# South Red Iron Lake

## Site Description

***Location***

| | |
|---|---|
| Water designation number (WDN) | 48-0002-00 |
| Legal description | T126N-R53W-Sec. 20,29,32 |
| County (ies) | Marshall |
| Location from nearest town | 8.0 miles southeast of Lake City, SD |

***Survey Dates and Sampling Information***

| | |
|---|---|
| Survey dates | June 9-11, 2015 (FN, GN) |
| Frame net sets (n) | 17 |
| Gill net sets (n) | 6 |

***Morphometry (Figure 1)***

| | |
|---|---|
| Watershed area (acres) | 28,863 |
| Surface area (acres) | 610 |
| Maximum depth (ft) | 15 |
| Mean depth (ft) | 8 |

***Ownership and Public Access***

South Red Iron Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. A single public access site is located on the southwestern shoreline and is maintained by the SDGFP (Figure 2). South Red Iron Lake is owned by the State of South Dakota and lands adjacent to the lake are owned by the State of South Dakota, Bureau of Indian Affairs, and private individuals.

***Watershed and Land Use***

The 28,863 acre Clear and Red Iron Lakes sub-watershed (HUC-12) is located within the larger Northern Coteau Lakes-Upper James River (HUC-10) watershed. Land use within the watershed is primarily agricultural with a mix of pasture or grassland, cropland, and scattered shelterbelts.

***Water Level Observations***

No OHWM has been established by the South Dakota Water Management Board on South Red Iron Lake. The elevation of South Red Iron Lake on April 28, 2015 was 1830.7 fmsl; 0.9 ft higher than the fall 2014 elevation of 1829.8 fmsl. The water level had declined to an elevation of 1829.5 fmsl on October 20, 2015.

***Fish Management Information***

| | |
|---|---|
| Primary species | northern pike, walleye, yellow perch |
| Other species | black bullhead, black crappie, bluegill, common carp, largemouth bass, smallmouth bass, white sucker |
| Lake-specific regulations | none |
| Management classification | warm-water permanent |
| Fish consumption advisories | none |

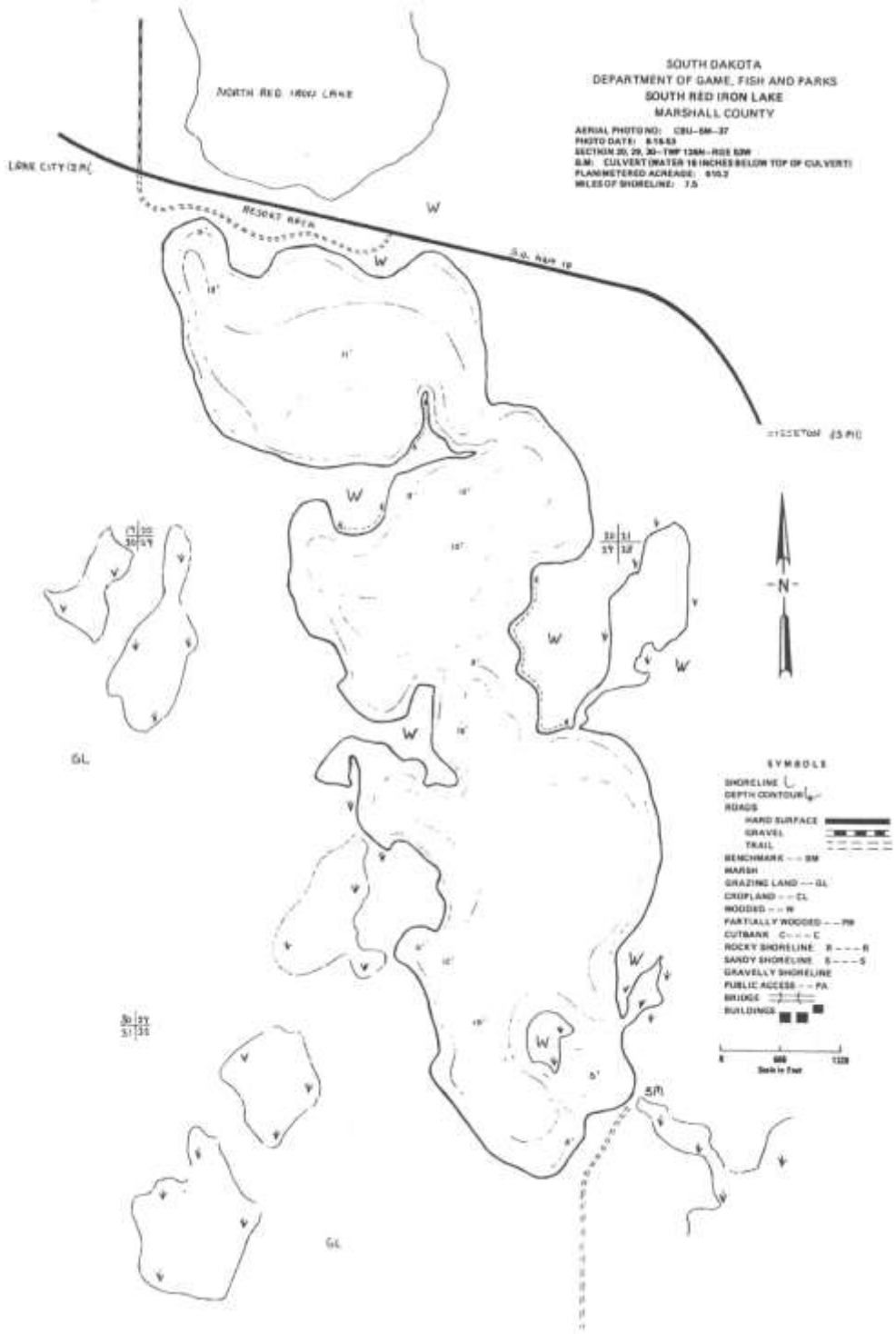


Figure 1. Map depicting depth contours of South Red Iron Lake, Marshall County, South Dakota.

