Savannah Harbor Expansion Project

Evaluation of Adult Shortnose Sturgeon (Summer) Habitat Impacts with Proposed Mitigation Plan

March 11, 2011

This report and the subsequent tables and maps are an addendum to the report titled *Evaluation of Fishery Habitat Impacts with Proposed Mitigation Plan* dated January 2010 which was included in the Draft GRR and EIS documents released to the public in November 2010 (Appendix C of the GRR, Engineering Investigations Supplemental Materials 1.1.29).

This document includes results of habitat suitability impact predictions for adult Shortnose Sturgeon due harbor deepening and mitigation using the habitat suitability criteria approved by the Fisheries Interagency Coordination Team. See Table 1.

Table 1: Habitat Suitability Impact Predictions for Adult Shortnose Sturgeon (Summer)

	Suitable Habitat						
Channel Depth (below MLLW)	No Deepening No Mitigation No D.O. Injection	With Deepening & Mitigation Plan 6a/6b		**With Deepening & Mitigation Plan 6a/6b & Middle River Sill No D.O. Injection**		**With Deepening & Mitigation Plan 6a/6b & D.O. Injection System & Middle River Sill**	
(ft)	(acres)	(acres)	(%) Change	**(acres)**	**(%) Change**	**(acres)**	**(%) Change**
42 ft (Existing)	1371	-	-	**-**	**-**	**-**	**-**
44 ft		1373	0.2	**-**	**-**	**1631**	**19.0**
45 ft		1370	-0.1	**-**	**-**	**1505**	**9.8**
46 ft		1321	-3.7	**-**	**-**	**1471**	**7.3**
47 ft		1295	-5.6	**-**	**-**	**1460**	**6.5**
48 ft		1278	-6.8	**1278**	**-6.8**	**1410**	**2.8**

Negative values indicate habitat lost, positive values indicated habitat gained.
*Columns in **blue** are scenarios completed in March 2011 and are updates to the December 2010 report.*

Impact predictions shown in Table 1 were generated using hydrodynamic and water quality models approved for this project (EFDC and WASP). The criteria used in determining habitat suitability for adult Shortnose Sturgeon was developed by the Interagency Coordination Team which includes representatives from the USACE and NOAA. Table 2 summarized the habitat suitability criteria used for impact predictions due to harbor deepening.

Table 2: Habitat Criteria for Adult Shortnose Sturgeon (Summer)

Species & Life Stage	Freshwater Flow Conditions	Simulation Period	Habitat Criteria
Adult Shortnose Sturgeon	50 percentile of Long Term	August	Suitable Habitat when D.O. is: >= 4.0 mg/L at 90% exceedance (10 percentile) >= 3.0 mg/L at 95% exceedance (5 percentile) >= 2.0 mg/L at 99% exceedance (1 percentile) Suitable Habitat when Max Salinity is <= 10 ppt

In addition to the flow conditions specified in Table 2 above, the point source discharges from 2004 were also utilized for the August simulation period. The point source discharge information was obtained from USEPA Region 4 and is based on the Discharge Monitoring Reports. Those discharges are shown in the following table (Table 3). Note that the values in this table reflect lbs/day of BOD loading (not Ultimate Oxygen Demand) and do not include the point source discharges near Augusta. EPA's April 2010 Revised Draft TMDL for D.O. requires a reduction in loading from about 600,000 lbs/day UOD to about 130,000 lbs/day. The use of the 2004 loadings in the impact analysis is conservative in light of this expected future reduction in UOD sources to the system.

Table 3: Point Source Loads in Savannah Harbor (CBODu lbs/day)

Facility	Model Grid Cell Location (I, J)	May-October 2004 Loads (lbs/day)	May-October 1999 Loads (lbs/day)	August 2004* Loads (lbs/day)
Beaufort-Jasper Water & Sewer Authority	14, 148	13.0	25.0	4.8
Georgia-Pacific	14, 171	5,873.0	3,810.5	1,183.4
Weyerhaeuser Co., Port Wentworth	13, 95	6,797.0	809.9	3,068.6
Garden City Water Pollution Control Plant	13, 77	32.0	122.0	347.2
Savannah Water Pollution Control Plant Travis Field	13, 74	27.0	129.0	254.6
Savannah Water Pollution Control Plant President Street	13, 54	1,489.0	4,399.0	3,923.3
International Paper Co.	15, 70	143,448.0	86,669.8	161,626.4
TOTAL	-	157,679.0	95,965.2	170,408.3

**August 2004 loads were used in model simulations.*

Mitigation specified for the Savannah Harbor Deepening Project varies by depth. Components of the mitigation plans include a flow altering plan (plans 6a and 6b) and D.O. injection. Figures 1 and 2 shown below and on the following page include the details of the 2 flow altering plans. Mitigation for harbor deepening to 44 ft below MLLW includes plan 6b and mitigation for harbor deepening to 45 ft, 46 ft, 47 ft and 48 ft below MLLW include plan 6a.

Figure 1: Plan 6b (44 ft depth mitigation)

