Anurans as Indicators of Landscape Change in Southwest Florida

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Acknowledgements

We acknowledge the work of over 250 volunteers who have participated in the Southwest Florida Amphibian Monitoring Network, particularly the consistent efforts of route leaders who have keep the database going through sixteen years. Without their efforts we might miss the signal that the anuran community is sending us through time. This work has been supported by the Charlotte Harbor National Estuary Program, and the Whitaker Center at Florida Gulf Coast University.

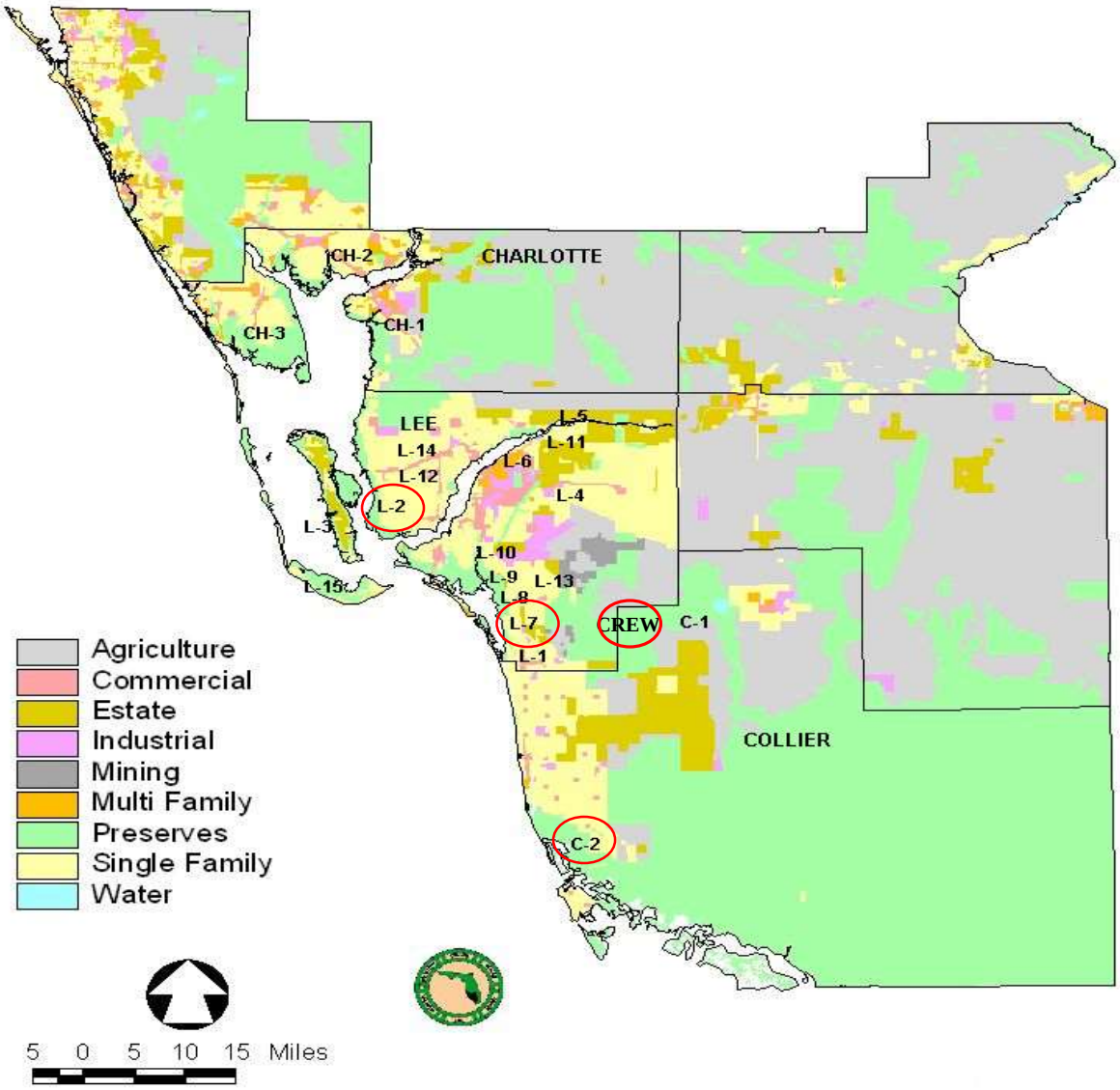
Background

- Early 1990's – focus on global decline of amphibians
- Mid 1990's – increasing occurrence of malformed frogs
- Recognition of frogs as critical indicators of environmental health, particularly water quality
- North American Amphibian Monitoring Program – (USGS) – started in 1997
- Frogwatch – Southwest Florida Frog Monitoring Program – started 2000

