# NEVADA DEPARTMENT OF WILDLIFE
# STATEWIDE FISHERIES MANAGEMENT

## FEDERAL AID JOB PROGRESS REPORTS

F-20-54
2018

## ELKO COUNTY
## SMALL LAKES AND RESERVOIRS
## EASTERN REGION

**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION**
**ANNUAL PROGRESS REPORT**

Table of Contents

**NEVADA DEPARTMENT OF WILDLIFE, FISHERIES DIVISION**
**ANNUAL PROGRESS REPORT**

**State:** *Nevada*
**Project Title:** *Statewide Fisheries Program*
**Job Title:** *Elko County Small Lakes and Reservoirs*
**Period Covered:** *January 1, 2018 through December 31, 2018*

## SUMMARY

For the 2018 calendar year, Elko County small lakes and reservoirs received nearly 21,000 stocked rainbow trout. Additionally, 750 channel catfish were stocked into Jakes Creek Reservoir in April.

Angling at most reservoirs was considered fair, which was expected during the rebuilding phase of the fisheries after several years of impacts from drought. Angler information was scarce in 2018, with 44 drop-box questionnaires received at Jakes Creek Reservoir, 17 from Jiggs Reservoir, and 3 from Dry Creek Reservoir.

An electroshocking survey at Jiggs Reservoir in June found good numbers of largemouth bass and bluegill, with both having recently spawned and showing multiple age-classes. Stocked trout were in poor body condition due to low water levels and high water temperatures.

In April, two experimental gill nets were set overnight in Jakes Creek Reservoir and produced 79 fish that included 31 bridgelip suckers (39.2% of the total fish caught). Although total abundance of suckers has only declined a bit, it appears that biological control by channel catfish predation may be effecting younger age class.

Approximately 2,004 8.6-inch rainbow trout were stocked into Dry Creek Reservoir in June and periodic visits were made to document water levels, stocking events, and angling conditions. The water level was at moderate capacity through July and by October, irrigation demands reduced the water level to 30% capacity. Approximately 75 signal crayfish (*Pacifastacus leniusculus)* were captured from Wildhorse Reservoir in August and were augmented into Dry Creek Reservoir to diversify the black bass diet.

After Willow Creek Reservoir dam was rebuilt and outlet works replaced/repaired in summer, a joint effort between Barrick Gold Corporation, contractors, NDOW, and volunteers constructed and placed out 152 fish habitat structures along the bottom during September. Designs types emulated structures from other fisheries throughout the country proven to benefit different life stages of sport fishes, especially white crappie, channel catfish, and black bass. A new concrete boat ramp was constructed by Barrick Gold Corporation on the southwest shoreline to improve boat launching.

## BACKGROUND

### Angel Lake

Angel Lake is a natural alpine lake located at 8,000 feet elevation that was modified to provide additional storage for irrigation. It covers 13 surface acres and has a maximum depth of 35 ft. It is located 13 miles southwest of the town of Wells in the East Humboldt Range. The lake contains brook trout, rainbow trout, tiger trout, and speckled dace. The fishery is managed under a Put-and-Take Fishery Management Concept due to trout having limited carryover and being immediately harvested after stocking.

### Carlin Pond

Designated as an urban fishery, Carlin Pond was created by overflow from the Carlin City water system. Biannual stocking provides a put-and-take trout fishery. It uniquely does not freeze during the winter, however, when water temperatures begin to rise in summer, a buildup of aquatic vegetation restricts fishing.

### Cow Creek Reservoir

Cow Creek Reservoir is located approximately 10 miles southeast of Jackpot. The reservoir is a small livestock-watering pond that is fed by Cow Creek and falls within a narrow canyon. The original dam blew out in 1984 and it was replaced with a smaller dam that impounded less water. Low water years, or when there is below average precipitation, create a limited water source for the trout fishery and, thus, only 500 trout are scheduled for stocking every other year. This water provides a put-grow-and-take fishery primarily for the residents of Jackpot.

### Dorsey Reservoir

Dorsey Reservoir is located approximately 18 miles north of Elko, covers 20 surface acres, and has a depth capacity of 24 ft. It is privately owned and used for irrigation and stock water, which causes seasonal drawdowns. Shortly after spring trout stocking, the water level typically begins to drop and as summer progresses and the water warms, it creates poor trout habitat. Dorsey Reservoir is managed under a Put-and-Take, Coldwater Fisheries Management Concept due to the high level of angler harvest and minimal carryover.

### Dry Creek Reservoir

Dry Creek Reservoir was constructed in 1961 and sits on private property with limited public access. It was first stocked with trout in 1963 and fishing was good for a few years. Nongame fish numbers rapidly increased so the reservoir and tributaries were treated with rotenone in 1970. The reservoir was restocked with rainbow trout and it continues to be stocked annually with catchable rainbow trout. In 1974, smallmouth

bass were introduced as a biological control for the recurrent, expanding nongame fish populations (bridgelip sucker and dace).

The smallmouth bass population became well established and it now provides a viable warmwater sport fishery. Largemouth bass salvaged from Wilson Sink Reservoir in 2014 were introduced into Dry Creek Reservoir to diversify angler opportunity. Dewatering of the reservoir to minimum pool occurred in 2009, 2013, and 2014 and limited the amount of fish habitat. Even with these setbacks, management emphasis has been to provide recreational panfish, black bass, and put-grow-take "quality" trout fisheries.

Jakes Creek Reservoir

Jakes Creek Reservoir is located about 35 miles north of Wells, six miles off Highway 93. The reservoir covers 62 surface acres and has a maximum depth of 16 ft at full capacity. It is managed primarily with a General Coldwater Fishery Management Concept and, secondarily, with a General Warmwater Fishery Management Concept. The reservoir is stocked yearly with rainbow trout and it has a self-sustaining population of largemouth bass. Channel catfish were introduced in 2008 to increase fishing opportunity and provide biological control of native bridgelip sucker. As summer progresses, shoreline vegetation increases and reduces the quality of shoreline fishing, but fishing by boat can greatly increase angler success. Trout fishing is typically good in spring and fall and somewhat slower in summer, although largemouth bass fishing tends to increase with the rise in water temperature. The reservoir provides a yearlong recreational opportunity, with safe levels of ice developing during most winters to facilitate ice fishing.

Jiggs Reservoir

Jiggs, or Zunino, Reservoir is located approximately 30 miles south of Elko. The reservoir covers 45 surface acres and has a maximum depth of 10 feet at full capacity. The reservoir is limited by the amount of inflow legally allotted to the reservoir, which makes it very susceptible to drought events. A low water level in winter has led to use of aerators during ice up periods to sustain the fishery during hypoxic conditions.

