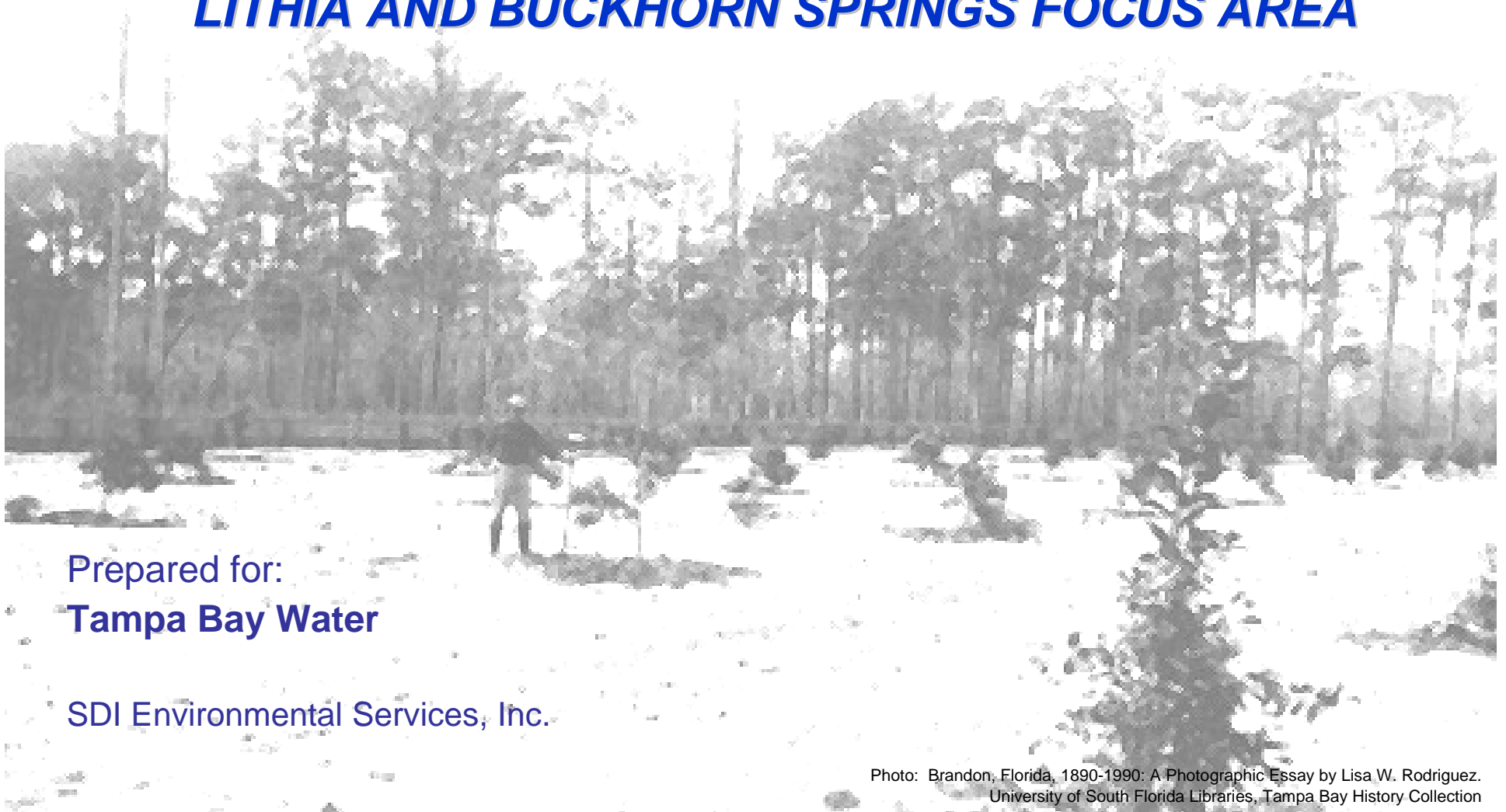




INVESTIGATION OF LAND USE AND NITRATE MIGRATION POTENTIAL IN LITHIA AND BUCKHORN SPRINGS FOCUS AREA

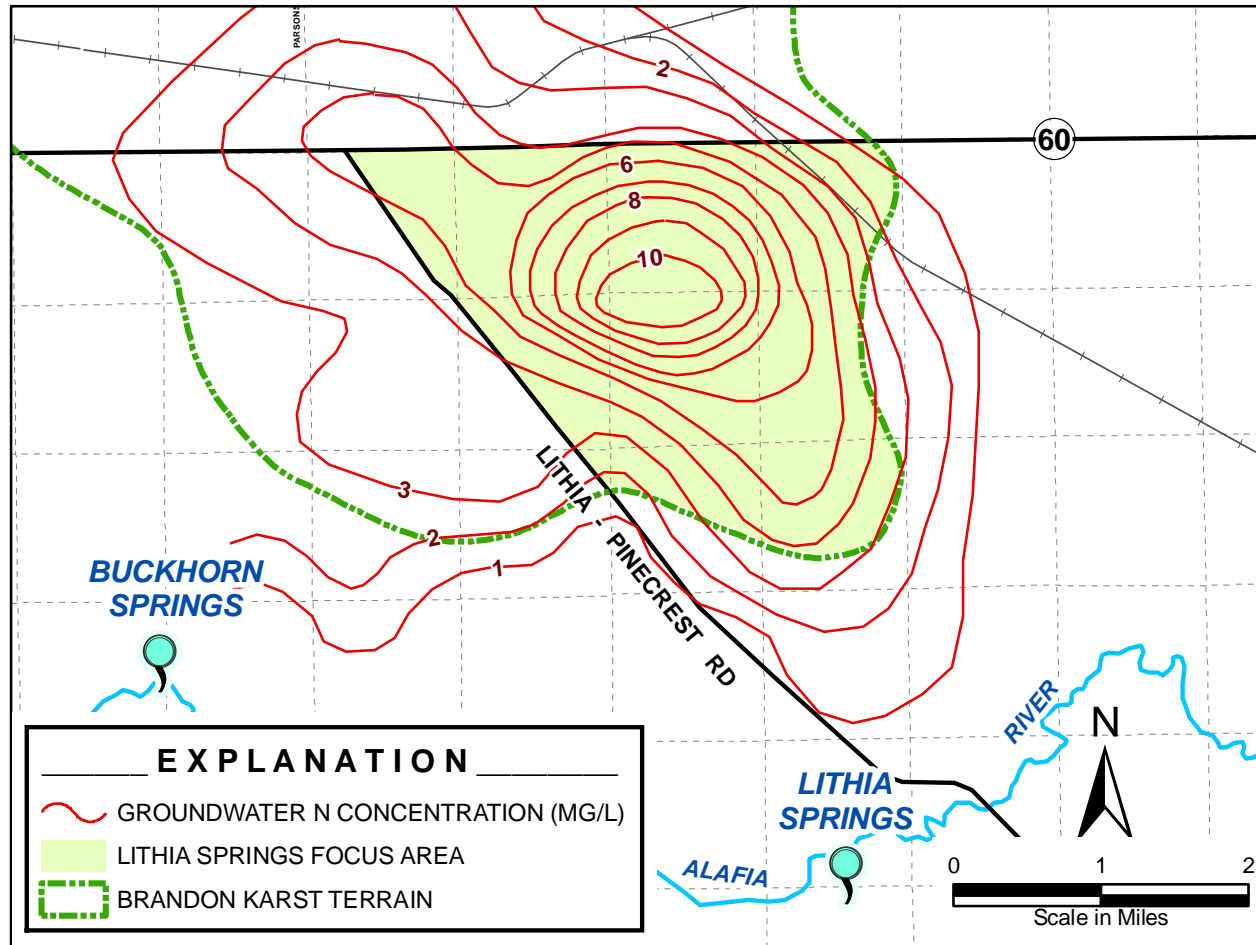


Prepared for:
Tampa Bay Water

SDI Environmental Services, Inc.

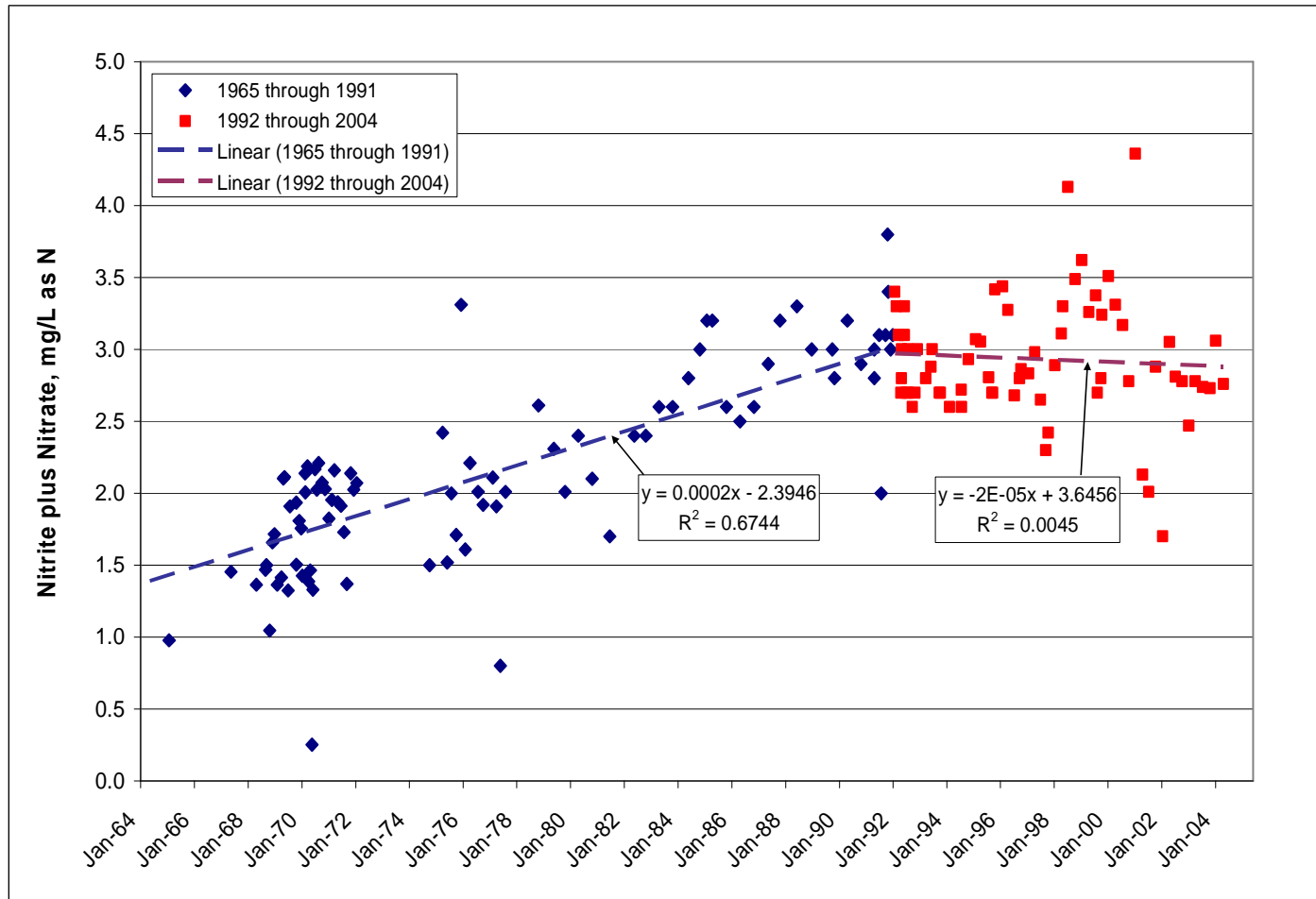


Lithia and Buckhorn Springs Focus Area, with Lines of Equal Nitrate Concentration in Study Area Groundwater in 1992





Nitrite plus Nitrate Concentration Trends in Lithia Springs





Purpose

- To provide an updated and more detailed discussion of the land uses and nitrate migration potential in the Lithia and Buckhorn Springs Focus Area
- This study will update and expand on the relevant discussions in the 1993 Jones and Upchurch Report



Methodology

- ❑ Quantify the nitrate loading potential of land uses and land practices within the Focus Area
- ❑ Identify spatial and temporal distributions of problematic land uses and land practices
- ❑ Estimate net loading of N to the Focus Area groundwater system over time
- ❑ Characterize the potential for pollutants to migrate from the Focus Area to the Springs
 - Vulnerable soils
 - Karst geology
- ❑ Compare time history of N loading into the Focus area groundwater to the measured mass loading of N out of Lithia Springs
 - Estimate average groundwater pollutant travel time?



