

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
East Vermillion Lake, McCook County
2102-F-21-R-47
2014

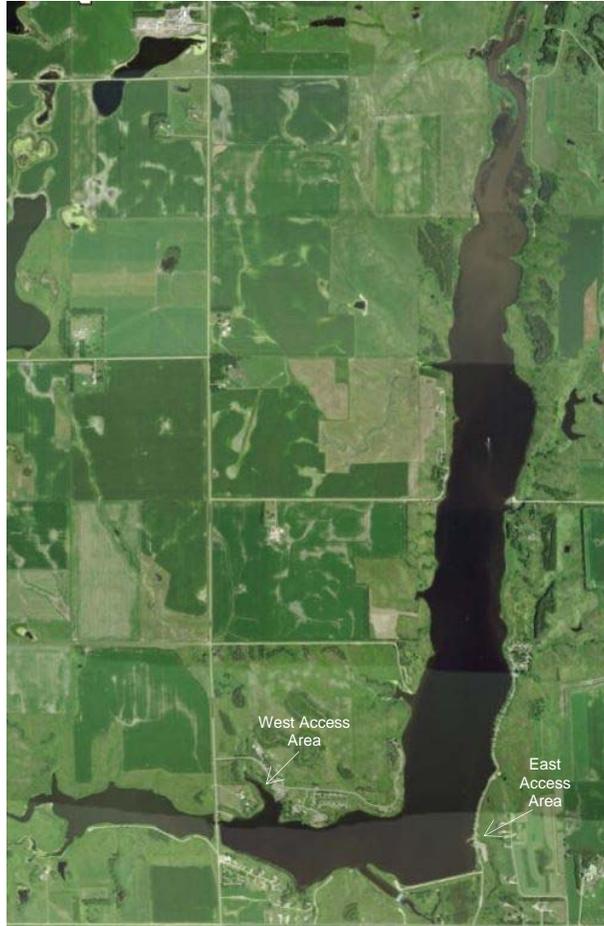


Figure 1. East Vermillion Lake, McCook County

Legal Description: T102N-R53W-Sec. 14-15, 22-23, 26-27, 33-35

Location from nearest town: 5 miles east, 1 mile south of Canistota, SD

Surface Area: 513 acres

Meandered (Y/N): No

OHWM elevation: insert

Outlet elevation: insert

Max. depth at outlet elevation: 23 feet

Observed water level: Full

Contour map available (Y/N): Yes

Watershed area: 264,789 acres

Shoreline length: 10.1 miles

Date set: insert

Date set: insert

Mean depth at outlet elevation: 12 feet

Lake volume: 6,600 acre feet

Date mapped: 1974

DENR beneficial use classifications: 4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Introduction

General

East Vermillion Lake, commonly known as Lake Vermillion, is an impoundment formed by the construction of a dam across the East Vermillion River in 1958. Battle Creek is a secondary tributary that forms the west arm of the lake. A low-level outlet gate can be opened for flood control and dam maintenance purposes. In April and July 1993, the primary and secondary spillways suffered significant damage during flood events. In March 1994, the primary spillway was undermined and collapsed due to the previous year's damage. The primary spillway was repaired by spring 1995.

Ownership of Lake and Adjacent Lakeshore Properties

East Vermillion Lake is owned and managed by the Parks and Wildlife Divisions of the South Dakota Department of Game, Fish and Parks (GFP). Together, the two divisions own 1,826 acres which includes the surface area of the lake. Public use easements grant the public the right to access and use a strip of land 50 feet wide outside the high water contour of the lake.

Fishing Access

The West Recreation Area, a fee area managed by the Parks Division, has a double lane boat ramp, boat dock, public toilet, handicapped fishing dock, modern campground, fish cleaning station, swimming beach, and shore fishing access (Figure 1). There is vehicle access to shore-fishing areas in the western arm of the lake. The East Recreation Area, also a fee area managed by the Parks Division, has a double lane boat ramp, boat dock, public toilet, campground, and shore fishing access.

Water Quality and Aquatic Vegetation

From 2005 to 2010, water clarity ranged from 61-100 cm (24-39 in) in East Vermillion (Table 1). However, from 2011-2014, there was a significant improvement with values ranging from 132-191 cm (52-75 in). The increase in water clarity coincides with a period of below average precipitation and reduced runoff in the watershed. If this trend continues, submerged aquatic vegetation should become more abundant.

Table 1. Water temperature, Secchi depth and observations/comments on water quality and aquatic vegetation in East Vermillion Lake, McCook County, 2005-2014.

