



**CITY OF
TALLAHASSEE**

TALLAHASSEE MASTER PLAN – SURFACE WATER (TMaPS): VOLUME 4

LAKE JACKSON BASIN



Submitted by:
Geosyntec Consultants, Inc.
2039 Centre Point Blvd, Suite 103
Tallahassee, Florida 32308

July 2025

Geosyntec 
consultants

engineers | scientists | innovators

VOLUME 4

LAKE JACKSON BASIN

CITY OF TALLAHASSEE

Prepared for

City of Tallahassee
300 South Adams Street
Tallahassee, Florida 32301

Prepared by

Geosyntec Consultants, Inc.
2039 Centre Point Blvd
Suite 103
Tallahassee, Florida 32308

Project Number: FW7714

City Project/CIP No. 265

July 2025

TMaPS: VOLUME 4

LAKE JACKSON BASIN

CITY OF TALLAHASSEE

Prepared for

City of Tallahassee

300 South Adams Street
Tallahassee, Florida 32301

Prepared by

Geosyntec Consultants, Inc.
2039 Centre Point Blvd
Suite 103
Tallahassee, Florida 32308

The engineering material and data contained within the enclosed report was prepared by Geosyntec Consultants, Inc. for sole use by the City of Tallahassee. This report was prepared under the supervision and direction of the respective undersigned, whose seal as a registered professional engineer is affixed below.

Mike D. Hardin, Ph.D., PE, CFM
Principal
Florida PE# 74749



Mike Hardin, PhD, P.E., CFM
Principal Engineer



Nico Pisarello, GISP
Professional Scientist



Lexie Foos
Staff Scientist

Project Number: FW7714
July 2025



Steve Peene, PhD
Senior Principal



Jovana Radovanovic
Sr. Staff Scientist

Tallahassee Master Plan – Surface Water (TMaPS)

Volume 1: Executive Summary

Volume 2: Background & Approach

Volume 3: Lake Munson Basin

Volume 4: Lake Jackson Basin

Volume 5: Lake Lafayette Basin

Volume 6: Wakulla Springs and Lake Talquin

Volume 7: Non-Structural and Structural Project Development

Volume 8: Regulatory Review

TABLE OF CONTENTS

4	LAKE JACKSON BASIN.....	4-1
4.1	Basin Overview and Project Waterbodies.....	4-1
4.2	Report Review Summary	4-5
4.3	Volume Outline	4-8
4.4	Lake Jackson	4-9
4.4.1	Overview and History	4-9
4.4.2	Regulatory Status	4-21
4.4.3	Waterbody Data Review and Summary	4-22
4.4.3.1	Bathymetry	4-22
4.4.3.2	Land Use.....	4-24
4.4.3.3	Soils	4-24
4.4.3.4	Septic Systems.....	4-25
4.4.3.5	Point Sources.....	4-25
4.4.3.6	Hydrologic Data	4-25
4.4.3.7	Surface Water Quality Data.....	4-30
4.4.3.8	Groundwater Data	4-42
4.4.3.9	Biological Data	4-42
4.4.3.10	Stormwater Treatment Facilities	4-44
4.4.3.11	Atmospheric Deposition Data	4-44
4.4.3.12	Data Summary	4-44
4.4.4	Qualitative Assessment of Sources	4-46
4.4.4.1	In-Lake Water Quality.....	4-46
4.4.4.2	Stormwater Runoff	4-54
4.4.4.3	Septic Systems.....	4-68
4.4.4.4	Internal Recycling and Seepage	4-68
4.4.4.5	Wastewater	4-70
4.4.4.6	Atmospheric Deposition.....	4-72
4.4.4.7	Interconnected Flows.....	4-72
4.4.4.8	Summary of Findings	4-73
4.4.5	Calculation of Potential Nutrient Loads	4-74
4.4.5.1	Stormwater Pollutant Load.....	4-74
4.4.5.2	Septic Load	4-85
4.4.5.3	Point Source Load	4-87
4.4.5.4	Lake Inflow Load	4-89
4.4.5.5	Internal Lake Load	4-91
4.4.5.6	Atmospheric Deposition.....	4-92
4.4.5.7	Summary of Calculated Loads	4-93
4.5	Carr Lake.....	4-101
4.5.1	Overview and History	4-101

4.5.2	Regulatory Status	4-104
4.5.3	Waterbody Data Review and Summary	4-104
4.5.3.1	Bathymetry	4-104
4.5.3.2	Land Use.....	4-104
4.5.3.3	Soils	4-104
4.5.3.4	Septic Systems.....	4-111
4.5.3.5	Hydrologic Data	4-111
4.5.3.6	Surface Water Quality Data.....	4-111
4.5.3.7	Groundwater Data	4-114
4.5.3.8	Biological Data	4-124
4.5.3.9	Stormwater Treatment Facilities	4-124
4.5.3.10	Atmospheric Deposition Data	4-124
4.5.3.11	Data Summary	4-126
4.5.4	Qualitative Assessment of Sources	4-126
4.5.4.1	In-Lake Water Quality.....	4-126
4.5.4.2	Stormwater Runoff	4-127
4.5.4.3	Septic Systems.....	4-136
4.5.4.4	Internal Recycling and Seepage	4-136
4.5.4.5	Wastewater	4-136
4.5.4.6	Atmospheric Deposition.....	4-136
4.5.4.7	Interconnected Flows.....	4-137
4.5.4.8	Summary of Findings	4-137
4.5.5	Calculation of Potential Nutrient Loads.....	4-138
4.5.5.1	Stormwater Pollutant Load.....	4-138
4.5.5.2	Septic Load.....	4-138
4.5.5.3	Point Source Load	4-144
4.5.5.4	Lake Inflow Load	4-144
4.5.5.5	Internal Lake Load	4-144
4.5.5.6	Atmospheric Deposition.....	4-144
4.5.5.7	Summary of Calculated Loads	4-144
4.6	Summerbrook Chain of Lakes and Summerbrook Creek	4-147
4.6.1	Overview and History	4-147
4.6.2	Regulatory Status	4-147
4.6.3	Waterbody Data Review and Summary	4-155
4.6.3.1	Bathymetry	4-155
4.6.3.2	Land Use.....	4-155
4.6.3.3	Soils	4-155
4.6.3.4	Septic Systems.....	4-155
4.6.3.5	Hydrologic Data	4-160
4.6.3.6	Surface Water Quality Data.....	4-160
4.6.3.7	Groundwater Data	4-167

4.6.3.8	Biological Data	4-167
4.6.3.9	Stormwater Treatment Facilities	4-167
4.6.3.10	Atmospheric Deposition Data	4-167
4.6.3.11	Data Summary	4-167
4.6.4	Qualitative Assessment of Sources	4-169
4.6.4.1	In-Stream Water Quality	4-169
4.6.4.2	Stormwater Runoff	4-170
4.6.4.3	Septic Systems.....	4-170
4.6.4.4	Internal Recycling and Seepage	4-176
4.6.4.5	Wastewater	4-176
4.6.4.6	Atmospheric Deposition.....	4-176
4.6.4.7	Interconnected Flows.....	4-176
4.6.4.8	Summary of Findings	4-177
4.6.5	Calculation of Potential Nutrient Loads	4-177
4.6.5.1	Stormwater Pollutant Load.....	4-177
4.6.5.2	Septic Load.....	4-178
4.6.5.3	Point Source Load	4-185
4.6.5.4	Lake Inflow Load	4-185
4.6.5.5	Internal Lake Load	4-185
4.6.5.6	Atmospheric Deposition.....	4-185
4.6.5.7	Summary of Calculated Loads	4-185
4.7	Lake Overstreet	4-188
4.7.1	Overview and History	4-188
4.7.2	Regulatory Status	4-188
4.7.3	Waterbody Data Review and Summary	4-195
4.7.3.1	Bathymetry	4-195
4.7.3.2	Land Use.....	4-195
4.7.3.3	Soils	4-195
4.7.3.4	Septic Systems.....	4-195
4.7.3.5	Hydrologic Data	4-199
4.7.3.6	Surface Water Quality Data.....	4-199
4.7.3.7	Groundwater Data	4-201
4.7.3.8	Biological Data.....	4-201
4.7.3.9	Stormwater Treatment Facilities	4-210
4.7.3.10	Atmospheric Deposition Data	4-210
4.7.3.11	Data Summary	4-210
4.7.4	Qualitative Assessment of Sources	4-210
4.7.4.1	In-Lake Water Quality.....	4-210
4.7.4.2	Stormwater Runoff	4-212
4.7.4.3	Septic Systems.....	4-221
4.7.4.4	Internal Recycling and Seepage	4-221

4.7.4.5	Wastewater	4-221
4.7.4.6	Atmospheric Deposition	4-221
4.7.4.7	Interconnected Flows.....	4-222
4.7.4.8	Summary of Findings	4-222
4.7.5	Calculation of Potential Nutrient Loads	4-222
4.7.5.1	Stormwater Pollutant Load.....	4-222
4.7.5.2	Septic Load	4-227
4.7.5.3	Point Source Load	4-227
4.7.5.4	Lake Inflow Load	4-227
4.7.5.5	Internal Lake Load	4-227
4.7.5.6	Atmospheric Deposition	4-227
4.7.5.7	Summary of Calculated Loads	4-230
4.8	Lake Hall	4-231
4.8.1	Overview and History	4-231
4.8.2	Regulatory Status	4-231
4.8.3	Waterbody Data Review and Summary	4-238
4.8.3.1	Bathymetry	4-238
4.8.3.2	Land Use.....	4-238
4.8.3.3	Soils	4-238
4.8.3.4	Septic Systems.....	4-238
4.8.3.5	Hydrologic Data	4-238
4.8.3.6	Surface Water Quality Data.....	4-243
4.8.3.7	Groundwater Data	4-253
4.8.3.8	Biological Data	4-253
4.8.3.9	Stormwater Treatment Facilities	4-253
4.8.3.10	Atmospheric Deposition Data	4-255
4.8.3.11	Data Summary	4-255
4.8.4	Qualitative Assessment of Sources	4-255
4.8.4.1	In-Lake Water Quality.....	4-255
4.8.4.2	Stormwater Runoff	4-256
4.8.4.3	Septic Systems.....	4-256
4.8.4.4	Internal Recycling and Seepage	4-265
4.8.4.5	Wastewater	4-265
4.8.4.6	Atmospheric Deposition	4-265
4.8.4.7	Interconnected Flows.....	4-265
4.8.4.8	Summary of Findings	4-266
4.8.5	Calculation of Potential Nutrient Loads	4-266
4.8.5.1	Stormwater Pollutant Load.....	4-266
4.8.5.2	Septic Load	4-271
4.8.5.3	Point Source Load	4-271
4.8.5.4	Lake Inflow Load	4-271

4.8.5.5	Internal Lake Load	4-271
4.8.5.6	Atmospheric Deposition	4-271
4.8.5.7	Summary of Calculated Loads	4-274
4.9	Lexington Creek	4-275
4.9.1	Overview and History	4-275
4.9.2	Regulatory Status	4-275
4.9.3	Waterbody Data Review and Summary	4-275
4.9.3.1	Land Use	4-277
4.9.3.2	Soils	4-277
4.9.3.3	Septic Systems	4-277
4.9.3.4	Hydrologic Data	4-277
4.9.3.5	Surface Water Quality Data	4-277
4.9.3.6	Groundwater Data	4-284
4.9.3.7	Biological Data	4-288
4.9.3.8	Stormwater Treatment Facilities	4-288
4.9.3.9	Atmospheric Deposition Data	4-288
4.9.3.10	Data Summary	4-288
4.9.4	Qualitative Assessment of Sources	4-290
4.9.4.1	In-Stream Water Quality	4-290
4.9.4.2	Stormwater Runoff	4-292
4.9.4.3	Septic Systems	4-292
4.9.4.4	Internal Recycling and Seepage	4-297
4.9.4.5	Wastewater	4-297
4.9.4.6	Atmospheric Deposition	4-297
4.9.4.7	Interconnected Flows	4-297
4.9.4.8	Summary of Findings	4-297
4.9.5	Calculation of Potential Nutrient Loads	4-297
4.9.5.1	Stormwater Pollutant Load	4-298
4.9.5.2	Septic Load	4-298
4.9.5.3	Point Source Load	4-304
4.9.5.4	Lake Inflow Load	4-304
4.9.5.5	Internal Lake Load	4-304
4.9.5.6	Atmospheric Deposition	4-304
4.9.5.7	Summary of Calculated Loads	4-304
4.10	Lake Jackson Basin Hot Spot Analysis	4-306
4.10.1	Waterbody Ranking	4-306
4.10.2	Pollutant Source Ranking	4-309
4.10.3	Identification of Hot Spot Areas	4-310
4.11	Water Quality Study Identification and Prioritization	4-315
4.11.1	Summary of Data Limitations, Waterbody Prioritization, and Key Stressors	4-315

4.11.1.1 Lexington Creek Key Stressors	4-316
4.11.1.2 Lake Jackson Key Stressors	4-317
4.11.1.3 Summerbrook Chain of Lakes Key Stressors.....	4-322
4.11.2 Study/Data Collection Recommendations.....	4-322
4.11.2.1 Lake Jackson: Re-establish Flow Measurements in Lexington Creek.....	4-322
4.11.2.2 Lexington Creek: FIB Source Assessment.....	4-325
4.11.2.3 Lake Jackson: MARS Facility Restoration Study	4-327
4.11.2.4 Lake Jackson: Butler Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment.....	4-327
4.11.2.5 Lake Jackson: Hydrologic Budget Assessment.....	4-330
4.11.2.6 Carr Lake: Flow Measurement and Water Quality of the Inflow from the Summerbrook Chain of Lakes	4-331
4.11.3 Study Prioritization.....	4-333

LIST OF TABLES

Table 4-1: Lake Jackson Basin Reference List.....	4-5
Table 4-2: City Measured Flows at LJB01 During Water Quality Sampling (2015 to 2020)...	4-31
Table 4-3: Summary of LVI Results from Lake Jackson	4-44
Table 4-4: Landscape Development Intensity Index Coefficients.....	4-58
Table 4-5: Aggregated Land Use.....	4-78
Table 4-6: Land Use DCIA and Non-DCIA Percentages.....	4-79
Table 4-7: Curve Number Lookup Table.....	4-80
Table 4-8: Event Mean Concentration by Land Use	4-80
Table 4-9: Direct Runoff BMP Removal Efficiencies.....	4-81
Table 4-10: Concentration Data, Volumes, and Calculated Loads Representing the Discharge from the MARS Treatment Facility.....	4-83
Table 4-11: Measurements of Vertical Variation in Specific Conductance and Percent Saturation within Lake Jackson	4-92
Table 4-12: Annual Atmospheric Total Nitrogen Load per Acre from Quincy Station.....	4-92
Table 4-13: Summary of Calculated Loads to Lake Jackson	4-93
Table 4-14: Summary of LVI Data for Carr Lake	4-124
Table 4-15: Summary of Calculated Loads to Carr Lake	4-144
Table 4-16: Summary of Calculated Loads to Lake Alyssa	4-185
Table 4-17: Summary of Calculated Loads to Somerset Lake	4-187
Table 4-18: Summary of Calculated Loads to Shelly Pond.....	4-187
Table 4-19: Summary of LVI Results from Lake Overstreet	4-201
Table 4-20: Summary of Calculated Loads to Lake Overstreet	4-230
Table 4-21: Summary of LVI Results from Lake Hall	4-253
Table 4-22: Summary of Calculated Loads to Lake Hall	4-274
Table 4-23: Summary of SCI Results from Lexington Creek	4-288

Table 4-24: Summary of Calculated Loads to Lexington Creek	4-304
Table 4-25: Waterbody Ranking.....	4-308
Table 4-26: Load Source Ranking	4-311
Table 4-27: Summary of Identified Data Limitations for Waterbodies in the Lake Jackson Basin	4-316
Table 4-28: Proposed Study Ranking	4-334

LIST OF FIGURES

Figure 4-1: Location Map	4-3
Figure 4-2: Bathymetry in Lake Jackson	4-23
Figure 4-3: Annual Precipitation from Lake Jackson Stations (1987 to 2020)	4-27
Figure 4-4: Measured Water Levels in Lake Jackson (1950 to 2020).....	4-28
Figure 4-5: Measured Flows in Lexington Creek (Station 008454) (1987 to 2020)	4-29
Figure 4-6: Plot of Measured TN.....	4-33
Figure 4-7: Plot of Measured TP	4-34
Figure 4-8: Plot of Measured Chl-a	4-35
Figure 4-9: Plot of Annual Geometric Means for TN with NNC Criteria for Lake Jackson ...	4-37
Figure 4-10: Plot of Annual Geometric Means for TP with NNC Criteria for Lake Jackson ...	4-38
Figure 4-11: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Lake Jackson.....	4-39
Figure 4-12: Trophic State Index for Lake Jackson.....	4-40
Figure 4-13: Plot of <i>E. coli</i> for Lake Jackson	4-41
Figure 4-14: Surficial Ground Water Sampling Wells	4-43
Figure 4-15: Locations of Atmospheric Deposition Stations Relative to Lake Jackson	4-45
Figure 4-16: Station Clustering for In-Lake Spatial Analyses for Lake Jackson	4-48
Figure 4-17: Spatial Assessment of Color in Lake Jackson	4-50
Figure 4-18: Spatial Assessment of Alkalinity in Lake Jackson	4-51
Figure 4-19: Spatial Assessment of TN in Lake Jackson	4-52
Figure 4-20: Spatial Assessment of TP in Lake Jackson.....	4-53
Figure 4-21: Spatial Assessment of Chl-a in Lake Jackson.....	4-55
Figure 4-22: Spatial Assessment of TSI in Lake Jackson.....	4-56
Figure 4-23: Spatial Assessment of <i>E. coli</i> in Lake Jackson	4-57
Figure 4-24: Land Development Index by Sub-Watershed within Lake Jackson Drainage Basin	4-59
Figure 4-25: Station Clustering for Analyses of Tributary Inflows to Lake Jackson	4-61
Figure 4-26: Spatial Assessment of TN in Tributaries to Lake Jackson.....	4-62
Figure 4-27: Spatial Assessment of TP in Tributaries to Lake Jackson	4-63
Figure 4-28: Spatial Assessment of TSS in Tributaries to Lake Jackson	4-65
Figure 4-29: Spatial Assessment of <i>E. coli</i> in Tributaries to Lake Jackson	4-66
Figure 4-30: BMPs near Tributary Inflows to Lake Jackson.....	4-67
Figure 4-31: Septic Tank Density by Subbasin within Lake Jackson Drainage Basin.....	4-69

Figure 4-32: City of Tallahassee Wastewater Service Areas within and Adjacent to Lake Jackson Drainage Basin	4-71
Figure 4-33: Lake Jackson Subbasin Delineation and BMPs	4-76
Figure 4-34: Lake Jackson Aggregated Land Use	4-77
Figure 4-35: Lake Jackson Concentrated Discharge Areas	4-82
Figure 4-36: Lake Jackson Concentrated Discharge Areas – Total Nitrogen	4-84
Figure 4-37: Lake Jackson Concentrated Discharge Areas – Total Phosphorus	4-86
Figure 4-38: Septic Loading to Lake Jackson	4-88
Figure 4-39: Inflow Loading to Lake Jackson	4-90
Figure 4-40: Carr Lake Drainage Basin Overview Map	4-102
Figure 4-41: Carr Lake Basin Land Use Map	4-109
Figure 4-42: Carr Lake Basin Soils Map	4-110
Figure 4-43: Carr Lake Drainage Basin Septic System Map	4-112
Figure 4-44: Carr Lake Water Quality Station Location Map	4-113
Figure 4-45: Plot of Measured TN	4-115
Figure 4-46: Plot of Measured TP	4-116
Figure 4-47: Plot of Measured Chl-a	4-117
Figure 4-48: Plot of Annual Geometric Means for TN with NNC Criteria for Carr Lake	4-118
Figure 4-49: Plot of Annual Geometric Means for TP with NNC Criteria for Carr Lake	4-119
Figure 4-50: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Carr Lake ..	4-120
Figure 4-51: Trophic State Index for Carr Lake	4-121
Figure 4-52: Plot of <i>E. coli</i> Measurements (2014 to 2020)	4-122
Figure 4-53: Surficial Groundwater Sampling Wells	4-123
Figure 4-54: BMPs in Carr Lake Drainage Basin	4-125
Figure 4-55: Station Clustering for In-Lake Analyses for Carr Lake	4-128
Figure 4-56: Spatial Assessment of Color in Carr Lake	4-129
Figure 4-57: Spatial Assessment of Alkalinity in Carr Lake	4-130
Figure 4-58: Spatial Assessment of TN in Carr Lake	4-131
Figure 4-59: Spatial Assessment of TP in Carr Lake	4-132
Figure 4-60: Spatial Assessment of Chl-a in Carr Lake	4-133
Figure 4-61: Spatial Assessment of TSI in Carr Lake	4-134
Figure 4-62: Spatial Assessment of <i>E. coli</i> in Carr Lake	4-135
Figure 4-63: Carr Lake: Subbasin Delineation and BMPs	4-139
Figure 4-64: Carr Lake Aggregated Land Use	4-140
Figure 4-65: Carr Lake Concentrated Discharge Areas	4-141
Figure 4-66: Carr Lake Concentrated Discharge Areas – Total Nitrogen	4-142
Figure 4-67: Carr Lake Concentrated Discharge Areas – Total Phosphorus	4-143
Figure 4-68: Septic Loading to Carr Lake	4-145
Figure 4-69: Inflow Loading to Carr Lake	4-146
Figure 4-70: Summerbrook Creek Drainage Basin Overview Map	4-148
Figure 4-71: Summerbrook Creek Basin Land Use Map	4-156
Figure 4-72: Summerbrook Creek Basin Soils Map	4-158
Figure 4-73: Summerbrook Creek Drainage Basin Septic System Map	4-159

Figure 4-74: Summerbrook Creek Water Quality Station Location Map.....	4-161
Figure 4-75: Plot of Measured TN in Summerbrook Creek	4-162
Figure 4-76: Plot of Measured TP in Summerbrook Creek.....	4-163
Figure 4-77: Plot of Annual Geometric Means for TN with NNC Criteria for Summerbrook Creek.....	4-164
Figure 4-78: Plot of Annual Geometric Means for TP with NNC Criteria for Summerbrook Creek.....	4-165
Figure 4-79: Plot of <i>E. coli</i> Measurements (2015 to 2020) in Summerbrook Creek.....	4-166
Figure 4-80: Summerbrook Creek Basin BMP Locations Map.....	4-168
Figure 4-81: Station Clustering for Summerbrook Creek.....	4-171
Figure 4-82: Spatial Assessment of TN in Summerbrook Creek	4-172
Figure 4-83: Spatial Assessment of TP in Summerbrook Creek	4-173
Figure 4-84: Spatial Assessment of TSS in Summerbrook Creek.....	4-174
Figure 4-85: Spatial Assessment of <i>E. coli</i> in Summerbrook Creek	4-175
Figure 4-86: Summerbrook Chain of Lakes Subbasin Delineation and BMPs	4-179
Figure 4-87: Summerbrook Chain of Lakes Aggregated Land Use	4-180
Figure 4-88: Summerbrook Chain of Lakes Concentrated Discharge Areas	4-181
Figure 4-89: Summerbrook Chain of Lakes Concentrated Discharge Areas – Total Nitrogen	4-182
Figure 4-90: Summerbrook Chain of Lakes Concentrated Discharge Areas – Total Phosphorus.....	4-183
Figure 4-91: Septic Loading to Summerbrook Chain of Lakes.....	4-184
Figure 4-92: Inflow Loading to Summerbrook Chain of Lakes	4-186
Figure 4-93: Lake Overstreet Drainage Basin Overview Map	4-190
Figure 4-94: Lake Overstreet Basin Land Use Map	4-196
Figure 4-95: Lake Overstreet Basin Soils Map.....	4-197
Figure 4-96: Lake Overstreet Drainage Basin Septic System Map	4-198
Figure 4-97: Lake Overstreet Water Quality Station Location Map	4-200
Figure 4-98: Plot of Measured TN.....	4-202
Figure 4-99: Plot of Measured TP	4-203
Figure 4-100: Plot of Measured Chl-a	4-204
Figure 4-101: Plot of Annual Geometric Means for TN with NNC Criteria for Lake Overstreet.....	4-205
Figure 4-102: Plot of Annual Geometric Means for TP with NNC Criteria for Lake Overstreet.....	4-206
Figure 4-103: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Lake Overstreet.....	4-207
Figure 4-104: Trophic State Index for Lake Overstreet.....	4-208
Figure 4-105: Plot of <i>E. coli</i> Measurements (2015 to 2019)	4-209
Figure 4-106: Lake Overstreet Drainage Basin BMPs Map.....	4-211
Figure 4-107: Station Clustering for In-Lake Analyses for Lake Overstreet	4-213
Figure 4-108: Spatial Assessment of Color in Lake Overstreet	4-214
Figure 4-109: Spatial Assessment of Alkalinity in Lake Overstreet	4-215

Figure 4-110: Spatial Assessment of TN in Lake Overstreet	4-216
Figure 4-111: Spatial Assessment of TP in Lake Overstreet.....	4-217
Figure 4-112: Spatial Assessment of Chl-a in Lake Overstreet.....	4-218
Figure 4-113: Spatial Assessment of TSI in Lake Overstreet.....	4-219
Figure 4-114: Spatial Assessment of <i>E. coli</i> in Lake Overstreet	4-220
Figure 4-115: Lake Overstreet Subbasin Delineation and BMPs.....	4-223
Figure 4-116: Lake Overstreet Aggregated Land Use.....	4-224
Figure 4-117: Lake Overstreet Concentrated Discharge Areas	4-225
Figure 4-118: Lake Overstreet Concentrated Discharge Areas – Total Nitrogen	4-226
Figure 4-119: Lake Overstreet Concentrated Discharge Areas – Total Phosphorus.....	4-228
Figure 4-120: Septic Loading to Lake Overstreet.....	4-229
Figure 4-121: Lake Hall Drainage Basin Overview Map.....	4-232
Figure 4-122: Bathymetry in Lake Hall.....	4-239
Figure 4-123: Lake Hall Drainage Basin Land Use Map	4-240
Figure 4-124: Lake Hall Drainage Basin Soils Map.....	4-241
Figure 4-125: Lake Hall Drainage Basin Septic System Map.....	4-242
Figure 4-126: Lake Hall Water Quality Station Locations Map.....	4-244
Figure 4-127: Plot of Measured TN.....	4-245
Figure 4-128: Plot of Measured TP	4-246
Figure 4-129: Plot of Measured Chl-a	4-247
Figure 4-130: Plot of Annual Geometric Means for TN with NNC Criteria for Lake Hall	4-248
Figure 4-131: Plot of Annual Geometric Means for TP with NNC Criteria for Lake Hall.....	4-249
Figure 4-132: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Lake Hall.....	4-250
Figure 4-133: Plot of Trophic State Index for Lake Hall.....	4-251
Figure 4-134: Plot of <i>E. coli</i> for Lake Hall	4-252
Figure 4-135: Lake Hall Basin BMP Locations Map	4-254
Figure 4-136: Station Clustering for In-Lake Analyses for Lake Hall	4-257
Figure 4-137: Spatial Assessment of Color in Lake Hall	4-258
Figure 4-138: Spatial Assessment of Alkalinity in Lake Hall	4-259
Figure 4-139: Spatial Assessment of TN in Lake Hall	4-260
Figure 4-140: Spatial Assessment of TP in Lake Hall.....	4-261
Figure 4-141: Spatial Assessment of Chl-a in Lake Hall	4-262
Figure 4-142: Spatial Assessment of TSI in Lake Hall	4-263
Figure 4-143: Spatial Assessment of <i>E. coli</i> in Lake Hall.....	4-264
Figure 4-144: Lake Hall Subbasin Delineation and BMPs.....	4-267
Figure 4-145: Lake Hall Aggregated Land Use.....	4-268
Figure 4-146: Lake Hall Concentrated Discharge Areas.....	4-269
Figure 4-147: Lake Hall Concentrated Discharge Areas – Total Nitrogen	4-270
Figure 4-148: Lake Hall Concentrated Discharge Areas – Total Phosphorus.....	4-272
Figure 4-149: Septic Loading to Lake Hall	4-273
Figure 4-150: Lexington Creek Drainage Basin Overview Map.....	4-276
Figure 4-151: Lexington Creek Basin Land Use Map.....	4-278
Figure 4-152: Lexington Creek Basin Soils Map	4-279

Figure 4-153: Lexington Creek Drainage Basin Septic System Map	4-280
Figure 4-154: Lexington Creek Water Quality Station Location Map	4-281
Figure 4-155: Plot of Measured TN	4-282
Figure 4-156: Plot of Measured TP	4-283
Figure 4-157: Plot of Annual Geometric Means for TN with NNC Criteria for Lexington Creek	4-285
Figure 4-158: Plot of Annual Geometric Means for TP with NNC Criteria for Lexington Creek	4-286
Figure 4-159: Plot of <i>E. coli</i> Measurements (2014 to 2020)(Leon County – blue, FDEP – red)	4-287
Figure 4-160: Lexington Creek Basin BMP Locations Map	4-289
Figure 4-161: Station Clustering for Lexington Creek	4-291
Figure 4-162: Spatial Assessment of TN in Lexington Creek	4-293
Figure 4-163: Spatial Assessment of TP in Lexington Creek	4-294
Figure 4-164: Spatial Assessment of TSS in Lexington Creek	4-295
Figure 4-165: Spatial Assessment of <i>E. coli</i> in Lexington Creek	4-296
Figure 4-166: Lexington Creek Subbasin Delineation and BMPs	4-299
Figure 4-167: Lexington Creek Aggregated Land Use	4-300
Figure 4-168: Lexington Creek Concentrated Discharge Areas	4-301
Figure 4-169: Lexington Creek Concentrated Discharge Areas – Total Nitrogen	4-302
Figure 4-170: Lexington Creek Concentrated Discharge Areas – Total Phosphorus	4-303
Figure 4-171: Septic Loading to Lexington Creek	4-305
Figure 4-172: Measured <i>E. coli</i> on Butlers Mill Creek (2020 and 2021)	4-318
Figure 4-173: Measured <i>E. coli</i> on Okeeheepkee Creek (2020 and 2021)	4-319
Figure 4-174: Measured TN and Inorganic Nitrogen on Butlers Mill Creek (2020 and 2021)	4-320
Figure 4-175: Measured TN and Inorganic Nitrogen on Okeeheepkee Creek (2020 and 2021)	4-321
Figure 4-176: Lake Jackson – Re-Establish Flow Measurements on Lexington Creek Watershed	4-324
Figure 4-177: Lexington Creek – FIB Source Assessment	4-326
Figure 4-178: Lake Jackson – MARS Facility Restoration Study	4-328
Figure 4-179: Lake Jackson – Butlers Mill Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment	4-329
Figure 4-180: Carr Lake – Flow Measurements and Water Quality Sampling of the Shelly Pond Outflow	4-332

LIST OF PHOTOGRAPHS

Photo 4-1: Flows Draining from Lake Jackson to Porter Sink (June 14, 2021)	4-10
Photo 4-2: Flows Going to Floridan Aquifer through Porter Sink (June 14, 2021)	4-10
Photo 4-3: Lake Jackson Aerial – 1937	4-12
Photo 4-4: Lake Jackson Aerial – 1949	4-12

Photo 4-5: Lake Jackson Aerial – 1954	4-13
Photo 4-6: Lake Jackson Aerial – 1970	4-13
Photo 4-7: Lake Jackson Aerial – 1983	4-14
Photo 4-8: Lake Jackson Aerial – 1996	4-14
Photo 4-9: Lake Jackson Aerial – 2007	4-15
Photo 4-10: Lake Jackson Aerial – 2020	4-15
Photo 4-11: Northern Lake Site (February 2017)	4-16
Photo 4-12: Southern Lake Site (February 2017)	4-16
Photo 4-13: MARS Facility Impoundment and Overflow (February 2021)	4-18
Photo 4-14: MARS Filter Marsh Intake (February 2021)	4-18
Photo 4-15: MARS Filter Marsh (February 2021)	4-19
Photo 4-16: Boone Boulevard Pond (February 2021)	4-19
Photo 4-17: Bank Stabilization Along Megginnis Creek	4-20
Photo 4-18: Carr Lake from Boat Ramp (February 2021)	4-103
Photo 4-19: Carr Lake from Boat Ramp (February 2021)	4-103
Photo 4-20: Carr Lake Basin Area Aerial (1937)	4-105
Photo 4-21: Carr Lake Basin Area Aerial (1949)	4-105
Photo 4-22: Carr Lake Basin Area Aerial (1954)	4-106
Photo 4-23: Carr Lake Basin Area Aerial (1970)	4-106
Photo 4-24: Carr Lake Basin Area Aerial (1983)	4-107
Photo 4-25: Carr Lake Basin Area Aerial (1996)	4-107
Photo 4-26: Carr Lake Basin Area Aerial (2007)	4-108
Photo 4-27: Carr Lake Basin Area Aerial (2020)	4-108
Photo 4-28a and b: Lake Alyssa	4-149
Photo 4-29: Lake Somerset	4-150
Photo 4-30: Shelly Pond	4-150
Photo 4-31: Summerbrook Creek Basin Area Aerial (1937)	4-151
Photo 4-32: Summerbrook Creek Basin Area Aerial (1949)	4-151
Photo 4-33: Summerbrook Creek Basin Area Aerial (1954)	4-152
Photo 4-34: Summerbrook Creek Basin Area Aerial (1970)	4-152
Photo 4-35: Summerbrook Creek Basin Area Aerial (1983)	4-153
Photo 4-36: Summerbrook Creek Basin Area Aerial (1996)	4-153
Photo 4-37: Summerbrook Creek Basin Area Aerial (2007)	4-154
Photo 4-38: Summerbrook Creek Basin Area Aerial (2020)	4-154
Photo 4-39: Aerial Image of Recent Development within Summerbrook Creek Basin	4-157
Photo 4-40: Lake Overstreet (2011)	4-189
Photo 4-41: Lake Overstreet (2012)	4-189
Photo 4-42: Lake Overstreet Basin Area Aerial (1937)	4-191
Photo 4-43: Lake Overstreet Basin Area Aerial (1949)	4-191
Photo 4-44: Lake Overstreet Basin Area Aerial (1954)	4-192
Photo 4-45: Lake Overstreet Basin Area Aerial (1970)	4-192
Photo 4-46: Lake Overstreet Basin Area Aerial (1983)	4-193
Photo 4-47: Lake Overstreet Basin Area Aerial (1996)	4-193

Photo 4-48: Lake Overstreet Basin Area Aerial (2007).....	4-194
Photo 4-49: Lake Overstreet Basin Area Aerial (2020).....	4-194
Photo 4-50: Lake Hall Photo 1.....	4-233
Photo 4-51: Lake Hall Photo 2.....	4-233
Photo 4-52: Lake Hall Aerial (1937)	4-234
Photo 4-53: Lake Hall Aerial (1949)	4-234
Photo 4-54: Lake Hall Aerial (1954)	4-235
Photo 4-55: Lake Hall Aerial (1970)	4-235
Photo 4-56: Lake Hall Aerial (1983)	4-236
Photo 4-57: Lake Hall Aerial (1996)	4-236
Photo 4-58: Lake Hall Aerial (2007)	4-237
Photo 4-59: Lake Hall Aerial (2020)	4-237

LIST OF EXHIBITS

Exhibit 4-1: Lake Jackson Drainage Basin Overview Map.....	4-4
Exhibit 4-2: Lake Jackson Drainage Basin Impairments Map	4-94
Exhibit 4-3: Lake Jackson Drainage Basin Land Use Map	4-95
Exhibit 4-4: Lake Jackson Drainage Basin Soils Map.....	4-96
Exhibit 4-5: Lake Jackson Drainage Basin Septic Systems Map	4-97
Exhibit 4-6: Lake Jackson Drainage Basin Hydrological Data Station Locations Map.....	4-98
Exhibit 4-7: Lake Jackson Water Quality Station Locations Map	4-99
Exhibit 4-8: Lake Jackson Drainage Basin BMP Locations Map	4-100
Exhibit 4-9: Stormwater Load Hot Spot Map.....	4-313
Exhibit 4-10: Septic Load Hot Spot Map	4-314

ACRONYMS AND ABBREVIATIONS

AGM	annual geometric mean
AH	Applicant's Handbook
BMAP	basin management action plan
BMP	best management practices
CDA	Concentrated Discharge Areas
cfs	cubic feet per second
Chl-a	chlorophyll <i>a</i>
City	City of Tallahassee
CN	curve number
DCIA	directly connected impervious area
DEM	Digital Elevation Model
DMR	Discharge Monitoring Report
DO	dissolved oxygen
<i>E. coli</i>	<i>Escherichia coli</i>
EMC	event mean concentration
EPA	U.S. Environmental Protection Agency
ERP	Environmental Resource Permit
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FIB	Fecal Indicator Bacteria
FLUCCS	Florida Land Use Cover Classification System
FSQAH	Florida Stormwater Quality Applicants Handbook
FSU	Florida State University
ft	feet
FWC	Florida Fish and Wildlife Conservation Commission
GIS	geographic information system
HA	Habitat Assessment
HOA	homeowners association

HSG	hydrologic soil group
ID	identification
IWR	Impaired Waters Rule
lb/yr	pounds per year
lb/acre/yr	pounds per acre per year
LDI	Landscape Development Intensity
LVI	Lake Vegetation Index
MARC	mean annual runoff coefficient
MARS	Megginnis Arm Regional Stormwater
mg/L	milligrams per liter
mL	milliliter
MPN	Most Probable Number
MS4	municipal separate storm sewer system
NADP	National Atmospheric Deposition Program
NAVD88	North American Vertical Datum of 1988
NHD	National Hydrological Data
NNC	Numeric Nutrient Criteria
NRCS	Natural Resource Conservation Service
NFWFMD	Northwest Florida Water Management District
OFW	Outstanding Florida Water
OSTDS	onsite sewage treatment and disposal systems
PCU	platinum-cobalt units
PO ₄	orthophosphate
QAPP	Quality Assurance Project Plan
SAV	submerged aquatic vegetation
SCI	Stream Condition Index
SIMPLE-Seasonal	Spatially Integrated Model for Pollutant Loading Estimates
SPOA	Summerbrooke Property Owners Association, Inc.
SSO	sanitary sewer overflow
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management

SWMM	Stormwater Management Model
TKN	total Kjeldahl nitrogen
TMaPS	Tallahassee Master Plan - Surface Water
TMDL	total maximum daily load
TN	total nitrogen
TP	total phosphorus
TSI	Trophic State Index
TSS	total suspended solids
µg/L	micrograms per liter
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WBID	waterbody identification

4 Lake Jackson Basin

4.1 Basin Overview and Project Waterbodies

The Lake Jackson basin is located in Leon County, FL north of Tallahassee and encompasses the township and ranges of: 001N 001E, 001N 001W, 002N 001E, and 002N 001W. **Figure 4-1** shows the location of the Lake Jackson basin in relation to the Tallahassee city limits and within the Leon County boundary. The basin covers 27,340 acres (42.7 square miles), of which 76.6 percent (20,948 acres) is land cover and the remaining 23.4 percent (6,392 acres) is surface water. **Exhibit 4-1** presents a map showing basin boundaries, waterbodies that are part of this study (termed primary waterbodies), tributary inputs, the extents of the City of Tallahassee (City) incorporated area, and smaller watershed areas that drain to Lake Jackson, which is the primary receiving waterbody in the basin.

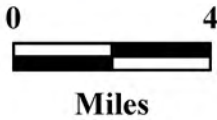
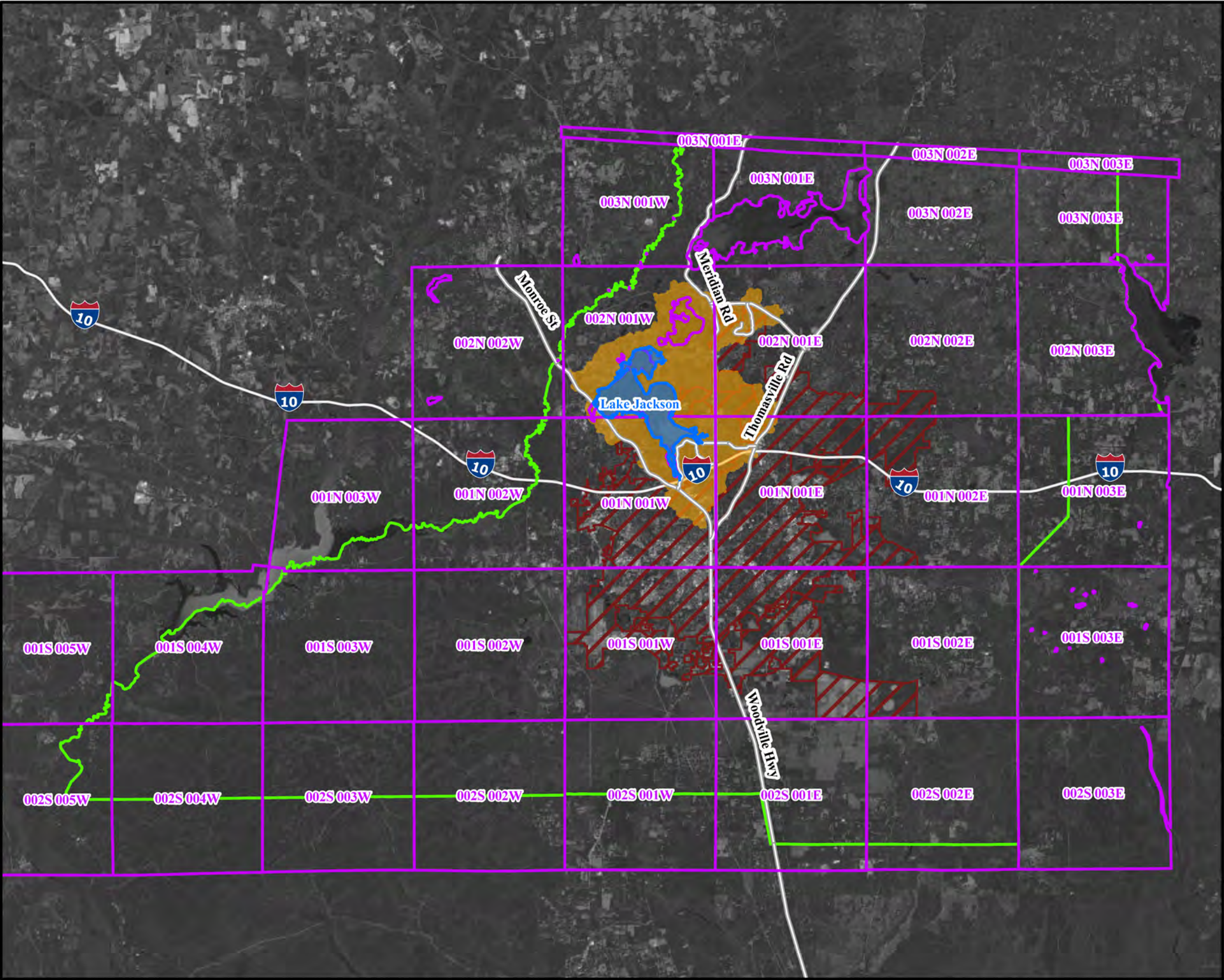
Looking at drainage to the lake (**Exhibit 4-1**), along the southern end, Megginnis Creek drains into Megginnis Arm, which flows into the southern end of the lake. East of this, Lexington Creek flows from the southeast portion of the watershed into Fords Arm. Along the southwest edge, a series of watersheds drain directly into the lake, including Okeeheepkee, Lake Jackson Mounds, Bellwood, and Harbinwood. Along the north side of Lake Jackson, three additional watersheds drain directly to the lake, Sunset, Blue Dog, and an unnamed watershed. Along the northeastern side, Carr Lake and its associated watershed drain into the northern lobe of Lake Jackson. Upstream of Carr Lake, Summerbrook Creek flows through the Summerbrook Chain of Lakes, including Lake Alyssa, Lake Somerset, and Shelly Pond draining a portion of the Bradfordville area. Along the eastern side, the Lake Overstreet watershed drains into Lake Jackson through Fords Arm. Two other unnamed watersheds drain into the eastern side of Lake Jackson and into the upper lobe of the lake. On the easternmost end of the basin, two waterbodies sit within closed watersheds (Lake Hall and Lake Elizabeth). Approximately 34 percent of the watershed is classified as developed, with a significant portion of development concentrated directly south and west of Lake Jackson. East and north of Lake Jackson (other than the Summerbrook Creek watershed) contains predominantly undeveloped and agricultural land, 54 percent and 13 percent, respectively. The City's incorporated area (shown on **Exhibit 4-1**) covers approximately 22 percent of the Lake Jackson basin along the southern and eastern sides.

For the Lake Jackson basin, the following nine primary waterbodies were identified for evaluation of potential pollutant loads and development of structural and non-structural projects to improve their water quality (as needed):

- Lake Jackson
- Carr Lake
- Summerbrook Chain of Lakes (Lake Alyssa, Somerset Lake, and Shelly Pond) and Summerbrook Creek
- Lake Overstreet
- Lake Hall

- Lexington Creek

These waterbodies are highlighted in **Exhibit 4-1** and are the focus of the analyses in the sections following this introduction.



Legend

- Lake Jackson Drainage Basin
- Leon County Boundary
- Lake Jackson
- Township - Range for Leon County
- Major Roads
- Tallahassee Corporate Limits

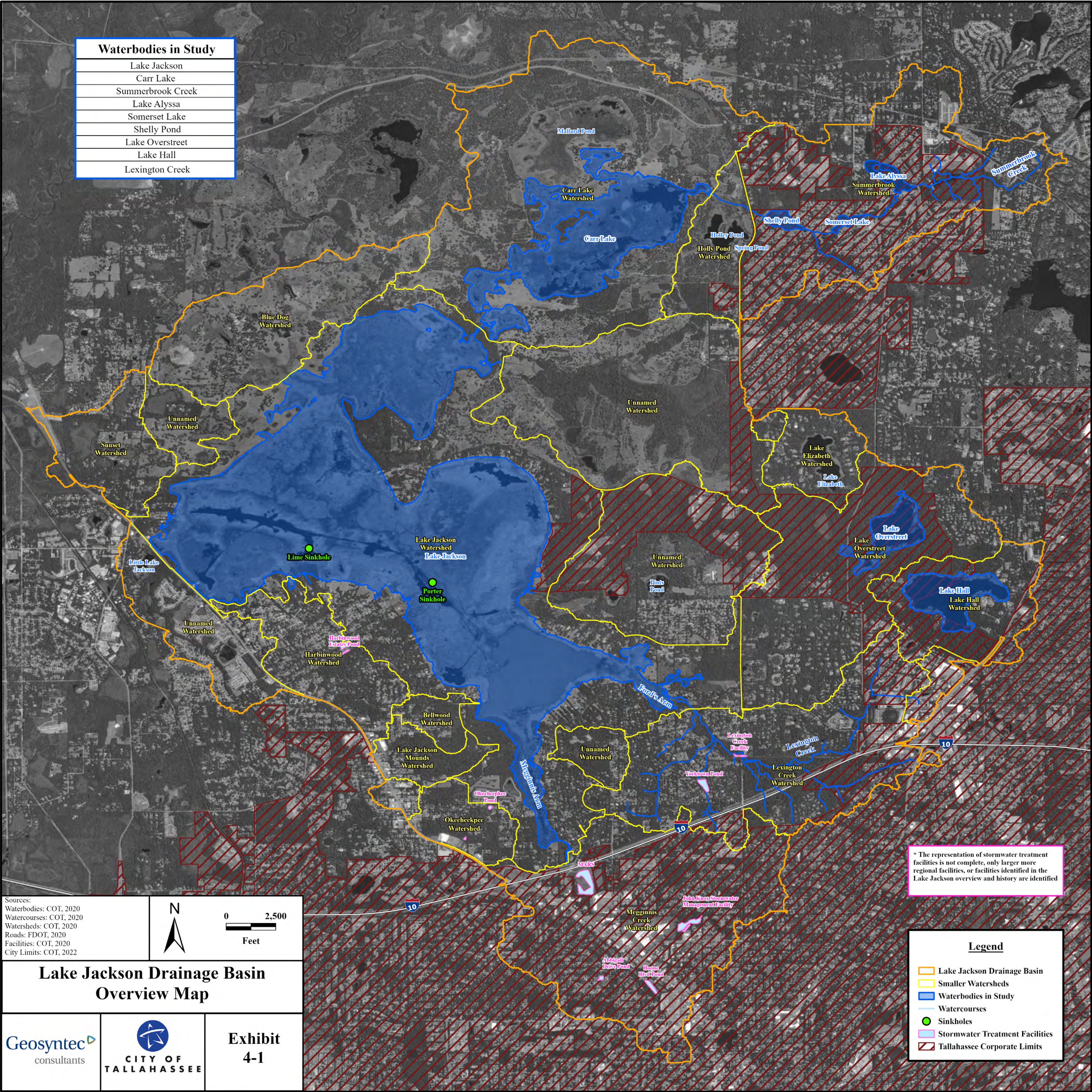
Sources:
Waterbodies: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

**Figure 4-1:
Location Map**

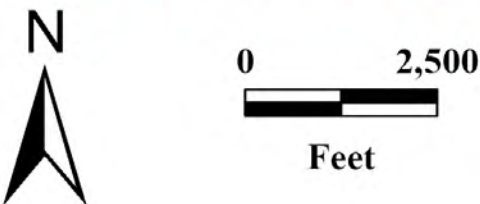
**Tallahassee Master Plan - Surface
Water (TMaPS)**



Waterbodies in Study
Lake Jackson
Carr Lake
Summerbrook Creek
Lake Alyssa
Somerset Lake
Shelly Pond
Lake Overstreet
Lake Hall
Lexington Creek



Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
Facilities: COT, 2020
City Limits: COT, 2022



Lake Jackson Drainage Basin Overview Map

Geosyntec
consultants



Exhibit
4-1

* The representation of stormwater treatment facilities is not complete, only larger more regional facilities, or facilities identified in the Lake Jackson overview and history are identified

Legend

- Lake Jackson Drainage Basin
- Smaller Watersheds
- Waterbodies in Study
- Watercourses
- Sinkholes
- Stormwater Treatment Facilities
- Tallahassee Corporate Limits

4.2 Report Review Summary

For the Lake Jackson basin, a series of reports were reviewed that provided the history and background of the basin and its waterbodies, along with data and other information to support the identification of potential sources and structural and non-structural projects to improve water quality. **Table 4-1** presents a list of the reports reviewed.

The reports range in time from the 1960s through the present and include studies on pollutant loads to the lakes and causes of water quality degradation; analyses of measured hydrologic, water quality, and biological data; and management plans to address restoration of Lake Jackson and other waterbodies within the basin. The spelling of “Megginis” in referring to the tributary into Lake Jackson has changed throughout the years depending on the source of information but all the uses of that name refer to the same waterbody (e.g., Meginnis, McGinnis, etc.). The Summerbrook Chain of Lakes and Summerbrook Creek have various spellings and naming. Summerbrook Creek is at times called Summer Creek and Summerbrook is at times spelled Summerbrooke. For this report the spelling will be Summerbrook and the creek identified as Summerbrook Creek. The Summerbrooke Neighborhood is spelled differently.

Table 4-1: Lake Jackson Basin Reference List

Report Name	Author	Year
Weblink	Home Sales of Tallahassee	2022
Email from Summerbrooke Property Owners Association	Charlie Messing	2021
Lake Jackson Dry Downs: Frequently Asked Questions	FDEP	2021
Lake Hall – Wikipedia	Open	2021
Lake Overstreet – Wikipedia	Open	2021
Lake Overstreet - Florida State Parks	FDEP	2021
Lake Overstreet Trails - Florida State Parks	FDEP	2021
Lake Ecosummary - Lake Hall	City	2020
Waterbody Summary - Lake Hall	Leon County	2020
Lake Jackson Monitoring Project	City	2020
Waterbody Summary - Summerbrook Creek	Leon County	2020
Lake Ecosummary - Lake Overstreet	City	2020
Megginis Arm Regional Stormwater Treatment Facility Evaluation Plan (Draft)	NWFWMD	2020
Stormwater Facility and Marsh (Emails between Paul Thorpe and Mark Heidecker)	NWFWMD/ City	2020
Lake Jackson Stormwater Monitoring Quality Assurance Project Plan (Draft)	City	2020
Waterbody Summary - Lexington Creek	Leon County	2020
Lake Hall Vegetation Index Results	Leon County	2019
Comments to FDEP, Cycle 4, Group 1, Verified List	City	2019
Manhole Lining Diagram	City	2019

Table 4-1: Lake Jackson Basin Reference List

Report Name	Author	Year
Waterbody Summaries 2019 Meginnis Creek	Leon County	2019
Waterbody Summaries 2019 Lake Jackson	Leon County	2019
Septic Tank Locations: Lake Jackson Drainage Basin	City /Leon County	2019
Meginnis Arm Regional Stormwater Treatment Facility Evaluation Plan (Draft)	NWFWMD	2019
Lake Jackson Aquatic Preserve Management Plan	FDEP	2019
Lake Carr Waterbody Summary	Leon County	2019
Lake Carr Lake Vegetation Index Results for 2019	Leon County	2019
Map of Septic Systems in the Basin and Just Outside	City	2019
Draft Lake Jackson Aquatic Preserve Management Plan Comments	City	2018
City of Tallahassee Mark Heidecker Letter to Florida Department of Environmental Protection (FDEP) on Draft Lake Jackson Aquatic Preserve Management Plan.	City	2018
Governing Board editorial: Future Bright for Lake Jackson	NWFWMD	2016
Determining the Influence of Septic Tanks on Lake Jackson's Nitrogen Levels Through Transport Modeling	Faraz Ahmed	2012
Florida Forever Competitive Grants Program Description and Application Package FY 2006-2007: Sharer Road Stormwater Improvements Plan	City	2006
Leon County Lakes Ecology, Lake Carr	Sean McGlynn	2006
Bradfordville Sector Plan	Leon County	2004
Effects of Septic Systems in the Lake Jackson Watershed	NWFWMD	2000
Lake Jackson Restoration Project	Leon County	1999
Lake Jackson Management Plan Addendum (Update and Extension of the 1994 Lake Jackson Management Plan	NWFWMD	1997
Lake Jackson Management Plan	NWFWMD	1994
I-10/Megginis Creek Stormwater Treatment Facility Project Completion Report	NWFWMD	1993
Diagnostic Study on Lake Jackson, Florida: Sources, Sinks and Solutions, Volume 1: Summary and Analysis Final Report	FSU	1991
Stormwater Management Plan, Volume III – Lake Jackson Basin	City and Leon County	1991
Expansion of the Lake Jackson Megginis Arm Stormwater Treatment Facility Final Report	NWFWMD	1990
Evaluation of the Lake Jackson Stormwater Treatment Facility Final Report	FSU	1988
Effectiveness of the Lake Jackson Restoration Project for the Treatment of Urban Runoff	Esry and Cairns	1988
Lake Jackson Clean Lakes Restoration Project Final Construction Report	NWFWMD	1984

Table 4-1: Lake Jackson Basin Reference List

Report Name	Author	Year
Engineering Design for Lake Jackson/Megginnis Arm Restoration: Lake Jackson Project	NWFWMD	1980
Analysis of the Water-Level Fluctuations of Lake Jackson Near Tallahassee, Florida	USGS	1967

4.3 Volume Outline

The sections that follow present the results from the completion of work tasks to date including: an overview of available data; assessment of the water quality conditions in the primary waterbodies and the tributaries that drain into them; development of potential pollutant loads; identification of “hot-spot” areas, by waterbody, to target for structural and non-structural projects within the Lake Jackson basin; and recommendations for additional data collection or studies to fill data gaps and support assessment of specific stressors to the primary waterbodies. The specific tasks, with a description of the work, include:

- Task 1 – Data Collection
 - Collection and review of data for use in project analyses.
- Task 2 – Waterbody Data Review and Summary
 - Evaluation of existing water quality conditions and general health of target waterbodies using available data and studies.
 - Qualitative assessment for each waterbody to identify pollutant loading sources to focus on.
- Task 3 – Water Quality Assessment
 - Calculation of pollutant load estimates to the target waterbodies including stormwater runoff, groundwater impacted by onsite sewage treatment and disposal systems (OSTDS), point sources, lake inflow, internal recycling, and atmospheric deposition.
 - Identification of hotspots within each drainage basin and prioritization of waterbodies to target for restoration efforts.
- Task 4 – Water Quality Study Identification and Prioritization
 - Identification of potential data collection or water quality improvement studies needed to address data gaps.

Sections 4.4 through **4.9** present an overview and history for each of the primary waterbodies along with the findings and results from Tasks 1 through 3. **Section 4.10** presents a basin-wide assessment of hot-spot areas to target for structural and non-structural projects based on the data and analyses presented in **Sections 4.4** through **4.9**. **Section 4.11** presents a summary of potential stressors within target waterbodies and recommendations on data collection or studies.

4.4 Lake Jackson

This section presents the results from Tasks 1 through 3 for Lake Jackson. This includes an overview and history of the lake and basin, present impairment status of waterbodies in the basin, an overview of available data, a qualitative assessment of potential pollutant sources, and calculation of potential pollutant loads.

4.4.1 Overview and History

Lake Jackson is a clastic upland lake that is generally shallow, with some deep depressional areas. The lake is underlain by a clay substrate layer [Florida Department of Environmental Protection (FDEP), 2019]. During typical (non-dry) pool conditions, the lake is approximately 4,200 acres in size, with an average depth of 6.6 feet (ft). Less than 1 percent of the overall lake area has depths greater than 10 ft. The lake serves as the primary receiving water for the 27,590-acre Lake Jackson drainage basin (**Exhibit 4-1**).

Historical records indicate that Lake Jackson may have been utilized by Native Americans as early as 14,500 years ago. In more recent historical times, prior to the Civil War, the lake was utilized for cotton farming. In the late 19th century and early 20th century, records indicate that it was used as a hunting preserve and into the 20th century became recognized for its world-renown bass fishery. Lake Jackson's original name, Okeeheepkee, came from the Creek Indian term for "disappearing waters" (FDEP, 2019) and reflects its unique hydrologic behavior.

The lake is within a closed basin so that all runoff and seepage from the basin enters the lake but does not flow out unless water levels are extremely high. The elevation of the lowest point on the ridge separating the Lake Jackson basin from the Ochlocknee basin is around 115 ft referenced to the North American Vertical Datum of 1988 (ft-NAVD88) [U.S. Geological Survey (USGS), 1967]. Typical elevations in the lake range from 76 up to 90 ft-NAVD88.

The lake has two primary sinkholes within its boundary, Lime Sink and Porter Sink (**Exhibit 4-1**). Presently, the degree of outflow through the sinks to the Floridan Aquifer is not fully understood. Historical studies identified that under typical conditions, the sinkholes are filled with sediments (USGS, 1967, FDEP 2019). USGS surmised that when local groundwater levels go down under drought conditions, the sediment fill will collapse, allowing the lake to flow into the Floridan Aquifer (USGS, 1967). Other more recent information indicates that Lake Jackson is constantly discharging through Porter Sink. This outflow becomes clear when lake levels are low, and the water can be seen directly draining to the sink. In summer 2021, this condition occurred, and the flow out of the lake to the aquifer was documented in photos and videos.

Photo 4-1 shows the flow entering the area of the Porter Sink from the lake as it drains. **Photo 4-2** shows the Porter sinkhole and the flow moving into the aquifer.

The hydrologic cycle for the lake is such that the levels decline due to evaporation, transpiration by aquatic vegetation, and groundwater outflow (either through two lake sinks or via seepage through sediments, known as aquifer recharge). The lake will rise due to stormwater inflows from the tributaries and direct rainfall. When one exceeds the other, the lake will either drain or fill. The cycle of draining and refilling is a natural process in Lake Jackson.



Photo 4-1: Flows Draining from Lake Jackson to Porter Sink (June 14, 2021)



Photo 4-2: Flows Going to Floridan Aquifer through Porter Sink (June 14, 2021)

Since 1900, the lake has had 11 documented “dry down” events; these occurred in 1907, 1909, 1932, 1935, 1936, 1957, 1982, 1999-2000, 2006-2007, 2012 and 2021. **Photo 4-3** through **Photo 4-10** present aerial views of the lake from 1937 through the present, including the dry down events in the 1930s and mid-2000s.

The varying nature of the lake, along with the areas of permanent pool even during dry down events, is visible in the aerial imagery. The permanent pool areas become refuges for lake flora and fauna when lake levels drop. At certain times, efforts were made to block the sinkholes to try to maintain water levels in the lake, but openings reformed, and the natural drying and flooding pattern continued (USGS, 1967). Studies have identified that refilling of the lake generally occurs following extreme storm conditions, rather than just a return to normal rainfall patterns and that dry downs have natural benefits, such as oxidation of sediments or reduction of invasive plant species. **Photo 4-11** and **Photo 4-12** present views of the lake under higher water level conditions.

In the latter part of the 20th century, increased access and the construction of I-10 made the property surrounding the lake appealing to developers. Additionally, portions of the urbanized areas of Tallahassee encroached into the smaller watersheds along the southern end of the lake. Due to increased urbanization, along with the lack of an outflow from the lake, sediments and pollutants began to build up, specifically in areas receiving inflow from urbanized smaller watersheds (Megginnis Arm and Fords Arm). Studies identified declining water quality, increased sediment and nutrient loading, and increased algal productivity, as well as shifts in algal species and changes in lake habitat (issues of invasive species). Based on various studies conducted since the 1970s, the primary changes were seen in the southern end of the lake, which drains the highly urbanized areas and areas undergoing significant development. Additionally, issues were seen along the western side, where there are numerous neighborhoods at higher densities than in other areas of the basin.

A number of studies looked at the potential sources of pollutants to the lake. Sources identified include sediment loading and nutrient runoff from stormwater inflows, septic systems from various developments surrounding the lake, atmospheric deposition, and internal loading from sediments (Larock, 1991). Because the lake has no outlet, the nutrients build up in reservoirs in the lake, including lake sediments, vascular plant communities, and the water column. A study conducted in the 1990s [Florida State University (FSU), 1991] identified that the nutrients measured in the water column represent a relatively small portion of the overall nutrient budget. Sediments and stormwater inflow were identified as having similar net input to the lake water column. By far though, plants within the lake were identified as containing the largest reservoir of nutrients. Due to the shallow nature of Lake Jackson, the aquatic vegetation plays a significant role in the storage and cycling of nutrients, as well as providing critical habitat for various species. Consequently, the volume of nutrient storage and cycling results in water column measurements that may not fully reflect the impact of nutrient loading to the lake due to rapid plant uptake.

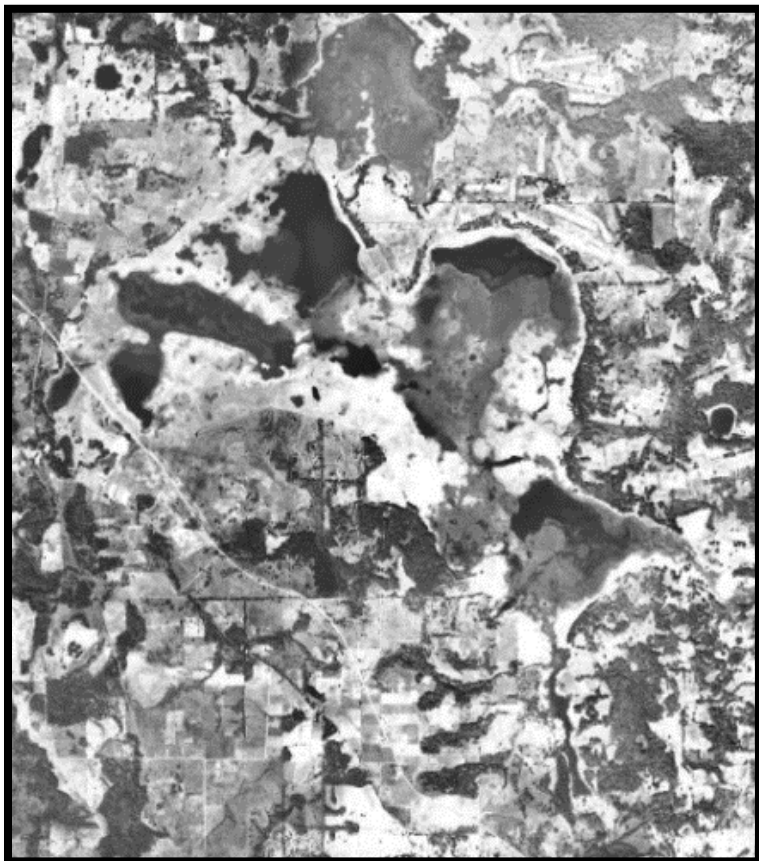


Photo 4-3: Lake Jackson Aerial – 1937



Photo 4-4: Lake Jackson Aerial – 1949



Photo 4-5: Lake Jackson Aerial – 1954



Photo 4-6: Lake Jackson Aerial – 1970



Photo 4-7: Lake Jackson Aerial – 1983

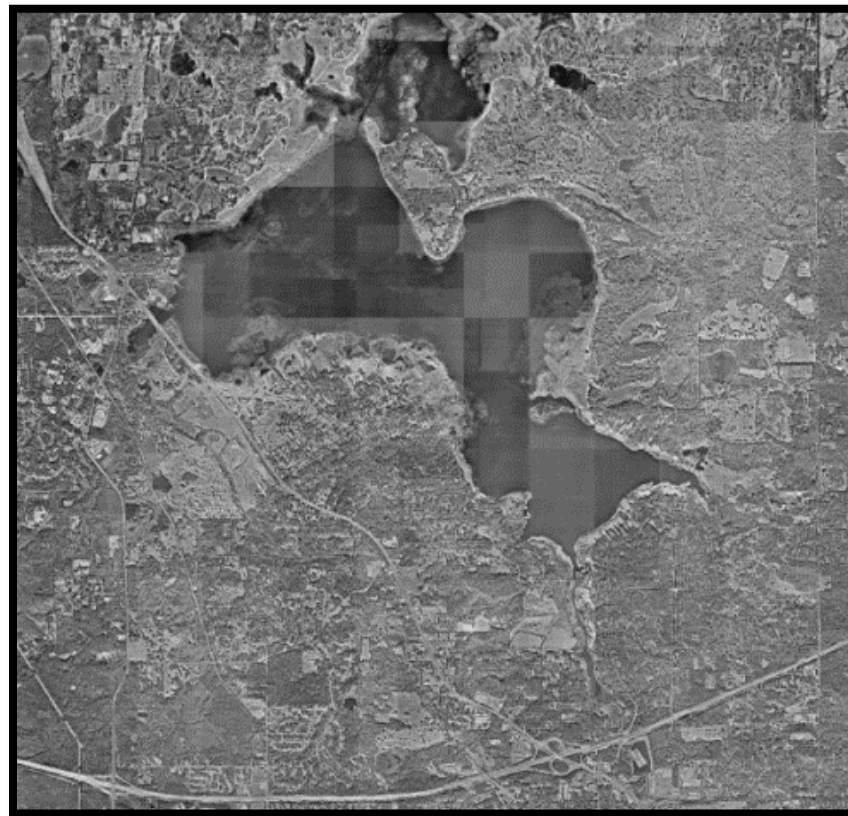


Photo 4-8: Lake Jackson Aerial – 1996



Photo 4-9: Lake Jackson Aerial – 2007

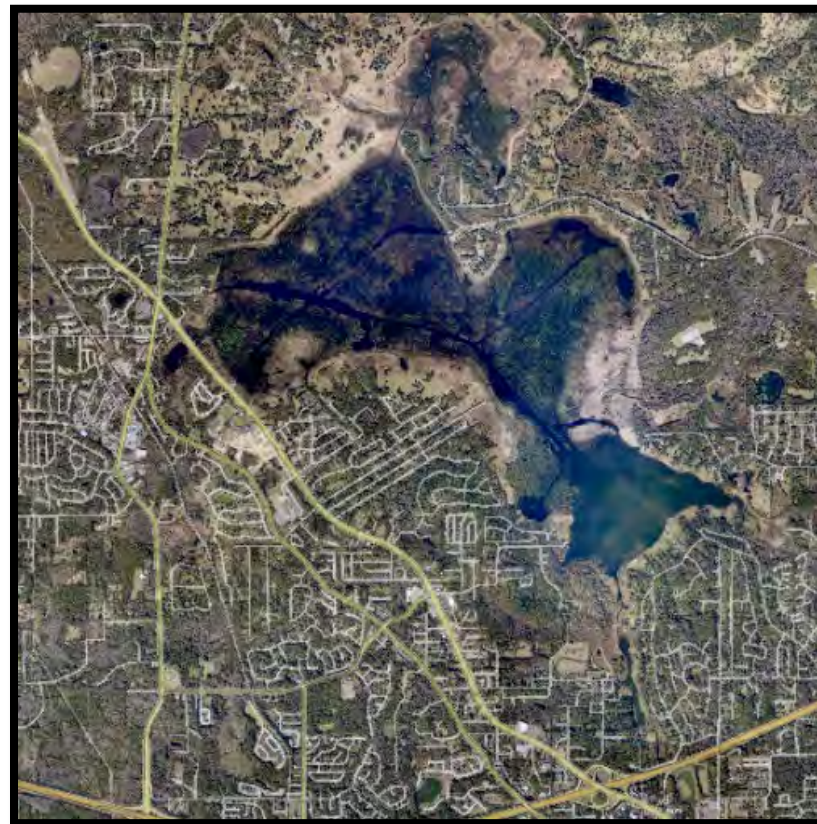


Photo 4-10: Lake Jackson Aerial – 2020



Photo 4-11: Northern Lake Site (February 2017)



Photo 4-12: Southern Lake Site (February 2017)

Multiple efforts have been undertaken to improve the lake water quality and habitat since the 1970s, when problems were identified. On the structural side, numerous stormwater treatment facilities have been built and others upgraded and retrofitted. These have generally been focused on urbanized tributaries south of Lake Jackson and into Megginnis Arm. The stormwater facilities discussed in this section are mapped in **Exhibit 4-1**.

The oldest and most significant project was the construction of the Megginnis Arm Regional Stormwater (MARS) facility. The project was completed in 1983 and funded through the U.S. Environmental Protection Agency (EPA) Clean Lakes Program. The project consists of a 130 acre-feet impoundment, along with a settling basin and a gravity filter upstream of I-10 along Megginnis Creek. Outflow from the impoundment flows through an artificial wetland area downstream of the I-10 crossing for polishing and final treatment. While the impoundment area did perform well relative to sediment removal and treatment of volume, excess flows and sediments (above design levels) overwhelmed the system. The gravity filter was clogged due to clay particles settling on the surface and, within a few years, the treatment capacity of the filter was reduced by around 50 percent. Additionally, maintenance of the MARS Facility has declined significantly over the years potentially reducing treatment capacity further. **Photo 4-13**, **Photo 4-14**, and **Photo 4-15** show the impoundment, filter marsh intake, and filter marsh, respectively, in 2021.

In 1989, the Lake Jackson Surface Water Improvement and Management (SWIM) program identified the need to expand the storage capacity of the MARS Facility. In 1990, a project was completed to increase the storage capacity by 31 percent. Around this same time, flows from I-10 and residential areas were identified as bypassing the impoundment and going directly into a diversion chamber upstream of the artificial marsh.

Other regional stormwater facility construction and retrofit projects in the impacted watersheds include Yorktown Pond, Boone Boulevard Pond, Okeeheepkee Prairie Regional Stormwater Facility, Harbinwood Estates Pond, Sharer Road pond, Abbigail Drive pond, the John Knox Stormwater Management Facility, and most recently, the Lexington Creek Facility. **Photo 4-16** shows the Boone Boulevard Pond. In addition to the various stormwater treatment facilities, several large projects were undertaken to stabilize conveyance systems to the lake that contributed to sediment loading due to erosion. **Photo 4-17** shows the stabilization along Megginnis Creek upstream of the MARS Facility.

In addition to structural best management practices (BMPs), a number of projects have focused on the removal of contaminated sediments. These removal efforts have coincided with lake dry down events, which provide the opportunity for excavation of organic sediments that add internal nutrient loading and other contaminants to the lake. Since 1990, more than 3,000,000 cubic yards of sediment have been removed from the lake bottom in the Megginnis and Ford Arm areas [Northwest Florida Water Management District (NFWFMD), 1997, Leon County, 1999].



Photo 4-13: MARS Facility Impoundment and Overflow (February 2021)



Photo 4-14: MARS Filter Marsh Intake (February 2021)



Photo 4-15: MARS Filter Marsh (February 2021)



Photo 4-16: Boone Boulevard Pond (February 2021)



Photo 4-17: Bank Stabilization Along Megginis Creek

A number of studies have been undertaken to try to quantify and/or determine the impacts of septic systems on lake water quality [Larock, 1991; NFWFMD, 2000; FSU, 2012]. The studies identified the presence of fecal indicator bacteria (FIB) in certain areas of the lake downstream of watersheds with high septic tank density. Evaluations of the impacts of nutrient loading from the studies were less definitive, but septic loading was identified as important. One concern raised through the studies is that conditions in many areas around the lake are not the best for locating septic systems due to poorly drained soils and high-water tables.

Finally, a number of regulatory, ordinance, land management, and management planning efforts have looked to provide additional protection for the lake and propose future projects to restore the lake. The Florida Legislature designated Lake Jackson, Carr Lake, and Mallard Pond as aquatic preserves in 1973. In 1979, Lake Jackson was designated as an Outstanding Florida Water (OFW).

In 1990, the Leon County Board of County Commissioners established a Lake Protection District for areas draining to Lake Jackson, which limits development in certain areas to one unit per 2 acres or two units per acre if only 40 percent of the area is developed. In 1991, the City and Leon County developed a Stormwater Management Plan for Lake Jackson. This plan outlined various structural and non-structural projects to reduce flooding and improve water quality. Many of the proposed structural projects have been completed.

A Lake Jackson Management Plan, developed by the Lake Jackson Action Team, was completed in 1994 and then updated in 1997 and 2019. The plan outlines efforts in the areas of water quality, preservation and restoration, watershed management, and public education and awareness. Under these programs, ongoing water quality sampling and studies are implemented, land purchases for maintenance of natural areas are made (including the 670-acre Phipps property and the 890-acre Lake Overstreet property), structural and non-structural projects are identified, and education programs outlined.

In February of 2021 FDEP put forward a proposed study entitled the Lake Jackson Monitoring Plan (FDEP, 2021). The objectives of the study are to investigate potential sources of pollutant loading in the southeastern section of Lake Jackson and to investigate the presence and extent of filamentous algal mats and submersed aquatic macrophytes in the eastern region of Lake Jackson.

4.4.2 Regulatory Status

EPA is authorized under Section 303(d) of the Clean Water Act to assist states in the identification of impaired waterbodies and the calculation of total maximum daily loads (TMDLs) to these waterbodies. FDEP administers the 303(d) program in Florida. A waterbody on the FDEP's 303(d) list falls into one of several categories:

Category 4a – The waterbody is impaired but does not require TMDL development because a TMDL has already been completed.

Category 4b – The waterbody is impaired but will not require a TMDL to be developed because the waterbody will attain standards due to existing or proposed measures.

Category 4c – The waterbody is impaired, but the impairment is not caused by a pollutant and therefore does not require a TMDL.

Category 4d – The waterbody is impaired but the pollutant causing impairment is not known. A TMDL cannot be calculated until the pollutant is identified.

Category 4e – The waterbody is impaired, but ongoing or recently completed restoration activities are underway to restore designated uses, so a TMDL calculation is not necessary.

Category 5 – The waterbody is impaired, and a TMDL will be calculated.

Waterbodies in Florida on the FDEP's 303(d) list are impaired. Waterbodies classified in Category 5 are placed on FDEP's comprehensive Verified List. When a waterbody is placed on the Verified List, FDEP is required by law to develop a TMDL. Waterbodies classified on Categories 4a through 4e are not on the comprehensive Verified List but are considered impaired. Generally, this means that more study is needed (4d) or FDEP has identified that local efforts are expected to restore the waterbody (4b and 4e).

FDEP has the option to develop basin management action plans (BMAPs) for waterbodies that have adopted TMDLs. A BMAP is a framework for water quality restoration in various forms containing commitments at local and state levels. These broad-based plans are developed with local stakeholders, including cities and counties. Once these plans are adopted by FDEP Secretarial Order, they are legally enforceable. FDEP also has a process by which local entities can initiate restoration activities in lieu of development of a TMDL. This type of activity fits under the 4e and 4b categories. These are locally driven restoration efforts with a goal to meet water quality standards. This process is often favored because it puts control in the hands of the local stakeholders to determine what is needed to restore their waterbodies rather than FDEP dictating the terms of a load reduction and is also much faster than the traditional TMDL/BMAP pathway, which can take more than a decade.

Presently, Lake Jackson [waterbody identification (WBID) 582B] is not verified impaired for any parameters. **Exhibit 4-2** displays the three verified impaired WBIDs inside the Lake Jackson drainage basin. These are as follows.

- Lexington Creek (WBID 758), which flows directly into Lake Jackson through Fords Arm in the southeast portion of the lake, is currently listed as a Category 5 impairment for *Escherichia coli* (*E. coli*). Anthropogenic sources have been confirmed as the source of the impairment by using genetic marker and chemical tracer data. A point of note is that there are data discrepancy issues between data collected by Leon County and FDEP that may impact the impairment status. This will be discussed further in later sections.
- Lake Overstreet Drain (WBID 689), which is adjacent to Lake Jackson, is impaired for fecal coliform. However, fecal coliform is no longer the applicable FIB parameter for its waterbody classification. *E. coli* will be included in the upcoming Strategic Monitoring Plan to collect the new applicable FIB parameter data while the WBID remains on the Verified List for a fecal coliform impairment. While the WBID encompasses the closed basins for Lake Hall and Lake Elizabeth, the impaired reach is along the drainageway downstream of Lake Overstreet upstream of the discharge into Fords Arm.
- Jackson Heights Creek (WBID 746A), which buttresses Lake Jackson from the western portion of the lake, is impaired for iron. It is worth noting that FDEP is in the process of further evaluating the iron impairment to determine if the iron content is due to natural conditions or if additional data can help qualify the waterbody to meet the delisting requirements established in 62-303.720 Florida Administrative Code (F.A.C.).

4.4.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Lake Jackson and the Lake Jackson basin including bathymetry, land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.

4.4.3.1 Bathymetry

The bathymetric information for Lake Jackson is from ReMetrix, LLC (2010) and is intended for assisting the Florida Fish and Wildlife Conservation Commission (FWC) in herbicide application as part of its aquatic plant management control initiative (**Figure 4-2**). The map is not based upon survey data. However, the map is based on conditions after the 1999-2000 sediment removal project and should reasonably reflect conditions in the lake today.

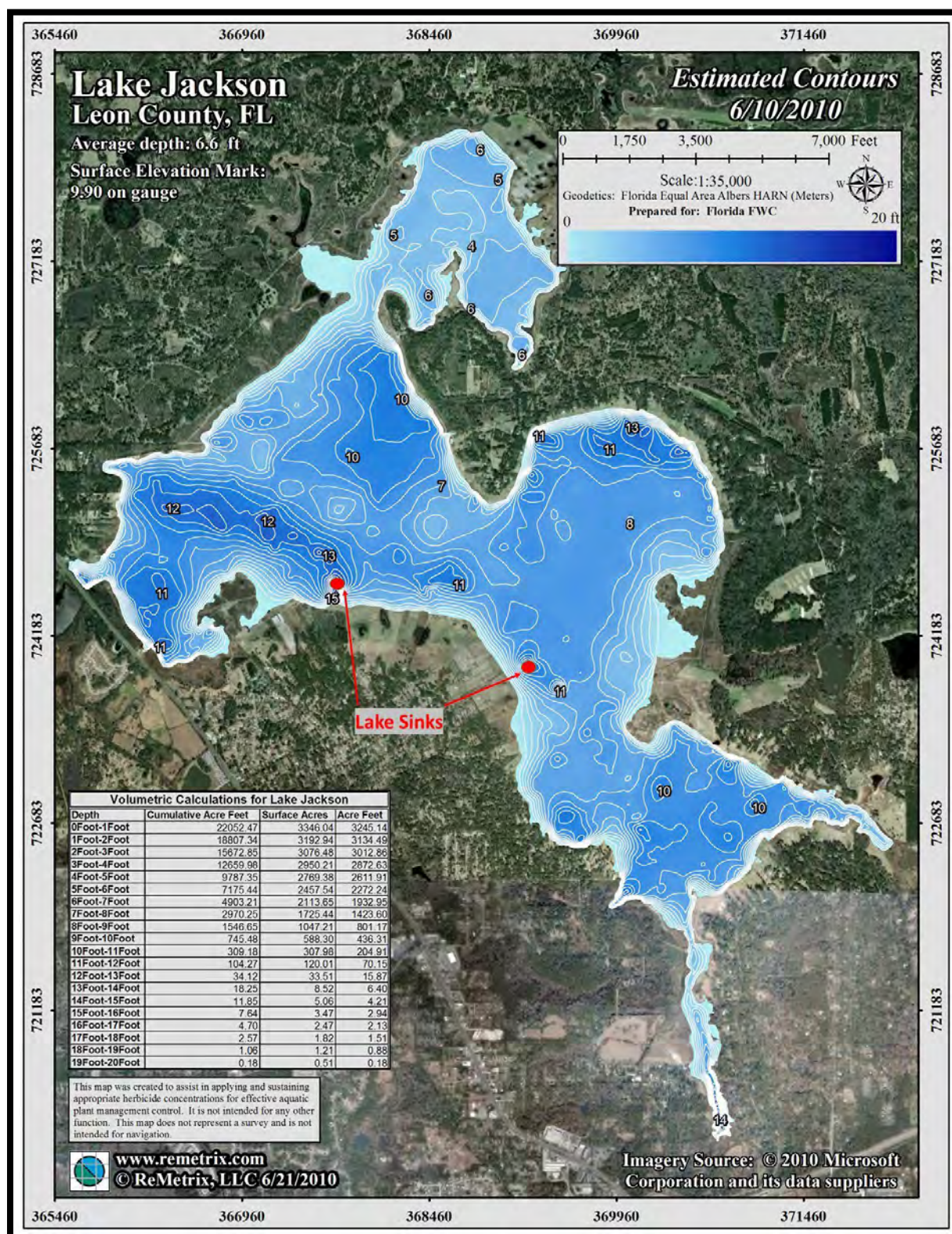


Figure 4-2: Bathymetry in Lake Jackson

The average depth of Lake Jackson is 6.6 ft, and much of the lake has depths less than 10 ft. The deepest points in the lake correspond with the sinkholes mapped in **Exhibit 4-1**, which are along the southern shoreline. Throughout the lake, narrow strips of deeper water are buttressed by shallower waters that encompass the majority of the lake, including its central locations. The northern lobe of the lake has the shallowest area. During a dry down period, waters pool in the westernmost, easternmost, and southeastern deeper areas of Lake Jackson. The lack of deep water allows for a more widespread presence of submerged aquatic vegetation (SAV), which necessitates more concentrated efforts by agencies such as FWC and FDEP to manage the waterbody for nutrients and hydrologic implications of biota in the water.

4.4.3.2 Land Use

Land use is the term used to describe the general purpose or function of a given area of land. It can represent economic and cultural activities, or it can depict the physical nature of the land (known as land cover). Land use categorization is used for planning and regulation purposes and assists agencies in keeping track of geographic areas for their respective organization purposes, such as zoning or environmental management. Impacts to waterbodies from watershed loading are evaluated, in part, as a function of land use. Event mean concentrations (EMCs) are utilized for simulating water quality concentrations in stormwater runoff. Pollutant loads are a function of pollutant concentration and volume of runoff. Land use types are used to determine appropriate EMCs when assessing water quality impacts from stormwater.

For the purpose of this study, the Level 2 Florida Land Use Cover Classification System (FLUCCS) codes were used to be consistent with classifications used to generate EMC values, which dictate pollutant loading with respect to precipitation and land use types. **Exhibit 4-3** presents a map of the Level 2 land uses within the Lake Jackson basin. A table is provided to show the overall acreages and percent cover for the various levels. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use types within the Lake Jackson drainage basin per the grouped Level 1 categories are Urban and Built Up (31 percent, **Exhibit 4-3**) and Upland Forest (25 percent, **Exhibit 4-3**). Within the Urban Built Up category, Low to Medium Density Residential takes up the largest portion. The anthropogenic land use categories are clustered around the southern and western sides of the basin directly adjacent to Lake Jackson. The northern areas of the basin are more dominated by forested areas with the exception of the Summerbrook Creek watershed. Wetland areas make up around 19 percent of the basin and water around 10 percent. All other land use classifications are less than 10 percent of the basin area. Approximately 34 percent of the basin is categorized as developed (combining level 1 FLUCCS for Urban and Built Up with Transportation, Communication, and Utilities), mainly located directly south and west of Lake Jackson. The basin is otherwise categorized as approximately 54 percent undeveloped (combining level 1 FLUCCS for Upland Forest with Water, and Wetlands) and nearly 12 percent Agricultural (combining level 1 FLUCCS for Agriculture with Rangeland and Barren Land).

4.4.3.3 Soils

Soil classifications for the study were determined from the area's hydrological soil group category. Hydrologic soil groups are based on estimates of runoff and infiltration potential. The Natural Resource Conservation Service (NRCS), an agency of the U.S. Department of

Agriculture (USDA), delineates four primary soil groups (A, B, C, and D) as well as three dual classes (A/D, B/D, and C/D). Group A soils are characterized as having high infiltration rates with low runoff potential, and each subsequent group is characterized by an iteratively lower infiltration rate and higher runoff potential, ending with Group D soils being designated as having very low infiltration rates with high runoff potential. The dual classes represent conditions where infiltration rates under dry conditions would be per the primary soil type, but due to high groundwater levels in these areas, infiltration is low.

The most prevalent soil group in the Lake Jackson drainage basin is Group B (37.3 percent per **Exhibit 4-4**). Group B soils are considered to have a moderate rate of infiltration. Lake Jackson is predominantly surrounded by Group B soils, along with sparse, isolated areas of Group C soils, which are considered to have slow rates of infiltration (**Exhibit 4-4**). A cluster of group A/D soils is along the western and southern edge of the lake. These are considered to have high infiltration potential but due to elevated groundwater table conditions, will act more similarly to soils with low infiltration potential.

4.4.3.4 Septic Systems

An estimated 4,515 septic tank units are within the boundaries of the Lake Jackson drainage basin based on the Florida Department of Health (FDOH) septic tank layer (**Exhibit 4-5**). Effluent from septic tanks that are in good condition should be comparable to secondarily treated wastewater effluent from sewage treatment plants. However, septic systems can be a source of pollutants, pathogens, and nutrients and are identified by FDEP as a potential source of FIB and nutrients to waterbodies in its assessment processes.

For recent TMDL analyses, FDEP used a radius of 200 meters to analyze direct contribution of nutrient loads from septic systems to a waterbody. Within that buffer, Lake Jackson is in proximity to over 280 septic systems. Accounting for tributaries that directly drain into Lake Jackson, that number rises to more than 1,000 septic systems. Septic nutrient loads to a waterbody are a function of the number of septic units, the number of people per household, the soil conditions in the area, groundwater table conditions, and if the systems are working properly. As discussed in **Section 4.4.3.3**, the predominant soil types surrounding Lake Jackson are Type B and Type A/D, which have moderate to moderate-low infiltration potential, respectively. The lake has large clusters of septic systems on the southern and western sides, with many of the units within the 200-meter buffer (of the lake or directly draining tributaries) dwelling on A/D soils, which are poorly drained, depending on antecedent moisture conditions. On a basin-wide standpoint, there are more than 580 septic units in areas of A/D soils near the lake and tributaries that drain to the lake.

4.4.3.5 Point Sources

A search of permitted facilities within the Lake Jackson basin was conducted using information from FDEP's Oculus platform. No active permitted facilities were identified within the basin.

4.4.3.6 Hydrologic Data

Rainfall station locations and data were retrieved from NFWFMD. There are five stations within the boundaries of the Lake Jackson Drainage Basin (**Exhibit 4-6**) that were utilized for precipitation data from the NFWFMD database, with one location directly adjacent to the lake

(Station 011321). The station with the longest period of record is located upstream of Megginnis Arm (Station 011289). Data gaps exist within each of the precipitation stations, so gaps within the primary station located directly on the lake (011321) were filled with data from the other stations.

Figure 4-3 presents the annual precipitation from the combined dataset from 1987 through 2020. The data show that rainfall levels range from around 40 inches in various years up to a maximum of more than 80 inches in 1994. Examination of the annual average rainfall against the documented dry down periods (periods discussed previously where the lake dries out due to flow out the sinkholes greater than inflows) showed that the dry down periods did align with low rainfall years in all cases since 1987, but there were some relatively dry years when the lake did not drain.

Lake stage data were retrieved from NFWFMD and USGS with the locations shown on **Exhibit 4-6**. Only one station from NFWFMD within the waterbody boundary, Station 011321, records water elevation in the lake, whereas the other two stations are upstream of the lake within stormwater treatment facilities. An additional water level station monitored by USGS (2329200) was located on the western side of the lake and was in place from 1950 to 2002. This data set had some gaps in the 1950s and a significant gap from 1994 to 2002.

Figure 4-4 presents the measured water levels in the lake from 1950 to 2021 based on merging the two datasets. Examination of the plots shows that prior to 1970, the lake fluctuations ranged nearly 20 ft with the highest measured stage more than 95 ft-NAVD88 in 1966. From 1960 to around 1970, the lake stage was above 85 ft-NAVD88 and stayed high the entire time. After 1970, the overall lake level fluctuation range dropped to generally between 87 ft-NAVD88 to lows near 76 to 77 ft-NAVD88, which represented dry down periods. In more recent years (since 2010), compared to the long-term average (84 ft on **Figure 4-4**) lake levels have been lower, with the average from 2010 to 2020 at around 82 ft.

Two additional stage recorders are located within the Lake Jackson basin, specifically within stormwater treatment facilities upstream of Megginnis Arm. Station 011289 is within the MARS Facility upstream of I-10, and Station 011337 is within the Boone Boulevard treatment pond. These two stations provide information on fluctuations in water level within their respective facilities and would identify periods when the elevations of the weirs or discharge structures were overtopped.

The only continuous direct discharge data available on a tributary flowing into Lake Jackson are for Station 008454, which is on Lexington Creek (where it crosses Meridian Road) and drains to Fords Arm. **Figure 4-5** presents the measured flows along this tributary. The figure shows measured flows from 1987 through 2018. A number of aspects can be derived from examination of the flows. First, the system is highly flashy, with periods of near zero flow followed by high inflows in response to rain events. This type of flow was identified as typical of conditions within the Lake Jackson basin, especially within more developed areas. Second, there are some significant differences in the overall flow conditions. Prior to 1998, where there is a gap in the data, baseflow conditions are much higher, and overall, the flow magnitudes are larger. After 1998, while maximum measured flows are similar, overall magnitudes have decreased, with conditions after 2014 significantly decreased.

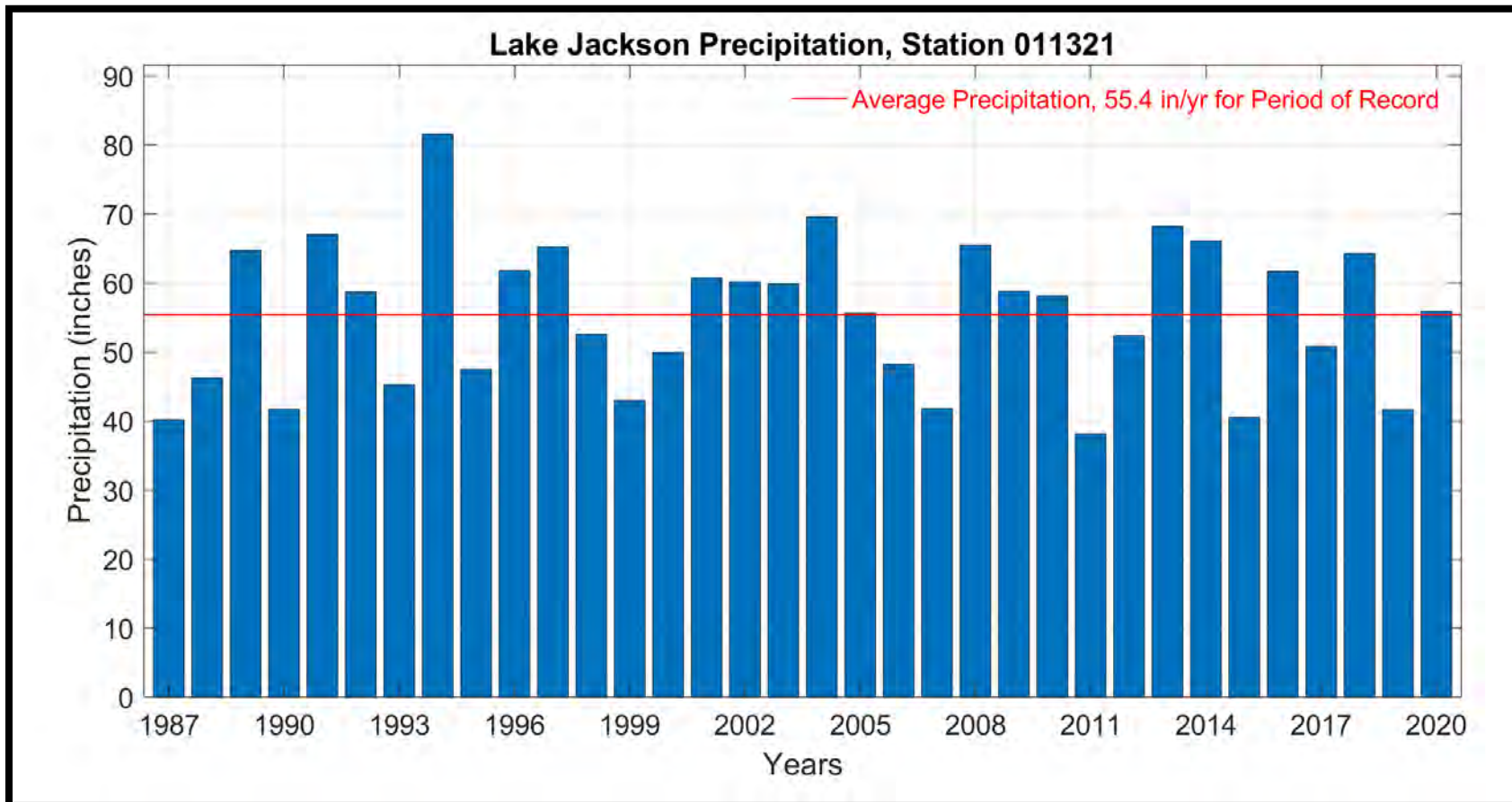


Figure 4-3: Annual Precipitation from Lake Jackson Stations (1987 to 2020)

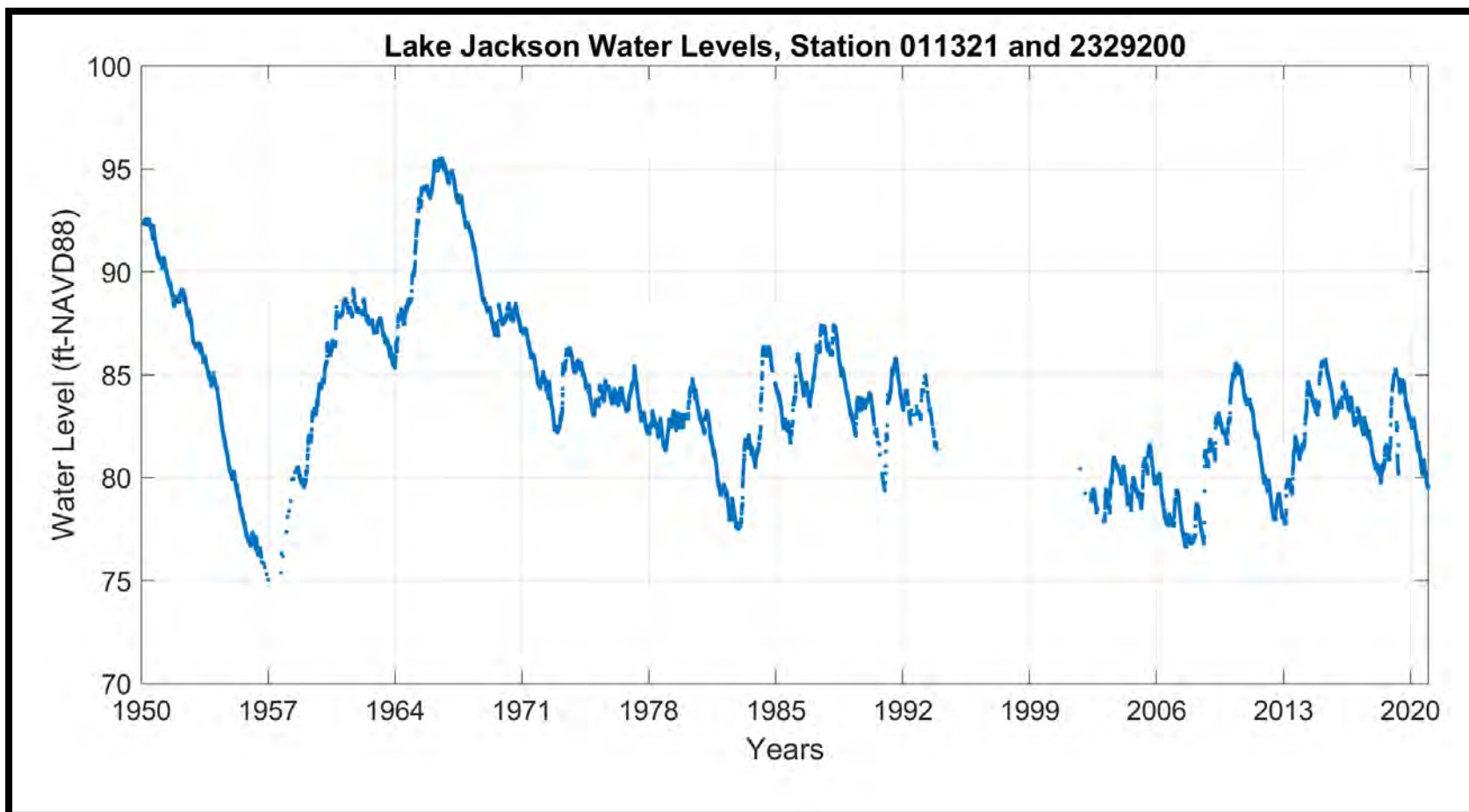


Figure 4-4: Measured Water Levels in Lake Jackson (1950 to 2020)

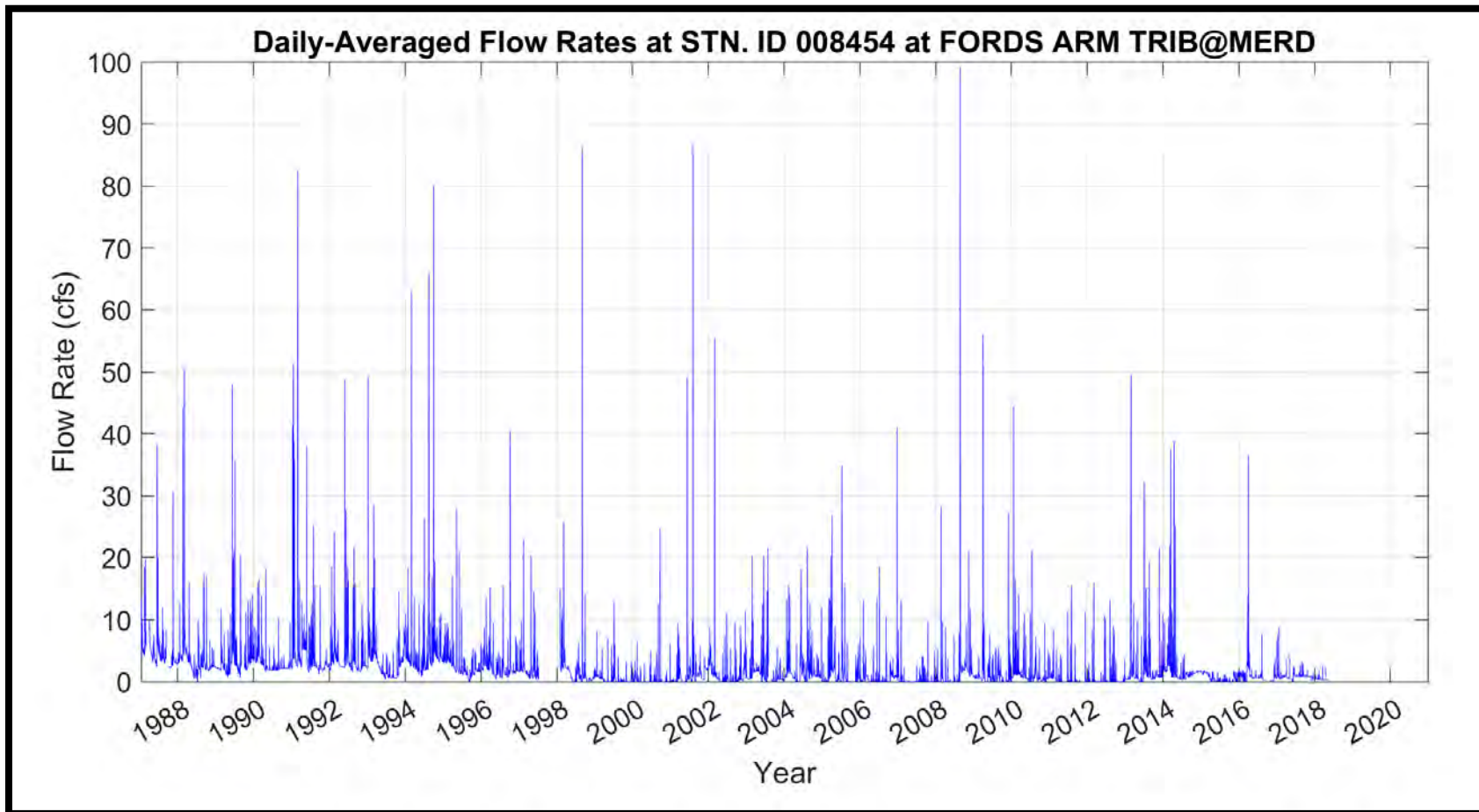


Figure 4-5: Measured Flows in Lexington Creek (Station 008454) (1987 to 2020)

The data after 2014 would indicate some significant alterations on the system or errors in the measurements. Some of the overall changes in the flows may be due to increased BMP-related stormwater storage and attenuation within the watershed draining to Fords Arm due to installation of stormwater treatment facilities and other stormwater infiltration and storage facilities.

The City measures flow at times of water quality data collection at Station LJB01 which is located on Megginnis Creek downstream of the MARS Facility. **Table 4-2** presents the measured flows from 2015 to 2020. Examination of the flow magnitudes identifies that the highest measured flow during sampling was around 18 cubic feet per second (cfs), with most of the flows around or below 1 cfs reflecting baseflow conditions.

The only other flow data identified were based on storm sampling conducted in September 1979. These data were utilized to calibrate a Stormwater Management Model (SWMM) as part of the Stormwater Management Plan (City and Leon County, 1991). Flow measurements were available at two stations flowing into Megginnis Arm and one Station flowing into Fords Arm. The data were for single storm events on July 24 and September 25 and 26, 1979. Examination of the measured flows on those days showed discharges of 387 and 133 cfs along Megginnis Creek and 62 cfs on Fords Arm. The 62 cfs measurement on Fords Arm is within the range of what was measured there pre-2010 (**Figure 4-5**), but above what was measured after 2010.

4.4.3.7 Surface Water Quality Data

The water quality data used for this study were retrieved from the FDEP Impaired Waters Rule (IWR) and City databases. The IWR outlines FDEP's methodology to identify waters that will be included in the 303(d) list. The IWR database is a collection of stations that are used to assess ambient water quality of surface waterbodies. The stations are not necessarily managed by FDEP, but any relevant data from various agencies are included for the purpose of collecting pertinent information for a given body of water.

The water quality dataset for Lake Jackson (WBID 582B) spans from 1961 to 2020 and includes contributions from local, state, and national agencies (City, Leon County, NFWFMD, FDEP, FWC, Florida LAKEWATCH, and USGS), as well as private sector firms (BRA, and McGlynn Lab). The IWR contains multiple parameters that are monitored. For these purposes, the primary parameters will be nutrients (and nutrient related parameters) and FIB. **Exhibit 4-7** presents the locations of in-lake water quality monitoring stations for Lake Jackson (yellow) along with stations that provide water quality data along tributaries that flow directly into Lake Jackson (red). A table is provided in **Exhibit 4-7** that shows the station identification (ID), station name, period of record, sample count, data source, and if the station represents in-lake or inflowing tributary data (upstream of the lake).

Based on the number of stations and the length of the station IDs, station IDs were not provided directly onto the station locations in the exhibit, rather each of the stations is given a number and the numbers correspond to stations in the table. Stations within or upstream of other waterbodies in the Lake Jackson basin are not shown in this exhibit. These stations will be presented along with the discussions for the individual waterbodies in the sections to follow.

Table 4-2: City Measured Flows at LJB01 During Water Quality Sampling (2015 to 2020)

Date	Result	Units	Qualifier
3/12/15 12:08	0.00	CFS	Insufficient volume & flow for sampling.
5/6/15 16:50	0.00	CFS	Insufficient volume & flow for sampling.
7/8/15 10:21	0.00	CFS	Insufficient volume & flow for sampling.
9/9/15 10:20	0.00	CFS	Insufficient volume & flow for sampling.
11/19/15 9:25	13.40	CFS	Swift flow, heavy exotic vegetation population in channel.
2/18/16 8:08	1.23	CFS	Station moved to North side of I-10 & new profile survey and elevation performed.
4/8/16 8:25	1.63	CFS	Clear with good flow. Heavy vegetation.
6/14/16 8:49	17.87	CFS	Green water with many riparian exotics water level is high.
8/2/16 10:30	0.66	CFS	Very shallow, low flow. Field blank performed.
10/5/16 12:40	0.24	CFS	Very shallow, moderate flow. Water clear and not tannic.
11/30/16 11:00	0.00	CFS	Dry Streambed
2/1/17 13:20	0.31	CFS	Water clear and slightly tannic
3/27/17 11:20	0.11	CFS	Very shallow, heavy algal growth with floating mats.
5/30/17 11:30	0.12	CFS	Shallow, green tint, thick algal mats near spillway.
7/24/17 11:20	3.25	CFS	Slightly turbid, heavy vegetation at station.
9/26/17 7:55	0.46	CFS	Clear flow in small channel.
11/27/17 12:20	0.04	CFS	Very shallow, very little flow, slight green tint, surface film in pooled area.
2/5/18 12:40	1.12	CFS	Good flow, clear, slight green tint, some vegetative debris in channel from recent maintenance.
4/11/18 12:50	0.63	CFS	DOT work in culvert and vegetation recently cleared on banks. Water very clear.
6/19/18 7:45	1.00	CFS	Stream morphology changing due to recent vegetation clearing.
8/6/18 13:00	9.05	CFS	Swift flow, heavy vegetation, channel much wider due to increased depth.
10/16/18 13:10	0.83	CFS	Shallow, swift flow, heavy vegetation. Lineman working upstream of station.
1/15/19 8:20	1.11	CFS	New channel configuration; vegetation completely cleared.
2/5/19 8:40	1.01	CFS	Clear water, recent maintenance at location changing flow channel.
4/9/19 9:00	1.74	CFS	Long strand green algae in flow, ~10% coverage.
6/11/19 8:05	0.98	CFS	Long strand green algae in flow, ~20% coverage.
8/5/19 9:30	0.37	CFS	Heavy vegetation, mainly invasive. Stream very narrow and shallow.
9/16/19 9:55	0.16	CFS	Heavy vegetation, mainly invasive. Stream very narrow and shallow. River otter present.
11/13/19 7:45	0.17	CFS	Heavy vegetation, mainly invasive. Stream very narrow and shallow. River otter present.
1/14/20 8:30	0.51	CFS	Very clear, average depth, floating algae in pooled area behind weir. Large tree cut and dropped in flow.
3/17/20 8:45	0.22	CFS	Shallow, clear, organic debris in channel.
6/16/20 10:20		CFS	No path for velocity meter readings due to split streams and heavy vegetation.
8/10/20 10:15	0.14	CFS	Highly vegetated with one 3-ft-wide discharge section.
10/12/20 10:45	0.74	CFS	Highly vegetated. Discharge section width 5.4 ft.
12/15/20 9:30	0.40	CFS	Discharge section width 5 ft.

Exhibit 4-7 shows that there are stations located throughout Lake Jackson, but the highest density of data exists in the southeastern portion of the lake in the area of Megginnis Arm and Fords Arm. Data exist for the vast majority of the main tributaries to Lake Jackson (Overstreet Drain, Meridian Creek, Sunset Creek, Butlers Mill Creek, Okeeheepkee Creek, and Megginnis Creek) but some of the data are sparse and old. The stations on Lexington Creek are not shown on the figure as they will be presented in **Section 4.7.3.6**, which discusses Lexington Creek. There are three tributaries flowing directly into Lake Jackson that currently have no data stations. These are the Blue Dog watershed, the unnamed watershed that flows into the upper lobe of the lake, and the unnamed watershed that flows into the northwest side of the lake (See **Exhibit 4-1**). The tributary data support the qualitative assessment of potential sources in **Section 4.4.4**.

Some initial plots of the available data in the lake are provided in this section. This includes plots of the data and analyses of annual geometric means (AGM) against numeric nutrient criteria (NNC). As nutrients are the primary constituent of interest relative to water quality conditions in Lake Jackson, plots are provided for the key parameters related to potential nutrient impairment. These include total nitrogen (TN), total phosphorus (TP), Chlorophyll *a* (Chl-*a*), and Trophic State Index (TSI). Additionally, based on interest relative to septic systems and other sources, FIB, specifically *Escherichia coli* (*E. coli*) is included. It is noted that additional data plots and analyses are provided as part of the qualitative assessment of sources in **Section 4.4.4**. For the data plots and analyses, only data after 2010 are presented or analyzed since the goal of this study is to assess present conditions. Some discussions of the historical measurements are provided in the text that follows where significant changes have occurred.

Through the analysis of the TN data for Lake Jackson and other waterbodies in the Lake Jackson basin, issues were identified relative to how certain total Kjeldahl nitrogen (TKN) data were used in the calculation of TN. **Appendix A** presents a short write up of the issues encountered and how they were rectified to get the TN levels utilized in the analyses below.

Figure 4-6 through **Figure 4-8** presents plots of the measured TN, TP, and Chl-*a* data from 2010 to 2020. Examination of the plots shows that from 2010 to 2020 TN concentrations went down slightly, while TP and Chl-*a* concentrations went up slightly. The data plots show missing data in 2012, which was likely due to the dry down that occurred that year.

Under FDEP's NNC, Lake Jackson is defined as a low color, low alkalinity system. Based on this designation, the AGM threshold for Chl-*a* is 6 micrograms per liter ($\mu\text{g/L}$). For TN and TP, a range of concentrations are allowed, based on maintaining Chl-*a* concentrations below 6 $\mu\text{g/L}$. For TN, the range is 0.51 milligram per liter (mg/L) to 0.93 mg/L . For TP, the range is 0.01 mg/L to 0.03 mg/L . TN or TP levels below the minimum indicate the system is not impaired for either parameter. Levels above the maximum would indicate impairment. Measurements in between are allowed so long as the Chl-*a* levels that coincide with the nutrient concentrations are below the 6 $\mu\text{g/L}$ threshold.

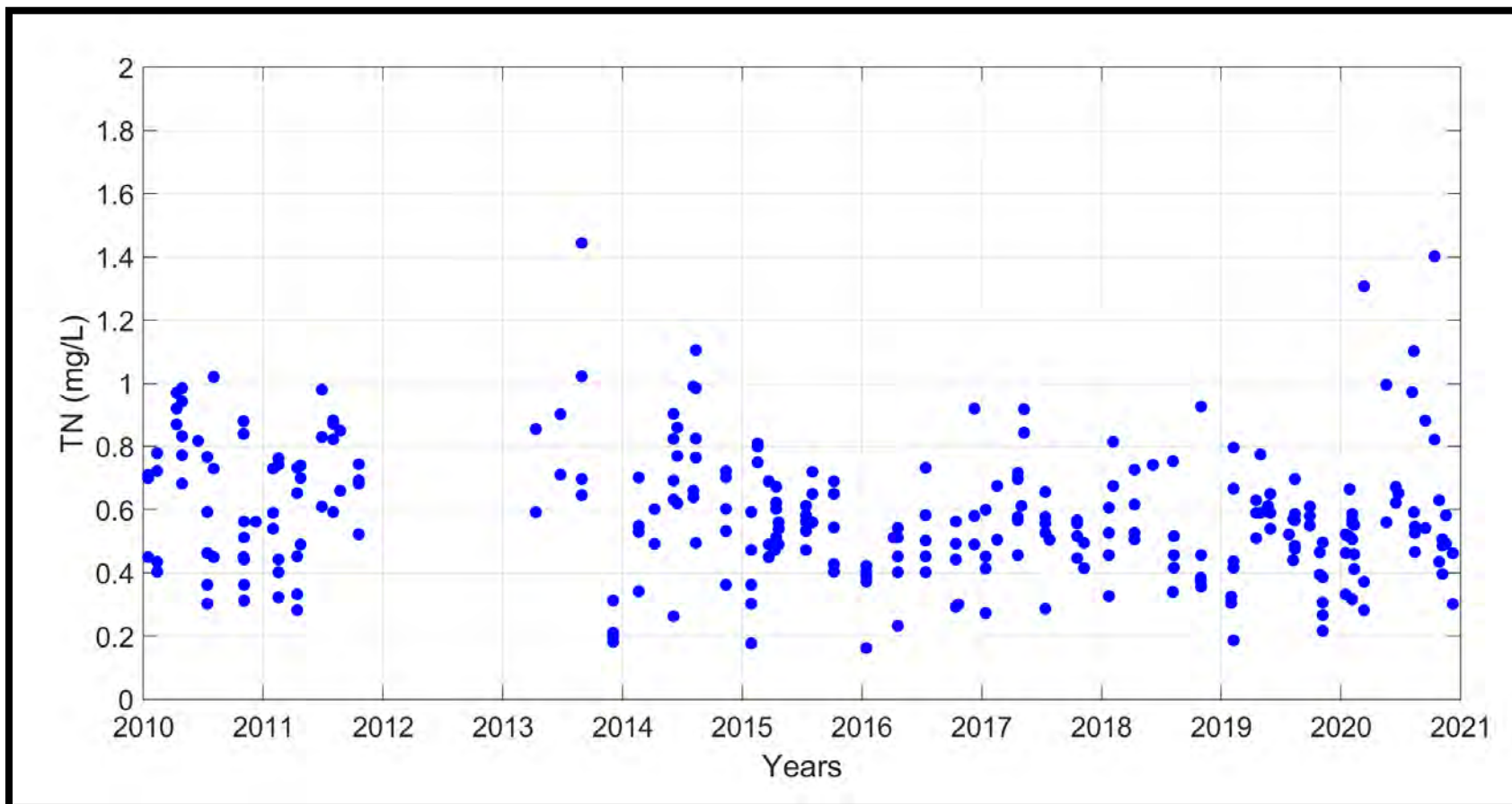


Figure 4-6: Plot of Measured TN

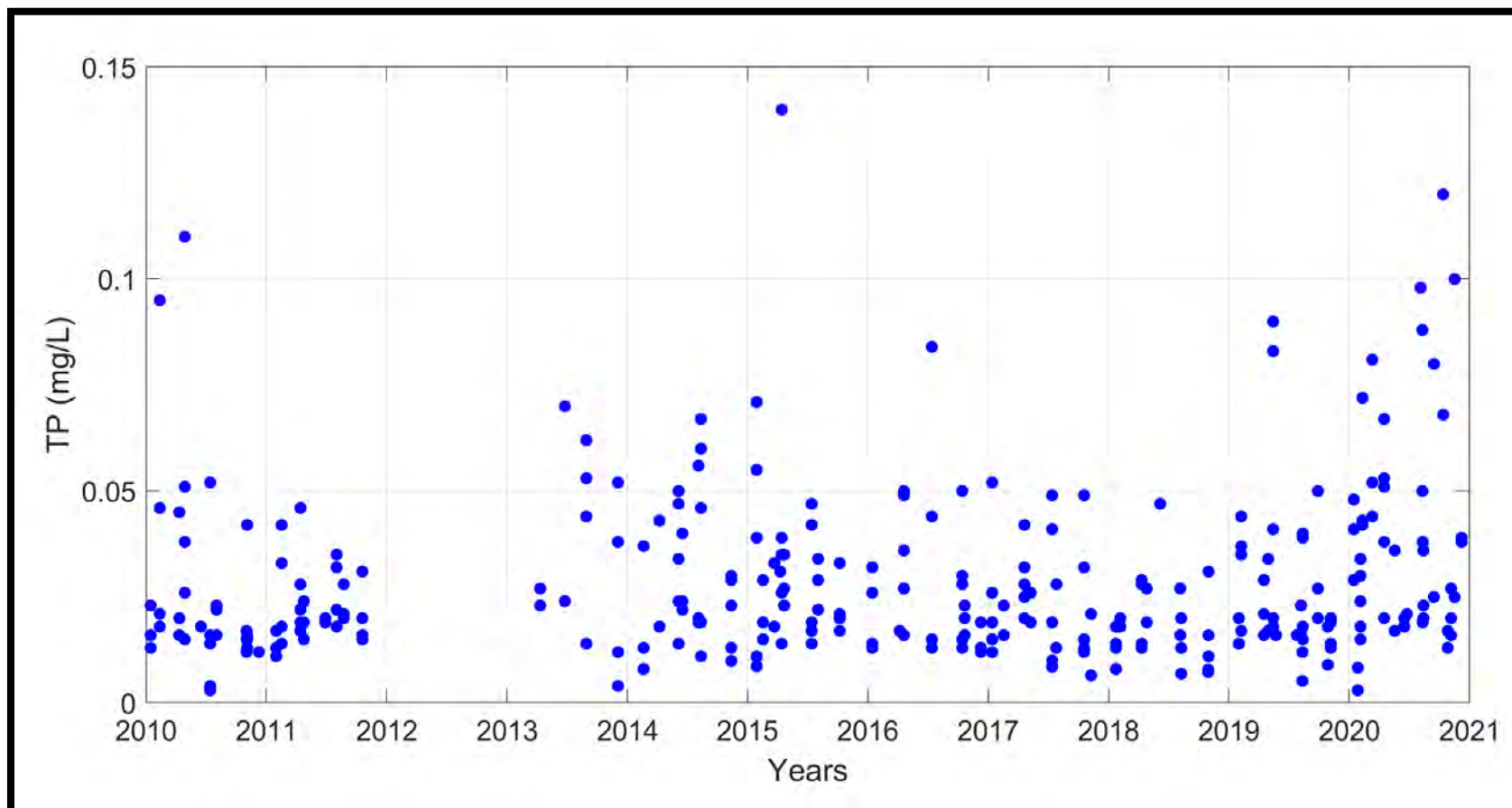


Figure 4-7: Plot of Measured TP

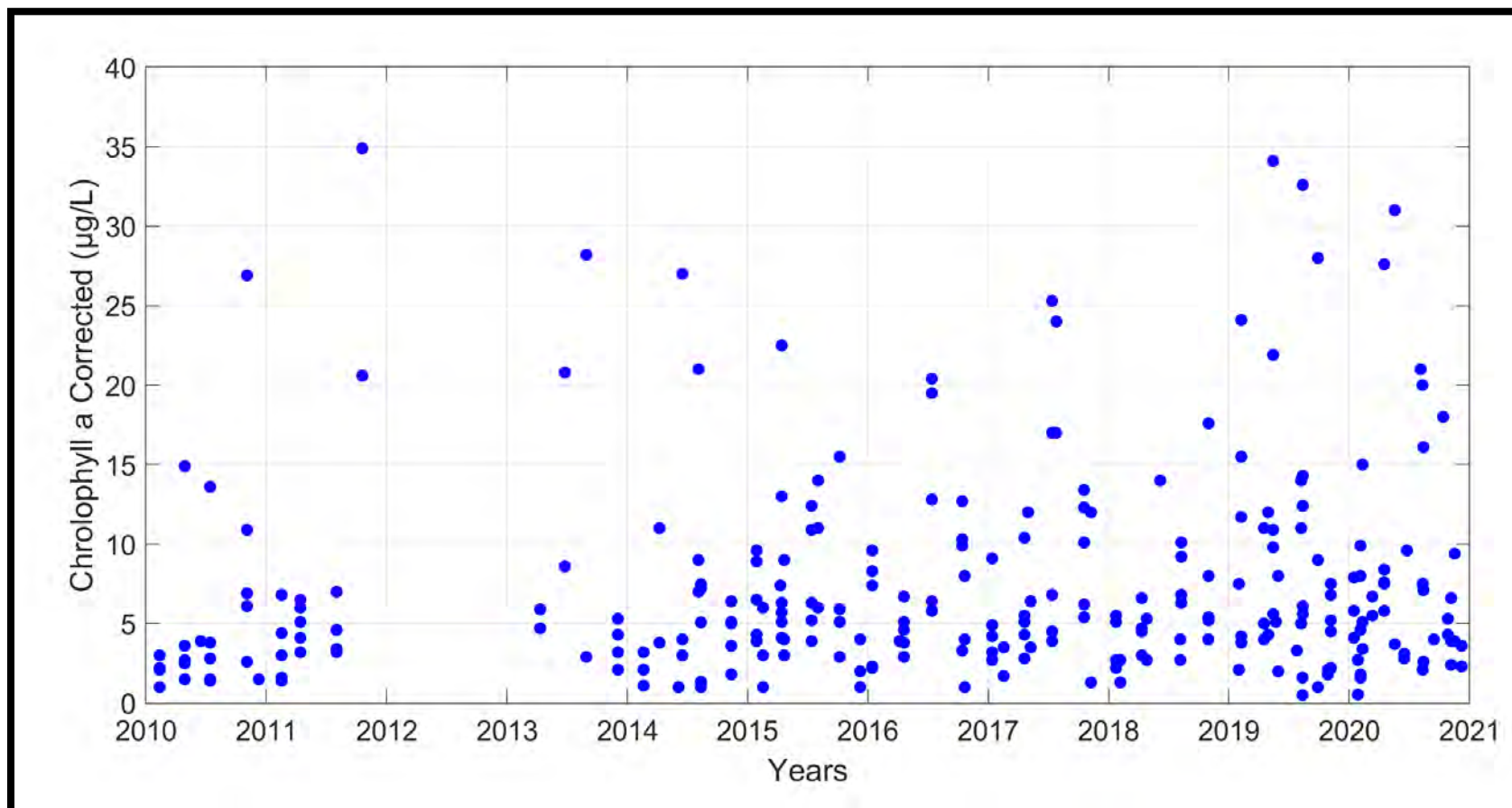


Figure 4-8: Plot of Measured Chl-a

Historically, FDEP utilized TSI as a metric for determination of surface waterbody impairment due to nutrients. TSI is a classification system designed to rate lakes based on the amount of biological productivity occurring in the waterbody, with higher TSI values indicative of more productive lakes. The calculations are based on a scale from 1 to 100. Lakes with TSI values less than 60 were considered good, lakes with values between 60 and 69 were considered fair, and lakes with values greater than 70 were considered poor. While no longer utilized for assessment of impairment, the TSI index remains a tool for evaluating potential nutrient enrichment and biological productivity. Therefore, data on TSI are presented against the thresholds listed above.

For *E. coli*, the criteria are monthly geometric means below 126 colonies per 100 milliliters (mL) of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period. Generally, insufficient samples are available to assess the monthly geometric means, therefore, the criteria most used for assessing *E. coli* is the 410 colonies per 100 mL. For the purposes of this report, the *E. coli* are presented against the 410 threshold to see if more than 10 percent of the available data are above it.

TN, TP, and Chl-a AGMs are plotted in **Figure 4-9** through **Figure 4-11**. Where sufficient data are available (based generally on the IWR rule requirements) to assess the AGMs, the levels are provided from 2010 through 2020. The Chl-a threshold and the minimum and maximum thresholds for TN and TP relative to the NNC are provided on each of the graphs as pink dashed lines. **Figure 4-12** presents a plot of calculated TSI values in the lake. **Figure 4-13** presents plots of *E. coli* data for the available period of record (2014 to 2020).

Examination of the TN plot (**Figure 4-9**) shows that between 2010 and 2020 the AGM values were just above or below the minimum criteria, with somewhat higher values in the earlier years (2010 to 2015). Historically, TN levels were generally higher but for the period of available data, the AGM levels were not above the maximum thresholds for TN. No AGM value is provided in 2012 due to the dry down discussed earlier.

In contrast, TP AGMs (**Figure 4-10**) have been higher relative to the NNC minimum and maximum. Since 2010, the TP values have ranged in the upper range between the minimum and maximum values, with the level in 2020 just above the maximum value. Historically, TP values were much higher, with historical levels prior to 2000 almost always above the maximum threshold, with some years well above.

Examination of the corrected Chl-a plot (**Figure 4-11**) shows that since 2010 the Chl-a AGMs have generally been around or near the threshold 6 µg/L with values above the threshold in 2011, 2013, 2017, 2019, and 2020. Lower Chl-a AGMs were calculated in 2010, 2014, and 2018.

Examination of the TSI plot (**Figure 4-12**) shows that since 2010, most of the calculated values fall within the good range (below 60). This is consistent with what was seen with the Chl-a, TN, and TP concentrations relative to the NNC, where later years showed Chl-a levels just above the threshold, and TN and TP levels were generally within acceptable ranges. For the calculated TSI values, the nutrient limitations are presented by color based on the method for calculation of TSI. In more recent years, the higher TSI levels occurred under nutrient balanced or nitrogen limited conditions, indicating that nitrogen does (at times) play an important role in the level of productivity in Lake Jackson.