Enhancement of the reservoir was completed in late 2014, which deepened the reservoir by several feet and added a mixture of bentonite clay to help reduce water loss from seepage. The dam was also rebuilt and upgraded to comply with safety standards. Improvements are expected greatly to improve the chance of creating a perennial pool that benefits fish and wildlife during drought years. Rainbow trout, largemouth bass, and bluegill were first (re)stocked in April and May of 2016, and since then, rainbow trout has been stocked annually.

Willow Creek Reservoir

Willow Creek Reservoir was historically a native Lahontan cutthroat trout fishery along with Tahoe sucker, speckled dace, and redside shiner. Since Lahontan cutthroat trout has not done well, management emphasis has been directed toward a diversified recreational fishery through augmentation with white crappie, black bass, and channel catfish. The reservoir was significantly dewatered in November 2017 due to faulty mechanical components of the dam's water release valves. The fix required a complete rebuild of components along with refurbishment of the existing dam face and outlet structure. Construction was completed by fall 2018 and rebuilding the popular sport fishery commenced soon after.

## OBJECTIVES and APPROACHES

Angel Lake

Objective: General Sport Fisheries Management

- Conduct a pre-stocking evaluation of road conditions and water quality/quantity.
- Conduct a general fisheries assessment through opportunistic angler contacts.
- Conduct a visual survey of the shoreline to evaluate over-winter mortality immediately after spring ice breakup.

Carlin Pond

Objective: General Sport Fisheries Management

- Visually assess water quantity (pond level, inflow/outflow) and quality (clarity) for coordinating trout stocking.

Cow Creek Reservoir

Objective: General Sport Fisheries Management

- Conduct a pre-stocking evaluation of road conditions and water quality/quantity.

Dorsey Reservoir

Objectives: General Sport Fisheries Management

- Conduct a pre-stocking evaluation of road conditions and water quality/quantity.
- Conduct a general fisheries assessment through opportunistic angler contacts.

Dry Creek Reservoir

Objectives: General Sport Fisheries Management

- Conduct an evaluation of water quantity and sport fish stocking opportunities in spring. Stock rainbow trout as conditions improve and stabilize.
- Perform opportunistic angler contacts to evaluate the fisheries and its recovery after the drought.
- Maintain and check return of angler drop-box surveys.
- If reservoir water levels allow, augment the crayfish population to supplement the black bass diet. Populations should be translocated from proximal waters.
- Implement a sport fish salvage in the reservoir if necessary due to low water levels associated with drought.

Jakes Creek Reservoir

Objectives: General Sport Fisheries Management

- Conduct a pre-stocking evaluation of road conditions and water quality/quantity.
- Conduct a general fisheries assessment through opportunistic angler contacts.
- Maintain and check for returns of voluntary angler drop-box surveys.
- Augment the channel catfish population (500) in the spring.
- Conduct a two net-night experimental gill netting survey in the spring.

Jiggs Reservoir

Objectives: Evaluate water improvements and fishery after reservoir renovation.

- Conduct a single nighttime electroshocking survey in the summer to evaluate the success of the previously stocked rainbow trout, largemouth bass, and bluegill sunfish.

Willow Creek Reservoir

Objectives: General Sport Fisheries Management

- Salvage game fish below the dam as needed for transplanting in Wildhorse Reservoir.
- Assist the private landowner (Barrick Gold Corporation) with rebuilding Willow Creek Dam, the fishery, and fish habitat structures as needed.
- Reintroduce white crappie, black bass, and channel catfish as the reservoir water level stabilizes. Utilize large- and smallmouth bass from South Fork Reservoir and/or Wildhorse Reservoir.

## PROCEDURES

Coordinating trout stocking with state hatcheries requires evaluating water levels, water temperatures, and access road conditions prior to scheduled stocking. Information is then relayed to hatchery personnel.

Following ice breakup in spring, fish winterkill surveys are completed by a one or two person crew walking the shoreline conducting an ocular survey and counting fish mortalities.

Creel surveys are completed by personally contacting anglers for fishing information or having anglers volunteer their information at drop-boxes located at certain reservoirs. Information gathered includes number of anglers, hours fished, fish caught, fish released, and fishing method used.

Electroshocking surveys are conducted by barge, with fixed probes as the anode and the barge serving as the cathode. Captured fish are identified, measured, weighed, and released.

Salvaging fish for transplanting in a different water body/fishery is accomplished through electroshocking, beach seining, hook-and-line, frame netting, and trawling from approved water sources of similar water quality and fish composition.

## FINDINGS

Angel Lake

In May, ice conditions and fish mortality were assessed. The lake was ice-free and only four trout mortalities were observed, which were presumed to be associated with angling. It was estimated that overwinter fish loss was low.

Road and water conditions were checked in early June, noting the stocking path was open and a full lake provided adequate water temperatures for planting trout. In June and July, over 3,300 Eagle Lake strain rainbow trout and 1,317 tiger trout were successfully stocked. An additional 1,611 Eagle Lake strain rainbow trout were stocked in August.

Combining creel visits with other work duties, no anglers were contacted in 2018. However, data was collected during the Angel Lake fishing derby in July, measuring 51 rainbow trout and two tiger trout. Tiger trout visually appeared to be in good body condition and rainbow trout were measured for body condition factor. From all rainbow trout, 36 fish (70.6%) were in poor condition, 13 (25.5%) in fair condition, and 2 (3.9%) in good condition. Due to the close timing of the fishing derby and the stocking of rainbow trout, it appears as though fish were in poor to fair body condition coming from the hatchery.

Carlin Pond

Conditions at this small spring-fed pond usually are relatively stable, which insures a suitable water temperature for spring and fall trout stocking. Carlin Pond received 1,851 rainbow trout between spring and fall plants.

Cow Creek Reservoir

During April, the water level was near capacity and the water temperature was within an acceptable level for stocking. In May, 539 rainbow trout were stocked.

Dorsey Reservoir

After a check of road conditions in April, this small reservoir was full and had an acceptable water temperature for stocking trout. A total of 2,035 Eagle Lake strain rainbow trout were stocked in May. Multiple visits were made in 2018 and no anglers were contacted. By mid- to late summer the water level dropped quite low, but it was suspected that trout would survive to carry over into next year.

Dry Creek Reservoir

Dry Creek Reservoir was stocked with 2,004 trout in June, the third time it was stocked with trout since 2013. The voluntary angler drop-box survey was available the entire year, but only collected three surveys. Three anglers reported fishing 15 hours to catch 32 bass, harvesting 21, and measuring between 8 and 16 inches. Random visits during the summer only contacted one angler who caught six large- and one smallmouth bass in two hours of angling effort. The average size was 10.1 in TL for largemouth and 9.4 in TL for the smallmouth.

Approximately 75 signal crayfish (*Pacifastacus leniusculus)* were captured from Wildhorse Reservoir and released into Dry Creek Reservoir on August 15 to augment the depleted stock and to diversify the diet of black bass.

