COASTAL OSDS LOCATION, INSPECTION AND MAINTENANCE

A 319 (h) Clean Water Act Funded Project

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Phase I Project Analysis

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This project was conducted in cooperation with the State of Georgia, Environmental Protection Division and the United States Environmental Protection Agency, Region 4

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GIS maps for each county can be obtained at the following web address:

http://www.marex.uga.edu/advisory/cssmip.html

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Introduction

Background and Setting:

The population boom in coastal areas is increasing in magnitude. The 2000 U.S. census found that 50% of the U.S. population lives along the coast on only 18% of the nation's land mass. When the latest 2010 census data is released, coastal populations are projected to increase by 15%, to 127 million people. Coastal Georgia follows this trend, as this area is the second fastest growing in the state.

Thus, the reliance on OSDS (onsite disposal systems) increases for wastewater treatment as most of Georgia's coastal counties have limited municipal sewage treatment systems and rely heavily on individual on-site septic tanks to handle human sewage production. OSDS have a great potential to become dysfunctional after a short period of time, if a homeowner maintenance schedule is not implemented. The threat of dysfunctional systems makes it important to inspect and maintain OSDS to prevent nonpoint source pollution, particularly in the areas of tidal wetlands, a highly productive biological nursery and ecosystem that is the predominant coastal boundary system. Georgia's OSDS Statute, Chapter 5 of Title 31 (OCGA 31-5) does ***require*** that individual property owners properly operate and maintain their OSDS. Maintenance of the system must be in accordance with the GADCH *Manual for Onsite Sewage Management Systems*.

Although failing septic systems are known to negatively impact water quality, it is important to note that to date, there are no studies that have found an impairment of coastal Georgia water quality due to dysfunctional OSDS. Bacterial source tracking studies have repeatedly shown animal sources rather than human sources.

Project Introduction:

As a requirement of the Coastal Management and Statewide Nonpoint Source Programs, Georgia must develop a comprehensive Coastal Nonpoint Source Management Program. The Environmental Protection Division (EPD) has worked to advance Georgia's program since 1999. The Coastal NPS Program is intended to implement a wide variety of management measures designed to control and prevent nonpoint source pollution from impacting the critical coastal environment. The Program was reviewed by NOAA/USEPA and received conditional approval in June 2002. Final approval of the Program is conditioned on the by achievement of certain management measures as described in the Findings of NOAA/USEPA. Specific requirements were imposed for the management of onsite sewage disposal systems, in addition to the requirement to address other nonpoint source categories.

In a 2002 grant-funded study, the University of Georgia's Marine Extension Service (MAREX) conducted a pilot survey of on-site septic disposal systems (OSDS) in McIntosh County. The survey revealed 1,056 tanks immediately adjacent (within 25') of coastal waters or salt marsh. Upon visual inspection of this limited sample of immediately adjacent systems, 53 (5%) were obviously dysfunctional. One hundred septic tank systems were found within one foot of a surface body of water. Another 11 tanks were between 1 and 25 feet of a body of water. Georgia law requires a minimum separation of twenty-five feet between the septic tank system and any waters of the state. The study revealed that most (63%) of the septic tank systems in McIntosh County are located in areas of high pollution susceptibility. Likewise, 75% of these septic tank systems in McIntosh County occur in the 100 year floodplain. Eighteen percent of the septic tank systems occur within water recharge areas. Dysfunctional septic tank systems and those located too near a water body are a potential threat to the water quality and human health of coastal Georgia.

In an effort to lift conditions attached to the 2002 conditional Coastal Nonpoint Source Program approval, a primary partnership was developed between MAREX, the Coastal Health District and Local Health Departments, the South Georgia Regional Commission and EPD's Coastal Nonpoint Source Program. MAREX serves as the main project coordinator for this partnership to implement a Section 319 (h) grant project that proposes to conduct a comprehensive environmental regulatory program for local government officials and homeowners defining the relationship between individual OSDS and surface water quality. This program stresses the requirement for protection and prevention of septic contamination, calling for the periodic system inspection and maintenance by homeowners. The primary step was to identify and locate all relevant existing OSDS and water wells, each individual system being visually inspected and evaluated for signs of failure by local health department personnel. The local health departments have taken immediate enforcement actions to ensure that all identified failing systems are repaired or replaced according to Georgia Statute. Such immediate actions to resolve problems with failing systems are essential to improving the quality and preventing impairment of coastal waters.

Figure 1.1

The location of all existing OSDS and wells were recorded with a handheld GPS unit to provide the geo-location within the proximity of marshlands or other waters of the state in Bryan, Effingham, Liberty and Long counties. The project also assisted Camden and McIntosh counties in transferring historical OSDS data into the WELstrom GIS database. The project produced GIS maps and overlays of the OSDS and wells utilizing the SGRC's transferable geo-referenced WELstrom database which are web accessible. The database provides a standardized method of recording all current and future OSDS installations for all of the Coastal NPS Area local health departments.

Though the county health departments are charged with regulation and enforcement of the OSDS rules, most agencies do not have sufficient resources to conduct routine inspections, thus non-functioning OSDS, often go undetected. As previously stated, of the 1,056 septic tank systems observed in the 2002 McIntosh County study 5% were visibly dysfunctional. That study included systems located within twenty-five feet of surface waters. This project encompasses systems using a watershed approach.

By ultimately locating and observing every relevant septic tank system in proximity to surface waters in the identified watersheds, the local county health departments provided immediate analyses of conditions upon which regulatory enforcement and compliance actions will be taken. The health departments required property owners to replace or repair faulty systems, thus eliminating the source of pollutant contamination. The products produced by this project can be utilized by the Georgia EPD to better articulate and quantify water quality conditions in all coastal watersheds. The products can be used to identify potential pollution sources; and as analytical tools to aid in establishing TMDL processes required for coastal waters.

Methodology

Research Design

The Geo-location & Inspection Process:

MAREX partnered with the Southern Georgia Regional Commission, Coastal Health District and the Bryan, Effingham, Liberty and Long County Health Departments to recruit and train one employee (inspector) whose duties would be to locate and provide GPS data on OSDS and well positions and provide other OSDS data related activities as required by the project. Each inspector received a Trimble Juno SB Global Positioning System (GPS) unit and appropriate training on both the use of the GPS unit and the use of the WELstrom database. Each county health inspector conducted a survey to geo-locate and inspecting OSDS and well locations within a 90' proximity of marshlands or other state waters in Bryan, Effingham, Liberty and Long counties.

The inspector recorded the GPS coordinates of the home structure in situations when access to the property was denied by such things as homeowner refusal, locked gates, animals, or dense tree canopy by noting the property and using the Google Earth mapping tool to gain the GPS coordinate. All located OSDS were evaluated and noted if the device was visually dysfunctional or not.

During each county survey, the collected GPS positions were transferred from the Trimble Juno SB GPS unit to a county health department computer equipped with the Trimble GPS software interface. The GPS data coordinates were then downloaded into a GIS folder. Periodically, this GIS folder was emailed to the MAREX GIS Specialist. The Specialist checked the data coordinates for discrepancies. Once the data was cleared for accuracy, the Specialist uploaded the coordinates into the Google Earth Tracking Website and forwarded the coordinates to the SGRC's GIS Director for input into the WELstrom GIS database. Even after project funding expires, each county will maintain access to the WELstrom septic and well database/map website and a map database website of specific datasets referencing public health planning.

WELstrom GIS Database:

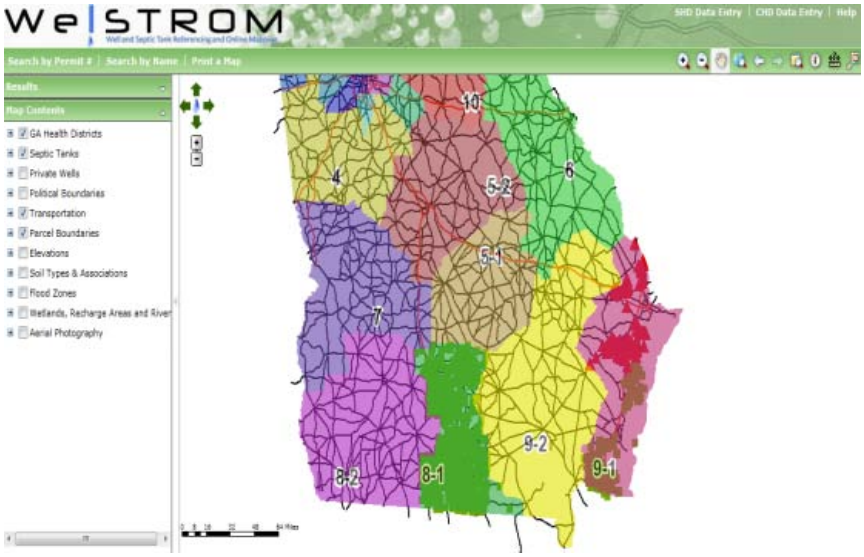

Figure 1.2

The WELstrom online database was designed by both the Southern Georgia Regional Commission and the Middle Georgia Regional Commission (MGRC), for the housing of well and septic tank reference data along with a GIS component for mapping. Individual county health departments are able to enter and edit new or existing well and septic permits within this database as it works in conjunction with the State contracted Garrison Enterprises, Inc. non-GIS database. Health Department personnel are able to search for data by numerous query options such as, permit number, permit year, last name, address and type of septic system. With a right click of the mouse, the map site option can be initiated. Here, the health department employee can view an OSDS permit within many geography layers. A host of variables needed for public health planning in the form of tools are established inside this map site. There tools may be used to calculate distances as well as analyze surrounding structures, roads, water bodies and parcels. The SGRC has had great success implementing this database for most of Georgia's south central counties.

