

Florida Department of Environmental Protection



Division of Environmental Assessment
and Restoration

Updates to Nitrogen Source Inventory and Loading to Ground Water: Silver Springs BMAP Area

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Silver Springs BMAP meeting; December 6, 2013

Methods Summary-- Updates

- ◇ Atmospheric Deposition

- ◇ NADP- wet deposition (2 sites)
- ◇ CASTNET- dry deposition (1 site)



- ◇ Waste Water Treatment Facilities

- ◇ TN and flow data from DMRs
- ◇ Updated since last meeting



- ◇ Septic Tanks

- ◇ Marion County provided tank distribution
- ◇ Other counties based on DOH study (Hall and McClelland 2009)
- ◇ Updated since last meeting



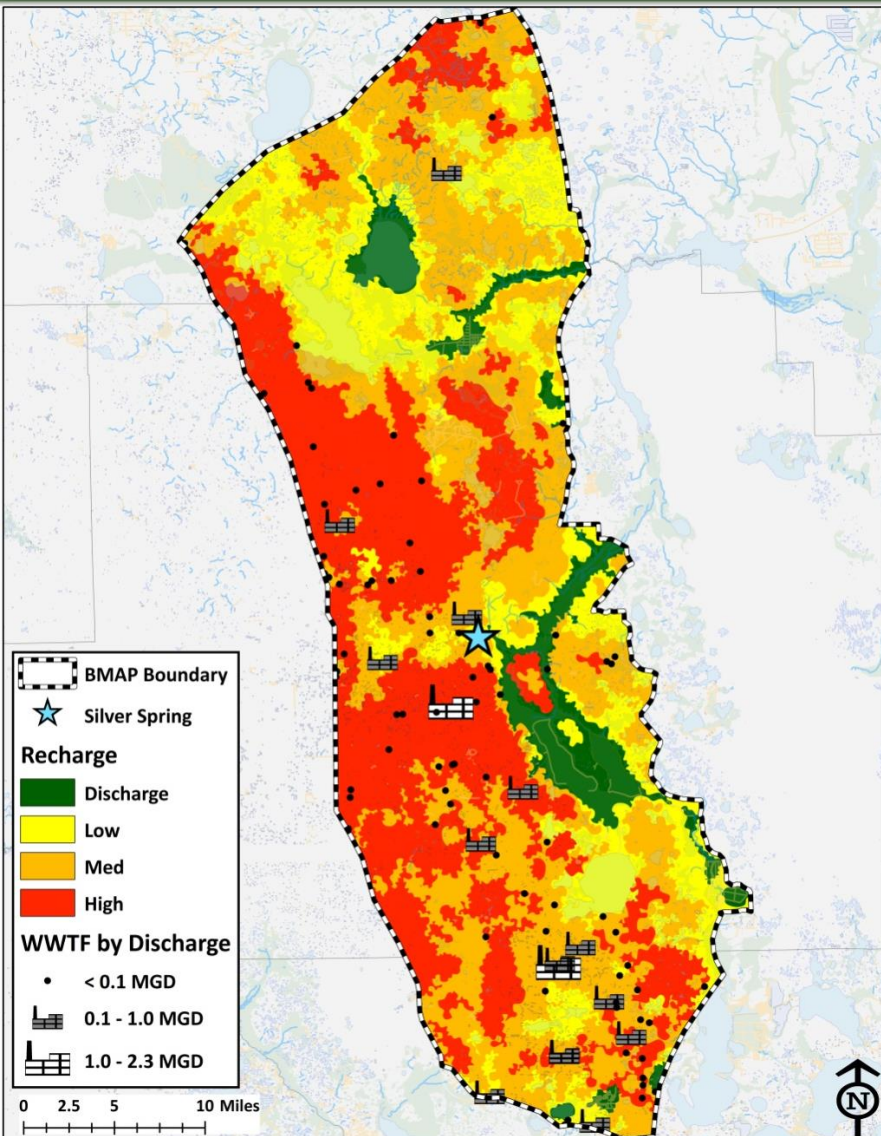
Methods Summary--Updates



- ◇ Livestock Waste
 - ◇ Population estimates based on Census of Agriculture
 - ◇ Animal specific loading factors
 - ◇ Land use percentages utilized
- ◇ Farm Fertilizers
 - ◇ Estimated based on application rates
 - ◇ Updated since last meeting
- ◇ Urban Fertilizers
 - ◇ Fertilizer sales data used to estimate urban fertilizer use
 - ◇ Land use percentages utilized
- ◇ NEW ADDITIONS TO INVENTORY
 - ◇ Horse Farms now a separate category
 - ◇ Drainage Wells and stormwater runoff

Wastewater Treatment Facilities: Updated

- ◇ 97 WWTF facilities in BMAP boundary
 - ◇ 17 with discharge ≥ 0.1 MGD
 - ◇ 80 with discharge < 0.1 MGD
- ◇ TN effluent concentrations and flow as reported in DMR