Jakes Creek Reservoir

Prior to stocking trout, water levels were found to be adequate and water temperatures were within suitable range for stocking. In June, 3,044 Eagle Lake strain rainbow trout were stocked, with an additional 2,021 Erwin Arlee strain rainbow trout stocked in October. After coordinating with the Western Region on the warmwater fish order, 750 channel catfish were stocked in April.

During multiple visits to the reservoir, eleven anglers were contacted that put forth 22 hours of effort to capture 32 fish, resulting in success rates of 2.9 fish per angler and 1.5 fish per hour. Between March and November, 44 drop-box angler questionnaires were received, showing 85 anglers put forth 322 hours of angling effort to capture 427 fish and resulting in success rates of 5.02 fish per angler and 1.33 fish

per hour. Anglers caught five channel catfish, further suggesting they survive in the reservoir, although at moderate levels.

On April 23, two experimental gill nets were soaked overnight for 16.3 hours. The first net was set at the dam and produced 23 rainbow trout, 3 bridgelip suckers, 1 channel catfish, and 1 largemouth bass. The second net was set near the inlet, producing 23 rainbow trout, 28 bridgelip suckers, 2 channel catfish, and 4 largemouth bass.

Bridgelip suckers comprised 39.2% of the fish caught and Table 1 compares bridgelip sucker numbers since 1982. Gill netting is conducted by soaking two-gill nets overnight, one perpendicular to the dam and one in the area of the shallow inlet. However, since 1987, when the water level drops, there are times when only one net is set in deep water. A five-year study was begun in 2014 using two nets to monitor bridgelip sucker abundance and size structure, and it appears there has been a reduction in bridgelip suckers smaller than 9.4 in (240 mm). Associated with this was a shift to a larger average size from 2004 to 2016 (Table 1). Channel catfish were initially stocked in 2008 and since then, it has become increasingly difficult to locate large numbers of suckers under 9.4 inches (240 mm). However, smaller suckers began to appear after 2016. The 2018 survey in the study found the largest suckers along with the most abundant small suckers, those under 240 mm. The current data suggests there is an ending of the older dominate generation of suckers and the beginning of the next, younger generation. Future of surveys will be critical in understanding the impact that channel catfish has on sucker population dynamics in this small reservoir. If the numbers of smaller suckers continues to remain low, it is likely that catfish are effective as a biological control.

**Table 1.** Jakes Creek Reservoir Bridgelip Sucker Survey Summaries.

| mm | inches | 1982 | 1987 | 1992 | 2000 | 2004 | ~375 channel catfish stocked in September of 2008 | 2008 | 2011 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 5.5 | 1 | 0 | 1 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160 | 6.3 | 1 | 1 | 1 | | | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 180 | 7.1 | 0 | 12 | 4 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 |
| 200 | 7.9 | 1 | 23 | 1 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |
| 220 | 8.7 | 0 | 23 | 5 | | | | 2 | 0 | 0 | 0 | 0 | 1 | 7 | 2 |
| 240 | 9.4 | 2 | 27 | 2 | | | | 0 | 1 | 0 | 0 | 0 | 0 | 5 | 3 |
| 260 | 10.2 | 3 | 22 | 1 | | | | 3 | 2 | 2 | 0 | 1 | 0 | 3 | 2 |
| 280 | 11.0 | 1 | 5 | 1 | | | | 4 | 7 | 0 | 5 | 2 | 0 | 1 | 0 |
| 300 | 11.8 | 4 | 5 | 6 | | | | 5 | 7 | 5 | 5 | 0 | 2 | 0 | 3 |
| 320 | 12.6 | 4 | 0 | 2 | | | | 4 | 2 | 6 | 4 | 2 | 4 | 1 | 0 |
| 340 | 13.4 | 8 | 0 | 7 | | | | 4 | 4 | 4 | 8 | 6 | 7 | 2 | 0 |
| 360 | 14.2 | 7 | 1 | 0 | | | | 1 | 0 | 5 | 5 | 10 | 13 | 4 | 7 |
| 380 | 15.0 | 1 | 2 | 0 | | | | 0 | 2 | 3 | 1 | 11 | 17 | 7 | 2 |
| 400 | 15.7 | | | 0 | | | | 0 | 1 | 0 | 1 | 3 | 10 | 3 | 6 |
| | N = | 33 | 121 | 31 | 20 | 43 | | 23 | 26 | 25 | 29 | 35 | 55 | 36 | 31 |
| Range | Low | 152.4 | 170.2 | 139.7 | 176 | 203 | | 231 | 246 | 273 | 282 | 245 | 162 | 165 | 179 |
| | High | 381 | 386.1 | 355.6 | 342 | 355 | | 362 | 400 | 390 | 400 | 390 | 403 | 401 | 412 |
| | | | | | | | | | | | | | | | |
| | Average | 314.9 | 243.8 | 271 | 257 | 297 | | 306.8 | 316.7 | 338.5 | 335.2 | 346.7 | 350.9 | 286.8 | 297.5 |

To evaluate the survival of the stocked channel catfish, a trotline was set in conjunction with gill nets. Ten hooks were baited with shrimp and soaked overnight to catch five channel catfish ranging from 15.6 to 22.8 inches (395 to 580 mm) total length. The average was 20.5 inches (520.4 mm). Over the first eight years after stocking, approximately 20 to 25 channel catfish have been documented through angler creel, trapping/netting, electroshocking, and trotlining. The last three years of population surveys have produced 18 channel catfish, with creel data providing an additional 15.

The increased documentation of adult channel catfish tends to correspond to the decline in smaller size classes of bridgelip suckers. Work will continue with monitoring to further support that channel catfish control sucker abundance along with evaluating dietary preference of channel catfish through use of gastric lavage.

The fishery appears to have successfully endured consecutive years of drought. It should continue to provide a quality fishing experience for rainbow trout, largemouth bass, and the occasional channel catfish and brown trout.

Jiggs Reservoir

Electroshocking was conducted on June 13 under relatively clear skies, a light wind, and 73.4°F degree water temperature. With a dry spring and early summer, the reservoir water level was relatively low, mainly at the low pool created from the enhancement project. A majority of the reservoir was surveyed, including the entire shoreline and the center of the reservoir in areas having dense vegetation. From 2000 to 2050 hrs, 801 electroshocking seconds were used to capture 83 fish. The catch was composed of 39 largemouth bass, 40 bluegill, and 4 rainbow trout. Several trout went purposely uncaptured to reduce stress levels from there being high water temperatures in the reservoir.

Length and weight were measured on 21 largemouth bass for body condition analysis, resulting in 10 largemouth bass in good condition (47.6%) and 11 in excellent condition (52.4%). Length of 39 largemouth bass averaged 8.4 inches (214.2 mm) TL, with a range from 3.3 to 19.3 inches (84 to 490 mm). The length frequency appeared to represent at least three different age classes, including transplanted largemouth bass and the next two years of reproduction. As this refurbished reservoir ages, it is expected the age structure of largemouth bass will stabilize and provide a quality largemouth bass fishery.