Year	Water Temp °C (°F)	Secchi Depth cm (in)	Observations/Comments (algae, aquatic vegetation, water quality, etc.)
2014	26 (78)	155 (61)	Algae and sago pondweed
2013	-- (--)	160 (63)	Sago pondweed
2012	28 (83)	132 (52)	Sago and cattails
2011	26 (78)	191 (75)	Sago pondweed
2010	25 (77)	94 (37)	Sago and cattails
2009	24 (75)	100 (39)	Sago pondweed
2008	26 (78)	71 (28)	Sago pondweed
2007	28 (83)	61 (24)	Algae, cattails and sago pondweed
2006	26 (79)	64 (25)	Sago pondweed
2005	27 (80)	71 (28)	Algae, cattails and sago pondweed

Fish Community

East Lake Vermillion contains a diverse fish community consisting of many game species and only four rough fish species (Table 2). Bighead carp and silver carp, two exotic invading species, can be found in the tailrace below the spillway and pose a threat to the lake as well as the entire East Vermillion watershed.

Table 2. Fish species commonly found in East Vermillion Lake, McCook County.

Game Species	Other Species
Walleye	Freshwater Drum
Black Crappie	Common Carp
Bluegill	White Sucker
Black Bullhead	Bigmouth Buffalo
Channel Catfish	
Yellow Perch	
Largemouth Bass	
White Crappie	
Northern Pike	
White Bass	

Fish Management

East Vermillion Lake is relatively deep with decent water quality and only one fish kill has been documented in recent history (Table 3). Walleye, black crappie, bluegill and yellow perch are the species most sought by anglers and those that have been actively managed by stocking in the last 10 years (Table 4).

Table 3. Fish kill history for East Vermillion Lake, McCook County.

Year	Severity	Comments
1998	Light	August 25 kill of ~300 crappies in west arm

Table 4. Stocking history for East Vermillion Lake, McCook County, 2005-2014.

Year	Number	Species	Size
2005	16,544	Walleye	Fingerling
2006	51,425	Walleye	Fingerling
2009	1,661	Black Crappie	Adult
	1,187	Bluegill	Adult
2010	6,125	Black Crappie	Adult
	405	Bluegill	Adult
2011	196	Walleye	Large Fingerling
	737	Yellow Perch	Adult
2013	50,530	Walleye	Fingerling
2014	10,207	Walleye	Large Fingerling

Methods

East Vermillion Lake was sampled on July 8-10, 2013 with six overnight gill-net sets and 10 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on Sept. 11, 2014 to evaluate walleye recruitment.

Results and Discussion

Net Catch Results

White sucker and black bullhead were the species sampled most frequently in the gill nets (Table 5), while black bullheads and bluegill were the most abundant species caught in the trap nets (Table 6). Black bullhead abundance has declined since 2011 and bigmouth buffalo were sampled for the first time in the last 10 years (Table 9).

Table 5. Total catch from six overnight gill nets set in East Vermillion Lake, McCook County, July 7-9, 2014.

Species	#	%	CPUE¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
White Sucker	52	24.9	8.7	<u>+1.7</u>	9.5	92	90	--
Black Bullhead	49	23.4	8.2	<u>+2.9</u>	95.4	100	2	--
White Bass	30	14.4	5.0	<u>+1.4</u>	0.6	20	10	93
Walleye	22	10.5	3.7	<u>+1.5</u>	9.7	85	20	88
Northern Pike	22	10.5	3.7	<u>+0.8</u>	1.9	59	5	85
Freshwater Drum	9	4.3	1.5	<u>+0.6</u>	1.0	--	--	--
Channel Catfish	9	4.3	1.5	<u>+0.4</u>	3.3	--	--	--
Yellow Perch	8	3.8	1.3	<u>+1.0</u>	5.9	--	--	--
Common Carp	6	2.9	1.0	<u>+0.6</u>	1.8	--	--	--
Black Crappie	2	1.0	0.3	<u>+0.4</u>	0.8	--	--	--

*10 years (2005-2014)

¹ See Appendix A for definitions of CPUE, PSD, RSD, RSD-P and mean Wr.

