# AN INTRODUCTION TO THE MAMMALIAN SPECIES OF THE ORDWAY-SWISHER PRESERVE

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The first comprehensive natural history survey of Florida by a European was conducted by William Bartram in the 18th century (Bartram 1792). *Homo sapiens* occupied North America by successive invasions from at least 25,000 to 10,000 years before present. For a survey of native southeastern Amerindians (*Homo sapiens*) and their cultures, see Swanton (1946). Burial mounds and canoes have been identified on the preserve.

Modern mammal surveys in Florida were initiated by Chapman and Bangs in the late 19th century after the Armed Settlement Act of 1847 which favored European occupancy. During the 20th century, naturalistic efforts became focused in south central Florida with the founding of the Archbold Biological Research Station, and early publications concentrated on Highlands County. Further work in south Florida is contained in the dissertation submitted by Schwartz to the University of Michigan in 1952. In north central Florida, H. B. Sherman and his students began work in the 1930s based in Gainesville. It should be of interest to contemporary students that he invented the Sherman trap and initiated studies of trap, mark, and release, thus gaining some insight into the natural history and demography of small mammals. H. B. Sherman subsequently became Chairman of the Department of Biology at the University of Florida, Gainesville. James N. Layne, formerly of the Florida State Museum and currently Senior Research Biologist at the Archbold, has perpetuated the tradition of small mammal population studies in Highlands County. Stevenson (1976) made the first attempt to list all living vertebrates of Florida.

Excluding the strictly aquatic taxa (Sirenia, Cetacea, and the Pinnipedia), Hamilton and Whitaker (1979) list 150 species of mammals found in the last 100 years east of the Mississippi. This number includes four well-established human introductions (*Mus, Rattus* [two species], and *Myocaster*) exclusive of domesticated species (e.g. cattle, dogs, cats, sheep, goats, swine, etc.). If we eliminate the four rodent introductions and domestics, then 146 species are valid for the eastern

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United States, east of the Mississippi. Much of the species richness in the Hamilton and Whittaker volume derives from the inclusion of the prairie forms from Wisconsin and Illinois, and boreal forms from New England. Given the preceding constraints, Virginia, Maryland, and the Carolinas include 75 species. Fifty species have been recorded in recent times within the political boundaries of Florida. Of the total 50, five are to be found exclusively in the Florida Panhandle and thus are part of the remnant Appalachian fauna more typical of eastern Alabama or western Georgia.

Mammal distributions in peninsular Florida are very complex. The area under consideration extends from the temperate zone into the subtropics. Northern forms may be reaching the limits of their distribution and often have fragmented ranges not necessarily induced by human disturbance. According to Hamilton and Whitaker (1979), 39 species could occur on the Ordway Preserve. Nine are bats, and the group that has received the least attention by investigators on the Ordway to date. As of May 1992, we have recorded firm evidence of 30 species that occur on the Ordway (exclusive of European introductions) (Table 1). We believe it possible that two more native species will be identified on the preserve. Two species, the black bear *Ursus americanus* and the cougar *Puma* (= *Felis*) *concolor*, not presently found on the preserve, were recorded in the last 30 to 50 years. These wide-ranging forms are on the decline in peninsular Florida and will never again be a part of the preserve's permanent mammalian fauna. To date, workers on the preserve have studied in some detail the natural history of 12 species and in part 4 more species (Table 1).

Much valuable information concerning the mammals of Florida remains in unpublished theses and dissertations submitted to the Graduate School of the University of Florida. Because this introduction has been written with the general reader in mind, I shall attempt to outline some useful references that may be obtained from either a library or the libraries within the Department of Zoology and the Department of Wildlife and Range Sciences at the University of Florida (see Bibliography). A. M. Laessle (1942) first described the plant communities of the Welaka area. This landmark dissertation is useful to students of the Ordway Preserve because Welaka lies only some 20 miles to the south and the habitats are comparable. In 1942, Joseph Moore submitted a survey of the mammals found on the University of Florida Conservation Reserve in Putnam County. This work includes useful notes on their natural history. In 1947, Robert D. Ivey presented a thesis on the mammals, exclusive of bats, from Palm Valley, Florida. This locality lies immediately to the east of the Ordway Preserve along the Atlantic Coast. Although the habitat complex in this region differs from the Ordway Preserve, the contribution contains much interesting material on the natural history of mammals