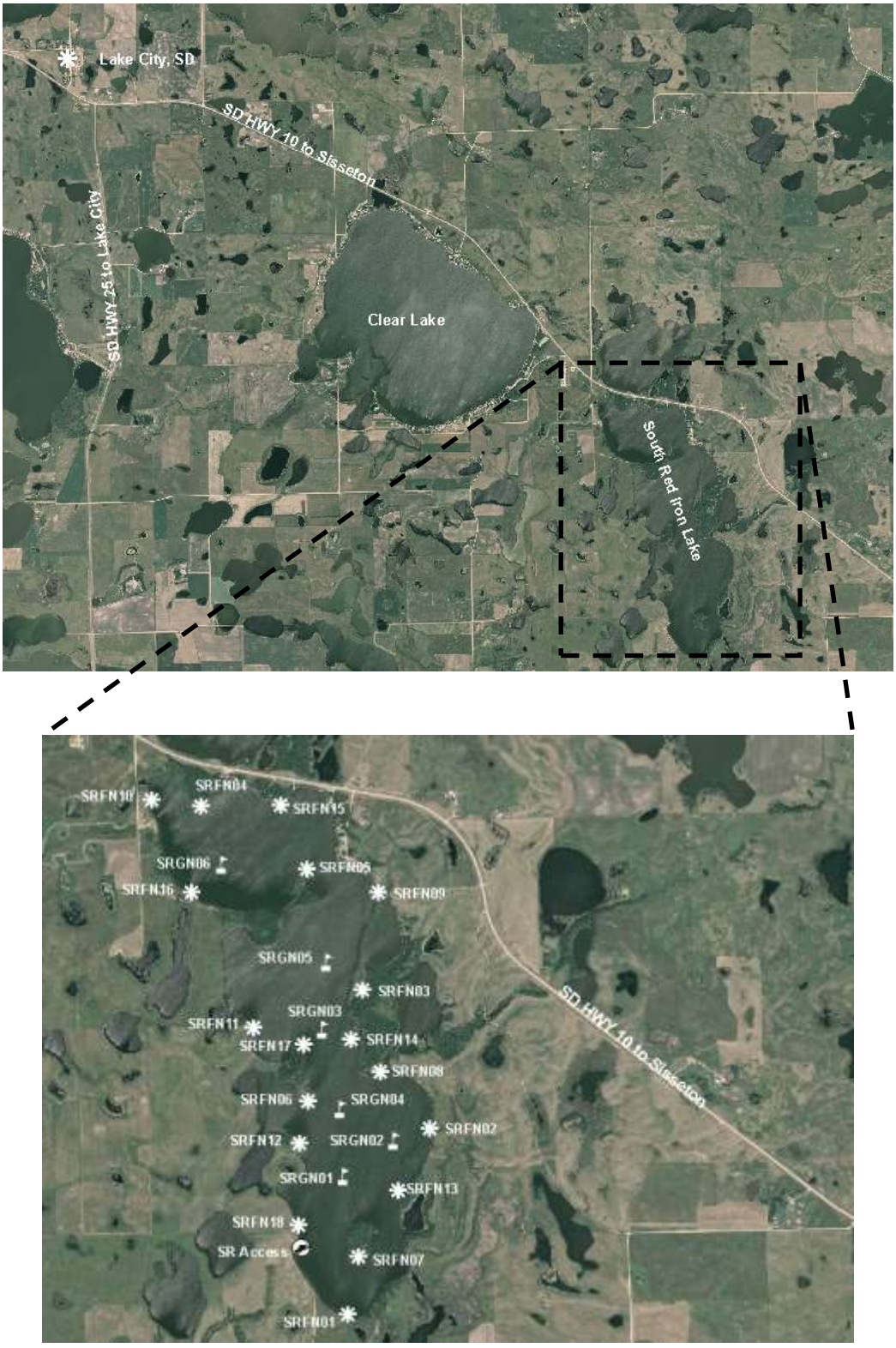


Figure 2. Map depicting geographic location of South Red Iron Lake from Lake City, South Dakota (top). Also noted is the boat ramp and standardized net locations for South Red Iron Lake (bottom). SRFN= frame nets, SRGN= gill nets

## Management Objectives

1) Maintain a mean gill net CPUE of stock-length northern pike ≥ 3, a PSD of 30-60, and a PSD-P of 5-10.

2) Maintain a mean gill net CPUE of stock-length walleye ≥ 10, a PSD of 30-60, and a PSD-P of 5-10.

3) Maintain a mean gill net CPUE of stock-length yellow perch ≥ 30, a PSD of 30-60, and a PSD-P of 5-10.

4) Maintain a mean frame net CPUE of stock-length black bullhead ≤ 100.

