ATTACHMENT 2: LAKE MAPS AND ASSOCIATED DATA

NEBRASKA GAME AND PARKS COMMISSION REPORT

2009 BATHYMETRIC SURVEY MAP

2022 BATHYMETRIC SURVEY MAPS

LAKE IMPROVEMENTS DESIGN

THIS PAGE LEFT INTENTIONALLY BLANK

Nebraska Game and Parks Commission Report

2022 Lake Hastings Report

Alex Engel

19 September, 2022

Lake Hastings was sampled on 6/22/2022.

Location

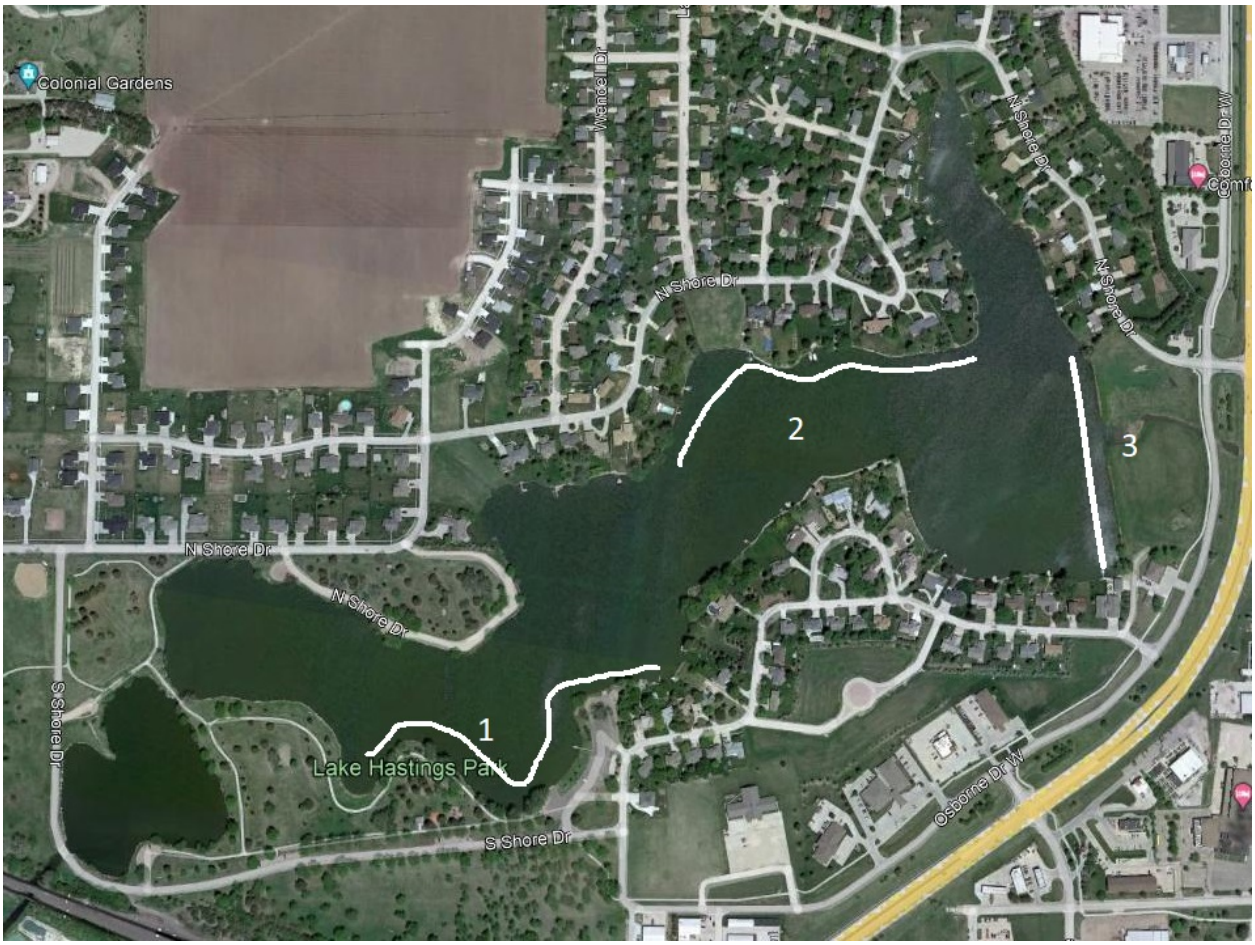
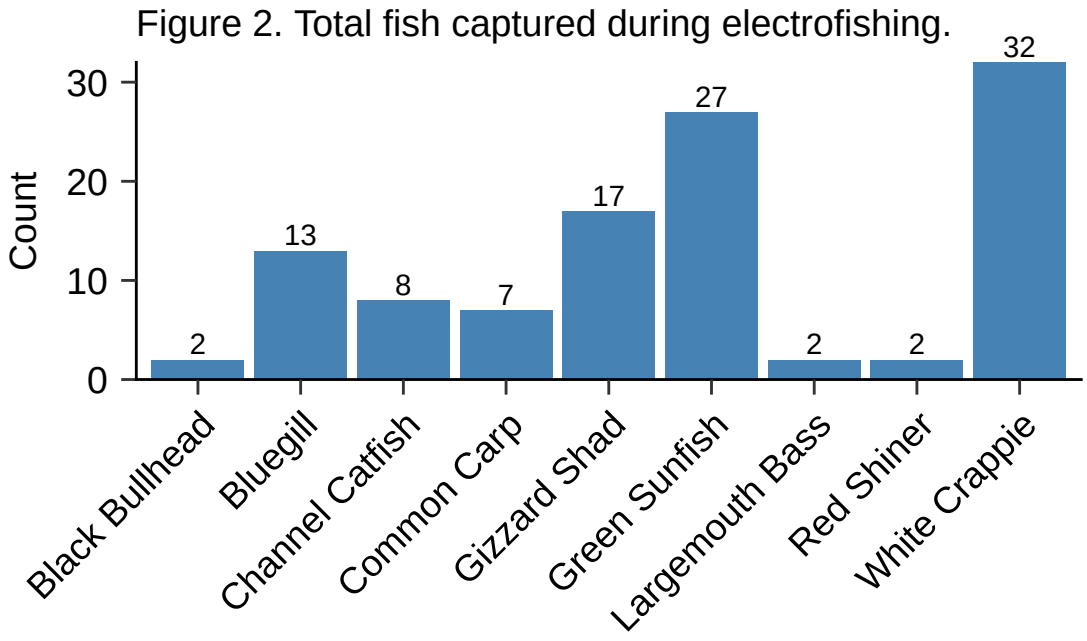