From 40 bluegill measured, the average was 4.4 inches (111.4 mm) TL and ranged from 2.1 to 6.9 inches (54 to 176 mm). Several smaller (two-inch range) fish went uncaptured. Because stocked bluegill were of various sizes, it was difficult to evaluate the number of age classes and determine growth, however, the presence of two-inch fish shows that natural reproduction is occurring. All fish appeared to be in good condition. The rainbow trout caught were visually slender and unhealthy looking.

Overall, the fishery appeared to be successful and has progressed in size over the last two years. Unfortunately, the dry spring and summer this year has restricted the size of the reservoir to the low pool area.

Jiggs Reservoir is unique since it does not have a drainage basin, but is reliant on water supplied by irrigation ditches. The primary goal of the bentonite clay layer was to retain water during drought conditions; however, the small, low-pool will be susceptible during high summer temperatures and winter freezing events. For this

reason, water quality and quantity monitoring will be required to help adequately manage this fishery.

Willow Creek Reservoir

Failure of the Willow Creek Reservoir dam regulating components (valves, actuators, slides, etc.) in fall of 2017 resulted in complete reservoir draw down and total loss of this popular sport fishery. The private property owner (Barrick Gold Corporation) repaired, replaced, and enhanced infrastructure dam hardware along with resurfacing the dam face and abutments with cement shotcrete and other materials. Work completed by September 2018. No salvage of sport fish occurred for replanting in Willow Creek Reservoir in 2018, however, a multitude of juvenile white crappie were caught downstream and stocked into other waters of the state.

A joint effort between Barrick Gold Corporation, contractors, NDOW, and volunteers constructed fish habitat structures during September. Along the northern shoreline, 152 structures of multiple designs were arranged throughout the dry lakebed. Design types copied those from other fisheries throughout the country that have been proven to benefit different life stages of sport fishes, especially white crappie, channel catfish, and black bass. Materials included wooden pallets, cut and limbed juniper trunks, cobble and boulders, 4x4 in timbers, 12 and 24-inch diameter HDPE pipe, and various concrete block (Attachment 1). On September 20, GPS locations were recorded at each structure for future monitoring and navigational use (Figure 1 and Attachment 2).

Commercial PVC fish habitat structures will be purchased for submerging along the south shoreline and county roadside, ensuring access for shore anglers and increase angling opportunities.

## MANAGEMENT REVIEW

Angel Lake

The approaches were completed in 2018.

Carlin Pond

The approach was completed in 2018.

Cow Creek Reservoir

The approach was completed in 2018.

Dorsey Reservoir

The approaches were completed in 2018.

Dry Creek Reservoir

The approaches were completed in 2018.

Jakes Creek Reservoir

All approaches were completed in 2018. After eight years of spring gill netting, data suggests some benefits from introduced channel catfish, including impacts on smaller age class Tahoe suckers. Future creel, gill netting, and electroshocking surveys will provide data to evaluate the contribution of channel catfish to the fishery. Jakes Creek Reservoir continues to be a successful "general," multispecies fishery.

Jiggs Reservoir

The single objective was completed in 2018.

Willow Creek Reservoir

With dam repairs completed by late summer, the rebuilding this popular sport fishery began with construction and placement of fish habitat structures on the dry lakebed. Habitat structurers will benefit multiple species during various life stages and act as angling targets to locate fish. Stocking of white crappie, channel catfish, and largemouth bass is anticipated for spring of 2019.

## RECOMMENDATIONS

Angle Lake
- Continue to evaluate water conditions prior to hatchery trout stocking.
- Collect angler creel data during the annual Angel Lake fishing derby in July.

Carlin Pond
- Continue to evaluate water conditions prior to hatchery trout stocking.

Cow Creek Reservoir
- Monitor water conditions and stock trout during suitable conditions.

Dorsey Reservoir
- Continue to evaluate water conditions prior to hatchery trout stocking.

Dry Creek Reservoir
- Monitor reservoir water levels and implement the 2017 Dry Creek Reservoir Fisheries Management Prescription.
- Continue to maintain the volunteer angler drop-box.

Jakes Creek Reservoir
- Continue to evaluate water conditions prior to hatchery trout stocking.

- Continue to collect angler creel data throughout the fishing season.
- Conduct a single nighttime electroshocking survey in 2019.

Jiggs Reservoir

- Continue to monitor water conditions throughout the year to document the overall success of the repair project.

Willow Creek Reservoir

- Continue to monitor reservoir water levels and reservoir conditions during rebuilding of dam and outlet structures.
- Augment white crappie, channel catfish, and black bass when available and when reservoir conditions allow.
- Publicize and inform the angling public on the current conditions of the fishery.