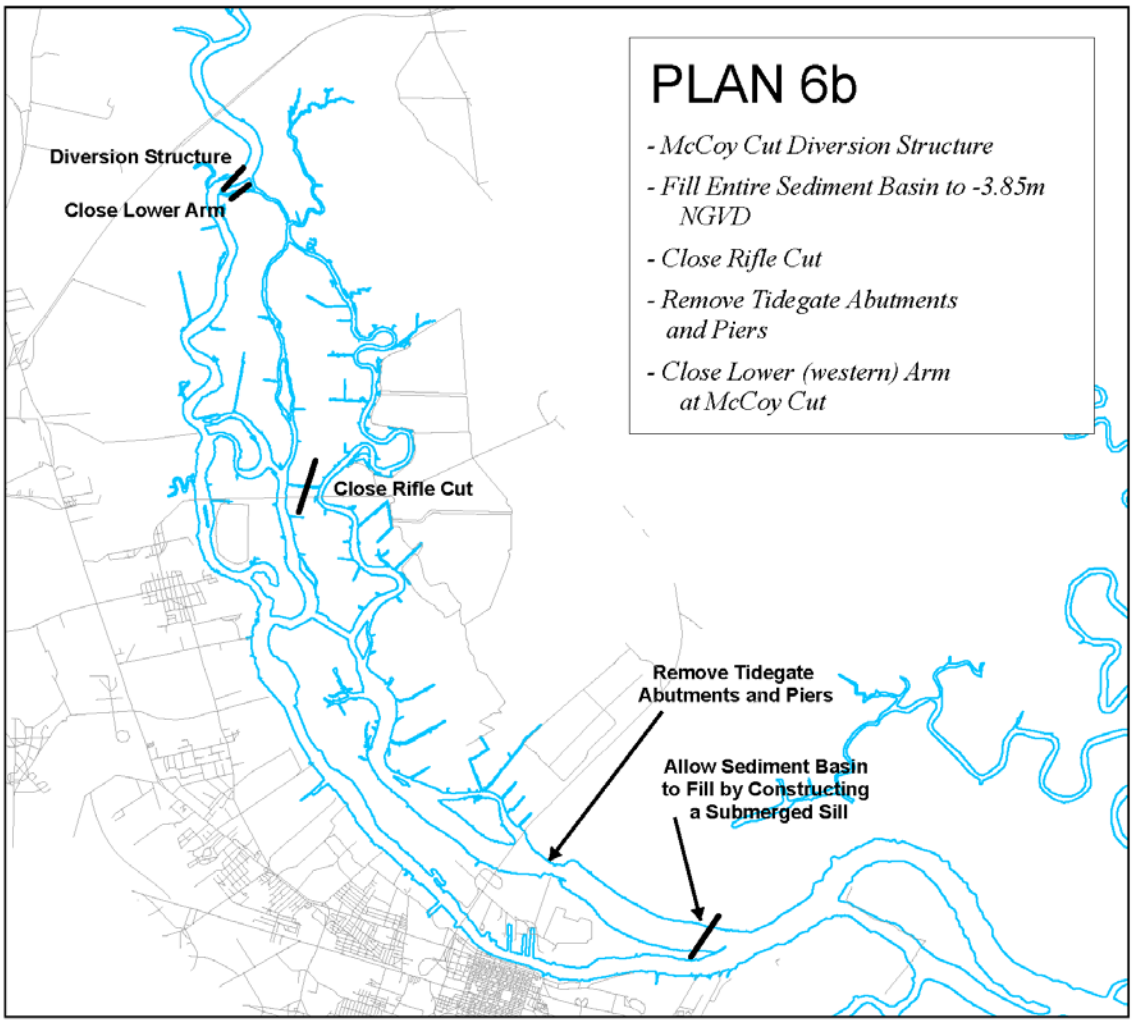
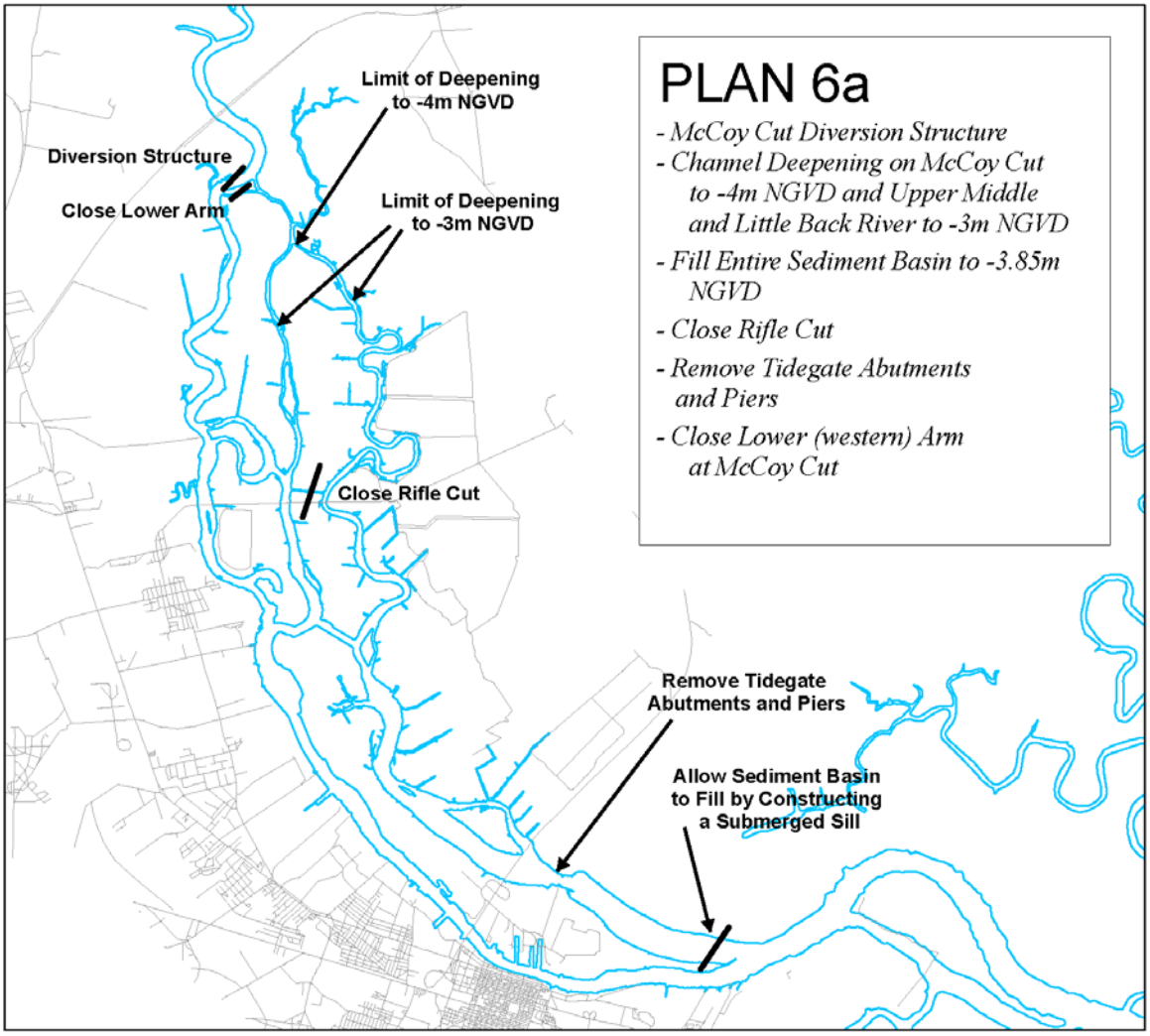
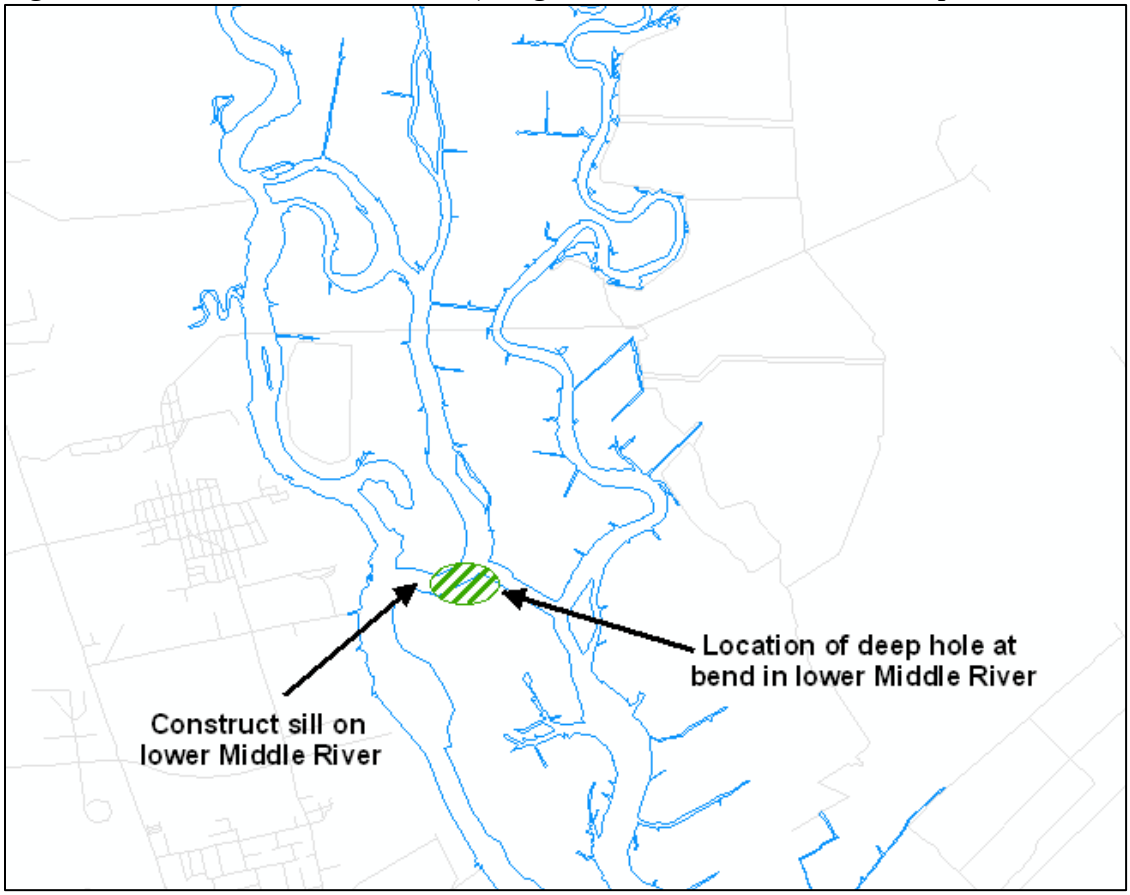


Figure 2: Plan 6a (45 ft, 46 ft, 47 ft, and 48 ft depth mitigation)



The Middle River Sill is a mitigation feature included in the project at all depth alternatives to protect a known habitat for shortnose sturgeons in a deep hole on Middle River. See Figure 3. This sill would produce a localized effect on salinity and hydrodynamics. It was designed to protect the deep hole at the bend in lower Middle River from salinity intrusion on Front River due to deepening the navigation channel. More details about the sill can be found in the report titled *Sensitivity Analysis of Proposed Sill on Middle River* dated September 2009. This report is included in the Draft GRR and EIS (Appendix C of the GRR, Engineering Investigations Supplemental Materials 1.1.35).