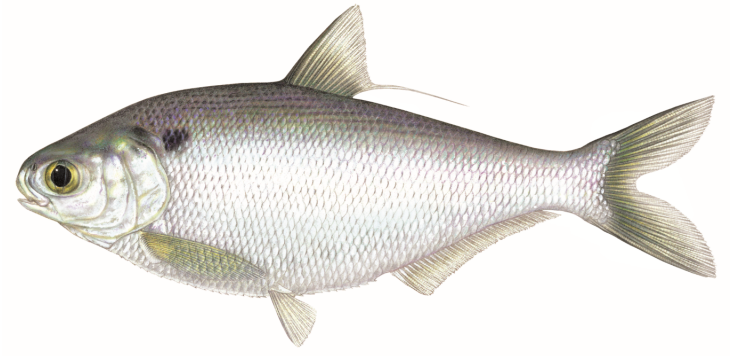
Figure 1: Map of Lake Hastings in Hastings, NE. Lines indicate specific electrofishing runs.

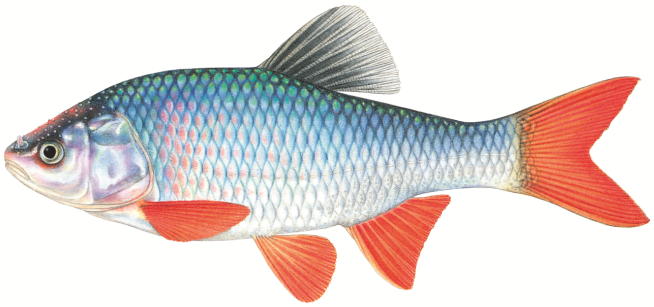
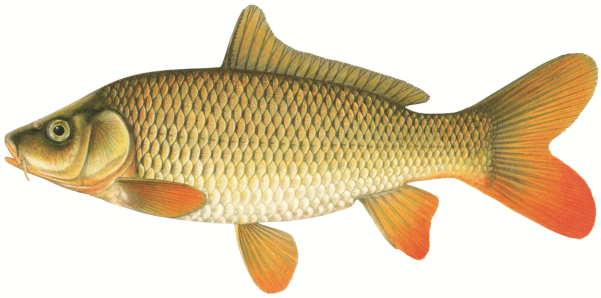
Fish Sampled

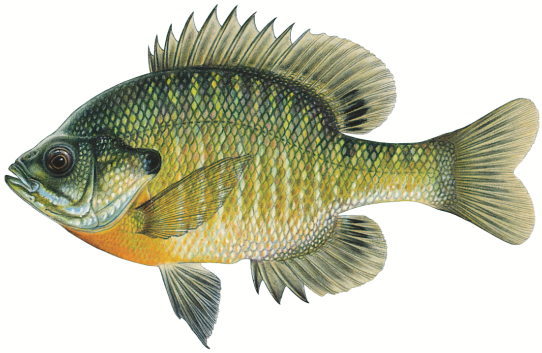
A total of 110 fish representing 9 species were collected during 30 minutes of boat mounted electrofishing. All largemouth bass, bluegill, green sunfish, crappie, and carp were collected during the first two electrofishing runs, only largemouth bass were collected during the 3rd electrofishing run. Finally, only a representative subsample of gizzard shad were sampled.



Species seen

Common Name	Photo
Gizzard Shad	

Common Name	Photo
Red Shiner	
Common Carp	
Black Bullhead	
Channel Catfish	

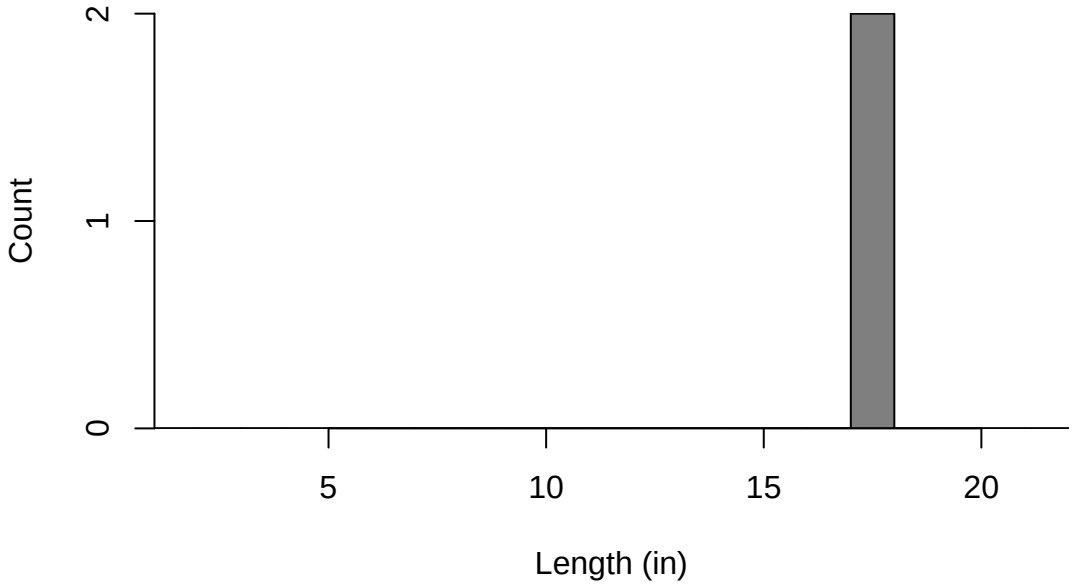
Common Name	Photo
Green Sunfish	
Bluegill	
Largemouth Bass	
White Crappie	

Largemouth Bass

Only 2 Largemouth bass were sampled. Both fish were around 18-inches in length, however, the lack of small fish sampled were indicate a problem with bass recruitment. I would consider this bass population to be poor. We typically want to see a catchrate of around 100 bass/hour with good numbers of stock sized fish (6-12 inches), quality (12-15 inches), preferred sized fish (15-20 inches), and a few memorable sized bass

(bigger than 20 inches). Bass declines could be caused by undesirable water quality and/or competition for food resources by other species such as gizzard shad, bluegills, or green sunfish.

