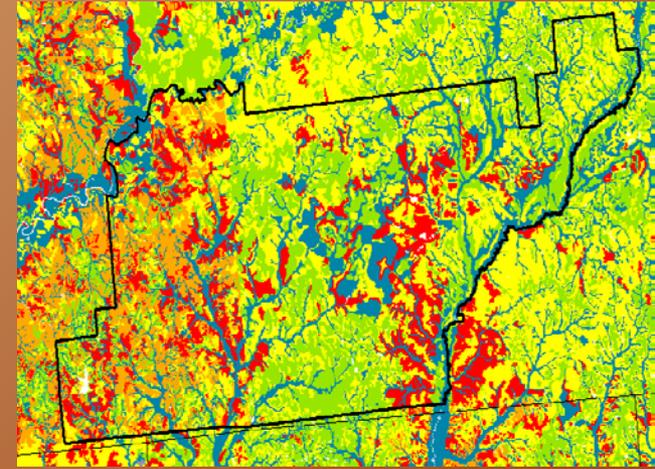
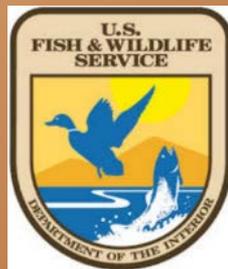


# Interpretations: From Training to Application



Revising Regional Interpretations based on customer feedback

July 21, 2015

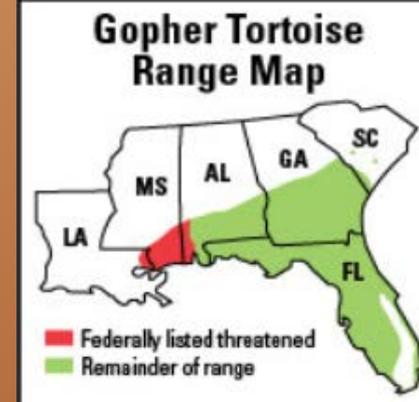


**Our Florida Committee Members:**



# Status of the Gopher Tortoise

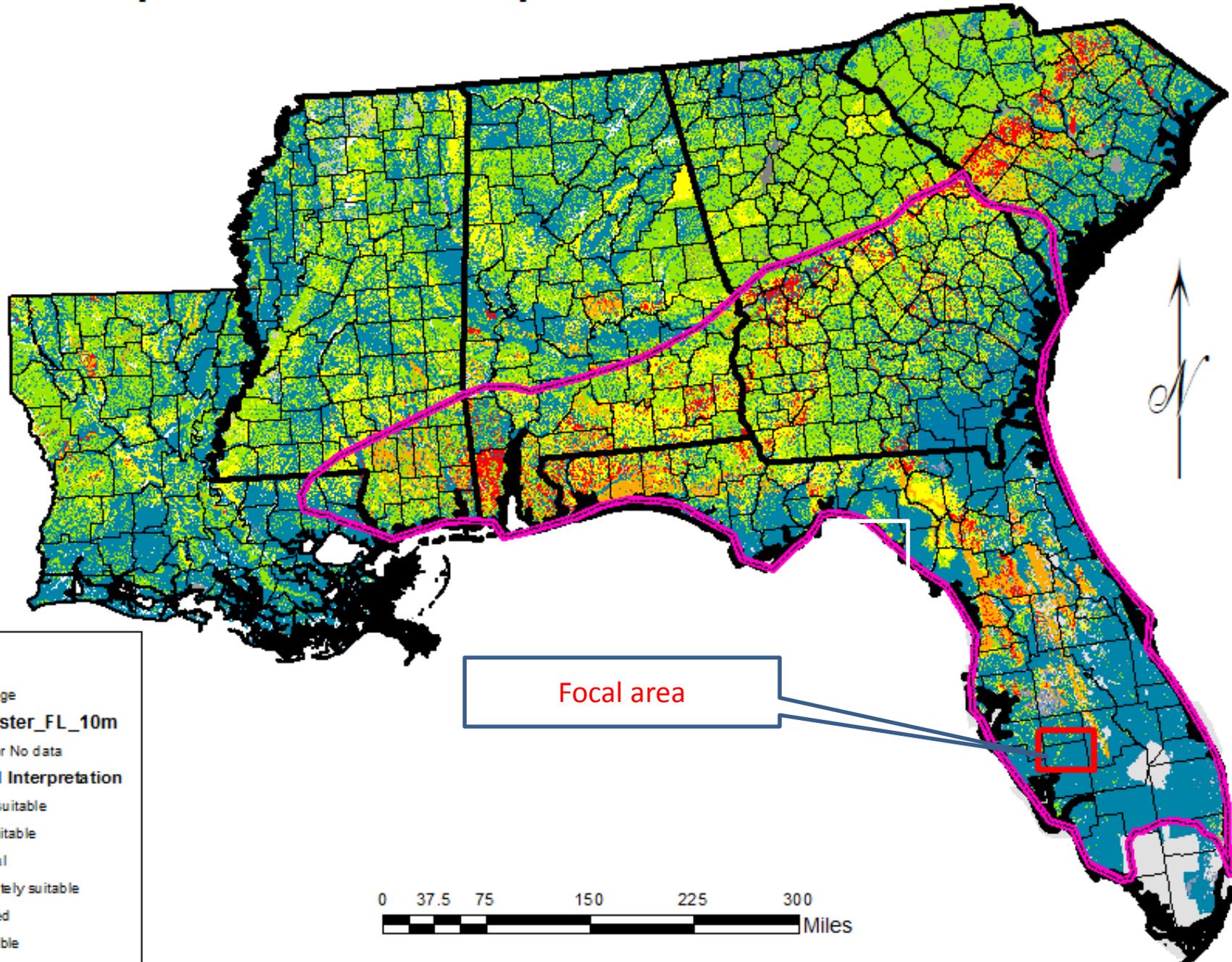
- Threatened species
- Declining populations throughout its range
- In Florida, gopher tortoises must be relocated before clearing or development takes place
- More than 80 percent of their habitat is privately owned.
- USFWS identifies “priority soils”
- Keystone species
- **USDA-NRCS programs:** Longleaf Pine Initiative (LLPI) and Working Lands for Wildlife (WLFW)



USFWS website:

<http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=C044>

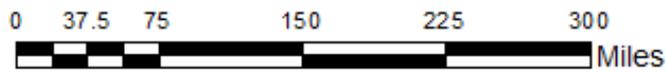
# National Gopher Tortoise Interpretation from NASIS