Table 6. CPUE by length category for selected species sampled with gill nets in East Vermillion Lake, McCook County, July 7-9, 2014.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
White Sucker	--	8.7	0.7	0.2	7.8	8.7	<u>+1.7</u>
Black Bullhead	--	8.2	--	8.0	0.2	8.2	<u>+2.9</u>
White Bass	--	5.0	4.0	0.5	0.5	5.0	<u>+1.4</u>
Walleye	0.3	3.3	0.4	2.2	0.7	3.7	<u>+1.5</u>
Northern Pike	--	3.7	1.5	2.0	0.2	3.7	<u>+0.8</u>
Freshwater Drum	0.3	1.2	--	1.2	--	1.5	<u>+0.6</u>
Channel Catfish	--	1.5	--	1.3	0.2	1.5	<u>+0.4</u>
Yellow Perch	--	1.3	--	1.1	0.2	1.3	<u>+1.0</u>
Common Carp	--	1.0	--	0.5	0.5	1.0	<u>+0.6</u>
Black Crappie	--	0.3	0.2	--	0.1	0.3	<u>+0.4</u>

Length categories can be found in Appendix A.

Table 7. Total catch from 10 overnight trap nets set in East Vermillion Lake, McCook County, July 7-9, 2014.

Species	#	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	236	54.6	23.6	<u>+10.6</u>	457.6	92	8	--
Bluegill	61	14.1	6.1	<u>+3.1</u>	3.7	53	42	120
Common Carp	32	7.4	3.2	<u>+1.8</u>	4.2	94	53	--
Northern Pike	22	5.1	2.2	<u>+0.8</u>	1.4	77	5	88
Walleye	20	4.6	2.0	<u>+1.3</u>	1.2	100	37	87
White sucker	19	4.4	1.9	<u>+1.1</u>	2.7	100	100	--
Channel Catfish	14	3.2	1.4	<u>+1.1</u>	2.0	79	0	90
White Bass	9	2.1	0.9	<u>+0.9</u>	0.2	--	--	--
Black Crappie	9	2.1	0.9	<u>+0.4</u>	5.3	--	--	--
Bigmouth Buffalo	5	1.2	0.5	<u>+0.5</u>	0.1	--	--	--
Freshwater Drum	3	0.7	0.3	<u>+1.8</u>	0.3	--	--	--
White Crappie	1	0.2	0.1	<u>+0.1</u>	0.6	--	--	--
Yellow Perch	1	0.2	0.1	<u>+0.1</u>	0.6	--	--	--

*10 years (2005-2014)

Table 8. CPUE by length category for selected species sampled with trap nets in East Vermillion Lake, McCook County, July 7-9, 2014.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Black Bullhead	0.2	23.4	1.8	21.6	--	23.6	<u>+10.6</u>
Bluegill	0.2	5.9	2.8	0.6	2.5	6.1	<u>+3.1</u>
Common Carp	--	3.2	0.2	1.3	1.7	3.2	<u>+1.8</u>
Northern Pike	--	2.2	0.5	1.6	0.1	2.2	<u>+0.8</u>
Walleye	0.1	1.9	--	1.2	0.7	2.0	<u>+1.3</u>
White sucker	--	1.9	--	--	1.9	1.9	<u>+1.1</u>
Channel Catfish	--	1.4	0.3	1.1	--	1.4	<u>+1.1</u>
White Bass	--	0.9	0.8	--	0.1	0.9	<u>+0.9</u>
Black Crappie	0.3	0.6	0.4	--	0.2	0.9	<u>+0.4</u>
Bigmouth Buffalo	--	0.5	0.3	--	0.2	0.5	<u>+0.5</u>
Freshwater Drum	0.1	0.2	0.1	0.1	--	0.3	<u>+1.8</u>
White Crappie	--	0.1	--	0.1	--	0.1	<u>+0.1</u>
Yellow Perch	--	0.1	0.1	--	--	0.1	<u>+0.1</u>

Length categories can be found in Appendix A.

Table 9. Gill-net (GN) and trap-net (TN) CPUE for selected fish species sampled in East Vermillion Lake, McCook County, 2005-2014.