Subject Selection

Population:

The sampled population consists of the four county region encompassing Bryan, Effingham, Liberty and Long counties. This area contains a potential 4,764 OSDS primary parcels.

Choosing the Potential OSDS Parcels:

MAREX surveyed all 11 COASTAL NPS PROGRAM counties within the coastal nonpoint source pollution program boundary to establish the status of the existing septic permit data format. The results determined that all counties have paper data on permits granted pre-1995. However, following 1995, permit data was housed in either an "in-house" database or TEC computer database. The Garrison Enterprises database has been used since 2008, which the WELstrom GIS database complements. When Phase I of this project was planned, the Welstrom database was in place and used in southwestern Georgia counties as a health department database with GIS capabilities. The State of Georgia's Garrison database at this time was not operational, with the designers having no plans of building a GIS module. From the beginning, project partners and planners have worked to ensure the compatibility of both systems.

MAREX gathered GIS layers and parcel data for Bryan, Effingham, Liberty, Long, Camden and McIntosh counties. This information was used to identify all parcels chosen to be surveyed by the study. This information was sent to the SGRC for the creation of the Coastal Health District's WELstrom GIS database.

The MAREX GIS Specialist used the hydrology and parcel layers to identify the parcels that would be surveyed in this project. Due to sensitivity, no city or county utility infrastructure layers were obtained for the parcel selection process. Therefore, some parcels that were identified by the process were actually on municipal wastewater treatment systems and hence, no GPS coordinate could be taken at those sites.

The 90' boundary was determined to be the best possible boundary choice for parcels adjacent to State waters or marshlands. Parcels that were known to have structures were classified as "improved" and were the primary focus of the project, whereas parcels with no known structure were classified as "unimproved" and were the secondary study focus. Both primary and secondary parcels had a 3-tiered designation, (1) within 90' of a major river, (2) within 90' feet of a river or marsh and (3) within 90' of a lake or pond. A Google Earth project tracking website was created to assist the counties in implementing a field data collection strategy. Below is the legend from and an example of the tracking website.

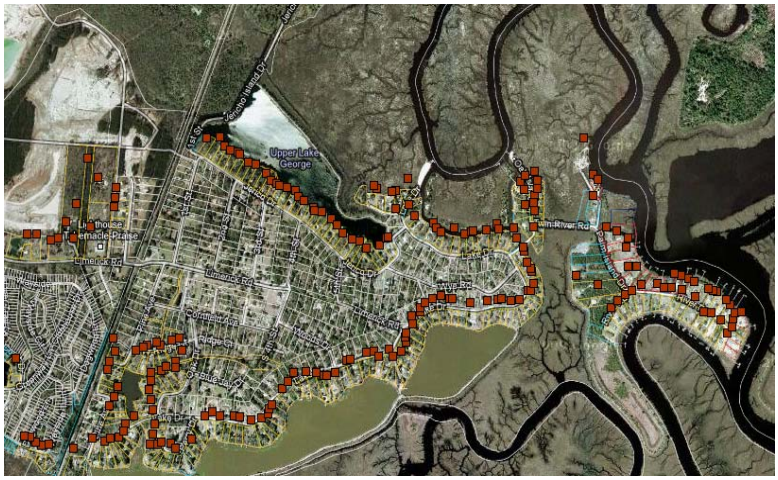

Figure 1.3

Parcel Coding Legend

Primary:

i1	red	improved within 90’ of a river
i2	orange	improved within 90’ of a river or marsh
i3	yellow	improved within 90’ of a lake or pond

Secondary:

u1	dark blue	unimproved within 90’ of a river
u2	medium blue	unimproved within 90’ of a river or marsh
u3	light green	unimproved within 90’ of a lake or pond

Instrumentation

Development Procedures and Instrumentation Selection:

MAREX field tested the GPS equipment and data collection process in a selected area of Liberty County. MAREX facilitated a project workshop to train study participants on operation of GPS units, processing of collecting data and the usage of a WELstrom database. Bryan, Effingham, Liberty and Long County Environmental Health Managers were supplied with (1-each) Trimble Juno SB handheld GPS units, (1-each) Bushnell Sport 450 Laser Rangefinder and (1-each) Suunto M2 Compass.

Validity and Reliability of Instruments:

All instruments used in this project are considered to be the industry standard. Each GPS coordinate taken, was analyzed at 30 intervals and the results were averaged. The south central county health departments have used the WELstrom GIS database for OSDS permit data with great success.

Data Collection Procedures:

Each county health inspector had the task of geo-locating and visually inspecting relevant parcels for OSDS tanks and wells located within 90' of marshlands or waters. The geo-located OSDS data was periodically uploaded onto a health department computer and emailed to the MAREX GIS Coordinator for quality control. The UGA GIS Specialist displayed the data on the UGA OSDS Project Tracking Website and then emailed data to the SGRC GIS Director to be uploaded into the WELstrom database.

The gathering of field data had its limitations during the project. In some cases, inspectors were unable to gain access to a GPS coordinate, due to dense tree coverage resulting in low satellite reception, gated properties, homeowners unwilling to allow GPS coordinates to be taken and potential dog attacks. In some areas where these issues arose, the inspector noted the property mailing address. The inspector then used the Google Earth Tracking Website or GIS imaging software to scan the property using the mapping tool. Once the inspector obtained the correct parcel location within the map, the official could use paper records as a guide to estimate the GPS coordinate with the latitude/longitude tool inside the WELstrom database or by the Trimble Juno handheld GPS device. All GPS coordinates were field verified.

Data Analysis Procedures:

The MAREX GIS Specialist completed mapping and analysis of the collected data. All analyzed GIS data was sent to SGRC to be uploaded into WELstrom. Maps and the GIS analysis were created by utilizing the following GIS layers: Floodplain data (Federal Emergency Management Agency), National Wetlands Inventory Data (U.S. Fish & Wildlife Service), Pollution Susceptibility (Georgia Geologic Survey), Geology (Georgia Department of Natural Resource), Ground Water Recharge Zones (Georgia Department

of Natural Resource), Licensed Shellfish Bed (Georgia Department of Natural Resources), Locator Maps (United States Geologic Survey).

GIS maps available: http://www.marex.uga.edu/advisory/cssmip.html

As a late project activity, MAREX hired a UGA student employee for the summer to assist in entering county health department paper OSDS permit records into the database as well as assist in clarifying in parcel data discrepancies. If the OSDS point had an address that did not match the address of the parcel in which it fell, the specialist went to the Tax Assessor's website, determined the correct address, identified the parcel number of the correct address and recorded the parcel number as an attribute of the OSDS point. If the OSDS point did not have an address associated with it, he found the point on the Google Maps website that we set up for this project, determined the parcel that it fell into, then found the parcel on the Tax Assessor's website, and if possible, assigned the parcel number to that point. Bryan, Effingham and Liberty counties were completed in this process over a two month period. All GPS coordinates were field verified.

Results

Project Summary:

Please see appendix for GIS map title descriptions.

To view or download GIS project maps, please visit:

http://www.marex.uga.edu/advisory/cssmip.html

During this project, a total 2,345 OSDS were geo-located and inspected in Bryan, Effingham, Liberty and Long counties. MAREX GIS identified 4,764 potential primary parcels to visit, without prior to removal of parcels from the data set with verified municipal connections. A complete breakdown of results by county follows. Of the four counties, only Bryan and Effingham reported OSDS failures in the project boundary, with 18 total failures reported during the grant period.

A total of 334 well heads were geo-located. A great number of these wells are “community wells” and service as many as 50 homes. 252 (75%) of these wells were located on primary parcels.

Bryan County Summary

MAREX GIS identified potentially 1,534 OSDS parcels for Bryan County. 580 (38%) OSDS parcels were geo-located and inspected. A total of 16 OSDS failures were documented, 7 of which were primary, tier 1 (parcel with structure and 90' proximity from a major river) and 9 of which were primary, tier 2 (parcel with structure and 90' proximity from a river or marshland). All 16 failed systems were repaired. There are approximately 13,319 parcels remaining in Bryan County, but included in the total are parcels with possible municipal connections as well as including parcels that are larger than 12 acres.