## Results and Discussion

South Red Iron Lake is a shallow natural lake located southeast of Lake City, South Dakota. The lake receives surface water from South and North Buffalo Lakes, which drain into Lake Almos. From Lake Almos water flows north through a series of small sloughs before it reaches the southeast end of South Red Iron Lake. Water from South Red Iron Lake flows north into North Red Iron then flows into Clear Lake.

South Red Iron Lake has a history of occasional winter and summer kill events (most recently documented in winter of 1988-1989). Historically the fish community was primarily comprised of black bullhead, northern pike, and yellow perch. However, sport fish such as walleye, black bass (i.e., largemouth and smallmouth bass), and panfish (e.g., bluegill) have contributed to the sport fishery in recent years due to decreased frequency of winter/summer kill events. Currently, South Red Iron Lake is managed as a northern pike, walleye and yellow perch fishery.

### *Primary Species*

Northern Pike: The 2015 mean gill net CPUE of stock-length northern pike was 3.0 (Table 1), and above the minimum objective of (≥ 3 stock-length fish/net night). Based on the 2015 gill net catch, relative abundance of northern pike in South Red Iron Lake appeared to be high.

Northern pike sampled in gill nets during 2015 ranged in TL from 45 to 91 cm (17.7 to 35.8 in), had a PSD of 67, and a PSD-P of 17 (Figure 3). Both the PSD and PSD-P were above the management objective ranges of 30-60 and 5-10, respectively (Table 3).

No age or growth information was collected from northern pike in 2015. Gill net captured northern pike had mean Wr values that ranged from 75 to 88 for all length categories (e.g., stock to quality) sampled, with the mean Wr for stock-length northern pike being 79 (Table 1). No length-related trends in condition were apparent.

Walleye: The 2015 mean gill net CPUE of stock-length walleye was 4.3 (Table 1) and below the minimum objective (≥ 10 stock-length walleye/net night). Since 2003 walleye relative abundance has remained low to moderate with mean gill net CPUE values ranging from 1.8 (2006) to 5.5 (2012; Table 2). Relative abundance is considered moderate.

Walleye captured in gill nets ranged in TL from 12 to 53 cm (4.7 to 20.9 in; Figure 4), had a PSD of 65, and PSD-P of 8 (Table 1). The PSD was slightly above the management objective range of 30-60 and PSD-P was within the management objective of 5-10 (Table 3), indicating a relatively balanced population.

Otoliths were collected from a sub-sample of walleye in the gill net catch. Six consecutive year-classes were present (2009-2014; Table 4). The 2010, 2012 and 2014 year classes correspond with large fingerling stockings. Contribution of natural reproduction during stocked years is unknown since large fingerlings were not marked. The 2009 and 2011 year classes were naturally produced.

The weighted mean length at capture for age-2 and age-3 walleye was 325 and 407 mm (12.8 and 16.0 in; Table 5), respectively, indicating good growth. Condition of walleye was good with mean Wr values >90 for all length categories (e.g., stock to quality) sampled. No length-related trend in Wr was observed.

Yellow Perch: The 2015 mean gill net CPUE of stock-length yellow perch was 3.5 (Table 1), and below the minimum objective (≥ 30 stock-length yellow perch/net night). The mean gill net CPUE observed for yellow perch in 2015 was substantially lower than the 24.5 observed in 2012 (Table 2). Based on the 2015 gill net catch, the relative abundance of stock-length yellow perch appears to be low.

Yellow perch captured in the 2015 gill net catch ranged in TL from 9 to 25 cm (3.5 to 9.8 in), with the majority being < quality-length (20 cm; 8 in; Figure 5). The PSD of 33 was within the management objective of 30-60 and PSD-P of 0 was below the management objective of 5-10 (Table 1; Table 3).

Otoliths were collected from a sub-sample of gill net captured yellow perch in 2015. Five consecutive year classes (2010-2014) were represented in the gill net catch (Table 7). The weighted mean TL at capture for age-2 yellow perch was 140 mm (5.5 in; Table 8). Mean Wr of gill net captured stock-length yellow perch in 2015 was 100 (Table 1) and no length related trend in Wr was observed.

*Other Species*

Black Bullhead: The mean frame net CPUE of stock-length black bullhead during 2015 was 49.9 (Table 1) and within the management objective (≤ 100 stock-length fish/net-night). Black Bullhead relative abundance was classified as high in South Red Iron Lake during 2015.

Black bullhead in the frame net catch ranged in TL from 10 to 32 cm (3.9 to 12.6 in; Figure 6), had a PSD of 68 and PSD-P of 2 (Table 1). The mean Wr for stock-length black bullhead was 92 (Table 1) and no length relate trend in Wr was observed.

Black Crappie: The mean frame net CPUE of stock-length black crappie during 2015 was 0.5, indicating low relative abundance (Table 1). Eight black crappies were captured ranging in TL from 25 to 31 cm (9.8 to 12.2 in).

Bluegill: Eight bluegill were capture in the 2015 frame net survey for a mean CPUE of stock-length bluegill of 0.5 (Table 1). The low CPUE indicates low relative abundance.

Largemouth Bass: No largemouth bass were sampled in the 2015 survey; however, the sampling gear utilized is not effective at capturing largemouth bass. Spring electrofishing is the most effective method for capturing largemouth bass. Anecdotal reports from anglers indicate that largemouth bass are present in sufficient numbers to provide a sport fishery.

