Minnesota
F-29-R(P)
Area 315
Study 3
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**Minnesota Department of Natural Resources**
**Division of Fish and Wildlife**
**Section of Fisheries**

# Stream Survey Report

# Willow Creek Population Assessment
# 2016

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**Sauk Rapids Area Fisheries Office**

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DEPARTMENT OF NATURAL RESOURCES

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**General Information**

| | |
|---|---|
| Stream Name: | Willow Creek |
| Alternate Name: | None |
| Tributary Number: | M-071-009 |
| Counties: | Stearns |
| Nearest Town: | Kimball |
| Source of flow: | Wetland complex southwest of the town of Kimball |
| Waterway sequence: | Wetland /Willow Creek/Clearwater River/ Mississippi River |
| Stream Length: | 3.6 miles from wetland complex to mouth |
| Gradient: | 25-53 ft/ mile |
| Sinuosity: | 1.9 |
| Classification: | Class I-C (Coldwater, Brown Trout) |

**Watershed Description**

| | |
|---|---|
| Major Watershed: | Mississippi River (17) – Clearwater River (17010) |
| Minor Watershed: | Willow Creek |
| Watershed Area: | 8,887.8 acres |
| Watershed Land Use: | 44.4% agricultural, 18.6% pasture/hay, 14.3% forest, 9.8% developed, 6.3% grassland, and 3.5% wetland (Based on 2011 National Land Cover Data; Figure 1) |
| Riparian Zone: | The surrounding land is primarily farmland with residential and commercial development in the City of Kimball. The stream is bordered by wetland or reed canary grass in upper reaches, with some willow and alder downstream. Numerous springs are found within the Willow Creek Park area, which also receives runoff from impervious surfaces in Kimball. |

## Abstract

A population assessment was conducted on Willow Creek near Kimball, MN on October 12, 2016. Backpack electrofishing was used to sample the Brown Trout population. Fingerling Brown Trout are stocked once every three years and recent sampling has shown good survival and some natural reproduction. Brown Trout lengths ranged from 158 to 307 mm in 2016. The length frequency indicates multiple year classes present. A lack of deeper pools and overhead cover likely limits growth and survival of larger trout. A temperature logger has been deployed at the survey area for several years; water temperatures have been favorable for Brown Trout in most years, but marginal in others. Some storm water improvements have been made and more are anticipated. High water temperatures and ground water diversion are threats to the stream. The current stocking regime is producing a viable fishery and Brown Trout fingerlings will continue to be stocked every third year, with electrofishing conducted one year after stocking.

## Introduction

Willow Creek is a small, coldwater stream in southeastern Stearns County (Figure 1). Brook Trout were stocked for many years, but natural reproduction and survival were limited. From 1996 to 2005, yearling Brown Trout were stocked in an attempt to establish a naturally reproducing population. Electrofishing catches of adult Brown Trout were low, likely due to high natural mortality, angling mortality or both and few young-of-year Brown Trout were captured. Fingerling Brown Trout have since been stocked in 2006, 2009, 2012, and 2015 to evaluate their potential for survival and reproduction. Results from electrofishing in 2007 showed very good survival from the 2006 fingerling stocking and some natural reproduction. Sampling in 2008 found only a few larger adults, presumably from the 2006 stocking, but some survival of a naturally produced 2007 year class. Sampling in 2010 again showed good survival from the 2009 stocking and some natural reproduction. Results in 2013 showed some natural reproduction, but survival from the 2012 stocking was lower than survival from previous fingerling stockings. Fingerling Brown Trout were last stocked in 2015 and evaluated by electrofishing on October 12, 2016.

## Results

Backpack electrofishing was conducted at two sites within Willow Creek Park (Figure 2.) The two sites covered approximately 2,633 feet and took a total of 1.04 hours of on-time to survey. A total of 74 Brown Trout were captured, but no young-of-year (Figure 3; Table 1). Adult fish covered a broad range of sizes and likely represent both stocked fish from 2015 and natural reproduction. Lengths ranged from 158 to 307 mm. Other species captured included: Brook Stickleback, Central Mudminnow, Creek Chub, Green Sunfish, Blacknose Dace, and White Sucker.