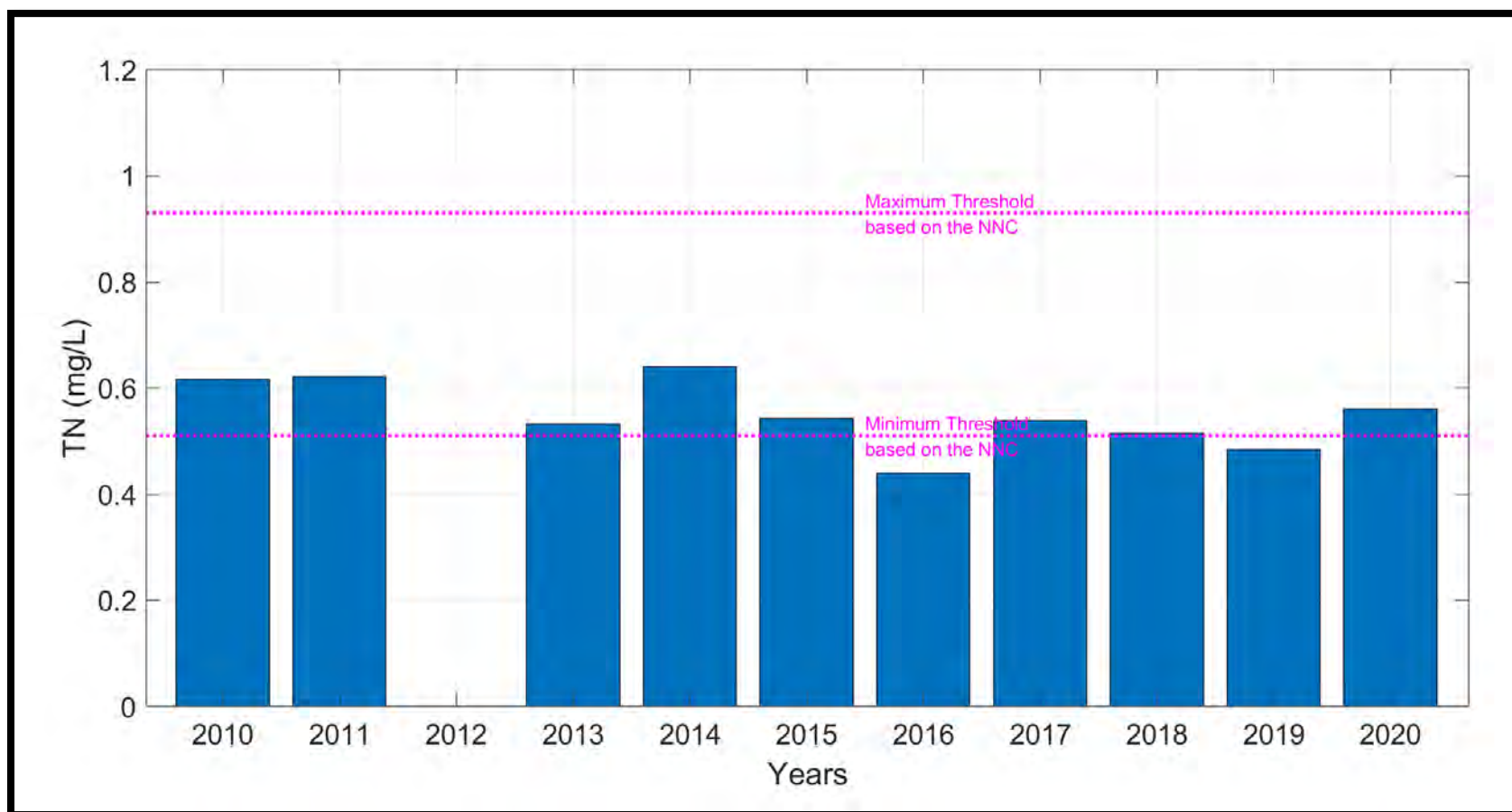


Figure 4-9: Plot of Annual Geometric Means for TN with NNC Criteria for Lake Jackson

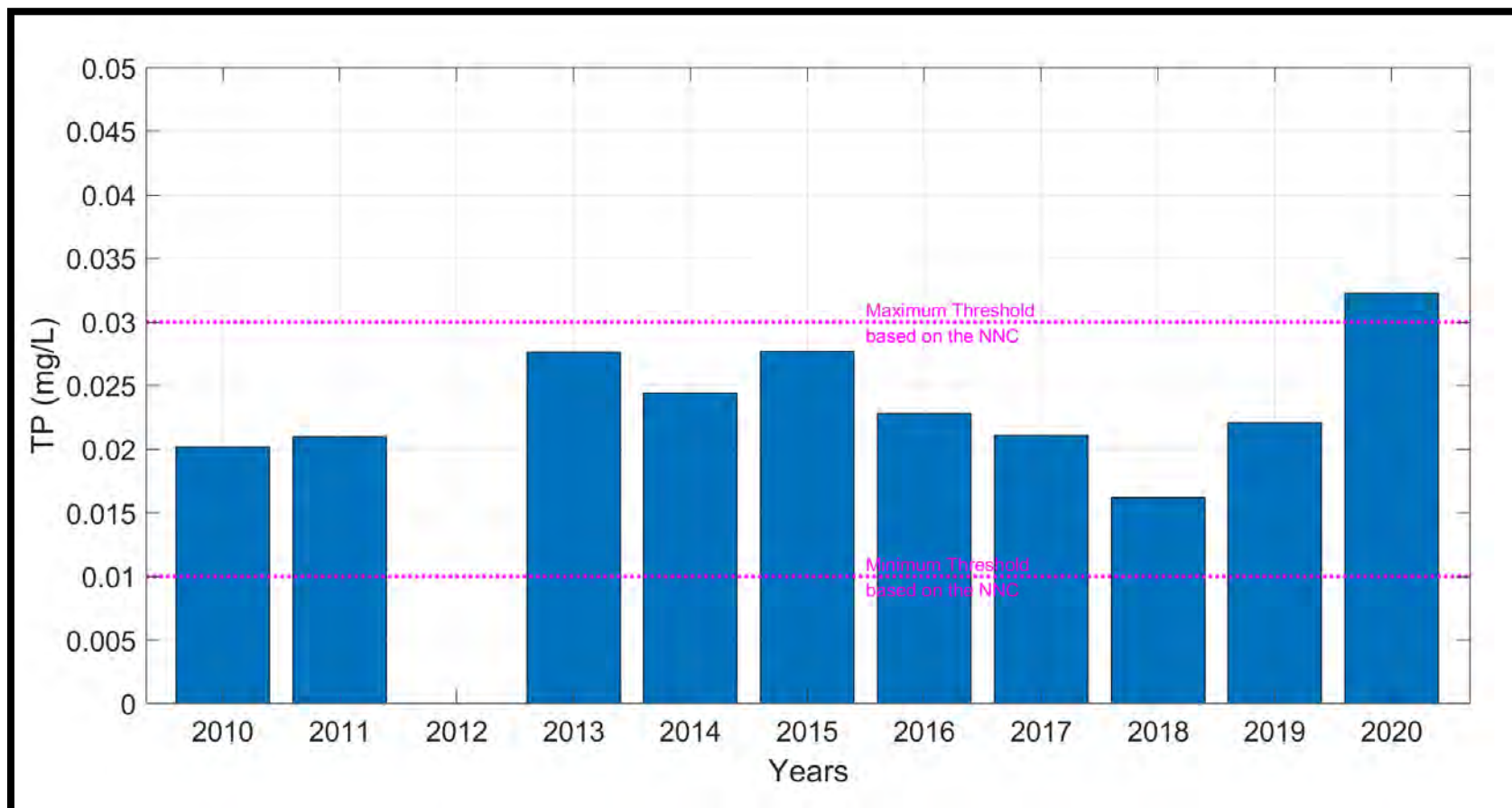


Figure 4-10: Plot of Annual Geometric Means for TP with NNC Criteria for Lake Jackson

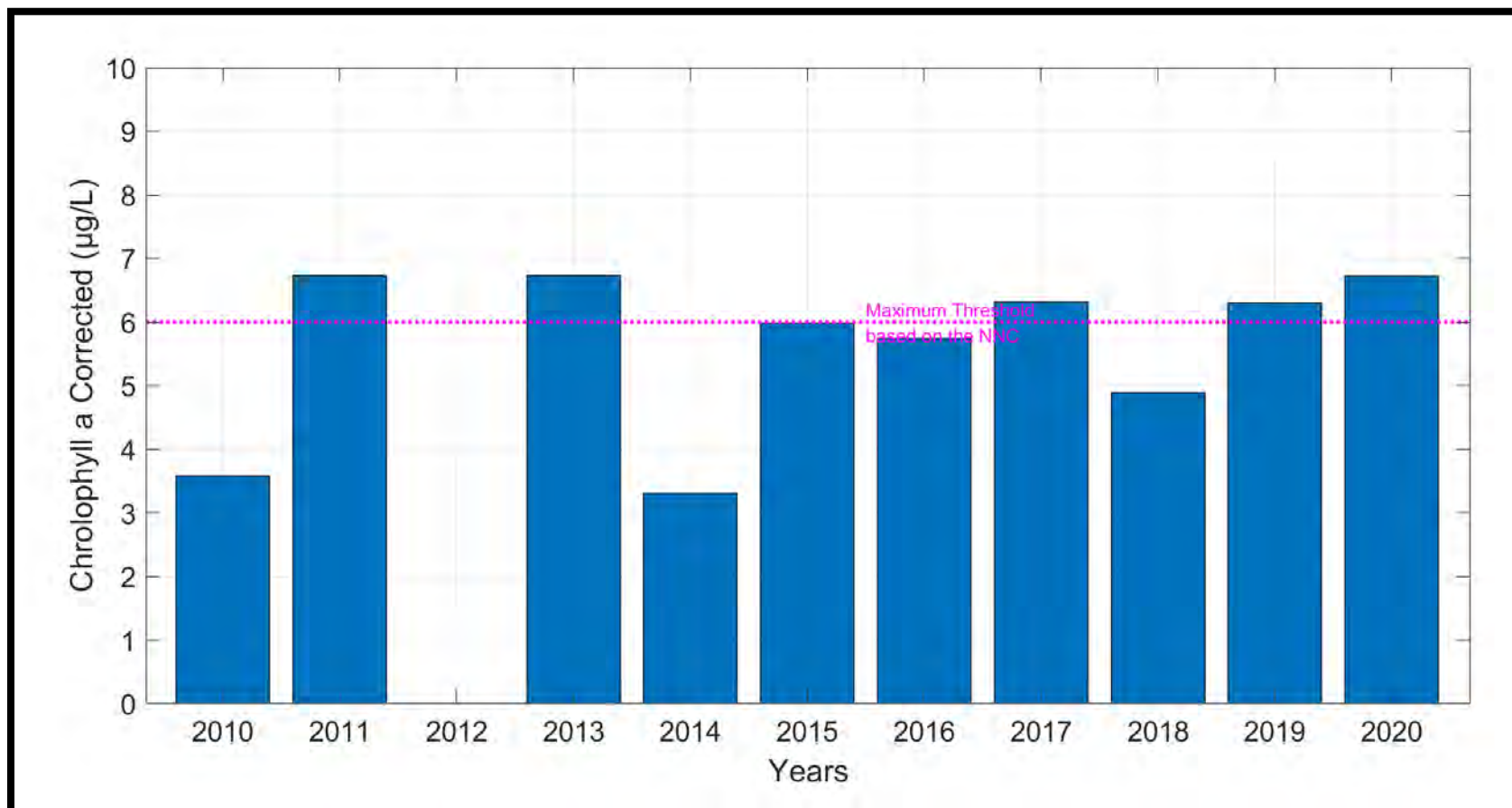


Figure 4-11: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Lake Jackson

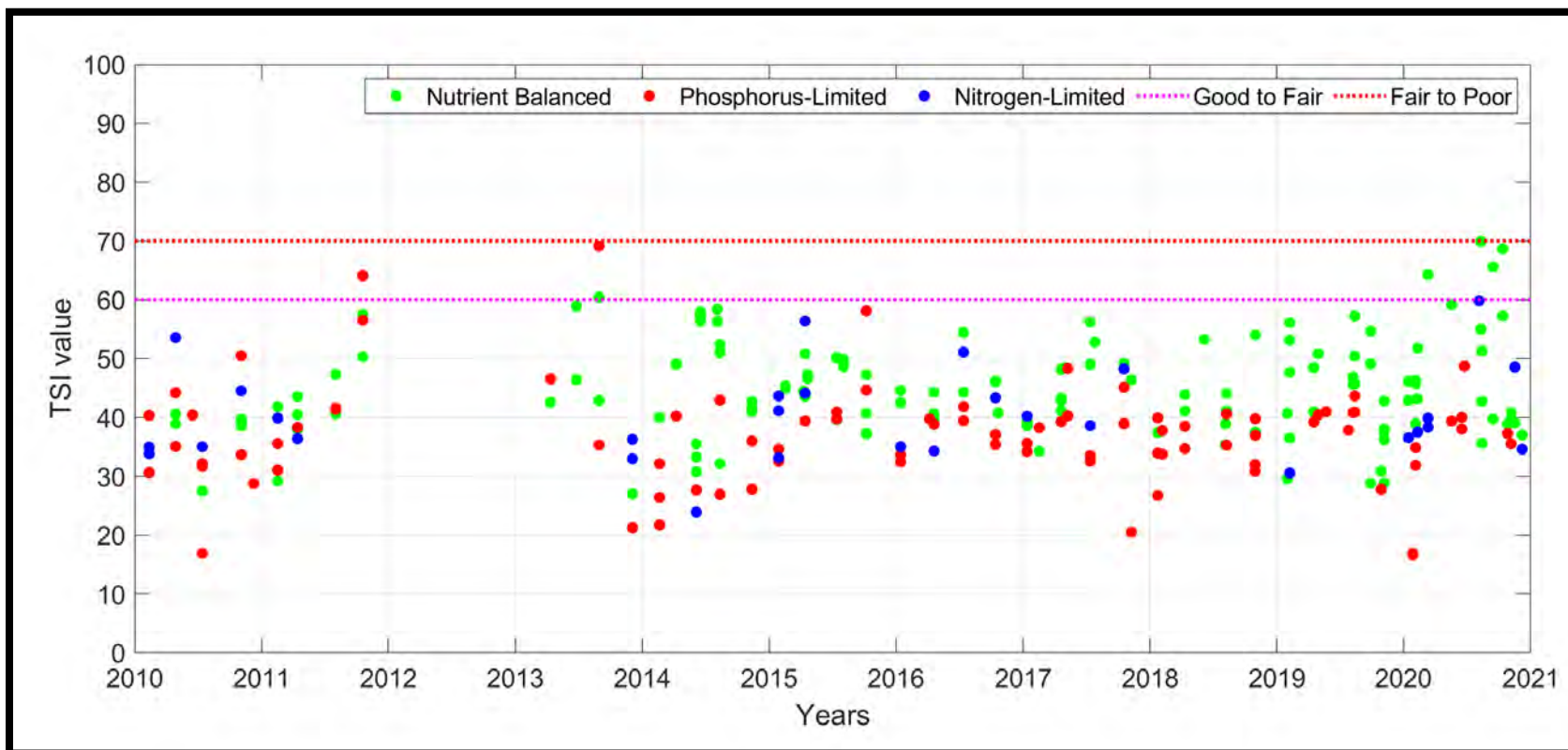


Figure 4-12: Trophic State Index for Lake Jackson

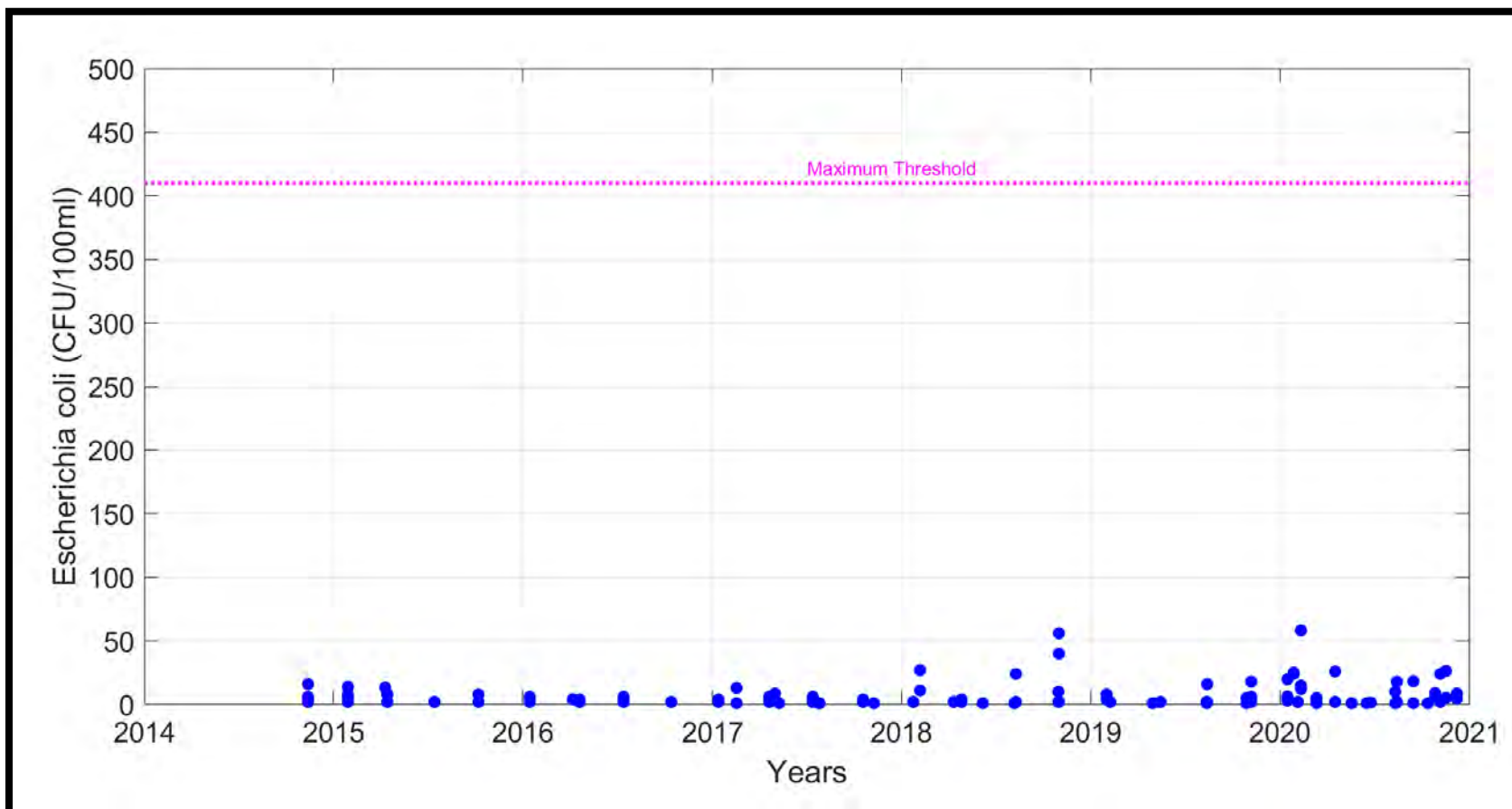


Figure 4-13: Plot of *E. coli* for Lake Jackson

Examination of the *E. coli* plot (**Figure 4-13**) shows that no measurements exceeded the less than 10 percent of samples above 410 colonies per 100 mL criteria for Class III freshwaters and values within the lake are very low.

4.4.3.8 Groundwater Data

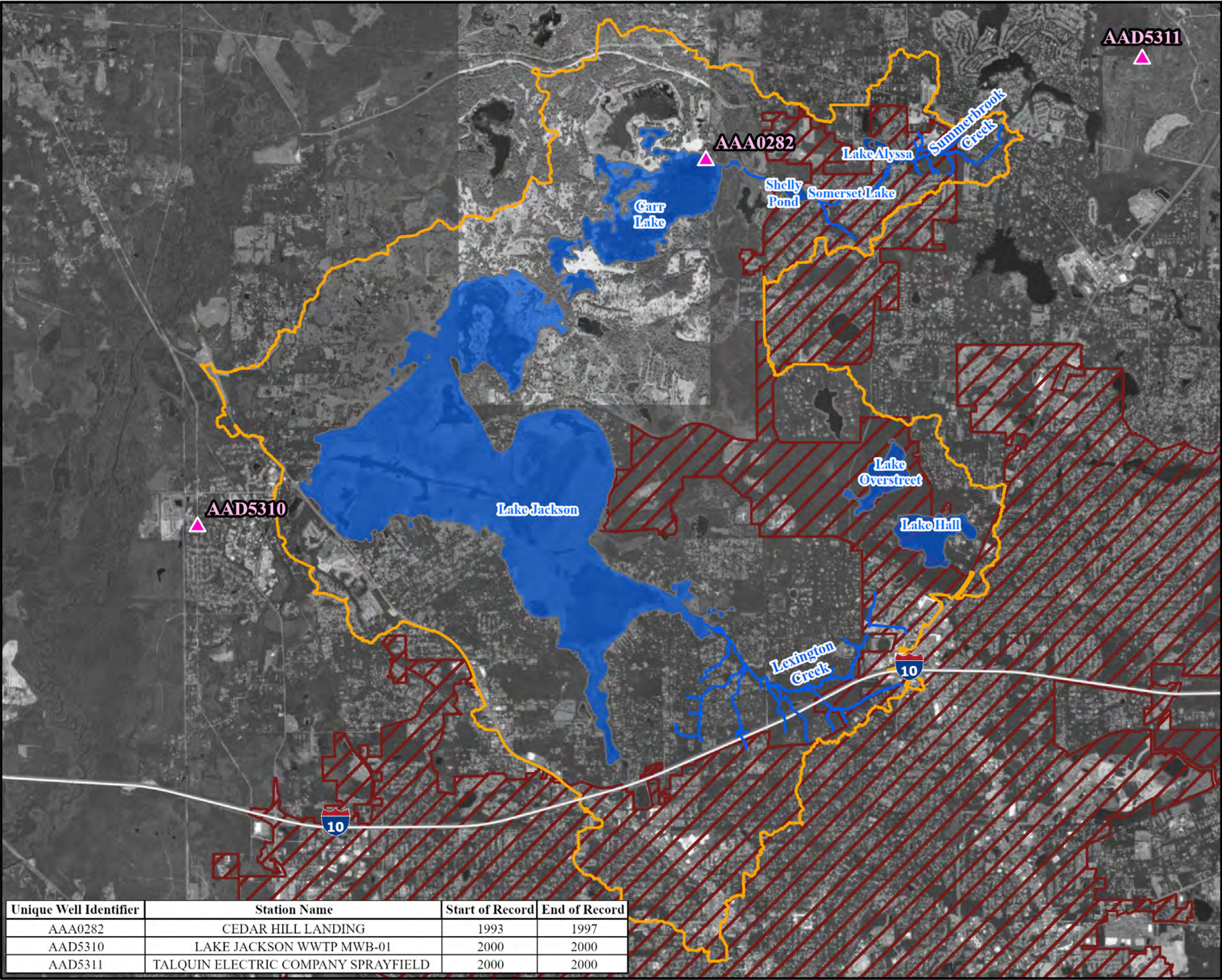
Groundwater is water that has infiltrated to fill spaces between sediments and cracks in rock. Groundwater is fed by precipitation and eventually resurfaces to replenish surface water, including lakes through seepage from the surficial aquifer and, at times, from inputs from the Floridan Aquifer. For Lake Jackson, flows to the Floridan Aquifer are through the Lime and Porter Sinks and are out of the lake and, therefore, not a source of water or nutrients. The surficial aquifer, on the other hand, could be a source of water and/or nutrients through direct seepage into the lake. Surficial groundwater flow into waterbodies may bring with it any contaminants or pollutants that it contacts on its way to a lake or surface water. Therefore, analysis of surficial groundwater data can be beneficial in evaluating potential seepage into the lake and its impacts on water quality.

Only one surficial aquifer groundwater sampling well is within the boundaries of the Lake Jackson Drainage Basin, Station AAA0282 (**Figure 4-14**). This well is more than 3,000 meters from the edge of Lake Jackson at the northern end of Carr Lake. Another well is located just outside of the Lake Jackson basin boundary along the western side (AAD5310) and is closer to Lake Jackson, but this station is associated with a wastewater treatment facility and is likely not representative of surficial seepage into Lake Jackson. The available groundwater quality data in the area limits the assessment of potential seepage issues into Lake Jackson and, therefore, is not analyzed directly in this report.

4.4.3.9 Biological Data

The Lake Vegetation Index (LVI) is a bioassessment procedure that analyzes the health of the plant community in lakes. FDEP performs sampling and calculations for waterbodies to interpret LVI values with respect to how closely they resemble the levels of a lake under conditions of minimal human disturbance. The LVI methodology was developed in 2005 in the pursuit of relating plant metrics to human disturbance. The LVI assesses factors such as the presence of exotic species and their ratio to native plant species, lakeshore alterations, and chemical disturbances such as excessive nutrients from surrounding land uses.

For lakes in Florida, an LVI range of 79 to 100 is considered Exceptional, a range of 43 to 78 is considered Healthy, and any values below 42 are deemed Impaired. **Table 4-3** presents LVI data for Lake Jackson. Between 2010 to 2019, there has been one instance in which the LVI measurements were below the 42 threshold. Most sampling events in the lake have yielded an LVI in the healthy range above 42, which denotes that while there are invasive plant taxa present in the lake, the vast majority are native plant taxa, and the invasive taxa have declined to a minimal amount.





CITY OF
TALLAHASSEE

N



0 1
Miles



Legend

-  Lake Jackson Drainage Basin
-  Waterbodies in Study
-  Groundwater Sampling Sites
-  Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Wells: Leon County, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-14:
Surficial Ground Water Sampling Wells

Tallahassee Master Plan - Surface
Water (TMaPS)



Geosyntec
consultants

Unique Well Identifier	Station Name	Start of Record	End of Record
AAA0282	CEDAR HILL LANDING	1993	1997
AAD5310	LAKE JACKSON WWTP MWB-01	2000	2000
AAD5311	TALQUIN ELECTRIC COMPANY SPRAYFIELD	2000	2000

Table 4-3: Summary of LVI Results from Lake Jackson

Date	Station ID	LVI	Aquatic Life Use Category
7/9/2010	21FLPNS 99LAKES09	79	Exceptional
9/7/2010	21FLLEONLEONLVI006	48	Healthy
7/19/2013	21FLGW 43541	59	Healthy
7/31/2014	21FLLEONLEONLVI006	52	Healthy
9/30/2014	21FLWQSPLEO09JAC01	40	Impaired
9/30/2014	21FLPNS 99LAKES09	70	Healthy
9/18/2015	21FLLEONLEONLVI006	61	Healthy
9/15/2016	21FLLEONLEONLVI006	52	Healthy
6/29/2017	21FLGW 43541	53	Healthy
7/25/2018	21FLLEONLEONLVI006	54	Healthy
7/26/2019	21FLWQSPLEO19JAC1	44	Healthy

4.4.3.10 Stormwater Treatment Facilities

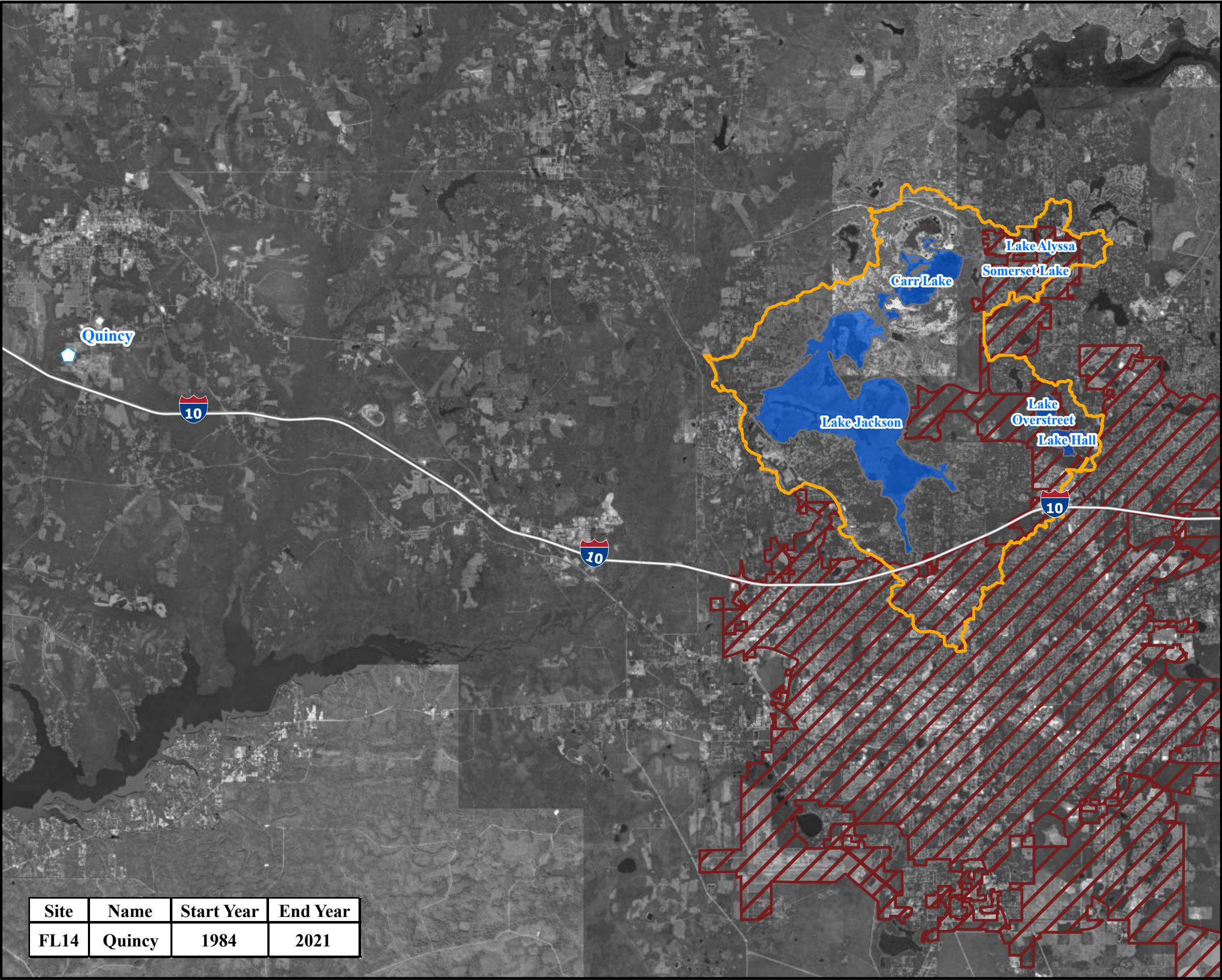
In assessing potential sources of pollutants to Lake Jackson, and ultimately for targeting nutrient reduction projects, it is important to identify existing treatment facilities adjacent to and along tributaries flowing into the downstream waterbodies. In **Section 4.4.1**, discussions were provided on stormwater treatment facilities that were constructed to deal with specific inputs to Megginnis Arm, Fords Arm and areas along the western side of the lake. **Exhibit 4-8** presents a map of stormwater treatment facilities (ponds) within the Lake Jackson basin boundaries based on available data from the City, Leon County and the Florida Department of Transportation (FDOT). As the exhibit shows, there are extensive treatment facilities located along the southern and western side of Lake Jackson, especially within Megginnis Creek and Lexington Creek watersheds. Additionally, there are numerous facilities within Summerbrook Chain of Lakes watershed.

4.4.3.11 Atmospheric Deposition Data

Atmospheric deposition is the loading contained in rainfall that falls directly onto the open water lake surface or that falls onto the surface as dry deposition. Stations are maintained throughout Florida that collect atmospheric deposition data. **Figure 4-15** shows the location of the nearest atmospheric deposition station to Lake Jackson. The station is in Quincy (FL14) and has been collecting data since 1984.

4.4.3.12 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Lake Jackson (**Section 4.4.4**), the available data are reasonable. There are sufficient active surface water quality stations within the lake and within key tributaries entering the lake to support the qualitative assessment. The following outlines limitations in the available data. Specific recommendations on additional data collection efforts are provided in **Section 4.11**.



Legend

- Lake Jackson Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits
- Atmospheric Deposition Station

Sources:
Waterbodies: COT, 2020
Station: NADP, 2022
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-15:
Locations of Atmospheric Deposition
Stations Relative to Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Site	Name	Start Year	End Year
FL14	Quincy	1984	2021

- There is limited flow data along key tributaries entering the lake. There was only one continuous gauge identified and that was in Lexington Creek. The gauge was discontinued in 2018.
- For some of the tributary inflows to the lake (especially in less developed watersheds), the available water quality data are sparse and older than 2005.
- There are limited data to evaluate the potential for seepage of pollutants to the lake from the surficial aquifer, i.e., surficial groundwater sampling stations around the lake.

4.4.4 Qualitative Assessment of Sources

Prior to performing loading calculations and other analyses to quantify existing pollutant sources to Lake Jackson, it is important to analyze available data and summarize findings from historical studies to support identification of the pathway and magnitude of potential sources. This aids in the determination of sources by providing a more complete understanding of the lake's water quality response and (where data and historical studies are available) highlights those tributaries and other inputs that are potential sources. Additionally, the determination of potential sources must take into account existing water quality treatment infrastructure and how their location and function mitigate conditions prior to discharge to Lake Jackson.

For Lake Jackson, the sources that were evaluated include the following:

- Stormwater runoff
- Septic systems
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition
- Interconnected flows

An overview of the analyses and findings for each source listed above is provided in the following sections. Prior to the discussions of each of the potential sources, in-lake analyses examining the spatial variation of the parameters of interest are provided to support determination of key focus areas around Lake Jackson. Following the discussions for each source type, a summary of findings for the qualitative assessment is provided.

4.4.4.1 In-Lake Water Quality

In-lake spatial variation was evaluated for the following parameters:

- Color
- Alkalinity
- Total Phosphorus

- Total Nitrogen
- Chl-a
- Trophic State Index
- *E. coli*

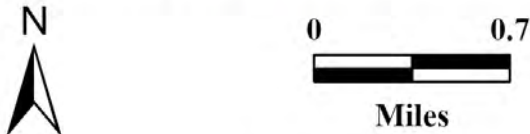
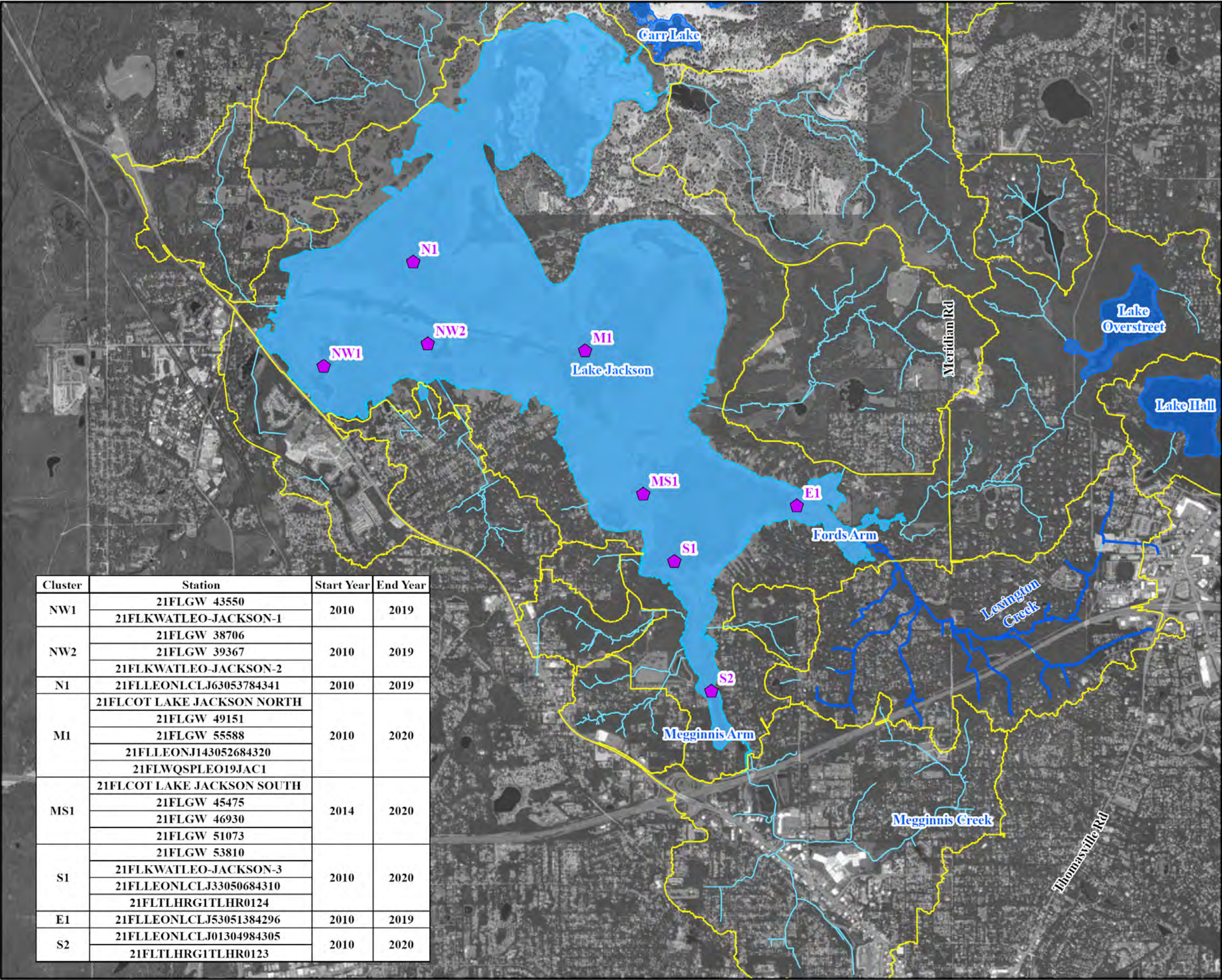
To maximize available data for use in the spatial analyses, data stations were clustered to represent general areas of the lake, such as stations in the south portion of the lake, north portion, etc. Analyses were then performed on the collective data for that general location. **Figure 4-16** presents the data clustering locations and the specific water quality stations where data were pulled for that specific cluster.

For Lake Jackson, a total of eight clusters were identified. The locations included S2 in Megginnis Arm, S1 near the mouth of Megginnis Arm, E1 near the mouth of Fords Arm, MS1 in the general open water area at the northwest side where Megginnis and Fords Arm drain, M1 in the lake center, N1 on the north side of the main lake area, and NW1 and NW2 in open water areas along the northwest edge of the lake. The spatial analyses were only performed using data after 2010 to represent recent conditions. Any station that had data after 2010 was assigned one of the cluster locations and a collective data set developed for that cluster. As such, all data available within the lake after 2010 was utilized in the spatial analyses. Clusters NW1 and NW2 had limited data compared to other clusters (as can be seen on the tables in the spatial figures) but a determination was made to include the analyses. No data were available after 2010 in the northern lobe that connects to Carr Lake.

Figure 4-17 through **Figure 4-23** present the spatial analyses. For all parameters (other than *E. coli*), the annual geomeans for the period of record from 2010 to 2020 were averaged to calculate the cluster values. For *E. coli* the 90th percentile of the data was calculated. Some cluster areas had more data than others and, as such, the period of record analyzed is not always the same between locations. The goal was to utilize as much data as available for each site. Where no symbol is shown on a map for a specific parameter at a cluster location, it indicates that a determination was made that insufficient or no data were available to assess the averages of the geometric means or the 90th percentile for *E. coli*.

The results at each cluster of stations are presented as colored symbols representing ranges of calculated values. FDEP or other criteria/thresholds were used to define breakpoints for the color transitions. For the in-lake TN and TP criteria, where maximum and minimum thresholds are defined through NNC, the transition from blue to green was at the minimum value and the transition from orange to red was at the maximum value. The levels between the minimum and maximum were evenly divided into the range for the transition from green to yellow and yellow to orange. For all other parameters with only a maximum criteria/threshold, the transition from orange to red was set at the criteria/threshold. The other four levels were then evenly divided down from the maximum to 0.

- For alkalinity and color, the cutoff from orange into red was set to 20 mg/L and 40 platinum-cobalt units (PCUs), respectively.



- Legend**
-  Lake Jackson
 -  Waterbodies in Study
 -  Watercourses
 -  Subbasins
 -  In-Lake Station Clusters

Cluster	Station	Start Year	End Year
NW1	21FLGW 43550	2010	2019
	21FLKWATLEO-JACKSON-1		
NW2	21FLGW 38706	2010	2019
	21FLGW 39367		
N1	21FLLEONLCLJ63053784341	2010	2019
M1	21FLCOT LAKE JACKSON NORTH	2010	2020
	21FLGW 49151		
	21FLGW 55588		
	21FLLEONJ143052684320		
MS1	21FLWQSPLEO19JAC1	2014	2020
	21FLCOT LAKE JACKSON SOUTH		
	21FLGW 45475		
	21FLGW 46930		
S1	21FLGW 51073	2010	2020
	21FLGW 53810		
	21FLKWATLEO-JACKSON-3		
E1	21FLLEONLCLJ33050684310	2010	2019
	21FLTLHRG1TLHR0124		
S2	21FLLEONLCLJ53051384296	2010	2020
	21FLLEONLCLJ01304984305		
	21FLTLHRG1TLHR0123		

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023

Figure 4-16:
Station Clustering for In-Lake Spatial
Analyses for Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)

- For TN and TP, cutoffs were set for orange to red at the maximum of the allowable range for Lake Jackson (0.93 mg/L TN and 0.03 mg/L TP) and blue to green at the minimum (0.51 mg/L TN and 0.01 mg/L TP).
- For Chl-a, the cutoff from orange to red was set at the criteria for Lake Jackson (6 µg/L).
- For TSI, the cutoff was set to 60 from orange to red, based on the transition from mesotrophic to eutrophic conditions.
- For *E. coli*, the transition from orange to red was set at 410 most probable number (MPN)/100 mL.

The analyses presented herein are not meant to indicate conditions of impairment or non-impairment per FDEP rules and criteria. The criteria/thresholds are to aid in assessing general conditions in the lake and spatial variation, and the thresholds provide baselines to evaluate against and to aid in defining potential target areas for water quality improvement projects.

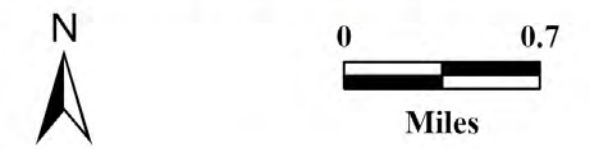
Figure 4-17 and **Figure 4-18** present the variations in color and alkalinity. Examination of the color map shows that there does not appear to be a significant variation between clusters (S1=14.9 PCU, S2=15.5 PCU, E1=16.1 PCU, MS1=15.7 PCU, M1=22.9 PCU, N1=25.4 PCU). One aspect that can be seen is that at the Megginnis Arm cluster, the levels are somewhat lower. In no case do the color values for any of the clusters go above 40 PCU, which would indicate transition to high color lake conditions. The alkalinity map does show some significant variation, with higher alkalinity in the clusters in the southern end of the system and lower values moving north and west (S1=22.1 mg/L, S2=53.3 mg/L, E1=19.9 mg/L, MS1=19.1 mg/L, M1=10.1 mg/L, N1=5.2 mg/L). In two of the clusters (S1 and S2), the values are above the 20 mg/L cutoff from low alkalinity to high alkalinity lake conditions as defined by the NNC.

Figure 4-19 and **Figure 4-20** present the spatial variation of TN and TP. TN cluster values are highest in the northwest side of the lake near where the Harbinwood neighborhood drains in (S1=0.43 mg/L, S2=0.21 mg/L, E1=0.36 mg/L, MS1=0.54 mg/L, M1=0.54 mg/L, N1=0.50 mg/L, NW1=0.66 mg/L, NW2=0.72 mg/L). The next highest levels are at the middle stations (M1, MS1). The lowest cluster values are at the northern cluster (N) and in the areas of Megginnis Arm and Fords Arm.

All of the values are below the maximum threshold. Examination of the TP map shows a distinct spatial pattern, with higher concentrations along the southern and southwestern side of the lake, decreasing moving further north (S1=0.025 mg/L, S2=0.046 mg/L, E1=0.037 mg/L, MS1=0.024 mg/L, M1= 0.017 mg/L, N1=0.014 mg/L, NW1=0.027 mg/L, NW2=0.019 mg/L).

The highest concentrations are seen in Megginnis Arm and the mouth of Fords Arm. The values at those two locations are above the maximum threshold range for TP. Overall, the TP levels were more elevated than TN in relation to the NNC thresholds. This is particularly evident in the southern portion of the lake and in the two arms where the TN clusters showed some of the lowest levels while the TP clusters showed values above the NNC maximum.

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- Color Average 2010-2020
PCU
 - 0 - 10
 - 10 - 20
 - 20 - 30
 - 30 - 40
 - > 40

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

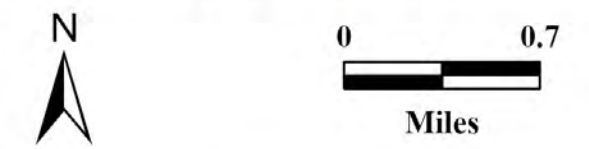
Figure 4-17:
Spatial Assessment of Color in Lake Jackson

Tallahassee Master Plan - Surface Water (TMaPS)



Cluster	Station	Start Year	End Year	Sample Count
N1	21FLLEONLCLJ63053784341	2010	2019	35
M1	21FLCOT LAKE JACKSON NORTH	2010	2020	50
	21FLGW 49151			
	21FLGW 55588			
MS1	21FLLEONJ143052684320	2014	2020	16
	21FLCOT LAKE JACKSON SOUTH			
	21FLGW 45475			
S1	21FLGW 46930	2010	2020	39
	21FLGW 51073			
	21FLGW 53810			
E1	21FLKWatLEO-JACKSON-3	2010	2019	35
	21FLLEONLCLJ33050684310			
S2	21FLTLHRG1TLHR0124	2010	2020	27
	21FLLEONLCLJ01304984305			
	21FLTLHRG1TLHR0123			

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- Alkalinity Average 2010-2020 mg/L
 - 0 - 5
 - 5 - 10
 - 10 - 15
 - 15 - 20
 - > 20

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

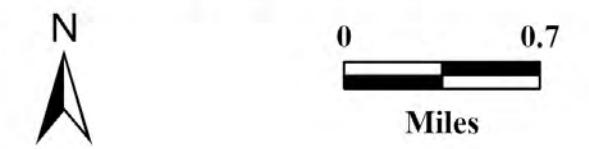
Figure 4-18:
Spatial Assessment of Alkalinity in Lake Jackson

Tallahassee Master Plan - Surface Water (TMaPS)



Cluster	Station	Start Year	End Year	Sample Count
N1	21FLLEONLCLJ63053784341	2010	2019	35
M1	21FLCOT LAKE JACKSON NORTH	2010	2020	50
	21FLGW 49151			
	21FLGW 55588			
MS1	21FLLEONJ143052684320	2017	2020	15
	21FLCOT LAKE JACKSON SOUTH			
	21FLGW 45475			
S1	21FLGW 46930	2010	2020	39
	21FLGW 51073			
	21FLGW 53810			
E1	21FLKWatLEO-JACKSON-3	2010	2020	35
	21FLLEONLCLJ33050684310			
	21FLTLHRG1TLHR0124			
S2	21FLLEONLCLJ53051384296	2010	2020	27
	21FLLEONLCLJ01304984305			
	21FLTLHRG1TLHR0123			

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- TN Average 2010-2020 mg/L
 - 0 - 0.51
 - 0.51 - 0.65
 - 0.65 - 0.79
 - 0.79 - 0.93
 - > 0.93

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

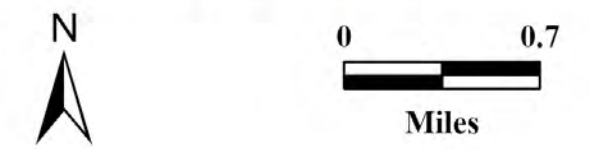
Figure 4-19:
Spatial Assessment of TN in Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Station	Start Year	End Year	Sample Count
NW1	21FLGW 43550	2010	2019	21
	21FLKWATLEO-JACKSON-1			
NW2	21FLGW 38706	2010	2019	21
	21FLKWATLEO-JACKSON-2			
N1	21FLLEONLCLJ63053784341	2010	2019	34
M1	21FLCOT LAKE JACKSON NORTH	2010	2020	47
	21FLGW 49151			
	21FLGW 55588			
	21FLLEONJ143052684320			
MS1	21FLWQSPLEO19JAC1	2014	2020	15
	21FLCOT LAKE JACKSON SOUTH			
	21FLGW 45475			
	21FLGW 46930			
S1	21FLGW 51073	2010	2020	57
	21FLGW 53810			
	21FLKWATLEO-JACKSON-3			
E1	21FLLEONLCLJ33050684310	2010	2019	34
	21FLTLHRG1TLHR0124			
S2	21FLLEONLCLJ53051384296	2010	2020	26
	21FLLEONLCLJ01304984305			
	21FLTLHRG1TLHR0123			

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- TP Average 2010-2020 mg/L
 - 0 - 0.010
 - 0.010 - 0.017
 - 0.017 - 0.024
 - 0.024 - 0.030
 - > 0.03

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-20:
Spatial Assessment of TP in Lake Jackson
Tallahassee Master Plan - Surface Water (TMaPS)



Cluster	Station	Start Year	End Year	Sample Count
NW1	21FLGW 43550	2010	2019	20
	21FLKWATLEO-JACKSON-1			
NW2	21FLGW 38706	2010	2019	21
	21FLKWATLEO-JACKSON-2			
N1	21FLLEONLCLJ63053784341	2010	2019	35
	21FLCOT LAKE JACKSON NORTH			
M1	21FLGW 49151	2010	2020	51
	21FLGW 55588			
	21FLLEONJ143052684320			
	21FLWQSPLEO19JAC1			
MS1	21FLCOT LAKE JACKSON SOUTH	2014	2020	17
	21FLGW 45475			
	21FLGW 46930			
	21FLGW 51073			
S1	21FLGW 53810	2010	2020	58
	21FLKWATLEO-JACKSON-3			
	21FLLEONLCLJ33050684310			
E1	21FLTLHRG1TLHR0124	2010	2019	35
	21FLLEONLCLJ53051384296			
S2	21FLLEONLCLJ01304984305	2010	2020	27
	21FLTLHRG1TLHR0123			

Figure 4-21 and **Figure 4-22** present maps of the spatial variation in Chl-a and TSI. These parameters represent the biological response of the system to nutrient loading. For Chl-a, there is a distinct pattern of higher values in the southern portion of the lake and along the western shoreline (S1=7.5 µg/L, S2=7.2 µg/L, E1=8.8 µg/L, MS1=7.1 µg/L, M1=3.6 µg/L, N1=5.0 µg/L, NW1=11.0 µg/L, NW2=3.9 µg/L). Values at five of the eight clusters showed levels above the 6.0 µg/L threshold. Moving away from the shorelines and north, the values generally decrease. TSI shows a similar but less distinct pattern relative to Chl-a (S1=28, S2=31, E1=32, MS1=29, M1=26, N1=23, NW1=32, NW2=29). It is important to note that based on studies outlined earlier, vegetation represents the largest store of nutrients in the system. As such, the uptake by vegetation is a key driver of in-lake concentrations. Examination of historical aerials identified that the dredging of sediments within the Megginnis and Fords Arm area created a somewhat larger open water area than historically existed, resulting in reduced natural vegetation in this area. This area of the lake has experienced overgrowth of hyacinth at times, which may drive some of the algal response.

Looking at the spatial comparisons of water quality overall, it does appear that the southern and western sides of the lake continue to exhibit more productive algal growth in comparison to other parts of the lake. This is demonstrated by elevated phosphorus and Chl-a. Due to elevated nutrients and Chl-a, the southern end of the lake, where Megginnis Arm and Fords Arm discharge, remains a target area for load reduction and potential restoration of the macrophyte community.

Figure 4-23 presents the map for *E. coli*. Examination of the map shows that the in-lake levels are low and present no distinct or discernable spatial patterns (S1=3.5 MPN/100 mL, S2=3.5 MPN/100 mL, E1=3.0 MPN/100 mL, MS1=5.5 MPN/100 mL, M1=4.9 MPN/100 mL, N1=4.5 MPN/100 mL).

4.4.4.2 Stormwater Runoff

To assess stormwater runoff as a potential source of pollutant loads to Lake Jackson, a number of analyses were conducted. First, calculations of Landscape Development Intensity (LDI) Index by sub-watershed were performed. LDI is an estimate of the intensity of human land use based on nonrenewable energy flow (Brown and Vivas, 2005). The LDI is calculated as the percentage area within a catchment of particular types of land use, multiplied by the coefficient of energy associated with that land use, summed over all land use types in the catchment.

$$LDI = \sum (LDI_i * \%LU_i)$$

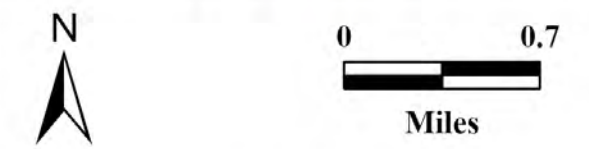
Where:

LDI_i = the nonrenewable energy land use for land use i, and

%LU_i = the percentage of land area in the catchment with land use i.

The LDI coefficients are provided in **Table 4-4**.

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- Chl a Average 2010-2020
µg/L
 - 0.0 - 1.5
 - 1.5 - 3.0
 - 3.0 - 4.5
 - 4.5 - 6.0
 - > 6.0

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

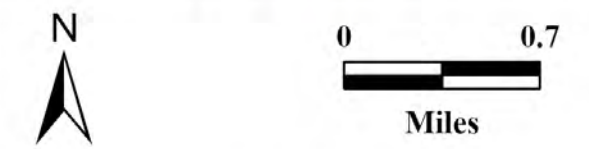
Figure 4-21:
Spatial Assessment of Chlorophyll a in
Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Station	Start Year	End Year	Sample Count
NW1	21FLGW 43550	2013	2019	12
	21FLKWATLEO-JACKSON-1			
NW2	21FLGW 38706	2010	2019	13
	21FLGW 39367			
N1	21FLKWATLEO-JACKSON-2	2010	2019	35
	21FLLEONLCLJ63053784341			
M1	21FLCOT LAKE JACKSON NORTH	2010	2020	51
	21FLGW 49151			
	21FLGW 55588			
	21FLLEONJ143052684320			
MS1	21FLWQSPLEO19JAC1	2014	2020	17
	21FLCOT LAKE JACKSON SOUTH			
	21FLGW 45475			
	21FLGW 46930			
S1	21FLGW 51073	2010	2020	50
	21FLGW 53810			
	21FLKWATLEO-JACKSON-3			
E1	21FLLEONLCLJ53051384296	2010	2019	35
	21FLLEONLCLJ01304984305			
S2	21FLTLHRG1TLHR0124	2010	2020	27
	21FLTLHRG1TLHR0123			

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- TSI Average 2010-2020
- TSI Score
 - 0 - 15
 - 15 - 30
 - 30 - 45
 - 45 - 60
 - > 60

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

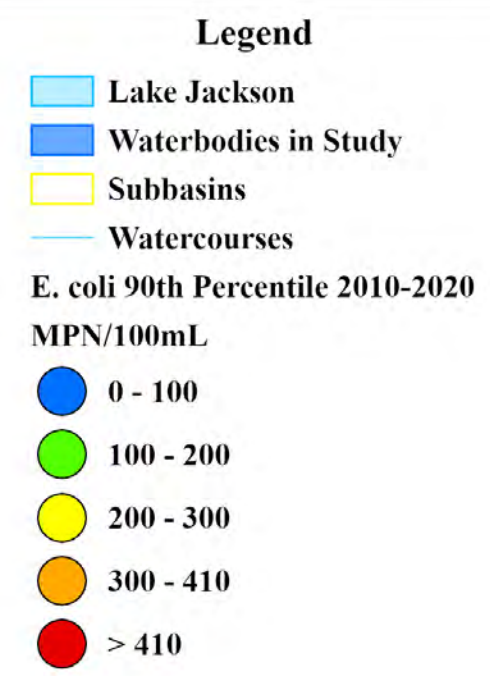
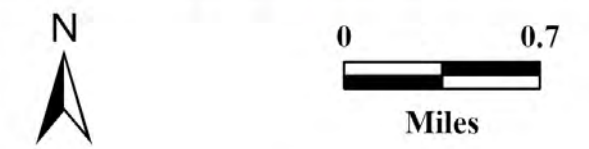
Figure 4-22:
Spatial Assessment of TSI in Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Station	Start Year	End Year	Sample Count
NW1	21FLGW 43550	2013	2019	36
	21FLKWATLEO-JACKSON-1			
NW2	21FLGW 38706	2010	2019	39
	21FLGW 39367			
N1	21FLKWATLEO-JACKSON-2	2010	2019	105
	21FLLEONLCLJ63053784341			
M1	21FLCOT LAKE JACKSON NORTH	2010	2020	153
	21FLGW 49151			
	21FLGW 55588			
	21FLLEONJ143052684320			
MS1	21FLWQSPLEO19JAC1	2014	2020	51
	21FLCOT LAKE JACKSON SOUTH			
	21FLGW 45475			
	21FLGW 46930			
S1	21FLGW 51073	2010	2020	150
	21FLGW 53810			
	21FLKWATLEO-JACKSON-3			
	21FLLEONLCLJ33050684310			
E1	21FLTLHRG1TLHR0124	2010	2020	81
	21FLLEONLCLJ53051384296			
S2	21FLLEONLCLJ01304984305	2010	2020	81
	21FLTLHRG1TLHR0123			

Clusters with insufficient data were removed from map



Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-23:
Spatial Assessment of E. coli in Lake Jackson

Tallahassee Master Plan - Surface Water (TMaPS)



Cluster	Station	Start Year	End Year	Sample Count
N1	21FLLEONLCLJ63053784341	2014	2019	22
M1	21FLCOT LAKE JACKSON NORTH	2014	2020	36
	21FLGW 49151			
	21FLGW 55588			
	21FLLEONJ143052684320			
	21FLWQSPLEO19JAC1			
MS1	21FLCOT LAKE JACKSON SOUTH	2015	2020	16
	21FLGW 45475			
	21FLGW 46930			
	21FLGW 51073			
S1	21FLGW 53810	2014	2020	25
	21FLKWATLEO-JACKSON-3			
	21FLLEONLCLJ33050684310			
	21FLTLHRG1TLHR0124			
E1	21FLLEONLCLJ53051384296	2010	2019	21
S2	21FLLEONLCLJ01304984305	2010	2020	20
	21FLTLHRG1TLHR0123			

Table 4-4: Landscape Development Intensity Index Coefficients

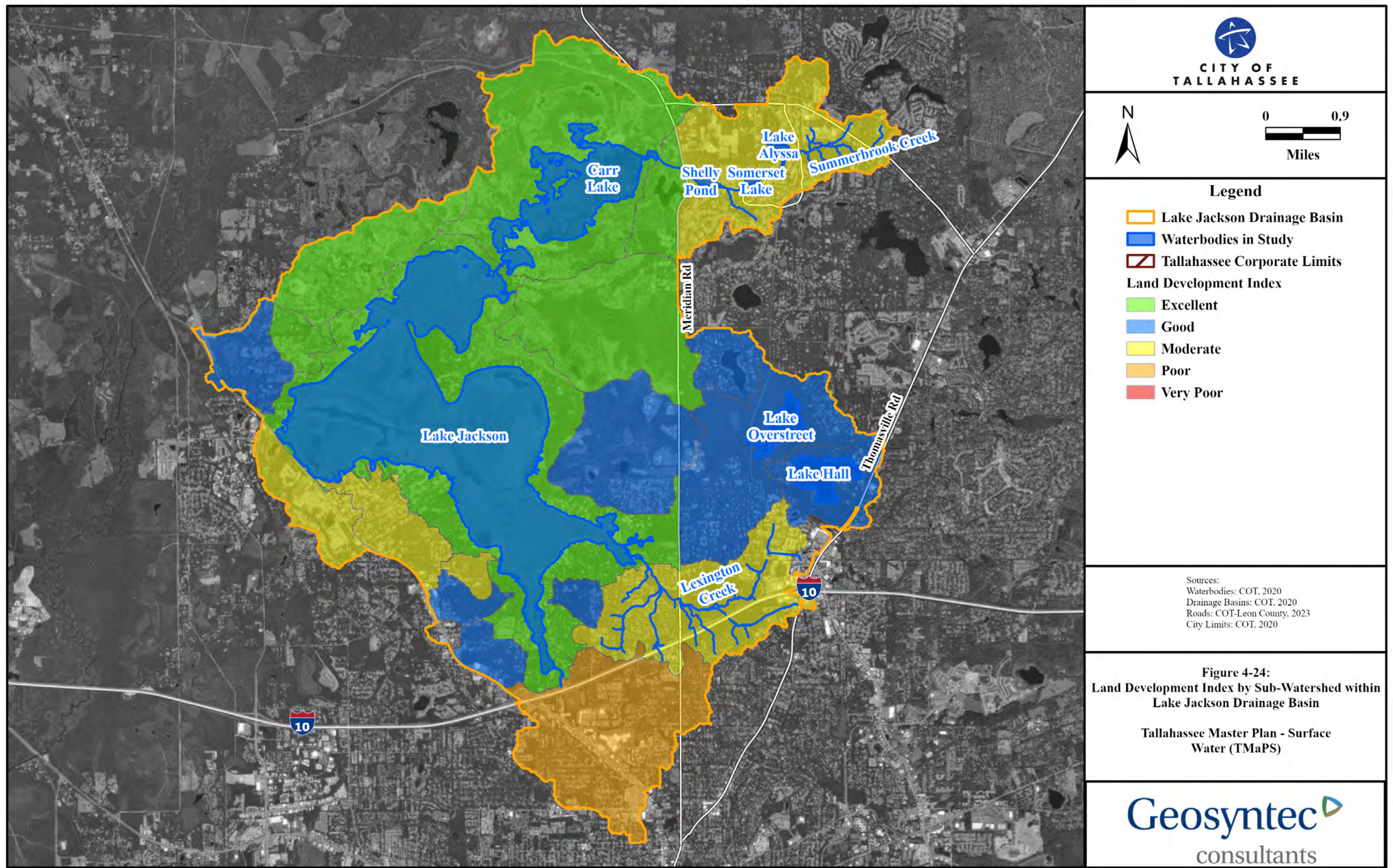
Category	Coefficient
Natural System	1
Pine Plantation	1.6
Pasture	3.4
Row Crops	4.5
Residential (low)	6.8
Residential (high)	7.6
Commercial	8.0
Industrial	8.3
Commercial (high)	9.2
Business District	10.0

FDEP uses the LDI as a tool to estimate potential adverse human effects from various land uses on adjacent waterbodies, such as streams, lakes, and wetlands. Based on the LDI score, the catchment area is rated as excellent (1 to 2), good (3 to 4), moderate (5 to 6), poor (7 to 8), or very poor (9 to 10) in relation to its potential for adverse impacts or loadings to waterbodies that receive runoff (FDEP, 2020).

Figure 4-24 presents the calculated LDIs by sub-watershed throughout the Lake Jackson basin. Examination of the map shows that much of the basin has excellent LDI values, indicating low potential for adverse runoff impacts. Only one subbasin in the northern area has a moderate LDI score and that is the Summerbrook Creek area. That area does not drain directly into Lake Jackson but flows into Carr Lake. The subbasins along the southern end that drain directly to Lake Jackson range from excellent to poor. The moderate subbasins include Harbinwood, Bellwood, and Lexington Creek. The land uses in those watersheds are primarily residential. The subbasin that drains to Megginnis Arm is rated as poor. This watershed has both residential and urban land uses. It is important to note that the calculated LDI does not account for any existing level of treatment within individual subbasins.

The second analysis utilized available data within the tributaries flowing into Lake Jackson to define average conditions in a manner similar to the analyses for the in-lake spatial variation. Where any limitation or absence of data exist, the figures are annotated to denote the limitation in data for the parameter assessed. The parameters analyzed included the following:

- Total Phosphorus
- Total Nitrogen
- Total Suspended Solids
- *E. coli*



As with the in-lake analyses, stations that were near each other or along the same drainageway were clustered to provide more data for the analyses and to represent general sub-watershed conditions. **Figure 4-25** presents the data clustering used. Where stations were located upstream and downstream of in-line treatment facilities, the stations were separated. This is the case for the Megginnis Creek clusters. The only stations with sufficient amounts of recent data were located in the Megginnis Creek, Lexington Creek, Overstreet Drain, Okeeheepkee, Lake Jackson Mounds, and Harbinwood watersheds. The other primary tributaries flowing directly into Lake Jackson have good LDI scores, in general, indicating that relative to surface runoff, they would have limited potential as anthropogenic sources to the lake. As with the in-lake analyses, the periods of record for the various clustered stations were not always the same. For each cluster, the available data after 2010 were utilized in the analyses and all stations that had data after 2010 were assigned to a cluster.

Similar to the in-lake analysis, where criteria/thresholds were available, those thresholds were utilized to define the breaks in the color scale.

- For TP and TN, the Panhandle East nutrient thresholds for streams were defined as the cutoff from yellow to red (0.18 mg/L and 1.03 mg/L, respectively).
- For *E. coli*, the freshwater criterion was defined as the cutoff between yellow and red (410 MPN/100 mL).

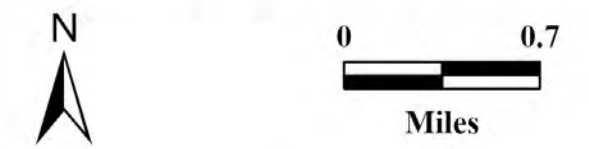
For the other parameters, the ranges were set to support the evaluation of spatial differences. As with the in-lake maps, the analyses presented herein are not meant to provide information on impairment or non-impairment per FDEP rules and criteria. They are utilized to aid in the evaluation of spatial differences and to help identify potential target areas.

Figure 4-26 and **Figure 4-27** present the TN and TP results. TN values did show some significant variations around the system (Trib 1=1.07 mg/L, Trib 2=0.83 mg/L, Trib 3=1.06 mg/L, Trib 4=0.36 mg/L, Trib 5=0.22 mg/L, Trib 6=0.29 mg/L, Trib 7=0.28 mg/L). The highest values were found along Megginnis Creek upstream of the MARS Facility and within the tributary draining the Lake Jackson Mound area. These values were above the stream threshold. Downstream of the MARS Facility along Megginnis Creek, the levels were lower.

As previously discussed, the MARS Facility is one of the most significant stormwater improvement projects in the basin. It provides stormwater treatment for Megginnis Creek, which is a significant portion of Lake Jackson inflow from the City, which is mostly characterized by residential and urban land use. However, limited preventative maintenance activities for the facility's treatment filter and marshes are currently performed and parts of the facility have known maintenance issues.

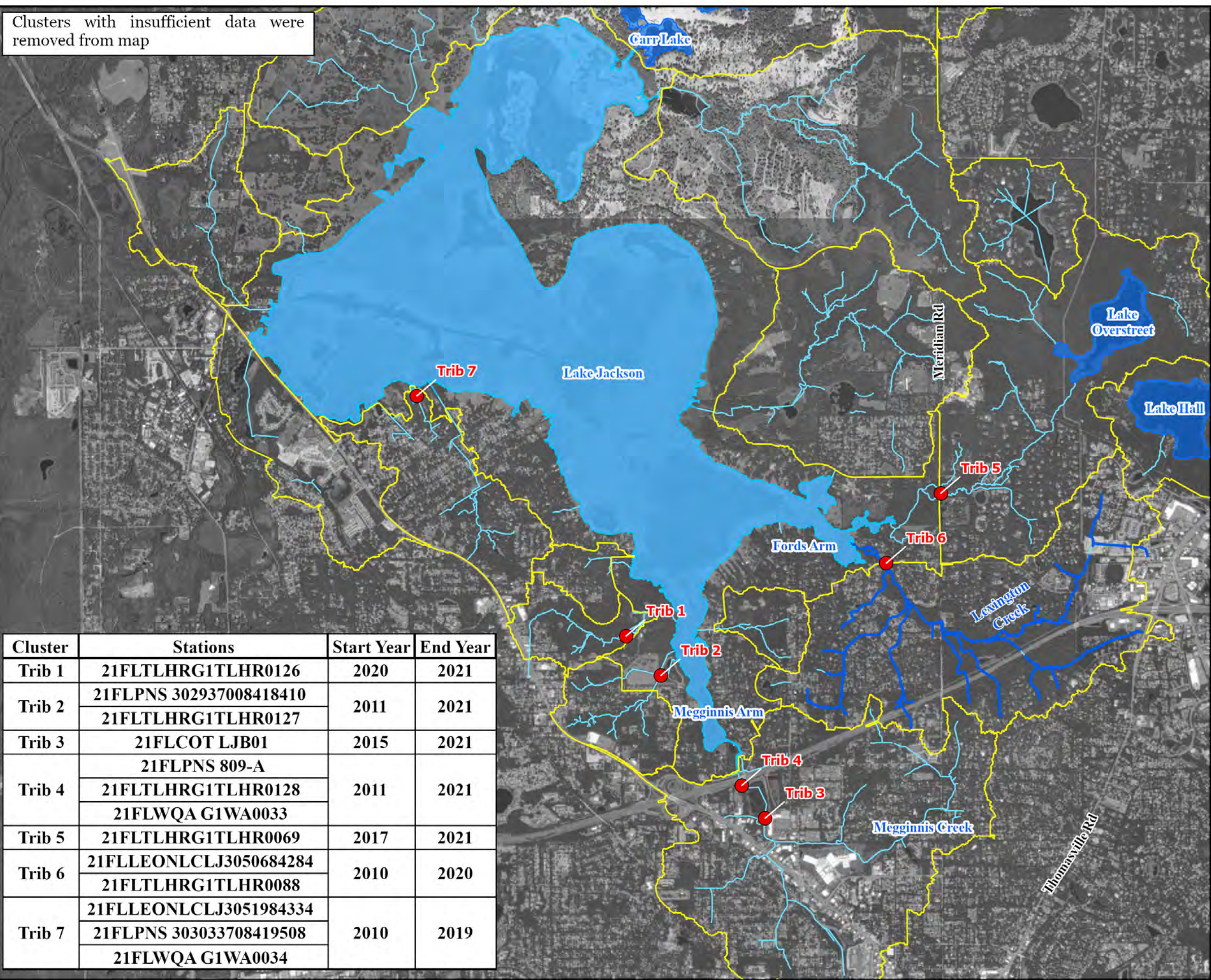
Given the investment made in the facility's treatment areas and their significance to the basin, appropriate maintenance activities are needed to ensure the facility operates in a design condition, and adequate treatment is being provided long-term to best protect Lake Jackson. The City, in coordination with FDEP and NFWFMD, recently initiated a monitoring project to assess the current removal efficiency of the MARS Facility. The preliminary results from that project and the data analyses completed for this study suggest that the facility is currently providing reasonable levels of nutrient load removal even with the known maintenance issues.

Clusters with insufficient data were removed from map



- Legend**
- Lake Jackson
 - Waterbodies in Study
 - Watercourses
 - Subbasins
 - Tributary Station Clusters

Cluster	Stations	Start Year	End Year
Trib 1	21FLTLHRG1TLHR0126	2020	2021
Trib 2	21FLPNS 302937008418410	2011	2021
	21FLTLHRG1TLHR0127		
Trib 3	21FLCOT LJB01	2015	2021
Trib 4	21FLPNS 809-A	2011	2021
	21FLTLHRG1TLHR0128		
	21FLWQA G1WA0033		
Trib 5	21FLTLHRG1TLHR0069	2017	2021
Trib 6	21FLLEONLCLJ3050684284	2010	2020
	21FLTLHRG1TLHR0088		
Trib 7	21FLLEONLCLJ3051984334	2010	2019
	21FLPNS 303033708419508		
	21FLWQA G1WA0034		



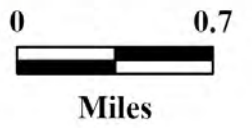
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-25:
Station Clustering for Analyses of
Tributary Inflows to Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- TN Average 2010-2020 mg/L
 - 0- 0.25
 - 0.25 - 0.50
 - 0.50 - 0.75
 - 0.75 - 1.03
 - > 1.03

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

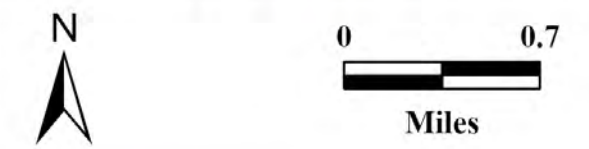
Figure 4-26:
Spatial Assessment of TN in Tributaries to
Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Stations	Start Year	End Year
Trib 1	21FTLHRG1TLHR0126	2020	2021
Trib 2	21FLPNS 302937008418410	2011	2021
	21FTLHRG1TLHR0127		
Trib 3	21FLCOT LJB01	2015	2021
Trib 4	21FLPNS 809-A	2011	2021
	21FTLHRG1TLHR0128		
	21FLWQA G1WA0033		
Trib 5	21FTLHRG1TLHR0069	2017	2021
Trib 6	21FLLEONLCLJ3050684284	2010	2020
	21FTLHRG1TLHR0088		
Trib 7	21FLLEONLCLJ3051984334	2010	2019
	21FLPNS 303033708419508		
	21FLWQA G1WA0034		

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- TP Average 2010-2020 mg/L
 - 0 - 0.040
 - 0.040 - 0.080
 - 0.080 - 0.120
 - 0.12 - 0.180
 - > .18

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-27:
Spatial Assessment of TP in Tributaries to
Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Stations	Start Year	End Year
Trib 1	21FTLHRG1TLHR0126	2020	2021
Trib 2	21FLPNS 302937008418410	2011	2021
	21FTLHRG1TLHR0127		
Trib 3	21FLCOT LJB01	2015	2021
Trib 4	21FLPNS 809-A	2011	2021
	21FTLHRG1TLHR0128		
	21FLWQA G1WA0033		
Trib 5	21FTLHRG1TLHR0069	2017	2021
Trib 6	21FLLEONLCLJ3050684284	2010	2020
	21FTLHRG1TLHR0088		
Trib 7	21FLLEONLCLJ3051984334	2010	2019
	21FLPNS 303033708419508		
	21FLWQA G1WA0034		

However, as is discussed in **Section 4.4.4**, spatial analyses within the lake continue to indicate elevated nutrient levels in the southern portions downstream of the MARS Facility and Megginnis Arm. Based on in-lake nutrient levels, maintenance of the MARS Facility to return treatment areas to the design condition and/or further improvements to the facility may be warranted to improve Megginnis Arm and the southern portion of Lake Jackson.

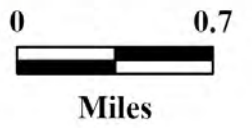
A point of note is that the TN concentrations for the Trib 1 cluster in the Lake Jackson Mound watershed were predominantly inorganic nitrogen, indicating the potential for anthropogenic sources. Higher TN concentrations were also seen in the tributary draining the Okeeheepkee watershed. Examination of the TP map shows some spatial differences between the locations (Trib 1=0.119 mg/L, Trib 2=0.126 mg/L, Trib 3=0.091 mg/L, Trib 4=0.078 mg/L, Trib 5=0.080 mg/L, Trib 6=0.176 mg/L, Trib 7=0.122 mg/L). The lowest values were found along Megginnis Creek downstream of the MARS Facility and along the Overstreet Drain. The highest concentrations were found along Lexington Creek just below the stream criteria threshold of 0.18 mg/L. The other tributaries showed similar concentration levels to each other.

Figure 4-28 presents the total suspended solids (TSS) map (Trib 1=9.4 mg/L, Trib 2=6.6 mg/L, Trib 3=2.8 mg/L, Trib 4=3.0 mg/L, Trib 5=3.3 mg/L, Trib 6=8.1 mg/L, Trib 7=5.4 mg/L). As seen in the in-lake data, the TSS concentrations in the tributaries are generally low, with somewhat higher values along Lexington Creek and the Lake Jackson Mounds tributary.

Figure 4-29 presents the analyses for *E. coli* (Trib 1=898 MPN/100 mL, Trib 2=830 MPN/100 mL, Trib 3=242 MPN/100 mL, Trib 4=115 MPN/100 mL, Trib 5=204 MPN/100 mL, Trib 6=871 MPN/100 mL, Trib 7=222 MPN/100 mL). The measurements in the Lexington Creek, Okeeheepkee, and Lake Jackson Mounds watersheds were above the 410 MPN/100 mL threshold. The levels within the remaining tributaries were at similar ranges to each other, with the lowest levels downstream of the MARS Facility. **Section 4.4.2** identified concerns on the methodology utilized for collecting some of the *E. coli* data within Lexington Creek and potentially other stations. The potential issues with the data have not been resolved to date.

Figure 4-30 presents the tributaries where data analyses were performed, with the cluster locations and stormwater BMPs identified. As was stated previously, the tributary analyses and resulting conclusions must account for existing treatment in the system that would further mitigate direct discharges to Lake Jackson. For Megginnis Creek, the data clusters are located immediately upstream (Trib 3) and downstream (Trib 4) of the MARS Facility. The most downstream data cluster along Megginnis Creek is upstream of the polishing wetlands, which would provide additional treatment to the already low values. For the Okeeheepkee watershed, the data cluster (Trib 2) is upstream of the Okeeheepkee Prairie Pond facility, which would provide treatment prior to discharge to Megginnis Arm. In Lexington Creek, there are presently no treatment facilities downstream of the cluster (Trib 6) prior to discharge to Fords Arm. In the Harbinwood sub-watershed, one of the stations in the cluster is upstream of potential treatment facilities, but the bulk of the data are from stations downstream.

Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins

TSS Average 2010-2020

mg/L

- 0- 2.5
- 2.5 - 5.0
- 5.0 - 7.5
- 7.5- 10
- > 10

Cluster	Stations	Start Year	End Year
Trib 1	21FTLHRG1TLHR0126	2020	2021
Trib 2	21FLPNS 302937008418410	2011	2021
	21FTLHRG1TLHR0127		
Trib 3	21FLCOT LJB01	2015	2021
Trib 4	21FLPNS 809-A	2011	2021
	21FTLHRG1TLHR0128		
	21FLWQA G1WA0033		
Trib 5	21FTLHRG1TLHR0069	2017	2021
Trib 6	21FLLEONLCLJ3050684284	2010	2020
	21FTLHRG1TLHR0088		
Trib 7	21FLLEONLCLJ3051984334	2010	2019
	21FLPNS 303033708419508		
	21FLWQA G1WA0034		

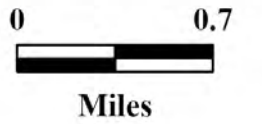
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-28:
Spatial Assessment of TSS in Tributaries to
Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Clusters with insufficient data were removed from map



Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins

E. coli 90th Percentile 2010-2020
MPN/100mL

- 0 - 100
- 100 - 200
- 200 - 300
- 300 - 410
- > 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-29:
Spatial Assessment of E. coli in Tributaries
to Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Stations	Start Year	End Year
Trib 1	21FLTLHRG1TLHR0126	2020	2021
Trib 2	21FLPNS 302937008418410	2011	2021
	21FLTLHRG1TLHR0127		
Trib 3	21FLCOT LJB01	2015	2021
Trib 4	21FLPNS 809-A	2011	2021
	21FLTLHRG1TLHR0128		
	21FLWQA G1WA0033		
Trib 5	21FLTLHRG1TLHR0069	2017	2021
Trib 6	21FLLEONLCLJ3050684284	2010	2020
	21FLTLHRG1TLHR0088		
Trib 7	21FLLEONLCLJ3051984334	2010	2019
	21FLPNS 303033708419508		
	21FLWQA G1WA0034		

Clusters with insufficient data were removed from map



0 0.7
Miles

Legend

- Lake Jackson
- Waterbodies in Study
- Watercourses
- Subbasins
- City of Tallahassee Stormwater Ponds
- Stormwater Ponds (Other)
- Leon County Stormwater Ponds
- FDOT Stormwater Ponds
- I-10/Megginnis Arm Treatment Facility

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021
BMPs: COT, 2020

Figure 4-30:
BMPs near Tributary Inflows to Lake Jackson

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec
consultants

4.4.4.3 Septic Systems

Figure 4-31 presents a map showing the septic tank densities by watershed to aid in identifying the areas more likely to be sources of loading to the lake. Examination of the figure shows that the highest density watersheds are in the areas along the southern and southwestern side of the lake, with densities ranging from 0.64 to 0.96 units per acre, including the following:

- Harbinwood
- Bellwood
- Okeeheepkee
- An unnamed watershed in the Lakeshore area.

The next level of density can be found in numerous watershed areas surrounding the lake, including the direct discharge areas, i.e., those areas immediately adjacent to the lake. For the calculation of the densities in this area, the lake area was removed. The densities in these watersheds range from 0.31 to 0.59 unit per acre. The densities in the Lake Overstreet Drain and within Lake Hall are somewhat lower, ranging from 0.13 to 0.17. Finally, areas to the north (other than Summerbrooke) and the Megginnis Arm subbasin (which is within the incorporated area of the city and generally sewerred) have the lowest densities.

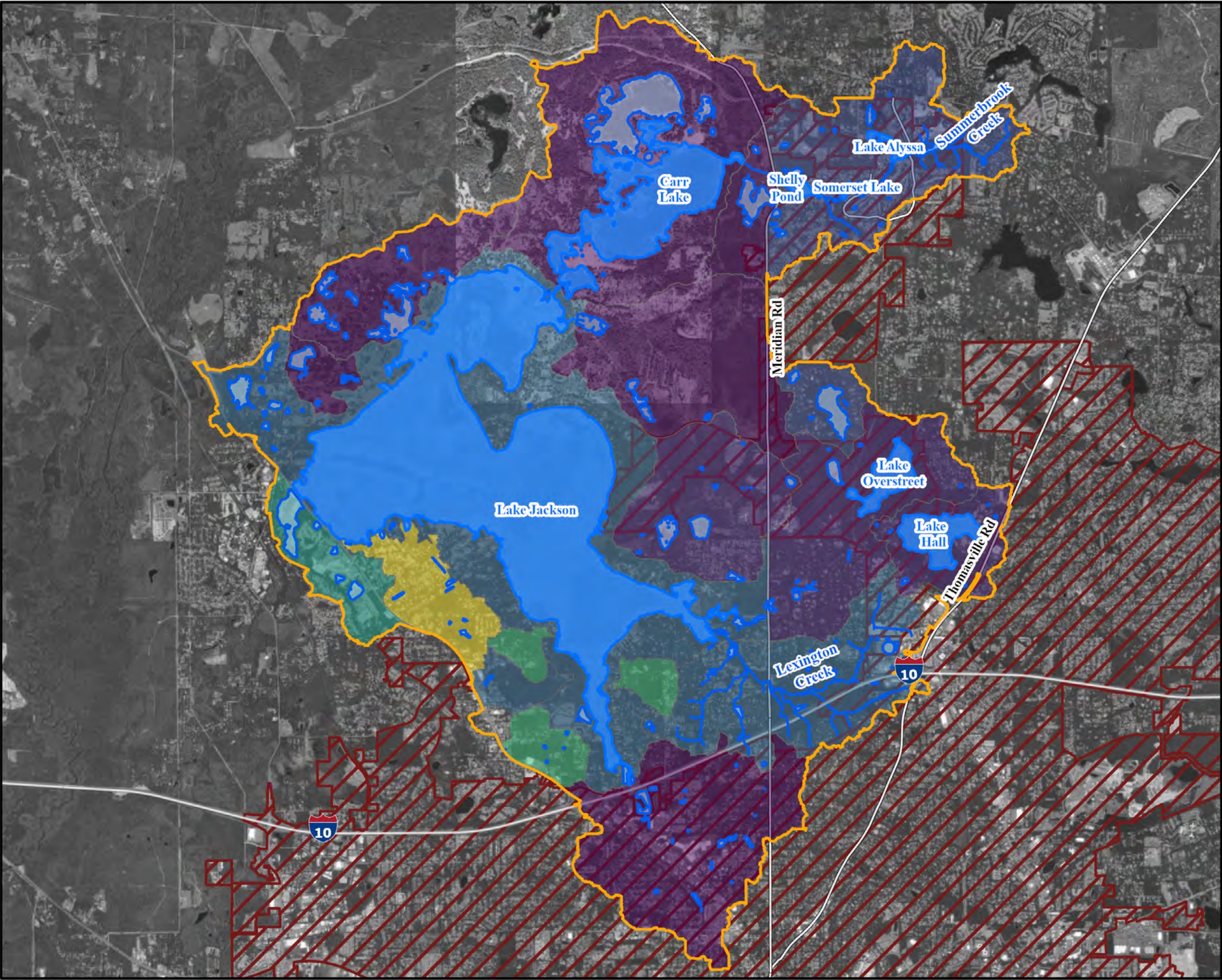
As outlined earlier, historical studies have not provided a definitive quantification of the impacts of septic system loading on the lake, but numerous studies have named them as a potential source. Based on the densities shown, and issues identified earlier on soil conditions in some of the higher density areas, septic systems are a potential source and should be further evaluated to determine potential loading.

4.4.4.4 Internal Recycling and Seepage

Internal Recycling

Lake Jackson's unique hydrology and restoration project history has direct impacts upon the potential for internal lake sediment/recycling as a source of loading. The natural dry-out of the lake bottom creates conditions where a significant portion of the bottom sediments are periodically desiccated. Additionally, in the late 1990s, a large volume of sediments (nearly 3 million cubic yards) was removed from the southern lobe of the lake where Megginnis and Fords Arm drain. This was to mitigate historical sediment loading prior to the installation of treatment in this highly developed area and the build up of organic muck. Finally, Lake Jackson is a closed basin. Therefore, the nutrients either accumulate in the sediments or are taken up by plants. These aspects impact the potential for sediment recycling as a potential source.

Historical studies (LaRock, 1991) determined that sediment flux was on the same order of magnitude as stormwater as a source of nutrient loads. While this study accounted for the periodic dry-out of the lake sediments, it did not account for the sediment removal that occurred in the late 1990s. This removal targeted much of the anthropogenic organic soils that would account for areas where nutrient flux was significant. As such, it is expected that the overall levels of nutrient sediment flux have been reduced and play a lesser role today.



Legend

- Lake Jackson Drainage Basin
- Waterbodies in Study
- Waterbodies
- Tallahassee Corporate Limits
- Septic Tank Density
- Density
- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9
- 0.9 - 1

Sources:
 Waterbodies: COT, 2020
 Drainage Basins: COT, 2020
 Roads: COT-Leon County, 2023
 City Limits: COT, 2020
 Septic Tanks: COT, 2020

Figure 4-31:
 Septic Tank Density by Sub-Basin within Lake
 Jackson Drainage Basin

Tallahassee Master Plan - Surface
 Water (TMAPS)



One aspect of the sediment removal that has been identified in past reports is that the total volume removed was larger than needed to get back to historical conditions. Examination of aerial photography presented earlier shows that the depths in the southern lobe have increased from historical conditions (pre circa 2000). This reduces the potential for aquatic vegetative growth in this area, the largest store of nutrients in the system. Additionally, the sediment removal can result in lake bottom substrate that is susceptible to propagation of undesirable exotic species such as hydrilla. As a result, these areas of the lake require herbicide treatment that may limit the re-establishment of native vegetation. As communicated by City personnel, recent evaluations of the southern lobe have not identified any areas of significant build up of organic material and, therefore, are not suggestive of significant potential internal recycling nutrient loads within the excavated area.

Seepage

As outlined in the data summary (**Section 4.4.3.11**), there are very few surficial sampling wells in the area that might provide direct data on the potential for seepage as a source.

Figure 4-14 presented three surficial sampling wells in or near the Lake Jackson basin. Two of the wells are located outside of the Lake Jackson basin boundaries. These wells are associated with sprayfields for Talquin Electric and, therefore, would not be suitable for general surficial aquifer conditions. The third site is north of Carr Lake and would provide data more appropriate to seepage to Carr Lake.

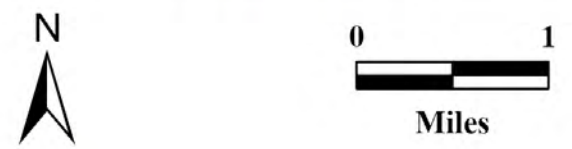
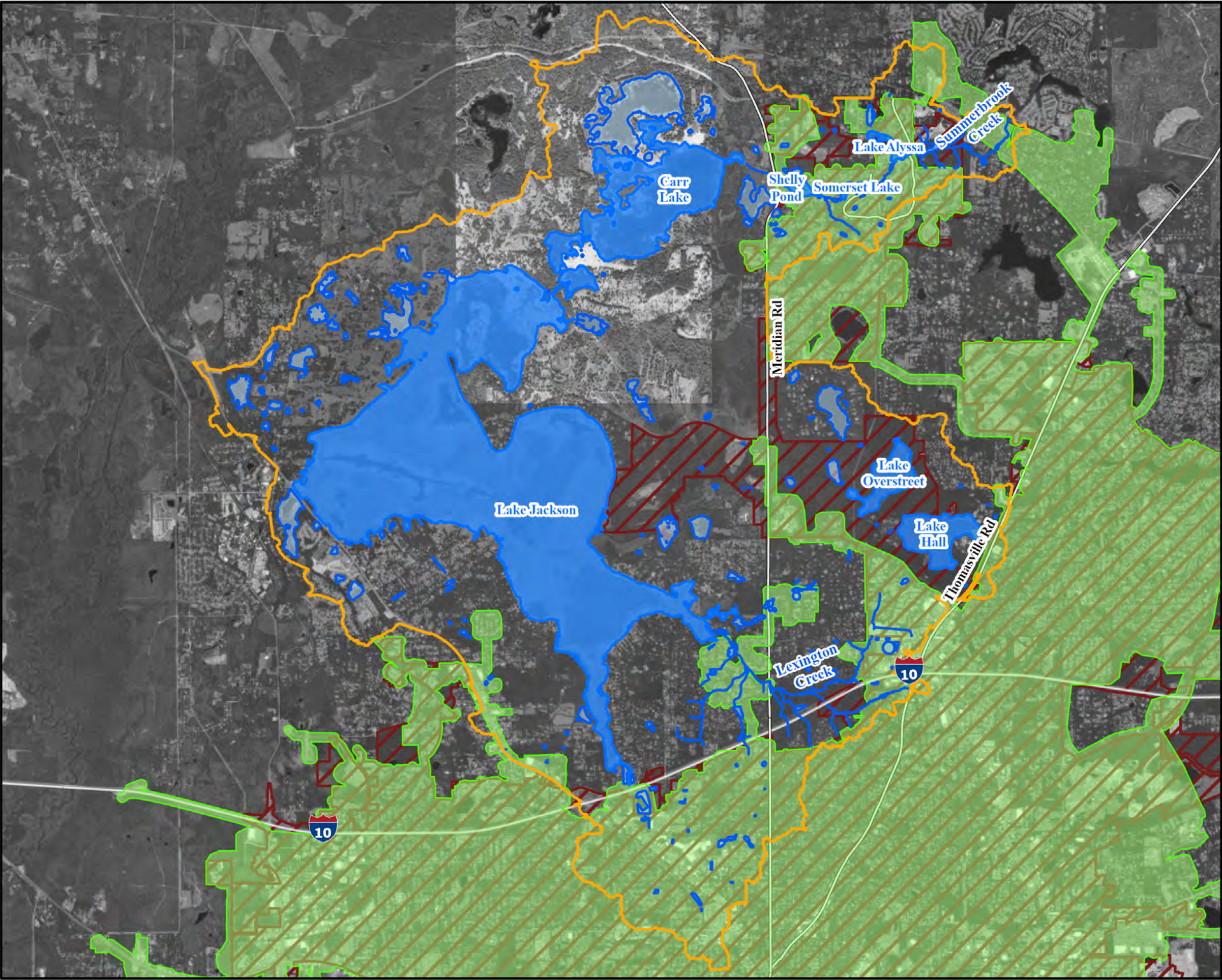
The primary potential source of pollutants to the surficial aquifer in the areas surrounding Lake Jackson are septic systems. **Section 4.4.4.3** provides an assessment of septic systems as a source and, therefore, addresses their source potential.

4.4.4.5 Wastewater

Within the Lake Jackson basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. Two sprayfields operated by Talquin are located in areas adjacent to the basin. These locations are shown in **Figure 4-14** as two groundwater wells that monitor the sites. Based on the lack of direct wastewater discharge, the primary potential for wastewater loading to Lake Jackson comes from leakage or the potential of spills from existing wastewater infrastructure.

Figure 4-32 presents a map of the Lake Jackson basin boundaries in relation to sewer service areas. Sewer infrastructure within the basin is located along the southern end in the Megginnis and Fords Arm drainageways. Additionally, there is infrastructure in the Lake Overstreet Drain and Summerbrook watersheds.

Within the Megginnis Creek watershed, the available data from the tributaries did not show elevated nutrient or FIB levels in relation to other sub-watersheds. Relative to *E. coli* (**Figure 4-29**), the levels upstream and downstream of the MARS Facility were lower than in other tributaries. This indicates that there is not a persistent source associated with wastewater leakage in this area.



- Legend**
- Lake Jackson Drainage Basin
 - Waterbodies in Study
 - Waterbodies
 - Tallahassee Corporate Limits
 - Sewer Service Area

Sources:
Waterbodies: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Waste Water: COT, 2020

Figure 4-32:
City of Tallahassee Wastewater Features Within
and Adjacent to Lake Jackson Drainage Basin

Tallahassee Master Plan - Surface
Water (TMaPS)



While sanitary sewer overflows (SSOs) occur from time to time, SSOs are acute events with impacts lasting for relatively short periods of time (hours to several days), depending on magnitude and environmental conditions. The mechanism for abatement would not be treatment projects but rather any needed maintenance to sewer infrastructure. The City presently tracks, reports, and addresses these issues as they arise.

4.4.4.6 Atmospheric Deposition

Atmospheric deposition is the load that falls directly onto the earth's surface. For this and future analyses, atmospheric deposition is accounted for both indirectly within stormwater runoff and directly as a load to the lake surface. In watersheds with a smaller watershed-to-lake area ratio (such as Lake Jackson), atmospheric deposition can play significant role in overall loading. As such, it should be considered in the assessment of loads to the lake. It is important to note that project-specific recommendations made within this report will not address direct deposition on the lake surface as a source, but its quantification relative to other sources is important.

As outlined in **Section 4.4.3.11**, there is an atmospheric deposition station in the vicinity of Tallahassee. This station is the Quincy station (FL14) (**Figure 4-15**). Data from this station is utilized to calculate the atmospheric deposition to Lake Jackson and other lakes within the basin.

Atmospheric deposition is a function of air quality that is able to be improved through regulation and public outreach. Analysis of atmospheric deposition and impacts from it was outside of the project scope and, therefore, will not be assessed in this report.

4.4.4.7 Interconnected Flows

There are four lakes identified with surface connections and the potential to flow into Lake Jackson. These are Little Lake Jackson, Carr Lake, Pints Pond, and Lake Overstreet. The individual waterbodies, the connections, and their potential to contribute load to Lake Jackson are discussed below.

Little Lake Jackson has a surface area of about 59 acres and is mainly surrounded by residential land use as well as some forested area. Little Lake Jackson connects to Lake Jackson through a crossing under Monroe Street, which acts as a buffer between the two lakes. There is no current water quality data for Little Lake Jackson so potential impacts from the connection cannot be assessed. The dynamics of the connection between waterbodies and whether it is unidirectional is also not known. Based on the size differences between the two lakes and land use surrounding the connection to Little Lake Jackson, it is not a significant source of anthropogenic loads to Lake Jackson.

Carr Lake discharges out of the southwestern end of the lake and into a flow path that travels approximately 2,500 ft into the northeastern portion of Lake Jackson. Carr Lake's surface area is about 692 acres and is predominantly surrounded by forest, wetland, and urban land use. Carr lake has no listed impairments. This connection is not a concern for anthropogenic nutrient loading based on water quality conditions in Carr Lake. **Section 4.5.3.6** shows that the concentrations in Carr Lake are lower than Lake Jackson and Carr Lake is not impaired for nutrients or any other parameters.

Pints Pond is a small waterbody that is approximately 24 acres in size and mostly surrounded by coniferous forests with a small portion of residential housing to the south. Pints Pond discharges out of the western portion of the waterbody and the flow path length to Lake Jackson is around 7,500 ft. There is presently no data to assess Pints Pond or its potential impacts. FDEP does not have any water quality data on record for the waterbody and there is no calculated flow data available for the connection. Based on the nature of the land use surrounding Pints Pond and its small size relative to Lake Jackson, it is not a significant potential anthropogenic nutrient load.

Lake Overstreet discharges out of its southwestern end. The flow path is the longest of all the inflows to Lake Jackson and stretches almost 20,000 ft before entering the eastern portion of Lake Jackson through Fords Arm. Lake Overstreet's 144-acre surface area is wholly surrounded by upland forest. This connection is not a concern for anthropogenic nutrient loading based on the water quality in Lake Overstreet. **Section 4.5.3.6** shows that the concentrations in Lake Overstreet are generally lower than Lake Jackson, and Lake Overstreet is not impaired for nutrients or any other parameters.

4.4.4.8 Summary of Findings

Based on the discussions above and data and information presented in **Section 4.6.3**, there are various potential sources of pollutant loads to Lake Jackson that should be targeted for further evaluation. As described earlier, the lake as a whole is not presently impaired for nutrients or Chl-a, but the AGM data show the system is close to being impaired and may become impaired in subsequent assessment cycles. The spatial analyses show levels above the NNC thresholds for Chl-a and TP within the southern (Fords Arm and Megginnis Arm area) and western sides of the lake. The analyses of tributary data identify that there are elevated nutrient and FIB levels within tributaries draining to the southern and western parts of the lake. This is especially true where there is less direct (in-line) treatment and higher LDI levels (Lexington Creek, Lake Jackson Mounds, and others). The following outlines the findings for each of the potential pollutant sources discussed above.

- Stormwater Runoff – Stormwater runoff, contributing to tributary inflow loads, is identified as a potential source of pollutants to Lake Jackson, with a focus on the southern and western sides.
- Septic Systems – Loads from septic system are identified as a potential source of pollutants to Lake Jackson, with a focus on areas with the highest septic densities and proximity of units to the lake and tributaries flowing into the lake.
- Interconnected Flows – Loading from adjacent lakes that drain to Lake Jackson is not deemed a significant source due to the generally pristine nature of the source lakes.
- Internal Recycling – Internal recycling is not identified as a potential significant load to Lake Jackson based upon historical dredging of organic rich sediments and recent evaluations showing limited muck build up subsequent to the sediment removal.
- Seepage – While no data on seepage into the lake is available, it is assumed that the primary source of seepage loads would be septic systems, which are assessed separately.

- Wastewater – No permitted point sources presently discharge within the Lake Jackson basin so direct wastewater discharge is not identified as a potential pollutant load. SSOs can contribute to loading but are short-term events that are typically addressed fairly quickly. Based on the available data and locations of sewer infrastructure, only the Lexington Creek area was identified for further evaluation of SSOs as a source. These are evaluated in **Section 4.9**, which focuses specifically on the Lexington Creek watershed.
- Atmospheric Deposition – Based on the relatively low ratio of the direct watershed discharge to Lake Jackson area, atmospheric deposition is identified as a potentially significant load. While this load is quantified for comparison to other loads, no recommendations will be made relative to potential reductions.

4.4.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Lake Jackson for the sources identified for calculation in **Section 4.4.4.8**. These include stormwater runoff, septic systems, interconnected flow and atmospheric deposition. Where loads were not calculated, the sections below provide brief discussions. The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another.

4.4.5.1 Stormwater Pollutant Load

To assess the potential stormwater TN and TP loads to Lake Jackson and other waterbodies within the Lake Jackson basin, average annual pollutant load modeling was performed. The goal was to identify areas that are contributing higher TN and TP loads relative to others within the drainage area to the waterbody and estimate a potential total load for comparison to other loading sources. TN and TP loads were calculated using the Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE-Seasonal) model. The approach described below was used for all project waterbodies within the Lake Jackson basin. Pollutant load models, such as the SIMPLE model, calculate loads by determining a volume of runoff from a specified area and then multiplying the runoff volume by EMCs. EMCs are concentrations of constituents (TN and TP in this case) that are found in runoff based on specified land uses.

SIMPLE-Seasonal Model Methodology

Pollutant loads from direct runoff for each subbasin are calculated using the SIMPLE-Seasonal model, originally developed by Jones Edmunds and Associates (Jones Edmunds) for Sarasota County and the Southwest Florida Water Management District (SWFWMD). The complete model development is documented in *Sarasota County County-Wide Non-Point Source Pollutant Loading Model* prepared by Jones Edmunds in August 2005. The model operates within a geographic information system (GIS) framework and is able to calculate pollutant loading over large areas with spatially variable characteristics, leveraging the runoff excess estimation methods described by Harper and Baker, 2007.

For the purposes of this project, the model was set up following the procedure outlined in the Hernando County guidance document developed by Jones Edmunds (Hernando County, 2013). It should be noted that when running the SIMPLE-Seasonal model, Geosyntec utilized default

model values to account for seasonal variability of rainfall. The model includes BMP, EMC, runoff, basins, septic, and point source feature classes. For the purposes of this project, the septic and point source feature classes were not utilized because those loads are quantified separately. TN and TP reductions due to the different types of BMPs are assigned in the BMP shapefile. The EMC shapefile includes the TN and TP EMCs based on the land use types. The runoff shapefile includes the land use, hydrologic soil group (HSG), and the average annual runoff coefficient, defined as the fraction of average annual rainfall volume converted to runoff. Finally, the basin shapefile includes the total acreages of each subbasin. No base flow was assigned for this analysis. The calculation of the pollutant load associated with the runoff was based on the Harper and Baker (2007) method of rainfall excess determination and pollutant loading. This method uses an average annual rainfall volume, which is multiplied by an average annual runoff coefficient to determine the average annual runoff volume. The average annual runoff coefficient is based on the percent directly connected impervious area (DCIA) and the non-DCIA curve number (CN), which are determined based on the land use and soil conditions. The average annual loading is determined by multiplying the average annual volume of runoff and the pollutant EMC.

The average annual rainfall depth for this watershed was estimated to be 59 inches using the Florida State University – Office of Institutional Research Tallahassee/Leon County, Florida.

The topography for the study area was analyzed via a Digital Elevation Model (DEM) from Leon County (2018). The elevations within the watershed range from approximately 255 ft down to approximately 64 ft, NAVD88 (**Figure 4-33**). The highest elevations appear in Elinor Klapp-Phipps Park and surrounding south portions of Lake Jackson. The lowest elevation is Lake Jackson.

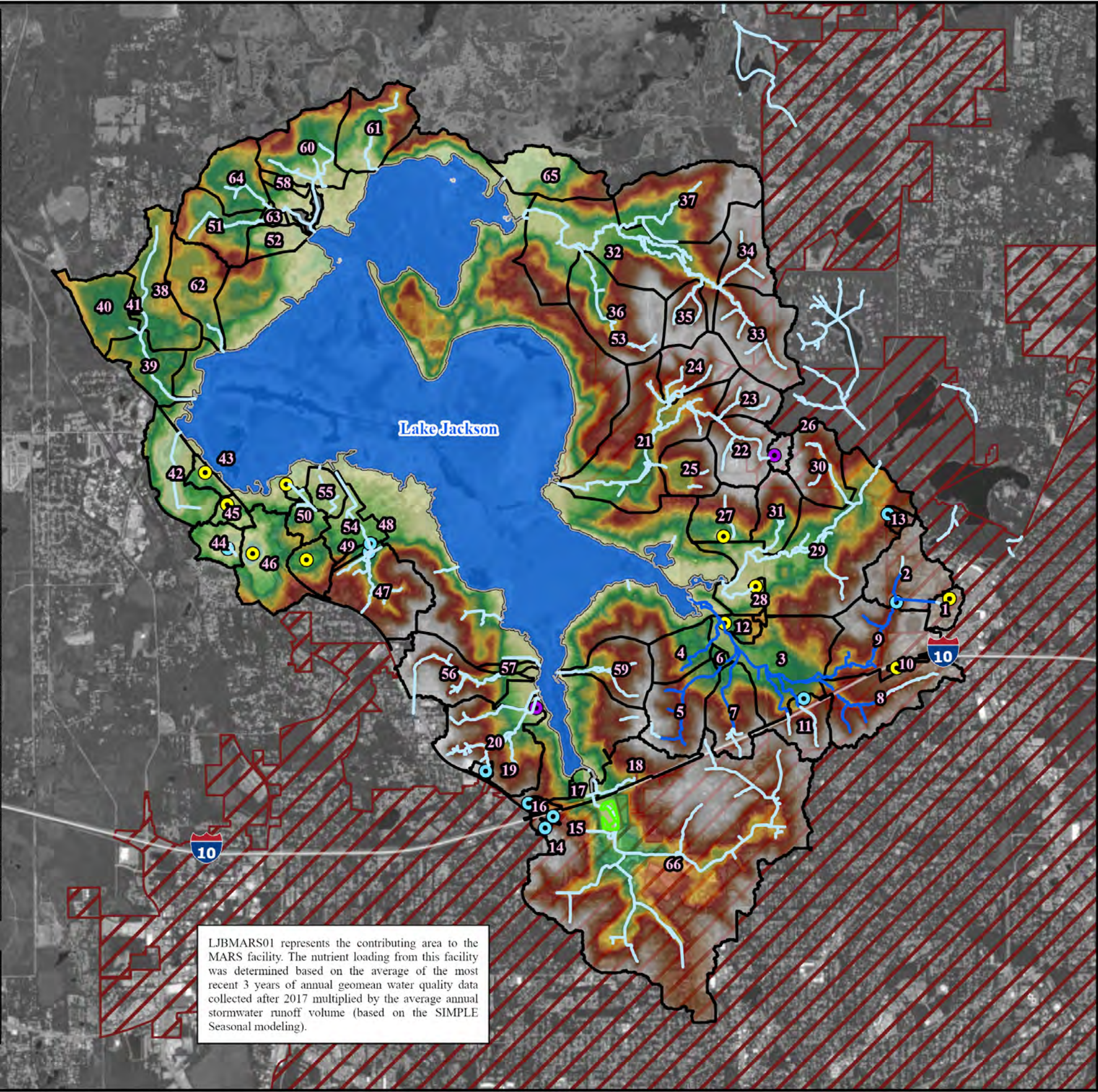
Subbasins were initially provided by the City within the Lake Jackson basin. For modeling purposes, subbasins were delineated to the BMP and the outfall level (**Figure 4-33**) to define where stormwater is generated and where it accumulates. The runoff volumes are estimated along with the associated pollutant loads. A total of 66 subbasins were delineated using the 2018 Leon County DEM and the flowlines from the USGS National Hydrological Data (NHD) (2020). The NHD represents the water drainage network within the study area, such as conduits, inlets, and junctions, and is used to delineate the watershed in a manner appropriate for the level of detail required for this study. The distribution of the subbasins, the subbasin sizes, and the BMP types for each are presented in **Figure 4-33**. Additionally, the treatment percentages utilized for each BMP type are presented.

The land use data used for this modeling effort referenced the 2019 NFWFMD feature class presented in **Section 0**. The data were manipulated for the purposes of this analysis as described below. First the NFWFMD land use data was aggregated into simplified land use categories as presented in the SIMPLE guidance document (Hernando County, 2013). This was done to generalize the watershed's land uses into 12 land use categories (**Figure 4-34**) which corresponded to available EMC data. A summary of how the land uses were aggregated is presented in **Table 4-5**.

Lake Jackson Subbasin Summary			
Number	Subbasin ID	Acres	BMP Type
1	LJBLC0010	49.2	None
2	LJBLC0020	210.4	Wet Detention
3	LJBLC0030	347.7	None
4	LJBLC0031	117.2	None
5	LJBLC0032	209.2	None
6	LJBLC0033	13.8	None
7	LJBLC0034	169.9	None
8	LJBLC0035	269.6	None
9	LJBLC0036	274.6	None
10	LJBLC0040	8.8	Wet Detention
11	LJBLC0050	120.9	Wet Detention
12	LJBLC0060	35.4	Dry Detention
13	LJBLJ0010	22.2	Dry Detention
14	LJBLJ0110	4.2	Dry Detention
15	LJBLJ0120	14.5	Dry Detention
16	LJBLJ0130	19.3	Dry Detention
17	LJBLJ0140	39.1	None
18	LJBLJ0150	123.7	None
19	LJBLJ0160	11.4	Dry Detention
20	LJBLJ0170	315.0	Wet Retention
21	LJBLJ0180	491.7	None
22	LJBLJ0181	164.1	None
23	LJBLJ0182	99.7	None
24	LJBLJ0183	157.7	None
25	LJBLJ0184	124.2	None
26	LJBLJ0190	30.7	Wet Retention
27	LJBLJ0200	147.3	Wet Detention
28	LJBLJ0210	14.2	Wet Detention
29	LJBLJ0220	708.9	None
30	LJBLJ0221	170.3	None
31	LJBLJ0222	128.4	None
32	LJBLJ0230	584.7	None
33	LJBLJ0231	269.7	None
34	LJBLJ0232	156.6	None
35	LJBLJ0233	99.5	None
36	LJBLJ0234	303.6	None
37	LJBLJ0235	371.1	None
38	LJBLJ0240	234.5	None
39	LJBLJ0241	135.2	None
40	LJBLJ0242	166.2	None
41	LJBLJ0243	8.3	None
42	LJBLJ0250	204.8	None
43	LJBLJ0260	36.3	Wet Detention
44	LJBLJ0270	78.9	Dry Detention
45	LJBLJ0280	40.5	Wet Detention
46	LJBLJ0290	226.8	Wet Detention
47	LJBLJ0300	271.7	Dry Detention
48	LJBLJ0310	17.2	Dry Detention
49	LJBLJ0320	79.8	Wet Detention
50	LJBLJ0330	69.8	Wet Detention
51	LJBLJ0340	170.6	None
52	LJBLJ0341	70.8	None
53	LJBLJ0350	3,261.1	None
54	LJBLJ0351	102.8	None
55	LJBLJ0352	62.8	None
56	LJBLJ0353	220.8	None
57	LJBLJ0354	19.1	None
58	LJBLJ0355	22.0	None
59	LJBLJ0356	156.2	None
60	LJBLJ0360	233.5	None
61	LJBLJ0365	218.7	None
62	LJBLJ0370	182.1	None
63	LJBLJ0380	18.7	None
64	LJBLJ0385	157.5	None
65	LJBLJ0390	181.8	None
66	LJBMARS01	2,033.9	Impoundment with Settling Basin and Filtration

BMP Type	Reduction Percentages	
	TN (%)	TP (%)
Wet Detention	30	65
Dry Retention	99	99
Wet Retention	80	80
Dry Detention	30	40

LJBMARS01 represents the contributing area to the MARS facility. The nutrient loading from this facility was determined based on the average of the most recent 3 years of annual geomean water quality data collected after 2017 multiplied by the average annual stormwater runoff volume (based on the SIMPLE Seasonal modeling).





CITY OF
TALLAHASSEE

N

0 0.9
Miles

Legend

- Subbasins
- Lake Jackson
- Lexington Creek
- Watercourses
- Tallahassee Corporate Limits
- MARS Impoundment with Settling Basin and Filtration
- BMP Type
 - Dry Detention
 - Wet Detention
 - Wet Retention
- Topographic Elevations
ft NAVD88
 - 255
 - 64

Sources:

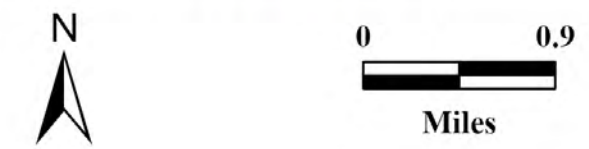
Waterbodies: COT, 2020	Sing Holes: Geosyntec, 2021
Watercourses: COT, 2020	Elevation: COT-Leon County, 2018
Subbasins: Geosyntec, 2023	City Limits: COT, 2020
Roads: COT-Leon County, 2023	
City Limits: COT, 2020	
BMPs: Geosyntec 2023	

Figure 4-33:
Lake Jackson Subbasin Delineation and
BMPs

Tallahassee Master Plan - Surface
Water (TMaPS)



The land uses presented in this map were derived from land cover data provided by NFWMD with guidance from the SIMPLE Seasonal model documentation.



- Legend**
- Lake Jackson Drainage Basin
 - Lake Jackson
 - Lexington Creek
 - Tallahassee Corporate Limits
 - Sinkholes
 - Aggregated Land Use
 - Land Use Type
 - Commercial and Services
 - General Agriculture
 - High-Density Residential
 - Highway
 - Light Industrial
 - Low-Density Residential
 - Low-Intensity Commercial
 - Medium-Density Residential
 - Recreational/Parks/Open Space
 - Undeveloped/Rangeland/Forest
 - Water
 - Wetlands

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Land Use: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Sing Holes: Geosyntec, 2021
Elevation: COT-Leon County, 2018
City Limits: COT, 2020

Figure 4-34:
Lake Jackson Aggregated Land Use
Tallahassee Master Plan - Surface Water (TMaPS)



Aggregated Land Use Summary		
SIMPLE	Area	Perecent
Commercial and Services	581	3.9%
General Agriculture	54	0.4%
High-Density Residential	409	2.7%
Highway	215	1.4%
Light Industrial	188	1.2%
Low-Density Residential	2,584	17.1%
Low-Intensity Commercial	258	1.7%
Medium-Density Residential	2,293	15.2%
Recreational/Parks/Open Space	91	0.6%
Undeveloped/Rangeland/Forest	6,339	42.0%
Water	140	0.9%
Wetlands	1,929	12.8%

Table 4-5: Aggregated Land Use

FLUCCS Code	FLUCCS Description	SIMPLE-Seasonal Aggregated Description
1100	Low Density Residential	Low Density Residential
1200	Medium Density Residential	Medium Density Residential
1300	High Density Residential	High Density Residential
1400	Commercial and Services	Commercial and Services
1700	Institutional	Low Intensity Commercial
1800	Community Recreational Facilities	Recreational/Parks/Open Space
1900	Open Land	Recreational/Parks/Open Space
2100	Cropland and Pastureland	Undeveloped/Rangeland/Forest
2200	Tree Crops	General Agriculture
2500	Specialty Farms	General Agriculture
3100	Range Land, Herbaceous (Dry Prairie)	Undeveloped/Rangeland/Forest
3200	Shrub and Brushland	Undeveloped/Rangeland/Forest
3300	Mixed Rangeland	Undeveloped/Rangeland/Forest
4100	Upland Coniferous Forests	Undeveloped/Rangeland/Forest
4200	Upland Hardwood Forests	Undeveloped/Rangeland/Forest
4300	Hardwood Coniferous - Mixed	Undeveloped/Rangeland/Forest
4400	Forest Regeneration Areas	Undeveloped/Rangeland/Forest
5200	Lakes	Water
5300	Reservoirs	Water
6100	Wetland Hardwood Forests	Wetlands
6200	Wetland Coniferous Forests	Wetlands
6300	Wetland Forested Mixed	Wetlands
6400	Vegetated Non-Forested Wetlands	Wetlands
6500	Non-Vegetated Wetlands	Wetlands
7400	Disturbed Lands	Undeveloped/Rangeland/Forest
8100	Transportation	Highway
8200	Communications	Light Industrial
8300	Utilities	Light Industrial

Note:

1. The aggregated descriptions are based on guidance from the SIMPLE-Seasonal Model guidance document.

As previously mentioned, the SIMPLE-Seasonal model uses the Harper and Baker (2007) method to determine stormwater pollutant loads. Specifically, a mean annual runoff coefficient (MARC) and the average annual rainfall depth are used to estimate average annual runoff volumes. The MARCs for all land use categories were developed based on the annual runoff coefficients for Meteorological Zone 1 in the draft *Florida Stormwater Quality Applicants Handbook* (FSQAH) (FDEP, 2010). The MARCs are assigned based on the percent DCIA and the non-DCIA CN. Impervious areas within representative areas for each simplified land use type were digitized to estimate representative DCIA and impervious percentages. The representative DCIA and impervious percentages were used for each land use with the values used provided in **Table 4-6**.

Table 4-6: Land Use DCIA and Non-DCIA Percentages

FLUCCS Code	FLUCCS Description	% Impervious	% DCIA	% Pervious
1100	Low Density Residential	11	3	89
1200	Medium Density Residential	37	12	63
1300	High Density Residential	38	18	62
1400	Commercial and Services	58	58	42
1700	Institutional	44	38	56
1800	Community Recreational Facilities	29	18	71
1900	Open Land	0	0	100
2100	Cropland and Pastureland	0	0	100
2200	Tree Crops	0	0	100
2500	Specialty Farms	0	0	100
3100	Range Land, Herbaceous (Dry Prairie)	0	0	100
3200	Shrub and Brushland	0	0	100
3300	Mixed Rangeland	0	0	100
4100	Upland Coniferous Forests	0	0	100
4200	Upland Hardwood Forests	0	0	100
4300	Hardwood Coniferous – Mixed	0	0	100
4400	Forest Regeneration Areas	0	0	100
5200	Lakes	100	100	0
5300	Reservoirs	100	100	0
6100	Wetland Hardwood Forests	100	100	0
6200	Wetland Coniferous Forests	100	100	0
6300	Wetland Forested Mixed	100	100	0
6400	Vegetated Non-Forested Wetlands	100	100	0
6500	Non-Vegetated Wetlands	100	100	0
7400	Disturbed Lands	4	0	96
8100	Transportation	72	38	28
8200	Communications	12	1	88
8300	Utilities	22	22	78

The non-DCIA CNs were calculated based on the percent impervious, minus the DCIA percentage, and the pervious fractions, which were based on open space in good condition and the soil hydraulic group. The impervious areas were assigned a CN value of 98. A lookup table was developed to relate soil hydrologic group to pervious area CNs [see **Table 4-7**, which were referenced from the USDA Urban Hydrology for Small Watersheds (TR-55) (June 1986)]. The overall non-DCIA CNs were then determined by taking an area-weighted average of the impervious and pervious fractions of the non-DCIA CNs.

Table 4-7: Curve Number Lookup Table

Land Use	A	B	C	D	W
Open Space in Good Condition (Grass Cover > 75%)	39	61	74	80	100
Water	100	100	100	100	100
Wetlands	100	100	100	100	100

The soils data used for this modeling effort were presented in **Section 4.4.3.3**. Stormwater runoff is generated when the rate of rainfall exceeds the infiltration capacity of the site soils, resulting in water flow along the land surface. For pits and urban land, soil types were assumed to be HSG D soil group. When dual HSGs were found, an average value was assigned (i.e., soils A/D were assigned a B runoff potential, soils B/D were assigned a C runoff potential, soils C/D were assigned a D runoff potential). This assumption is appropriate because the SIMPLE-Seasonal model is based on an average annual analysis and dual-classed soils will sometimes behave as one hydrologic group and other times behave as the other. If the worst-case hydrologic group is taken, as is done for event-based floodplain modeling, it would result in an over estimation of volume of stormwater generated and thus pollutant loading.

Pollutant loads for direct runoff are determined by multiplying the average annual runoff volumes by the appropriate EMCs. The EMC values used for this study were a combination of values determined by the City (2015) and those reported by Harper and Baker (2007). Water and wetland land use types were assigned a value of zero (0) as they are assumed in this analysis to not contribute pollutants but act as a pollutant sink. **Table 4-8** shows the EMC values used for the SIMPLE-Seasonal model. Mean annual runoff coefficients were calculated for each polygon resulting from the intersection of the land use layer and the soils layer, based on the FSQAH (FDEP, 2010).

Table 4-8: Event Mean Concentration by Land Use

SIMPLE-Seasonal Aggregated Description	TP (mg/L)	TN (mg/L)	Reference
General Agriculture	0.94	1.32	City, 2015
High Density Residential	0.43	1.58	City, 2015
Commercial and Services	0.22	1.05	City, 2015
Highway	0.22	1.64	Harper, 2007
Light Industrial	0.13	1.22	City, 2015
Low Density Residential	0.27	1.18	City, 2015
Low Intensity Commercial ¹	0.18	1.18	Harper, 2007
Medium Density Residential	0.43	1.58	City, 2015
Water ²	0.0	0.0	-
Wetlands ²	0.0	0.0	-
Undeveloped/Rangeland/Forest	0.11	0.79	City, 2015
Recreational/Parks/Open Space	1.13	2.33	City, 2015

Note:

1. Low density commercial land use type was used for institutional land use type.
2. EMCs assumed to be zero (0) since water bodies and wetlands are typically assumed to be sinks and not sources of pollutant loads within a watershed.

Water quality treatment provided by existing BMPs within the subbasins were considered as part of this analysis. Runoff BMPs were identified and classified as wet detention, wet retention, dry retention, or dry detention. Aerial imagery, 2018 Leon County DEM, and BMP shapefiles from the City, Leon County, and FDOT were reviewed to identify BMPs within the subbasins draining to Lake Jackson greater than 1 acre. **Figure 4-33** shows the BMPs by subbasin. The BMPs were assigned a removal efficiency based on the type of practice. The removal efficiencies for BMPs are provided in **Table 4-9** and also on **Figure 4-33**. The values were based on the study conducted by Harper and Baker (2007) and the draft Environmental Resource Permit (ERP) Applicant's Handbook (AH) Volume I Section 8 from FDEP (2022). Based on guidance from the City, all the dry detention ponds were assumed to have sand filters due to local land development regulations.

Table 4-9: Direct Runoff BMP Removal Efficiencies

BMP Type	TN (%)	TP (%)
Wet Detention ¹	30	65
Wet Retention ²	80	80
Dry Retention ¹	99	99
Dry Detention ¹	30	40

Note:

1. The values were from H. Harper and D. Baker, *Evaluation of Current Stormwater Design Criteria within the State of Florida* (June 2007).
2. Stormwater quality nutrient permitting requirements (FDEP 2022)

Natural depressions, wetlands, and natural waterbodies were not included as BMPs since removal efficiencies are based on retaining a certain design volume from engineered systems. Additionally, as outlined previously, any BMP less than 1 acre was not considered due to the scale of this study. Based on the assumptions outlined above, the SIMPLE modeling presented for Lake Jackson and subsequent waterbodies has the potential to calculate high load values due to not considering removal associated with natural features and small local BMPs as well as other processes. As such, the purpose of the SIMPLE model is to provide total loads and per acre loading for comparison between contributing areas around the waterbody, and total loads for comparison to other loading sources to the waterbody.

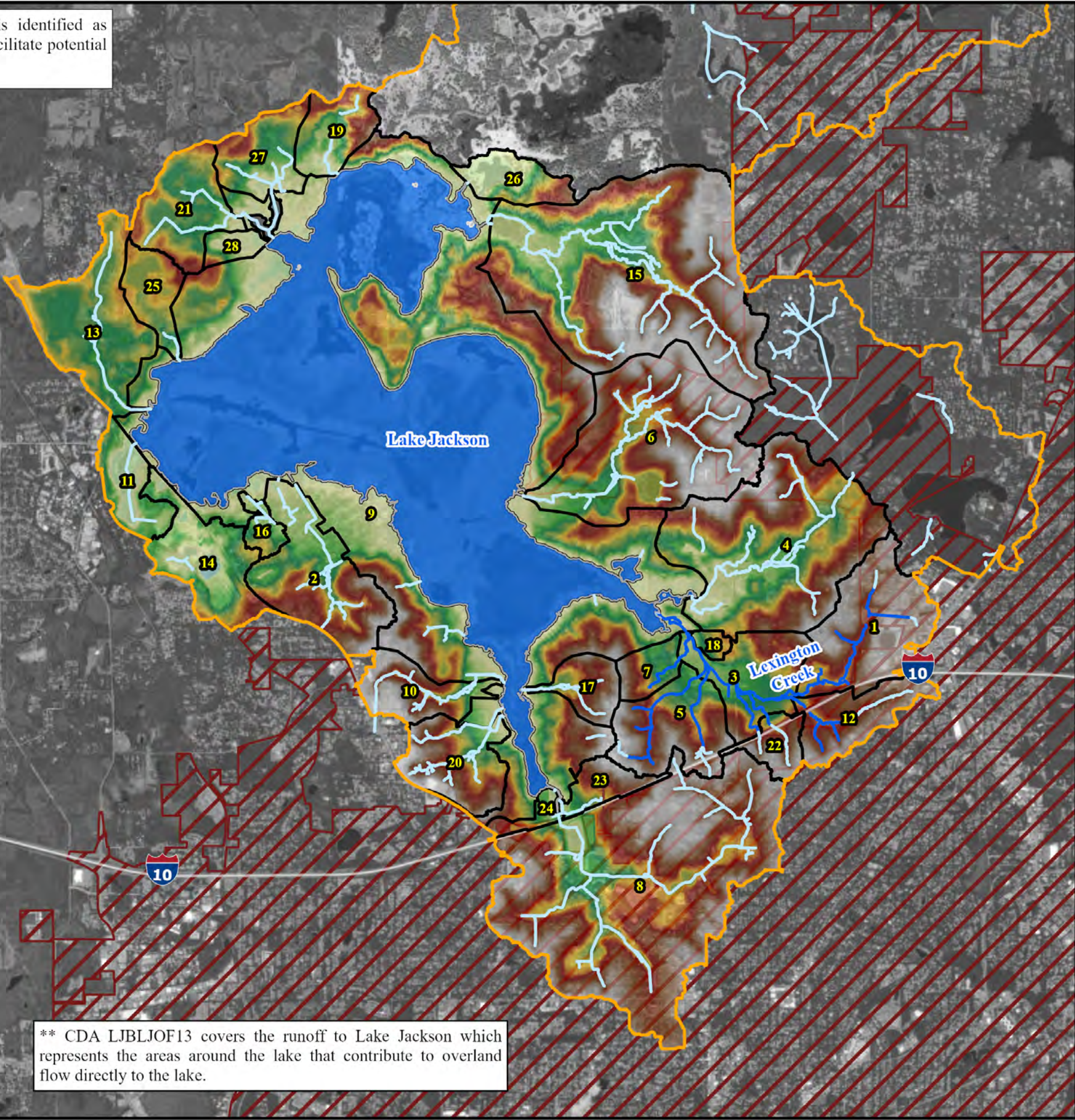
For the purposes of the loading calculations, the subbasins were grouped into Concentrated Discharge Areas (CDA) which represent discrete areas of loading to Lake Jackson. The loads from the subbasins were then summed for each of the CDAs. **Figure 4-35** presents the CDAs along with their associated acreage. The CDAs represent the discrete areas upon which evaluations of total loading and per acre loading are presented below.

Utilizing the calculated total loads and the per acre loads, the various CDAs were ranked. The approach for the ranking was to order the total loads and the per acre load from lowest to highest and assign a numeric order number for each waterbody, where the highest load would receive the higher numeric order number and the lowest load would receive the lower. This represents a score that can be used to identify CDAs of interest. The two scores were then added together (total load rank and per acre load rank) to get a total score. These were then ordered from highest to lowest value to define the ranking.

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

Summary of Concentrated Discharge Area		
Number	CDA ID	Acres
1	LJBLCOF05	543.0
2	LJBLJOF14	534.2
3	LJBLCOF01	347.7
4	LJBLJOF06	1,191.4
5	LJBLCOF03	392.9
6	LJBLJOF05	1,068.1
7	LJBLCOF02	117.2
8	LJBMARS01	2,052.6
9	LJBLJOF13	3,261.0
10	LJBLJOF15	239.9
11	LJBLJOF09	204.8
12	LJBLCOF04	269.6
13	LJBLJOF08	544.2
14	LJBLJOF10	382.5
15	LJBLJOF07	1,785.2
16	LJBLJOF11	69.8
17	LJBLJOF16	156.2
18	LJBLCOF07	35.4
19	LJBLJOF18	218.7
20	LJBLJOF04	326.4
21	LJBLJOF20	346.8
22	LJBLCOF06	120.9
23	LJBLJOF03	123.7
24	LJBLJOF02	58.4
25	LJBLJOF19	182.1
26	LJBLJOF21	181.8
27	LJBLJOF17	255.4
28	LJBLJOF12	70.8

** CDA LJBLJOF13 covers the runoff to Lake Jackson which represents the areas around the lake that contribute to overland flow directly to the lake.





CITY OF
TALLAHASSEE

N

0 0.9
Miles

Legend

- Lake Jackson Drainage Basin
- Lake Jackson
- Lexington Creek
- Concentrated Discharge Areas
- Watercourses
- Tallahassee Corporate Limits

Topographic Elevations
ft NAVD88

255
64

Sources:

Waterbodies: COT, 2020	Sing Holes: Geosyntec, 2021
Watercourses: COT, 2020	Elevation: COT-Leon County, 2018
CDAs: Geosyntec, 2023	City Limits: COT, 2020
Roads: COT-Leon County, 2023	
City Limits: COT, 2020	

Figure 4-35:
Lake Jackson Concentrated Discharge
Areas

Tallahassee Master Plan - Surface
Water (TMaPS)



The goal was for the ranking to consider both the total load from an area (which allows focus on areas with significant load) along with the per-acre loading (which allows focus on areas with high discharge concentrations or greater anthropogenic impact). The combining of the two allows focus on both available load for reduction and targeted higher concentration areas that represent greater opportunity for treatment.

Stormwater Nutrient Loads to Lake Jackson

For the load coming out of the MARS Facility upstream of Megginnis Arm, measured water quality data from downstream of the impoundment was used for the load calculation out of CDA LJBARS01. The data were collected at Station LJB01 and were part of the data sets presented in earlier sections. The water quality at this station is representative of discharge from the MARS Facility prior to entering the polishing wetland system. The runoff volume calculated from the SIMPLE-Seasonal model was used as the volume discharged from the system. The TN and TP loads were then calculated by multiplying the volume by the measured average TN and TP concentrations (**Table 4-10**). The average value of the most recent 3 years of geometric mean TN and TP data was used for the load calculations. It is noted that no data earlier than 2017 were used for this analysis because it is not considered representative of current conditions. This approach is different than the SIMPLE modeling approach presented earlier as it accounts for the removal processes that occur upstream and within the MARS Facility. This was done because of the nature of the MARS Facility as a significant and unique regional treatment system, along with the availability of sufficient water quality data to perform the calculation.

Table 4-10: Concentration Data, Volumes, and Calculated Loads Representing the Discharge from the MARS Treatment Facility

Station ID LJB01	Concentration (mg/L)	Year of data	Volume (ac-ft/yr) ¹	Loads (lb/yr)
Total N	0.435	2019-2021	2,717	3,212
Total P	0.078	2020-2022	2,717	574

Note:

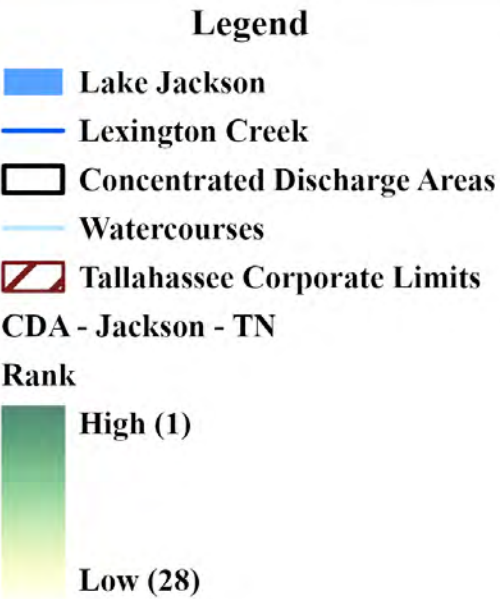
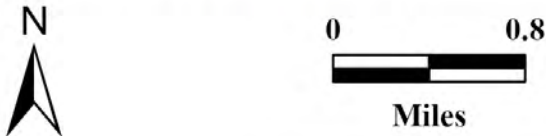
1. The value was calculated in SIMPLE-Seasonal Model.

Figure 4-36 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-36**). The rankings are color coded with the highest ranked CDAs in dark green, moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 24 pounds per year (lb/yr) up to 4,220 lb/yr. The per acre loads ranged from 0.34 pounds per acre per year (lb/acre/yr) up to 3.21 lb/acre/yr. The highest ranked CDAs were along Lexington Creek, the Overstreet Drain, and neighborhoods on the western side of the lake. The total potential stormwater runoff load for TN is 22,162 lb/yr.

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

Summary of concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBLCOF05	1,713.43	3.21	1
2	LJBLJOF14	1,549.32	2.56	2
14	LJBLJOF10	997.43	2.61	3
4	LJBLJOF06	2,182.76	1.83	4
8	LJBMARS01	3,212.27	1.56	5
3	LJBLCOF01	800.53	2.30	6
9	LJBLJOF13	4,220.11	1.29	7
12	LJBLCOF04	559.03	2.07	8
5	LJBLCOF03	771.59	1.96	9
7	LJBLCOF02	285.92	2.44	10
16	LJBLJOF11	181.68	2.60	11
10	LJBLJOF15	487.73	2.03	12
13	LJBLJOF08	787.59	1.45	13
6	LJBLJOF05	1,138.36	1.07	14
11	LJBLJOF09	365.96	1.79	15
18	LJBLCOF07	112.56	3.18	16
15	LJBLJOF07	1,241.94	0.70	17
23	LJBLJOF03	174.10	1.41	18
24	LJBLJOF02	112.37	1.92	19
21	LJBLJOF20	220.73	0.64	20
17	LJBLJOF16	155.97	1.00	21
19	LJBLJOF18	161.44	0.74	22
22	LJBLCOF06	144.76	1.20	23
27	LJBLJOF17	157.84	0.62	24
26	LJBLJOF21	137.80	0.76	25
20	LJBLJOF04	154.29	0.47	26
25	LJBLJOF19	110.29	0.61	27
28	LJBLJOF12	24.23	0.34	28
Total Load:		22,162.0		

** CDA LJBLJOF13 covers the runoff to Lake Jackson which represents the areas around the lake that contribute to overland flow directly to the lake.



Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Sing Holes: Geosyntec, 2021
Elevation: COT-Leon County, 2018
City Limits: COT, 2020

Figure 4-36:
Lake Jackson Concentrated Discharge
Areas – Total Nitrogen

Tallahassee Master Plan - Surface
Water (TMaPS)



Figure 4-37 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-37**). The calculated total stormwater TP loads from the CDAs ranged from as low as 3.4 lb/yr up to 894 lb/yr. The per acre loads ranged from 0.05 lb/acre/yr up to 0.63 lb/acre/yr. As was seen for TN, the highest ranked CDAs were along Lexington Creek, the Overstreet Drain, and a neighborhood on the western side of the lake, with some minor differences in overall ranking between the two constituents. The total potential stormwater runoff load for TP is 4,374 lb/yr.

4.4.5.2 Septic Load

Methodology

To quantify the potential nutrient load from septic tank units to Lake Jackson and other waterbodies within the Lake Jackson basin, the SPIL method, as adopted by FDEP, was utilized. The SPIL method calculates the TN load based on the number of septic tanks within a specified distance to the waterbody and an assumed loading of 9.012 lb of TN per person per year. Additionally, per the SPIL method, a percent loss of 50 percent is assumed as septic tank effluent moves through the unsaturated zone to groundwater.

The equation for estimating potential loading is:

$$S * P * I * L = \text{Total TN (lb) per year}$$

Where:

- **S** = Number of known septic tanks within 200 meters of a waterbody
- **P** = Average number of people per household
- **I** = Constituent annual load
- **L** = Percentage of nutrient loss during seepage

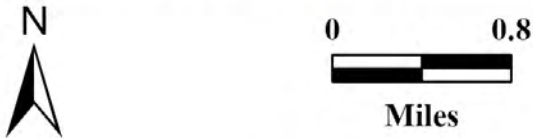
The latest available census data was utilized to calculate the 2.4 persons per household within Leon County. The buffer zone for selecting septic tanks was also applied to tributaries discharging to the waterbody of interest, as delineated by the City. The inclusion of the tributaries in the loading calculation deviates from the approach utilized by FDEP, but based on internal project team discussion, was felt to be a reasonable addition as these represent a direct connection to the waterbody.

The FDEP method only calculates TN load since the majority of phosphorous in septic tank effluent is assumed to be adsorbed onto soil particles before reaching the groundwater table. Published studies on phosphorus attenuation in groundwater show that phosphorus plumes from septic units typically do not extend beyond 50 meters, with approximately 96 percent of phosphorus removal occurring within the first 10 meters (Corbett et al., 2002; Robertson et al., 2019). Therefore, FDEP's decision to not include TP was followed in this study.

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs TP/yr)	Area Load (lbs TP/ac/yr)	Ranking
1	LJBLCOF05	326.3	0.61	1
2	LJBLJOF14	311.2	0.52	2
3	LJBLCOF01	207.4	0.60	2
4	LJBLJOF06	435.6	0.37	4
5	LJBLCOF03	176.9	0.45	5
6	LJBLJOF05	343.3	0.32	6
7	LJBLCOF02	73.7	0.63	6
8	LJBLJOF01	574.3	0.28	8
9	LJBLJOF13	894.8	0.27	8
10	LJBLJOF15	106.1	0.44	10
12	LJBLCOF04	105.2	0.39	11
11	LJBLJOF09	80.4	0.39	11
13	LJBLJOF08	164.0	0.30	13
14	LJBLJOF10	114.2	0.30	14
15	LJBLJOF07	195.1	0.11	15
16	LJBLJOF11	23.7	0.34	16
17	LJBLJOF16	31.3	0.20	17
18	LJBLCOF07	15.3	0.43	17
19	LJBLJOF18	24.8	0.11	19
20	LJBLJOF04	29.8	0.09	20
21	LJBLJOF20	31.3	0.09	20
22	LJBLCOF06	18.0	0.15	20
24	LJBLJOF02	10.6	0.18	23
25	LJBLJOF19	19.6	0.11	23
23	LJBLJOF03	15.9	0.13	23
26	LJBLJOF21	19.2	0.11	26
27	LJBLJOF17	22.0	0.09	27
28	LJBLJOF12	3.4	0.05	28
Total Load:		4,373.5		

** CDA LJBLJOF13 covers the runoff to Lake Jackson which represents the areas around the lake that contribute to overland flow directly to the lake.