FEMA Flood Plain Classes:

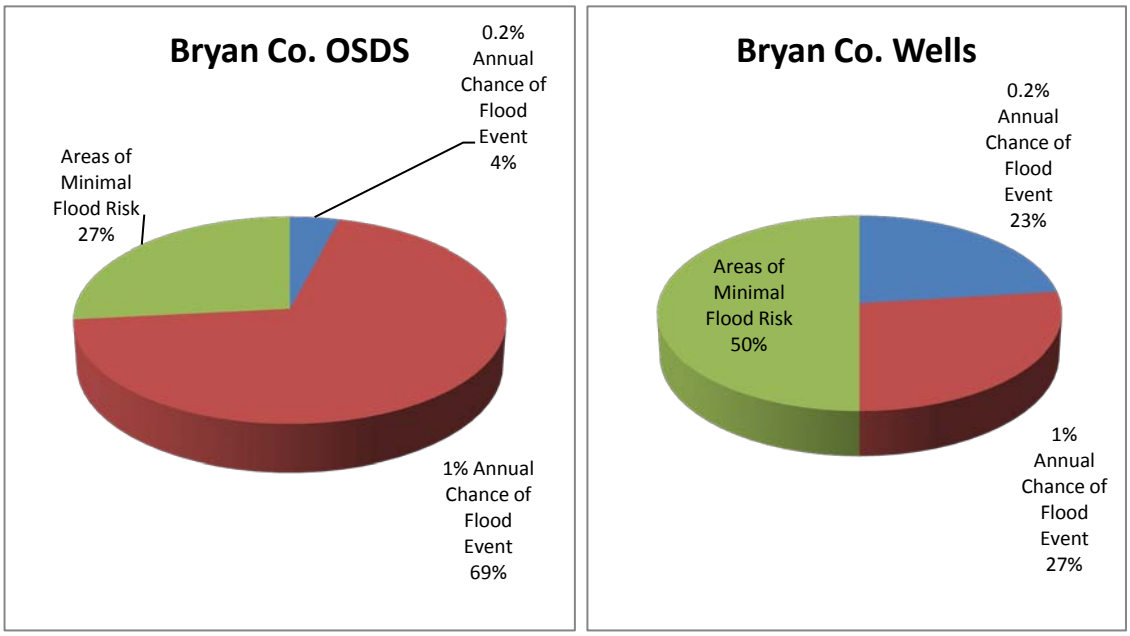

Figure 2.1

The majority, 403 (69%) of OSDS surveyed in Bryan County were within the 100 year flood plain, while 13 (50%) of the wells surveyed were in areas of minimal flood risk. A 1% annual chance of a flood refers to the 100 year flood plain, and a 0.2% annual chance of flooding refers to the 500 year flood plain.

U.S. Fish & Wildlife National Wetlands Inventory:

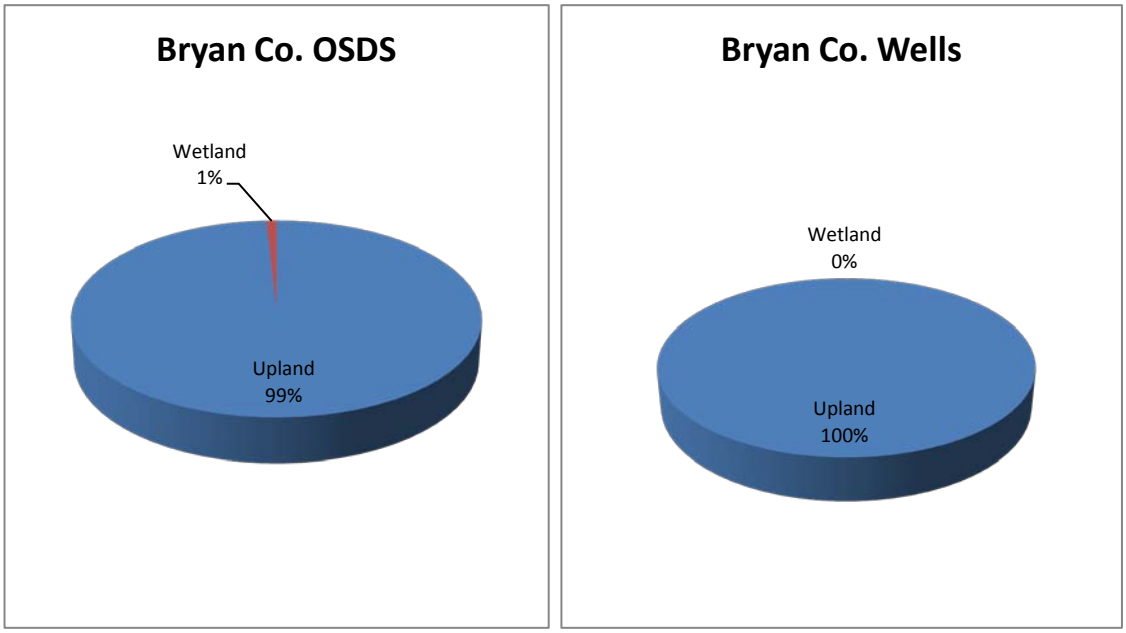

Figure 2.2

Only 5 (1%) of the OSDS surveyed were located in an area classified by the U.S. fish and wildlife Service as a. No wells (0%) were located in classified wetlands.

The U.S. Fish & Wildlife classifies 17 subsets of wetland types. For this study, all OSDS and well coordinates captured were designated as either being in a wetland area or an upland area.

Georgia Geologic Survey Pollution Susceptibility:

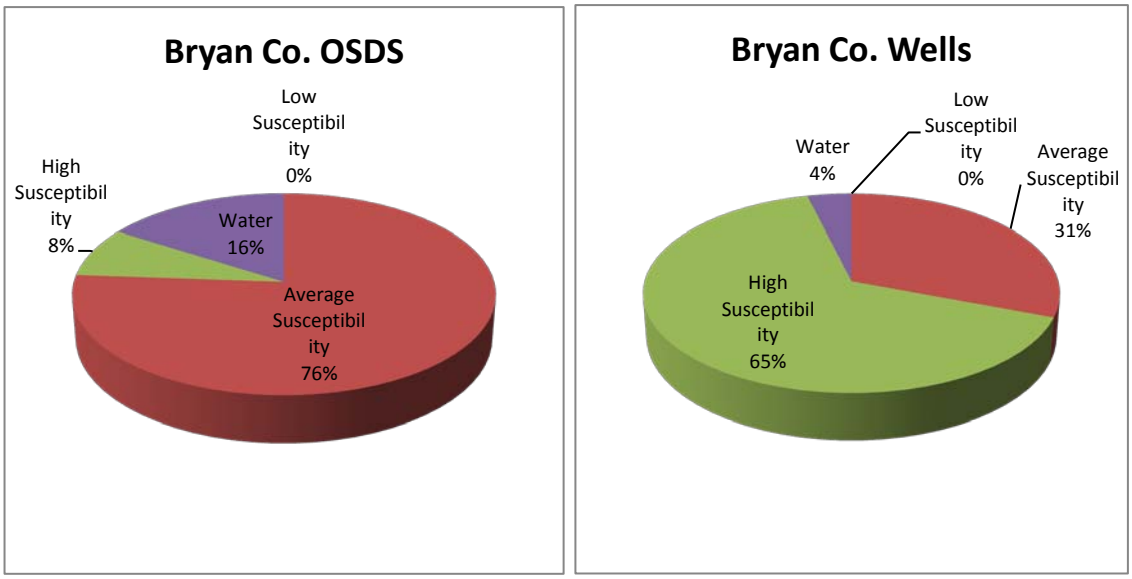

Figure 2.3

The majority, 443 (76%) of the OSDS surveyed were located in an average pollution susceptibility zone, whereas the majority, 17 (65%) of the wells were located in a high pollution susceptibility zone.

Pollution susceptibility levels in this chart refer to the time needed to complete groundwater runoff in relation to soil types found in this area. A high, low or average susceptibility refers to the travel time or speed required for groundwater runoff to completely pass through a landscape.