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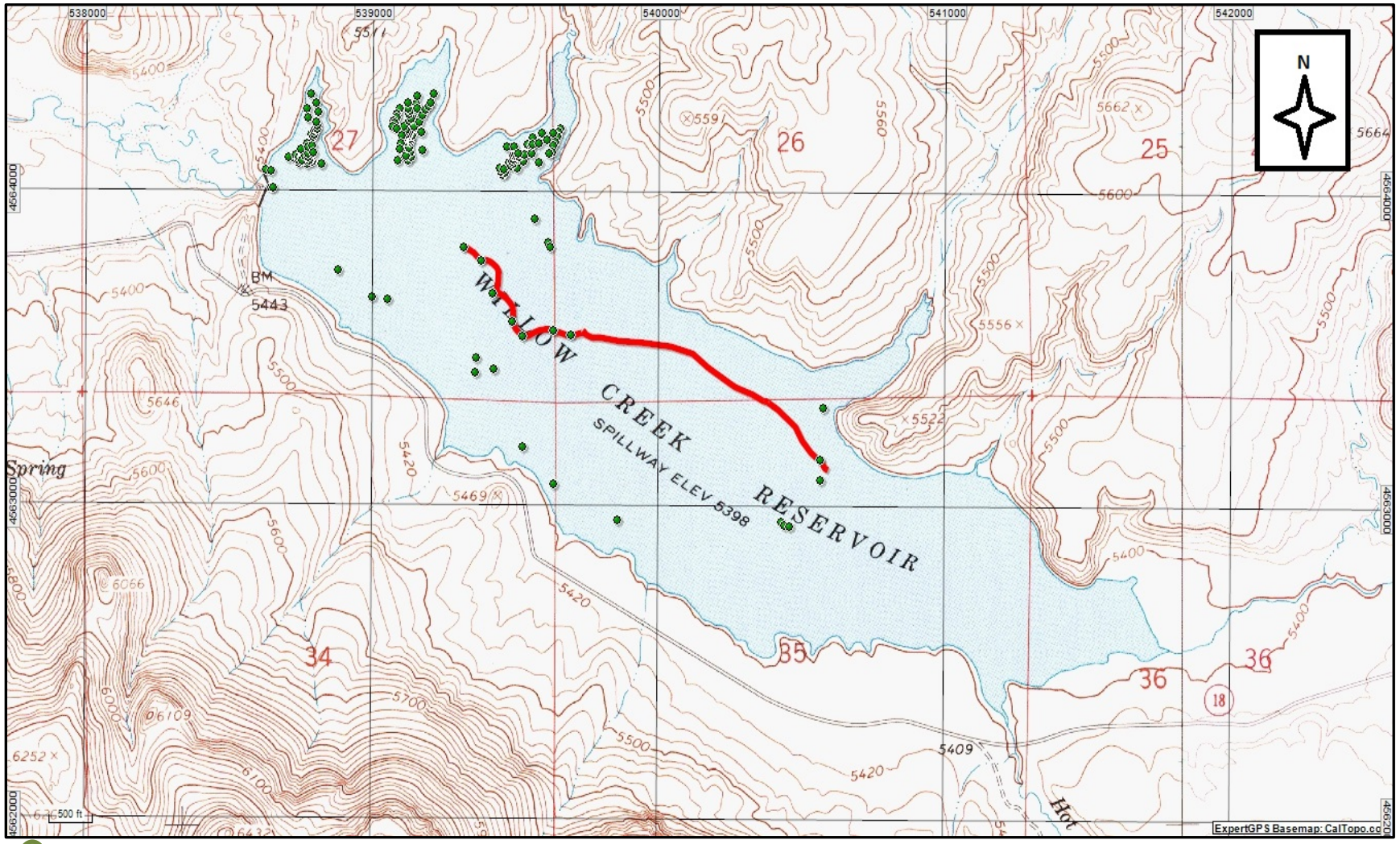
Chris Drake, Biologist III, Eastern Region

Date: February 2019

**Figure 1**

## Willow Creek Reservoir Fish Habitats Locations



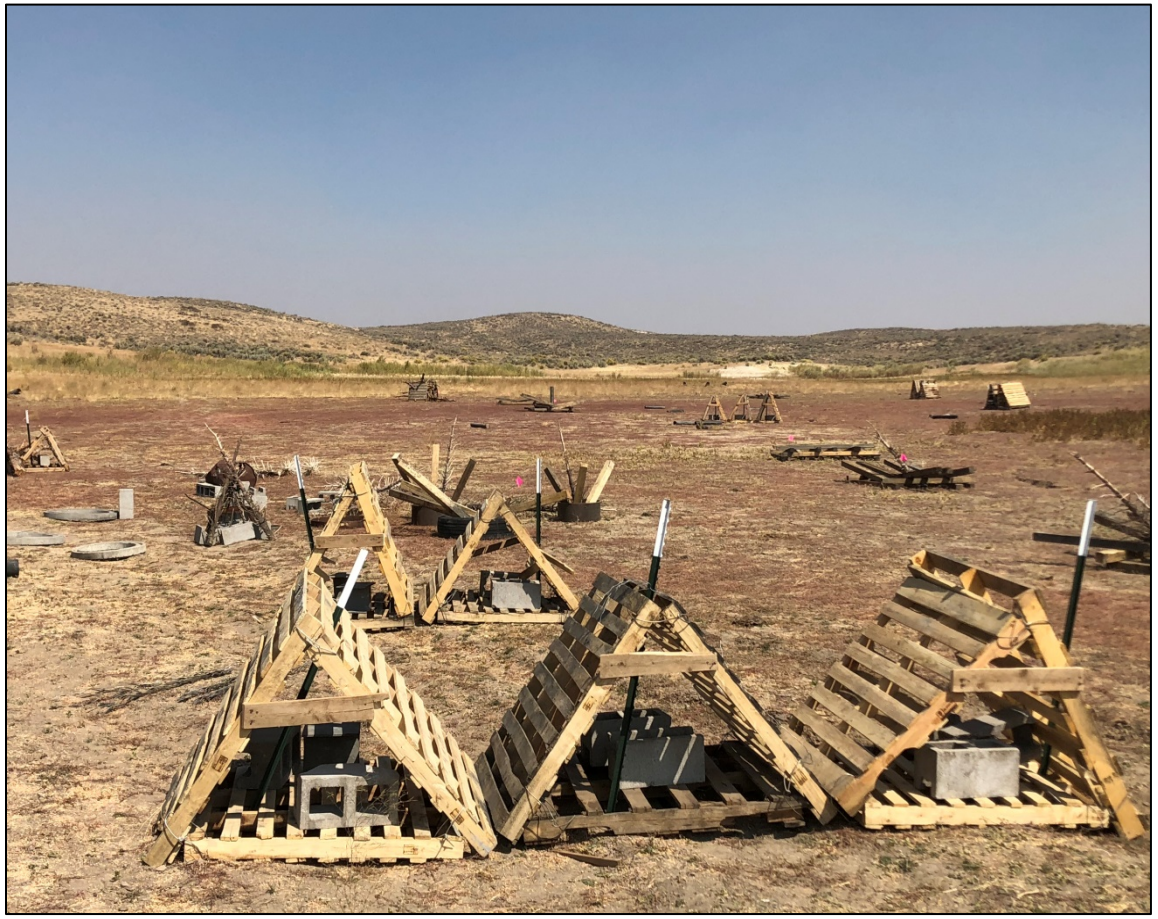

September 2018 Artificial Habitat Locations

Main Reservoir Channel Location

**Attachment 1**

## Willow Creek Reservoir Sport Fish Habitat Structures September 2018

Crappie Porcupine Crib timbers with rock anchors.



“Crappie Condos” with two and three teepee pallet units.

12-inch HDPE pipe “Catfish Cannons,” embedded into shoreline.

Anchored vertical juniper trunks with rock substrate base.

24-inch HDPE black bass spawning ring with rock substrate center.

View of north shore, 3rd Cove fish habitat structures during construction and placement on September 8, 2018.