Smallmouth Bass: The mean frame net and gill net CPUE of stock-length smallmouth bass in 2015 were 0.4 and 1.8, respectively (Table 1); however, the sampling gear utilized is not effective at capturing smallmouth bass. Spring electrofishing is the most effective method for capturing smallmouth bass. Anecdotal reports from anglers indicate that smallmouth bass are present in sufficient numbers to provide a sport fishery.

Other: White sucker was the only other species captured during the 2015 fish community survey and likely have a minimal impact on the fishery (Table 1).

## Management Recommendations

1) Conduct fish community surveys utilizing gill nets on an every third year basis (next survey scheduled in summer 2018) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Continue to manage as a self-sustaining northern pike and yellow perch fishery.

3) Stock walleye on a biennial basis (≈25 large fingerling/acre) to establish additional year classes.

4) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.

5) Monitor winter and summer kill events. In cases of substantial winter or summer kill stock with northern pike, walleye, and yellow perch to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in frame nets and experimental gill nets from South Red Iron Lake, 2015. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= black bullhead; BLC= black crappie; BLG= bluegill; NOP= northern pike; SMB= smallmouth bass; WAE= walleye; WHS= white sucker; YEP= yellow perch

| | Abundance | | Stock Density Indices | | | | Condition | |
|---|---|---|---|---|---|---|---|---|
| Species | CPUE | CI-80 | PSD | CI-90 | PSD-P | CI-90 | Wr | CI-90 |
| *Frame nets* | | | | | | | | |
| BLB | 49.9 | 18.7 | 68 | 3 | 2 | 1 | 92 | 1 |
| BLC | 0.5 | 0.3 | 100 | 0 | 100 | 0 | 94 | 3 |
| BLG | 0.5 | 0.3 | 100 | 0 | 100 | 0 | 129 | 6 |
| NOP | 0.4 | 0.2 | 33 | 42 | 0 | --- | 76 | 5 |
| SMB | 0.4 | 0.2 | 29 | 36 | 29 | 36 | 106 | 7 |
| WHS | 0.5 | 0.4 | 100 | 0 | 100 | 0 | 109 | 3 |
| YEP | 0.1 | 0.1 | 50 | 50 | 0 | --- | 93 | 58 |
| *Gill nets* | | | | | | | | |
| BLB | 96.3 | 26.7 | 59 | 3 | 0 | --- | 95 | 1 |
| BLC | 1.5 | 1.1 | 100 | 0 | 100 | 0 | 91 | 3 |
| NOP | 3.0 | 1.1 | 67 | 20 | 17 | 16 | 79 | 3 |
| SMB | 1.8 | 1.0 | 100 | 0 | 91 | 16 | 100 | 2 |
| WAE | 4.3 | 2.4 | 65 | 16 | 8 | 9 | 91 | 1 |
| WHS | 2.0 | 1.1 | 100 | 0 | 100 | 0 | 107 | 2 |
| YEP | 3.5 | 1.1 | 33 | 18 | 0 | --- | 100 | 1 |

Table 2. Historic mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish for various fish species captured by frame nets and experimental gill nets in South Red Iron Lake, 2002-2015. BLB = black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; LMB= largemouth bass; NOP = northern pike; SMB= smallmouth bass; WAE = walleye; WHS = white sucker; YEP = yellow perch

| | CPUE | | | | | |
|---|---|---|---|---|---|---|
| Species | 2003 | 2004 | 2006[1] | 2009 | 2012 | 2015 |
| *Frame nets* | | | | | | |
| BLB | 127.8 | 38.6 | 8.9 | 0.4 | 15.9 | 49.9 |
| BLC | 0.9 | 0.5 | 0.9 | 1.0 | 1.3 | 0.5 |
| BLG | 1.6 | 1.6 | 23.4 | 2.4 | 3.6 | 0.5 |
| COC | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 |
| LMB | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| NOP | 0.3 | 0.2 | 1.2 | 0.4 | 1.3 | 0.4 |
| SMB | 0.2 | 0.6 | 0.4 | 0.4 | 0.7 | 0.4 |
| WAE | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| WHS | 0.3 | 0.1 | 0.2 | 0.2 | 0.1 | 0.5 |
| YEP | 0.7 | 0.3 | 11.6 | 0.0 | 1.6 | 0.1 |
| *Gill nets* | | | | | | |
| BLB | 44.2 | 2.3 | 1.5 | 0.0 | 26.5 | 96.3 |
| BLC | 1.8 | 0.8 | 0.7 | 0.5 | 1.2 | 1.5 |
| BLG | 0.5 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 |
| COC | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 |
| NOP | 9.7 | 6.2 | 9.2 | 6.0 | 12.0 | 3.0 |
| SMB | 0.2 | 0.7 | 0.3 | 0.2 | 1.5 | 1.8 |
| WAE | 3.7 | 4.3 | 1.8 | 3.8 | 5.5 | 4.3 |
| WHS | 10.8 | 6.2 | 7.3 | 4.8 | 6.8 | 2.0 |
| YEP | 34.2 | 24.2 | 24.7 | 4.2 | 24.5 | 3.5 |

[1] Monofilament gill net mesh size change (0.75”, 1.00”, 1.25”, 1.50”, 2.00” and 2.50”).