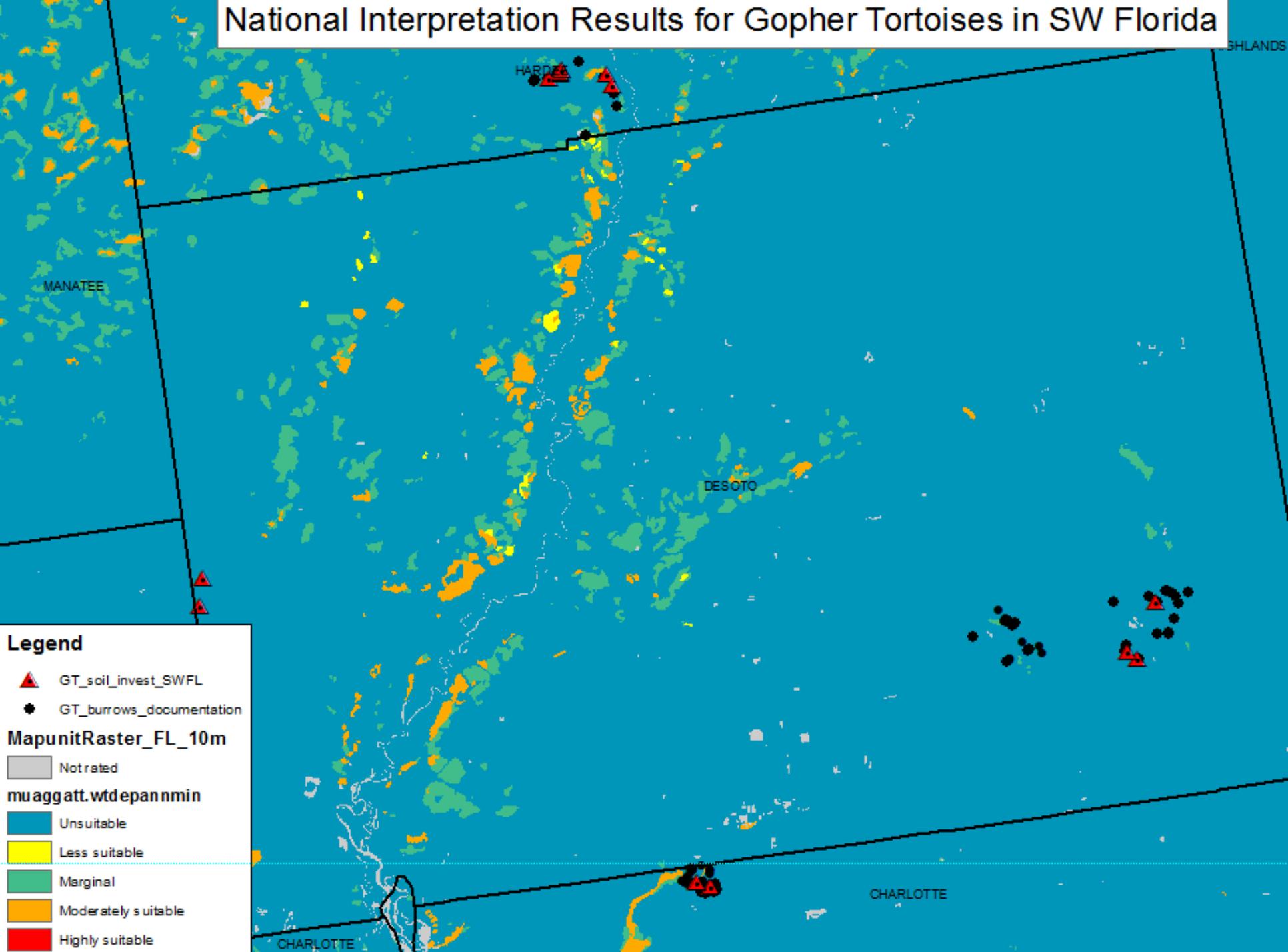
**Legend**

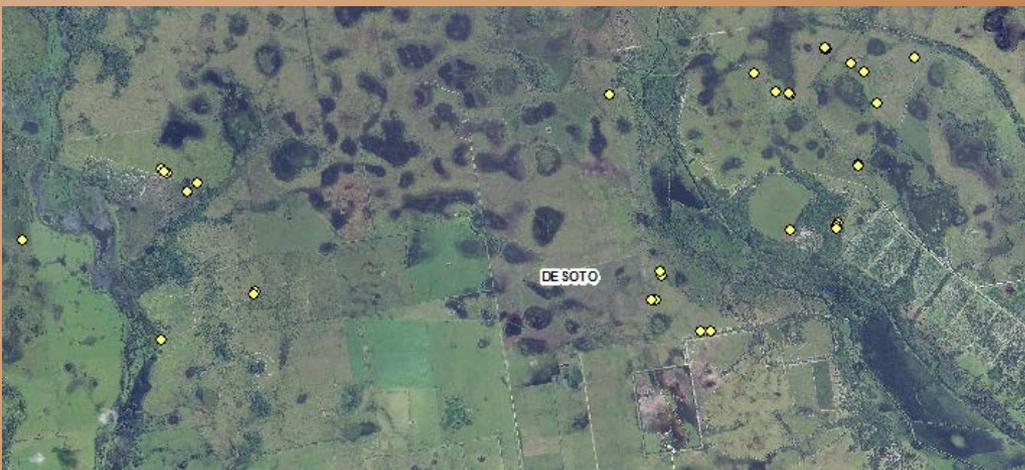
- GT\_range
- MapunitRaster\_FL\_10m
- Water or No data
- FL Regional Interpretation
- Highly suitable
- Less suitable
- Marginal
- Moderately suitable
- Not rated
- Unsuitable

Focal area



# National Interpretation Results for Gopher Tortoises in SW Florida





Field documented gopher  
tortoise burrows

Land use and ecosystem matrices

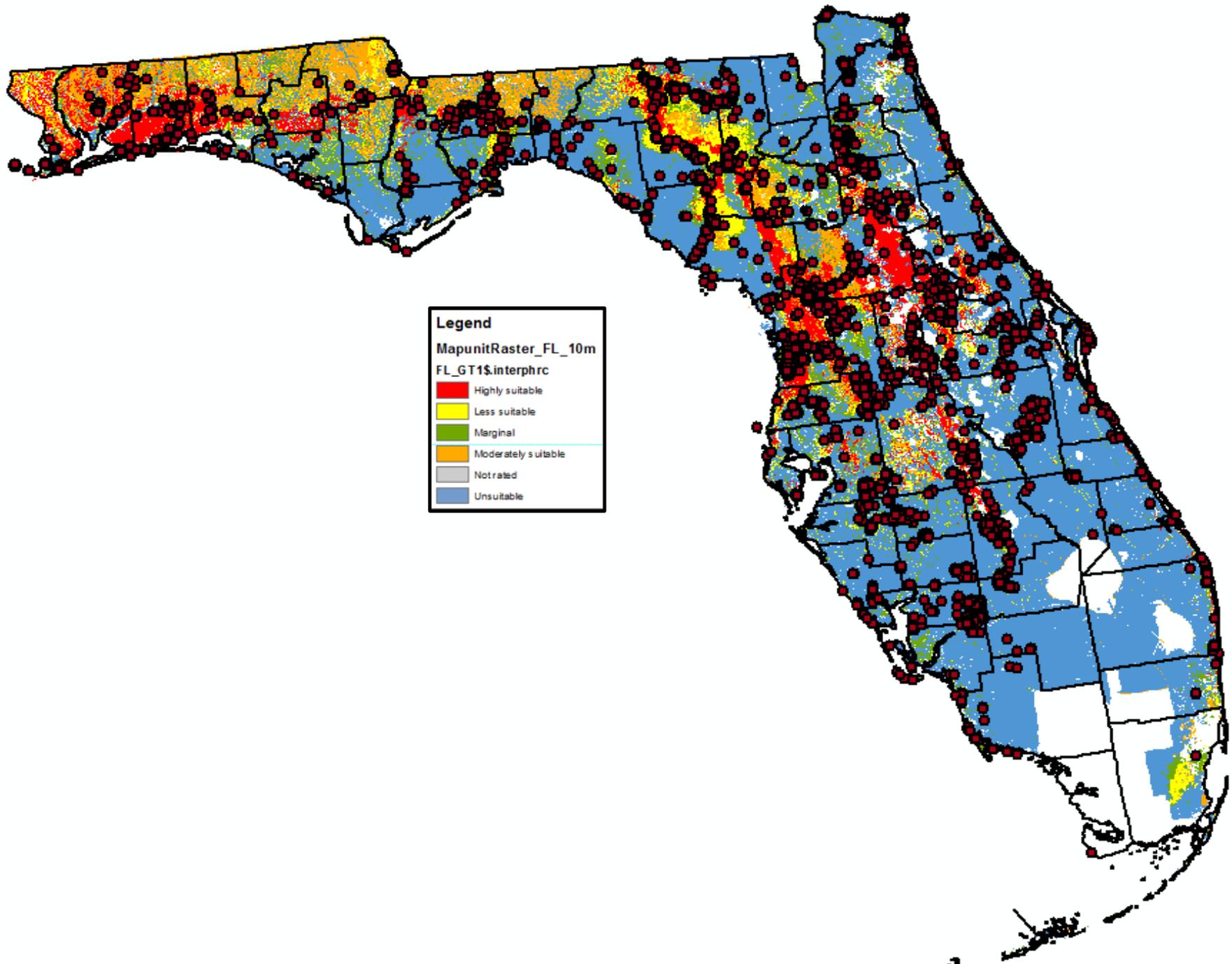




**Excessively drained soils (above) and poorly drained soils (below)**



**Onsite gopher tortoise burrows with an apron of spodic horizon material**

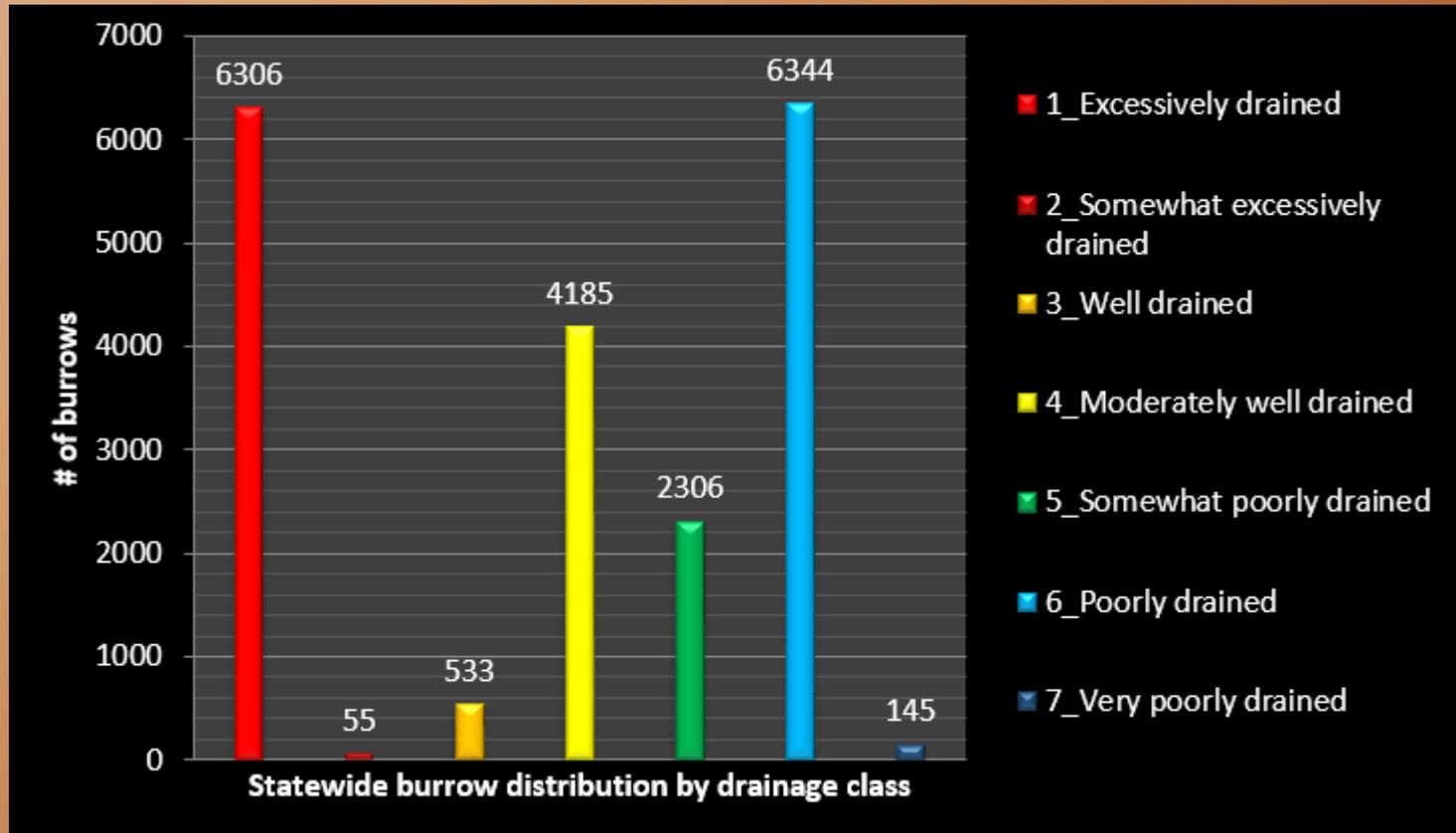


- With almost 20,000 data points from various agencies and partners

Next step, data analysis:

- Join burrow locations to SSURGO (soils)
- Evaluate data statewide

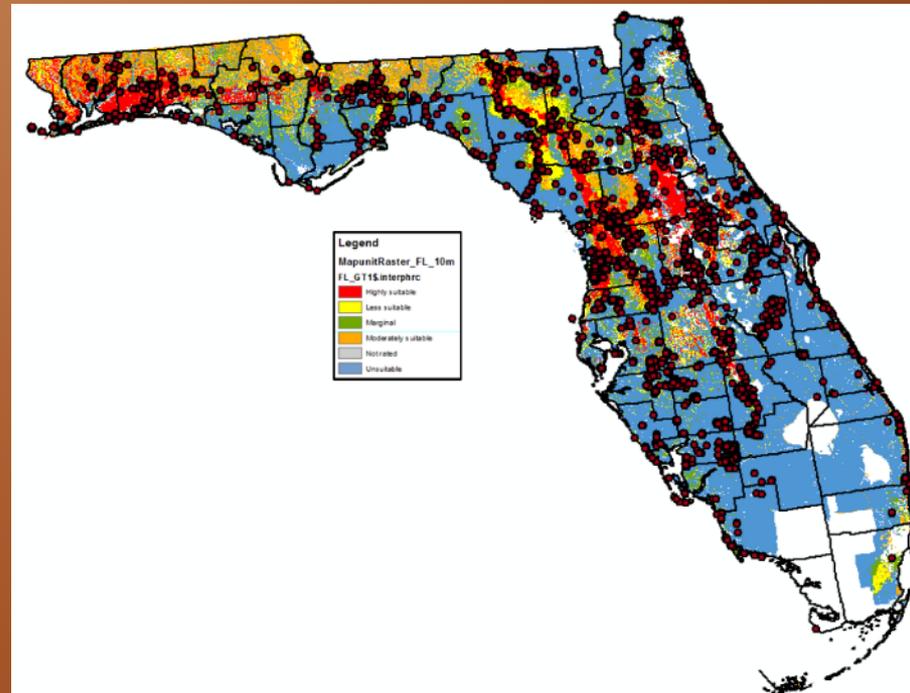
19,905  
burrows



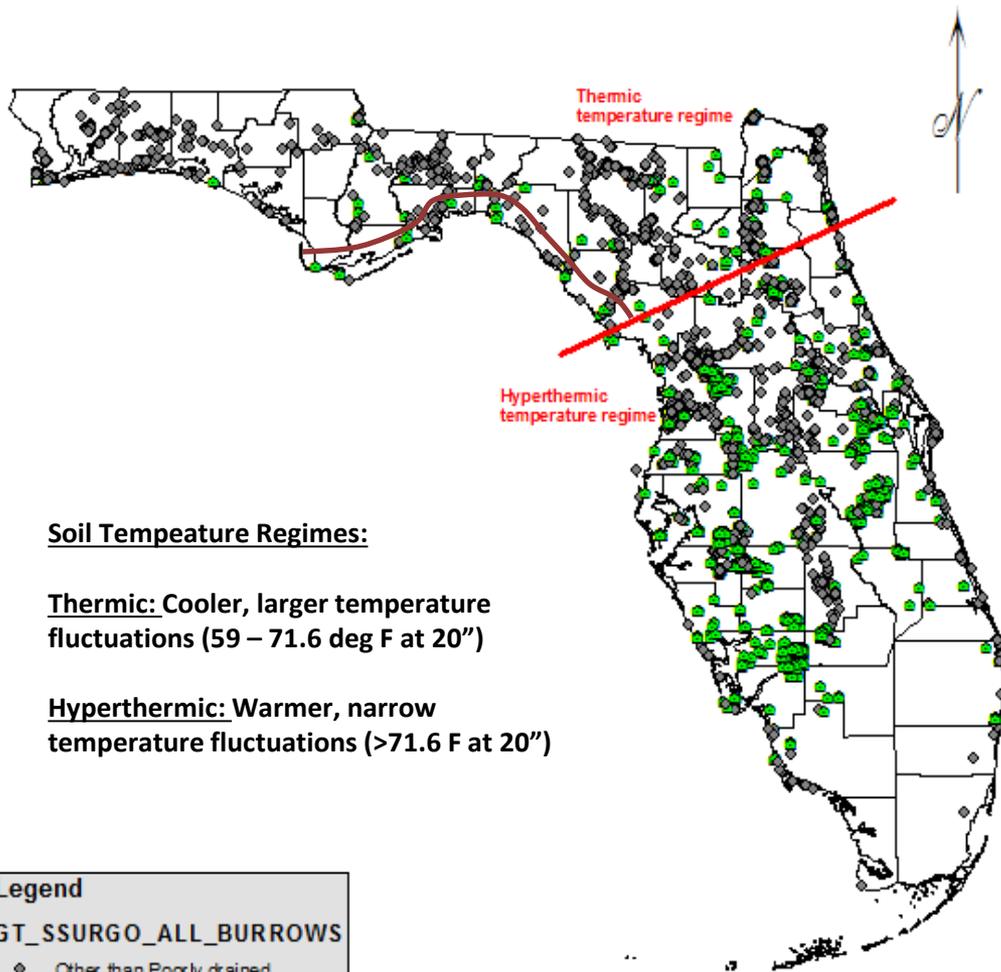
- Excessively: No water table, low AWC
- Well: 122 to 200 cm
- Moderately well: 76 to 122 cm
- Somewhat poorly: 42 to 76 cm
- Poorly: 25 to 42 cm
- Very poorly: 0 to 25 cm

**But we acknowledged that there are differences between north and south Florida, due to various reasons:**

- Investigative bias due to distribution of public lands
- Distribution of drainage classes
- Distribution of parent materials
- Climatic differences (mostly temperature and seasonality of precipitation)
- Topographical differences
- Hydrology differences
- Land use pressures and patterns



## Documented Gopher Tortoise Distribution



### Soil Temperature Regimes:

**Thermic:** Cooler, larger temperature fluctuations (59 – 71.6 deg F at 20")

**Hyperthermic:** Warmer, narrow temperature fluctuations (>71.6 F at 20")

### Legend

GT\_SSURGO\_ALL\_BURROWS

◇ Other than Poorly drained

### Drainage class

■ Poorly drained

Survey Area: State of Florida  
Survey Area Version: 10/1/2014; fully certified  
Orthoimagery: None  
Map Created: 10/22/2014  
Rick Robbins, (Phone: 352.338.9538)  
USDA-NRCS, Gainesville  
Sources:  
Soils: Statewide SSURGO  
Tortoise: FNAI, USFSW, FWC



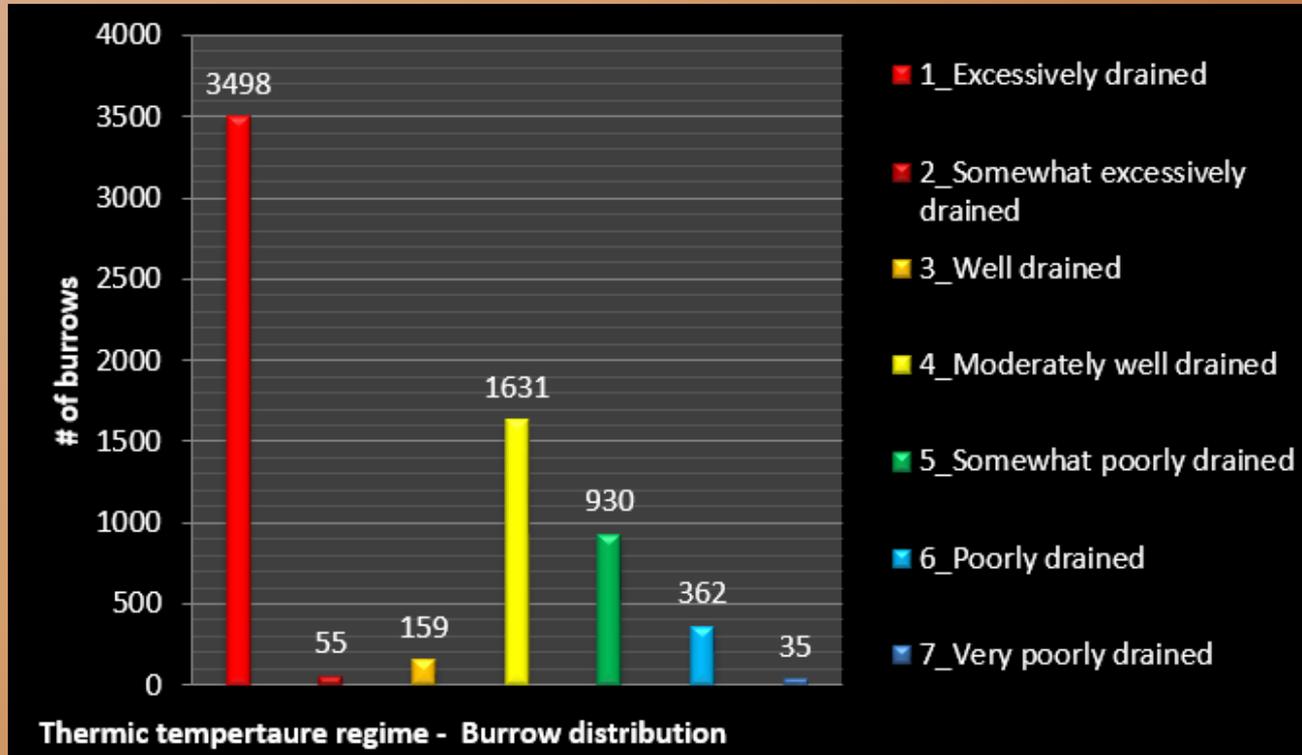
0 20 40 80 120 160  
Miles

## Why is temperature regime important?

- Thermoregulation requirements
- Burrow depths
- Seasonal vs. year-round foraging
- Different forage species present