**Attachment 2**

# Willow Creek Reservoir September 2018 Artificial Fish Habitat Locations (UTM's)

**North Cove - Spillway**

| Easting | Northing | Elevation | Way Point Number | Habitat Type | Comments |
|---|---|---|---|---|---|
| 538823.4 | 4564081.3 | 5,339.4 | 113 | Catfish Cannons | Associated With Old X-mas trees |
| 538790.3 | 4564088.6 | 5,344.0 | 114 | Rock Mound | Approx. 3 ' Tall x 10' Long |
| 538781.4 | 4564091.9 | 5,341.8 | 115 | Rock Mound | Rock with pallets |
| 538771.8 | 4564083.6 | 5,345.4 | 116 | Crappie Porcupine Crib | With Rock on top |
| 538778.6 | 4564093.1 | 5,344.8 | 117 | Crappie Porcupine Crib | With Rock on top |
| 538763.2 | 4564091.9 | 5,345.5 | 118 | Rock Mound | Approx. 2 ' Tall x 6' Long |
| 538743.8 | 4564085.6 | 5,344.6 | 119 | Crappie Condo | 3 Teepees, spaced 10' apart |
| 538730.0 | 4564098.7 | 5,345.1 | 120 | Crappie Condo | 4 Teepees in a row |
| 538741.8 | 4564093.2 | 5,346.0 | 121 | Crappie Condo | Single Teepee |
| 538744.4 | 4564104.7 | 5,345.7 | 122 | Crappie Condo | Single Teepee |
| 538708.7 | 4564102.8 | 5,349.6 | 123 | Catfish Cannons | |
| 538731.8 | 4564111.5 | 5,348.6 | 124 | Catfish Cannons | |
| 538742.2 | 4564104.5 | 5,346.0 | 125 | Crappie Condo | Single Teepee |
| 538752.5 | 4564105.2 | 5,347.4 | 126 | Crappie Condo | Single Teepee |
| 538758.5 | 4564102.0 | 5,346.4 | 127 | Crappie Porcupine Crib | With Rock on top |
| 538761.4 | 4564098.2 | 5,348.9 | 128 | Crappie Condo | 3 Teepees, |
| 538753.2 | 4564093.9 | 5,348.2 | 129 | Crappie Condo | 3 Teepees, |
| 538763.3 | 4564108.2 | 5,348.5 | 130 | Crappie Condo | 3 Teepees, |
| 538776.9 | 4564103.2 | 5,351.4 | 131 | Crappie Condo | 2 Teepees, |
| 538776.4 | 4564115.7 | 5,353.3 | 132 | Crappie Porcupine Crib | With Rock on top |
| 538750.6 | 4564128.1 | 5,356.9 | 133 | Catfish Cannons | |
| 538769.8 | 4564145.3 | 5,354.2 | 134 | Catfish Cannons | |
| 538775.1 | 4564137.6 | 5,353.0 | 135 | Crappie Porcupine Crib | With Rock on top |
| 538788.0 | 4564140.2 | 5,356.4 | 136 | Catfish Cannons | |
| 538792.5 | 4564117.9 | 5,356.1 | 137 | Catfish Cannons | |
| 538784.5 | 4564175.2 | 5,357.4 | 138 | String of Ol,d X-mas trees | From 2018 Habitat Improvement Project |
| 538793.1 | 4564169.9 | 5,363.7 | 139 | Bass Ring | No Rock associated with ring |
| 538797.9 | 4564176.4 | 5,366.1 | 140 | Bass Ring | No Rock associated with ring |
| 538795.7 | 4564188.1 | 5,363.0 | 141 | Bass Ring | No Rock associated with ring |
| 538799.1 | 4564193.0 | 5,363.6 | 142 | Bass Ring | No Rock associated with ring |
| 538807.8 | 4564194.5 | 5,364.5 | 143 | Bass Ring | With Rock inside ring |
| 538808.3 | 4564202.8 | 5,365.3 | 144 | Bass Ring | With Rock inside ring |
| 538805.3 | 4564214.5 | 5,366.0 | 145 | Bass Ring | With Rock inside ring |
| 538812.2 | 4564247.1 | 5,369.7 | 146 | Bass Ring | With Rock inside ring |
| 538803.6 | 4564276.5 | 5,371.9 | 147 | Bass Ring | With Rock inside ring |
| 538783.6 | 4564304.4 | 5,377.0 | 148 | Bass Ring | With Rock inside ring, w willow nearby |
| 538771.9 | 4564256.6 | 5,376.3 | 149 | Bass Ring | With Rock inside ring |
| 538773.3 | 4564228.2 | 5,373.0 | 150 | Bass Ring | With Rock inside ring |
| 538628.5 | 4564062.8 | 5,383.6 | 151 | Spillway | Elevation 5,383 @ 100% capacity |
| 538646.6 | 4564059.0 | 5,373.0 | 152 | Dam Bedrock | |
| 538648.0 | 4564006.1 | 5,347.7 | 153 | Lower Dam Intake | |
| 538654.5 | 4564005.7 | 5,353.4 | 154 | 4 Culverts | Rock Pad 100' Long x 30' wide |