Primary Data Sources

- ❑ Typical land-use based N loading and leaching rates
 - Published values, numerous studies conducted in 1990's and early 2000's
- ❑ Spatial and temporal distributions of land uses and land practices
 - Previous mapping efforts
 - ❖ SWFWMD, 1990 (detailed land use map)
 - ❖ Jones and Upchurch, 1993
 - ❖ FCCDR, 2003 (septic tank locations)
 - ❖ Parsons, 2004 (septic tank locations)
 - Aerial photographs, 1968, 1979, 1995, 1999, 2004
 - Maps of sanitary sewer lines (Hillsborough County Water Dept.)
 - Field reconnaissance
- ❑ Soils and Geology
 - Jones and Upchurch, 1993
 - SWFWMD SSURGO Database (based on NRCS data)
 - Tampa Bay Water monitor wells
 - SWFWMD 1'-Contour Aerial Maps

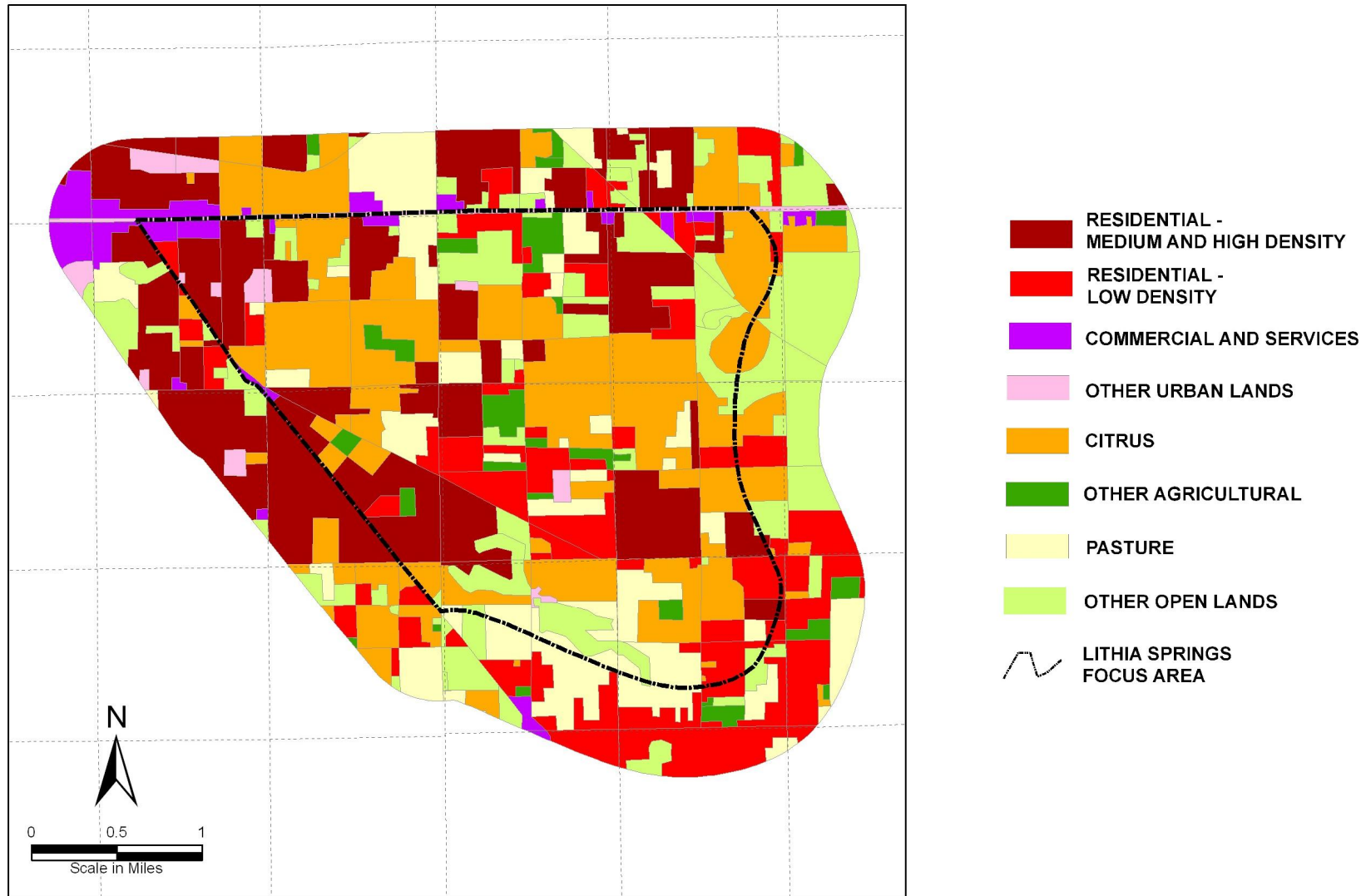


Net Nitrate-N Loading to Groundwater System, Summarized by Land Use

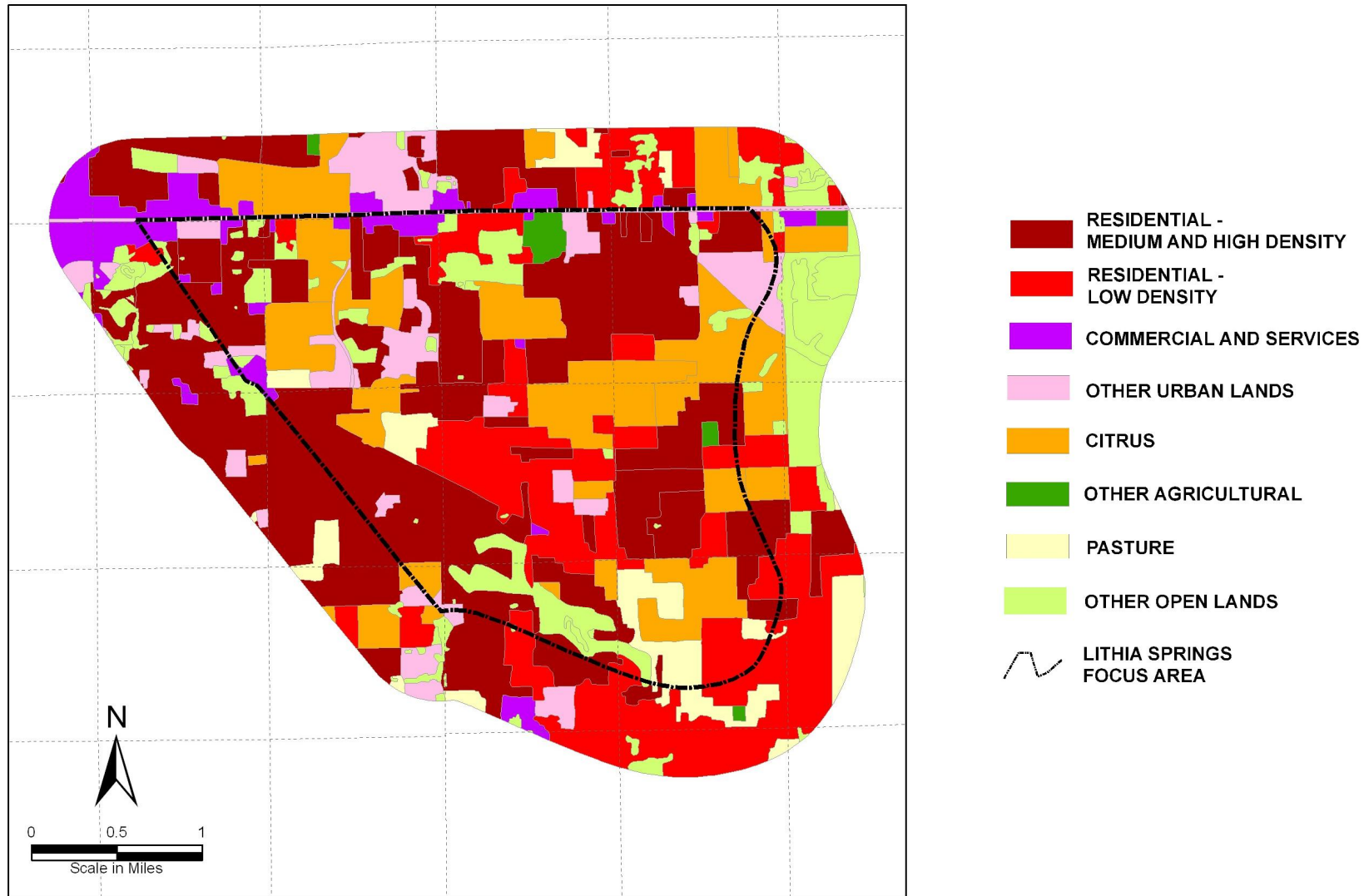
- ❑ Citrus
 - 1940's through 1960's – Approx. 100 lb/ac/yr
 - Present – 40-50 lb/ac/yr
- ❑ Septic Tanks
 - About 40 lb per septic tank per year (Jones and Upchurch, 1993)
 - ❖ At 1 septic tank per acre, N loading is similar to citrus
 - ❖ At 4 septic tanks per acre, N loading is 3-4 times that of citrus
- ❑ Package Wastewater Treatment Plants
 - About 30 lb/yr per home served = 90 lb/ac/yr at 3 units per acre
- ❑ Golf Courses
 - 20-30 lb/ac/yr (combined greens and fairways)
- ❑ Residential and Commercial Landscaping
 - 0-5 lb/parcel/yr x approx. gross density of 2 units per acre = 0-10 lb/ac/yr



