



# Emergence Patterns and Distribution of Overwintering Wood Frogs, *Rana sylvatica*

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## Introduction

The wood frogs breeds in temporary ponds where fish are absent. From late February to early March the wood frogs emerge from hibernation, migrate toward the vernal pond, and breed explosively for a few days to one week. The wood frog population on the Richard Stockton College campus has bred and laid eggs in vernal pond 'S' (VPS) for at least two years now. Like many pool-breeding amphibians, the wood frog utilizes the terrestrial habitat surrounding the vernal pond for feeding and overwintering in leaf litter. Loss or reduction of this critical habitat could have serious consequences for the population. The extent of the wood frogs' terrestrial habitat on campus is unknown. Knowledge of such information could have management and conservation implications for the population.

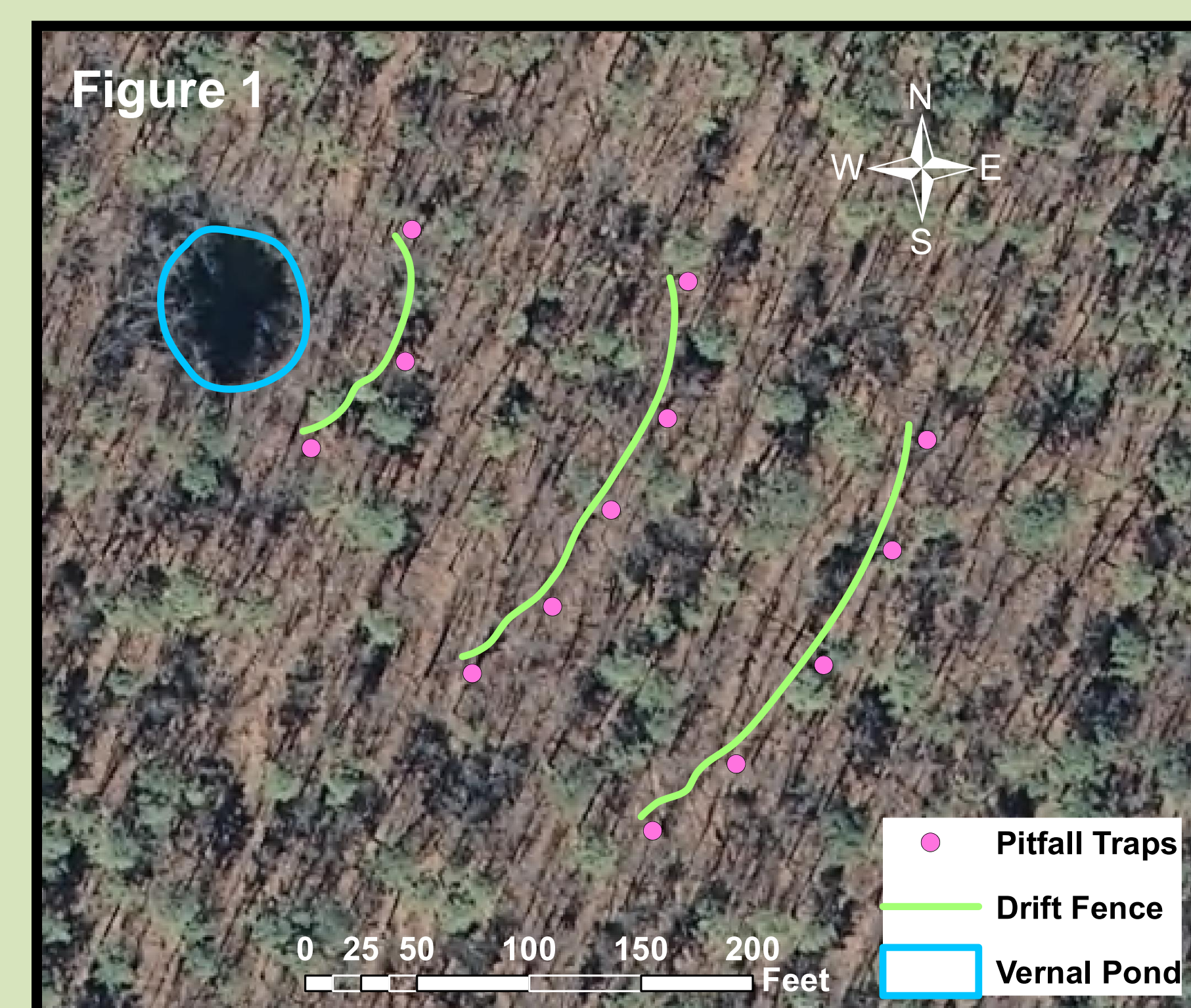
## Methods

To sample emerging frogs as they leave their winter hibernation sites, three rows of drift fencing were installed on February 3<sup>rd</sup>, 2014 (Table 1, Fig. 1). To capture frogs as they move laterally after encountering the drift fence, 5-gallon plastic buckets were buried flush with the ground. Dampened sponges were placed at the bottom of the bucket to prevent against desiccation of captured frogs. Buckets were checked from February 4<sup>th</sup> – March 