Species	Gear	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bigmouth Buffalo	GN	--	--	--	--	--	--	--	--	--	--
	TN	--	--	--	--	--	--	--	--	--	0.5
Black Bullhead	GN	124.0	174.5	98.8	86.8	131.3	59.0	86.5	164.7	20.3	8.2
	TN	258.8	2718.8	534.1	78.9	491.4	39.5	214.4	152.4	64.0	23.6
Black Crappie	GN	--	0.3	--	0.3	0.3	2.0	2.0	2.3	0.3	0.3
	TN	0.3	1.1	0.9	0.3	0.5	11.3	35.5	0.9	0.8	0.9
Bluegill	GN	--	--	--	--	--	--	--	--	0.3	--
	TN	6.6	4.9	2.5	3.6	0.8	2.1	4.1	2.1	3.7	6.1
Channel Catfish	GN	5.0	10.8	2.8	3.8	5.5	0.3	0.3	2.3	0.3	1.5
	TN	6.6	3.1	3.1	2.7	0.3	0.2	0.1	1.1	1.2	1.4
Common Carp	GN	0.8	3.0	3.8	2.0	0.8	0.5	1.0	3.3	1.8	1.0
	TN	6.3	2.3	8.2	7.5	0.3	1.8	1.1	3.3	7.6	3.2
Freshwater Drum	GN	--	0.3	--	--	--	0.8	1.3	1.7	4.3	1.5
	TN	--	--	--	0.1	0.1	1.0	1.0	0.4	0.3	0.3
Northern Pike	GN	0.8	--	0.5	0.8	0.3	1.0	4.3	3.7	4.0	3.7
	TN	0.6	1.3	0.2	1.0	0.3	0.7	2.7	3.4	1.2	2.2
White Crappie	GN	0.3	0.3	--	--	--	2.0	--	--	--	--
	TN	0.3	--	0.2	--	0.1	0.1	4.1	1.1	0.3	0.1
Walleye	GN	9.8	17.8	8.8	10.0	7.3	10.5	7.5	13.7	8.0	3.7
	TN	0.3	0.1	2.2	2.2	1.7	1.7	1.2	0.4	0.4	2.0
White Bass	GN	--	--	--	--	--	--	--	--	1.0	5.0
	TN	--	--	--	--	--	--	0.3	0.1	0.3	0.9
White Sucker	GN	4.5	3.0	8.3	10.0	10.0	18.5	19.8	3.3	9.0	8.7
	TN	1.7	2.1	1.6	2.5	5.2	4.4	5.2	2.0	0.6	1.9
Yellow Perch	GN	8.8	6.3	7.3	11.5	2.8	4.3	12.0	1.7	3.0	1.3
	TN	0.4	1.5	0.7	0.1	0.1	1.5	1.9	--	--	0.1

Walleye

Management Objective

- maintain a walleye population with a total gill-net CPUE of at least 10

Management Strategy

- stock small walleye fingerlings at the rate of 70/acre (35,910) as needed to achieve the management objective

Walleye gill-net CPUE has been declining since 2012 and is now well below the management objective (Table 10). Although age-0 abundance was quite high in fall 2013, these fish apparently did not survive as only seven age-1 fish per hour were sampled in fall 2014 (Table 12). Low age-1 abundance combined with poor natural reproduction prompted the stocking of large fingerlings in late fall 2014 (Table 11). Even though abundance is low at this time, the population has a good size distribution (Figures 2, 3) and anglers should have some opportunity to catch a very nice fish.

Table 10. CPUE, PSD, RSD-P, and mean *Wr* for all walleyes sampled with gill nets in East Vermillion Lake, McCook County, 2005-2014. Stocked years are shaded.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE	9.8	17.8	8.8	10.0	7.3	10.5	7.5	13.7	8.0	3.7
PSD	50	60	59	0	21	40	33	43	22	85
RSD-P	15	4	15	0	4	0	11	8	3	20
Mean <i>Wr</i>	92	98	86	89	94	85	84	82	89	88

Table 11. Walleyes stocked into East Vermillion Lake, McCook County, 2005-2014.

Year	Number	Size
2005	16,544	Fingerling
2006	51,425	Fingerling
2011	196	Large Fingerling
2013	50,530	Fingerling
2014	10,207	Large Fingerling

Table 12. Age-0 and age-1 walleyes sampled with nighttime electrofishing on East Vermillion Lake, McCook County, 2005-2014.

Year	Stocking	Age-0 CPH	% stocked	Mean length (range; mm)	<i>Wr</i>	Age-1 CPH	Mean length (range; mm)	<i>Wr</i>
2014	none	1		157 (155-157)	89	7	259 (235-259)	79
2013	fingerling	154		176 (127-210)	94	0		
2012	none	0					272 (189-282)	85
2011	none	52		133 (112-164)	90	60	215 (185-256)	78
2010	none	102		172 (138-220)	81	24	¹ (238-343)	
2009	none	164		174 (135-190)	97	7	206 (205-211)	98
2008	none	35		188 (170-215)	98	2	226 (226-226)	83
2007	none	23		151 (131-151)	75	156	221 (171-262)	81
2006	fingerling	326	8	144 (116-205)	85	2	254 (212-268)	92
2005	none	39		201 (152-230)	98	3	228 (220-230)	93

¹ Only the smallest and largest age-1 individuals were measured to provide a range of lengths.