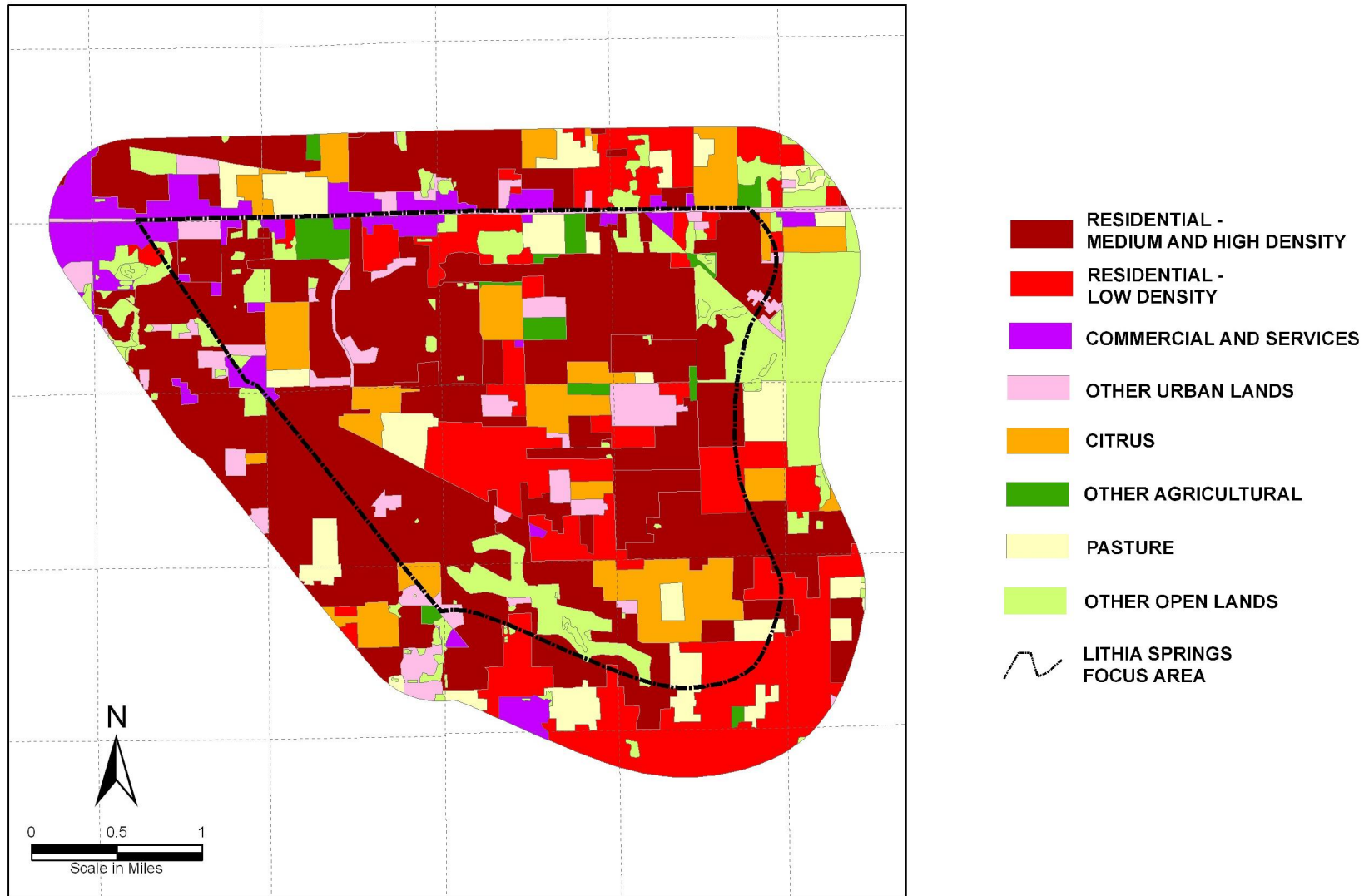
1979 Land Use



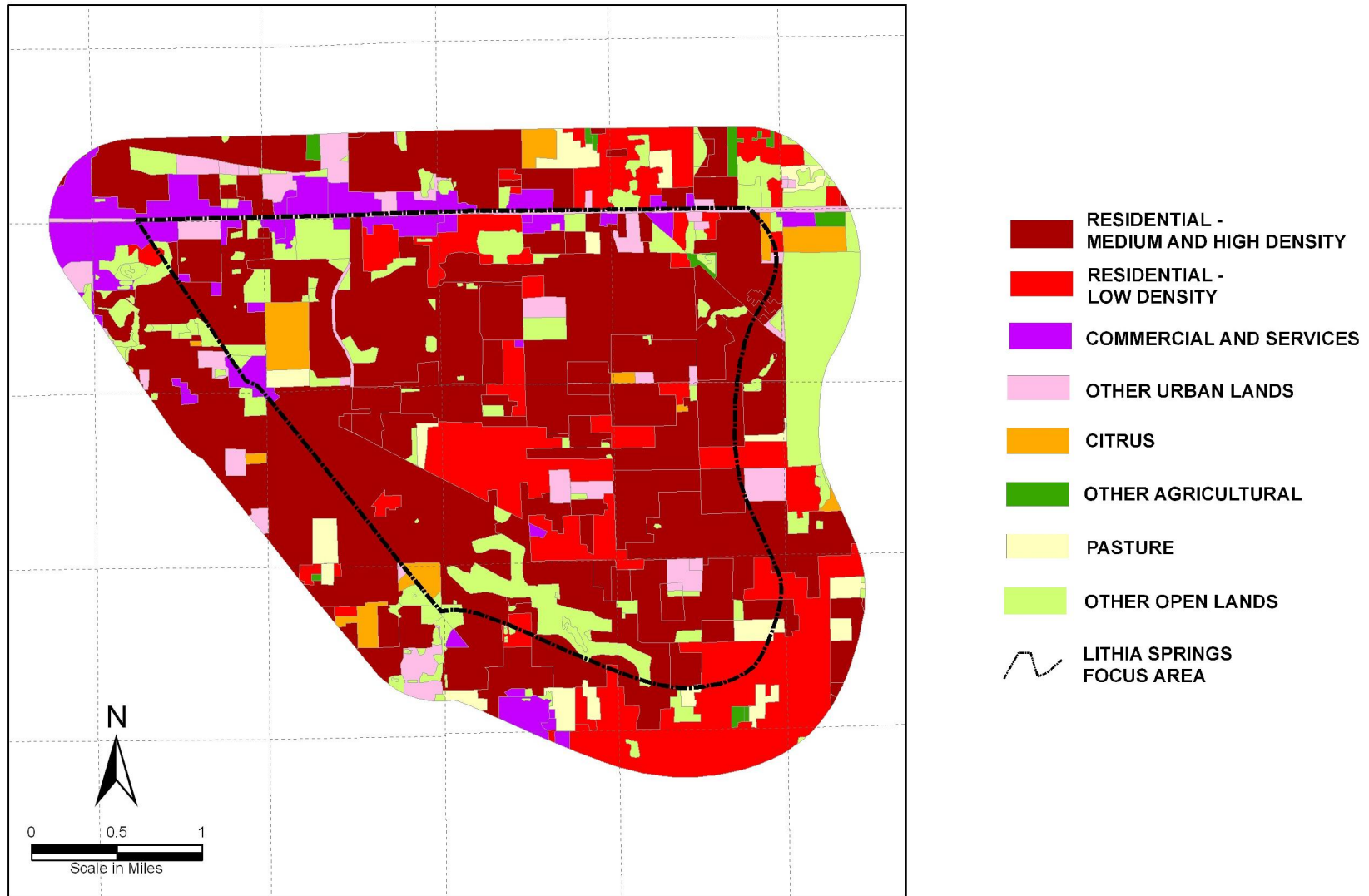
1990 Land Use



1999 Land Use



2005 Land Use



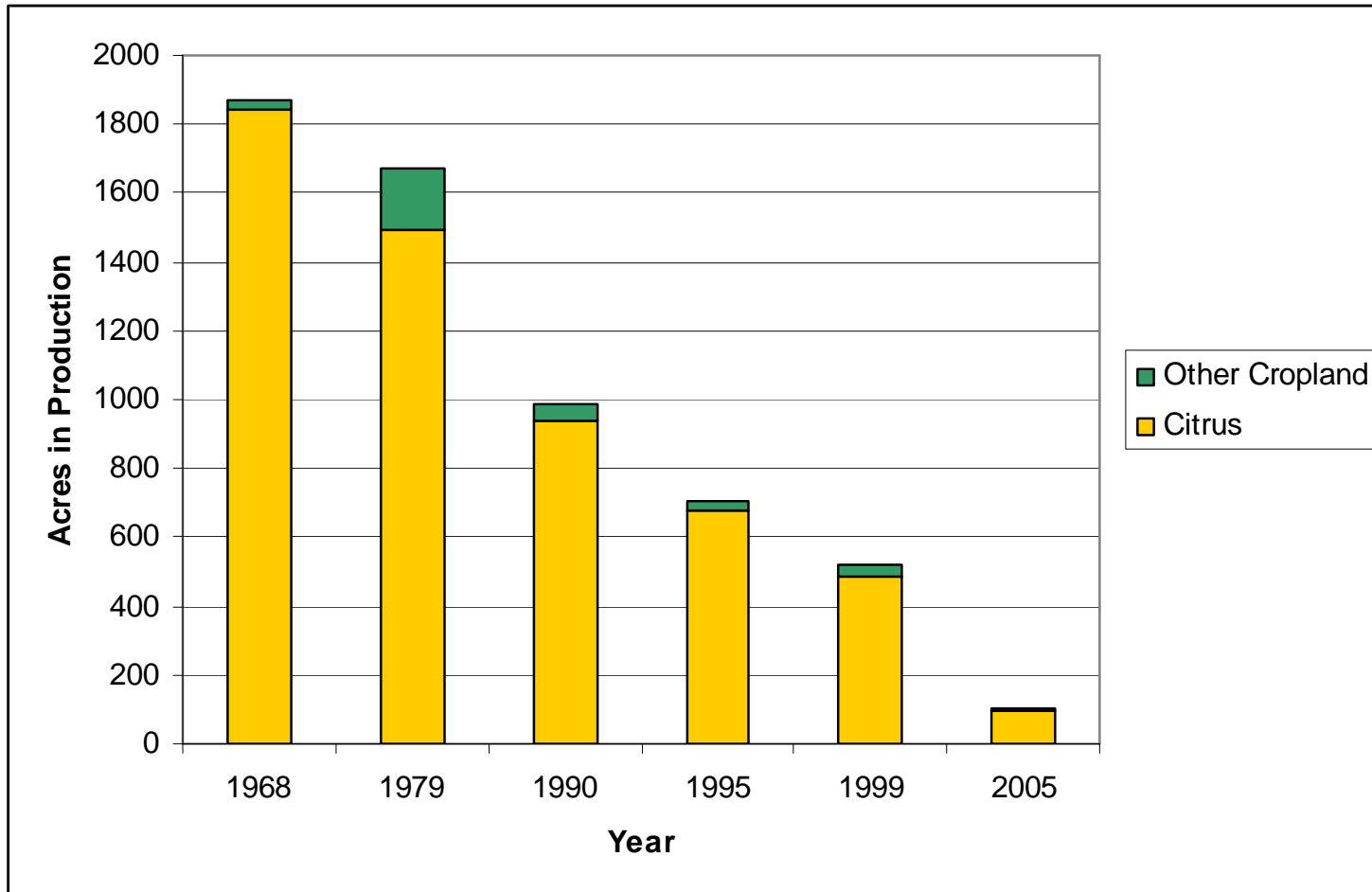


Comparison of 1979, 1990, 1999, and 2005 Land Use in the Focus Area

Land Use	1979 (acres)	1990 (acres)	1999 (acres)	2005 (acres)
Citrus	1,496	940	469	97
Pasture	501	183	173	53
Other agricultural	172	46	110	5
Other open lands (mining, recreational, native lands, water, wetlands)	495	318	345	436