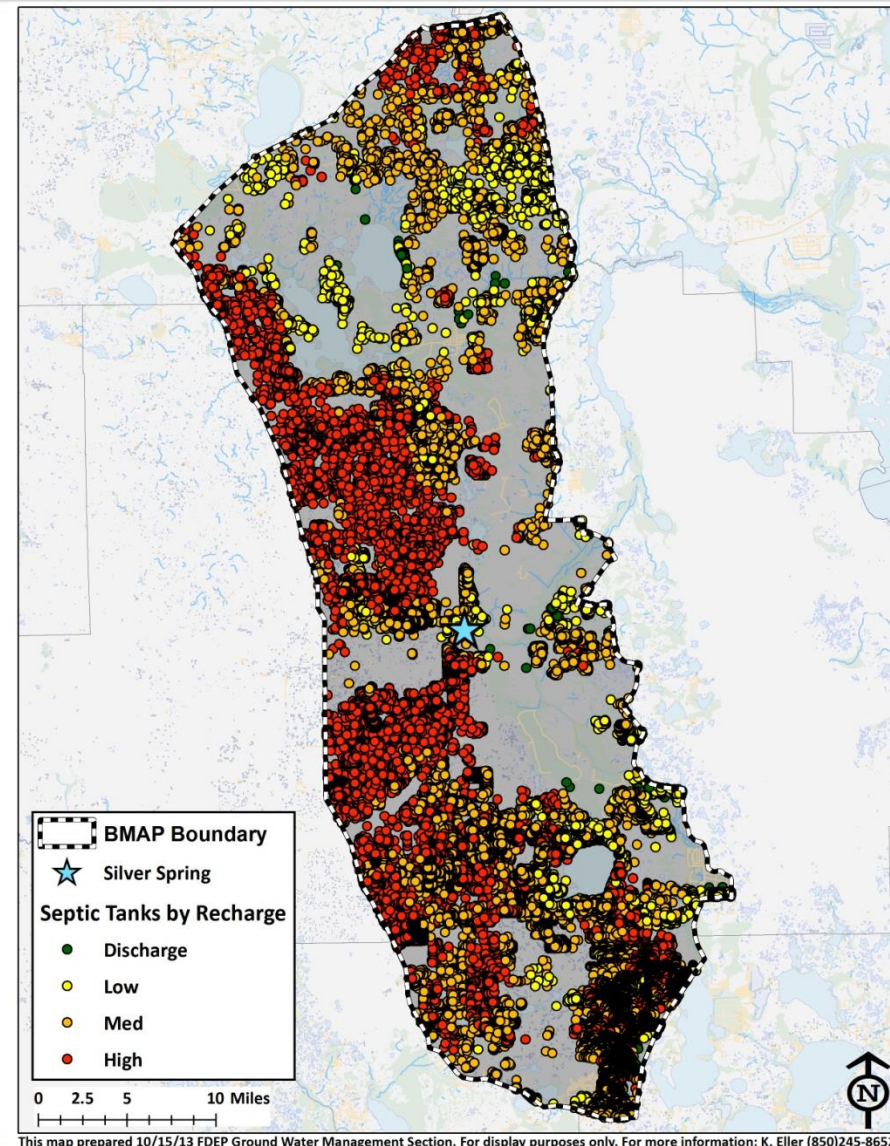
Recharge Area	Input to Land Surface (kg-N)
Low	29,218
Medium	68,872
High	46,630

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Septic Tanks: Updated

- ♦ Marion County provided best available septic tank data
- ♦ DOH model relying on tax parcel data and sewer service areas
- ♦ Average annual input to septic tank = 4.5 kg-N/person

Recharge Area	Input to Land Surface (kg-N)
Low	73,907
Medium	274,562
High	269,615