Brown Trout catch per unit of effort (CPUE) in 2016 (71.2/hr) was similar to 2007 (80.2/hr) and 2010 (88.3/hr), but much higher than 2013 (25.7/hr; Table 1). Each of these surveys was conducted one year after a fingerling stocking year. Sampling in 2008 was conducted two years after the 2006 stocking and CPUE (23.1/hr) was low, but a few larger individuals were captured (320, 348 mm; Table 1).

A stage logger was in place from 2002 to 2012, approximately 400 meters from the mouth of the creek at Lake Betsy. The logger was removed in 2012 due to erosion and sedimentation at the site. Flows were somewhat flashy following rain events and ranged between 2 and 14 cfs (MNDNR 2010, 2008; unpublished data 2011, 2012). The large watershed (>8,000 acres; Figure 1) contains the City of Kimball and likely contributes to high flows in the middle and lower portions of the stream, which includes the reach containing trout. The city recently installed a storm water catch basin to capture runoff from part of the city instead of allowing it to run directly into Willow Creek.

Temperature monitors have been placed in Willow Creek since 2002. Water temperatures have mostly been favorable for Brown Trout in Willow Creek Park and the easement reach upstream, but temperatures in 2011 and 2012 were warmer and marginal for Brown Trout. Juvenile and adult Brown Trout prefer temperatures between 12°C and 20°C; 27°C is considered lethal (Raleigh et al. 1986). A temperature monitor was deployed between June 1 and October 12, 2016 just below the culvert downstream of State Highway 15. The maximum temperature in 2016 was 23.5°C and 461 hourly readings were above 20°C. (Figure 4, Table 2). The maximum number of consecutive readings above 20°C was 40 in late July. Temperatures have been logged near this site since 2008 and have varied considerably; 2008 was the coolest season with a

maximum temperature of 19.2°C. The highest temperature recorded was 26.7°C in 2012 and the highest number of hours above 20°C was 1,138 in 2011.

## Summary and Recommendations

Stocking 6,000 fingerling Brown Trout every third year has been the management strategy since 2006. Electrofishing results indicate that this has successfully maintained a Brown Trout fishery in Willow Creek and no change in management strategy seems necessary. The presence of natural year classes is a bonus and provides additional angling opportunities between stocking events as well as providing insurance against the failure of a stocked year class; natural reproduction alone is unlikely to sustain the fishery. The next Brown Trout fingerling stocking is scheduled for 2018, followed by a population assessment in 2019.

Large Brown Trout (>300 mm) have historically been rare in Willow Creek. The stream has few deep pools and overhead cover is scarce, likely limiting survival and growth of larger trout. Angling pressure and harvest are unknown, but exploitation is probably low. There is limited evidence of angling along the banks and some areas are overgrown and difficult to access or angle from. Creel data would be helpful, but funding and staffing considerations make a creel survey unlikely in the near future. Other options such as trail cameras or a self-reporting postcard survey might provide useful data.

Natural and angling mortality are unknown, but the low number of adults in 2008 suggests that overall mortality is high. Some fish certainly move downstream of the sampling area and the amount of emigration may be influenced by the flow regime in a given year. Annual sampling between stocking years could give a better idea of both mortality and natural reproduction and is recommended as time allows.

A variety of habitat improvements have been undertaken, including root wad placement, brush layering, and rock vanes. Some of these have been successful, but many have been displaced by high flow events. Additional habitat improvements should be implemented as funding and manpower are available.