Table 13. Weighted mean length at capture (mm) for walleyes sampled with gill nets in East Vermillion Lake, McCook County, 2005-2014. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size is in parentheses.

Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11
2014	248 (22)	-- (3)	372 (2)	404 (10)	462 (4)	--	--	594 (1)	485 (1)	--	--
2013	-- (32)	304 (6)	347 (22)	466 (4)	--	--	--	--	--	--	--
2012	269 (41)	320 (17)	391 (15)	449 (3)	496 (3)	587 (2)	--	--	--	--	--
2011	196 (30)	334 (13)	397 (2)	--	466 (2)	--	--	--	--	550 (1)	--
2010	255 (39)	-- (28)	408 (3)	438 (8)	--	--	--	--	--	--	--
2009	-- (28)	291 (4)	351 (23)	555 (1)	--	--	--	--	--	--	--
2008	216 (40)	290 (37)	372 (1)	--	--	--	--	--	--	--	--
2007	270 (35)	323 (5)	387 (5)	392 (5)	461 (2)	446 (2)	468 (3)	518 (3)	552 (1)	629 (2)	478 (1)
2006	229 (71)	325 (19)	418 (20)	--	448 (5)	457 (5)	510 (3)	--	531 (1)	--	--
2005	288 (34)	369 (9)	--	440 (8)	467 (2)	522 (3)	596 (1)	641 (1)	--	--	--

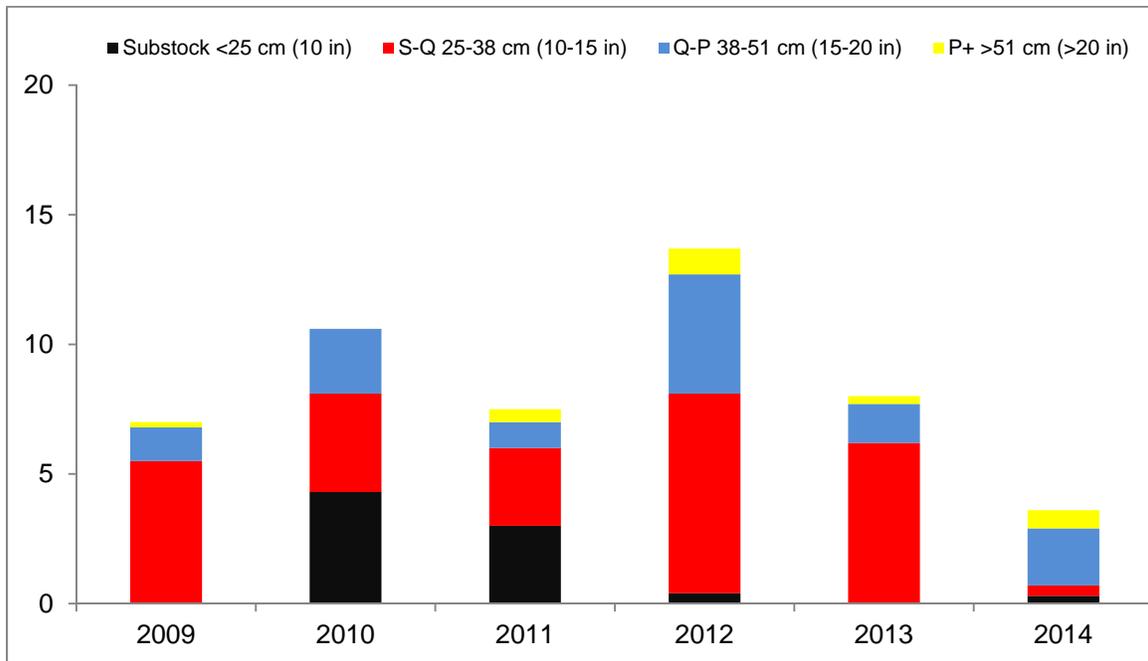


Figure 2. CPUE by length category for walleye sampled with gill nets in East Vermillion Lake, McCook County, 2009-2014.