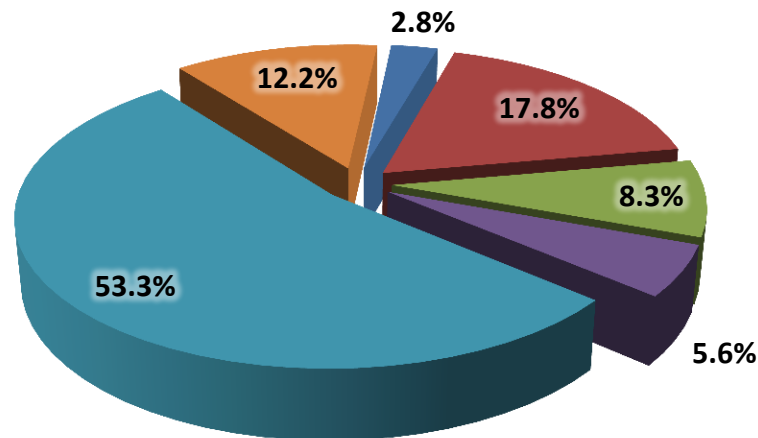


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Horse Farms: Updated



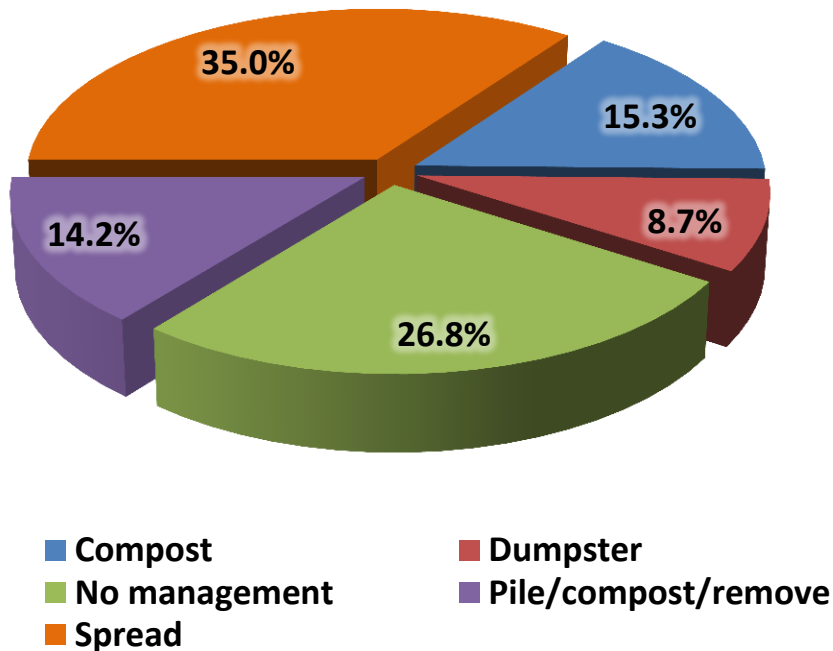
- ◊ Previously combined with livestock and farm fertilizer categories
- ◊ Now separated into its own loading category
- ◊ Horse Farm Fertilizer applications
 - ◊ 26% at 30 lb N /ac
 - ◊ 21% at 100 lb N /ac



Detailed information from extensive horse farm visits by Jamie Cohen (2011-2013)

2x_3x_per_yr annual as needed
 every 2-3 yrs no application will

Horse Farms: Updated



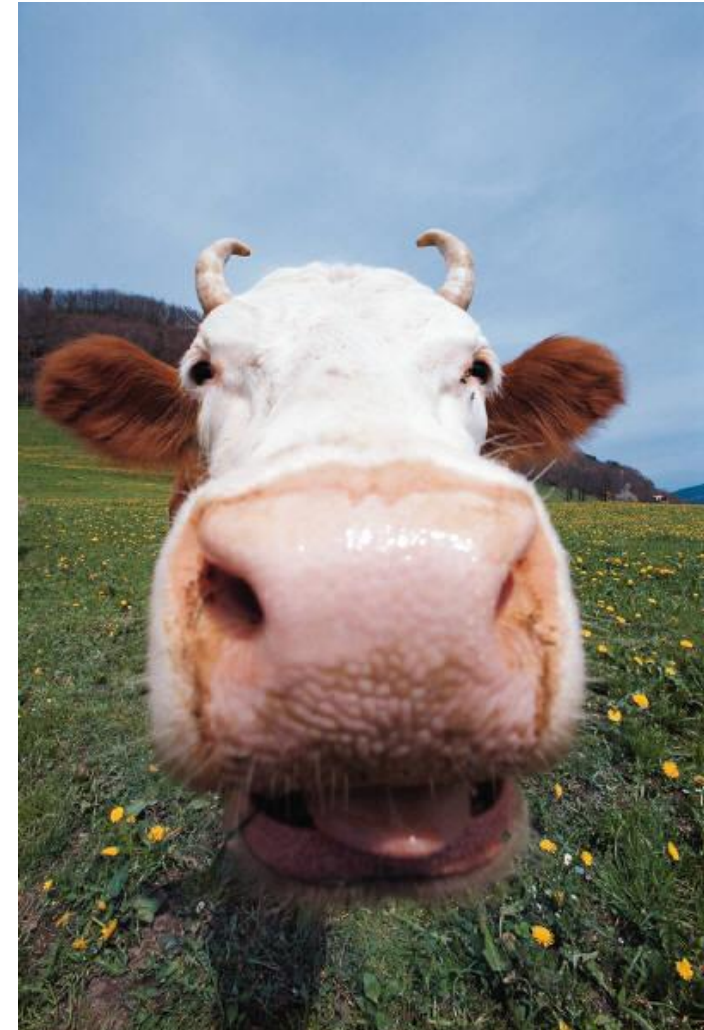
Detailed information from extensive horse farm visits by Jamie Cohen (2011-2013)

- ◇ Horse manure management
 - ◇ Population estimated from Census of Agriculture
 - ◇ Land use percentages calculated for only horse farmlands
 - ◇ Only 62% of the horses are contributing N to the BMAP area based on BMPs