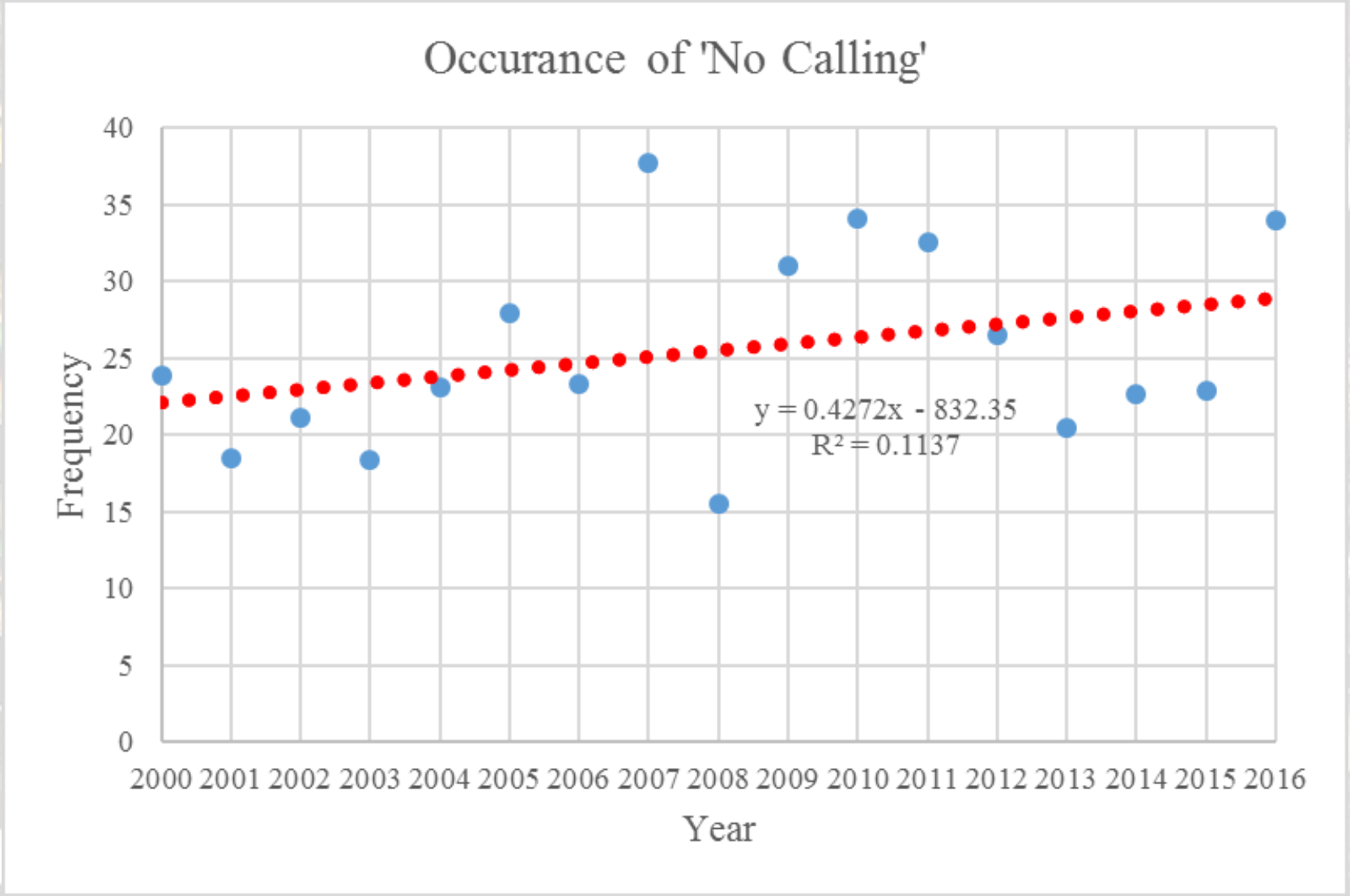
METHODS

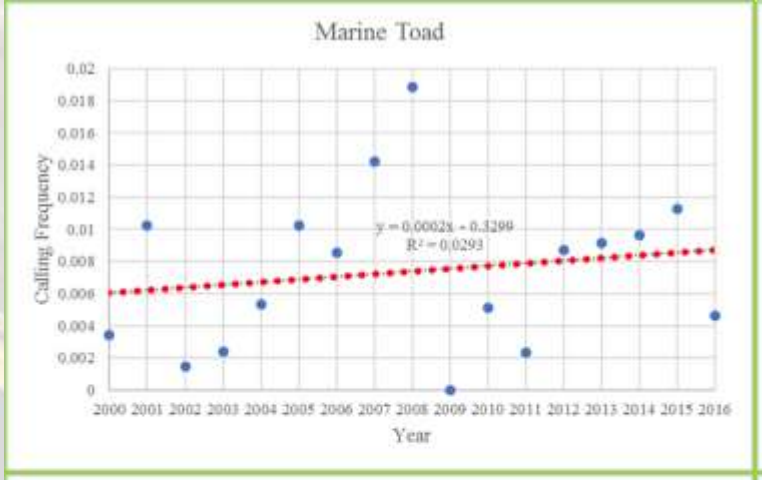
- Following NAAMP protocol
- 23 routes – nine currently active
- Each route 10-15 stops
- Sampled four times a year (June-September)
- Each stop – listen for three minutes, recorded each species on a calling intensity of 1, 2, or 3
- Data collected on weather and habitat changes
- Data analyzed by entire database, individual routes, and individual stops
- Calling frequency – proportion of the time a call is heard (counts divided by total stops)
- Mean Calling Intensity – sum of all calling intensity divided by total number of stops