Legend

- Lake Jackson
- Lexington Creek
- Concentrated Discharge Areas
- Watercourses
- Tallahassee Corporate Limits
- CDA - Jackson - TP
- Rank
 - High (1)
 - Low (28)

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Sing Holes: Geosyntec, 2021
Elevation: COT-Leon County, 2018
City Limits: COT, 2020

Figure 4-37:
Lake Jackson Concentrated Discharge
Areas – Total Phosphorus

Tallahassee Master Plan - Surface
Water (TMaPS)



The literature review also indicated that the 200-meter buffer around waterways that FDEP uses to capture septic tank TN contributions is a conservative approach. The literature suggests that most of the TN attenuation takes place within the first 10 meters (Corbett et al., 2022; Robertson et al., 2019; Van Stempvoort et al., 2021). For the purpose of identifying potential problem areas and based on general soil characteristics in and around tributaries and the lake (higher water table conditions), the 200-meter buffer (as defined by FDEP) for TN contributions was maintained. The watercourse layer provided by the City was used to assess the 200-meter buffer.

Based on the available literature on septic movement, it is understood that the approach presented herein may overpredict the nitrogen load to the waterbodies and, therefore, potentially represents a conservative potential load. Presently, further study is needed to better quantify septic loading to the lake and other waterbodies in the basin.

Results

An estimated 1,316 septic tank units were identified within 200 meters of Lake Jackson and primary tributaries that drain to Lake Jackson. **Figure 4-38** shows the septic systems utilized in this analysis, with green representing those associated with direct loading to the waterbody and pink representing those associated with loading to tributaries. A table provided on the figure summarizes the calculated nutrient load from septic units for Lake Jackson. Lake Jackson has an estimated annual TN load of 14,232 lb/yr. The majority of that load is from tributaries flowing into Lake Jackson. Direct septic loading to the lake is at about 3,071 lb/yr.

4.4.5.3 Point Source Load

A source of pollution that is discretely identifiable and from which pollutants are discharged is known as a point source. Common types of point sources include facilities like factories, paper/pulp mills, and water treatment plants. Effluent from these facilities can be discharged either directly to a waterbody or via land application on designated sprayfields. In either case, these discharges pose the potential to be a source of pollutants to waterbodies in the basin. This section of the report, and subsequent sections for other waterbodies, focuses on known point sources within the Lake Jackson basin and reviews their potential for impacting water quality as a function of loading, with a focus on TN and TP.

To identify potential point source discharges within the Lake Jackson basin, Discharge Monitoring Report (DMR) datasets provided by the City were reviewed along with a search of permits within FDEP's Oculus database. At present, no active permitted point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lake Jackson.

Location points of septic systems are digital estimations from related parcel locations and not meant to depict accuracy of unit location within the property.



Legend

- Lake Jackson Drainage Basin
- Lake Jackson
- Waterbodies in Study
- Watercourses
- Relevant Septic Sites
 - Lake
 - Tributaries

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 4-38:
Septic Loading to Lake Jackson
Tallahassee Master Plan - Surface Water (TMaPS)

Summary of Nutrient Loading from Septic			
Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Lake Jackson	3,071	13,010	16,081

Only septic units within 200 meters of the waterbody or its tributaries were selected and shown on this map as they are the sources of the calculated nutrient loads, the remainder of septic units that were not selected are not shown on the map.



4.4.5.4 Lake Inflow Load

Methodology

Surface water connections between waterbodies are inherently potential sources of pollutants to a downstream waterbody. This section, and others to follow, focuses on the interconnectivity of lakes within the Lake Jackson basin and their potential for impacting water quality as a function of loading from one lake to another. Estimation of this loading requires having flow and water quality data. When assessing the potential for inter-lake loading to Lake Jackson, and other lakes within the basin, the analyses will focus on nutrient loading (TN and TP) and considerations of impairment and nutrient concentrations in the upstream and downstream lakes.

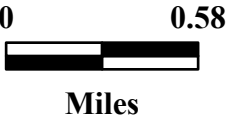
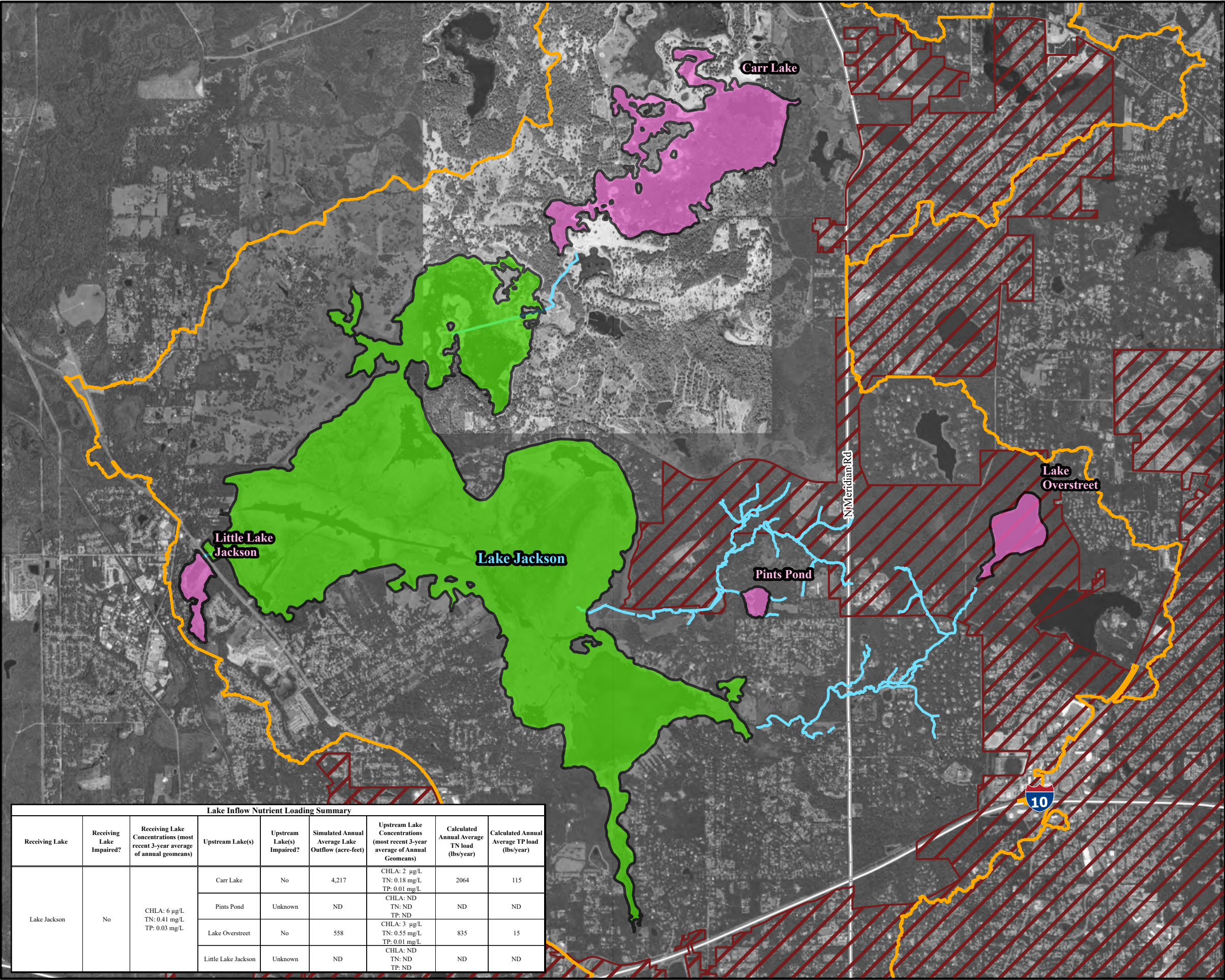
At present, there are no direct flow measurements immediately downstream of the lakes discussed as sources in this and subsequent sections. Therefore, to calculate annual nutrient loads out of the lakes (where nutrient concentration data are available), an average annual flow volume out must be calculated. To this end, the results from the SIMPLE-Seasonal modeling performed as part of the analysis presented in **Section 4.4.5.1** were used to estimate the annual average flows into the upstream lakes. The average annual flow into the lakes was then assumed to be equivalent to the average annual flow out (rainfall and evaporation generally being equivalent on an average annual basis). The calculated flows were then multiplied by TN and TP concentrations in the upstream lake. The TN and TP concentrations represent averages of the latest 3 years of geomeans with no data prior to 2017 utilized. This approach was utilized for all the lake loading calculations within the Lake Jackson basin where recent lake nutrient concentration data are available and direct inflows have been calculated using the SIMPLE-Seasonal model.

Results

There were four lakes identified with surface connections and the potential to flow into Lake Jackson in **Section 4.4.4.7**, Little Lake Jackson, Carr Lake, Pints Pond, and Lake Overstreet. While none were determined to be significant potential sources of pollutant loads to Lake Jackson, data are available to calculate the loads from Carr Lake and Lake Overstreet based on the methodology listed above. The following presents the loading from each.

The lakes and connections are shown in **Figure 4-39** along with a table that presents information on the water quality within the various waterbodies along with the calculated annual average flow and nutrient loads (where data allows). The waterbody concentrations (presented in the table on **Figure 4-39**) are based on the average of the latest 3 years of annual geomeans where data are available after 2017.

For Carr Lake, utilizing the calculated flow and the average in-lake concentrations, the TN and TP loads are 2,064 lb/yr and 115 lb/yr, respectively. For Lake Overstreet, utilizing the calculated flow and the average lake TN and TP concentrations, the loads were calculated as 835 lb/yr and 15 lb/yr, respectively.



Legend

- Lake Jackson Drainage Basin
- Lake Jackson
- Inflowing Lakes
- Flows Into Jackson
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-39:
Inflow Loading to Lake Jackson

Tallahassee Master Plan - Surface
Water (TMaPS)



4.4.5.5 Internal Lake Load

Internal recycling loads represent fluxes from benthic substrate that build up from the deposition of ongoing or legacy loads coming into a waterbody. Additionally, build up can also occur through the accumulation of organic material that settles following algal blooms. These algal blooms occur due to excess nutrient loading to the water column, which results in a positive feedback loop of benthic nutrient releases followed by algal blooms. Nutrients are bound into the benthic substrate and, under different conditions (depending upon the nature of the nutrients in the sediments), can be released into the water column. In many lakes within Florida, benthic flux, or internal recycling, can be a significant portion of the nutrient budget. While naturally occurring flux does occur, it is the portion caused by the excessive historical and/or ongoing anthropogenic impacts that would require remediation.

In the qualitative assessment of potential pollutant loads to Lake Jackson (**Section 4.4.4.4**), an assessment was made relative to the potential for anthropogenically driven internal loading to play a significant role in the nutrient balance of Lake Jackson. The assessment pointed out that historical studies identified internal recycling to be a significant portion of the loading to Lake Jackson. That is partially based on naturally occurring internal processes associated with the extensive vegetation cover throughout the lake. In the late 1990s, a large volume of sediments (nearly 3 million cubic yards) was removed from the southern lobe of the lake where Megginnis and Fords Arm drain. This effort was to mitigate historical sediment loading that occurred prior to the installation of upstream stormwater treatment throughout the subbasins for the highly developed area draining to these two inflows. Finally, the naturally occurring dry-out of the lake bottom, which was discussed in **Section 4.4.1**, creates conditions where a significant portion of the bottom sediments are periodically desiccated. A dry down of the lake recently occurred in 2021. The assessment in **Section 4.4.4.4** concluded that overall, the levels of nutrient flux from the sediments have likely been reduced compared to historical conditions. The earlier assessment also identified that recent evaluations of organic sediments within the excavated portion of the lake on the southern side did not show significant build up, supporting the premise that anthropogenic internal loading of nutrients is not an issue at present.

No direct data/studies were identified to quantify the present benthic flux conditions in Lake Jackson. A method for identifying the presence of benthic flux is the analysis of vertical profiles of water quality data, including specific conductance, dissolved oxygen (DO), temperature and nutrient species. Specific conductance measures the presence of ions in the water column. When benthic flux occurs, specific ions can flux into the water column, therefore a significant vertical variation or increase in near-bottom specific conductance can be an indication of benthic flux. Additionally, under anoxic conditions, orthophosphate (PO_4) liberates from iron and can flux into the water column. While profile data within Lake Jackson is limited due to its shallow nature, some locations did collect surface and near-bottom data. Evaluation of the available data for Lake Jackson identified three locations where surface and bottom data were collected. One was within the eastern side of the main lake, one was in the southeastern lobe just outside of where Megginnis Arm flows in, and one was in Megginnis Arm. **Table 4-11** shows a summary of this data for specific conductance and percent saturation. **Exhibit 4-7** in **Section 4.4.3.7** presented the locations of the water quality sampling stations. In all three locations, for all the samples, the bottom and surface specific conductance values were nearly identical. Only one of the samples (main lake station)

showed near anoxic conditions with the vertical variation in the other samples small. This limited information supports the idea of benthic flux playing a lesser role in Lake Jackson.

Table 4-11: Measurements of Vertical Variation in Specific Conductance and Percent Saturation within Lake Jackson

Station ID	Station Name	Date	Depth (m)	Percent Saturation (%)	Specific Conductance (umhos/cm)
21FLGW 55588	Z1-LL-13014 LAKE JACKSON	4/6/2016	0.3	76.7	33
			1.7	62.8	31
		5/23/19	0.3	77.9	39
			1.4	8.3	38
21FLTLHRG1 TLHR0123	Megginnis Arm off Fuller Road Ramp	1/15/2020	0.3	98.6	124.9
			2.1	88.9	125.9
21FLTLHRG1 TLHR0124	Megginnis Arm off Crowder Landing	2/10/2020	0.3	97.7	60.0
			1.5	92.0	59.8

4.4.5.6 Atmospheric Deposition

In order to calculate the atmospheric deposition loading for nutrients to Lake Jackson, the data from the Quincy station (FL14), identified in earlier sections and shown on **Figure 4-15**, were utilized. The National Atmospheric Deposition Program (NADP) provides a clearinghouse for deposition data. The NADP sites collect nitrogen data but not phosphorus, as such, only TN is available. **Table 4-12** presents the annual TN loads per acre from 2010 to 2020. No data were available at the Quincy station for 2020 so the value from the next nearest station (Sumatra – FL23) was utilized. Averaging the annual load per acre over the 10-year period gives a value of 2.56 lb/acre/yr. Multiplying the 2.56 lb/acre/yr TN load by the acreage of Lake Jackson (4,200 acres) gives a total average TN load of 10,752 lb/yr.

Table 4-12: Annual Atmospheric Total Nitrogen Load per Acre from Quincy Station

Year	TN (lb/acre)
2010	2.19
2011	2.31
2012	2.20
2013	2.57
2014	4.95
2015	2.57
2016	2.47
2017	2.31
2018	2.40
2019	1.97
2020*	2.16*

*Data from NADP Website Sumatra Station

4.4.5.7 Summary of Calculated Loads

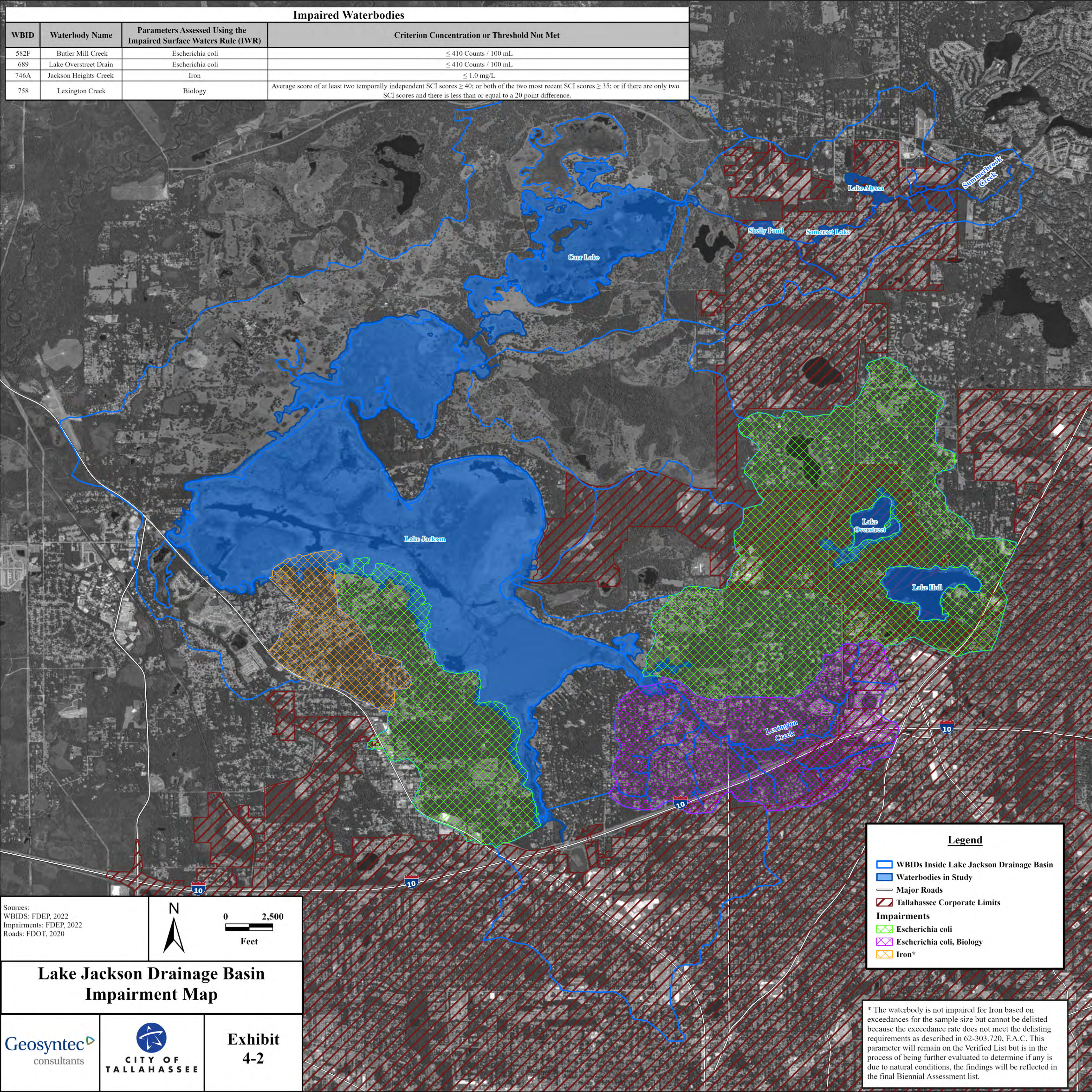
Nutrient loads to Lake Jackson were calculated for stormwater runoff, septic systems, interconnected flow (where data allowed), and atmospheric deposition. **Table 4-13** presents the calculated total loads to the lake for TN and TP. For septic systems and atmospheric deposition, only TN loads were calculated (see **Section 4.4.5.2** and **Section 4.4.5.6** respectively for explanation).

Table 4-13: Summary of Calculated Loads to Lake Jackson

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	22,162	4,374
Septic Systems	14,232	NC
Interconnected Flow	3,524	142
Atmospheric Deposition	10,752	NC

NC – Not calculated

Impaired Waterbodies			
WBID	Waterbody Name	Parameters Assessed Using the Impaired Surface Waters Rule (IWR)	Criterion Concentration or Threshold Not Met
582F	Butler Mill Creek	Escherichia coli	≤ 410 Counts / 100 mL
689	Lake Overstreet Drain	Escherichia coli	≤ 410 Counts / 100 mL
746A	Jackson Heights Creek	Iron	≤ 1.0 mg/L
758	Lexington Creek	Biology	Average score of at least two temporally independent SCI scores ≥ 40; or both of the two most recent SCI scores ≥ 35; or if there are only two SCI scores and there is less than or equal to a 20 point difference.



Sources:
WBIDS: FDEP, 2022
Impairments: FDEP, 2022
Roads: FDOT, 2020

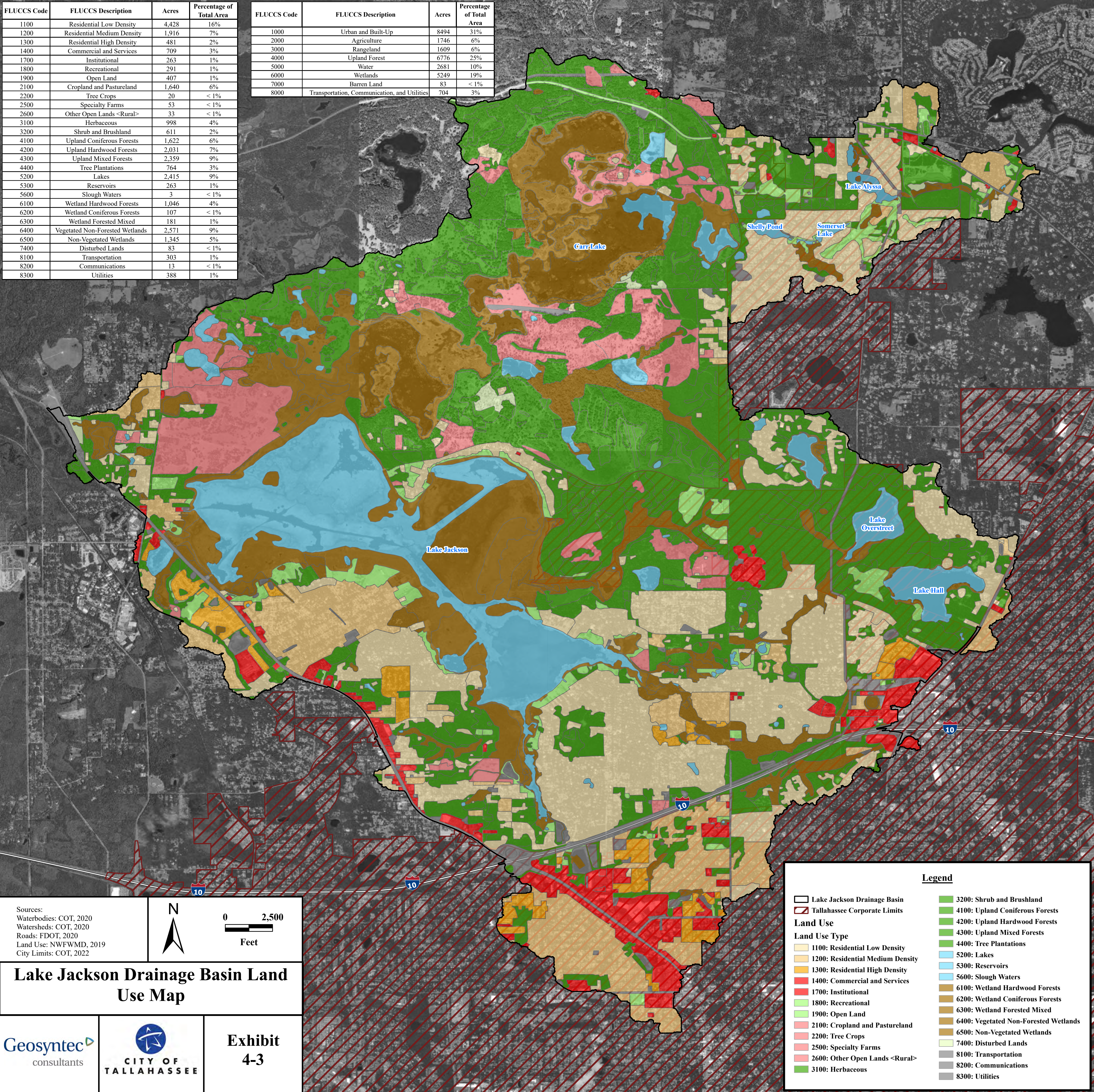
N
0 2,500
Feet

Lake Jackson Drainage Basin Impairment Map

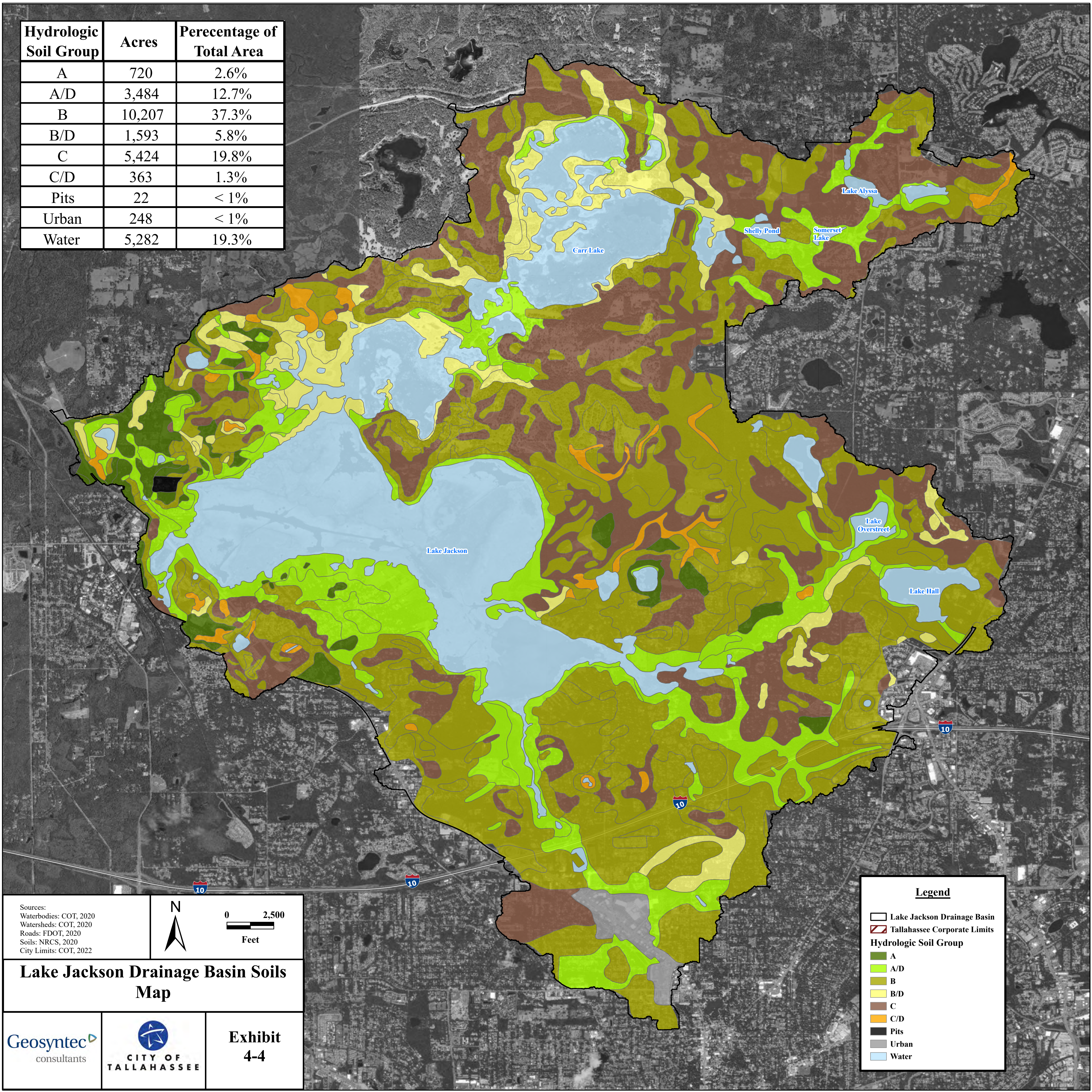
**Exhibit
4-2**

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	4,428	16%
1200	Residential Medium Density	1,916	7%
1300	Residential High Density	481	2%
1400	Commercial and Services	709	3%
1700	Institutional	263	1%
1800	Recreational	291	1%
1900	Open Land	407	1%
2100	Cropland and Pastureland	1,640	6%
2200	Tree Crops	20	< 1%
2500	Specialty Farms	53	< 1%
2600	Other Open Lands <Rural>	33	< 1%
3100	Herbaceous	998	4%
3200	Shrub and Brushland	611	2%
4100	Upland Coniferous Forests	1,622	6%
4200	Upland Hardwood Forests	2,031	7%
4300	Upland Mixed Forests	2,359	9%
4400	Tree Plantations	764	3%
5200	Lakes	2,415	9%
5300	Reservoirs	263	1%
5600	Slough Waters	3	< 1%
6100	Wetland Hardwood Forests	1,046	4%
6200	Wetland Coniferous Forests	107	< 1%
6300	Wetland Forested Mixed	181	1%
6400	Vegetated Non-Forested Wetlands	2,571	9%
6500	Non-Vegetated Wetlands	1,345	5%
7400	Disturbed Lands	83	< 1%
8100	Transportation	303	1%
8200	Communications	13	< 1%
8300	Utilities	388	1%

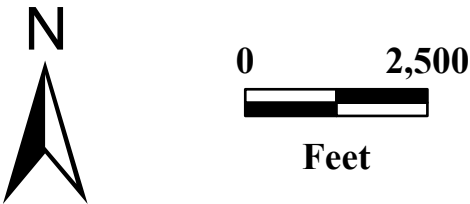
FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	8494	31%
2000	Agriculture	1746	6%
3000	Rangeland	1609	6%
4000	Upland Forest	6776	25%
5000	Water	2681	10%
6000	Wetlands	5249	19%
7000	Barren Land	83	< 1%
8000	Transportation, Communication, and Utilities	704	3%



Hydrologic Soil Group	Acres	Perecentage of Total Area
A	720	2.6%
A/D	3,484	12.7%
B	10,207	37.3%
B/D	1,593	5.8%
C	5,424	19.8%
C/D	363	1.3%
Pits	22	< 1%
Urban	248	< 1%
Water	5,282	19.3%



Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
Soils: NRCS, 2020
City Limits: COT, 2022



Lake Jackson Drainage Basin Soils Map





**Exhibit
4-4**

Legend

 Lake Jackson Drainage Basin

 Tallahassee Corporate Limits

Hydrologic Soil Group

 A

 A/D

 B

 B/D

 C

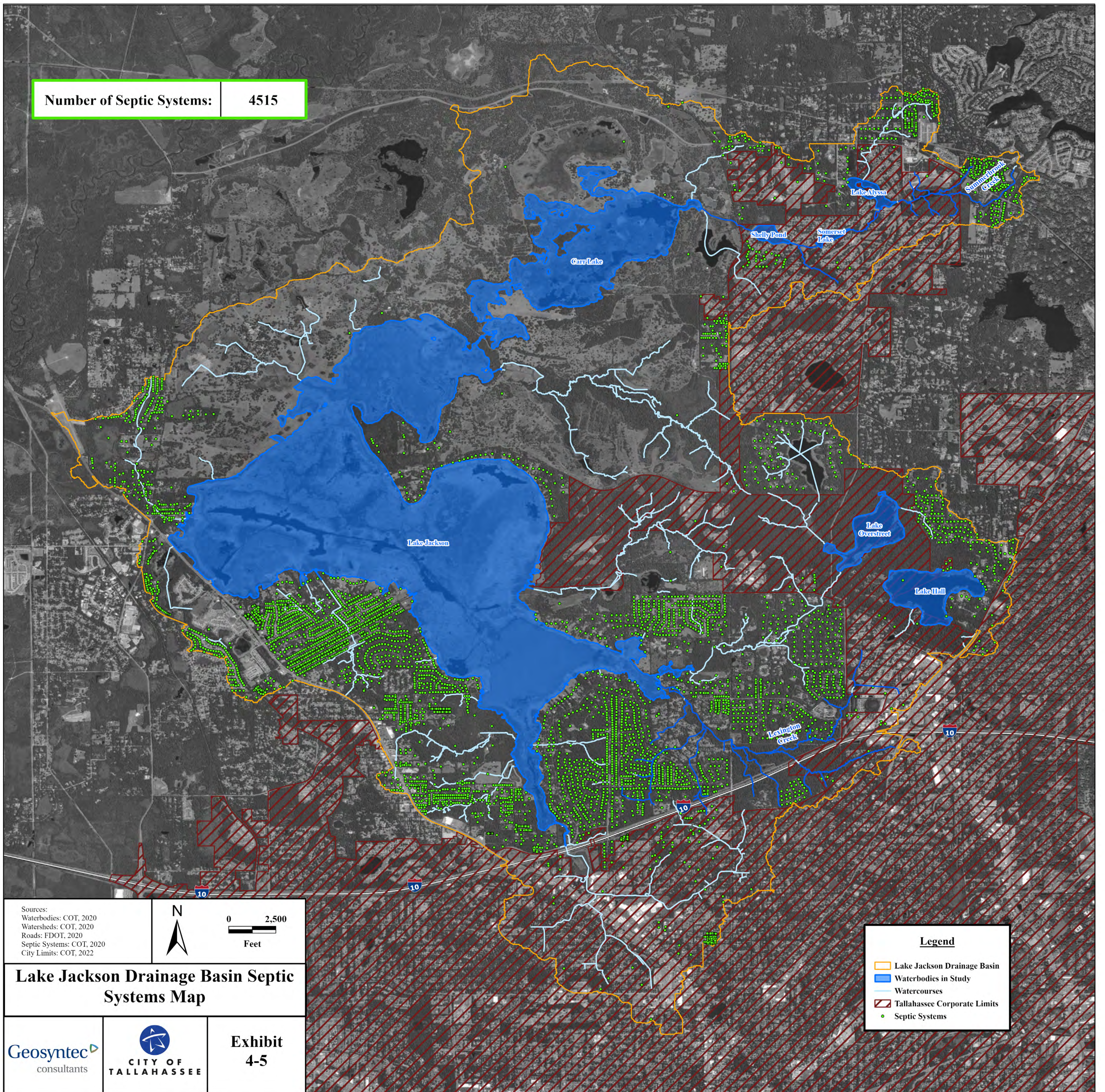
 C/D

 Pits

 Urban

 Water

Number of Septic Systems: 4515

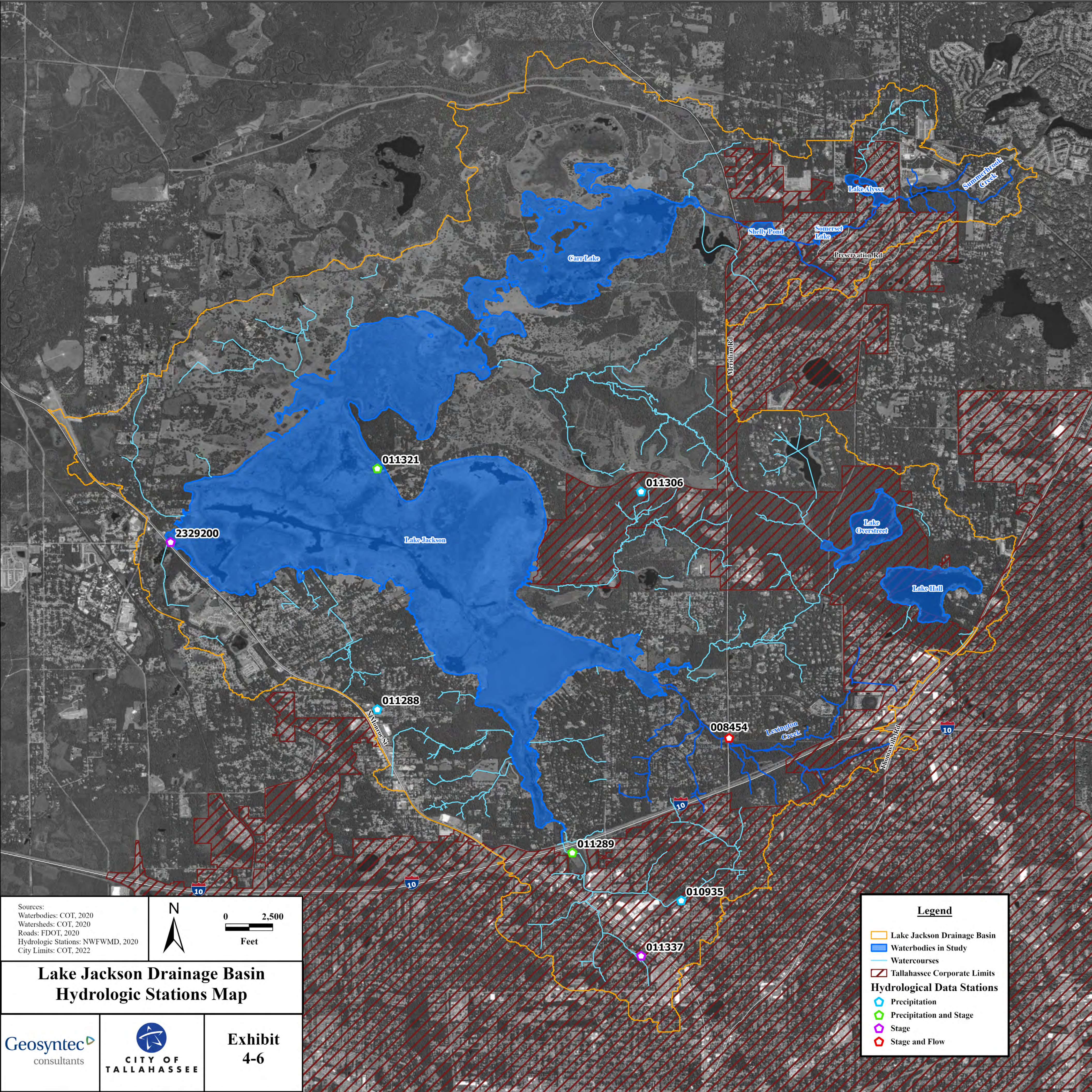


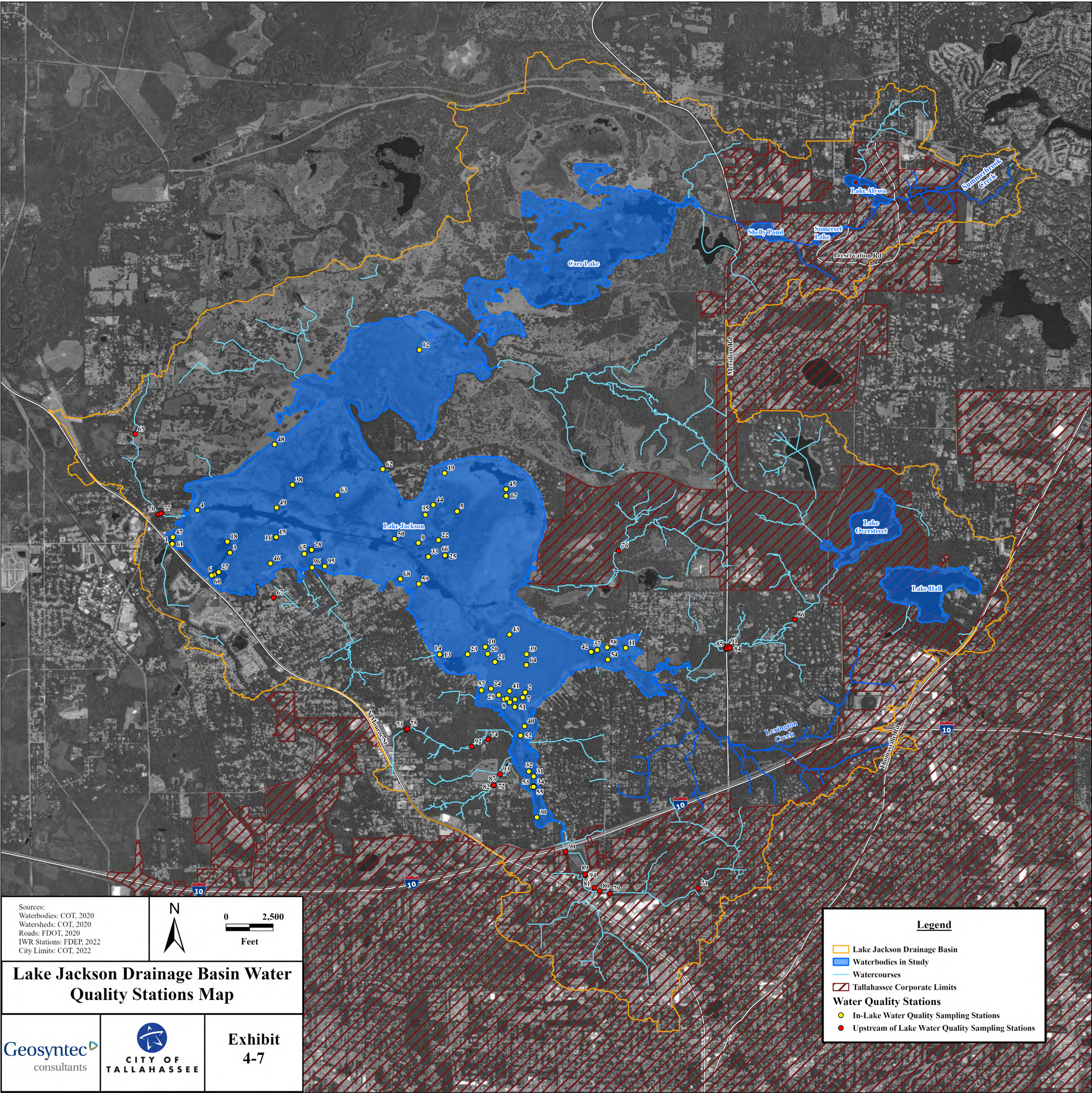
Lake Jackson Drainage Basin Septic Systems Map

Geosyntec
consultants

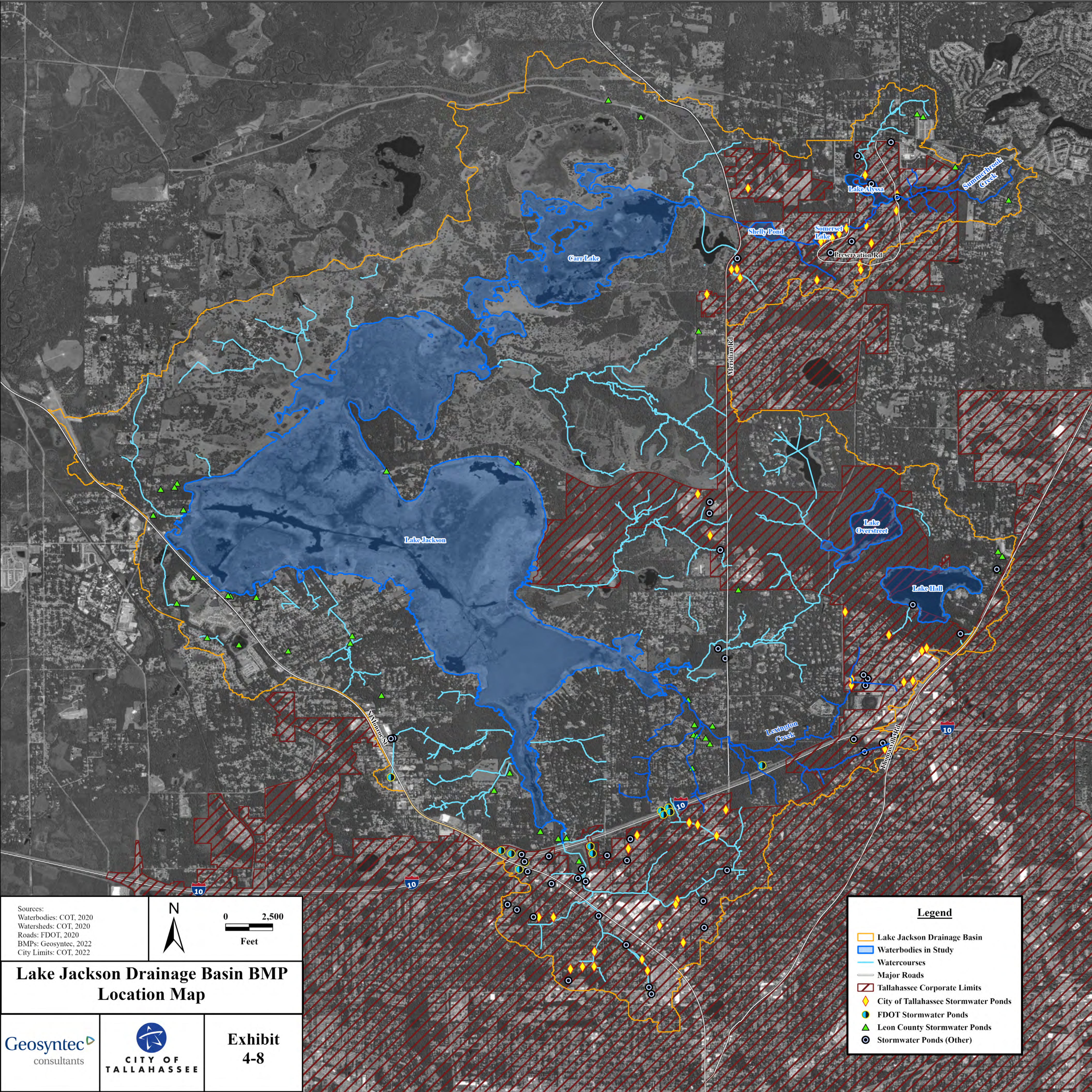


Exhibit
4-5





Number	StationID	Station Name	Start of Record	End of Record	Source	Location
1	112WRD 02329200	LAKE JACKSON NR TALLAHASSEE, FLA	1965	1981	USGS	In-Lake
2	112WRD 303025084182500	MEGGINNIS ARM NR TALLAHASSEE, FL	1981	1981	USGS	In-Lake
3	21FLBRA 582-B	582 - Lake Jackson - 400m NE of US-27 boat ramp	2006	2007	Biological Research Associates	Upstream of Lake
4	21FLBRA 582-C	582 - Lake Jackson - 100m S of dock (Jackson Cove Landing)	2006	2006	Biological Research Associates	In-Lake
5	21FLBRA 582-D	582 - Lake Jackson - 50m W of Miller's Landing boat ramp	2006	2007	Biological Research Associates	In-Lake
6	21FLBRA 582-E	582 - Lake Jackson - at US-27 boat ramp	2006	2007	Biological Research Associates	In-Lake
7	21FLBRA 582-F	582 - Lake Jackson - near MacGinnis Arm Inlet	2007	2007	Biological Research Associates	In-Lake
8	21FLBRA 582-G	582 - Lake Jackson - near connectivity to MacGinnis Arm	2007	2007	Biological Research Associates	In-Lake
9	21FLCOT LAKE JACKSON NORTH	Lake Jackson North	2017	2020	City of Tallahassee	In-Lake
10	21FLCOT LAKE JACKSON SOUTH	Lake Jackson South	2017	2020	City of Tallahassee	Upstream of Lake
11	21FLGFWF03120003-LJ01	Lake Jackson Station 1	1996	1999	FWC	Upstream of Lake
12	21FLGFWF03120003-LJ04	Lake Jackson Station 4	1996	1998	FWC	Upstream of Lake
13	21FLGW 36992	Z1-L1-3017 JACKSON, LAKE	2009	2009	FDEP	Upstream of Lake
14	21FLGW 37928	Z1-L1-3017B JACKSON, LAKE	2009	2009	FDEP	Upstream of Lake
15	21FLGW 38706	Z1-L1-4008 JACKSON, LAKE	2010	2010	FDEP	In-Lake
16	21FLGW 39367	Z1-L1-4008B JACKSON, LAKE	2010	2010	FDEP	In-Lake
17	21FLGW 43541	Z1-L1-7003 JACKSON, LAKE	2013	2013	FDEP	Upstream of Lake
18	21FLGW 43550	Z1-L1-7014 JACKSON, LAKE	2013	2013	FDEP	In-Lake
19	21FLGW 45472	Z1-L1-8007 JACKSON, LAKE	2014	2014	FDEP	In-Lake
20	21FLGW 45475	Z1-L1-8011 JACKSON, LAKE	2014	2014	FDEP	In-Lake
21	21FLGW 46950	Z1-L1-8016 JACKSON, LAKE	2015	2015	FDEP	In-Lake
22	21FLGW 49151	Z1-L1-10097 JACKSON, LAKE	2016	2016	FDEP	In-Lake
23	21FLGW 51073	Z1-L1-11024 JACKSON, LAKE	2017	2017	FDEP	In-Lake
24	21FLGW 53810	Z1-L1-12017 LAKE JACKSON	2018	2018	FDEP	In-Lake
25	21FLGW 55588	Z1-L1-13014 LAKE JACKSON	2019	2019	FDEP	In-Lake
26	21FLGW 9233	NWA-L1-1003 LAKE JACKSON	2000	2000	FDEP	In-Lake
27	21FLKWAILEO-JACKSON-1	LEO-JACKSON-1	2002	2019	FL LAKEWATCH	In-Lake
28	21FLKWAILEO-JACKSON-2	LEO-JACKSON-2	2002	2019	FL LAKEWATCH	In-Lake
29	21FLKWAILEO-JACKSON-3	LEO-JACKSON-3	2002	2019	FL LAKEWATCH	In-Lake
30	21FLKWAILEO-MEGINNIS-1	LEO-MEGINNIS-1	1999	2002	FL LAKEWATCH	In-Lake
31	21FLKWAILEO-MEGINNIS-2	LEO-MEGINNIS-2	1999	2002	FL LAKEWATCH	In-Lake
32	21FLKWAILEO-MEGINNIS-3	LEO-MEGINNIS-3	1999	2002	FL LAKEWATCH	In-Lake
33	21FILLEONCLJ30526	Lake Jackson	2008	2019	Leon County	In-Lake
34	21FILLEONCLJ0130	Lake Jackson Meginnis Arm	2010	2019	Leon County	In-Lake
35	21FILLEONCLJ1305	Lake Jackson North	2007	2007	Leon County	In-Lake
36	21FILLEONCLJ3305	Lake Jackson South	2006	2019	Leon County	In-Lake
37	21FILLEONCLJ3305	Lake Jackson South East	2006	2019	Leon County	In-Lake
38	21FILLEONCLJ6305	Lake Jackson Mid Lake West	2007	2019	Leon County	In-Lake
39	21FILLEONCLJ3305	Lake Jackson Mid South	2006	2007	Leon County	In-Lake
40	21FLMCGJLJ01	Meginnis Arm Near Livingston Landing	2001	2006	McGlynn Lab	In-Lake
41	21FLMCGJLJ03	Meginnis Arm	1991	2006	McGlynn Lab	In-Lake
42	21FLMCGJLJ05	Fork Arm	1991	2006	McGlynn Lab	In-Lake
43	21FLMCGJLJ08	Center of SE part of Lake	1991	2006	McGlynn Lab	In-Lake
44	21FLMCGJLJ10	Center of Lake near Porter Hole	1991	2006	McGlynn Lab	In-Lake
45	21FLMCGJLJ11	Church Cove	1991	1999	McGlynn Lab	In-Lake
46	21FLMCGJLJ13	The Lake's Creek near including pond	1991	1999	McGlynn Lab	In-Lake
47	21FLMCGJLJ14	Red mud Sums	1991	1997	McGlynn Lab	In-Lake
48	21FLMCGJLJ15	Near Phlips Plantation	1991	1997	McGlynn Lab	In-Lake
49	21FLMCGJLJ16	Center of SW part of Lake. Very near to Lime Sink	1991	2006	McGlynn Lab	In-Lake
50	21FLMCGJLJPH	Porter Hole Sink, very near J10, stream flowing into sink	1999	2000	McGlynn Lab	In-Lake
51	21FLNWDTS141	North End, Meginnis Arm	1995	1999	NWWM	In-Lake
52	21FLNWDTS142	Popline, Meginnis Arm	1995	1999	NWWM	In-Lake
53	21FLNWDTS143	Fuller Road, Meginnis Arm	1995	1999	NWWM	In-Lake
54	21FLTLHRG1TLHR0	Forks Arm	2020	2020	FDEP	In-Lake
55	21FLTLHRG1TLHR0	Meginnis Arm Off Fuller Rd Ramp	2020	2020	FDEP	In-Lake
56	21FLTLHRG1TLHR0	Meginnis Arm Off Crowder Landing	2020	2020	FDEP	In-Lake
57	21FLWQA 303026708418475	Lake Jackson at Crowder Rd landing	2001	2006	FDEP	In-Lake
58	21FLWQA 303049708417417	Lake Jackson at Rhodes Cove Landing	2001	2001	FDEP	In-Lake
59	21FLWQA 303122408419203	Lake Jackson at Porter Sink near end of Faulk Dr	2001	2001	FDEP	In-Lake
60	21FLWQA 303126008421088	Lake Jackson at boat ramp at US 27	2001	2006	FDEP	Upstream of Lake
61	21FLWQA 303143408421295	Little Lake Jackson at culvert at US 27	2001	2001	FDEP	In-Lake
62	21FLWQA 303222508419392	Lake Jackson at Miller Landing Rd	2001	2006	FDEP	In-Lake
63	21FLWQSP99LAKE	Lake Jackson West	2009	2009	FDEP	In-Lake
64	21FLWQSPLE009JA	Lake Jackson East	2009	2009	FDEP	Upstream of Lake
65	21FLWQSPLE0120C	Jackson Heights Creek At Mouth (WBID 583B)	2005	2006	FDEP	Upstream of Lake
66	21FLWQSPLE019JA	Lake Jackson	2019	2019	FDEP	Upstream of Lake
67	21FLBRA 582-A	582 - Lake Jackson - W-SW section	2006	2007	Biological Research Associates	Upstream of Lake
68	21FLGFWF03120003-LJ03	Lake Jackson Station 3	1996	1999	FWC	Upstream of Lake
69	21FLNWDTS490	Kennel Road, Upper Sunset Landing Basin	1995	1995	NWWM	Upstream of Lake
70	21FLNWDTS491	Lake Road, Lower Sunset Landing Basin	1995	1995	NWWM	Upstream of Lake
71	21FLNWDTS496	Stannum Drive, above Lake Road Pond	1995	1996	NWWM	Upstream of Lake
72	21FLNWDTS483	Fuller Road, Lower Okeshopkee Basin	1995	1996	NWWM	In-Lake
73	21FLNWDTS484	Bellevue Road, Lake Jackson Mounds	1995	1996	NWWM	In-Lake
74	21FLNWDTS485	Indian Mound State Park	1995	1996	NWWM	In-Lake
75	21FLWQA 303060508419264	Butlers Mill Creek at end of Bellevue Dr	2001	2001	FDEP	Upstream of Lake
76	21FLWQA 303139908417356	Meridina Creek UPS small lake	2001	2001	FDEP	Upstream of Lake
77	21FLWQA 303159408421354	Sunset Creek at Lake Dr	2001	2001	FDEP	Upstream of Lake
78	21FLBRA 809-A	809 - Meginnis Arm Run - W of Movies S	2006	2006	Biological Research Associates	Upstream of Lake
79	21FLBRA 809-B	809 - Meginnis Arm Run - at Allen Road	2006	2006	Biological Research Associates	Upstream of Lake
80	21FLBRA 809-D	809 - Meginnis Arm Run - South of Shaver Rd.	2006	2006	Biological Research Associates	Upstream of Lake
81	21FLWQA 302843308417484	Meginnis Creek at Shaver Rd	2006	2006	FDEP	In-Lake
82	21FLWQA 30297008418410	Okeshopkee Creek at Fuller Rd	2001	2006	FDEP	Upstream of Lake
83	21FLWQA 303048608416389	Overstreet Trib at Meridina Rd (SR 155)	2001	2006	FDEP	In-Lake
84	21FLWQSPLE0124C	Overstreet Trib At Meridina Rd (SR 155) (WBID 689)	2005	2006	FDEP	In-Lake
85	21FLBRA 689-A	689 - Lake Overstreet Drain - at Meridina Rd.	2006	2007	Biological Research Associates	In-Lake
86	21FLBRA 689-B	689 - Lake Overstreet Drain - At West Bobbin Brook	2006	2007	Biological Research Associates	In-Lake
87	21FLPNS 30297008418410	Okeshopkee Creek At Fuller Rd (also 21FLWQA)	2011	2011	FDEP	Upstream of Lake
88	21FLPNS 809-A	Meginnis Arm Run - W Of Movies S (also 21FLBRA)	2011	2012	FDEP	In-Lake
89	21FLWQA G1WA0033	Meginnis Arm Run Downstream of Shaver	2016	2018	FDEP	Upstream of Lake
90	21FLCOT LIB01	LIB01	2015	2020	City of Tallahassee	In-Lake
91	21FLTLHRG1TLHR0	Lake Overstreet Drain @ N Meridina Rd	2017	2020	FDEP	Upstream of Lake
92	21FLTLHRG1TLHR0	Butlers Mill Creek Upstream of Dorris Dr	2020	2020	FDEP	In-Lake
93	21FLTLHRG1TLHR0	Okeshopkee Creek Above Park	2020	2020	FDEP	In-Lake
94	21FLTLHRG1TLHR0	Meginnis Arm Run Downstream of Shaver Rd	2020	2020	FDEP	In-Lake
95	21FLWQA 303131708420095	Jackson Heights Creek at mouth	2001	2001	FDEP	Upstream of Lake
96	21FILLEONCLJ3051	Jackson Heights Creek	2006	2019	Leon County	In-Lake



Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
BMPs: Geosyntec, 2022
City Limits: COT, 2022



0 2,500
Feet

**Lake Jackson Drainage Basin BMP
Location Map**

Geosyntec
consultants



**Exhibit
4-8**

- Legend**
- Lake Jackson Drainage Basin
 - Waterbodies in Study
 - Watercourses
 - Major Roads
 - Tallahassee Corporate Limits
 - City of Tallahassee Stormwater Ponds
 - FDOT Stormwater Ponds
 - Leon County Stormwater Ponds
 - Stormwater Ponds (Other)

4.5 Carr Lake

This section presents the results from Tasks 1 through 3 for Carr Lake. This includes an overview and history of the lake and basin, present impairment status, an overview of available data, a qualitative assessment of potential pollutant sources, and calculation of potential pollutant loads.

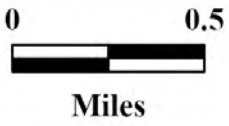
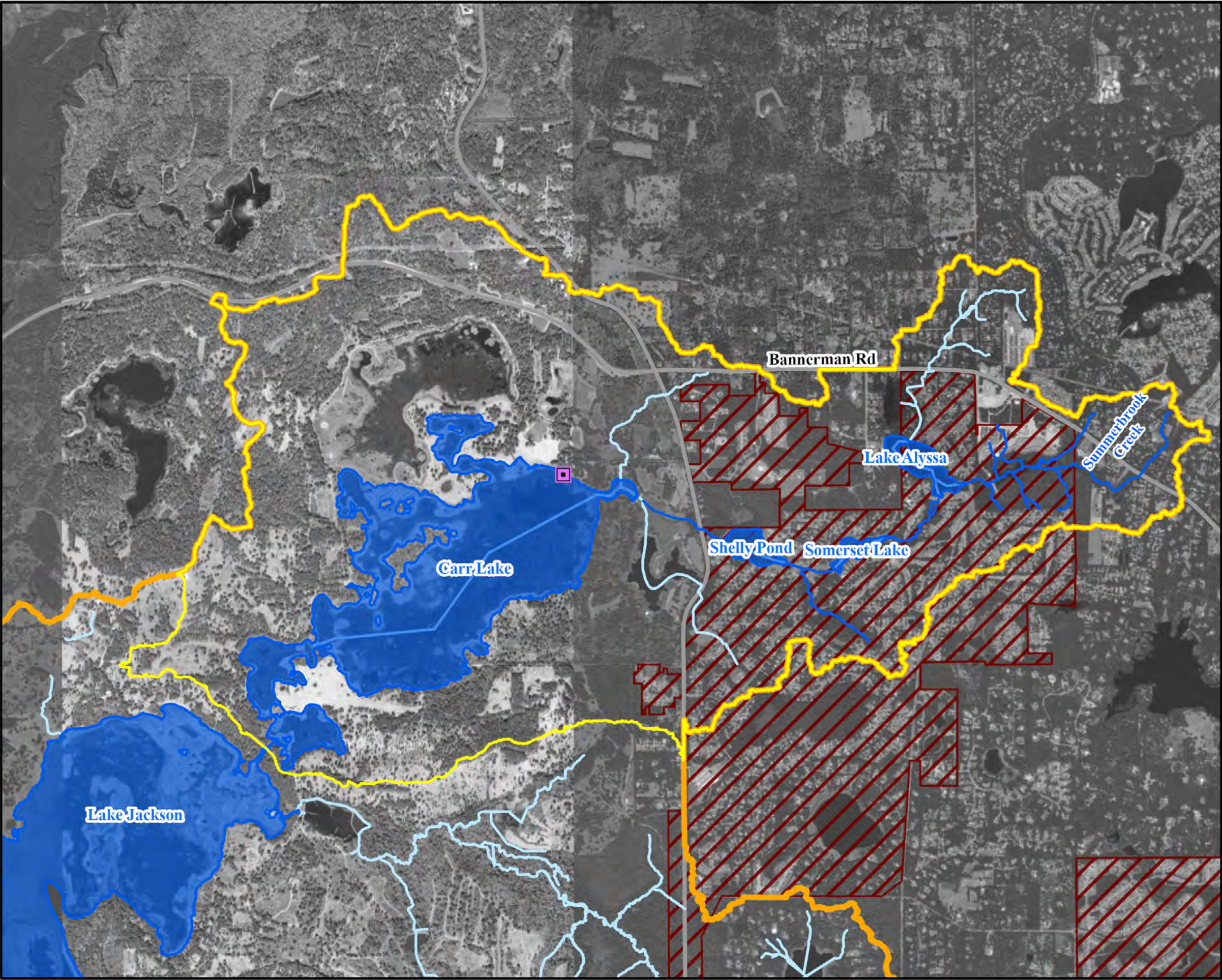
4.5.1 Overview and History

Carr Lake is a very shallow, approximately 692-acre lake located north of Lake Jackson. The lake itself is located entirely within Leon County. The lake is surrounded by two primary property owners, Ayavalla Land Company and Orchard Pond LLC. Orchard Pond LLC is a farming cooperative that produces organic produce and other products. Carr Lake is a valued biological, aesthetic, and recreational resource of Leon County. It was designated an Aquatic Preserve in 1973 (Leon County, 2018).

The drainage basin for Carr Lake covers an area of 5,964 acres (**Figure 4-40**). Meridian Road runs in a north-south direction through the basin, with the area to the west of Meridian Road almost entirely within Leon County and the area to the east primarily within the City's incorporated area. **Figure 4-40** shows a split of the Carr Lake drainage basin into two subbasins. The eastern (up-stream) subbasin drains into Summerbrook Creek, which flows through the northern end of Holley Pond into the northeastern side of Carr Lake. The Summerbrook Creek subbasin includes a small portion of the Killearn Lakes neighborhood north of Bannerman Road, most of the Summerbrooke neighborhood, and a northern portion of Ox Bottom Manor. This subbasin is discussed in more detail within **Section 4.6**. The western subbasin is the immediate area that drains directly to Carr Lake, including a subbasin that drains to Holley Pond. This area has very limited development, with only a few single-family homes, farms, limited rural roadways, and the newly constructed Orchard Pond Parkway to the north. Mallard Pond, which is interconnected with Carr Lake, is also located within this subbasin and receives some of the drainage from the northern portion of the subbasin. Outflow from Carr Lake flows into the northern lobe of Lake Jackson.

Carr Lake presently supports a number of recreational activities including kayaking, air boating, fishing, and duck hunting and can support some motorboat activities in the open water area along the northern side where the public boat ramp is located. Due to vegetative cover, much of the lake is only accessible using airboats and through pathways cut through the vegetation that interconnect other smaller open water areas. **Photo 4-18** and **Photo 4-19** show the open water areas and nearshore vegetation from the boat ramp along the northern end.

Similar to Lake Jackson, the hydrologic cycle for the lake is such that the levels decline due to evaporation and transpiration by aquatic vegetation, and outflow to Lake Jackson. The lake rises due to stormwater, and baseflow inflows from the tributaries and direct rainfall. When one exceeds the other, the lake will either drain or fill. Unlike Lake Jackson, Carr Lake does not have the direct connection to groundwater through sinkholes and, therefore, during historical drought periods, the lake has retained water while Lake Jackson has been dry.



Legend

-  Lake Jackson Drainage Basin
-  Carr Lake Drainage Basin
-  Waterbodies in Study
-  Watercourses
-  Boat Ramp
-  Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-40:
Carr Lake Drainage Basin Overview
Tallahassee Master Plan - Surface
Water (TMaPS)





Photo 4-18: Carr Lake from Boat Ramp (February 2021)



Photo 4-19: Carr Lake from Boat Ramp (February 2021)

Photo 4-20 through **Photo 4-27** present aerial views of the lake from 1937 through the present. Examination of the aerial photos shows that the areas of open water have expanded and contracted through time. In the 1937 aerial photo (**Photo 4-20**), the open water areas are of a similar size and nature to those seen in the 2020 aerial (**Photo 4-27**). Through the remaining aerials, the open water areas appear to expand in size, with the largest appearing to be in the 1970 aerial (**Photo 4-23**) and then, subsequently, decreasing in size up to the present.

4.5.2 Regulatory Status

As stated previously, Carr Lake (WBID 582C) was designated an Aquatic Preserve in 1973 and maintains that special protected status. **Exhibit 4-2** presented the verified impaired waters within the overall Lake Jackson basin. Presently, no verified impaired waters are within the Carr Lake drainage basin.

4.5.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Carr Lake and the Carr Lake basin, including bathymetry, land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.

4.5.3.1 Bathymetry

No bathymetric data for Carr Lake is available currently. Based upon general descriptions of the lake found in various references, depths within the lake range from shallow areas of 2 to 3 ft supporting extensive vegetation, up to some deeper, open water areas, such as is seen in the northern area (**Figure 4-40**). Depths in the deeper areas are not much more than 5 ft.

4.5.3.2 Land Use

Figure 4-41 presents a map of the Level 2 land uses within the Carr Lake basin. A table is provided to show the overall acreages and percent cover for the various levels. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use types within the Carr Lake drainage basin per the grouped Level 1 categories are Upland Forrest (32 percent), Wetlands (23 percent), and Urban and Built Up (22 percent). Nearly all of the Urban and Built Up land uses are located in the basin area east of Meridian Road. Within the Urban Built Up category, Low to Medium Density Residential takes up the largest portion. A large area of the eastern basin currently identified as Upland Forrest is now under development. This is the area upstream of Lake Alyssa. West of Meridian Road, the primary land use is Upland Forrest, with some areas presently in Agricultural use. This use would be associated in part with the Orchard Pond LLC.

4.5.3.3 Soils

The most prevalent soil groups in the Carr Lake drainage basin are Group C (**Figure 4-42**) and Group B, accounting for 36 percent and 25 percent of the area, respectively. Group B soils are considered to have a moderate rate of infiltration, whereas Group C soils are considered to have slow rates of infiltration. Small clusters of Group A/D soils are found along the primary tributary pathways. These are considered to have high infiltration potential, but due to elevated water table conditions, will act more similarly to soils with low infiltration potential.

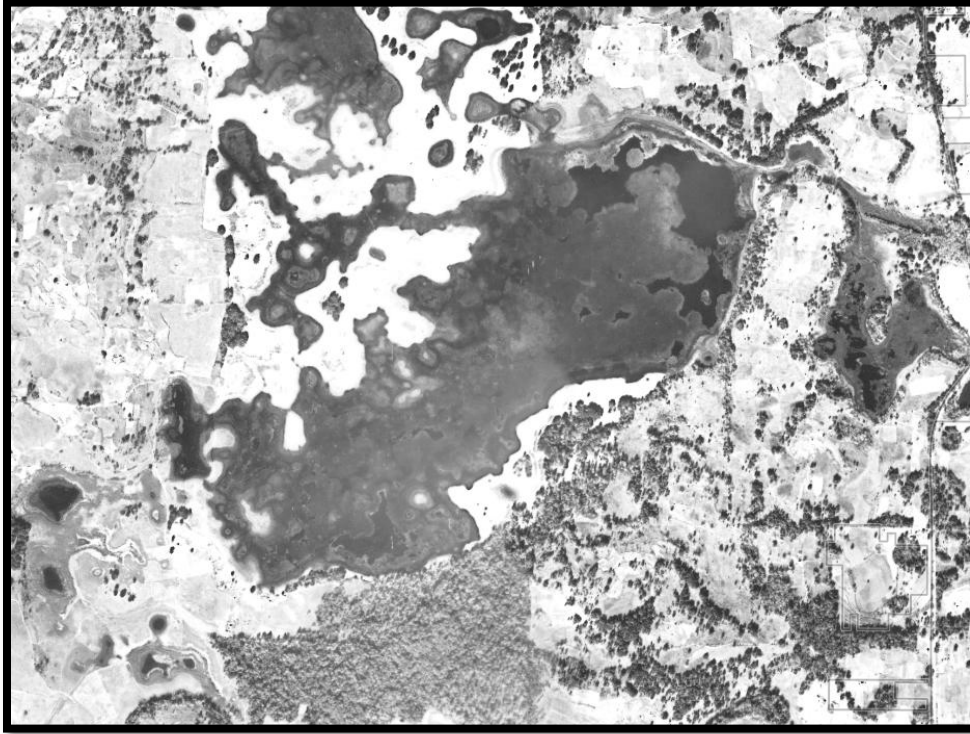


Photo 4-20: Carr Lake Basin Area Aerial (1937)



Photo 4-21: Carr Lake Basin Area Aerial (1949)

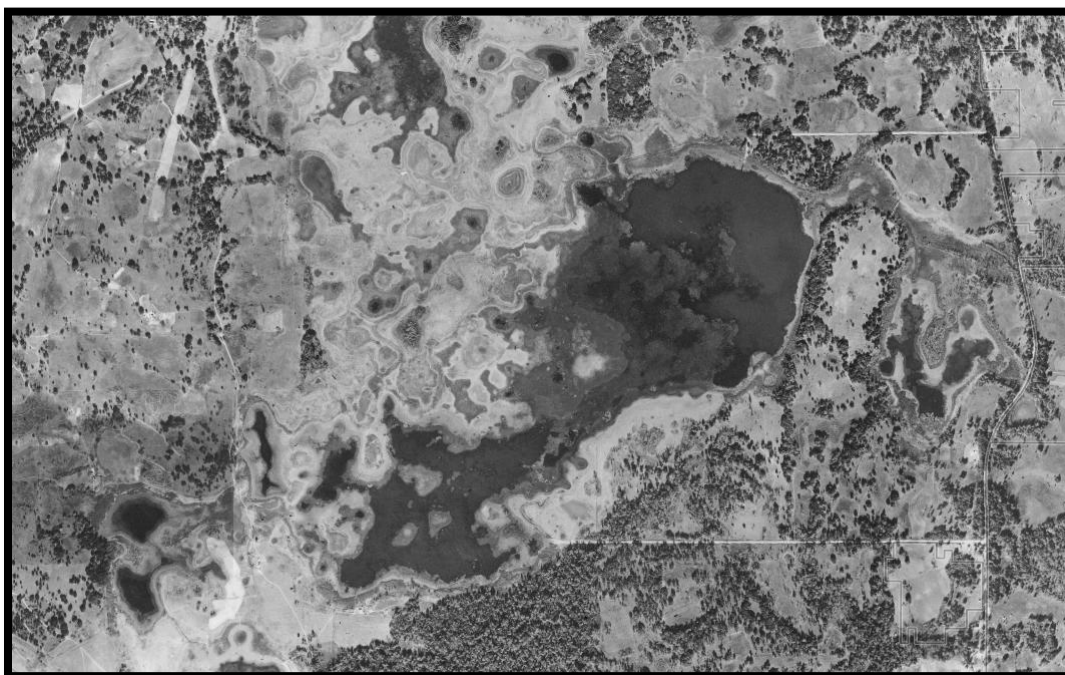


Photo 4-22: Carr Lake Basin Area Aerial (1954)



Photo 4-23: Carr Lake Basin Area Aerial (1970)

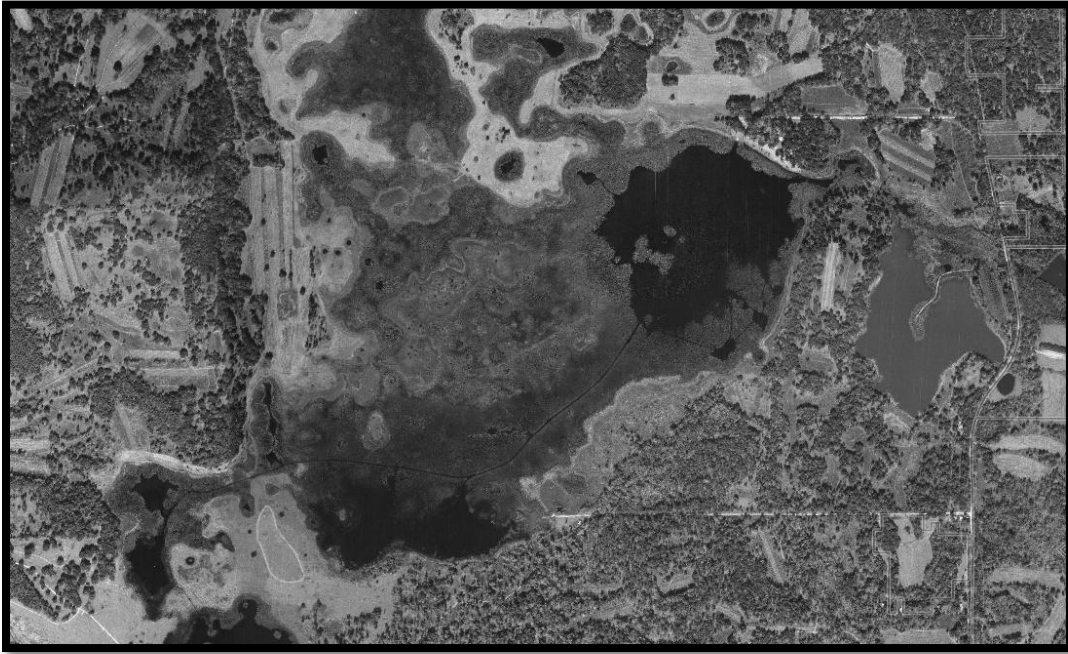


Photo 4-24: Carr Lake Basin Area Aerial (1983)

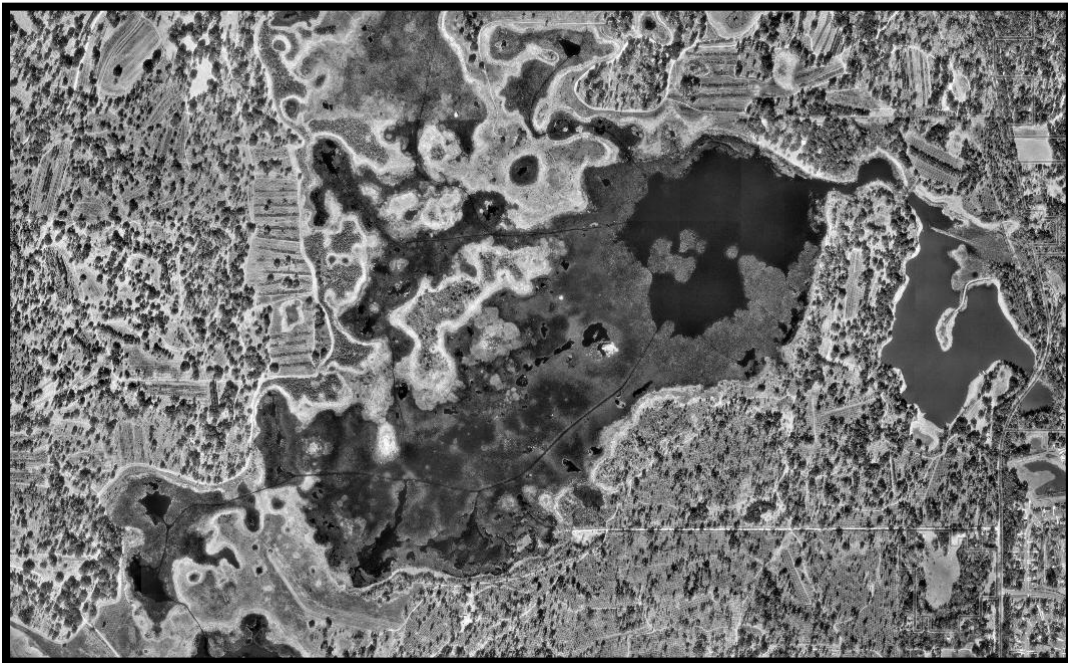
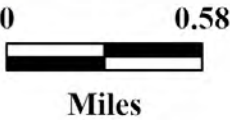
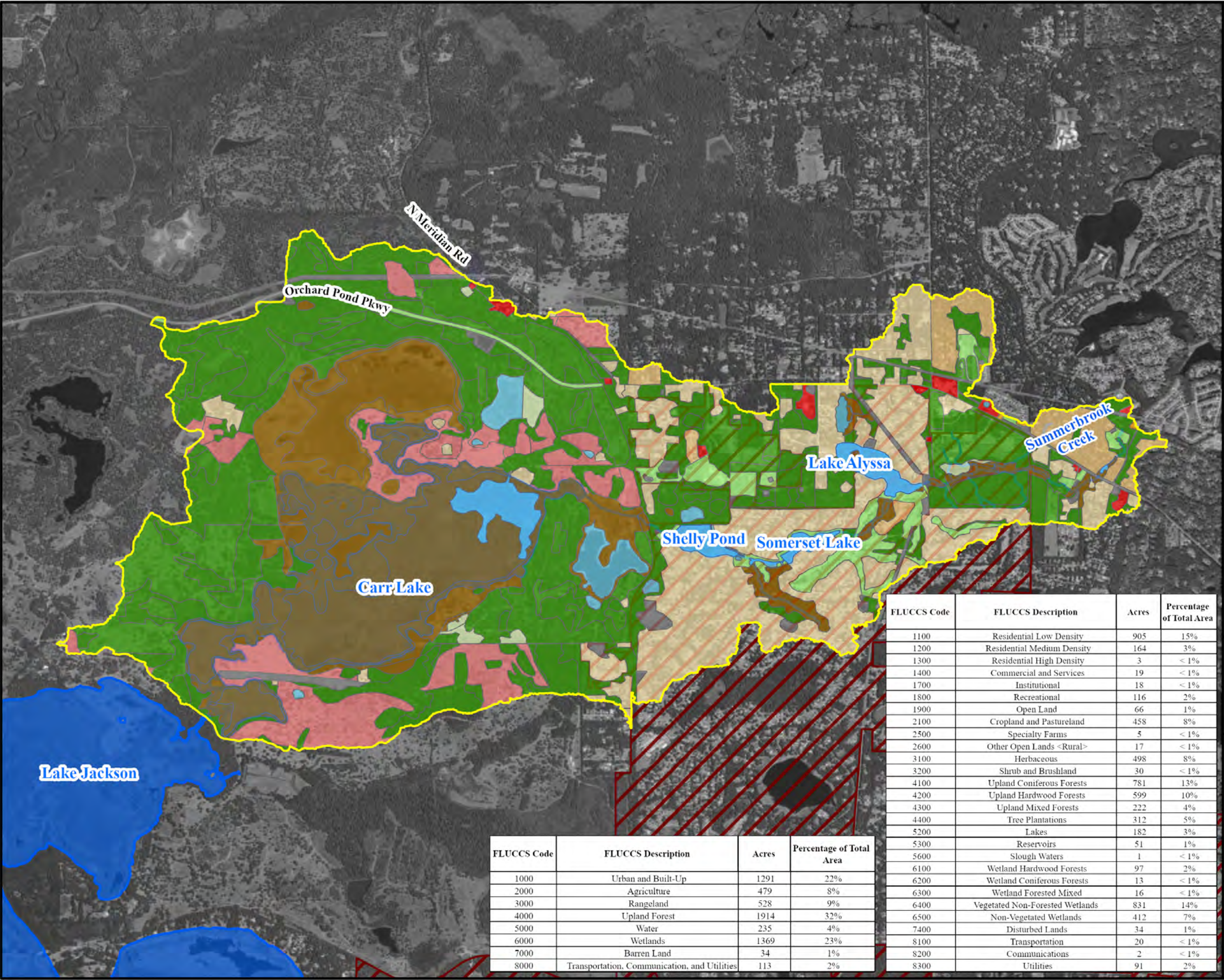


Photo 4-25: Carr Lake Basin Area Aerial (1996)

July 2025



- Legend**
- Carr Lake Drainage Basin
 - Tallahassee Corporate Limits
 - Waterbodies in Study
- Land Use Type**
- 1100: Residential Low Density
 - 1200: Residential Medium Density
 - 1300: Residential High Density
 - 1400: Commercial and Services
 - 1700: Institutional
 - 1800: Recreational
 - 1900: Open Land
 - 2100: Cropland and Pastureland
 - 2500: Specialty Farms
 - 2600: Other Open Lands <Rural>
 - 3100: Herbaceous
 - 3200: Shrub and Brushland
 - 4100: Upland Coniferous Forests
 - 4200: Upland Hardwood Forests
 - 4300: Upland Mixed Forests
 - 4400: Tree Plantations
 - 5200: Lakes
 - 5300: Reservoirs
 - 5600: Slough Waters
 - 6100: Wetland Hardwood Forests
 - 6200: Wetland Coniferous Forests
 - 6300: Wetland Forested Mixed
 - 6400: Vegetated Non-Forested Wetlands
 - 6500: Non-Vegetated Wetlands
 - 7400: Disturbed Lands
 - 8100: Transportation
 - 8200: Communications
 - 8300: Utilities

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Land Use: NWFWM, 2019

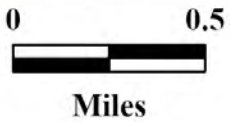
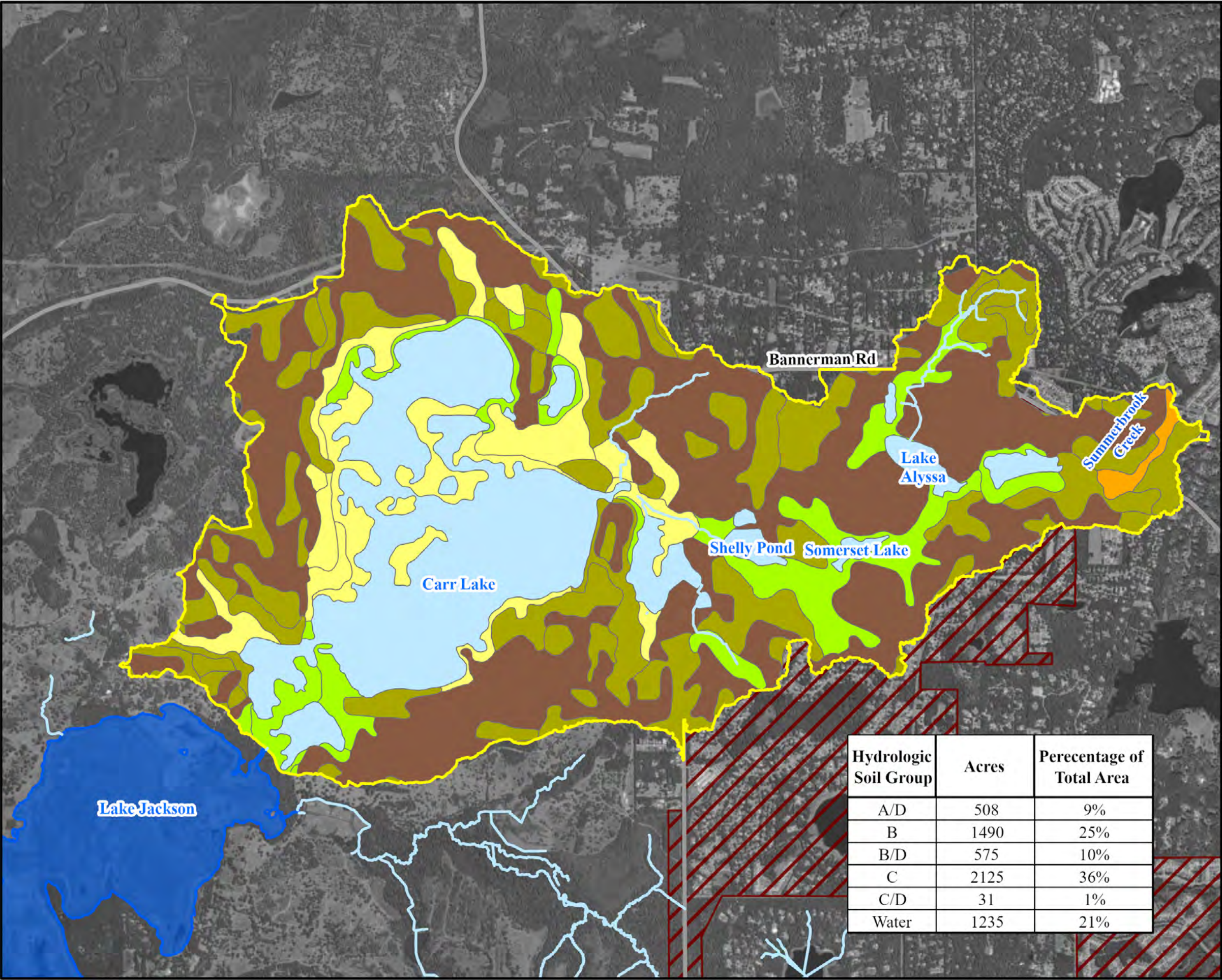
**Figure 4-41:
Carr Lake Basin Land Use**

**Tallahassee Master Plan - Surface
Water (TMAPS)**



FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	1291	22%
2000	Agriculture	479	8%
3000	Rangeland	528	9%
4000	Upland Forest	1914	32%
5000	Water	235	4%
6000	Wetlands	1369	23%
7000	Barren Land	34	1%
8000	Transportation, Communication, and Utilities	113	2%

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	905	15%
1200	Residential Medium Density	164	3%
1300	Residential High Density	3	< 1%
1400	Commercial and Services	19	< 1%
1700	Institutional	18	< 1%
1800	Recreational	116	2%
1900	Open Land	66	1%
2100	Cropland and Pastureland	458	8%
2500	Specialty Farms	5	< 1%
2600	Other Open Lands <Rural>	17	< 1%
3100	Herbaceous	498	8%
3200	Shrub and Brushland	30	< 1%
4100	Upland Coniferous Forests	781	13%
4200	Upland Hardwood Forests	599	10%
4300	Upland Mixed Forests	222	4%
4400	Tree Plantations	312	5%
5200	Lakes	182	3%
5300	Reservoirs	51	1%
5600	Slough Waters	1	< 1%
6100	Wetland Hardwood Forests	97	2%
6200	Wetland Coniferous Forests	13	< 1%
6300	Wetland Forested Mixed	16	< 1%
6400	Vegetated Non-Forested Wetlands	831	14%
6500	Non-Vegetated Wetlands	412	7%
7400	Disturbed Lands	34	1%
8100	Transportation	20	< 1%
8200	Communications	2	< 1%
8300	Utilities	91	2%



Legend

- Carr Lake Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Hydrologic Soil Group**
- A/D
- B
- B/D
- C
- C/D
- Water

Sources:
 Waterbodies: COT, 2020
 Watercourses: COT, 2020
 Drainage Basins: COT, 2020
 Roads: COT-Leon County, 2023
 City Limits: COT, 2020

Hydrologic Soil Group	Acres	Percentage of Total Area
A/D	508	9%
B	1490	25%
B/D	575	10%
C	2125	36%
C/D	31	1%
Water	1235	21%

Figure 4-42:
Carr Lake Basin Soils

Tallahassee Master Plan - Surface Water (TMaPS)



4.5.3.4 Septic Systems

An estimated 455 septic tank units are within the boundaries of the Carr Lake drainage basin, based on the FDOH septic tank layer (**Figure 4-43**). The bulk of the septic tanks are located in specific clusters, including the Killearn Lakes neighborhood north of Bannerman Road, residences off Greystone Drive and Reynolds Drive, an unsewered portion of Summerbrooke, and other smaller neighborhoods.

Effluent from septic tanks that are in good condition should be comparable to secondarily treated wastewater effluent from sewage treatment plants. However, septic systems can be a source of pollutants, pathogens, and nutrients and are identified by FDEP as a potential source of FIB and nutrients to waterbodies in its assessment processes.

4.5.3.5 Hydrologic Data

There are no current or recent historical hydrologic monitoring stations specific to Carr Lake or the Carr Lake drainage basin. All rainfall, water level, and flow monitoring stations were presented and discussed in **Section 4.4.3** for the entire Lake Jackson basin.

4.5.3.6 Surface Water Quality Data

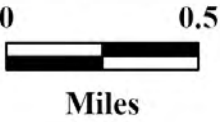
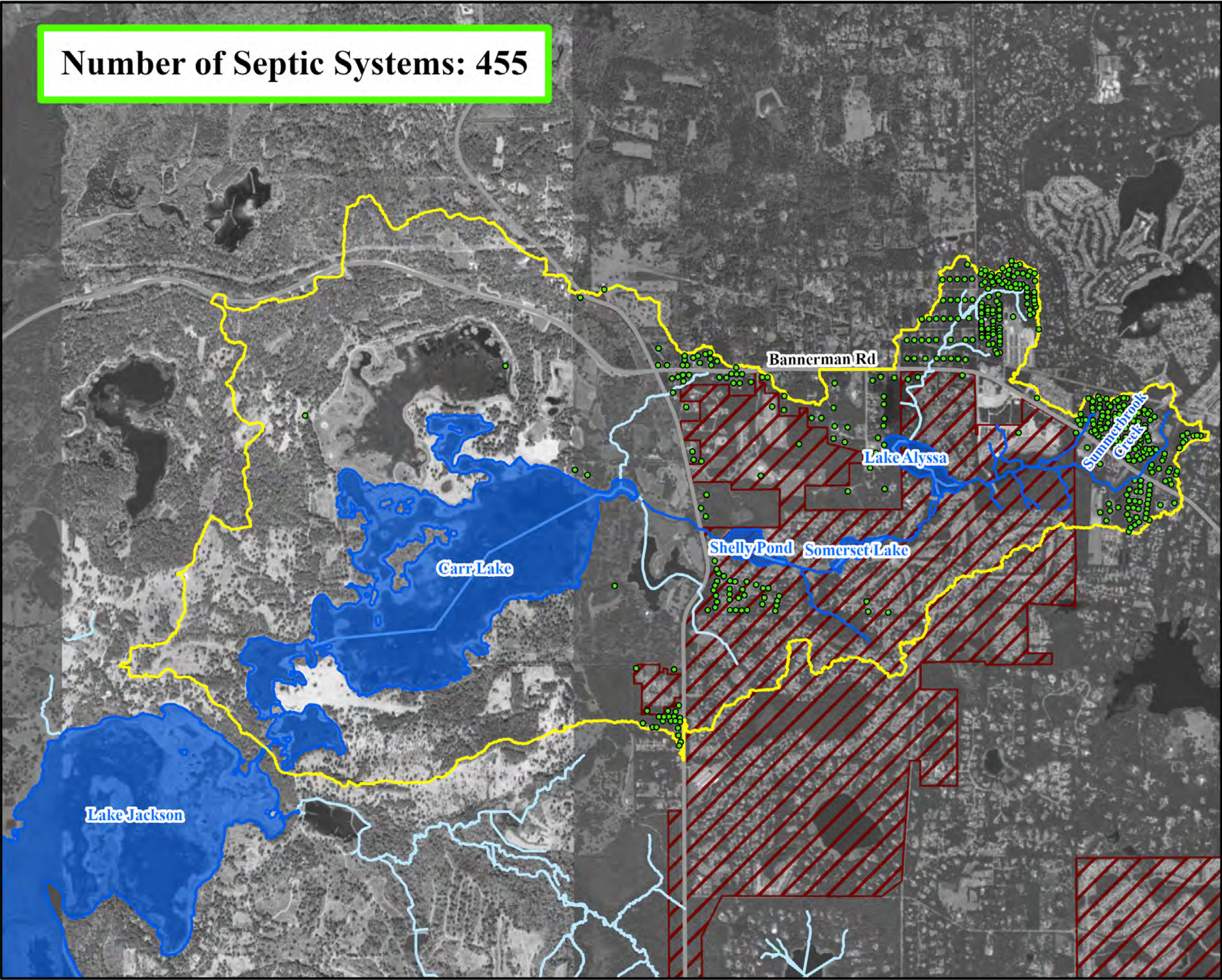
The IWR dataset for Carr Lake (WBID 582) spans from 2000 to 2020 and includes contributions from local and state agencies (Leon County, FDEP, and Florida LAKEWATCH) as well as private sector firms (BRA, and McGlynn Lab).

Figure 4-44 presents the locations of in-lake water quality monitoring stations for Carr Lake (yellow) along with stations that provide water quality data along tributaries that flow directly into Carr Lake (red). A table is provided in **Figure 4-44** that shows the station identification (ID), station name, period of record, sample count, data source, and if the station represents in-lake or inflowing tributary data. Based on the number of stations and the length of the station IDs, station IDs were not included on the figure, rather each of the stations is given a number and the numbers correspond to stations in the table.

Figure 4-44 shows that most of the stations are located in the northern section of Carr Lake, within the open water area. There are stations located further south but the data are all prior to 2010. The only stations that have data past 2010 are maintained by Leon County and are numbers 6 and 9 on the map. For the upstream tributary inflow stations (15 through 17 on the map), data are all on or before 2011.

Some initial plots of the available data in the lake are provided in this section. This includes plots of the raw data along with AGM. As nutrients are the primary constituent of interest relative to water quality conditions in Carr Lake, plots are provided for the key parameters related to potential nutrient impairment. These include TN, TP, Chl-a, and TSI. Additionally, based on interest in the area relative to septic systems and other sources, FIB, specifically *E. coli* are included. Additional data plots and analyses are provided as part of the qualitative assessment of sources in **Section 4.5.4**.

Number of Septic Systems: 455



Legend

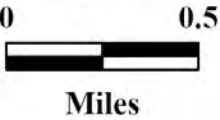
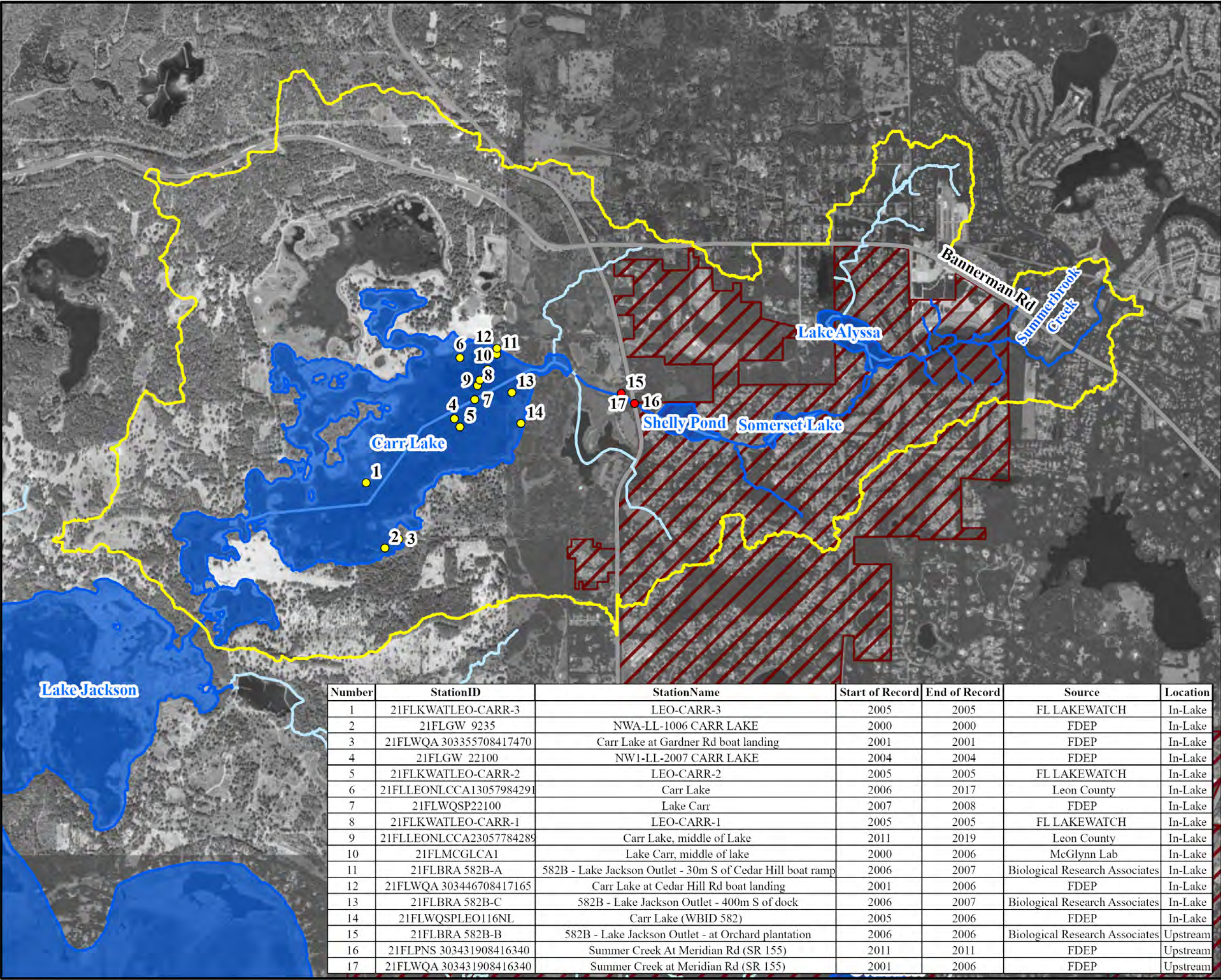
- Carr Lake Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Septic Systems

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-43:
Carr Lake Drainage Basin Septic Systems

Tallahassee Master Plan - Surface
Water (TMaPS)





Legend

- Carr Lake Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Water Quality Stations
 - In-Lake
 - Upstream of Lake

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
WQ Stations: FDEP, 2022

Number	StationID	StationName	Start of Record	End of Record	Source	Location
1	21FLKWATLEO-CARR-3	LEO-CARR-3	2005	2005	FL LAKEWATCH	In-Lake
2	21FLGW 9235	NWA-LL-1006 CARR LAKE	2000	2000	FDEP	In-Lake
3	21FLWQA 303355708417470	Carr Lake at Gardner Rd boat landing	2001	2001	FDEP	In-Lake
4	21FLGW 22100	NW1-LL-2007 CARR LAKE	2004	2004	FDEP	In-Lake
5	21FLKWATLEO-CARR-2	LEO-CARR-2	2005	2005	FL LAKEWATCH	In-Lake
6	21FLLEONLCCA13057984291	Carr Lake	2006	2017	Leon County	In-Lake
7	21FLWQSP22100	Lake Carr	2007	2008	FDEP	In-Lake
8	21FLKWATLEO-CARR-1	LEO-CARR-1	2005	2005	FL LAKEWATCH	In-Lake
9	21FLLEONLCCA23057784289	Carr Lake, middle of Lake	2011	2019	Leon County	In-Lake
10	21FLMCGLCA1	Lake Carr, middle of lake	2000	2006	McGlynn Lab	In-Lake
11	21FLBRA 582B-A	582B - Lake Jackson Outlet - 30m S of Cedar Hill boat ramp	2006	2007	Biological Research Associates	In-Lake
12	21FLWQA 303446708417165	Carr Lake at Cedar Hill Rd boat landing	2001	2006	FDEP	In-Lake
13	21FLBRA 582B-C	582B - Lake Jackson Outlet - 400m S of dock	2006	2007	Biological Research Associates	In-Lake
14	21FLWQSPLEO116NL	Carr Lake (WBID 582)	2005	2006	FDEP	In-Lake
15	21FLBRA 582B-B	582B - Lake Jackson Outlet - at Orchard plantation	2006	2006	Biological Research Associates	Upstream
16	21FLPNS 303431908416340	Summer Creek At Meridian Rd (SR 155)	2011	2011	FDEP	Upstream
17	21FLWQA 303431908416340	Summer Creek at Meridian Rd (SR 155)	2001	2006	FDEP	Upstream

Figure 4-44:
Carr Lake Water Quality Station Locations

Tallahassee Master Plan - Surface Water (TMaPS)



Figure 4-45 through **Figure 4-47** present plots of the measured TN, TP, and Chl-a data from 2010 to 2020. All three parameters show similar slight downward trends from 2010 to 2020. Additionally, the concentrations of all three parameters are low indicating a relatively pristine lake. Qualitative evaluation of historical nutrient data shows that the lake has not changed significantly over the period of record.

Under FDEP's NNC, Carr Lake is defined as a low color, low alkalinity system. Based on this designation, the AGM threshold for Chl-a is 6 µg/L. For TN and TP, a range of concentrations are allowable, based on maintaining Chl-a levels in the lake below 6 µg/L. For TN, the range is 0.51 mg/L to 0.93 mg/L. For TP, the range is 0.01 mg/L to 0.03 mg/L. For *E. coli*, the criteria are monthly geometric means below 126 colonies per 100 mL of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period.

TN, TP, and Chl-a AGMs are plotted in **Figure 4-48** through **Figure 4-50**, as these define the status of the lake relative to nutrient impairments. Where sufficient data are available to assess the AGMs, the levels are provided from 2010 through 2020. For Chl-a, only data with corrected Chl-a are provided. The Chl-a threshold and the minimum and maximum thresholds for TN and TP relative to the NNC are provided on each of the graphs as pink dashed lines. **Figure 4-51** presents a plot of calculated TSI values in the lake. While TSI is no longer utilized for the determination of impairment, it does serve as an indicator of lake health. Based on TSI definitions, levels below 60 are deemed good condition, levels between 60 and 70 indicate fair condition while levels above 70 indicate poor condition. **Figure 4-52** presents plots of *E. coli* data for the available period of record.

Examination of the TN plot (**Figure 4-48**) shows that between 2010 and 2020, the TN AGMs were all below the minimum threshold. TP AGM levels (**Figure 4-49**) have fallen between the minimum and maximum threshold values in a number of years and below the minimum threshold for other years. **Figure 4-50** presents the Chl-a AGMs from 2010 through 2020. At no time during this period of record did the Chl-a AGM go above the threshold 6 µg/L. Based on the rainfall record shown in **Section 4.4.3.6**, 2011 was a low rainfall year, as was 2015, which also had higher Chl-a levels. These patterns may reflect the effects of residence time on Chl-a levels. Examination of the TSI plot (**Figure 4-51**) shows that the lake is well below the threshold, with a general downward trend as was seen for the TN, TP, and Chl-a. This further supports the findings from the Chl-a measurements that the lake is not presently exhibiting nutrient enrichment.

Figure 4-52 present a plot of measured *E. coli* levels in the lake from 2014 through 2020. The data all show very low values, with most at below detection limits and well below the 410 MPN/100 mL threshold.

4.5.3.7 Groundwater Data

Figure 4-53 presents the surficial aquifer groundwater sampling wells within and adjacent to the Carr Lake basin. Station AAA0282 is located along the shoreline of Carr Lake and serves as a source of data on surficial groundwater quality in the immediate shoreline area. Data for this station is only available from 1993 to 1997, but given the limited development in the area, may be representative of surficial aquifer water quality conditions today.

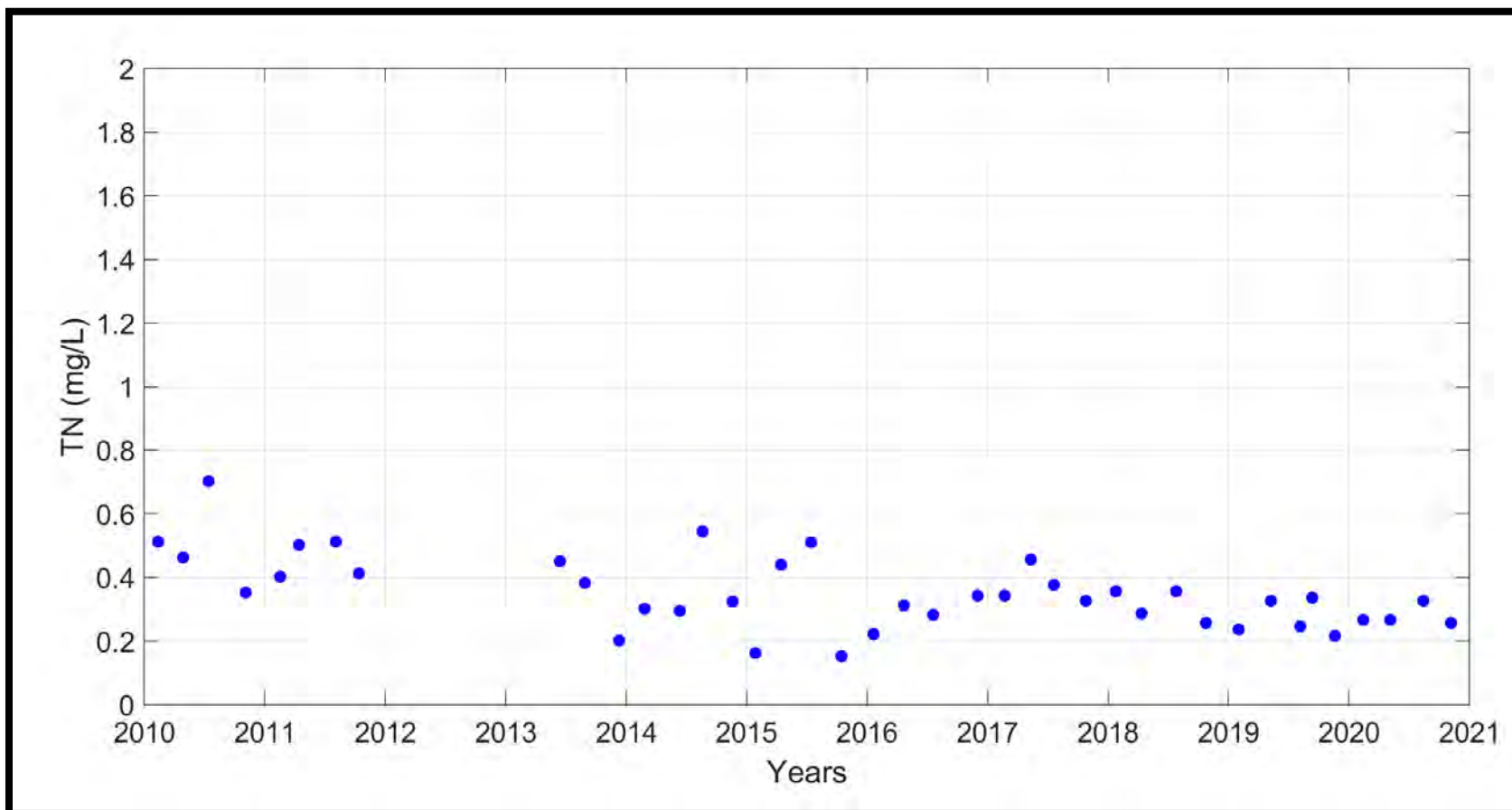


Figure 4-45: Plot of Measured TN

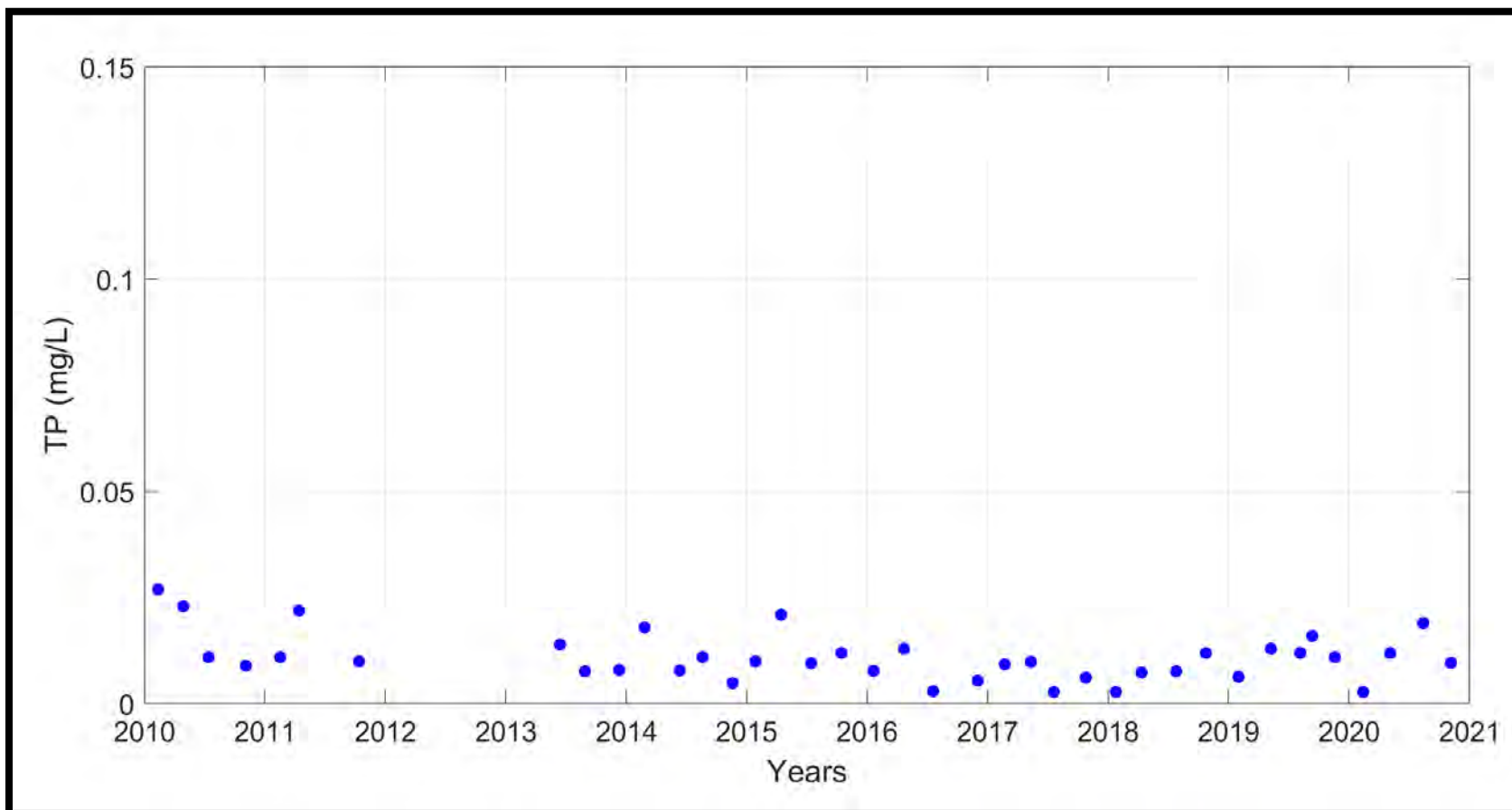


Figure 4-46: Plot of Measured TP

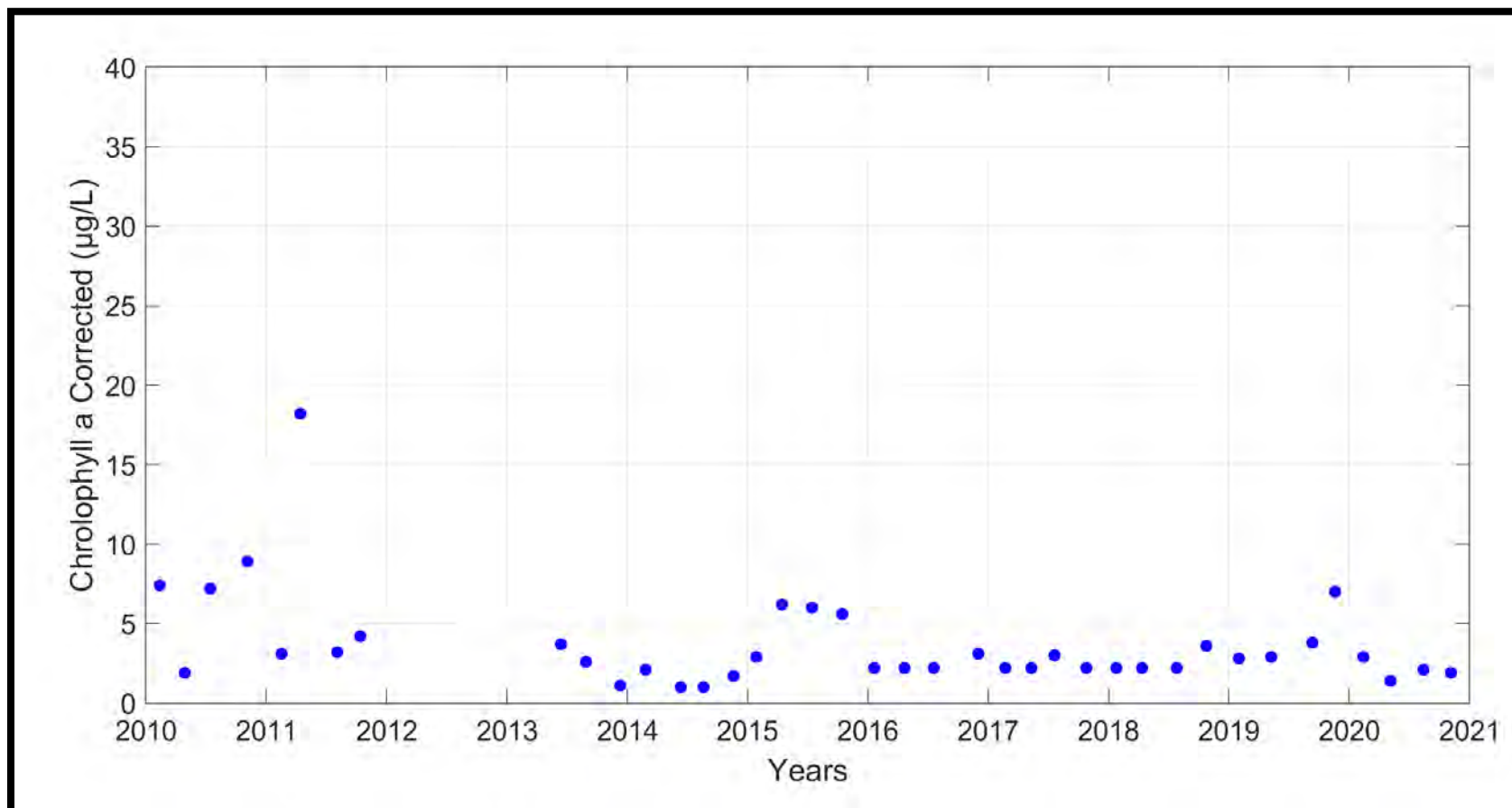


Figure 4-47: Plot of Measured Chl-a

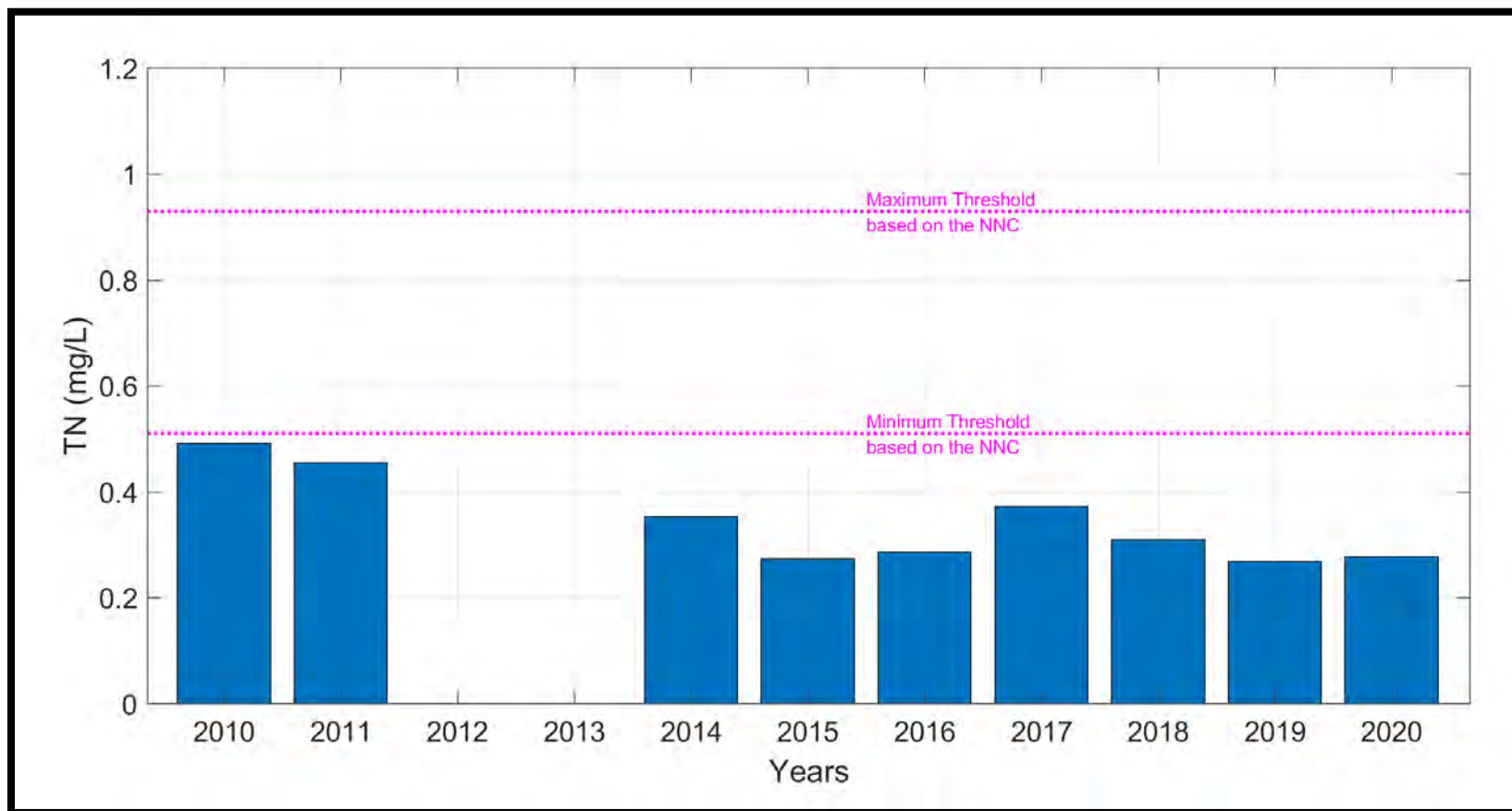


Figure 4-48: Plot of Annual Geometric Means for TN with NNC Criteria for Carr Lake

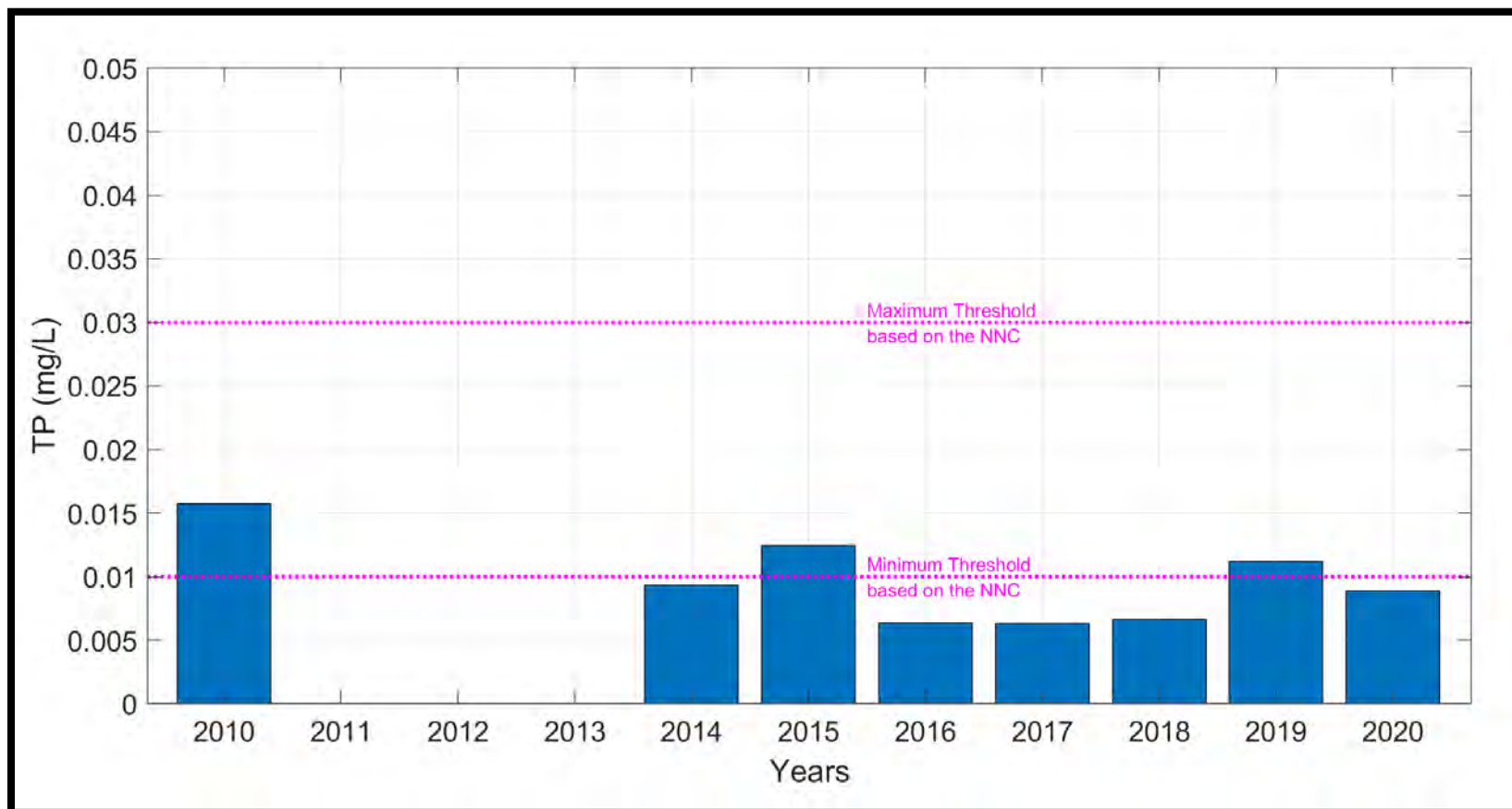


Figure 4-49: Plot of Annual Geometric Means for TP with NNC Criteria for Carr Lake

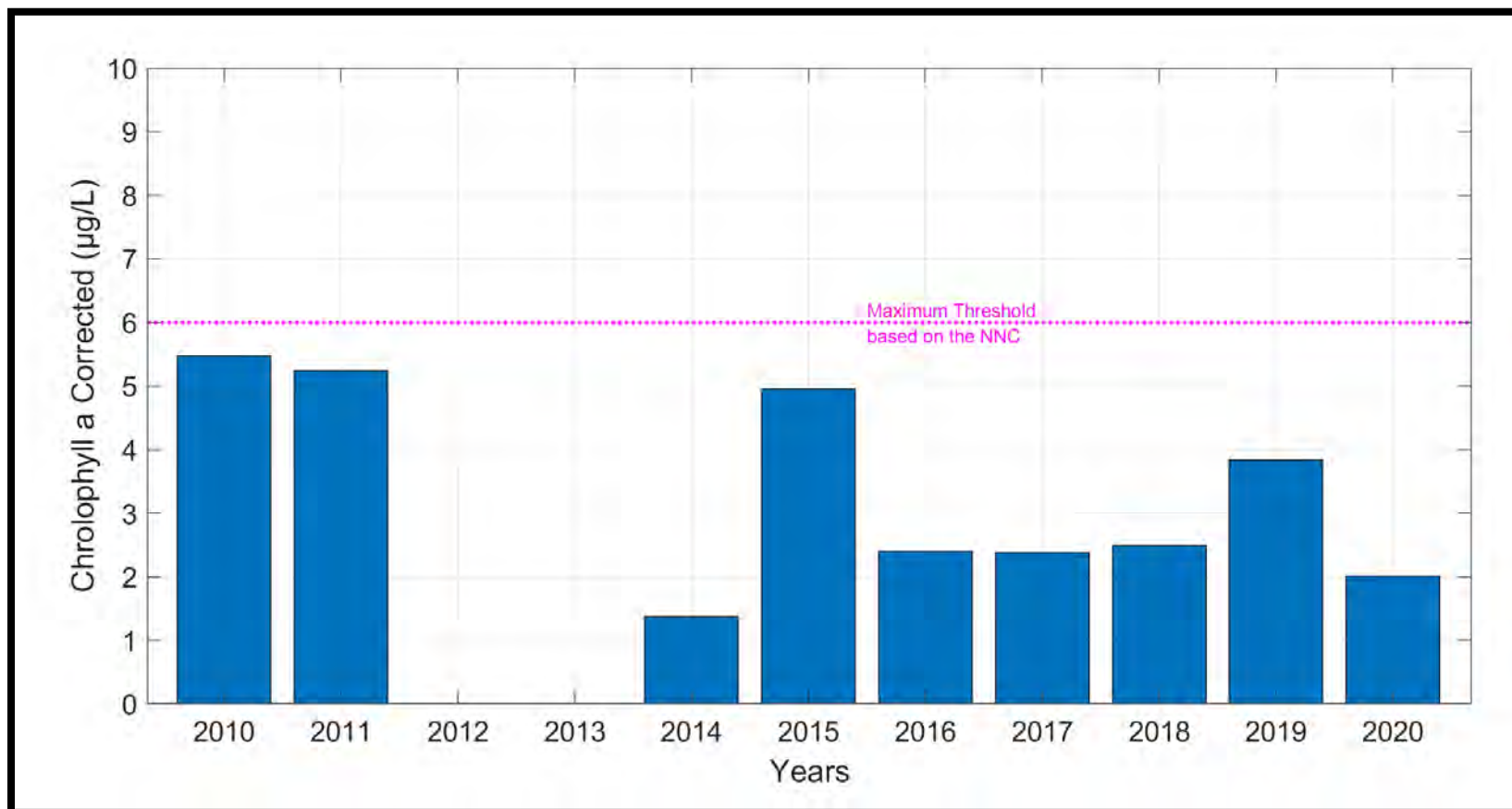


Figure 4-50: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Carr Lake

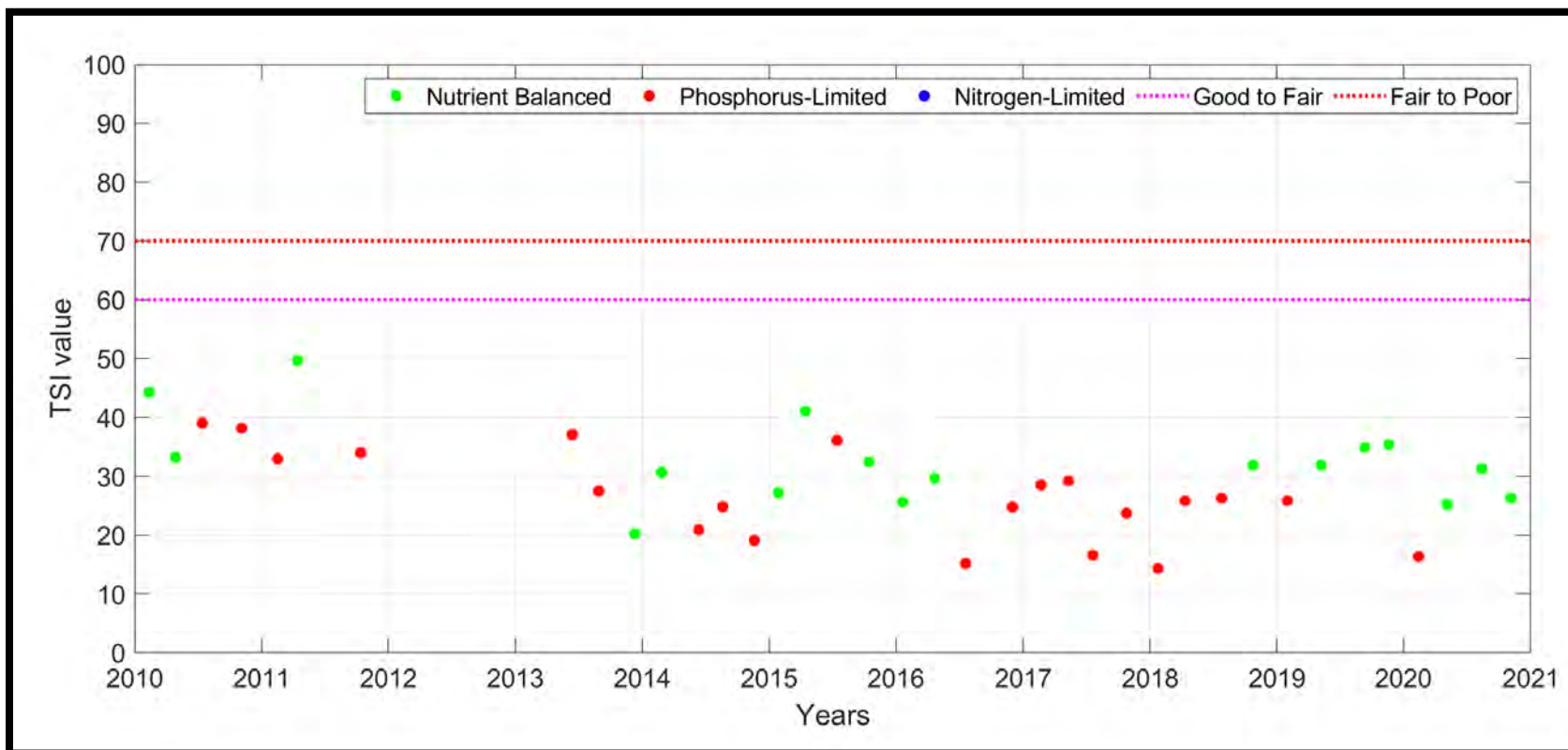
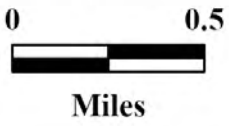
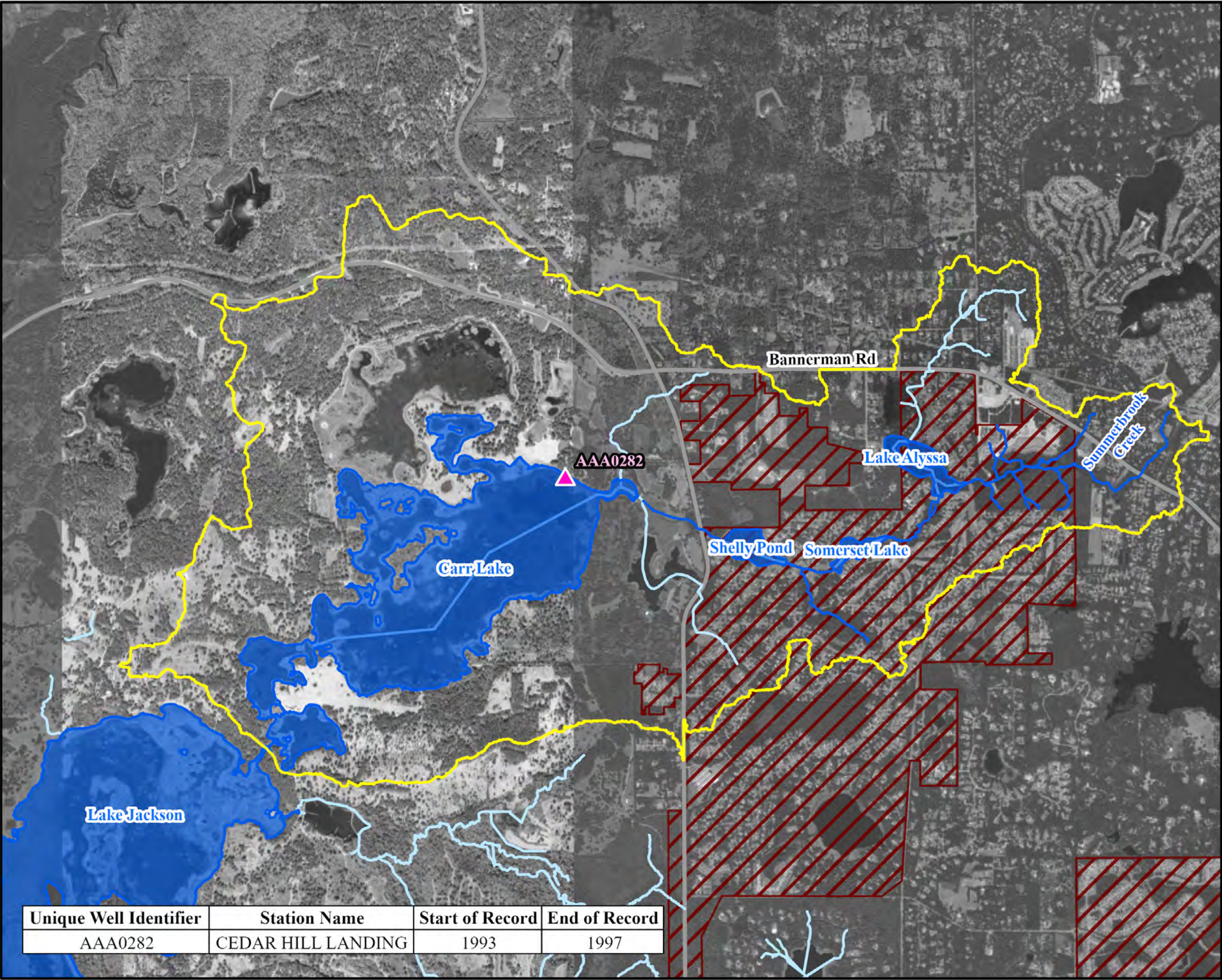


Figure 4-51: Trophic State Index for Carr Lake

Volume 4 – Lake Jackson Basin



Legend

- Carr Lake Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Groundwater Sampling Sites

Sources:
Waterbodies: COT, 2020
Wells: Leon County, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-53:
Surficial Ground Water Sampling Wells

Tallahassee Master Plan - Surface Water (TMaPS)

Unique Well Identifier	Station Name	Start of Record	End of Record
AAA0282	CEDAR HILL LANDING	1993	1997



4.5.3.8 Biological Data

Table 4-14 presents LVI data collected by Leon County and FDEP between 2010 and 2019. The data show a range of from 53 up to 71, reflecting healthy conditions in the lake. Overall, the LVI values have improved, with some values below 60 prior to 2011 and all scores above 65 after 2016.