Residential – medium and high density	1,130	1,931	2,390	3,010
Residential – low density	574	690	652	616
Commercial and services	68	96	108	134
Other urban lands	45	277	234	130
Total	4,481	4,481	4,481	4,481



Acresage of Citrus and Other Cropland within the Focus Area



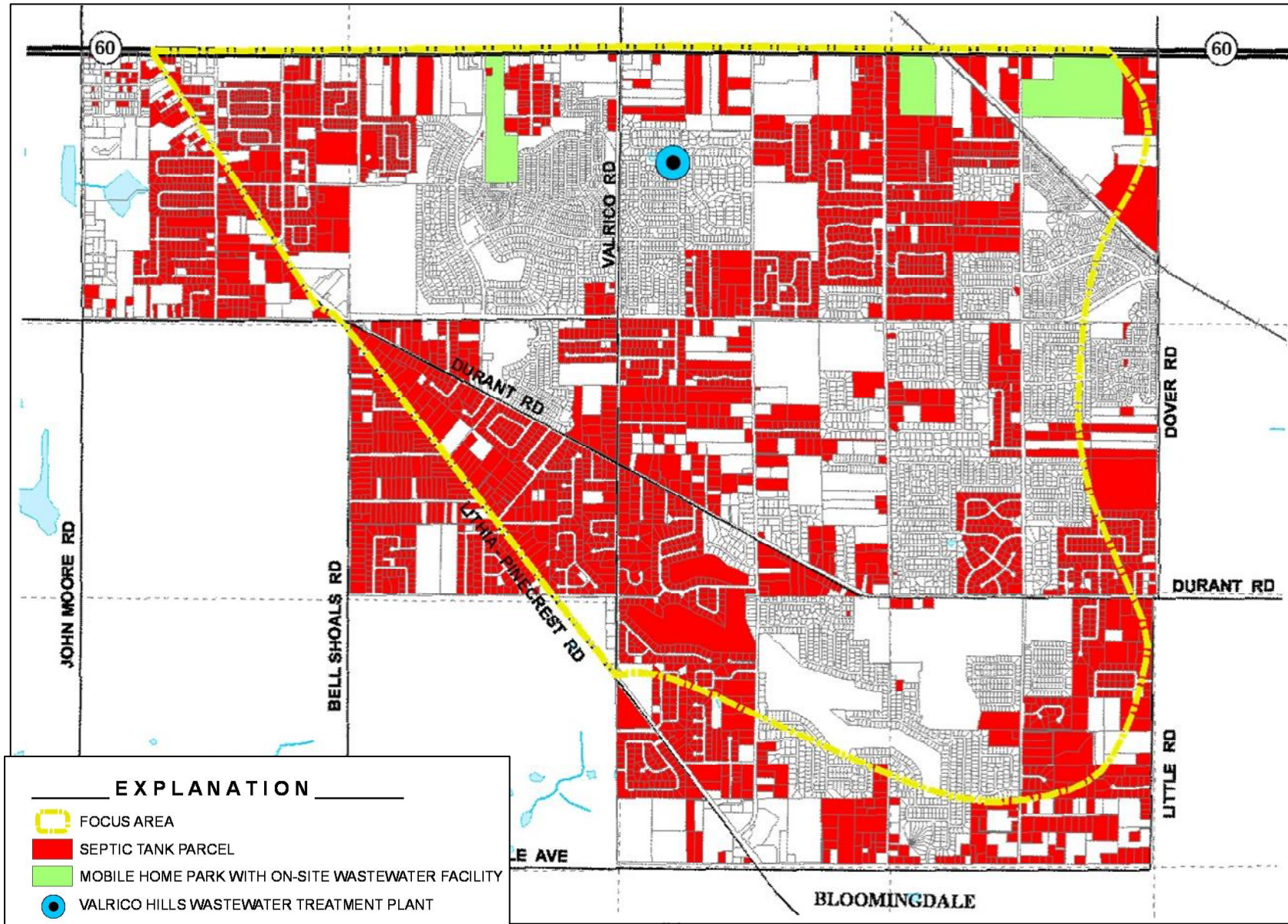


Septic Tank Mapping Methodology

- ❑ SDI evaluated the 2003 GIS map prepared for Hillsborough County by FCCDR and the 2004 septic tank permit mapping prepared for Tampa Bay Water by Parsons, Inc.
- ❑ Data gaps and inconsistencies were evident.
 - Numerous parcels in the FCCDR database with septic tank permits on file were incorrectly attributed as “confirmed sanitary sewer”
 - Parsons 2004 map only includes septic tanks with post-1997 permits on file.
- ❑ SDI obtained maps of the current extent of the County’s central sewer system.
- ❑ Each occupied parcel without an available central sewer connection was assumed to be served by a septic tank.