**North Cove - Middle Cove**

| Easting | Northing | Elevation | Way Point Number | Habitat Type | Comments |
|---|---|---|---|---|---|
| 539088.6 | 4564094.5 | 5,351.5 | 155 | Rock Mound | 5' Tall x 15' Long |
| 539114.0 | 4564106.4 | 5,352.9 | 156 | Vertical Juniper Trunks | With Rock base, approx 12' Tall |
| 539124.2 | 4564093.1 | 5,351.9 | 157 | Vertical Juniper Trunks | With Rock base, approx 12' Tall |
| 539134.1 | 4564105.0 | 5,348.7 | 158 | Vertical Juniper Trunks | With Rock base, approx 8' Tall |
| 539131.9 | 4564120.6 | 5,353.4 | 159 | Vertical Juniper Trunks | With Rock base, approx 8' Tall |
| 539115.7 | 4564110.4 | 5,353.4 | 160 | Rock Mound | Approx. 2 ' Tall x 8' Long |
| 539121.7 | 4564132.6 | 5,355.3 | 161 | Crappie Condo | 2 Teepees, |
| 539128.5 | 4564136.0 | 5,355.3 | 162 | Crappie Condo | Single Teepee |
| 539132.3 | 4564151.6 | 5,355.0 | 163 | Crappie Porcupine Crib | With Rock on top |
| 539126.2 | 4564154.2 | 5,355.5 | 164 | Ring Crib | With Rock & Wood |
| 539116.5 | 4564157.5 | 5,355.2 | 165 | Crappie Porcupine Crib | With Rock on top |
| 539114.3 | 4564165.1 | 5,360.5 | 166 | Crappie Porcupine Crib | With Rock on top |
| 539124.7 | 4564164.2 | 5,358.2 | 167 | Crappie Porcupine Crib | With Rock on top |
| 539130.0 | 4564162.5 | 5,359.0 | 168 | Crappie Porcupine Crib | With Rock on top |
| 539136.9 | 4564173.7 | 5,358.4 | 169 | Crappie Porcupine Crib | With Rock on top |
| 539125.3 | 4564171.9 | 5,359.5 | 170 | Crappie Porcupine Crib | With Rock on top |
| 539119.7 | 4564170.7 | 5,358.8 | 171 | Crappie Porcupine Crib | With Rock on top |
| 539113.5 | 4564170.8 | 5,359.4 | 172 | Crappie Porcupine Crib | With Rock on top |
| 539131.6 | 4564182.9 | 5,359.3 | 173 | Crappie Porcupine Crib | With Rock on top |
| 539129.7 | 4564190.9 | 5,359.5 | 174 | Crappie Porcupine Crib | With Rock on top |
| 539125.3 | 4564198.5 | 5,360.0 | 175 | Crappie Porcupine Crib | With Rock on top |
| 539128.2 | 4564208.2 | 5,359.9 | 176 | Crappie Porcupine Crib | With Rock on top |
| 539121.8 | 4564185.2 | 5,359.7 | 177 | Crappie Porcupine Crib | With Rock on top |
| 539122.6 | 4564177.4 | 5,358.7 | 178 | Crappie Porcupine Crib | With Rock on top & 8' Vertical wood trunk |
| 539115.0 | 4564178.0 | 5,359.9 | 179 | Crappie Condo | 3 Teepees, |
| 539114.7 | 4564183.3 | 5,357.9 | 180 | Crappie Condo | 2 Teepees, |
| 539115.0 | 4564192.3 | 5,362.7 | 181 | Bone Yard | Misc. Habitats w concrete rings, tire, 55 gallon drum, old X-Mas trees |
| 539107.7 | 4564202.4 | 5,366.6 | 182 | Crappie Condo | 3 Teepees, with Juniper |
| 539146.4 | 4564203.8 | 5,367.2 | 183 | Crappie Condo | Single Teepee |
| 539149.5 | 4564234.4 | 5,369.6 | 184 | Crappie Condo | 2 Teepees, |
| 539140.9 | 4564226.6 | 5,365.8 | 185 | 8 " Catfish PVC w Block | Old Habitats from 2007 |
| 539126.2 | 4564220.5 | 5,364.2 | 186 | 8 " Catfish PVC w Block | Old Habitats from 2007 |
| 539133.3 | 4564228.1 | 5,369.0 | 187 | Crappie Condo | 3 Teepees, |
| 539126.7 | 4564240.9 | 5,370.8 | 188 | Crappie Porcupine Crib | With Rock on top & 8" Vertical PVC trunk |
| 539129.1 | 4564253.0 | 5,369.2 | 189 | Crappie Porcupine Crib | With Rock on top |
| 539152.8 | 4564275.1 | 5,372.5 | 190 | Crappie Porcupine Crib | With Rock on top |
| 539157.0 | 4564259.7 | 5,373.9 | 191 | Crappie Condo | 2 Teepees, |
| 539121.9 | 4564261.3 | 5,372.5 | 192 | Crappie Condo | 3 Teepees, |
| 539157.1 | 4564301.3 | 5,375.7 | 193 | Catfish Cannons | |
| 539123.7 | 4564279.7 | 5,375.6 | 194 | Catfish Cannons | |
| 539096.4 | 4564258.8 | 5,373.7 | 195 | Catfish Cannons | |
| 539085.0 | 4564242.6 | 5,373.0 | 196 | Bass Ring | With Rock inside ring |
| 539082.8 | 4564229.4 | 5,369.5 | 197 | Bass Ring | With Rock inside ring |
| 539072.1 | 4564219.7 | 5,373.4 | 198 | Bass Ring | With Rock inside ring |
| 539076.0 | 4564211.4 | 5,368.1 | 199 | Bass Ring | With Rock inside ring |
| 539071.3 | 4564203.7 | 5,370.8 | 200 | Bass Ring | With Rock inside ring |
| 539083.7 | 4564194.3 | 5,370.0 | 201 | Catfish Cannons | |
| 539101.1 | 4564174.5 | 5,367.1 | 202 | Catfish Cannons | |
| 539098.9 | 4564146.8 | 5,366.0 | 203 | Catfish Cannons | 4 Pipes |
| 539096.0 | 4564130.3 | 5,363.7 | 204 | Catfish Cannons | |
| 539173.8 | 4564128.4 | 5,361.1 | 205 | Rock Mound | Approx. 2 ' Tall x 5' Long |
| 539168.8 | 4564185.2 | 5,368.7 | 206 | Catfish Cannons | With 1 Vertical trunk |
| 539163.6 | 4564216.6 | 5,368.4 | 207 | Catfish Cannons | |
| 539174.2 | 4564239.3 | 5,372.5 | 208 | Catfish Cannons | |
| 539183.0 | 4564256.2 | 5,371.9 | 209 | Bass Ring | With Rock inside ring, near willow bank, approx. 8' depth |
| 539196.6 | 4564266.2 | 5,374.6 | 210 | Bass Ring | With Rock inside ring, near willow bank, approx. 8' depth |
| 539203.7 | 4564279.2 | 5,375.1 | 211 | Bass Ring | With Rock inside ring, near willow bank, approx. 8' depth |
| 539211.8 | 4564308.3 | 5,372.3 | 212 | Bass Ring | With Rock inside ring, near willow bank, approx. 8' depth |

