictiobus bubalus - smallmouth buffalo. Common but never abundant. No evidence of spawning.

Carpiodes carpio - river carpsucker. Common and abundant throughout the watershed. This species is regarded as the scourge of the Conchos, and dominates any turbid water association where it is found.

Moxostoma congestum - gray redhorse. Common and particularly abundant in the upper clear water associations. These fish reproduced in areas where the stream volume expands and is repressed by irrigation withdrawals.

Family: CYPRINIDAE - Shiners and minnows

Cyprinus carpio - carp. Common and abundant in localities. Particularly abundant in the Middle Concho indolent, turbid pool associations, and above the dam on the South Concho River.

Notemigonus crysoleucas - golden shiner. Common but never abundant. An invader or exotic introduction, but apparently not problematic.

Notropis venustus - spottail shiner. Common and abundant in localities. Particularly numerous near Gardner Dam on the South Concho and below Christoval Dam.

Notropis lutrensis - redhorse shiner. Common and abundant in localities. Apparently more adaptable than most species. Found spawning in the lower portions of Spring Creek.

Dionda episcopa - roundnose minnow. Common and the most abundant species present in shallow-rapid flow-clear water associations. An invader or exotic introduction that apparently is gaining dominance over endemic species.

Pimephales vigilax - parrot minnow. Common and abundant in the lower portions of the entire watershed. Particularly numerous below dams on Spring Creek.

Family: AMEIURIDAE - Freshwater catfishes

Ictalurus punctatus - channel catfish. Common but not abundant. Virtually no young discovered during survey work. Probably the most adaptable and widespread in distribution of principal game species.

Ictalurus melas - black bullhead. Common and very abundant in some spring fed associations. Especially abundant at headwaters of Spring Creek and Cold Creek of the South Concho River.

Ictalurus natalis - yellow bullhead. Common and abundant in the lower stream areas where water is more turbid and the stream bottoms are more silty.

Pylodictus olivaris - flathead catfish. Common and widely distributed, but seldom numerous. Several natural spawning sites were located on Spring Creek and the South Concho River.

Family: CYPRINODONTIDAE - Killifishes and topminnows

Fundulus kansae - plains killifish. Restricted to the Middle Concho watershed. An exotic introduction or invader.

Family: ATHERINIDAE - Silversides

Menidia beryllina - tidewater silversides. An invader that dominates localities in Dove Creek and the South Concho River. Especially abundant in the reservoir created by Guinn Dam.

Family: POECILIIDAE - Mosquitofishes

Gambusia affinis - mosquitofish. Common in pools where flow is not prohibitive.

Family: SERRANIDAE - Basses

Roccus chrysops - white bass. Common in the lower reaches of Spring and Dove Creeks and the South Concho River. Extends its distribution up the Middle Concho River to the Len Mertz ranch. Irrigation dams may be effective barriers to upstream migrations by this species.

Family: CENTRARCHIDAE - Black basses and sunfishes

Micropterus salmoides - largemouth bass. Common but not abundant.

Micropterus punctulatus - spotted bass. Rare but found in mid-stream areas of Dove Creek and the South Concho River.

Micropterus treculi - Texas spotted bass. Endemic to headwater spring areas. Distribution restricted to headwater springs of the South Concho River and Dove Creek.

Chaenobryttus gulosus - warmouth bass. Rare, but found throughout the watershed.

Lepomis punctatus - spotted sunfish. Rare. Found only in headwater spring areas.

Lepomis cyanellus - green sunfish. Common and abundant throughout the watersheds. Stunted populations of these sunfish occur in the lower watersheds.

Lepomis microlophus - redear sunfish. Rare, but widely distributed. An exotic introduction that apparently does not create a problem.

Lepomis macrochirus - bluegill. Common, abundant and widely distributed. A problematic species through overpopulating and stunting. An exotic introduction or invader.

Lepomis megalotis - longear sunfish. Common and relatively abundant. Most common in the South Concho and Dove Creek in the upper stream areas.

Lepomis auritus - yellowbelly sunfish. Common and relatively abundant. From the anglers' standpoint the most desirable sunfish in the Conchos.

Pomoxis annularis - white crappie. Common, abundant and widely distributed. Regarded as a problematic species. Only on XQZ ranch were crappie captured of sufficient size to provide sport. Not found in abundance in the South Concho River.

Family: PERCIDAE - Perches and darters

Percina caprodes - logperch. Common to all watersheds, but seldom numerous. Found in backwater pools.

Etheostoma lepidum - greenthroat darter. Abundant in spring areas. Found as far downstream as the Christoval area on the South Concho River.

Family: SCIAENIDAE - Croakers, drum and weakfishes

Aplodinotus grunniens - freshwater drum. Rare but widely distributed. More common in deep indolent pools with silty bottoms.

Family: CICHILIDAE - Cichlids

Cichlasoma cyanoguttatum - Rio Grande cichlid. Common in the South Concho River and Dove Creek. An exotic introduction.

### Netting Results

Data obtained through examination of 2,906 individuals captured by gill nets adequately expresses relative abundance of existing fish populations. Previously presented seining data is less reliable in establishing species occurrence and distribution. All tributaries of the watershed are heavily dominated by problematic species. Probably Dove Creek has more favorable game fish populations than do other waters, but none of the sub-watersheds surveyed have less than 93 per cent problematic species by number or less

than 88 per cent undesired fish by weight.