16<sup>th</sup> at least one time daily. Each captured frog's sex was determined by the presence or absence of nuptial pads on the thumbs, time and location of each capture was recorded, and the frog was immediately released at the vernal pond's edge.

**Study Area:** The vernal pond is located in upland deciduous forest dominated primarily by pitch pine (*Pinus rigida*) and scarlet oak (*Quercus coccinea*).

Table 1: Drift Fence Rows

Fence Number	Distance from Pond Edge	Capture Zone	Dimensions	# of Pitfall Traps
1	~ 25 ft.	< 175 ft.	100" x 3"	3
2	~ 175 ft.	175 – 300 ft.	200" x 3"	5
3	~ 300 ft.	> 300 ft.	200" x 3"	5



**Figure 1:** Three rows of drift fencing were installed to create 3 capture zones. Frogs captured in the 1<sup>st</sup> fence were hibernating less than 175 ft. away from the pond. Captures in the 2<sup>nd</sup> fence were hibernating between 175 – 300 ft., and captures in the 3<sup>rd</sup> fence were hibernating > 300 ft. away from the pond.

## Purpose

1.) Determine whether the current reduced buffer regulation (175 ft.) and standard buffer regulation (300 ft.) protect the majority of the wood frogs' winter habitat on campus. *How close to the vernal pond are wood frogs overwintering?*

2.) Identify sex-specific wood frog emergence patterns.



## Results

### Quick Facts

- Total Captures: 180 frogs from Feb 4 – Mar 13
- Breeding Season: Mar 11, 12 & 15
- Two major "spikes" in frog activity: Feb. 20 –24 and Mar 8 –13 (Fig. 2)