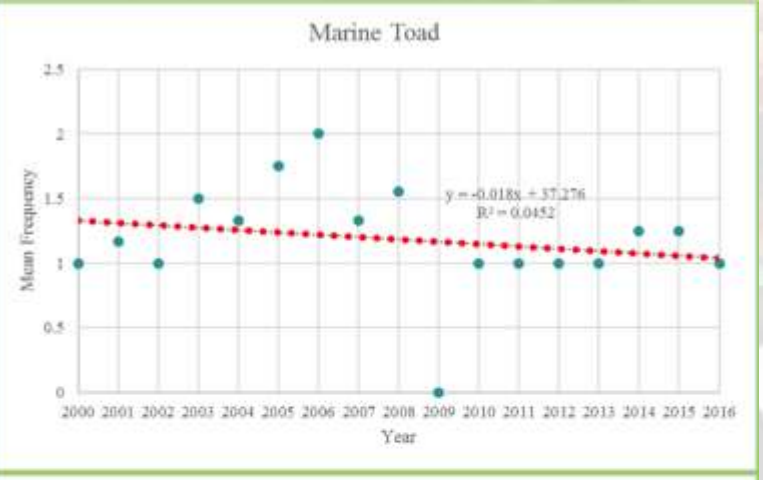
Southwest Florida 2020 Future Land Use

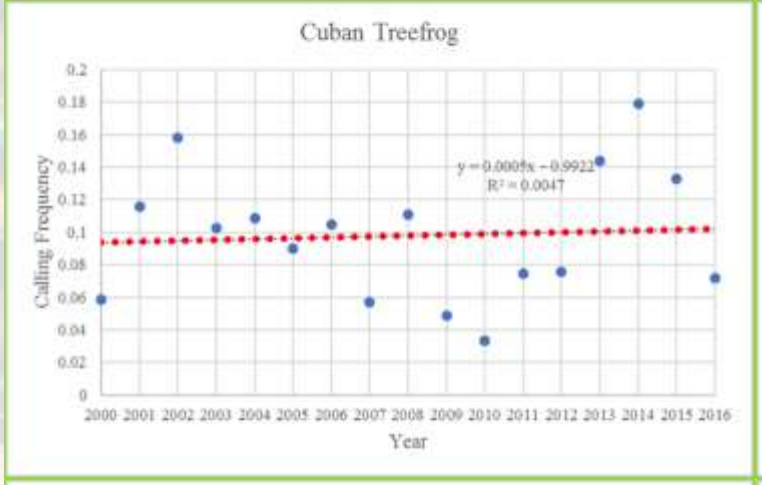


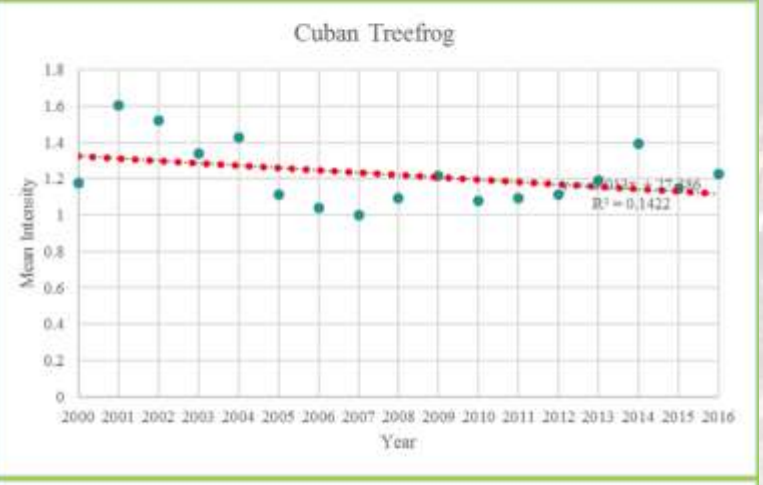

Questions
so far?

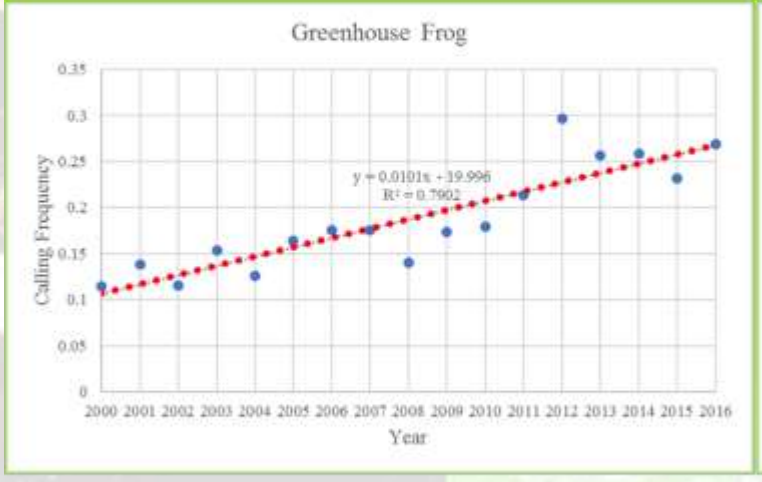

Occurance of 'No Calling'
Frequency
Year
y = 0.4272x - 832.35
R² = 0.1137
0
5
10
15
20
25
30
35
40
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