### Fishery Problems and Conclusions

1. Man-made circumstances and conditions have drastically altered the fishery habitat of Twin Buttes watershed. Within the past twenty years excessive irrigation practices have resulted in extreme fluctuations of the natural flow of 94 per cent of the total stream area. The expansion and development of irrigated farms, with more and deeper wells that exploit subsurface waters, has reduced or eliminated springs. Ruinous floods that follow abusive grazing practices have destroyed natural food producing and spawning areas. Irresponsible releases of exotic species of fish have furthered the decline of natural game fish production, and the expansion and recession of native species are no longer controlled through natural phenomena.
2. As a result of the above conditions, the entire Twin Buttes watershed is dominated by problematic or presently non-utilizable fish. Reproduction of many species, such as largemouth bass and channel catfish, is prohibited by stream fluctuations, and in other species, such as crappie and some sunfish, over reproduction is followed by irrigation withdrawals and receding waters that overcrowd young fish and result in stunting. Invaders such as carp and Rio Grande cichlids provide few fishery benefits, but compete with native game species for the basic means of subsistence. Some normally desirable forage species, such as gizzard shad, have grown excessively large and occupy space but do not afford food for game fish production. The effect of exotics, such as tidewater silversides and roundnose minnows, on game fish produced is questionable.
3. There is little reason to believe these fishery problems will correct themselves without drastic management effort. Further agricultural development of the watershed is in progress, and laws that provide for maintaining stream flow do not and may never exist. The need for corrective action is imminent and urgent. Construction of the dam is eight months ahead of schedule, and Twin Buttes structures will be completed and retaining gates closed in December of 1962. The occurrence of run-off after that date can result in the impoundment of 40,000 acre-feet of water before any releases can be made. At present, excavations and natural depressions in the two basins are capable of impounding 10,500 acre-feet of water before the water level will be high enough to result in flow through the outlet structures. The cost of any management action taken, that will require chemical treatment of impounded water, will be between 2 and 5 times greater than present costs if significant run-off occurs before remedial action is taken.
4. It would be advantageous to complete ~~management~~ effort at this time in order that the current fish production of the state fish hatchery will be available and can be used in restocking during the fall. If restocking can not be immediately carried out, the success of the program will be jeopardized should reinfestation occur before hatchery

produced fish are again available in the spring.

5. A clearing of the upper watershed might conceivably be partially effective in improving fish production even if the entire program is not completed. Irrigation dams could provide effective barriers to upstream migrations of problematic fish, and game fish produced could migrate downstream and be of benefit to the public reservoir.

Recommendations:

1. A drastic reduction of the existing fish populations of Twin Buttes watershed should be immediately initiated. Chemicals should be employed for this purpose.
2. Relic spring areas should not be treated to assure survival of endemic species.
3. Following the completion of the chemical treatment, and a suitable detoxification period, the watershed should be restocked with game fish and native minnows.
4. The reservoir should then be closed to fishing for an undetermined period to permit growth of the stocked fish.
5. Future reconnaissance studies should include an intensive study of Lake Nasworthy and other area waters with the view of continuing renovation work where needed.

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Date May 8, 1963

Approved by Marion Toole  
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Figure 1 Comparison of problematic fish populations to utilizable fish populations as indicated by gill net collections from South Concho River.

| Species  | Number | Per Cent<br>of Number | Est. Weight<br>lbs. | Weight<br>ozs. | Per Cent<br>of Weight |
|--|--------|-----------------------|---------------------|----------------|-----------------------|
| Problematic Fish Populations<br>(gizzard shad, longnose gar,<br>grey redhorse suckers, river<br>carpsuckers, carp, stunted<br>white crappie and sunfishes) | 575    | 99.48                 | 696                 | 8              | 92.56                 |
| Usable Game Fish Populations<br>(largemouth bass, channel<br>catfish, flathead catfish,<br>usable white crappie, white<br>bass and usable sunfish)         | 3      | .52                   | 55                  | 12             | 7.44                  |
| Totals   | 578    | 100.00                | 752                 | 4              | 100.00                |

Figure 2. Results of three gill nets set for fisheries inventory at head of South Concho River

| Species                 | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Total Weight<br>ozs. | Average Weight<br>lbs. | Average Weight<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|-------------------------|--------|-----------------------|----------------------|----------------------|------------------------|------------------------|-----------------------|----------------|
| Gizzard Shad            | 2      | 4.00                  | 2                    | 11                   | 1                      | 5.5                    | 3.03                  | 1.91           |
| River Carpsucker        | 8      | 16.00                 | 16                   | 7                    | 2                      | 1.0                    | 18.59                 | 2.05           |
| Grey Redhorse Sucker    | 17     | 34.00                 | 48                   | 13                   | 2                      | 13.9                   | 55.00                 | 1.83           |
| Channel Catfish         | 2      | 4.00                  | 10                   | 13                   | 5                      | 6.5                    | 12.19                 | 1.63           |
| Yellow Bullheads        | 9      | 18.00                 | 5                    | 13                   |                        | 10.3                   | 6.55                  | 1.81           |
| Largemouth Bass         | 2      | 4.00                  | 1                    | 3                    |                        | 9.5                    | 1.34                  | 1.84           |
| Bluegill Sunfish        | 2      | 4.00                  |                      | 13                   |                        | 6.5                    | .91                   | 3.05           |
| Western Longear Sunfish | 8      | 16.00                 | 2                    | 2                    |                        | 4.2                    | 2.39                  | 3.52           |
| Totals                  | 50     | 100.00                | 88                   | 9                    |                        |                        | 100.00                |                |