# Thermic temperature regime – Burrow distribution

6,670  
burrows



## Burrow Distribution:

Excessively – 52.4%

Somewhat excessively – 0.8%

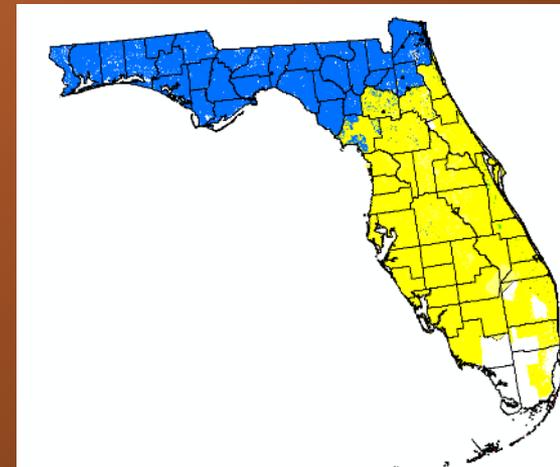
Well – 2.4%

Moderately well – 24.5%

Somewhat poorly – 13.9%

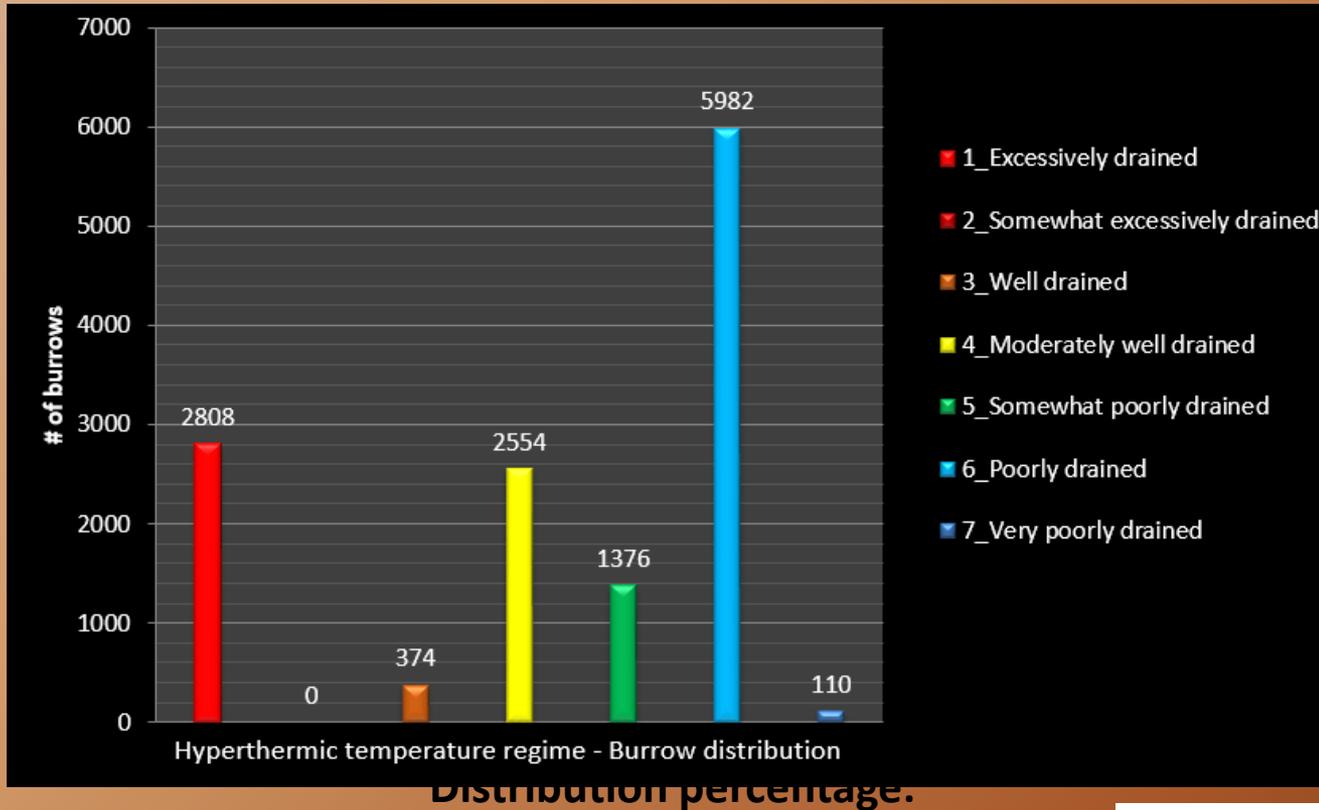
Poorly – 5.4%

Very poorly – 0.5%



# Hyperthermic temperature regime – Burrow distribution

12,797  
burrows



Excessively – 21.3%

Somewhat excessively – Not present

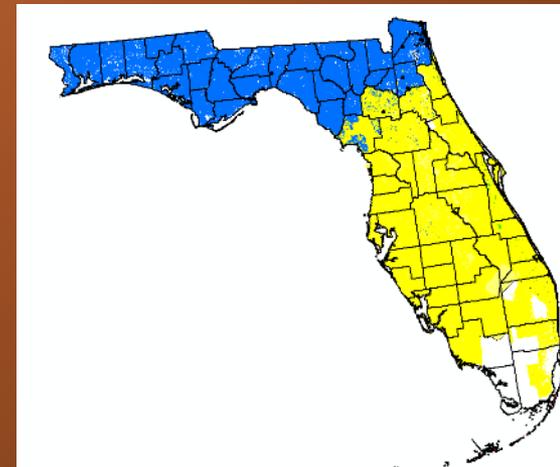
Well – 2.8%

Moderately well – 19.3%

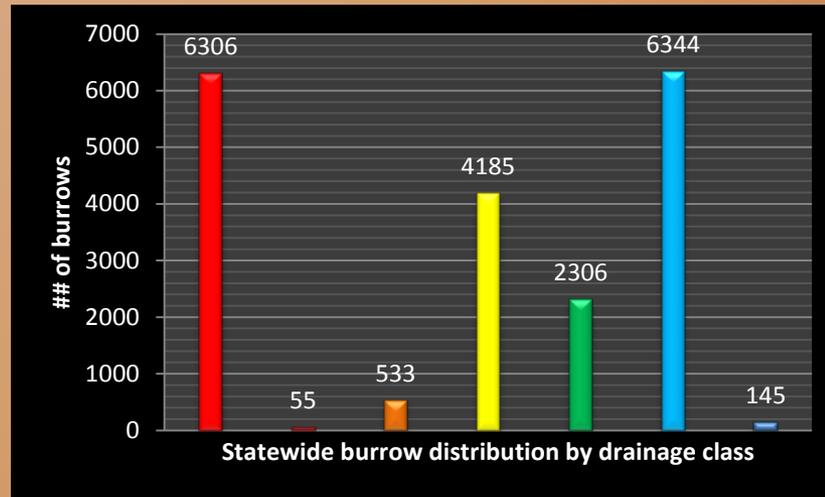
Somewhat poorly – 10.4%

Poorly – 45.3%

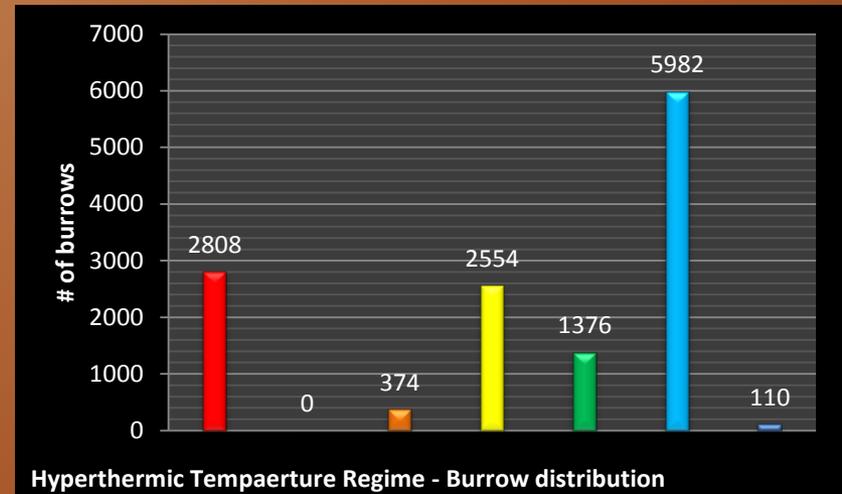
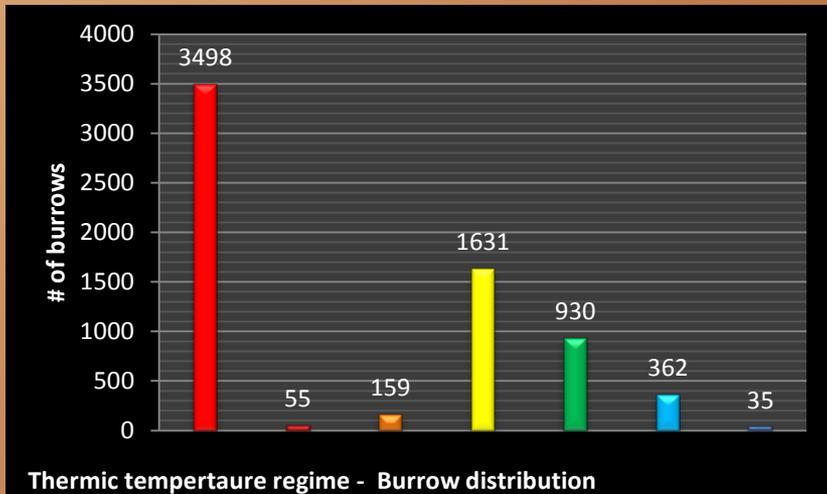
Very poorly – 0.8%