Recharge Area	Input to Land Surface (kg-N)
Low	10,912
Medium	60,183
High	321,415

Livestock Waste: Updated

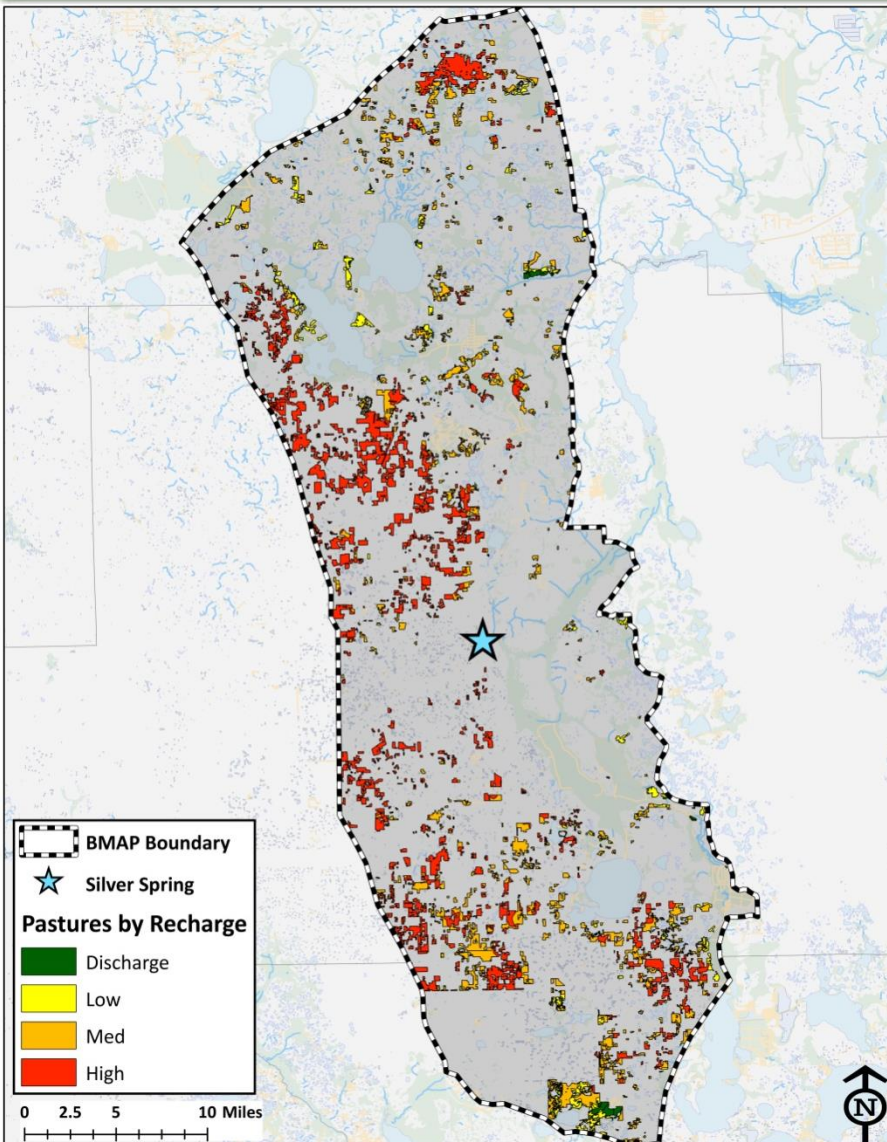
- ◊ Previously included all livestock animals
- ◊ Animal populations estimated from Census of Agriculture
- ◊ Loading factors applied per animal in BMAP boundary
- ◊ Estimated 35,902 cows in BMAP which contribute 97.7% of livestock nitrogen



Recharge Area	Input to Land Surface (kg-N)
Low	364,760
Medium	1,129,853
High	1,443,313

Fertilizers: Farmlands: Updated

- ◇ Based on application rates
- ◇ 49,177 ha of fertilized farmlands
 - ◇ 26,090 ha is improved pastures
 - ◇ Only 25% is estimated to be fertilized every 3-4 years



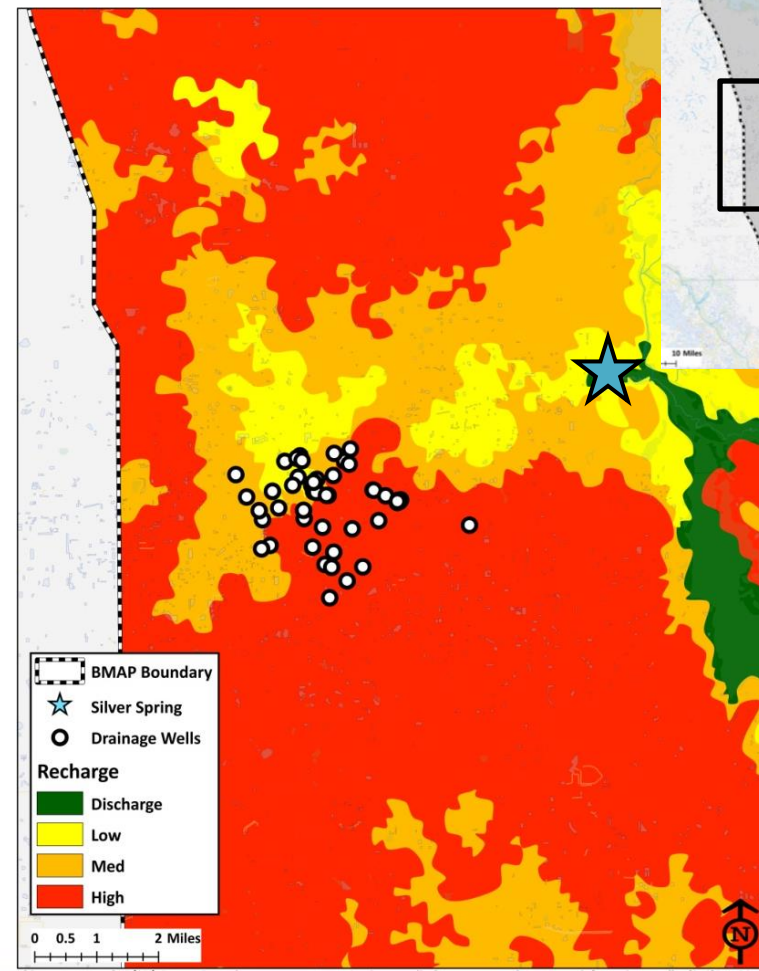
Recharge Area	Input to Land Surface (kg-N)
Low	191,951
Medium	594,748
High	1,072,963