Figure 3: Middle River Sill location (mitigation feature included in all depth alternatives)

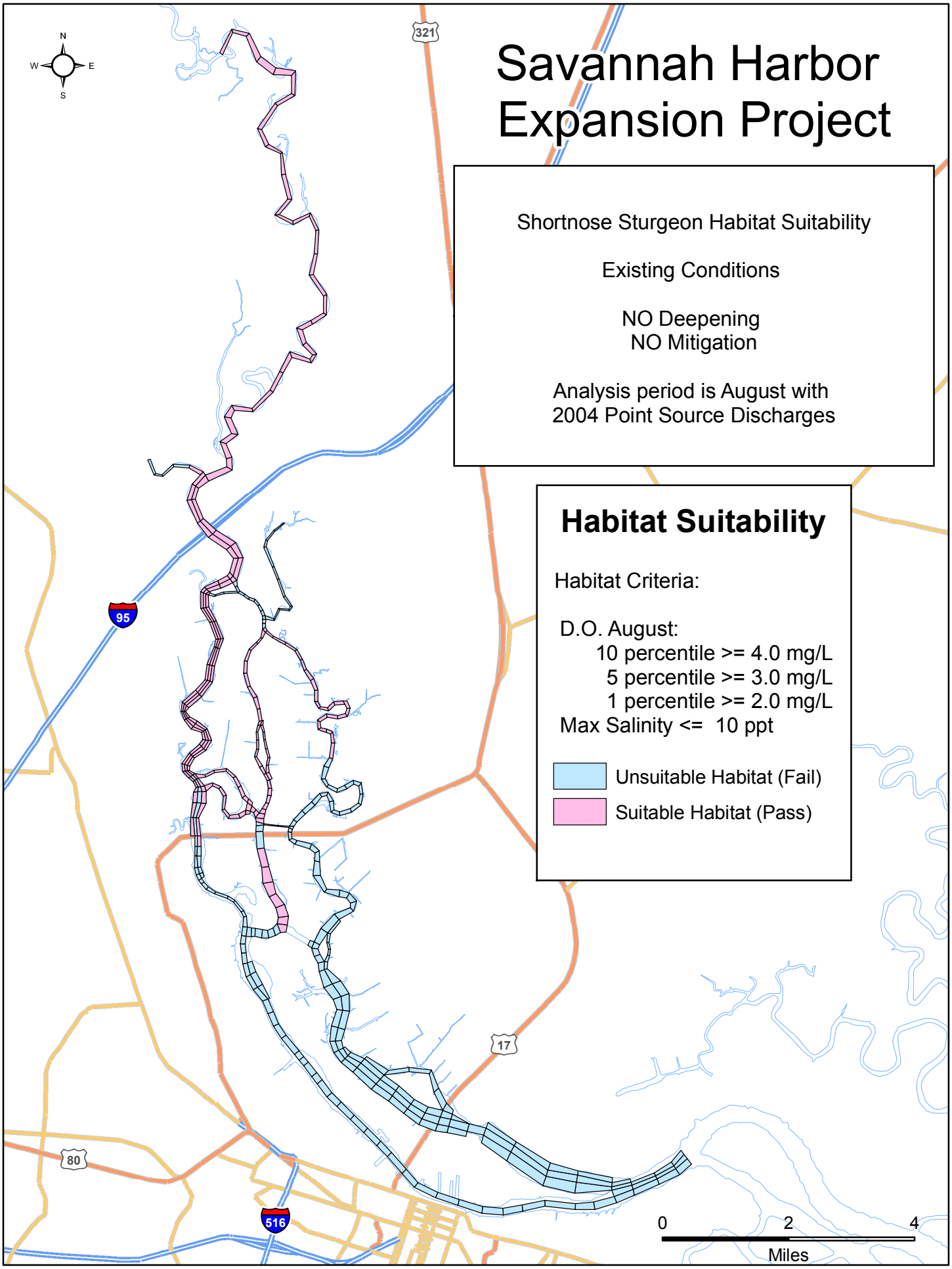


In addition to flow alteration of the river system, mitigation includes D.O. injection which mitigates for impacts to D.O. within the harbor. Details of the D.O. injection system can be found in the report titled *Oxygen Injection Design Report* dated October 15, 2010 prepared by Tetra Tech, Inc. This report is included in the Draft GRR and EIS (Appendix C of the GRR, Engineering Investigations Supplemental Materials 1.1.4). Findings from the October 2010 report were modified in March 2011 to incorporate increases in D.O. loads required to meet water quality mitigation goals with inclusion of the Middle River sill as a mitigation feature. Increases in D.O. loadings were minor and resulted in adding one additional Speece Cone at the upstream location for the 48, 47 and 46 ft project depths. Additional D.O. loading was also incorporated in the 45 and 44 ft depths by operating the cones at a prescribed 80% efficiency or 4,000 lbs of Oxygen/day. Additional cones at these depths were not required. Oxygen injection loading varies by project depth and is shown in Table 4.

Table 4: Summary of D.O. Injection for SHEP Mitigation

Channel Depth (ft below MLLW)	48 ft	47 ft	46 ft	45 ft	44 ft
D.O. Addition (lbs/day)	44,000	40,000	36,000	32,000	36,000
No. of Speece Cones	11	10	9	8	9

The following maps show where the changes in habitat suitability occur within the river system. These maps support the results shown in Table 1.



Savannah Harbor Expansion Project

Shortnose Sturgeon Habitat Suitability

Existing Conditions

NO Deepening
NO Mitigation

Analysis period is August with
2004 Point Source Discharges

Habitat Suitability

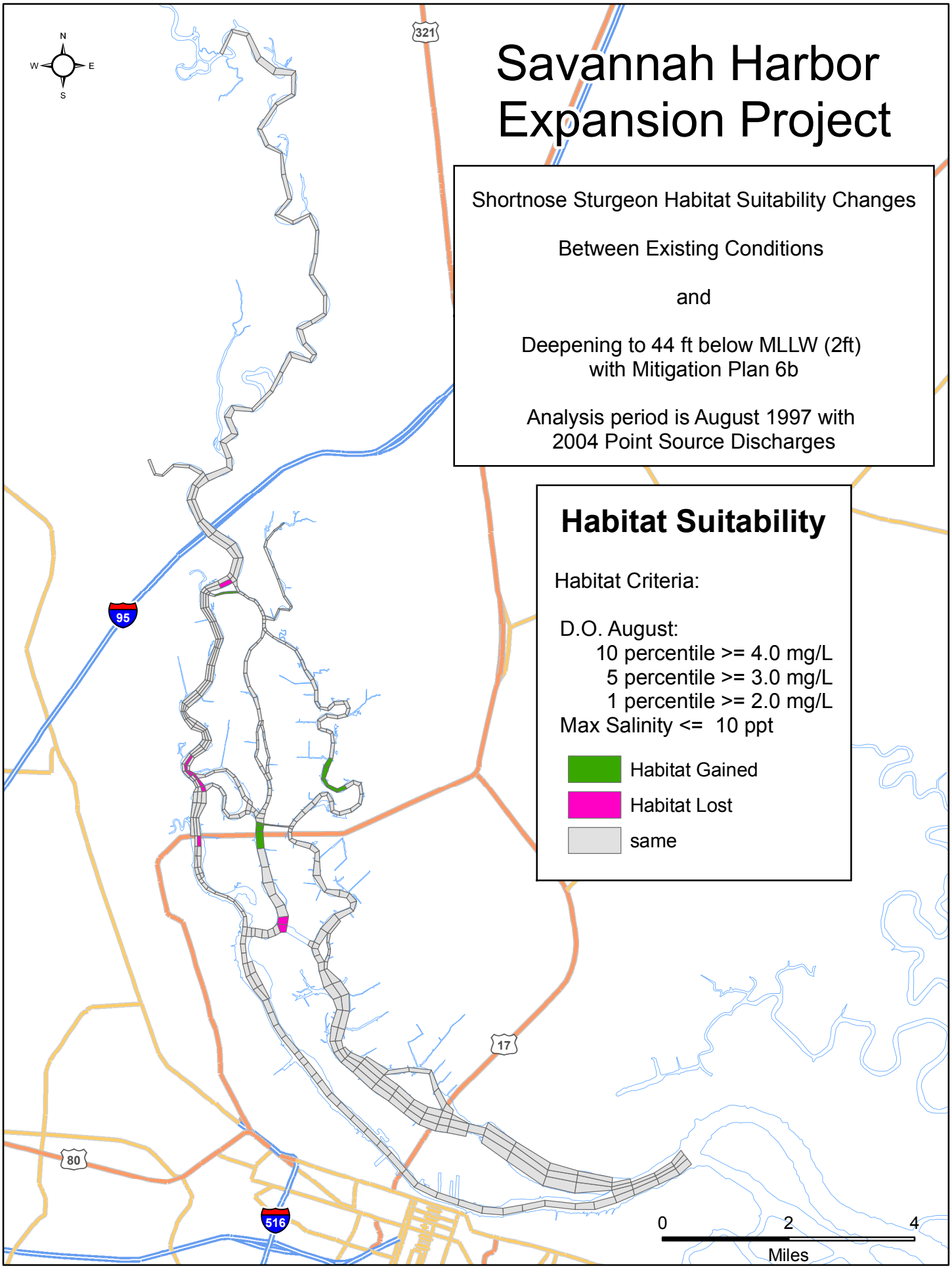
Habitat Criteria:

D.O. August:
10 percentile >= 4.0 mg/L
5 percentile >= 3.0 mg/L
1 percentile >= 2.0 mg/L
Max Salinity <= 10 ppt

Unsuitable Habitat (Fail)

Suitable Habitat (Pass)

December 2010



Savannah Harbor Expansion Project

Shortnose Sturgeon Habitat Suitability Changes

Between Existing Conditions

and

Deepening to 44 ft below MLLW (2ft)
with Mitigation Plan 6b

Analysis period is August 1997 with
2004 Point Source Discharges

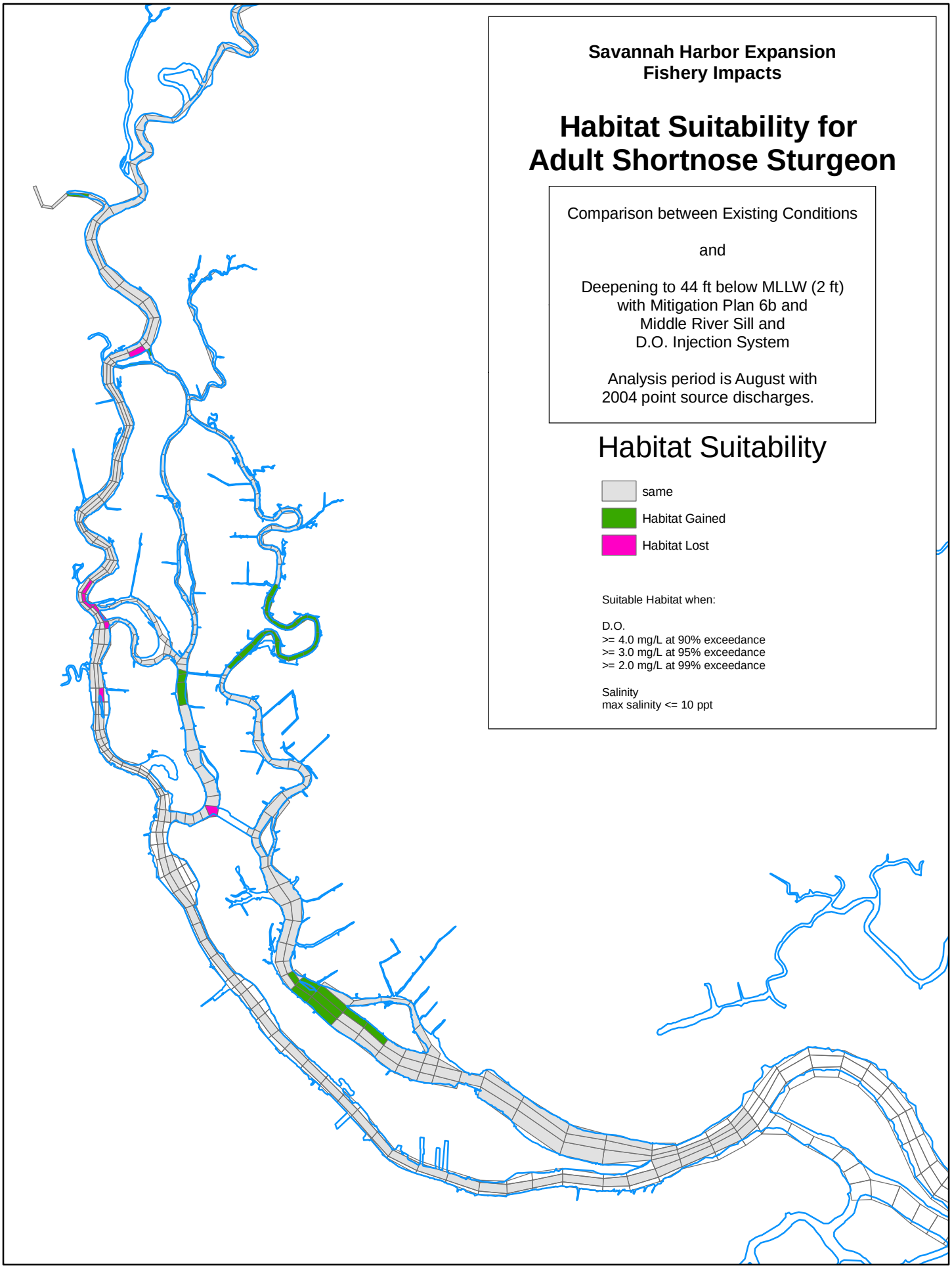
Habitat Suitability

Habitat Criteria:

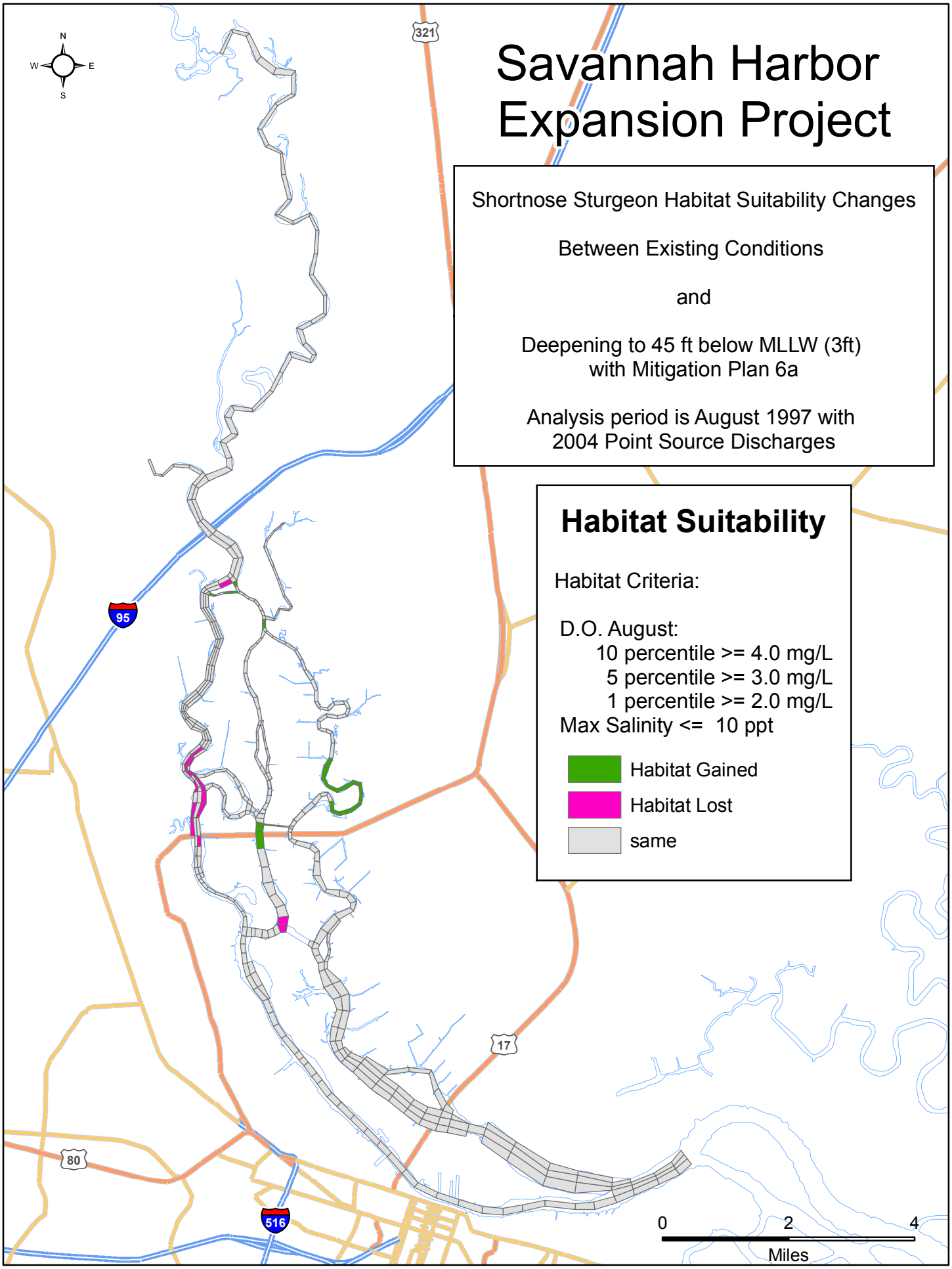
D.O. August:
10 percentile >= 4.0 mg/L
5 percentile >= 3.0 mg/L
1 percentile >= 2.0 mg/L
Max Salinity <= 10 ppt