Georgia EPD Geologic Substrates:

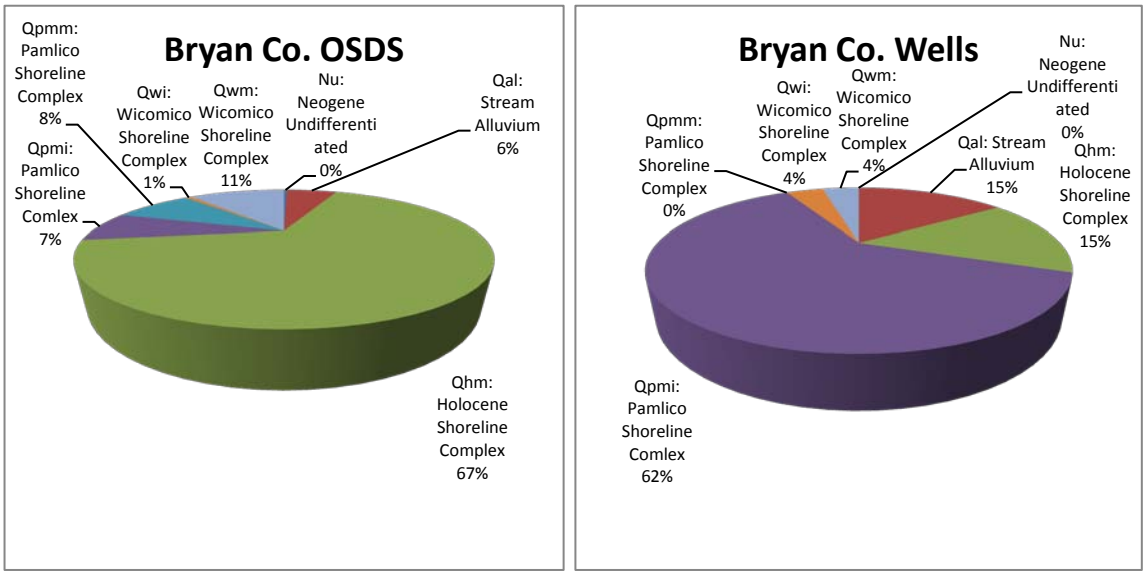

Figure 2.4

The majority, 387 (67%) of the OSDS surveyed were located in the Qhm: Holocene Shoreline Complex, while 16 (62%) of the wells were located in the Qpmi:Pamlico Shoreline Complex.

The Holocene and Pamlico Shoreline Complex indicate that these systems are located in marshland and lagoon bedrock areas.

Georgia EPD Ground Water Recharge Zones:

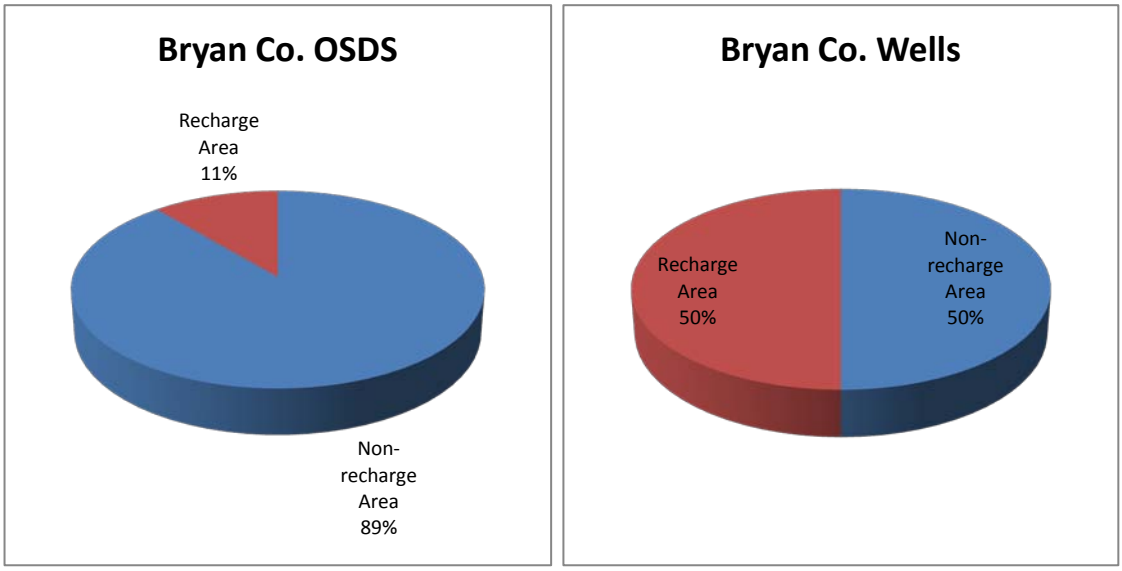

Figure 2.5

The majority, 517 (89%) of the OSDS were located in non-groundwater recharge areas, while a 13 (50%) of the wells were located in groundwater recharge areas.

Groundwater recharge is a hydrologic process in which rain water percolates through the soil column as it transforms from surface water to groundwater.

Effingham County Summary

UGA MAREX GIS identified potentially 962 OSDS parcels for Effingham County. 284 (30%) OSDS parcels were geo-located and inspected. Inspectors identified 2 OSDS failures, 1 of which were primary, tier 1 (parcel with structure and 90' proximity from a major river) and 1 of which were primary, tier 3 (parcel with structure and 90' proximity from a lake or pond). All failing systems were repaired.

There are approximately 24, 818 parcels remaining in Effingham County, however any parcels that may have a municipal connection or are larger than 12 acres total were not subtracted from the total.

FEMA Flood Plain Classes:

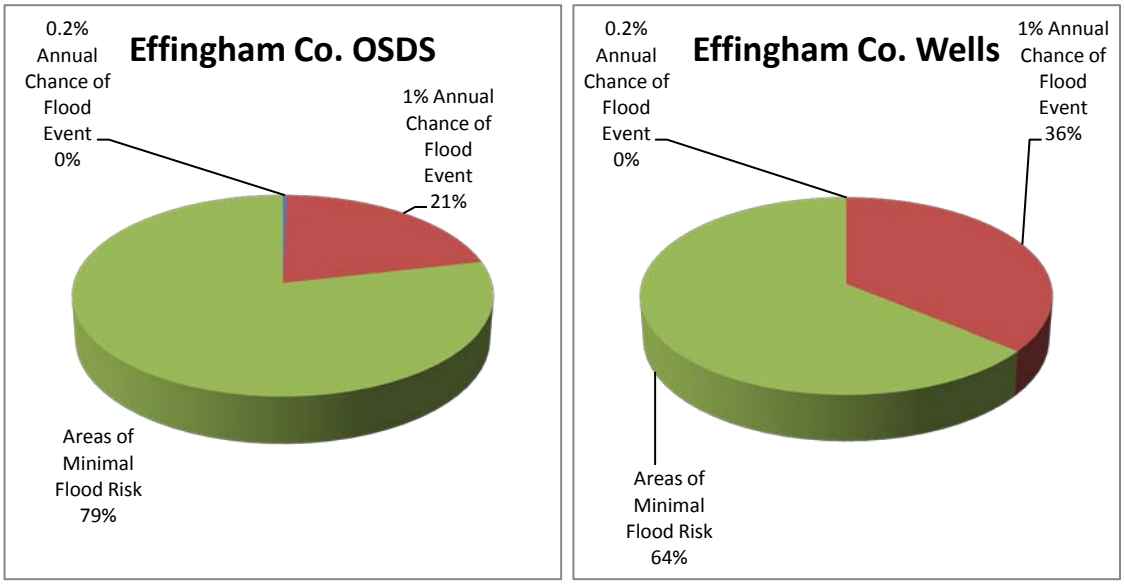

Figure 3.1

The majority, 223 (79%), of the OSDS surveyed were found in areas of minimal flood risk, as well as 57 (64%) of wells surveyed.

U.S. Fish & Wildlife National Wetlands Inventory:

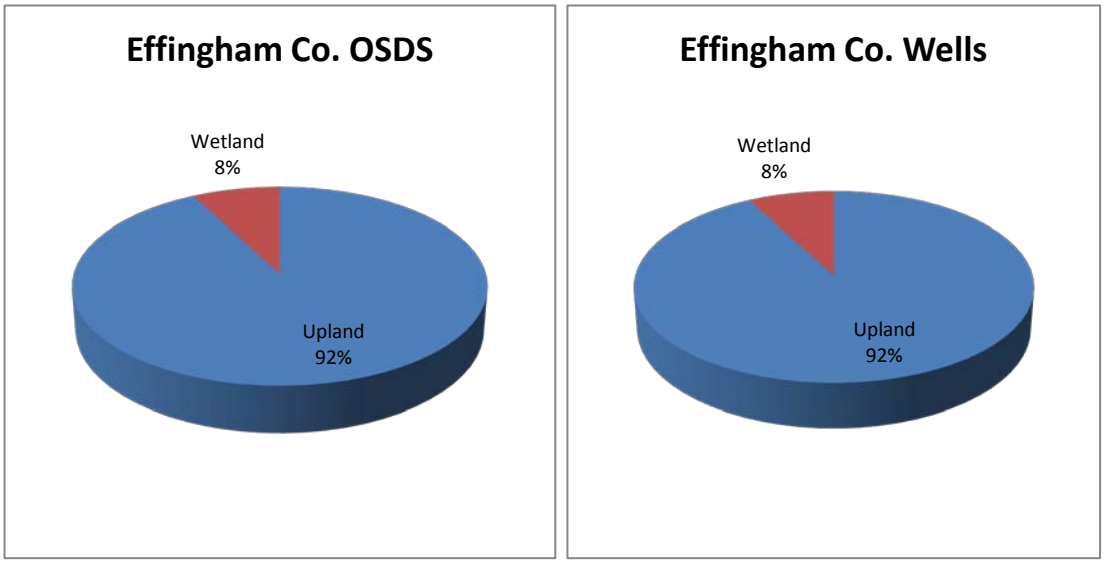

Figure 3.2

The majority, 262 (92%) of the OSDS surveyed and 82 (92%) of the wells surveyed were located in an upland area.