Figure 3. Results of 5 gill nets set for fisheries inventory of South Concho River at Christoval, Texas

| Species               | Number | Per Cent of Number | Total Weight lbs. | ozs.  | Average Weight lbs. | ozs.  | Per Cent of Weight | Average "K" |
|-----------------------|--------|--------------------|-------------------|-------|---------------------|-------|--------------------|-------------|
| Gizzard shad          | 144    | 61.54              | 171               | 3.00  | 1                   | 3.00  | 53.75              | 1.95        |
| River carpsucker      | 37     | 15.81              | 75                | .75   | 2                   | .75   | 23.81              | 2.33        |
| Grey redbreast sucker | 34     | 14.53              | 63                | 14.00 | 1                   | 14.00 | 20.04              | 1.87        |
| Channel catfish       | 10     | 4.27               | 4                 | 7.50  | 11                  | 7.50  | 1.47               | 1.58        |
| Black bullheads       | 1      | .43                | 7                 | 7.00  | 7                   | 7.00  | .14                | 2.00        |
| Largemouth bass       | 1      | .43                | 1                 | 14.00 | 1                   | 14.00 | .59                | 2.07        |
| Bluegill sunfish      | 7      | 2.99               | 11                |       | 11                  |       | .20                | 3.20        |
| Totals                | 234    | 100.00             | 318               | 3     | 3                   |       | 100.00             |             |

Figure 4. Results of 6 gill nets set for fisheries inventory of South Concho River at Gardner Dam

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. ozs. | Average Weight<br>lbs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|---------------------------|------------------------|-----------------------|----------------|
| Longnose gar         | 4      | 2.15                  | 26 8                      | 6 10                   | 11.56                 | 1.35           |
| Gizzard shad         | 116    | 62.36                 | 87                        | 12                     | 37.97                 | 1.62           |
| River carpsucker     | 31     | 16.67                 | 69 13                     | 2 4                    | 30.47                 | 2.32           |
| Grey redhorse sucker | 9      | 4.84                  | 15 1                      | 1 11                   | 6.57                  | 2.10           |
| Channel catfish      | 11     | 5.91                  | 15 1                      | 1 6                    | 6.57                  | 1.69           |
| Flathead catfish     | 3      | 1.61                  | 12 6                      | 4 2                    | 5.41                  | 1.69           |
| Largemouth bass      | 1      | .54                   | 1 4                       | 1 4                    | .54                   | 1.90           |
| Bluegill sunfish     | 11     | 5.92                  | 2 1                       | 3 3                    | .91                   | 3.10           |
| Totals               | 186    | 100.00                | 229 2                     |                        | 100.00                |                |

Figure 5. Results of 4 gill nets set for inventory of South Concho River at Reservoir Area.

| Species          | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Longnose gar     | 6      | 5.55                  | 23                   | 4    | 3                      | 14   | 20.00                 | .33            |
| Gizzard shad     | 18     | 16.67                 | 6                    | 12   |                        | 6    | 5.80                  | 1.40           |
| River carpsucker | 16     | 14.81                 | 30                   |      | 1                      | 14   | 25.81                 | 2.30           |
| Carp             | 61     | 56.48                 | 45                   | 12   |                        | 12   | 39.35                 | 2.42           |
| Channel catfish  | 1      | .93                   | 1                    | 12   | 1                      | 12   | 1.51                  | 1.49           |
| Largemouth bass  | 2      | 1.85                  | 6                    | 12   | 3                      | 6    | 5.80                  | 1.68           |
| White crappie    | 4      | 3.71                  | 2                    |      |                        | 8    | 1.73                  | 3.33           |
| Totals           | 108    | 100.00                | 116                  | 4    |                        |      | 100.00                |                |

Figure 6. Summary of gill net collections taken from South Concho River

| Species               | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|-----------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Longnose gar          | 10     | 1.73                  | 49                   | 12   | 4                      | 15   | 6.61                  | .34            |
| Gizzard shad          | 280    | 48.44                 | 267                  | 7    |                        | 15   | 35.55                 | 1.72           |
| River carpsucker      | 92     | 15.92                 | 192                  |      | 2                      | 1    | 25.52                 | 2.25           |
| Grey redbreast sucker | 60     | 10.38                 | 127                  | 10   | 2                      | 3    | 16.96                 | 1.93           |
| Carp                  | 61     | 10.55                 | 45                   | 12   |                        | 12   | 6.08                  | 2.42           |
| Channel catfish       | 24     | 4.15                  | 32                   | 5    | 1                      | 5    | 4.31                  | 1.59           |
| Flathead catfish      | 3      | .52                   | 12                   | 6    | 3                      | 12   | 1.66                  | 1.69           |
| Largemouth bass       | 6      | 1.04                  | 11                   | 1    | 1                      | 13   | 1.47                  | 1.87           |
| White crappie         | 4      | .69                   | 2                    |      |                        | 8    | .26                   | 3.33           |
| Bluegill sunfish      | 18     | 3.12                  | 2                    | 12   |                        | 4    | .36                   | 3.15           |
| Other sunfish         | 10     | 1.73                  | 2                    | 15   |                        | 4    | .39                   | 3.28           |
| White bass            |        |                       |                      |      |                        |      |                       |                |
| <u>Bullheads</u>      | 10     | 1.73                  | 6                    | 4    |                        | 10   | .83                   | 1.90           |
| <u>Totals</u>         | 578    | 100.00                | 752                  | 4    |                        |      | 100.00                |                |

Figure 7. Comparison of problematic fish populations to utilizable fish populations as indicated by gill net collections from Dove Creek

| Species   | Number | Per Cent<br>of Number | Est. Weight<br>lbs. | Weight<br>ozs. | Per Cent<br>of Weight |
|---|--------|-----------------------|---------------------|----------------|-----------------------|
| Problematic Fish Populations<br>(gizzard shad, longnose gar,<br>grey redbreast suckers, river<br>carpsuckers, carp, stunted<br>white crappie and sunfishes) | 402    | 92.63                 | 719                 | 8              | 91.40                 |
| Usable Game Fish Populations<br>(largemouth bass, channel<br>catfish, usable white crappie,<br>white bass and usable sunfish)                               | 32     | 7.37                  | 67                  | 10             | 8.60                  |
| Totals  | 434    | 100.00                |                     |                | 100.00                |