Best Estimate of Parcels Served by Septic Tanks





Package Wastewater Treatment Plants in the Focus Area

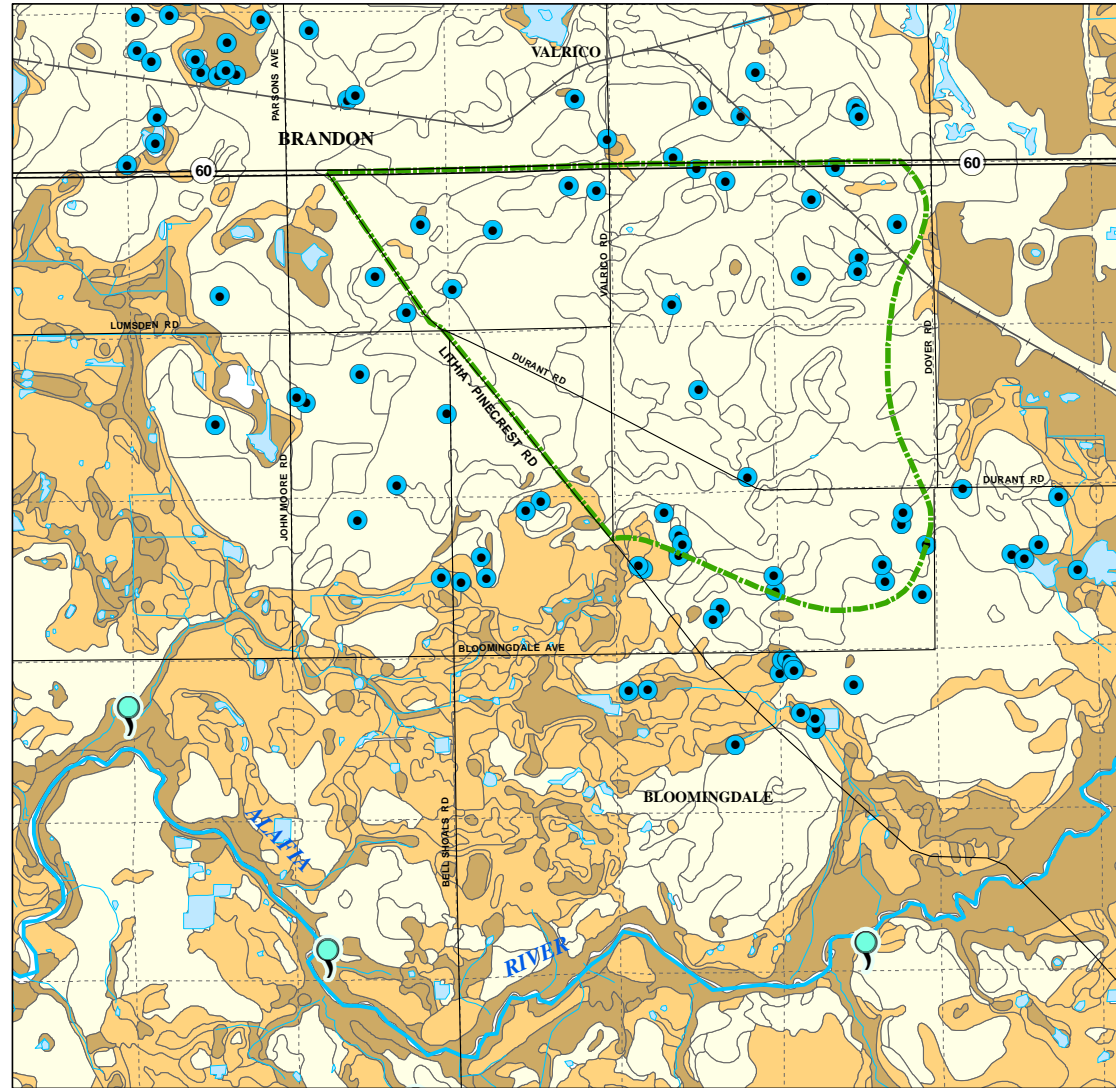
Facility Name	Estimated # of Homes Connected	Effluent Disposal Method
Brandon-Valrico Hills WWTP	355	Percolation Pond
Brandon Trailer Park	208	Percolation Pond
Southern Pines MHP	40	Percolation Pond
Valrico Hills MHP	383	Percolation Pond
Total	986	

Note: Brandon-Valrico Hills WWTP is expected to go off-line in late 2006.



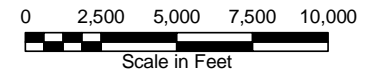
Sinkholes and Soils Classified by Leaching Potential

Note: Sinkhole locations not field verified



EXPLANATION

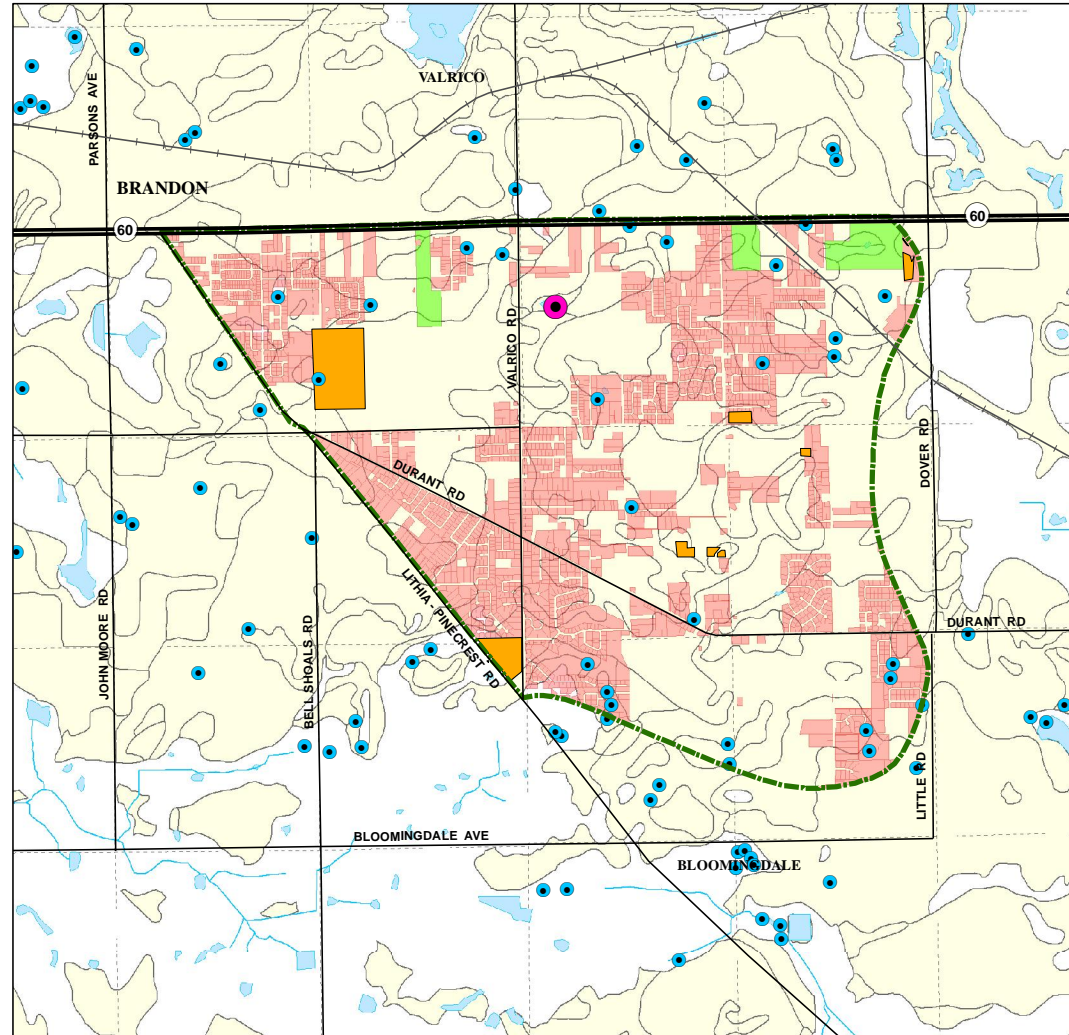
- | | | |
|--|------------|--------------------------------|
| | FOCUS AREA | SOIL LEACHING POTENTIAL |
| | SINKHOLE | High |
| | SPRING | Medium |
| | | Low |