Efforts to reduce and divert storm water should be continued and groundwater appropriation should be monitored carefully. Base flows are low and increased pumping for agriculture or municipal use could adversely affect stream flow. Recent stormwater improvements by the City

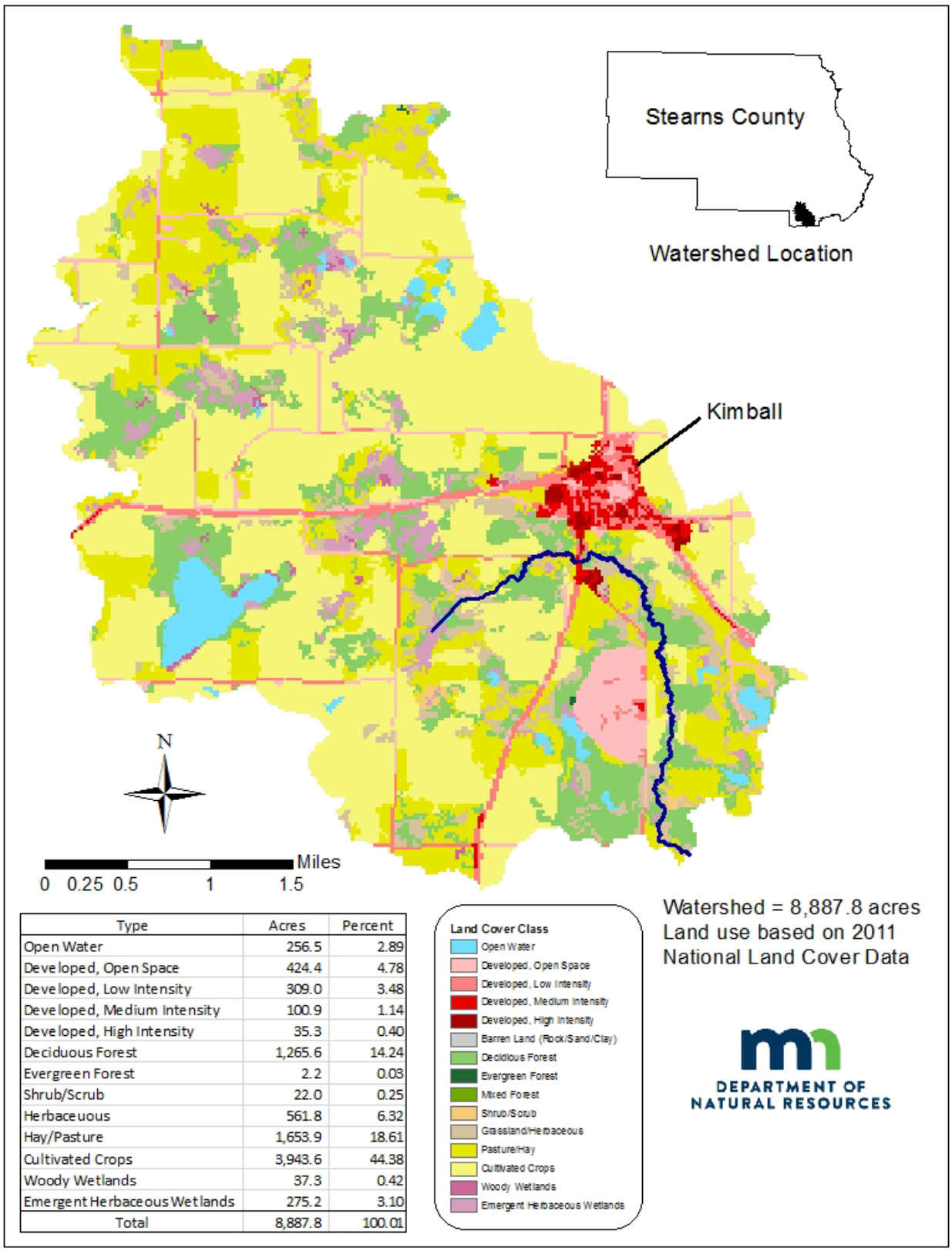
of Kimball should help moderate flashy, sediment-laden, warm inflows and more such projects are being planned. Any increase in water temperature or decrease in base flow could make it difficult to sustain the fishery.