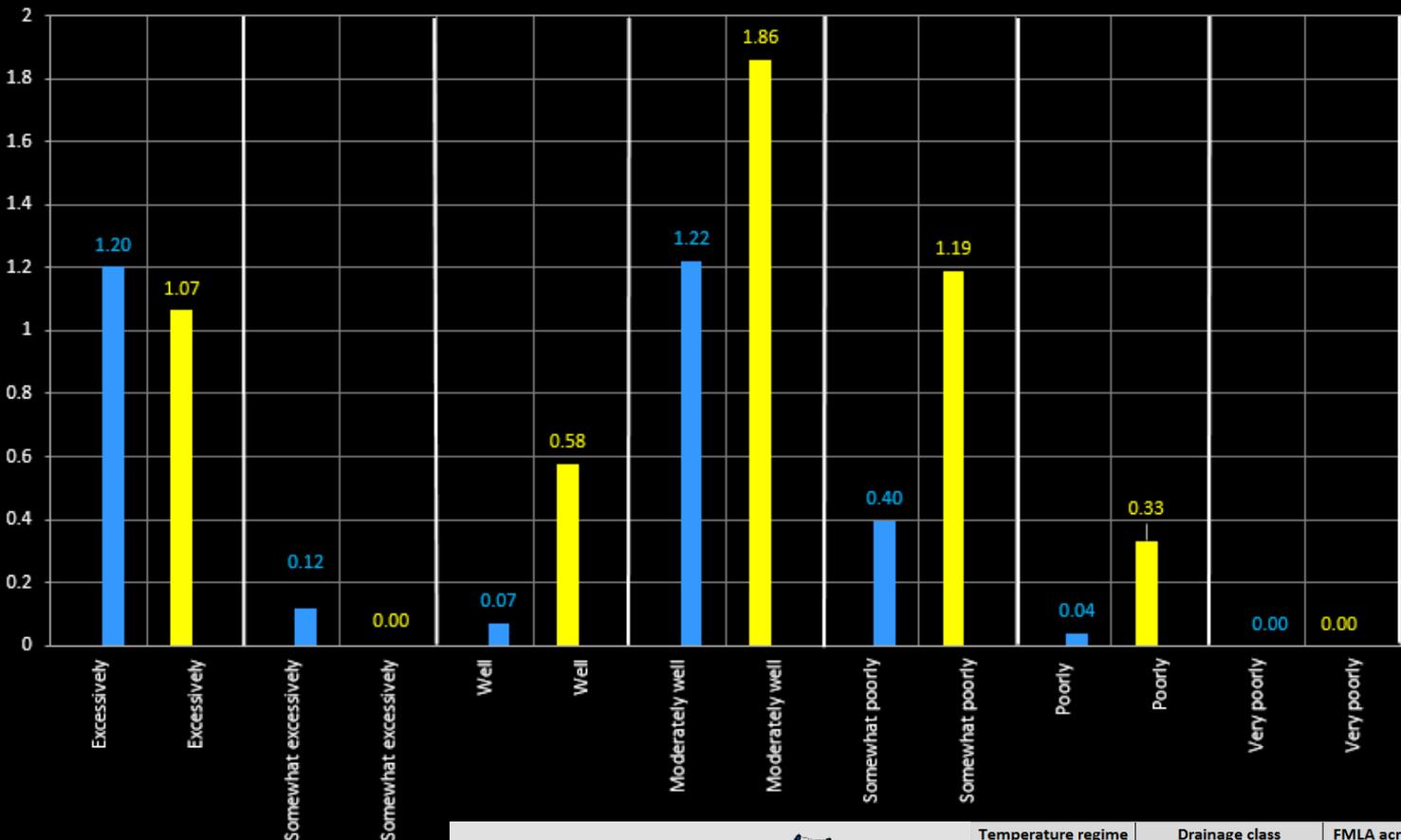
# Data comparison



- 1\_Excessively drained
- 2\_Somewhat excessively drained
- 3\_Well drained
- 4\_Moderately well drained
- 5\_Somewhat poorly drained
- 6\_Poorly drained
- 7\_Very poorly drained

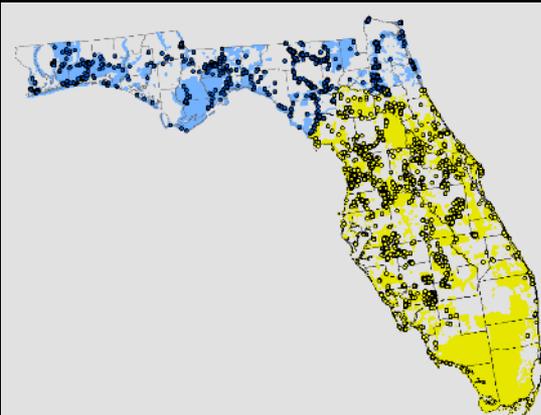


# Gopher Tortoise Preference: Drainage Class (burrows/100 acres)



Temperature reg... ▼

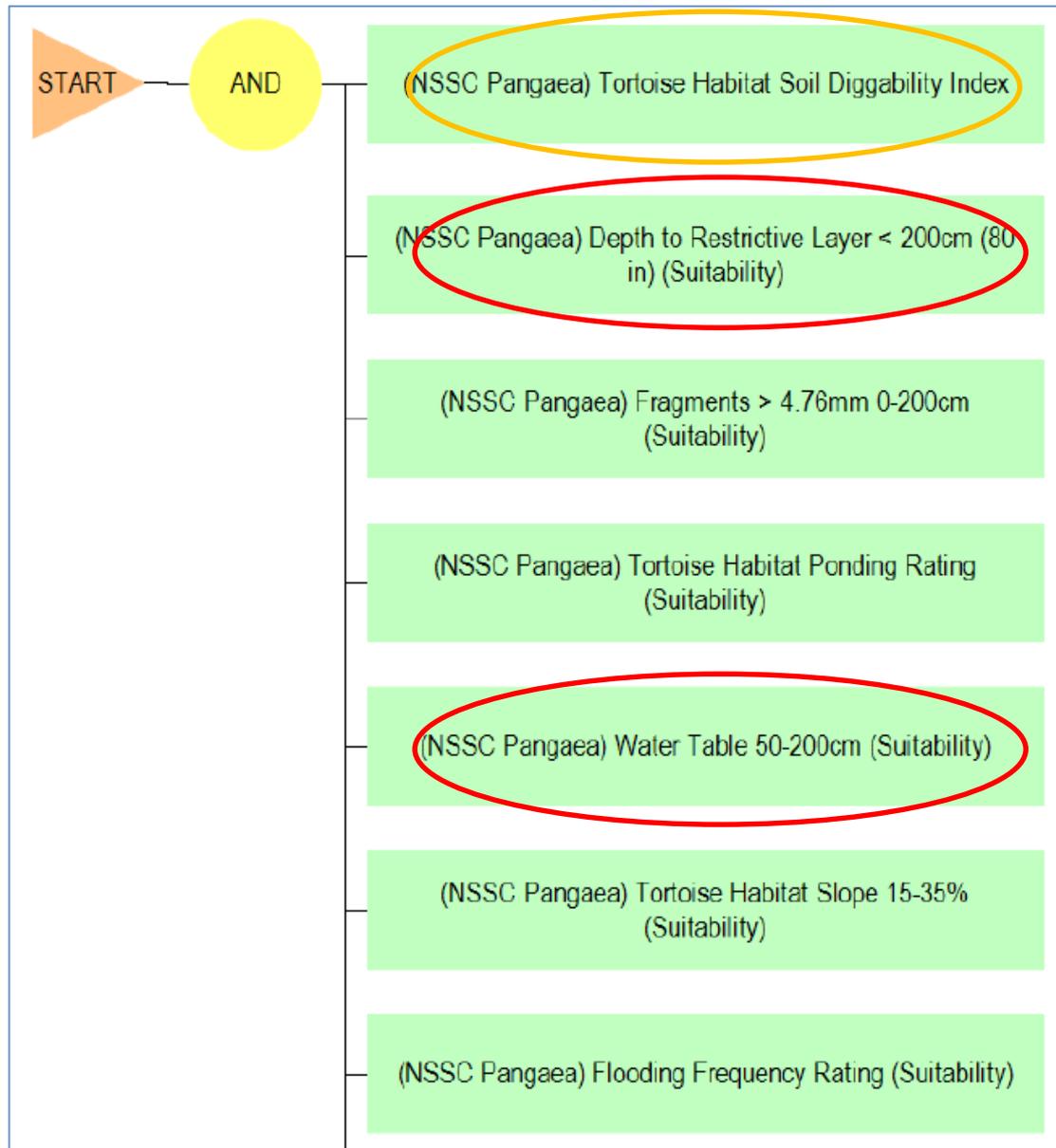
- Hyperthermic
- Thermic



Temperature regime	Drainage class	FMLA acres	# of burrows	burrows per acre	burrows/100 acres
Thermic	1_Excessively	290964	3498	0.0120	1.20
Hyperthermic	1_Excessively	263632	2808	0.011	1.07
Thermic	2_Somewhat excessively	47296	55	0.0012	0.12
Hyperthermic	2_Somewhat excessively	2326	0	0.000	0.00
Thermic	3_Well	222619	159	0.0007	0.07
Hyperthermic	3_Well	64928	374	0.006	0.58
Thermic	4_Moderately well	133516	1631	0.0122	1.22
Hyperthermic	4_Moderately well	137287	2554	0.019	1.86
Thermic	5_Somewhat poorly	235352	930	0.0040	0.40
Hyperthermic	5_Somewhat poorly	115740	1376	0.012	1.19
Thermic	6_Poorly	934198	362	0.0004	0.04
Hyperthermic	6_Poorly	1796348	5982	0.003	0.33
Thermic	7_Very poorly	846611	35	0.0000	0.00
Hyperthermic	7_Very poorly	1685059	110	0.000	0.00
<b>Thermic</b>	<b>Total FMLA Soils</b>	<b>2710556</b>	<b>6670</b>	<b>0.0025</b>	<b>0.25</b>
<b>Hyperthermic</b>	<b>Total FMLA Soils</b>	<b>4065320</b>	<b>12797</b>	<b>0.0032</b>	<b>0.32</b>

Review of National  
Interpretation for  
Gopher Tortoise  
Habitat Suitability

### National Gopher Tortoise Interpretation (all subrules)



(NSSC Pangaea) Depth to Restrictive Layer < 200cm (80 in) (Suitability)

Restrictive layers such as plinthic zones, fragipan, or **spodic** horizons are thought to adversely affect the potential depth of excavation by burrowing species. The layers may be too dense for the species to excavate or it may be the perched water over this layer. Shallow depth to a restrictive layer limits the depth of habitat. Depth to restrictive feature must be synchronized with the depth to the restrictive feature horizon shown in the horizon table.