Figure 8. Results of 3 gill nets set for fisheries inventory of Dove Creek at Schreiner Lake

| Species               | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|-----------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Gizzard shad          | 12     | 17.91                 | 39                   | 3    | 3                      | 5    | 25.65                 | 1.41           |
| River carpsucker      | 3      | 4.47                  | 9                    | 12   | 3                      | 4    | 6.38                  | 2.22           |
| Grey redbreast sucker | 42     | 62.69                 | 91                   | 3    | 2                      | 3    | 59.70                 | 2.10           |
| Channel catfish       | 4      | 5.97                  | 10                   | 10   | 4                      | 11   | 6.96                  | 1.62           |
| Bluegill sunfish      | 4      | 5.97                  | 1                    | 4    |                        | 5    | .81                   | 2.80           |
| Longear sunfish       | 2      | 2.99                  |                      | 12   |                        | 6    | .50                   | 3.20           |
| Totals                | 67     | 100.00                | 152                  | 12   |                        |      | 100.00                |                |

Figure 9. Results of 4 gill nets set for inventory of Dove Creek at Tweedy Ranch

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Longnose gar         | 2      | 4.00                  | 7                    |      | 3                      | 8    | 6.74                  | .34            |
| Gizzard shad         | 21     | 42.00                 | 45                   | 9    | 2                      | 3    | 43.89                 | 1.56           |
| River carpsucker     | 8      | 16.00                 | 24                   |      | 3                      |      | 23.12                 | 2.20           |
| Grey redhorse sucker | 11     | 22.00                 | 24                   | 8    | 2                      | 4    | 23.60                 | 2.18           |
| Channel catfish      | 1      | 2.00                  | 1                    | 6    | 1                      | 6    | 1.38                  | 1.68           |
| Largemouth bass      | 1      | 2.00                  | 1                    | 2    | 1                      | 2    | 1.08                  | 1.80           |
| Bluegill sunfish     | 6      | 12.00                 |                      | 3    | 1                      | 2    | .19                   | 3.20           |
| Totals               | 50     | 100.00                | 103                  | 12   |                        |      | 100.00                |                |

Figure 10. Results of 2 gill nets set for fisheries inventory of Dove Creek at Cobert Farm

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Gizzard shad         | 18     | 60.00                 | 40                   | 5    | 2                      | 4    | 65.28                 | 1.60           |
| River carpsucker     | 4      | 13.33                 | 9                    |      | 2                      | 4    | 14.57                 | 2.34           |
| Grey redhorse sucker | 6      | 20.00                 | 8                    | 10   | 1                      | 7    | 13.97                 | 2.18           |
| Channel catfish      | 1      | 3.33                  | 1                    | 4    | 1                      | 4    | 2.03                  | 1.60           |
| Largemouth bass      | 1      | 3.34                  | 2                    | 9    | 2                      | 9    | 4.15                  | 1.80           |
| Totals               | 30     | 100.00                | 61                   | 12   |                        |      | 100.00                |                |

Figure 11. Results of 5 gill nets set for fisheries inventory of Dove Creek at XQZ Ranch

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs.  | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------|------------------------|-------|-----------------------|----------------|
| Longnose gar         | 10     | 5.23                  | 25                   | 14   | 2                      | 8.75  | 10.43                 | .30            |
| Gizzard shad         | 120    | 62.83                 | 127                  | 8    | 1                      | 1.00  | 51.42                 | 1.78           |
| River carpsucker     | 28     | 14.66                 | 59                   | 12   | 2                      | 2.20  | 24.09                 | 2.03           |
| Grey redborse sucker | 6      | 3.14                  | 22                   | 1    | 3                      | .67   | 8.91                  | 1.77           |
| Channel catfish      | 6      | 3.14                  | 5                    | 8    |                        | 13.50 | 2.20                  | 1.50           |
| Largemouth bass      | 3      | 1.57                  | 3                    | 5    | 1                      | .76   | 1.34                  | 2.18           |
| Bluegill sunfish     | 15     | 7.85                  | 3                    | 3    |                        | 3.40  | 1.29                  | 2.70           |
| White crappie        | 3      | 1.58                  |                      | 12   |                        | 4.00  | .32                   | 1.75           |
| Totals               | 191    | 100.00                | 247                  | 15   |                        |       | 100.00                |                |

Figure 12. Results of 3 gill nets set for fisheries inventory of Dove Creek at XQZ Ranch

| Species          | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Longnose gar     | 55     | 57.29                 | 145                  | 5    | 2                      | 10.0 | 65.77                 | .33            |
| Gizzard shad     | 10     | 10.41                 | 6                    | 3    |                        | 9.9  | 2.80                  | 1.41           |
| River carpsucker | 13     | 13.55                 | 24                   | 6    | 1                      | 14.0 | 11.03                 | 2.22           |
| Channel catfish  | 14     | 14.58                 | 34                   | 2    | 2                      | 7.0  | 15.44                 | 1.51           |
| Flathead catfish | 1      | 1.04                  | 7                    | 12   | 7                      | 12.0 | 3.51                  | 1.67           |
| White crappie    | 3      | 3.13                  | 3                    | 3    | 1                      | 1.0  | 1.45                  | 2.62           |
| Totals           | 96     | 100.00                | 220                  | 15   |                        |      | 100.00                |                |