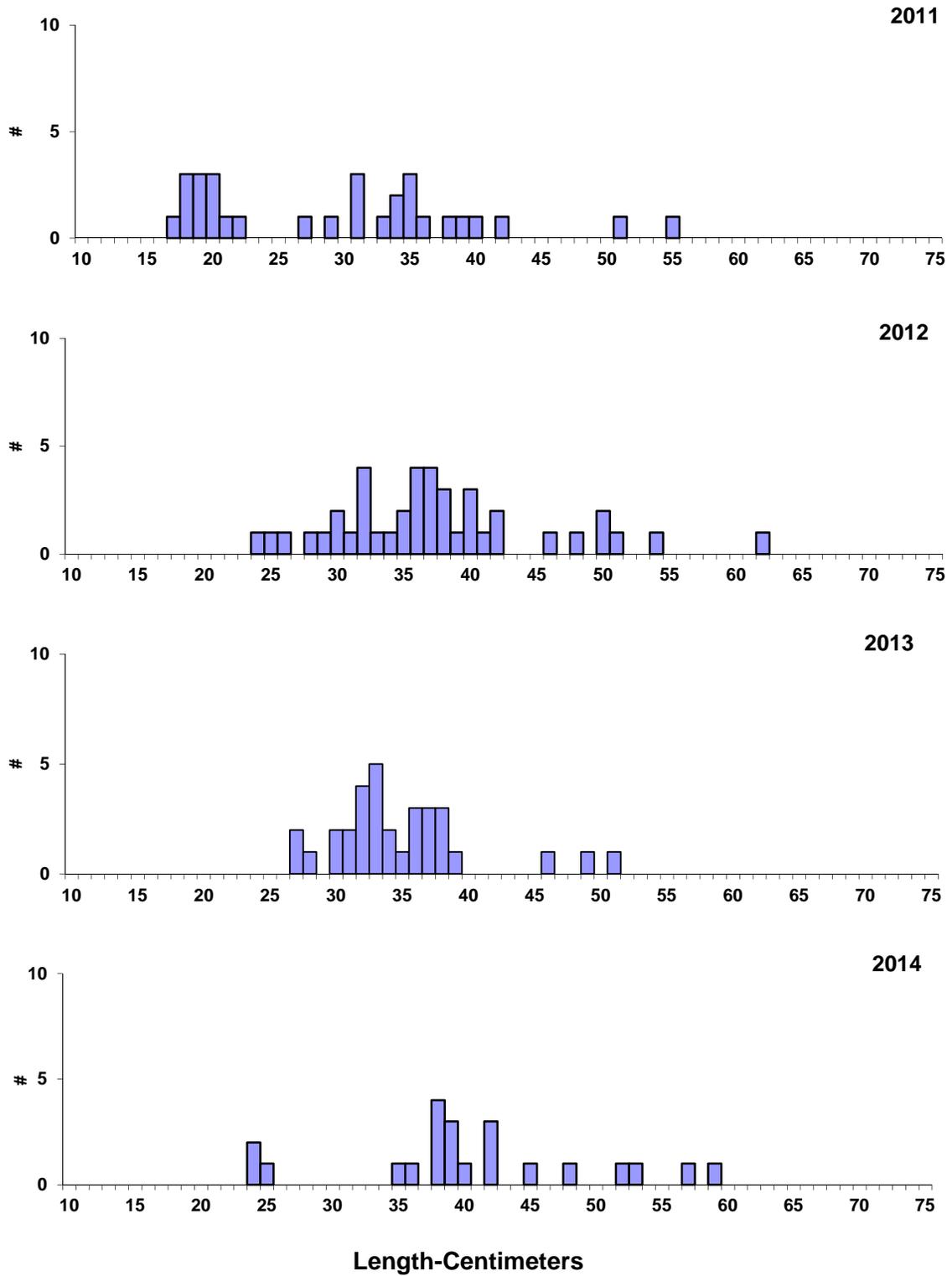


Figure 3. Length frequency histograms for walleye sampled with gill nets in East Vermillion Lake, McCook County, 2011-2014.

Black Crappie

Management Objective

- none

Management Strategy

- monitor the population during annual lake surveys

Black crappie abundance remains very low (Table 18) because no significantly large year class has been naturally created since 2010-2011 (Figures 6, 7).