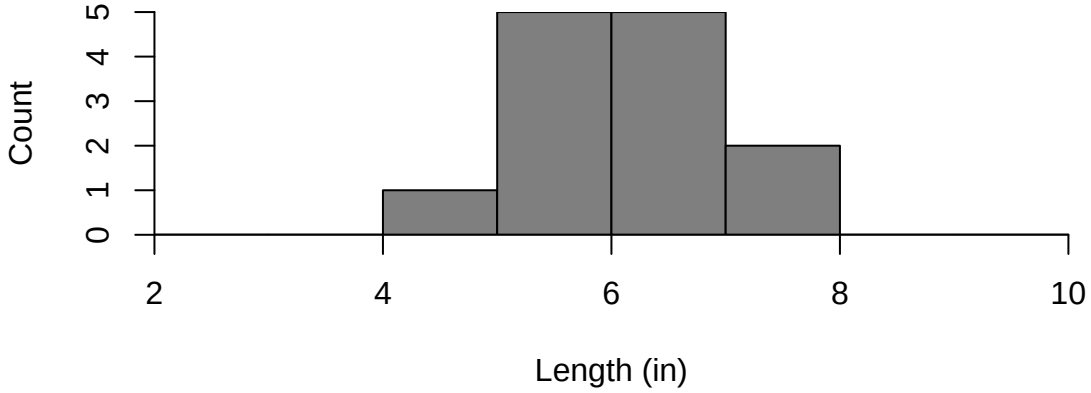
Figure 3. Length frequency of Largemouth Bass



Bluegills

A total of 13 bluegills were caught, 54% were 6 inches or larger with the rest less than 6 inches in length. No bluegills were preferred harvestable length, 8 inches or better. I would consider this bluegill population to be marginal. In future, growth and age information will be collected to determine if stunting is occurring to the bluegill population.

Figure 4. Length frequency of Bluegills



Common Carp, Gizzard Shad, and Green Sunfish

7 carp were sampled ranging from 17 to 22 inches. A representative subsample of 17 gizzard shad were sampled ranging from 5 to 13 inches. Density of gizzard shad in Lake Hastings was quite high. 27 green sunfish were sampled. Green sunfish often hybridize with bluegill and can take over small lakes, stunting both populations.

Common carp and gizzard shad are not considered very beneficial for small lakes. Shad can quickly overpopulate, competing directly with bluegills and changing nutrient cycles. However, shad are considered a good food source for larger predators such as largemouth bass. Newly hatched shad will also be eaten by white crappie until they become to large to feed on.

The feeding behavior of carp stirs up sediment within a waterbody. Suspended sediment reduces ultraviolet light penetration needed for aquatic plant growth. Aquatic plants help oxygenate the lake and also provide habitat for aquatic insects and fish. Increased turbidity also inhibits sight feeding species like largemouth bass and crappie.

Figure 5. Length frequency of Common Carp

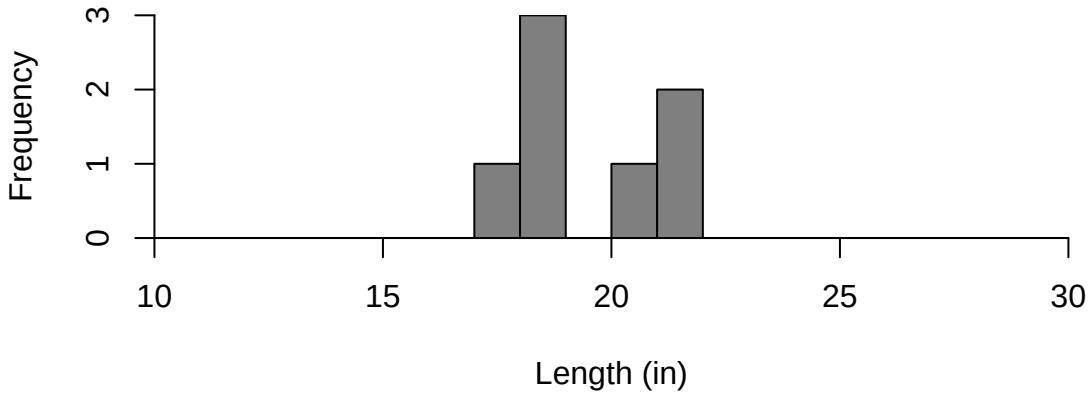


Figure 6. Length frequency of Gizzard Shad

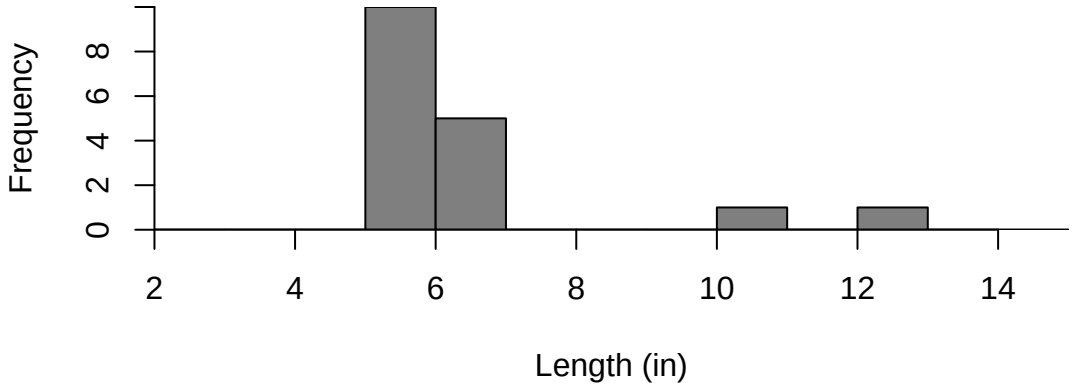
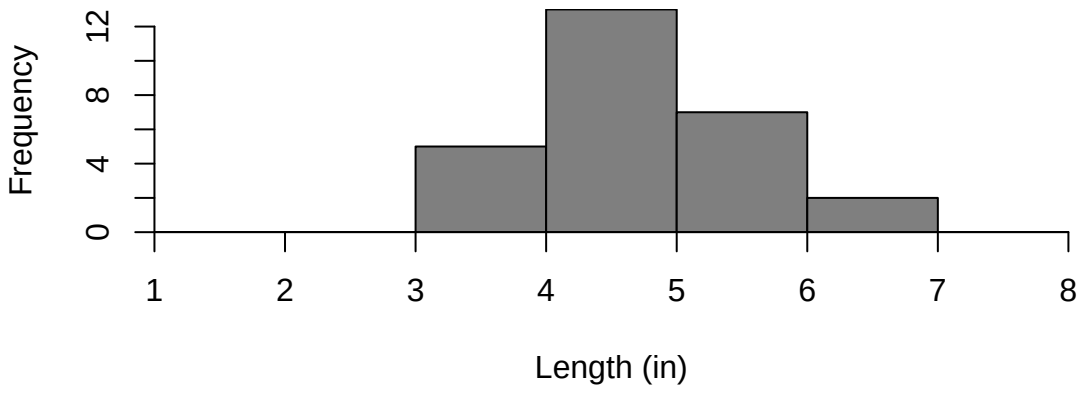