Figure 13. Summary of gill net collections taken from Dove Creek

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. ozs. | Average Weight<br>lbs. | Average Weight<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|---------------------------|------------------------|------------------------|-----------------------|----------------|
| Longnose gar         | 67     | 15.43                 | 178                       | 2                      | 10                     | 22.63                 | .32            |
| Gizzard shad         | 181    | 41.71                 | 258                       | 1                      | 6                      | 32.87                 | 1.55           |
| River carpsucker     | 56     | 12.90                 | 126                       | 2                      | 4                      | 16.11                 | 2.20           |
| Grey redhorse sucker | 65     | 14.98                 | 146                       | 2                      | 4                      | 18.59                 | 2.05           |
| Channel catfish      | 26     | 5.99                  | 52                        | 2                      |                        | 6.74                  | 1.58           |
| Flathead catfish     | 1      | .23                   | 7                         | 7                      | 12                     | .98                   | 1.67           |
| Largemouth bass      | 5      | 1.15                  | 7                         | 1                      | 6                      | .88                   | 1.92           |
| White crappie        | 6      | 1.38                  | 3                         |                        | 10                     | .52                   | 2.18           |
| Bluegill sunfish     | 25     | 5.76                  | 4                         | 10                     | 2                      | .59                   | 2.75           |
| Other sunfish        | 2      | .47                   |                           | 12                     | 6                      | .09                   | 3.20           |
| Totals               | 434    | 100.00                | 787                       | 2                      |                        | 100.00                |                |

Figure 14. Comparison of problematic fish populations to utilization fish populations as indicated by gill net collections from Spring Creek

| Species  | Number | Per Cent of Number | Est. Weight | Per Cent of Weight |
|--|--------|--------------------|-------------|--------------------|
| Problematic Fish Populations<br>(gizzard shad, longnose gar, grey redhorse suckers, river carpsuckers, carp, stunted white crappie, and sunfishes) | 1350   | 97.33              | 2256.7      | 88.37              |
| Usable Game Fish Populations<br>(largemouth bass, channel catfish, flathead catfish, usable white crappie, white bass and usable sunfish)          | 37     | 2.67               | 73.9        | 11.63              |
| Totals   | 1387   | 100.00             |             | 100.00             |

Figure 15. Results of 2 gill nets set for the fisheries inventory of Spring Creek at City Reservoir at Mertzou

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. ozs. | Average Weight<br>lbs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|---------------------------|------------------------|-----------------------|----------------|
| Longnose gar         | 4      | 9.30                  | 9 12                      | 2 7                    | 11.71                 | .36            |
| Gizzard shad         | 12     | 27.90                 | 9 8                       | 13                     | 11.41                 | 1.38           |
| River carpsucker     | 19     | 44.19                 | 57 3                      | 3                      | 68.47                 | 2.34           |
| Grey redhorse sucker | 6      | 13.95                 | 6 12                      | 1 2                    | 8.10                  | 1.67           |
| Bluegill sunfish     | 2      | 4.66                  | 4 4                       | 2                      | .31                   | 3.38           |
| Totals               | 43     | 100.00                | 83 4                      | 4                      | 100.00                |                |

Figure 16. Results of 8 gill nets set for fisheries inventory of Spring Creek near Tankersley, Texas

| Species               | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs.  | Per Cent<br>of Weight | Average<br>"K" |
|-----------------------|--------|-----------------------|----------------------|------|------------------------|-------|-----------------------|----------------|
| Longnose gar          | 106    | 20.50                 | 616                  | 4    | 5                      | 13.00 | 55.00                 | .35            |
| Gizzard shad          | 254    | 49.13                 | 127                  |      |                        | 8.00  | 11.33                 | 1.38           |
| River carpsucker      | 86     | 16.63                 | 279                  | 8    | 3                      | 4.00  | 24.94                 | 2.34           |
| Grey redbhorse sucker | 14     | 2.71                  | 41                   | 2    | 2                      | 15.00 | 3.67                  | 1.67           |
| Carp                  | 5      | .97                   | 25                   |      | 5                      |       | 2.23                  | 2.33           |
| Channel catfish       | 9      | 1.74                  | 18                   |      | 2                      |       | 1.63                  | 1.62           |
| Largemouth bass       | 5      | .96                   | 4                    | 14   |                        | 15.60 | .43                   | 2.03           |
| Bluegill sunfish      | 13     | 2.52                  | 1                    | 9    |                        | 1.92  | .14                   | 3.38           |
| White crappie         | 25     | 4.84                  | 7                    |      |                        | 4.48  | .63                   | 2.24           |
| Totals                | 517    | 100.00                | 1120                 | 5    |                        |       | 100.00                |                |

Figure 17. Results of 6 gill nets set for fisheries inventory of Spring Creek at Foster Park

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Longnose gar         | 29     | 14.28                 | 63                   | 3    | 2                      | 3    | 24.25                 | .35            |
| Gizzard shad         | 104    | 51.23                 | 78                   |      |                        | 12   | 29.94                 | 1.38           |
| River carpsucker     | 38     | 18.72                 | 90                   | 3    | 2                      | 6    | 34.60                 | 2.34           |
| Grey redborse sucker | 12     | 5.91                  | 18                   |      | 1                      | 8    | 6.91                  | 1.67           |
| Channel catfish      | 2      | .99                   | 3                    | 8    | 1                      | 12   | 1.34                  | 1.62           |
| White crappie        | 11     | 5.42                  | 4                    | 8    |                        | 7    | 1.73                  | 2.24           |
| White bass           | 2      | .98                   | 2                    | 4    | 1                      | 2    | .86                   | 2.30           |
| Bluegill sunfish     | 4      | 1.97                  |                      | 12   |                        | 3    | .29                   | 3.38           |
| Redear sunfish       | 1      | .50                   |                      | 3    |                        | 3    | .08                   | 3.38           |
| Totals               | 203    | 100.00                | 260                  | 9    |                        |      | 100.00                |                |