## References

Minnesota Department of Natural Resources. 2010. Willow Creek Stream Survey Report. Division of Fish and Wildlife, St. Paul, MN.

Minnesota Department of Natural Resources. 2008. Willow Creek Stream Survey Report. Division of Fish and Wildlife, St. Paul, MN.

Raleigh, R. F., L. D. Zuckerman, and P. C. Nelson. 1986. Habitat Suitability Index Models and Instream Flow Suitability Curves: Brown Trout. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.124). U.S. Fish and Wildlife Service.




| Type | Acres | Percent |
|---|---|---|
| Open Water | 256.5 | 2.89 |
| Developed, Open Space | 424.4 | 4.78 |
| Developed, Low Intensity | 309.0 | 3.48 |
| Developed, Medium Intensity | 100.9 | 1.14 |
| Developed, High Intensity | 35.3 | 0.40 |
| Deciduous Forest | 1,265.6 | 14.24 |
| Evergreen Forest | 2.2 | 0.03 |
| Shrub/Scrub | 22.0 | 0.25 |
| Herbaceuous | 561.8 | 6.32 |
| Hay/Pasture | 1,653.9 | 18.61 |
| Cultivated Crops | 3,943.6 | 44.38 |
| Woody Wetlands | 37.3 | 0.42 |
| Emergent Herbaceous Wetlands | 275.2 | 3.10 |
| Total | 8,887.8 | 100.01 |

Figure 1. Watershed land use, Willow Creek, MN.


Figure 2. Location of electrofishing sites, Willow Creek, MN 2016.