Table 1. Mammals of the Ordway Preserve recorded and studies. 1

| | Species | Observed | Trapped | Comments |
|---|---|---|---|---|
| 1. | *Didelphis virginiana* | « | « | Major studies by M. Sunquist, D. Daneke, J. Ryser, & D. Wright |
| 2. | *Sorex longirostris* | | « | Morphological studies by D. Pearson |
| 3. | *Blarina carolinensis* | | « | Morphological studies by D. Pearson |
| 4. | *Cryptotis parva* | | « | Morphological studies by D. Pearson |
| 5. | *Scalopus aquaticus* | « | | |
| 6. | *Lasiurus intermedius* | | « | Preliminary studies by W. Kern |
| 7. | *Nycticeius humeralis* | | « | |
| 8. | *Myotis austroriparius* | | « | |
| 9. | *Dasypus novemcinctus* | « | | |
| 10. | *Sylvilagus palustris* | « | « | |
| 11. | *Sylvilagus floridanus* | « | | |
| 12. | *Sciurus carolinensis* | « | | |
| 13. | *Sciurus niger* | « | « | Major study by A. Kantola & S. Humphrey |
| 14. | *Glaucomys volans* | « | « | |
| 15. | *Geomys pinetis* | « | « | Major study by C. Gates |
| 16. | *Peromyscus polionotus* | | « | |
| 17. | *Peromyscus gossypinus* | | « | Major study by S. Brand |
| 18. | *Podomys floridanus* | | « | Major study by C. Jones & J. Eisenberg |
| 19. | *Ochrotomys nuttali* | | « | |
| 20. | *Oryzomys palustris* | | « | |
| 21. | *Sigmodon hispidus* | | « | |
| 22. | *Neotoma floridana* | | « | Major study by L. HaySmith |
| 23. | *Neofiber alleni* | « | | Preliminary study by F. Evans |
| 24. | *Vulpes vulpes* | « | « | Major study by M. Sunquist |
| 25. | *Urocyon cinereoargenteus* | « | « | Major study by M. Sunquist |
| 26. | *Procyon lotor* | « | « | Major study by S. Walker |
| 27. | *Lutra canadensis* | « | | |
| 28. | *Mephitis mephitis* | « | « | |
| 29. | *Lynx rufus* | « | « | |
| 30. | *Odocoileus virginianus* | « | | Preliminary study by D. Daneke |

common to both areas. In 1947, George Pournelle contributed his masters thesis on the mammals of a swamp region near Gainesville. In 1949, B. A. Barrington submitted a dissertation on the mammals of a north Florida flatwoods. This extremely useful contribution discusses a vegetation form which is uncommon in the Ordway but very common immediately to the west of it, including the Austin Carey Forest (managed by the School of Forest Resources and Conservation). In 1951, P. G. Pearson submitted the mammals of Gulf Hammock, Levy County, Florida. This important contribution emphasizes the vegetation types inhabited by mammalian fauna of the Gulf Coast some 40 miles to the southwest of Gainesville. In 1963, S. C. Snedacker completed his investigation of some aspects of the

ecology of the Florida sandhills. This masters thesis provides useful background for students of sandhill vegetation.

## RESPONSES OF SMALL MAMMAL POPULATIONS TO A LONG-TERM DROUGHT IN NORTH CENTRAL FLORIDA

The Ordway-Swisher Tract consists of about 10,000 acres in Putnam County, Florida, separately owned, but jointly managed by the University of Florida and The Nature Conservancy (TNC). It includes lakes, marshes, a creek system, and uplands. The uplands are the typical North Central Florida sandhills with longleaf pine and wiregrass as the dominant vegetational feature. The current major human manipulation of the habitat involves a three-year rotational burn of various compartments mainly confined to the uplands. From 1982 to the present, organized research has been carried out on plant communities, invertebrates, and vertebrates.

For over 10 years, our region has been in a net deficit in terms of rainfall. We have had years of near-average rainfall and many years of below-average. The result has been a fluctuation in vertebrate populations. Of course some of these fluctuations are not directly attributable to the drought. During the last three years (1989-1992), the situation has become acute and many of our lakes have disappeared. One of our largest--Lake Ashley--ceased to exist as a lake in late 1991.

In the mesic habitats, the situation has been locally catastrophic, and with respect to the sandhill communities on the uplands, we can only say they have exhibited persistence and resiliency under adversity. The following examples illustrate these points, I wish to highlight some typical vertebrate populations.

Long-term study plots have been maintained at various locations on the preserve. Sixteen species of small mammals may be routinely identified on some of the plots (Table 2). For the purpose of this introduction, I only wish to refer to data concerning six species (Table 3). In particular, I want to refer to study plots on Ross Lake, a lake that has persisted although falling in level, and Ashley Lake--a lake that has disappeared.