Figure 18. Results of 7 gill nets set for fisheries inventory of Spring Creek at Boys Ranch

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Average Weight<br>lbs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------------------------|-----------------------|----------------|
| Longnose gar         | 28     | 7.73                  | 171                  | 6                      | 31.33                 | .35            |
| Gizzard shad         | 212    | 58.56                 | 140                  | 7                      | 25.66                 | 1.38           |
| River carpsucker     | 56     | 15.47                 | 115                  | 2                      | 21.10                 | 2.34           |
| Grey redhorse sucker | 31     | 8.57                  | 73                   | 2                      | 13.45                 | 1.67           |
| Carp                 | 3      | .83                   | 21                   | 7                      | 3.86                  | 2.33           |
| Channel catfish      | 4      | 1.10                  | 5                    | 1                      | 1.05                  | 1.62           |
| Flathead catfish     | 2      | .55                   | 9                    | 4                      | 1.79                  | 1.64           |
| Largemouth bass      | 6      | 1.66                  | 4                    | 3                      | .77                   | 2.03           |
| White crappie        | 3      | .83                   | 2                    | 3                      | .41                   | 2.24           |
| Freshwater drum      | 1      | .28                   | 1                    | 14                     | .34                   | 2.41           |
| Sunfish              | 16     | 4.42                  | 1                    | 4                      | .24                   | 3.38           |
| Totals               | 362    | 100.00                | 547                  | 4                      | 100.00                |                |

Figure 19. Results of 3 gill nets set for fisheries inventory of Spring Creek at confluence with Dove Creek

| Species          | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Longnose gar     | 4      | 2.43                  | 24                   | 8    | 6                      | 2    | 17.57                 | .35            |
| Gizzard shad     | 131    | 79.88                 | 73                   | 7    |                        | 9    | 52.67                 | 1.38           |
| River carpsucker | 11     | 6.71                  | 19                   | 9    | 1                      | 13   | 14.04                 | 2.34           |
| Flathead catfish | 1      | .61                   | 11                   | 4    | 11                     | 4    | 8.07                  | 1.67           |
| Channel catfish  | 1      | .61                   | 3                    | 9    | 3                      | 9    | 2.56                  | 1.62           |
| White crappie    | 9      | 5.49                  | 3                    | 4    |                        | 6    | 2.33                  | 2.64           |
| White bass       | 1      | .61                   | 2                    | 10   | 2                      | 10   | 1.88                  | 2.40           |
| Bluegill sunfish | 4      | 2.44                  |                      | 12   |                        | 3    | .53                   | 3.68           |
| Longear sunfish  | 2      | 1.22                  |                      | 8    |                        | 4    | .35                   | 3.68           |
| Totals           | 164    | 100.00                | 139                  | 7    |                        |      | 100.00                |                |

Figure 20. Results of 4 gill nets set for fisheries inventory of Spring Creek at Reservoir

| Species          | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Average Weight<br>lbs. | Average Weight<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|------------------|--------|-----------------------|----------------------|------------------------|------------------------|-----------------------|----------------|
| Longnose gar     | 3      | 3.75                  | 24                   | 8                      | 3                      | 13.71                 | .36            |
| Gizzard shad     | 16     | 20.00                 | 9                    |                        | 9                      | 5.03                  | 1.40           |
| River carpsucker | 21     | 26.25                 | 47                   | 2                      | 4                      | 26.32                 | 2.20           |
| Carp             | 21     | 26.25                 | 87                   | 4                      | 3                      | 48.88                 | 2.19           |
| Channel catfish  | 2      | 2.50                  | 4                    | 2                      | 5                      | 2.58                  | 1.68           |
| White crappie    | 16     | 20.00                 | 5                    |                        | 5                      | 2.79                  | 2.48           |
| White bass       | 1      | 1.25                  | 1                    | 1                      | 3                      | .69                   | 2.38           |
| Bluegill sunfish |        |                       |                      |                        |                        |                       |                |
| Other sunfish    |        |                       |                      |                        |                        |                       |                |
| Totals           | 80     | 100.00                | 179                  | 1                      | 1                      | 100.00                |                |

Figure 21. Summary of gill net collections taken from Spring Creek

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Total Weight<br>ozs. | Average Weight<br>lbs. | Average Weight<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|----------------------|------------------------|------------------------|-----------------------|----------------|
| Longnose gar         | 174    | 12.55                 | 909                  | 13                   | 5                      | 3.66                   | 39.06                 | .35            |
| Gizzard shad         | 729    | 52.55                 | 437                  | 6                    |                        | 9.59                   | 18.77                 | 1.38           |
| River carpsucker     | 231    | 16.65                 | 608                  | 14                   | 2                      | 10.00                  | 26.13                 | 2.34           |
| Grey redhorse sucker | 63     | 4.54                  | 139                  | 8                    | 2                      | 3.00                   | 5.99                  | 1.67           |
| Carp                 | 29     | 2.09                  | 133                  | 11                   | 4                      | 6.00                   | 5.75                  | 2.28           |
| Channel catfish      | 18     | 1.31                  | 35                   | 7                    | 1                      | 15.00                  | 1.52                  | 1.63           |
| Flathead catfish     | 3      | .24                   | 21                   | 1                    | 7                      |                        | .90                   | 1.65           |
| Largemouth bass      | 11     | .79                   | 9                    | 1                    |                        | 13.00                  | .38                   | 2.03           |
| White crappie        | 64     | 4.61                  | 21                   | 15                   |                        | 5.00                   | .94                   | 2.36           |
| Bluegill sunfish     | 42     | 3.02                  | 3                    | 5                    |                        | 1.00                   | .14                   | 3.45           |
| Other sunfish        | 18     | 1.29                  | 1                    | 15                   |                        | 1.72                   | .08                   | 3.48           |
| White bass           | 4      | .29                   | 6                    | 2                    | 1                      | 8.00                   | .26                   | 2.36           |
| Freshwater drum      | 1      | .07                   | 1                    | 14                   | 1                      | 14.00                  | .08                   | 2.41           |
| Totals               | 1387   | 100.00                | 2330                 |                      |                        |                        | 100.00                |                |