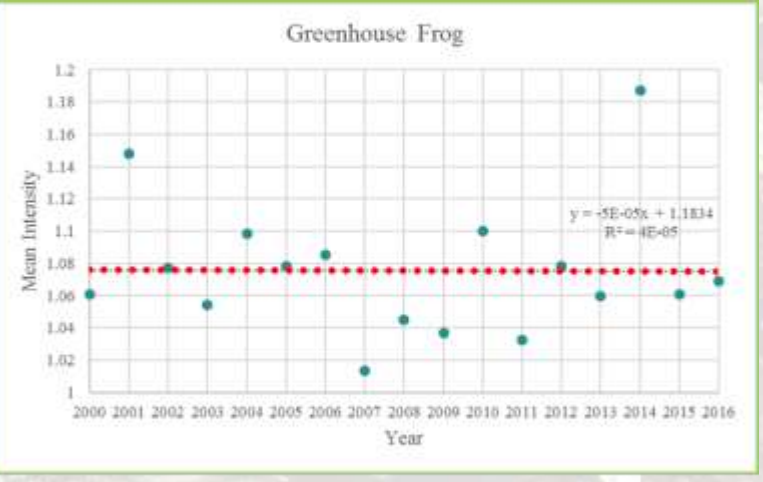

Marine Toad
Calling Frequency
y = 0.0002x - 0.3299
R² = 0.0293
Year

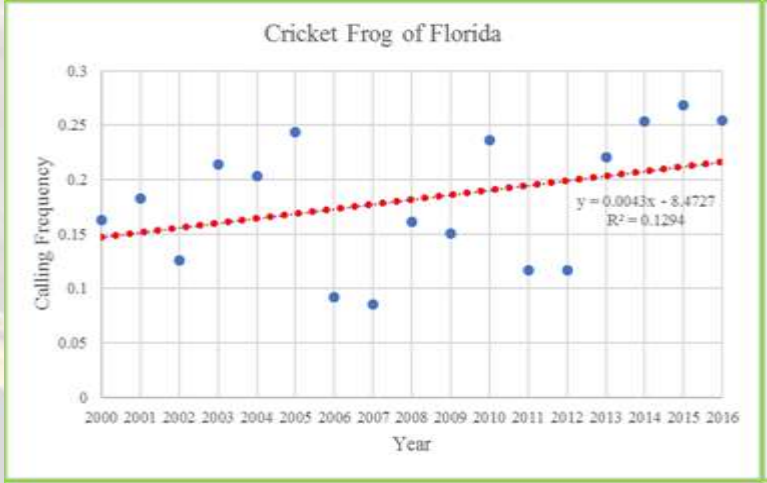

Marine Toad
Mean Frequency
y = -0.018x + 37.276
R² = 0.0452
Year

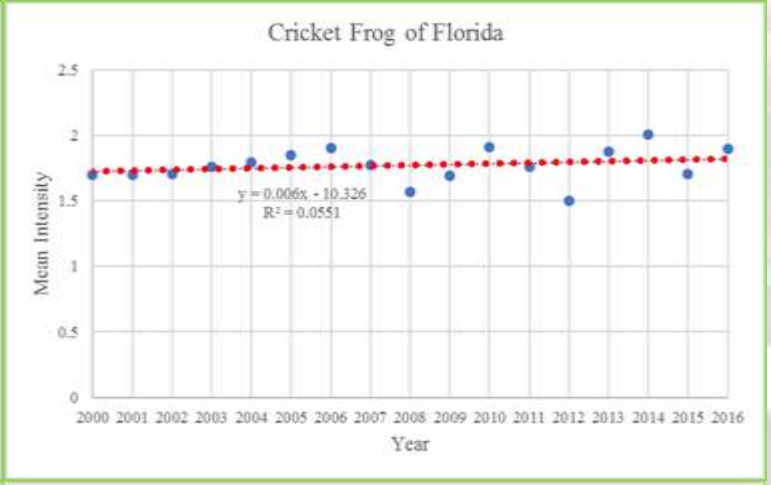

Cuban Treefrog
Calling Frequency
y = 0.0005x - 0.9922
R² = 0.0047
Year


Cuban Treefrog
Mean Intensity
R² = 0.1422
Year

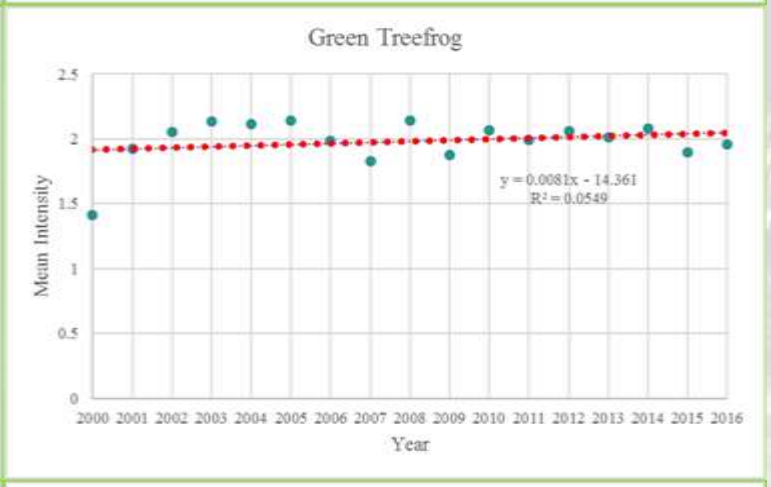

Greenhouse Frog
Calling Frequency
y = 0.0101x - 19.996
R² = 0.7902
Year