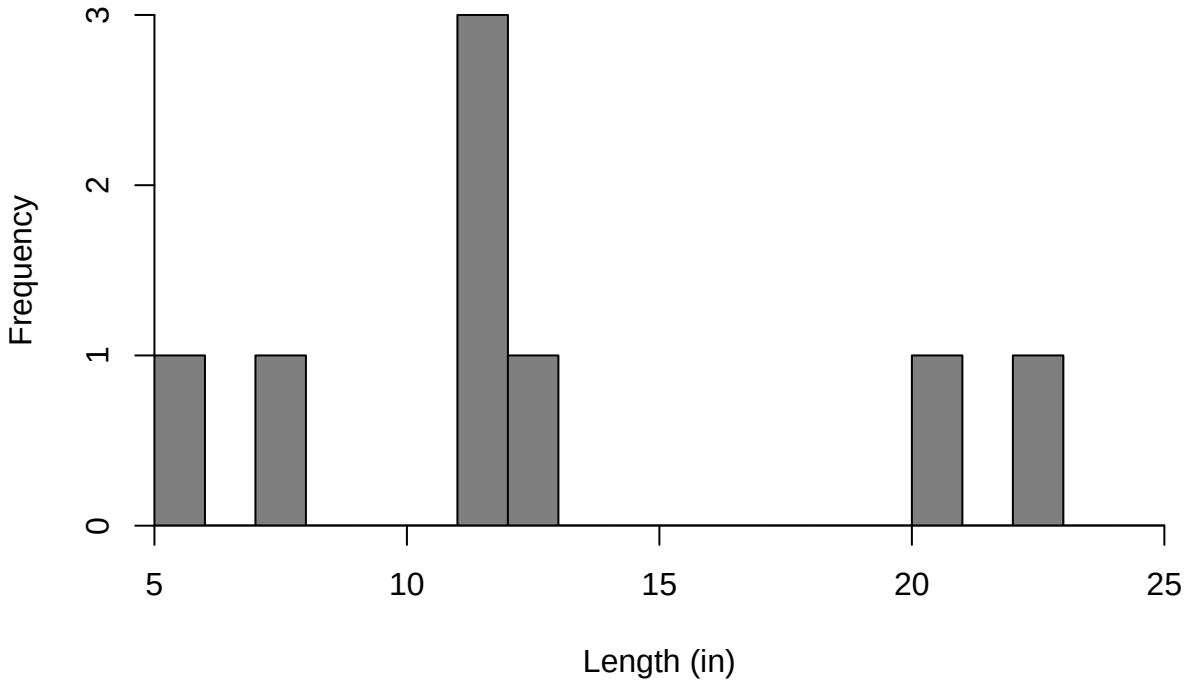
Figure 7. Length frequency of Green Sunfish



Channel Catfish

Channel catfish are traditionally hard to sample with boat electrofishing, however 8 catfish were sampled ranging from 5 to 22-inches. Based on the limited sample, I believe the catfish population is doing well and that some natural recruitment is occurring.

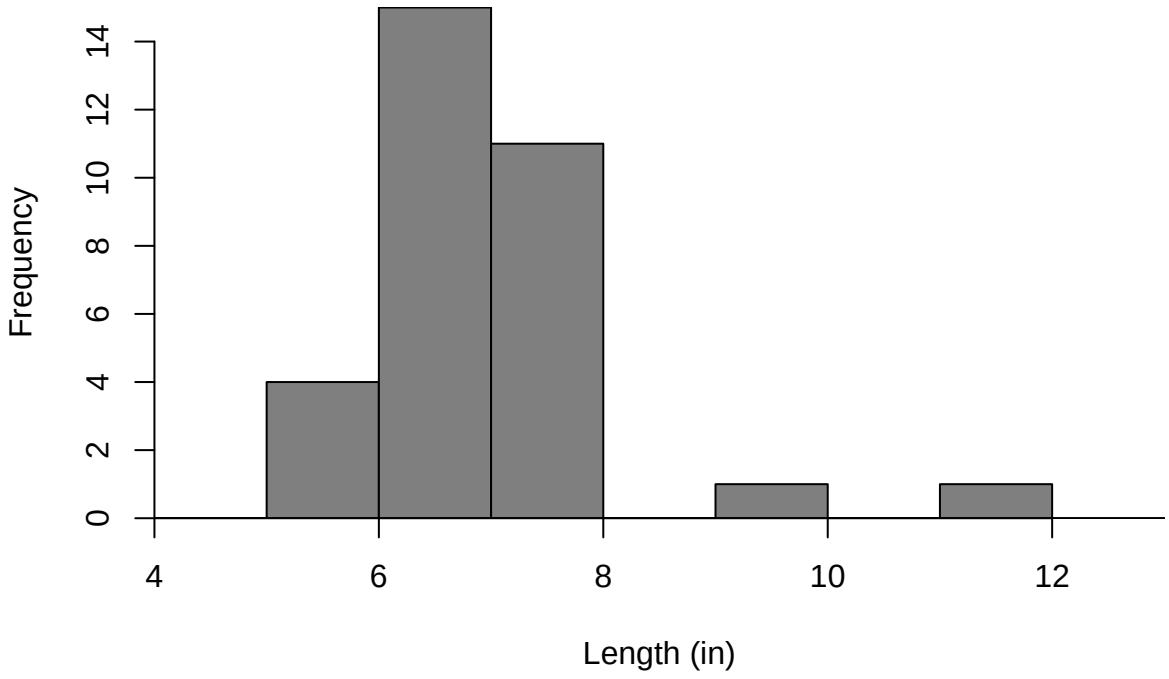
Figure 8. Length frequency of Channel Catfish



White Crappie

A total of 32 white crappie were caught, ranging from 5 to 12 inches. There were no master angler white crappies sampled. There was one crappie sampled of preferred harvestable size (i.e. 10 inches) but most were 6 to 8-inches. Crappie population may be suffering from over competition of resources.