Table 18. CPUE, PSD, RSD-P, and mean Wr for all black crappie sampled with trap nets in East Vermillion Lake, McCook County, 2005-2014.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CPUE	0.3	1.1	0.9	0.3	0.5	11.3	35.5	0.9	0.8	0.9
PSD	--	--	--	--	--	47	41	--	--	--
RSD-23	--	--	--	--	--	5	10	--	--	--
RSD-P	--	--	--	--	--	3	5	--	--	--
Mean Wr	--	--	--	--	--	110	108	--	--	--

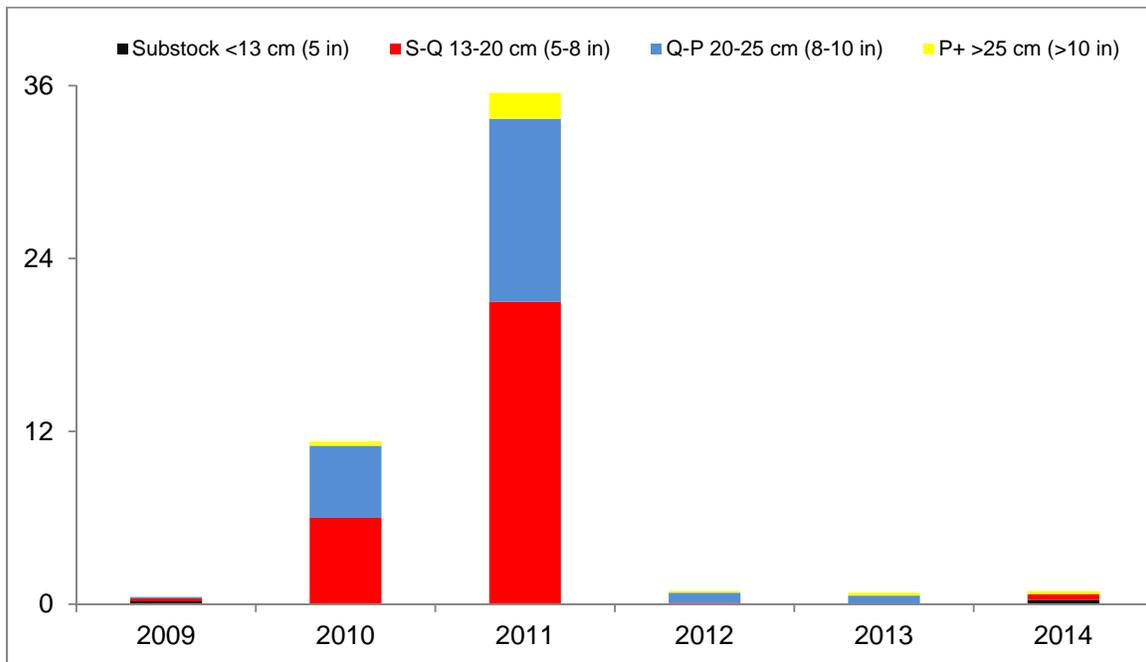


Figure 6. CPUE by length category for black crappies sampled with trap nets in East Vermillion Lake, McCook County, 2009-2014.