Table 3. Mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured by frame nets and experimental gill nets in South Red Iron Lake, 2002-2015. BLB = black bullhead; NOP = northern pike; WAE = walleye; YEP = yellow perch

| Species | 2003 | 2004 | 2006[1] | 2009 | 2012 | 2015 | Objective |
|---|---|---|---|---|---|---|---|
| *Frame nets* | | | | | | | |
| BLB | | | | | | | |
| CPUE | 128 | 39 | 9 | <1 | 16 | 50 | ≤ 100 |
| PSD | 44 | 86 | 83 | 100 | 72 | 68 | --- |
| PSD-P | 4 | 51 | 77 | 25 | 15 | 2 | --- |
| Wr | 89 | 91 | 93 | 90 | 96 | 92 | --- |
| *Gill nets* | | | | | | | |
| NOP | | | | | | | |
| CPUE | 10 | 6 | 9 | 6 | 12 | 3 | ≥ 3 |
| PSD | 43 | 57 | 49 | 53 | 49 | 67 | 30-60 |
| PSD-P | 5 | 8 | 7 | 8 | 3 | 17 | 5-10 |
| Wr | 84 | 86 | 90 | 90 | 88 | 79 | --- |
| WAE | | | | | | | |
| CPUE | 4 | 4 | 2 | 4 | 6 | 4 | ≥ 10 |
| PSD | 32 | 50 | 73 | 100 | 33 | 65 | 30-60 |
| PSD-P | 18 | 0 | 36 | 35 | 6 | 8 | 5-10 |
| Wr | 92 | 93 | 93 | 86 | 94 | 91 | --- |
| YEP | | | | | | | |
| CPUE | 34 | 24 | 25 | 4 | 25 | 4 | ≥ 30 |
| *PSD* | 5 | 58 | 7 | 0 | 3 | 33 | 30-60 |
| PSD-P | 0 | 1 | 1 | 0 | 1 | 0 | 5-10 |
| Wr | 104 | 100 | 107 | 102 | 102 | 100 | --- |

[1] Monofilament gill net mesh size (0.75", 1.0", 1.25", 1.5", 2.0" and 2.5").

Table 4. Year class distribution based on the expanded age/length summary for walleye sampled in gill nets and associated stocking history (# stocked x 1,000) from South Red Iron Lake, 2009-2015.

| | Year Class | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Survey Year | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 |
| 2015 | | 2 | 8 | 11 | 1 | 5 | 1 | | | | | | |
| 2012 | --- | --- | --- | | 2 | 22 | 7 | 3 | | | | | |
| 2009[1] | --- | --- | --- | --- | --- | --- | | 11 | | 8 | 6 | | 5 |
| # stocked | | | | | | | | | | | | | |
| fry | | | | | | | | | | | | | |
| sm. fingerling | | | | | | | | | | 61 | 79 | | 61 |
| lg. fingerling | | 11 | | 7 | | 17 | | 13 | | | | | |

[1] Older walleye were sampled, but are not reported in this table.

Table 5. Weighted mean TL at capture (mm) for walleye age-1 through age-10 sampled in experimental gill nets (expanded sample size) from South Red Iron Lake, 2005-2015. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

| | Age | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2015 | 138(2) | 325(8) | 407(11) | 460(1) | 499(5) | 502(1) | --- | --- | --- | --- |
| 2012 | 245(2) | 343(22) | 460(7) | 521(3) | --- | --- | --- | --- | --- | --- |
| 2009[1] | 196(11) | --- | 408(8) | 462(6) | --- | 552(5) | --- | 559(2) | --- | --- |
| 2007[1] | --- | 288(6) | --- | 478(2) | 552(1) | --- | --- | --- | --- | --- |
| 2006 | 184(1) | 320(1) | 425(1) | 334(1) | 424(3) | --- | 439(1) | 565(1) | 498(1) | 563(1) |
| 2005 | 186(1) | 297(4) | 374(4) | 427(5) | --- | --- | 532(2) | --- | 641(1) | --- |

[1] Older walleye were sampled, but are not reported in this table.

Table 6. Stocking history including size and number for fishes stocked into South Red Iron Lake, 2003-2015. WAE= walleye

| Year | Species | Size | Number |
|---|---|---|---|
| 2003 | WAE | small fingerling | 60,840 |
| 2005 | WAE | small fingerling | 79,300 |
| 2006 | WAE | small fingerling | 60,800 |
| 2008 | WAE | large fingerling | 12,638 |
| 2010 | WAE | large fingerling | 16,687 |
| 2012 | WAE | large fingerling | 7,380 |
| 2014 | WAE | large fingerling | 11,224 |

Table 7. Year class distribution based on the age/length summary for yellow perch sampled in gill nets from South Red Iron Lake, 2009-2015.

| | Year Class | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Survey Year | 2015 | 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 |
| 2015 | | 1 | 14 | 1 | 2 | 5 | | | |
| 2012 | --- | --- | --- | | 3 | 107 | 41 | 6 | |
| 2009 | --- | --- | --- | --- | --- | --- | --- | 6 | 27 |

Table 8. Weighted mean TL (mm) at capture for yellow perch captured in experimental gill nets (expanded sample size) in South Red Iron Lake, 2009-2015.