Table 4-14: Summary of LVI Data for Carr Lake

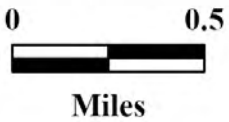
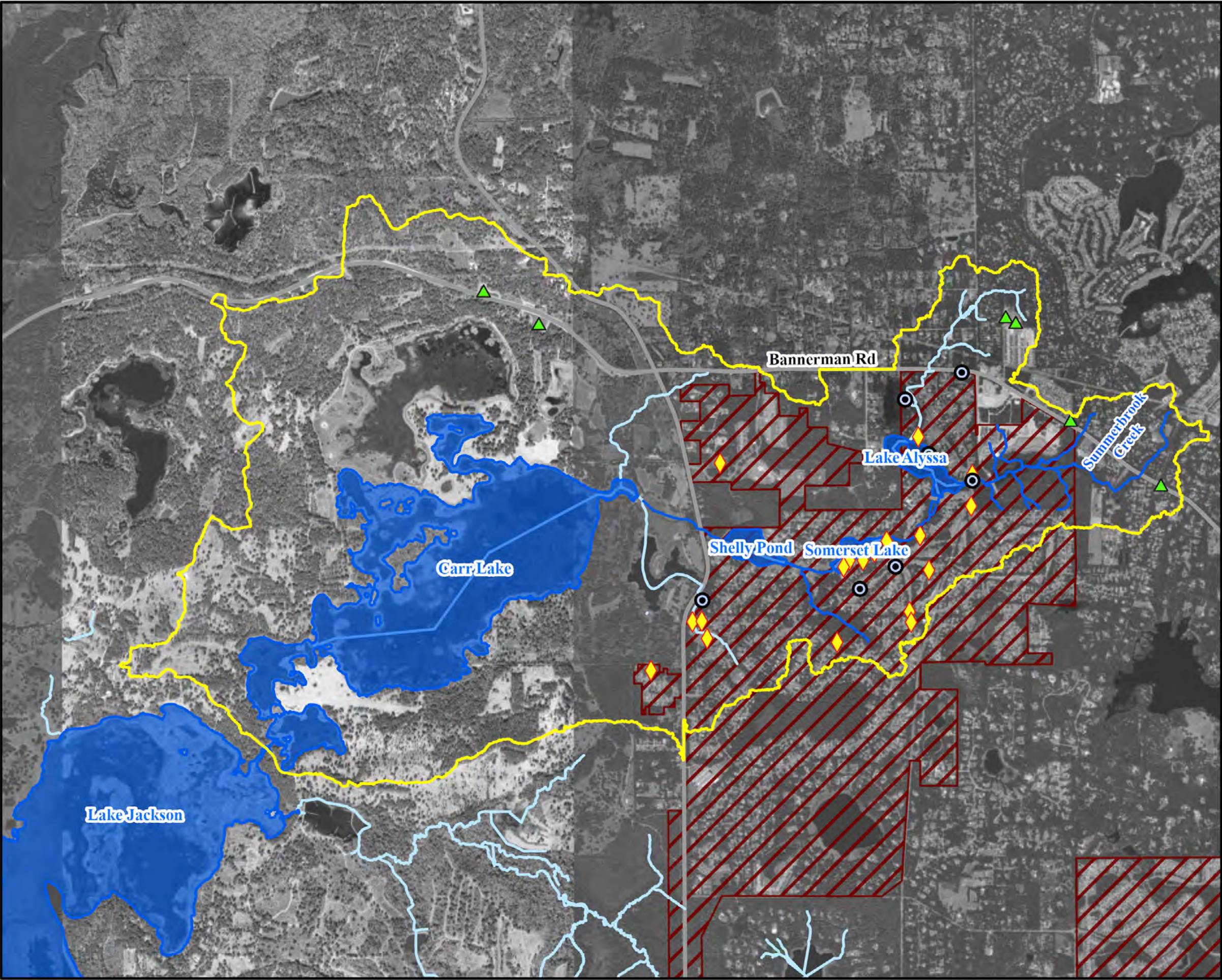
Date	Station ID	LVI	Aquatic Life Use Category
9/3/2010	21FLLEONLEONLVI0	59	Healthy
8/30/2013	21FLLEONLEONLVI0	69	Healthy
9/30/2014	21FLLEONLEONLVI0	70	Healthy
10/12/2015	21FLLEONLEONLVI0	68	Healthy
8/4/2016	21FLLEONLEONLVI0	64	Healthy
6/1/2017	21FLGW22100	68	Healthy
6/15/2017	21FLGW22100	66	Healthy
6/15/2017	21FLGW22100	71	Healthy
6/26/2014	21FLGW22100	65	Healthy
7/23/2018	21FLLEONLEONLVI0	68	Healthy
7/25/2019	21FLLEONLEONLVI0	65	Healthy

4.5.3.9 Stormwater Treatment Facilities

In assessing potential sources of pollutants to Carr Lake, and ultimately for targeting loads and reductions, it is important to identify treatment facilities adjacent to and along tributaries flowing into the lake. **Figure 4-54** presents a map showing the locations of stormwater treatment facilities throughout the Carr Lake subbasin. These are maintained by Leon County, the City, and private neighborhoods. Only three facilities are located west of Meridian Road. These include two along the newly constructed Orchard Pond Parkway maintained by Leon County and one serving the Cortona Hills neighborhood maintained by the City. A total of 23 facilities are located east of Meridian Road, with the largest number within the Ox Bottom and Summerbrooke neighborhoods. These are maintained by the City or the local neighborhood Homeowner Associations (HOAs). Four facilities are located along and north of Bannerman Road, which are maintained by Leon County or the local neighborhood HOAs.

4.5.3.10 Atmospheric Deposition Data

Section 4.4.3.11 presented the location of the nearest atmospheric deposition station to Carr Lake. This is the same station that was utilized in the Lake Jackson calculations.



Legend

- Carr Lake Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Stormwater Ponds (Other)
- City of Tallahassee Stormwater Ponds
- Leon County Stormwater Ponds

Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2022
City Limits: COT, 2020

Figure 4-54:
BMPs in Carr Lake Drainage Basin

Tallahassee Master Plan - Surface Water (TMaPS)



4.5.3.11 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Carr Lake (**Section 4.5.4**), the available data are reasonable. There are sufficient active surface water quality stations within the lake to support the qualitative assessment. The water quality conditions in the lake limit the need for additional data. Based on the relatively pristine water quality, it is assumed anthropogenic loads are minimal. The following outlines some limitations in the available data. Specific recommendations on additional data collection efforts are provided in **Section 4.11**.

- Data are not available for the flow in the primary tributary entering the northern end of Carr Lake which drains the Summerbrook basin.
- Water quality data in the primary tributary from the Summerbrook basin is old (pre-2010).

4.5.4 Qualitative Assessment of Sources

As outlined in **Section 4.4.4** for Lake Jackson, prior to performing loading calculations and other analyses to quantify existing pollutant sources to Carr Lake, it is important to analyze available data and summarize findings from historical studies to support identification of likely sources and quantification of the magnitude of impact.

For Carr Lake, the sources to be evaluated include the following:

- Stormwater runoff
- Septic systems
- Interconnected flows
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition

An overview of analyses and findings for each source listed above is provided in the following sections. Prior to the discussions of each of the potential sources, an in-lake analysis is provided to build on the information presented in **Section 4.5.3.6**. Following the discussions for each source type, a summary of findings for the qualitative assessment is provided.

4.5.4.1 In-Lake Water Quality

Following the methodology utilized for Lake Jackson in **Section 4.4.4.1**, analyses were conducted on the available in-lake data from 2010 to the present. This provides an evaluation of the baseline water quality conditions. The parameters analyzed for Carr Lake include color, alkalinity, TP, TN, Chl-a, TSI, and *E. coli*.

As was done for Lake Jackson (**Section 4.4.4.1**), stations were clustered where they represent conditions within a specific area, and all stations with data after 2010 were assigned to a specific cluster. The clustered data from 2010 to the present were analyzed to provide the average of the

annual geomeans or the 90th percentile, depending upon the parameter. The results are presented on a map, with colors representing the results. The levels associated with the colors are reflective of water quality thresholds as outlined in 62-302 F.A.C. and are discussed and presented in **Section 4.4.4.1**. The Carr Lake analyses use the same ranges as the Lake Jackson analyses.

Figure 4-55 presents the data clustering used for the analyses and associated stations. For Carr Lake, data since 2010 were only available in one general location, which is at the northern end of the lake near the boat ramp. Therefore, a single cluster was analyzed. As such, the spatial comparisons discussed for Lake Jackson are not provided, rather the results from the single cluster are discussed against the thresholds.

Figure 4-56 and **Figure 4-57** present the color and alkalinity. Both are low, indicating the lake is a clear, low alkaline system with the associated criteria.

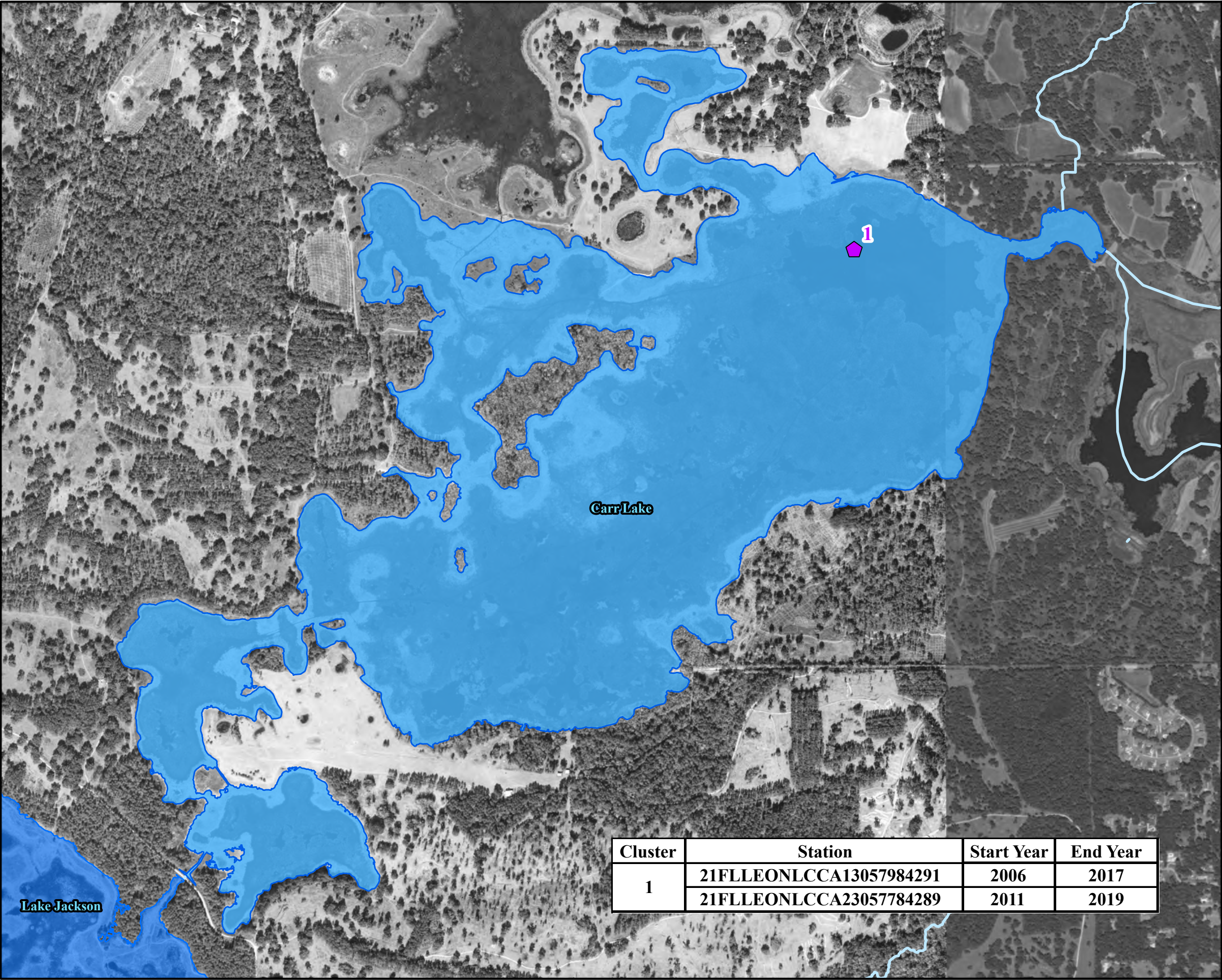
Figure 4-58 and **Figure 4-59** present the TN and TP. For all of the parameters, the nutrient levels in the northern portion of the lake are low. TN levels are below the minimum lake threshold while TP levels are just above the minimum threshold. It should be noted that the upper portion of the lake contains the discharge from the Summerbrook Creek Drainage Basin. The Summerbrook Creek Drainage Basin has higher levels of development and septic systems than the immediate drainage basin of Carr Lake, west of Meridian Road. The Summerbrook Creek Drainage Basin is discussed in greater detail in **Section 4.6**.

Figure 4-60 and **Figure 4-61** present maps of the Chl-a and TSI. The Chl-a levels on average are low, between 3 and 4 µg/L. The TSI values are within the lowest segment between 0 and 15, identifying the system as Oligotrophic, with very low nutrient levels.

Figure 4-62 presents a map of the *E. coli* levels. The data analyzed are from 2014 through 2020 and the data were analyzed to provide the 90th percentile to compare against the 410 MPN/100 mL criteria per the FDEP approach in the IWR analyses. The results show that the 90th percentile for the data are well within the criteria in the lowest blue range (less than 100 MPN/100 mL).

4.5.4.2 Stormwater Runoff

To assess stormwater runoff as a potential source of pollutant loads to Carr Lake, the first step was to evaluate the LDI levels within the subbasins draining to the lake. In **Section 4.4.4.2**, LDI values were presented by subbasin in **Figure 4-24**. The map showed that in the immediate watershed area surrounding Carr Lake (west of Meridian Road), LDI levels were excellent. This would indicate that this area has limited potential for anthropogenic pollutant loads from stormwater runoff. Within the Summerbrook Creek Drainage Basin (east of Meridian Road), the levels were moderate, indicating higher potential for anthropogenic pollutant loads from stormwater runoff. The next section (**Section 4.6**) provides a detailed evaluation of the Summerbrook Creek subbasin and its potential for stormwater pollutant loading. This includes analyses of data along Summerbrook Creek upstream of the discharge into Carr Lake.



- Legend**
- Carr Lake
 - Waterbodies in Study
 - Watercourses
 - In-Lake Station Cluster

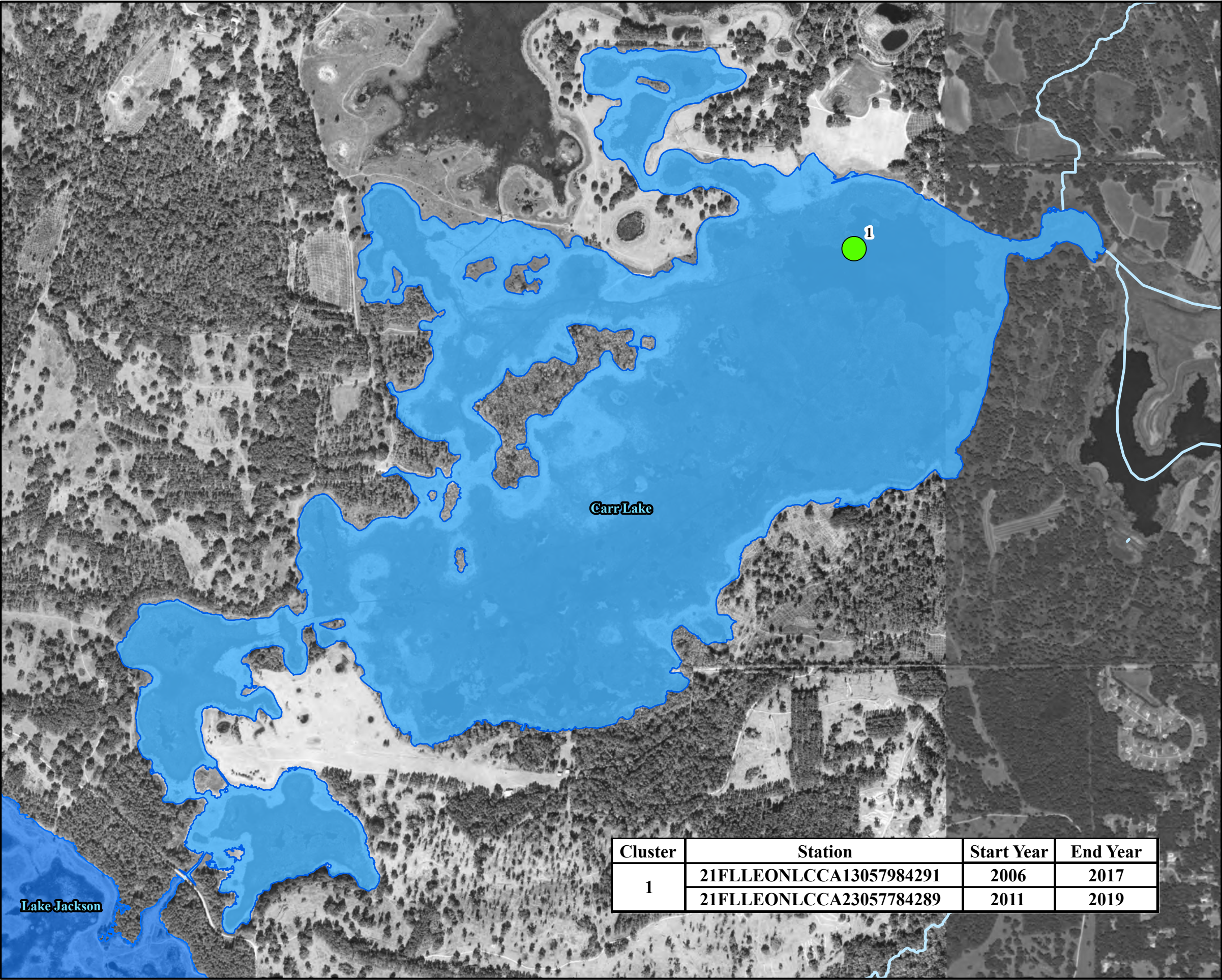
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-55:
Station Clustering for In-Lake Spatial
Analyses for Carr Lake

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019



Legend

- Carr Lake
- Waterbodies in Study
- Watercourses

Color Average 2010-2020

PCU

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- > 40

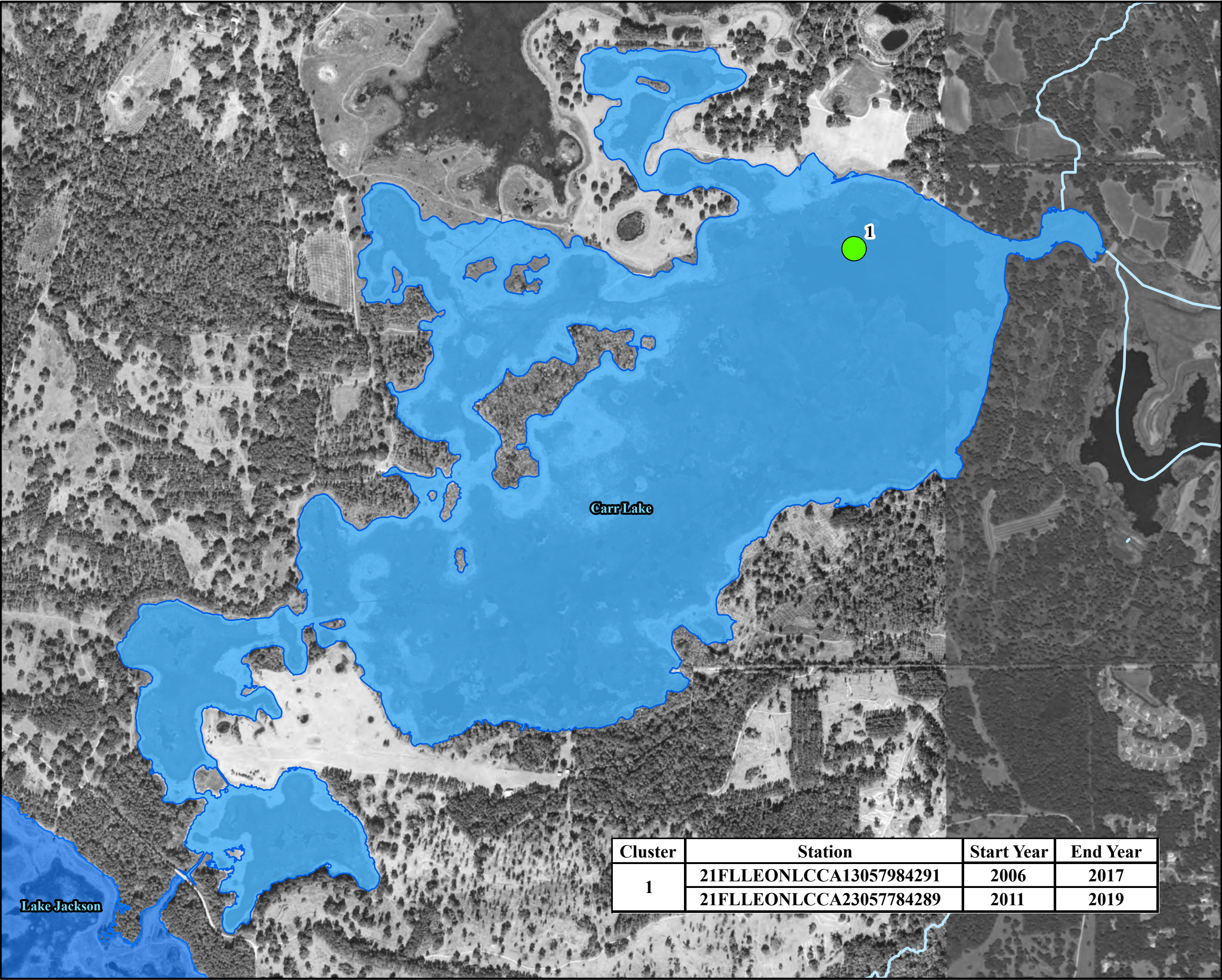
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-56:
Spatial Assessment of Color in Carr Lake

Tallahassee Master Plan - Surface
Water (TMaPS)

Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019





- Legend**
- Carr Lake
 - Waterbodies in Study
 - Watercourses
- Alkalinity Average 2010-2020
mg/L**
- 0 - 5
 - 5 - 10
 - 10 - 15
 - 15 - 20
 - > 20

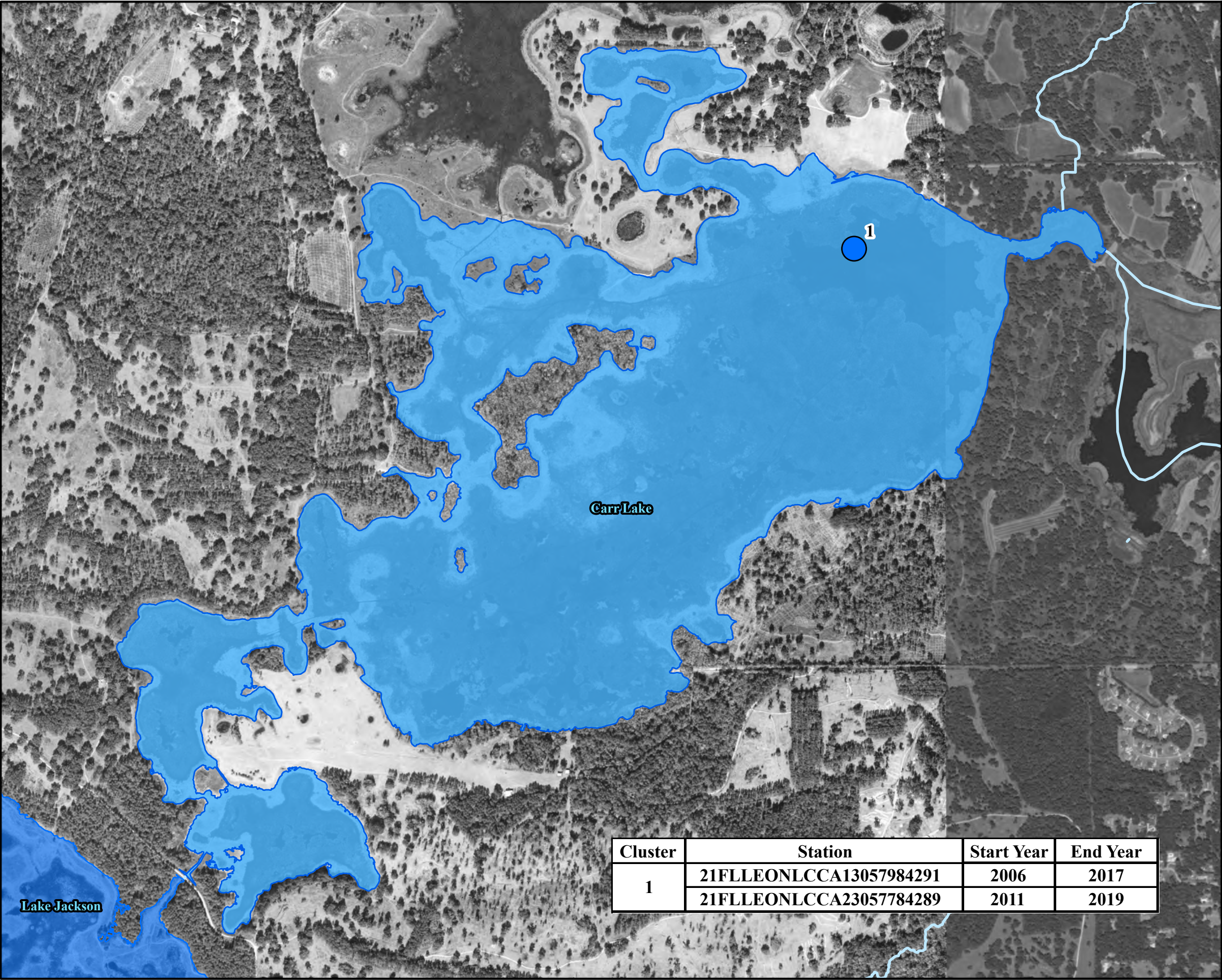
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-57:
Spatial Assessment of Alkalinity in Carr Lake

**Tallahassee Master Plan - Surface
Water (TMaPS)**



Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019



Legend

- Carr Lake
- Waterbodies in Study
- Watercourses
- TN Average 2010-2020
mg/L
 - 0 - 0.53
 - 0.53 - 0.66
 - 0.66 - 0.79
 - 0.79 - 0.93
 - > 0.93

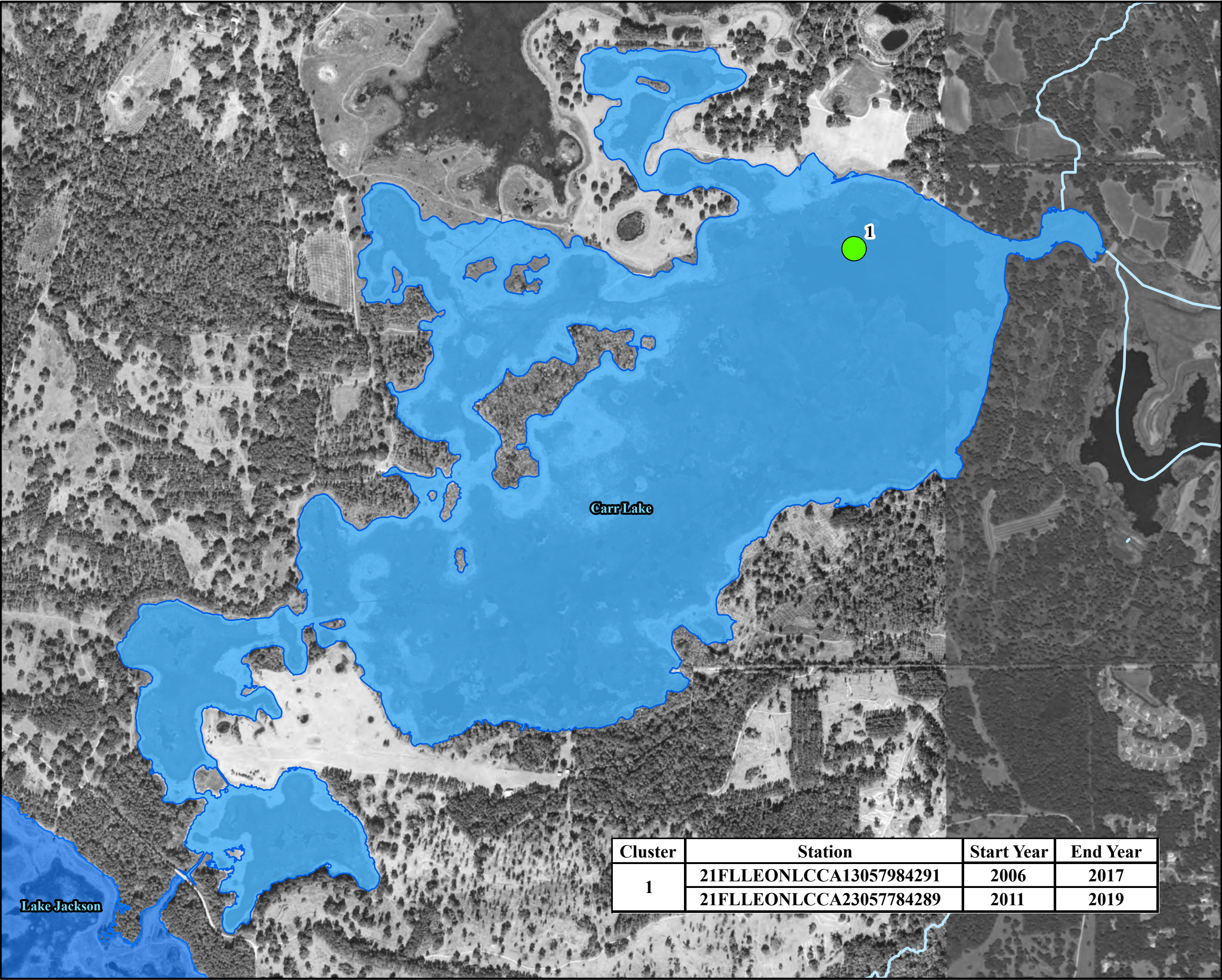
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-58:
Spatial Assessment of TN in Carr Lake

Tallahassee Master Plan - Surface
Water (TMaPS)

Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019





Legend

- Carr Lake
- Waterbodies in Study
- Watercourses
- TP Average 2010-2020
mg/L
 - 0- 0.010
 - 0.010 - 0.017
 - 0.017 - 0.024
 - 0.024 - 0.030
 - > 0.03

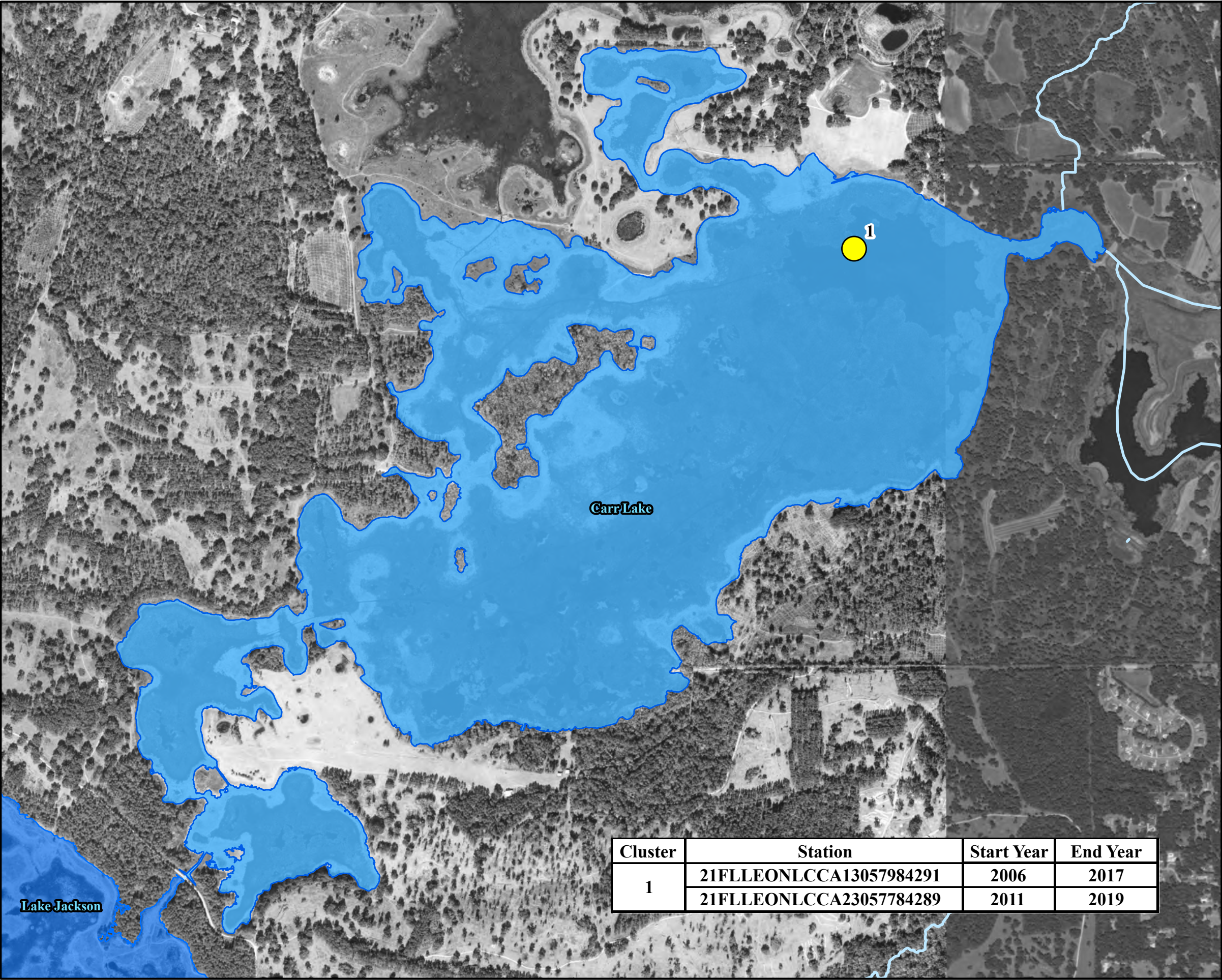
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-59:
Spatial Assessment of TP in Carr Lake

**Tallahassee Master Plan - Surface
Water (TMaPS)**

Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019





Legend

- Carr Lake
- Waterbodies in Study
- Watercourses
- Chl a Average 2010-2020
µg/L
 - 0.0 - 1.5
 - 1.5 - 3.0
 - 3.0 - 4.5
 - 4.5- 6.0
 - > 6

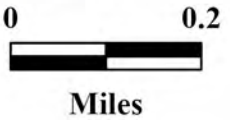
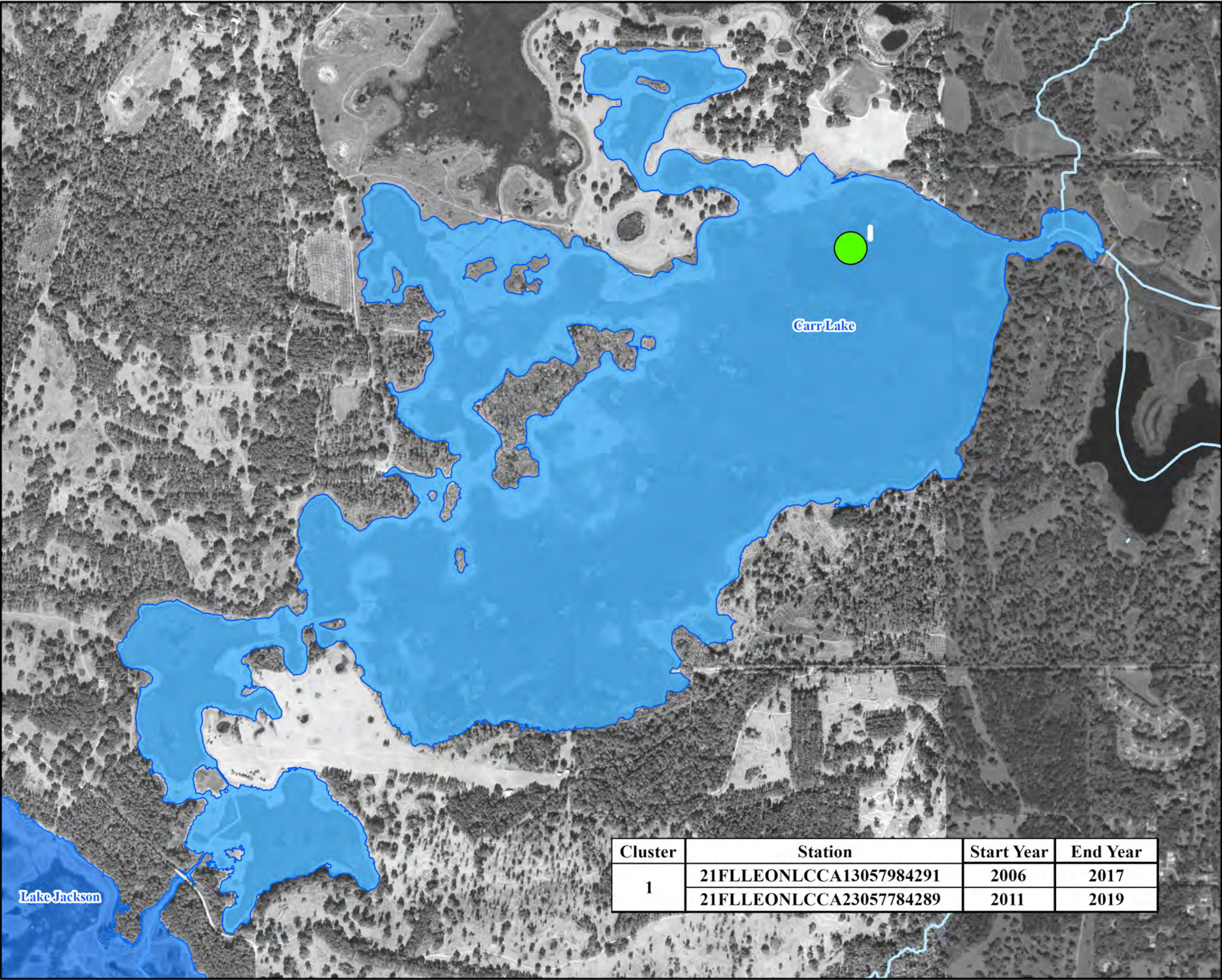
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-60:
Spatial Assessment of Chl a in Carr Lake

Tallahassee Master Plan - Surface
Water (TMaPS)

Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019





Legend

- Carr Lake
- Waterbodies in Study
- Watercourses

TSI Average 2010-2020

TSI Score

- 0 - 15
- 16 - 30
- 31 - 45
- 46 - 60
- > 60

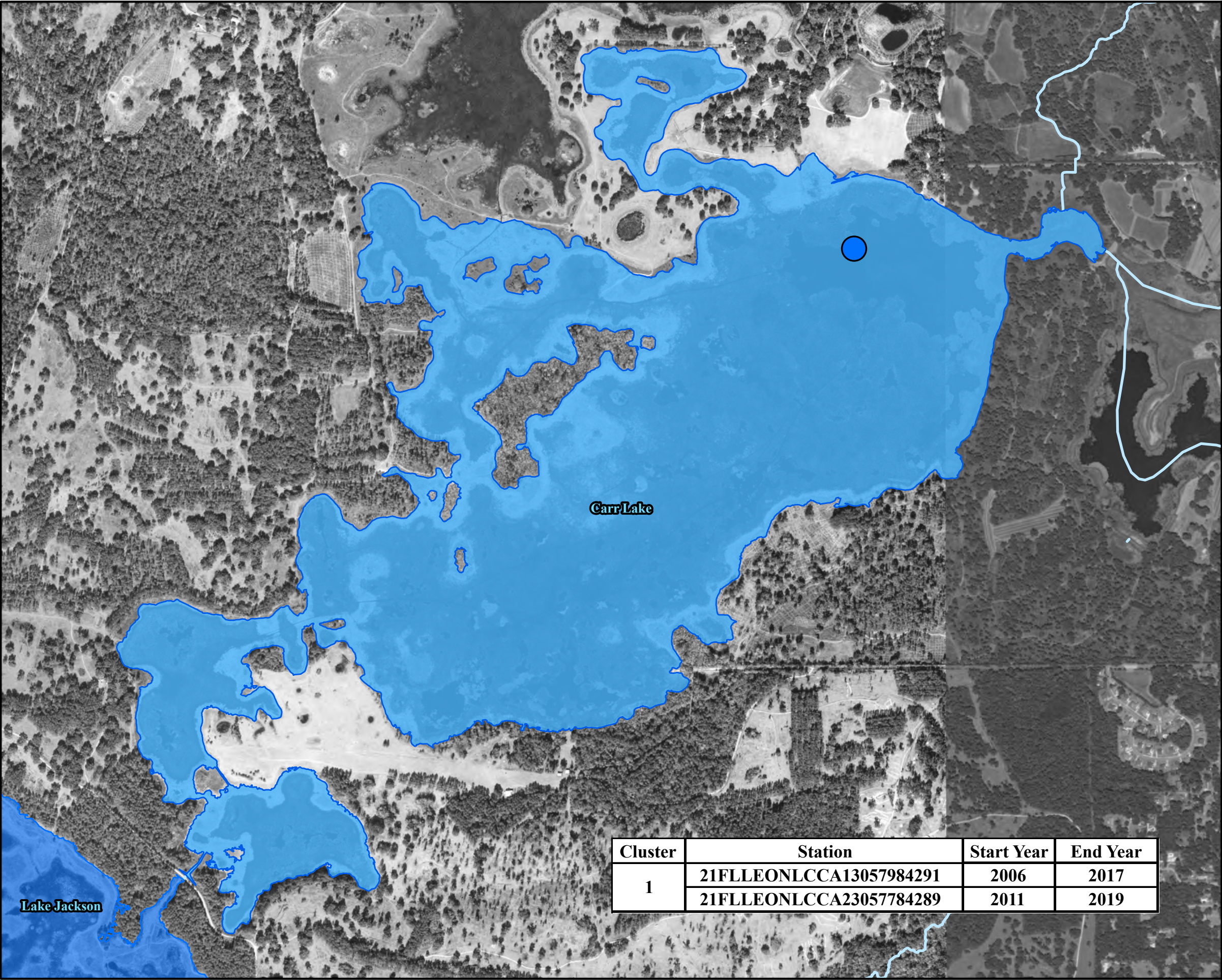
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-61:
Spatial Assessment of TSI in Carr Lake

Tallahassee Master Plan - Surface
Water (TMaPS)

Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019





Legend

-  Carr Lake
-  Waterbodies in Study
-  Watercourses

**E. coli 90th Percentile 2010-2020
MPN/100mL**

-  < 100
-  100 - 200
-  200 - 300
-  300 - 410
-  > 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

**Figure 4-62:
Spatial Assessment of E. coli in Carr Lake**

**Tallahassee Master Plan - Surface
Water (TMaPS)**

Cluster	Station	Start Year	End Year
1	21FLLEONLCCA13057984291	2006	2017
	21FLLEONLCCA23057784289	2011	2019



4.5.4.3 Septic Systems

Figure 4-43 presented the locations of septic systems within the Carr Lake basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin. As with the LDI values, the septic tank densities in the immediate Carr Lake basin are low. A total of five septic systems are within the immediate drainage area of the lake. There is a small cluster located in the southeast corner of the drainage area west of Meridian Road, which is part of the subbasin that drains to Holley Pond and not Carr Lake. Based on these analyses, the potential for septic loads from the areas west of Meridian Road would be deemed low. East of Meridian Road (within the Summerbrook Creek basin) is where the bulk of the septic systems are located. The septic density within this subbasin is higher, indicating a greater potential for load from this area. The septic loading in the Summerbrook Creek basin is addressed in more detail in **Section 4.6**.

4.5.4.4 Internal Recycling and Seepage

Internal Recycling

To date, no studies or data collection efforts have been undertaken to assess the potential for nutrient loading/recycling from sediments in Carr Lake. Given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake, internal loading is not identified as a significant source of loading to the lake.

Seepage

As outlined in **Section 4.5.3.10** and presented in **Figure 4-53**, there was a single surficial aquifer sampling site within the Carr Lake basin. This station was located at the Cedar Hill Landing boat ramp park immediately adjacent to the northern end of Carr Lake. The data gathered at this location was from 1993 to 1997, with a total of three samples. The data did show some higher levels of ammonia (0.8 to 1.3 mg/L). Given the limited sample set, age, and location of the data, they were not considered representative of present conditions for seepage to Carr Lake.

4.5.4.5 Wastewater

No direct wastewater discharges are currently within the Carr Lake basin. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries in relation to sewer service areas. There is no sewer infrastructure located in the immediate drainage basin for Carr Lake (west of Meridian Road). There is a small area in the southeast corner of the drainage area west of Meridian Road, but this infrastructure is within the subbasin for Holley Pond. East of Meridian Road, within the Summerbrook Creek basin, there is extensive sewer infrastructure. The potential for this infrastructure to contribute pollutant loads to Summerbrook Creek and, ultimately Carr Lake, is addressed in the discussion of the Summerbrook Creek basin (**Section 4.6.4.5**).

4.5.4.6 Atmospheric Deposition

For Carr Lake, the ratio of the watershed area to lake area is around 10:1. With this ratio, and the potential attenuation of rainfall runoff, direct atmospheric deposition to the lake can play a role in overall loading to the lake, especially for nitrogen. Atmospheric deposition will be accounted for both indirectly within stormwater runoff and directly as a load to the lake surface as part of

this study. **Section 4.5.3.10** identified the nearest atmospheric deposition station as the Quincy station (FL14) (**Figure 4-15**).

4.5.4.7 Interconnected Flows

There are three waterbodies that have surface connections and the potential to flow into Carr Lake. These are Mallard Pond, Holley Pond, and Shelly Pond. The individual waterbodies, the connections, and their potential to contribute load to the lake are discussed in further detail below.

Mallard Pond has a surface area of roughly 257 acres and is amidst a collection of dry and wet prairies, forests, and marshes. Mallard Pond buttresses Carr Lake to the northeast and appears to be isolated under dry conditions. There is no current water quality data within Mallard Pond so nutrient loads out of the lake cannot be calculated. The dynamics of the connection between the two waterbodies and whether it is unidirectional are also not known. Based on land uses around Mallard Pond, it is unlikely as a potential anthropogenic source of nutrients to Carr Lake.

Shelly Pond discharges out of its western side into a stream that connects under Meridian Road with a total flow length of about 3,400 ft. Shelly Pond's surface area is approximately 23 acres and is mostly surrounded by residential land use on the southern side and hardwood forest on its northern side. As Shelly Pond has been discharging to Carr Lake for many years, and the water quality within the lake has not degraded, this load is not a likely significant anthropogenic source of nutrients to Carr Lake.

Holley Pond discharges out of its northernmost point to the western portion of the waterbody and flows north approximately 650 ft before converging with the flowpath coming from Shelly Pond and traveling an additional 1,000 ft before inflowing to Carr Lake. Holley Pond has a surface area of about 48 acres and is mostly surrounded by woodlands/forested area land use. Based on land uses around Holley Pond, it is not identified as a potential anthropogenic source to Carr Lake.

4.5.4.8 Summary of Findings

At present, water quality and biological conditions in Carr Lake are very good and are not exhibiting declining trends. The immediate drainage basin to the lake (west of Meridian Road) is mostly undeveloped and is not expected to be a potential source of pollutant loads. The area to the east of Meridian Road, while developed, has been discharging under the same conditions for many years without any declining water quality in Carr Lake, suggesting pollutant loads from these areas are also minimal.

Though these sources do not appear significant, stormwater runoff contributing to tributary inflow, septic, and atmospheric deposition are quantified for comparative purposes as part of this study based on available data. Interconnected flow, internal recycling, seepage, and wastewater also do not appear to be significant sources and were not quantified as part of this study based on limited data. Interconnected flow from Shelly Pond is identified for future evaluation outside of this study to better assess potential contributions from the City's municipal separate storm sewer system (MS4) to Carr Lake.

4.5.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Carr Lake for the sources identified for calculation in **Section 4.5.4.8**. These include stormwater runoff, septic systems, and atmospheric deposition. Where loads were not calculated, the sections below provide brief discussions. The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

4.5.5.1 Stormwater Pollutant Load

In order to calculate the stormwater TN and TP loads to Carr Lake, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to Carr Lake. TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-63 presents the subbasins and the DEM utilized in the SIMPLE model calculations for Carr Lake. **Figure 4-64** presents the aggregated land use. Finally, **Figure 4-65** presents the CDAs for the Carr Lake stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs around the Lake.

Stormwater Nutrient Loads to Carr Lake

Figure 4-66 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-66**). The rankings are color coded with the highest ranked CDAs in green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 128 lb/yr up to 754 lb/yr. The per acre loads ranged from 0.7 lb/acre/yr up to 1.0 lb/acre/yr. Evaluation of per acre loads only shows a small difference between the various CDAs. Additionally, compared to the numbers for Lake Jackson, the per acre loading is small and more representative of natural conditions throughout. While the ranking highlights CDAs north and south of the lake, all of the areas have relatively low per acre loads and would not generally be deemed areas of focus for projects. The total potential stormwater runoff load for TN is 2,805 lb/yr.

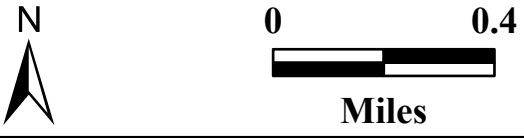
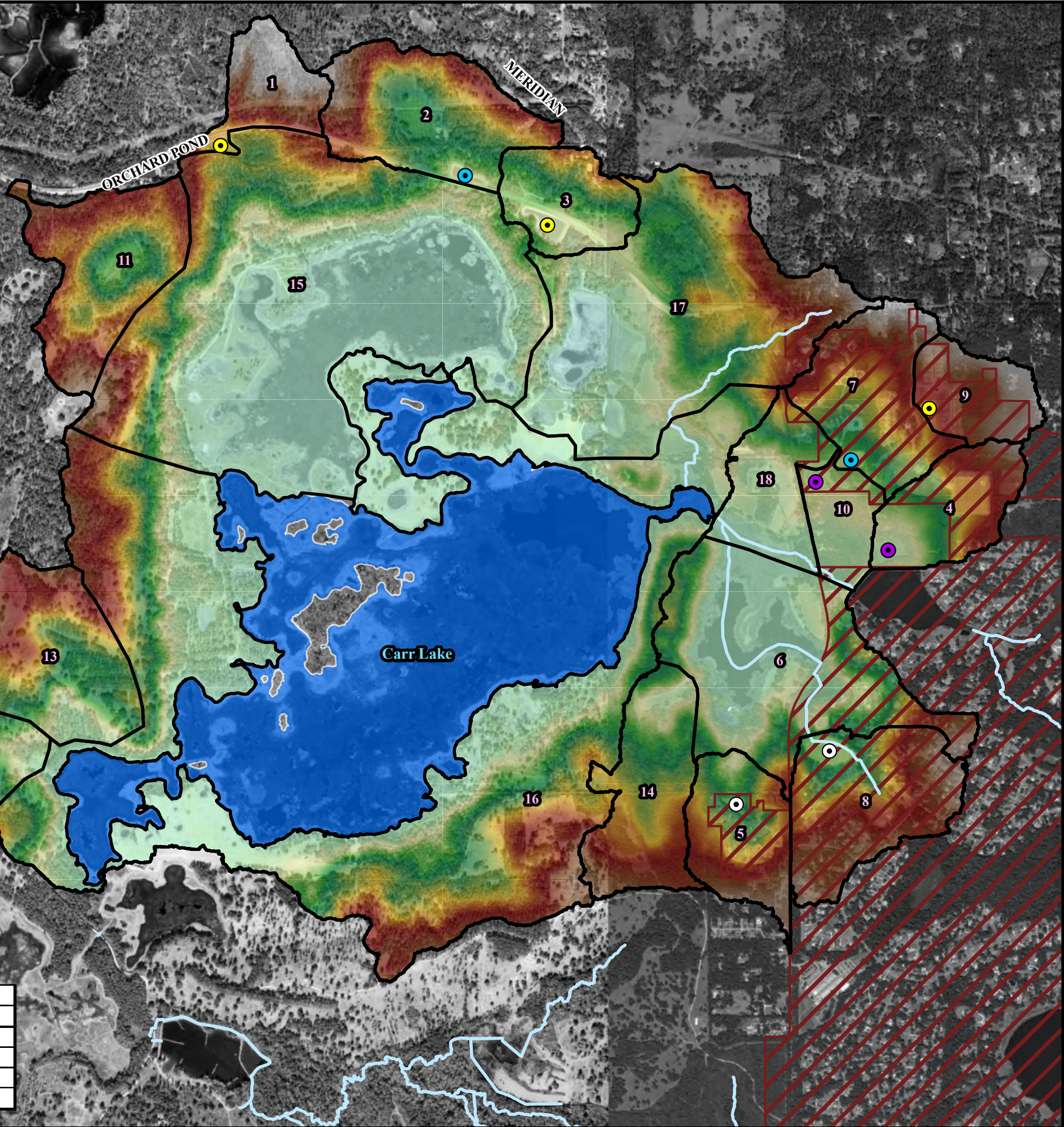
Figure 4-67 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-67**). The calculated total stormwater TP loads from the CDAs ranged from as low as 18 lb/yr up to 106 lb/yr. The per acre loads ranged from 0.09 lb/acre/yr up to 0.17 lb/acre/yr. Similar to what was seen for TN, while the ranking would point to the CDA on the southeast side, overall, the low per acre loads would not indicate any as targets for load reduction. The total potential stormwater runoff load for TP is 432 lb/yr.

4.5.5.2 Septic Load

In order to analyze the potential impacts from septic tank units to Carr Lake, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The approach and calculations were described earlier in **Section 4.4.5.2**, which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN), and based on literature on transport and assimilation, may represent a conservative potential load.

Subbasin Summary Table			
Number	Subbasin ID	Acreage	BMP Type
1	LJBCL0100	59.2	Wet Retention
2	LJBCL0080	140.1	Dry Retention
3	LJBCL0090	72.4	Wet Detention
4	LJBCL0030	81.7	Wet Retention
5	LJBCL0060	85.5	Dry Retention
6	LJBCL0070	244.7	None
7	LJBCL0020	116.5	Dry Detention
8	LJBCL0050	133.3	Dry Retention
9	LJBCL0010	62.0	Wet Detention
10	LJBCL0040	45.6	Wet Retention
11	LJBCL0115	135.4	None
12	LJBCL0120	142.3	None
13	LJBCL0125	144.8	None
14	LJBCL0075	114.5	None
15	LJBCL0130	645.5	None
16	LJBCL0111	873.4	None
17	LJBCL0112	350.4	None
18	LJBCL0071	77.1	None

BMP Type	Reduction Percentages	
	TN (%)	TP (%)
Wet Detention	30	65
Dry Retention	99	99
Wet Retention	80	80
Dry Detention	30	40



Legend

- Carr Lake
- Subbasins
- Watercourses
- Tallahassee Corporate Limits
- BMP Type
 - Dry Detention
 - Dry Retention
 - Wet Detention
 - Wet Retention
- Topographic Elevations
ft NAVD88
 - 278
 - 80

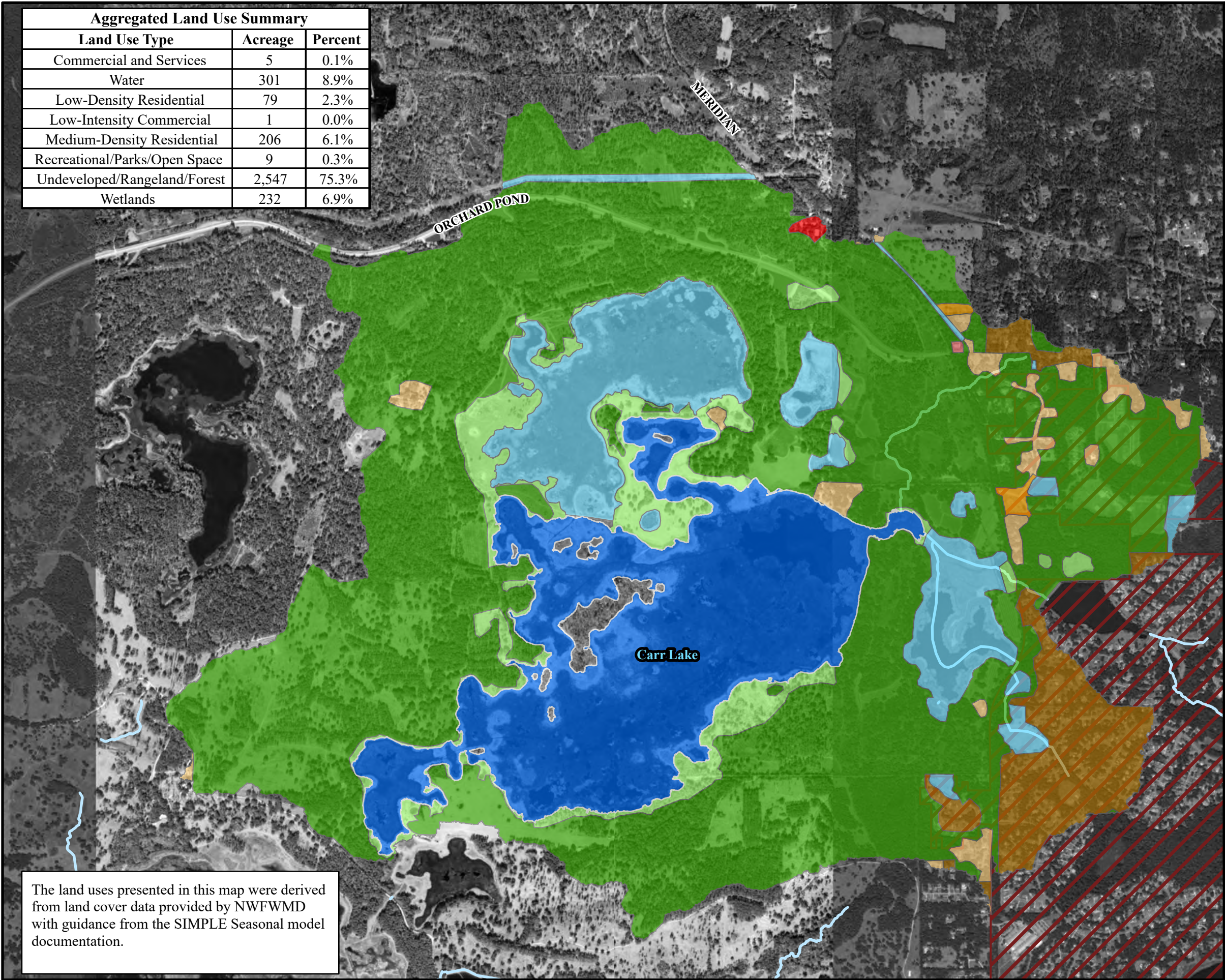
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-63:
Carr Lake Subbasin Delineation
and BMPs

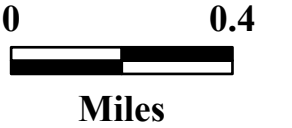
Tallahassee Master Plan - Surface
Water (TMaPS)



Aggregated Land Use Summary		
Land Use Type	Acreage	Percent
Commercial and Services	5	0.1%
Water	301	8.9%
Low-Density Residential	79	2.3%
Low-Intensity Commercial	1	0.0%
Medium-Density Residential	206	6.1%
Recreational/Parks/Open Space	9	0.3%
Undeveloped/Rangeland/Forest	2,547	75.3%
Wetlands	232	6.9%



The land uses presented in this map were derived from land cover data provided by NFWMD with guidance from the SIMPLE Seasonal model documentation.



Legend

-  Carr Lake
-  Watercourses
-  Tallahassee Corporate Limits
- Aggregated Land Use**
- Land Use Type**
-  Commercial and Services
-  Low-Density Residential
-  Low-Intensity Commercial
-  Medium-Density Residential
-  Recreational/Parks/Open Space
-  Undeveloped/Rangeland/Forest
-  Water
-  Wetlands

Sources:
Waterbodies: COT, 2020
Land Use: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 2020

Figure 4-64
Carr Lake Aggregated Land Use
Tallahassee Master Plan - Surface
Water (TMaPS)



Summary of Concentrated Discharge Areas

Number	CDA ID	Acerage
1	LJBCLOF03	873.4
2	LJBCLOF04	422.9
3	LJBCLOF01	578.0
4	LJBCLOF07	980.2
5	LJBCLOF05	142.3
6	LJBCLOF06	144.8
7	LJBCLOF02	382.9



CITY OF
TALLAHASSEE



0 0.4

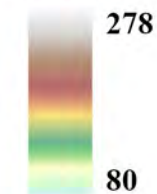
Miles

Legend

- Carr Lake
- Concentrated Discharge Area
- Tallahassee Corporate Limits
- Watercourses

Topographic Elevations

ft NAVD88



Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

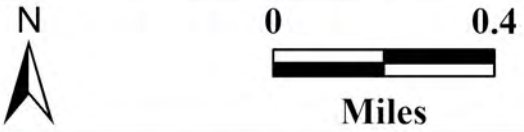
Figure 4-65:
Carr Lake Concentrated Discharge Areas

Tallahassee Master Plan - Surface
Water (TMaPS)

Geosyntec
consultants

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBCLOF03	786.1	0.9	1
2	LJBCLOF04	422.9	1.0	4
3	LJBCLOF01	462.4	0.8	3
4	LJBCLOF07	686.1	0.7	2
5	LJBCLOF05	128.1	0.9	7
6	LJBCLOF06	130.3	0.9	6
7	LJBCLOF02	268.0	0.7	5
Total Load:		2,883.9		



Legend

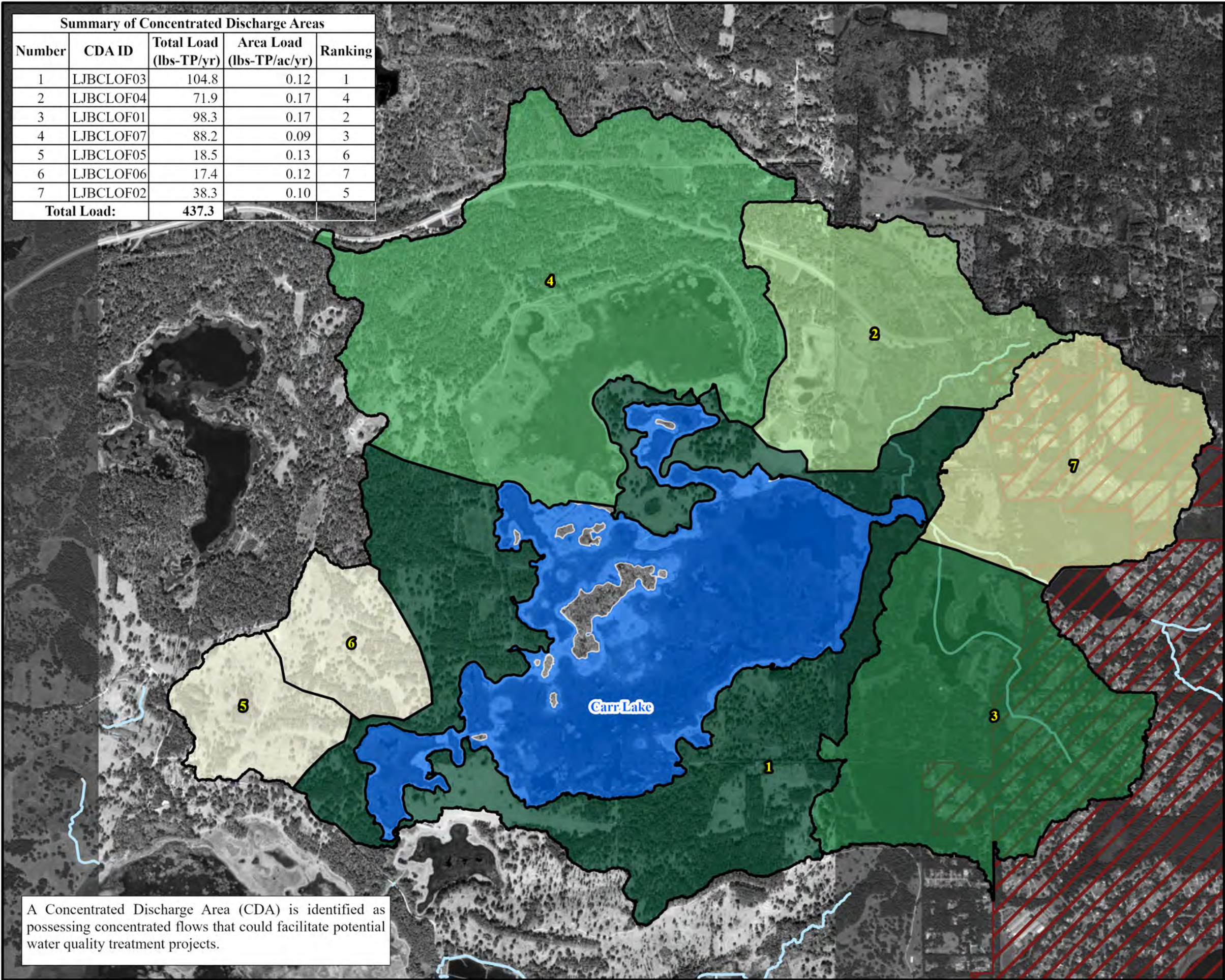
- Carr Lake
- Concentrated Discharge Area
- Watercourses
- Tallahassee Corporate Limits
- Ranking
- High (1)
- Low (7)

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-66
Carr Lake Concentrated Discharge Areas
Total Nitrogen

Tallahassee Master Plan - Surface
Water (TMaPS)

Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBCLOF03	104.8	0.12	1
2	LJBCLOF04	71.9	0.17	4
3	LJBCLOF01	98.3	0.17	2
4	LJBCLOF07	88.2	0.09	3
5	LJBCLOF05	18.5	0.13	6
6	LJBCLOF06	17.4	0.12	7
7	LJBCLOF02	38.3	0.10	5
Total Load:		437.3		



0 0.4



Miles

Legend

- Carr Lake
- Concentrated Discharge Area
- Watercourses
- Tallahassee Corporate Limits

Ranking

- High (1)
- Low (7)

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-67:
Carr Lake Concentrated Discharge Areas
Total Phosphorus

Tallahassee Master Plan - Surface
Water (TMaPS)



An estimated 37 septic tank units were identified within 200 meters of Carr Lake and associated upstream tributaries. **Figure 4-68** shows the septic systems utilized in this analysis, with green representing those associated with direct loading to the waterbody and pink representing those associated with loading to tributaries. A table provided on the figure summarizes the calculated TN load from septic units. The loads are split between tributary inputs (379 lb/yr) and direct inputs (22 lb/yr).

4.5.5.3 Point Source Load

No active point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Carr Lake.

4.5.5.4 Lake Inflow Load

The approach utilized in the calculation of the inter-lake loading was described in **Section 4.4.5.4** for Lake Jackson. The lakes and connections are shown in **Figure 4-69**, along with a table summarizing available water quality data, flow, load calculations (where available), and impairment status. None of the lakes identified in **Figure 4-69** (Mallard Pond, Shelly Pond, Holley Pond) have recent water quality data to allow for calculation of the loading into Carr Lake. As such, no lake inflow load was calculated.

4.5.5.5 Internal Lake Load

Based on the qualitative assessment of potential pollutant loads to Carr Lake (see **Section 4.5.4.4**), internal loading is not likely to have a high potential for loading to the lake. Additionally, no data are available that quantifies the internal loads. Therefore, this load was not calculated.

4.5.5.6 Atmospheric Deposition

As presented and discussed in **Section 4.4.5.6** the annual average atmospheric TN load per acre was calculated from the Quincy NADP station (F14) at 2.56 lb/acre/yr. Multiplying this by the acreage of Carr Lake (692 acres) gives a total TN load of 1,772 lb/yr. No data are available for TP, therefore only the nitrogen load is provided.

4.5.5.7 Summary of Calculated Loads

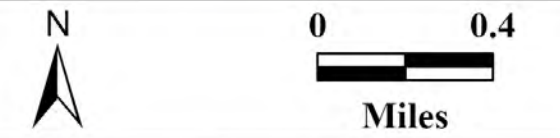
Nutrient loads to Carr Lake were calculated for stormwater runoff, septic systems, and atmospheric deposition. **Table 4-15** presents the calculated total loads to the lake for TN and TP. For septic systems and atmospheric deposition, only TN loads were calculated (see **Section 4.5.5.2** and **Section 4.5.5.6**, respectively, for explanation).

Table 4-15: Summary of Calculated Loads to Carr Lake

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	2,805	432
Septic Systems	400	NC
Atmospheric Deposition	1,772	NC

NC – Not calculated.

Location points of septic systems are digital estimations from related parcel locations and not meant to depict accuracy of unit location within the property.



Legend

- Lake Jackson Drainage Basin
- Waterbodies in Study
- Watercourses
- Relevant Septic Sites
 - Lake
 - Tributaries

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 4-68:
Septic Loading to Carr Lake

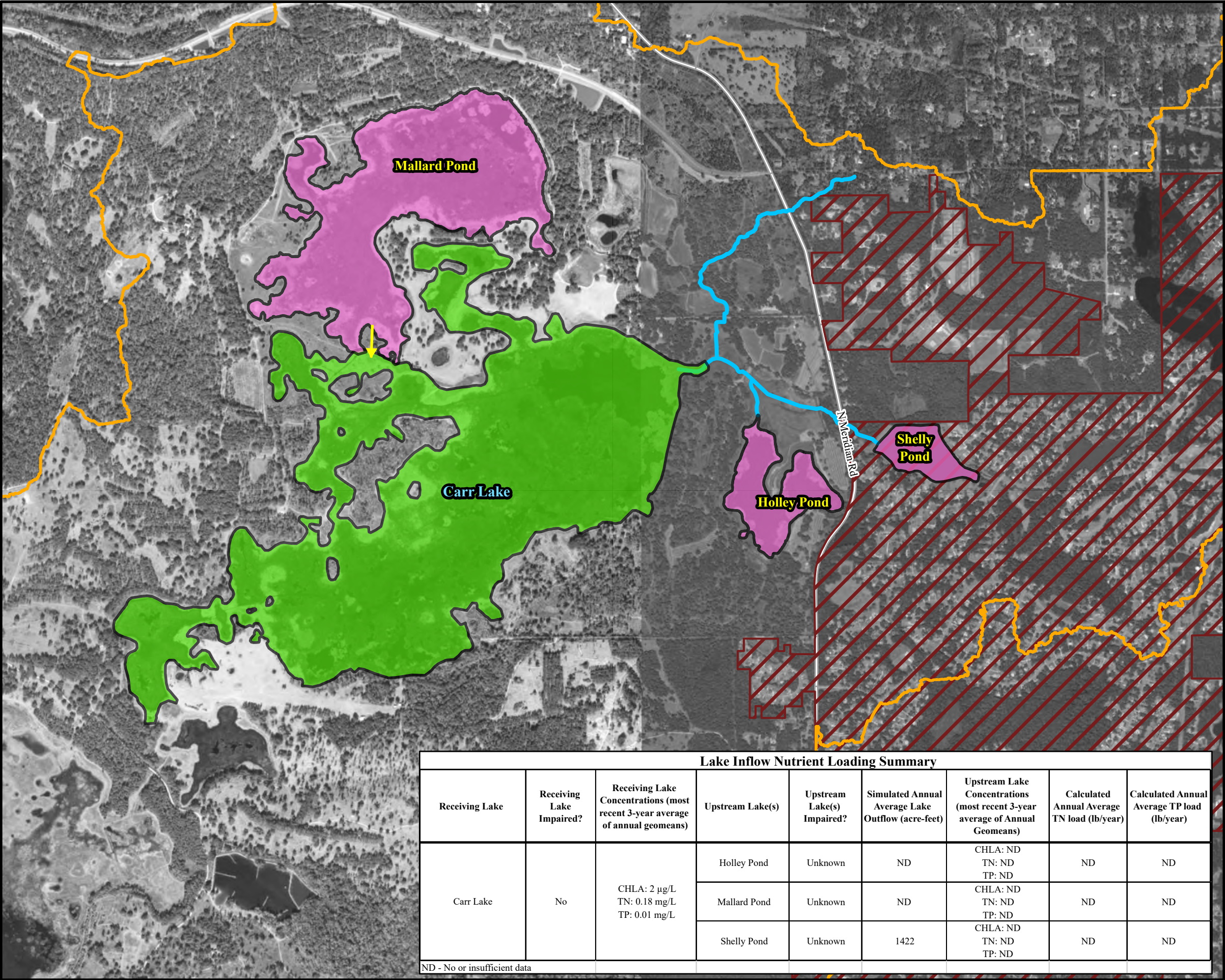
Tallahassee Master Plan - Surface
Water (TMaPS)

Summary of Nutrient Loading from Septic

Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Carr Lake	22	379	400

Only septic units within 200 meters of the waterbody or its tributaries were selected and shown on this map as they are the sources of the calculated nutrient loads, the remainder of septic units that were not selected are not shown on the map.





Legend

- Lake Jackson Drainage Basin
- Carr Lake
- Inflowing Lakes
- Flows Into Carr
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-69:
Inflow Loading to Carr Lake

Tallahassee Master Plan - Surface
Water (TMaPS)



Lake Inflow Nutrient Loading Summary								
Receiving Lake	Receiving Lake Impaired?	Receiving Lake Concentrations (most recent 3-year average of annual geomeans)	Upstream Lake(s)	Upstream Lake(s) Impaired?	Simulated Annual Average Lake Outflow (acre-feet)	Upstream Lake Concentrations (most recent 3-year average of Annual Geomeans)	Calculated Annual Average TN load (lb/year)	Calculated Annual Average TP load (lb/year)
Carr Lake	No	CHLA: 2 µg/L TN: 0.18 mg/L TP: 0.01 mg/L	Holley Pond	Unknown	ND	CHLA: ND TN: ND TP: ND	ND	ND
			Mallard Pond	Unknown	ND	CHLA: ND TN: ND TP: ND	ND	ND
			Shelly Pond	Unknown	1422	CHLA: ND TN: ND TP: ND	ND	ND

ND - No or insufficient data

4.6 Summerbrook Chain of Lakes and Summerbrook Creek

This section presents the results from Tasks 1 through 3 for Summerbrook Creek and the Summerbrook Chain of Lakes (Lake Alyssa, Somerset Lake, and Shelly Pond). This includes an overview and history of the lakes and basin, present impairment status, an overview of available data, a qualitative assessment of potential pollutant sources, and calculation of potential pollutant loads.

4.6.1 Overview and History

Summerbrook Creek is a slightly tannic stream in northwestern Leon County that flows from near Bradfordville Road, through the Summerbrooke neighborhood, and into Carr Lake (Leon County, 2020). The Summerbrook Creek basin (**Figure 4-70**) covers an area of 2,062 acres and is located in the Bradfordville Urban Service Area (Leon County, 2004). While the Summerbrook Creek basin includes a small area west of Meridian Road, for this section, only those areas east of Meridian Road are presented and discussed since the area west does not contain any waterbodies in the study nor any other items of analysis such as water quality stations or BMPs.

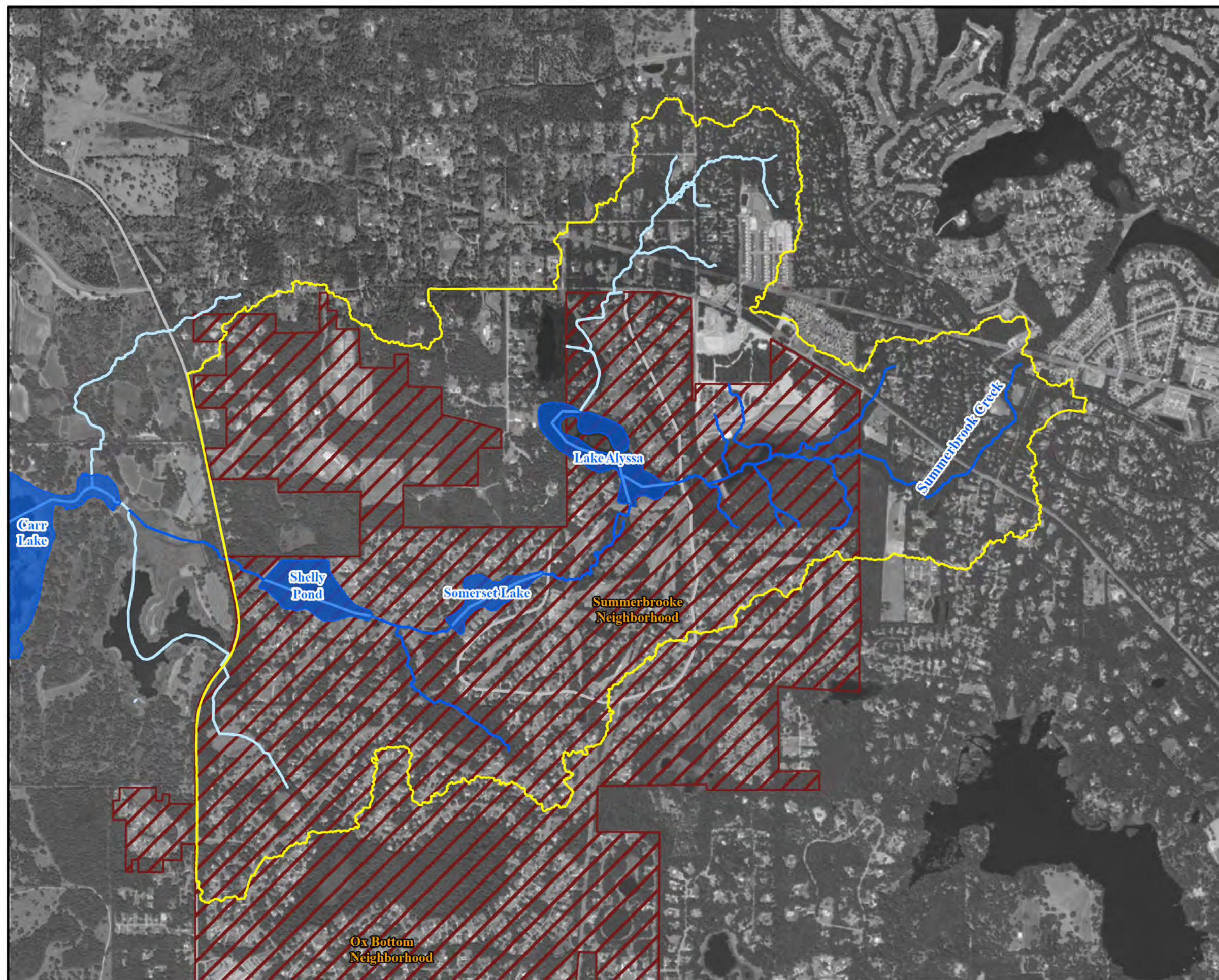
Bradfordville is a small community that originated in the 1820s serving numerous plantations throughout the area. These plantations primarily grew cotton. Following the Civil War, much of the land in Bradfordville was purchased by wealthy industrialists and used as hunting plantations and winter homes. In the 1980s and 1990s, the areas in Bradfordville around Thomasville Road and Bannerman Road were developed into medium to low density housing. The Summerbrooke neighborhood was established in 1989.

Summerbrook Creek flows through the Summerbrook Chain of Lakes located within the Summerbrooke subdivision. From upstream to downstream, these are Lake Alyssa, Somerset Lake, and Shelly Pond (**Figure 4-70**). The three lakes are managed by the Summerbrooke Property Owners Association, Inc. (SPOA) as community lakes. **Photo 4-28** through **Photo 4-30** presents views of each of the lakes, Alyssa, Somerset, and Shelly Pond, respectively.

Photo 4-31 through **Photo 4-38** present aerial views of the Summerbrook Creek basin area from 1937 through the present. In the early aerial views (prior to 1970), the three lakes were not there, but rather, there were small depressional wetland areas that can be seen throughout the basin. Some of the depressional areas line up with the future lake locations. In the 1970 aerial, the footprints of the three lakes can be seen, with Shelly Pond in the process of excavation. In the 1996 aerial, the Summerbrooke subdivision can be seen, along with the footprints of the three lakes.

4.6.2 Regulatory Status

Exhibit 4-2 presented the verified impaired waters within the overall Lake Jackson basin. Presently there are no verified impaired waterbodies within the Summerbrook Creek basin.



CITY OF
TALLAHASSEE



0 0.3
Miles

Legend

- Summerbrook Creek Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2022
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-70:
Summerbrook Creek Drainage Basin
Overview

Tallahassee Master Plan - Surface
Water (TMaPS)

Geosyntec
consultants



a



b

Photo 4-28a and b: Lake Alyssa



Photo 4-29: Lake Somerset



Photo 4-30: Shelly Pond

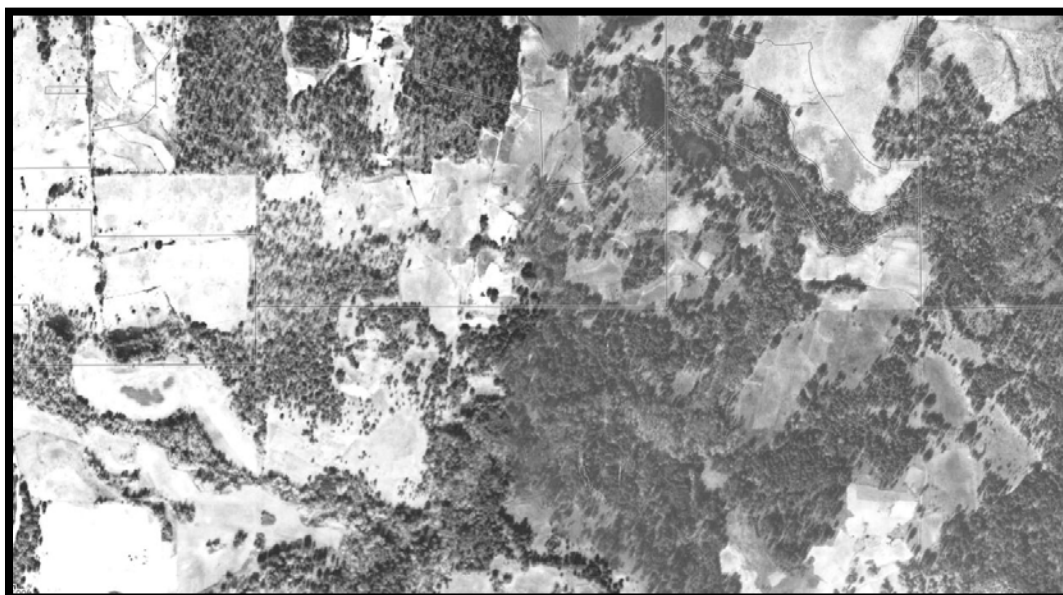


Photo 4-31: Summerbrook Creek Basin Area Aerial (1937)

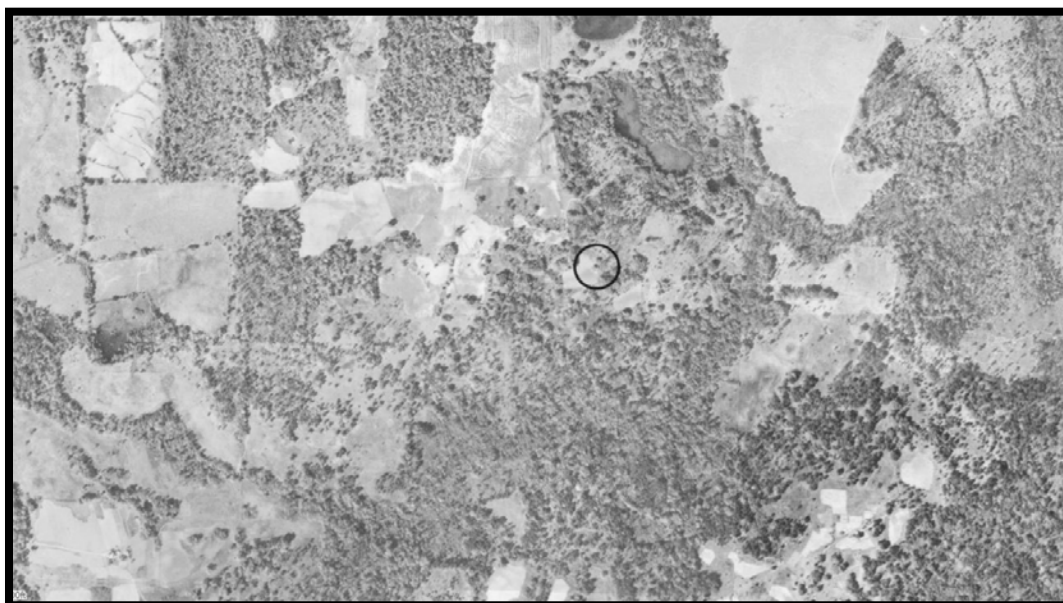


Photo 4-32: Summerbrook Creek Basin Area Aerial (1949)

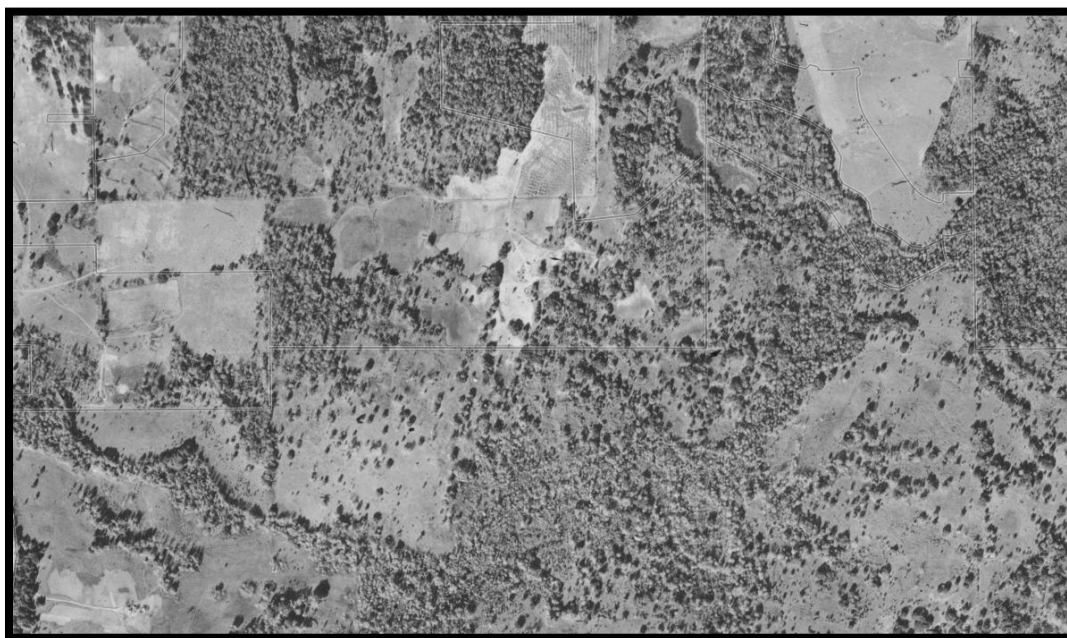


Photo 4-33: Summerbrook Creek Basin Area Aerial (1954)



Photo 4-34: Summerbrook Creek Basin Area Aerial (1970)



Photo 4-35: Summerbrook Creek Basin Area Aerial (1983)



Photo 4-36: Summerbrook Creek Basin Area Aerial (1996)



Photo 4-37: Summerbrook Creek Basin Area Aerial (2007)



Photo 4-38: Summerbrook Creek Basin Area Aerial (2020)

4.6.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Summerbrook Creek and the Summerbrook Chain of Lakes, including bathymetry, land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.

4.6.3.1 Bathymetry

No bathymetric data within any of the lakes has been provided to date. Based on discussions with personnel familiar with the lakes, in general, they are relatively shallow, with depths less than 5 to 6 ft.

4.6.3.2 Land Use

Figure 4-71 presents a map of the Level 2 land uses within the Summerbrook Creek basin. A table is provided to show the overall acreages and percent cover. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use within the Summerbrook Creek basin, per the grouped Level 1 categories, is Urban and Built Up (57 percent). This is made up primarily of Low Density Residential, with some Medium Density Residential and some Recreational. The Recreational use is primarily associated with the Summerbrooke Golf Course. Per the land use map, which was based on 2019 data, a large area of Upland Forest is in the upper portion of the basin, just south of Bannerman Road. That area is presently undergoing development. **Photo 4-39** presents this area in a recent (2021) aerial image showing cleared areas. This area drains into Lake Alyssa across Preservation Road. In **Photo 4-28a**, the silt curtains presently deployed to reduce sediment load from this project can be seen where the discharge enters Lake Alyssa. The source of the silt was not identified in the review.

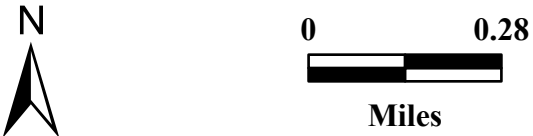
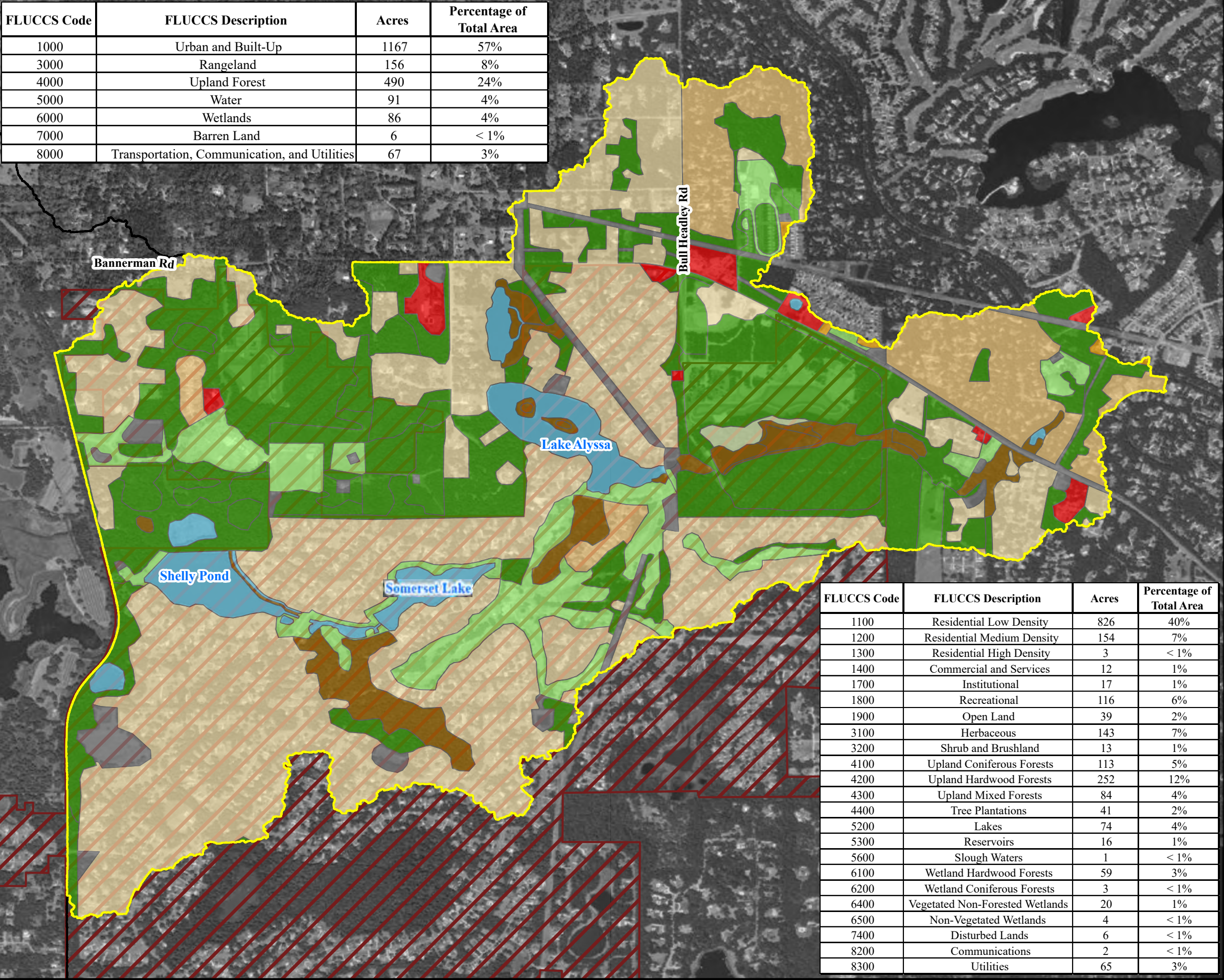
4.6.3.3 Soils

The most prevalent soil group in the Summerbrook Creek basin is Group C (47 percent) (**Figure 4-72**). Group C soils are considered to have slow rates of infiltration and a high runoff potential. This is consistent with the overall nature of the area, with high clay content throughout. The second highest soil group coverage is Group B (30 percent), which has moderate rates of infiltration. The remaining soil groups throughout the basin are generally in areas with high water tables so they also would not drain well and have large runoff potentials.

4.6.3.4 Septic Systems

An estimated 402 septic systems are within the boundaries of the Summerbrook Creek Drainage Basin. The bulk of the systems are located in specific clusters, including the Killearn Lakes neighborhood north of Bannerman Road, other residences south of Bannerman Road, an unsewered portion of Summerbrooke, and other smaller neighborhoods off Bannerman Road and Meridian Road (**Figure 4-73**).

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	1167	57%
3000	Rangeland	156	8%
4000	Upland Forest	490	24%
5000	Water	91	4%
6000	Wetlands	86	4%
7000	Barren Land	6	< 1%
8000	Transportation, Communication, and Utilities	67	3%



- Legend**
- Summerbrook Creek Drainage Basin
 - Land Use Type**
 - 1100: Residential Low Density
 - 1200: Residential Medium Density
 - 1300: Residential High Density
 - 1400: Commercial and Services
 - 1700: Institutional
 - 1800: Recreational
 - 1900: Open Land
 - 3100: Herbaceous
 - 3200: Shrub and Brushland
 - 4100: Upland Coniferous Forests
 - 4200: Upland Hardwood Forests
 - 4300: Upland Mixed Forests
 - 4400: Tree Plantations
 - 5200: Lakes
 - 5300: Reservoirs
 - 5600: Slough Waters
 - 6100: Wetland Hardwood Forests
 - 6200: Wetland Coniferous Forests
 - 6400: Vegetated Non-Forested Wetlands
 - 6500: Non-Vegetated Wetlands
 - 7400: Disturbed Lands
 - 8200: Communications
 - 8300: Utilities

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Land Use: NFWFMD, 2019

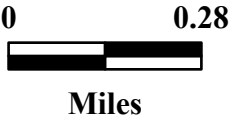
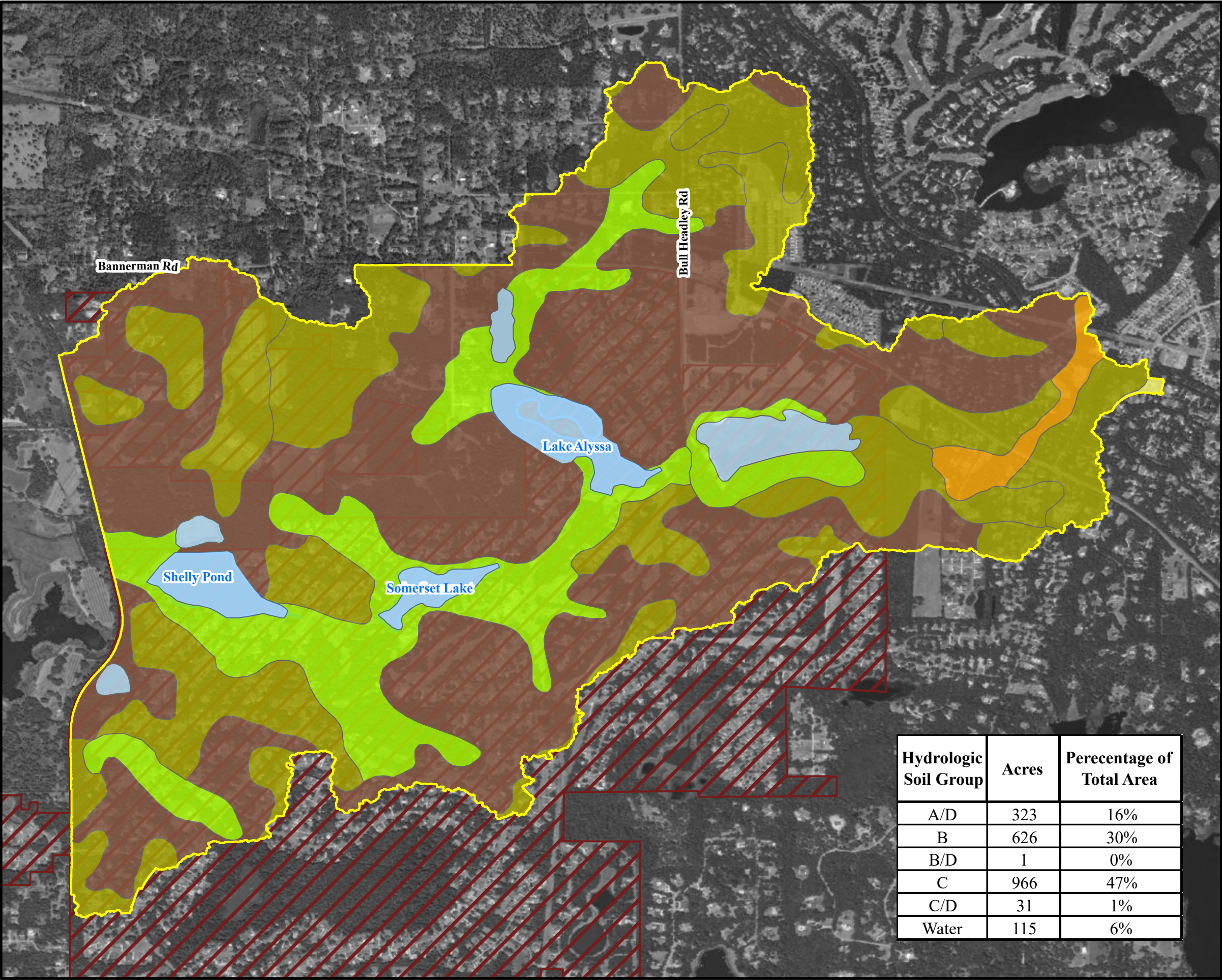
Figure 4-71:
Summerbrook Creek Basin Land Use
Tallahassee Master Plan - Surface Water (TMaPS)



FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	826	40%
1200	Residential Medium Density	154	7%
1300	Residential High Density	3	< 1%
1400	Commercial and Services	12	1%
1700	Institutional	17	1%
1800	Recreational	116	6%
1900	Open Land	39	2%
3100	Herbaceous	143	7%
3200	Shrub and Brushland	13	1%
4100	Upland Coniferous Forests	113	5%
4200	Upland Hardwood Forests	252	12%
4300	Upland Mixed Forests	84	4%
4400	Tree Plantations	41	2%
5200	Lakes	74	4%
5300	Reservoirs	16	1%
5600	Slough Waters	1	< 1%
6100	Wetland Hardwood Forests	59	3%
6200	Wetland Coniferous Forests	3	< 1%
6400	Vegetated Non-Forested Wetlands	20	1%
6500	Non-Vegetated Wetlands	4	< 1%
7400	Disturbed Lands	6	< 1%
8200	Communications	2	< 1%
8300	Utilities	65	3%



Photo 4-39: Aerial Image of Recent Development within Summerbrook Creek Basin



Legend

- Summerbrook Creek Drainage Basin
- Tallahassee Corporate Limits
- Hydrologic Soil Group
 - A/D
 - B
 - B/D
 - C
 - C/D
 - Water

Sources:
Waterbodies: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Soils: NRCS, 2020

Hydrologic Soil Group	Acres	Perecentage of Total Area
A/D	323	16%
B	626	30%
B/D	1	0%
C	966	47%
C/D	31	1%
Water	115	6%

Figure 4-72:
Summerbrook Creek Basin Soils

Tallahassee Master Plan - Surface Water (TMaPS)



Number of Septic Systems: 402



0 0.3
Miles

Legend

- Summerbrook Creek Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Septic Systems

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2022
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Septic Systems: COT, 2022

Figure 4-73:
Summerbrook Creek Drainage Basin Septic
Systems

Tallahassee Master Plan - Surface
Water (TMaPS)

Geosyntec
consultants

4.6.3.5 Hydrologic Data

No recent historical or current hydrologic monitoring stations are located within the Summerbrook Creek basin.

4.6.3.6 Surface Water Quality Data

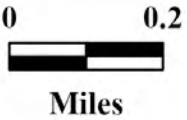
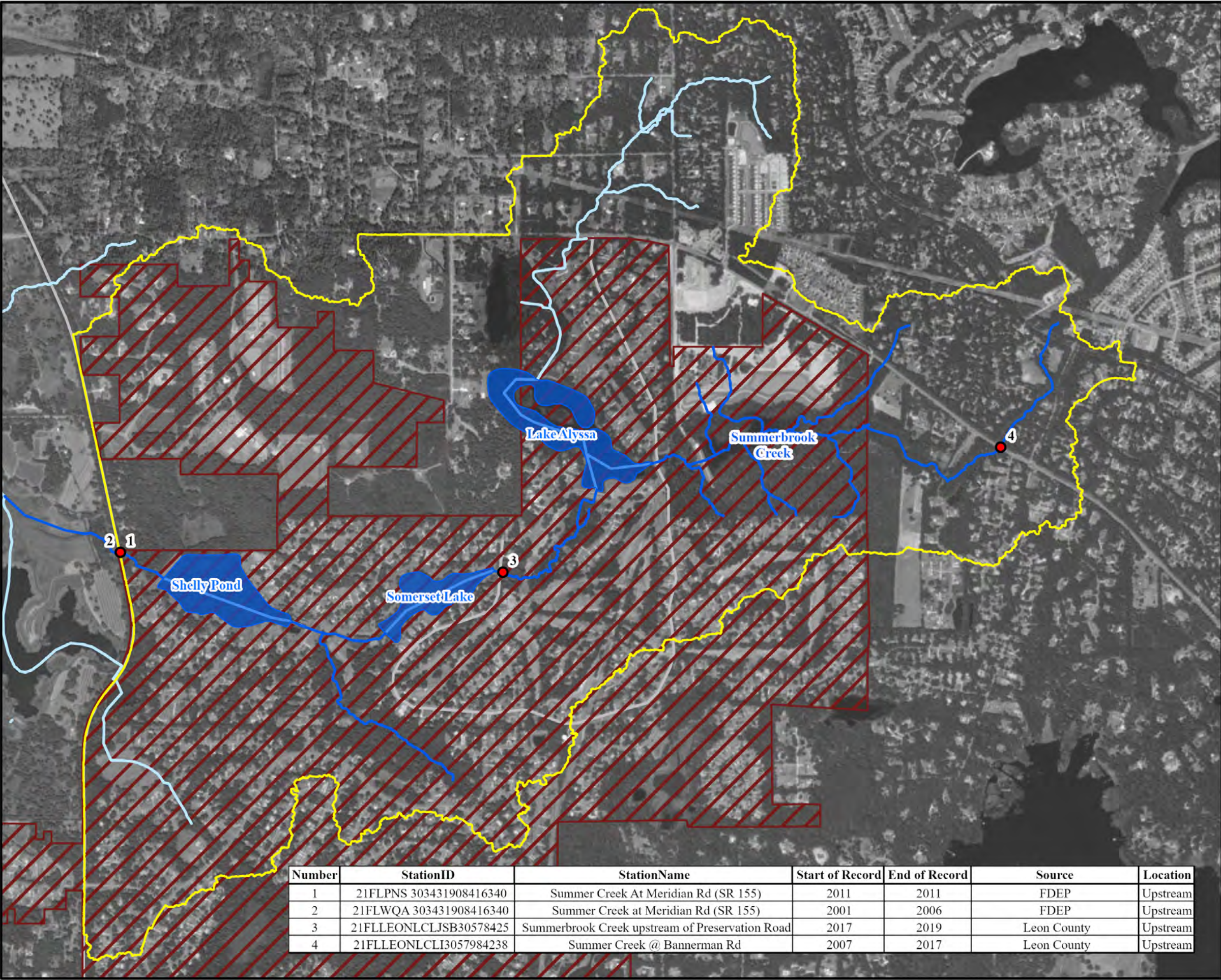
The IWR dataset for the Summerbrook Creek drainage basin spans from 2001 to 2020 and includes data collected by FDEP and Leon County. No direct water quality data are available from the lakes, but rather data are available at three locations along Summerbrook Creek, upstream and downstream of the lakes. **Figure 4-74** presents the locations where data have been collected. A table is provided in **Figure 4-74** that shows the station ID, station name, period of record, sample count, and data source. Based on the number of stations and the length of the station IDs, station IDs were not included on the figure, rather each of the stations is given a number and the numbers correspond to stations in the table. The most upstream station (#4, where the creek crosses Bannerman Road) was sampled by Leon County from 2007 to 2017. Due to intermittent flows, there were multiple years where insufficient samples were collected to assess compliance. In 2017, the station was moved further downstream (#3) (Leon County, 2020). The most downstream stations (#1 and #2) were sampled by FDEP between 2001 to 2006 and then again in 2011, but with very limited data. No recent data are available for that location.

Figure 4-75 and **Figure 4-76** present plots of the TN and TP data, respectively, from 2010 to 2020. Examination of the data shows TN levels decreasing during that period. For TP a slight increasing trend can be seen in the data with higher values in recent years.

Under FDEP's NNC, the freshwater stream nutrient thresholds are 0.18 mg/L for TP and 1.03 mg/L for TN as annual geometric means. For *E. coli*, the freshwater stream criteria are monthly geometric means below 126 colonies per 100 mL of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period. For the purpose of determining FIB impairments where data are collected monthly, per 62-303 F.A.C., FDEP assesses all of the samples collected through the verified period to determine the number of samples that are above the threshold. If the number of samples (based on the sample size) is greater than or equal to numbers provided in the tables within 62-303, the waterbody is deemed impaired. The FDEP threshold for this analysis is 410 MPN/100 mL.

Figure 4-77 and **Figure 4-78** present plots of the TN and TP annual geomeans from 2010 to 2020 along the creek for years with sufficient samples. In addition to the geomeans, the NNC criteria are plotted as dashed lines on the graphs. The data show that while data were limited for AGM calculation, the years with sufficient data showed TN and TP geometric means well below the NNC stream thresholds.

Figure 4-79 presents a plot of the measured *E. coli* from all of the stations from 2010 through 2020. The data are plotted with the 410 MPN/100 mL threshold (described previously) as a dashed line. The data show elevated concentrations with one point above the threshold.



Legend

- Summerbrook Creek Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Water Quality Stations
 - Upstream of Lake
 - In-Lake

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
WQ Stations: FDEP, 2022

Figure 4-74:
Summerbrook Creek Water Quality Station
Locations

Tallahassee Master Plan - Surface
Water (TMaPS)

Number	StationID	StationName	Start of Record	End of Record	Source	Location
1	21FLPNS 303431908416340	Summer Creek At Meridian Rd (SR 155)	2011	2011	FDEP	Upstream
2	21FLWQA 303431908416340	Summer Creek at Meridian Rd (SR 155)	2001	2006	FDEP	Upstream
3	21FLLEONLCLJSB30578425	Summerbrook Creek upstream of Preservation Road	2017	2019	Leon County	Upstream
4	21FLLEONLCLI3057984238	Summer Creek @ Bannerman Rd	2007	2017	Leon County	Upstream



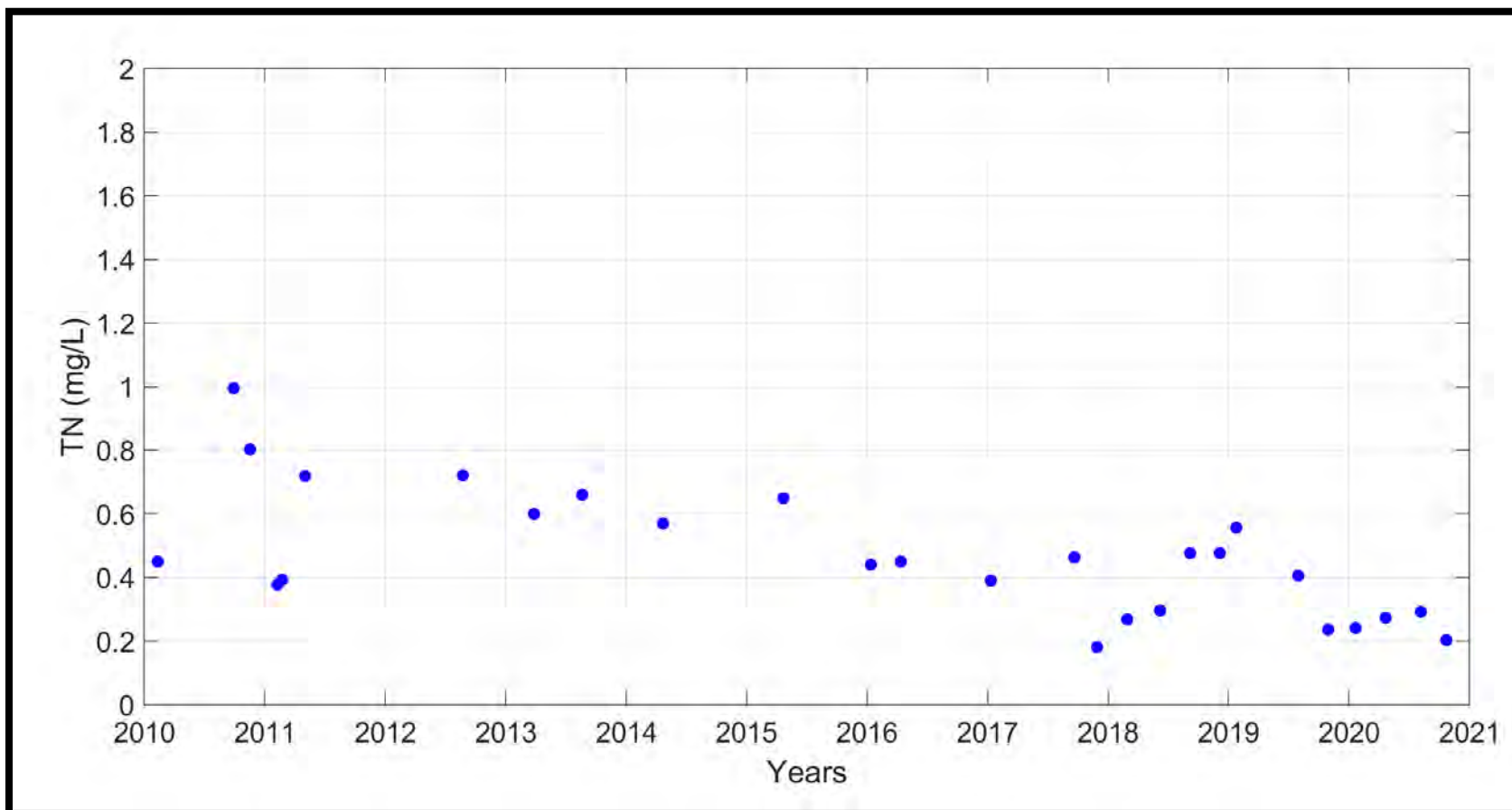


Figure 4-75: Plot of Measured TN in Summerbrook Creek

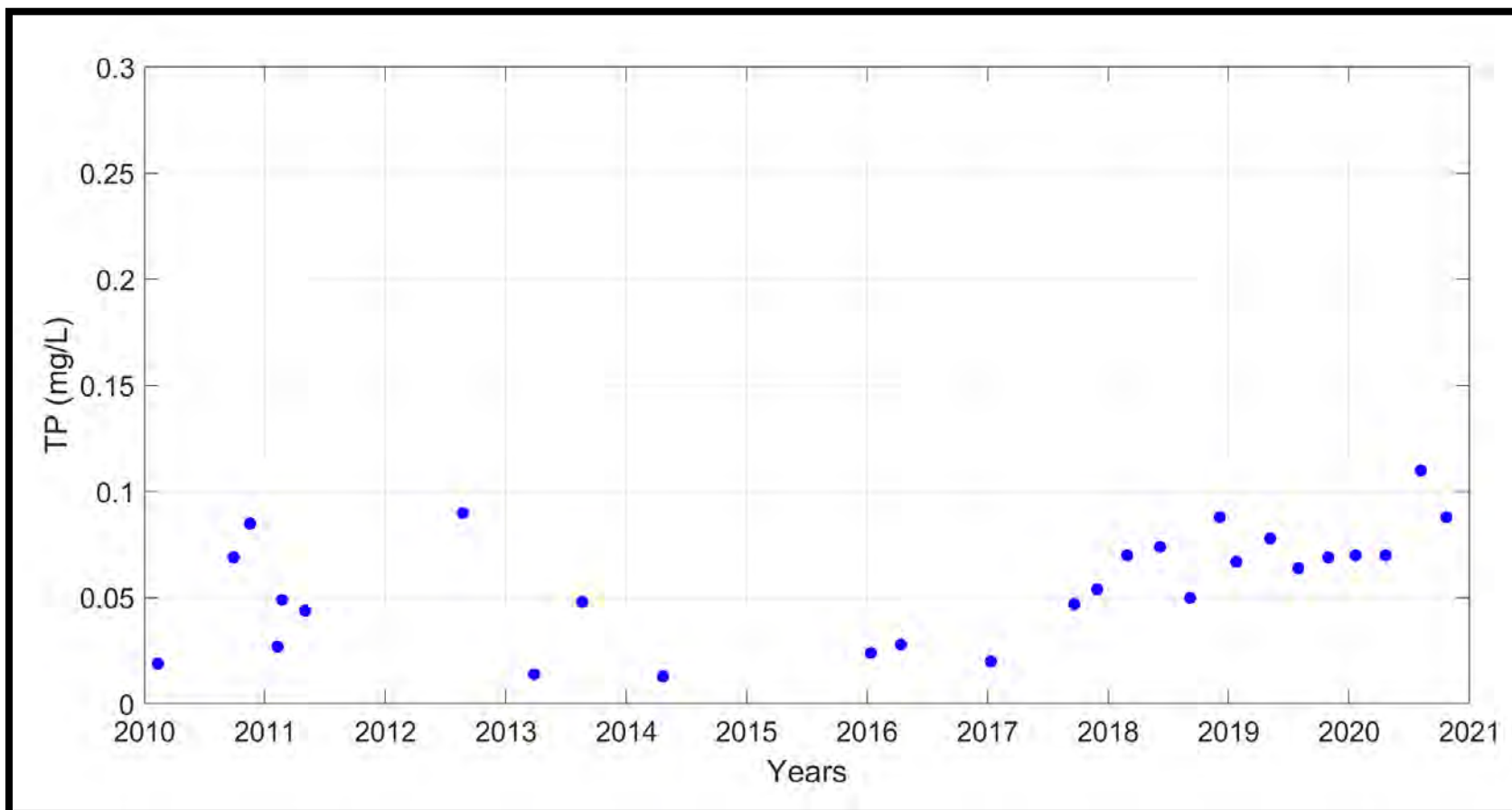


Figure 4-76: Plot of Measured TP in Summerbrook Creek

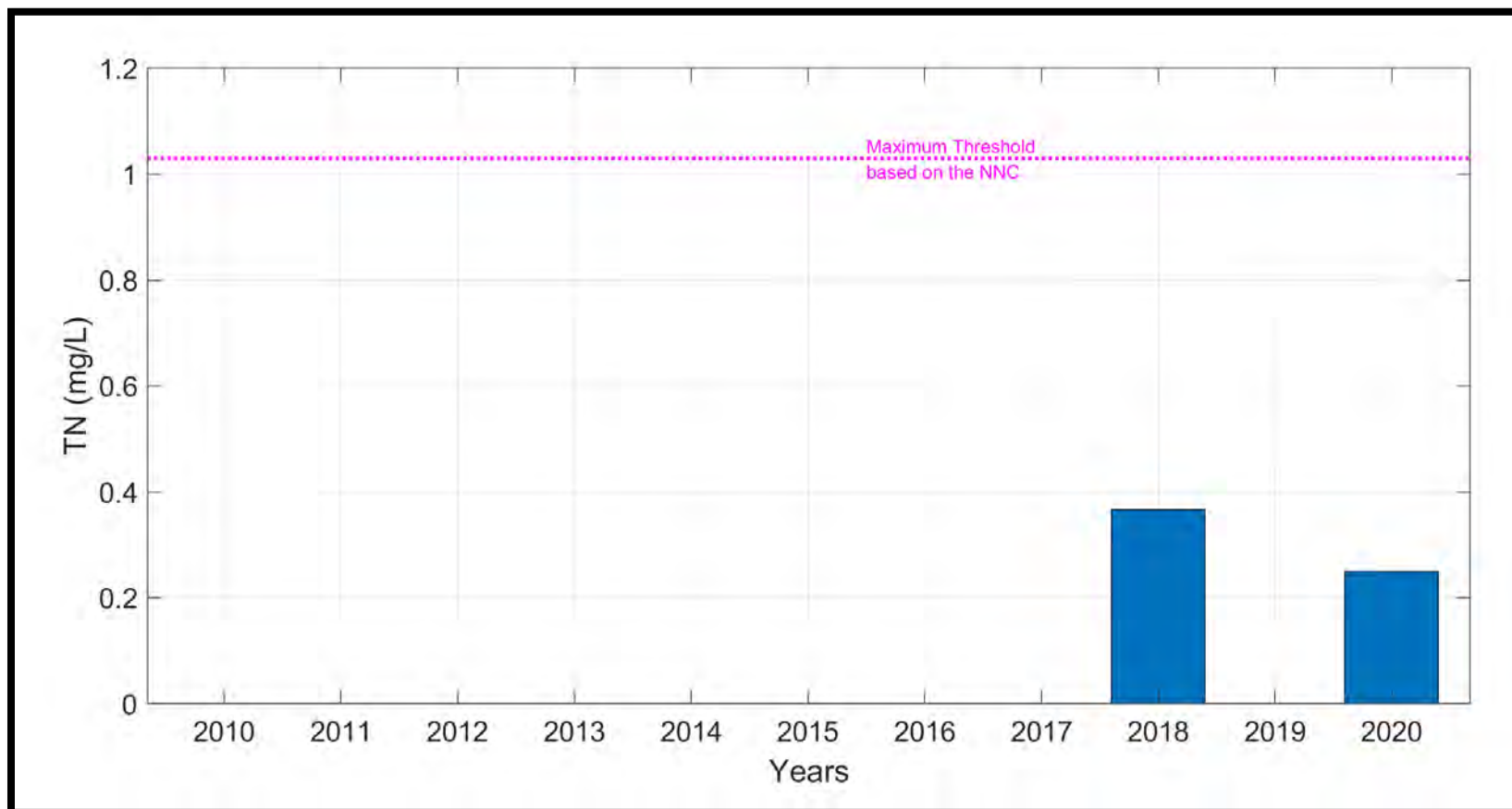


Figure 4-77: Plot of Annual Geometric Means for TN with NNC Criteria for Summerbrook Creek

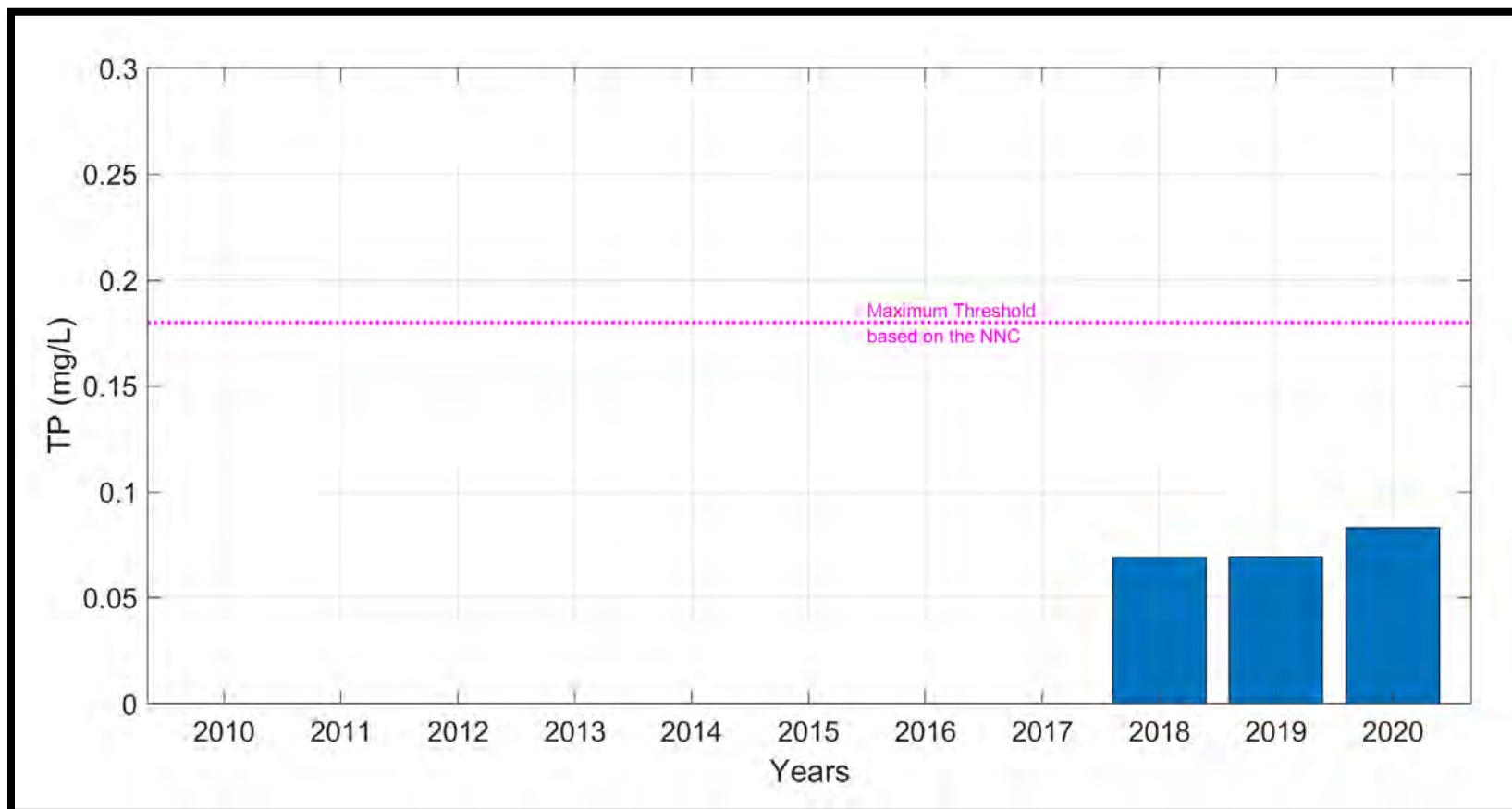


Figure 4-78: Plot of Annual Geometric Means for TP with NNC Criteria for Summerbrook Creek

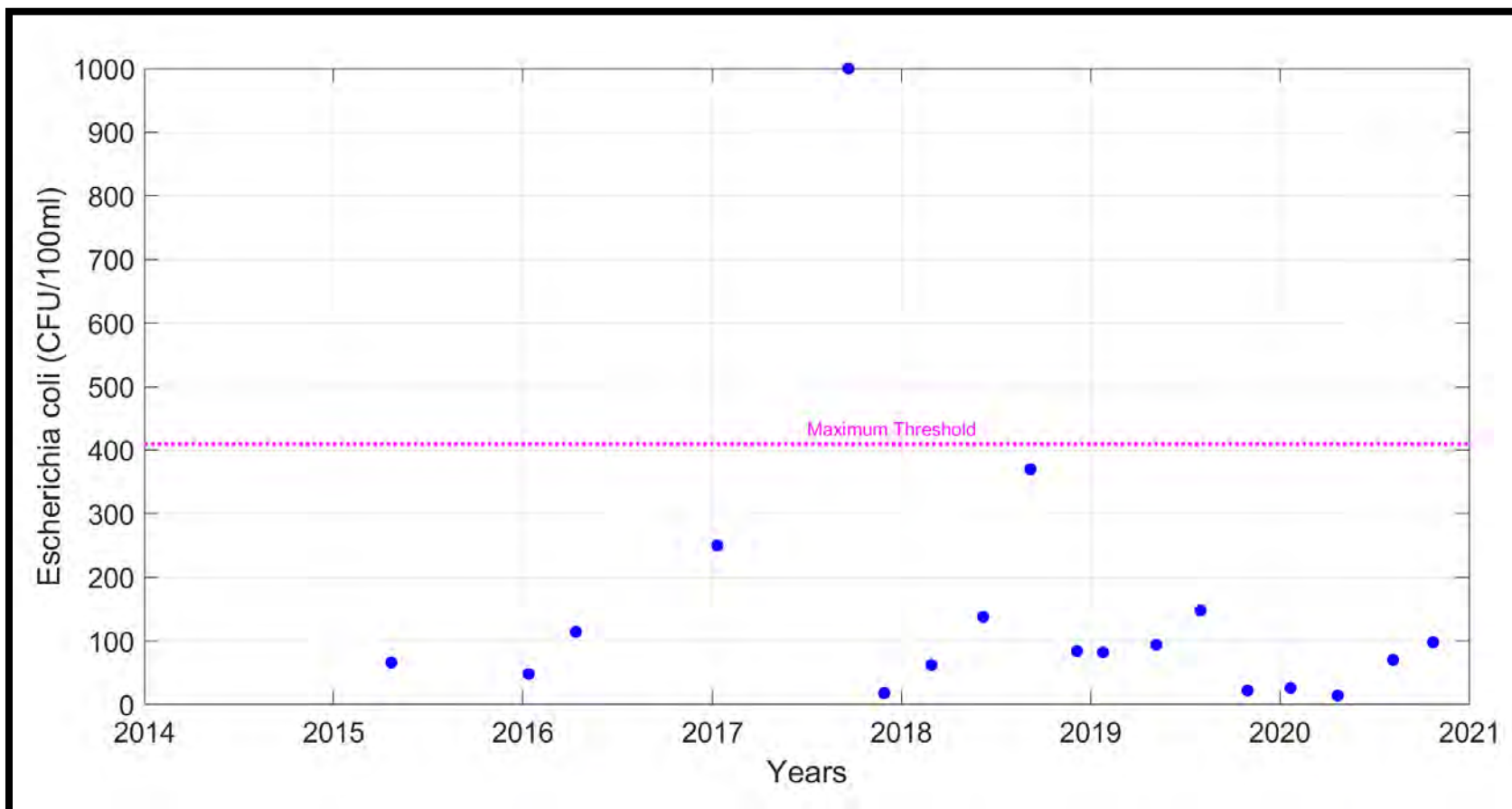


Figure 4-79: Plot of *E. coli* Measurements (2015 to 2020) in Summerbrook Creek

4.6.3.7 Groundwater Data

Presently, there are no identified surficial groundwater monitoring wells within the Summerbrook Creek basin.

4.6.3.8 Biological Data

Presently, no LVI or Stream Condition Index (SCI) data has been identified for the lakes and streams within the Summerbrook Creek basin.

4.6.3.9 Stormwater Treatment Facilities

Figure 4-80 presents a map showing the locations of stormwater treatment facilities throughout the Summerbrook Creek basin. Four Leon County stormwater ponds are located in the upper reaches of the basin along Bannerman Road and within a neighborhood off Glenn Oak Trail. South of Bannerman Road, there are multiple stormwater ponds scattered throughout the basin. These facilities are maintained by the City and private entities. Many of the City facilities are located around Lake Alyssa and Somerset Lake, providing treatment of stormwater prior to discharge into the lakes. The Summerbrooke neighborhood has an extensive swale system that provides conveyance and treatment of stormwater prior to discharge to Summerbrook Creek or the Summerbrook Chain of Lakes.