Georgia Geologic Survey Pollution Susceptibility:

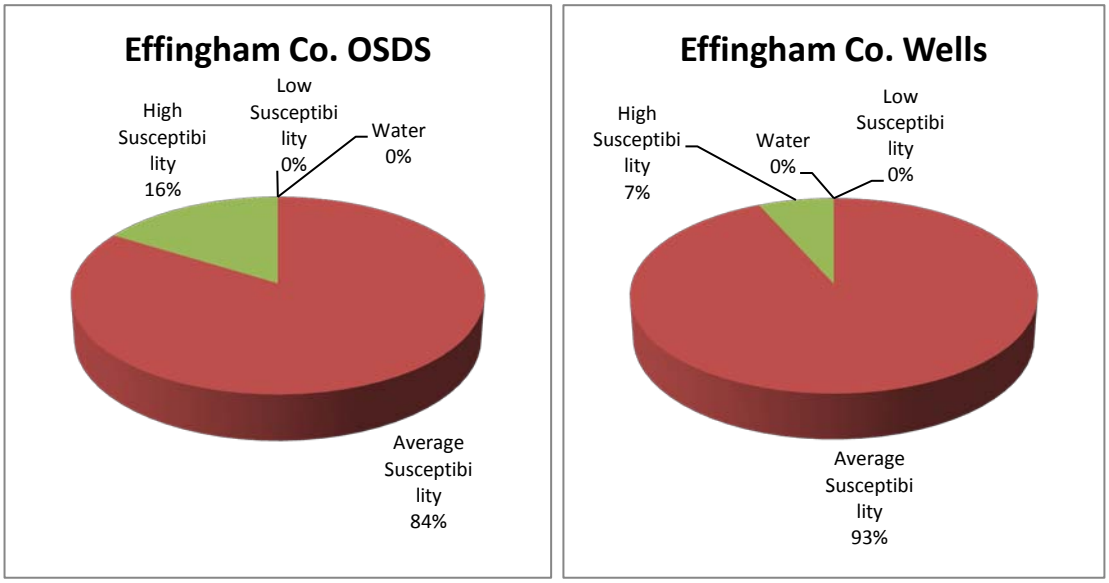

Figure 3.3

The majority, 238 (84%) of OSDS surveyed were located in an average susceptibility area, and 83 (93%) of the wells surveyed were located in an average susceptibility area.

Georgia EPD Geologic Substrates:

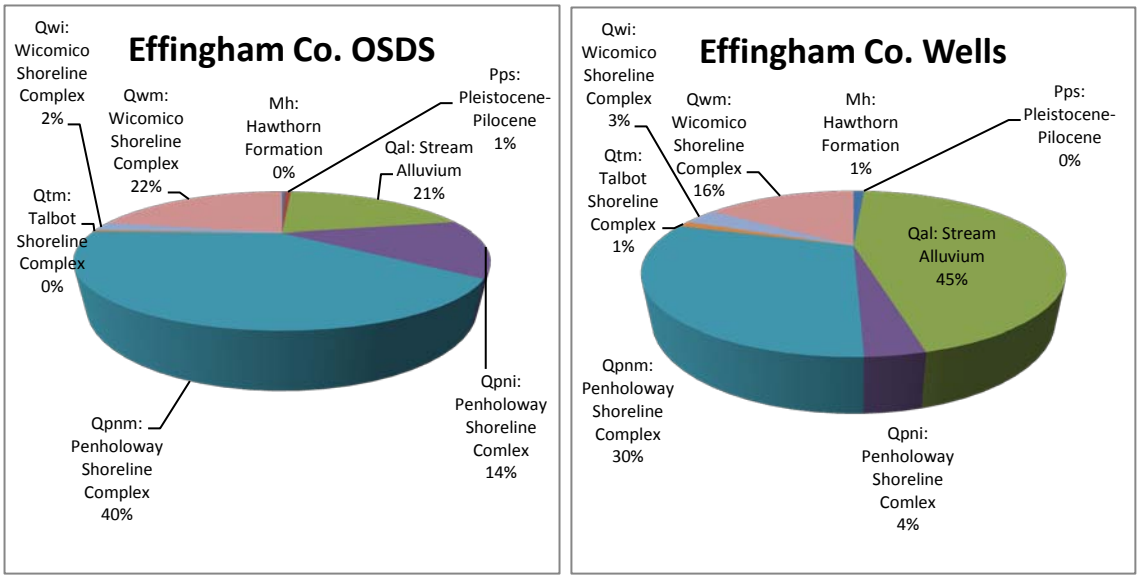

Figure 3.4

The majority of OSDS were located in the Qpnm:Penholoway Shoreline Complex -114 (40%), Qwm: Wicomico Shoreline Complex-63 (22%), Qal: Stream Alluvium-59 (21%) and Qpni: Penholoway Shoreline Complex-38 (14%) substrate. The majority of wells were located in the Qal: Stream Alluvium-40 (45%), Qpnm: Penholoway Shoreline

Complex-27 (30%) and Qwm: Wicomico Shoreline Complex-14 (16%) substrate. The Penholoway Shoreline Complex is defined by clay loam sediments located at 50-70 feet above sea level.

Georgia EPD Ground Water Recharge Zones:

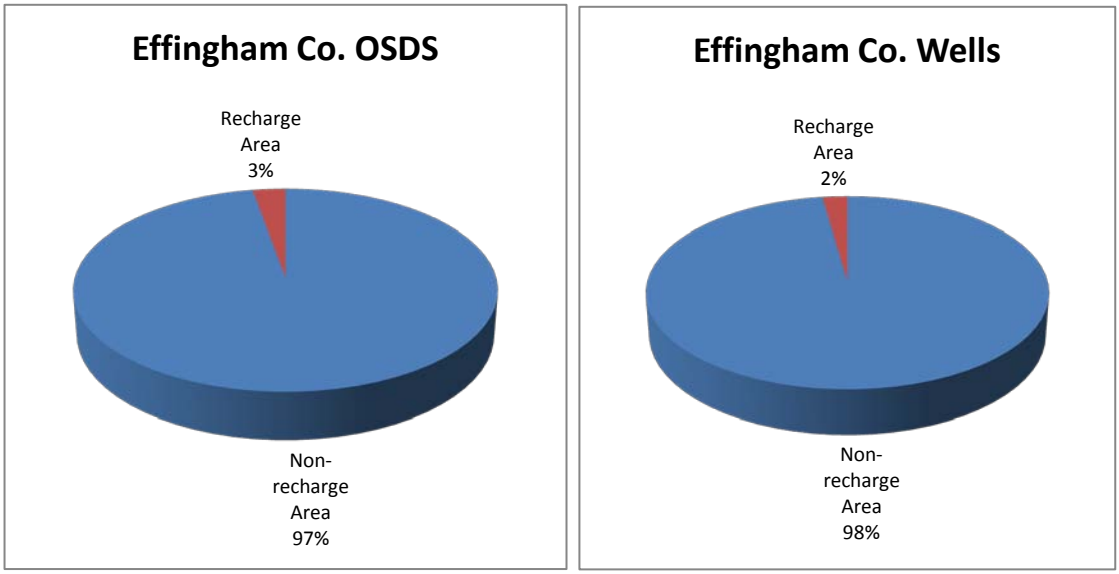

Figure 3.5

The majority, 276 (97%) of OSDS surveyed were located in a non-recharge area, and 87 (98%) of wells were located in a non-recharge area.

Liberty County Summary

MAREX GIS identified potentially 1,979 OSDS parcels for Liberty County. 1,369 (69%) OSDS parcels were geo-located and inspected. The inspector found 0 OSDS failures and no repairs were recorded within the project boundary and within the project period.

There are approximately 21, 587 parcels remaining in Liberty County, but that includes parcels having possible municipal connections and that are larger than 12 acres.