| | Age | | | | |
|---|---|---|---|---|---|
| Year | 1 | 2 | 3 | 4 | 5 |
| 2015 | 98(1) | 140(14) | 171(1) | 224(2) | 227(5) |
| 2012 | 92 (3) | 144 (107) | 176 (41) | 202 (6) | --- |
| 2009 | 94 (6) | 142 (27) | --- | --- | --- |

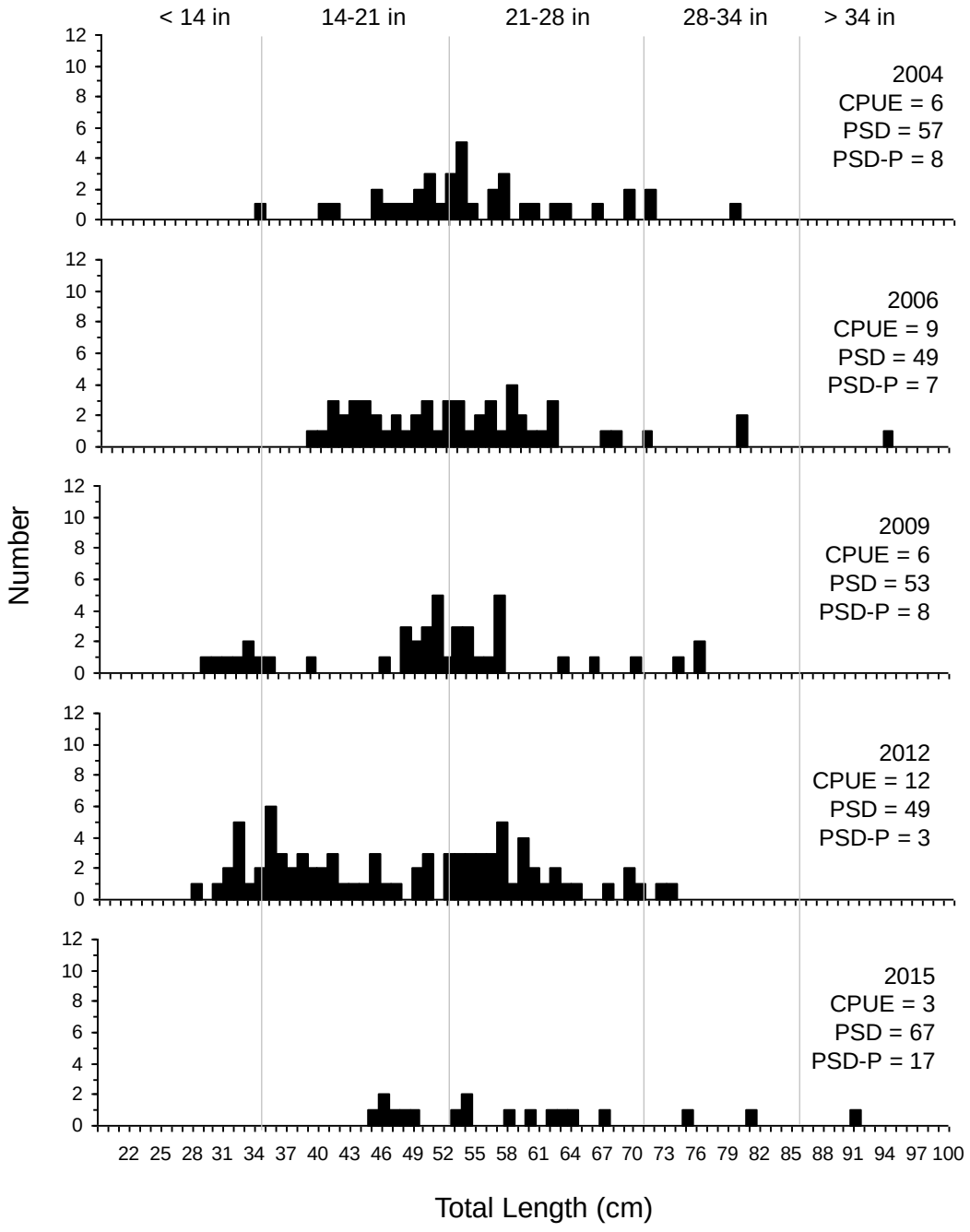


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using experimental gill nets in South Red Iron Lake, 2004-2015.