- Habitat Gained
- Habitat Lost
- same

December 2010


Savannah Harbor Expansion
Fishery Impacts
Habitat Suitability for
Adult Shortnose Sturgeon
Comparison between Existing Conditions
and
Deepening to 44 ft below MLLW (2 ft)
with Mitigation Plan 6b and
Middle River Sill and
D.O. Injection System
Analysis period is August with
2004 point source discharges.
Habitat Suitability
same
Habitat Gained
Habitat Lost
Suitable Habitat when:
D.O.
>= 4.0 mg/L at 90% exceedance
>= 3.0 mg/L at 95% exceedance
>= 2.0 mg/L at 99% exceedance
Salinity
max salinity <= 10 ppt

March 2011



Savannah Harbor Expansion Project

Shortnose Sturgeon Habitat Suitability Changes

Between Existing Conditions

and

Deepening to 45 ft below MLLW (3ft)
with Mitigation Plan 6a

Analysis period is August 1997 with
2004 Point Source Discharges

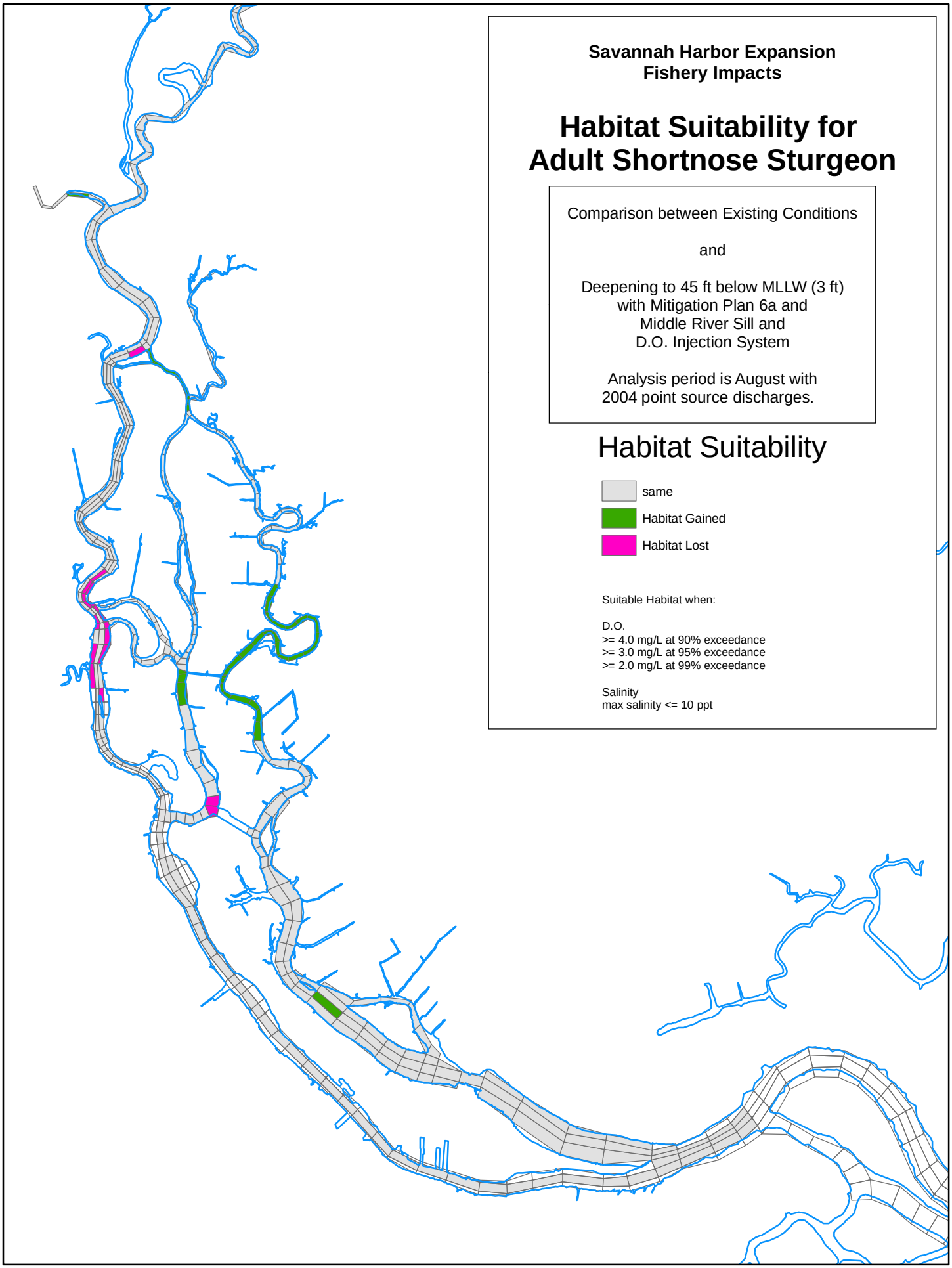
Habitat Suitability

Habitat Criteria:

D.O. August:
10 percentile >= 4.0 mg/L
5 percentile >= 3.0 mg/L
1 percentile >= 2.0 mg/L
Max Salinity <= 10 ppt

- Habitat Gained
- Habitat Lost
- same

December 2010


Savannah Harbor Expansion
Fishery Impacts
Habitat Suitability for
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Deepening to 45 ft below MLLW (3 ft)
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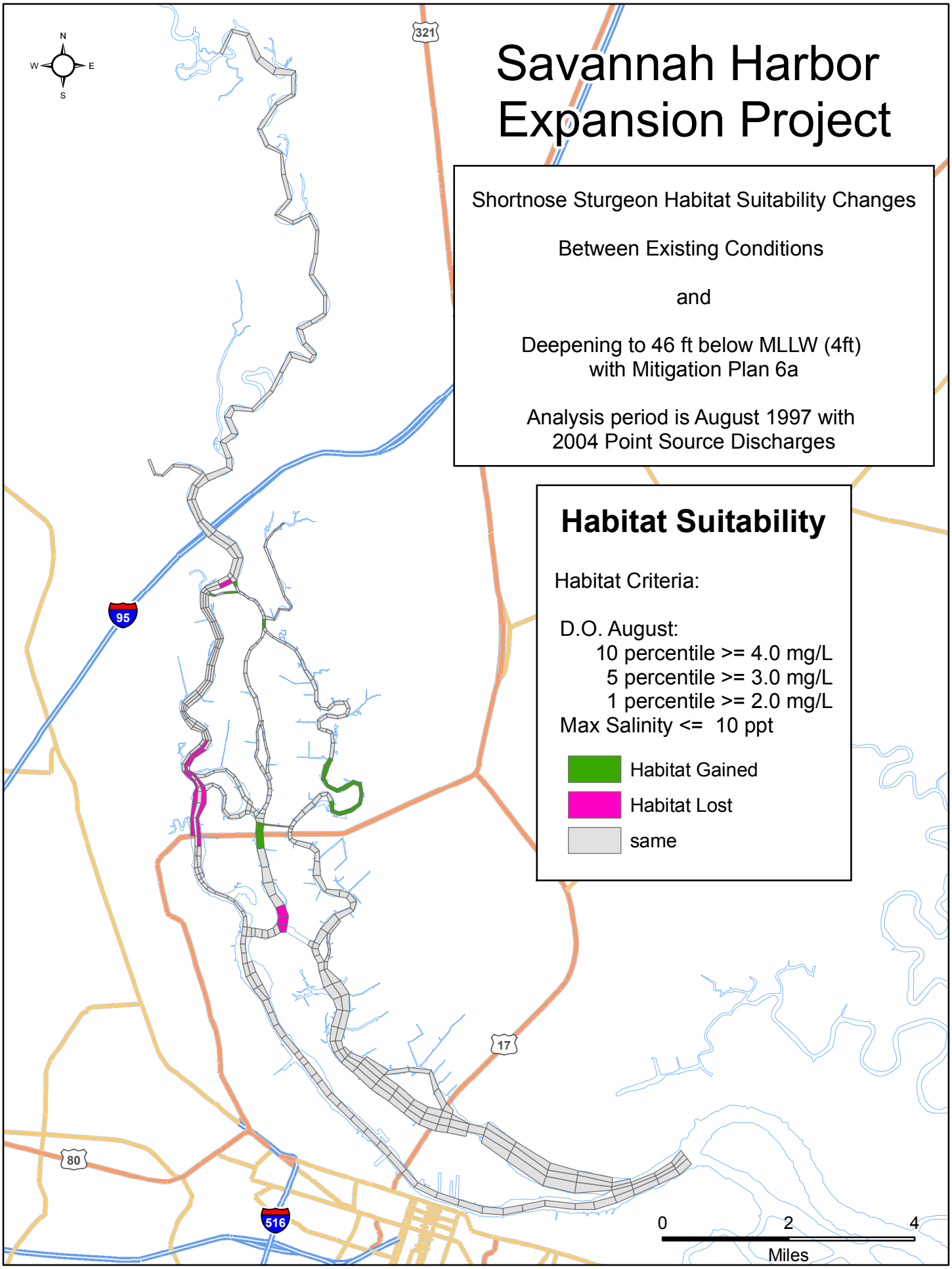
Analysis period is August with
2004 point source discharges.
Habitat Suitability
same
Habitat Gained
Habitat Lost
Suitable Habitat when:
D.O.
>= 4.0 mg/L at 90% exceedance
>= 3.0 mg/L at 95% exceedance
>= 2.0 mg/L at 99% exceedance
Salinity
max salinity <= 10 ppt