Figure 9. Length frequency of White Crappie



If you have any questions regarding this report or need fishery management recommendations please contact:

Alex Engel

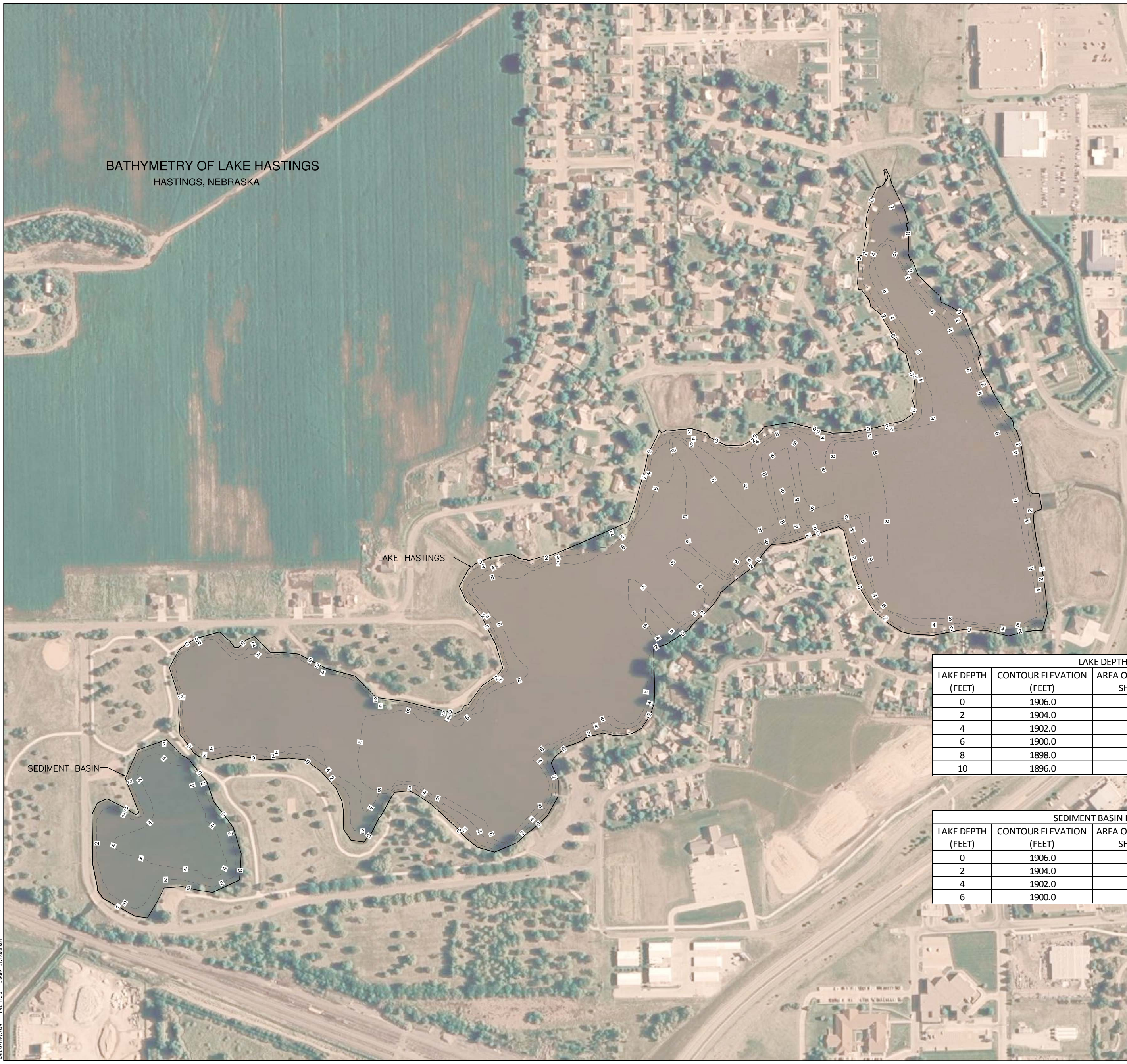
Nebraska Game and Parks Commission

1617 1st Ave

Kearney, NE 68847

Email: **alex.engel@nebraska.gov**

Office Phone: **(308) 865-5330**



DATE OF SURVEY:
5/12/09

CONSERVATION POOL ELEVATION:
1906.0

AREA (AT CONSERVATION POOL)
66.8 ACRES

NOTE:
CONSERVATION POOL ELEVATION OBTAINED FROM THE CITY OF HASTINGS.