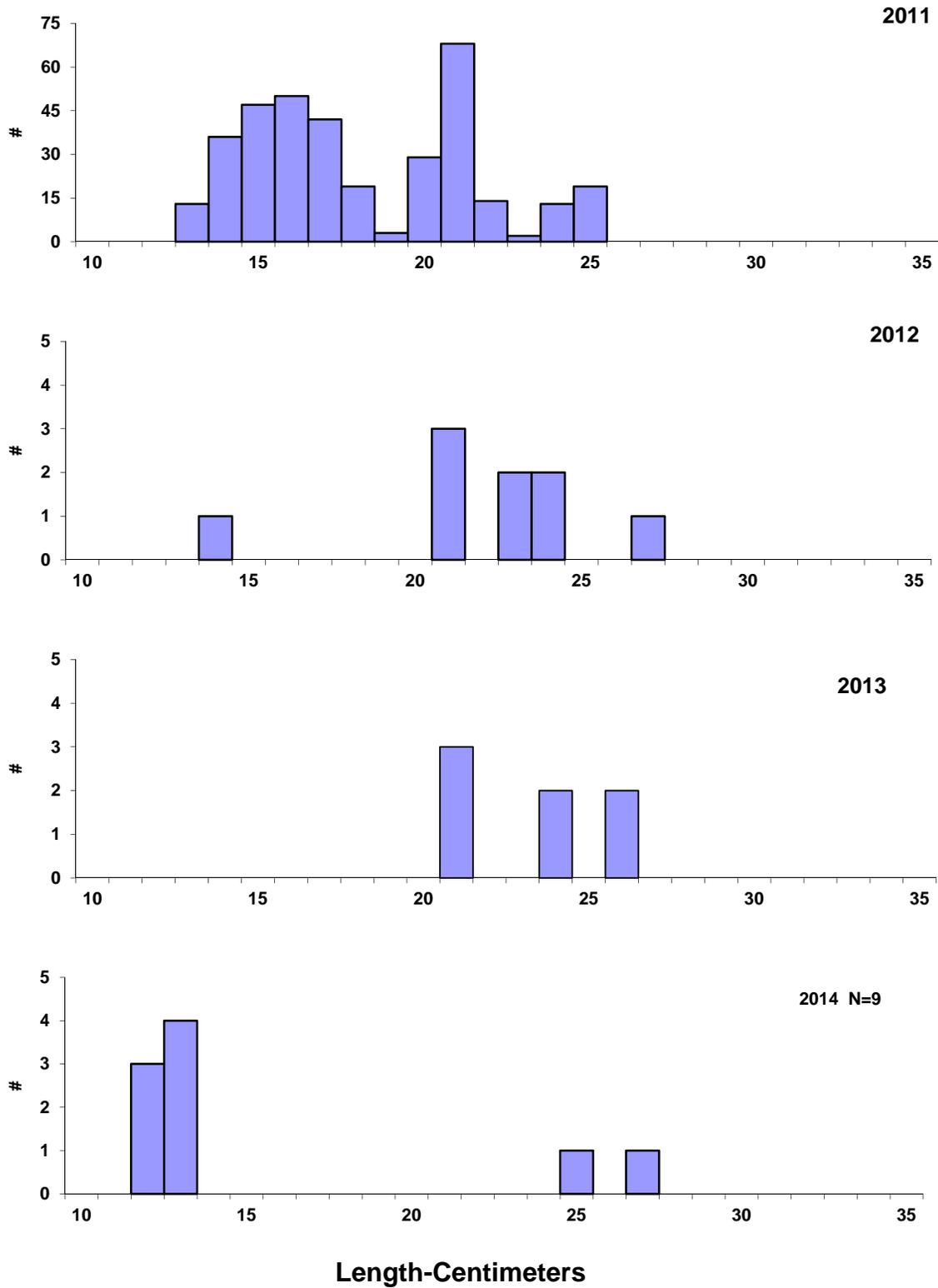


Figure 7. Length frequency histograms for black crappies sampled with trap nets in East Vermillion Lake, McCook County, 2011-2014.

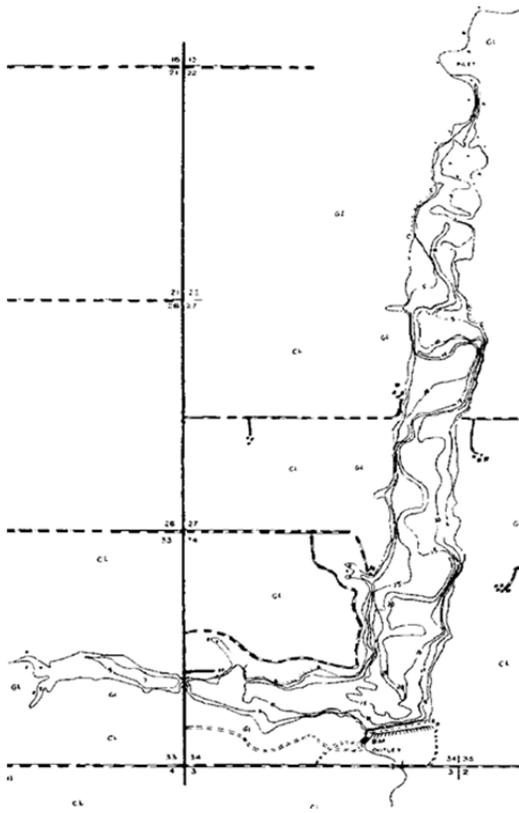


Figure 8. Contour map of East Vermillion Lake, McCook County.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters (Inches in parenthesis).

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25 (10)	38 (15)	51 (20)	63 (25)	76 (30)
Yellow perch	13 (5)	20 (8)	25 (10)	30 (12)	38 (15)
Black crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
White crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
Bluegill	8 (3)	15 (6)	20 (8)	25 (10)	30 (12)
Largemouth bass	20 (8)	30 (12)	38 (15)	51 (20)	63 (25)
Smallmouth bass	18 (7)	28 (11)	35(14)	43 (17)	51 (20)
Northern pike	35 (14)	53 (21)	71 (28)	86 (34)	112 (44)
Channel catfish	28 (11)	41 (16)	61 (24)	71 (28)	91 (36)
Black bullhead	15 (6)	23 (9)	30 (12)	38 (15)	46 (18)
Common carp	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)
Bigmouth buffalo	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.