

Purpose of the Study

The Florida Legislature tasked the Florida Department of Health to conduct the Wekiva Onsite Nitrogen Contribution Study. One task within that study was an assessment of whether onsite sewage treatment and disposal systems (OSTDS), also known as septic systems, are a significant source of nitrogen to the underlying groundwater relative to other sources. This poster presents results of the literature-based initial assessment and revisions incorporating field data.

Wekiva Study Area



Figure 2. Location of Wekiva Study Area within Florida



Figure 3. Wekiva Study Area with springs recharge area and surface drainage basins (from Mattson, et al. 2006)

The urbanizing Wekiva Study Area (WSA) is comprised of about 305,000 acres covering portions of Lake, Orange, and Seminole Counties north of Orlando. The population was 485,000 based on 2000 census data.

Septic Systems or OSTDS

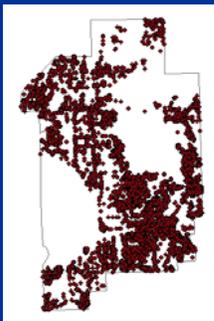


Figure 4. Location of septic systems within the Wekiva Study Area

Over 55,000 septic systems were located in the Wekiva Study Area in 2004.

Input of total nitrogen from a typical system was initially estimated to be 20 lbs/year. This value was at the lower end of the range (19-38lbs/year for 2.6 persons/household) observed during field work on three sites in the Wekiva Study Area and in other recent literature. Therefore, the estimate was revised to the mid-range, 29 lbs/yr.

Load of total nitrogen per system to ground water was initially based on a soil classification. The revised estimate was 60% of the input or 17 lbs/yr based on field work, similar to the 14lbs/yr estimated by MACTEC (2007).

Nitrogen Inputs and Loads

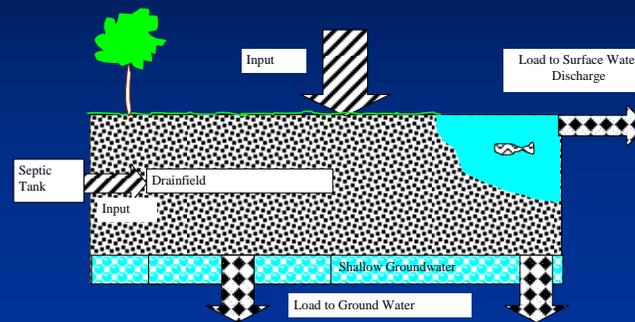


Figure 1. Conceptual sketch of distinction between inputs and loads

Input is the total nitrogen released to or near the surface of the environment, while load is the total nitrogen that enters the ground or surface water. Methods followed largely a similar study for nitrate in the combined surface water/springshed (MACTEC, 2007).

Inputs of total nitrogen to the Wekiva Study Area estimated were the application of fertilizer, livestock waste, atmospheric deposition; effluents from centralized wastewater treatment facilities (WWTF) and septic systems.

Loads to groundwater were estimated as the product of shallow groundwater concentrations and average groundwater recharge rate for land use classifications and as fractions of wastewater inputs. Estimates for loads via surface water were based on stormwater runoff. Both loads were adjusted for background (undeveloped) contributions.

Land and Fertilizer Use

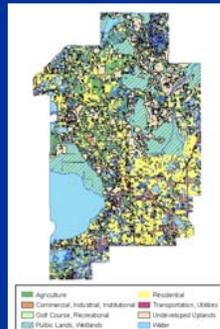


Figure 5. Land uses within the Wekiva Study Area

Residential was the largest single land use classification (25%). Water and wetlands together comprise 30% of the area, while agriculture occupies 13%.

Input rates for fertilizer based on IFAS recommendations were initially applied to all pervious surfaces. This estimate was too high by about a factor of two in comparison to fertilizer sales data maintained by the Department of Agriculture and Consumer Services.

This comparison suggested that an equivalent of about 60% of non-agricultural and 85% of agricultural pervious areas are fertilized at recommended application rates. Livestock waste and atmospheric deposition were also considered.

Results

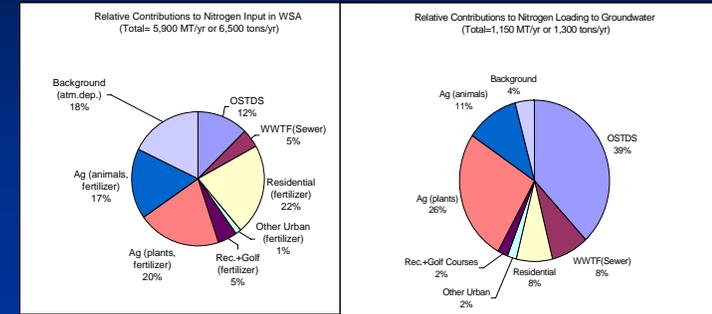


Figure 6. Estimates of total nitrogen inputs and groundwater loads in the Wekiva Study Area

Land Use/Source (input)	Input (tons/yr)	Load as surface water (tons/yr)	Load to groundwater (tons/yr)
OSTDS	804	0	482
WWTF(Sewer)	293	32	102
Residential (fertilizer)	1,421	212	97
Other Urban (fertilizer)	90	96	24
Rec.+Golf (fertilizer)	302	5	31
Ag (plants, fertilizer)	1,315	6	334
Ag (animals, fertilizer)	1,083	15	143
Background (atm.dep.)	1,154	239	52
Sum	6,462	604	1,266

Conclusions

Nitrogen loads to groundwater are much reduced compared to inputs, emphasizing the assimilation capacity of the soil. Assimilation appeared not the same for all sources.

Fertilizer use accounted for 54% of the estimated total nitrogen inputs and is a likely cause for somewhat less than half of the groundwater load. Agriculture contributions to both estimated loads and inputs was 37%.

In contrast, the relative contributions of wastewater sources increased more than two-fold from 17% of input to 47% of groundwater loads. OSTDS more than tripled from 12% to 39%.

Atmospheric deposition, while 18% of input, appeared to contribute less than a quarter of that percentage to groundwater loads.

References

MACTEC. 2007. *Phase 1 Report: Wekiva River Basin Nitrate Sourcing Study*. Report for Florida's Department of Environmental Protection. Further details about the studies and the Wekiva Study Area can be found at: <http://www.doh.state.fl.us/environment/ostds/wekiva/wekiva.htm>