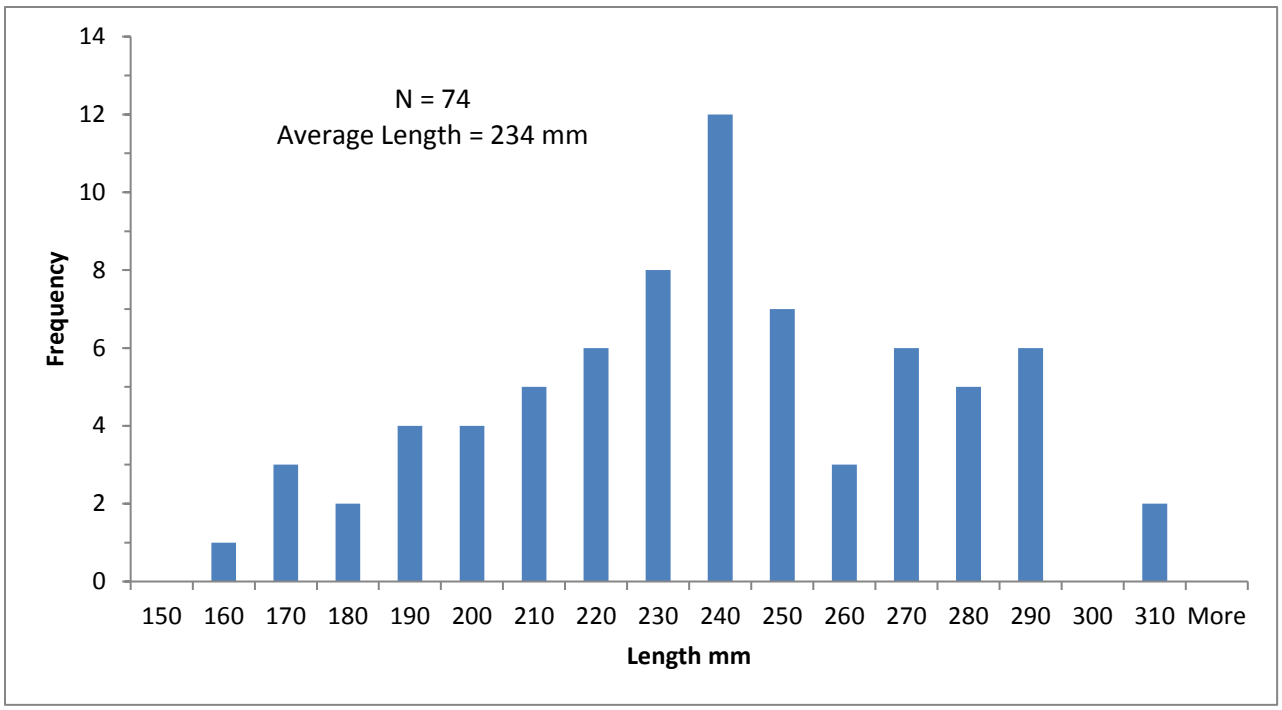



Figure 3. Length frequency of Brown Trout captured by electrofishing, Willow Creek, MN 2016.

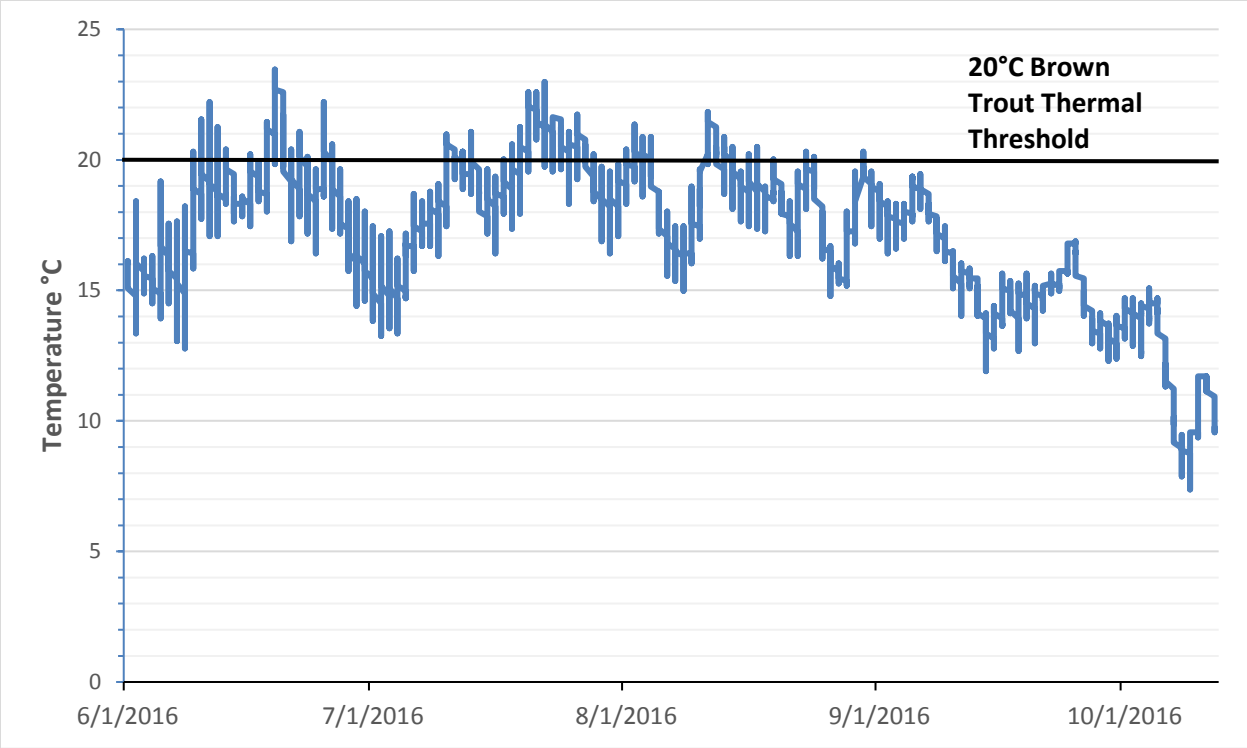



Figure 4. Hourly temperatures (°C) near Highway 15, Willow Creek, MN, June – October 2016.