Figure 22. Comparison of problematic fish populations to utilizable fish populations as indicated by gill net collections from Middle Concho River

| Species   | Number | Per Cent<br>of Number | Est. Weight<br>lbs. | Weight<br>ozs. | Per Cent<br>of Weight |
|---|--------|-----------------------|---------------------|----------------|-----------------------|
| Problematic Fish Populations<br>(gizzard shad, longnose gar,<br>grey rehorse suckers, river<br>carpsuckers, carp, stunted<br>white crappie and sunfishes) | 474    | 93.49                 | 707                 | 8              | 92.11                 |
| Usable Game Fish Populations<br>(largemouth bass, channel<br>catfish, flathead catfish,<br>usable white crappie, white<br>bass and usable sunfish)        | 33     | 6.51                  | 6                   | 9              | 7.89                  |
| Totals  | 507    | 100.00                |                     |                | 100.00                |

Figure 23. Results of 4 gill nets set for fisheries inventory of Middle Concho River at Hemphill Ranch

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs.   | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------|------------------------|--------|-----------------------|----------------|
| Longnose gar         | 12     | <del>14.10</del>      | 79                   | 6    | 8                      | 34.43  | .38                   |                |
| Gizzard shad         | 19     | 22.36                 | 14                   | 4    | 12                     | 6.21   | 1.38                  |                |
| River carpsucker     | 31     | 36.47                 | 69                   | 8    | 4                      | 30.28  | 2.24                  |                |
| Grey redhorse sucker | 8      | 9.41                  | 17                   | 2    | 2                      | 7.41   | 2.16                  |                |
| Carp                 | 11     | 12.95                 | 38                   | 5    | 8                      | 16.69  | 2.68                  |                |
| Channel catfish      | 2      | 2.35                  | 4                    | 8    | 4                      | 1.96   | 1.90                  |                |
| Flathead catfish     | 1      | 1.18                  | 6                    | 12   | 12                     | 2.94   | 1.87                  |                |
| Bluegill sunfish     | 1      | 1.18                  | 3                    | 3    | 3                      | .8     | 3.36                  |                |
| Totals               | 85     | 100.00                | 229                  | 8    |                        | 100.00 |                       |                |

Figure 24. Results of 2 gill nets set for inventory of Middle Concho at Mertz Ranch.

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Average Weight<br>ozs. | Average Weight<br>lbs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------------------------|------------------------|-----------------------|----------------|
| Gizzard shad         | 38     | 63.33                 | 19                   | 8                      |                        | 19.79                 | 1.36           |
| River carpsucker     | 4      | 6.67                  | 8                    | 8                      | 2                      | 8.85                  | 2.40           |
| Grey redhorse sucker | 2      | 3.33                  | 3                    | 12                     | 1                      | 3.91                  | 2.28           |
| Carp                 | 14     | 23.34                 | 58                   | 6                      | 4                      | 60.81                 | 2.32           |
| Channel catfish      | 1      | 1.67                  | 2                    | 1                      | 2                      | 2.15                  | 1.69           |
| Largemouth bass      | 1      | 1.66                  | 4                    | 5                      | 4                      | 4.49                  | 2.30           |
| Totals               | 60     | 100.00                | 96                   |                        |                        | 100.00                |                |

Figure 25. Results of 2 gill nets set for fisheries inventory of Middle Concho River at Waldrop Ranch

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs.<br>ozs. | Average Weight<br>lbs.<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|------------------------------|--------------------------------|-----------------------|----------------|
| Longnose gar         | 16     | 38.09                 | 115                          | 7                              | 67.75                 | .40            |
| Gizzard shad         | 2      | 4.76                  | 8                            | 4                              | .29                   | 1.32           |
| River carpsucker     | 16     | 38.10                 | 40                           | 2                              | 23.56                 | 2.40           |
| Grey redhorse sucker | 2      | 4.76                  | 4                            | 2                              | 2.80                  | 2.32           |
| Carp                 | 1      | 2.39                  | 6                            | 6                              | 3.97                  | 2.40           |
| Channel catfish      |        |                       |                              |                                |                       |                |
| White crappie        | 4      | 9.52                  | 1                            | 8                              | .89                   | 3.24           |
| Largemouth bass      | 1      | 2.38                  | 1                            | 4                              | .74                   | 2.19           |
| Totals               | 42     | 100.00                | 169                          | 12                             | 100.00                |                |

Figure 26. Results of 3 gill nets set for fisheries inventory of Middle Concho River at Blake Duncan Ranch