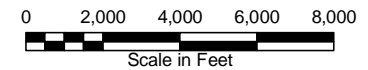
Groundwater Nitrate Vulnerability Map, Lithia and Buckhorn Springs Focus Area

Note: Sinkhole locations not field verified



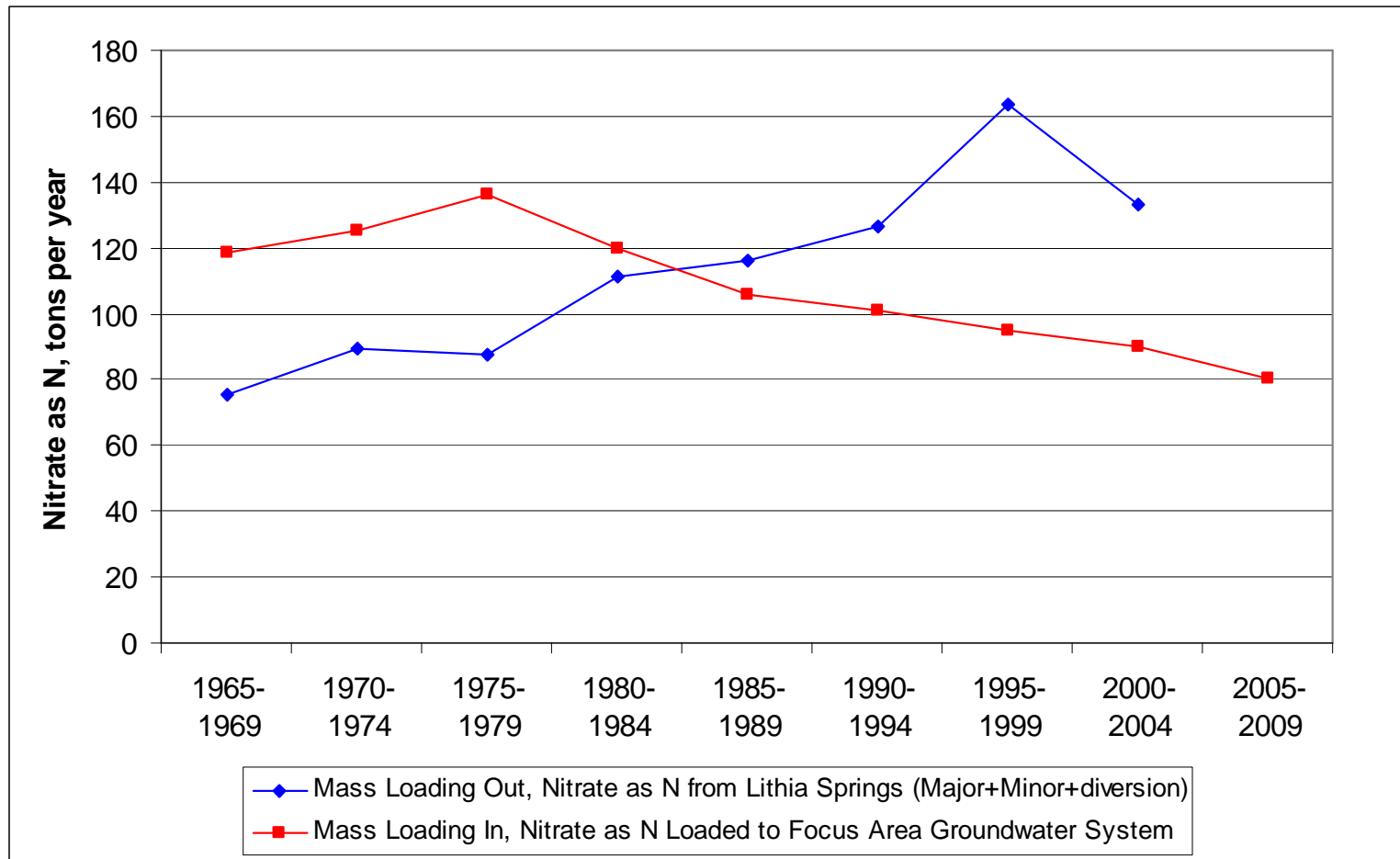
EXPLANATION

- FOCUS AREA
- SINKHOLES
- SEPTIC TANKS
- MOBILE HOME PARK WITH ON-SITE WASTEWATER FACILITY
- CITRUS GROVES
- HIGH SOIL LEACH RATE
- WASTEWATER TREATMENT PLANT





Comparison of Past and Present Mass Loading of Nitrate into the Focus Area Groundwater and Out of Lithia Springs





Estimated Current (2005) Net Annual Loading Rates of Nitrate to Groundwater within the Focus Area

Source	Estimated net loading rates of nitrate (as N) to groundwater within the Focus Area
Septic Tanks	50 tons per year
Small Wastewater Treatment Plants	15 tons per year
Natural Sources	10 tons per year
Residential and Commercial Landscaping	2-10 tons per year
Golf Courses	3 tons per year*
Citrus	2 tons per year
Other Agricultural Lands	insignificant
Total	80-90 tons per year



Conclusions

- ❑ The decline in nitrate loading to the groundwater system over the past 25 years is expected to eventually result in a gradual decrease in nitrate concentrations in the Springs (currently about 3 mg/L).
- ❑ Magnitude of expected decrease depends on how much residual nitrogen remains.
 - In FY 2007, SWFWMD will re-sample subset of wells from Jones and Upchurch Study
- ❑ But, if nothing is done to reduce loadings from septic tanks, N concentrations in the springs will remain well above background levels.
 - 0.2 mg/L historical, Lithia Springs
 - 0.7 mg/L current, Alafia River at Lithia
 - 1.0 mg/L current, Alafia River at Bell Shoals