Table 1. Length frequency of Brown Trout and catch statistics from backpack electrofishing, Willow Creek, MN 2002-2016.

| Brown Trout | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Length Group (mm)** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2010** | **2013** | **2016** |
| **70** | | | | | 1 | | | | | |
| **80** | | | | | 4 | 5 | | | | |
| **90** | | | | | 7 | 8 | | | | |
| **100** | | | | | 12 | 12 | 1 | | 1 | |
| **110** | | | | | 29 | 8 | | 2 | 3 | |
| **120** | | | | | 30 | 6 | 1 | 4 | 3 | |
| **130** | | | | | 19 | | | 3 | 9 | |
| **140** | | | | 1 | 24 | 1 | | 1 | 1 | |
| **150** | | | | 1 | 12 | 3 | | | | |
| **160** | | | | 4 | 10 | 9 | | 1 | | 1 |
| **170** | | | | 10 | 2 | 12 | | 2 | | 3 |
| **180** | | 1 | | 13 | 1 | 12 | | 2 | 3 | 2 |
| **190** | | | | 14 | | 13 | 1 | 2 | 2 | 4 |
| **200** | 2 | 1 | | 20 | | 6 | 4 | 3 | 3 | 4 |
| **210** | 1 | | | 11 | | 15 | 6 | 9 | 5 | 5 |
| **220** | 3 | | | 8 | | 13 | 3 | 6 | 4 | 6 |
| **230** | 6 | 4 | | 3 | 2 | 8 | 2 | 5 | 2 | 8 |
| **240** | 4 | | | 4 | | 2 | | 9 | 7 | 12 |
| **250** | 3 | 1 | | 4 | 2 | 8 | | 9 | | 7 |
| **260** | 7 | 1 | | 1 | 3 | 1 | | 5 | | 3 |
| **270** | 7 | 3 | | 1 | 2 | 1 | | 4 | | 6 |
| **280** | | 2 | | | 1 | | 1 | 4 | | 5 |
| **290** | 2 | 4 | | | 1 | | | 2 | | 6 |
| **300** | 1 | 2 | | | | | | 1 | | |
| **310** | 1 | 3 | | 1 | | | | | | 2 |
| **320** | 2 | | | | | | 1 | | | |
| **330** | | | | | | | | | | |
| **340** | 1 | 1 | | | | | | | | |
| **350** | | | | | | | 1 | | | |
| **360** | | | | | | | | | | |
| **370** | | | | | | | | | | |
| **Total** | 40 | 23 | 0 | 96 | 162 | 143 | 21 | 74 | 43 | 74 |
| **Unmeasured** | 0 | 0 | 0 | 0 | 255 | 0 | 0 | 0 | 0 | 0 |
| **Effort (hr)** | 4.64 | 2.11 | 1.78 | 1.76 | 1.31 | 1.78 | 0.91 | 0.84 | 1.67 | 1.04 |
| **Length (ft)** | 8,485 | 5,275 | 5,275 | 5,275 | 5,470 | 4,391 | 1,672 | 1,529 | 5,728 | 2,633 |
| **CPUE** | 8.6 | 10.9 | 0 | 54.7 | 318.3 | 80.2 | 23.1 | 88.3 | 25.7 | 71.2 |

Table 2. Water temperature statistics from Onset temperature monitor located near State Highway 15, Kimball, MN.

| Year | Max °C | Hrs > 20°C |
|---|---|---|
| 2016 | 23.5 | 461 |
| 2013 | 24.4 | 538 |
| 2012 | 26.7 | 499 |
| 2011 | 26.3 | 1138 |
| 2010 | 20.2 | 22 |
| 2009 | 20.1 | 1 |
| 2008 | 19.2 | 0 |

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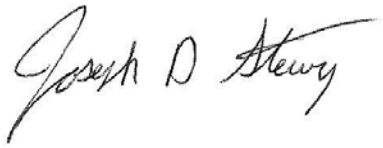
3/21/2017

Author — Date



3/21/2017

Area Fisheries Supervisor — Date

Regional Fisheries Supervisor — Date

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