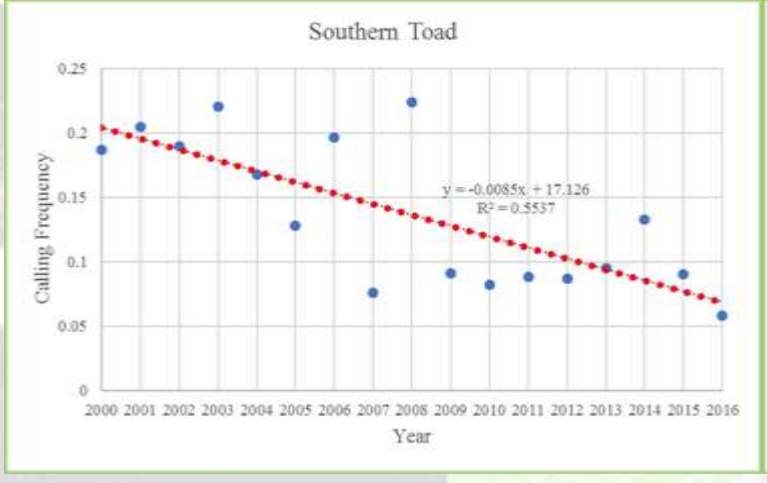

Greenhouse Frog
Mean Intensity
y = -5E-05x + 1.1834
R² = 4E-05
Year

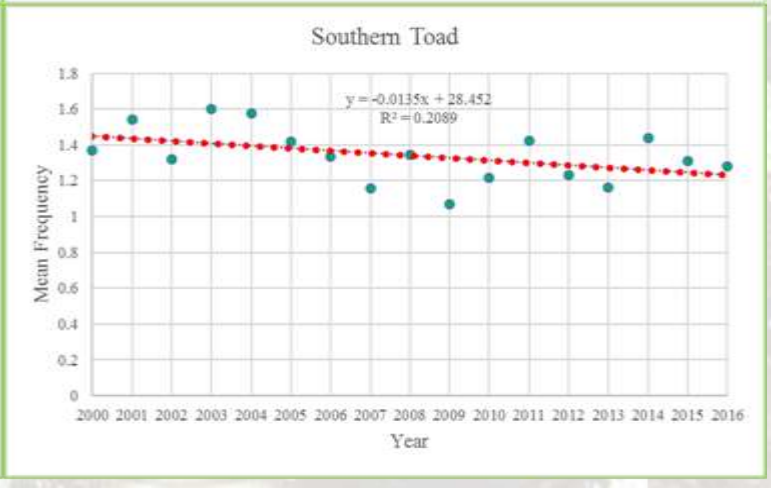

Cricket Frog of Florida
Calling Frequency
Year
y = 0.0043x - 8.4727
R² = 0.1294

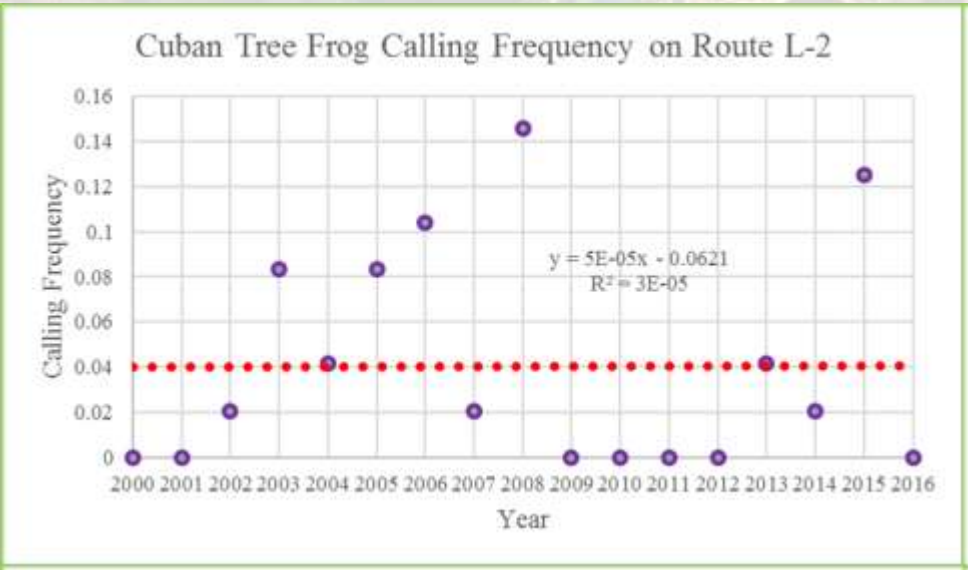

Cricket Frog of Florida
Mean Intensity
Year
y = 0.006x - 10.326
R² = 0.0551

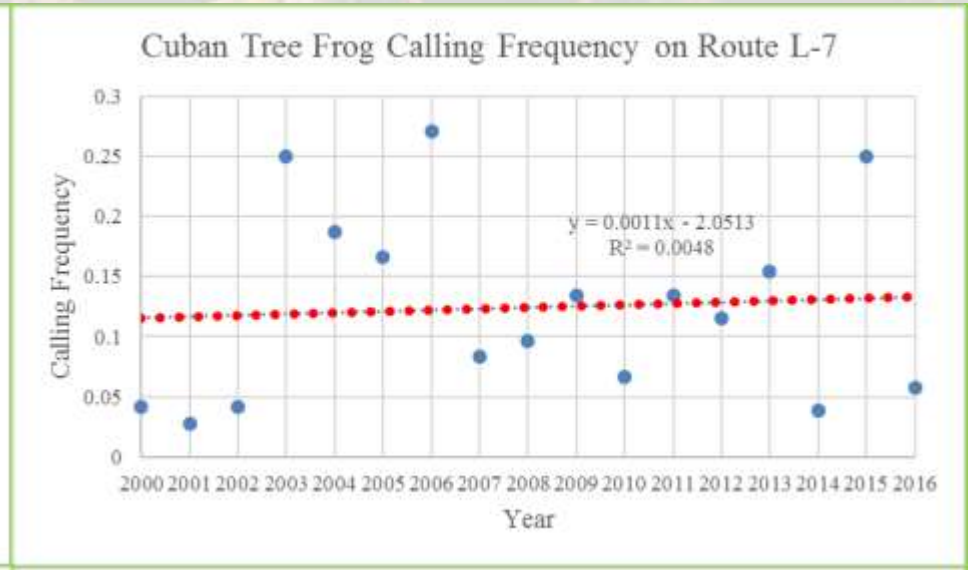

Green Treefrog
Calling Frequency
Year
y = 0.0001x + 0.0684
R² = 6E-05

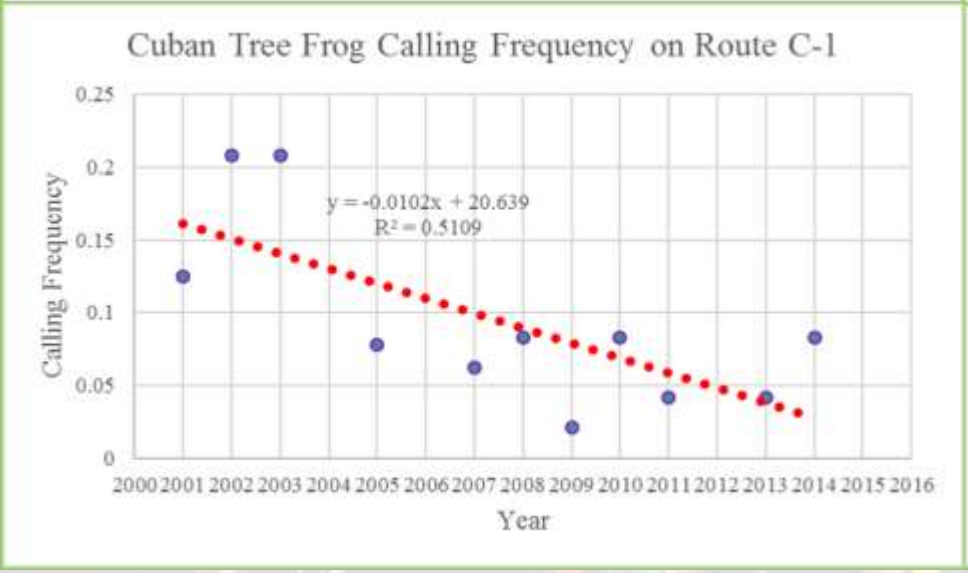

Green Treefrog
Mean Intensity