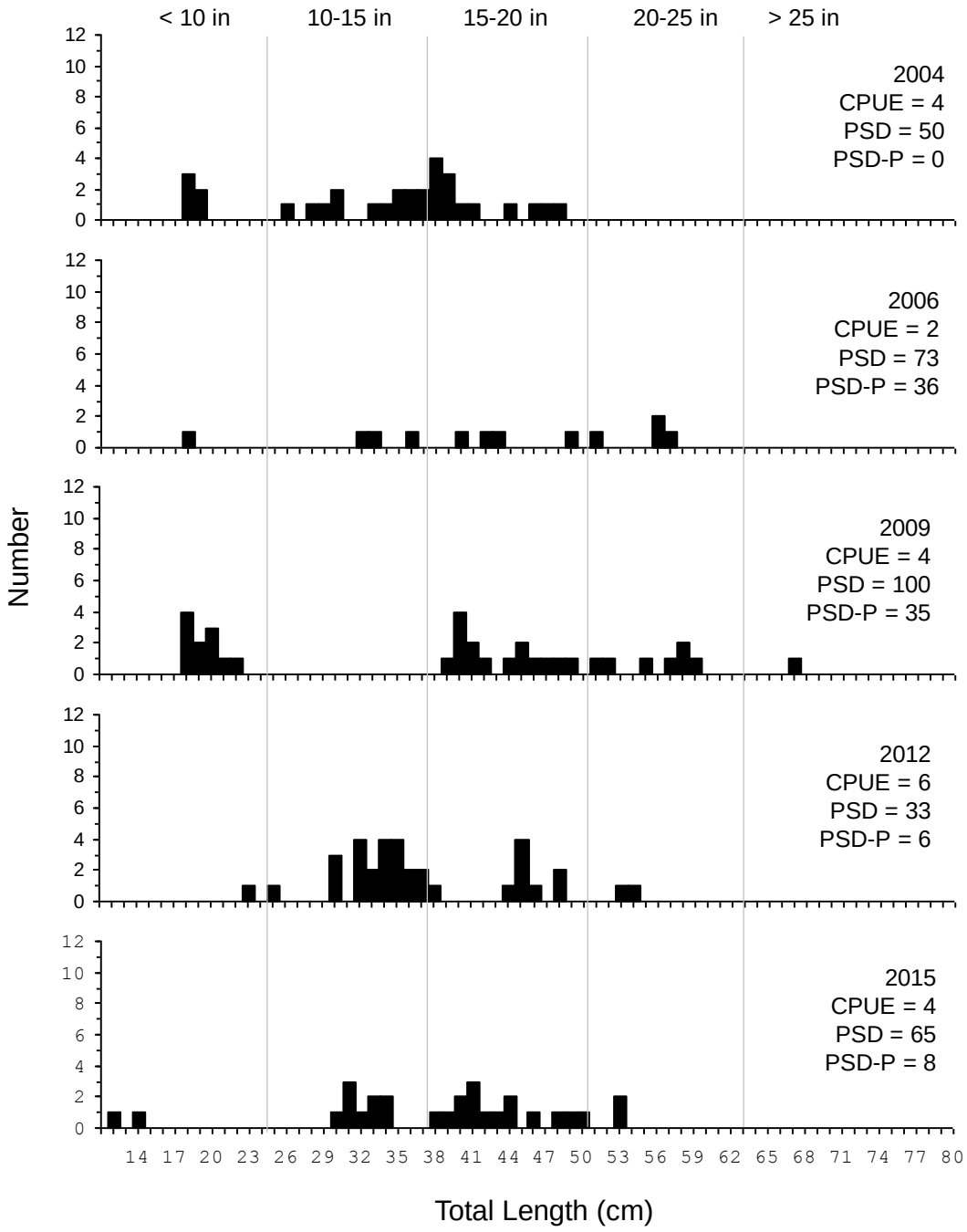


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in South Red Iron Lake, 2004-2015.