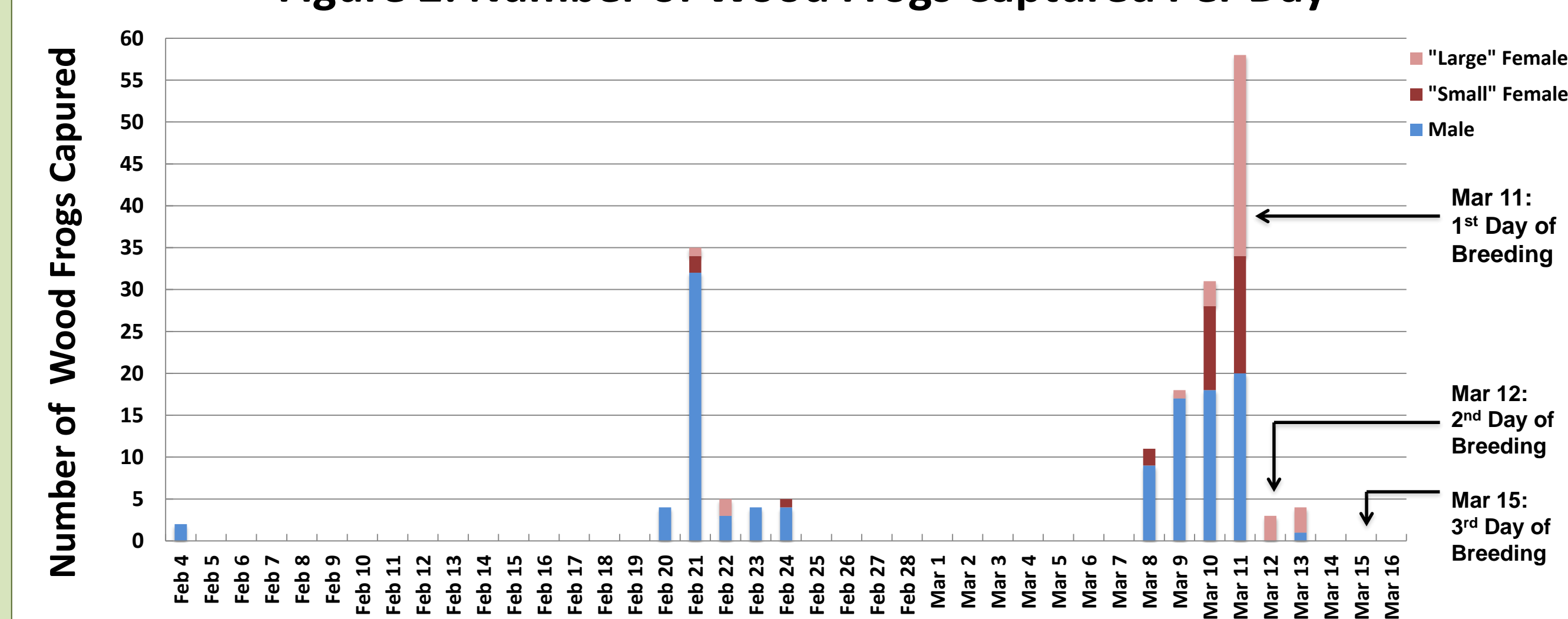
### Distance Patterns

- 44% of total captures were >175 ft. from the pond (Fig. 3)
- 41% of "large" females captured were >175 ft. from the pond
- Sex and distance to vernal pond were independent of one another. Chi-squared ( $\chi^2 (2, N = 180) = 1.17, p > .05$ ).