FEMA Flood Plain Classes:

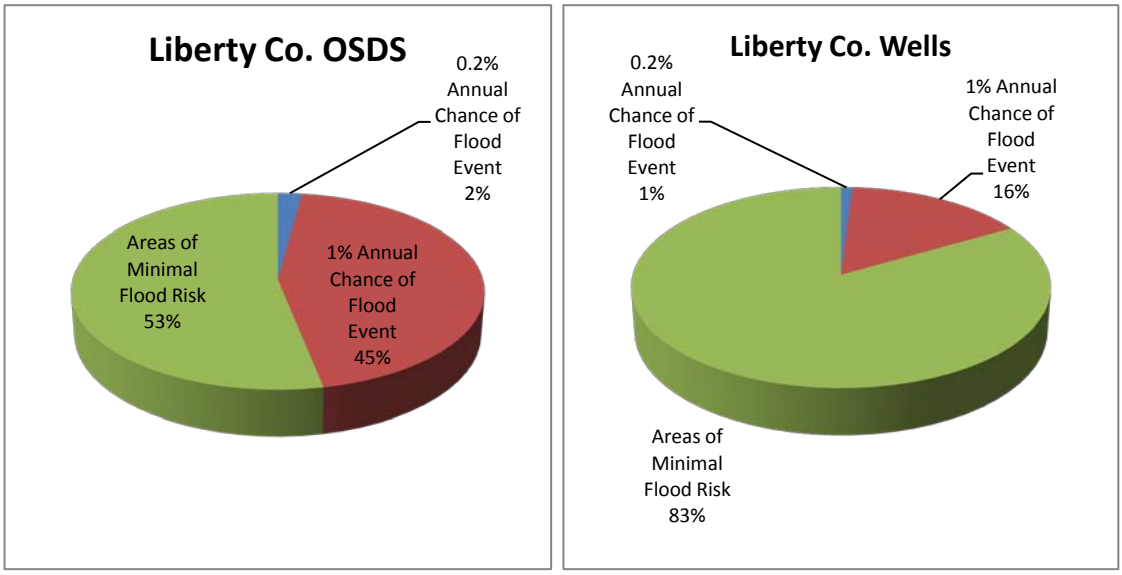

Figure 4.1

Of the OSDS surveyed, 728 (53%) were located in areas of minimal flood risk and 613 (45%) were located in the 1% annual chance of flood event region. The majority, 170 (83%) of wells surveyed were located in areas of minimal flood risk with 32 (16%) located in the 1% annual chance of flood event region.

U.S. Fish & Wildlife National Wetlands Inventory:

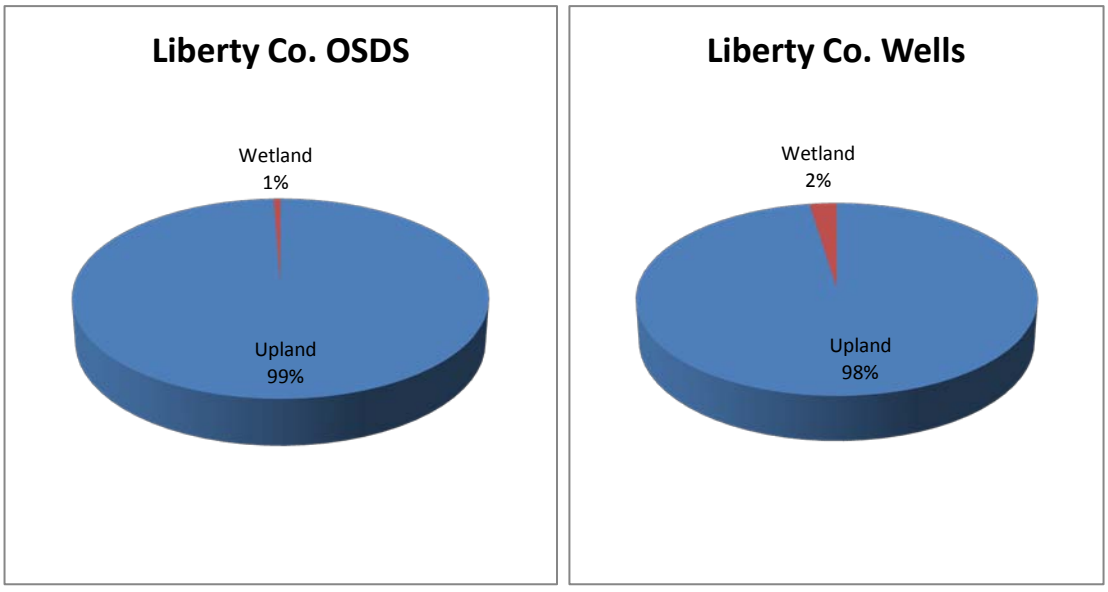

Figure 4.2

The majority, 1362 of the OSDS (99%) and 199 (98%) of wells were located in an upland area.

Georgia Geologic Survey Pollution Susceptibility:

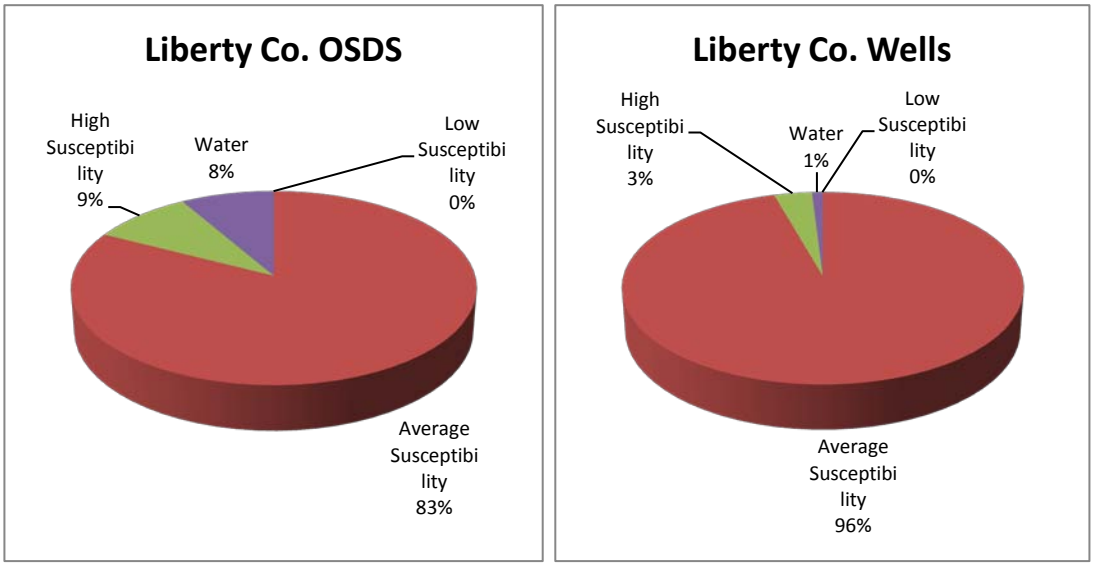

Figure 4.3

The majority of OSDS, 1,131 (83%) and wells, 195 (96%) surveyed were located in the average susceptibility zone.

Georgia EPD Geologic Substrates:

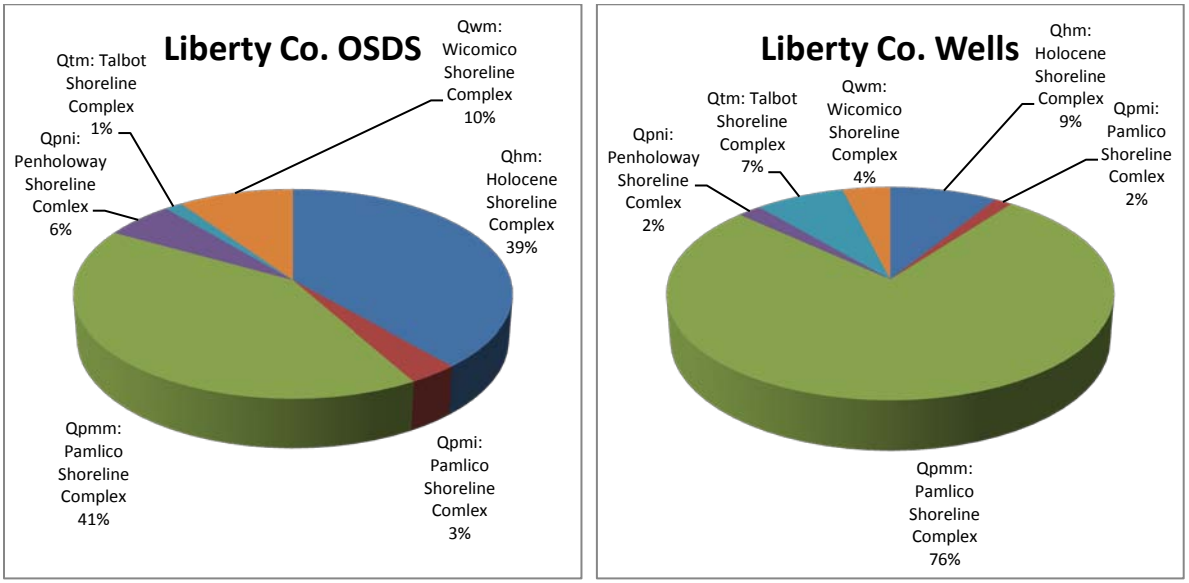

Figure 4.4

The majority of OSDS were located in the Qpmm: Pamlico Shoreline Complex-566 (41%) and Ohm: Holocene Shoreline Complex-528 (39%) substrate. The majority of wells were located in the Qpmm: Pamlico Shoreline Complex-156 (76%) substrate. The

Holocene and Pamlico Shoreline Complex refers to systems located in marshland and lagoon bedrock areas.