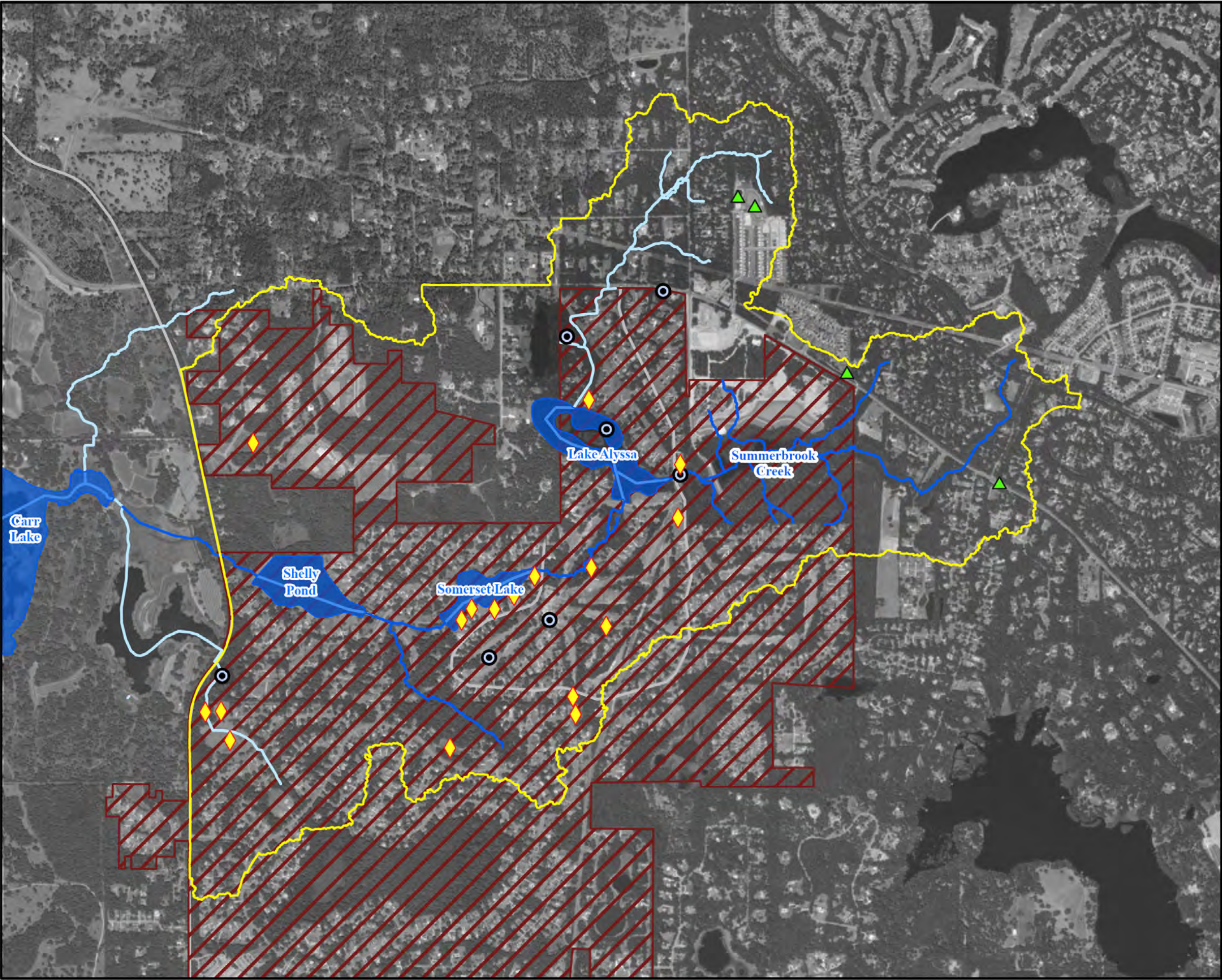
4.6.3.10 Atmospheric Deposition Data

Section 4.4.3.11 presented the location of the nearest atmospheric deposition station to the Lake Jackson basin. The data from this station will be utilized to calculate atmospheric deposition to the Summerbrook Chain of Lakes.

4.6.3.11 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Summerbrook Creek and the Summerbrook Chain of Lakes (**Section 4.6.4**), the available data are somewhat limited. No direct water quality measurements were provided for any of the lakes. The only available data were from Summerbrook Creek upstream, between, and downstream of the lakes, and at certain locations, these data were limited. The following outlines some specific data limitations. Specific recommendations on additional data collection efforts are provided in **Section 4.11**.

- No available in-lake water quality data for any of the three lakes.
- Data are not available for the flow in Summerbrook Creek or other hydrologic parameters (water levels).
- No data on potential internal recycling as a potential load to the lakes.
- No surficial aquifer measurements around the lake to assess potential seepage.



Legend

- Summerbrook Creek Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- City of Tallahassee Stormwater Ponds
- Leon County Stormwater Ponds
- Stormwater Ponds (Other)

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2022
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-80:
Summerbrook Creek Basin BMPs
Tallahassee Master Plan - Surface
Water (TMaPS)



4.6.4 Qualitative Assessment of Sources

As outlined in previous sections, prior to performing loading calculations and other analyses to quantify existing pollutant sources to Summerbrook Creek and the Summerbrook Chain of Lakes (Lake Alyssa, Somerset Lake, and Shelly Pond), it is important to analyze available data and summarize findings from historical studies to support identification and magnitude of likely sources.

For Summerbrook Creek and the Summerbrook Chain of Lakes, the sources to be evaluated include the following:

- Stormwater runoff
- Septic systems
- Interconnected flows
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition

An overview of analyses and findings for each source listed above is provided in the following sections. Prior to the discussions of each of the potential sources, additional analyses of the data collected along Summerbrook Creek are provided to build on the information presented in **Section 4.6.3**. Following the discussions for each source type, a summary of findings for the qualitative assessment is provided.

4.6.4.1 In-Stream Water Quality

Following the methodology utilized for the lakes, analyses were conducted on the available stream data from 2010 to the present. This provides an evaluation of the baseline water quality conditions and the spatial differences along the creek. The parameters analyzed include TP, TN, TSS, and *E. coli*.

As was done for the lakes, stations were clustered where they represent conditions within a specific area. The clustered data from 2010 to 2020 were then analyzed to provide the average of the annual geomeans or the 90th percentile, depending upon the parameter. The results are presented on a map, with colors representing the results. The levels associated with the colors are reflective of water quality thresholds as outlined in 62-302 F.A.C. for the freshwater stream criteria. For the parameters with freshwater stream criteria (TN, TP, and *E. coli*), the transition between orange and red was set at the criteria. The remaining transition levels are set at even increments from the criteria down to zero. For TSS, where there is no freshwater stream criteria, the ranges were set at levels that allow evaluation of the spatial differences between the clusters.

Figure 4-81 presents the data clustering used for the analyses and associated stations. For Summerbrook Creek, data since 2010 were available at three locations along the stream. Since each location had only one sampling station identified for data from 2010 forward, these three stations became the clusters. The locations include where the creek crosses Meridian Road just upstream of the discharge to Carr Lake (W), upstream of Lake Somerset (C), and in the upper portions of the watershed where the creek crosses Bannerman Road (E). Each station had data over different periods, with limited overlap between clusters, so the discussion of spatial differences must be evaluated with this understanding. The available data for the W station only had 1 year of data in 2011.

Figure 4-82 and **Figure 4-83** present the TN and TP results. First and foremost, it should be noted that the analyses for both TP and TN show that all stations are below the stream criteria. This is in line with the AGM plots presented in **Section 4.6.3.6**. Some potential spatial variation can be seen in the data that can be noted, such as higher TP levels further downstream.

Figure 4-84 presents a map of the TSS levels. The measured TSS levels were somewhat higher than those seen in the lake data as expected, but are generally low, i.e., below 10 mg/L.

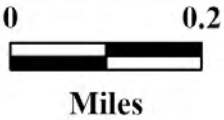
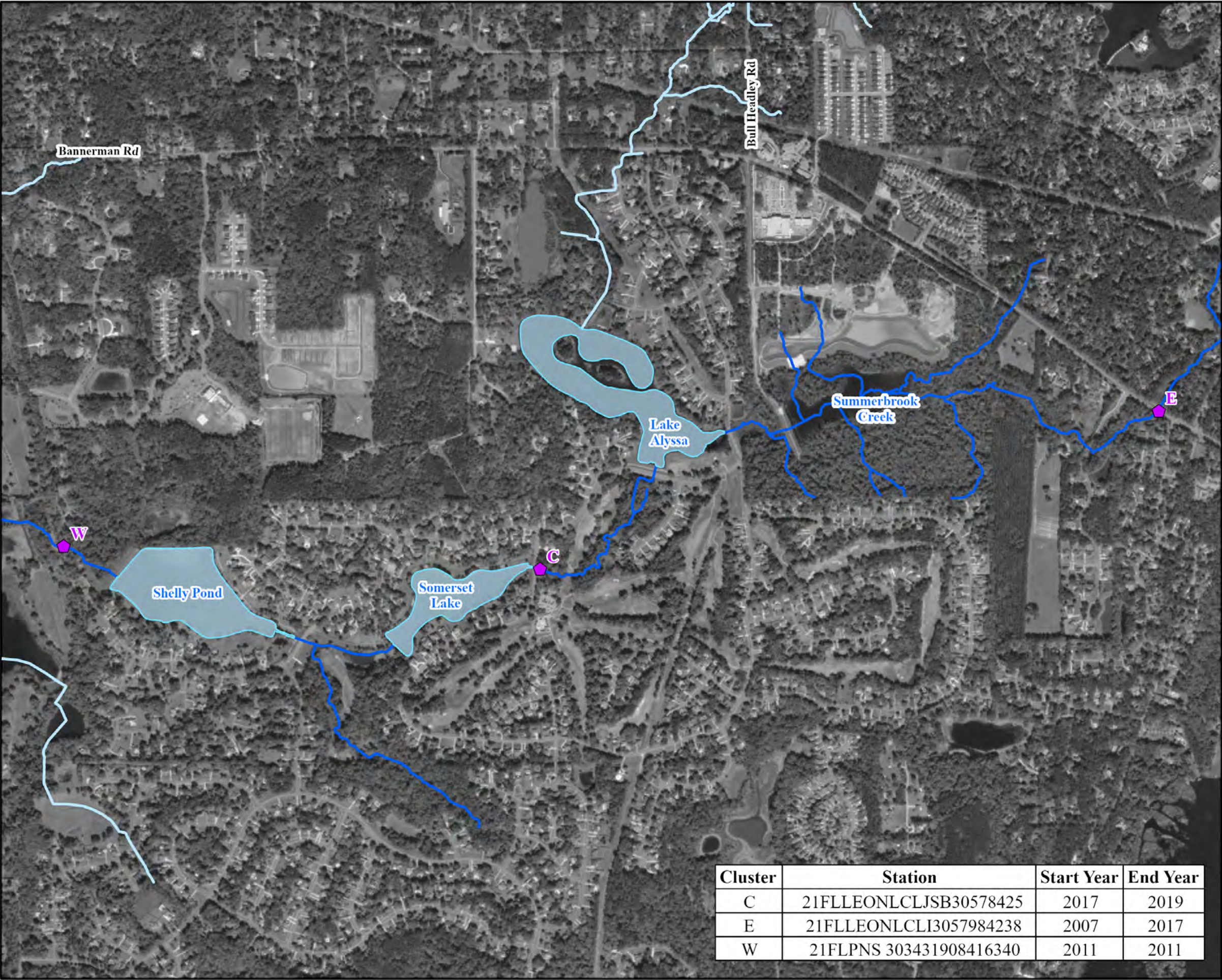
Figure 4-85 presents a map of the *E. coli* levels. The data analyzed are from 2015 through 2020, and the data were analyzed to provide the 90th percentile to compare against the 410 MPN/100 mL criteria per the FDEP approach in the IWR analyses. The results show that the 90th percentile for the data at the upstream station (E) and just upstream of Lake Somerset are between 200 and 300 MPN/100 mL.

4.6.4.2 Stormwater Runoff

No data are available for the smaller tributaries flowing into Summerbrook Creek or into the Summerbrook Chain of Lakes, only data along Summerbrook Creek. To assess stormwater runoff as a potential source of pollutant loads to Summerbrook Creek, the Summerbrook Chain of Lakes, and ultimately to Carr Lake, the LDI levels within the Summerbrook Creek basin were evaluated. In **Section 4.4.4.2**, LDI values were presented by subbasin in **Figure 4-24**. The map showed that the LDI level in the Summerbrook Creek basin is moderate, indicating potential for pollutant loading from stormwater runoff. The data at present are well within the stream criteria, but TP concentrations were trending upward somewhat, which raises some concerns relative to future conditions. Additionally, the analyses of *E. coli* showed some elevated values. Presently, there is significant new development occurring in the upstream reaches of the basin that is not represented in the LDI calculations.

4.6.4.3 Septic Systems

Figure 4-73 presented the locations of septic systems within the Summerbrook Creek basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin, including the Summerbrook Creek basin. The septic tank densities are elevated relative to downstream watersheds and, while the nutrient levels are low, *E. coli* levels are somewhat elevated based on the data presented in **Section 4.6.3.6**. This indicates that septic systems may be a potential source of pollutant loading to the system.



Legend

- Summerbrook Creek
- Summerbrook Chain of Lakes
- Watercourses
- Stream Clusters

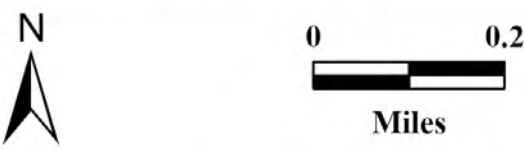
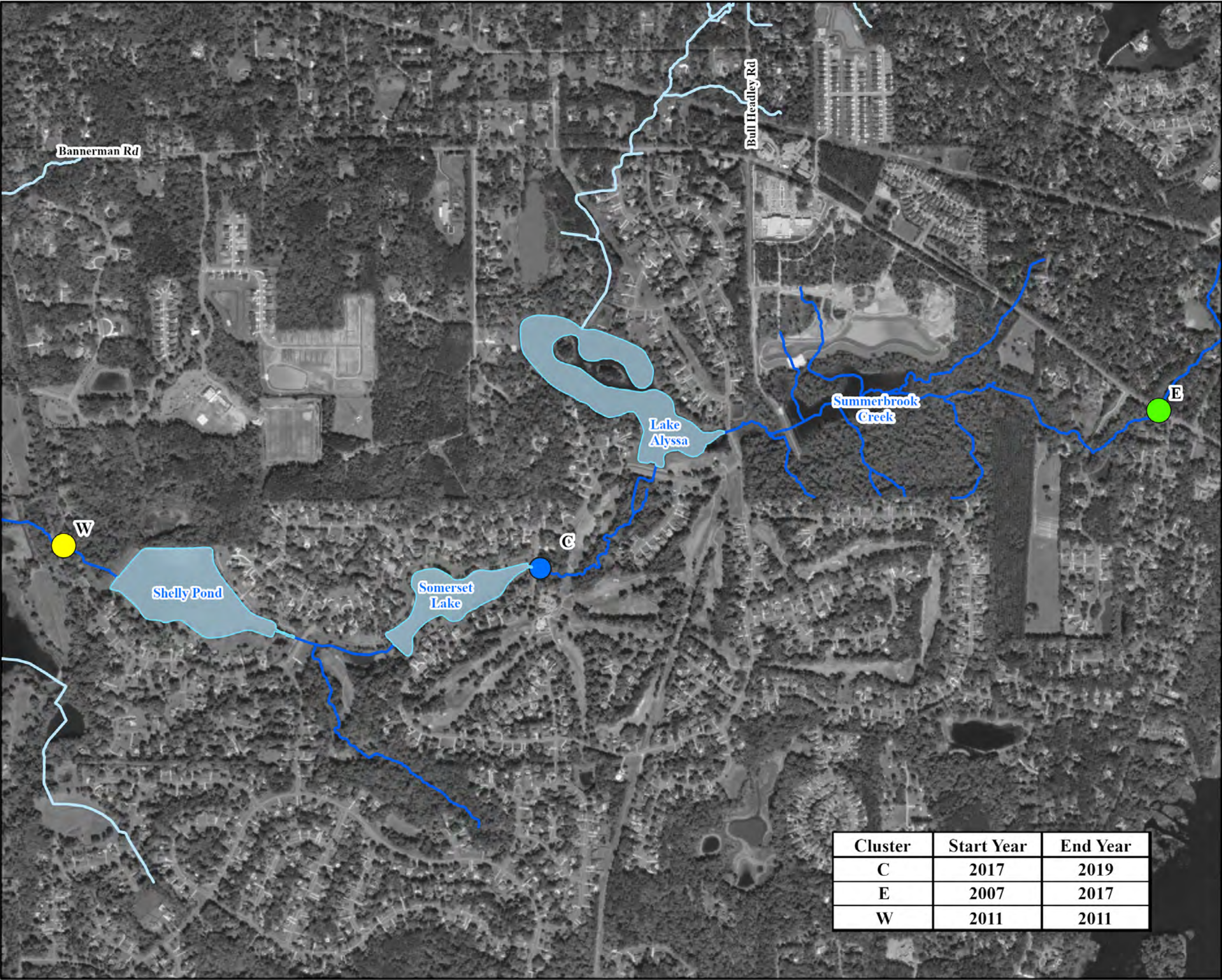
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-81:
Station Clustering for Spatial Analyses of
Summerbrook Creek

Tallahassee Master Plan - Surface
Water (TMaPS)

Cluster	Station	Start Year	End Year
C	21FLLEONLCLJSB30578425	2017	2019
E	21FLLEONLCLI3057984238	2007	2017
W	21FLPNS 303431908416340	2011	2011





Legend

- Summerbrook Creek
- Summerbrook Chain of Lakes
- Watercourses

TN Average 2010-2020
mg/L

- 0- 0.2
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.03
- > 1.03

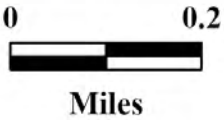
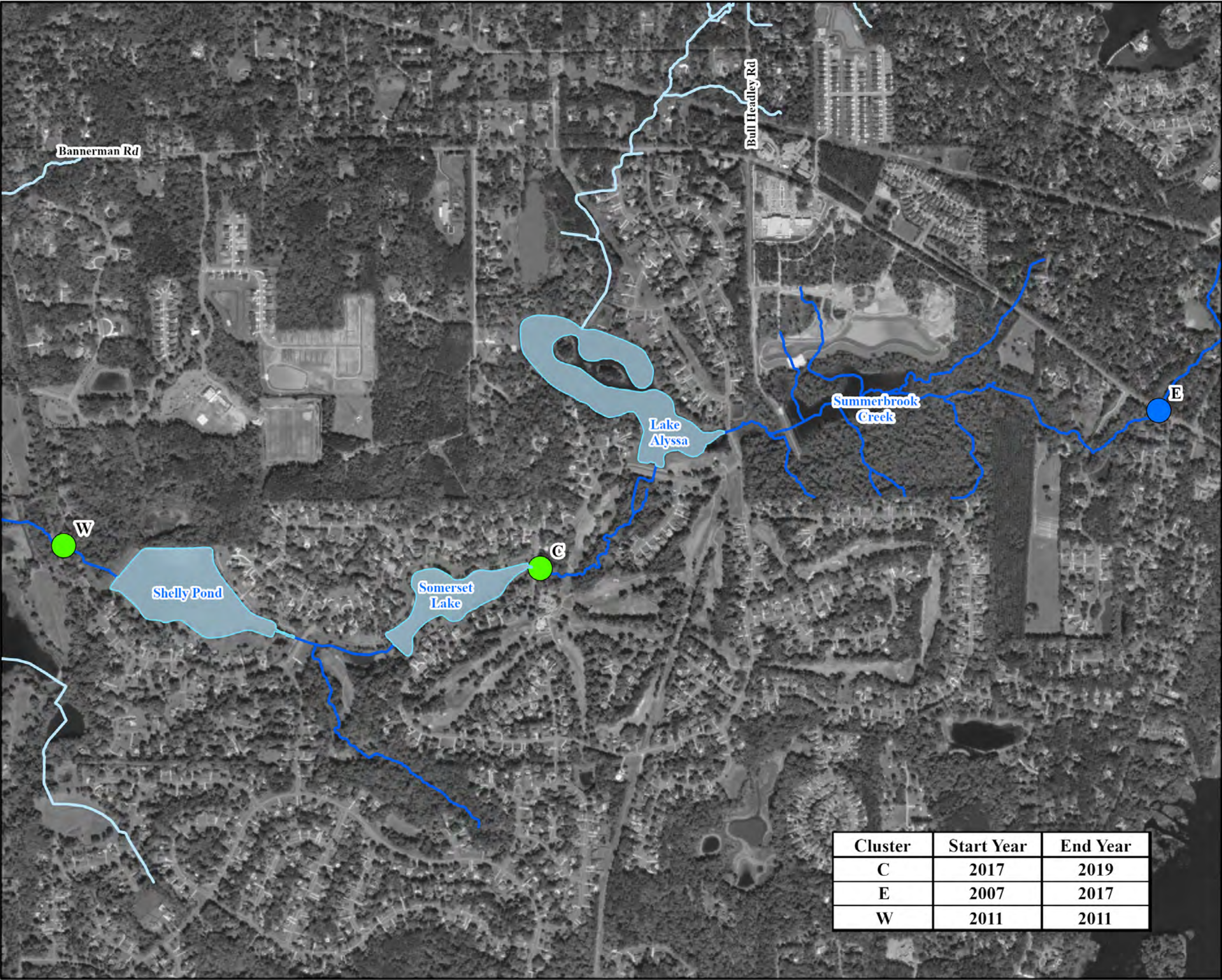
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-82:
Spatial Assessment of TN in Summerbrook Creek

Tallahassee Master Plan - Surface Water (TMaPS)

Cluster	Start Year	End Year
C	2017	2019
E	2007	2017
W	2011	2011





Legend

- Summerbrook Creek
- Summerbrook Chain of Lakes
- Watercourses
- TP Average 2010-2020
mg/L
 - 0 - 0.045
 - 0.045 - 0.090
 - 0.090 - 0.135
 - 0.135 - 0.180
 - > .18

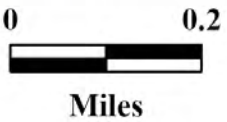
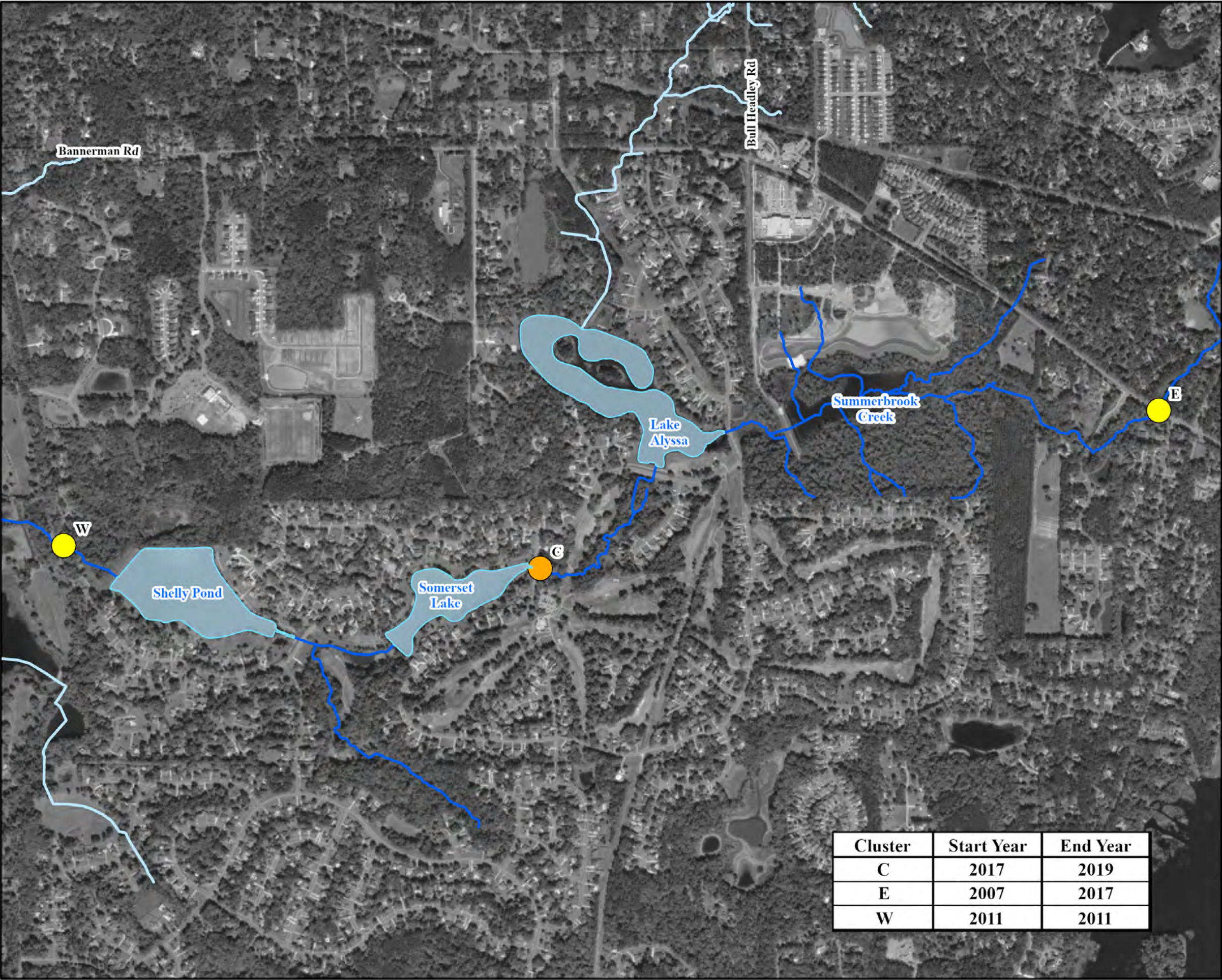
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-83:
Spatial Assessment of TP in Summerbrook
Creek

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Start Year	End Year
C	2017	2019
E	2007	2017
W	2011	2011



Legend

- Summerbrook Creek
- Summerbrook Chain of Lakes
- Watercourses
- TSS Average 2010-2020
mg/L
 - 0- 2.5
 - 2.5 - 5.0
 - 5.0 - 7.5
 - 7.5- 10
 - > 10

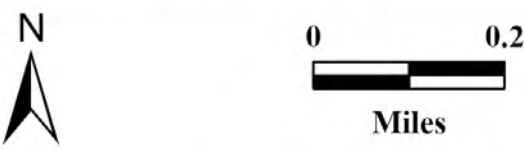
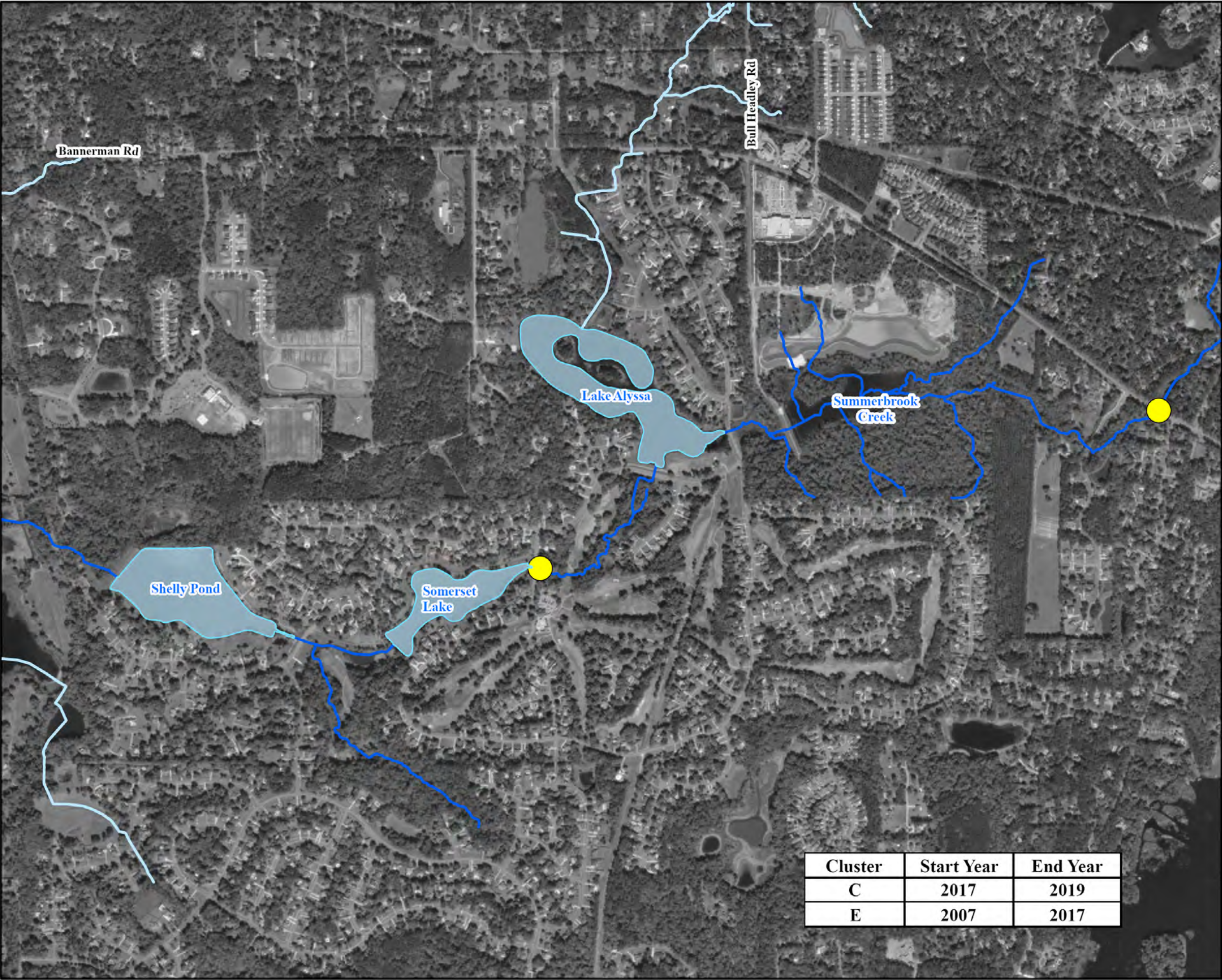
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-84:
Spatial Assessment of TSS in Summerbrook
Creek

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Start Year	End Year
C	2017	2019
E	2007	2017
W	2011	2011



Legend

- Summerbrook Creek
- Summerbrook Chain of Lakes
- Watercourses

**E. coli 90th Percentile 2010-2020
MPN/100mL**

- 0 - 100
- 100 - 200
- 200 - 300
- 300 - 410
- > 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT-Leon County, 2023
Station Data: FDEP, 2021

Figure 4-85:
**Spatial Assessment of E. coli in
Summerbrook Creek**

Tallahassee Master Plan - Surface
Water (TMaPS)

Cluster	Start Year	End Year
C	2017	2019
E	2007	2017



4.6.4.4 Internal Recycling and Seepage

Internal Recycling

To date, no studies or data collection efforts have been undertaken to assess the potential for benthic fluxes as a source of nutrients to the lakes. Generally, low nutrient levels in the available stream measurements would indicate that internal loading is not significant. But based on the lack of measured data in the lakes, increasing trends in the TP data in the creek, and the uses of the lakes for stormwater retention, this loading should be considered a potential source for further evaluation.

Seepage

As outlined in **Section 4.6.3.7**, there are no surficial aquifer sampling sites identified within the Summerbrook Creek basin to provide potential for seepage to contribute to the loading to the creek and lakes. It should be noted that based on the soil types in this basin, sub-surface transmissivity levels are expected to be low, impeding transport of pollutants through seepage. Thus, seepage is not likely a significant source of nutrients to Summerbrook Creek and the Summerbrook Chain of Lakes.

4.6.4.5 Wastewater

Within the Summerbrook Creek basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin currently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries and subbasins in relation to sewer service areas and sewer infrastructure. Presently, 63 percent of the Summerbrook Creek basin has sewer infrastructure. As was noted for the septic systems, while nutrient levels in the stream are low, *E. coli* levels are somewhat elevated, identifying the potential for wastewater infrastructure as a source of pollutant loads.

4.6.4.6 Atmospheric Deposition

For the Summerbrook Chain of Lakes, the ratio of the watershed area to lake area is around 33:1. With this ratio and the potential attenuation of rainfall runoff due to upstream BMPs, direct atmospheric deposition to the lakes can play a role in overall loading, especially for nitrogen. Atmospheric deposition will be accounted for both indirectly within stormwater runoff and directly as loads to the lake surfaces. **Section 4.6.3.10** identified the nearest atmospheric deposition station as the Quincy station (FL14) (**Figure 4-15**).

4.6.4.7 Interconnected Flows

Within the Summerbrook Chain of Lakes, Lake Alyssa is the most upstream waterbody and discharges directly into Somerset Lake. Somerset Lake then flows into Shelly Pond. The upstream lakes have the potential to contribute to nutrient loading and be a source to consider for the downstream lakes.

Lake Alyssa has a surface area of about 36 acres and is located within an area that is an even mix of residential land use and upland hardwood forest. Lake Alyssa discharges from its southern end into a stream that flows over 2,500 ft and into the easternmost point of Somerset Lake. Currently there is no in-lake water quality data for Lake Alyssa to make a determination on its potential as

a source of pollutants to Somerset Lake. However, while there are no data in Lake Alyssa, there is a water quality station for Summerbrook Creek upstream of Somerset Lake and downstream of Lake Alyssa. In **Section 4.6.3.6**, the data at the station between the two lakes was analyzed and the data did not indicate high nutrient concentrations but did show an increasing trend in TP. The data also showed elevated *E. coli* levels. Based on the surrounding land uses, increasing TP levels and the presence of elevated FIB levels, this connection is identified as a potential source for loading to Somerset Lake.

Somerset Lake has a surface area of about 12.5 acres and is located within an area that is predominantly surrounded by residential land use. Water discharges from the western portion of the lake and flows through over 1,200 ft of stream before inflowing to the eastern side of Shelly Pond. There is currently no in-lake water quality data in Somerset Lake. Furthermore, historical water quality stations along Summerbrook Creek do not include the segment connection between Shelly Pond and Somerset Lake. Based on the lack of water quality data, surrounding land uses, and determinations made based on upstream data, this connection is identified as a potential source of pollutant loads to Shelly Pond.

4.6.4.8 Summary of Findings

Based on the discussions above and data and information presented in **Section 4.6.3**, there are various potential sources of pollutant loads to the Summerbrook Chain of Lakes. The primary constituent of concern is FIB given elevated *E. coli* levels, but TP data is also showing a somewhat concerning increasing trend.

Stormwater runoff contributing to tributary inflow and septic appear significant and are quantified as part of this study. Interconnected flow, internal recycling, seepage, and wastewater are not quantified due to data limitations, but may warrant further evaluation as part of future studies. Direct atmospheric load to the lakes is identified as a potential source and the loads calculated as part of this study.

4.6.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Summerbrook Creek and the Summerbrook Chain of Lakes for the sources identified for calculation in **Section 4.6.4.8**. These include stormwater runoff, septic systems, and atmospheric deposition. Where loads were not calculated the sections below provide brief discussions. The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

4.6.5.1 Stormwater Pollutant Load

To calculate the stormwater TN and TP loads to the Summerbrook Chain of Lakes, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to each of the lakes (Lake Alyssa, Somerset Lake, and Shelly Pond). TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-86 presents the subbasins and the DEM utilized in the SIMPLE model calculations for the Summerbrook Chain of Lakes. **Figure 4-87** presents the aggregated land use. Finally, **Figure 4-88** presents the CDAs for the Chain of Lakes stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs around the lakes.

Stormwater Nutrient Loads to Summerbrook Chain of Lakes

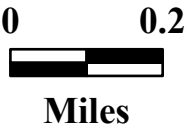
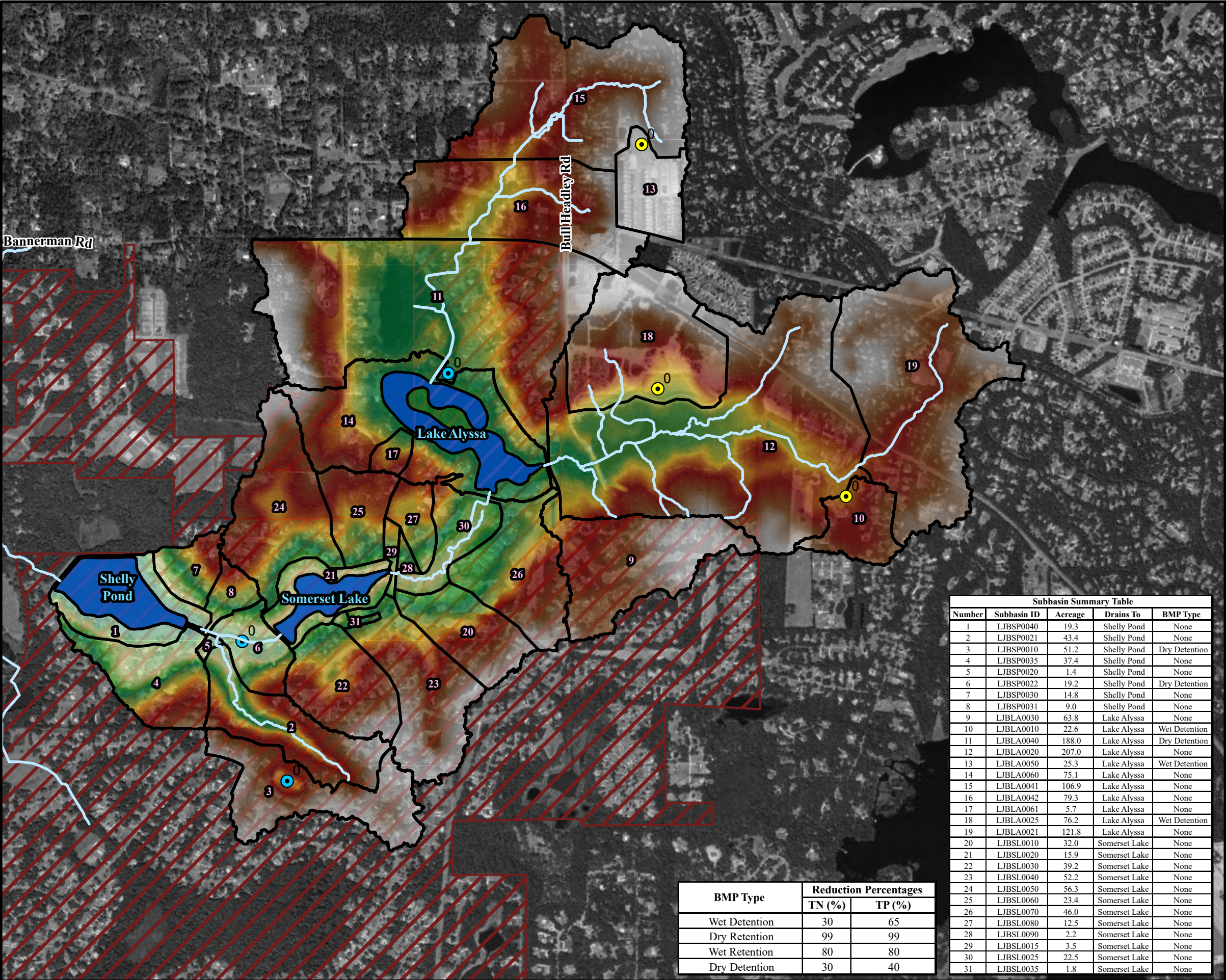
Figure 4-89 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads for each waterbody (see the tables on **Figure 4-89**). The rankings are color coded with the highest ranked CDAs (by waterbody) in dark green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 7.5 lb/yr up to 1,059.0 lb/yr. The per acre loads ranged from 2.0 lb/acre/yr up to 5.8 lb/acre/yr. The highest ranked CDAs were located along the southeastern side of the chain of lakes. This is likely a function of the size of the CDAs in that area along with the presence of recreational land use (associated with a golf course) in the more southern ones. The per acre loads are higher than more natural areas such as those surrounding Carr Lake. The total potential stormwater runoff loads for TN for Lake Alyssa, Somerset Lake and Shelly Pond are 2,482 lb/yr, 1,365 lb/yr, and 560 lb/yr, respectively.

Figure 4-90 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads for each waterbody (see the tables on **Figure 4-90**). The calculated total stormwater TP loads from the CDAs ranged from as low as 2.1 lb/yr up to 210.0 lb/yr. The per acre loads ranged from 0.4 lb/acre/yr up to 2.0 lb/acre/yr. As was seen for the TN, the highest ranked CDAs were located primarily in the areas southeast of the lakes in the area of the recreational land use. TP per acre loads were higher throughout the CDAs draining to the chain of lakes in comparison to those seen in more natural areas. The total potential stormwater runoff loads for TP for Lake Alyssa, Somerset Lake and Shelly Pond are 541 lb/yr, 450 lb/yr, and 149 lb/yr, respectively.

4.6.5.2 Septic Load

In order to analyze the potential impacts from septic tank units to Summerbrook Creek and the Summerbrook Chain of Lakes, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The calculations were done for each of the three waterbodies in this area (Lake Alyssa, Somerset Lake, and Shelly Pond). The approach and calculations were described earlier in **Section 4.4.5.2**, which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN), and based on literature on transport and assimilation, may represent a conservative potential load.

An estimated 272 septic tank units were identified within 200 meters of Summerbrook Creek, Summerbrook Chain of Lakes, and associated tributaries. **Figure 4-91** shows the septic systems utilized in the analyses with those associated with direct loading to the waterbody green and those associated with loading to tributaries pink. Tables provided on the figure summarize the calculated nutrient load from septic units to each of the three waterbodies (Lake Alyssa, Somerset Lake, and Shelly Pond). The total TN load to Lake Alyssa is 2801 lb/yr with 2,725 lb/yr of that total load coming from tributaries. The total TN load to Somerset Lake is 0 lb/yr. The TN load to Shelly Pond is 141 lb/yr with 108 lb/yr from direct loading to the lake.



Legend

- Summerbrook Chain of Lakes
- Subbasins
- Tallahassee Corporate Limits
- BMP Type
 - Dry Detention
 - Wet Detention
- Topographic Elevations
ft NAVD88
 - 252
 - 108

Subbasin Summary Table				
Number	Subbasin ID	Acreage	Drains To	BMP Type
1	LJBSP0040	19.3	Shelly Pond	None
2	LJBSP0021	43.4	Shelly Pond	None
3	LJBSP0010	51.2	Shelly Pond	Dry Detention
4	LJBSP0035	37.4	Shelly Pond	None
5	LJBSP0020	1.4	Shelly Pond	None
6	LJBSP0022	19.2	Shelly Pond	Dry Detention
7	LJBSP0030	14.8	Shelly Pond	None
8	LJBSP0031	9.0	Shelly Pond	None
9	LJBLA0030	63.8	Lake Alyssa	None
10	LJBLA0010	22.6	Lake Alyssa	Wet Detention
11	LJBLA0040	188.0	Lake Alyssa	Dry Detention
12	LJBLA0020	207.0	Lake Alyssa	None
13	LJBLA0050	25.3	Lake Alyssa	Wet Detention
14	LJBLA0060	75.1	Lake Alyssa	None
15	LJBLA0041	106.9	Lake Alyssa	None
16	LJBLA0042	79.3	Lake Alyssa	None
17	LJBLA0061	5.7	Lake Alyssa	None
18	LJBLA0025	76.2	Lake Alyssa	Wet Detention
19	LJBLA0021	121.8	Lake Alyssa	None
20	LJBLSL0010	32.0	Somerset Lake	None
21	LJBLSL0020	15.9	Somerset Lake	None
22	LJBLSL0030	39.2	Somerset Lake	None
23	LJBLSL0040	52.2	Somerset Lake	None
24	LJBLSL0050	56.3	Somerset Lake	None
25	LJBLSL0060	23.4	Somerset Lake	None
26	LJBLSL0070	46.0	Somerset Lake	None
27	LJBLSL0080	12.5	Somerset Lake	None
28	LJBLSL0090	2.2	Somerset Lake	None
29	LJBLSL0015	3.5	Somerset Lake	None
30	LJBLSL0025	22.5	Somerset Lake	None
31	LJBLSL0035	1.8	Somerset Lake	None

BMP Type	Reduction Percentages	
	TN (%)	TP (%)
Wet Detention	30	65
Dry Retention	99	99
Wet Retention	80	80
Dry Detention	30	40

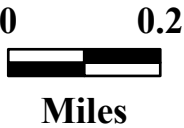
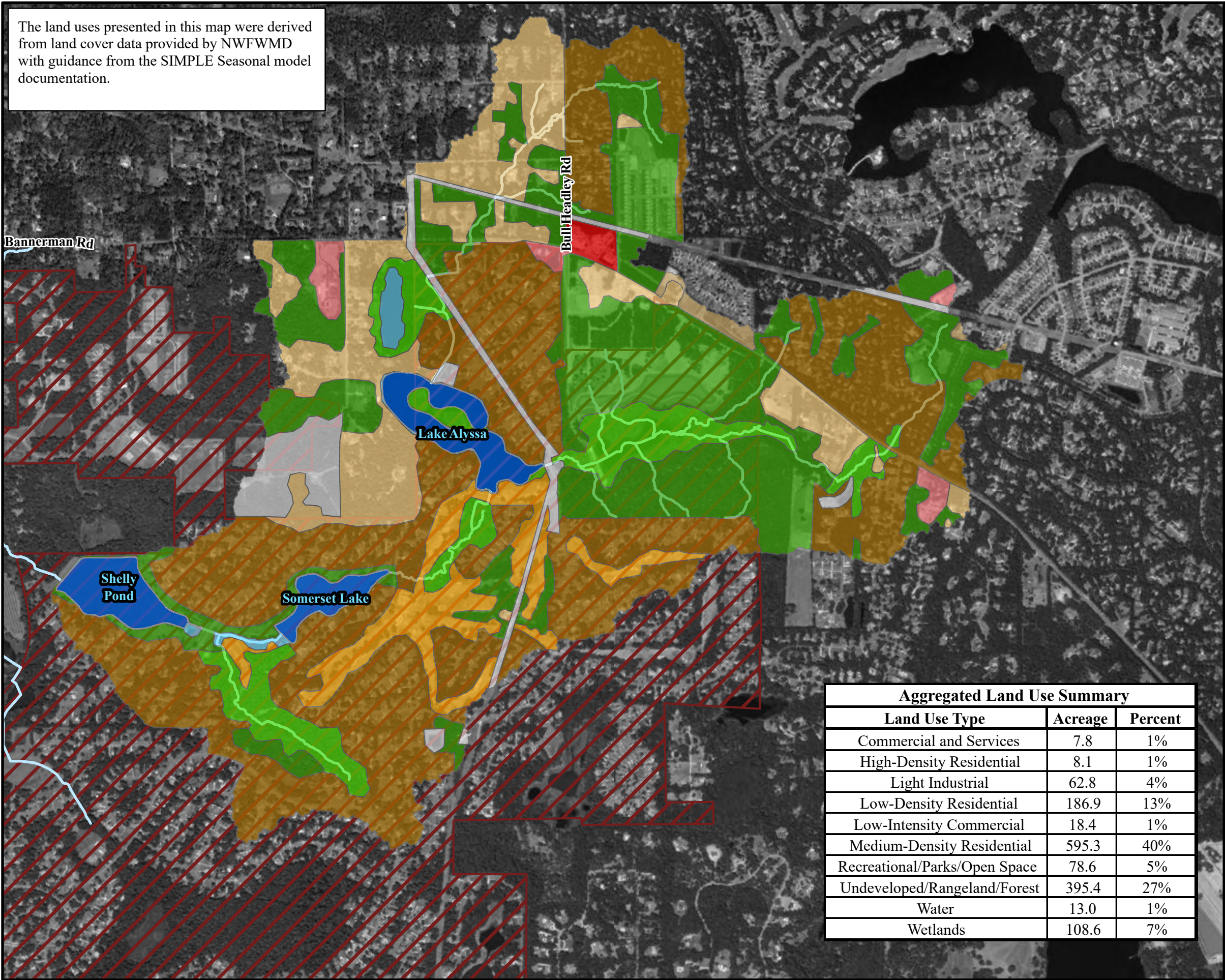
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 2020

Figure 4-86:
Summerbrook Chain of Lakes Subbasin
Delineation and BMPs

Tallahassee Master Plan - Surface
Water (TMaPS)



The land uses presented in this map were derived from land cover data provided by NFWFMD with guidance from the SIMPLE Seasonal model documentation.



Legend

- Summerbrook Chain of Lakes
- Tallahassee Corporate Limits
- Watercourses
- Aggregated Land Use
- Land Use Type
 - Commercial and Services
 - High-Density Residential
 - Light Industrial
 - Low-Density Residential
 - Low-Intensity Commercial
 - Medium-Density Residential
 - Recreational/Parks/Open Space
 - Undeveloped/Rangeland/Forest
 - Water
 - Wetlands

Sources:
Waterbodies: COT, 2020
Land Use: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 2020

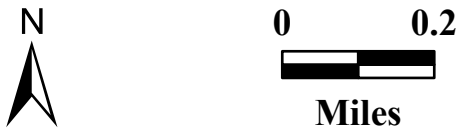
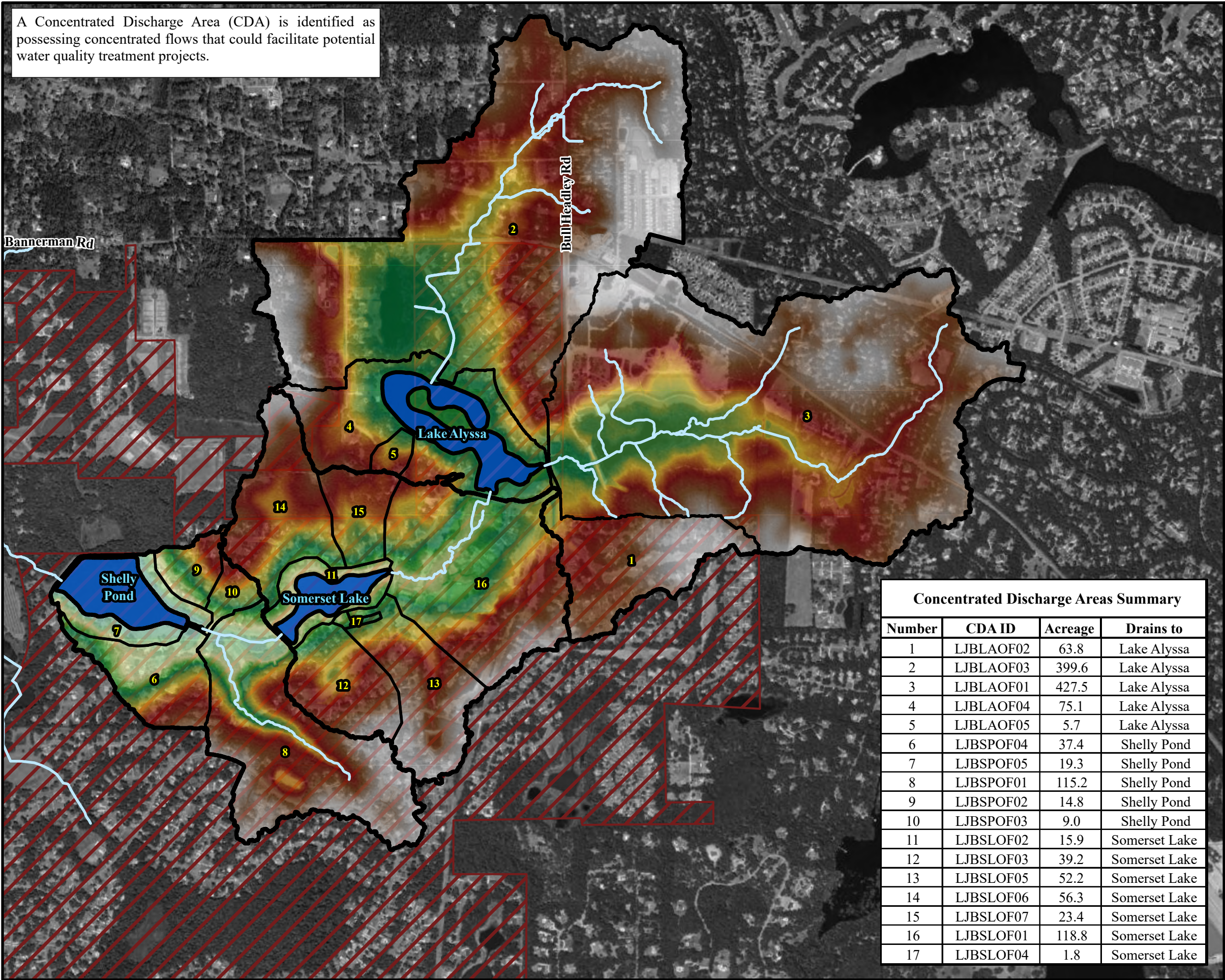
Aggregated Land Use Summary		
Land Use Type	Acreage	Percent
Commercial and Services	7.8	1%
High-Density Residential	8.1	1%
Light Industrial	62.8	4%
Low-Density Residential	186.9	13%
Low-Intensity Commercial	18.4	1%
Medium-Density Residential	595.3	40%
Recreational/Parks/Open Space	78.6	5%
Undeveloped/Rangeland/Forest	395.4	27%
Water	13.0	1%
Wetlands	108.6	7%

Figure 4-87:
Summerbrook Chain of Lakes Aggregated
Land Use

Tallahassee Master Plan - Surface
Water (TMaPS)



A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Legend

- Summerbrook Chain of Lakes
- Concentrated Discharge Area
- Watercourses
- Tallahassee Corporate Limits

Topographic Elevations
ft NAVD88



Concentrated Discharge Areas Summary			
Number	CDA ID	Acreage	Drains to
1	LJBLAOF02	63.8	Lake Alyssa
2	LJBLAOF03	399.6	Lake Alyssa
3	LJBLAOF01	427.5	Lake Alyssa
4	LJBLAOF04	75.1	Lake Alyssa
5	LJBLAOF05	5.7	Lake Alyssa
6	LJBSP0F04	37.4	Shelly Pond
7	LJBSP0F05	19.3	Shelly Pond
8	LJBSP0F01	115.2	Shelly Pond
9	LJBSP0F02	14.8	Shelly Pond
10	LJBSP0F03	9.0	Shelly Pond
11	LJBSLOF02	15.9	Somerset Lake
12	LJBSLOF03	39.2	Somerset Lake
13	LJBSLOF05	52.2	Somerset Lake
14	LJBSLOF06	56.3	Somerset Lake
15	LJBSLOF07	23.4	Somerset Lake
16	LJBSLOF01	118.8	Somerset Lake
17	LJBSLOF04	1.8	Somerset Lake

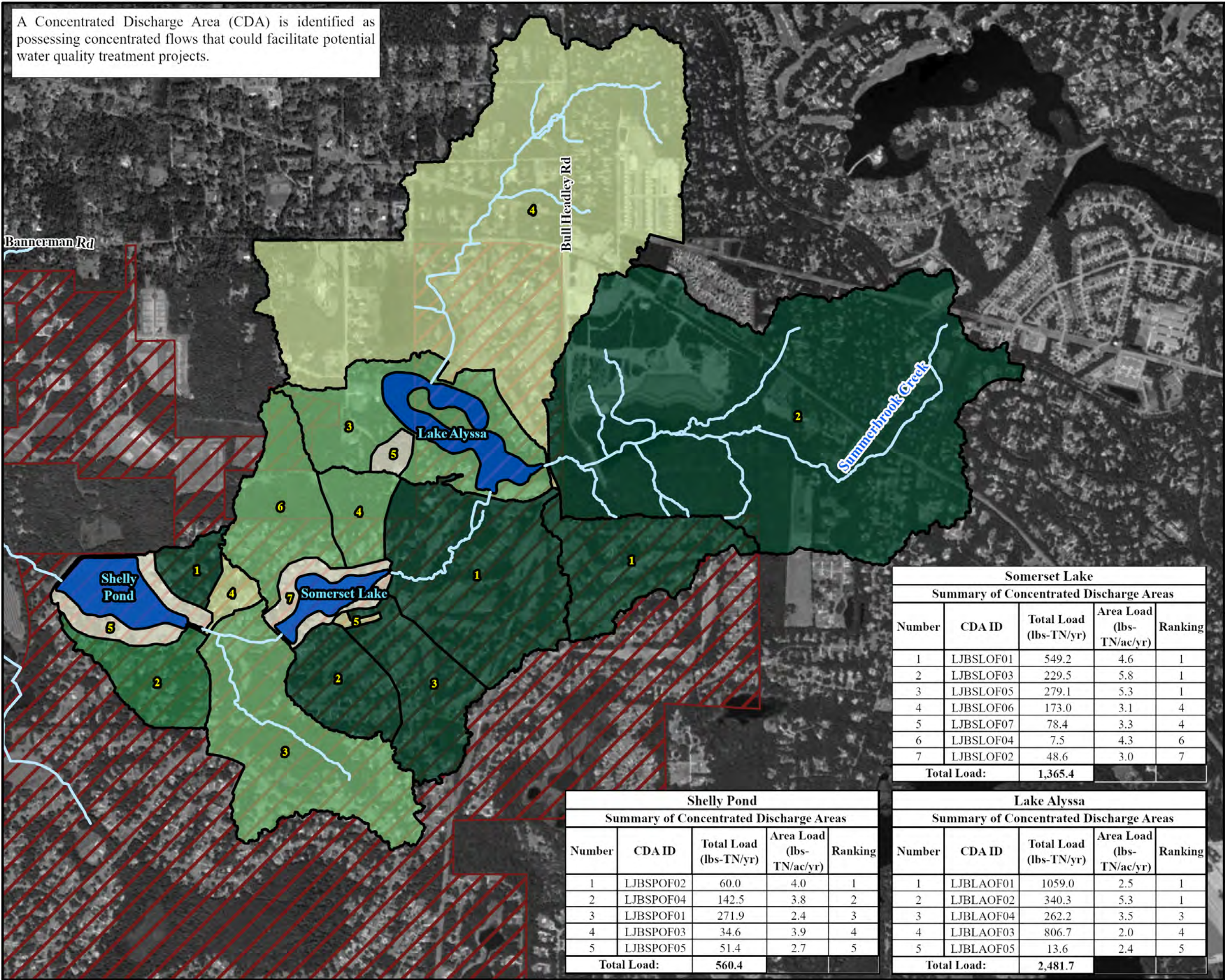
Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-88:
Summerbrook Chain of Lakes
Concentrated Discharge Areas

Tallahassee Master Plan - Surface
Water (TMaPS)



A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Legend

- Summerbrook Chain of Lakes
- Concentrated Discharge Area
- Watercourses
- Tallahassee Corporate Limits
- Ranking
 - High (1)
 - Low (7)

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-89:
Summerbrook Chain of Lakes Concentrated
Discharge Areas Total Nitrogen

Tallahassee Master Plan - Surface
Water (TMaPS)

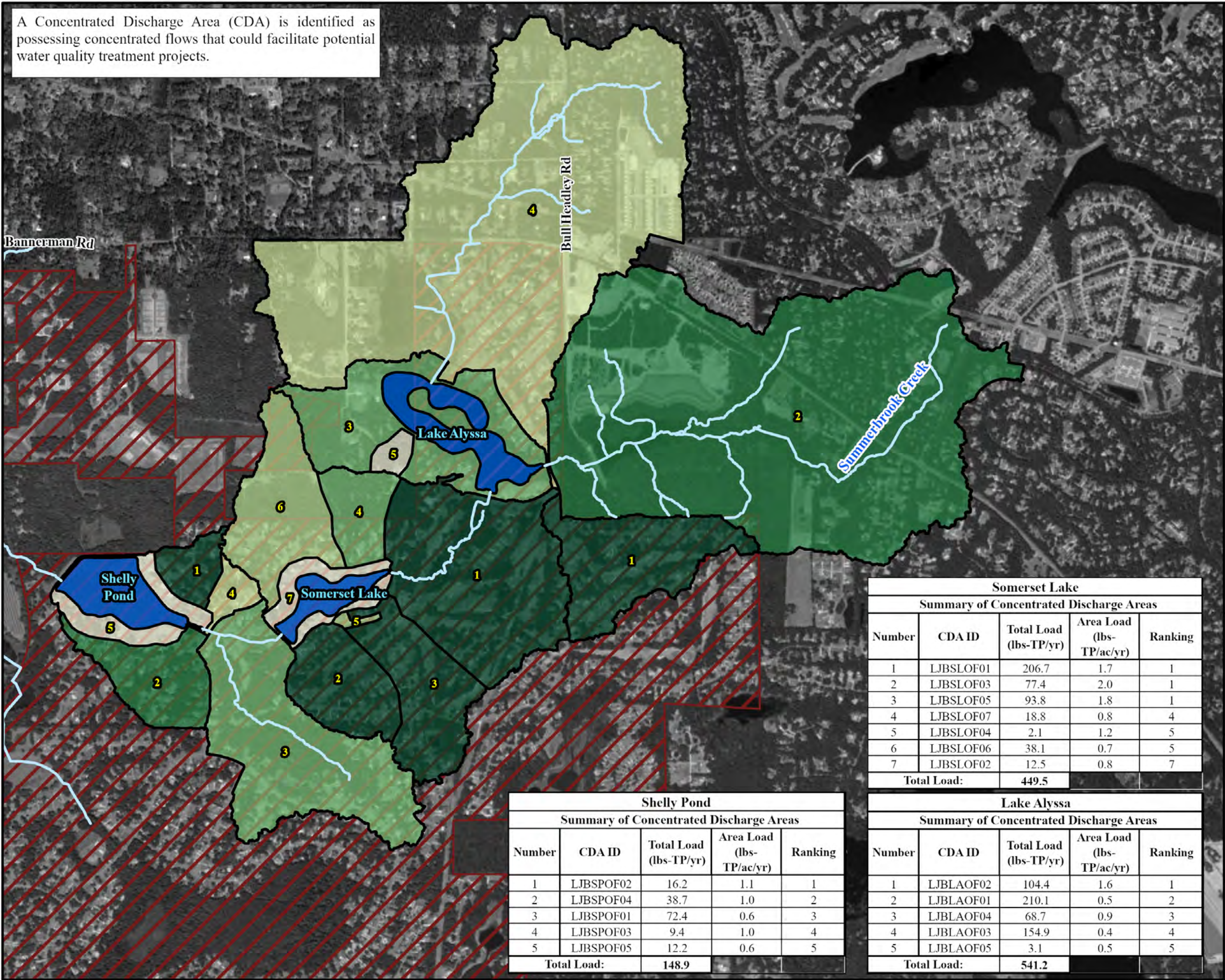


Somerset Lake				
Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBSLOF01	549.2	4.6	1
2	LJBSLOF03	229.5	5.8	1
3	LJBSLOF05	279.1	5.3	1
4	LJBSLOF06	173.0	3.1	4
5	LJBSLOF07	78.4	3.3	4
6	LJBSLOF04	7.5	4.3	6
7	LJBSLOF02	48.6	3.0	7
Total Load:		1,365.4		

Shelly Pond				
Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBSPOF02	60.0	4.0	1
2	LJBSPOF04	142.5	3.8	2
3	LJBSPOF01	271.9	2.4	3
4	LJBSPOF03	34.6	3.9	4
5	LJBSPOF05	51.4	2.7	5
Total Load:		560.4		

Lake Alyssa				
Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBLAOF01	1059.0	2.5	1
2	LJBLAOF02	340.3	5.3	1
3	LJBLAOF04	262.2	3.5	3
4	LJBLAOF03	806.7	2.0	4
5	LJBLAOF05	13.6	2.4	5
Total Load:		2,481.7		

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Legend

- Summerbrook Chain of Lakes
- Concentrated Discharge Area
- Watercourses
- Tallahassee Corporate Limits
- Ranking
 - High (1)
 - Low (7)

Sources:
Waterbodies: COT, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-90:
Summerbrook Chain of Lakes Concentrated
Discharge Areas Total Phosphorus

Tallahassee Master Plan - Surface
Water (TMaPS)



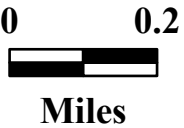
Somerset Lake				
Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBSLOF01	206.7	1.7	1
2	LJBSLOF03	77.4	2.0	1
3	LJBSLOF05	93.8	1.8	1
4	LJBSLOF07	18.8	0.8	4
5	LJBSLOF04	2.1	1.2	5
6	LJBSLOF06	38.1	0.7	5
7	LJBSLOF02	12.5	0.8	7
Total Load:		449.5		

Lake Alyssa				
Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBLAOF02	104.4	1.6	1
2	LJBLAOF01	210.1	0.5	2
3	LJBLAOF04	68.7	0.9	3
4	LJBLAOF03	154.9	0.4	4
5	LJBLAOF05	3.1	0.5	5
Total Load:		541.2		

Shelly Pond				
Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBSP0F02	16.2	1.1	1
2	LJBSP0F04	38.7	1.0	2
3	LJBSP0F01	72.4	0.6	3
4	LJBSP0F03	9.4	1.0	4
5	LJBSP0F05	12.2	0.6	5
Total Load:		148.9		

Location points of septic systems are digital estimations from related parcel locations and not meant to depict accuracy of unit location within the property.

Only septic units within 200 meters of the waterbody or its tributaries were selected and shown on this map as they are the sources of the calculated nutrient loads, the remainder of septic units that were not selected are not shown on the map.



Legend

- Lake Jackson Drainage Basin
- Summerbrook Chain of Lakes
- Watercourses
- Tallahassee Corporate Limits
- Relevant Septic Sites**
 - Lake
 - Tributaries

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 4-91:
Septic Loading to Summerbrook Chain of Lakes

Tallahassee Master Plan - Surface
Water (TMaPS)



Summary of Nutrient Loading from Septic			
Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Somerset Lake	0	0	0
Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Lake Alyssa	76	2,725	2,801
Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Shelly Pond	108	32	141

4.6.5.3 Point Source Load

No active point sources were identified within the Summerbrook Creek basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lake Alyssa, Somerset Lake, and Shelly Pond.

4.6.5.4 Lake Inflow Load

The approach utilized in the calculation of the inter-lake loading was described in **Section 4.4.5.4** for Lake Jackson. The lakes and connections are shown in **Figure 4-92** along with a table summarizing available data, calculated flows, and if inter-lake loads could be calculated. It should be noted that Somerset Lake represents both a receiving lake and an inflowing lake for these analyses. This is reflected on **Figure 4-92**. As no water quality data are available within either of the two upstream lakes, the loading cannot be calculated either from Lake Alyssa to Somerset Lake, or from Somerset Lake to Shelly Pond.

4.6.5.5 Internal Lake Load

While internal lake load was identified as a potentially significant source, no direct data/studies were identified to quantify the present benthic flux conditions in the Summerbrook Chain of Lakes. Additionally, no in-lake field parameter data are available for assessment of vertical profiles for parameters such as DO, temperature, ORP, and specific conductance as described for Lake Jackson. Therefore, internal lake load was not estimated.

4.6.5.6 Atmospheric Deposition

As presented and discussed in **Section 4.4.5.6** the annual average atmospheric TN load per acre was calculated from the Quincy NADP station (F14) at 2.56 lb/acre/yr. Multiplying this by the acreage of Lake Alyssa (36 acres), Somerset Lake (12.5 acres), and Shelly Pond (23 acres) gives total TN loads of 92 lb/yr, 32 lb/yr, and 59 lb/yr, respectively. No data are available for TP therefore only the nitrogen load is provided.

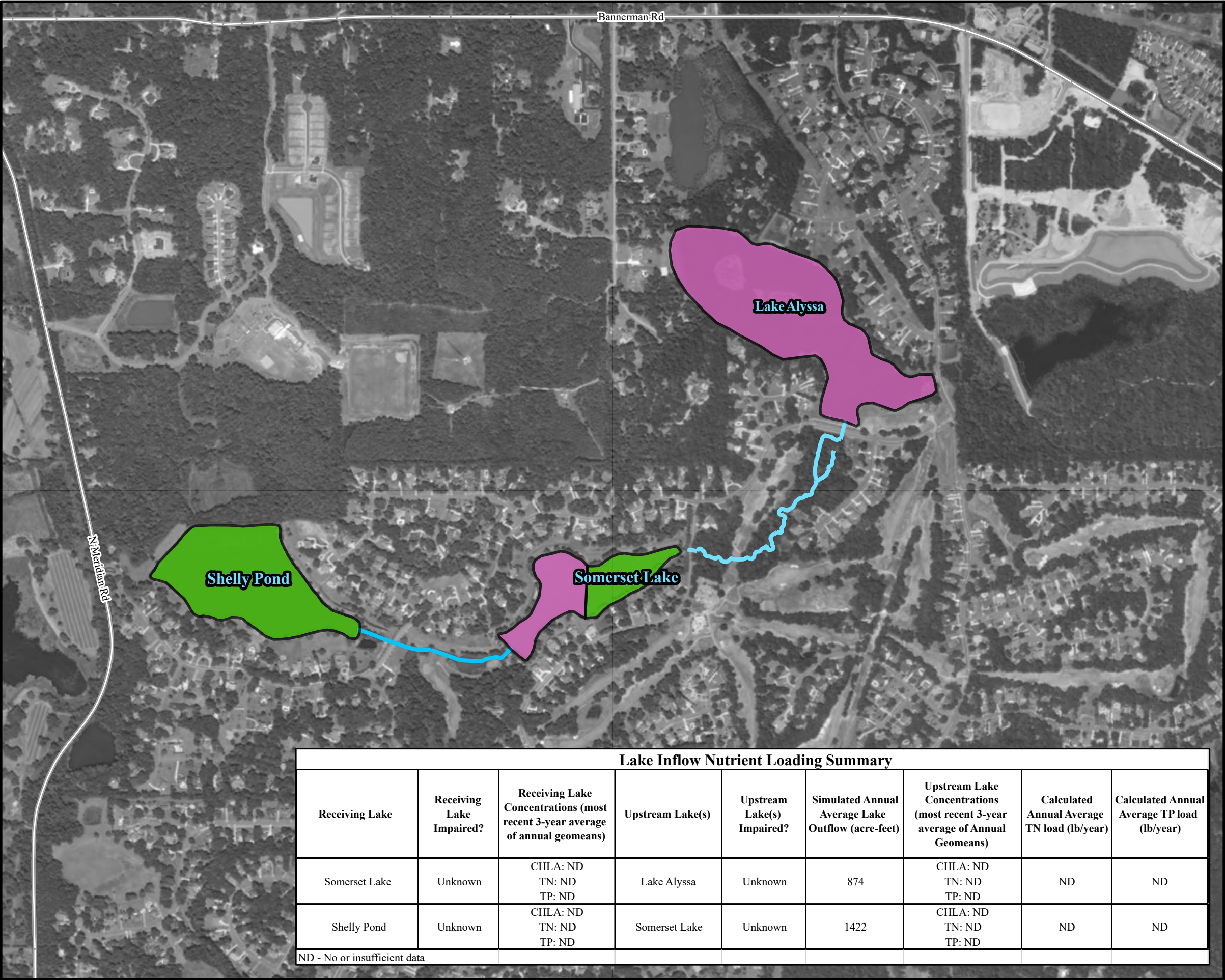
4.6.5.7 Summary of Calculated Loads

Nutrient loads to Lake Alyssa, Somerset Lake, and Shelly Pond were calculated for stormwater runoff, septic systems, and atmospheric deposition. **Table 4-16** through **Table 4-18** present the calculated total loads to the lake for TN and TP. For septic systems and atmospheric deposition, only TN loads were calculated (see **Section 4.6.5.2** and **Section 4.6.5.6**, respectively, for explanation).

Table 4-16: Summary of Calculated Loads to Lake Alyssa

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	2,482	541
Septic Systems	2,801	NC
Atmospheric Deposition	92	NC

NC – Not calculated.



- Legend**
- Shelly Pond
 - Somerset Lake
 - Inflowing Lakes
 - Flowlines

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023
City Limits, COT, 202

Lake Inflow Nutrient Loading Summary								
Receiving Lake	Receiving Lake Impaired?	Receiving Lake Concentrations (most recent 3-year average of annual geomeans)	Upstream Lake(s)	Upstream Lake(s) Impaired?	Simulated Annual Average Lake Outflow (acre-feet)	Upstream Lake Concentrations (most recent 3-year average of Annual Geomeans)	Calculated Annual Average TN load (lb/year)	Calculated Annual Average TP load (lb/year)
Somerset Lake	Unknown	CHLA: ND TN: ND TP: ND	Lake Alyssa	Unknown	874	CHLA: ND TN: ND TP: ND	ND	ND
Shelly Pond	Unknown	CHLA: ND TN: ND TP: ND	Somerset Lake	Unknown	1422	CHLA: ND TN: ND TP: ND	ND	ND
ND - No or insufficient data								

Figure 4-92:
Inflow Loading to Summerbrook Chain of Lakes

Tallahassee Master Plan - Surface Water (TMaPS)



Table 4-17: Summary of Calculated Loads to Somerset Lake

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	1,365	449
Septic Systems	0	NC
Atmospheric Deposition	32	NC

NC – Not calculated.

Table 4-18: Summary of Calculated Loads to Shelly Pond

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	560	149
Septic Systems	141	NC
Atmospheric Deposition	59	NC

NC – Not calculated.

4.7 Lake Overstreet

This section presents the results from Tasks 1 through 3 for Lake Overstreet. This includes an overview and history of the lake and basin; present impairment status; an overview of available data; a qualitative assessment of potential pollutant sources; and calculation of potential pollutant loads.

4.7.1 Overview and History

Lake Overstreet is a 144-acre pristine natural lake located on the property of Alfred B Maclay Gardens State Park. The lake maintains its natural condition primarily due to limited access and prohibitions on boating and fishing. The lake is only accessible by hiking trails that start within Maclay Gardens State Park and off Meridian Road. **Photo 4-40** and **Photo 4-41** were taken in 2011 and 2012, respectively.

Historically the lake and surrounding properties were part of the Lafayette Land Grant in the early 1800s. The Land Grant was a gift from the United States government to the Marquis de Lafayette, who lent money to the government during the American Revolution. Fertile land around the lake was good for crops, and much of the area was cleared for cotton production. In 1994, the FDEP Division of Recreation and Parks, with assistance from the City, purchased 887 acres of property, including Lake Overstreet. This property was made part of Maclay Gardens State Park.

The drainage basin for Lake Overstreet covers an area of 1,670 acres (**Figure 4-93**). The upper portion of the basin, which drains into Lake Overstreet (815 acres), is primarily undeveloped, with a portion containing the High Grove neighborhood. The outflow of the lake flows into the Lake Overstreet Drain, which flows through the Bobbin Brook and Woodbrook neighborhoods prior to crossing Meridian Road and ultimately discharging into Fords Arm.

Lake Overstreet is a relatively deep lake for the area, with depths throughout much of the lake greater than 20 ft. **Photo 4-42** through **Photo 4-49** present aerial views of the lake from 1937 through the present. Examination of the aerial photos shows that the lake has generally remained the same over this period of time and, due to the depths, maintains open water throughout much of its area. The only variations seen are in the degree of vegetative cover in the southern portion and the degree of clearing in the land surrounding the lake. Prior to 1970, much of the land surrounding the lake was cleared, especially along the eastern side. After 1970, the surrounding land was reforested, and presently the entire shoreline and a significant buffer around the lake are natural.

4.7.2 Regulatory Status

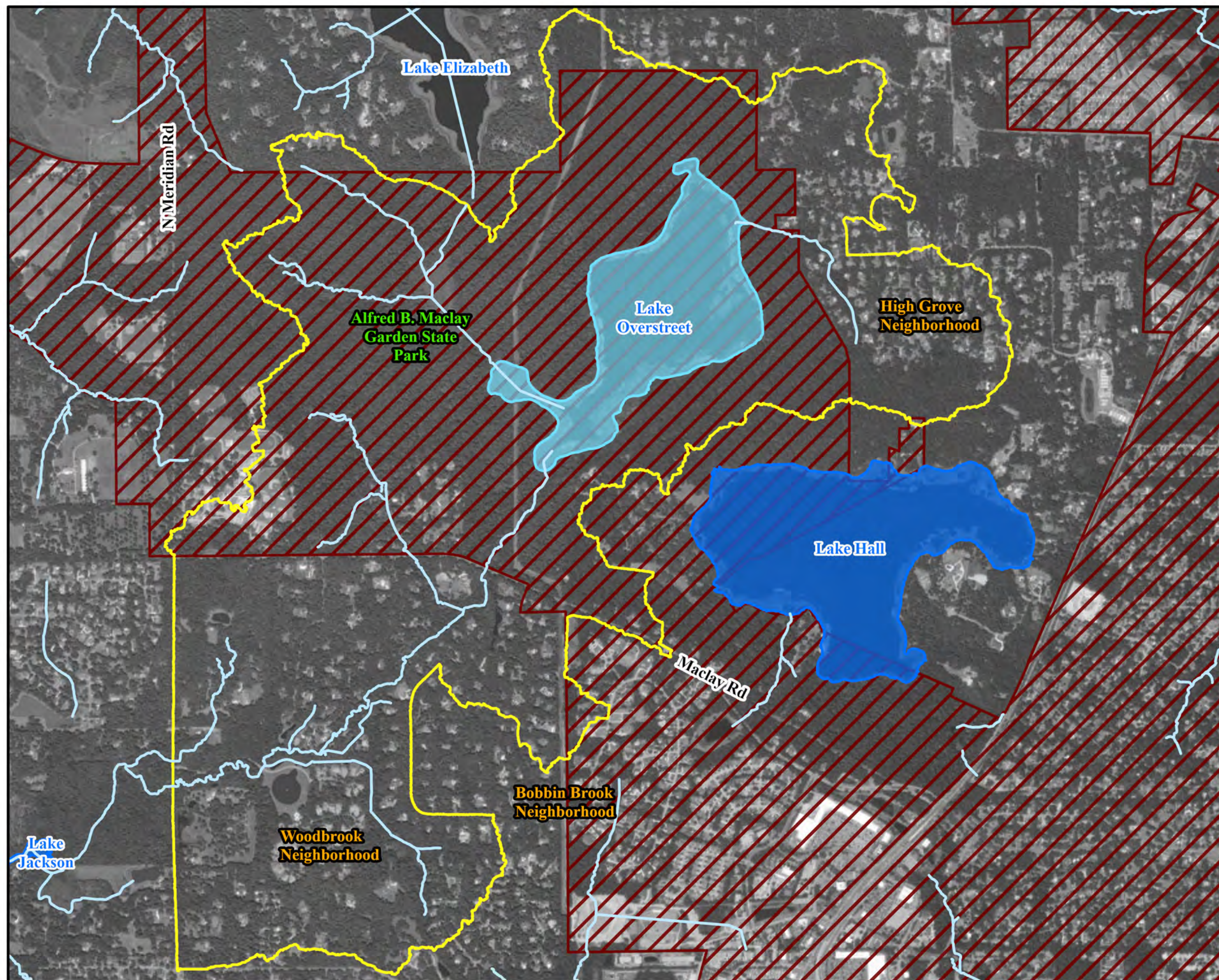
Exhibit 4-2 presented the verified impaired waters within the overall Lake Jackson basin. The Overstreet Drain (WBID 689) was placed on the verified list in 2008 for fecal coliform. As outlined in **Section 4.4.2**, fecal coliform is no longer the applicable FIB parameter for the waterbody classification. *E. coli* will be included in the upcoming Strategic Monitoring Plan to collect the new applicable FIB parameter data while the WBID remains on the Verified List for fecal coliform impairment. It is noted that analyses of the *E. coli* data on the Overstreet Drain to Lake Jackson (**Section 4.4.4.2**) did not show levels above the *E. coli* threshold of 410 MPN/100 mL.



Photo 4-40: Lake Overstreet (2011)



Photo 4-41: Lake Overstreet (2012)



0 0.2
Miles

Legend

- Lake Overstreet Drainage Basin
- Lake Overstreet
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2022
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-93:
Lake Overstreet Drainage Basin Overview

**Tallahassee Master Plan - Surface
Water (TMaPS)**

Geosyntec
consultants

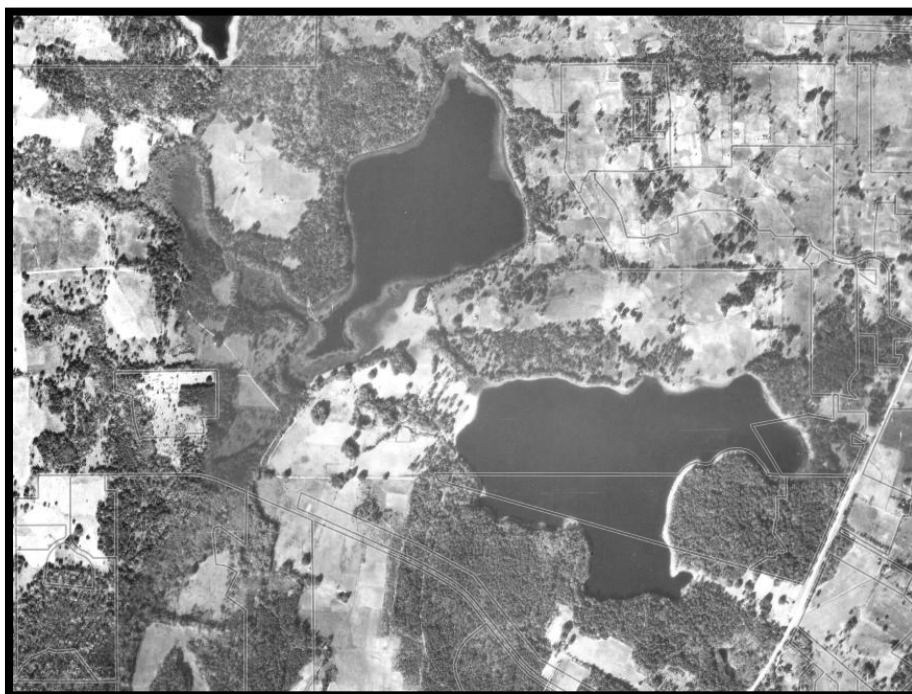


Photo 4-42: Lake Overstreet Basin Area Aerial (1937)



Photo 4-43: Lake Overstreet Basin Area Aerial (1949)



Photo 4-44: Lake Overstreet Basin Area Aerial (1954)



Photo 4-45: Lake Overstreet Basin Area Aerial (1970)



Photo 4-46: Lake Overstreet Basin Area Aerial (1983)



Photo 4-47: Lake Overstreet Basin Area Aerial (1996)

July 2025

4.7.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Lake Overstreet and the Lake Overstreet basin including bathymetry, land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.

4.7.3.1 Bathymetry

Presently, no bathymetric data are available for Lake Overstreet. Depths are based upon general descriptions of the lake. As stated earlier, Lake Overstreet is a deeper lake, with maximum depths on the order of 26 ft, with much of the area of the lake greater than 20 ft deep.

4.7.3.2 Land Use

Figure 4-94 presents a map of the Level 2 land uses within the Lake Overstreet and Overstreet Drain basin. A table is provided to show the overall acreages and percent cover for the various levels. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use within the Lake Overstreet and Overstreet Drain drainage basin per the grouped Level 1 categories is Upland Forrest (50 percent). The bulk of the Upland Forrest land use is located within the upper portions of the basin surrounding Lake Overstreet. The second largest land use in the overall basin is Residential (Low Density). A portion of the Low Density Residential is located in the upper reaches of the basin (High Grove neighborhood). The remaining Low Density with some High Density Residential areas drain into Overstreet Drain and ultimately to Lake Jackson.

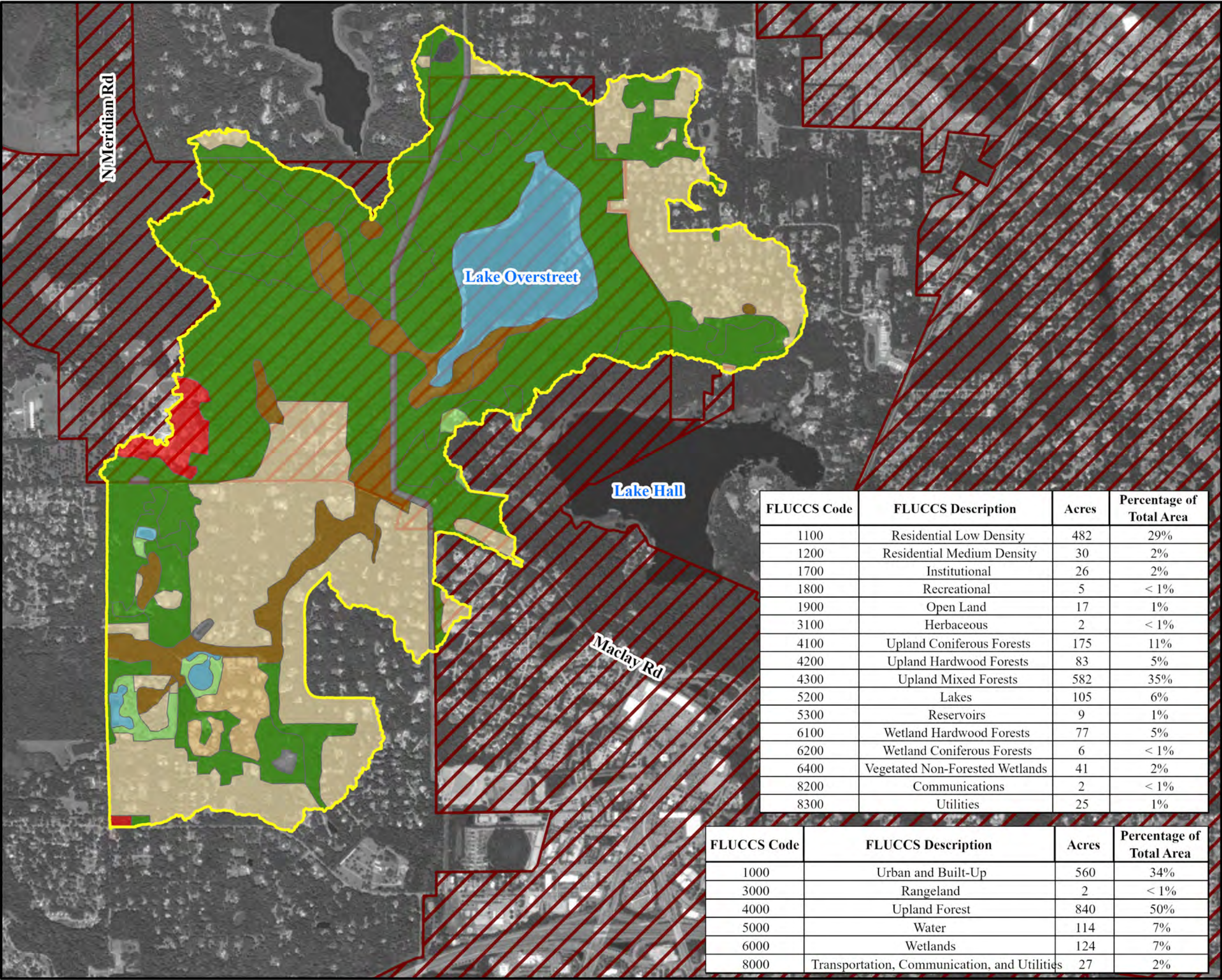
4.7.3.3 Soils

The most prevalent soil groups in the Lake Overstreet and Overstreet Drain basin are Group B (**Figure 4-95**) and Group C, accounting for 37 percent and 31 percent of the area, respectively. Group B soils are considered to have a moderate rate of infiltration, whereas Group C soils are considered to have slow rates of infiltration. Group A/D soils (18 percent) are found along the primary tributary pathways. These are considered to have high infiltration potential, but due to elevated water table conditions, will act more similarly to soils with low infiltration potential.

4.7.3.4 Septic Systems

An estimated 254 septic systems are within the boundaries of the Lake Overstreet and Overstreet Drain basin based on the FDOH septic tank layer (**Figure 4-96**). The septic tanks are located in two clusters. The first cluster is located at the upper end of the basin, primarily in the High Grove neighborhood. The second cluster is primarily within the Bobbin Brook and Woodbrook neighborhoods, downstream of Lake Overstreet.

For recent TMDL analyses, FDEP used a radius of 200 meters to analyze direct contribution of nutrient loads from septic systems to a waterbody. There are presently no identified septic systems within 200 meters of the shoreline of Lake Overstreet. A total of 105 septic systems are within the High Grove neighborhood and within a half-mile radius of Lake Overstreet. While some of the septic systems downstream of the lake are within a half-mile radius, any loading from these would go to Overstreet Drain and downstream toward Lake Jackson.



Legend

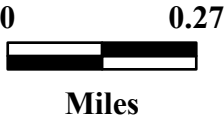
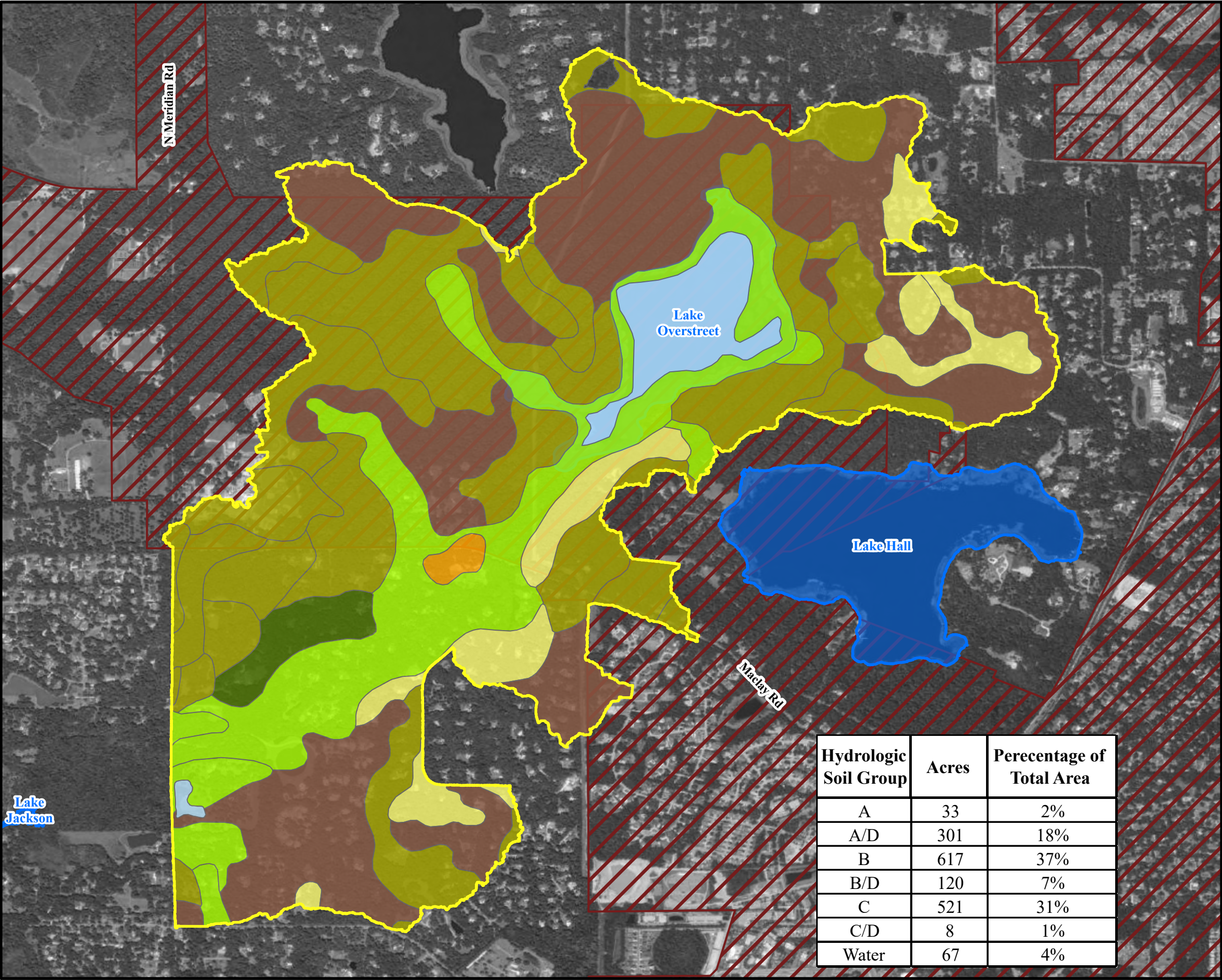
- Lake Overstreet Drainage Basin
- Tallahassee Corporate Limits
- Land Use Type
 - 1100: Residential Low Density
 - 1200: Residential Medium Density
 - 1700: Institutional
 - 1800: Recreational
 - 1900: Open Land
 - 3100: Herbaceous
 - 4100: Upland Coniferous Forests
 - 4200: Upland Hardwood Forests
 - 4300: Upland Mixed Forests
 - 5200: Lakes
 - 5300: Reservoirs
 - 6100: Wetland Hardwood Forests
 - 6200: Wetland Coniferous Forests
 - 6400: Vegetated Non-Forested Wetlands
 - 8200: Communications
 - 8300: Utilities

Sources:
 Waterbodies: COT, 2020
 Watercourses: COT, 2020
 Drainage Basins: COT, 2022
 Roads: COT-Leon County, 2023
 City Limits: COT, 2020
 Land Use: NFWFMD, 2019

Figure 4-94:
Lake Overstreet Basin Land Use
Tallahassee Master Plan - Surface
Water (TMaPS)

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	482	29%
1200	Residential Medium Density	30	2%
1700	Institutional	26	2%
1800	Recreational	5	< 1%
1900	Open Land	17	1%
3100	Herbaceous	2	< 1%
4100	Upland Coniferous Forests	175	11%
4200	Upland Hardwood Forests	83	5%
4300	Upland Mixed Forests	582	35%
5200	Lakes	105	6%
5300	Reservoirs	9	1%
6100	Wetland Hardwood Forests	77	5%
6200	Wetland Coniferous Forests	6	< 1%
6400	Vegetated Non-Forested Wetlands	41	2%
8200	Communications	2	< 1%
8300	Utilities	25	1%

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	560	34%
3000	Rangeland	2	< 1%
4000	Upland Forest	840	50%
5000	Water	114	7%
6000	Wetlands	124	7%
8000	Transportation, Communication, and Utilities	27	2%



Legend

- Lake Overstreet Drainage Basin
 - Waterbodies in Study
 - Tallahassee Corporate Limits
- Hydrologic Soil Group**
- A
 - A/D
 - B
 - B/D
 - C
 - C/D
 - Water

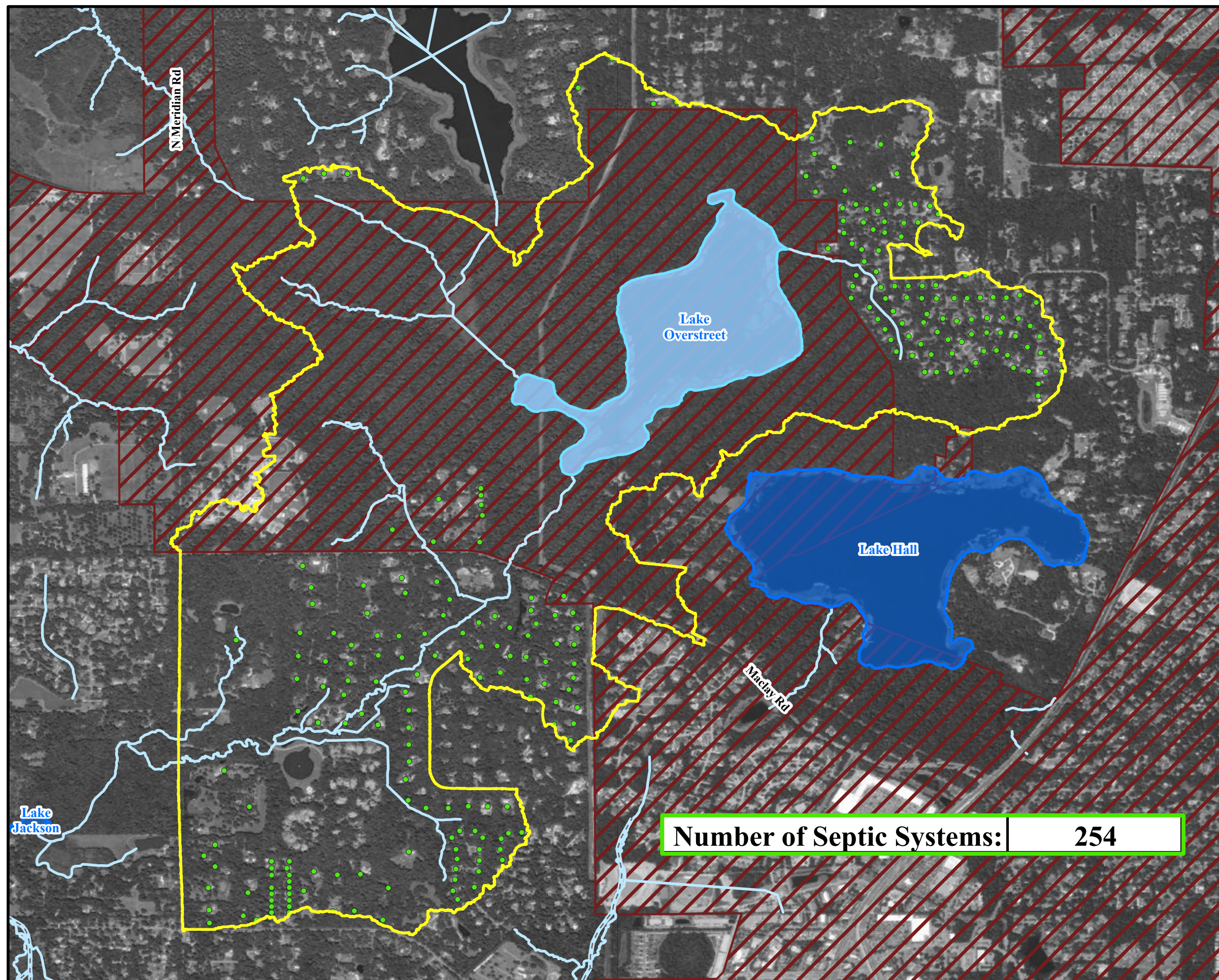
Sources:
 Waterbodies: COT, 2020
 Drainage Basins: COT, 2020
 Roads: COT-Leon County, 2023
 City Limits: COT, 2020
 Soils: NRCS, 2020

Hydrologic Soil Group	Acres	Perecentage of Total Area
A	33	2%
A/D	301	18%
B	617	37%
B/D	120	7%
C	521	31%
C/D	8	1%
Water	67	4%

Figure 4-95:
 Lake Overstreet Basin Soils

Tallahassee Master Plan - Surface Water (TMaPS)





0 0.27
Miles

Legend

-  Lake Overstreet Drainage Basin
-  Lake Overstreet
-  Waterbodies in Study
-  Watercourses
-  Tallahassee Corporate Limits
-  Septic Systems

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Septic Systems: COT, 2022

Figure 4-96:
Lake Overstreet Drainage Basin Septic Systems

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec
consultants

4.7.3.5 Hydrologic Data

No recent historical or present hydrologic monitoring stations are located within the Lake Overstreet or the Overstreet Drain basin.

4.7.3.6 Surface Water Quality Data

The IWR dataset for Lake Overstreet (WBID 689A) and Overstreet Drain (WBID 689) spans from 1991 to 2020 and includes contributions from local and state agencies (the City, FDEP, and Florida LAKEWATCH), as well as a private sector firm (BRA).

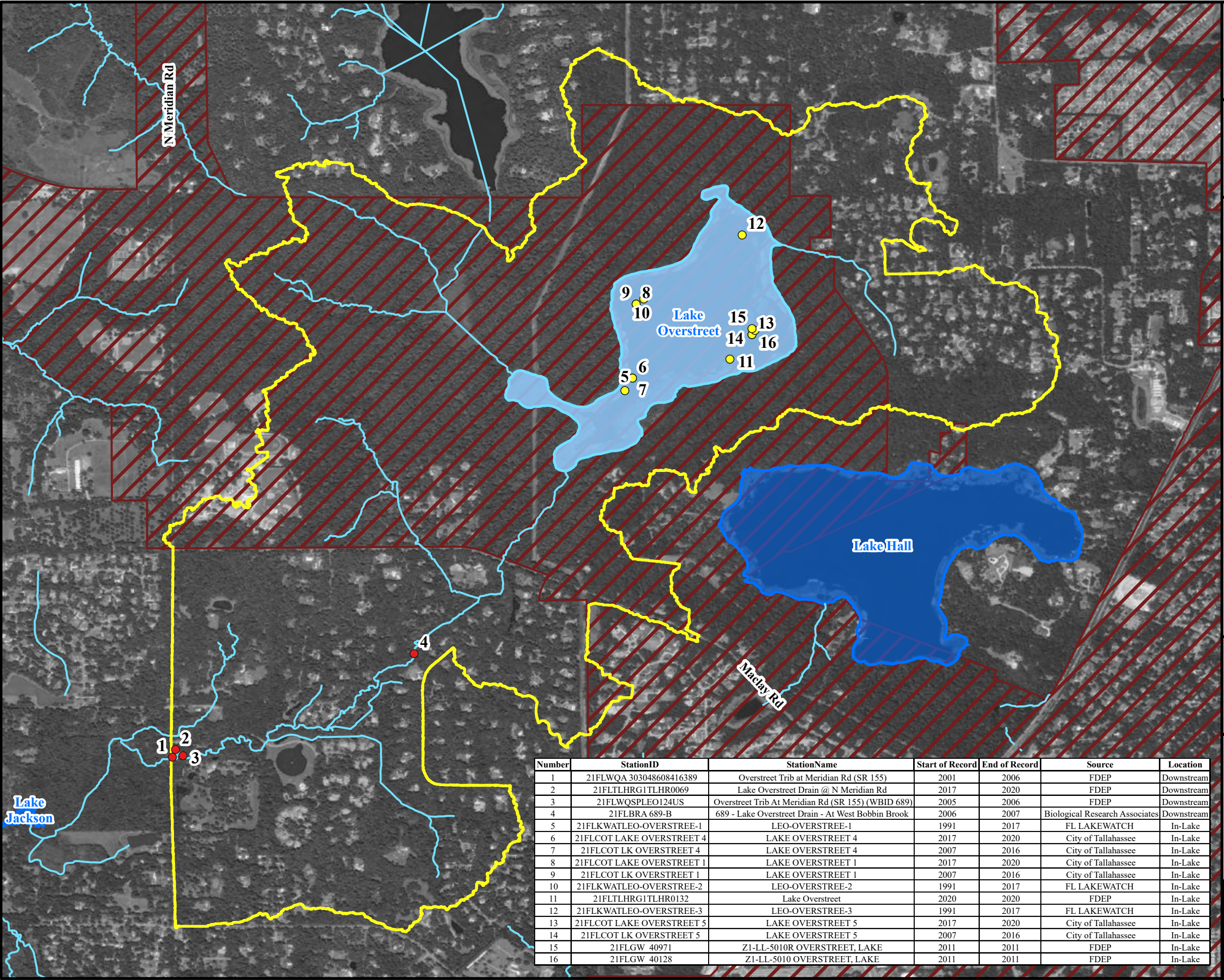
Figure 4-97 presents the locations of in-lake water quality monitoring stations for Lake Overstreet (yellow), along with stations that provide water quality data along Overstreet Drain (red), which is downstream of the lake. A table is provided in **Figure 4-97** that shows the station ID, station name, period of record, sample count, data source, and if the station represents in-lake or tributary data. Based on the number of stations and the length of the station IDs, station IDs were not included on the figure, rather each of the stations is given a number and the numbers correspond to stations in the table.

Figure 4-97 shows that in-lake water quality monitoring is grouped around four locations. These are north of the lake (Station 12), the western side (Stations 8, 9, and 10), the eastern side (Stations 11, 13, 14, 15, and 16) and the southern arm (Stations 5, 6, and 7). All four groups have good periods of record and relatively continuous monitoring.

Some initial plots of the available data in the lake are provided in this section. This includes plots of the raw data along with AGM. Nutrients are the primary constituent of interest relative to water quality conditions in Lake Overstreet, therefore, plots are provided for the key parameters related to potential nutrient impairment. These include TN, TP, Chl-a, and TSI. As discussed earlier, data are plotted from 2010 to 2020 to represent present conditions. Additionally, based on interest in the area relative to septic systems and other sources, FIB, specifically *E. coli* are included. Additional data plots and analyses are provided as part of the qualitative assessment of sources in **Section 4.7.4.1**.

Figure 4-98 through **Figure 4-100** present plots of the measured TN, TP and Chl-a from 2010 to 2020. Overall, the TN, TP and Chl-a concentrations are not elevated, with slight decreasing trends for TN and Chl-a and for the most part level TP concentration. There was a period between 2012 to 2014 where Chl-a and to some extent TN and TP levels were elevated in relation to other years after 2010. Qualitative comparison of the present TN and TP levels with historical measurements (pre-2000) showed somewhat elevated levels today in relation to historical measurements but the levels today are still relatively low.

Under FDEP's NNC, Lake Overstreet is defined as a low color, low alkalinity system. Based on this designation, the AGM threshold for Chl-a is 6 µg/L. For TN and TP, a range of concentrations are allowable, based on maintaining Chl-a levels in the lake below 6 µg/L. For TN, the range is 0.51 mg/L to 0.93 mg/L. For TP, the range is 0.01 mg/L to 0.03 mg/L. For *E. coli*, the criteria are monthly geometric means below 126 colonies per 100 mL of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period.



Legend

- Lake Overstreet Drainage Basin
- Lake Overstreet
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Water Quality Stations
 - Downstream of Lake Water Quality Sampling Stations
 - In-Lake Water Quality Sampling Stations

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
WQ Stations: FDEP, 2022

Figure 4-97:
Lake Overstreet Water Quality Station
Locations

Tallahassee Master Plan - Surface
Water (TMaPS)



Number	StationID	StationName	Start of Record	End of Record	Source	Location
1	21FLWQA 303048608416389	Overstreet Trib at Meridian Rd (SR 155)	2001	2006	FDEP	Downstream
2	21FLTLHRG1TLHR0069	Lake Overstreet Drain @ N Meridian Rd	2017	2020	FDEP	Downstream
3	21FLWQSPLEO124US	Overstreet Trib At Meridian Rd (SR 155) (WBID 689)	2005	2006	FDEP	Downstream
4	21FLBRA 689-B	689 - Lake Overstreet Drain - At West Bobbin Brook	2006	2007	Biological Research Associates	Downstream
5	21FLKWATLEO-OVERSTREE-1	LEO-OVERSTREE-1	1991	2017	FL LAKEWATCH	In-Lake
6	21FLCOT LAKE OVERSTREET 4	LAKE OVERSTREET 4	2017	2020	City of Tallahassee	In-Lake
7	21FLCOT LK OVERSTREET 4	LAKE OVERSTREET 4	2007	2016	City of Tallahassee	In-Lake
8	21FLCOT LAKE OVERSTREET 1	LAKE OVERSTREET 1	2017	2020	City of Tallahassee	In-Lake
9	21FLCOT LK OVERSTREET 1	LAKE OVERSTREET 1	2007	2016	City of Tallahassee	In-Lake
10	21FLKWATLEO-OVERSTREE-2	LEO-OVERSTREE-2	1991	2017	FL LAKEWATCH	In-Lake
11	21FLTLHRG1TLHR0132	Lake Overstreet	2020	2020	FDEP	In-Lake
12	21FLKWATLEO-OVERSTREE-3	LEO-OVERSTREE-3	1991	2017	FL LAKEWATCH	In-Lake
13	21FLCOT LAKE OVERSTREET 5	LAKE OVERSTREET 5	2017	2020	City of Tallahassee	In-Lake
14	21FLCOT LK OVERSTREET 5	LAKE OVERSTREET 5	2007	2016	City of Tallahassee	In-Lake
15	21FLGW 40971	Z1-LL-5010R OVERSTREET, LAKE	2011	2011	FDEP	In-Lake
16	21FLGW 40128	Z1-LL-5010 OVERSTREET, LAKE	2011	2011	FDEP	In-Lake

TN, TP, and Chl-a, AGMs are plotted in **Figure 4-101** through **Figure 4-103** as these define the status of the lake relative to nutrient impairments. Where sufficient data are available to assess the AGMs, the levels are provided from 2010 through 2020. The Chl-a threshold and the minimum and maximum thresholds for TN and TP relative to the NNC are on each of the graphs as pink dashed lines. **Figure 4-104** presents a plot of calculated TSI values in the lake. While TSI is no longer utilized for the determination of impairment, it does serve as an indicator of lake health. Based on TSI definitions, levels below 60 are deemed good condition, levels between 60 and 70 indicate fair condition, while levels above 70 indicate poor condition. **Figure 4-105** presents plots of *E. coli* data for the available period of record.

Examination of the TN plot (**Figure 4-101**) shows that from 2010 to 2020 TN AGM levels have been at or below the minimum threshold. The AGMs show a similar rise between 2012 and 2014 that was noted for the raw data.

TP AGM levels (**Figure 4-102**) have fallen between the minimum and maximum threshold values for most of the years, with general downward trend. In 2018 and 2019, the levels fall below the minimum threshold. In 2020, the value pops back up above the minimum.

Figure 4-103 presents the Chl-a AGMs from 2010 through 2020. The Chl-a AGM was above the threshold in 2012 by a significant amount and then right at the threshold in 2020. Other times showed the Chl-a AGMs below the threshold. The general rise between 2012 and 2014/2015 can be seen.

Examination of the TSI plot (**Figure 4-104**) shows similar patterns as seen in TN, TP, and Chl-a, with higher levels between 2012 to 2015 and again in 2020. No values went above the 60 threshold during the period of record.

Figure 4-105 present a plot of measured *E. coli* levels in the lake from 2015 through 2020. The data all show very low values, with most at below detection limits. Some higher concentrations were measured in 2020.

4.7.3.7 Groundwater Data

Presently, there are no identified surficial groundwater monitoring wells within the Lake Overstreet and Overstreet Drain basin.

4.7.3.8 Biological Data

Table 4-19 presents LVI data collected by the City and FDEP between 2010 and 2013. The data show a range of from 61 up to 71, reflecting healthy conditions in the lake.

Table 4-19: Summary of LVI Results from Lake Overstreet

Date	Station ID	LVI	Aquatic Life Use Category
6/24/2010	21FLCOTCOTLVI006	67	Healthy
7/20/2011	32FLGW40128	61	Healthy
10/1/2012	21FLCOTCOTLVI006	71	Healthy
10/29/2013	21FLCOTCOTLVI006	70	Healthy

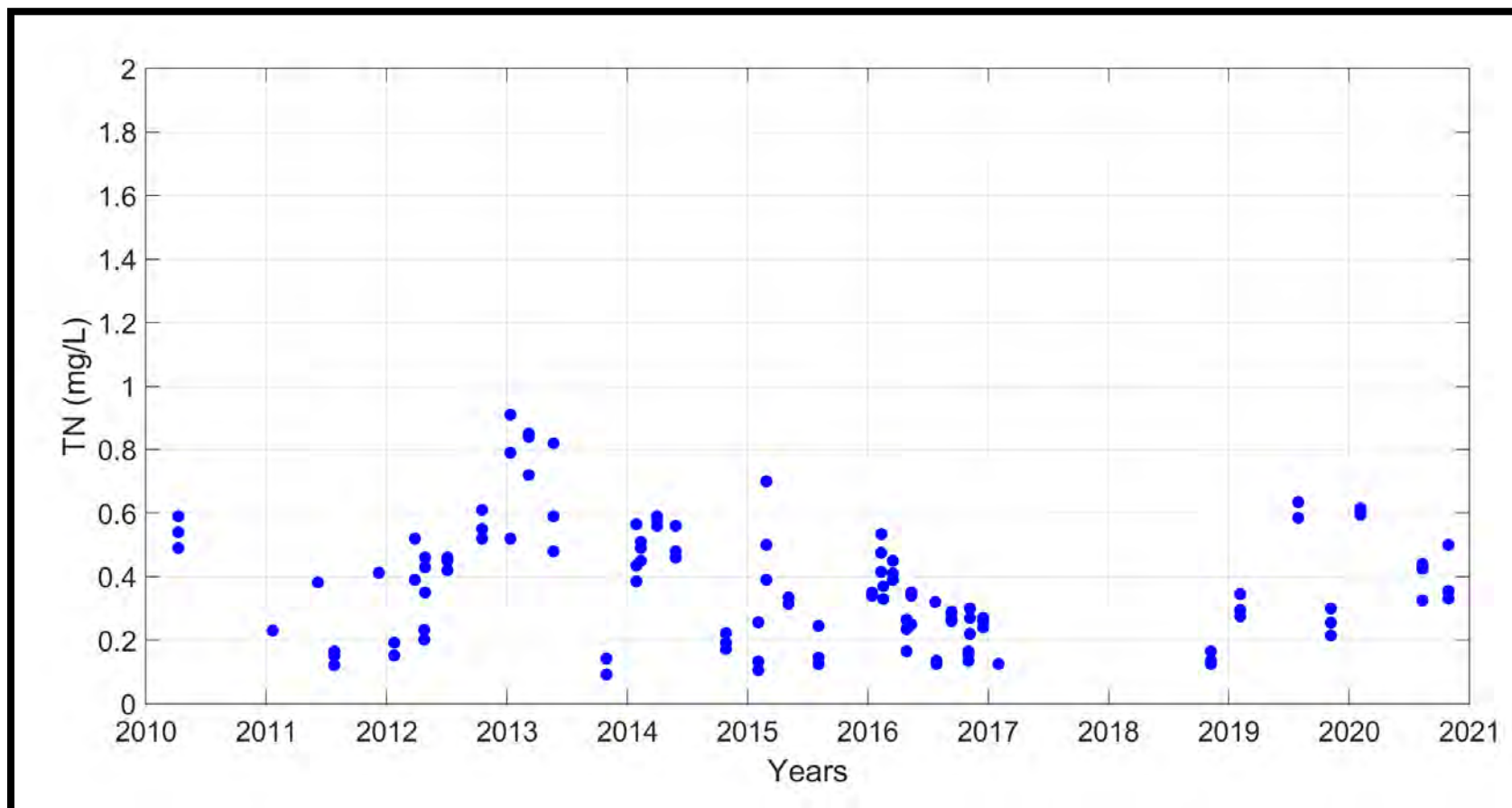


Figure 4-98: Plot of Measured TN

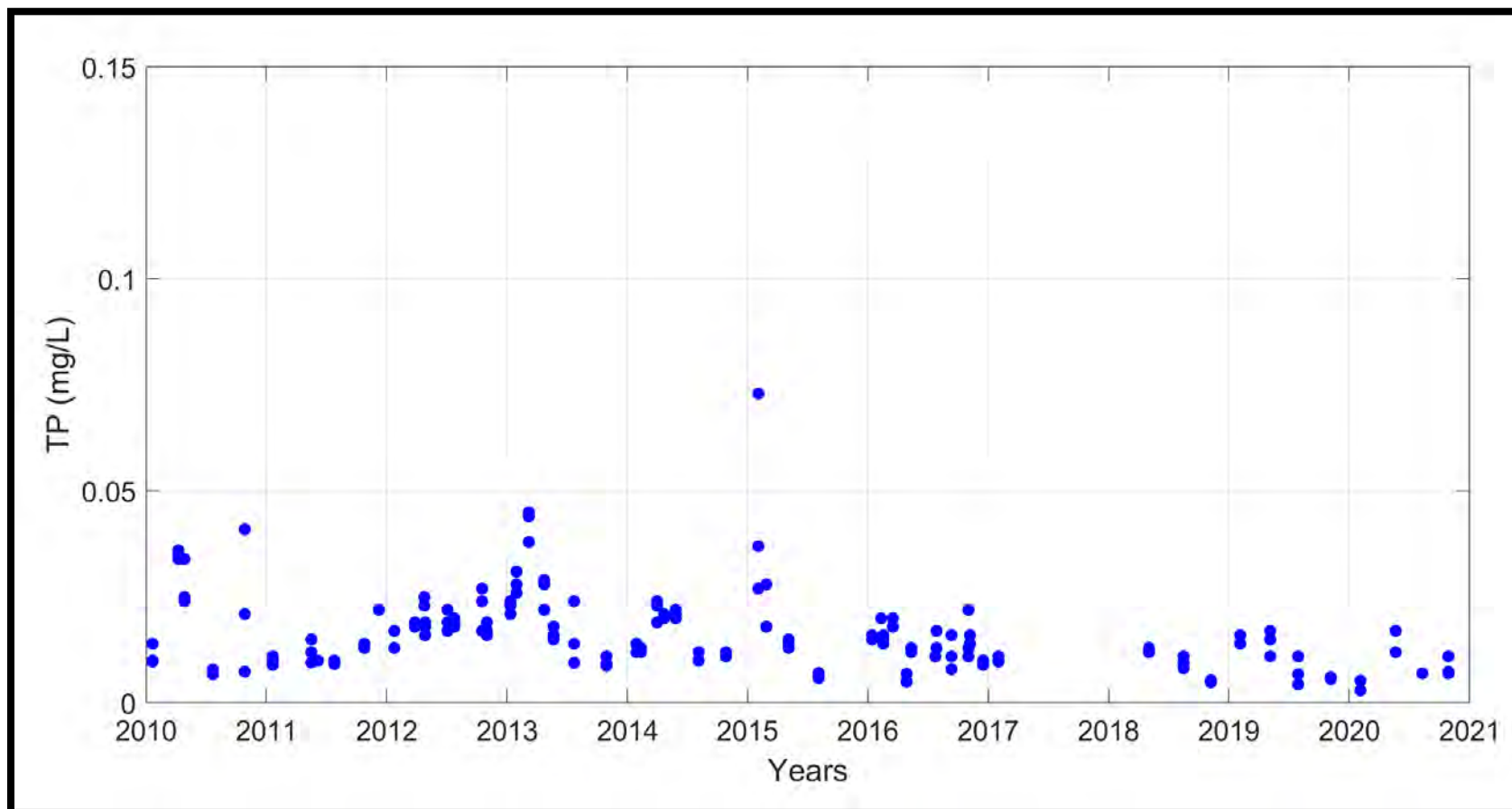


Figure 4-99: Plot of Measured TP

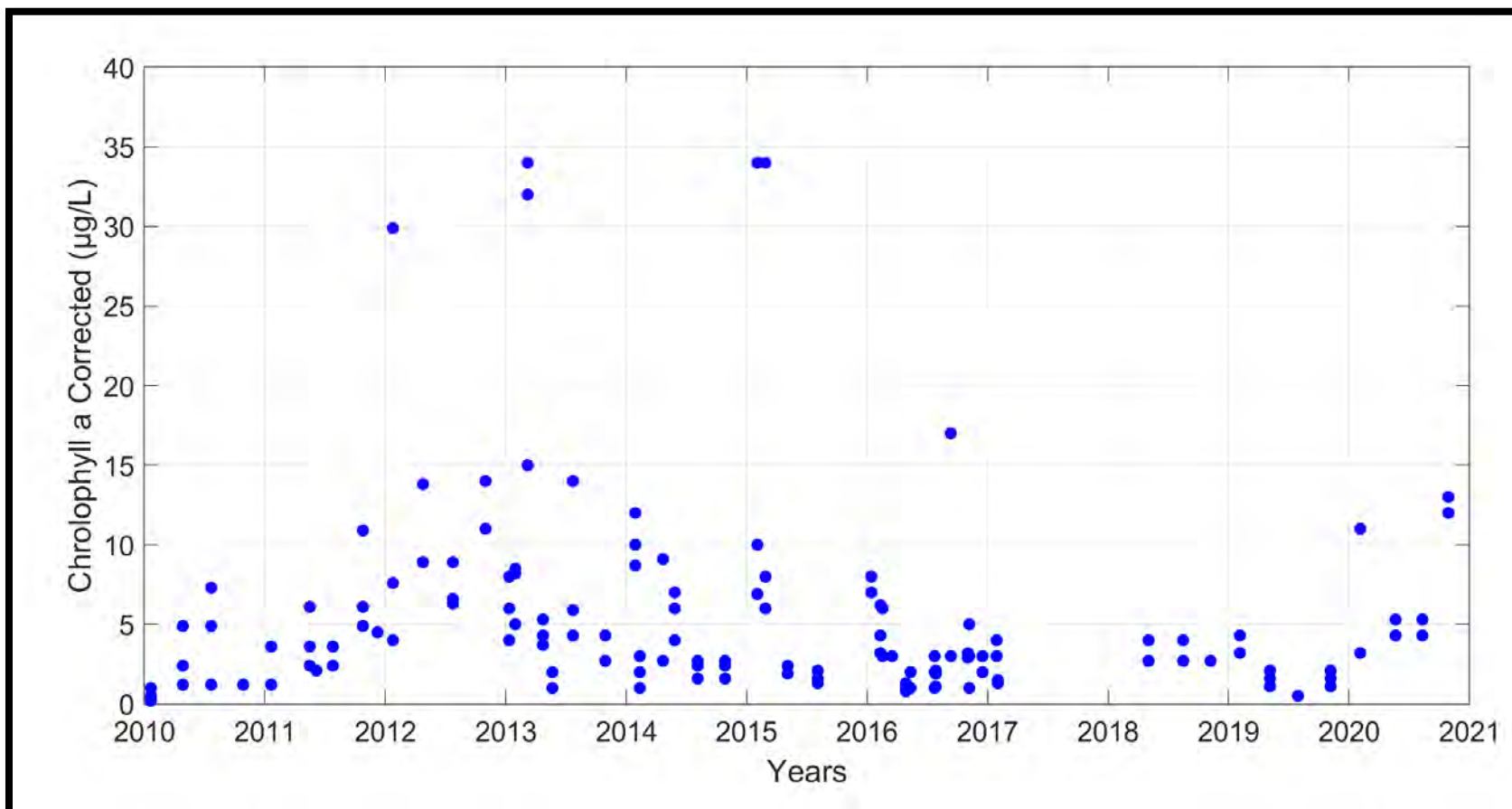


Figure 4-100: Plot of Measured Chl-a

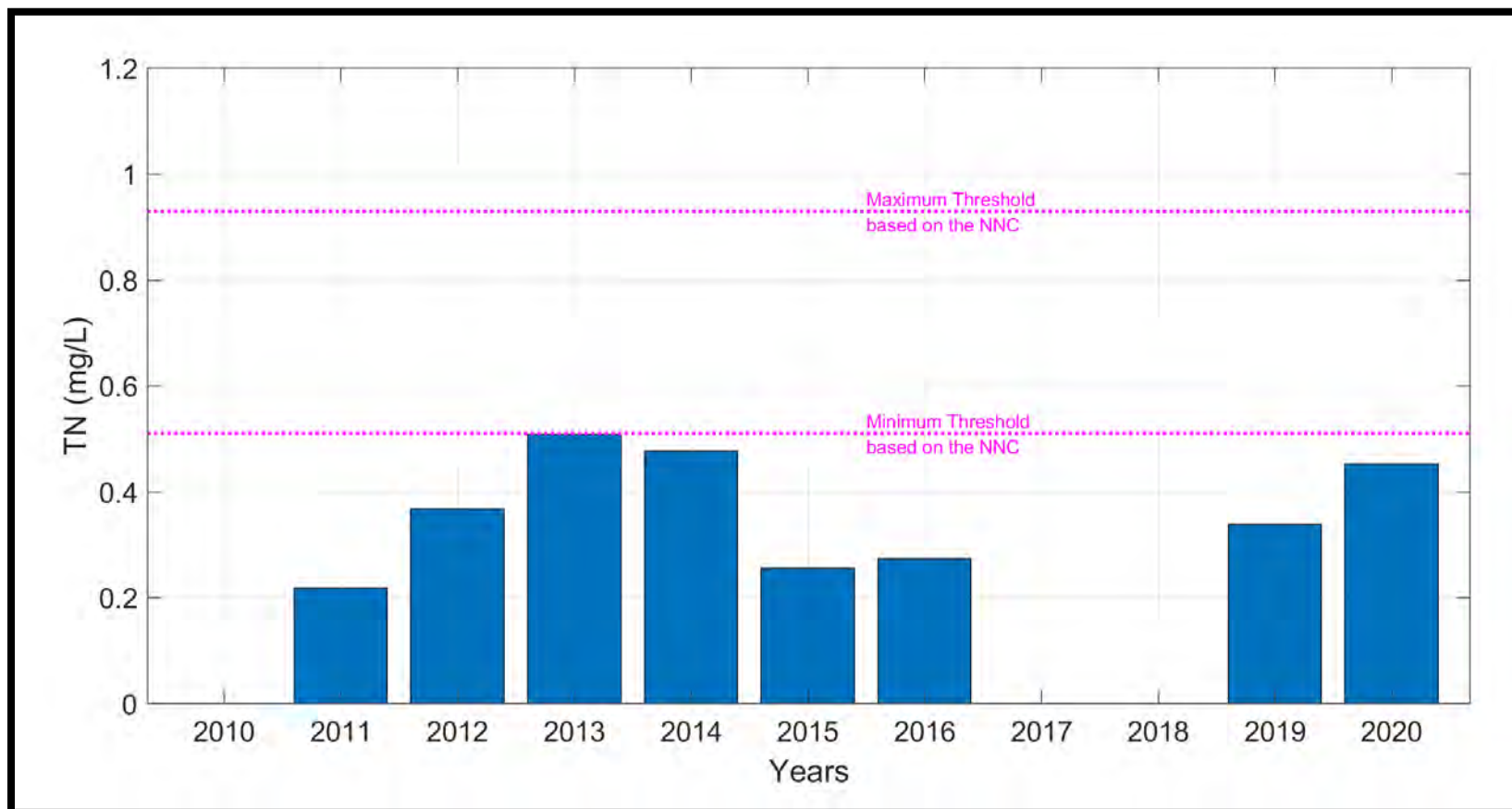


Figure 4-101: Plot of Annual Geometric Means for TN with NNC Criteria for Lake Overstreet

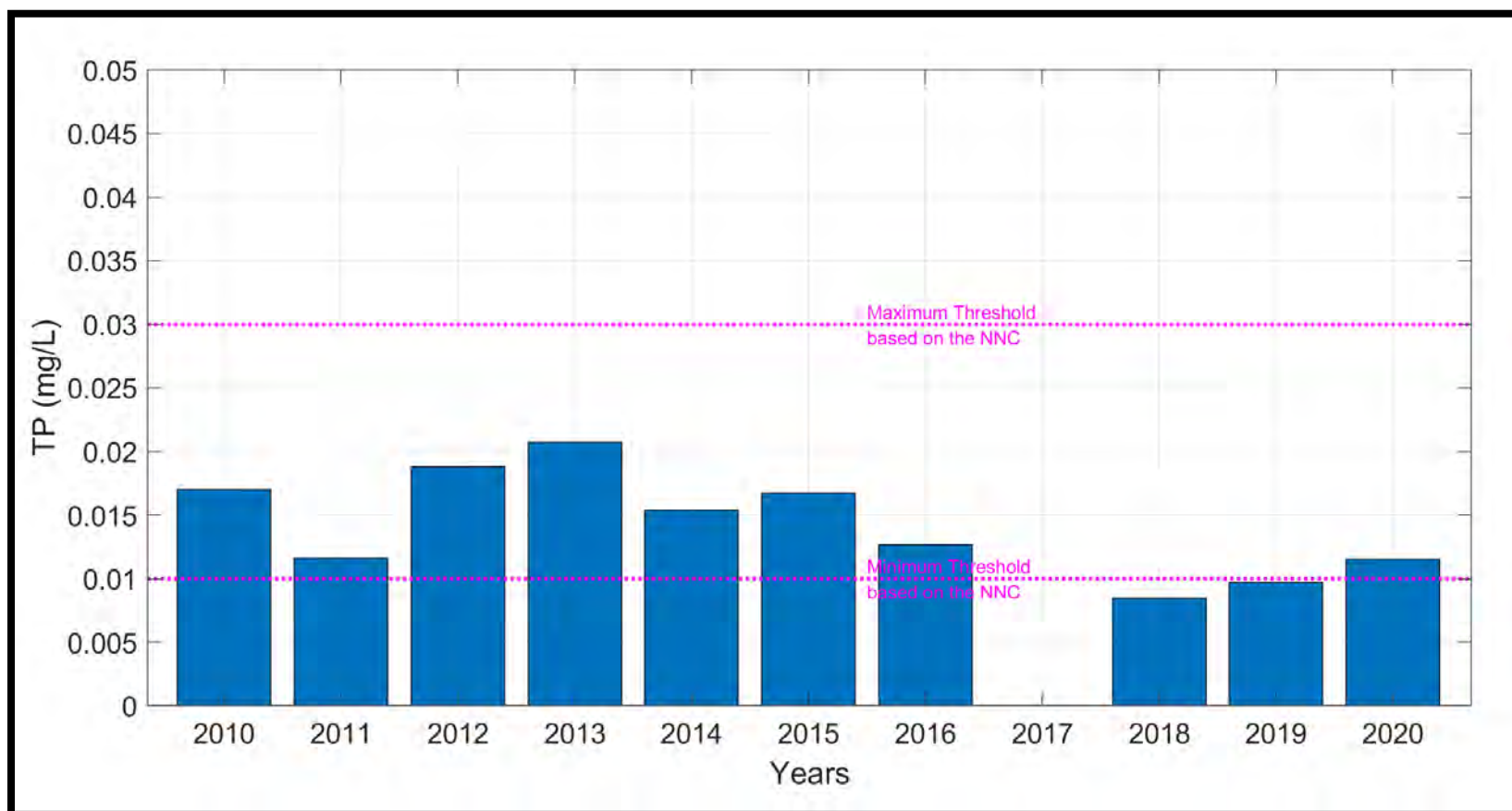


Figure 4-102: Plot of Annual Geometric Means for TP with NNC Criteria for Lake Overstreet

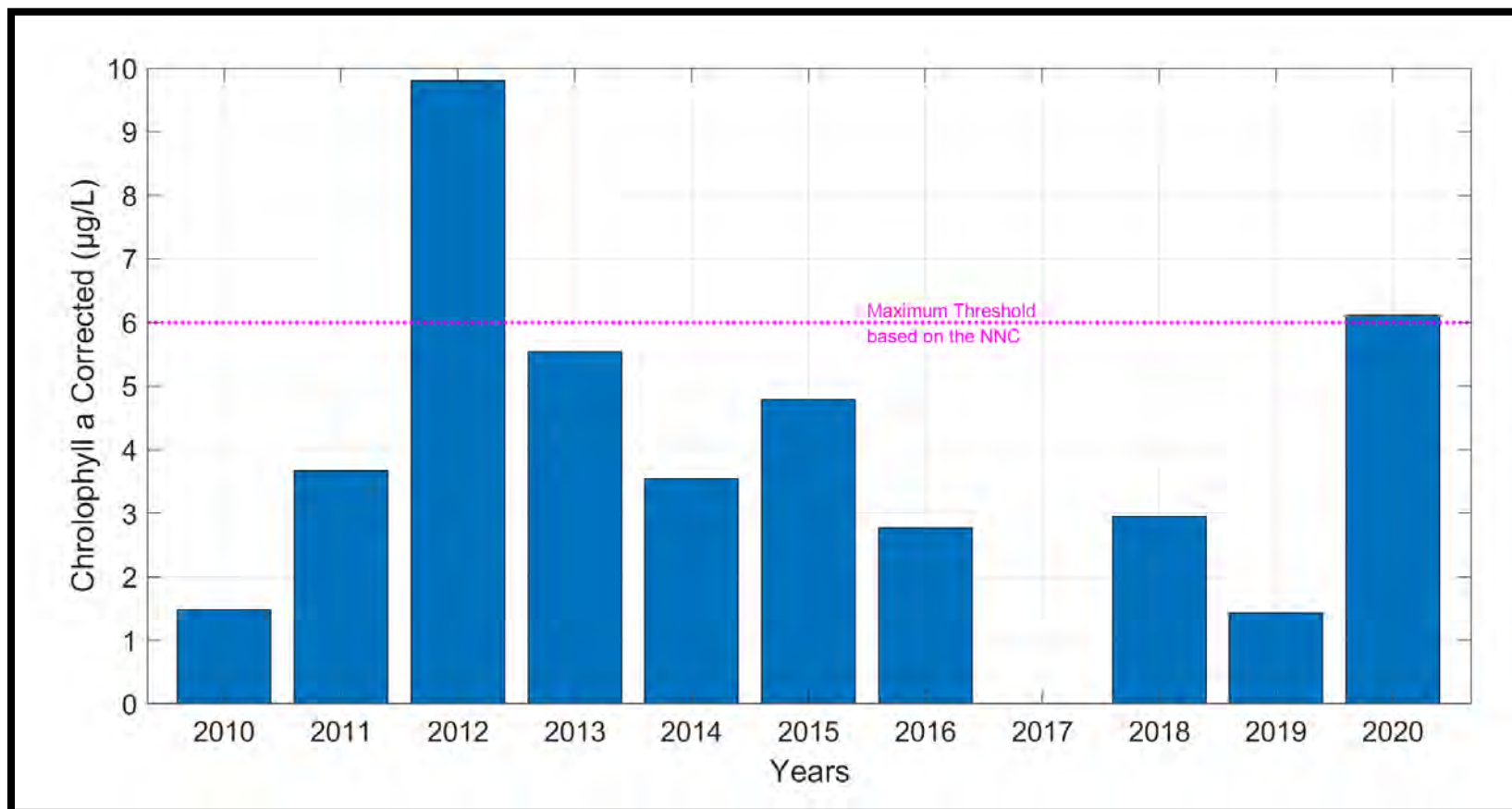


Figure 4-103: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Lake Overstreet

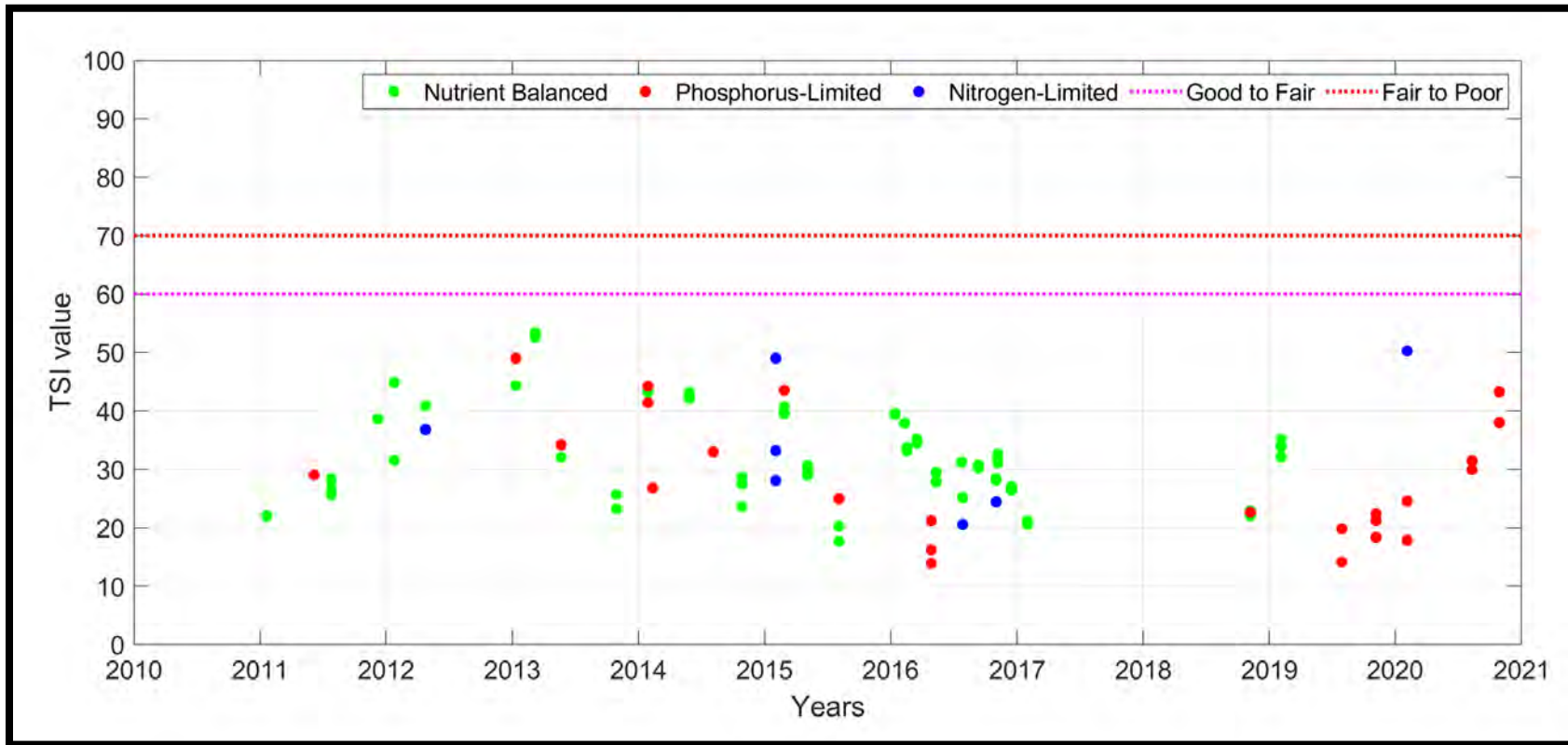


Figure 4-104: Trophic State Index for Lake Overstreet

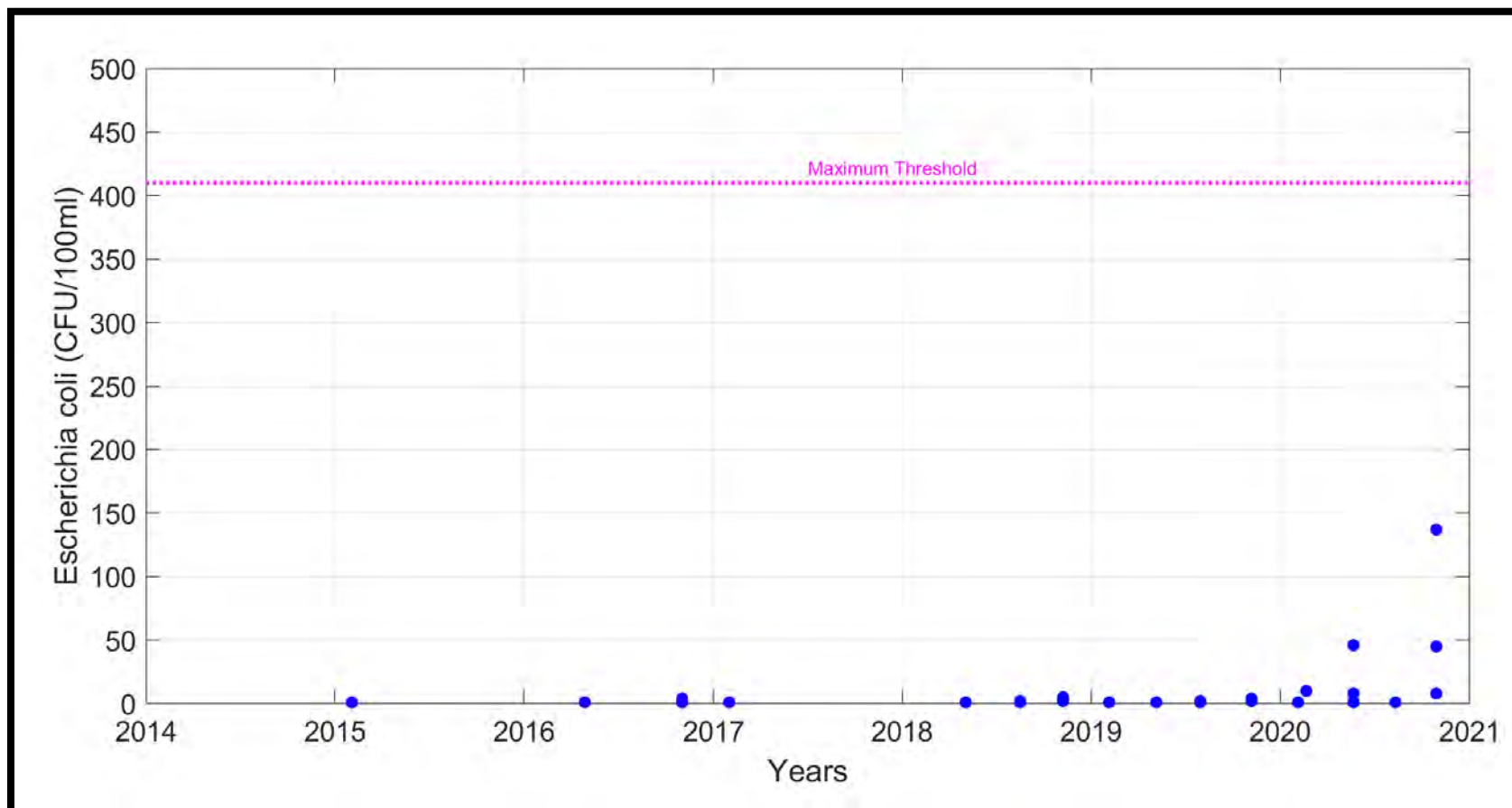


Figure 4-105: Plot of *E. coli* Measurements (2015 to 2019)

4.7.3.9 Stormwater Treatment Facilities

Figure 4-106 presents a map showing the locations of stormwater treatment facilities throughout the Lake Overstreet and Overstreet Drain drainage basin. The figure shows only one stormwater pond within the basin. The pond (Maclay Road Pond) is located along Maclay Road on the western boundary of the basin. It is maintained by Leon County and is downstream of Lake Overstreet.