**North Cove - 3rd Cove from Spillway**

| Easting | Northing | Elevation | Way Point Number | Habitat Type | Comments |
|---|---|---|---|---|---|
| 539469.0 | 4564141.2 | 5,380.1 | 213 | 8 " Catfish PVC | Old Habitats from 2007 |
| 539495.7 | 4564141.5 | 5,379.3 | 214 | Catfish Cannons | |
| 539559.7 | 4564169.2 | 5,382.3 | 215 | Catfish Cannons | |
| 539592.8 | 4564182.1 | 5,382.1 | 216 | Catfish Cannons | |
| 539657.4 | 4564196.6 | 5,385.3 | 217 | Bass Ring | With Rock inside ring |
| 539650.6 | 4564188.2 | 5,383.2 | 218 | Bass Ring | With Rock inside ring |
| 539644.4 | 4564171.4 | 5,381.9 | 219 | Bass Ring | With Rock inside ring |
| 539639.5 | 4564156.6 | 5,383.5 | 220 | Bass Ring | With Rock inside ring |
| 539632.0 | 4564145.2 | 5,379.7 | 221 | Bass Ring | With Rock inside ring |
| 539627.0 | 4564124.0 | 5,381.7 | 222 | Bass Ring | No rock, old willow in center |
| 539618.7 | 4564118.4 | 5,382.1 | 223 | Bass Ring | No rock |
| 539579.7 | 4564091.0 | 5,383.7 | 224 | Catfish Cannons | |
| 539527.4 | 4564093.6 | 5,378.2 | 225 | Catfish Cannons | Embeded in cobble shoreline |
| 539505.0 | 4564070.9 | 5,378.6 | 226 | Catfish Cannons | Embeded in cobble shoreline |
| 539455.2 | 4564051.4 | 5,369.4 | 227 | Crappie Condo | Single Teepee, w T post |
| 539463.5 | 4564058.6 | 5,371.0 | 228 | Crappie Condo | Single Teepee, w T post |
| 539446.5 | 4564059.9 | 5,367.1 | 229 | Crappie Condo | Single Teepee, w T post |
| 539452.4 | 4564072.2 | 5,371.5 | 230 | Crappie Condo | Single Teepee, w T post |
| 539442.9 | 4564071.6 | 5,369.4 | 231 | Crappie Porcupine Crib | With Rock on top & Juniper |
| 539458.1 | 4564066.2 | 5,369.6 | 232 | Crappie Porcupine Crib | With Rock on top |
| 539477.6 | 4564089.1 | 5,372.0 | 233 | Crappie Porcupine Crib | With Rock on top |
| 539483.9 | 4564079.8 | 5,372.6 | 234 | Crappie Condo | Single Teepee, w T post |
| 539490.6 | 4564084.2 | 5,373.0 | 235 | Crappie Condo | |
| 539489.2 | 4564092.1 | 5,370.6 | 236 | Crappie Condo | |
| 539493.4 | 4564096.8 | 5,373.7 | 237 | Crappie Condo | |
| 539491.1 | 4564099.5 | 5,374.4 | 238 | Crappie Condo | |
| 539490.3 | 4564110.0 | 5,370.4 | 239 | Crappie Condo | |
| 539499.4 | 4564110.5 | 5,372.4 | 240 | Crappie Condo | |
| 539506.4 | 4564108.0 | 5,376.3 | 241 | Crappie Condo | |
| 539512.4 | 4564112.3 | 5,373.2 | 242 | Crappie Condo | |
| 539514.1 | 4564108.2 | 5,377.6 | 243 | Crappie Condo | |
| 539523.5 | 4564114.6 | 5,376.3 | 244 | Crappie Condo | |
| 539525.4 | 4564118.0 | 5,376.0 | 245 | Crappie Condo | |
| 539527.9 | 4564114.6 | 5,375.2 | 246 | Crappie Condo | |
| 539531.5 | 4564114.4 | 5,376.5 | 247 | Crappie Condo | |
| 539542.4 | 4564147.9 | 5,376.2 | 248 | Crappie Condo | |
| 539508.2 | 4564118.2 | 5,374.8 | 249 | Crappie Porcupine Crib | With Rock on top |
| 539555.7 | 4564117.6 | 5,374.4 | 250 | Crappie Porcupine Crib | With Rock on top |
| 539554.6 | 4564142.3 | 5,374.9 | 251 | Crappie Porcupine Crib | With Rock on top |
| 539560.2 | 4564147.1 | 5,375.1 | 252 | Old X-Mas Trees | |
| 539581.8 | 4564150.3 | 5,376.1 | 253 | Crappie Porcupine Crib | With Rock on top |
| 539609.7 | 4564163.1 | 5,376.4 | 254 | Crappie Porcupine Crib | With Rock on top, Large size & Juniper limbs |
| 539632.3 | 4564182.0 | 5,375.3 | 255 | 5-gal bucket w Limbs | 4 Buckets w Cement base, Vertical |

| Easting | Northing | Elevation | Other Fish Habitats Marked | | |
|---|---|---|---|---|---|
| 539568.1 | 4563910.3 | 5,358.1 | 256 | Large spring source | 200' W x 100' long |
| 539613.9 | 4563835.7 | 5,352.2 | 257 | Small spring | |
| 539623.6 | 4563820.5 | 5,355.8 | 258 | Small spring | |
| 540578.9 | 4563312.2 | 5,379.3 | 259 | Bedrock Point | |
| 540569.9 | 4563081.5 | 5,370.9 | 260 | Mouth of Main Channel | Inlet of reservoir, end of Willows 2018 |
| 540432.2 | 4562945.5 | 5,375.4 | 261 | Large Rock Mound | 6' Tall x 12' Wide, southeast end of reservoir, shallow |
| 540445.1 | 4562935.5 | 5,372.4 | 262 | Large Rock Mound | 6' Tall x 12' Wide, southeast end of reservoir, shallow |
| 540460.6 | 4562933.2 | 5,373.4 | 263 | Large Rock Mound | 6' Tall x 12' Wide, southeast end of reservoir, shallow |
| 540567.2 | 4563147.3 | 5,373.7 | 264 | Northeast side of Main Channel | 10 yards off of main channel |
| 539695.1 | 4563540.4 | 5,361.4 | 265 | Northeast side of Main Channel | 10 yards off of main channel, possible Trophy Tree or Kit locations |
| 539632.9 | 4563553.6 | 5,358.5 | 266 | Northeast side of Main Channel | 10 yards off of main channel, possible Trophy Tree or Kit locations |
| 539527.6 | 4563536.7 | 5,358.2 | 267 | Northeast side of Main Channel | 10 yards off of main channel, possible Trophy Tree or Kit locations |
| 539489.6 | 4563583.6 | 5,358.2 | 268 | Northeast side of Main Channel | 10 yards off of main channel, possible Trophy Tree or Kit locations |
| 539423.3 | 4563670.1 | 5,356.4 | 269 | Northeast side of Main Channel | 10 yards off of main channel, possible Trophy Tree or Kit locations |
| 539379.7 | 4563777.3 | 5,354.0 | 270 | Northeast side of Main Channel | 10 yards off of main channel, possible Trophy Tree or Kit locations |
| 539321.8 | 4563819.1 | 5,354.0 | 271 | Northeast side of Main Channel | 10 yards off of main channel, possible Trophy Tree or Kit locations |
| 538880.8 | 4563745.4 | 5,371.6 | 272 | Boulder Point | East of Boat Ramp |
| 539000.2 | 4563657.9 | 5,360.2 | 273 | Rocky Shoal on Lake Bottom | W Boulders. Mossback Habitats placements ?? |
| 539053.4 | 4563650.6 | 5,361.4 | 274 | Rocky Shoal on Lake Bottom | W Boulders. Mossback Habitats placements ?? |
| 539363.2 | 4563419.8 | 5,368.5 | 275 | Mouth of Southwest cove | |
| 539364.3 | 4563468.1 | 5,365.7 | 276 | Rocky Shoal on Lake Bottom | W Boulders. Mossback Habitats placements ?? |
| 539427.9 | 4563429.3 | 5,362.5 | 277 | Rocky Shoal on Lake Bottom | W Boulders. Mossback Habitats placements ?? |
| 539636.5 | 4563063.9 | 5,378.4 | 278 | Honey Hole Habitats Locations ?? | In Front of Willow Patch & Spring ?? |
| 539527.7 | 4563183.6 | 5,371.6 | 279 | Honey Hole Habitats Locations ?? | In Front of Willow Patch & Spring ?? |
| 539861.4 | 4562950.5 | 5,378.0 | 280 | Honey Hole Shrub Habitats Locations ?? | |

**NAD 83 Datum**