Stormwater runoff to drainage wells

- ◇ 45 stormwater drainage wells
 - ◇ 30% in Low Recharge
 - ◇ 26% in Medium Recharge
 - ◇ 44% in High Recharge
- ◇ Runoff curve numbers and event mean N concentrations from H. Harper
- ◇ Average annual rainfall of 50.8 in/yr; assumed each storm had similar contribution to runoff

Recharge Area	Input to Land Surface (kg-N)
Low	5,563
Medium	4,768
High	7,947

Drainage areas from
Dyer et al, 1984

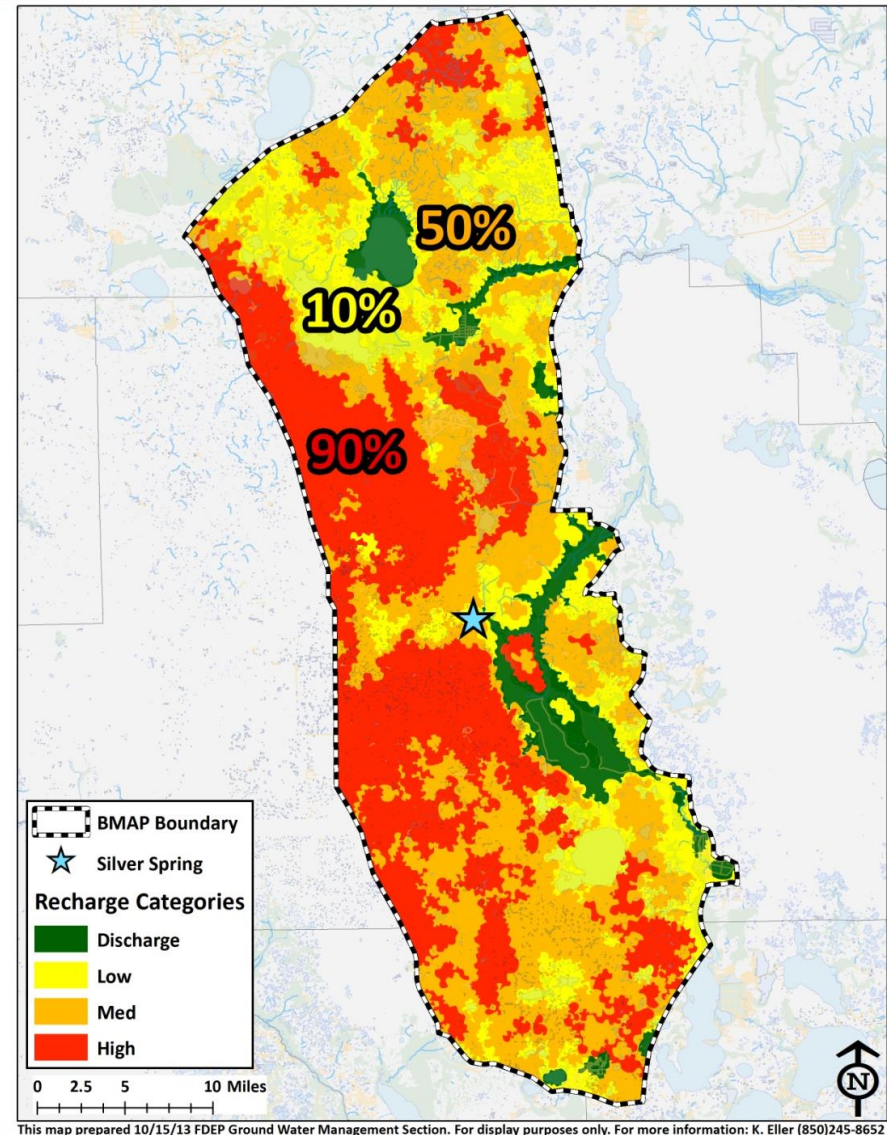


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Attenuation and Recharge Factors