Property used: DEPTH TO FIRST RESTRICTIVE LAYER (Modality - representative value)

**Restrictive limits:**

Not suited	< 50cm
Somewhat suited	>= 50 to < 200cm
Well suited	>= 200cm

Null depth is assigned to the Well Suited class.

**Spodic will be modified to “orstein”, as a spodic horizon is not limiting. Otherwise, sub-rule is accurate.**

So, how does the Florida specific water table sub-rule compare to the National Interpretation?

Rating values

Spatial representation

## (NSSC Pangaea) Water Table 50-200cm (Suitability)

A seasonal high water table can affect burrowing species by restricting burrowing, and possibly cause drowning when the water table returns. Caving or tunnel collapse may be a problem, especially during the rising and falling of the water table depths between seasons of year. Perched or apparent water tables can increase drowning of species during wet periods especially during inactive times.

Property used: DEPTH TO HIGH WATER TABLE MINIMUM (Modality - representative value)

### **Restrictive limits:**

Not suited	<50 cm
Somewhat suited	>=50 to <200cm
Well suited	>=200cm

Null depth to high water table is assigned to the well suited class.

Sub-rule requires modification for Florida (and possibly southeast Georgia)

(MLRA07\_Auburn) GT\_Water Table 25-200cm (Suitability-subrule) (FL)

A seasonal high water table can affect burrowing species by restricting burrowing, and possibly cause drowning when the water table returns. Caving or tunnel collapse may be a problem, especially during the rising and falling of the water table depths between seasons of year. Perched or apparent water tables can increase drowning of species during wet periods especially during inactive times.

Property used: DEPTH TO HIGH WATER TABLE MINIMUM (Modality - representative value)

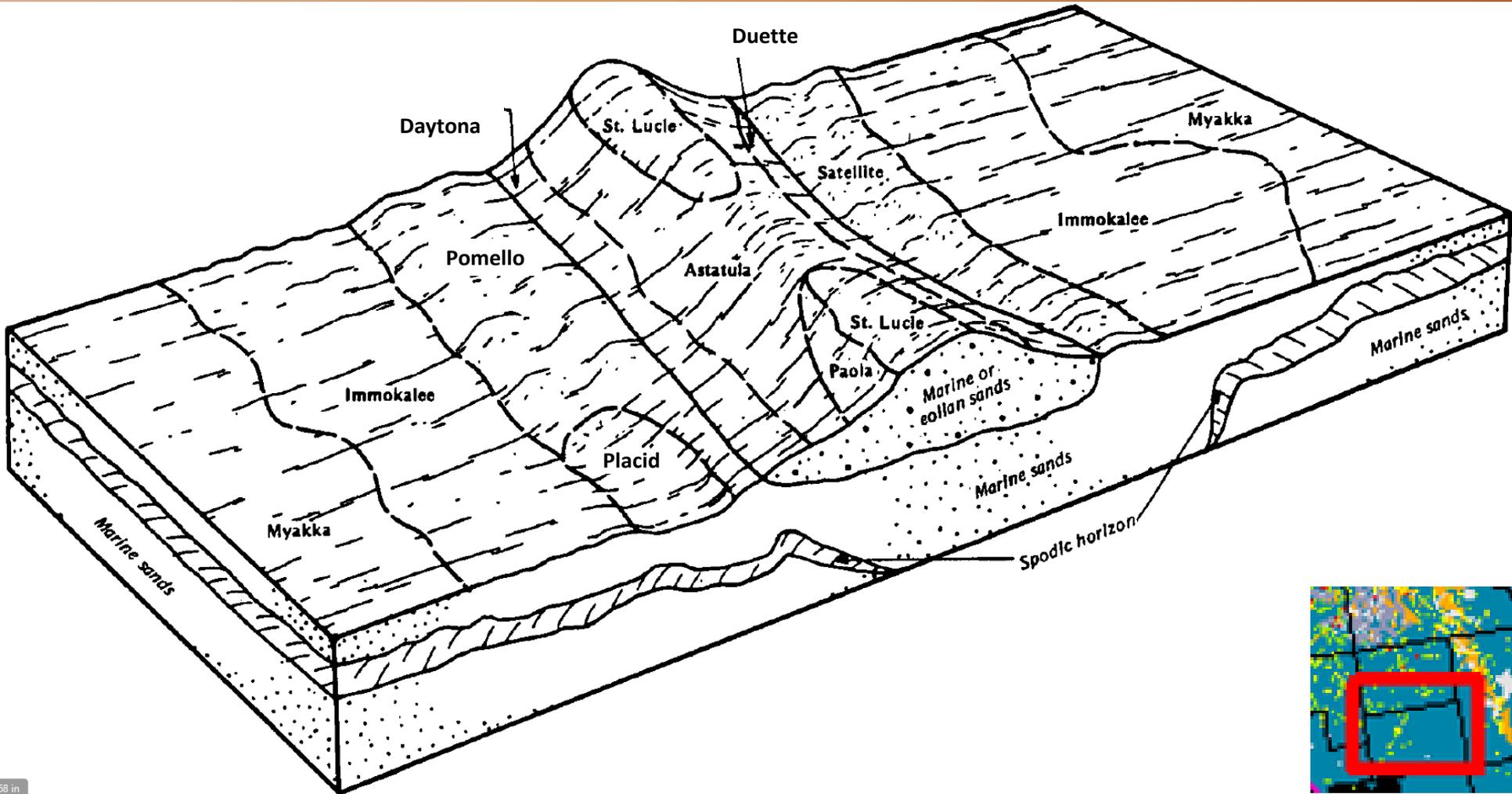
**Restrictive limits:**

Not suited	<25 cm
Somewhat suited	>=25 to <200cm
Well suited	>=200cm

Null depth to high water table is assigned to the well suited class.

Since maintaining high humidity and a water source within burrows is important, we should explore narrowing the Somewhat suited upper limit of 200 cm.

# A collective catena of south Florida soils



Moderately suited: Astatula, St. Lucie, Paola

Unsuited: Satellite, Immokalee, Myakka, Placid

Less suited: Daytona, Duette

Marginal: Pomello

(MLRA07\_Auburn) GT\_Water Table 25-200cm (Suitability-subrule) (FL)

A seasonal high water table can affect burrowing species by restricting burrowing, and possibly cause drowning when the water table returns. Caving or tunnel collapse may be a problem, especially during the rising and falling of the water table depths between seasons of year. Perched or apparent water tables can increase drowning of species during wet periods especially during inactive times.

Property used: DEPTH TO HIGH WATER TABLE MINIMUM (Modality - representative value)

**Restrictive limits:**

Not suited	<25 cm
Somewhat suited	>=25 to <200cm
Well suited	>=200cm

Null depth to high water table is assigned to the well suited class.

## Somewhat poorly drained soil with water table at 24 inches - Scrubby flatwoods

Interpretation	Series	top of SHWT (RV in cm)	Sub-rule Name	Low RV Rating	High RV Rating	High High Rating	Null Data	Default Data	Inconsistent Data
FL Interp	Pomello	61	GT_Gopher Tortoise Habitat Suitability (FL)	Less suitable (0.428)	Less suitable (0.428)	Less suitable (0.549)	FALSE	FALSE	FALSE
Reg_Interp	Pomello	61	Gopher Tortoise Habitat Suitability	Marginal (0.227)	Marginal (0.227)	Marginal (0.227)	FALSE	FALSE	FALSE

## Somewhat poorly drained soil with water table at 18 inches - Scrubby flatwoods

Interpretation	Series	top of SHWT (RV in cm)	Sub-rule Name	Low RV Rating	High RV Rating	High High Rating	Null Data	Default Data	Inconsistent Data
FL Interp	Satellite	46	GT_Gopher Tortoise Habitat Suitability (FL)	Marginal (0.201)	Marginal (0.201)	Less suitable (0.549)	FALSE	FALSE	FALSE
Reg_Interp	Satellite	46	Gopher Tortoise Habitat Suitability	Unsuitable (0)	Unsuitable (0)	Unsuitable (0)	FALSE	FALSE	FALSE

## Poorly drained soil with water table at 10 inches -Mesic flatwoods

Interpretation	Series	top of SHWT (RV in cm)	Sub-rule Name	Low RV Rating	High RV Rating	High High Rating	Null Data	Default Data	Inconsistent Data
FL Interp	Myakka	31	GT_Gopher Tortoise Habitat Suitability (FL)	Marginal (0.112)	Marginal (0.112)	Marginal (0.201)	FALSE	FALSE	FALSE
Reg_Interp	Myakka	31	Gopher Tortoise Habitat Suitability	Unsuitable (0)	Unsuitable (0)	Unsuitable (0)	FALSE	FALSE	FALSE

## Poorly drained soil with water table at the surface during some period - Hydric flatwoods, Slough, Freshwater marsh

Interpretation	Series	top of SHWT (RV in cm)	Sub-rule Name	Low RV Rating	High RV Rating	High High Rating	Null Data	Default Data	Inconsistent Data
FL Interp	Placid, dep	0 (ponded)	GT_Gopher Tortoise Habitat Suitability (FL)	Unsuitable (0)	Unsuitable (0)	Unsuitable (0)	FALSE	FALSE	FALSE
Reg_Interp	Placid, dep	0 (ponded)	Gopher Tortoise Habitat Suitability	Unsuitable (0)	Unsuitable (0)	Unsuitable (0)	FALSE	FALSE	FALSE