Georgia EPD Ground Water Recharge Zones:

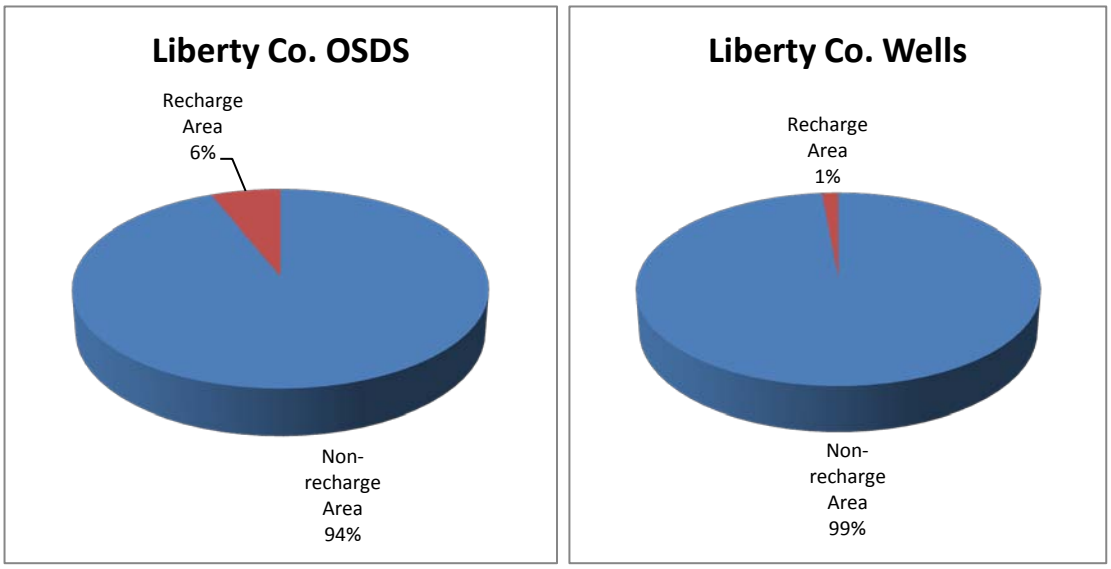

Figure 4.5

The majority of OSDS, 1286 (94%) and wells, 201 (99%) were located in non-groundwater recharge areas.

Long County Summary

UGA MAREX GIS identified potentially 289 OSDS parcels for Long County. 112 (39%) OSDS parcels were geo-located and inspected. The inspector noted 0 OSDS failures and no needed repairs were recorded within the project boundary and within the project period.

There are approximately 5,268 remaining parcels in Long County; however parcels with municipal connections or those larger than 12 acres were not removed from the total number of parcels.

FEMA Flood Plain Classes:

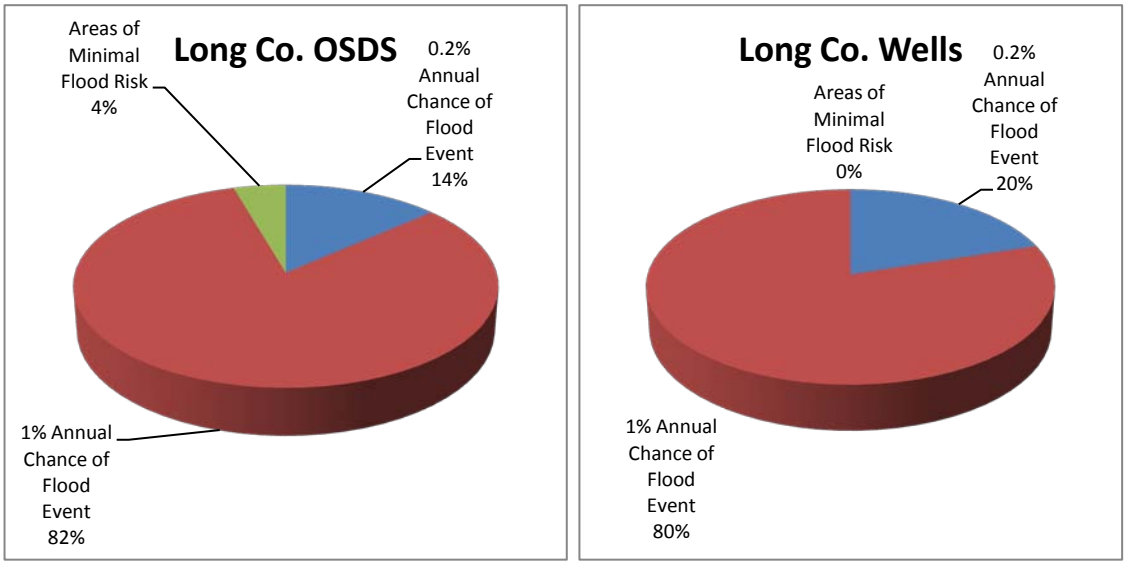

Figure 5.1

The majority of OSDS, 91 (82%) and wells, 12 (80%) were located in the 1% annual chance of flood event region.

U.S. Fish & Wildlife National Wetlands Inventory:

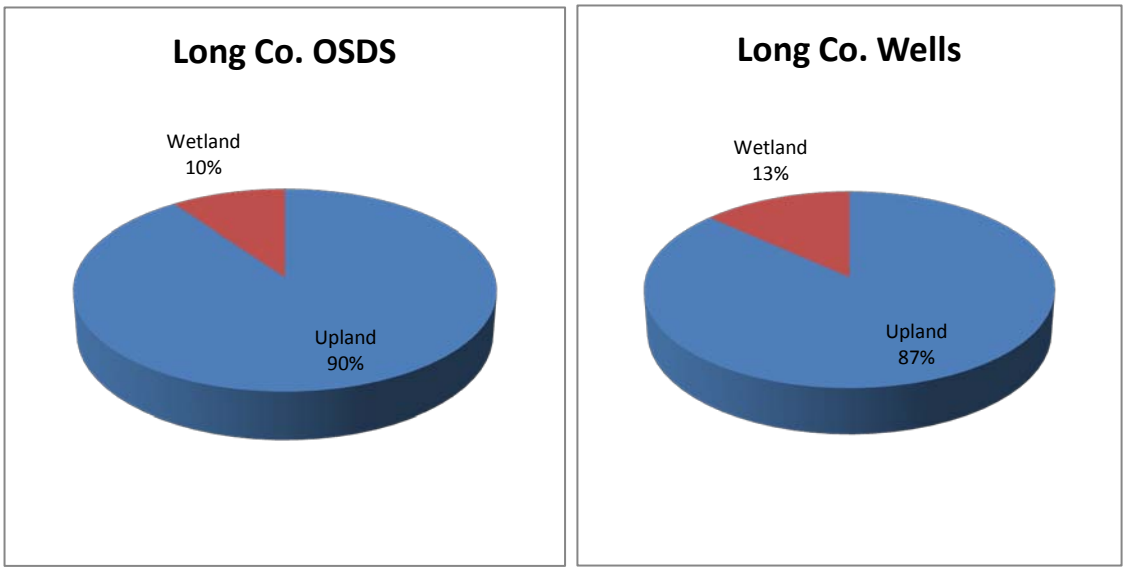

Figure 5.2

The majority of the OSDS, 100 (90%) and the wells, 13 (87%) were located in an upland area.

Georgia Geologic Survey Pollution Susceptibility:

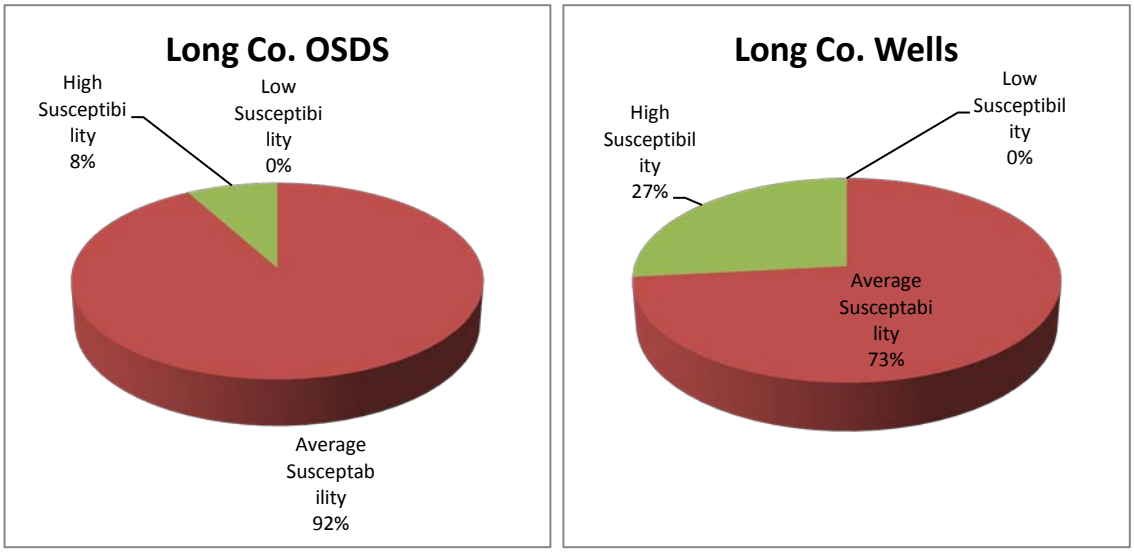

Figure 5.3

The majority of OSDS, 102 (92%) surveyed were located in an average susceptibility zone, whereas, 11(73%) of wells were located in an average susceptibility zone, although 27% were located in a high susceptibility zone.