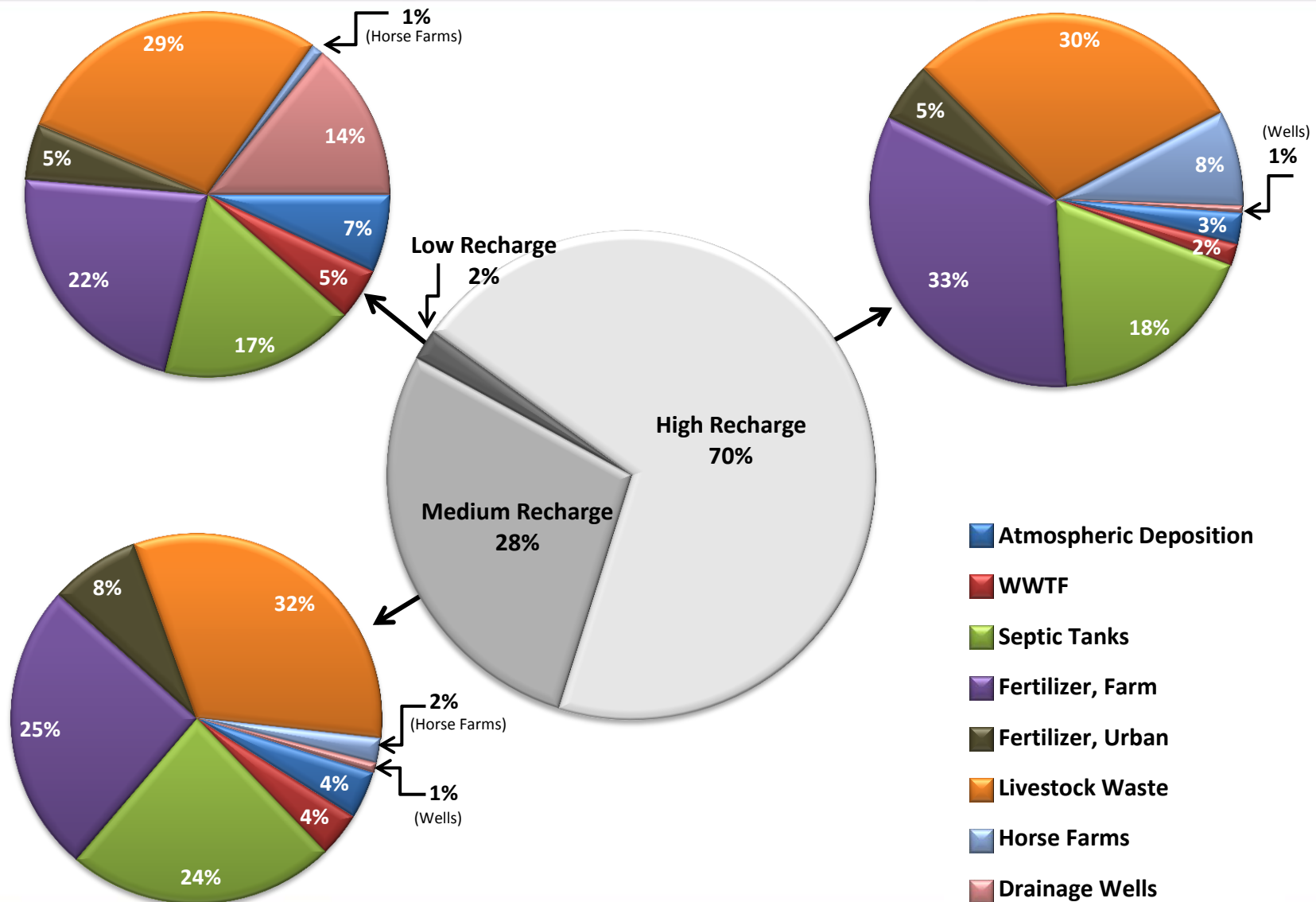
N loads to groundwater were adjusted for N attenuation and recharge rates

Loading Category	Attenuation Factor
Atmospheric Deposition	90%
Wastewater Treatment Facilities	60%
Septic Tanks	40%
Farm Fertilizers	70%
Urban Fertilizers	80%
Livestock	80%
Horse Farms	75%
Stormwater Drainage Wells	35%

