# THE FISHERY POTENTIAL OF STOCKWATER RESERVOIRS ON BUREAU OF LAND MANAGEMENT LANDS IN GARFIELD COUNTY

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## Abstract

A total of 119 stockwater reservoirs were surveyed in Garfield County, with 25 being suitable for fish. Most ponds were small (77.4% less than 0.81 ha) and shallow (74.2% less than 2 m deep). Turbidity was considered to be limiting in most ponds. Fish populations were found in three ponds. Management recommendations were made to the Bureau of Land Management in relation to public access and fishery potential of the reservoirs.


## Introduction

In the past few years southeastern Montana has experienced a population explosion, with the increased interest in the coal reserves of the surrounding area. This ever growing number of people has brought about an intensified demand for recreational activities. In Montana, fishing is the most popular outdoor recreational activity. Since water-based recreation is scarce in southeastern Montana, maximum recreational use of stockwater dams is essential in fulfilling this demand.

There are many reservoirs currently situated on BLM land which may be suitable for recreational fisheries, and new ponds are being developed each year. Although pond construction should be encouraged in all areas, priorities should be assigned to proposed pond sites. Top priorities should be assigned to pond sites which are located close to the population centers. By placing the emphasis on pond construction within this area, recreational potential will be recognized. Another top priority is to identify ponds and pond sites which are located on public domain. This assures public access which enhances the recreational potential of the pond.

This study will investigate each reservoir by using certain features, i.e., water depth, water temperature, water quality, and access as parameters in determining suitability for a fish species. In this way BLM will be provided with an accurate inventory of their stockwater reservoirs and Montana Fish and Game will have a better idea of the fisheries potential represented by these ponds.

## Objectives

To inventory stockwater reservoirs located on BLM lands and make fishery management recommendations on these waters.

To resurvey previously stocked ponds in order to evaluate and update management recommendations.

To evaluate potential reservoir sites and assist in water development planning on BLM lands.

## Methods

The location of each pond was obtained from U.S.G.S. quad sheets and BLM recreation access guide maps. Each reservoir was photographed by a Rolle 120 camera and drawn in detail to assist in management decisions. Problem areas, i.e., dam erosion, seepage, spillway washes, and heavy silt deposition areas were given special attention.

Each reservoir was sequentially numbered and surveyed in the manner outlined in BLM manuals "Lake and Reservoir Surveys 6672" and "Water Analysis for Fisheries 6674". Field notes were recorded on Forms 6672-1 and 6674-3 and later transcribed to Forms 6672-2 and 6674-4. Photos were labeled with each ponds' number, location and other pertinent information. The size and shoreline lengths were estimated by measuring the water surface outline and comparing it with a pond of a known acreage. Depths were measured with a sounding line marked with one foot graduations. The light penetration was measured by a standard eight inch Secchi disc.

Surface to bottom temperatures and dissolved oxygen series were made 1 M intervals with a model T-4 Marine Hydrographic termometer and a kemmerer sampler respectively. Analysis for turbidity, pH and specific conductance were made with a Hach model Dr-El/2 chemical kit as outlined in the methods manual.

Fish populations were sampled by 38.1 m (125 ft.) x 1.5 m (5 ft.) monofilament gill nets. The nets were experimental, with meshes ranging from 1.9 cm (3/4 in.) to 5.1 cm (2 in.). Scale samples from largemouth bass and rainbow trout were sent to MSU for mounting.

## Results

The 119 ponds studied are located in the rough arid range country of northern Garfield County, at about the 2500 foot elevation level. The surrounding country is a sagebrush vegetative type with variations in the amount of grass and tree cover. This type of country lends itself easily to erosion and silt is a common problem with the stock water dams of this area. Of the 119 ponds surveyed,

26 were dry and 68 had a silt problem related to the direct runnoff into the reservoir.

The original copies of Forms 6672-2 and 6674-4 were submitted to the BLM along with the set of colored photos. All field notes and photograph negatives are on file in the Regional Fisheries office in Miles City.

The ponds ranged in size from .04 to 3.3 surface hectares (.1 - 7.5 acres) and averaged 0.6 surface hectares (1.4 acres). Maximum depths ranged from .15 to 3.31 meters (0.5 to 10.9 ft.) and averaged 1.53 meters (5.0 ft.). Light penetration ranged from .001 to 3.05 meters (.04 - 120.1 inches) and averaged .6 meters (23.6 in.). The bottoms of all reservoir surveyed consisted of a fine silt with varying amounts of detritus.

The dissolved oxygen ranged from 6.5 to 12.5 mg/l and averaged 8.47 mg/l. The turbidity ranged from 15 to 500 FTUs (Formazin Turbidity Units) and averaged 171.4 FTUs. The pH ranged from 7.5 to 10.1 and averaged 9.5, while the specific conductance ranged from 150 to 4000 microhm/cm and averaged 700 microhms/cm.