4.7.3.10 Atmospheric Deposition Data

Section 4.4.3.11 presented the location of the nearest atmospheric deposition station to the Lake Jackson basin. The data from this station will be utilized to calculate atmospheric deposition to Lake Overstreet.

4.7.3.11 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Lake Overstreet (**Section 4.7.4**), the available data are reasonable. There are sufficient active surface water quality stations within the lake to support the qualitative assessment. The water quality conditions in the lake limit the need for additional data. Based on the relatively pristine water quality, it is assumed anthropogenic loads are minimal. No noteworthy limitations were identified.

4.7.4 Qualitative Assessment of Sources

As outlined in previous sections, prior to performing loading calculations and other analyses to quantify existing pollutant sources to Lake Overstreet, it is important to analyze available data and summarize findings from historical studies to support identification of likely sources.

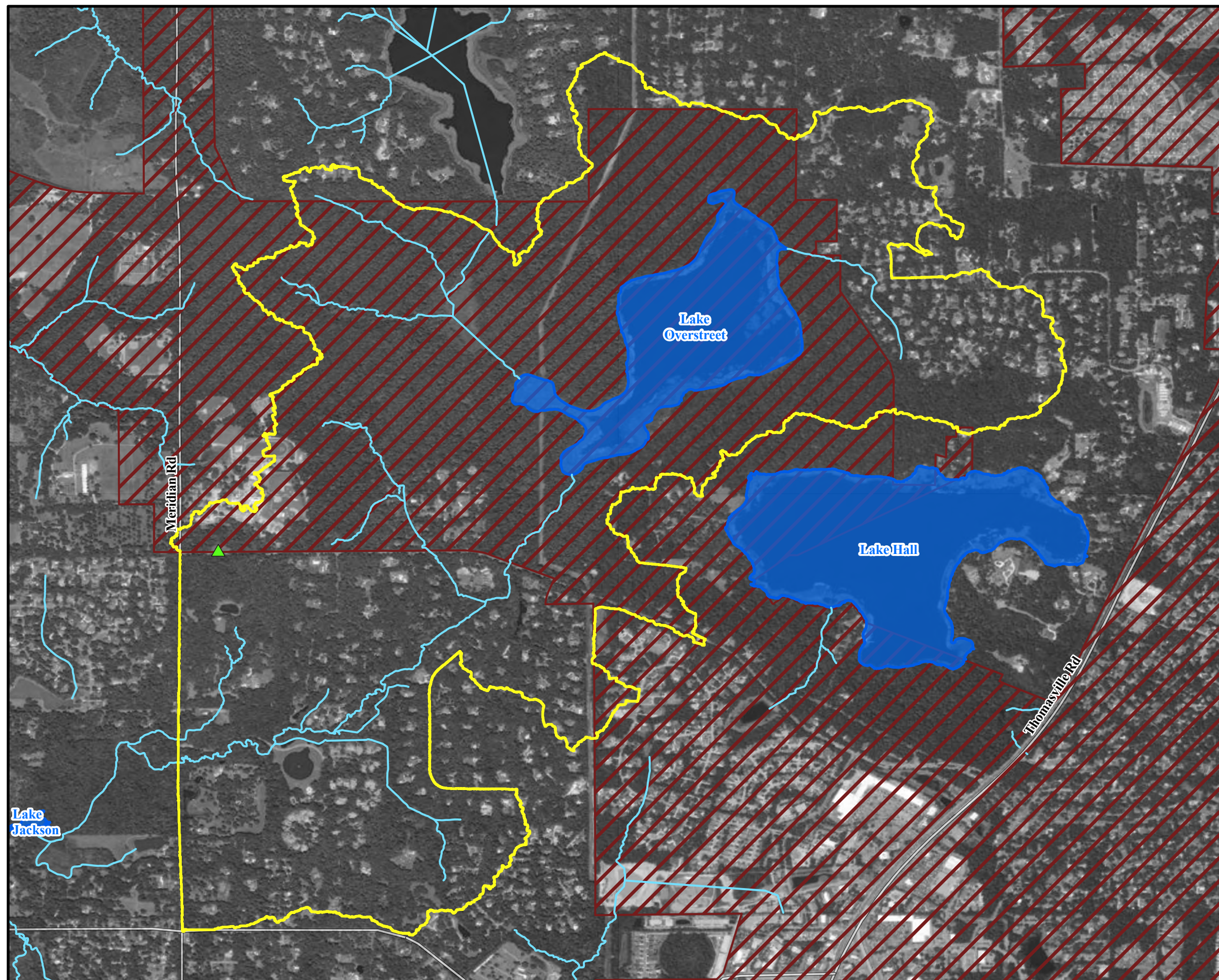
For Lake Overstreet, the sources to be evaluated include the following:

- Stormwater runoff
- Septic systems
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition
- Interconnected flows

An overview of analyses and findings for each source listed above is provided in the following sections. Prior to the discussions of each of the potential sources, an in-lake analysis is provided to build on the information presented in **Section 4.7.3.6**. Following the discussions for each source type, a summary of findings for the qualitative assessment is provided.

4.7.4.1 In-Lake Water Quality

Following the methodology utilized for other lakes, analyses were conducted on the available in-lake data from 2010 to the present. This provides an evaluation of the baseline water quality conditions and the spatial differences within the lake. The parameters analyzed for Lake Overstreet include color, alkalinity, TP, TN, Chl-a, TSI, and *E. coli*.



0 0.25
Miles

Legend

- Lake Overstreet Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Leon County Stormwater Ponds

Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
BMPs: Geosyntec, 2022
City Limits: COT, 2022

Figure 4-106:
Lake Overstreet Drainage Basin BMPs

**Tallahassee Master Plan - Surface
Water (TMaPS)**

Geosyntec
consultants

As was done for the other lakes, stations were clustered where they represent conditions within a specific area. The clustered data from 2010 to the present were analyzed to provide the average of the annual geomeans or the 90th percentile, depending upon the parameter. The results are presented on a map, with colors representing the results. The levels associated with the colors are reflective of water quality thresholds as outlined in 62-302 F.A.C. and were discussed and presented in **Section 4.4.4.1**. The Lake Overstreet analyses use the same ranges as the Lake Jackson analyses.

Figure 4-107 presents the data clustering used for the analyses and associated stations. For Lake Overstreet, data since 2010 were available within four clusters around the lake. These are in the northern end of the lake (N), the western and eastern sides (W and E), and the south-central side where the lake necks down prior to its discharge to the south (SC). Clusters W, E, and SC had complete data sets and were analyzed for all parameters. Cluster N was LAKEWATCH data, which has a more limited parameter list.

Figure 4-108 and **Figure 4-109** present the color and alkalinity. Both parameters show low values with no discernible spatial variation in the data. This supports the lake as a clear, low alkaline system with the associated criteria.

Figure 4-110 and **Figure 4-111** present the TN and TP results. TN levels are below the minimum lake threshold at all the clusters. The results do not show any significant spatial variation in the data. TP levels are between the minimum and maximum values, toward the lower end. There is some spatial variation seen in the results, with values at the north (N) and western (W) sides slightly higher.

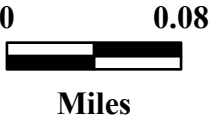
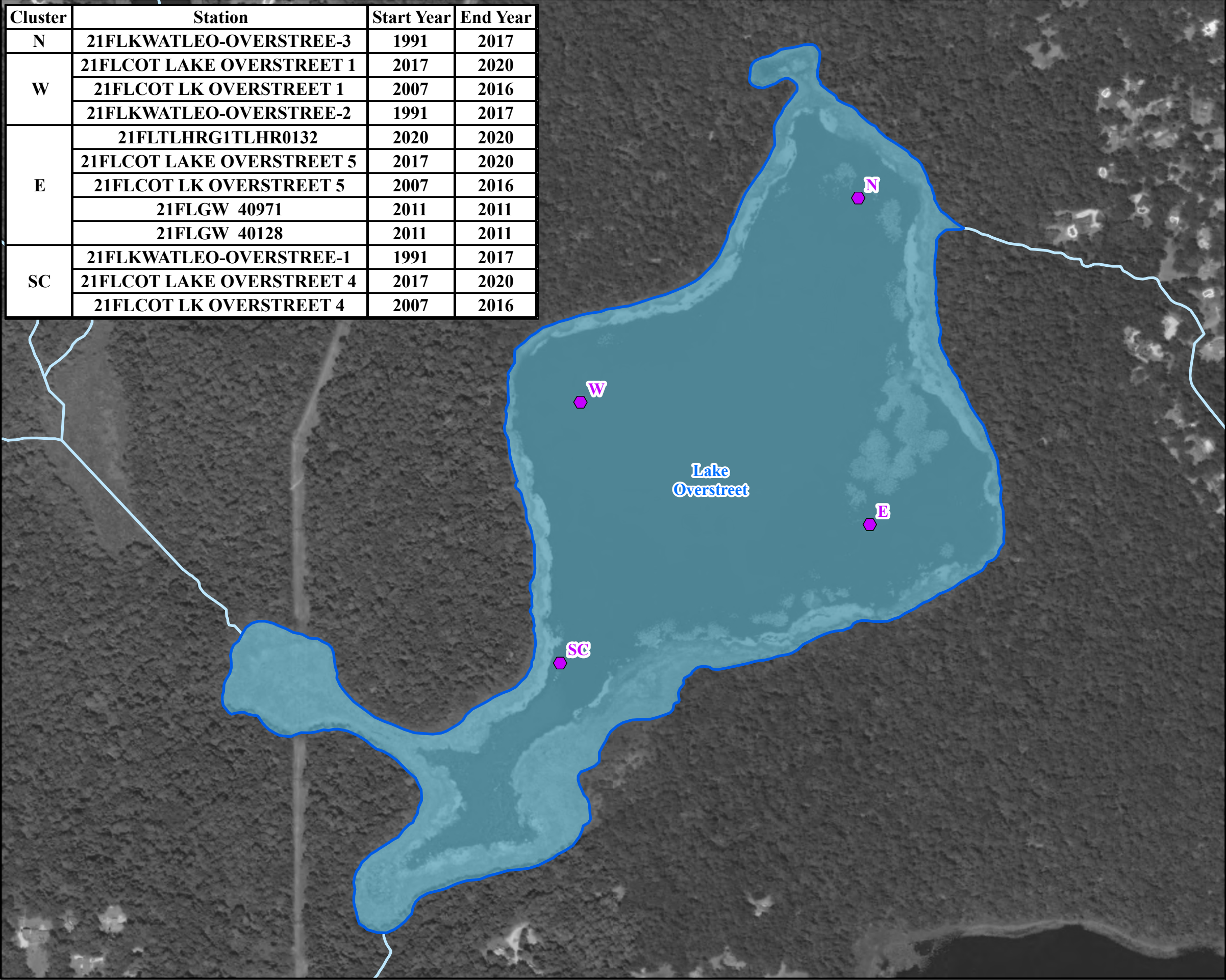
Figure 4-112 and **Figure 4-113** present maps of the Chl-a and TSI. The Chl-a levels, on average, are low, between 3.0 and 4.5 µg/L, with the northern station (N) showing slightly elevated average values (4.5 to 6.0 µg/L). This difference may be a function of the timeframe of the available data, with the northern station having data only from 2013 to 2017. Additionally, it could be a function of the isolated nature of the northern lobe and distance from the outflow. The TSI values are in the 15 to 45 range.

Figure 4-114 presents a map of the *E. coli* levels. The data analyzed were from 2015 through 2020, and the data were analyzed to provide the 90th percentile to compare against the 410 MPN/100 mL criteria per the FDEP approach in the IWR analyses. The results show that the 90th percentile for the data are well within the criteria in the lowest blue range (less than 100 MPN/100 mL).

4.7.4.2 Stormwater Runoff

To assess stormwater runoff as a potential source of pollutant loads to Lake Overstreet, the first step was to evaluate the LDI levels within the subbasin draining to the Lake. In **Section 4.4.4.2**, LDI values were presented by subbasin in **Figure 4-24**. The map shows that in the immediate watershed area draining to Lake Overstreet, LDI levels were good. This would indicate that this area has limited potential for anthropogenic pollutant loads from stormwater runoff. Additionally, the LDI levels in the downstream watershed area (Overstreet Drain down to Lake Jackson) go from good to excellent, indicating limited potential for anthropogenic pollutant loads from stormwater runoff in the Lake Overstreet basin to Lake Jackson. No data are available for any of the tributaries flowing into Lake Overstreet.

Cluster	Station	Start Year	End Year
N	21FLKWATLEO-OVERSTREE-3	1991	2017
W	21FLCOT LAKE OVERSTREET 1	2017	2020
	21FLCOT LK OVERSTREET 1	2007	2016
	21FLKWATLEO-OVERSTREE-2	1991	2017
E	21FLTLHRG1TLHR0132	2020	2020
	21FLCOT LAKE OVERSTREET 5	2017	2020
	21FLCOT LK OVERSTREET 5	2007	2016
	21FLGW 40971	2011	2011
	21FLGW 40128	2011	2011
SC	21FLKWATLEO-OVERSTREE-1	1991	2017
	21FLCOT LAKE OVERSTREET 4	2017	2020
	21FLCOT LK OVERSTREET 4	2007	2016



- Legend**
- Lake Overstreet
 - Watercourses
 - In-Lake Station Clusters

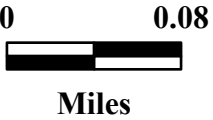
Sources:
 Waterbodies: COT, 2020
 Watercourses: COT, 2020
 Station Data: FDEP, 2021

Figure 4-107:
Station Clustering for In-Lake Analyses for
Lake Overstreet

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Station	Start Year	End Year
E	21FLTLHRG1TLHR0132	2009	2020
	21FLCOT LAKE OVERSTREET 5	2009	2020
	21FLCOT LK OVERSTREET 5	2009	2020
	21FLGW 40971	2009	2020
	21FLGW 40128	2009	2020
SC	21FLKWATLEO-OVERSTREE-1	2009	2020
	21FLCOT LAKE OVERSTREET 4	2009	2020
	21FLCOT LK OVERSTREET 4	2009	2020
W	21FLCOT LAKE OVERSTREET 1	2009	2020
	21FLCOT LK OVERSTREET 1	2009	2020
	21FLKWATLEO-OVERSTREE-2	2009	2020



Legend

- Lake Overstreet
- Watercourses
- Color Average 2010-2020
- PCU
- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- > 40

Sources:
 Waterbodies: COT, 2020
 Watercourses: COT, 2020
 Station Data: FDEP, 2021

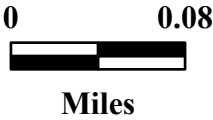
Figure 4-108:
Spatial Assessment of Color in Lake Overstreet

Tallahassee Master Plan - Surface Water (TMaPS)



Clusters with insufficient data were removed from map

Cluster	Station	Start Year	End Year
E	21FLT LHRG1TLHR0132	2009	2020
	21FLCOT LAKE OVERSTREET 5	2009	2020
	21FLCOT LK OVERSTREET 5	2009	2020
	21FLGW 40971	2009	2020
	21FLGW 40128	2009	2020
SC	21FLKWATLEO-OVERSTREE-1	2009	2020
	21FLCOT LAKE OVERSTREET 4	2009	2020
	21FLCOT LK OVERSTREET 4	2009	2020
W	21FLCOT LAKE OVERSTREET 1	2009	2020
	21FLCOT LK OVERSTREET 1	2009	2020
	21FLKWATLEO-OVERSTREE-2	2009	2020



Legend

Lake Overstreet

Watercourses

Alkalinity Average 2010-2020
mg/L

0 - 5

5 - 10

10 - 15

15 - 20

> 20

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

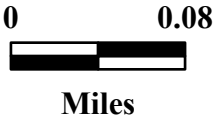
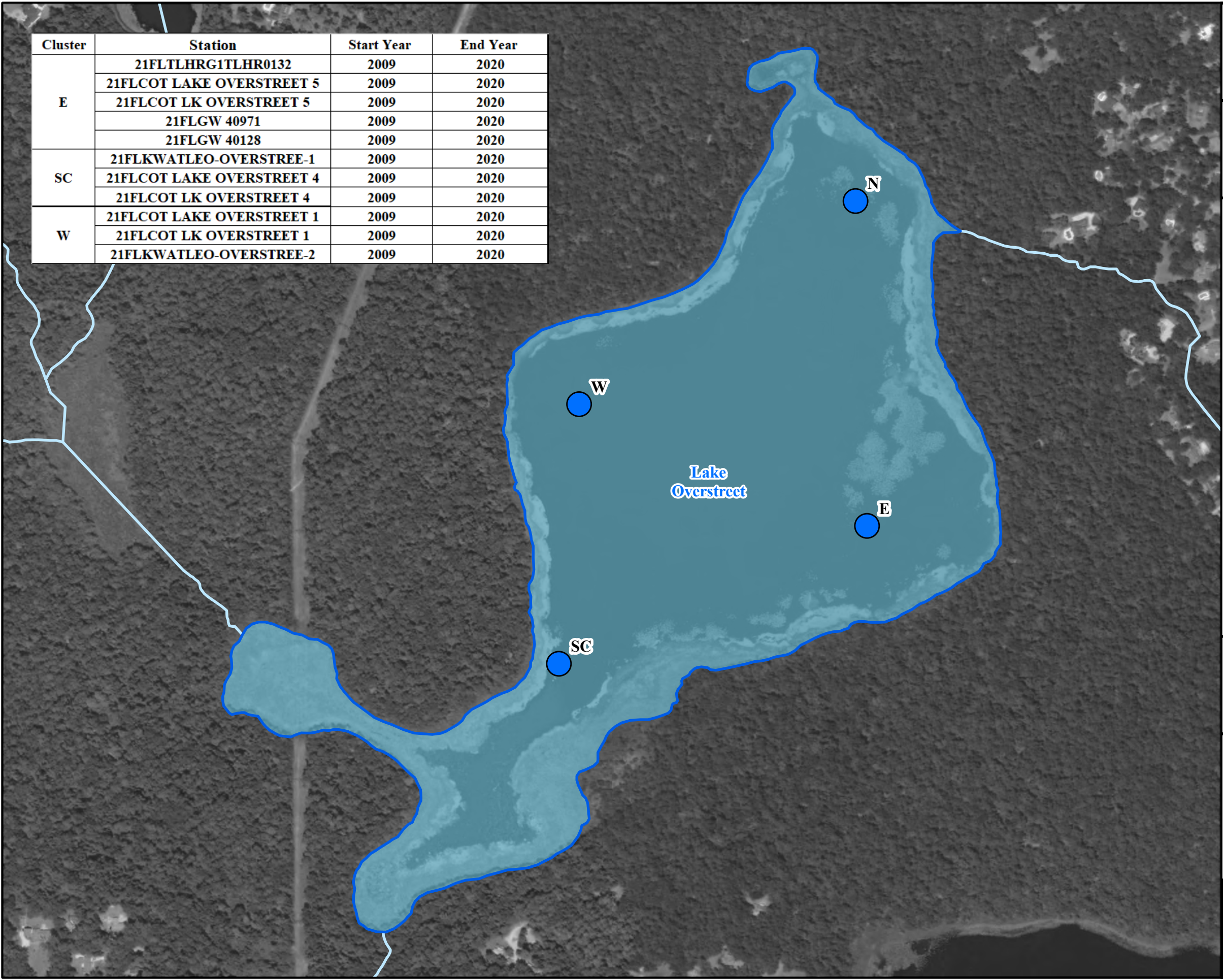
Figure 4-109:
Spatial Assessment of Alkalinity in Lake
Overstreet

Tallahassee Master Plan - Surface
Water (TMaPS)



Clusters with insufficient data were removed from map

Cluster	Station	Start Year	End Year
E	21FLTLHRG1TLHR0132	2009	2020
	21FLCOT LAKE OVERSTREET 5	2009	2020
	21FLCOT LK OVERSTREET 5	2009	2020
	21FLGW 40971	2009	2020
	21FLGW 40128	2009	2020
SC	21FLKWATLEO-OVERSTREE-1	2009	2020
	21FLCOT LAKE OVERSTREET 4	2009	2020
	21FLCOT LK OVERSTREET 4	2009	2020
W	21FLCOT LAKE OVERSTREET 1	2009	2020
	21FLCOT LK OVERSTREET 1	2009	2020
	21FLKWATLEO-OVERSTREE-2	2009	2020



Legend

 Lake Overstreet

 Watercourses

TN Average 2010-2020

mg/L

 0 - 0.53

 0.53 - 0.66

 0.66 - 0.79

 0.79 - 0.93

 > 0.93

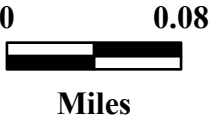
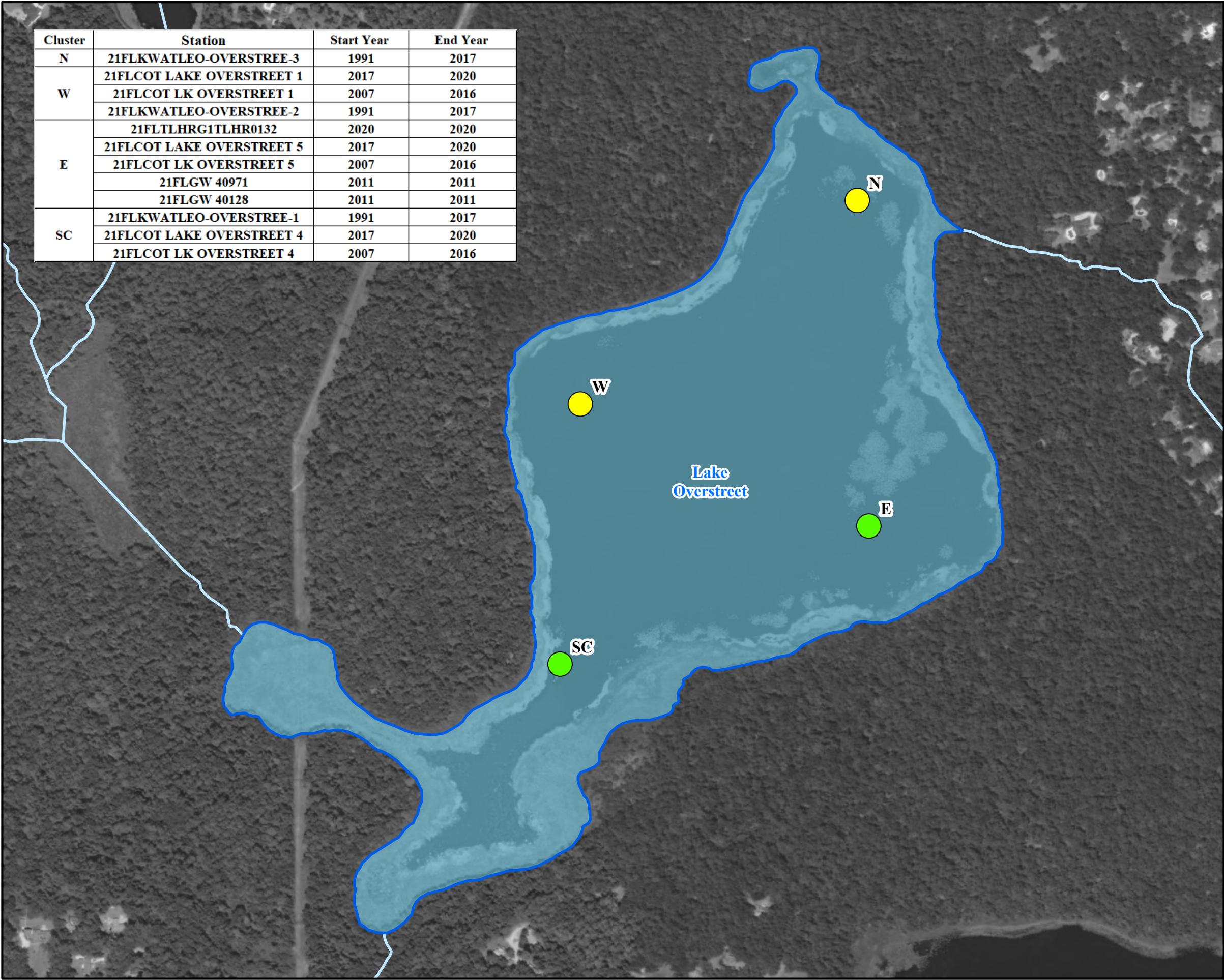
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-110:
Spatial Assessment of TN in Lake
Overstreet

Tallahassee Master Plan - Surface
Water (TMaPS)



Cluster	Station	Start Year	End Year
N	21FLKWATLEO-OVERSTREE-3	1991	2017
W	21FLCOT LAKE OVERSTREET 1	2017	2020
	21FLCOT LK OVERSTREET 1	2007	2016
	21FLKWATLEO-OVERSTREE-2	1991	2017
E	21FLTTLHRG1TLHR0132	2020	2020
	21FLCOT LAKE OVERSTREET 5	2017	2020
	21FLCOT LK OVERSTREET 5	2007	2016
	21FLGW 40971	2011	2011
	21FLGW 40128	2011	2011
SC	21FLKWATLEO-OVERSTREE-1	1991	2017
	21FLCOT LAKE OVERSTREET 4	2017	2020
	21FLCOT LK OVERSTREET 4	2007	2016



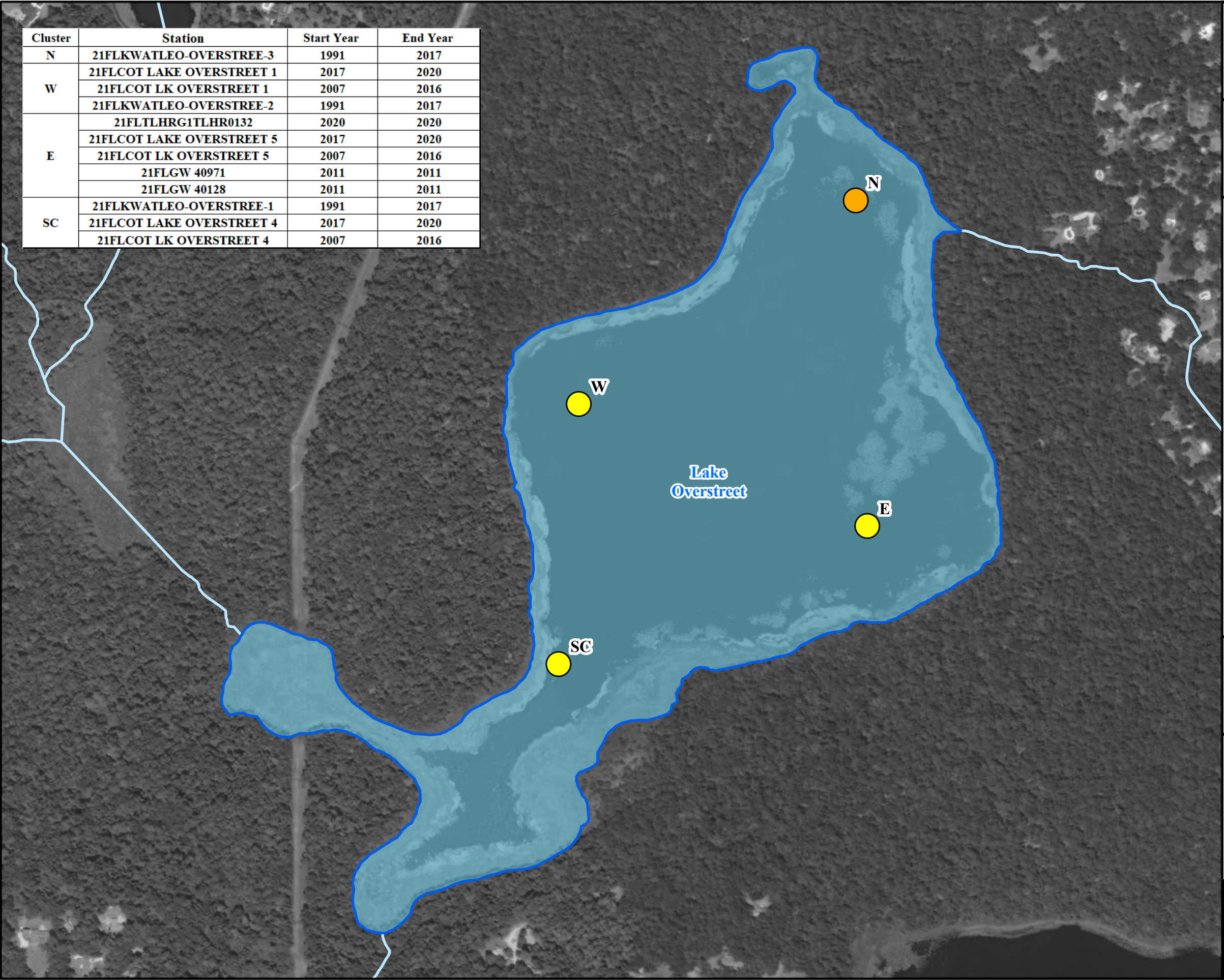
- Legend**
- Lake Overstreet
 - Watercourses
 - TP Average 2010-2020
mg/L
 - 0- 0.010
 - 0.010 - 0.017
 - 0.017 - 0.024
 - 0.024 - 0.030
 - > 0.03

Sources:
 Waterbodies: COT, 2020
 Watercourses: COT, 2020
 Station Data: FDEP, 2021

Figure 4-111:
Spatial Assessment of TP in Lake
Overstreet

Tallahassee Master Plan - Surface
Water (TMaPS)

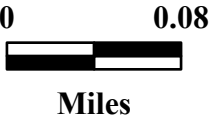




Cluster	Station	Start Year	End Year
N	21FLKWATLEO-OVERSTREE-3	1991	2017
	21FLCOT LAKE OVERSTREET 1	2017	2020
W	21FLCOT LK OVERSTREET 1	2007	2016
	21FLKWATLEO-OVERSTREE-2	1991	2017
E	21FLTLHRG1TLHR0132	2020	2020
	21FLCOT LAKE OVERSTREET 5	2017	2020
	21FLCOT LK OVERSTREET 5	2007	2016
	21FLGW 40971	2011	2011
	21FLGW 40128	2011	2011
SC	21FLKWATLEO-OVERSTREE-1	1991	2017
	21FLCOT LAKE OVERSTREET 4	2017	2020
	21FLCOT LK OVERSTREET 4	2007	2016



CITY OF
TALLAHASSEE



Legend

Lake Overstreet

Watercourses

Chl a Average 2010-2020

µg/L

0.0 - 1.5

1.5 - 3.0

3.0 - 4.5

4.5 - 6.0

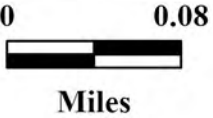
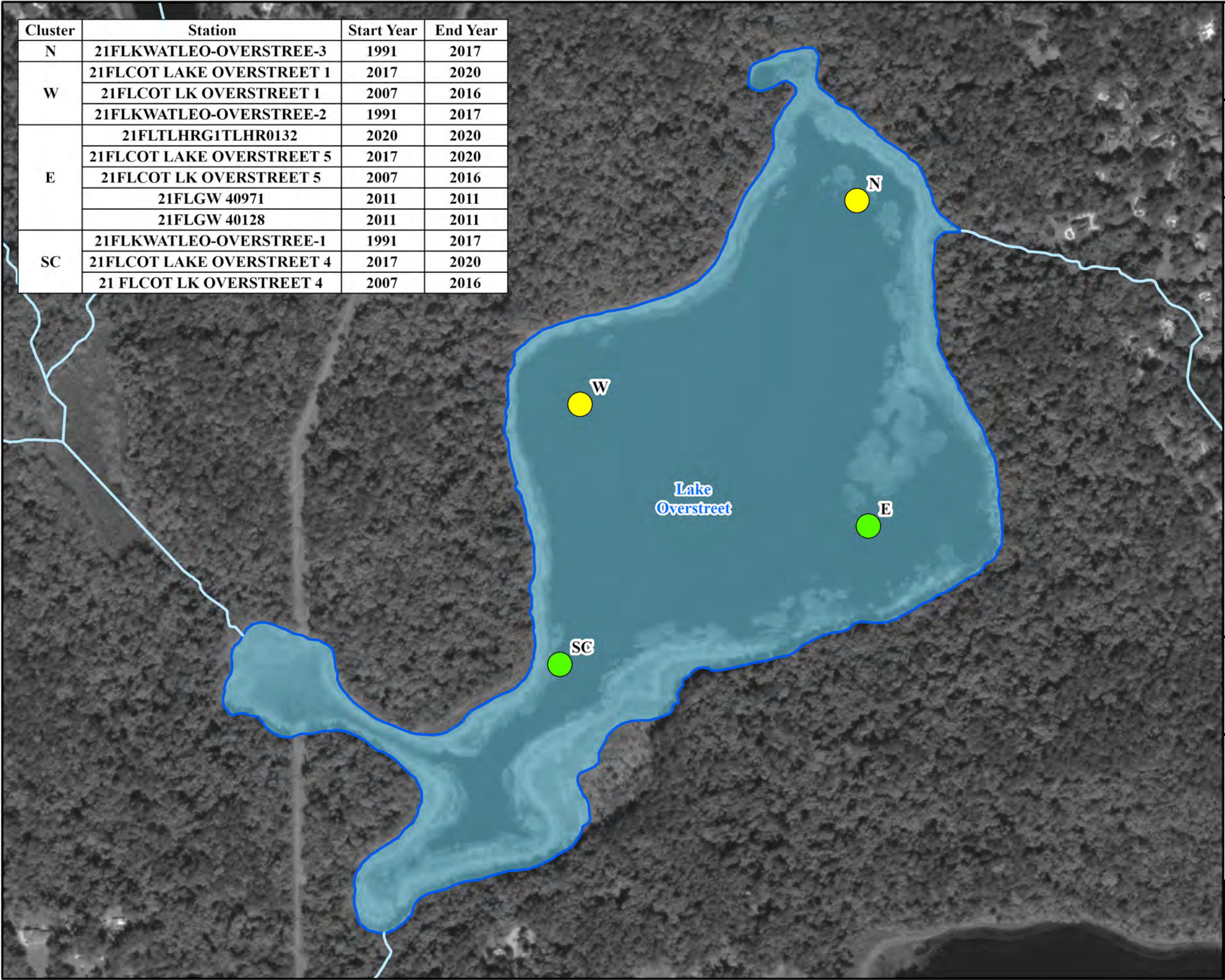
> 6

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-112:
Spatial Assessment of Chl a in Lake
Overstreet

Tallahassee Master Plan - Surface
Water (TMaPS)

Cluster	Station	Start Year	End Year
N	21FLKWATLEO-OVERSTREE-3	1991	2017
W	21FLCOT LAKE OVERSTREET 1	2017	2020
	21FLCOT LK OVERSTREET 1	2007	2016
	21FLKWATLEO-OVERSTREE-2	1991	2017
E	21FLTLHRG1TLHR0132	2020	2020
	21FLCOT LAKE OVERSTREET 5	2017	2020
	21FLCOT LK OVERSTREET 5	2007	2016
	21FLGW 40971	2011	2011
	21FLGW 40128	2011	2011
SC	21FLKWATLEO-OVERSTREE-1	1991	2017
	21FLCOT LAKE OVERSTREET 4	2017	2020
	21 FLCOT LK OVERSTREET 4	2007	2016



- Legend**
- Lake Overstreet
 - Watercourses
 - TSI Average 2010-2020
 - TSI Score
 - 0 - 15
 - 15 - 30
 - 30 - 45
 - 45 - 60
 - > 60

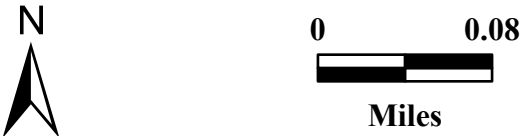
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-113:
Spatial Assessment of TSI in Lake Overstreet

Tallahassee Master Plan - Surface Water (TMaPS)



Cluster	Station	Start Year	End Year
E	21FLT LHRG1TLHR0132	2009	2020
	21FLCOT LAKE OVERSTREET 5	2009	2020
	21FLCOT LK OVERSTREET 5	2009	2020
	21FLGW 40971	2009	2020
	21FLGW 40128	2009	2020
SC	21FLKWATLEO-OVERSTREE-1	2009	2020
	21FLCOT LAKE OVERSTREET 4	2009	2020
	21FLCOT LK OVERSTREET 4	2009	2020
W	21FLCOT LAKE OVERSTREET 1	2009	2020
	21FLCOT LK OVERSTREET 1	2009	2020
	21FLKWATLEO-OVERSTREE-2	2009	2020



Legend

- Lake Overstreet
- Watercourses
- E. coli 90th Percentile 2010-2020 MPN/100mL
 - < 100
 - 100 - 200
 - 200 - 300
 - 300 - 410
 - > 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-114:
Spatial Assessment of E. coli in Lake Overstreet

Tallahassee Master Plan - Surface Water (TMaPS)



Clusters with insufficient data were removed from map

4.7.4.3 Septic Systems

Figure 4-96 presented the locations of septic systems within the Lake Overstreet basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin. The septic tank densities in the immediate Lake Overstreet basin and within the Lake Overstreet Drain basin downstream are in the middle to lower range, compared to other subbasins within the overall Lake Jackson basin. This increases their potential as a source of pollutants to the lake and drain but, based on the existing water quality and recent trends along with the low *E. coli* levels, the potential appears low.

4.7.4.4 Internal Recycling and Seepage

Internal Recycling

To date, no studies or data collection efforts have been undertaken to assess the potential for loading from sediments in Lake Overstreet. Given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake, internal recycling is not a significant source for loading to the lake.

A method for identifying the presence of benthic flux is the analysis of vertical profile data for field parameters such as DO, temperature, ORP, and specific conductance. This was described in **Section 4.4.5.5** for Lake Jackson. Evaluation of the available water quality data did not identify any vertical profile data collected. As such, this method could not be utilized for independent evaluation of the potential for internal recycling. Based on the determinations described above, no additional data collection/studies are recommended to quantify the internal nutrient flux for Lake Overstreet.

Seepage

As outlined in **Section 4.7.3.7**, no surficial aquifer data in the immediate vicinity of the lake and drain were identified. As with the internal recycling assessment, the existing water quality and recent trends, along with the low *E. coli* levels, would indicate low potential.

4.7.4.5 Wastewater

Within the Lake Overstreet basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries and subbasins in relation to sewer service areas and sewer infrastructure. There is no sewer infrastructure located in the immediate drainage basin for Lake Overstreet. There is limited sewer infrastructure located along the drain upstream of Lake Jackson. Therefore, wastewater infrastructure is not a potential significant source of pollutant loads to Lake Overstreet.

4.7.4.6 Atmospheric Deposition

For the immediate Lake Overstreet basin, the ratio of the watershed area to lake area is around 8:1. With this ratio, and the potential attenuation of rainfall runoff, direct atmospheric deposition to the lake can play a role in overall loading, especially for nitrogen. **Section 4.6.3.10** identified the nearest atmospheric deposition station as the Quincy station (FL14) (**Figure 4-15**).

4.7.4.7 Interconnected Flows

No lakes are located upstream of Lake Overstreet, therefore, interconnected loads are not a source for the lake.

4.7.4.8 Summary of Findings

At present, nutrient levels and biological conditions in Lake Overstreet are very good and are not exhibiting significant declining trends. *E. coli* levels are low for all recent measurements. Based on these analyses, and that the immediate drainage basin to the lake is mostly undeveloped and restrictions are in place for future development, the qualitative assessment indicates limited sources of pollutant loading to Lake Overstreet now and under future conditions. Septic densities are somewhat elevated over more pristine areas of the Lake Jackson basin.

Though these sources do not appear significant, stormwater runoff contributing to tributary inflow, septic, and atmospheric deposition are quantified for comparative purposes as part of this study based on available data. Internal recycling, seepage, and wastewater also do not appear to be significant sources and were not quantified as part of this study based on limited data. As no upstream waterbodies drain into Lake Overstreet, interconnected flow is not identified as a source.

4.7.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Lake Overstreet for the sources identified for calculation in **Section 4.7.4.8**. These include stormwater runoff, septic systems, and atmospheric deposition. Where loads were not calculated the sections below provide brief discussions. The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

4.7.5.1 Stormwater Pollutant Load

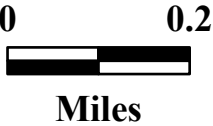
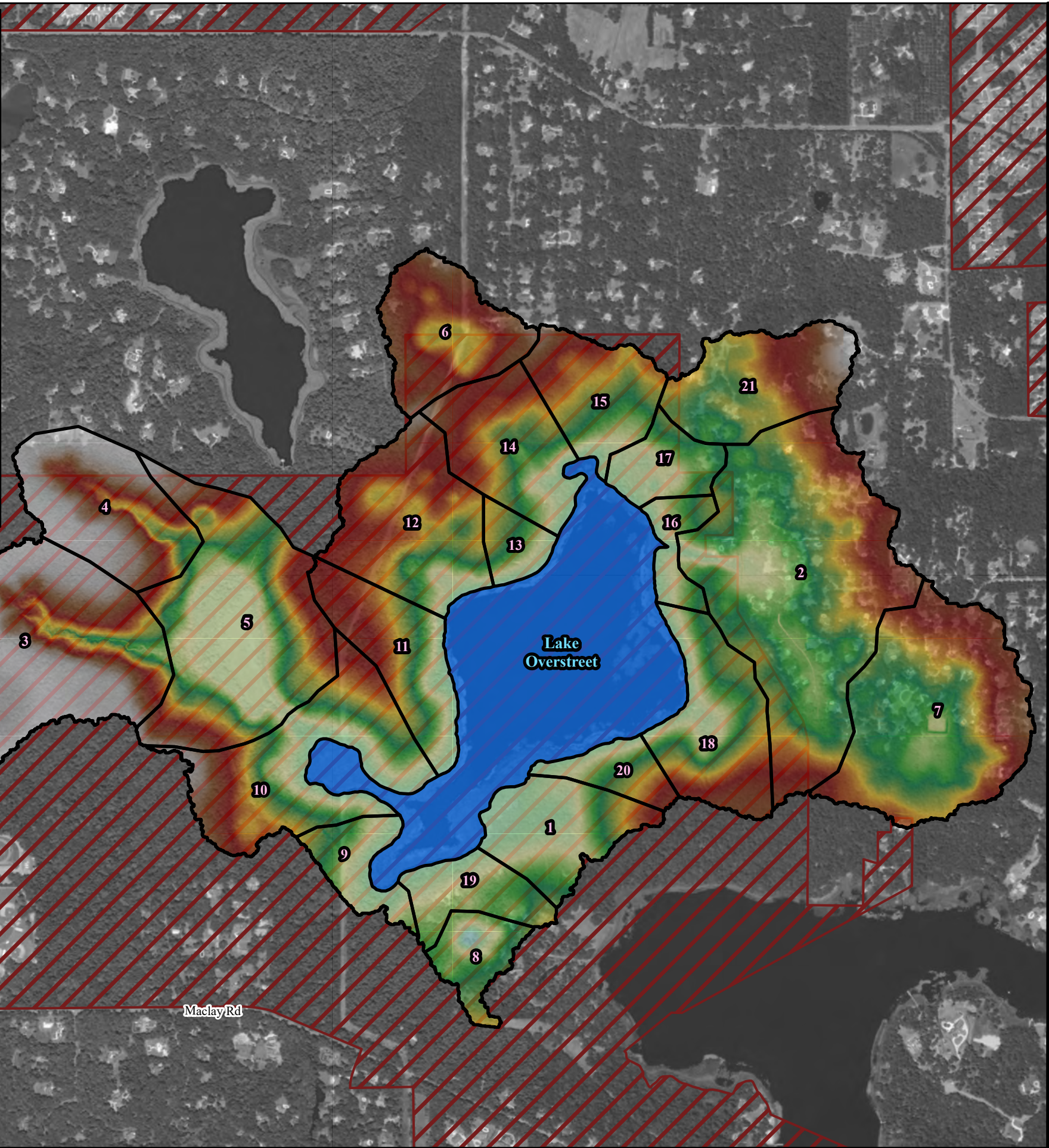
To calculate the stormwater TN and TP loads to Lake Overstreet, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to Lake Overstreet. TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-115 presents the subbasins and the DEM utilized in the SIMPLE model calculations for Lake Overstreet. **Figure 4-116** presents the aggregated land use. Finally, **Figure 4-117** presents the CDAs for the Lake Overstreet stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs around the lake.

Stormwater Nutrient Loads to Lake Overstreet

Figure 4-118 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-118**). The rankings are color coded with the highest ranked CDAs in dark green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 6.6 lb/yr up to 64.8 lb/yr. The per acre loads ranged from 0.6 lb/acre/yr up to 3.9 lb/acre/yr.

Subbasin Summary Table			
Number	Subbasin ID	Acreage	BMP Type
1	LJBLO0040	28.8	None
2	LJBLO0010	111.5	None
3	LJBLO0020	91.6	None
4	LJBLO0050	41.3	None
5	LJBLO0060	78.0	None
6	LJBLO0045	33.4	None
7	LJBLO0015	74.2	None
8	LJBLO0041	13.8	None
9	LJBLO0042	14.4	None
10	LJBLO0044	54.0	None
11	LJBLO0046	30.4	None
12	LJBLO0047	46.0	None
13	LJBLO0048	9.2	None
14	LJBLO0049	33.8	None
15	LJBLO0051	27.5	None
16	LJBLO0052	10.0	None
17	LJBLO0053	14.9	None
18	LJBLO0055	37.1	None
19	LJBLO0056	17.7	None
20	LJBLO0057	11.6	None
21	LJBLO0011	35.2	None



Legend

- Lake Overstreet
- Subbasins
- Tallahassee Corporate Limits

Topographic Elevations

ft NAVD88

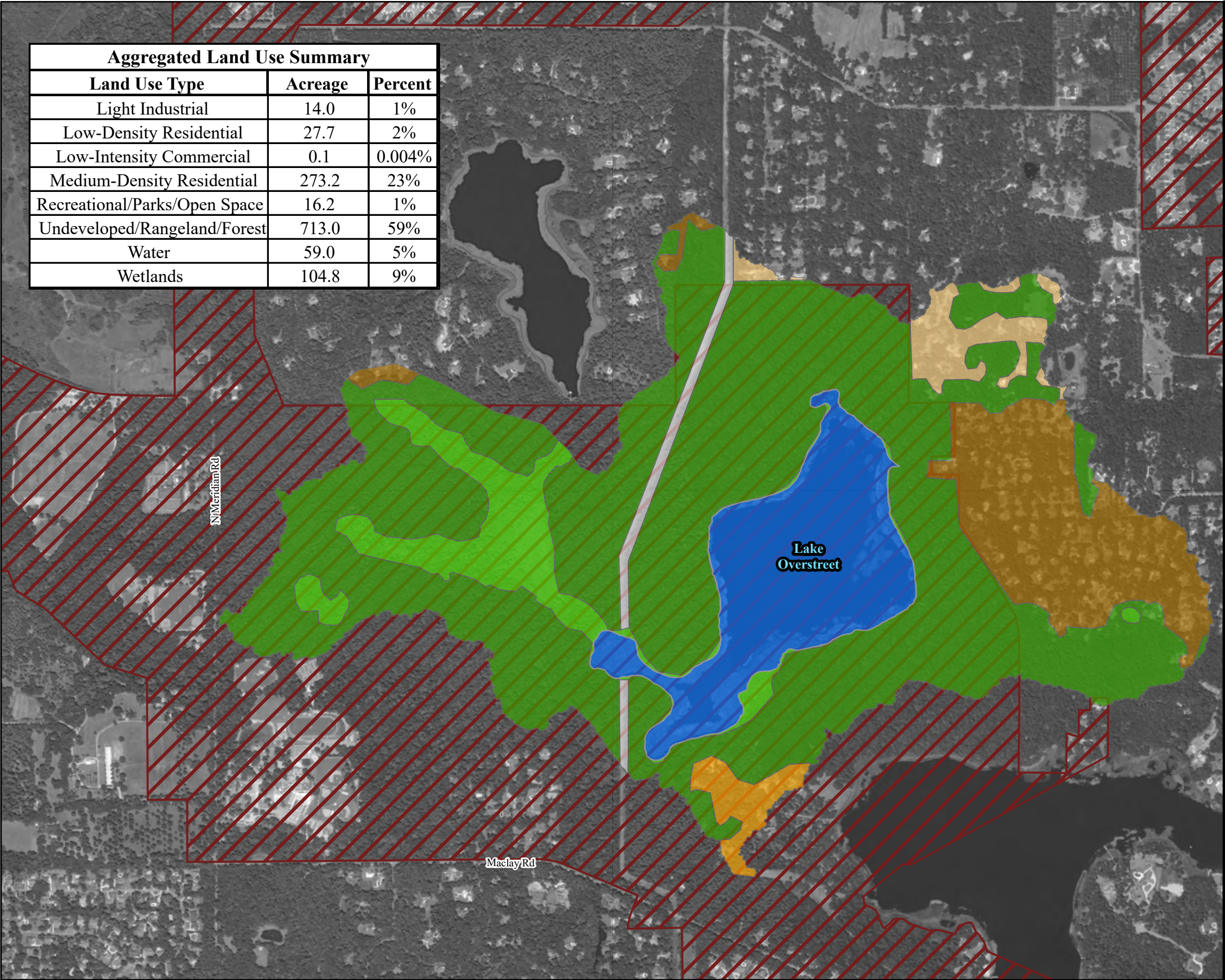


Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-115:
Lake Overstreet Subbasin Delineation
and BMPs

Tallahassee Master Plan - Surface
Water (TMaPS)







CITY OF
TALLAHASSEE

N

0 0.16

Miles

Legend

 Lake Overstreet

 Tallahassee Corporate Limits

Aggregated Land Use

Land Use Type

 Light Industrial

 Low-Density Residential

 Low-Intensity Commercial

 Medium-Density Residential

 Recreational/Parks/Open Space

 Undeveloped/Rangeland/Forest

 Water

 Wetlands

Sources:
Waterbodies: COT, 2020
Land Use: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

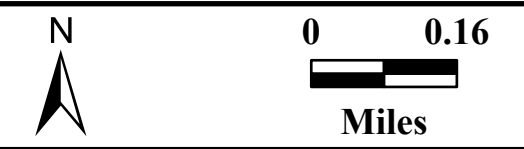
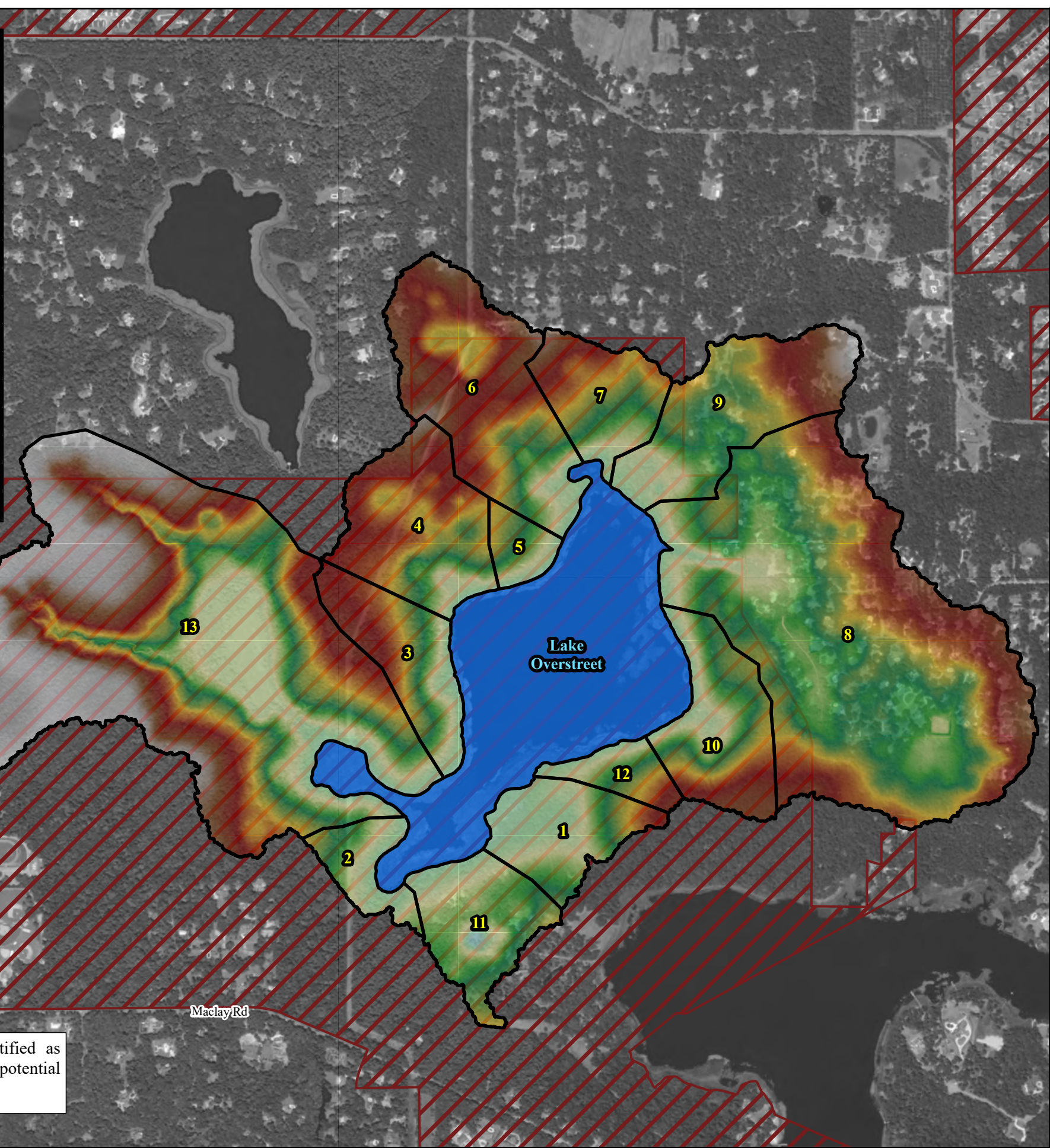
Figure 4-116:
Lake Overstreet Aggregated Land Use

**Tallahassee Master Plan - Surface
Water (TMaPS)**


Geosyntec
consultants

Summary of Concentrated Discharge Areas

Number	CDA ID	Acreage
1	LJBLOOF01	28.8
2	LJBLOOF02	14.4
3	LJBLOOF04	30.4
4	LJBLOOF05	46.0
5	LJBLOOF06	9.2
6	LJBLOOF07	67.2
7	LJBLOOF08	27.5
8	LJBLOOF09	195.8
9	LJBLOOF10	50.2
10	LJBLOOF11	37.1
11	LJBLOOF12	31.6
12	LJBLOOF13	11.6
13	LJBLOOF03	264.9



Legend

- Lake Overstreet
- Tallahassee Corporate Limits
- Major Roads
- Concentrated Discharge Areas
- Topographic Elevations
ft NAVD88
- 237

131

Sources:
 Waterbodies: COT, 2020
 Flowlines: USGS, 2020
 CDAs: Geosyntec, 2023
 Roads: COT-Leon County, 2023
 Elevation: COT-Leon County, 2018
 City Limits, COT, 202

Figure 4-117:
Lake Overstreet Concentrated Discharge Areas

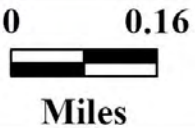
Tallahassee Master Plan - Surface Water (TMaPS)



A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.

Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBLOOF09	647.8	3.3	1
2	LJBLOOF12	121.6	3.9	2
3	LJBLOOF07	93.2	1.4	3
4	LJBLOOF05	68.4	1.5	3
5	LJBLOOF10	68.0	1.4	5
6	LJBLOOF03	179.0	0.7	6
7	LJBLOOF08	26.1	0.9	7
8	LJBLOOF04	24.6	0.8	8
9	LJBLOOF02	15.2	1.0	9
10	LJBLOOF06	10.8	1.2	9
11	LJBLOOF01	19.6	0.7	11
12	LJBLOOF11	22.5	0.6	12
13	LJBLOOF13	6.6	0.6	13
Total Load:		1,303.2		

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Legend

- Lake Overstreet
- Concentrated Discharge Areas
- Flowlines
- Tallahassee Corporate Limits
- Ranking
 - High (1)
 - Low (13)

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-118:
Lake Overstreet Concentrated Discharge
Areas Total Nitrogen

Tallahassee Master Plan - Surface
Water (TMaPS)



The map identifies two CDAs as ranking highest. These are on the southern side of the lake and the CDA that covers the High Grove neighborhood. The per acre loads are highest for these two and are well above those seen for the other CDA areas. The total potential stormwater runoff load for TN for Lake Overstreet is 1,303 lb/yr.

Figure 4-119 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-119**). The calculated total stormwater TP loads from the CDAs ranged from as low as 0.9 lb/yr up to 165 lb/yr. The per acre loads ranged from 0.1 lb/acre/yr up to 1.7 lb/acre/yr. As was seen for TN, the CDA at the southern end and the CDA covering the High Grove neighborhood have the highest per acre load, well above the remaining CDAs. The total potential stormwater runoff load for TP for Lake Overstreet is 301 lb/yr.

4.7.5.2 Septic Load

To analyze the potential impacts from septic tank units to Lake Overstreet, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The approach and calculations were described earlier in **Section 4.4.5.2** which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN) and, based on literature on transport and assimilation, may represent a conservative potential load.

There were 45 septic tank units identified within 200 meters of a primary tributary that drains to Lake Overstreet. **Figure 4-120** shows the septic systems utilized in the analyses with those associated with loading to a tributary upstream of the lake (pink). A table provided on the figure summarizes the calculated TN load from septic units. The load to the tributary is 487 lb/yr, with no septic units within 200 meters of the shoreline of the lake. The septic units are within the High Grove neighborhood.

4.7.5.3 Point Source Load

No active point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lake Overstreet.

4.7.5.4 Lake Inflow Load

There are no identified lakes upstream of Lake Overstreet. Therefore, the inter-lake TN and TP loads are set to 0 lb/yr.

4.7.5.5 Internal Lake Load

The source assessment determined that, given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake, internal loading was not likely to be a significant source of loading to the lake. Given the assessment and lack of data available for evaluation, no loading estimates were developed.

4.7.5.6 Atmospheric Deposition

As presented and discussed in **Section 4.4.5.6**, the annual average atmospheric TN load per acre was calculated from the Quincy NADP station (F14) at 2.56 lb/acre/yr. Multiplying this by the acreage of Lake Overstreet (144 acres) gives a total TN load of 369 lb/yr. No data are available for TP therefore only the nitrogen load is provided.

Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBLOOF12	54.6	1.7	1
2	LJBLOOF09	165.0	0.8	1
3	LJBLOOF07	14.3	0.2	3
4	LJBLOOF10	13.2	0.3	3
5	LJBLOOF05	8.9	0.2	5
6	LJBLOOF03	26.8	0.1	6
7	LJBLOOF08	3.6	0.1	6
8	LJBLOOF01	3.5	0.1	8
9	LJBLOOF06	1.5	0.2	9
10	LJBLOOF02	1.9	0.1	10
11	LJBLOOF04	3.2	0.1	10
12	LJBLOOF11	3.1	0.1	12
13	LJBLOOF13	0.9	0.1	13
Total Load:		300.5		

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Legend

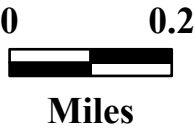
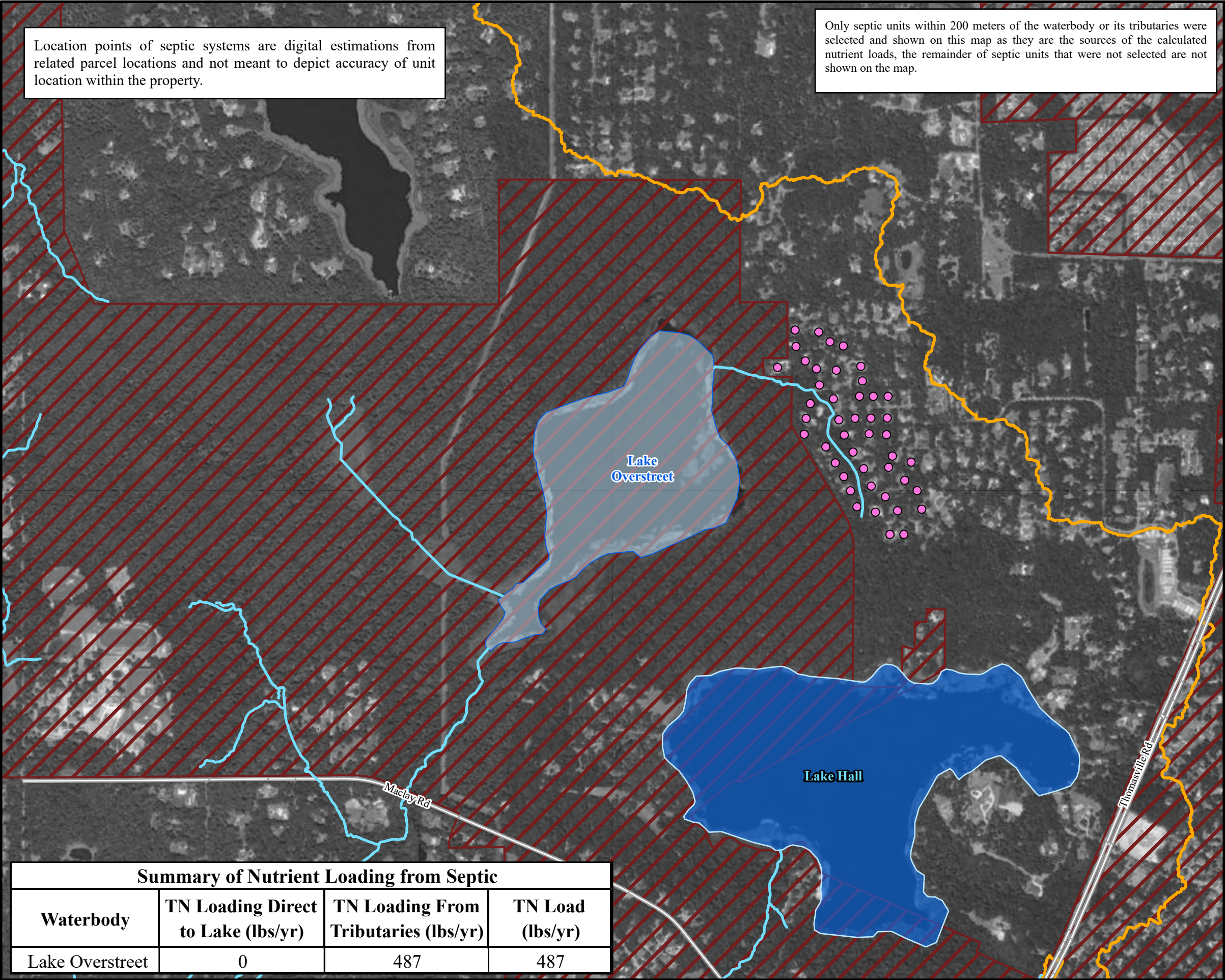
- Lake Overstreet
- Concentrated Discharge Areas
- Flowlines
- Tallahassee Corporate Limits
- Ranking
 - High (1)
 - Low (13)

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-119:
Lake Overstreet Concentrated Discharge
Areas Total Phosphorus

Tallahassee Master Plan - Surface
Water (TMaPS)





Legend

- Lake Jackson Drainage Basin
- Lake Overstreet
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Relevant Septic Sites**
 - Tributaries

Sources:
 Waterbodies: COT, 2020
 Watercourses: COT, 2020
 Septic Systems: COT, 2020
 Watershed: COT, 2020
 Roads: COT-Leon County, 2023

Figure 4-120:
Septic Loading to Lake Overstreet
 Tallahassee Master Plan - Surface Water (TMaPS)



4.7.5.7 Summary of Calculated Loads

Nutrient loads to Lake Overstreet were calculated for stormwater runoff, septic systems, and atmospheric deposition. **Table 4-20** presents the calculated total loads to the lake for TN and TP. For septic systems and atmospheric deposition, only TN loads were calculated (see **Section 4.7.5.2** and **Section 4.7.5.6** respectively for explanation).

Table 4-20: Summary of Calculated Loads to Lake Overstreet

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	1,303	301
Septic Systems	487	NC
Atmospheric Deposition	369	NC

NC – Not calculated.

4.8 Lake Hall

This section presents the results from Tasks 1 through 3 for Lake Hall. This includes an overview and history of the lake and basin, present impairment status, an overview of available data, a qualitative assessment of potential pollutant sources, and calculation of potential pollutant loads.

4.8.1 Overview and History

Lake Hall is a 172-acre closed basin lake (**Figure 4-121**). A closed basin lake is one that does not have a direct surface outflow. The lake has been designated as an OFW (Leon County, 2020). Portions of the western side of the lake are within the incorporated areas of the City (**Figure 4-121**), while the eastern side is within Leon County. The portion within the City's incorporated area is primarily within Maclay Gardens State Park. The lake is used for boating, waterskiing, fishing and swimming. The lake is the home of the Capital City Rowers and hosts the swimming portion of the Redhills Sprint triathlon (City, 2020).

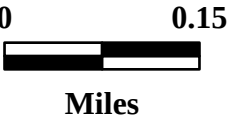
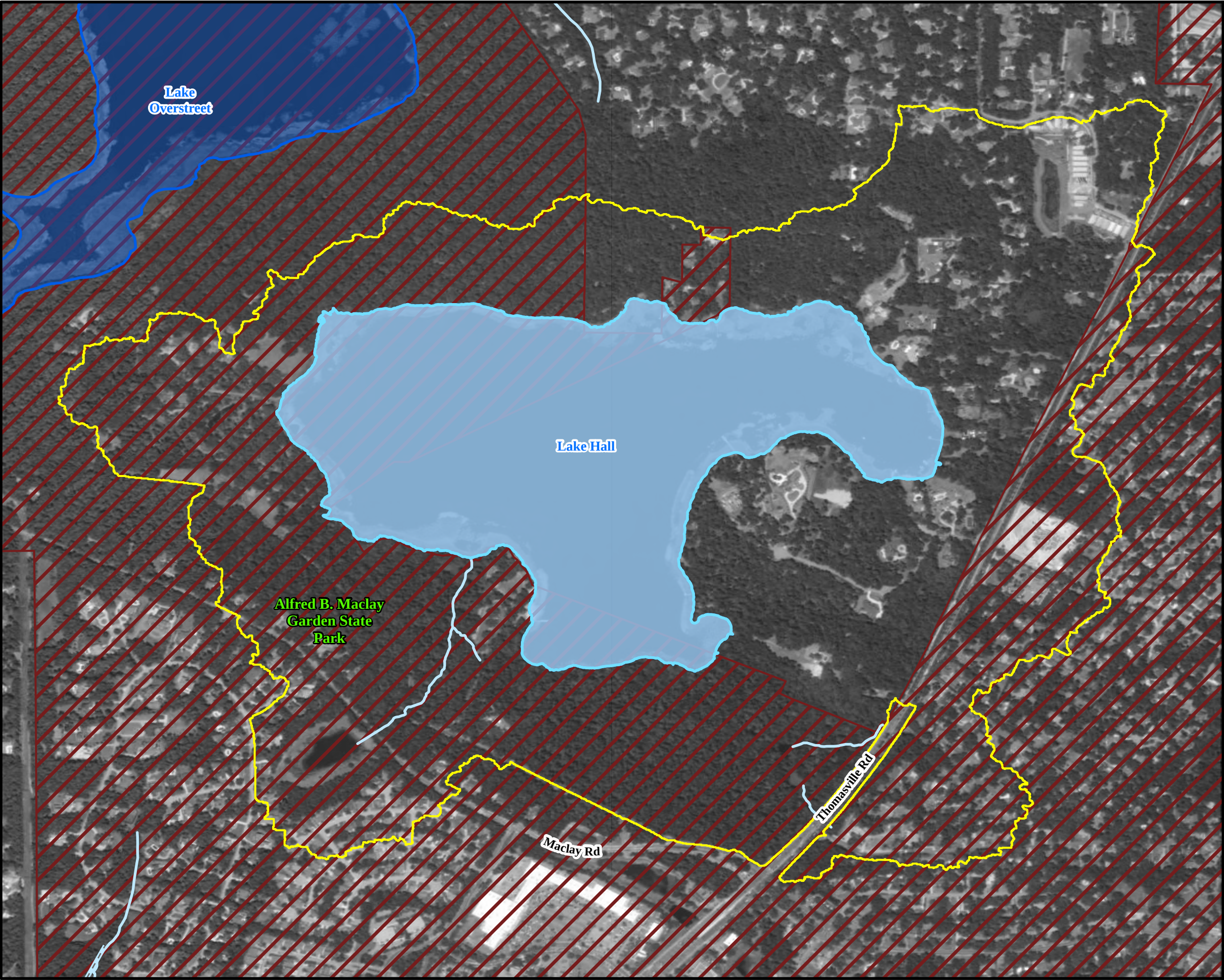
Lake Hall has been identified as one of the most pristine waterbodies in the area. **Photo 4-50** and **Photo 4-51** were taken from the Maclay Gardens boat dock, located in the southern lobe of the lake looking north. The photos show the open water nature of the lake and the general shoreline conditions.

The drainage basin for Lake Hall covers an area of 723 acres ((**Figure 4-121**). There is relatively limited development around the lake, with Maclay Gardens State Park along the western shoreline and some smaller neighborhoods along portions of the eastern lobe. Residences around the lake generally have vegetative buffer zones to the water's edge that limit nutrient inputs (Lake Ecosummary). Portions of the Lake Hall basin include neighborhoods east of Thomasville Road, south of Maclay Road, and a portion of the High Grove neighborhood to the northeast.

Lake Hall is a deep lake for the area, with maximum depths around 30 ft. **Photo 4-52** through **Photo 4-59** present aerial views of the lake from 1937 through the present. As was seen for Lake Overstreet, the aerial photos show that the lake has generally remained the same over this period of time and, due to the depths, maintains open water throughout much of its area. Prior to 1970, much of the land north of the lake was cleared and was reforested over the years. Lands to the south of the lake have not changed significantly. The residential developments within the closed basin appear over time after around 1970.

4.8.2 Regulatory Status

Exhibit 4-2 presented the verified impaired waters within the overall Lake Jackson basin. Presently, Lake Hall is not verified impaired for any parameters. As stated earlier, Lake Hall was designated an OFW (62-302.700 F.A.C.) and is afforded the highest protection by FDEP.



Legend

- Lake Hall Drainage Basin
- Lake Hall
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-121:
Lake Hall Drainage Basin Overview

Tallahassee Master Plan - Surface Water (TMaPS)





Photo 4-50: Lake Hall Photo 1



Photo 4-51: Lake Hall Photo 2



Photo 4-52: Lake Hall Aerial (1937)



Photo 4-53: Lake Hall Aerial (1949)



Photo 4-54: Lake Hall Aerial (1954)



Photo 4-55: Lake Hall Aerial (1970)



Photo 4-56: Lake Hall Aerial (1983)



Photo 4-57: Lake Hall Aerial (1996)

July 2025

4.8.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Lake Hall and the Lake Hall basin including bathymetry, land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.

4.8.3.1 Bathymetry

Figure 4-122 presents a map of the lake bathymetry from 2007 (ReMetrix, 2007). The lake conditions have not changed significantly over the years, so this map is a good representation of the present bathymetric conditions. The maximum depths within the lake, 26 to 29 ft, are located within the central, western, and southern areas. There are some shallower banks (9 to 14 ft) along the western shoreline, with relatively steep dropoffs into the deeper waters. The maximum depths within the northeastern lobe of the lake are on the order of 15 ft.

4.8.3.2 Land Use

Figure 4-123 presents a map of the Level 2 land uses within the Lake Hall basin. A table is provided to show the overall acreages and percent cover for the various levels. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use within the Lake Hall basin per the grouped Level 1 categories is Upland Forest (41 percent). The Upland Forest areas surround most of the lake. The second largest land use in the overall basin is Urban and Built Up (Low Density Residential, 30 percent). The bulk of the Residential land use areas are along the eastern side of the lake bordering Thomasville Road.

4.8.3.3 Soils

The most prevalent soil group in the Lake Hall basin is Group B (**Figure 4-124**) (59 percent). Group B soils are considered to have a moderate rate of infiltration. There is an area of Group C soils in the northeast corner of the basin (10 percent). Group C soils are considered to have slow rates of infiltration.

4.8.3.4 Septic Systems

An estimated 75 septic systems are within the boundaries of the Lake Hall basin, based on the FDOH septic tank layer (**Figure 4-125**). The septic systems are predominantly located on the eastern lobe of the lake in the limited residences along the shoreline and within the Thomasville Road neighborhoods.

For recent TMDL analyses, FDEP used a radius of 200 meters to analyze direct contribution of nutrient loads from septic systems to a waterbody. There are presently 10 septic systems within 200 meters of the shoreline of Lake Hall. All the remaining septic systems are within a half-mile radius of Lake Hall.

4.8.3.5 Hydrologic Data

No recent historical or present hydrologic monitoring stations are located within the Lake Hall basin.

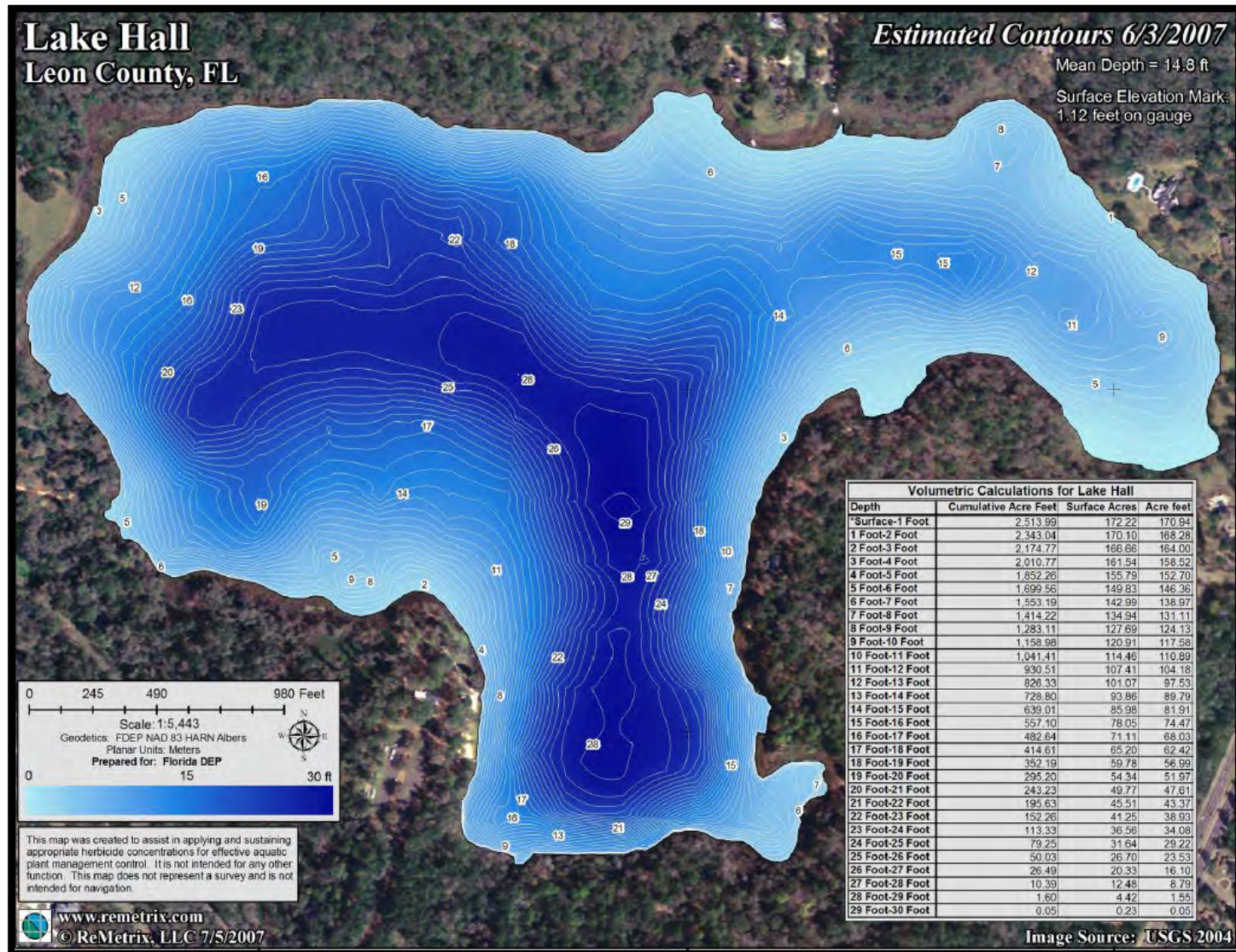
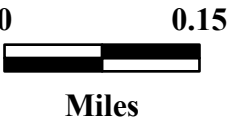


Figure 4-122: Bathymetry in Lake Hall

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	100	14%
1200	Residential Medium Density	57	8%
1300	Residential High Density	9	1%
1400	Commercial and Services	0	< 1%
1700	Institutional	5	1%
1800	Recreational	47	6%
4100	Upland Coniferous Forests	93	13%
4200	Upland Hardwood Forests	11	1%
4300	Upland Mixed Forests	196	27%
5200	Lakes	164	23%
6400	Vegetated Non-Forested Wetlands	20	3%
8100	Transportation	12	2%
8300	Utilities	10	1%

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	218	30%
4000	Upland Forest	299	41%
5000	Water	164	23%
6000	Wetlands	20	3%
8000	Transportation, Communication, and Utilities	22	3%



Legend

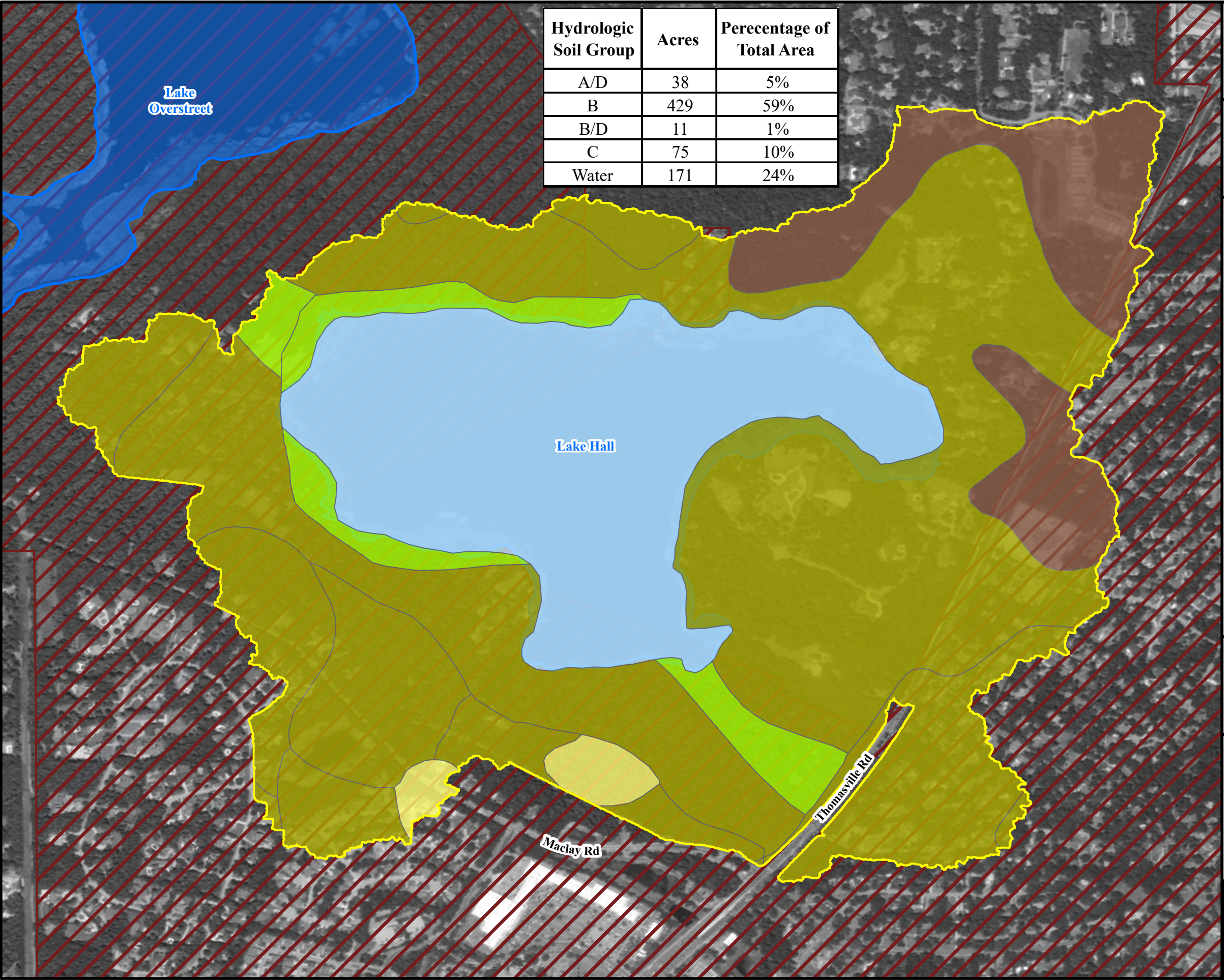
- Lake Hall Drainage Basin
- Land Use Type
 - 1100: Residential Low Density
 - 1200: Residential Medium Density
 - 1300: Residential High Density
 - 1400: Commercial and Services
 - 1700: Institutional
 - 1800: Recreational
 - 4100: Upland Coniferous Forests
 - 4200: Upland Hardwood Forests
 - 4300: Upland Mixed Forests
 - 5200: Lakes
 - 6400: Vegetated Non-Forested Wetlands
 - 8100: Transportation
 - 8300: Utilities

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Land Use: NFWFMD, 2019

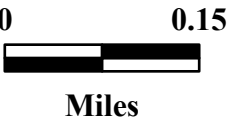
Figure 4-123:
Lake Hall Basin Land Use

Tallahassee Master Plan - Surface
Water (TMaPS)





Hydrologic Soil Group	Acres	Percentage of Total Area
A/D	38	5%
B	429	59%
B/D	11	1%
C	75	10%
Water	171	24%



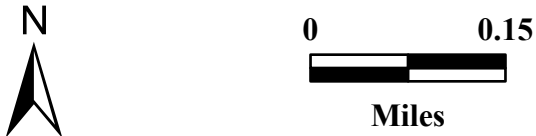
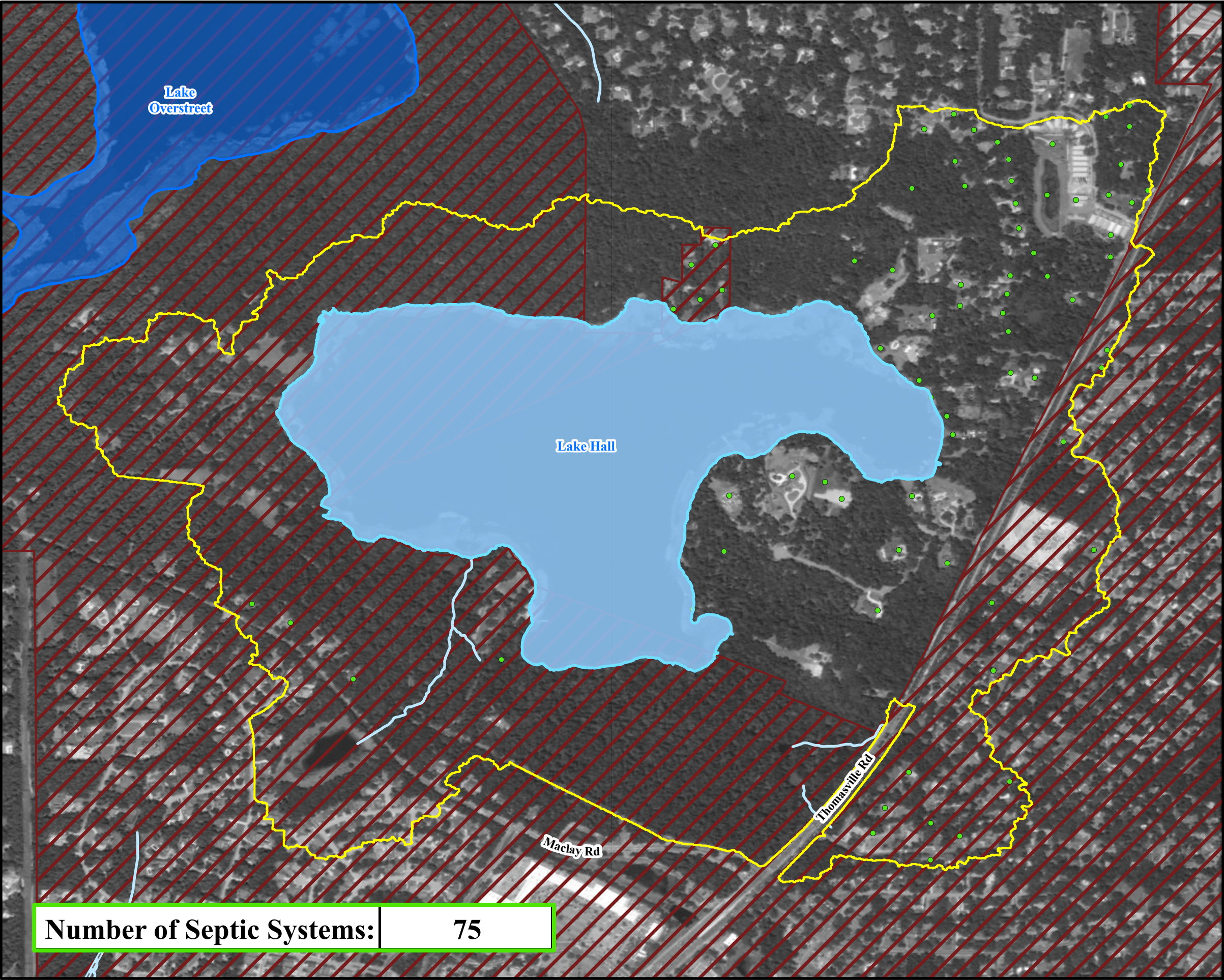
Legend

- Lake Hall Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits
- Hydrologic Soil Group**
- A/D
- B
- B/D
- C
- Water

Sources:
 Waterbodies: COT, 2020
 Drainage Basins: COT, 2020
 Roads: COT-Leon County, 2023
 City Limits: COT, 2020
 Soils: NRCS, 2020

Figure 4-124:
Lake Hall Basin Soils
Tallahassee Master Plan - Surface
Water (TMaPS)





- Legend**
- Lake Hall Drainage Basin
 - Lake Hall
 - Waterbodies in Study
 - Watercourses
 - Tallahassee Corporate Limits
 - Septic Systems

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Septic Systems: COT, 2022

Figure 4-125:
Lake Hall Drainage Basin Septic Systems

Tallahassee Master Plan - Surface Water (TMaPS)



Number of Septic Systems:	75
----------------------------------	-----------

4.8.3.6 Surface Water Quality Data

The IWR dataset for Lake Hall (WBID 689B) spans from 1990 to 2020 and includes contributions from local and state agencies (City, Leon County, FDEP, and Florida LAKEWATCH), as well as a private sector firm (McGlynn Lab).

Figure 4-126 presents the locations of in-lake water quality monitoring stations for Lake Hall (yellow). No data are available for tributaries flowing into Lake Hall. A table is provided in **Figure 4-126** that shows the station ID, station name, period of record, sample count, data source, and if the station represents in-lake or tributary data. Based on the number of stations and the length of the station IDs, station IDs were not included on the figure, rather each of the stations is given a number and the numbers correspond to stations in the table.

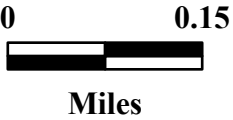
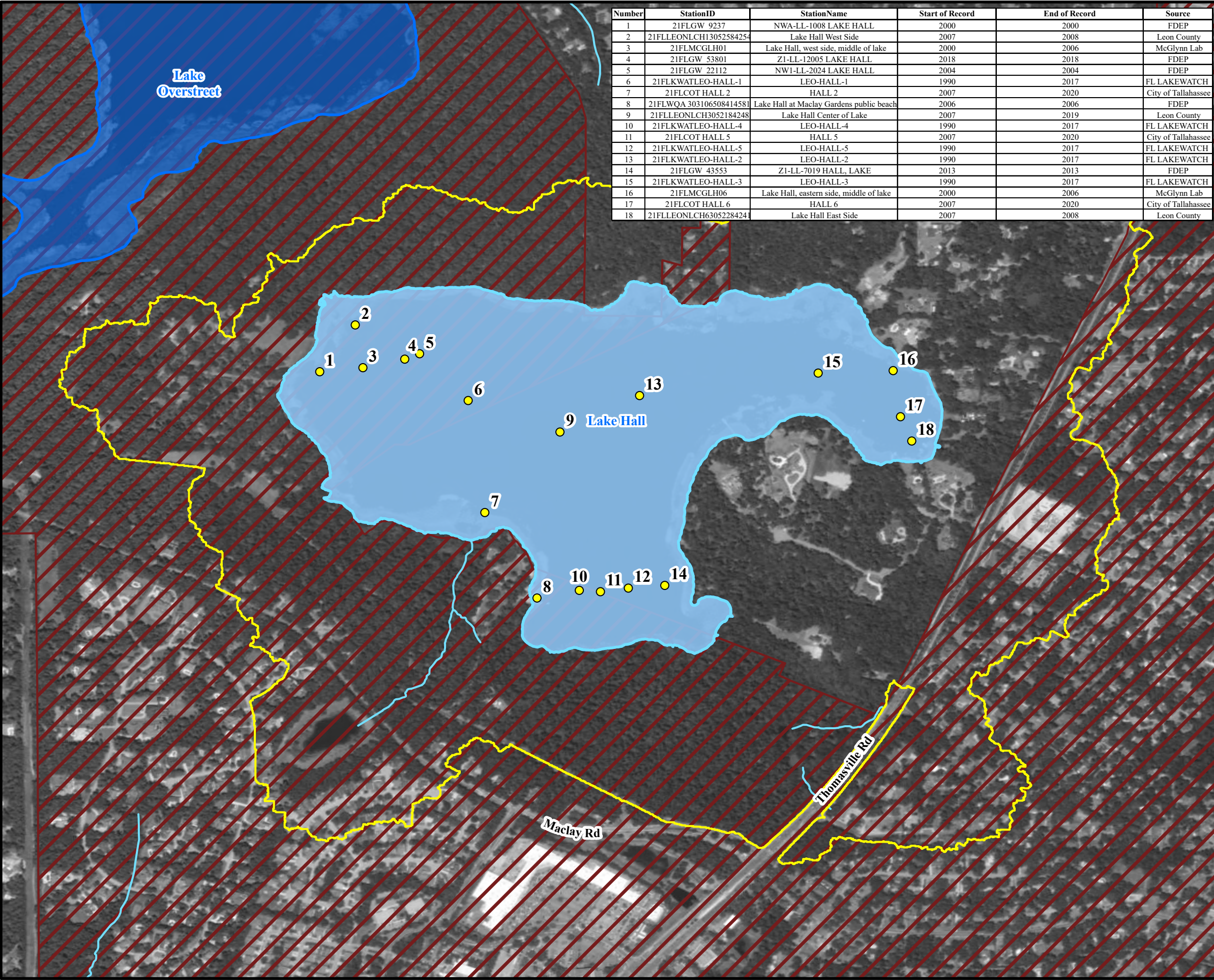
Figure 4-126 shows that in-lake water quality monitoring data have been collected at multiple locations throughout the lake, with long-term monitoring stations within the southern lobe, the eastern lobe and the western lobe. These data provide an extensive data set for evaluation of temporal and spatial conditions in Lake Hall.

Some initial plots of the full data set in the lake are provided in this section. This includes plots of the raw data and AGM comparisons to NNC thresholds. As nutrients are the primary constituent of interest relative to water quality conditions in Lake Hall, plots are provided for the key parameters related to potential nutrient impairment. These include TN, TP, Chl-a, and TSI. Additionally, based on interest in the area relative to septic systems and other sources, FIB, specifically *E. coli*, are included. Additional data plots and analyses are provided as part of the qualitative assessment of sources (**Section 4.8.4.1**).

Figure 4-127 through **Figure 4-129** present plots of the measured TN, TP, and Chl-a from 2010 to 2020. TN, TP and Chl-a data show no significant trends between 2010 and 2020, with low concentrations of all three. Examination of historical data showed that overall, conditions have not changed significantly over the period of the available data.

Under FDEP's NNC, Lake Hall is defined as a low color, low alkalinity system. Based on this designation, the AGM threshold for Chl-a is 6 µg/L. For TN and TP, a range of concentrations are allowable, based on maintaining Chl-a levels in the lake below 6 µg/L. For TN, the range is 0.51 mg/L to 0.93 mg/L. For TP, the range is 0.01 mg/L to 0.03 mg/L. For *E. coli*, the criteria are monthly geometric means below 126 colonies per 100 mL of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period.

TN, TP, and Chl-a, AGMs are plotted in **Figure 4-130** through **Figure 4-132** from 2010 to 2020, and these define the status of the lake relative to nutrient impairments. The Chl-a threshold and the minimum and maximum thresholds for TN and TP relative to the NNC are on each of the graphs as pink dashed lines. **Figure 4-133** presents a plot of calculated TSI values in the lake. Although TSI is no longer utilized for the determination of impairment, it does serve as an indicator of lake health. Based on TSI definitions, levels below 60 are deemed good condition, levels between 60 and 70 indicate fair condition, and levels above 70 indicate poor condition. **Figure 4-134** presents plots of *E. coli* data for the available period of record.



Legend

- Lake Hall Drainage Basin
- Lake Hall
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Water Quality Stations**
 - In-Lake Water Quality Sampling Stations

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
WQ Stations: FDEP, 2022

Figure 4-126:
Lake Hall Water Quality Station Locations

Tallahassee Master Plan - Surface Water (TMaPS)



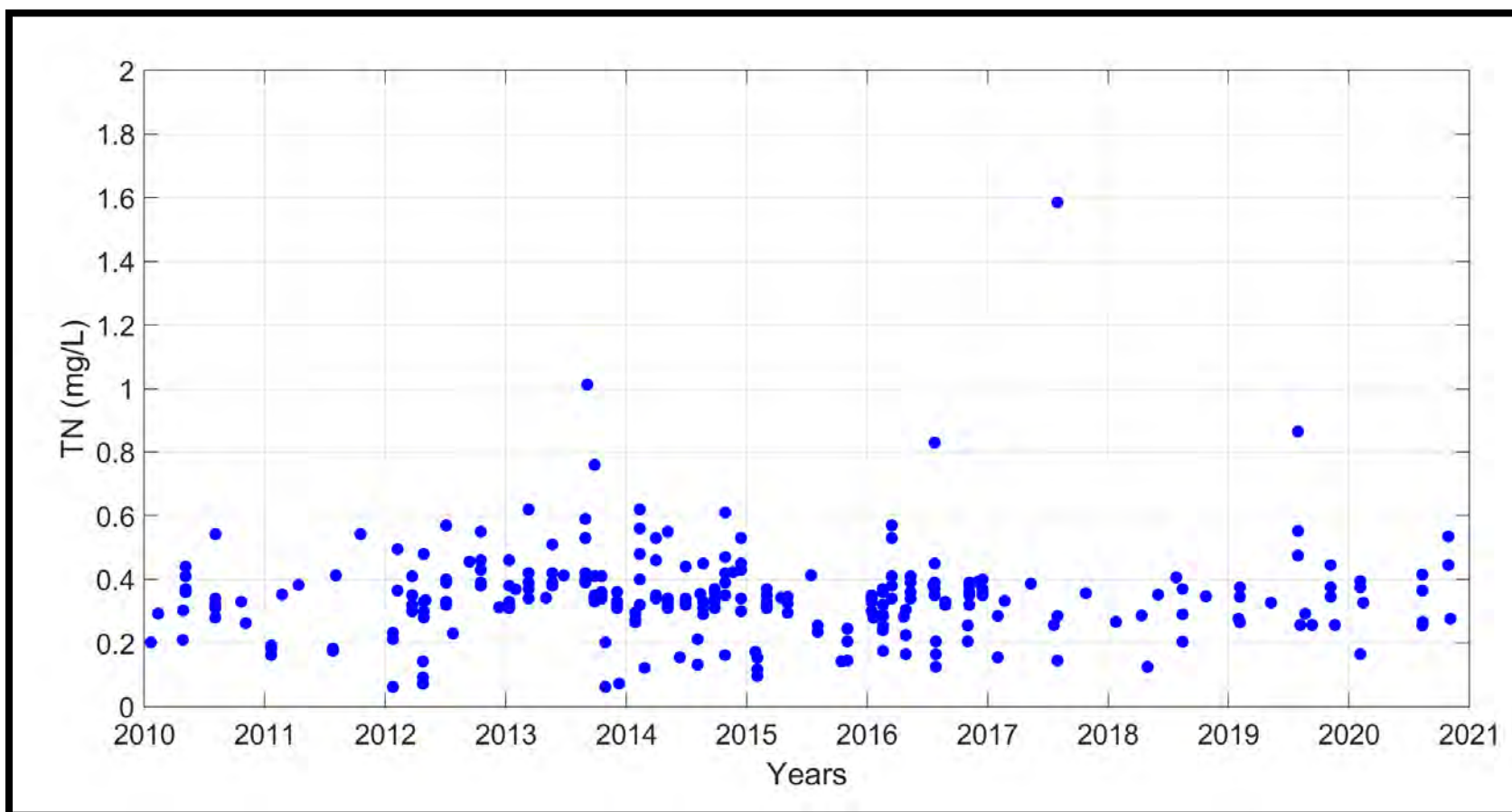


Figure 4-127: Plot of Measured TN

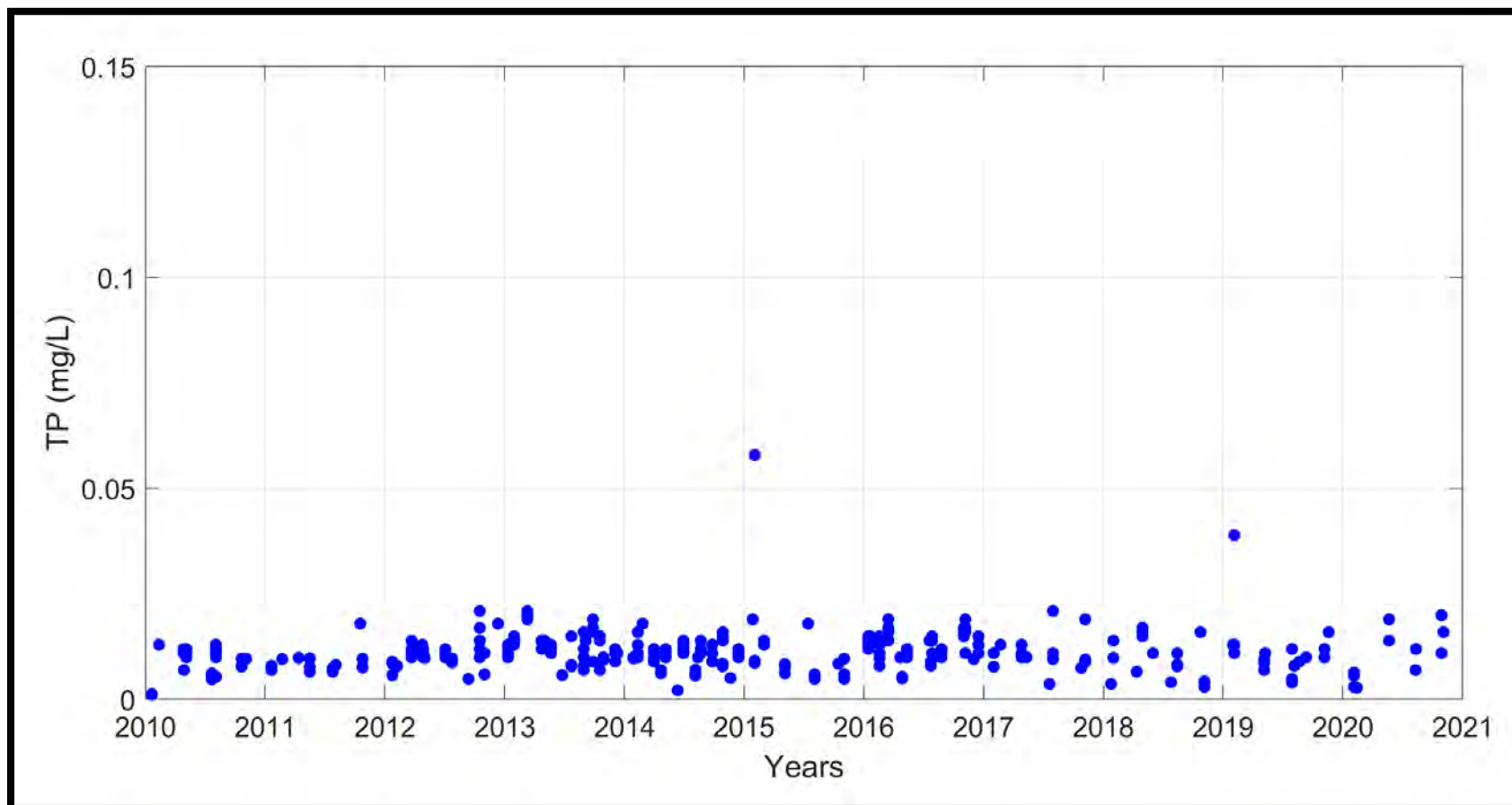


Figure 4-128: Plot of Measured TP

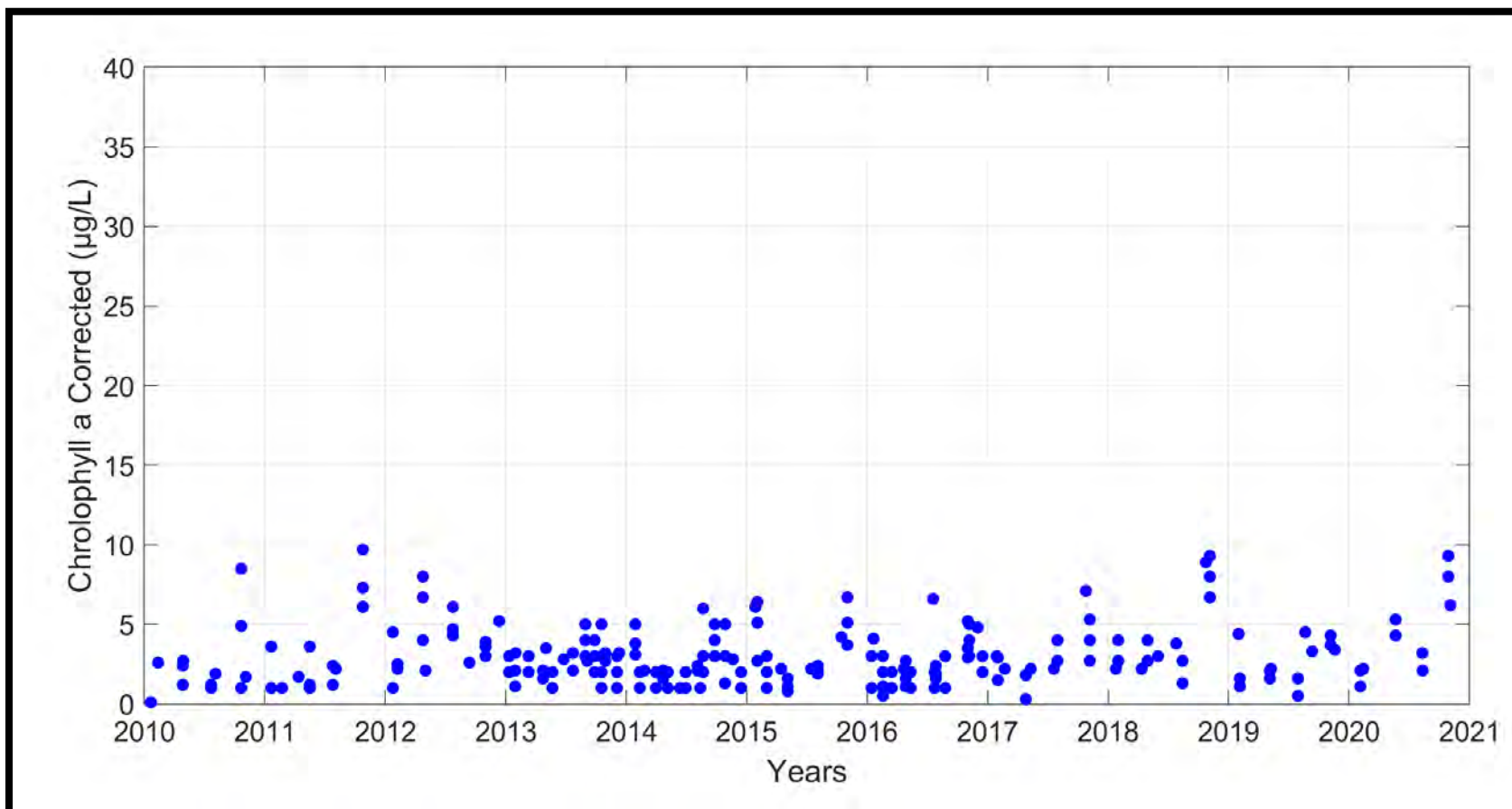


Figure 4-129: Plot of Measured Chl-a

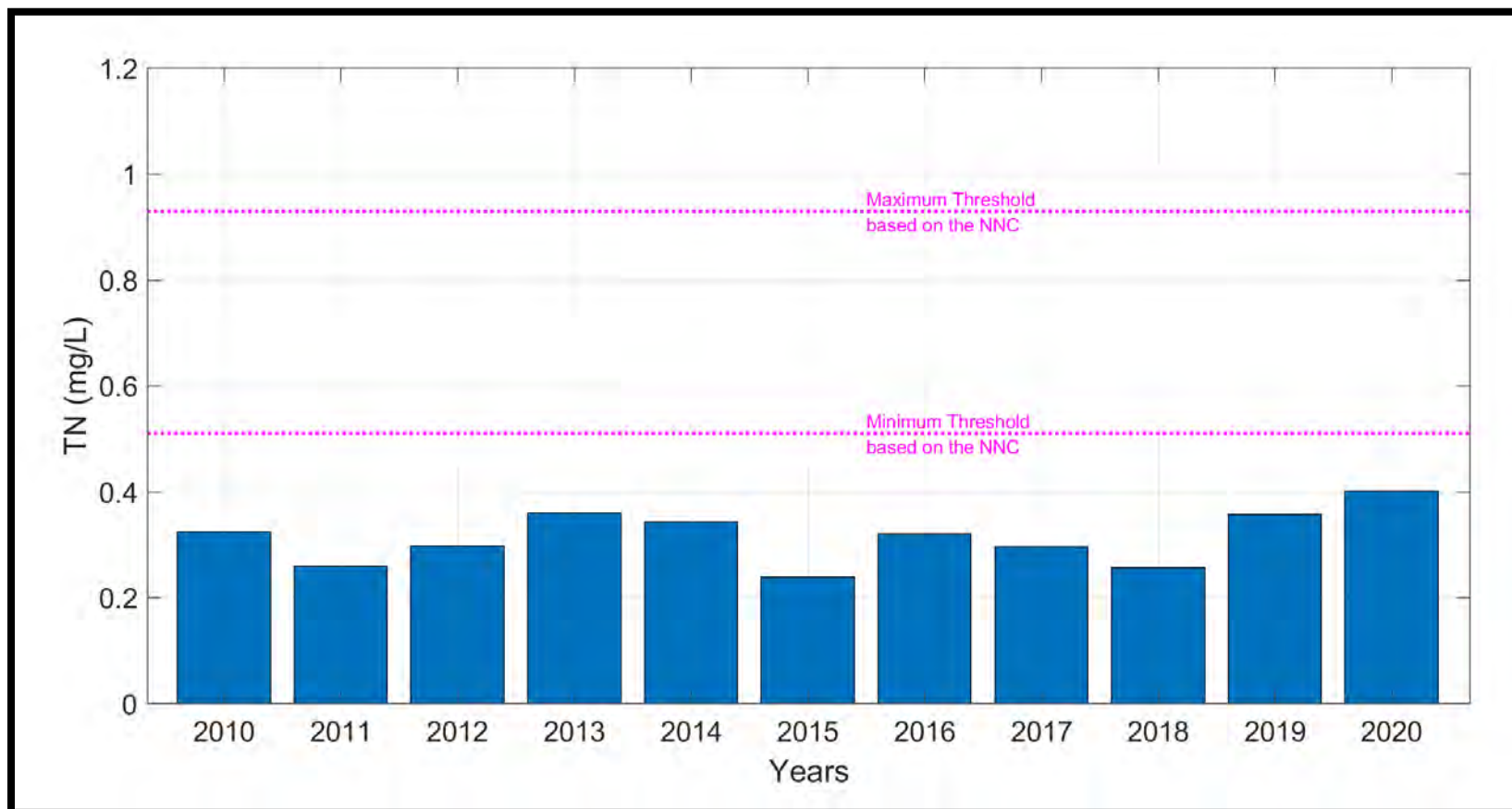


Figure 4-130: Plot of Annual Geometric Means for TN with NNC Criteria for Lake Hall

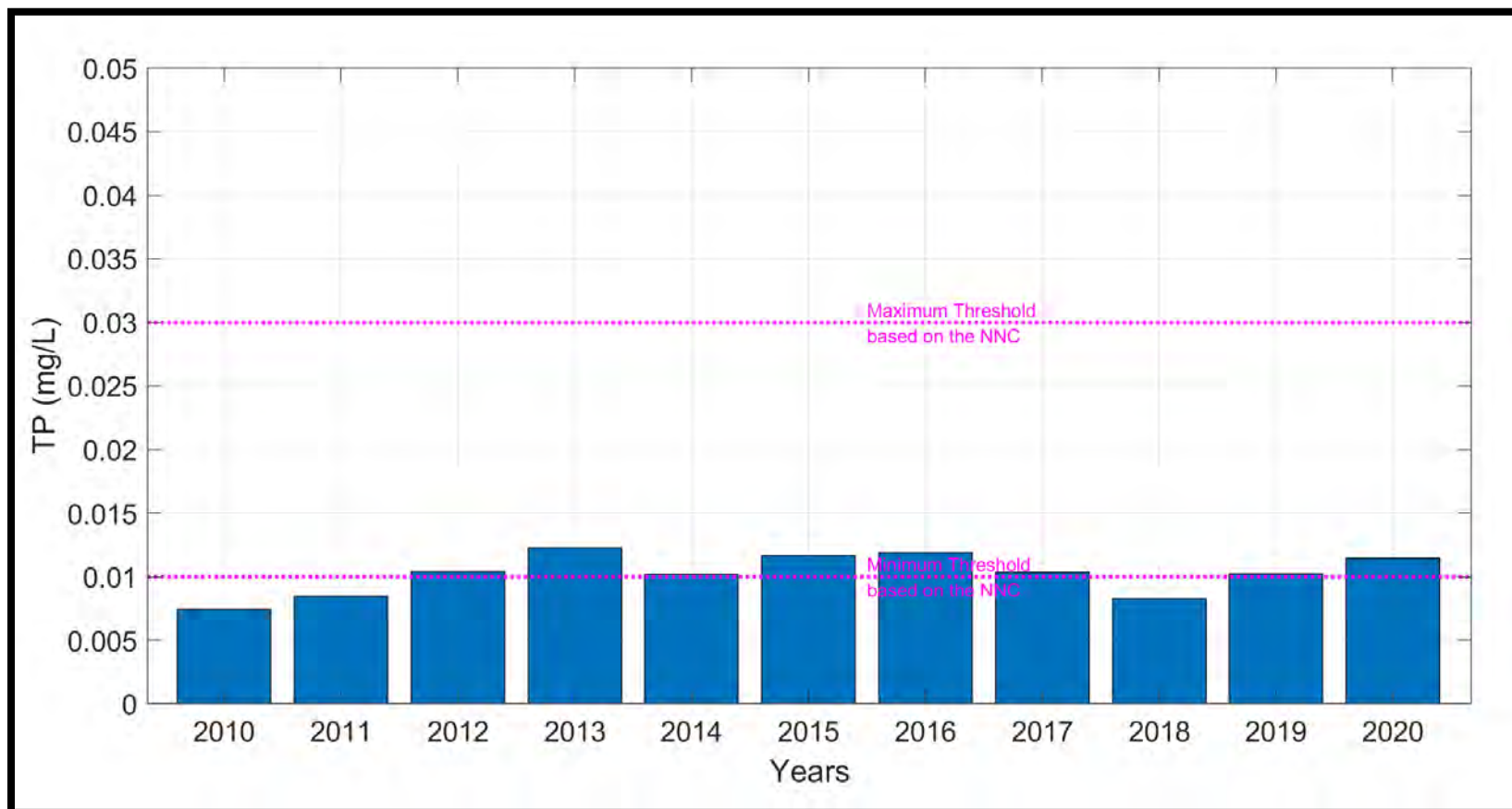


Figure 4-131: Plot of Annual Geometric Means for TP with NNC Criteria for Lake Hall

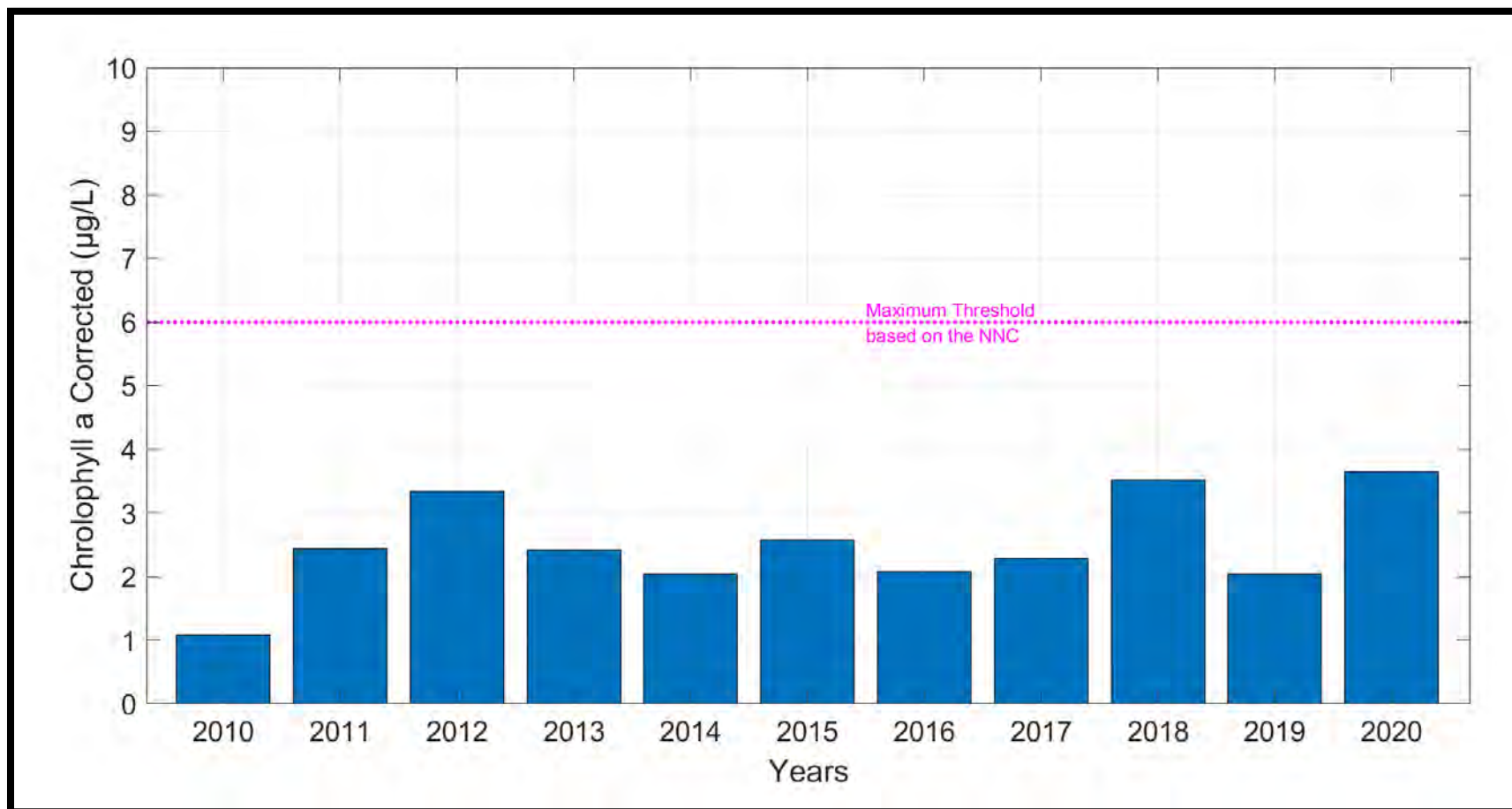


Figure 4-132: Plot of Annual Geometric Means for Chl-a with NNC Criteria for Lake Hall

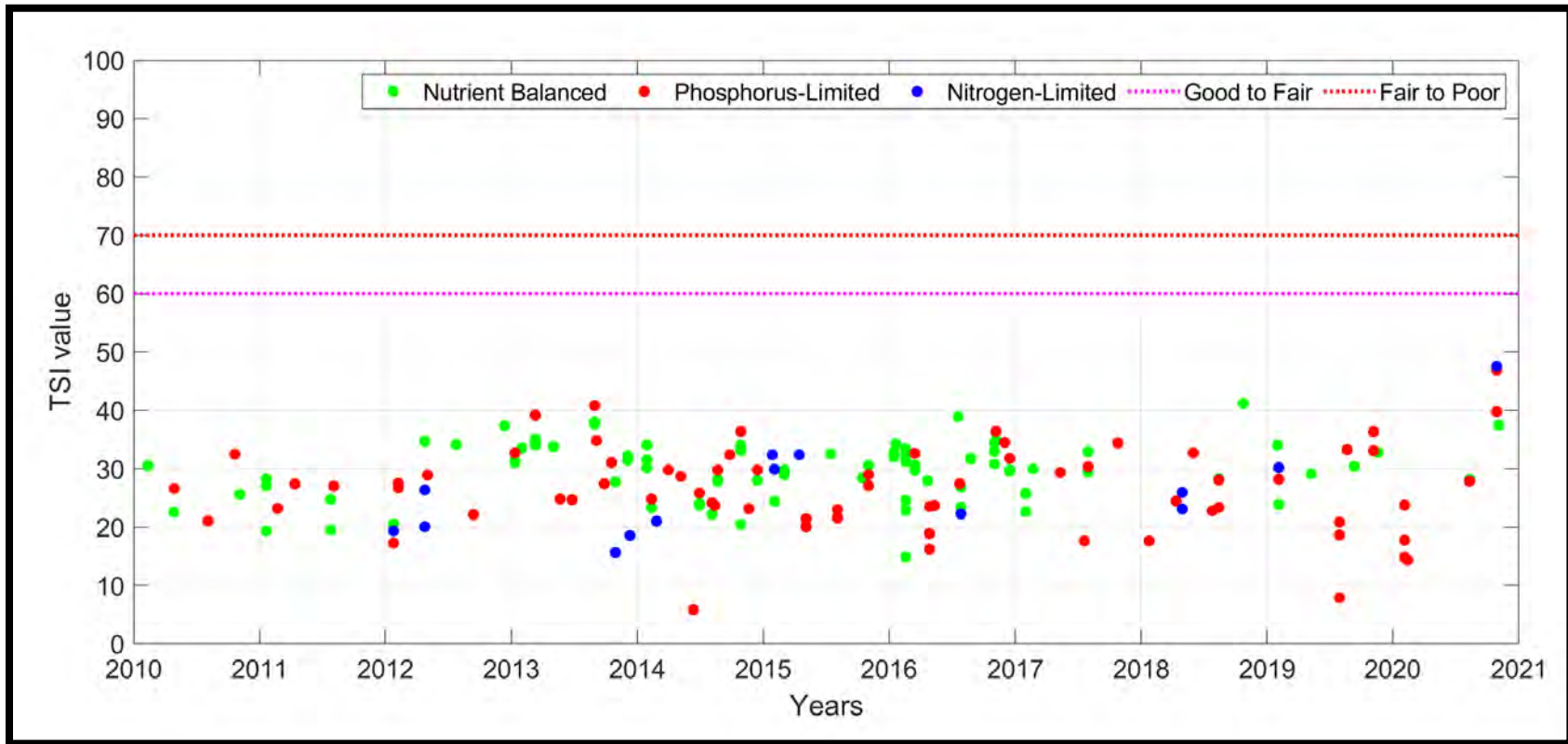


Figure 4-133: Plot of Trophic State Index for Lake Hall

Volume 4 – Lake Jackson Basin

The data show why Lake Hall is considered to have some of the best water quality in the area. Examination of the TN plot (**Figure 4-130**) shows that from 2010 to 2020, TN AGM levels remained well below the minimum NNC threshold. The TP AGM levels (**Figure 4-131**) range from just above to below the minimum threshold from 2010 to 2020. Chl-a measurements (**Figure 4-132**) are well below the threshold of 6 µg/L, with all the years showing values below 4 µg/L. The TSI values (**Figure 4-133**) are almost entirely at or below 40, which represents oligotrophic conditions. Finally, the *E. coli* data (**Figure 4-134**) are nearly all below 5 colony-forming units MPN/100 mL, indicating no bacterial issues within the lake.

4.8.3.7 Groundwater Data

There are no identified surficial groundwater monitoring wells currently within the Lake Hall basin.

4.8.3.8 Biological Data

Table 4-21 presents LVI data collected by the City and Leon County between 2010 and 2018. The data show a range of from 66 up to 86, reflecting healthy to exceptionally healthy conditions in the lake.

Table 4-21: Summary of LVI Results from Lake Hall

Date	Station ID	LVI	Aquatic Life Use Category
6/21/2010	21FLCOTCOTLVI002	84	Exceptional
8/4/2010	21FLLEONLVI004	76	Healthy
7/26/2011	21FLCOTCOTLVI002	76	Healthy
9/12/2012	21FLLEONLVI004	67	Healthy
10/3/2012	21FLCOTCOTLVI002	77	Healthy
6/5/2013	21FLGW43553	76	Healthy
9/4/2013	21FLLEONLVI004	66	Healthy
10/29/2013	21FLCOTCOTLVI002	82	Exceptional
8/13/2014	21FLLEONLVI004	71	Healthy
7/27/2015	21FLLEONLVI004	67	Healthy
10/21/2015	21FLCOTCOTLVI002	86	Exceptional
7/21/2016	21FLLEONLVI004	70	Healthy
7/25/2018	21FLLEONLVI004	81	Exceptional

4.8.3.9 Stormwater Treatment Facilities

Figure 4-135 presents a map showing the locations of stormwater treatment facilities throughout the Lake Hall basin. There are relatively few facilities throughout the basin, and these are located within the neighborhoods along Thomasville Road and Maclay Road. The facilities are maintained by the City, Leon County, and Maclay Gardens. No facilities are located within the portion of the basin within neighborhoods east of Thomasville Road.