Year
y = 0.0081x - 14.361
R² = 0.0549

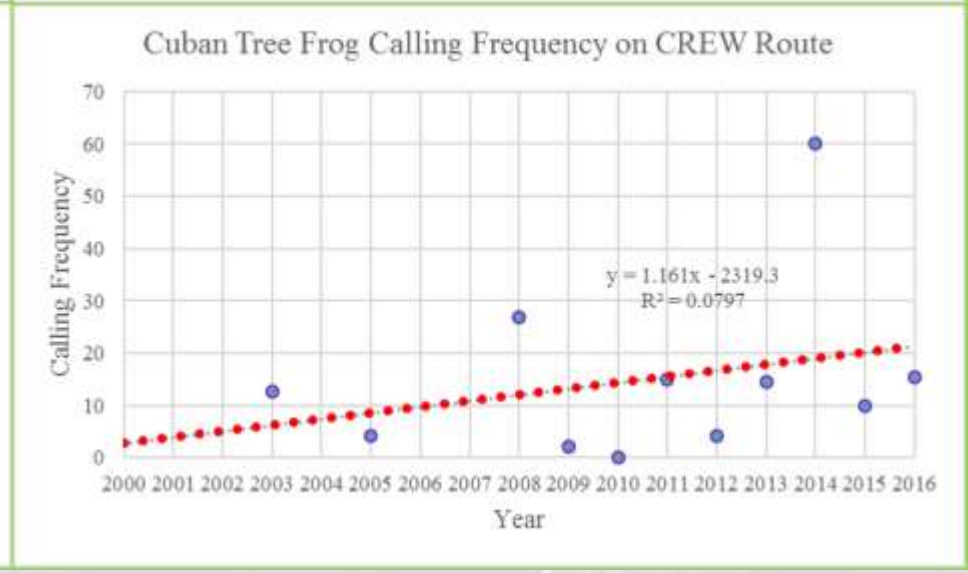

Southern Toad
Calling Frequency
Year
y = -0.0085x + 17.126
R² = 0.5537

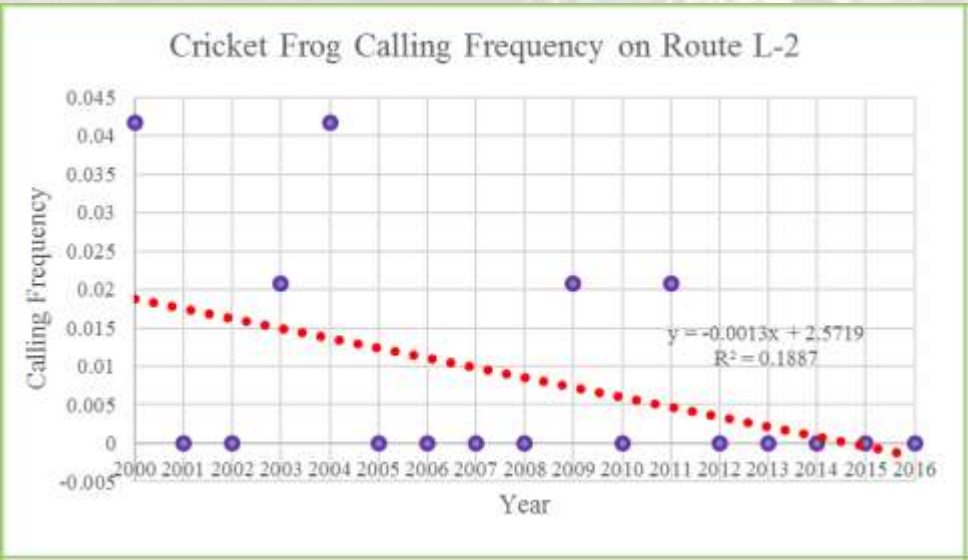

Southern Toad
Mean Frequency
Year
y = -0.0135x + 28.452
R² = 0.2089

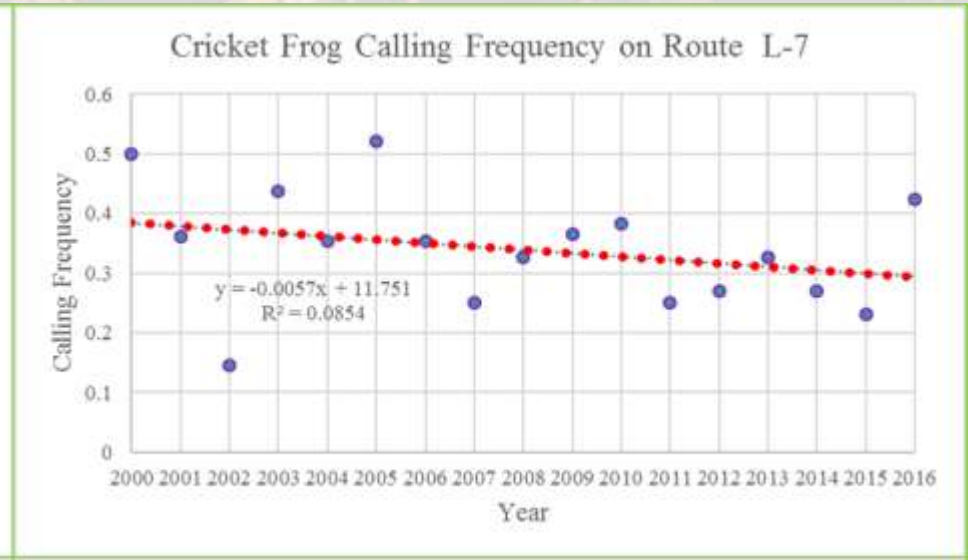

Cuban Tree Frog Calling Frequency on Route L-2
Calling Frequency
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
y = 5E-05x - 0.0621
R² = 3E-05
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year