Corresponding Property

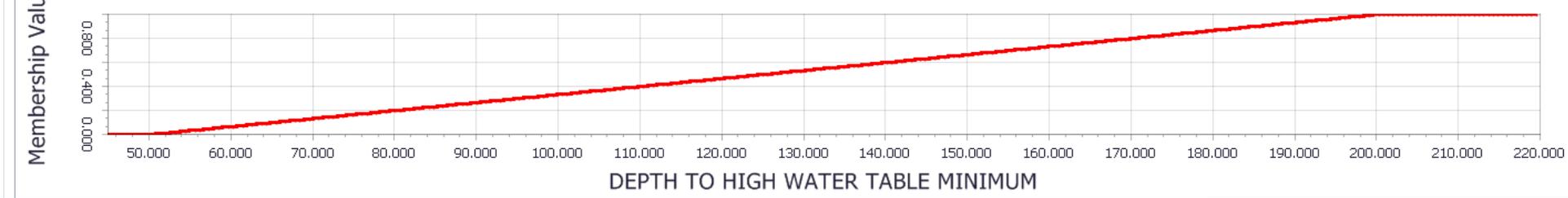
Property: DEPTH TO HIGH WATER TABLE MINIMUM Open

Evaluation

Evaluation: Linear  Use Property Domain  Invert Evaluation Results

	Low Value	High Value
Data	50	200

Membership Graph



Corresponding Property

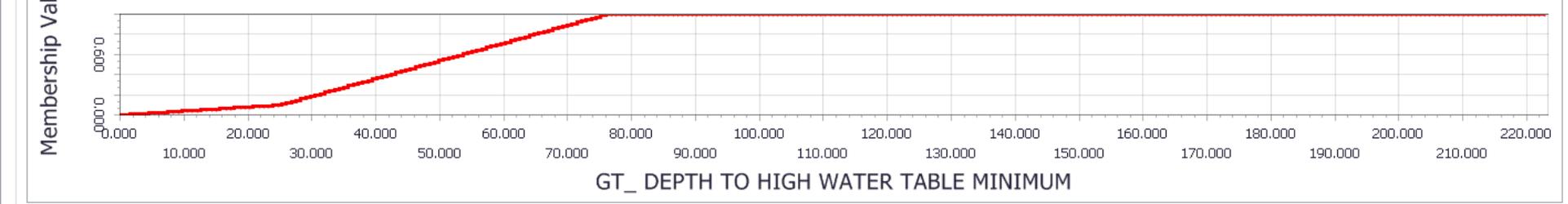
Property: GT\_ DEPTH TO HIGH WATER TABLE MINIMUM Open

Evaluation

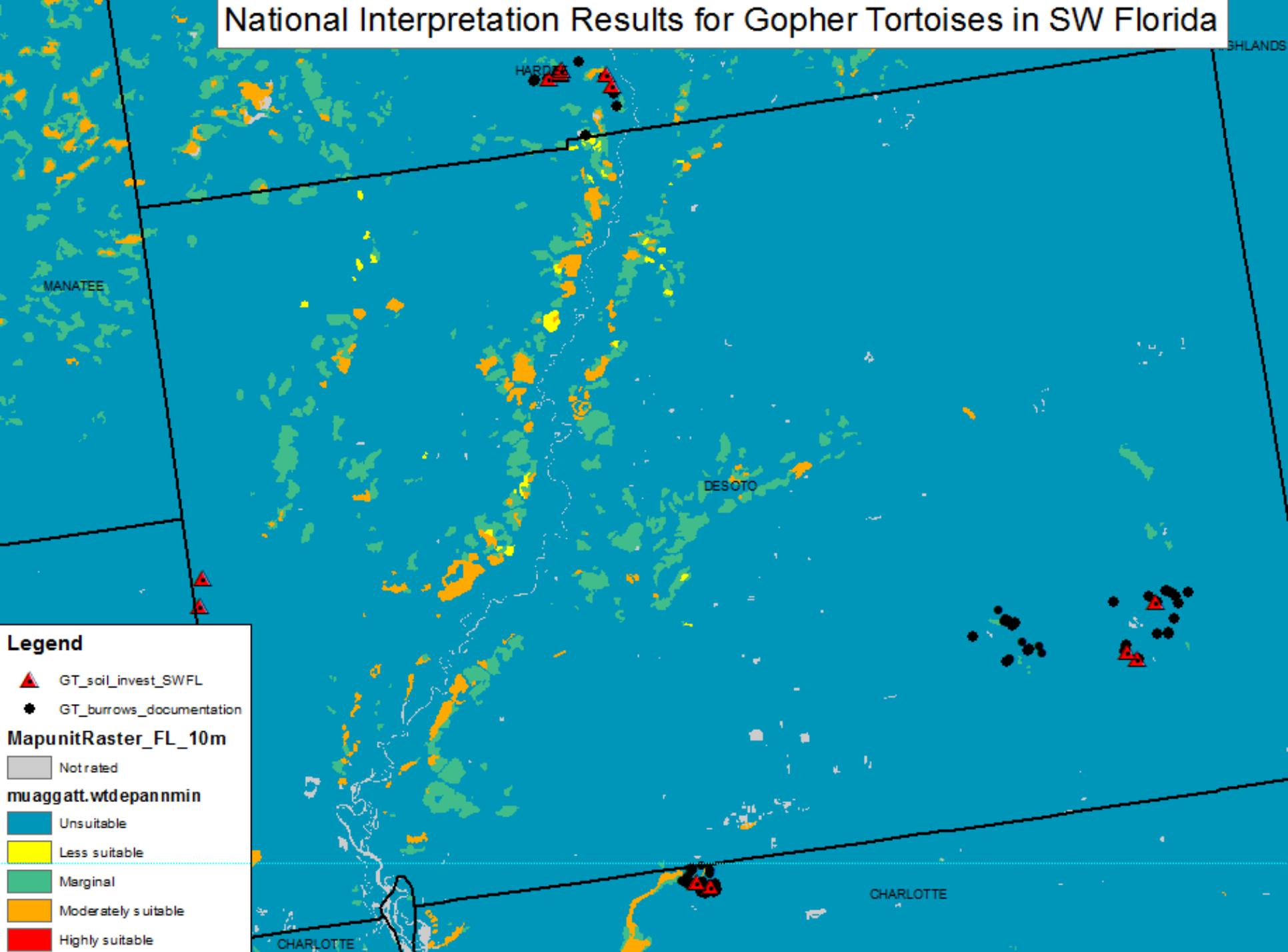
Evaluation: ArbitraryLinear  Use Property Domain  Invert Evaluation Results

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
X Value	0	25	76	203																					
Y Value	0	0.1	1	1																					