0 0.14
Miles

Legend

- Lake Hall Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- City of Tallahassee Stormwater Ponds
- Leon County Stormwater Ponds
- Stormwater Ponds (Other)

Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
BMPs: Geosyntec, 2022
City Limits: COT, 2022

Figure 4-135:
Lake Hall Basin BMP Locations
Tallahassee Master Plan - Surface
Water (TMaPS)

4.8.3.10 Atmospheric Deposition Data

Section 4.4.3.11 presented the location of the nearest atmospheric deposition station to the Lake Jackson basin. The data from this station will be utilized to calculate atmospheric deposition to Lake Hall.

4.8.3.11 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Lake Hall (**Section 4.8.4**), the available data are reasonable. There are sufficient active surface water quality stations within the lake to support the qualitative assessment. The water quality conditions in the lake limit the need for additional data. Based on the pristine water quality, it is assumed anthropogenic loads are minimal. No noteworthy limitations were identified.

4.8.4 Qualitative Assessment of Sources

As outlined in previous sections, prior to performing loading calculations and other analyses to quantify existing pollutant sources to Lake Hall, it is important to analyze available data and summarize findings from historical studies to support identification of likely sources.

For Lake Hall, the sources to be evaluated include the following:

- Stormwater runoff
- Septic systems
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition
- Interconnected flows

An overview of analyses and findings for each source listed above is provided in the following sections. Prior to the discussions of each of the potential sources, an in-lake analysis is provided to build on the information presented in **Section 4.8.3**. Following the discussions for each source type, a summary of findings for the qualitative assessment is provided.

4.8.4.1 In-Lake Water Quality

Following the methodology utilized for other lakes, analyses were conducted on the available in-lake data from 2010 to the present. This provides an evaluation of the baseline water quality conditions and the spatial differences within the lake. The parameters analyzed for Lake Hall include color, alkalinity, TP, TN, Chl-a, TSI, and *E. coli*.

As was done for the other lakes, stations were clustered where they represent conditions within a specific area. The clustered data from 2010 to the present were analyzed to provide the average of the annual geomeans or the 90th percentile, depending upon the parameter. The results are presented on a map, with colors representing the results. The levels associated with the colors are reflective of water quality thresholds as outlined in 62-302 F.A.C. and were discussed and

presented in **Section 4.4.4.1**. The Lake Hall analyses use the same ranges as the Lake Jackson analyses.

Figure 4-136 presents the data clustering used for the analyses and associated stations. For Lake Hall, data since 2010 were available within five clusters around the lake. There are two along the western side of the lake (W and NW), a group in the center of the lake (C), one in the northeast lobe (NE), and one in the southern lobe (S). The NW cluster is primarily from LAKEWATCH data, therefore, the parameters measured were more limited.

Figure 4-137 and **Figure 4-138** present the color and alkalinity. Both parameters show low values, with limited discernible spatial variation in the data. For alkalinity, the data show slightly higher values at the W and C clusters. These results support the determination of the lake as a clear, low alkaline system with the associated criteria.

Figure 4-139 and **Figure 4-140** present the TN and TP results. The TN clusters show levels below the minimum throughout the lake with no discernable spatial pattern. TP levels at all the clusters are low, with the W, S, and NE clusters showing values below the minimum. The C and NW clusters have slightly higher values but still near the minimum levels.

Figure 4-141 and **Figure 4-142** present maps of the Chl-a and TSI. Chl-a levels are low at all clusters between 1.5 and 3.0 µg/L. TSI levels are all below 30, with the W, S, and NE clusters below 15 and the C and NW clusters between 15 and 30, indicating oligotrophic conditions.

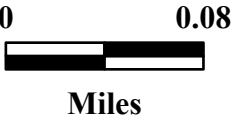
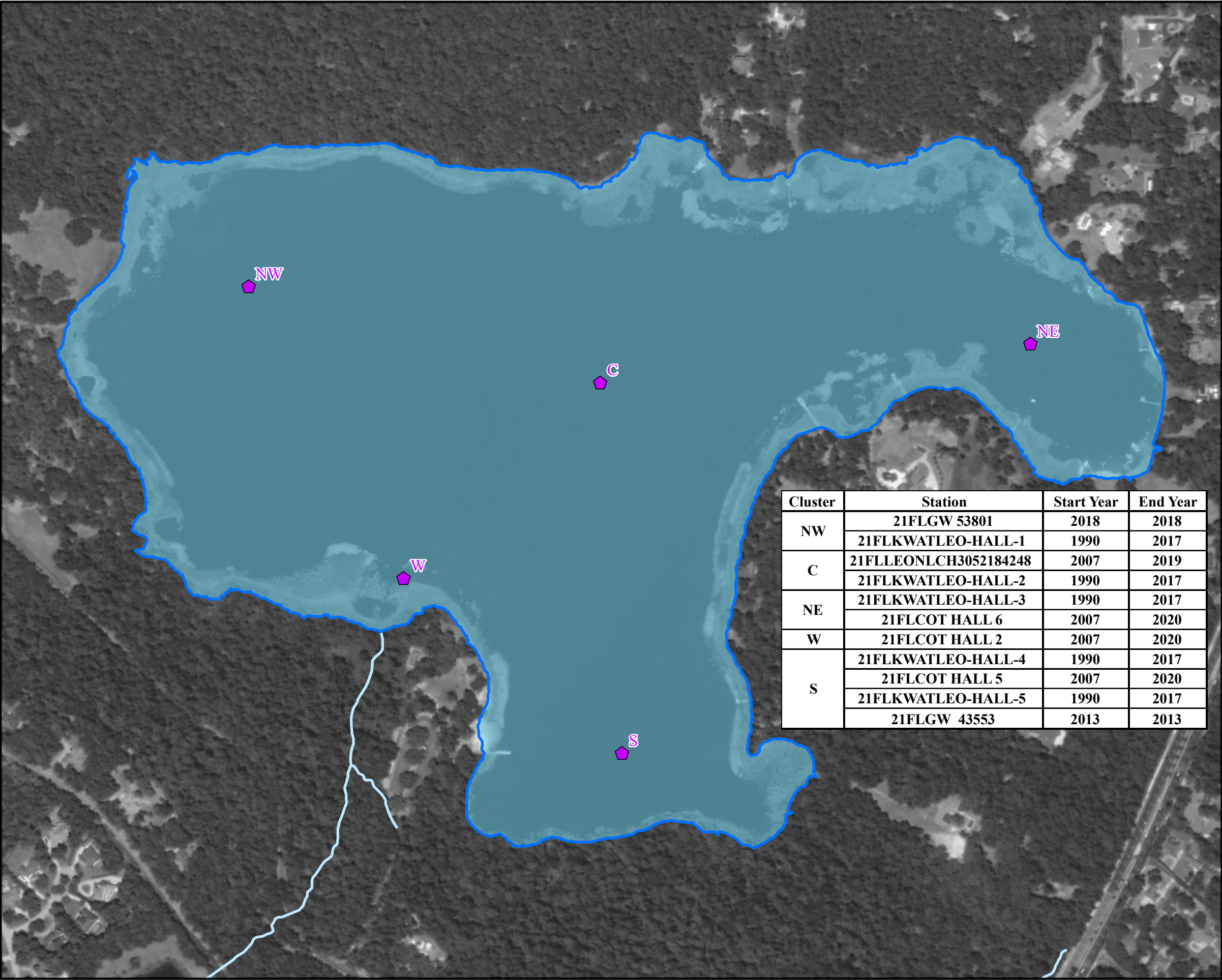
Figure 4-143 presents a map of the *E. coli* levels. The data analyzed are from 2014 through 2020, and the data were analyzed to provide the 90th percentile to compare against the 410 MPN/100 mL criteria per the FDEP approach in the IWR analyses. The results show that for the stations with *E. coli* data, the 90th percentile are well within the criteria, in the lowest blue range (less than 100 MPN/100 mL).

4.8.4.2 Stormwater Runoff

To assess stormwater runoff as a potential source of pollutant loads to Lake Hall, the first step was to evaluate the LDI levels within the subbasins draining to the lake. In **Section 4.4.4.2**, LDI values were presented by subbasin in **Figure 4-24**. The map shows that in the immediate watershed area surrounding Lake Hall, LDI levels were good. This would indicate that this area has limited potential for anthropogenic pollutant loads from stormwater runoff. No data were available on tributaries flowing into Lake Hall.

4.8.4.3 Septic Systems

Figure 4-125 presented the locations of septic systems within the Lake Hall basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin. The septic tank densities in the Lake Hall closed basin are in the middle to lower range compared to other subbasins within the overall Lake Jackson basin. This would increase their potential as a source of pollutants to the lake but, based on the existing water quality and recent trends along with the low *E. coli* levels, the potential appears low.



Legend

- Watercourses
- Lake Hall
- In-Lake Station Clusters

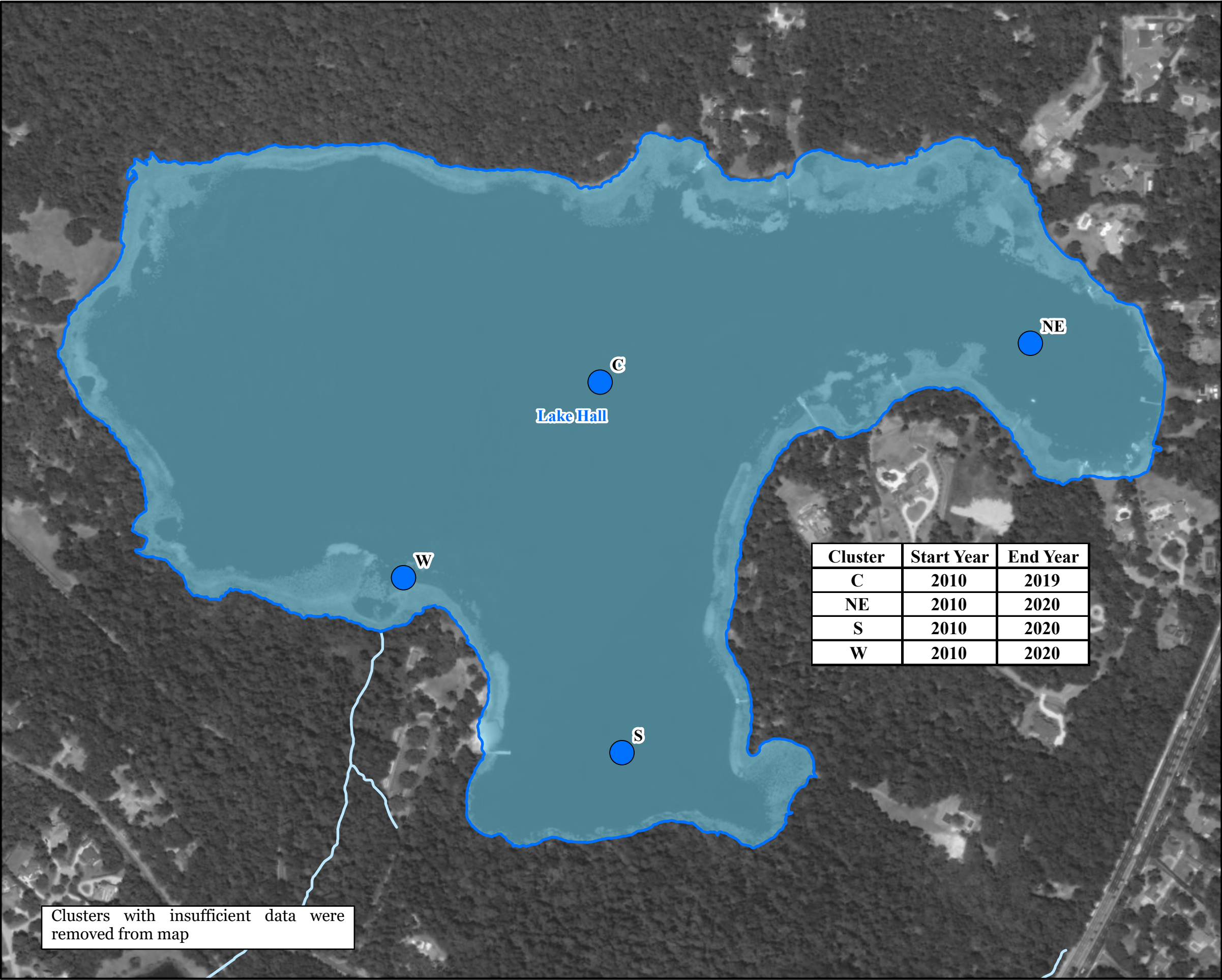
Cluster	Station	Start Year	End Year
NW	21FLGW 53801	2018	2018
	21FLKWATLEO-HALL-1	1990	2017
C	21FLLEONLCH3052184248	2007	2019
	21FLKWATLEO-HALL-2	1990	2017
NE	21FLKWATLEO-HALL-3	1990	2017
	21FLCOT HALL 6	2007	2020
W	21FLCOT HALL 2	2007	2020
S	21FLKWATLEO-HALL-4	1990	2017
	21FLCOT HALL 5	2007	2020
	21FLKWATLEO-HALL-5	1990	2017
	21FLGW 43553	2013	2013

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-136:
Station Clustering for In-Lake Analyses for
Lake Hall

Tallahassee Master Plan - Surface
Water (TMaPS)





Clusters with insufficient data were removed from map



0 0.08
Miles

Legend

- Lake Hall
- Watercourses

Color Average 2010-2020

PCU

- 0 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- > 40

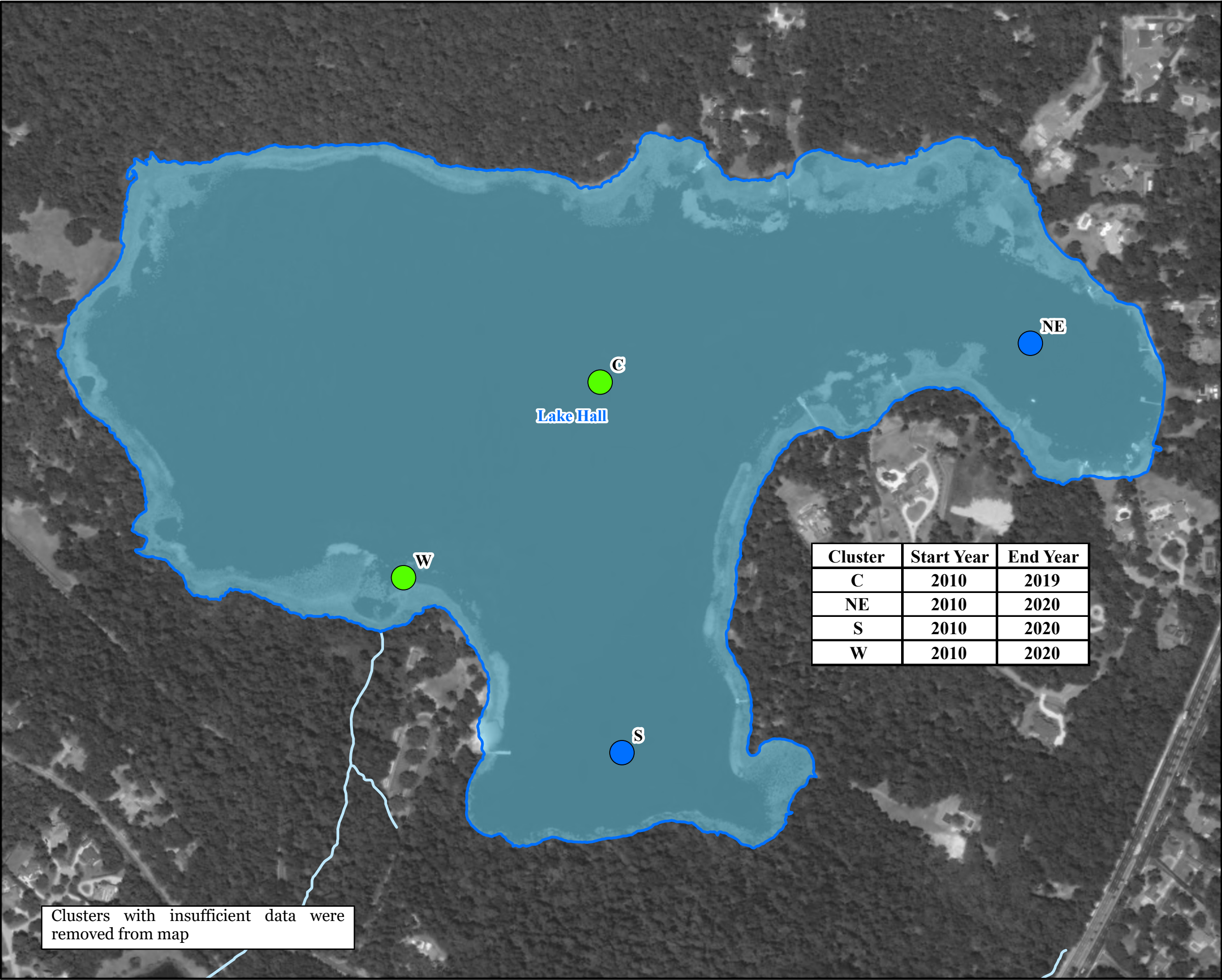
Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
S	2010	2020
W	2010	2020

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

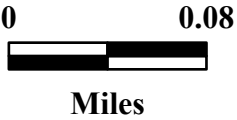
Figure 4-137:
Spatial Assessment of Color in Lake Hall

Tallahassee Master Plan - Surface
Water (TMaPS)





Clusters with insufficient data were removed from map



Legend

Lake Hall

Watercourses

Alkalinity Average 2010-2020
mg/L

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- > 20

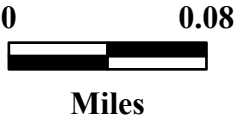
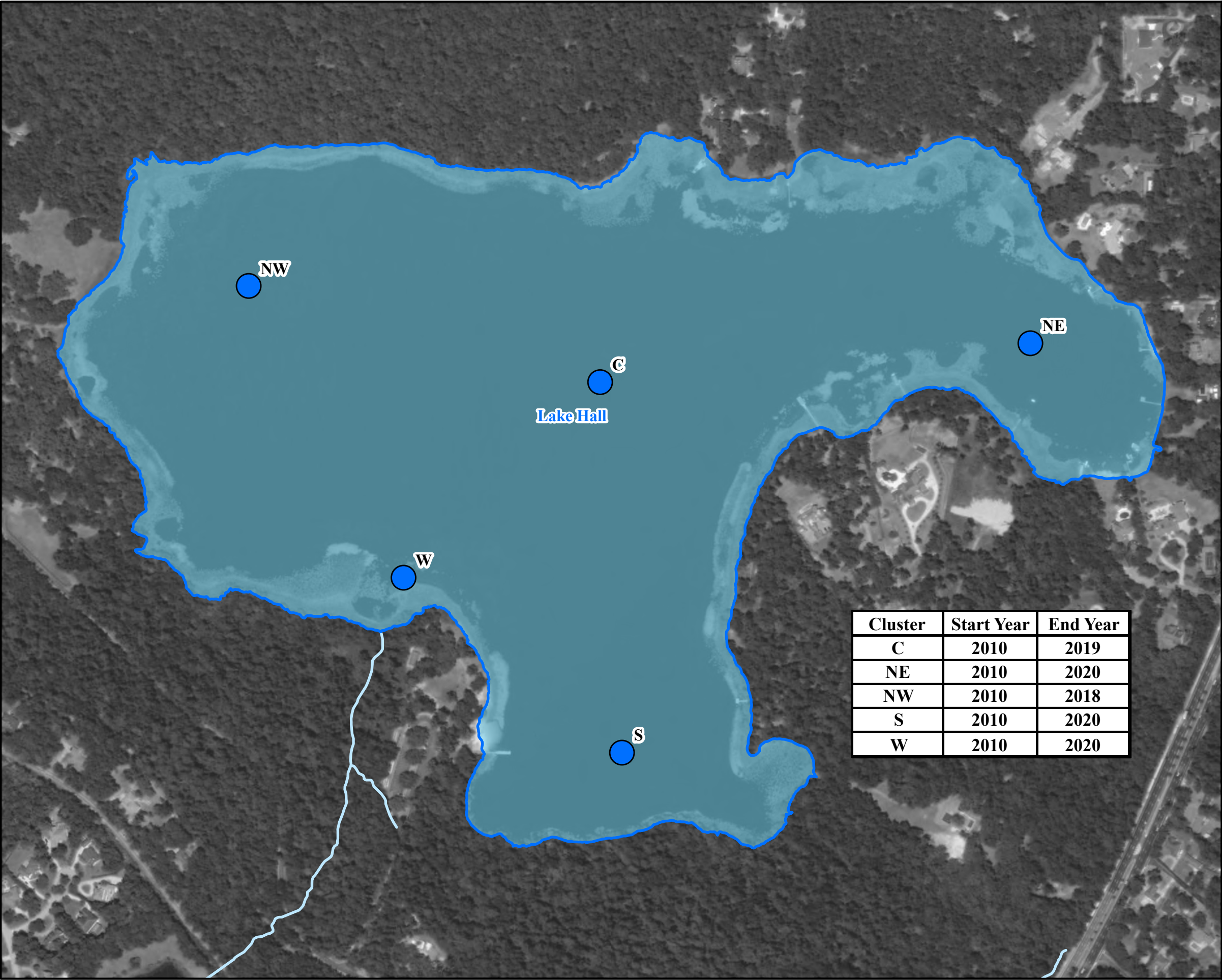
Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
S	2010	2020
W	2010	2020

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-138:
Spatial Assessment of Alkalinity in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)





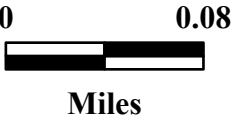
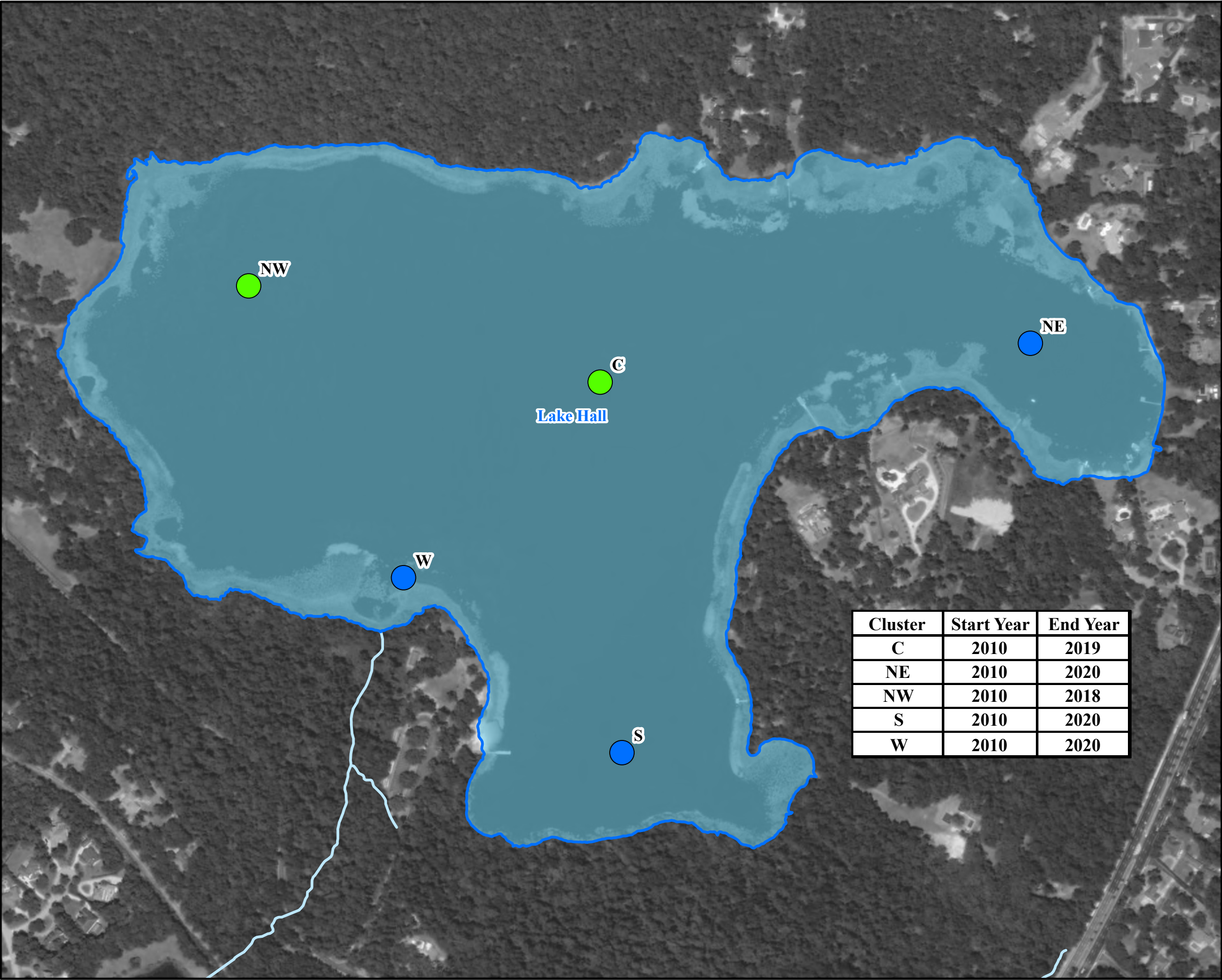
Legend

- Lake Hall
- Watercourses
- TN Average 2010-2020**
mg/L
 - 0 - 0.53
 - 0.53 - 0.66
 - 0.66 - 0.79
 - 0.79 - 0.93
 - > 0.93

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-139:
Spatial Assessment of TN in Lake Hall
Tallahassee Master Plan - Surface
Water (TMaPS)





Legend

 Lake Hall

 Watercourses

TP Average 2010-2020
mg/L

 0- 0.010

 0.010 - 0.017

 0.017 - 0.024

 0.024 - 0.030

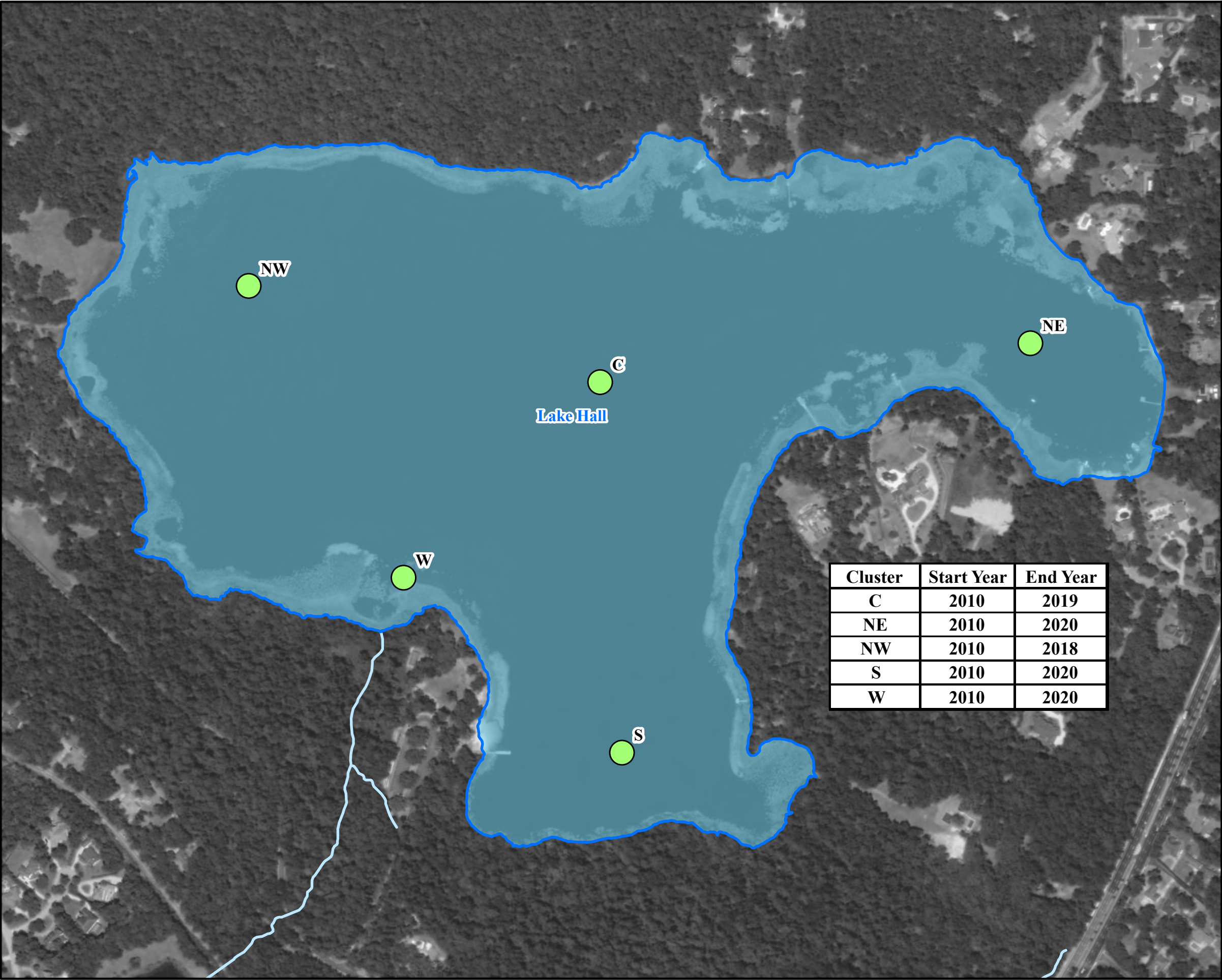
 > 0.03

Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
NW	2010	2018
S	2010	2020
W	2010	2020

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-140:
Spatial Assessment of TP in Lake Hall

**Tallahassee Master Plan - Surface
Water (TMaPS)**



- Legend**
- Lake Hall
 - Watercourses
 - Chl a Average 2010-2020**
µg/L
 - 0.0 - 1.5
 - 1.5 - 3.0
 - 3.0 - 4.5
 - 4.5 - 6.0
 - > 6

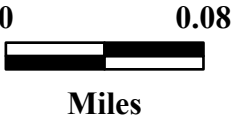
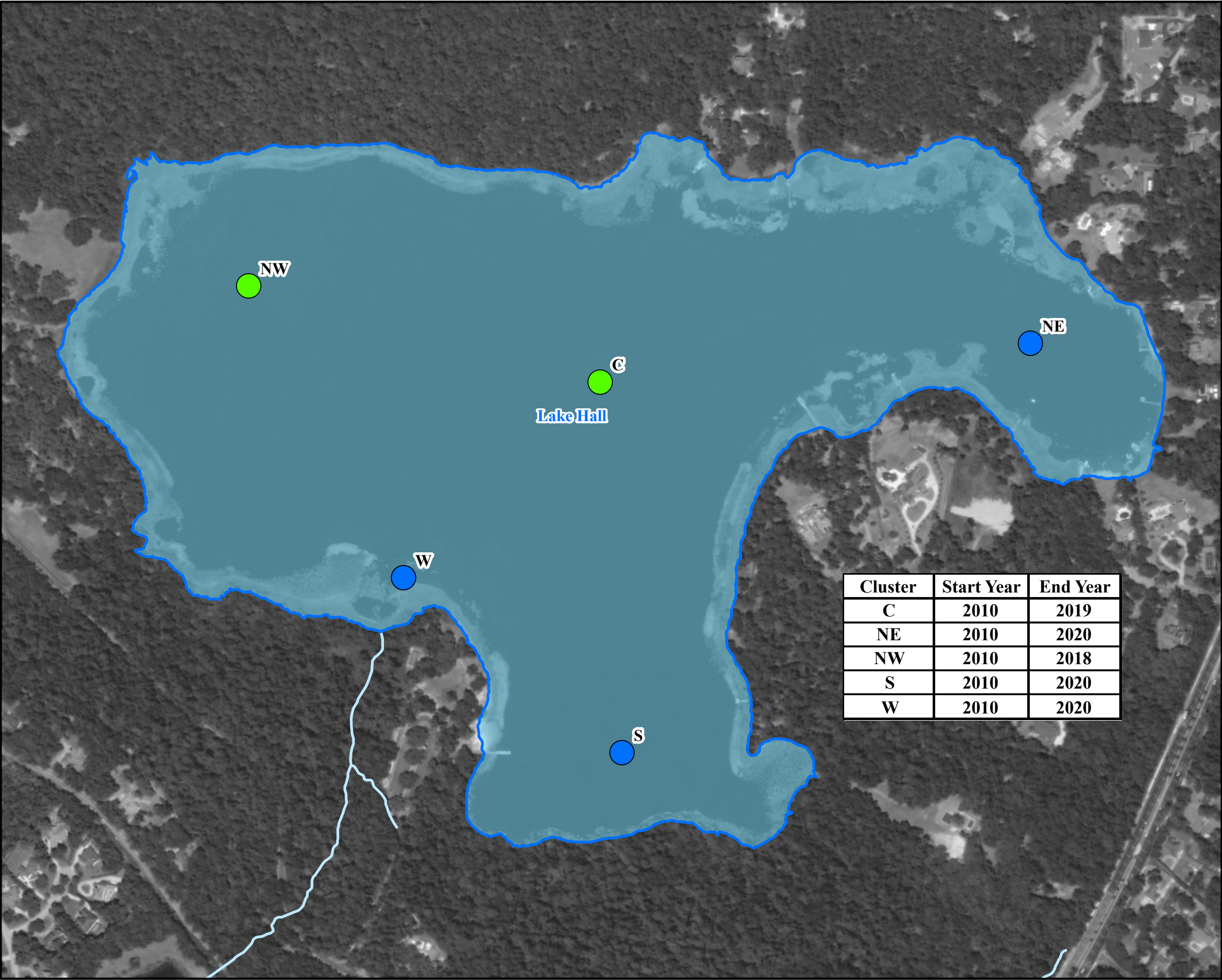
Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
NW	2010	2018
S	2010	2020
W	2010	2020

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-141:
Spatial Assessment of Chl a in Lake Hall

**Tallahassee Master Plan - Surface
Water (TMaPS)**





Legend

- Lake Hall
- Watercourses
- TSI Average 2010-2020
- TSI Score
 - 0 - 15
 - 15 - 30
 - 30 - 45
 - 45 - 60
 - > 60

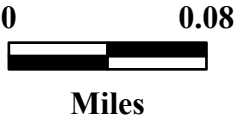
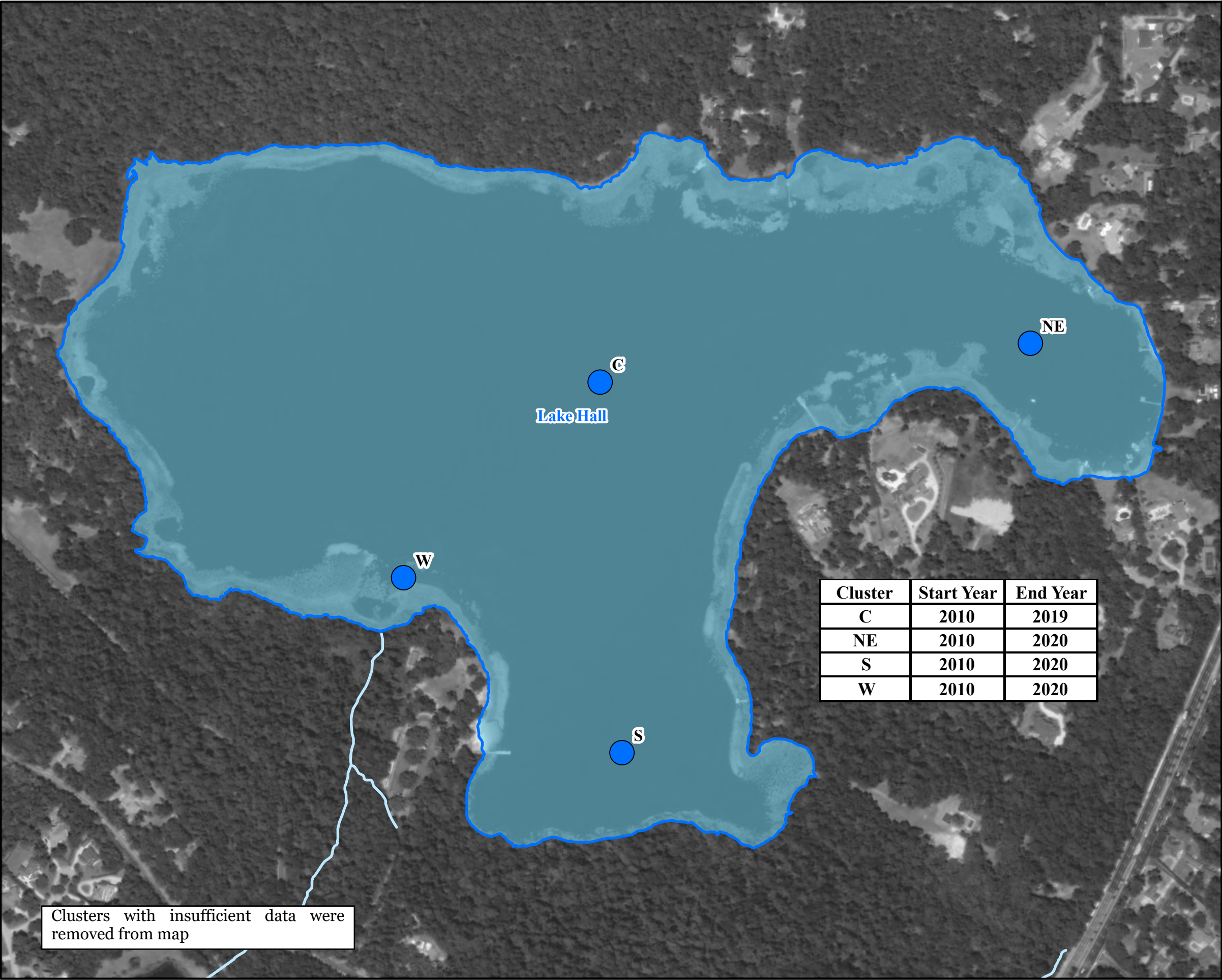
Cluster	Start Year	End Year
C	2010	2019
NE	2010	2020
NW	2010	2018
S	2010	2020
W	2010	2020

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-142:
Spatial Assessment of TSI in Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)





Legend

Lake Hall

Watercourses

E. coli 90th Percentile 2010-2020
MPN/100mL

< 100

100 - 200

200 - 300

300 - 410

> 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-143:
Spatial Assessment of E. coli in Lake Hall

Tallahassee Master Plan - Surface
Water (TMaPS)



4.8.4.4 Internal Recycling and Seepage

Internal Recycling

To date no studies or data collection efforts have been undertaken to assess the potential for loading from sediments in Lake Hall. Given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake and the lake depths, internal recycling is not identified as a significant source for loading to the lake.

A method for identifying the presence of benthic flux is the analysis of vertical profile data for field parameters such as DO, temperature, ORP, and specific conductance. This was described in **Section 4.4.5.5** for Lake Jackson. Evaluation of the available water quality data did not identify any vertical profile data collected. As such, this method could not be utilized for independent evaluation of the potential for internal recycling. Based on the determinations described above, no additional data collection/studies are recommended to quantify the internal nutrient flux for Lake Hall.

Seepage

As outlined in **Section 4.8.3.7**, no surficial aquifer data in the immediate vicinity of the lake and drain were identified. As such, no direct determination of seepage as a potential source can be made. As with the internal recycling assessment, the existing water quality and recent trends, along with the low *E. coli* levels, would indicate low potential.

4.8.4.5 Wastewater

Within the Lake Hall basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries and subbasins in relation to sewer service areas and sewer infrastructure. There is limited sewer infrastructure located in the drainage basin for Lake Hall, covering approximately 22 percent of the basin. Based on the limited sewer service area, along with the existing and trending water quality, wastewater infrastructure is not identified as a potential significant source of pollutant loads to Lake Hall.

4.8.4.6 Atmospheric Deposition

For Lake Hall, the ratio of the watershed area to lake area is around 4:1. With this low ratio, and the potential attenuation of rainfall runoff, direct atmospheric deposition to the lake would likely play a significant role in overall loading, especially for nitrogen. Atmospheric deposition will be accounted for both indirectly within stormwater runoff and directly as a load to the lake surface. **Section 4.4.3.11** identified the nearest atmospheric deposition station as the Quincy station (FL14) (**Figure 4-15**).

4.8.4.7 Interconnected Flows

No lakes are located upstream of Lake Hall, therefore, interconnected loads are not a source for the lake.

4.8.4.8 Summary of Findings

At present, nutrient levels and biological conditions in Lake Hall are excellent and are not exhibiting significant declining trends. *E. coli* levels are low for all recent measurements. Based on these analyses, and that the immediate drainage basin to the lake is mostly undeveloped and restrictions are in place for future development, the qualitative assessment indicates limited sources of pollutant loading to Lake Hall now and under future conditions. Septic densities are generally low, but some systems are found in the immediate vicinity of the lake.

Though these sources do not appear significant, stormwater runoff contributing to tributary inflow, septic, and atmospheric deposition are quantified for comparative purposes as part of this study based on available data. Internal recycling, seepage, and wastewater also do not appear to be significant sources and were not quantified as part of this study based on limited data. As no upstream waterbodies drain into Lake Hall, interconnected flow is not identified as a source.

4.8.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Lake Hall for the sources identified for calculation in **Section 4.8.4.8**. These include stormwater runoff, septic systems, and atmospheric deposition. Where loads were not calculated, the sections below provide brief discussions. The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

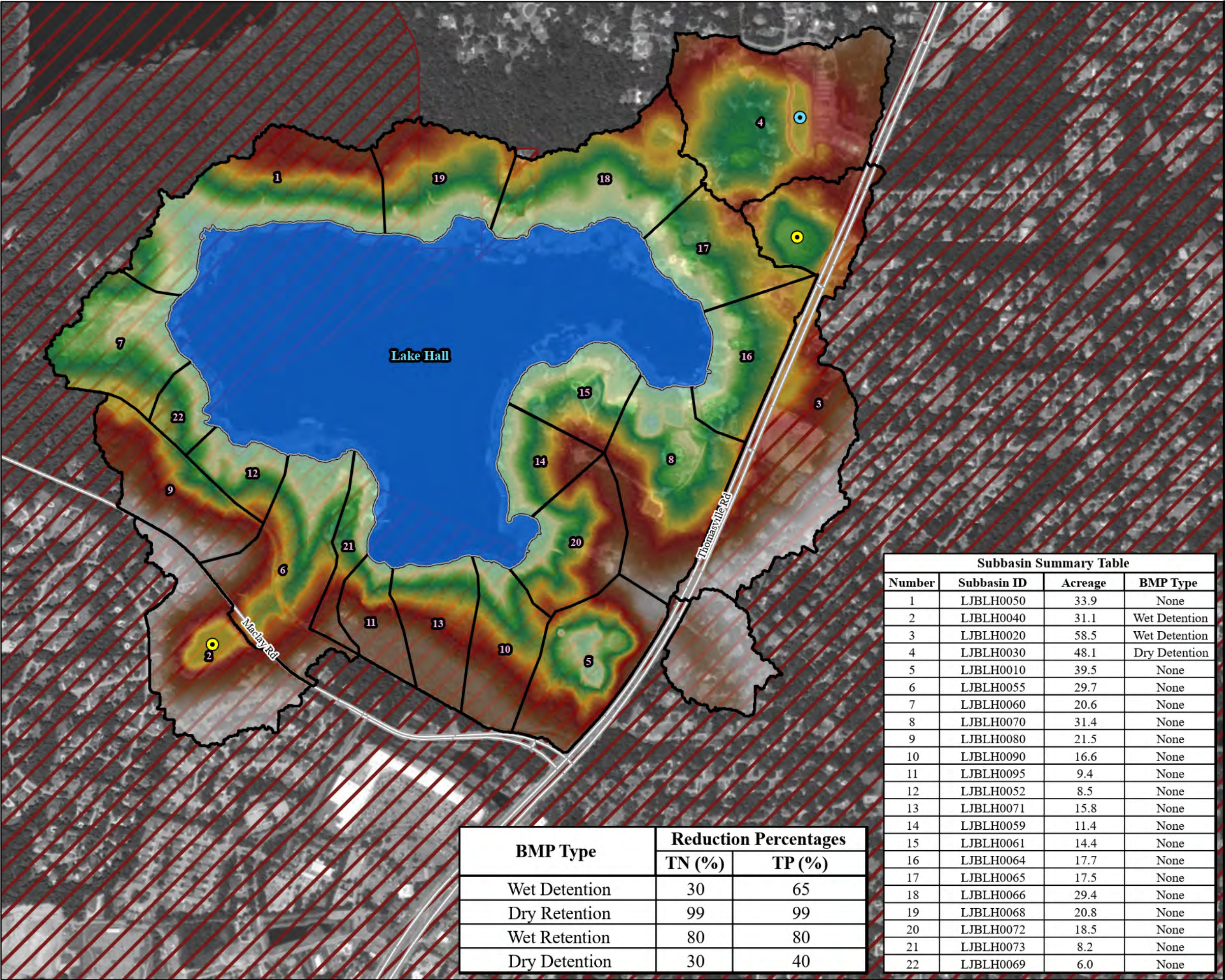
4.8.5.1 Stormwater Pollutant Load

To calculate the stormwater TN and TP loads to Lake Hall, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to Lake Hall. TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-144 presents the subbasins and the DEM utilized in the SIMPLE model calculations for Lake Hall. **Figure 4-145** presents the aggregated land use. Finally, **Figure 4-146** presents the CDAs for the Lake Hall stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs around the Lake.

Stormwater Nutrient Loads to Lake Hall

Figure 4-147 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-147**). The rankings are color coded, with the highest ranked CDAs in dark green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 7.3 lb/yr up to 243.3 lb/yr. The per acre loads ranged from 0.6 lb/acre/yr up to 6.0 lb/acre/yr. The highest ranked CDA (LJBLHOF05) was located within what is identified as a recreational land use area that has a high EMC value. This may not be fully reflective of conditions from this area. The other high ranked CDAs were located along the eastern side within areas of medium density land use. The higher ranked CDAs showed significantly higher per acre loads than those seen for the other more natural areas. The total potential stormwater runoff load for TN for Lake Hall is 1,049 lb/yr.





CITY OF
TALLAHASSEE

N

0 0.12

Miles

Legend

Lake Hall

Subbasins

Tallahassee Corporate Limits

BMP Type

Dry Detention

Wet Detention

Topographic Elevations
ft NAVD88

235

141

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-144:
**Lake Hall Subbasin Delineation
and BMPs**

**Tallahassee Master Plan - Surface
Water (TMaPS)**



BMP Type	Reduction Percentages	
	TN (%)	TP (%)
Wet Detention	30	65
Dry Retention	99	99
Wet Retention	80	80
Dry Detention	30	40

Subbasin Summary Table			
Number	Subbasin ID	Acreage	BMP Type
1	LJBLH0050	33.9	None
2	LJBLH0040	31.1	Wet Detention
3	LJBLH0020	58.5	Wet Detention
4	LJBLH0030	48.1	Dry Detention
5	LJBLH0010	39.5	None
6	LJBLH0055	29.7	None
7	LJBLH0060	20.6	None
8	LJBLH0070	31.4	None
9	LJBLH0080	21.5	None
10	LJBLH0090	16.6	None
11	LJBLH0095	9.4	None
12	LJBLH0052	8.5	None
13	LJBLH0071	15.8	None
14	LJBLH0059	11.4	None
15	LJBLH0061	14.4	None
16	LJBLH0064	17.7	None
17	LJBLH0065	17.5	None
18	LJBLH0066	29.4	None
19	LJBLH0068	20.8	None
20	LJBLH0072	18.5	None
21	LJBLH0073	8.2	None
22	LJBLH0069	6.0	None

The land uses presented in this map were derived from land cover data provided by NFWFMD with guidance from the SIMPLE Seasonal model documentation.



0 0.12
Miles

Legend

- Lake Hall
- Tallahassee Corporate Limits
- Aggregated Land Use
- Land Use Type
 - Commercial and Services
 - High-Density Residential
 - Highway
 - Light Industrial
 - Low-Density Residential
 - Low-Intensity Commercial
 - Medium-Density Residential
 - Recreational/Parks/Open Space
 - Undeveloped/Rangeland/Forest
 - Water
 - Wetlands

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

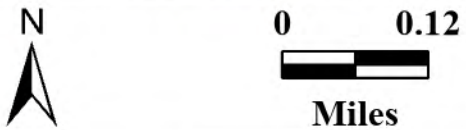
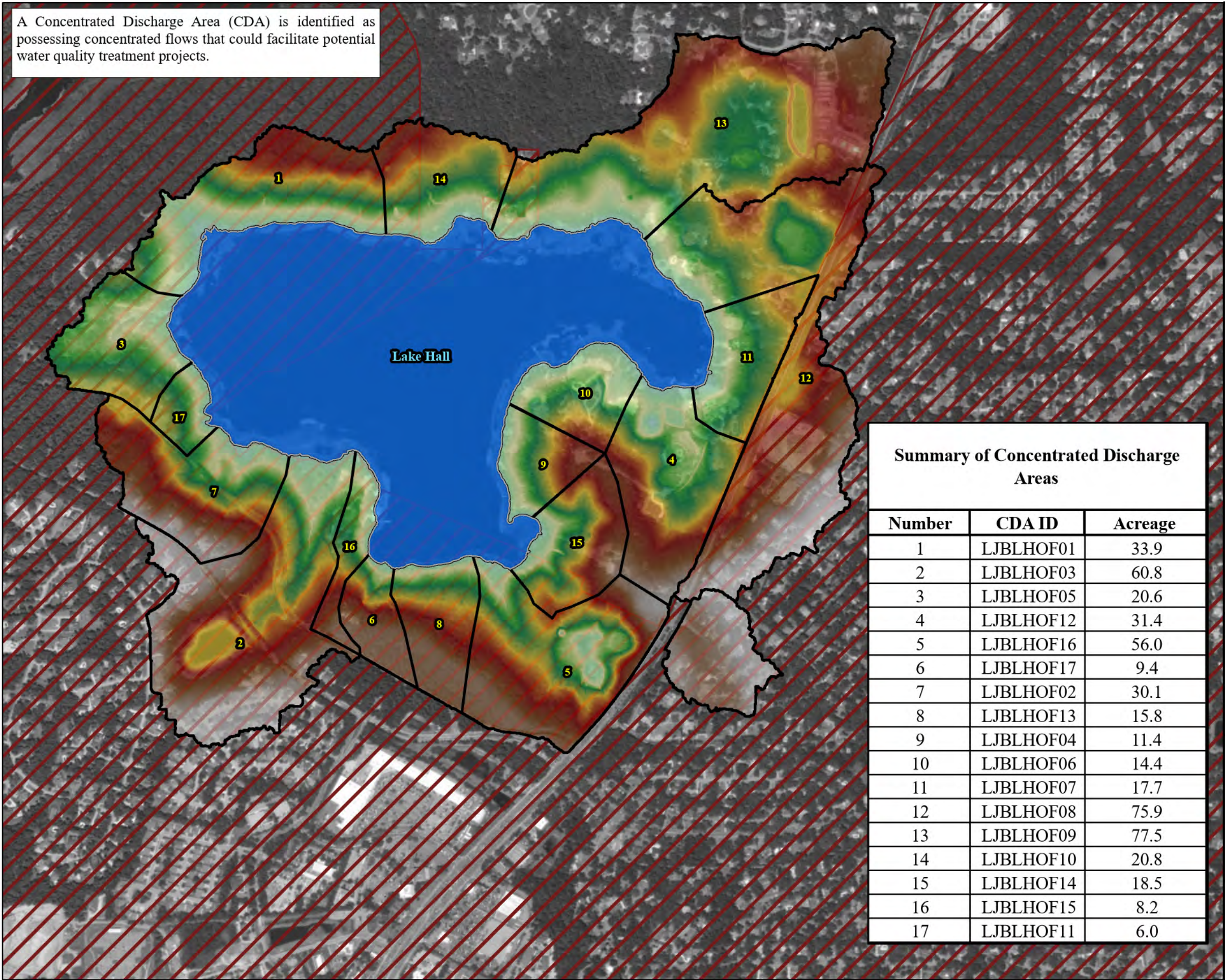
Aggregated Land Use Summary

Land Use Type	Acreage	Percent
Commercial and Services	5.5	1.1%
High-Density Residential	9.1	1.8%
Highway	11.4	2.2%
Light Industrial	6.5	1.3%
Low-Density Residential	120.1	23.6%
Low-Intensity Commercial	4.1	0.8%
Medium-Density Residential	89.3	17.6%
Recreational/Parks/Open Space	32.0	6.3%
Undeveloped/Rangeland/Forest	227.0	44.6%
Water	1.6	0.3%
Wetlands	2.0	0.4%

Figure 4-145:
Lake Hall Aggregated Land Use
Tallahassee Master Plan - Surface
Water (TMaPS)



A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



Legend

- Lake Hall
- Concentrated Discharge Areas
- Tallahassee Corporate Limits
- Topographic Elevations
ft NAVD88
 - 235
 - 141

Summary of Concentrated Discharge Areas

Number	CDA ID	Acreage
1	LJBLHOF01	33.9
2	LJBLHOF03	60.8
3	LJBLHOF05	20.6
4	LJBLHOF12	31.4
5	LJBLHOF16	56.0
6	LJBLHOF17	9.4
7	LJBLHOF02	30.1
8	LJBLHOF13	15.8
9	LJBLHOF04	11.4
10	LJBLHOF06	14.4
11	LJBLHOF07	17.7
12	LJBLHOF08	75.9
13	LJBLHOF09	77.5
14	LJBLHOF10	20.8
15	LJBLHOF14	18.5
16	LJBLHOF15	8.2
17	LJBLHOF11	6.0

Sources:
Waterbodies: COT, 2020
Flowlines: USGS, 2022
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-146:
Lake Hall Concentrated Discharge Areas

Tallahassee Master Plan - Surface
Water (TMaPS)



A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



CITY OF
TALLAHASSEE



0 0.12



Miles

Legend

Lake Hall

Concentrated Discharge Areas

Flowlines

Tallahassee Corporate Limits

CDA_s_TP

Ranking

High (1)

Low (17)

Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TN/yr)	Area Load (lbs-TN/ac/yr)	Ranking
1	LJBLHOF08	243.3	6.9	1
2	LJBLHOF05	124.0	6.0	2
3	LJBLHOF03	105.6	3.4	3
4	LJBLHOF07	78.2	4.4	3
5	LJBLHOF09	122.0	2.9	5
6	LJBLHOF16	103.4	3.1	6
7	LJBLHOF15	35.4	4.3	7
8	LJBLHOF12	56.7	1.8	8
9	LJBLHOF01	48.4	1.4	9
10	LJBLHOF02	28.5	1.7	9
11	LJBLHOF14	27.0	1.5	11
12	LJBLHOF04	15.7	1.4	12
13	LJBLHOF06	19.7	1.4	12
14	LJBLHOF11	7.6	1.3	14
15	LJBLHOF13	13.4	0.8	14
16	LJBLHOF10	13.4	0.6	16
17	LJBLHOF17	7.3	0.8	17
Total Load:		1,049.3		

Sources:
Waterbodies: COT, 2020
CDA_s: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-147:
Lake Hall Concentrated Discharge Areas
Total Nitrogen

Tallahassee Master Plan - Surface
Water (TMaPS)

Geosyntec
consultants

Figure 4-148 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-148**). The calculated total stormwater TP loads from the CDAs ranged from as low as 1.0 lb/yr up to 59.7 lb/yr. The per acre loads ranged from 0.1 lb/acre/yr up to 2.9 lb/acre/yr. The results for the TP looked similar in distribution and degree of per acre load as was seen for TN, with the recreational area again showing as highest ranked along with the medium density residential areas on the eastern side. The total potential stormwater runoff load for TP for Lake Hall is 259 lb/yr.

4.8.5.2 Septic Load

To analyze the potential impacts from septic tank units to Lake Hall, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The approach and calculations were described earlier in **Section 4.4.5.2**, which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN) and, based on literature on transport and assimilation, may represent a conservative potential load.

An estimated 24 septic tank units were identified within 200 meters of Lake Hall. **Figure 4-149** shows the septic systems utilized in the analyses with those associated with direct loading to the waterbody green and those associated with tributaries pink. Only one unit was identified as loading to tributaries. A table provided on the figure summarizes the calculated TN load from septic units. The total load is 270 lb/yr, with nearly all of this load from septic systems along the lake boundary.

4.8.5.3 Point Source Load

No active point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lake Hall.

4.8.5.4 Lake Inflow Load

There are no identified lakes upstream of Lake Hall. Therefore, the inter-lake TN and TP loads are set to 0 lb/yr.

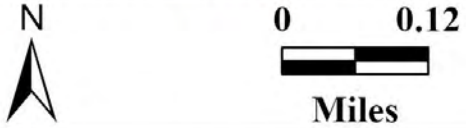
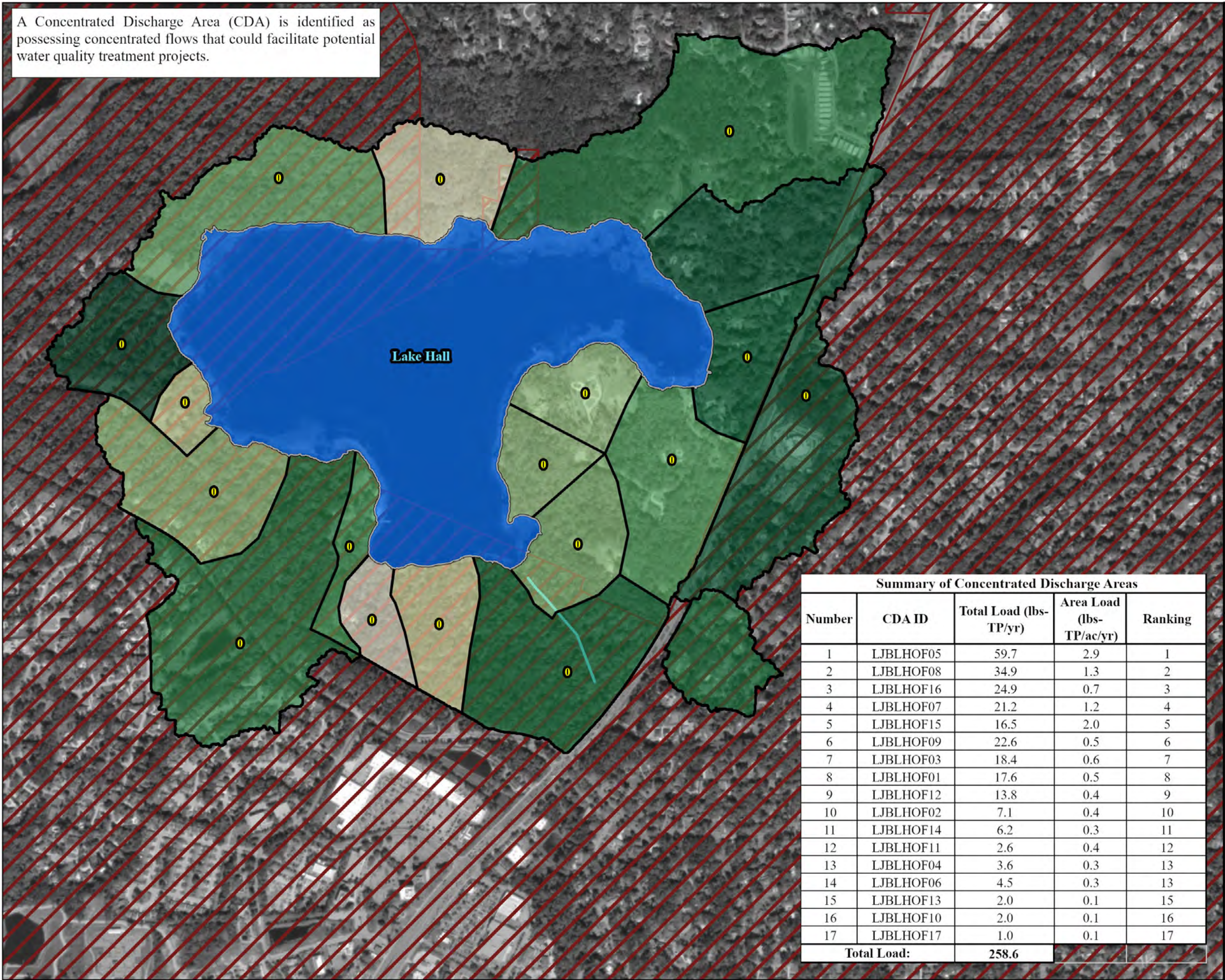
4.8.5.5 Internal Lake Load

The source assessment determined that, given the good water quality, healthy biological conditions, and general pristine nature of the direct drainage areas to the lake, internal loading was not likely to be a significant source of loading to the lake. Given the assessment and lack of data available for evaluation, no loading estimates were developed.

4.8.5.6 Atmospheric Deposition

As presented and discussed in **Section 4.4.5.6** the annual average atmospheric TN load per acre was calculated from the Quincy NADP station (F14) at 2.56 lb/acre/yr. Multiplying this by the acreage of Lake Hall (172 acres) gives a total TN load of 440 lb/yr. No data are available for TP, therefore only the nitrogen load is provided.

A Concentrated Discharge Area (CDA) is identified as possessing concentrated flows that could facilitate potential water quality treatment projects.



- Legend**
- Lake Hall
 - Concentrated Discharge Areas
 - Flowlines
 - Tallahassee Corporate Limits
- Ranking**
- High (1)
 - Low (17)

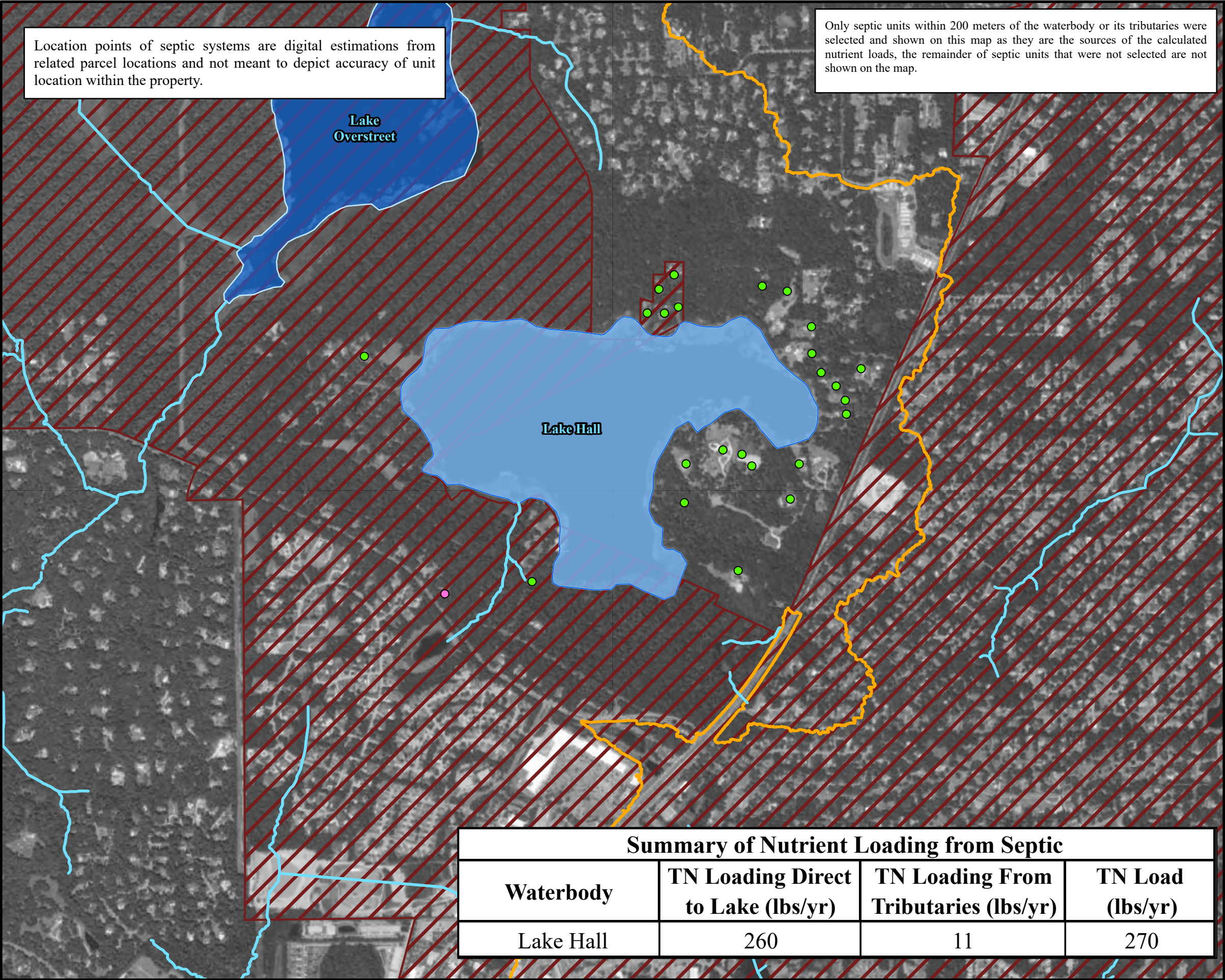
Summary of Concentrated Discharge Areas				
Number	CDA ID	Total Load (lbs-TP/yr)	Area Load (lbs-TP/ac/yr)	Ranking
1	LJBLHOF05	59.7	2.9	1
2	LJBLHOF08	34.9	1.3	2
3	LJBLHOF16	24.9	0.7	3
4	LJBLHOF07	21.2	1.2	4
5	LJBLHOF15	16.5	2.0	5
6	LJBLHOF09	22.6	0.5	6
7	LJBLHOF03	18.4	0.6	7
8	LJBLHOF01	17.6	0.5	8
9	LJBLHOF12	13.8	0.4	9
10	LJBLHOF02	7.1	0.4	10
11	LJBLHOF14	6.2	0.3	11
12	LJBLHOF11	2.6	0.4	12
13	LJBLHOF04	3.6	0.3	13
14	LJBLHOF06	4.5	0.3	13
15	LJBLHOF13	2.0	0.1	15
16	LJBLHOF10	2.0	0.1	16
17	LJBLHOF17	1.0	0.1	17
Total Load:		258.6		

Sources:
Waterbodies: COT, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

Figure 4-148:
Lake Hall Concentrated Discharge Areas
Total Phosphorus

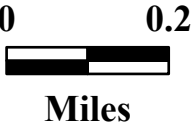
Tallahassee Master Plan - Surface
Water (TMaPS)





Location points of septic systems are digital estimations from related parcel locations and not meant to depict accuracy of unit location within the property.

Only septic units within 200 meters of the waterbody or its tributaries were selected and shown on this map as they are the sources of the calculated nutrient loads, the remainder of septic units that were not selected are not shown on the map.



Legend

- Lake Jackson Drainage Basin
- Lake Hall
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Relevant Septic Sites**
 - Lake
 - Tributaries

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 4-149:
Septic Loading to Lake Hall

Tallahassee Master Plan - Surface Water (TMaPS)

Summary of Nutrient Loading from Septic			
Waterbody	TN Loading Direct to Lake (lbs/yr)	TN Loading From Tributaries (lbs/yr)	TN Load (lbs/yr)
Lake Hall	260	11	270



4.8.5.7 Summary of Calculated Loads

Nutrient loads to Lake Hall were calculated for stormwater runoff, septic systems, and atmospheric deposition. **Table 4-22** presents the calculated total loads to the lake for TN and TP. For septic systems and atmospheric deposition, only TN loads were calculated (see **Section 4.8.5.2** and **Section 4.8.5.6** respectively for explanation).

Table 4-22: Summary of Calculated Loads to Lake Hall

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	1,049	259
Septic Systems	270	NC
Atmospheric Deposition	440	NC

NC – Not calculated.

4.9 Lexington Creek

This section presents the results from Tasks 1 through 3 for Lexington Creek. This includes an overview and history of the basin, present impairment status, an overview of available data, a qualitative assessment of potential pollutant sources, and calculation of potential pollutant loads.

4.9.1 Overview and History

Lexington Creek is an urban stream that flows from its headwaters in commercial areas off Timberlane Road, through wooded areas between Timberlane Road and I-10, crosses Meridian Road through the Lakeshore neighborhood, and eventually drains into Fords Arm and Lake Jackson (**Figure 4-150**). The creek is intermittent in nature, which at times has limited the ability to collect water quality samples. The southern side of the basin drains a considerable length of I-10. Lexington Creek basin (**Figure 4-150**) covers an area of 1,827 acres.

Leon County has identified potential water quality related issues on Lexington Creek. Those include increased erosion/sedimentation and higher nutrient concentrations associated with sampling during significant rain events. In 2012, a sampling event caught one of the larger rainfall events. Water quality measurements associated with this event showed elevated levels of turbidity, TSS, copper, and lead (Leon County, 2020). Additionally, Leon County staff identified that excessive erosion and sedimentation along the creek is a common event. In recent years, Leon County has noted higher TP levels in the creek, which have exceeded the NNC threshold for freshwater streams.

In addition to these issues, FIB concerns have been raised based on elevated concentrations of *E. coli*. Recent measurements by FDEP have shown elevated levels, although coincident measurements by Leon County did not show the same elevated concentrations. These discrepancies in the available measured data are being evaluated as part of a joint effort between FDEP and Leon County to quantify pollutant loads to Lake Jackson from the Lexington Creek watershed. The approach is outlined within the Lake Jackson Monitoring Plan prepared by FDEP (FDEP, 2021). The FIB data discrepancies are discussed later in this section.

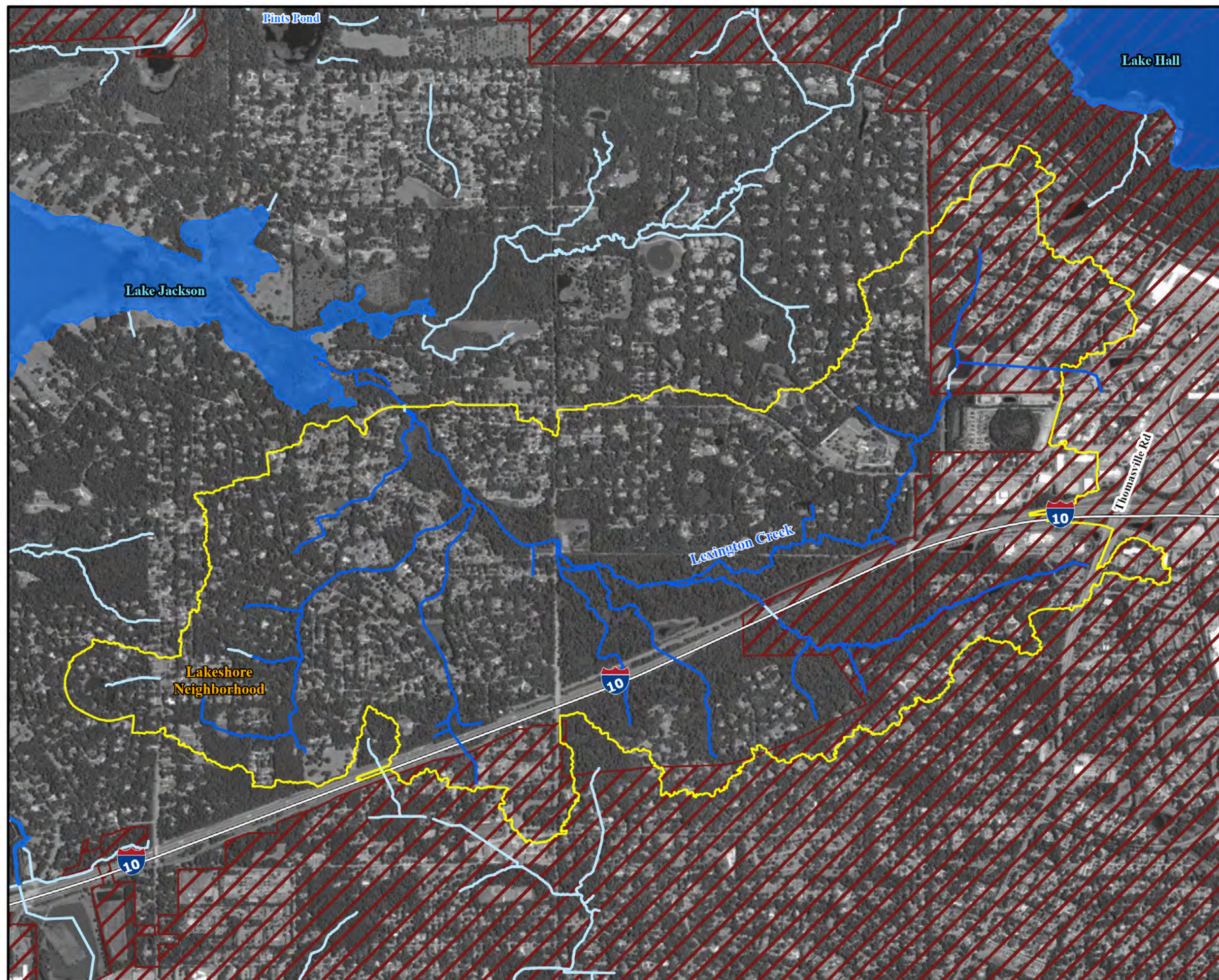
In response to concerns on FIB levels in Lexington Creek, beginning in March 2019, the City performed maintenance activities on the sanitary sewer system to alleviate concerns with inflow/infiltration in proximity to Lexington Creek. As part of this work, 156 manholes and more than 4,500 linear feet of clay pipe within the service area surrounding Lexington Creek were lined.

4.9.2 Regulatory Status

Exhibit 4-2 presented the verified impaired waters within the overall Lake Jackson basin. Presently, Lexington Creek is verified impaired for *E. coli*. This is the only verified listing for Lexington Creek.

4.9.3 Waterbody Data Review and Summary

This section presents an overview of available data and data sources for Lexington Creek and the Lexington Creek basin, including land use, soils, septic systems, hydrologic measurements, surface water quality, groundwater quality, biological, stormwater treatment facilities, and atmospheric deposition.



0 0.32
Miles

Legend

- Lexington Creek Drainage Basin
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020

Figure 4-150:
Lexington Creek Drainage Basin Overview

Tallahassee Master Plan - Surface
Water (TMaPS)

Geosyntec
consultants

4.9.3.1 Land Use

Figure 4-151 presents a map of the Level 2 land uses within the Lexington Creek basin. A table is provided to show the overall acreages and percent cover. Tables are provided for both the Level 2 and grouped Level 1 land uses. The largest land use within the Lexington Creek basin per the grouped Level 1 categories is Urban and Built Up (69 percent). This is made up primarily of Low Density Residential with some Medium Density Residential. There is a cluster of Commercial land use in the headwaters of the drainage basin in the area where Timberlane Road and Thomasville Road meet.

4.9.3.2 Soils

The most prevalent soil group in the Lexington Creek basin is Group B (64 percent) (**Figure 4-152**). Group B soils are considered to have moderate rates of infiltration. The second highest soil group is Group A/D (18 percent), which has low rates of infiltration due to a high-water table. There is also a significant area of Group C soils, which have moderate rates of infiltration.

4.9.3.3 Septic Systems

An estimated 594 septic systems are within the boundaries of the Lexington Creek drainage basin (**Figure 4-153**). The systems are located in specific clusters, including portions of the Lakeshore neighborhood and other neighborhoods to the southwest of Lakeshore Drive, various neighborhoods north of the creek along Timberlane Road, and a small cluster south of I-10.

4.9.3.4 Hydrologic Data

There is a single stage and flow station located along Lexington Creek where it crossed Meridian Road (Station 008454). The station location is shown on **Exhibit 4-6**. The flow data from this station was presented and discussed in **Section 4.4.3.6** for Lake Jackson.

4.9.3.5 Surface Water Quality Data

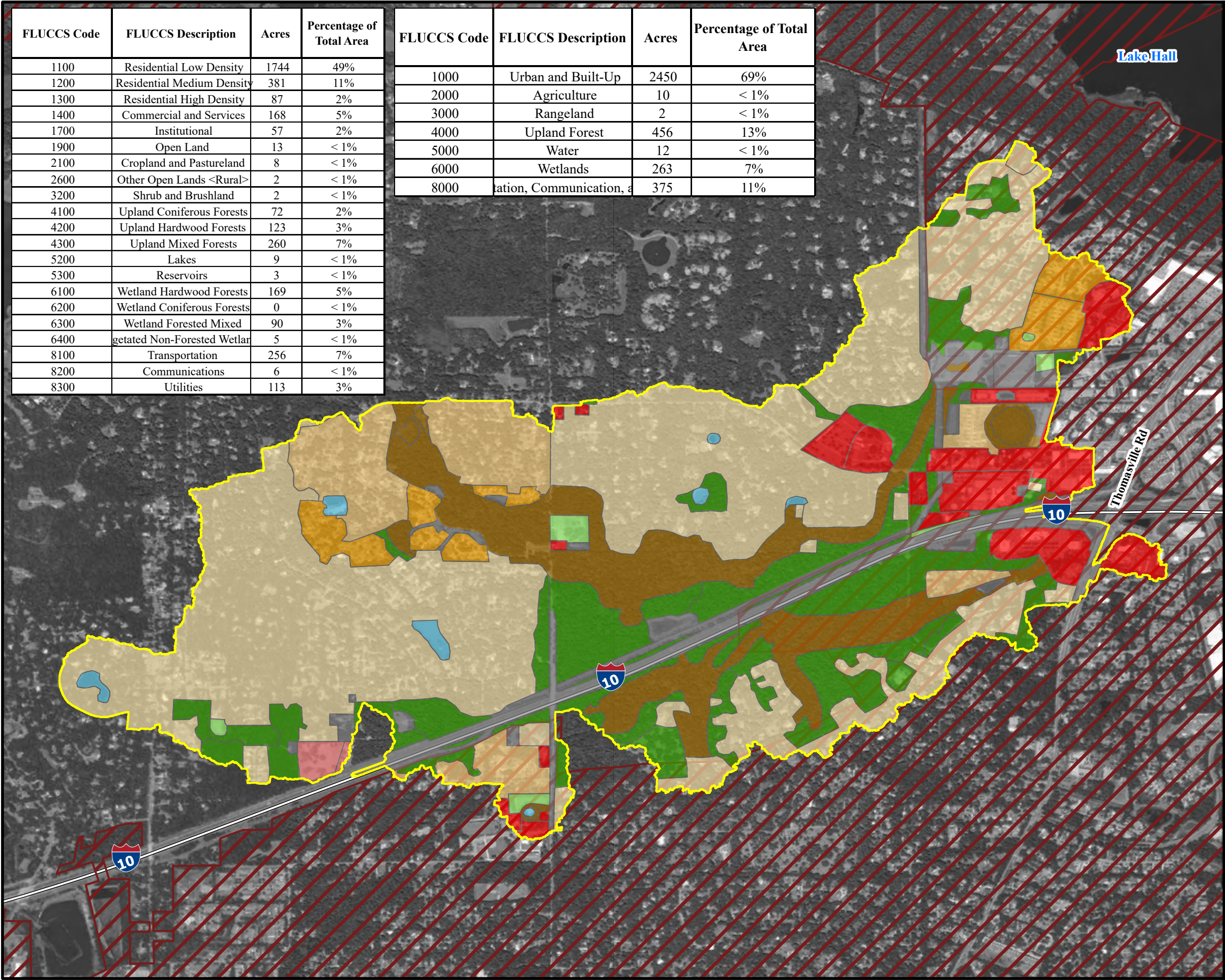
The IWR dataset for the Lexington Creek drainage basin spans from 1996 to 2020 and includes data collected by FWC, FDEP and Leon County (**Figure 4-154**). A table is provided in **Figure 4-154** that shows the ID, station name, period of record, sample count, and data source. Based on the number of stations and the length of the station IDs, station IDs were not included on the figure, rather each of the stations is given a number and the numbers correspond to stations in the table.

The data collected prior to 2001 was from a single station (#1) located in an upstream portion of the basin. The primary location with continuous measurements is just upstream of where the creek flows into Fords Arm (#5, #6, and #7). These data were collected by Leon County and FDEP. At this site, data are available from 2005 to the present. The other locations throughout the basin were sampled for short discrete periods by FDEP.

Figure 4-155 and **Figure 4-156** present plots of the TN and TP data, respectively, from 2010 to 2020. Examination of the data shows TN and TP levels slightly decreasing during that period. There was a significant outlier point in 2012 which was from an event sampled by Leon County that was described earlier.

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1100	Residential Low Density	1744	49%
1200	Residential Medium Density	381	11%
1300	Residential High Density	87	2%
1400	Commercial and Services	168	5%
1700	Institutional	57	2%
1900	Open Land	13	< 1%
2100	Cropland and Pastureland	8	< 1%
2600	Other Open Lands <Rural>	2	< 1%
3200	Shrub and Brushland	2	< 1%
4100	Upland Coniferous Forests	72	2%
4200	Upland Hardwood Forests	123	3%
4300	Upland Mixed Forests	260	7%
5200	Lakes	9	< 1%
5300	Reservoirs	3	< 1%
6100	Wetland Hardwood Forests	169	5%
6200	Wetland Coniferous Forests	0	< 1%
6300	Wetland Forested Mixed	90	3%
6400	Vegetated Non-Forested Wetlands	5	< 1%
8100	Transportation	256	7%
8200	Communications	6	< 1%
8300	Utilities	113	3%

FLUCCS Code	FLUCCS Description	Acres	Percentage of Total Area
1000	Urban and Built-Up	2450	69%
2000	Agriculture	10	< 1%
3000	Rangeland	2	< 1%
4000	Upland Forest	456	13%
5000	Water	12	< 1%
6000	Wetlands	263	7%
8000	ation, Communication, &	375	11%



Legend

Lexington Creek Drainage Basin

Land Use Type

- 1100: Residential Low Density
- 1200: Residential Medium Density
- 1300: Residential High Density
- 1400: Commercial and Services
- 1700: Institutional
- 1900: Open Land
- 2100: Cropland and Pastureland
- 2600: Other Open Lands <Rural>
- 3200: Shrub and Brushland
- 4100: Upland Coniferous Forests
- 4200: Upland Hardwood Forests
- 4300: Upland Mixed Forests
- 5200: Lakes
- 5300: Reservoirs
- 6100: Wetland Hardwood Forests
- 6200: Wetland Coniferous Forests
- 6300: Wetland Forested Mixed
- 6400: Vegetated Non-Forested Wetlands
- 8100: Transportation
- 8200: Communications
- 8300: Utilities

Sources:
 Waterbodies: COT, 2020
 Watercourses: COT, 2020
 Drainage Basins: COT, 2020
 Roads: COT-Leon County, 2023
 City Limits: COT, 2020
 Land Use: NFWMD, 2019

Figure 4-151:
Lexington Creek Basin Land Use
Tallahassee Master Plan - Surface
Water (TMaPS)



Hydrologic Soil Group	Acres	Perecentage of Total Area
A	21	1%
A/D	331	18%
B	1185	64%
B/D	15	1%
C	278	15%
C/D	16	1%
Water	8	< 1%



Legend

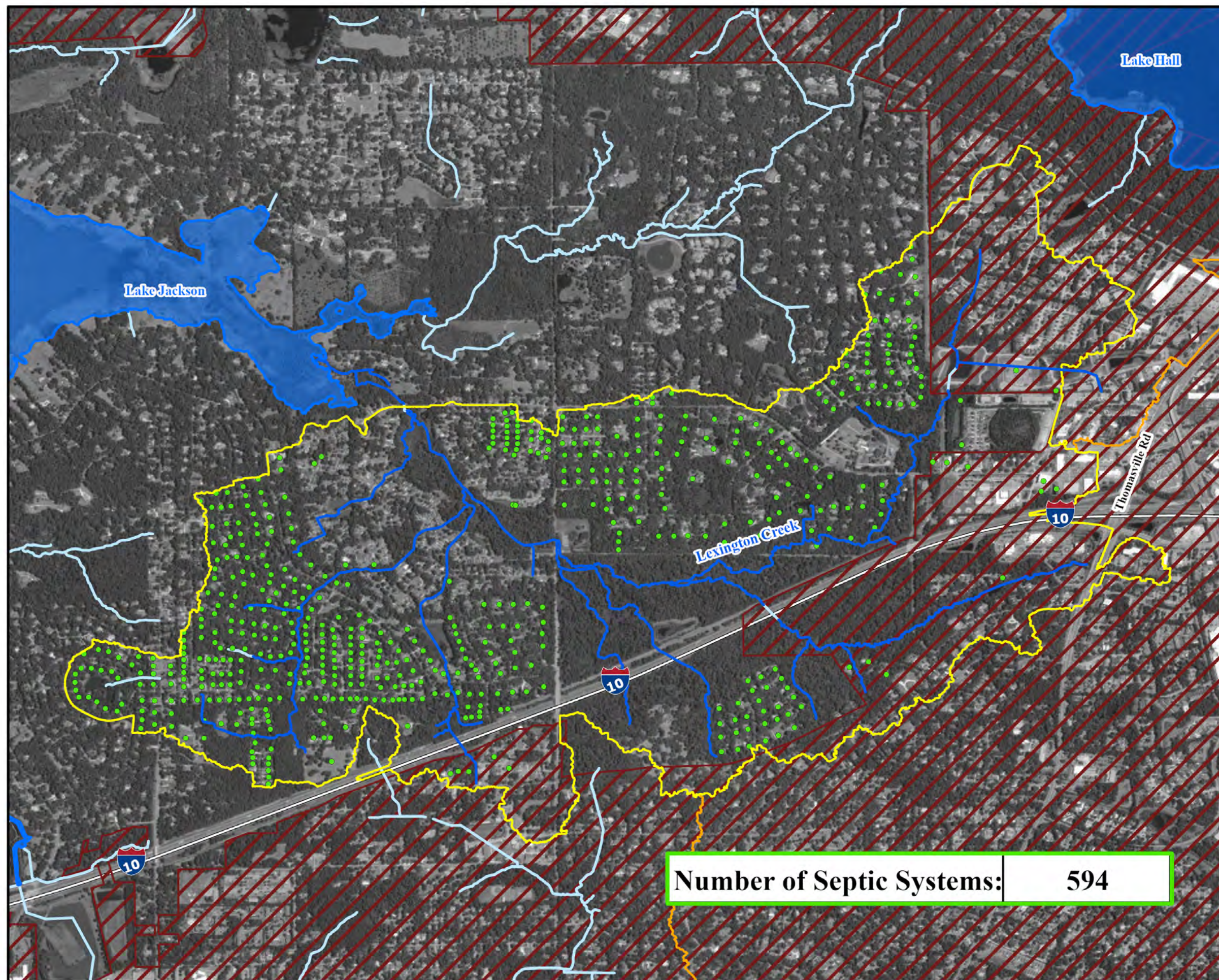
- Lexington Creek Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits
- Hydrologic Soil Group
 - A
 - A/D
 - B
 - B/D
 - C
 - C/D
 - Water

Sources:
Waterbodies: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Soils: NRCS, 2020

Figure 4-152:
Lexington Creek Basin Soils

Tallahassee Master Plan - Surface
Water (TMaPS)





Legend

- Lexington Creek Drainage Basin
- Lexington Creek
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Septic Systems

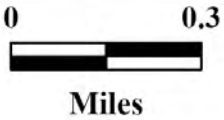
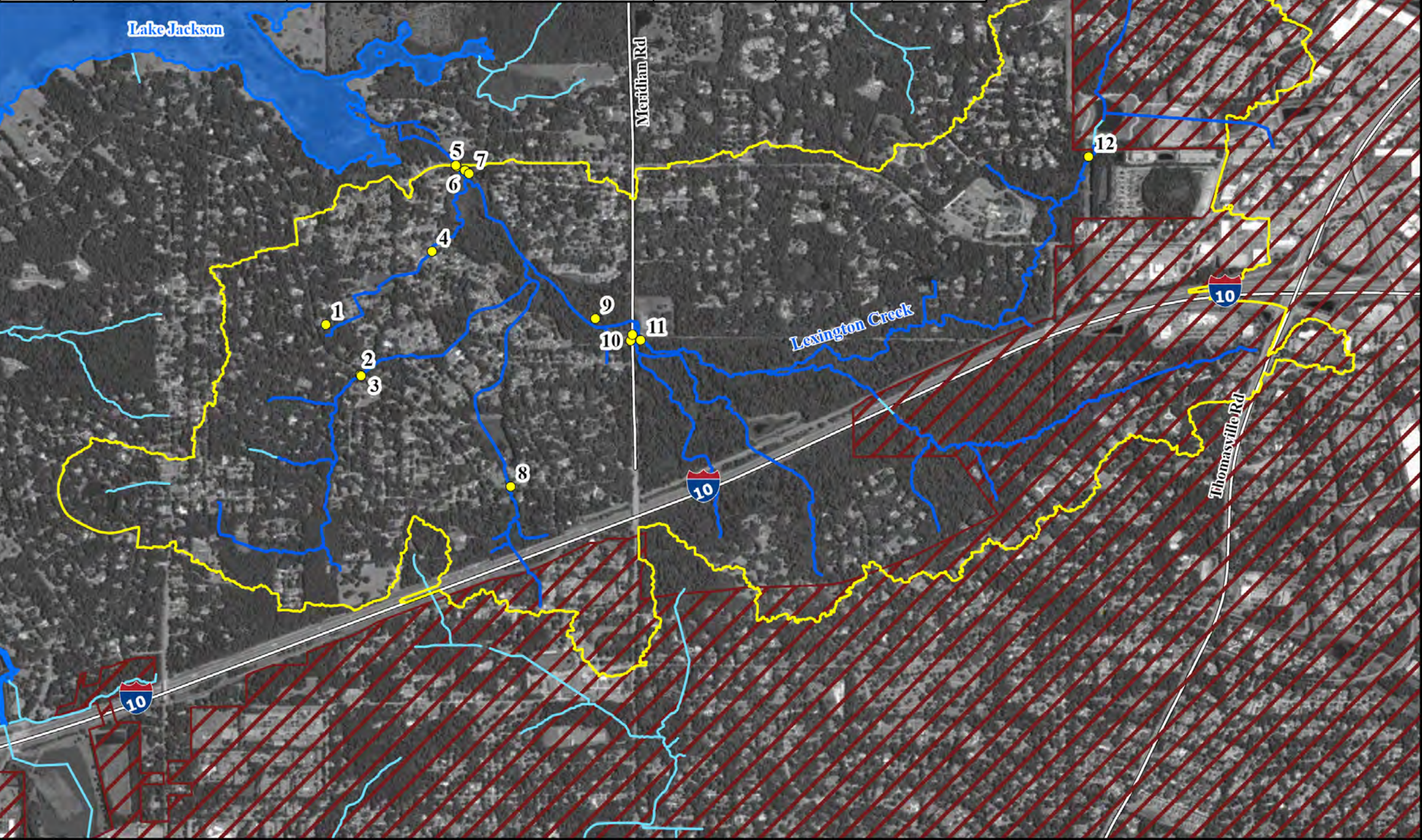
Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
Septic Systems: COT, 2022

Figure 4-153:
Lexington Creek Drainage Basin Septic Systems

Tallahassee Master Plan - Surface Water (TMaPS)

Geosyntec
consultants

Number	StationID	StationName	Start of Record	End of Record	Source
1	21FLGFWF03120003-LJ-02	Lake Jackson Station 2	1996	1999	FWC
2	21FLTLHRG1TLHR0108	Unnamed Branch @ Lakeshore Dr	2019	2019	FDEP
3	21FLWQA 302954908417159	Brookforest Trib at Lakeshore Dr	2001	2001	FDEP
4	21FLTLHRG1TLHR0105	Unnamed Branch @ John Hancock Dr	2019	2019	FDEP
5	21FLLEONLCLJ3050684284	Lexington Trib @ Timberlane Rd	2007	2019	Leon County
6	21FLTLHRG1TLHR0088	Lexington Creek @ Timberlane Rd	2018	2020	FDEP
7	21FLWQSPLEO122US	Lexington Trib At Timberlane Rd (WBID 758)	2005	2006	FDEP
8	21FLWQA 302939708416553	Yorktown Trib at Lakeshore Dr	2001	2001	FDEP
9	21FLTLHRG1TLHR0109	Lexington Creek 100m downstream n Meridian Rd	2019	2019	FDEP
10	21FLWQA 302959708416388	Lexington Trib at Meridian Rd (SR 155)	2001	2006	FDEP
11	21FLTLHRG1TLHR0106	Lexington Creek @ N Meridian Rd	2019	2019	FDEP
12	21FLTLHRG1TLHR0107	Lexington Creek @ Power Line	2019	2019	FDEP



Legend

- Lexington Creek Drainage Basin
- Lexington Creek
- Waterbodies in Study
- Watercourses
- Tallahassee Corporate Limits
- Water Quality Stations

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Drainage Basins: COT, 2020
Roads: COT-Leon County, 2023
City Limits: COT, 2020
WQ Stations: FDEP, 2022

Figure 4-154:
Lexington Creek Water Quality Station
Locations

Tallahassee Master Plan - Surface
Water (TMaPS)



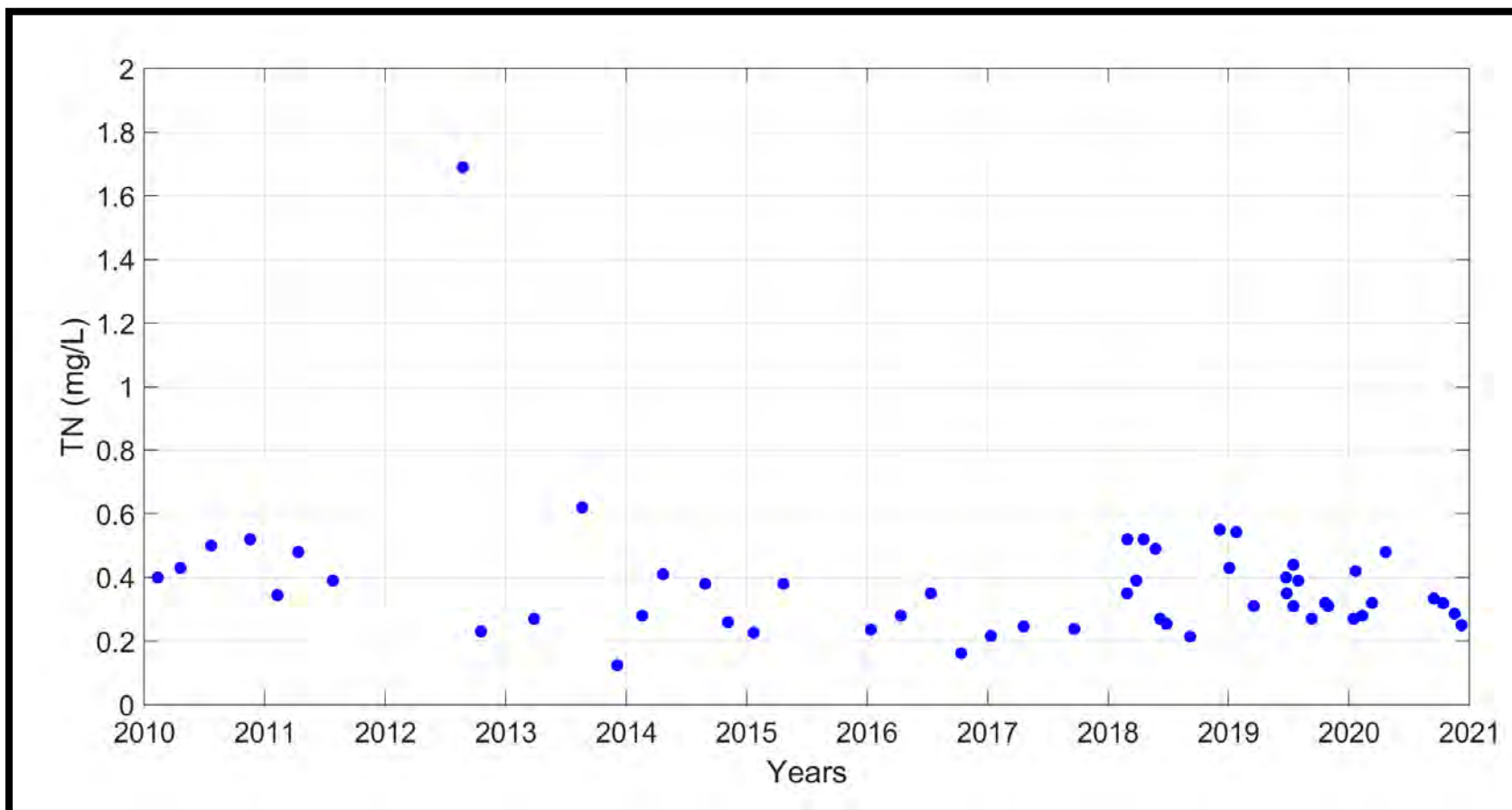
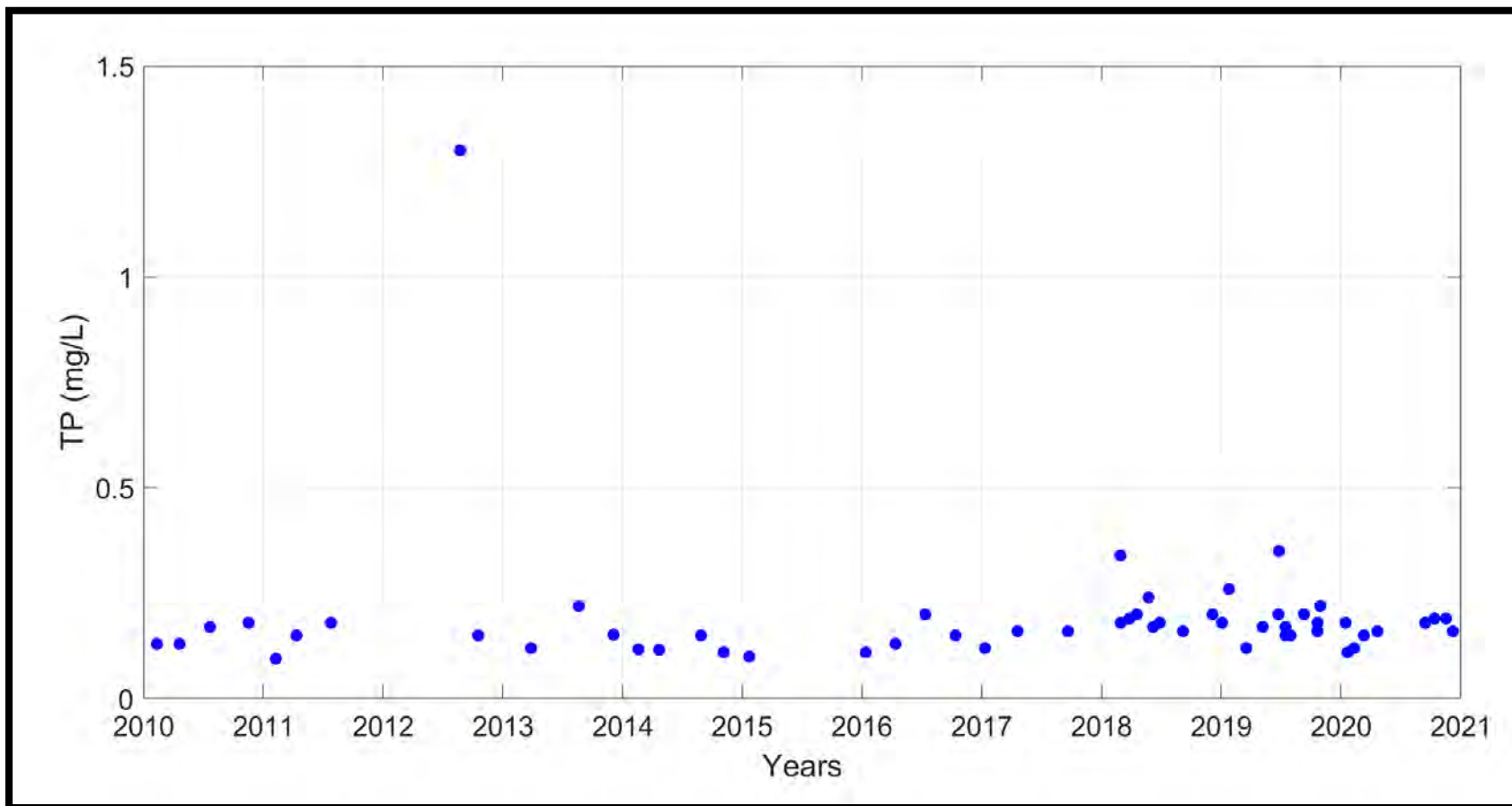


Figure 4-155: Plot of Measured TN



Under FDEP's NNC, the freshwater stream thresholds are 0.18 mg/L for TP and 1.03 mg/L for TN as AGMs. For *E. coli*, the freshwater stream criteria are monthly geometric means below 126 colonies per 100 mL of water and less than 10 percent of samples above 410 colonies per 100 mL of water in any 30-day period. For the purpose of determining FIB impairments where data are collected monthly, per 62-303 F.A.C., FDEP assesses all the samples collected through the verified period to determine the number of samples that are above the threshold. If the number of samples (based on the sample size) is greater than or equal to numbers provided in the tables within 62-303 (to provide 90 percent confidence), the waterbody is deemed impaired. The FDEP threshold for this analysis is 410 MPN/100 mL.

Figure 4-157 and **Figure 4-158** present plots of the TN and TP annual geomeans from 2010 to 2020 for all the data along the creek for years with sufficient samples. In addition to the geomeans, the NNC criteria are plotted as dashed lines on the graphs. The data show that TN geometric means are well below the NNC threshold for years with sufficient data. The TP annual geomeans are generally below the thresholds, with a number of years above the threshold. The TP annual geomeans were above the threshold for two consecutive years in 2018 and 2019. This aspect was noted by Leon County in its assessment of the waterbody (Leon County, 2019). In response to higher TP levels in the creek in recent years, concerns have been raised on sediment issues associated with the recently constructed stormwater treatment facility at the intersection of Lexington Creek and Meridian Road. This issue warrants further investigation.

Figure 4-159 presents a plot of the measured *E. coli* from all the stations from 2014 through 2020. The data are plotted with the 410 MPN/100 mL threshold (described earlier) as a dashed line. Examination of the data indicates that the 410 MPN/100 mL threshold was exceeded at times prior to 2018, but the more recent data show much greater exceedances, with measurements as high as 8,000 MPN/100 mL, with multiple samples above 1,000 MPN/100 mL.

As was noted previously, discrepancies in the measured data between FDEP and Leon County are significant and may impact the present FIB impairment status of the creek as outlined in **Section 4.9.2**. Based on review of the methodologies used in the data analyses, Leon County utilized the EPA methodology (EPA, 1603) that the water quality standards were based on. The

City notified FDEP of this issue in comments made on the Revised Draft Verified List of Impaired Waters in the Ochlockonee – St. Marks Basin (City, 2019). The differences cannot be explained based on timing of the sampling or based on sample locations (FDEP sampled a number of other locations along with the primary station) because samples collected at nearly coincident times and conditions showed distinctly different results. The City identified in its comments that the improvements to the sanitary sewer system in the area occurred in conjunction with Leon County sampling that showed improvements in the *E. coli* levels. The discrepancies can be seen in the Leon County data plotted in **Figure 4-159** in blue versus the FDEP data in red.

4.9.3.6 Groundwater Data

Presently there are no surficial groundwater monitoring wells identified within the Lexington Creek basin.

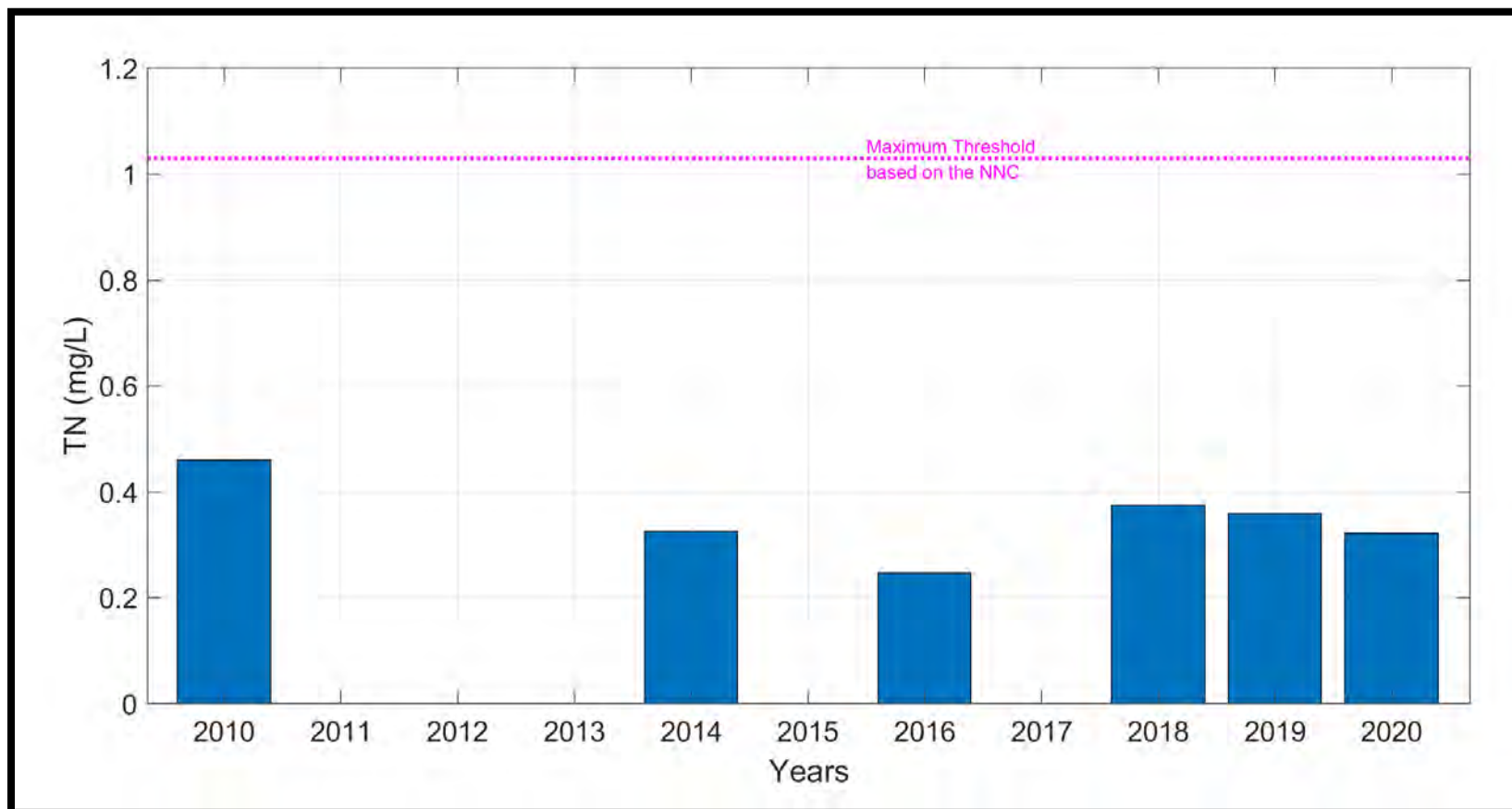


Figure 4-157: Plot of Annual Geometric Means for TN with NNC Criteria for Lexington Creek

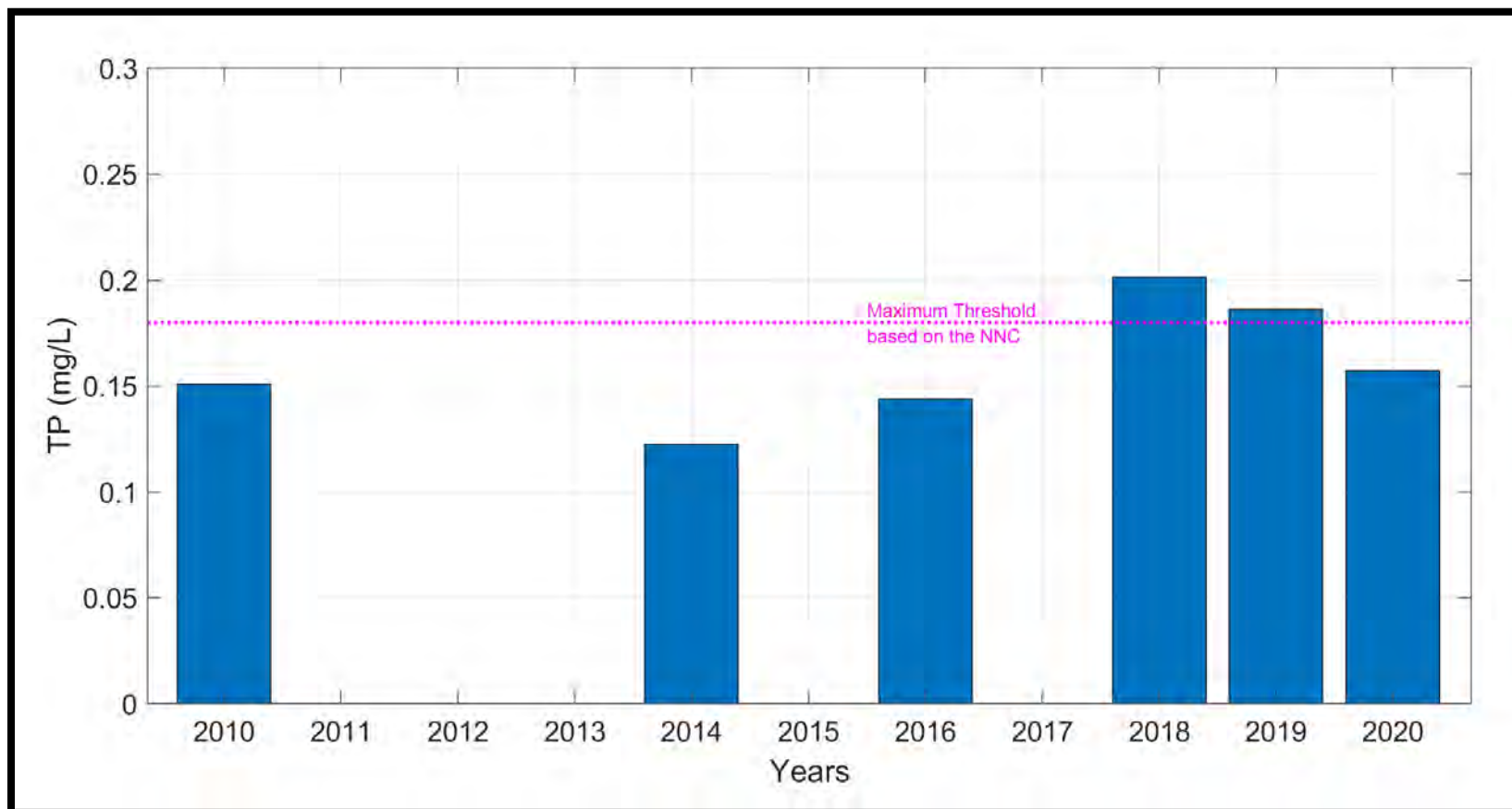


Figure 4-158: Plot of Annual Geometric Means for TP with NNC Criteria for Lexington Creek

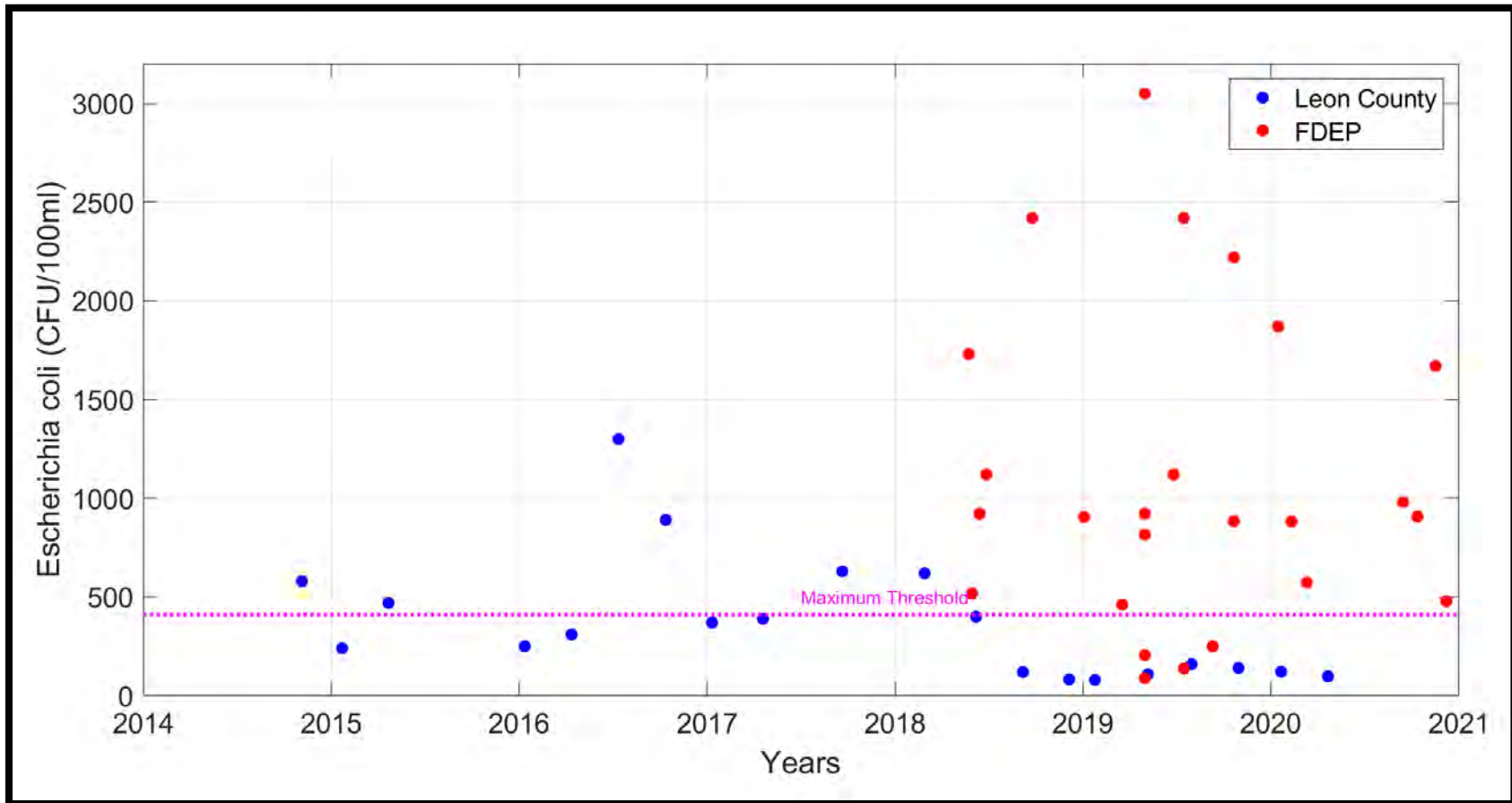


Figure 4-159: Plot of *E. coli* Measurements (2014 to 2020)(Leon County – blue, FDEP – red)

4.9.3.7 Biological Data

Biological data in Lexington Creek consists of SCI and habitat assessment (HA) conducted by Leon County and FDEP. **Table 4-23** presents SCI data collected on the creek. Data are available only from 2010 and 2018. The SCI score in 2010 was 33, whereas the two scores from 2018 were 35 and 42. A score above 39 represents healthy conditions. Therefore, the limited SCI determinations would indicate the system may not be healthy relative to taxa. The HA scores ranged from optimal to suboptimal and, based on the Leon County assessment in 2018, were identified as suboptimal overall (Leon County, 2019).

Table 4-23: Summary of SCI Results from Lexington Creek

Date	Station ID	SCI	Aquatic Life Use Category
8/20/2010	21FLLEONLCLJ3050684284	33	Impaired
4/18/2018	21FLTLHRG1TLHR0088	35	Impaired
10/30/2018	21FLLEON26	42	Healthy

4.9.3.8 Stormwater Treatment Facilities

Figure 4-160 presents a map showing the locations of stormwater treatment facilities throughout the Lexington Creek basin. Within the City incorporated areas on the eastern and southern edges of the basin, there are a number of City treatment ponds, along with some privately maintained ponds. These are a mixture of dry and wet ponds. FDOT maintains multiple wet detention facilities that provide treatment for waters draining off I-10. Leon County maintains a number of dry retention facilities (and one wet) on the edge of the riparian area of the creek to treat runoff from the adjacent neighborhoods. Leon County also maintains a large regional treatment facility (Yorktown Pond) within the basin (**Exhibit 4-1**). In 2018, Leon County constructed a stormwater facility where the creek crosses Meridian Road.

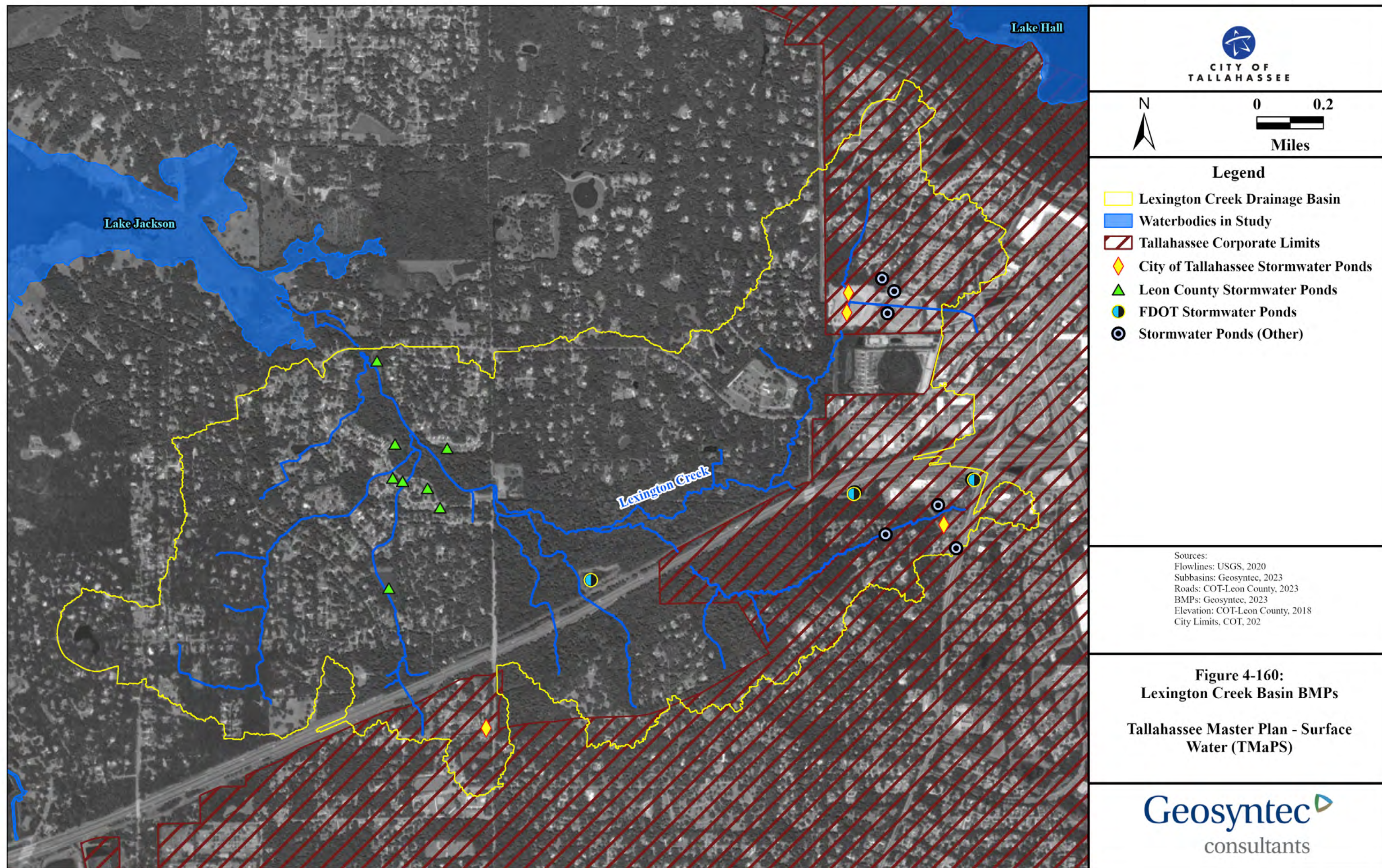
4.9.3.9 Atmospheric Deposition Data

As no lake waterbodies are included in the Lexington Creek basin, direct atmospheric deposition is not calculated but will be included in stormwater runoff calculations through land use based EMCs.

4.9.3.10 Data Summary

For the purposes of the qualitative analysis of sources of pollutants to Lexington Creek (**Section 4.9.4**), the available data are reasonable. There are sufficient active surface water quality stations at key locations within the creek to support the qualitative assessment. The following outlines a limitation in the available data. Specific recommendations on additional data collection efforts are provided in **Section 4.11**.

- A gage that was located on Lexington Creek was decommissioned in 2018, and may be beneficial to re-establish flow measurements on the creek.



4.9.4 Qualitative Assessment of Sources

As outlined in previous sections, prior to performing loading calculations and other analyses to quantify existing pollutant sources to Lexington Creek, it is important to analyze available data and summarize findings from historical studies to support identification of likely sources.

For Lexington Creek, the sources to be evaluated include the following:

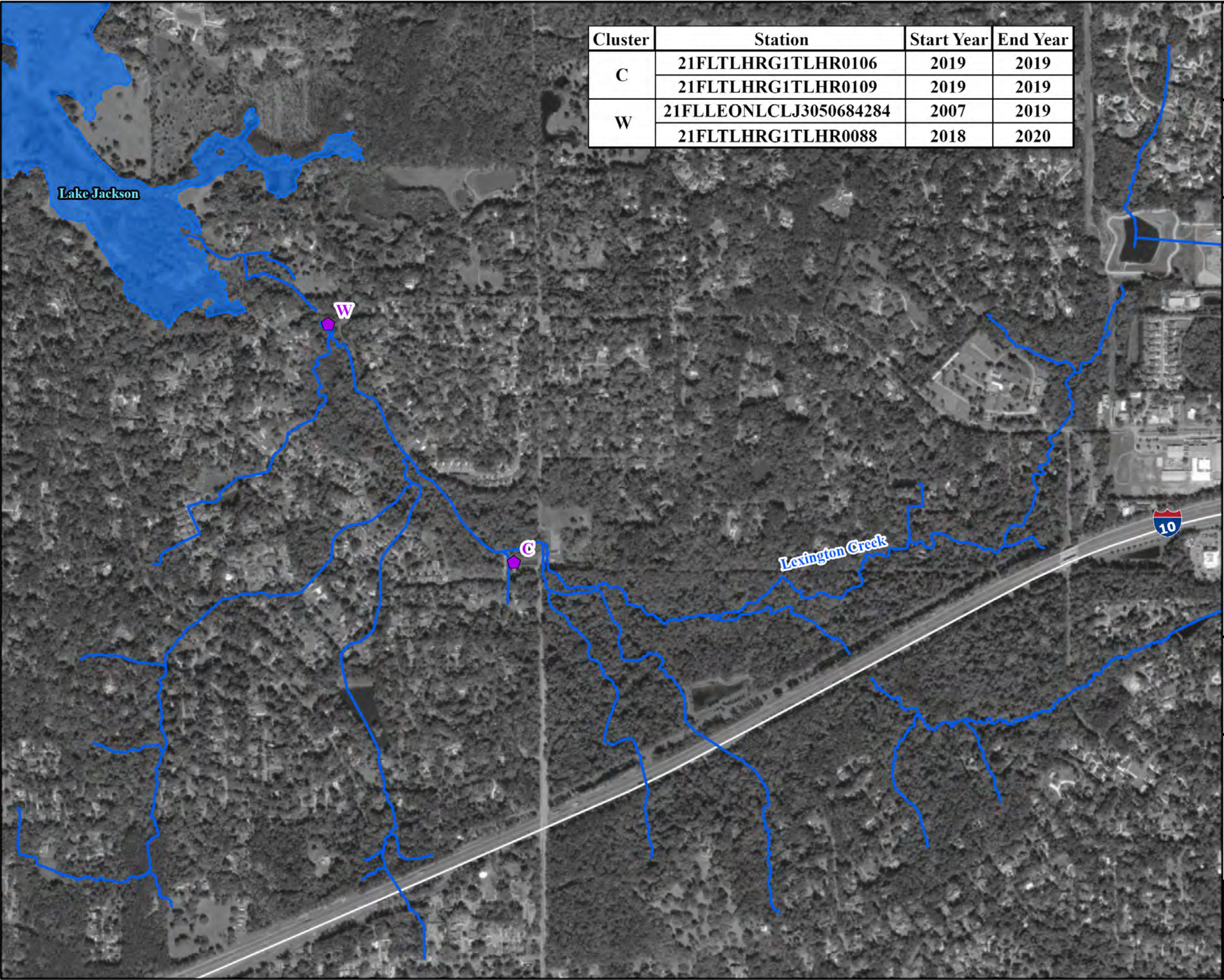
- Stormwater runoff
- Septic systems
- Internal recycling and seepage
- Wastewater
- Atmospheric deposition
- Interconnected flows

4.9.4.1 In-Stream Water Quality

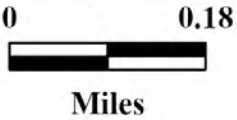
Following the methodology utilized for the lakes, analyses were conducted on the available stream data from 2010 to the present. This provides an evaluation of the baseline water quality conditions and the spatial differences along the creek (where data support a spatial assessment). The parameters analyzed include TP, TN, TSS, and *E. coli*.

As was done for the lakes, stations were clustered where they represent conditions within a specific area. The clustered data from 2010 to the present were analyzed to provide the average of the annual geomeans or the 90th percentile, depending upon the parameter. The results are then presented on a map with colors representing the results. The levels associated with the colors are reflective of water quality thresholds as outlined in 62-302 F.A.C. for the freshwater stream criteria. For the parameters with freshwater stream criteria (TN, TP, and *E. coli*), the transition between orange and red was set at the criteria. The remaining transition levels are set at even increments from the criteria down to zero. For the parameters without a freshwater stream criteria, the ranges were set at levels that represent reasonable ratios to the total values and match ranges presented for the other stream data.

Figure 4-161 presents the data clustering used for the analyses and associated stations. For Lexington Creek, data from 2010 through 2020 were available at two locations along the main stem. One cluster is located along the main stem near where it crosses Meridian Road. The second cluster is located further downstream, where the creek crosses Timberlane Road just upstream of the discharge to Fords Arm. The upstream station only had data from 2019 whereas the downstream station had a complete data set from 2010 to 2020. As such, intercomparison between the two locations needs to take this into account. Any stations with data after 2010 were utilized in the analyses.



Cluster	Station	Start Year	End Year
C	21FTLHRG1TLHR0106	2019	2019
	21FTLHRG1TLHR0109	2019	2019
W	21FLLEONLCLJ3050684284	2007	2019
	21FTLHRG1TLHR0088	2018	2020



- Legend**
- Lexington Creek
 - Waterbodies in Study
 - Stream Station Clusters

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-161:
Station Clustering for Lexington Creek

Tallahassee Master Plan - Surface Water (TMaPS)



Figure 4-162 and **Figure 4-163** present the TN and TP results. Looking first at the TP shows higher average levels, with the average for the upstream station (only from 2019) showing above the threshold. This is consistent with the AGM plots presented in **Section 4.9.3.3**, where it showed 2019 as above the threshold. As such, the spatial variation between the two stations most likely is reflective of the time frames of the data rather than a true spatial difference. In contrast, TN levels are low within the creek at both stations.

Figure 4-164 presents a map of the TSS levels. The measured TSS levels are high in relation to values seen in other tributaries around the basin, with average levels above 10 mg/L at the cluster just before the discharge to Fords Arm. This location had the highest TSS levels of any of the tributaries analyzed in previous sections within the Lake Jackson basin.

Figure 4-165 presents a map of the *E. coli* levels. The data analyzed are from 2014 through 2020 and the data were analyzed to provide the 90th percentile to compare against the 410 MPN/100 mL criteria per the FDEP approach in the IWR analyses. The analyses show that both stations when analyzed using the full dataset show results above the 410 MPN/100 mL threshold. This determination needs to be qualified based on the data discrepancy between the FDEP and the Leon County monitoring that was discussed in **Section 4.9.3.3**. If the FDEP data were excluded, the conclusion would be different. This data discrepancy issue must be resolved as part of future assessment of FIB issues in Lexington Creek.

4.9.4.2 Stormwater Runoff

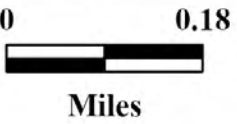
To assess stormwater runoff as a potential source of pollutant loads to Lexington Creek and, ultimately, to Fords Arm in Lake Jackson, the first step was to evaluate the LDI levels within the Lexington Creek basin. In **Section 4.4.4.2**, LDI values were presented by subbasin in **Figure 4-24**. The map showed that the LDI level in Lexington Creek basin is moderate, indicating potential for pollutant loading from stormwater runoff. The data, at present, indicate potential issues with TP levels in the creek (trend and threshold exceedance), as well as higher TSS levels. These conditions collectively indicate stormwater runoff for Lexington Creek should be a focus for additional quantitative assessment. It should be noted that a number of projects have been initiated in recent years to deal with stormwater runoff in Lexington Creek, including the Lexington Creek Meridian Road stormwater facility and work in the Market District in the upper reaches of the basin.

4.9.4.3 Septic Systems

Figure 4-153 presented the locations of septic systems within the Lexington Creek basin. **Figure 4-31** presented a map showing the septic tank densities by subbasin for the full Lake Jackson basin, including the Lexington Creek basin. The septic tank density in the Lexington Creek basin is above the overall median for the full Lake Jackson basin. Additionally, albeit qualified based on issues of data discrepancy, *E. coli* levels are also elevated. This indicates that septic systems may be a potential source of pollutant loading, although this may change after the data issues are resolved.