Georgia EPD Geologic Substrates:

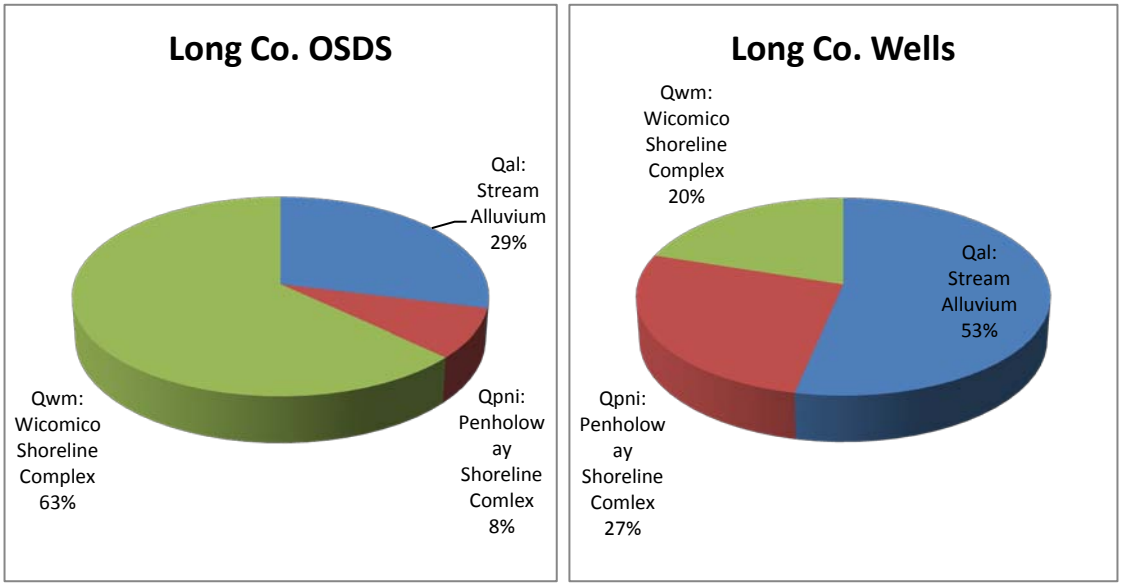

Figure 5.4

The surveyed OSDS were located in the Qwm: Wicomico Shoreline Complex-70 (63%), Qal: Stream Alluvium-32 (29%) and Qpni: Penholoway Shoreline Complex-9 (8%) substrate. The majority of wells were located in the Qal: Stream Alluvium-8 (53%),

Qpmm: Penholoway Shoreline Complex-4 (27%) and Qwm: Wicomico Shoreline Complex-3 (20%) substrate.

Georgia EPD Ground Water Recharge Zones:

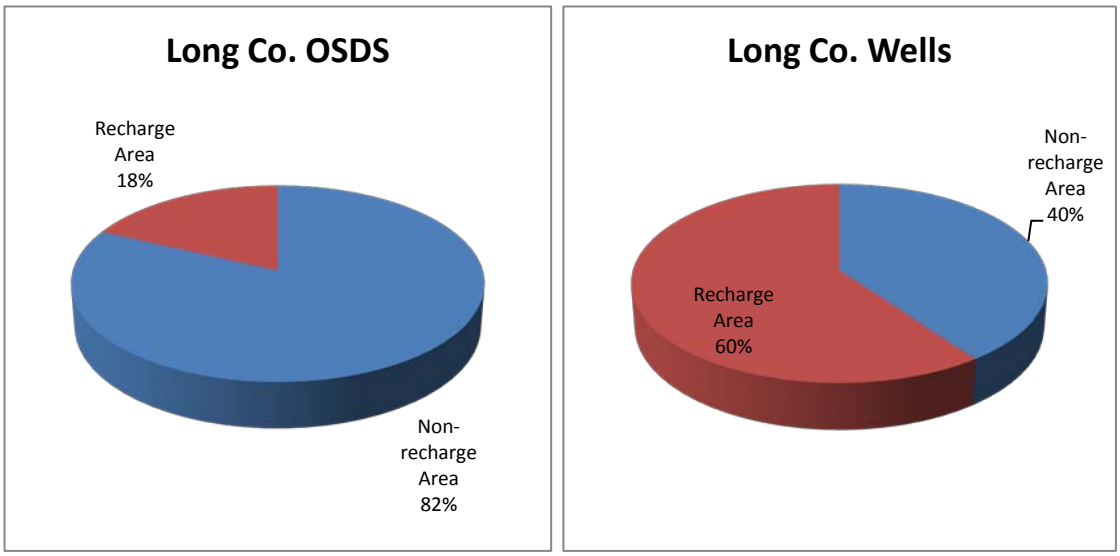

Figure 5.5

The majority of OSDS, 91 (82%) surveyed were located in a non-groundwater recharge zone. Of the wells surveyed, 9 (60%) were located in a groundwater recharge zone and 6 (40%) were located in a non-groundwater recharge zone.

Discussion

Phase I of this project established a technical process, that coastal counties will continue using to protect and maintain public health. This pilot project process has been transferred to Camden, Chatham, Glynn & McIntosh counties. Phase II of the project will continue efforts that will include an OSDS pollution susceptibility index developed by a panel of water quality and septic system experts. Along with the index, Phase II will provide maps showing locations of OSDS and wells within areas highly susceptibility to OSDS related pollution and conduct an enforcement program aimed at dysfunctional systems (repairs & replacements) for all 8 counties.

Appendix:

Georgia OSDS Statue

Title 31 of the Official Code of Georgia (OCGA 31-3) stipulates that the Georgia Department of Community Health (GADCH) has primary authority to regulate individual onsite disposal systems, including septic tank systems. The code section also established County Boards of Health within the GADCH and empowered those boards to regulate the installation and operation of OSDS within their respective jurisdictions. Recognizing that failing OSDS or even fully functioning OSDS sited in close proximity to surface waters can become sources of impairment, by legal authority, the GADCH enacted the *Rules and Regulations for On-Site Sewage Management Systems*. Chapter v.290-5-26-.05 states the following: *"Location" - No septic tank shall be installed less than fifty feet (50') from existing or proposed wells/springs, sink holes, or suction water lines, and tanks shall be located downgrade from wells or springs if physically possible; less than twenty-five feet (25') from lakes, ponds, streams, water courses, and other impoundments; less than ten feet (10') from pressure water supply lines, or less than ten feet (10') from a property line. No septic tank shall be installed less than fifteen feet (15') from a drainage ditch or embankment. Septic tanks shall be installed so as to provide ready access for necessary maintenance. Normally, the distance a septic tank should be located from a building foundation is at least ten feet (10') but, lesser distances may be allowed by the County Board of Health. The County Board of Health, after site inspection, may require greater separation distances than cited herein due to unusual conditions of topography, or other site configuration; subsurface soil characteristics and/or groundwater interference.*

Chapter 5 of Title 31 (OCGA 31-5) goes on to require that individual property owners be responsible for properly operating and maintaining the OSDS. Maintenance of the system must be in accordance with the GADCH *Manual for Onsite Sewage Management Systems*.

GIS Analysis Categories

FEMA Flood Plain Classes:

Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30. Moderate flood hazard areas, labeled Zone B or Zone X (shaded) are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded).

(www.fema.gov)

U.S. Fish & Wildlife National Wetland Inventory

Through the National Wetlands Inventory, the USFWS has developed a series of topical maps to show wetlands and deepwater habitats. These maps have been used extensively to make resource management decisions at the federal, state and local government levels. The goal of the National Wetlands Inventory is to provide current geospatially referenced information on the status, extent, characteristics and functions of wetland, riparian, deepwater and related aquatic habitats in priority areas to promote the understanding and conservation of these resources.

(www.fws.gov/wetlands)

Georgia Geologic Survey Pollution Susceptibility

The Georgia Geologic Survey has developed a 1:500,000 scale map (GIS database) which shows the relative susceptibility of the shallow water table aquifer in Georgia to pollution from manmade surface sources. Relative susceptibility was derived by generally following the DRASTIC method developed by the United States Environmental Protection Agency. DRASTIC is a methodology that allows the pollution potential of any hydrogeologic setting to be systematically evaluated, providing a standardized technical basis for environmental decision making using existing data.. Areas within the state of Georgia are classified as having a relatively lower, average, or higher susceptibility to pollution. The pollution susceptibility map was developed using a

computer based geographic information system to overlay different natural resource and cultural data bases.

(http://csat.er.usgs.gov/statewide/layers/drastic.html)

Georgia EPD Geologic Substrates

(www.gaepd.org/documents/wpd.html)

Georgia EPD Ground Water Recharge

(www.gaepd.org/documents/wpd.html)

For the downloadable final report & maps, please visit:

http://www.marex.uga.edu/advisory/cssmip.html