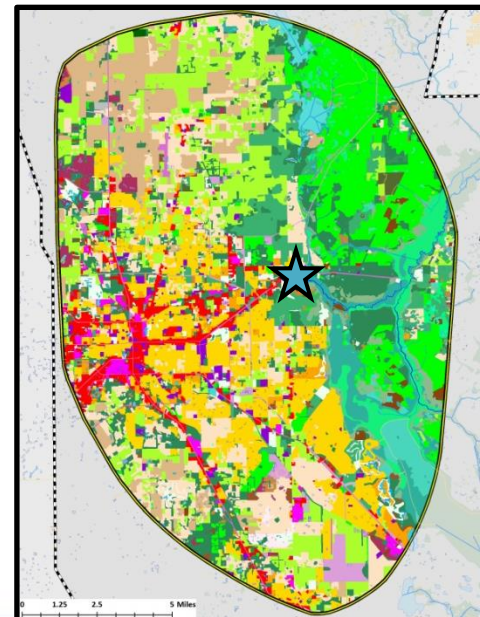
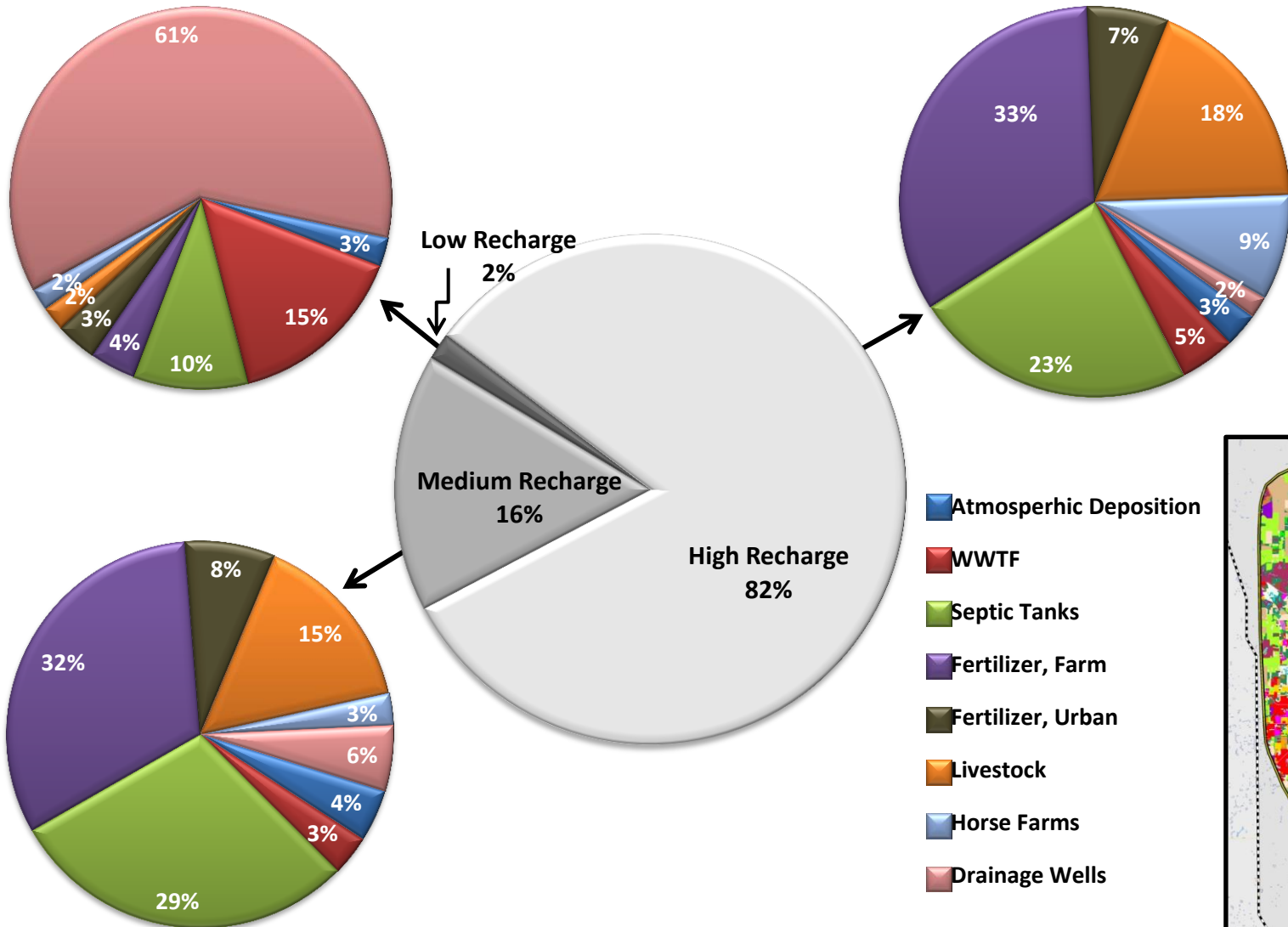




Annual Average N Loading to Ground Water (BMAP area): Updated



10-Year Capture Zone





QUESTIONS??