Physical parameters for the ponds are summarized in Table 1. The majority of the ponds surveyed were small with 77.4 percent less than .85 hectare (2.1 acres) in size. Only 22.6 percent were greater than .85 hectares (2.1 acres). Ponds were found to be generally shallow, with 74.2 percent having an average depth less than 2.0 meters (6.56 ft.). Light penetration was not considered good, with about 67 percent of the ponds showing penetration no deeper than 0.50 m (1.64 ft.). This illustrates the general high incidence of turbidity in the ponds. This is further shown by measured turbidity (Table 2). Turbidities greater than FTUs were found in 37.3 percent of the ponds.

At most ponds sites several orders of insects were observed among which were Odonata (dragon flies and damsel flies). Diptera, Ephemeroptera (mayflies) and Hemiptera (water boatment). Other aquatic invertebrates observed included Gastropoda (snails) and Hirudinea (leeches).

The emergent vegetation around most ponds included cattails (Typha), sweet flag (Acorus calnmus) and numerous types of rushes. Floating and submerged vegetation was present in most ponds and was classified as aquatic weeds.

Of the 93 ponds which contained water, 3 had existing fish populations. These were Twitchell Reservoir (T21N, R42E, Sec. 18), Coldwell Walleye Pond (T21N, R40E, Sec. 10) and the Engdale C.C. Reservoir (T20N, R36E, Sec. 1). Twitchell Reservoir had largemouth bass whereas Coldwell Walleye Pond had only pumkinseeds with walleyes being present

in 1975. The Engdahl C.C. Reservoir had a thriving population of rainbow trout ranging in size from 1.6 to 3.2 kilograms and averaging about 2.0 kilograms.

## Discussion

This study was conducted under many varied conditions and all data presented should be reviewed in a general manner. The temperature and dissolved oxygen combinations tend to favor the warm water fish species. Only 3 out of the 25 satisfactory ponds have water quality suitable for trout (Table 3). Eight ponds would support either largemouth bass or northern pike, six were suitable for walleye, six for largemouth alone and two for northerns alone.

Turbidity would probably be the greatest limiting factor in attempting to establish fisheries in these stock water dams. A study conducted on farm ponds showed that maximum production occurred where the average turbidity was less than 25 JTU. (Federal Water Pollution Control Administration, 1968). As turbidity between 25 and 100 JTU showed losses in fish production of 41.7 percent. And in muddy ponds where turbidity exceeded 100 JTU, the yield was only 18.2 percent of the clear ponds. Few ponds had clear water and the majority exceeded 100 JTU, suggesting limited fishery potential.

Access to these ponds should be given top priority. For example, of the 25 ponds suitable for fish only five have adequate access for sportsmen with two wheel drive vehicles. The remaining twenty have trails which are in poor condition and in need of repairs.

Overgrazing by livestock is a common land use problem in the Garfield County area. Since range conditions on most watersheds are poor, erosion is accelerated, resulting in heavy silt loads dumped into the reservoirs. Excessive livestock use of ponds is another problem, resulting in a loss of shoreline vegetation and increased turbidity. Changes in land use patterns and reservoir fencing programs would help reduce the turbidity common in these ponds. Problems associated with erosion of fills and spillways could be corrected with riprap.

The northern Garfield area represents a valuable resource in fishery potential. The utilization of this potential would be a valuable asset to the recreational fisheries of southeastern Montana.

Table 1. Array of physical parameters for stock water ponds found in Garfield County, Montana, 1976.

| Size (Hectares) | Number | Percent | Max. Depth (meters) | Number | Percent | Light Penetration (meters) | Number | Percent |
|---|---|---|---|---|---|---|---|---|
| .04 - .405 | 44 | 47.3 | .1 - 1.0 | 29 | 31.2 | 0- .01 | 40 | 33.6 |
| .455 - .81 | 28 | 30.1 | 1.1 - 2.0 | 40 | 43. | .01 - .50 | 40 | 33.6 |
| .85 - 1.22 | 13 | 14.0 | 2.1 - 3.0 | 15 | 16.1 | .51 - 1.00 | 19 | 16.0 |
| 1.26 - + | 8 | 8.6 | 3.1 - + | 9 | 9.8 | 1.01 - 1.50 | 13 | 1.09 |
| | | | | | | 1.51 - + | 7 | 5.9 |
| Total | 93 | 100 | | 93 | 100 | | 93 | 100 |

Table 2. Array of chemical parameters for stock water pond found in Garfield County, Montana, 1976.