March 2011



Savannah Harbor Expansion Project

Shortnose Sturgeon Habitat Suitability Changes

Between Existing Conditions

and

Deepening to 46 ft below MLLW (4ft)
with Mitigation Plan 6a

Analysis period is August 1997 with
2004 Point Source Discharges

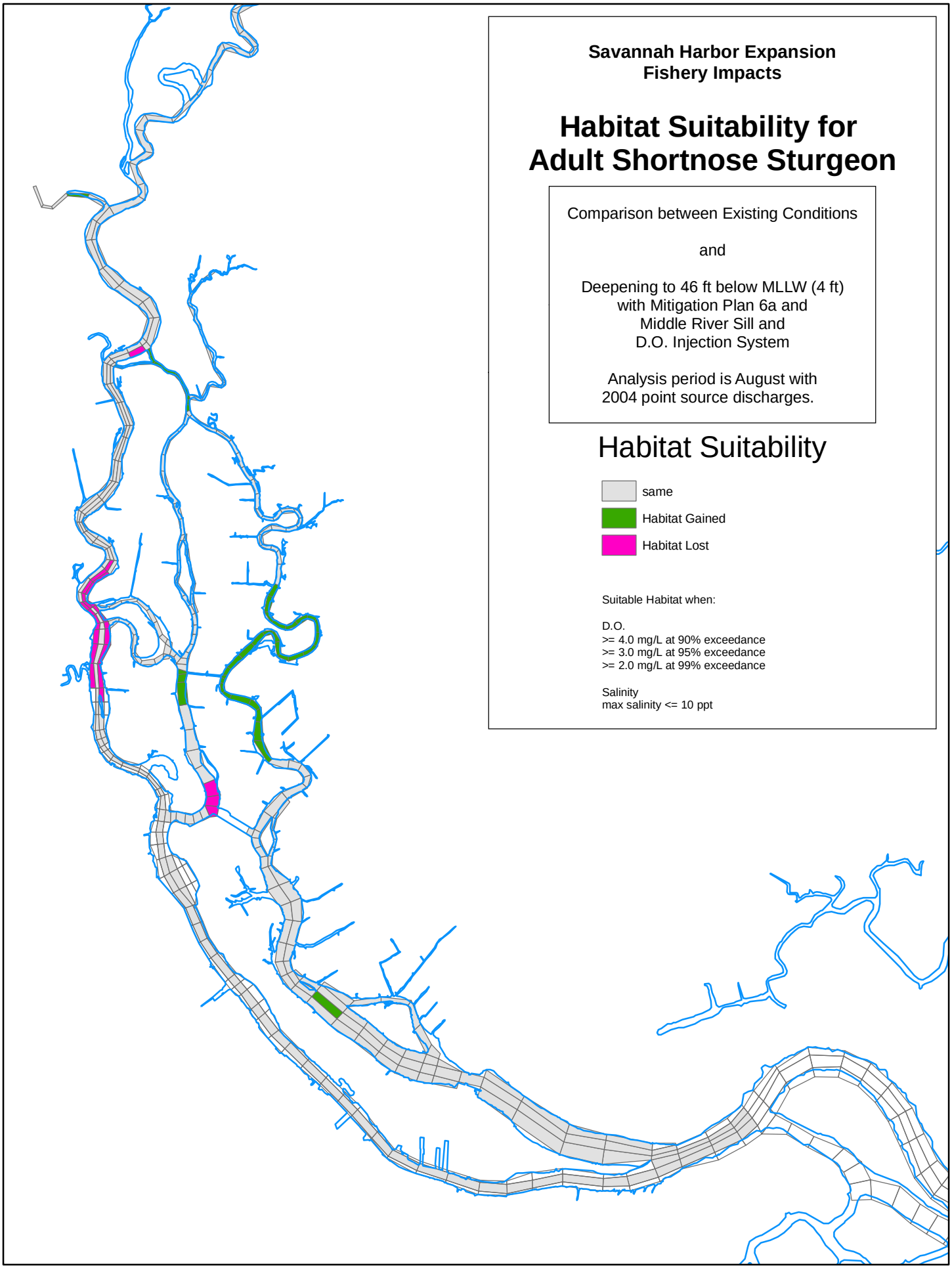
Habitat Suitability

Habitat Criteria:

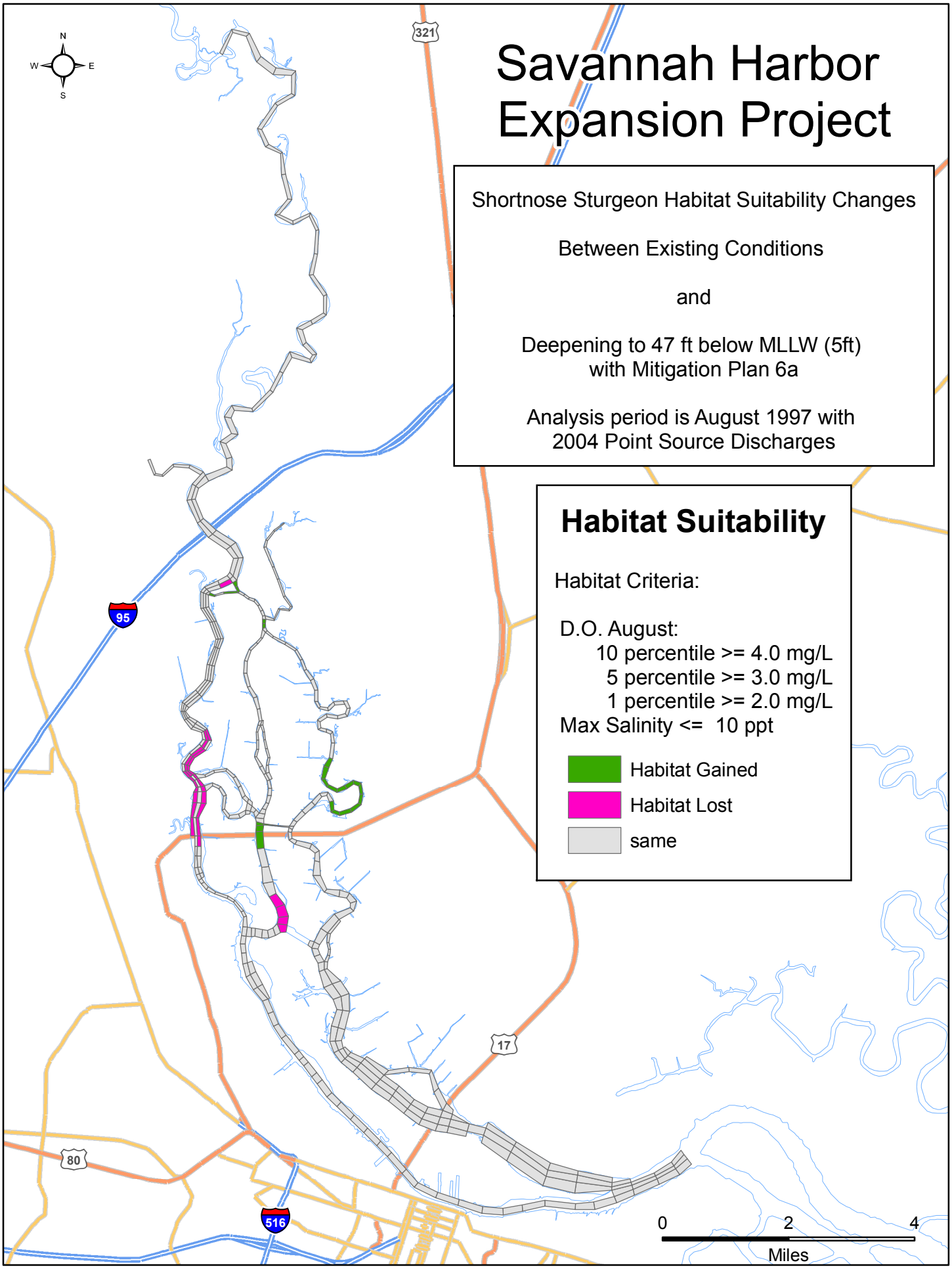
D.O. August:
10 percentile >= 4.0 mg/L
5 percentile >= 3.0 mg/L
1 percentile >= 2.0 mg/L
Max Salinity <= 10 ppt