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | ozs. | Average Weight<br>lbs. | ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------|------------------------|------|-----------------------|----------------|
| Longnose gar         | 11     | 14.10                 | 49                   | 8    | 4                      | 8    | 43.16                 | .38            |
| Gizzard shad         | 29     | 37.18                 | 7                    | 4    |                        | 4    | 6.32                  | 1.32           |
| River carpsucker     | 16     | 20.51                 | 30                   |      | 1                      | 14   | 26.16                 | 2.42           |
| Grey redhorse sucker | 4      | 5.13                  | 7                    |      | 1                      | 12   | 6.10                  | 2.28           |
| Carp                 | 13     | 16.67                 | 9                    | 12   |                        | 12   | 8.50                  | 2.48           |
| Channel catfish      | 1      | 1.28                  | 4                    | 2    | 4                      | 2    | 3.60                  | 1.86           |
| Largemouth bass      | 3      | 3.85                  | 6                    | 12   | 2                      | 4    | 5.88                  | 1.90           |
| Bluegill sunfish     | 1      | 1.28                  |                      | 5    |                        | 5    | .28                   | 3.38           |
| Totals               | 78     | 100.00                | 114                  | 11   |                        |      | 100.00                |                |

Figure 27. Results of 2 gill nets set for inventory of Middle Concho at Palisades

| Species          | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Average Weight<br>lbs. | Average Weight<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|------------------|--------|-----------------------|----------------------|------------------------|------------------------|-----------------------|----------------|
| Gizzard shad     | 131    | 83.43                 | 24                   | 8                      | 3                      | 49.30                 | 1.36           |
| River carpsucker | 4      | 2.55                  | 12                   | 8                      | 2                      | 25.16                 | 2.38           |
| Carp             | 4      | 2.55                  | 2                    | 1                      | 8                      | 4.16                  | 2.42           |
| Channel catfish  | 1      | .64                   | 1                    | 4                      | 4                      | 2.52                  | 1.68           |
| White crappie    | 12     | 7.64                  | 3                    | 12                     | 5                      | 7.54                  | 3.20           |
| White bass       | 5      | 3.19                  | 5                    | 10                     | 2                      | 11.32                 | 2.30           |
| Totals           | 157    | 100.00                | 49                   | 11                     |                        | 100.00                |                |

Figure 28. Results of 3 gill nets set for inventory of Middle Concho River below McGowen Ranch

| Species               | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Total Weight<br>ozs. | Average Weight<br>lbs. | Average Weight<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|-----------------------|--------|-----------------------|----------------------|----------------------|------------------------|------------------------|-----------------------|----------------|
| Longnose gar          | 1      | 1.18                  | 4                    | 2                    | 4                      | 2                      | 3.77                  | .36            |
| Gizzard shad          | 18     | 21.18                 | 5                    | 7                    |                        | 5                      | 4.97                  | 1.38           |
| River carpsucker      | 26     | 30.59                 | 61                   | 12                   | 2                      | 6                      | 56.49                 | 2.32           |
| Grey redbhorse sucker | 4      | 4.70                  | 8                    |                      | 2                      |                        | 7.32                  | 2.18           |
| Channel catfish       | 3      | 3.53                  | 8                    | 4                    | 2                      | 12                     | 7.55                  | 1.81           |
| Flathead catfish      | 1      | 1.18                  | 9                    | 1                    | 9                      | 1                      | 8.29                  | 1.69           |
| Largemouth bass       | 2      | 2.35                  | 2                    | 12                   | 1                      | 6                      | 2.51                  | 1.96           |
| White crappie         | 16     | 18.81                 | 6                    |                      |                        | 6                      | 5.49                  | 3.32           |
| Bluegill sunfish      | 3      | 3.53                  |                      | 9                    |                        | 3                      | .52                   | 3.36           |
| White bass            | 11     | 12.95                 | 3                    | 6                    |                        | 5                      | 3.09                  | 2.41           |
| Totals                | 85     | 100.00                | 109                  | 5                    |                        |                        | 100.00                |                |

Figure 29. Summary of gill net collections for fisheries inventory of Middle Concho River

| Species              | Number | Per Cent<br>of Number | Total Weight<br>lbs. | Average Weight<br>lbs. | Average Weight<br>ozs. | Per Cent<br>of Weight | Average<br>"K" |
|----------------------|--------|-----------------------|----------------------|------------------------|------------------------|-----------------------|----------------|
| Longnose gar         | 40     | 7.88                  | 147                  | 3                      | 11                     | 19.17                 | .38            |
| Gizzard shad         | 237    | 46.75                 | 88                   | 13                     | 6                      | 11.56                 | 1.52           |
| River carpsucker     | 97     | 19.13                 | 269                  | 2                      | 12                     | 35.04                 | 2.36           |
| Grey redhorse sucker | 20     | 3.95                  | 52                   | 2                      | 10                     | 6.77                  | 2.24           |
| Carp                 | 43     | 8.48                  | 137                  | 1                      | 3                      | 17.85                 | 2.46           |
| Channel catfish      | 8      | 1.58                  | 19                   | 2                      | 6                      | 2.48                  | 1.78           |
| Flathead catfish     | 2      | .39                   | 15                   | 4                      | 10                     | 1.98                  | 1.78           |
| Largemouth bass      | 7      | 1.38                  | 17                   | 5                      | 9                      | 2.25                  | 2.13           |
| White crappie        | 32     | 6.31                  | 12                   |                        | 6                      | 1.57                  | 3.25           |
| Bluegill sunfish     | 5      | .99                   | 1                    | 4                      | 4                      | .16                   | 3.36           |
| White bass           | 16     | 3.16                  | 9                    |                        | 9                      | 1.17                  | 2.36           |
| Totals               | 507    | 100.00                | 768                  | 1                      |                        | 100.00                |                |