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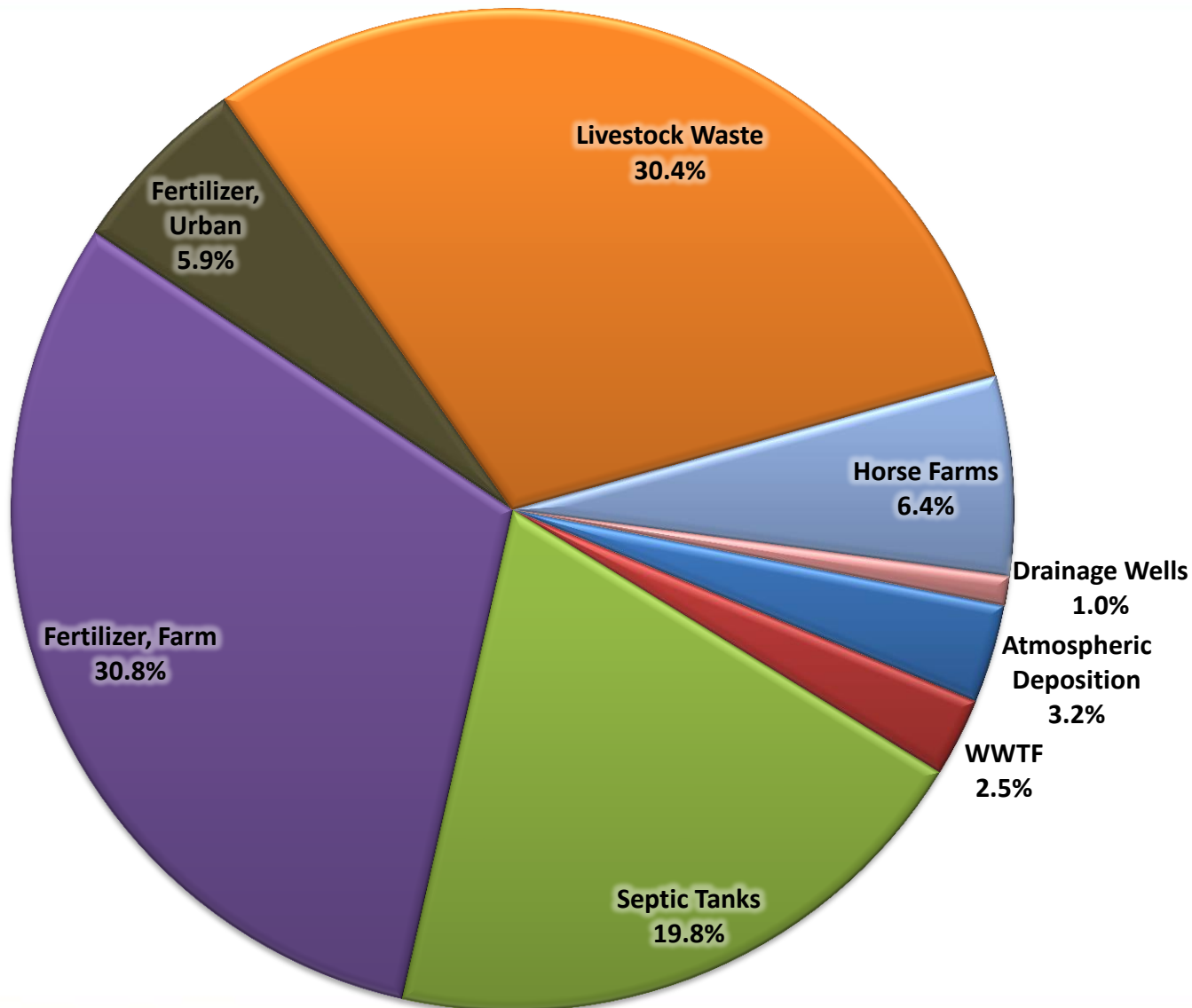
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BMAP Loading (kg-N/yr)

County	Area (ha)	Atmospheric Deposition	WWTF	Septic Tanks	Fertilizer,		Livestock	Horse Farms	Drainage Wells
					Farm	Urban			
Years Inc.		2007-2012	2012-2013	2009-2010	2009 LU		2007		
Adjusted Silver Spring BMAP (sorted by county)									
Alachua	46,108	5,197	112	9,596	21,477	3,320	77,593	21	
Marion	141,884	27,122	17,158	186,054	312,143	46,243	228,032	77,670	11,881
Lake	12,227	2,264	3,688	32,859	21,946	15,184	16,626	944	
Sumter	19,011	3,076	10,598	9,715	18,633	7,743	48,980	1,458	
Putnam	18,895	2,128	173.87	8,751	10,472	1,547	8,846	21	
Adjusted Silver Spring BMAP (sorted by recharge area)									
High	85,543	23,532	16,787	160,172	289,700	45,109	259,796	72,318	5,166
Medium	94,809	14,490	13,774	82,368	89,212	27,661	112,985	7,523	3,099
Low	57,773	1,766	1,169	4,434	5,759	1,268	7,295	273	3,616
TOTAL LOADING									
Total	238,125	39,787	31,730	246,975	384,671	74,038	380,077	80,114	11,881
Percentage		3.2	2.5	19.8	30.8	5.9	30.4	6.4	1.0

Nitrogen Loading in BMAP area





N loading in 10-year capture zone

County	Area (ha)	Atmospheric Deposition	WWTF	Septic Tanks	Fertilizer,		Livestock	Horse Farms	Drainage Wells
					Farm	Urban			
Years Inc.		2007-2012	2012-2013	2009-2010	2009 LU		2007		
Adjusted Silver Spring BMAP (sorted by recharge area)									
High	29,757	8,186	13,085	67,145	95,594	19,262	52,332	25,037	5,166
Medium	16,172	2,471	1,908	16,617	18,160	4,287	8,665	1,521	3,099
Low	4,798	147	896	574	230	204	122	109	3,616
TOTAL LOADING									
Total (Marion County Only)	50,727	10,804	15,889	84,336	113,984	23,753	61,120	26,667	11,881
Percentage		3.1	4.6	24.2	32.7	6.8	17.5	7.7	3.4

N loading in 10-year capture zone