Cluster	Start Year	End Year
C	2019	2019
W	2010	2020



Legend

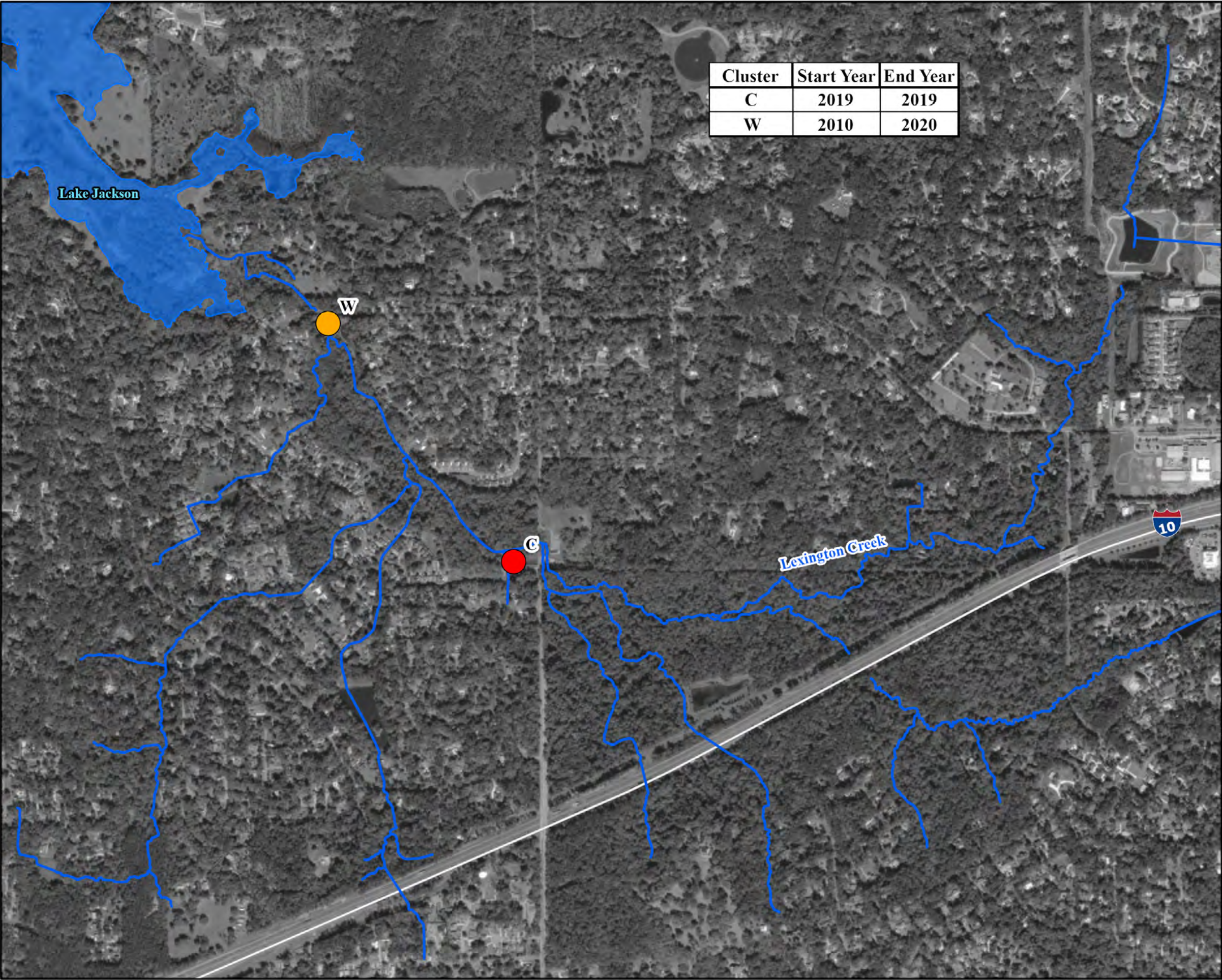
- Lexington Creek
- Waterbodies in Study
- TN Average 2010-2020
mg/L
 - 0 - 0.25
 - 0.25 - 0.50
 - 0.50 - 0.75
 - 0.75- 1.03
 - > 1.03

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

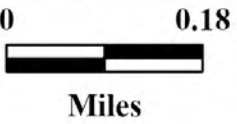
Figure 4-162:
Spatial Assessment of TN in Lexington
Creek

Tallahassee Master Plan - Surface
Water (TMaPS)





Cluster	Start Year	End Year
C	2019	2019
W	2010	2020



Legend

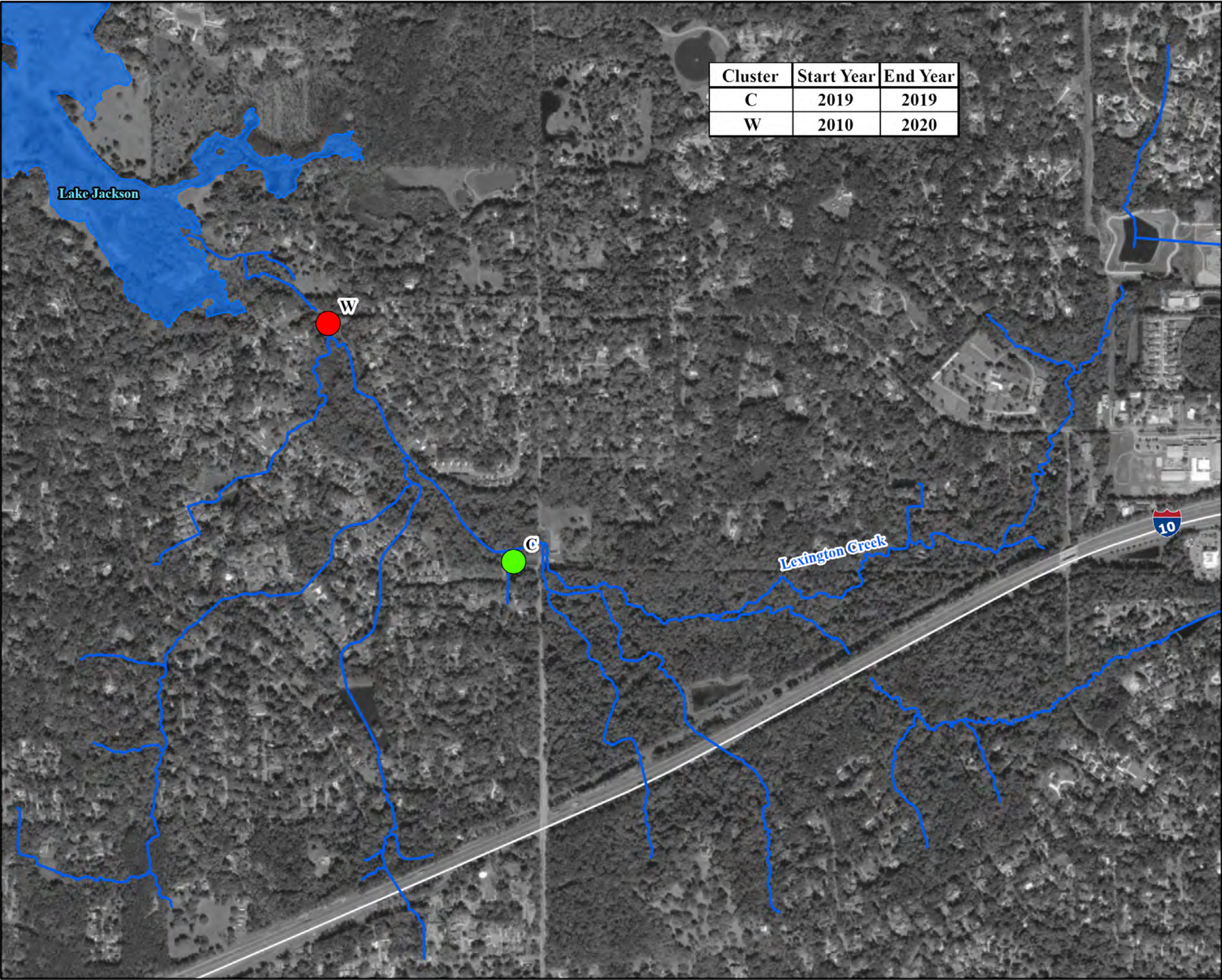
- Lexington Creek
- Waterbodies in Study
- TP Average 2010-2020
mg/L
 - 0 - 0.045
 - 0.045 - 0.090
 - 0.090 - 0.135
 - 0.135 - 0.180
 - > .18

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

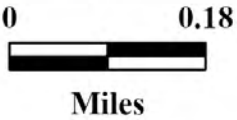
Figure 4-163:
Spatial Assessment of TP in Lexington
Creek

Tallahassee Master Plan - Surface
Water (TMaPS)





Cluster	Start Year	End Year
C	2019	2019
W	2010	2020



Legend

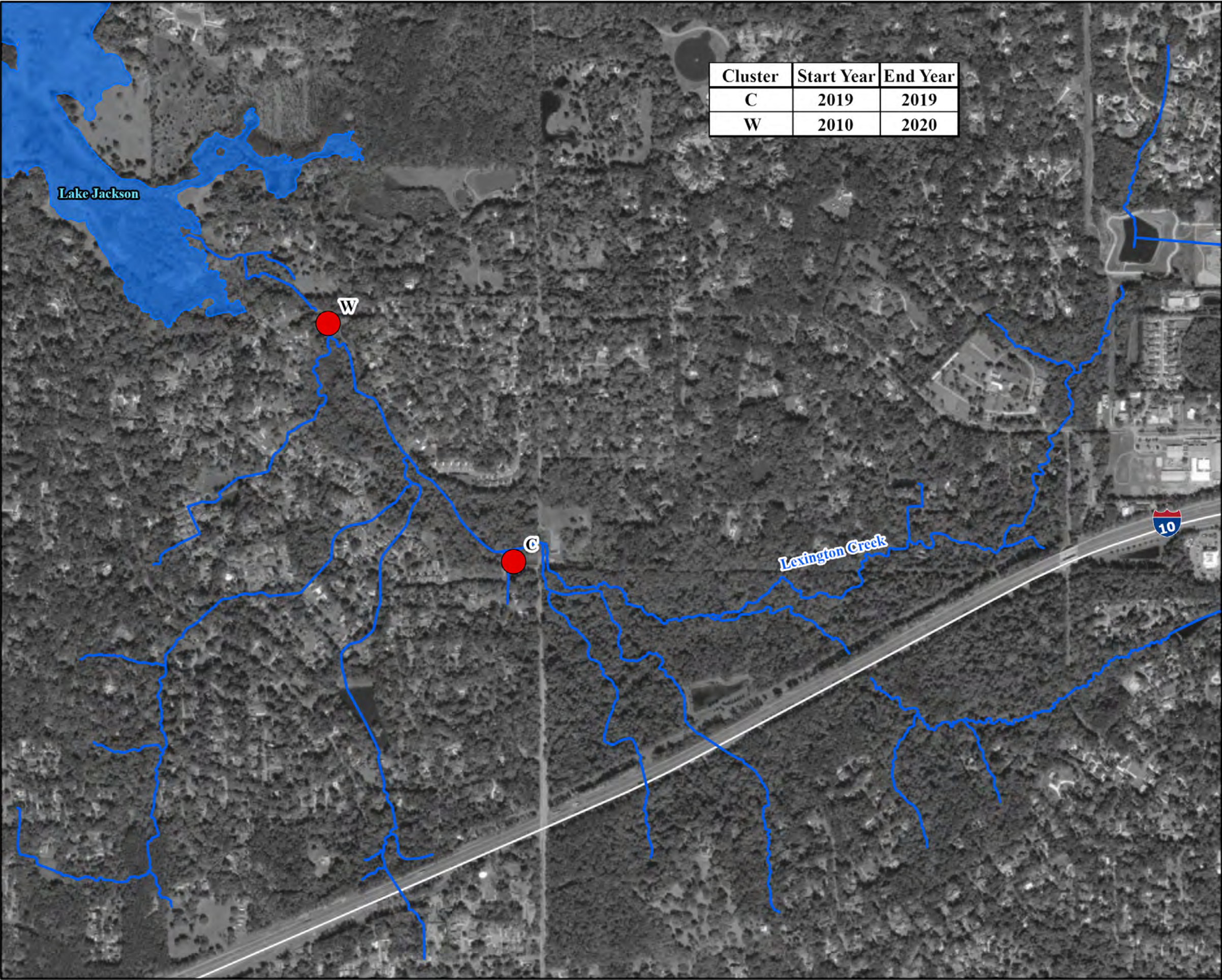
- Lexington Creek
- Waterbodies in Study
- TSS Average 2010-2020
mg/L
 - 0- 2.5
 - 2.5 - 5.0
 - 5.0 - 7.5
 - 7.5- 10
 - > 10

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

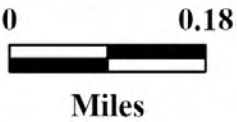
Figure 4-164:
Spatial Assessment of TSS in Lexington
Creek

Tallahassee Master Plan - Surface
Water (TMaPS)





Cluster	Start Year	End Year
C	2019	2019
W	2010	2020



Legend

- Lexington Creek
- Waterbodies in Study
- E. coli 90th Percentile 2010-2020 MPN/100mL
 - 0 - 100
 - 100 - 200
 - 200 - 300
 - 300 - 410
 - > 410

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Station Data: FDEP, 2021

Figure 4-165:
Spatial Assessment of E. coli in Lexington
Creek

Tallahassee Master Plan - Surface
Water (TMaPS)



4.9.4.4 Internal Recycling and Seepage

Internal Recycling

No lakes are included in the waterbodies evaluated in the Lexington Creek basin, so internal sediment loading is not evaluated.

Seepage

As outlined in **Section 4.9.3.6**, there are no surficial aquifer sampling sites identified within the Lexington Creek basin to provide potential for seepage to contribute to the loading to the creek. It should be noted that based on the soil types in this basin, sub-surface transmissivity levels are expected to be low, impeding transport of pollutants through seepage.

4.9.4.5 Wastewater

Within the Lexington Creek basin, there currently are no direct wastewater discharges. Additionally, no areas in the Lake Jackson basin presently have reuse discharges. **Figure 4-32** presented a map of the Lake Jackson basin boundaries and subbasins in relation to sewer service areas and sewer infrastructure. Presently, 43 percent of the Lexington Creek basin has sewer infrastructure, and some of this infrastructure is located adjacent to the creek. As noted previously, significant efforts were undertaken in 2019 to line the sewer infrastructure in the area of the creek, reducing the potential for leakage as a source. This activity coincided with a drop in *E. coli* measurements by Leon County in more recent years (although per FDEP data, levels are still high). Based on data discrepancy issues, and the resultant uncertainty created, wastewater should be considered as a potential source for this basin.

4.9.4.6 Atmospheric Deposition

No lakes are included in the waterbodies evaluated in the Lexington Creek basin, so direct atmospheric loads are not considered.

4.9.4.7 Interconnected Flows

No lakes are located upstream that discharge directly to Lexington Creek, therefore interconnected loads are not a source for the stream.

4.9.4.8 Summary of Findings

Based on these discussions and data and information presented in **Section 4.9.3**, there are various potential sources of pollutant loads to Lexington Creek and downstream into Fords Arm. These are identified based upon elevated water quality measurements for TP and FIB.

Stormwater runoff contributing to tributary inflow and septic appear significant and are quantified as part of this study. Wastewater loads due to infrastructure leakage are not quantified, due to data limitations, but may warrant further evaluation as part of future studies.

4.9.5 Calculation of Potential Nutrient Loads

This section presents calculations of potential nutrient (TN and TP) loads to Lexington Creek for the sources identified for calculation in **Section 4.6.4.8**. These include stormwater runoff and septic systems. Where loads were not calculated, the sections below provide brief discussions.

The load calculations are for the purpose of comparing the potential magnitudes of each source relative to one another to support determination of sources to target for load reduction.

4.9.5.1 Stormwater Pollutant Load

To calculate the stormwater TN and TP loads to Lexington Creek, average annual pollutant load modeling was performed. The goal was to identify outfalls that are contributing higher TN and TP loads relative to one another and to quantify the total TN and TP loads to Lexington Creek. TN and TP loads were calculated using the SIMPLE-Seasonal model. The model methodology was described in detail in **Section 4.4.5.1** for the stormwater loads to Lake Jackson.

Figure 4-166 presents the subbasins and the DEM utilized in the SIMPLE model calculations for Lexington Creek. **Figure 4-167** presents the aggregated land use. Finally, **Figure 4-168** presents the CDAs for the Lexington Creek stormwater loading to define total and per acre TN and TP loads, as well as the ranking of CDAs throughout the subbasin.

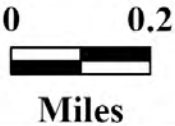
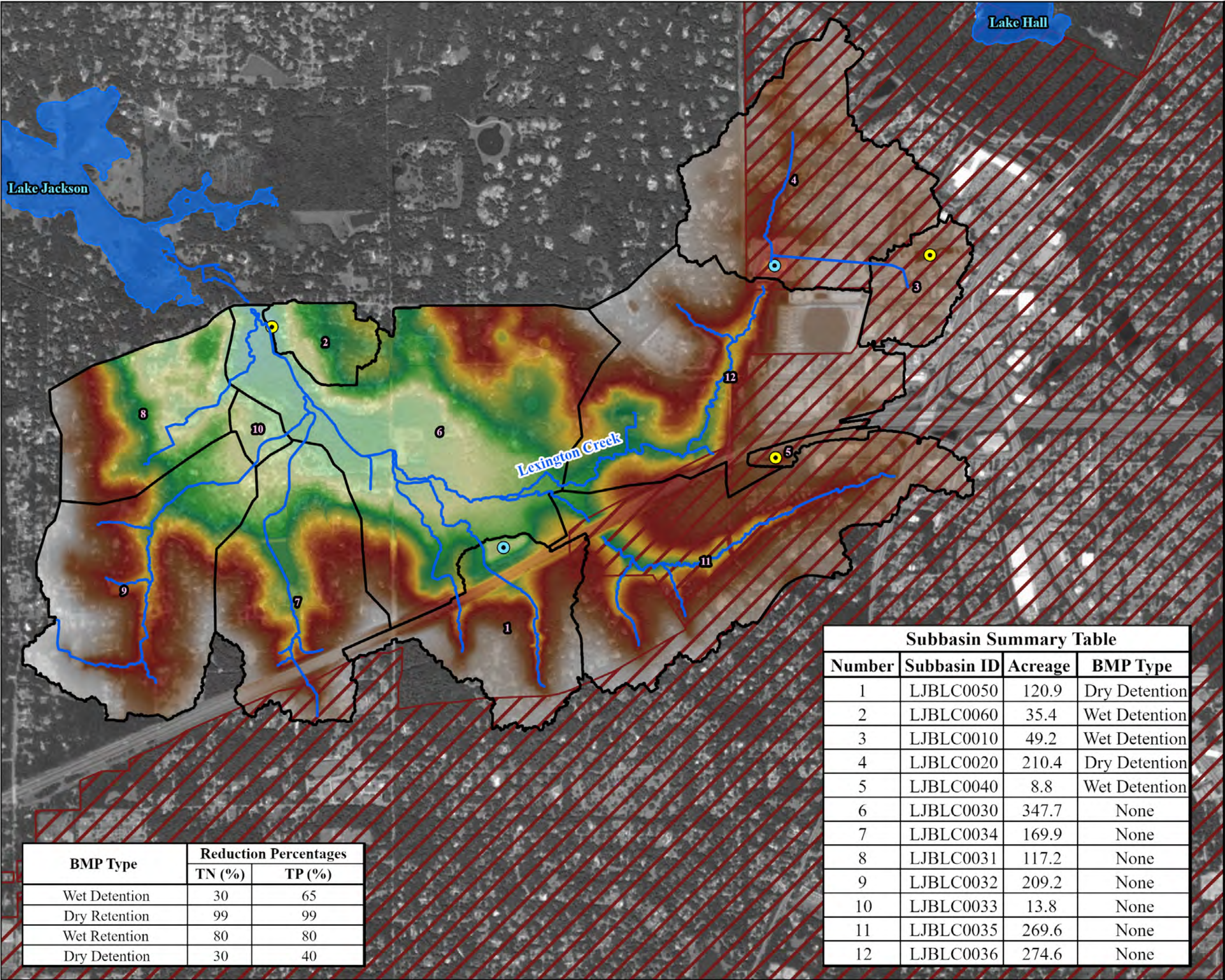
Stormwater Nutrient Loads to Lexington Creek

Figure 4-169 presents the distribution of the ranking of the CDAs for TN along with the total load and per acre loads (see the table on **Figure 4-169**). The rankings are color coded with the highest ranked CDAs in dark green moving down to the lowest ranked in pale yellow. The calculated total stormwater TN loads from the CDAs ranged from as low as 112.6 lb/yr up to 1,713.4 lb/yr. The per acre loads ranged from 1.2 lb/acre/yr up to 3.2 lb/acre/yr. The highest ranked CDA is located in the upper reaches of Lexington Creek in an area with a high concentration of commercial, high density residential, and industrial land uses. Overall, the per acre loads throughout the CDAs are higher in relation to more natural areas, with the lowest in the area of low density residential on the southwestern side. The total potential stormwater runoff load for TN for Lexington Creek is 4,389 lb/yr.

Figure 4-170 presents the distribution of the ranking of the CDAs for TP along with the total load and per acre loads (see the table on **Figure 4-170**.) The calculated total stormwater TP loads from the CDAs ranged from as low as 15.3 lb/yr up to 326.3 lb/yr. The per acre loads ranged from 0.1 lb/acre/yr up to 0.6 lb/acre/yr. The TP shows similar results to those seen for TN, with the highest rank CDA in the upper reach of the creek and overall high per acre loads in most of the CDAs in comparison to natural areas in other waterbodies. The total potential stormwater runoff load for TP for Lexington Creek is 922 lb/yr.

4.9.5.2 Septic Load

To analyze the potential impacts from septic tank units to Lexington Creek, the SPIL method adopted by FDEP was utilized to quantify the potential septic load. The approach and calculations were described earlier in **Section 4.4.5.2** which presented the septic loading to Lake Jackson. As outlined earlier, the calculations were only done for nitrogen (TN), and based on literature on transport and assimilation, may represent a conservative potential load. It should be noted that the Lexington Creek load was included within the overall Lake Jackson septic loading.



Legend

- Lexington Creek
- Waterbodies in Study
- Subbasins
- Tallahassee Corporate Limits
- BMP Type
 - Dry Detention
 - Wet Detention
- Topographic Elevations
ft NAVD88
 - 255
 - 93

Sources:
Flowlines: USGS, 2020
Subbasins: Geosyntec, 2023
Roads: COT-Leon County, 2023
BMPs: Geosyntec, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-166:
Lexington Creek Subbasin Delineation
and BMPs

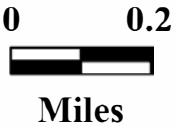
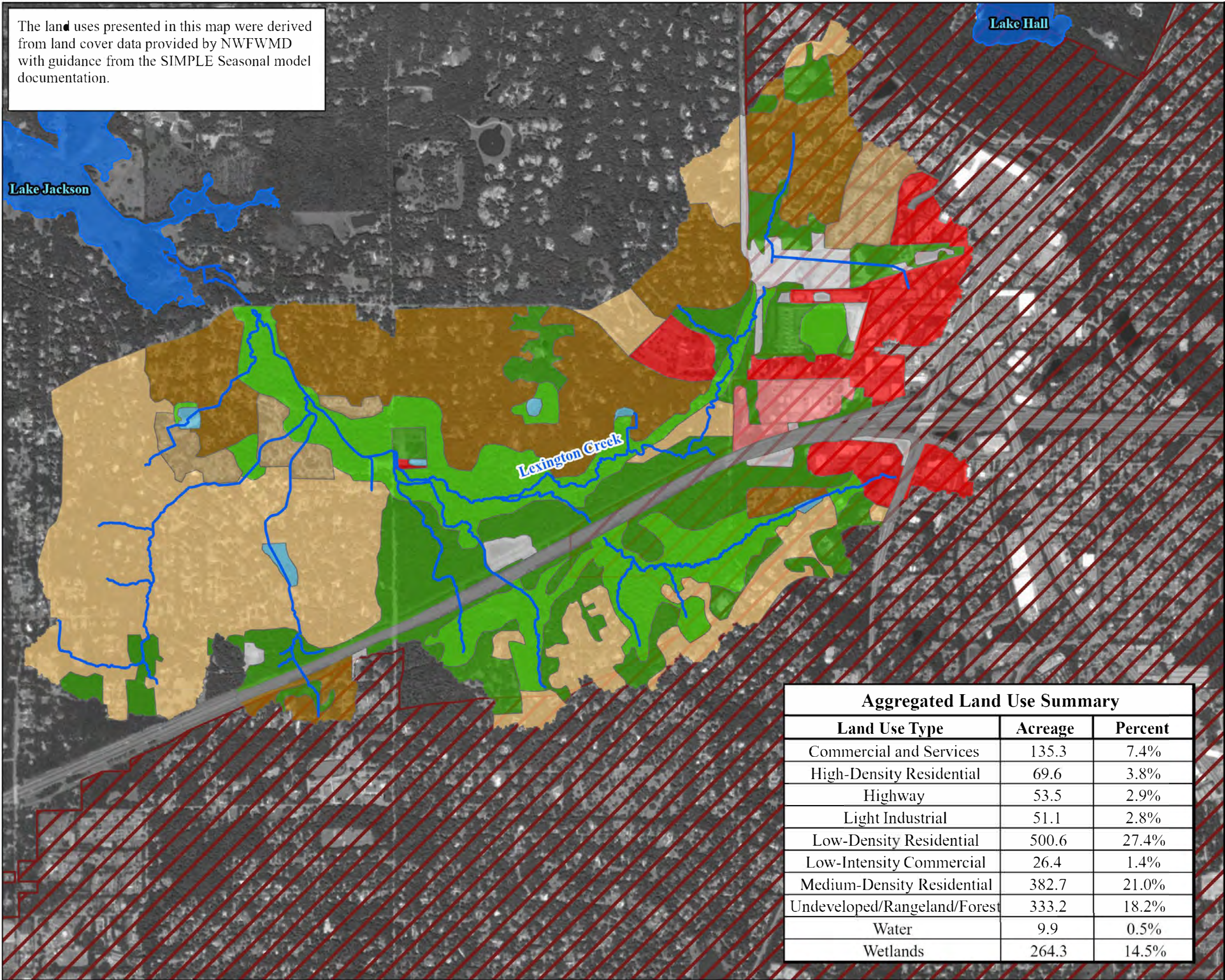
Tallahassee Master Plan - Surface
Water (TMaPS)



BMP Type	Reduction Percentages	
	TN (%)	TP (%)
Wet Detention	30	65
Dry Retention	99	99
Wet Retention	80	80
Dry Detention	30	40

Subbasin Summary Table			
Number	Subbasin ID	Acreage	BMP Type
1	LJBLC0050	120.9	Dry Detention
2	LJBLC0060	35.4	Wet Detention
3	LJBLC0010	49.2	Wet Detention
4	LJBLC0020	210.4	Dry Detention
5	LJBLC0040	8.8	Wet Detention
6	LJBLC0030	347.7	None
7	LJBLC0034	169.9	None
8	LJBLC0031	117.2	None
9	LJBLC0032	209.2	None
10	LJBLC0033	13.8	None
11	LJBLC0035	269.6	None
12	LJBLC0036	274.6	None

The land uses presented in this map were derived from land cover data provided by NFWFMD with guidance from the SIMPLE Seasonal model documentation.



Legend

- Lexington Creek
- Waterbodies in Study
- Tallahassee Corporate Limits
- Aggregated Land Use
- Land Use Type
 - Commercial and Services
 - High-Density Residential
 - Highway
 - Light Industrial
 - Low-Density Residential
 - Low-Intensity Commercial
 - Medium-Density Residential
 - Undeveloped/Rangeland/Forest
 - Water
 - Wetlands

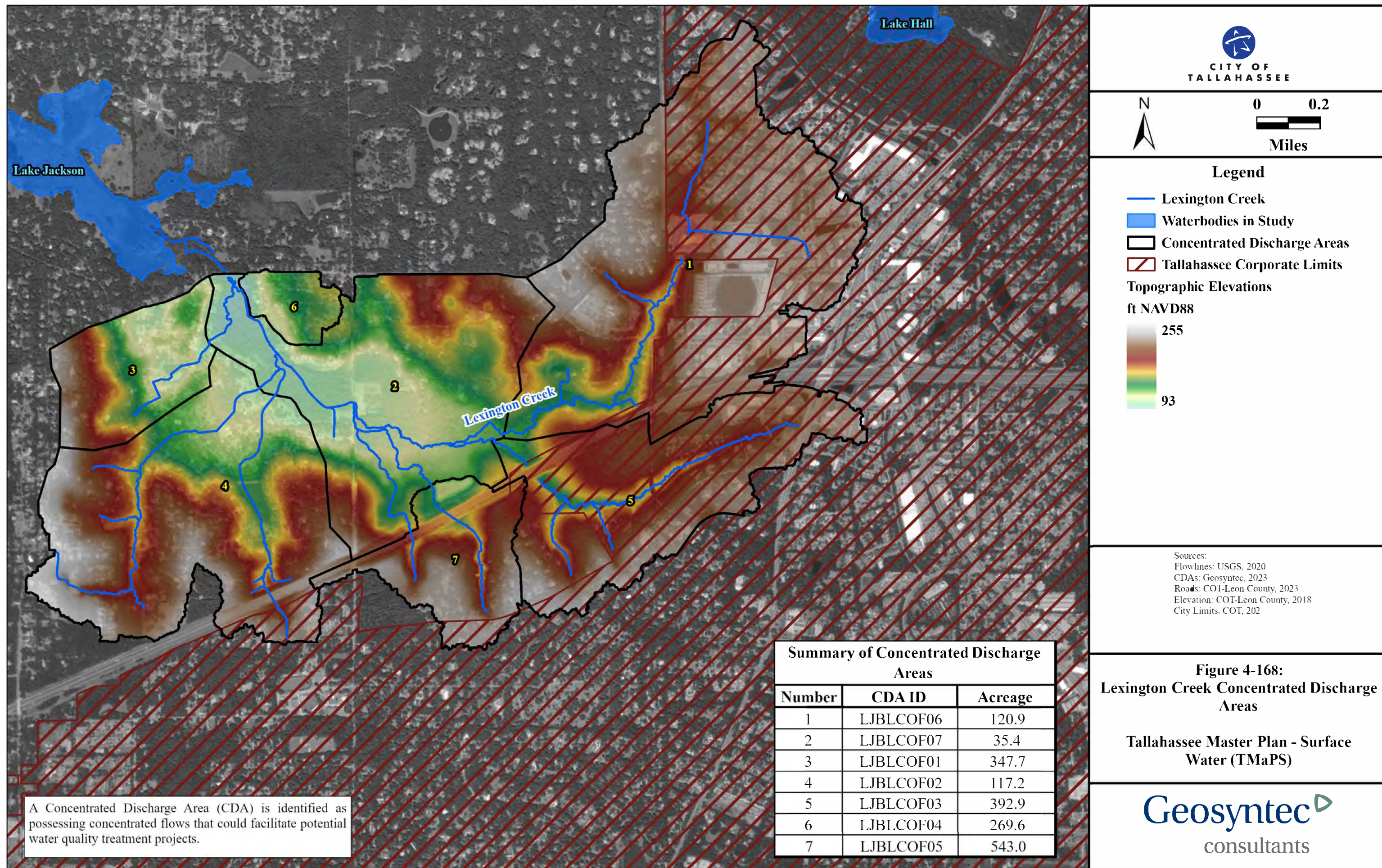
Sources:
Flowlines: USGS, 2020
Land Use: Geosyntec, 2023
Roads: COT-Leon County, 2023
City Limits, COT, 202

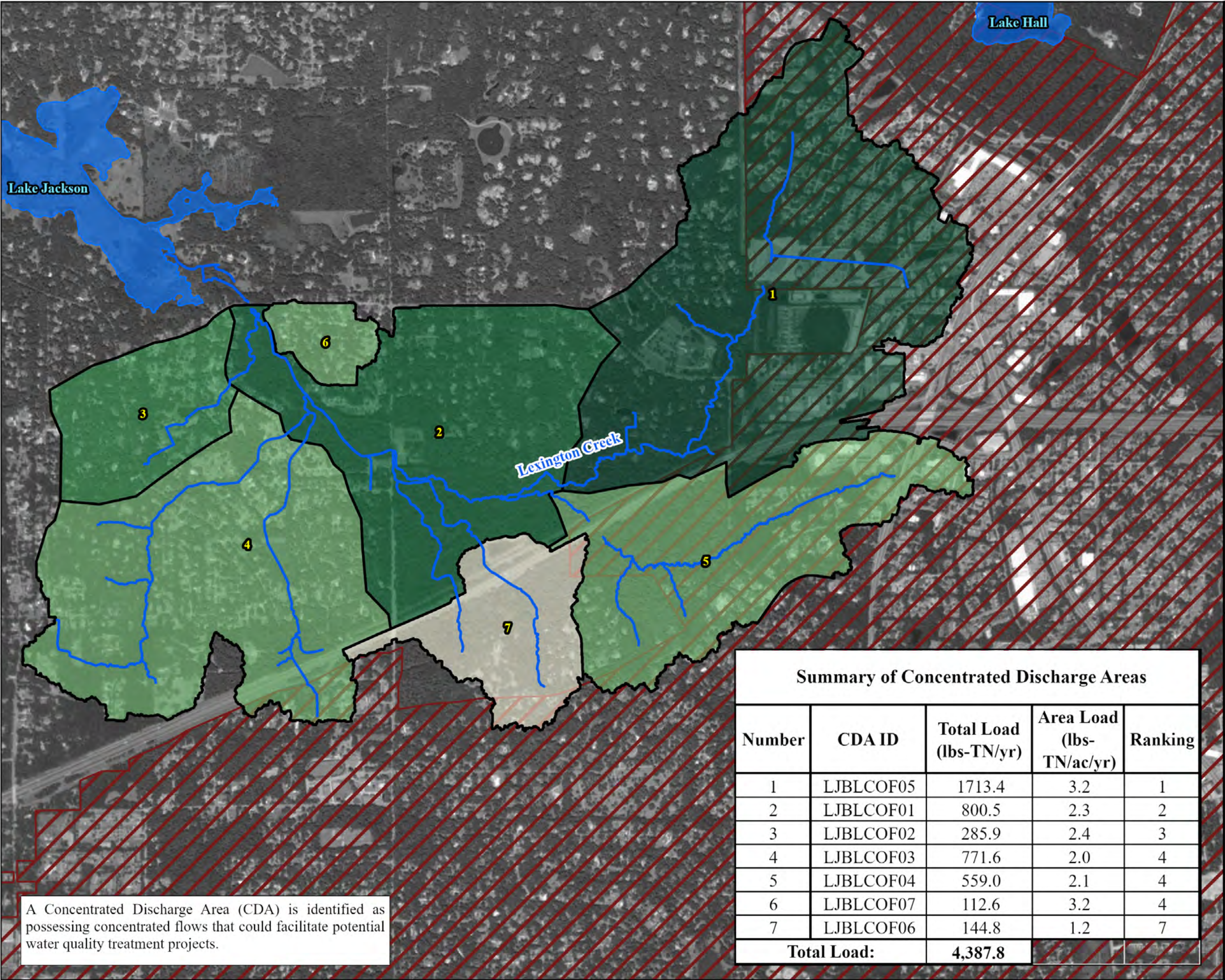
Aggregated Land Use Summary		
Land Use Type	Acreage	Percent
Commercial and Services	135.3	7.4%
High-Density Residential	69.6	3.8%
Highway	53.5	2.9%
Light Industrial	51.1	2.8%
Low-Density Residential	500.6	27.4%
Low-Intensity Commercial	26.4	1.4%
Medium-Density Residential	382.7	21.0%
Undeveloped/Rangeland/Forest	333.2	18.2%
Water	9.9	0.5%
Wetlands	264.3	14.5%

Figure 4-167:
Lexington Creek Aggregated Land Use

Tallahassee Master Plan - Surface
Water (TMaPS)









CITY OF
TALLAHASSEE

N

0 0.2

Miles

Legend

- Lexington Creek
- Waterbodies in Study
- Concentrated Discharge Areas
- Tallahassee Corporate Limits

Ranking

High (1)

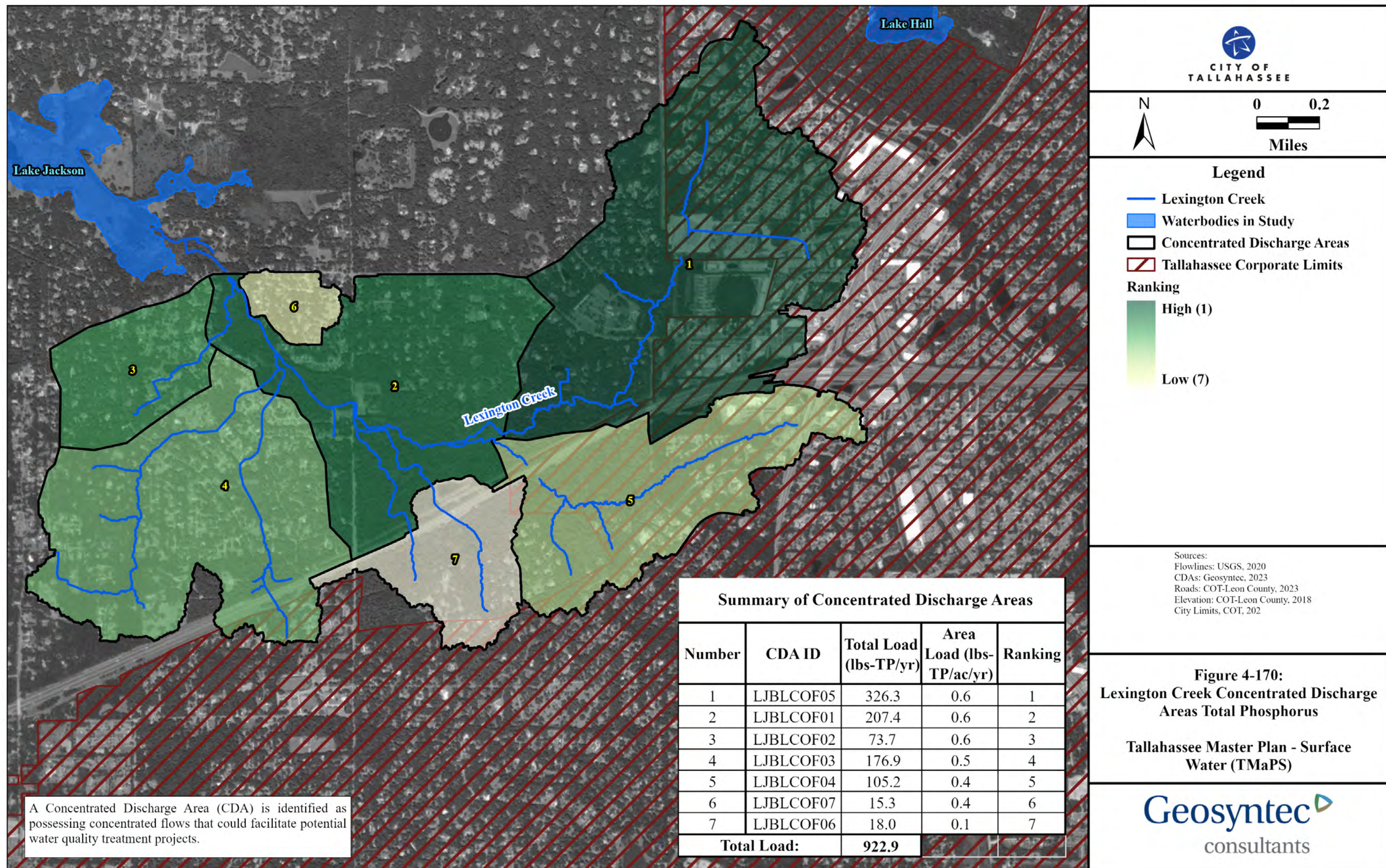
Low (7)

Sources:
Flowlines: USGS, 2020
CDAs: Geosyntec, 2023
Roads: COT-Leon County, 2023
Elevation: COT-Leon County, 2018
City Limits, COT, 202

Figure 4-169:
Lexington Creek Concentrated Discharge
Areas Total Nitrogen

Tallahassee Master Plan - Surface
Water (TMaPS)





An estimated 355 septic tank units were identified within 200 meters of Lexington Creek and its primary tributaries. **Figure 4-171** shows the septic systems utilized in the analyses. A table provided on the figure summarizes the calculated TN load from septic units. The total load is 3,839 lb/yr.

4.9.5.3 Point Source Load

No active point sources were identified within the Lake Jackson basin. Therefore, the point source loads for TN and TP are set to 0 lb/yr for Lexington Creek.

4.9.5.4 Lake Inflow Load

There are no identified lakes upstream of Lexington Creek. Therefore, the lake load for TN and TP are set to 0 lb/yr.

4.9.5.5 Internal Lake Load

There are no lakes identified for study in the Lexington Creek basin, therefore, no internal lake load is calculated.

4.9.5.6 Atmospheric Deposition

There are no lakes identified for study in the Lexington Creek basin, therefore, no direct atmospheric load is calculated.

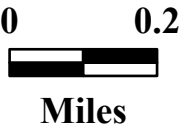
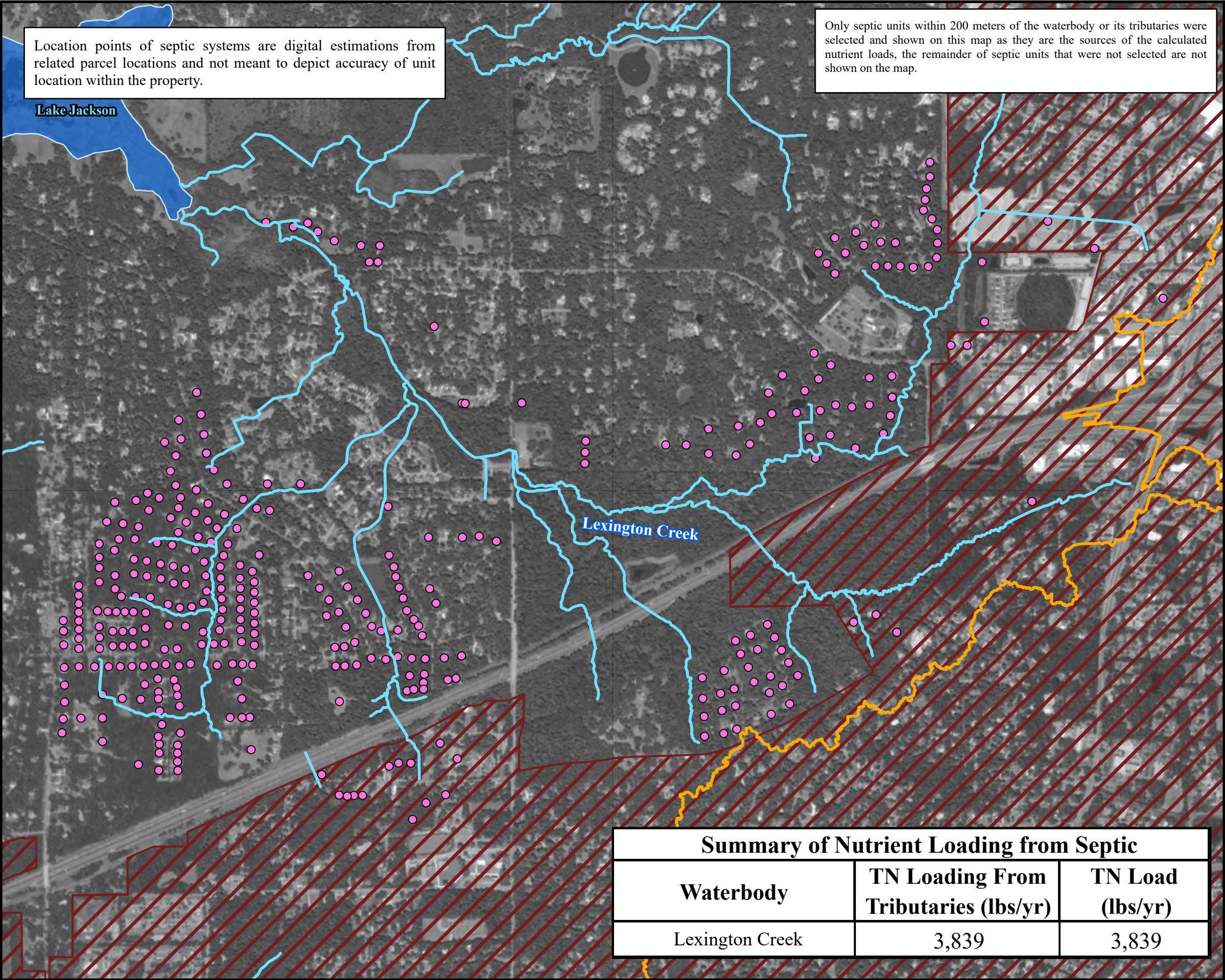
4.9.5.7 Summary of Calculated Loads

Nutrient loads to Lexington Creek were calculated for stormwater runoff and septic systems. **Table 4-24** presents the calculated total loads to the lake for TN and TP. For septic systems only TN loads were calculated (see **Section 4.9.5.2** for explanation).

Table 4-24: Summary of Calculated Loads to Lexington Creek

Source	TN (lb/year)	TP (lb/year)
Stormwater Runoff	4,389	922
Septic Systems	3,839	NC

NC – Not calculated.



Legend

- Lake Jackson Drainage Basin
- Waterbodies in Study
- Tallahassee Corporate Limits
- Watercourses
- Relevant Septic Sites
 - Tributaries

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
Watershed: COT, 2020
Roads: COT-Leon County, 2023

Figure 1-171:
Septic Loading to Lexington Creek

Tallahassee Master Plan - Surface
Water (TMaPS)



4.10 Lake Jackson Basin Hot Spot Analysis

Using the information presented and discussed in **Section 4.4** through **Section 4.9**, qualitative and quantitative rankings were performed to identify target areas (hot spots) within the Lake Jackson basin for development of structural and non-structural projects to reduce loads and improve water quality.

The hot spot analysis was completed in three steps. The first step was to collate information presented for each of the waterbodies to support their ranking from highest to lowest based on need for water quality restoration. The second step was to utilize the load calculations presented for each of the waterbodies to rank the sources (by waterbody) from lowest to highest using normalized loads. The final step was to provide spatial ranking of CDAs (as defined in the TN and TP load calculations) by waterbody for use in the identification of structural and non-structural projects. The higher ranked CDAs within a highly ranked waterbody are hot spots and will be targeted for potential pollutant load reduction projects.

For the rankings, nutrients were the primary driver, with FIB data used to support some of the determinations. All rankings using actual loading data were based on nutrients. The following sections discuss the data utilized, the methodology, and the results of each step of the hot spot analysis, culminating in stormwater runoff and septic hot spot maps for the Lake Jackson basin.

4.10.1 Waterbody Ranking

The waterbodies within the Lake Jackson basin were ranked with respect to water quality or factors that could negatively affect water quality, using a qualitative approach. The ranking identified those waterbodies most in need of restoration. The waterbodies evaluated in this analysis include the following:

- Lake Jackson
- Carr Lake
- Summerbrook Creek and the Summerbrook Chain of Lakes (Lake Alyssa, Somerset Lake, Shelly Pond)
- Lake Overstreet
- Lake Hall
- Lexington Creek

While the Summerbrook Creek basin contains four waterbodies assessed for this study, due to the lack of data within the lakes (data are available along the creek connecting the lakes), the ranking is done for the Summerbrook basin as a whole using the data from Summerbrook Creek.

The information utilized in the development of the waterbody ranking included the following:

- Verified impairment status
- Waterbody and tributary water quality data analyses

- Biological data
- Land-development indices
- Septic densities

Table 4-25 presents a summary of the information by waterbody for each of these categories. For each of the five categories, the waterbodies were ranked based on the summary information provided. The rankings were qualitative for some categories and quantitative in others. The five rankings were then averaged. Using the average ranking, the waterbodies were ranked from highest to lowest based on need for water quality restoration.

For impairment status, two results were defined, verified impaired or not verified impaired for nutrients or FIB. Waterbodies that were impaired for nutrients were given the higher ranking. Based on impairment, the highest ranked waterbody was Lexington Creek due to its verified impairment for *E. coli*. The remaining waterbodies were then equally ranked second due to the lack of verified impairment.

Analyses of water quality data presented earlier, which included evaluations of the data against the NNC for the waterbodies themselves and primary inflowing tributaries, were utilized for the waterbody water quality ranking. The highest ranked waterbody was Lexington Creek due to TP levels in the creek found to be above the NNC threshold, along with FIB data that also exceeded the FIB threshold. The second ranked waterbody was Lake Jackson. The lake showed 1 year with TP levels above the NNC threshold (in 2020) and Chl-a levels that were at or just below the threshold. The spatial analyses presented in **Section 4.4.4.1** and **Section 4.4.4.2** identified that along the southeastern side of the lake, where Megginnis Arm and Fords Arm drain into the lake, the levels were above the NNC TP and Chl-a thresholds. Additionally, based on the tributary data, there were elevated levels of TP and TN coming in from various tributaries along the southeastern side of the lake. The third ranked waterbody was Summerbrook Creek. While the nutrient and FIB levels were below the stream threshold, the TP concentrations did show higher levels within the creek in recent years, and the FIB concentrations were somewhat elevated. The remaining waterbodies, Carr Lake, Lake Overstreet, and Lake Hall all had very good water quality and clearly fall below the prior waterbodies in terms of need for water quality improvement. The ultimate ranking (for these non-priority waterbodies) was based on which had the higher AGM levels for the primary nutrient parameters (TN, TP, and Chl-a) overall. This approach resulted in the next ranked waterbody being Lake Overstreet, followed by Carr Lake, and Lake Hall last.

For the biological assessment, the waterbody rankings used the Exceptional, Healthy, and Impaired determinations for the rankings. Where no data existed, the ranking was set just below the healthy. Based on this assessment (outlined in **Table 4-25**), the top ranked waterbody was Lexington Creek, followed by Lake Jackson, Summerbrook Creek, Carr Lake/Lake Overstreet (tied), and then Lake Hall.

Table 4-25: Waterbody Ranking

Waterbody	Impairment Status	Rank	Waterbody WQ Analyses	Tributary Analyses	Rank	Biological Data (LVI or SCI)	Rank	LDI	Rank	Septic Density	Rank	Average Rank	Waterbody Rank
Lake Jackson	Not Impaired	2	Overall lake is below but close, parts of the lake near Meginnis and Fords Arms are above the NNC thresholds	Lexington, Okeeheepkee, Harbinwood (higher TP, just below stream standard). TN - Lake Jackson Mounds above standard, Okeeheepkee high. <i>E. coli</i> - Lexington, Lake Jackson Mounds, Okeeheepkee above threshold	2	Mostly healthy with two years of impaired.	2	Poor - Megginnis Arm. Moderate - Fords Arm, Southwest side of lake, and Summerbrook.	1	Highest in Harbinwood, high values just around the lake (but relative). All less than 1 unit per acre	2	1.80	2
Carr Lake	Not Impaired	2	Nitrogen below minimum , TP between min and max some below min, Chl-a all below like 2-4. TSI all good. <i>E. coli</i> all way low	No specific trib data	5	Healthy	4	All excellent around the lake. Moderate in Summerbrook that drains in	4	Very low all around the lake, mid-level in Summerbrook (0.3 to 0.4 units per acre)	4	3.80	5
Summerbrook Creek	Not Impaired	2	TN trending down and well below stream threshold, TP trending up but well below stream criteria, some higher <i>E. coli</i> , one above 410.	TN trending down and well below stream threshold, TP trending up but well below stream criteria, some higher <i>E. coli</i> , one above 410.	3	ND	3	Moderate	2	Mid level (0.3 to 0.4)	3	2.60	3
Lake Overstreet	Not Impaired	2	Well below all water quality criteria, no issues	N/A	4	Healthy	4	Good	3	Lower level (0.16-0.20)	4	3.40	4
Lake Hall	Not Impaired	2	Well below all water quality criteria, no issues	N/A	6	Healthy to Exceptional	5	Good	3	Lower level (0.11-0.15)	5	4.20	6
Lexington Creek	Impaired (FIB)	1	TP levels above AGM stream criteria. <i>E. coli</i> levels above criteria but question on validity of the data	TP levels above AGM stream criteria. <i>E. coli</i> levels above criteria but question on validity of the data	1	Impaired and Healthy	1	Moderate	2	Upper Level (0.31-0.4)	1	1.20	1

Note: Merging of Summerbrook Creek

Using the LDI scores presented earlier, the individual waterbodies were ranked based upon where they fell overall in the potential for anthropogenic loading based on the watershed that drains to it (**Table 4-25**). Based on LDI, the highest ranked waterbody was Lake Jackson due to the land use conditions for the part of the watershed draining to the southeast portion of the lake, followed by Lexington Creek and Summerbrook Creek, which were tied, then Lake Overstreet and Lake Hall which were tied, and finally Carr Lake as the lowest ranked.

The final waterbody ranking criteria was septic density within the immediate drainage area. The waterbodies were ranked based on the results presented earlier and summarized in **Table 4-25**. The top ranked waterbody was Lexington Creek followed by Lake Jackson, then Summerbrook Creek, then Carr Lake and Lake Overstreet which were tied, and finally Lake Hall as the lowest ranked.

Table 4-25 provides an average ranking for each of the waterbodies and then a final ranking based on the average ranking. The final ranking by waterbody, with respect to the need for restoration activities, are presented from most pressing (1) to least pressing (6) in the order shown below.

1. Lexington Creek
2. Lake Jackson (southeastern and southern sides)
3. Summerbrook Creek
4. Lake Overstreet
5. Carr Lake
6. Lake Hall

Based on their overall water quality and potential for loading (as summarized above and in **Table 4-25**), Lake Overstreet, Carr Lake, and Lake Hall were removed from further ranking, and not considered targets for stormwater load reduction projects.

4.10.2 Pollutant Source Ranking

The pollutant source ranking utilizes load calculations presented in the **Calculation of Potential Nutrient Loads** sections for each waterbody. The specific loads quantified (where data allowed) included the following:

- Stormwater pollutant load
- Septic load
- Point source load
- Lake inflow load
- Internal lake load, and shallow groundwater seepage
- Atmospheric deposition

Using the calculated total loads for nutrients, the load sources are ranked for each individual waterbody to identify which type of loading to prioritize. The ranking (by waterbody) is based upon the total loads, with the highest rank (the top source to target) assigned to the largest load.

For the Lake Jackson basin, no data were available for internal lake loading, therefore this load category was not included in the source ranking by waterbody. Additionally, insufficient data were available to calculate the inter-lake loads in the Summerbrook basin.

Where insufficient data are available, the load sources are not considered in the ranking. Additionally, where the loads are zero, i.e., no load, these source types are not included in the ranking. This is the case for point source loads in the Lake Jackson basin as well as inter-lake loads for some of the waterbodies.

Table 4-26 presents the results of the source ranking by waterbody. As some of the load types only had TN data, TN became the driving load for the ranking. Almost across the board, stormwater loads are identified as the top ranked source on a per acre basis. The only waterbody where it was not the top ranked source was Lake Alyssa, which had a higher per acre septic load (due to the number of septic systems along primary tributaries).

The only place where data were available for inter-lake loads was for Lake Jackson, and these loads were not high in relation to others on a per acre basis. In general, the lakes that discharge directly to Lake Jackson (for which data were available to calculate load) are relatively pristine.

Finally, atmospheric loads were calculated and normalized to evaluate their potential relative to other sources. In general, atmospheric loads are small on a per acre basis relative to other sources.

Based on this analysis, the top load source to target for the waterbodies within the Lake Jackson basin would be stormwater loads. The next target would be septic loading. Other loading sources are either at zero, are low compared to the stormwater or septic, are not addressable through projects (atmospheric deposition), or have insufficient data at this time and therefore would not be targeted for structural or non-structural projects as part of this study.

4.10.3 Identification of Hot Spot Areas

Section 4.10.1 ranked the waterbodies in the Lake Jackson basin based on their need for water quality restoration. The next step in the evaluation of the waterbodies was to determine if each one should be considered for development of projects. This is a qualitative assessment that accounts for the present conditions and the potential for future degradation. For the Lake Jackson basin, it was determined that Lexington Creek, Lake Jackson, and Summerbrook Creek (and the Summerbrook Chain of Lakes) would be considered for project development.

The next step was to present the stormwater and septic load rankings for each of the chosen waterbodies presented on a basin-wide map. The stormwater load rankings were presented by waterbody drainage area in the **Calculation of Potential Nutrient Loads** sections. The highest to lowest ranked CDAs were highlighted from dark green to pale yellow, with the dark green representing the top ranked areas to target for load reduction activities.

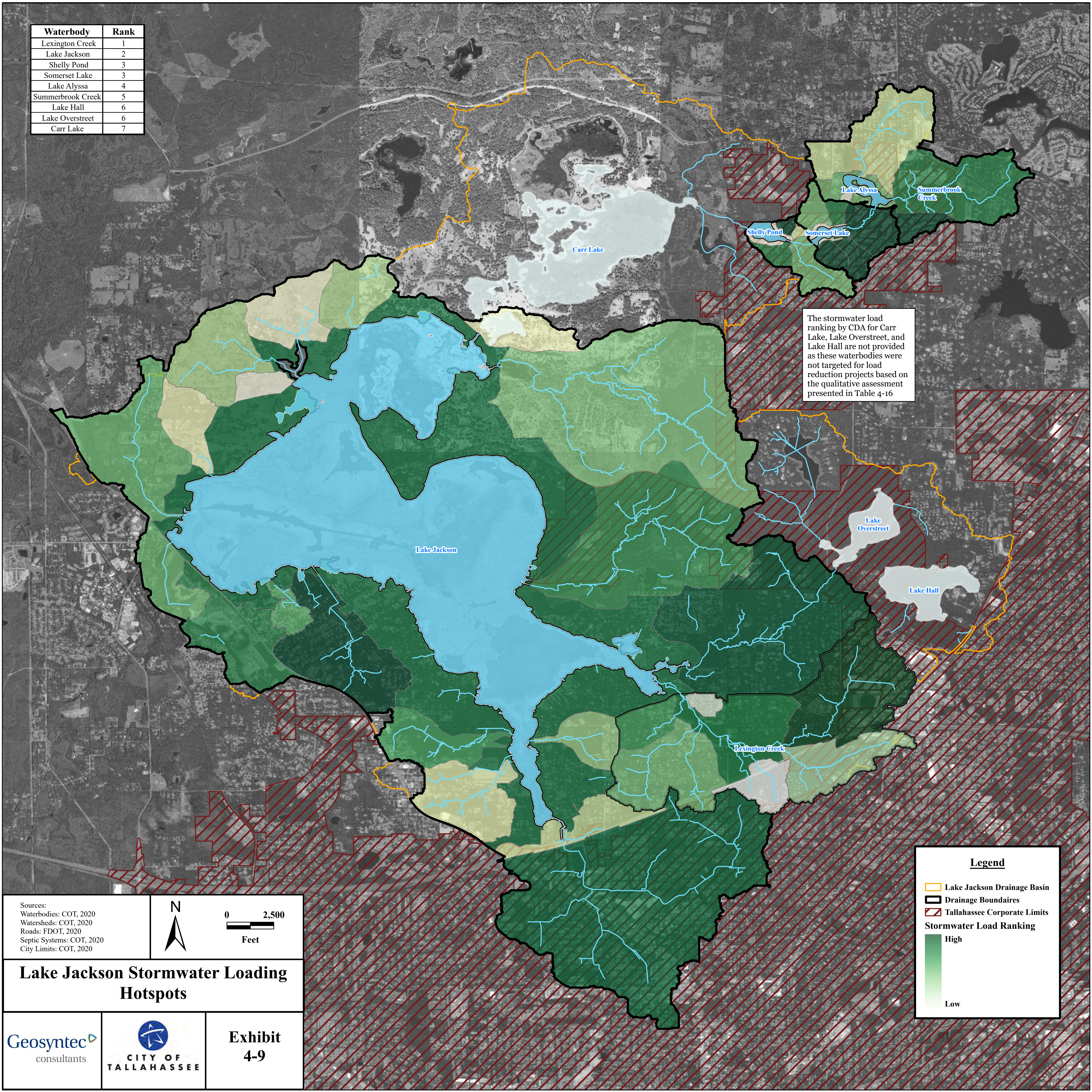
Table 4-26: Load Source Ranking

Waterbody	Stormwater Pollutant Load			Septic Load			Lake Inflow Load			Atmospheric Deposition		
	Total		Rank	Total		Rank	Total		Rank	Total		Rank
	TN (lb/yr)	TP (lb/yr)		TN (lb/yr)	TN Direct (lb/yr)		TN (lb/yr)	TP (lb/yr)		TN (lb/yr)	TP (lb/yr)	
Lake Jackson	22,162	4,374	1	14,232	3,071	2	3,524	142	4	6,906	ND	3
Carr Lake	2,804	431	1	401	22	3	ND	ND	NA	1,428	ND	2
Lake Alyssa	2,482	541	2	2,801	76	1	NA	NA	NA	74	ND	3
Somerset Lake	1,365	450	1	0	0	NR	ND	ND	NA	26	ND	2
Shelly Pond	560	149	1	141	108	2	ND	ND	NA	47	ND	3
Summerbrook Creek	4,407	1,140	1	2,942	184	2	ND	ND	NA	NA	NA	NR
Lake Overstreet	1,303	301	1	487	0	2	0	0	NR	297	ND	3
Lake Hall	1,049	259	1	0	270	3	0	0	NR	355	ND	2
Lexington Creek	4,388	923	1	3,839	0	2	0	0	NR	NA	NA	NR

For septic loads, the total loads (calculated and presented in earlier sections) were sub-divided into the CDAs based upon the location of septic systems which were determined to load the waterbodies or tributaries draining to the waterbodies. The total septic load for each of the CDAs was calculated and then ranked (by waterbody drainage area) as largest to smallest based on total load, with the highest ranked having the largest total load. The septic load CDA rankings are presented separately because their loads will be different and the potential project types also different, i.e., septic to sewer conversions.

Exhibit 4-9 and **Exhibit 4-10** present the CDA rankings for the stormwater and septic loads respectively for each of the chosen waterbodies, with the drainage areas for the waterbodies not identified for projects (Carr Lake, Lake Overstreet, and Lake Hall) greyed out. The rankings are by waterbody drainage area and are shown as green for the highest ranked areas and pale yellow for the lowest ranked areas. These two hot spot maps provide the basis for project targeting for the two primary sources identified, stormwater and septic loads. Projects are discussed in **Volume 7**.

Waterbody	Rank
Lexington Creek	1
Lake Jackson	2
Shelly Pond	3
Somerset Lake	3
Lake Alyssa	4
Summerbrook Creek	5
Lake Hall	6
Lake Overstreet	6
Carr Lake	7



Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Roads: FDOT, 2020
Septic Systems: COT, 2020
City Limits: COT, 2020



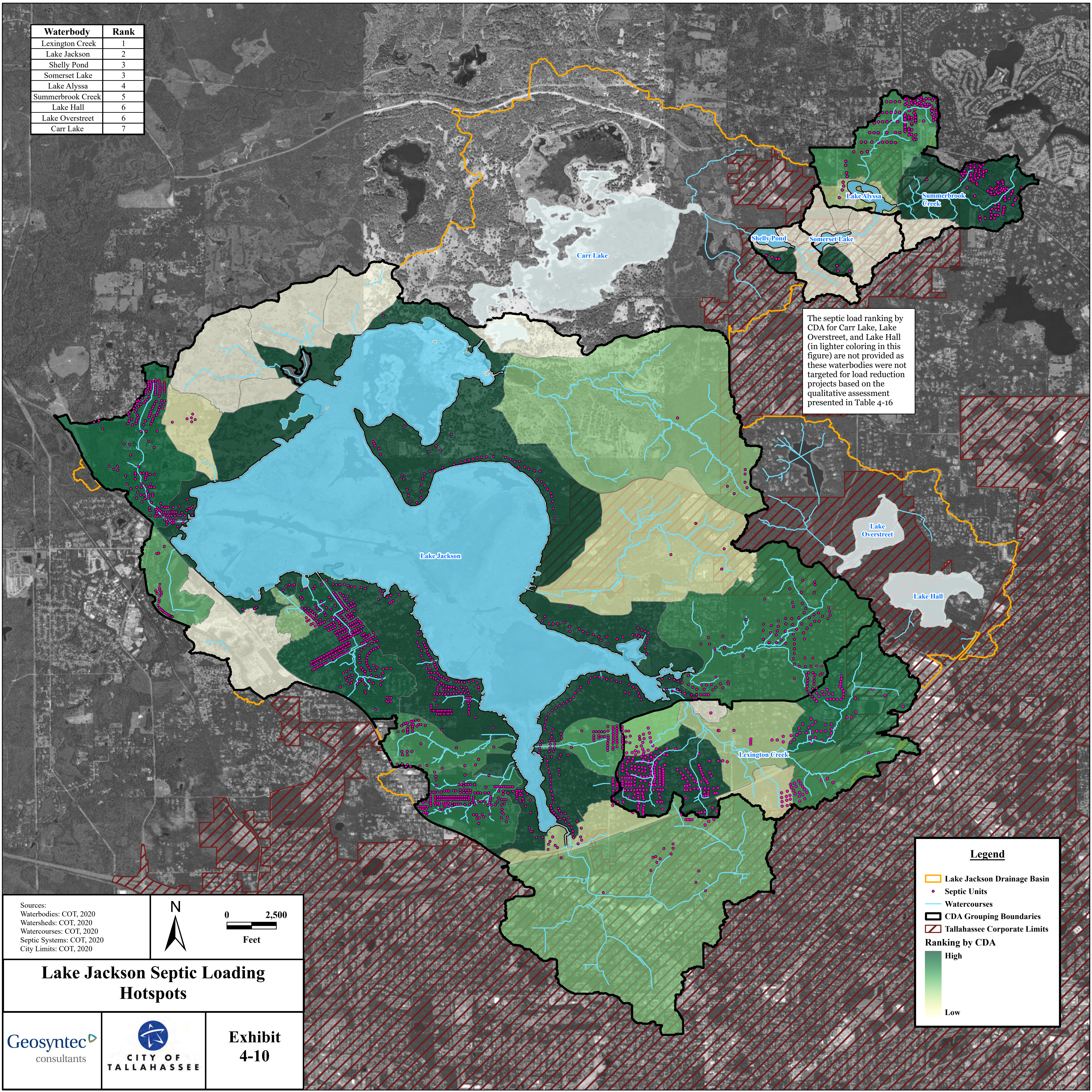
Lake Jackson Stormwater Loading Hotspots

Geosyntec
consultants



Exhibit
4-9

Waterbody	Rank
Lexington Creek	1
Lake Jackson	2
Shelly Pond	3
Somerset Lake	3
Lake Alyssa	4
Summerbrook Creek	5
Lake Hall	6
Lake Overstreet	6
Carr Lake	7



Sources:
Waterbodies: COT, 2020
Watersheds: COT, 2020
Watercourses: COT, 2020
Septic Systems: COT, 2020
City Limits: COT, 2020



Lake Jackson Septic Loading Hotspots

4.11 Water Quality Study Identification and Prioritization

As part of the data review and summary provided for each of the target waterbodies (**Section 4.4** through **Section 4.9**), limitations in available hydrologic, water quality (groundwater and surface water), and benthic sediment data were identified. Additionally, as part of the qualitative assessment of sources for each waterbody, specific key stressors, i.e., significant potential sources of anthropogenic load or factors contributing to degraded water quality, were identified. Finally, **Section 4.10** presents a hot spot analysis for the Lake Jackson basin that ranked the waterbodies relative to their need for restoration and identified specific waterbodies to target for restoration projects, additional data collection, or studies.

Utilizing the information outlined above, potential water quality improvement studies needed to address data gaps and quantify key stressors were proposed and ranked. The results of the previous tasks are summarized in **Section 4.11.1**, along with an overview of key stressors for the priority waterbodies (Lexington Creek, Lake Jackson, and the Summerbrook Chain of Lakes). Studies are identified that fill in data gaps and support quantification of specific waterbody stressor(s) or support targeted waterbody restoration (**Section 4.11.2**). The proposed studies include re-establishment of hydrologic monitoring, sub-watershed-level source assessments based on key stressors, a whole-basin hydrologic evaluation, and a study on potential restoration of the MARS Facility.

4.11.1 Summary of Data Limitations, Waterbody Prioritization, and Key Stressors

Table 4-27 provides a summary of the data limitations presented at the end of the data review and summary sections for each of the waterbodies in this study (**Section 4.4** through **Section 4.9**). Data limitations were previously only identified for Lake Jackson, Lexington Creek, the Summerbrook Chain of Lakes, and Carr Lake. No data limitations were previously identified for Lake Hall and Lake Overstreet, so no studies or additional data collection are proposed for these waterbodies.

Examination of **Table 4-27** shows some common themes relative to the identified data limitations. The themes include limited continuous flow data along key tributaries, old or no water quality data, no groundwater quality data in the area of the study waterbodies to allow assessment of potential seepage load impacts, and no data to quantify internal nutrient loading in target lakes.

Section 4.10.3 and **Exhibit 4-9** present the prioritized waterbodies for restoration within the Lake Jackson basin. These included, in order of priority, Lexington Creek, Lake Jackson, and the Summerbrook Chain of Lakes. These waterbodies were targeted for development of projects to support water quality improvement. Identified projects are discussed in **Volume 7 – Non-Structural and Structural Project Development**. The prioritized waterbodies are also targeted for studies to fill data gaps to further refine restoration strategies. As such, the proposed studies will focus on these waterbodies. While Carr Lake was not identified as a priority waterbody, the Summerbrook Chain of Lakes (which is a priority waterbody) drains into Carr Lake. Currently, limited information is available on the load entering Carr Lake. Therefore, based on the desire to maintain the present water quality in Carr Lake, discussions with City staff identified quantification of the flows, concentrations, and loads going to Carr Lake from the Summerbrook Chain as a priority.

Table 4-27: Summary of Identified Data Limitations for Waterbodies in the Lake Jackson Basin

Lake Jackson	Lexington Creek	Summerbrook Chain	Carr Lake
Limited flow on key tributaries	Flow station decommissioned in 2018	No flow measurements anywhere along Summerbrook Creek	No measured flow in primary tributary flowing into the lake from the Summerbrook Chain of Lakes
Old water quality data on tributaries	Discrepancies in measured <i>E. coli</i> concentrations between FDEP and Leon County, with Leon County concentrations significantly lower than FDEP from the same locations and generally same time periods.	No water quality data provided for any of the three lakes	Water quality data on the primary tributary from the Summerbrook Chain of Lakes is old and sparse
No adjacent surficial aquifer data to assess seepage		No adjacent surficial aquifer data to assess seepage in any of the lakes.	
No recent data to quantify internal recycling of nutrients		No data to quantify internal recycling of nutrients in any of the three lakes	

A key task under the scope of work for the basin studies identification was to review and assess stressors for the priority waterbodies. The stressor sources were reviewed to confirm potential water quality impact and pathways of pollutant migration to the waterbodies. The intent is to identify where additional data collection and analysis of advanced analytic parameters might help better understand the expected load/contribution of the source. The following sections outline the key stressors identified in previous sections for each of the prioritized waterbodies within the Lake Jackson basin (Lexington Creek, Lake Jackson, and Summerbrook Chain of Lakes).

4.11.1.1 Lexington Creek Key Stressors

The stressors identified for Lexington Creek were twofold. Water quality analyses and the qualitative assessment of sources (**Section 4.9.3.5** and **Section 4.9.4**) identified phosphorus and FIB loading as key stressors. Phosphorus loading was related primarily to stormwater runoff contributing to tributary inflow, whereas FIB loads were associated primarily with septic systems and, to a limited degree, potential wastewater infrastructure leakage or spills.

In relation to phosphorus, **Figure 4-158** showed AGM TP levels exceeding the Panhandle East TP threshold of 0.18 mg/L in the creek in recent years. For some of the years with high TP levels, construction of the BMP at Meridian Road was ongoing, therefore, some TP data may be

representative of those conditions. Additionally, two of the three available SCI assessments since 2010 identified the stream as impaired (**Table 4-23**).

Lexington Creek is impaired for FIB based on *E. coli* data primarily sampled at the downstream end of the creek where it crosses Timberlane Road. **Figure 4-159** presented a plot of the *E. coli* data on Lexington Creek through 2020. The plot showed numerous (greater than the 10 percent threshold) exceedances of the 410 MPN/100 mL criteria. **Figure 4-159** also highlighted an issue with the available data, which is discussed in **Section 4.9.3.5**. The issue is the discrepancy between the Leon County and FDEP results, with the Leon County results much lower and generally not showing exceedances, whereas the FDEP data are significantly higher and do show exceedances. The proposed study outlined in **Section 4.11.2.2** is scoped in part to resolve the question of the data inconsistency.

4.11.1.2 Lake Jackson Key Stressors

Lake Jackson water quality analyses and the qualitative assessment of sources (**Section 4.4.3.7** and **Section 4.4.4**) identified phosphorus, and associated Chl-a response, as the key stressor in the southern portion of the lake. Additionally, FIB was identified as a stressor for certain tributaries to the lake (not including Lexington Creek, which was discussed previously). While the lake is presently not impaired for nutrients and Chl-a, recent data had lake-wide average Chl-a AGMs slightly above the 6 µg/L threshold (**Figure 4-11**), with TP AGMs at times above the maximum, but always above the minimum threshold (**Figure 4-10**). Analyses of the spatial variation in the lake (**Section 4.4.4.1**) showed that long-term average AGM levels of TP (**Figure 4-20**) and Chl-a (**Figure 4-21**) on the south end of the lake, including Megginnis Arm (Megginnis Creek inflow) and Fords Arm (Lexington Creek inflow), are significantly higher than other areas of the lake and above the allowable thresholds per the NNC.

Analyses of tributary inflow data, other than Lexington Creek, which was discussed above, showed high FIB and nitrogen levels in two tributaries flowing into the upper western side of Megginnis Arm (**Figure 4-26** and **Figure 4-29**, Tribs 1 and 2). These are Butlers Mill Creek and Okeeheepkee Creek. **Figure 4-172** and **Figure 4-173** present the available *E. coli* data (after 2020) along Butlers Mill Creek and Okeeheepkee Creek, respectively. The plots show where the *E. coli* concentrations in both creeks exceed the 410 MPN/100 mL threshold a majority of the time, with percent exceedances of 92 percent and 71 percent for Butlers Mill Creek and Okeeheepkee Creek, respectively.

Analyses of the nitrogen constituents showed that the high TN levels on both creeks were primarily due to inorganic nitrogen, indicating a potential anthropogenic source in the area. **Figure 4-174** and **Figure 4-175** present plots of the total nitrogen and inorganic nitrogen concentrations within each of the creeks, using the available data (since 2020). The plots show the high percentage of inorganic nitrogen in each creek, with average percentages of between 55 percent and 87 percent, which is indicative of an anthropogenic source of nitrogen. While the Okeeheepkee Creek flows pass through a regional treatment facility prior to entering Megginnis Arm, the Butler Mill Creek flows discharge directly to Megginnis Arm and, therefore, are a higher priority for a study or restoration efforts.

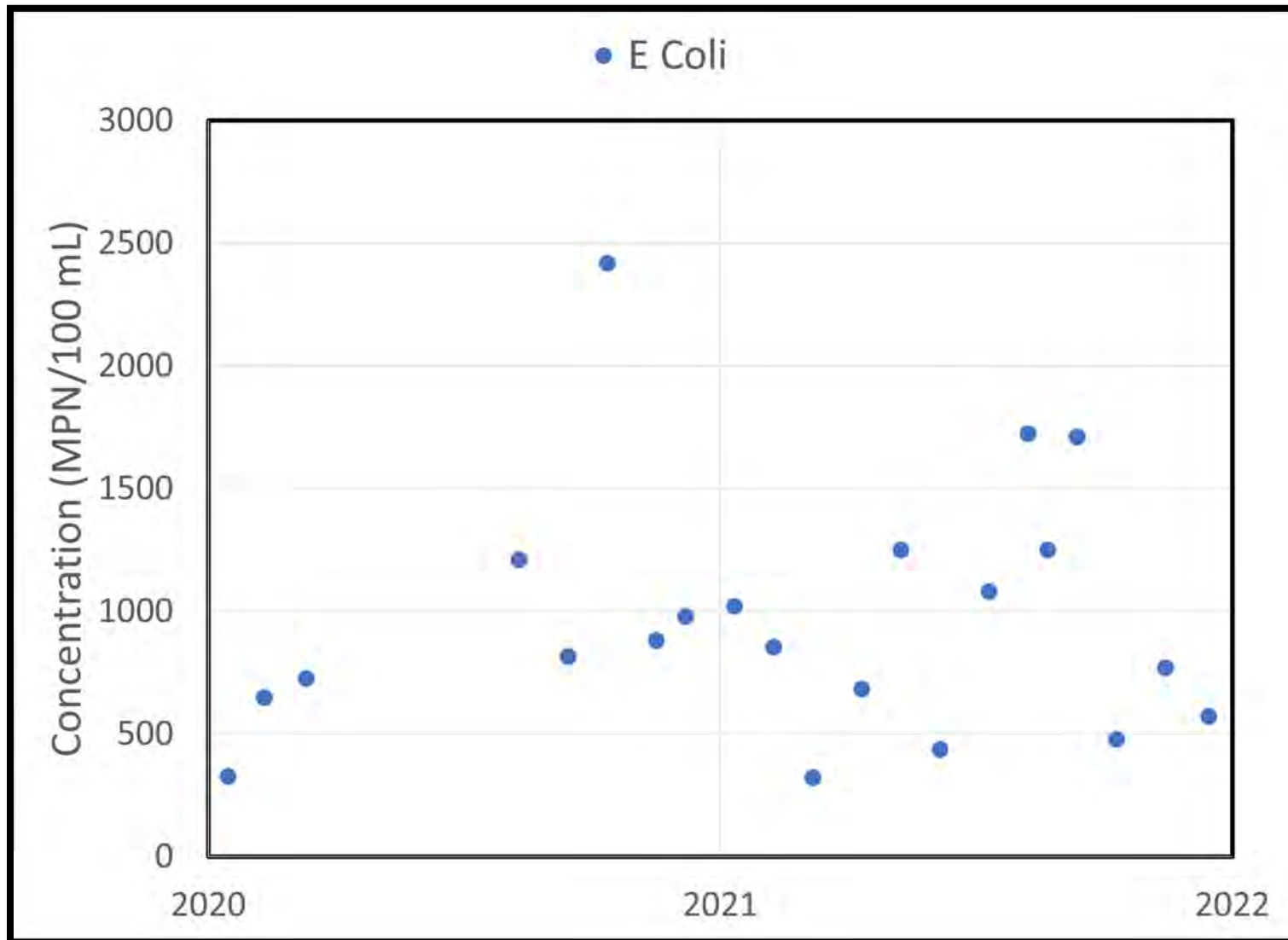


Figure 4-172: Measured *E. coli* on Butlers Mill Creek (2020 and 2021)

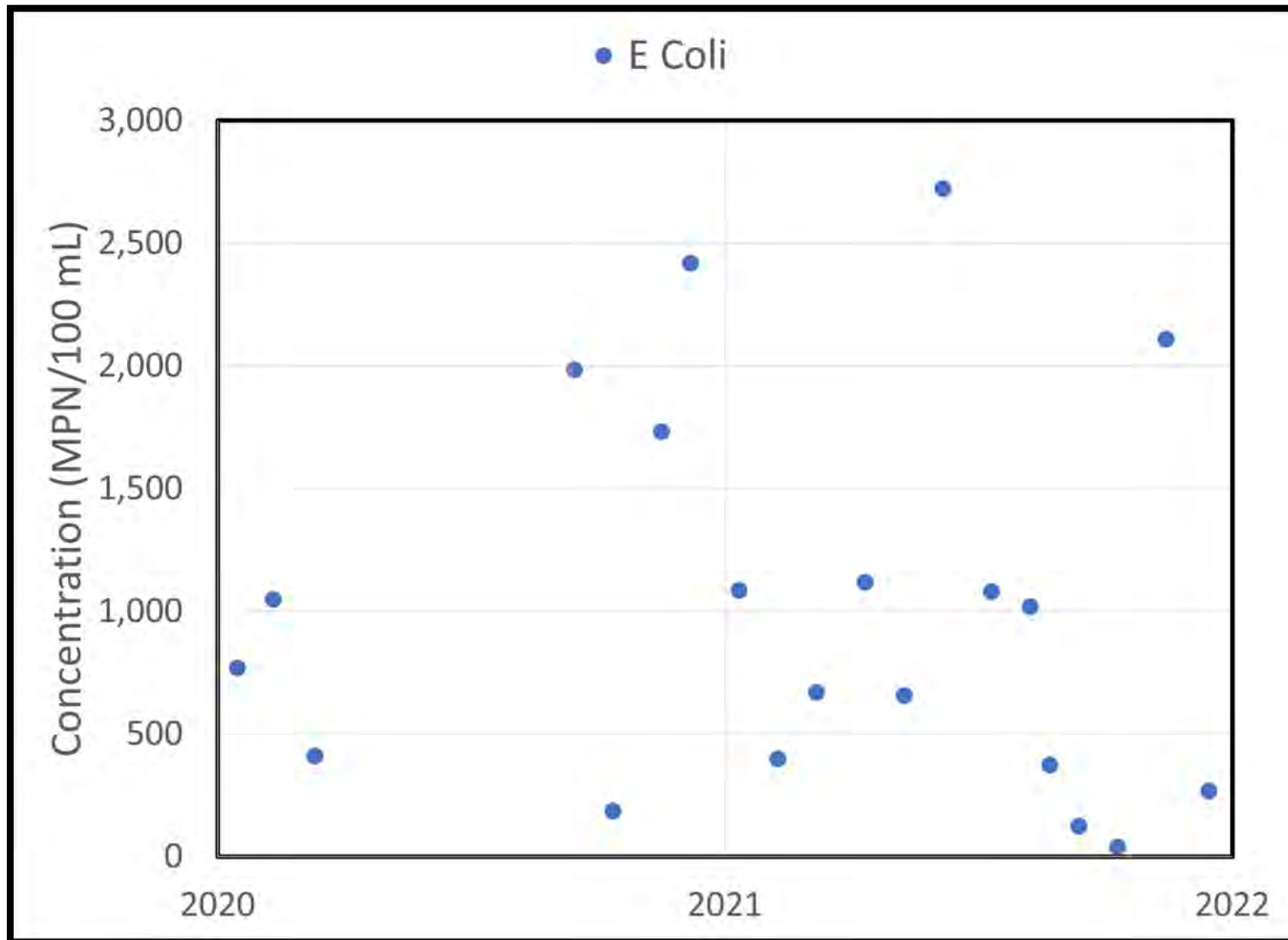


Figure 4-173: Measured *E. coli* on Okeechepke Creek (2020 and 2021)

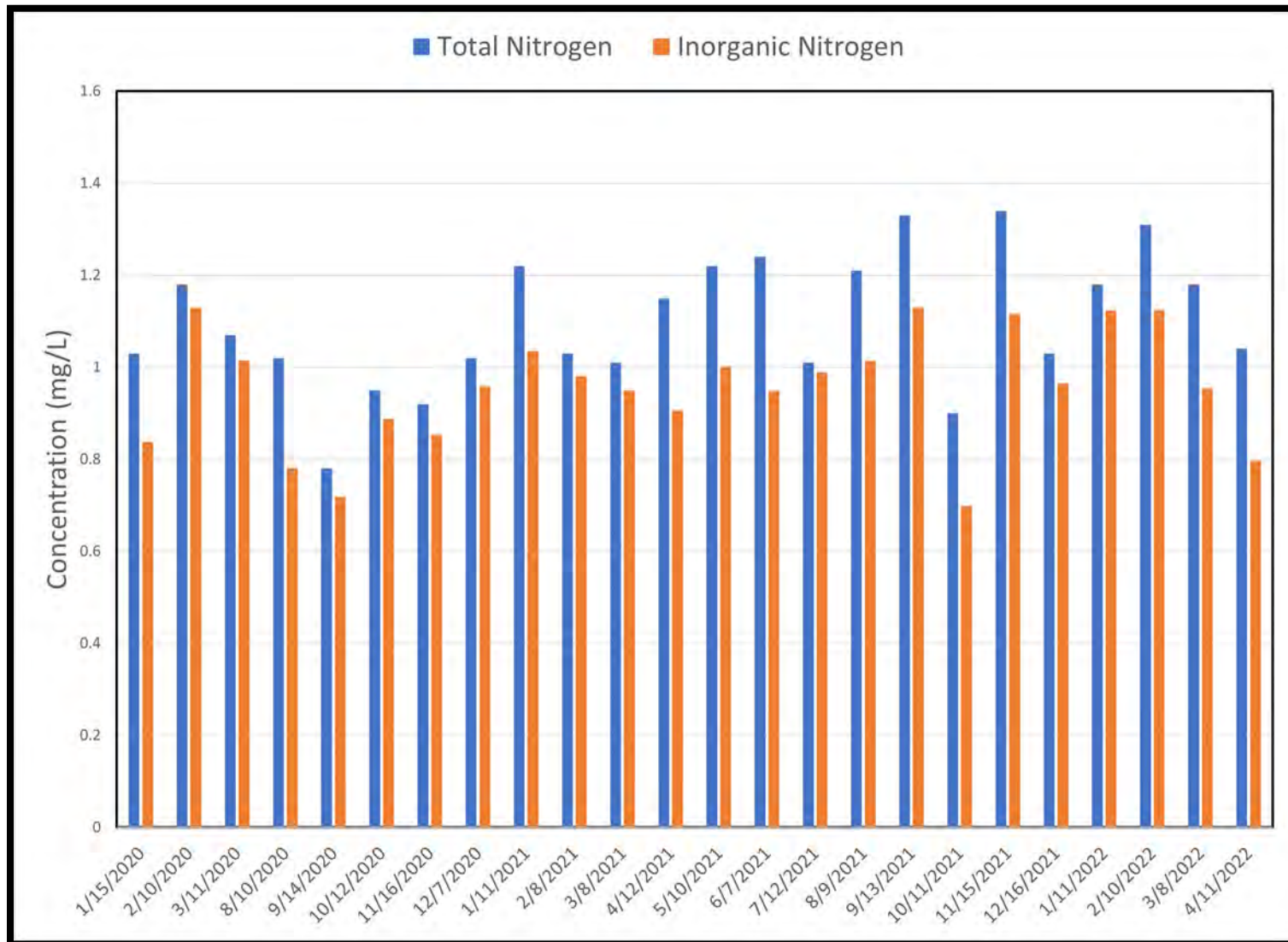


Figure 4-174: Measured TN and Inorganic Nitrogen on Butlers Mill Creek (2020 and 2021)

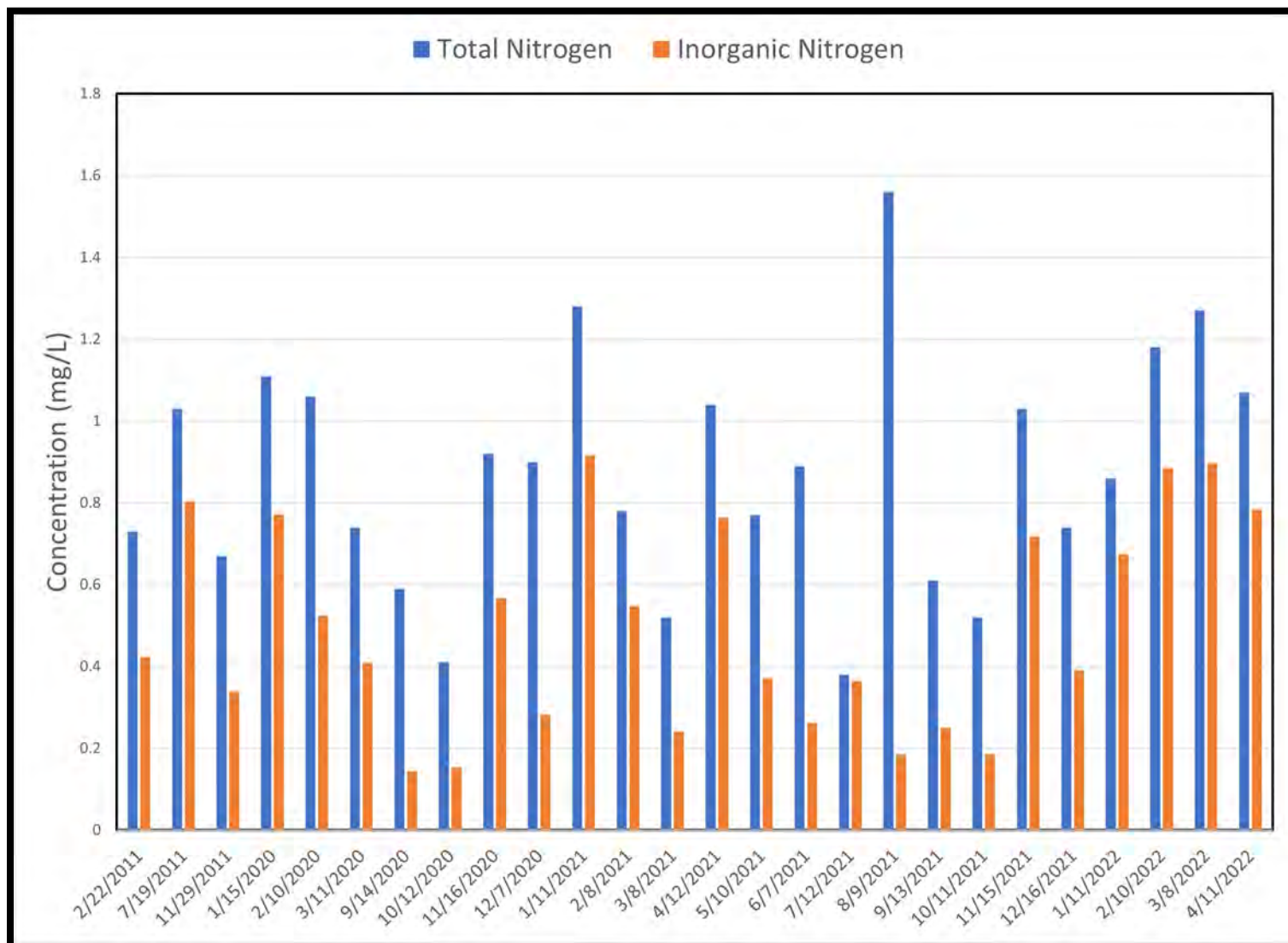


Figure 4-175: Measured TN and Inorganic Nitrogen on Okeechepke Creek (2020 and 2021)

Finally, septic loading was identified as a potential source of pollutant loads in **Section 4.4.4.3** and, primarily the areas along the southwestern side of the lake that include the Harbinwood, Lake Jackson Mounds, and the Okeeheepkee sub-watersheds (Lexington Creek was addressed in the previous section). **Figure 4-172** through **Figure 4-175** showed elevated FIB and inorganic nitrogen in two of the creeks draining this area.

4.11.1.3 Summerbrook Chain of Lakes Key Stressors

The Summerbrook Chain of Lakes had no available data to define water quality conditions within each of the three lakes and limited data along Summerbrook Creek. The qualitative assessment (**Section 4.6.4**) identified stormwater loading and septic loading as potential stressors, with the focus on septic loading limited to areas upstream of Lake Alyssa. The limited water quality data in the creek did not show elevated nutrient levels relative to the NNC (**Figure 4-77** and **Figure 4-78**) but did show some upward trends in recent phosphorus measurements (**Figure 4-76**). *E. coli* data, while generally below the 410 MPN/100 mL threshold, were elevated in comparison to other more natural waterbodies in the area (**Figure 4-79**).

4.11.2 Study/Data Collection Recommendations

Based on the data limitations and waterbody stressors outlined in **Section 4.11.1**, additional data collection and waterbody study recommendations were developed in conjunction with City staff. The following studies are recommended:

- Lake Jackson: Re-Establish Flow Measurements in Lexington Creek,
- Lexington Creek: FIB Source Assessment,
- Lake Jackson: MARS Facility Restoration Study,
- Lake Jackson: Butlers Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment,
- Lake Jackson: Hydrologic Budget Assessment, and
- Carr Lake: Flow Measurement and Water Quality of the Inflow from the Summerbrook Chain of Lakes.

The following outlines the justification, what stressors or data limitations are being addressed, and a general description of the work to be performed, along with initial scope items for each of the data collection/studies listed previously. It is noted that some of these studies are outside of the City incorporated areas and the areas where the studies would occur are under the jurisdiction of Leon County.

4.11.2.1 Lake Jackson: Re-establish Flow Measurements in Lexington Creek

In the waterbody prioritization, Lexington Creek was the highest ranked waterbody in terms of need for restoration activities. Lexington Creek discharges to the southern end of Lake Jackson through Fords Arm. Discharges to the southern end of Lake Jackson were prioritized based on the high TP and Chl-a levels in that area (**Figure 4-20** and **Figure 4-21**). Historical flow measurements along Lexington Creek are limited, and the station that was located at Timberlane Road was discontinued in 2018. The location of the historical flow measurements,

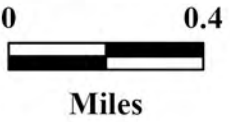
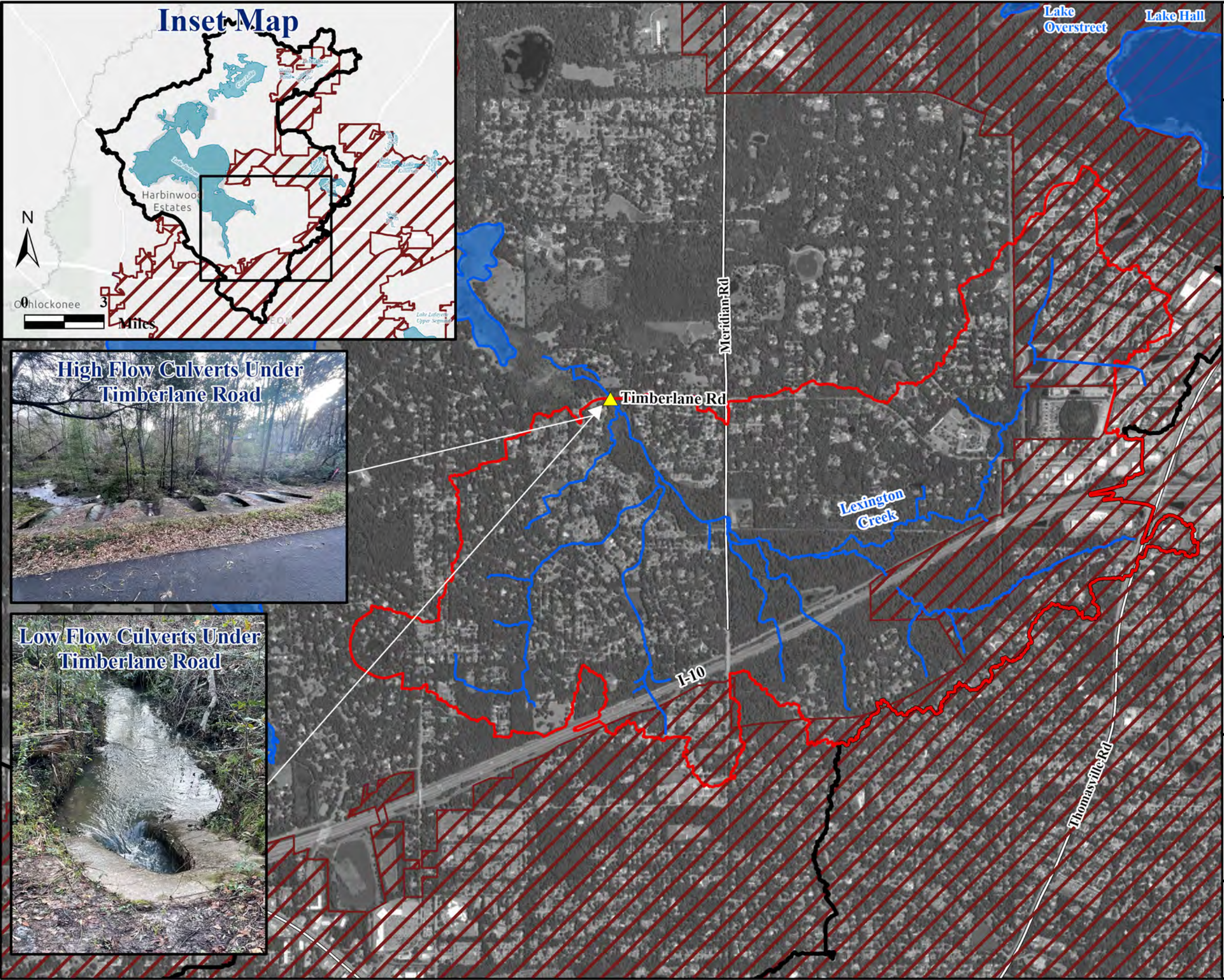
maintenance and calibration concerns, and significant discrepancies between more recent flow data and historical measurements has raised questions on the validity of the flow data. Additionally, the flow station was upstream of two additional inflows that drain significant areas of the sub-watershed. These inflows drain large neighborhoods with the potential for significant loads.

Accurate quantification of the nutrient load (especially phosphorus) coming into Lake Jackson from Lexington Creek is necessary for understanding the potential impacts to the degraded areas of the lake along the southern side. Presently, ongoing water quality monitoring is being performed along Lexington Creek where it crosses Timberlane Road (**Figure 4-176**). Based on the discontinuance of the flow measurements in 2018, calculation of loads, using the flow and water quality data, cannot be done for recent conditions. As such, it is recommended to re-establish flow measurements on Lexington Creek, but at the location where it crosses Timberlane Road to coincide with the water quality measurements. An additional benefit of providing continuous flow measurements at Timberlane (versus the previous location at Meridian) is flows will be reflective of more than 90 percent of the Lexington Creek sub-watershed. Additionally, an evaluation of the frequency of ambient sampling at Timberlane under the present data collection efforts should be evaluated to determine if an alternate frequency would better characterize conditions.

Figure 4-176 provides a map showing the location of the data collection in relation to the Lexington Creek watershed, the location of the proposed monitoring station, and photos of the culverts that cross Timberlane Road where the measurements would be taken (see photos in **Figure 4-176**). This location has a lower flow bypass culvert separate from the culverts that carry the higher flows (see photo). While the multiple culverts and the low flow bypass pose difficulties in setting up a continuous flow station, the site offers the best opportunity to quantify the full flow from the Lexington Creek sub-watershed.

The re-establishment of the flow station is recommended to be conducted in two phases, where the first phase focuses on reconnaissance of the site and development of a plan for the installation of equipment, and the second phase is the data collection. The recommended elements for the re-establishment of the flow measurements are presented below.

- Site Reconnaissance and Survey (Phase 1) to better understand the site logistics, including inflow/outflow invert elevations, as well as develop consensus with City staff on the approach for measuring the flow and development of a Quality Assurance Project Plan (QAPP).
- Equipment Installation and Data Collection (Phase 2) to facilitate and perform data collection.
- Data Reporting and Analyses (Phase 2) to prepare reports that present the data from the flow measurements.



Legend

- Lexington Creek Watershed
- Waterbodies in Study
- Tallahassee Corporate Limits
- Lake Jackson Basin
- Flow and Water Quality Sampling Location

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Road: COT, 2020

Figure 4-176:
Lake Jackson - Re-Establish Flow
Measurements on Lexington Creek Watershed

Tallahassee Master Plan - Surface
Water (TMaPS)



4.11.2.2 Lexington Creek: FIB Source Assessment

FIB loading was identified as a potential stressor for the Lexington Creek sub-watershed based on available *E. coli* data and septic tank density and distribution. **Figure 4-177** shows the Lexington Creek sub-watershed with historical water quality sampling stations identified. While the bulk of the historical data were collected where the creek crosses Timberlane Road (yellow triangle on **Figure 4-177**), high *E. coli* concentrations were also found at the secondary stations (orange triangles).

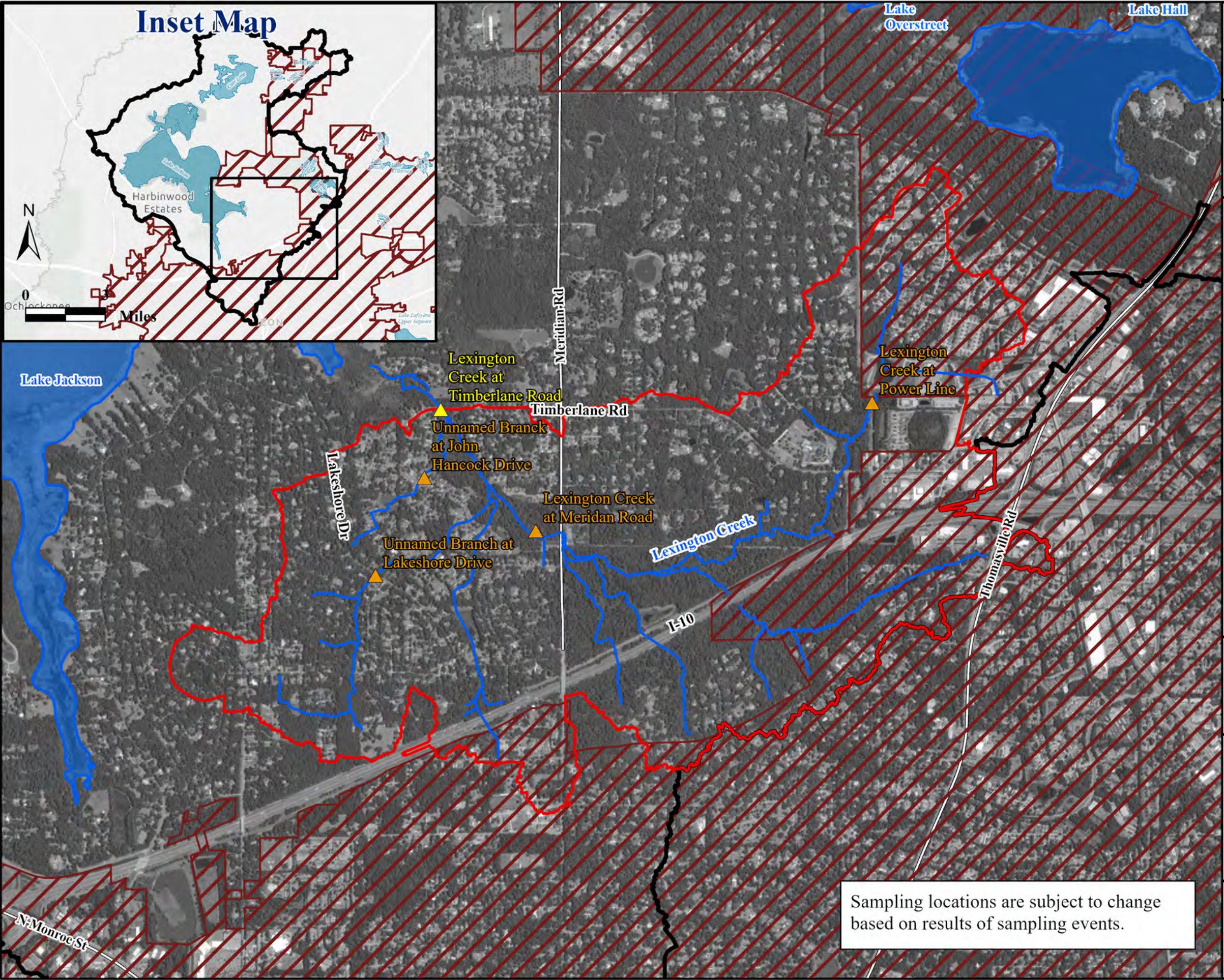
Determination of the sources of the FIB is necessary to support development of a restoration plan. Additionally, concerns raised earlier around discrepancies between monitoring by FDEP and Leon County create a need for an independent assessment to determine if *E. coli* levels are actually elevated. A study is recommended to evaluate if present FIB levels on the creek are elevated (resolve the discrepancy identified earlier) and, if determined to be elevated, define the sources of the FIB.

To evaluate if the present *E. coli* concentrations on the creek are elevated, more recent data collected by the County and FDEP will be analyzed to see if those data continue to show the discrepancies seen in the data through 2020. If the analyses do not fully resolve the discrepancies, an independent sampling will be performed utilizing methods approved by the City and FDEP. The sampling is proposed to be done at the Timberlane Road location.

If needed to help determine the origin of the elevated FIB, including species of origin (i.e., human, animal, etc.) and location of input to the Lexington Creek sub-watershed, molecular source tracking (DNA analytical testing) is proposed along with an iterative sampling approach throughout the sub-watershed. The investigation will include sampling from multiple locations within and around the sub-watershed, working upstream and into the various tributaries.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Field reconnaissance of the Lexington Creek sub-watershed to identify potential FIB sources as well as potential sampling locations.
- Development of a QAPP that details staff responsibilities, sampling procedure, methodology, equipment, and laboratory analytical requirements for the project.
- Field monitoring and sampling to verify the FIB levels and identify potential sources of FIB to Lexington Creek.
- Data analyses to test hypotheses on potential sources that were identified for this investigation.
- Develop a draft and final report summarizing the findings from the study.





CITY OF
TALLAHASSEE

N



0 0.6
Miles

Legend

-  Lexington Creek Watershed
-  Waterbodies in Study
-  Lake Jackson Basin
-  Tallahassee Corporate Limits

Water Quality Sampling Locations

-  Primary Location
-  Secondary Locations

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT, 2020

Figure 4-177:
Lexington Creek - FIB Source Assessment

Tallahassee Master Plan - Surface
Water (TMaPS)

Geosyntec
consultants

Sampling locations are subject to change based on results of sampling events.

4.11.2.3 Lake Jackson: MARS Facility Restoration Study

Nutrient loading to the southern side of Lake Jackson was identified as a key stressor in **Section 4.11.1.2**. Megginnis Arm is one of the two primary discharges to the southern side of the lake and drains a highly urbanized area. The MARS Facility was constructed to treat runoff into Megginnis Creek. **Figure 4-178** provides an overview of the MARS Facility, including an aerial view of the system components, a diagram outlining the design components, and photos taken in 2021 of the overflow, the filter marsh intake, and a portion of the filter marsh.

The MARS Facility resides outside the City limits and is currently operated by NFWFMD. Additionally, an FDEP-sponsored study, completed by the City, shows the facility is effective at removing nutrients. However, as described in **Section 4.4.1**, maintenance of the MARS Facility has declined significantly over the years, potentially reducing treatment effectiveness. Based on this, a study is proposed to accomplish the following:

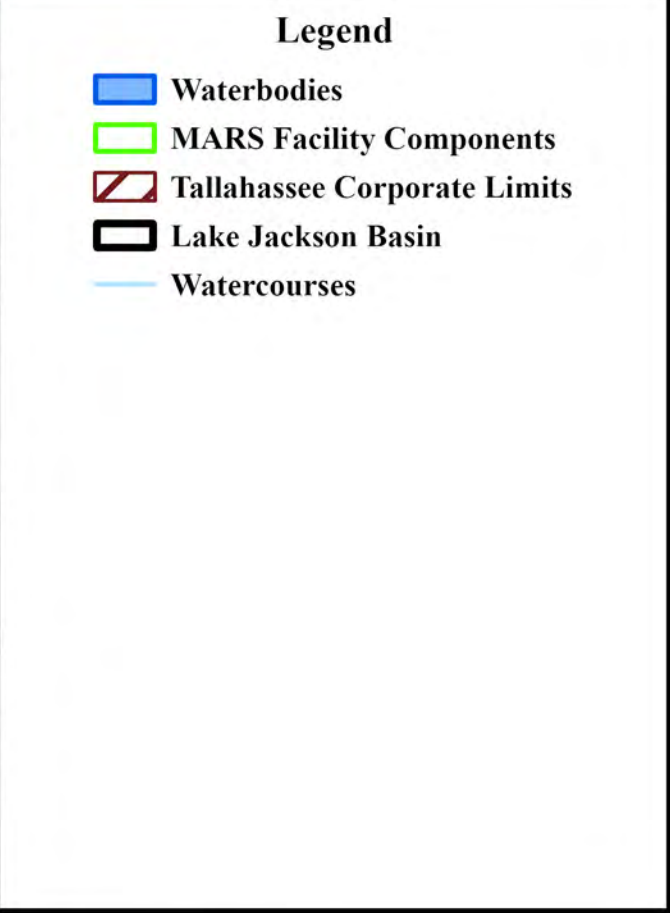
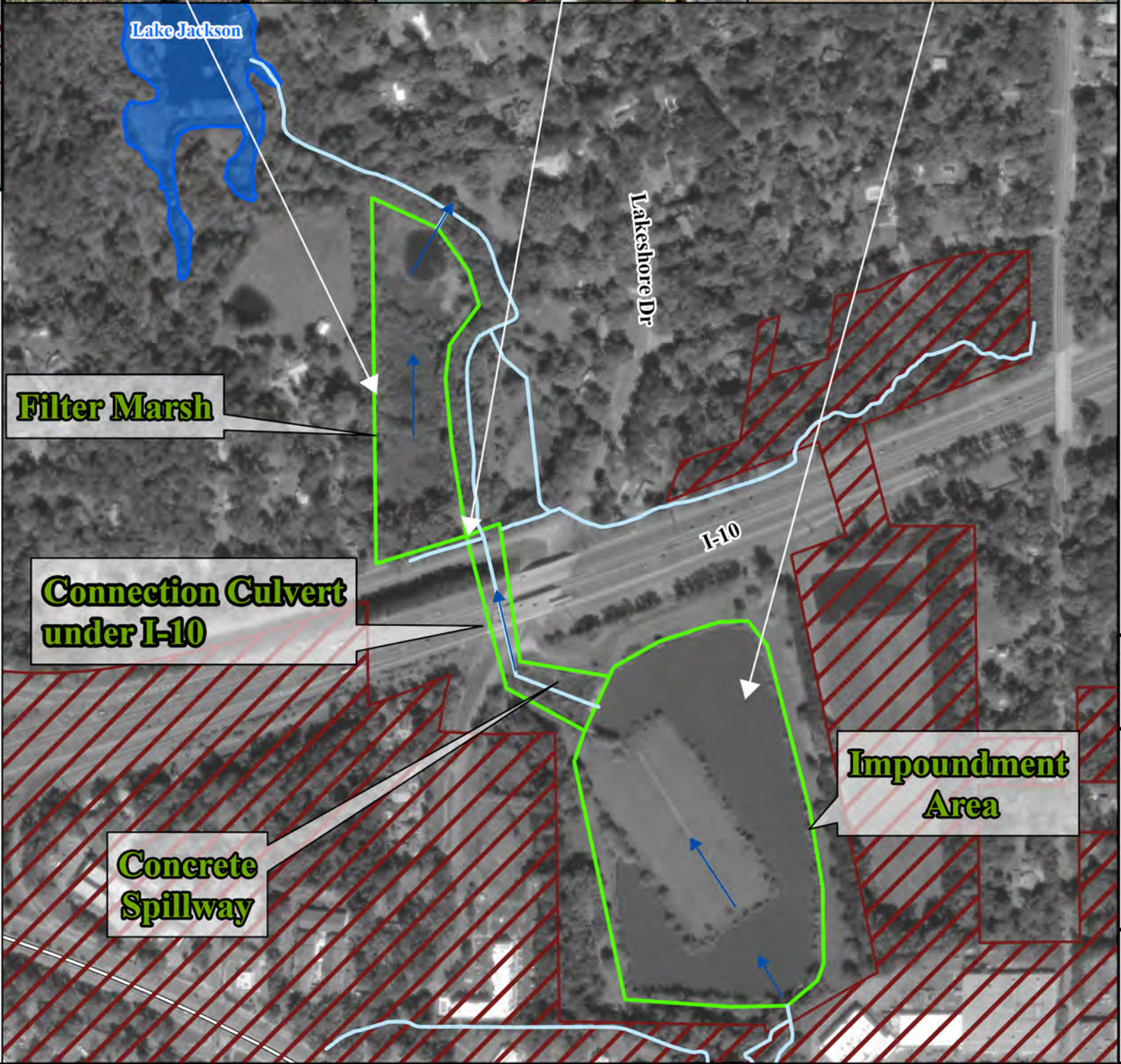
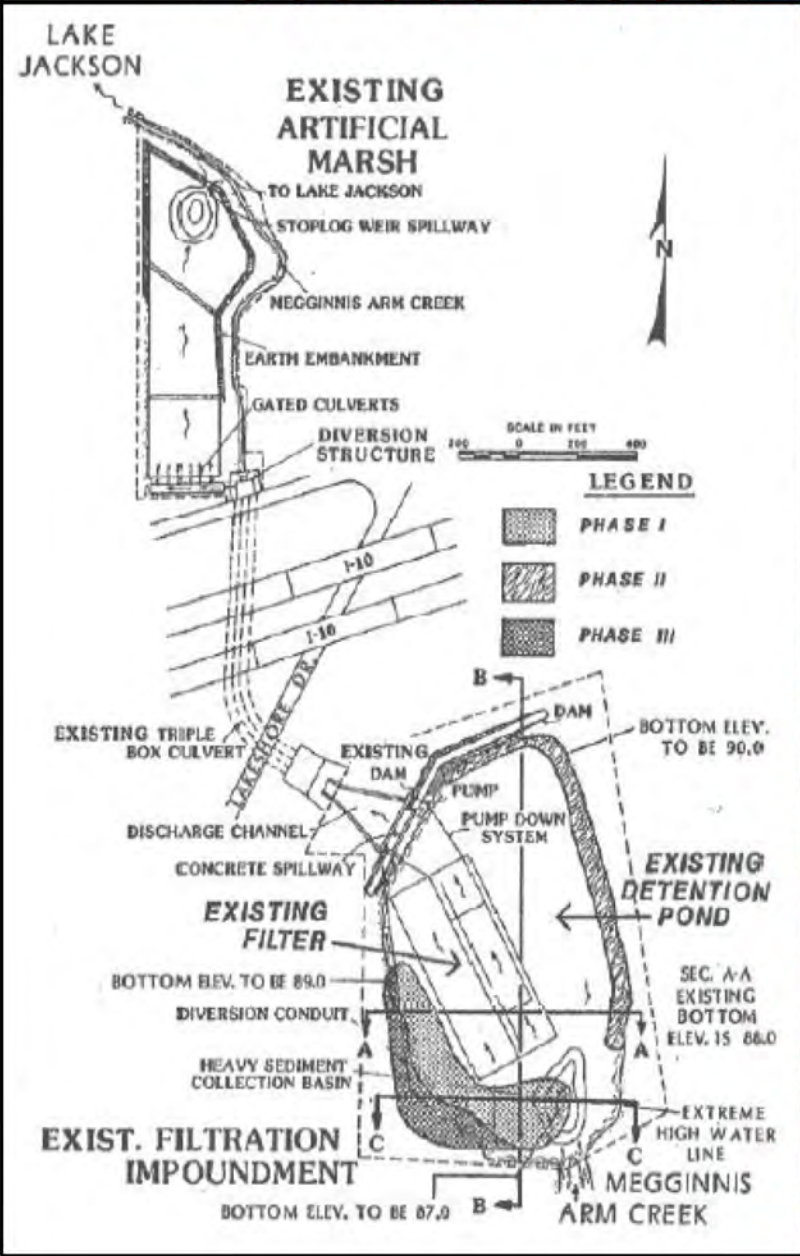
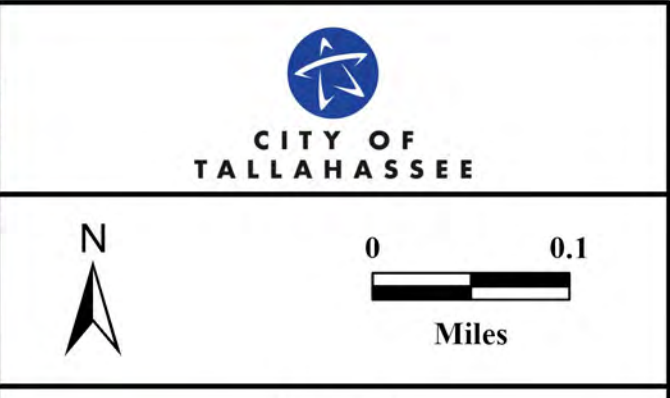
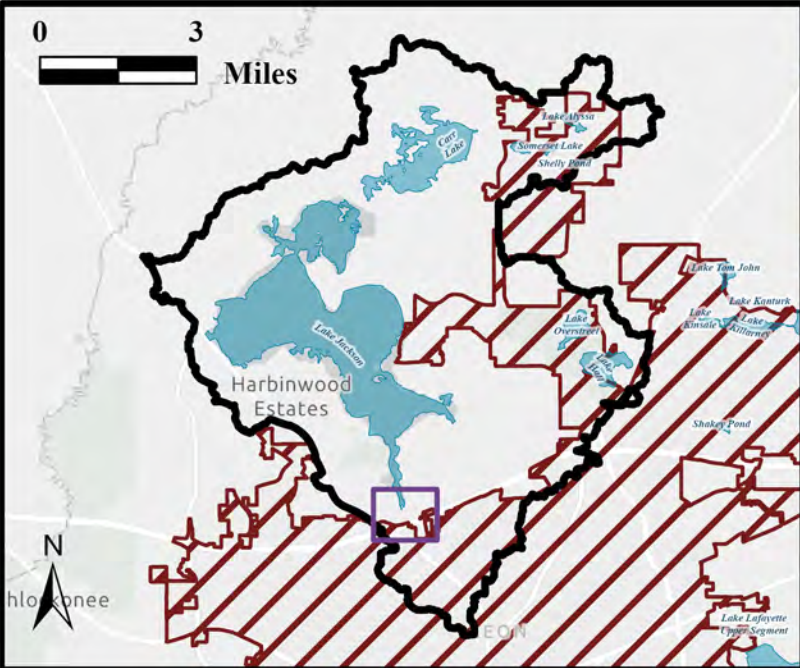
- Evaluate the present conditions of the facility against its historical design,
- Quantify the present performance of the facility based on existing and new data collected, and
- Assess options for restoration of design components to improve water quality treatment including impoundment and wetland polishing areas.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Gather and assess all available information relevant to the MARS Facility and its overall design and performance
- Conduct a detailed engineering assessment of all components of the MARS Facility based on available information on the individual design components
- Perform a facility performance evaluation using available data and additional data gathered as needed
- Develop restoration recommendations based on the findings from previous work tasks
- Develop a draft and final report summarizing the findings of the study

4.11.2.4 Lake Jackson: Butler Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment

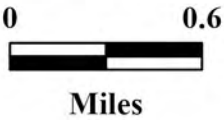
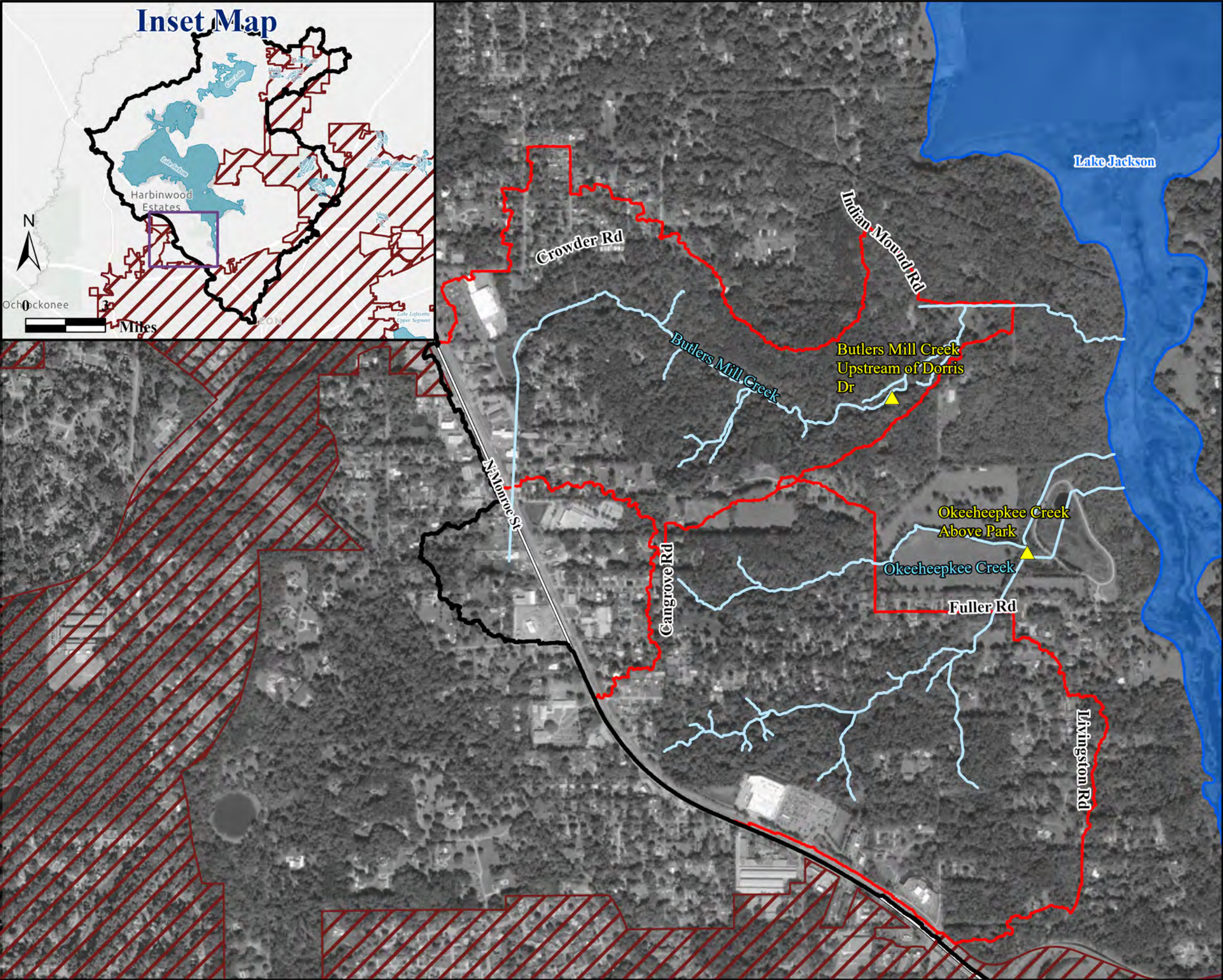
High *E. coli* and inorganic nitrogen concentrations within Butlers Mill Creek and Okeeheepkee Creek were identified in **Section 4.11.1.2** as stressors to Lake Jackson (**Figure 4-172** to **Figure 4-175**). These high concentrations are indicators of anthropogenic loading sources that need to be identified and addressed. **Figure 4-179** shows the Butlers Mill Creek and Okeeheepkee Creek sub-watersheds with historical water quality sampling stations identified. As outlined previously, while Okeeheepkee Creek flows through the Okeeheepkee Creek Regional Treatment Facility, Butlers Mill Creek discharges directly to Megginnis Arm.



Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
MARS Facility Layout: COT, 2023

Figure 4-178:
Lake Jackson - MARS Facility Restoration Study

Tallahassee Master Plan - Surface Water (TMaPS)



Legend

- Subbasins
- Waterbodies in Study
- Tallahassee Corporate Limits
- Lake Jackson Basin
- Historic Water Quality Sampling Location
- Watercourses

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT, 2020

Figure 4-179:
Lake Jackson - Butlers Mill Creek and
Okecheepkee Creek Inorganic Nitrogen and
FIB Source Assessment

Tallahassee Master Plan - Surface
Water (TMaPS)



Determination of the sources of the elevated inorganic nitrogen and FIB is necessary to support development of a restoration plan. A study is recommended to identify and define the sources.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- A field and desktop reconnaissance of the Butlers Mill Creek and Okeeheepkee Creek sub-watersheds to identify potential inorganic and FIB sources, as well as potential sampling locations.
- Development of a QAPP that details staff responsibilities, sampling procedure, methodology, equipment, and laboratory analytical requirements for this project.
- Field monitoring and sampling to verify the inorganic nitrogen and FIB levels and identify potential sources to the two creeks.
- Data analyses to test hypotheses on potential sources that were identified for this investigation.
- Development of a draft and final report summarizing the findings from the study.

4.11.2.5 Lake Jackson: Hydrologic Budget Assessment

Section 4.4.3.6 presented measured flows in Lexington Creek from 1987 to 1996 and from 2016 to 2018 (**Figure 4-5**). That data indicated significant reductions in the flow from Lexington Creek in the later measurements. While some concerns were raised relative to the accuracy of the data, the significant differences raise questions. The questions include what changes occurred in the sub-watershed to result in the significant reduction in flow, and how do those reductions on this tributary and potential reductions in other tributaries impact the hydrologic and water quality response in the lake. Additionally, examination of the historical water level record in Lake Jackson (**Figure 4-4**) showed significant changes in the water level patterns since the earliest records in the 1950s and 1960s, along with an overall water level decline.

Understanding the hydrologic budget for a waterbody and its response to that budget, along with how that budget has changed over time, is important relative to impacts on water quality response. This is especially true for closed basin systems such as Lake Jackson, where water level and exchange impact the ecological response. The changes in water level patterns are likely a function of changes in the loss to groundwater through the sinkholes, but they may also be influenced by changes in the overall runoff. If the flow data are accurate, the reductions in flows from Lexington Creek may be due to increased retention from stormwater pond construction in the more urbanized sub-watershed. A similar condition potentially exists within the other significant input from the south, Megginnis Creek, due to the construction of the MARS Facility, with its extensive impoundment volume and other upstream improvements.

A Lake Jackson Hydrologic Study is proposed. The goals of the study are as follows.

- Quantify the present hydrologic budget to the lake, including rainfall, baseflow and runoff from tributaries, evaporation/transpiration, and losses to groundwater.

- Develop historical hydrologic stage and water budget based on pre-development conditions and compare with present stage and water budget.
- Provide hydrologic restoration alternatives, if needed.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Gather and assess all available information relevant to hydrologic conditions in the Lake Jackson basin.
- Develop a data collection and modeling plan that will identify the need for additional measurements to support development of a hydrologic and hydraulic model of the basin and outline the assumptions, model(s), data, and methodologies for simulating the existing and pre-development conditions in the basin.
- Develop a hydrologic model of the Lake Jackson basin to simulate existing as well as pre-development conditions.
- Develop a draft and final report summarizing the findings of the study.

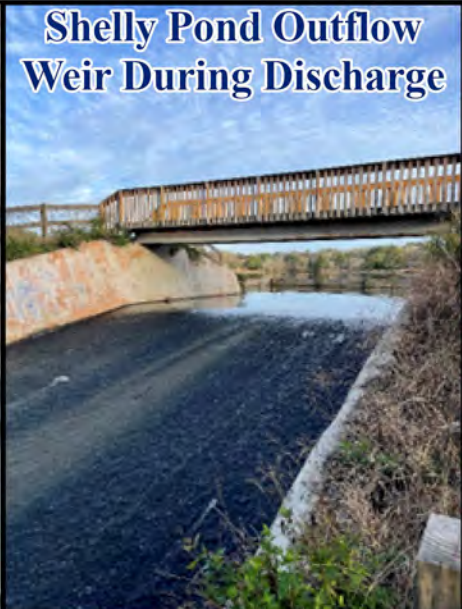
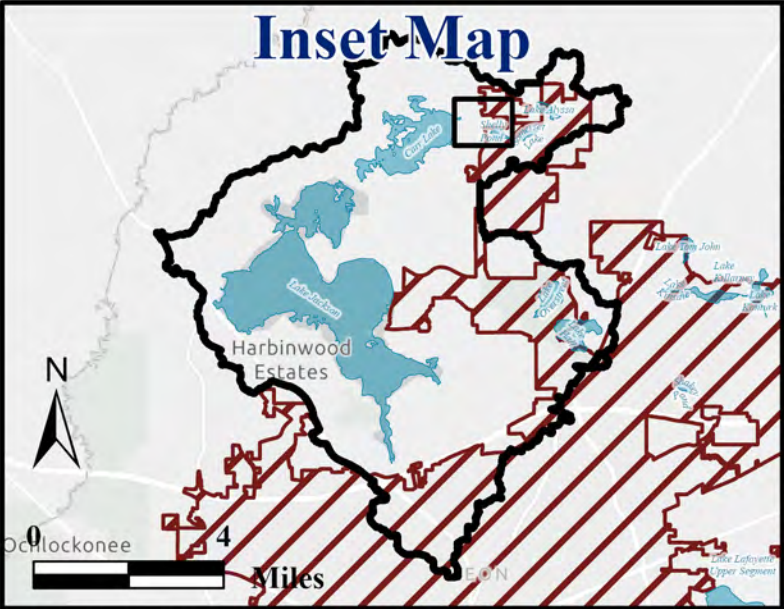
4.11.2.6 Carr Lake: Flow Measurement and Water Quality of the Inflow from the Summerbrook Chain of Lakes

As outlined earlier in the summary of data limitations, while Carr Lake was not identified as a priority waterbody, the Summerbrook Chain of Lakes (which is a priority waterbody) drains into Carr Lake. Currently, there is limited information on the load entering Carr Lake, and based on the desire to maintain the existing water quality in Carr Lake, discussions with City staff identified a need to quantify the flow, concentrations, and load coming into Carr Lake from the Summerbrook Chain.

Accurate quantification of the nutrient load coming into Carr Lake from the Summerbrook Chain of Lakes requires the collection of ambient data within Shelly Pond (the source of water flowing to Carr Lake) and flow measurements over the spillway leaving the pond. **Figure 4-180** provides a map showing the location of the proposed data collection at the outfall weir from Shelly Pond, along with photos of the weir when dry and flowing. The study would include establishment of ambient monitoring of Shelly Pond and installation of a pressure sensor to measure water levels to allow calculation of flow over the weir.

The following study scope of work is proposed with brief descriptions of the work performed. A project kick-off meeting task and project management task would also be included.

- Reconnaissance of the site with City staff to understand the site logistics and develop consensus with City staff on the approach for setting up the monitoring at the site.
- Performance of a survey of the site that includes a full survey of the weir and setting of elevations for a staff gage or water level instrument.
- Development of a QAPP that details staff responsibilities, sampling procedure, methodology, equipment, and laboratory analytical requirements for this project.





**CITY OF
TALLAHASSEE**

N



0 0.1 Miles



Legend

-  Waterbodies in Study
-  Tallahassee Corporate Limits
-  Lake Jackson Basin
-  Flow and Water Quality Sampling Location
-  Watercourses

Sources:
Waterbodies: COT, 2020
Watercourses: COT, 2020
Roads: COT, 2020

Figure 4-180:
**Carr Lake - Flow Measurements and Water
Quality Sampling of the Shelly Pond Outflow**

Tallahassee Master Plan - Surface
Water (TMaPS)

Geosyntec 
consultants



- Ambient sampling of Shelly Pond.
- Installation of water level monitoring equipment in Shelly Pond.
- Ongoing maintenance of the station as outlined in the QAPP.
- Data reporting and analyses that present the raw data and any analyses outlined in the QAPP, along with an overview of the sampling methodology, issues encountered, and methods of resolution.

4.11.3 Study Prioritization

To prioritize the proposed studies, a ranking table was developed that scored each of the projects in relation to the following:

- Waterbody priority ranking (**Table 4-25**),
- Source target ranking (the overall ranking of the source addressed by the study),
- Restoration benefits (qualitative assessment of the benefits of the study),
- Extent of missing data, and
- Relative estimated cost.

Table 4-28 presents the study rankings for each of the individual metrics, the average score based on the individual rankings, and the final study ranking. The studies are divided between those that are within the City's incorporated area and those within unincorporated Leon County. The locations are provided in **Table 4-28**.

Only one study is fully within the City's incorporated area, the flow measurement and water quality of the inflow from the Summerbrook Chain of Lakes. This project overall is ranked fourth.

For the studies within unincorporated Leon County, the top priority is the MARS Facility restoration project, followed by the flow and event-based water quality sampling on Lexington Creek. The third and fourth ranked projects are the FIB source assessment for Lexington Creek and the inorganic and FIB source assessment for Butlers Mill Creek and Okeeheepkee Creek, respectively. The lowest ranked project is the hydrologic budget assessment for the Lake Jackson basin, which covers incorporated and unincorporated areas found within the basin.

Table 4-28: Proposed Study Ranking

Target Waterbody	Proposed Study	Study Location	Waterbody Priority Ranking	Source Ranking	Restoration Benefits	Extent of Missing Data	Relative Cost	Average Rank	Study Ranking
Lake Jackson	Flow and Event Based Water Quality Sampling of Lexington Creek	Leon County	2	1	2	3	3	2.20	2
Lake Jackson	MARS Facility Restoration Study	Leon County	2	1	1	2	4	2.00	1
Lake Jackson	Butlers Creek and Okeeheepkee Creek Inorganic Nitrogen and FIB Source Assessment	Leon County	2	3	4	4	2	3.00	4
Carr Lake	Flow Measurement and Event Based Water Quality of the Inflow from the Summerbrook Chain of Lakes	City Incorporated Area	3	2	6	1	3	3.00	4
Lake Jackson	Hydrologic Budget Assessment	Leon County, City Incorporated Area	2	5	5	5	5	4.40	6
Lexington Creek	FIB Source Assessment	Leon County	1	4	3	4	1	2.60	3

We are engineers, scientists and innovators

Geosyntec is a specialized consulting and engineering firm that works with private and public sector clients to address their new ventures and complex problems involving the environment, our natural resources, and our civil infrastructure. Geosyntec has a staff of over 2,000 engineers, scientists, and related technical and project support staff located in more than 90 offices throughout the U.S. and in Canada, Sweden, Australia, and the United Kingdom.

Geosyntec 
consultants

engineers | scientists | innovators

Offices in Principal Cities of the United States and Select International Locations

www.geosyntec.com