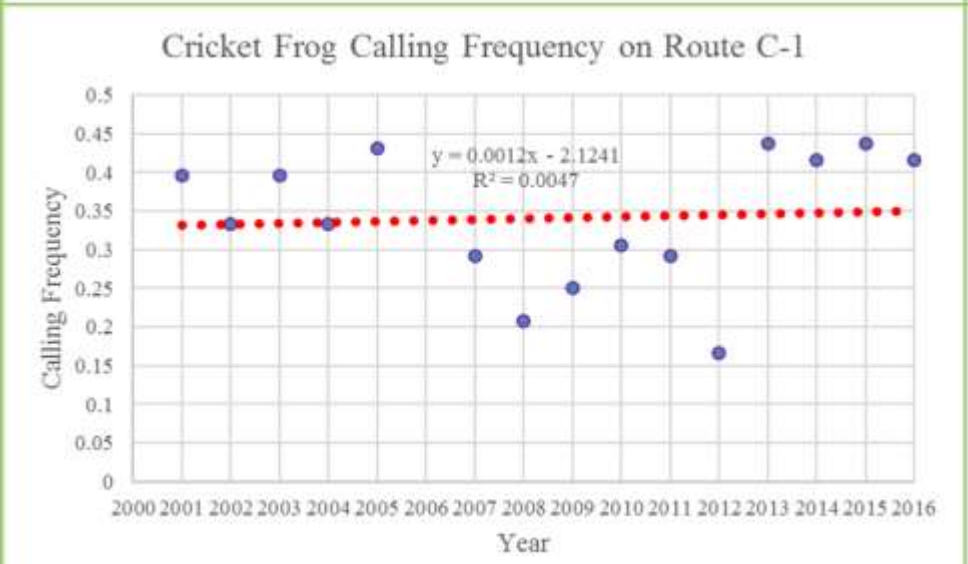

Cuban Tree Frog Calling Frequency on Route L-7
Calling Frequency
0.3
0.25
0.2
0.15
0.1
0.05
0
y = 0.0011x - 2.0513
R² = 0.0048
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year

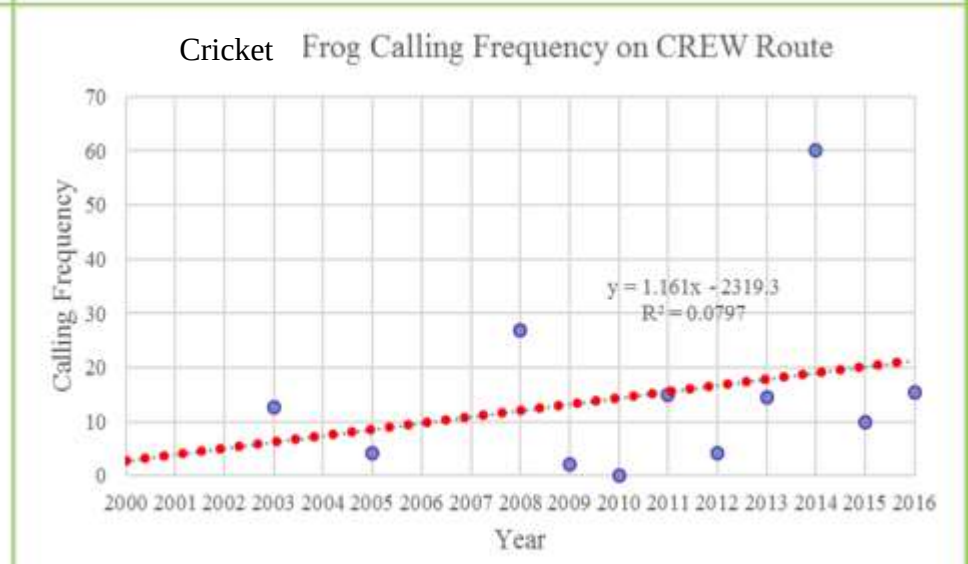

Cuban Tree Frog Calling Frequency on Route C-1
Calling Frequency
0.25
0.2
0.15
0.1
0.05
0
y = -0.0102x + 20.639
R² = 0.5109
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year