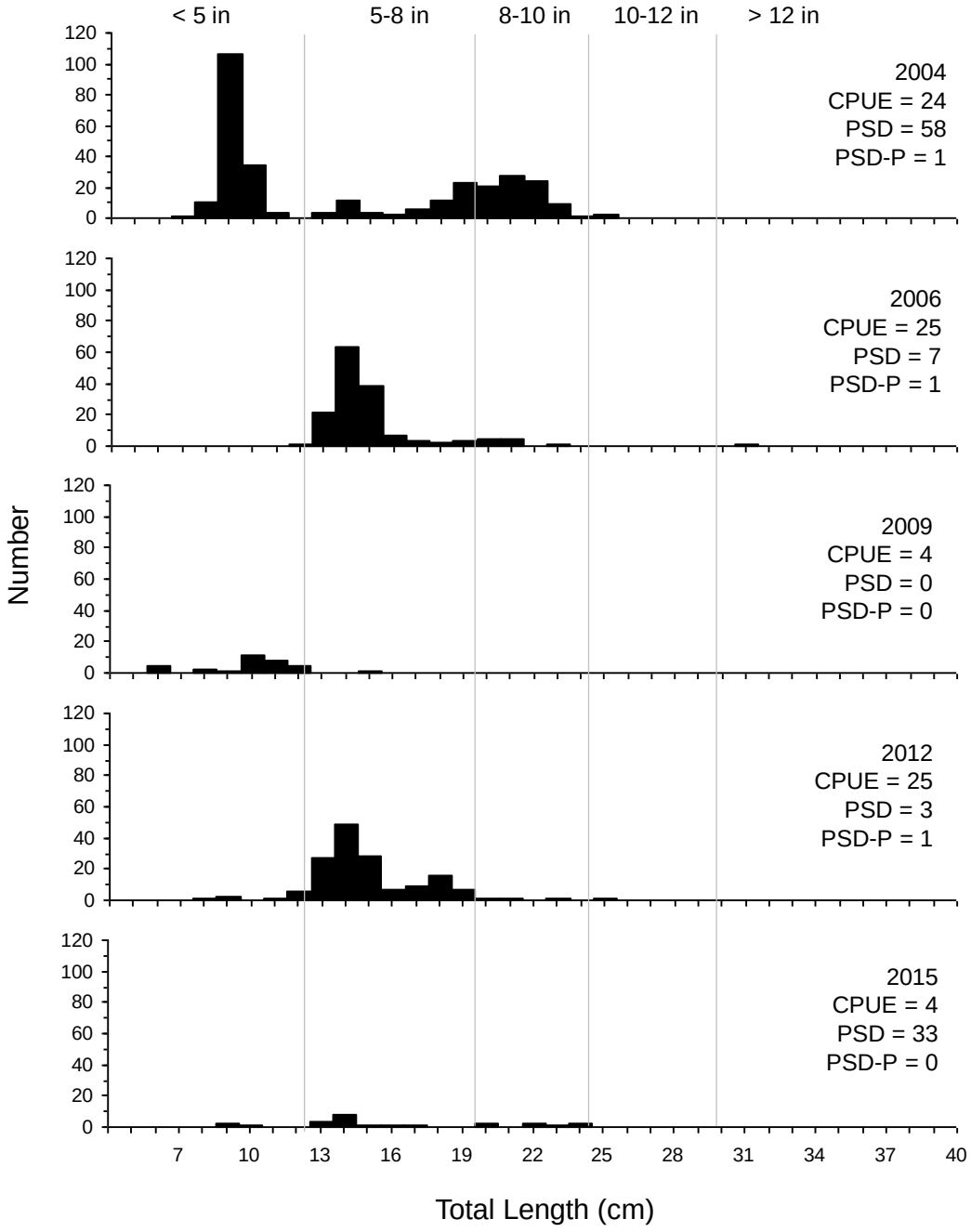


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in South Red Iron Lake, 2004-2015.

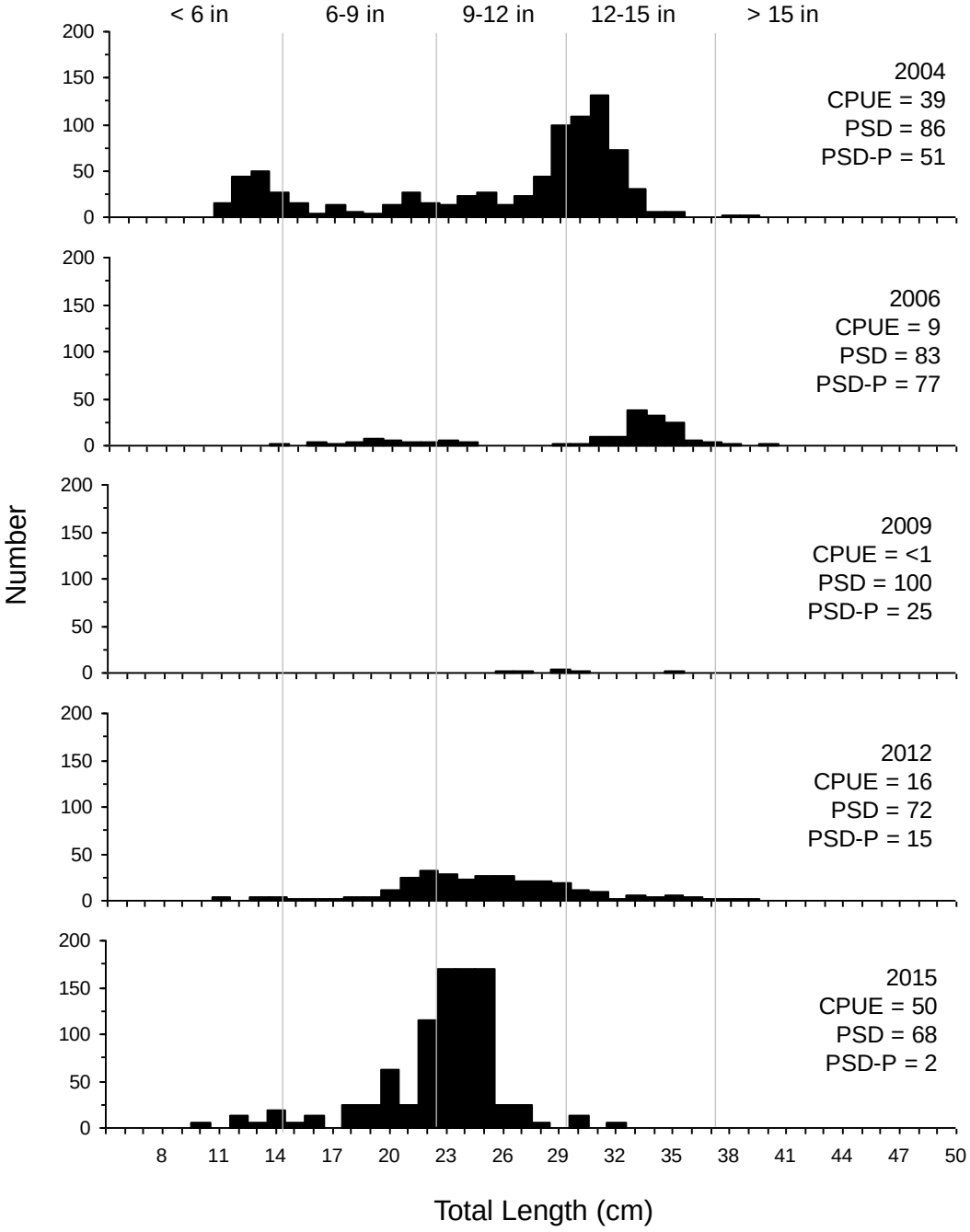


Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black bullhead captured using frame nets in South Red Iron Lake, 2004-2015.