LAKE DEPTH/AREA RELATIONSHIP STATISTICS

LAKE DEPTH (FEET)	CONTOUR ELEVATION (FEET)	AREA OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRES)	VOLUME OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRE-FEET)
0	1906.0	66.7	395.8
2	1904.0	62.4	266.7
4	1902.0	55.7	148.6
6	1900.0	41.5	51.5
8	1898.0	5.0	5.0
10	1896.0	0.0	0.0

SEDIMENT BASIN DEPTH/AREA RELATIONSHIP STATISTICS

LAKE DEPTH (FEET)	CONTOUR ELEVATION (FEET)	AREA OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRES)	VOLUME OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRE-FEET)
0	1906.0	7.2	25.5
2	1904.0	6.0	12.2
4	1902.0	3.1	3.1
6	1900.0	0.4	0.0

200 100 0 200 400
GRAPHIC SCALE IN FEET

REVISIONS

NO.	DATE	BY	DESCRIPTION

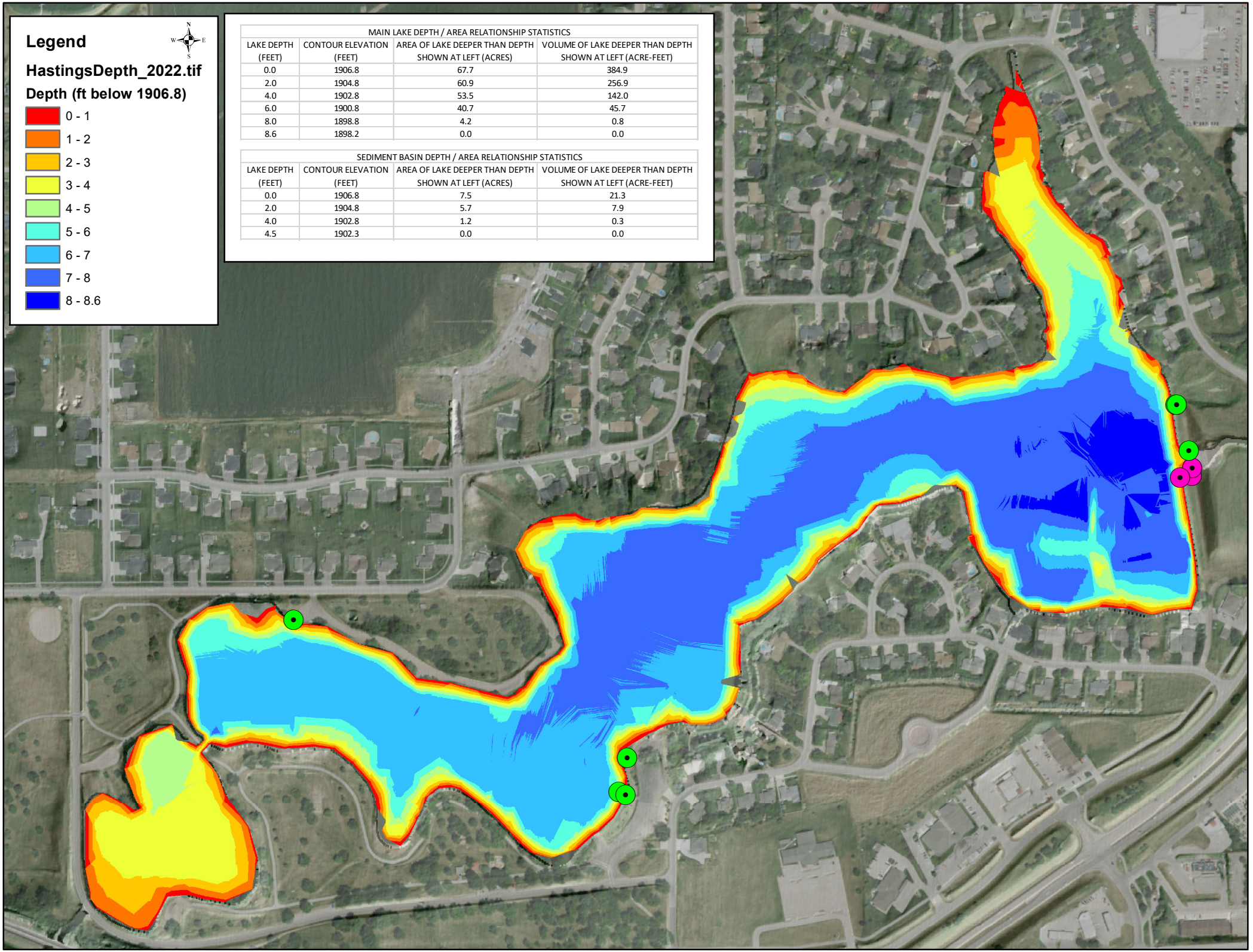
SEAL

NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY
LAKE HASTINGS
BATHYMETRIC SURVEY
HASTINGS, NEBRASKA

DEPTH CONTOUR MAP

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
221 Sun Valley Boulevard
Suite D
Lincoln, Nebraska 68528
(402) 476-3766

DATE: JULY 2009
DESIGNED BY: KMD
DRAWN BY: CNS
CHECKED BY: DJS
PROJECT MANAGER: DLB
PROJECT NUMBER: 14669.01
SCALE: AS SHOWN
FILE NAME: –
DRAWING NUMBER: –
SHEET NUMBER: 1 OF 1