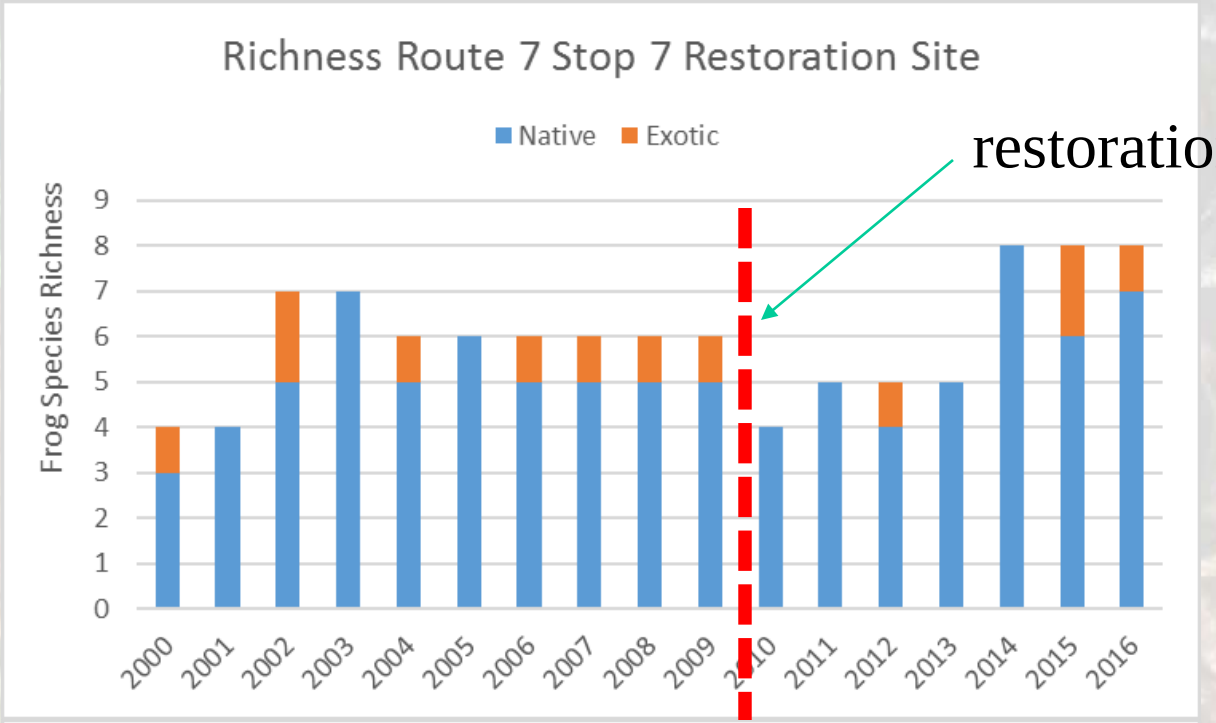

Cuban Tree Frog Calling Frequency on CREW Route
Calling Frequency
70
60
50
40
30
20
10
0
y = 1.161x - 2319.3
R² = 0.0797
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year

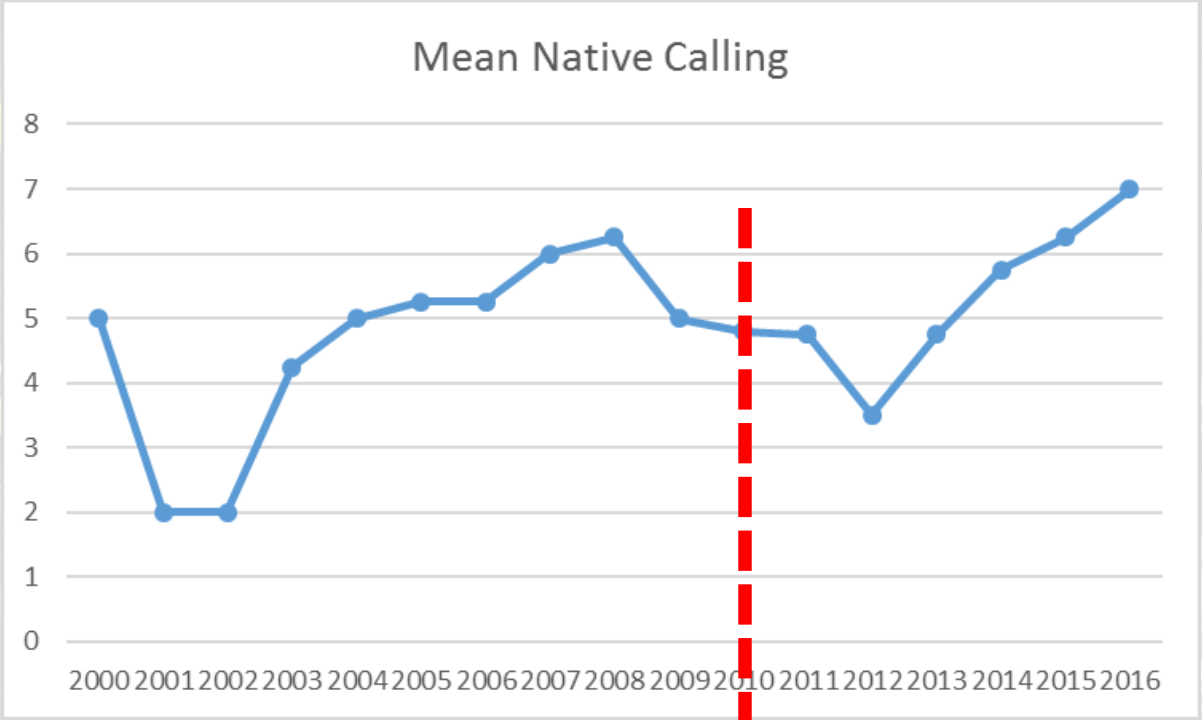

Cricket Frog Calling Frequency on Route L-2
Calling Frequency
Year
y = -0.0013x + 2.5719
R² = 0.1887


Cricket Frog Calling Frequency on Route L-7
Calling Frequency
Year
y = -0.0057x + 11.751
R² = 0.0854


Cricket Frog Calling Frequency on Route C-1
Calling Frequency
Year
y = 0.0012x - 2.1241
R² = 0.0047


Cricket Frog Calling Frequency on CREW Route
Calling Frequency
Year
y = 1.161x - 2319.3
R² = 0.0797


Richness Route 7 Stop 7 Restoration Site
Native
Exotic
restoration
Frog Species Richness
0
1
2
3
4
5
6
7
8
9
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016


Mean Native Calling
0
1
2
3
4
5
6
7
8
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016

Preliminary Conclusions

- Overall frog calling is declining for the entire region
- Exotic species calling frequency is increasing.
- Some native frogs are maintaining or increasing calling , others are declining (southern toad, squirrel treefrog, leopard frog, barking treefrog, pinewoods treefrog, and little grass frog)
- Individual routes show variation in population changes suggested localized impacts rather than regional or global
- Preliminary (*very*) stop analysis indicates that wetland restoration can maintain – maybe improve - habitat for native frogs
- Next steps - Individual stop analysis may help illuminate driving mechanisms (site-specific, regional trends, or global changes).



Questions?