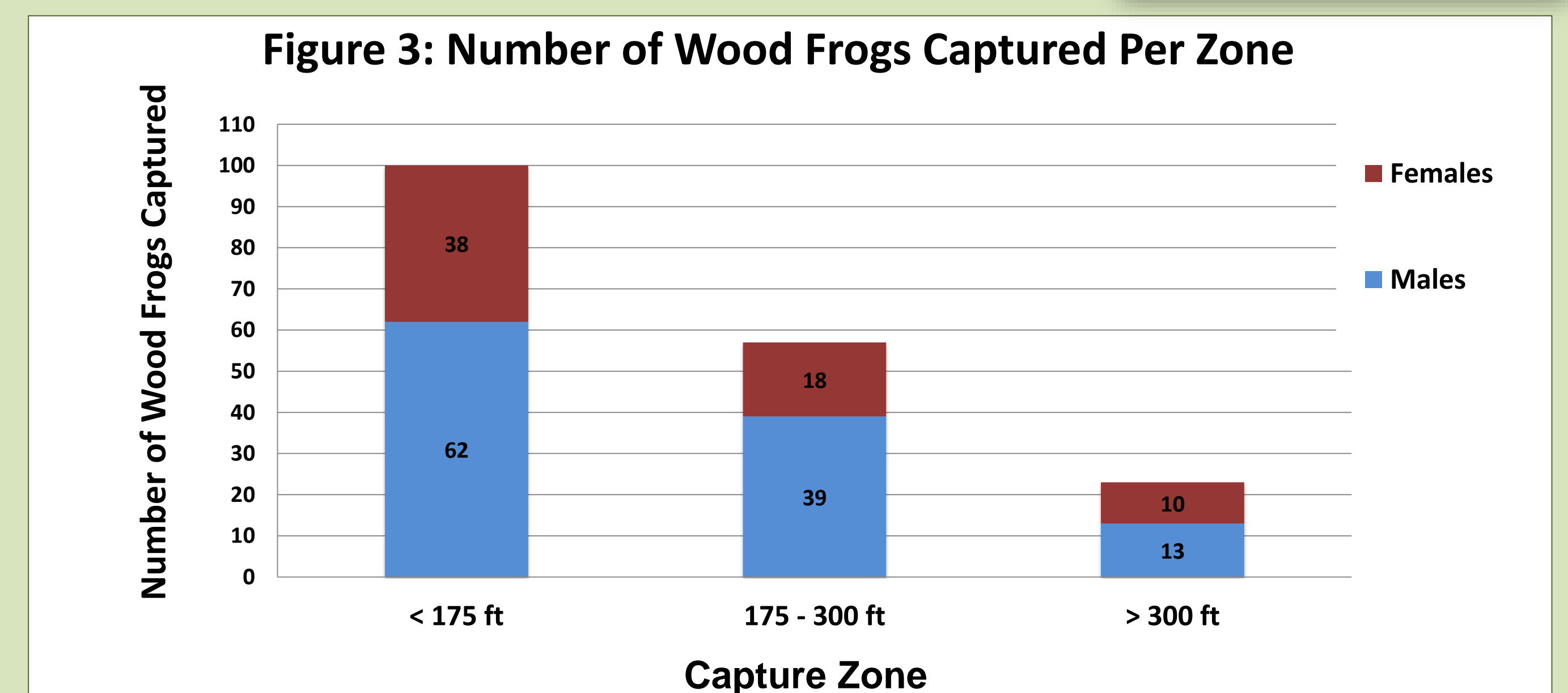
### Sex-Specific Patterns

- 63% of total captures were male and 37% were female
- 21% of total captures were "large" females
- Prior to Mar 11, 93 males captured and 7 "large" females captured
- On Mar 11, 24 "large" females captured; more females captured on Mar 11 than males (Fig. 2)

Figure 2: Number of Wood Frogs Captured Per Day



**Figure 2:** Frog captures occurred in two "spikes," Feb 20 – 24 and Mar 7 – 13, with the exception of Feb 4. Prior to the first day of breeding, Mar 11, 7 "large" females were captured and 93 males. "Large" females emerged in unprecedented numbers on the first day of breeding.



**Figure 3:** This graph displays the number of frogs, by sex, captured in the 3 zones created by the drift fences. The most frogs were captured in the fence nearest the pond. 44% of the total captures occurred greater than 175 ft. away from the pond in fences 2 and 3.

## Discussion

The current buffer regulation of 175 ft. does not protect the entire wood frog winter habitat. It may protect even less than measured due to possible recaptures at the first fence and frogs entering the nearest fence from outside the forest sample plot. A standard 300 ft. buffer would include 87% of captures but exclude 22% of "large" female captures. It is hypothesized that male frogs may gain an advantage by hibernating closer to the vernal pond in order to arrive at the pond earlier<sup>3</sup>. Although these results fail to support this specific hypothesis, males did emerge before females. This phenological strategy may increase one's individual reproductive success by maximizing the number of potential mates available, especially if females are the mate-limiting sex<sup>1</sup>. Alternatively, females may simply "warm up" slower or require more time to become reproductive ready. Overall, knowledge of the extent of the frogs' winter habitat has conservation and management implications.

## Acknowledgments

The Richard Stockton College Board of Trustees, The Richard Stockton College Plant Management Grounds Crew, Gordon Sabol, & Students of *Ecological Principles*

<sup>1</sup>Michener, Gail. 1983. Spring Emergence Schedules and Vernal Behavior of Richardson's Ground Squirrels: Why Do Males Emerge From Hibernation Before Females? *Behavioral Ecology and Sociobiology*, 14: 29-38.

<sup>2</sup>Regosin, Jonathan, B.S. Windmiller, and J.M. Reed. 2003. Terrestrial Habitat Use and Winter Densities of the Wood Frog (*Rana sylvatica*). *Journal of Herpetology*, 37: 390-394.

<sup>3</sup>Zweifel, R.G. 1989. Calling by the frog, *Rana sylvatica*, outside the breeding season. *Journal of Herpetology*, 23:185 – 186.