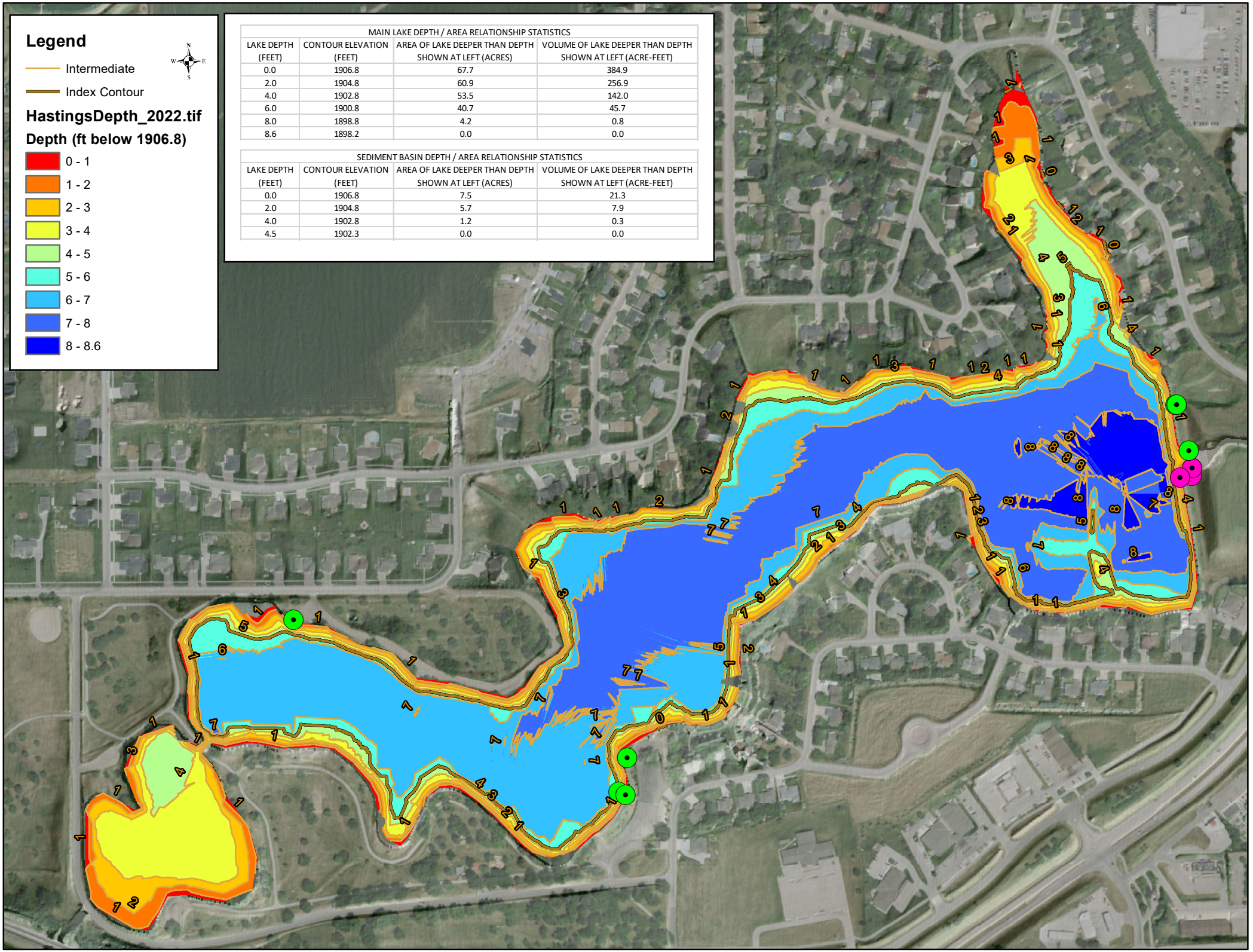


MAIN LAKE DEPTH / AREA RELATIONSHIP STATISTICS

LAKE DEPTH (FEET)	CONTOUR ELEVATION (FEET)	AREA OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRES)	VOLUME OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRE-FEET)
0.0	1906.8	67.7	384.9
2.0	1904.8	60.9	256.9
4.0	1902.8	53.5	142.0
6.0	1900.8	40.7	45.7
8.0	1898.8	4.2	0.8
8.6	1898.2	0.0	0.0

SEDIMENT BASIN DEPTH / AREA RELATIONSHIP STATISTICS

LAKE DEPTH (FEET)	CONTOUR ELEVATION (FEET)	AREA OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRES)	VOLUME OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRE-FEET)
0.0	1906.8	7.5	21.3
2.0	1904.8	5.7	7.9
4.0	1902.8	1.2	0.3
4.5	1902.3	0.0	0.0