- Habitat Gained
- Habitat Lost
- same

December 2010


Savannah Harbor Expansion
Fishery Impacts
Habitat Suitability for
Adult Shortnose Sturgeon
Comparison between Existing Conditions
and
Deepening to 46 ft below MLLW (4 ft)
with Mitigation Plan 6a and
Middle River Sill and
D.O. Injection System
Analysis period is August with
2004 point source discharges.
Habitat Suitability
same
Habitat Gained
Habitat Lost
Suitable Habitat when:
D.O.
>= 4.0 mg/L at 90% exceedance
>= 3.0 mg/L at 95% exceedance
>= 2.0 mg/L at 99% exceedance
Salinity
max salinity <= 10 ppt

March 2011



Savannah Harbor Expansion Project

Shortnose Sturgeon Habitat Suitability Changes

Between Existing Conditions

and

Deepening to 47 ft below MLLW (5ft)
with Mitigation Plan 6a

Analysis period is August 1997 with
2004 Point Source Discharges

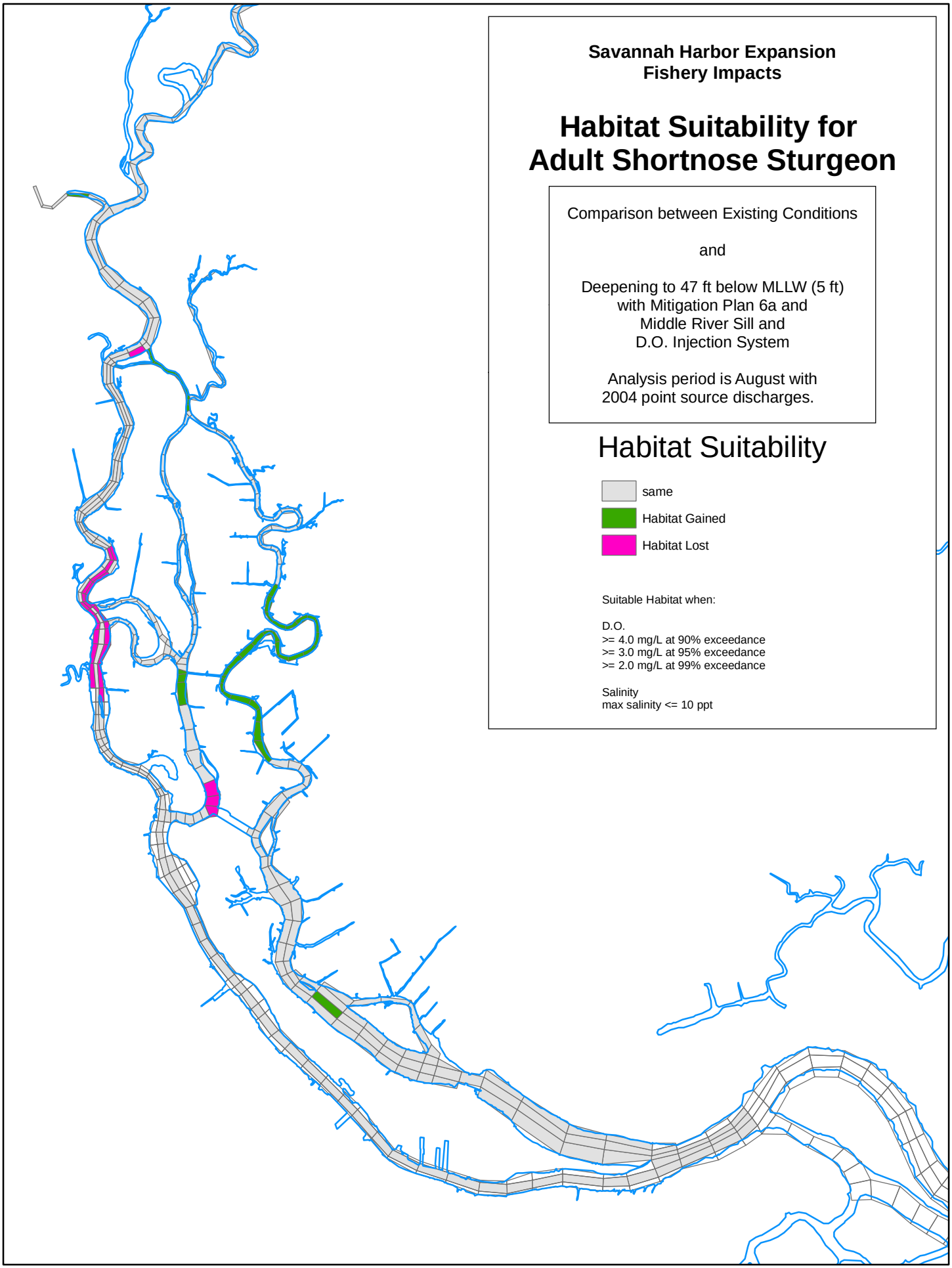
Habitat Suitability

Habitat Criteria:

D.O. August:
10 percentile >= 4.0 mg/L
5 percentile >= 3.0 mg/L
1 percentile >= 2.0 mg/L
Max Salinity <= 10 ppt

- Habitat Gained
- Habitat Lost
- same

December 2010


Savannah Harbor Expansion
Fishery Impacts
Habitat Suitability for
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Comparison between Existing Conditions
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Deepening to 47 ft below MLLW (5 ft)
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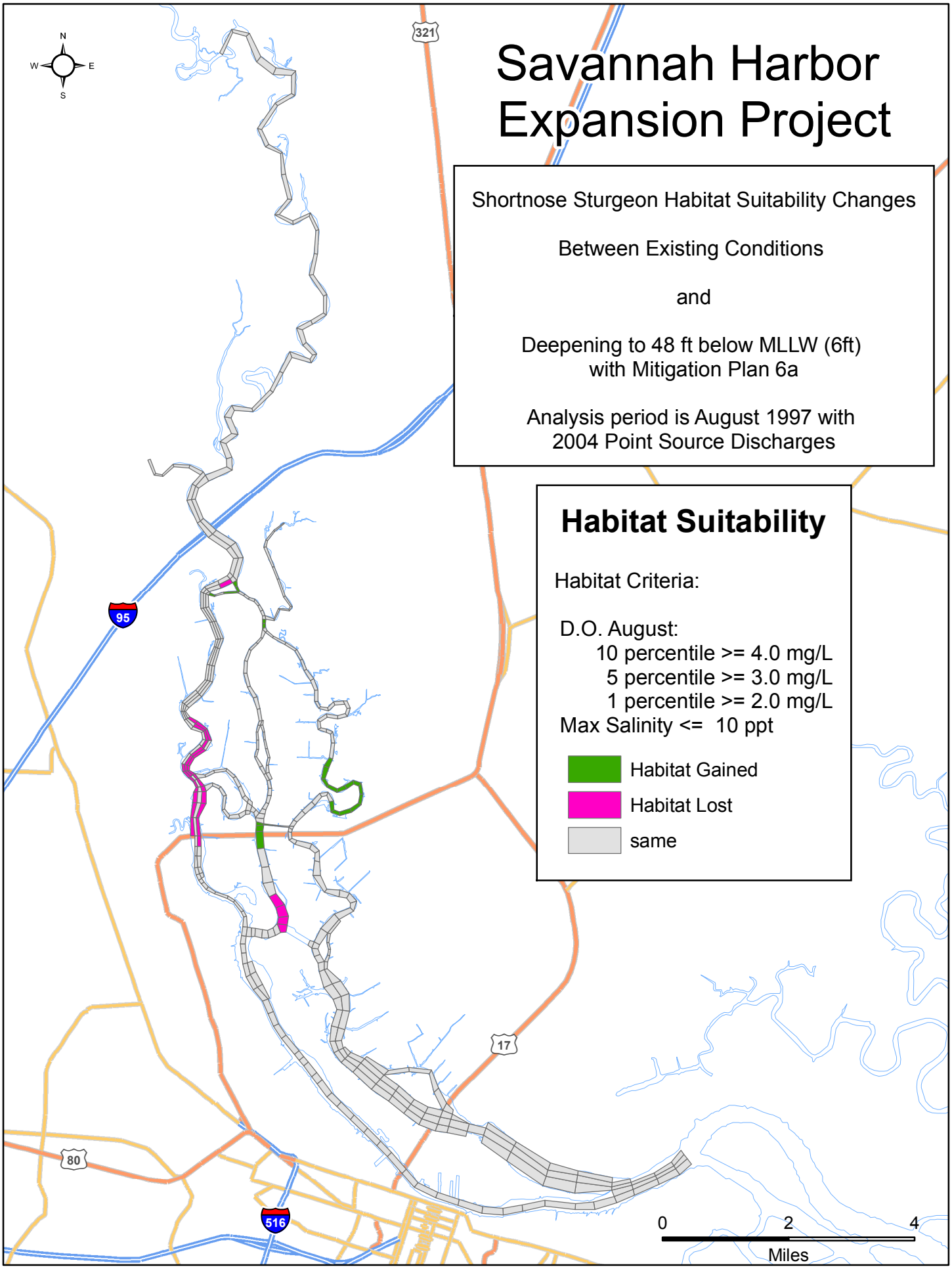
Middle River Sill and
D.O. Injection System
Analysis period is August with
2004 point source discharges.
Habitat Suitability
same
Habitat Gained
Habitat Lost
Suitable Habitat when:
D.O.
>= 4.0 mg/L at 90% exceedance
>= 3.0 mg/L at 95% exceedance
>= 2.0 mg/L at 99% exceedance
Salinity
max salinity <= 10 ppt