| Dissolved Oxygen mg/l | Number | Percent | pH | Number | Percent | Turbidity (FTUs) | Number | Percent | Specific Conductance (microhms/cm) | Number | Percent |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.5 - 7.5 | 18 | 32.1 | 7.5 - 8.0 | 1 | 1.9 | 0 - 50 | 24 | 40.7 | 0 - 250 | 3 | 7.7 |
| 7.6 - 8.5 | 16 | 28.6 | 8.1 - 8.5 | 2 | 3.8 | 51 - 100 | 13 | 22.0 | 251 - 500 | 15 | 38.5 |
| 8.6 - 9.5 | 14 | 25.0 | 8.6 - 9.0 | 4 | 7.5 | 101 - 150 | 8 | 13.6 | 501 - 750 | 14 | 35.8 |
| 9.6 - 10.5 | 5 | 8.9 | 9.1 - 9.5 | 15 | 28.3 | 151 - + | 0 | 0 | 751 - 1000 | 1 | 2.6 |
| 10.6 - + | 3 | 5.4 | 9.6 - + | 31 | 58.5 | | 14 | 23.7 | 1001 - + | 6 | 15.4 |
| Total | 56 | 100 | | 53 | 100 | | 59 | 100 | | 39 | 100 |

Table 3. Summary of stock water reservoirs surveyed in Garfield County, 1976, recommended for introduction of fish.

| No. | | T | R | S | Size (ha) | Max. Depth (M) | Road 1/ Condition | Species 2/ Recommended |
|---|---|---|---|---|---|---|---|---|
| 1 | Twitchell #410 | 21N, | 42E, | 18 | 1.0 | 2.1 | Good | NP |
| 13 | Childers #83 | 21N, | 42E, | 10 | 0.5 | 2.7 | Good | LMB & NP |
| 14 | Three Bars #6595 | 21N, | 42E, | 17 | 0.5 | 2.1 | Poor | WEP |
| 15 | Richie #M-2-R-1361 | 21N, | 42E, | 29 | 0.2 | 3.4 | Fair | WEP |
| 22 | Upper Flat #6091 | 22N, | 40E, | 25 | 0.5 | 4.1 | Excellent | LMB |
| 28 | Ruby #1-C-117 | 22N, | 41E, | 25 | 0.5 | 1.5 | Fair | LMB |
| 33 | Breaks #2680 | 21N, | 41E, | 14 | 0.5 | 2.4 | Excellent | LMB |
| 35 | - | 21N, | 41E, | 22 | 0.6 | 3.4 | Excellent | WEP |
| 41 | - | 21N, | 40E, | 26 | 1.8 | 2.1 | Good | LMB & NP |
| 46 | - | 21N, | 40E, | 22 | 1.2 | 2.8 | Fair | LMB & NP |
| 47 | Coldwell | 21N, | 40E, | 10 | 1.6 | 4.0 | Good | WEP |
| 51 | - | 22N, | 41E, | 31 | 0.8 | 2.4 | Good | LMB & NP |
| 53 | Top Deck #6594 | 22N, | 40E, | 35 | 1.0 | 4.6 | Fair | WEP |
| 56 | Pass Cr. #6R-1 | 21N, | 40E, | 5 | 0.9 | 2.6 | Good | WEP |
| 57 | - | 22N, | 41E, | 7 | - | - | Poor | LMB & NP |
| 61 | - | 21N, | 40E, | 4 | 0.8 | 3.1 | Fair | LMB & NP |
| 77 | - | 21N, | 37E, | 28 | 0.5 | 2.1 | Good | LMB & NP |
| 85 | Pearl | 20N, | 37E, | 6 | 0.9 | 1.8 | Fair | NP |
| 86 | Engdahl C.C. | 20N, | 36E, | 1 | 0.6 | 3.3 | Fair | Rb |
| 91 | Last Chance | 21N, | 32E, | 13 | 0.4 | 2.0 | Poor | LMB |
| 95 | - | 21N, | 31E, | 26 | 0.4 | 2.1 | Poor | LMB |
| 99 | - | 20N, | 32E, | 21 | 0.6 | 3.1 | Good | Rb |
| 110 | - | 21N, | 30E, | 13 | 0.8 | 2.4 | Poor | LMB |
| 116 | - | 21N, | 35E, | 6 | 0.5 | 1.8 | Fair | LMB & NP |
| 117 | - | 21N, | 35E, | 5 | 0.8 | 3.1 | Good | Rb |

1/ Excellent and good road conditions - accessible with 2-wheel drive vehicle most time; fair-poor- accessible with 4-wheel drive or walking.

2/ NP - northern pike; LMB - large mouth bass; WEP - walleye pike; Rb - rainbow trout.

## Literature Cited

Federal Water Pollution Control Administration. 1968. Water Quality Criteria. U.S. Dept. Interior; 234 pp.