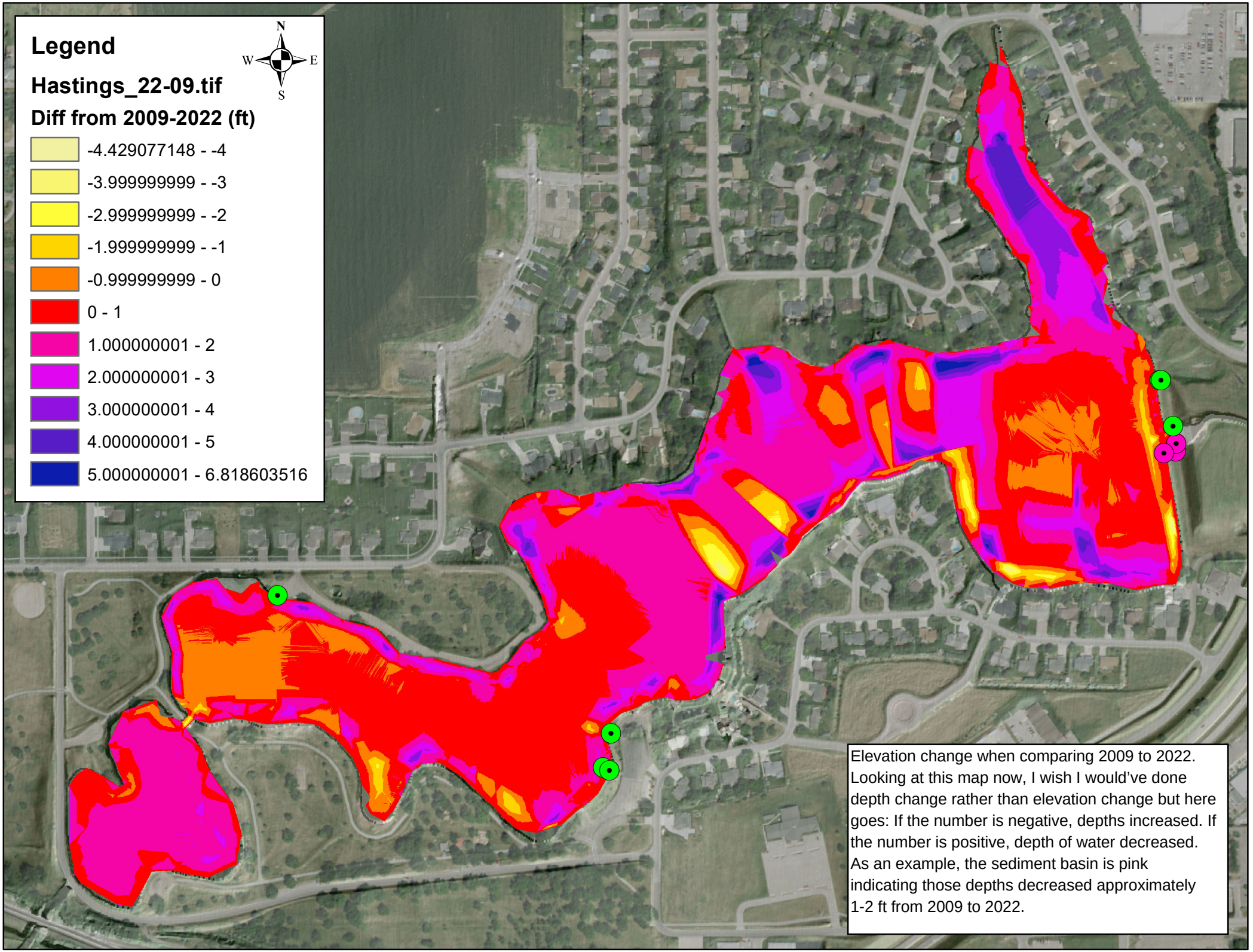


MAIN LAKE DEPTH / AREA RELATIONSHIP STATISTICS

LAKE DEPTH (FEET)	CONTOUR ELEVATION (FEET)	AREA OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRES)	VOLUME OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRE-FEET)
0.0	1906.8	67.7	384.9
2.0	1904.8	60.9	256.9
4.0	1902.8	53.5	142.0
6.0	1900.8	40.7	45.7
8.0	1898.8	4.2	0.8
8.6	1898.2	0.0	0.0

SEDIMENT BASIN DEPTH / AREA RELATIONSHIP STATISTICS

LAKE DEPTH (FEET)	CONTOUR ELEVATION (FEET)	AREA OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRES)	VOLUME OF LAKE DEEPER THAN DEPTH SHOWN AT LEFT (ACRE-FEET)
0.0	1906.8	7.5	21.3
2.0	1904.8	5.7	7.9
4.0	1902.8	1.2	0.3
4.5	1902.3	0.0	0.0


Legend
Hastings_22-09.tif
Diff from 2009-2022 (ft)
-4.429077148 - -4
-3.999999999 - -3
-2.999999999 - -2
-1.999999999 - -1
-0.999999999 - 0
0 - 1
1.000000001 - 2
2.000000001 - 3
3.000000001 - 4
4.000000001 - 5
5.000000001 - 6.818603516
N
W
E
S
Elevation change when comparing 2009 to 2022. Looking at this map now, I wish I would've done depth change rather than elevation change but here goes: If the number is negative, depths increased. If the number is positive, depth of water decreased. As an example, the sediment basin is pink indicating those depths decreased approximately 1-2 ft from 2009 to 2022.


N
W
E
S
Legend
HastingsDEM_2022.tif
Value
High : 1906.8
Low : 1898.2

HASTINGS LAKE DESIGN NOTES:

DESIGN MAXIMUM STORAGE VOLUME (TOP OF DAM)* = 455 AC-FT
DESIGN NORMAL STORAGE VOLUME:

- 1957* = 276 AC-FT
- 1970** = 525 AC-FT
- 2009 = 421 AC-FT
- 2022 = 404 AC-FT

% VOLUME LOST (1970 - 2022) = >23%

* 1957 AS-BUILT CONDITION WHICH IS ALSO CONSISTENT WITH THE DNR DATABASE.
** 1970 DREDGING PROJECT DATA BASED ON INFORMATION PROVIDED BY THE CITY OF HASTINGS.

SEDIMENT REMOVAL		
LOCATION	AVG. REMOVAL DEPTH (FT)	SEDIMENT REMOVED (CY)
AREA A	4	28446.82
AREA B	3.5	3795.29
AREA C	3	8387.23
AREA D	2.5	1795.52
AREA E	2.5	8579.05
AREA F	4	47692.58
TOTAL	**3.25**	**98696.49**

NOTE:
EDUCATIONAL SIGNAGE TO BE INSTALLED AT PUBLIC ACCESS AND NEAR NEWLY INSTALLED WATER QUALITY FEATURES.

GRAPHIC SCALE
0 100 200 400
UNIT OF MEASURE IS FEET

AREA E
AREA D
DRAINAGE OUTFALL & BIOSWALE REHABILITATION, TYP.
FUTURE DAY USE FACILITY AREA, (SHELTER, PIT LATRINE, ADA PARKING, ETC.)
AREA F
ADA FISHING PIER
ADA PARKING PAD
ARTIFICIAL FISH HABITAT, TYP.
AREA C
BRUSH PILE HABITAT, TYP.
ROCK RIPRAP WEIR, (PROTECT PEDESTRIAN BRIDGE)
COMMUNITY GARDEN
NO WAKE ZONE
REMOVE AND REPLACE TRAIL
AREA B
PROTECT EXISTING BOAT RAMP
POTENTIAL SPOILS AREA
ROCK SHOAL HABITAT, TYP.
FISHING PIER, TYP.
RIPRAP BANK STABILIZATION, TYP.
BOAT DOCK
BOAT RAMP REPLACEMENT
SWIMMING BEACH AREA, (SITE RESTORATION)
ADA PARKING PAD
ROCK RIPRAP CHECK STRUCTURE, TYP.
AREA A, (SEDIMENT STORAGE BASIN)
FUTURE COMMUNITY SPACE, (OUTDOOR CLASSROOM, AMPHITHEATER, SPLASH PAD, ETC.)
ROCK RIPRAP BREAKWATER, TYP.
POTENTIAL WETLAND RETENTION AREA

NOTE:
BATHYMETRIC SURVEY DONE BY OTHERS IN 2022.

JEO CONSULTING GROUP
1-800-728-8567

2023
LAKE HASTINGS WATERSHED PLAN
UPPER BIG BLUE NRD
HASTINGS, NEBRASKA

WATERSHED IMPLEMENTATION PLAN

PRELIMINARY
NOT FOR CONSTRUCTION
0%
DATE:
1/18/2024

PROJECT NO.	220905.00
DATE	1/18/2024
DRAWN BY	----
FILE NAME	S-220905.00.dwg
FIELD BOOK	----
FIELD CREW	----
SURVEY FILE NO.	----
PLAN IN HAND INITIALS	----
PLAN IN HAND DATE	----
70 PERCENT REVIEW INITIALS	----
70 PERCENT REVIEW DATE	----
95 PERCENT REVIEW INITIALS	----
95 PERCENT REVIEW DATE	----
REVISIONS	

C1.1

P:\Engineering\220905.00 - Upper Big Blue NRD\Lake Hastings Watershed Plan\7 Design\2 Drawings\S-220905.00.dwg, pc 1/30/2024 8:51 AM