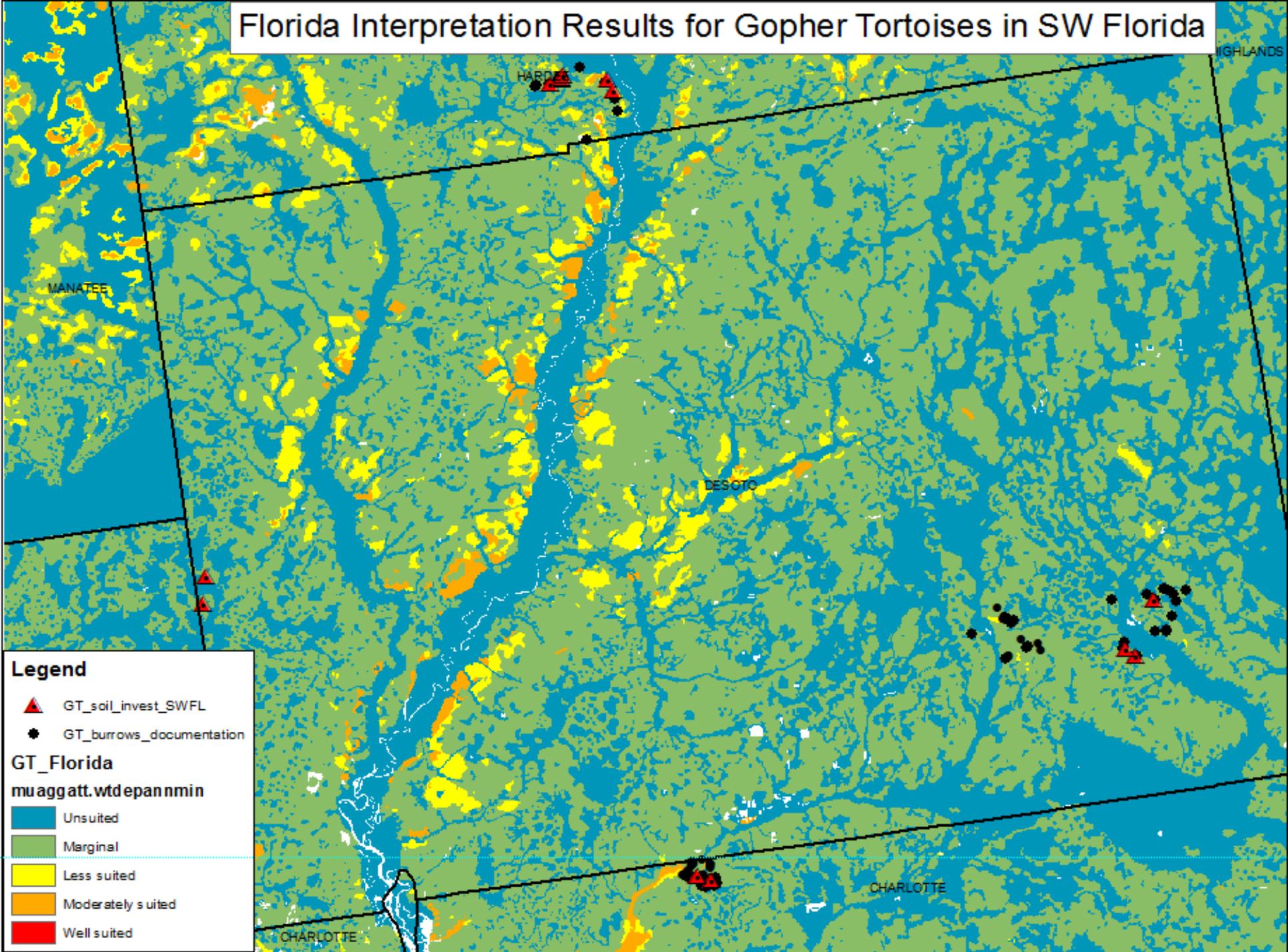
Membership Graph



# National Interpretation Results for Gopher Tortoises in SW Florida



# Florida Interpretation Results for Gopher Tortoises in SW Florida



**Legend**

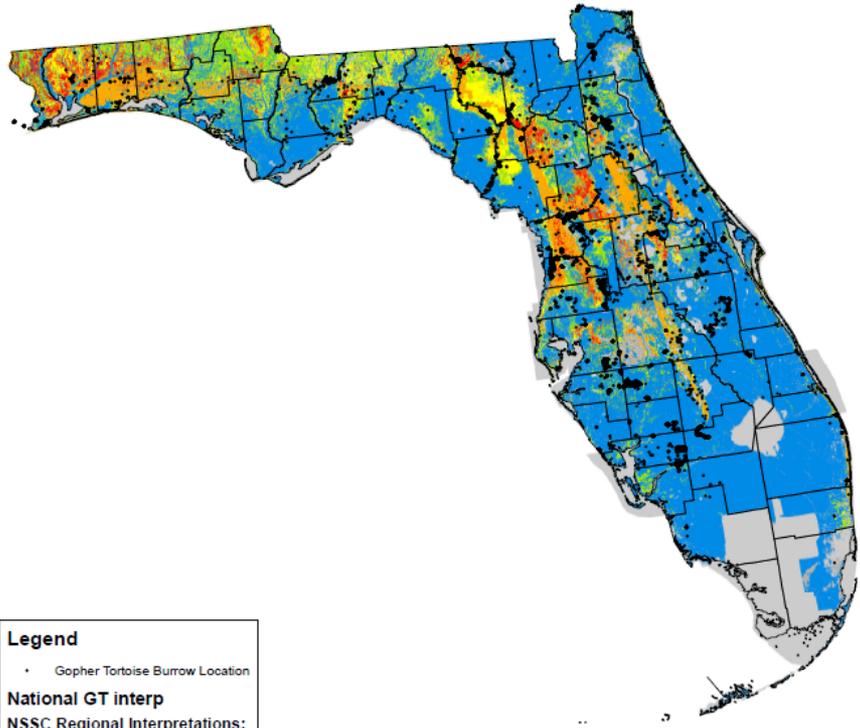
- ▲ GT\_soil\_invest\_SWFL
- GT\_burrows\_documentation

**GT\_Florida**  
mu agg att. wtd epan mmin

- Unsuited
- Marginal
- Less suited
- Moderately suited
- Well suited

# Regional Interpretation: Gopher Tortoise Habitat Suitability

Gridded SSURGO appended with GT interpretation results



**Legend**

- Gopher Tortoise Burrow Location

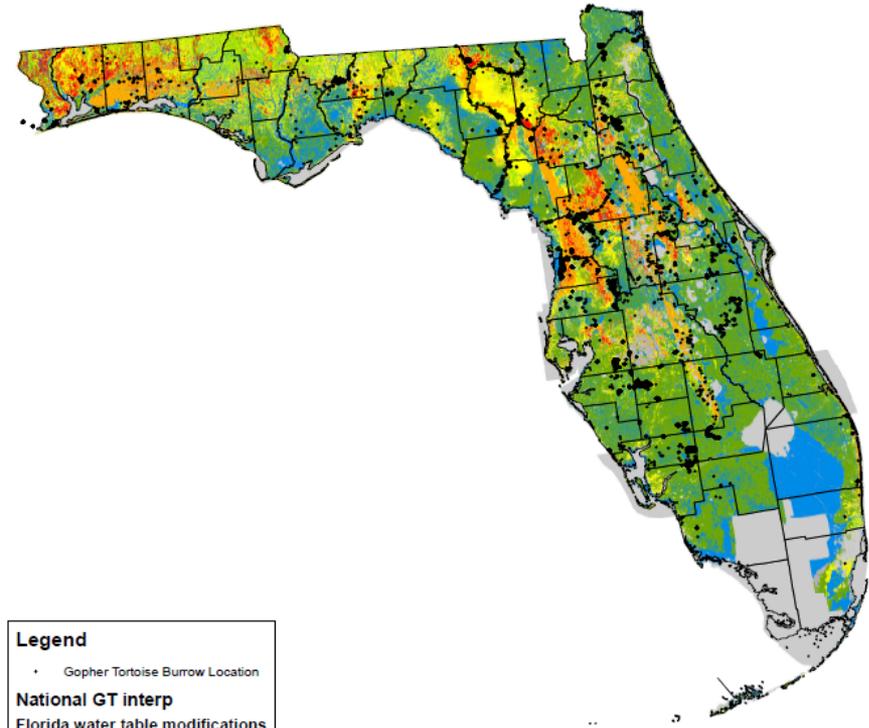
**National GT interp**

**NSSC Regional Interpretations:**

- Highly suitable
- Less suitable
- Marginal
- Moderately suitable
- Not rated
- Unsuitable

# Regional Interpretation: Gopher Tortoise Habitat Suitability

Gridded SSURGO appended with Florida water table sub-rule modifications



**Legend**

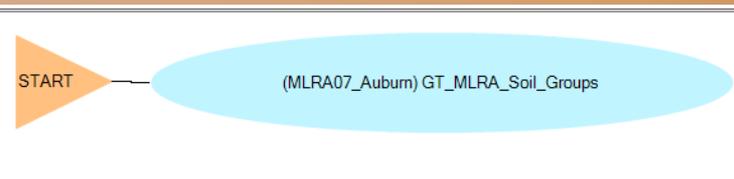
- Gopher Tortoise Burrow Location

**National GT interp**

**Florida water table modifications**

- Highly suitable
- Less suitable
- Marginal
- Moderately suitable
- Not rated
- Unsuitable

- Developed an MLRA sub-rule, evaluation and property for the region to exclude regions outside the range or combination of both
  - At the component level, accesses the Map Unit Overlap Table data
  - Returns 0 for MLRA's outside of the Tortoise's range
  - Returns different values for each of the MLRA's as illustrated below



General Evaluation Text

Corresponding Property  
**Property:** GT\_MLRA Soil Groups (component)

Evaluation  
**Evaluation:** ArbitraryLinear

	1	2	3	4	5	6
X Value	0	1	2	3		
Y Value	0	0.25	0.5	1		

```

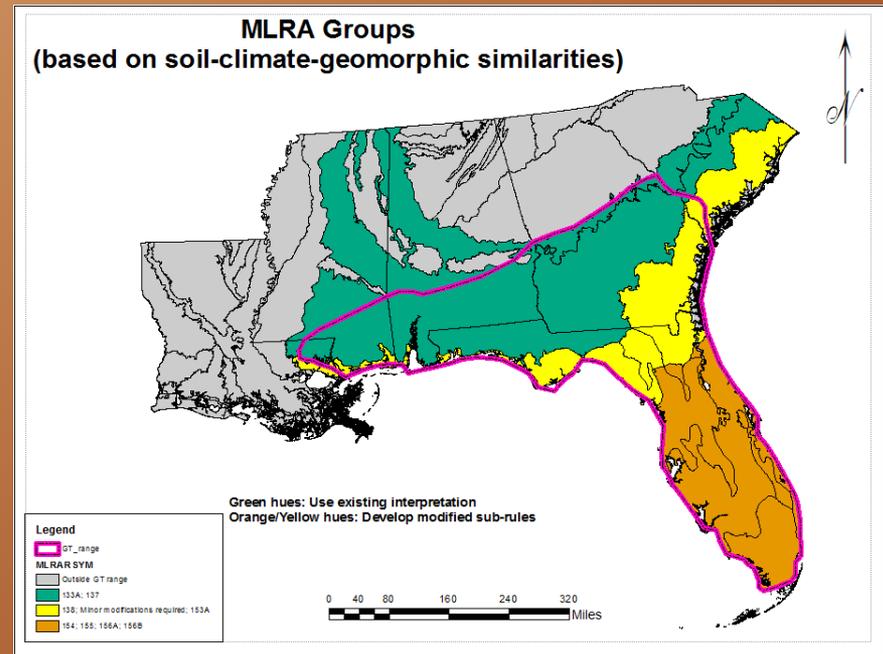
#Returns a one where Gopher Tortoise interp is functioning correctly, returns a two where minor edits are needed, returns a 3 when
#there are major edits needed.

BASE TABLE component.

EXEC SQL
SELECT area_symbol
FROM component, datamapunit, correlation,
mapunit, lmapunit, lmuaoverlap, laoverlap, area, area_type
WHERE area_type_name = "MLRA" AND
JOIN component TO datamapunit AND
JOIN datamapunit TO correlation and
join correlation to mapunit and
join mapunit to lmapunit and
join lmapunit to lmuaoverlap and
join lmuaoverlap to laoverlap by default and
join lmuaoverlap to laoverlap and
join laoverlap to area and
join area to area_type;.

define mira (area_symbol matches "133A" ? 1 : area_symbol matches "137" ? 1 : area_symbol matches "136" ? 2 : area_symbol mat

DEFINE rv arraymax(isnull(mira) then mira else mira).
  
```



# Further refinements:

- **Evaluate the Diggability Index**
  - Using SSURGO-burrow evaluation
- **Change Rating Class values for suitability**
  - Currently highly suited is limited to 1.00 value.
  - Explore values of 0.90 to 1.00 = highly suited.
- **Consider a productivity sub-rule for biomass (forage) generation**
- **USFWS and FWC should identify Priority Soils based on MLRA's.**
- **USDA-NRCS will provide an addendum to the USFWS publication based on actual data.**

## Gopher Tortoise (*Gopherus polyphemus*) Soil Classifications for the Federally Listed Range using the National Soil Information System Database



A Report Prepared By:

U.S. Fish and Wildlife Service  
Alabama and Mississippi Field Offices

And

Natural Resources Conservation Service  
Alabama, Mississippi, and Nebraska Offices

February 2012

A photograph of a white, segmented snake skeleton lying on a ground covered with dry leaves and twigs. The skeleton is curved into a loose 'S' shape. The background is a mix of brown soil, small twigs, and dried leaves. The word "Questions" is overlaid in black text on the lower-left portion of the image.

Questions