March 2011



Savannah Harbor Expansion Project

Shortnose Sturgeon Habitat Suitability Changes

Between Existing Conditions

and

Deepening to 48 ft below MLLW (6ft)
with Mitigation Plan 6a

Analysis period is August 1997 with
2004 Point Source Discharges

Habitat Suitability

Habitat Criteria:

D.O. August:
10 percentile >= 4.0 mg/L
5 percentile >= 3.0 mg/L
1 percentile >= 2.0 mg/L
Max Salinity <= 10 ppt

- Habitat Gained
- Habitat Lost
- same

December 2010

Savannah Harbor Expansion
Fishery Impacts

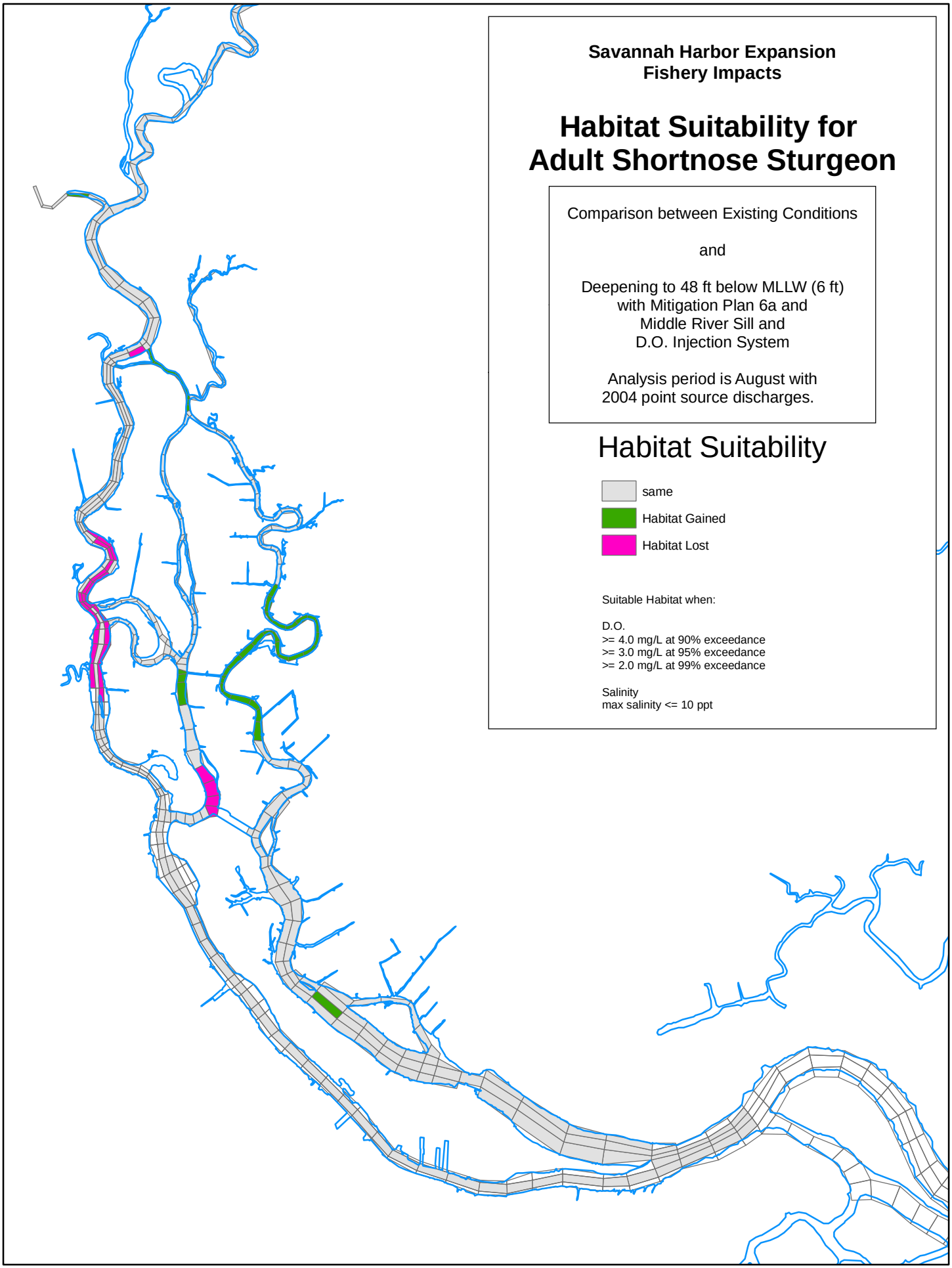
Habitat Suitability for Adult Shortnose Sturgeon

Comparison between Existing Conditions

and

Deepening to 48 ft below MLLW (6 ft)
with Mitigation Plan 6a and
Middle River Sill and
D.O. Injection System

Analysis period is August with
2004 point source discharges.



Habitat Suitability

- same
- Habitat Gained
- Habitat Lost

Suitable Habitat when:

D.O.
>= 4.0 mg/L at 90% exceedance
>= 3.0 mg/L at 95% exceedance
>= 2.0 mg/L at 99% exceedance

Salinity
max salinity <= 10 ppt

March 2011

Savannah Harbor Expansion
Fishery Impacts

Habitat Suitability for Adult Shortnose Sturgeon

Comparison between Existing Conditions

and

Deepening to 48 ft below MLLW (6 ft)
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Middle River Sill and
D.O. Injection System

Analysis period is August with
2004 point source discharges.

Habitat Suitability

- same
- Habitat Gained
- Habitat Lost

Suitable Habitat when:

D.O.
>= 4.0 mg/L at 90% exceedance
>= 3.0 mg/L at 95% exceedance
>= 2.0 mg/L at 99% exceedance

Salinity
max salinity <= 10 ppt

Gains due to
DO improvements
ONLY

90% exceedance DO
increases on average from
2.87 to 4.96 mg/L

Losses due to
salinity increases
ONLY

Existing Conditions
max salinity
ranges from
1 to 9.6 ppt

Project Conditions
max salinity
ranges from
10.6 to 16.3 ppt

Gains due to
DO improvements
ONLY

90% exceedance DO
increases on average from
3.50 to 4.78 mg/L

Gains due to
DO improvements
ONLY

90% exceedance DO
increases on average from
3.96 to 5.12 mg/L

Losses due to
salinity increases
ONLY

Existing Conditions
max salinity
ranges from
7.1 to 9.0 ppt

Project Conditions
max salinity
ranges from
10.1 to 12.0 ppt

Gains due to
salinity and DO
improvements

max salinity
reduced from
14.8 to 9.5 ppt

90% exceedance DO
increases from
3.37 to 4.61 mg/L

March 2011