The woodrat (*Neotoma*) may be considered a "mover." Leslie Hay-Smith will present her data in this volume based on a radiotelemetric study which clearly indicated that the woodrat population shifted in response to extreme drought conditions and concentrated in the Mill Creek Swamp area.

At the other end of the spectrum with respect to mesic-adapted species, we may take the case of the rice rat *Oryzomys*; this species is at the moment, definitely a loser. It went locally extinct on Ashley Prairie and individuals apparently immigrating were taken in various wet site localities only briefly before the species disappeared from areas we were monitoring; this occurred in 1988.

Table 2. List of "small" mammals recorded and trapped[1] on the long-term study sites of the Ordway-Swisher tract, Putnam County, Florida 1983-1993.

Rodentia
- Sciuridae
  - *Glaucomys volans*
  - *Sciurus carolinensis*
  - *Sciurus niger*
- Geomyidae
  - *Geomys pinetis*
- Arvicolidae
  - *Neofiber alleni*
- Cricetidae
  - *Oryzomys palustris*
  - *Sigmodon hispidus*
  - *Neotoma floridana*
  - *Ochrotomys nuttalli*
  - *Peromyscus gossypinus*
  - *Peromyscus polionotus*
  - *Podomys floridanus*

Insectivora
- Soricidae
  - *Blarina carolinensis*
  - *Cryptotis parva*
  - *Sorex longirostris*
- Talpidae
  - *Scalopus aquaticus*

[1] Standard Sherman live traps or pit-fall traps.

*Sigmodon hispidus* may be considered a loser, a mover, and a winner since its populations on the monitored areas gradually declined throughout the drought period but shifted to Harry's Prairie. Trapping results (not reported) indicate sustained high levels of *Sigmodon* on dry prairies from 1990 to 1993. I might add at this point that parallel studies on rat snakes and rattlesnakes indicated congregation in the remaining mesic areas, and predation by these species may have contributed to the decline, not only of *Sigmodon,* but also of *Oryzomys* (Figs. 1, 3).

In the case of *Peromyscus gossypinus*, we observed a restriction in habitat, which is to say that it persists, but in densities much lower than under more optimal conditions. On the other hand, the Florida mouse (*Podomys floridanus*) is able to persist although adversely affected by the prolonged drought. Still, it maintains numbers and in some cases has expanded its habitat use pattern. Whether this is due to some as yet poorly understood competitive interaction between *Peromyscus gossypinus* and *Podomys floridanus* remains to be investigated, but the data are suggestive (Figs. 2, 4).

In North Central Florida the xeric-adapted community, including the gopher tortoise, gopher frog, spadefoot toad, and Florida mouse, exhibits extreme resilience even in the face of a prolonged drought period. This is not to imply that these vertebrates are **not** negatively affected, but does reinforce the notion that the xeric-adapted community that we have been discussing has been under an extraordinarily long period of selection to face such adversities and fluctuations in precipitation.

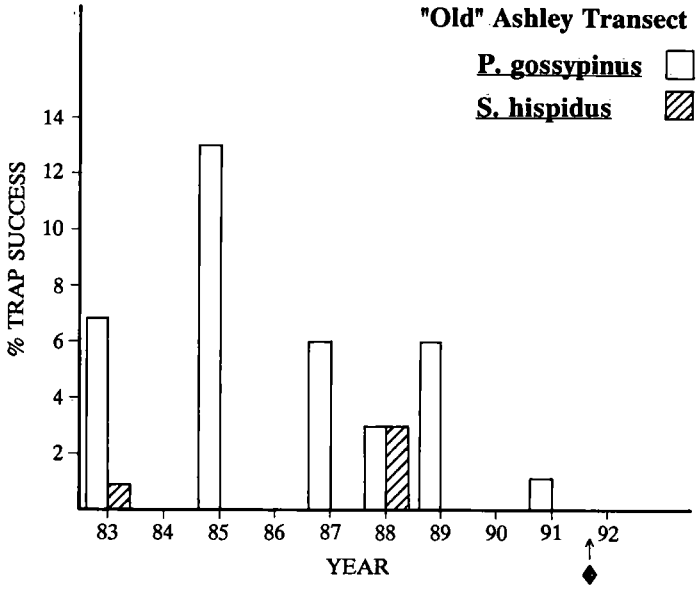


Figure 1. Trapping results for two small mammal species on the original Ashley Transect of the Ordway-Swisher Tract. Note the decline of *Peromyscus gossypinus* and the sporadic occurrence of *Sigmodon hispidus* during the drought years. ♦ = Ashley Lake and marsh went dry by 1991, the prairie went dry in 1988 (see also Table 3).

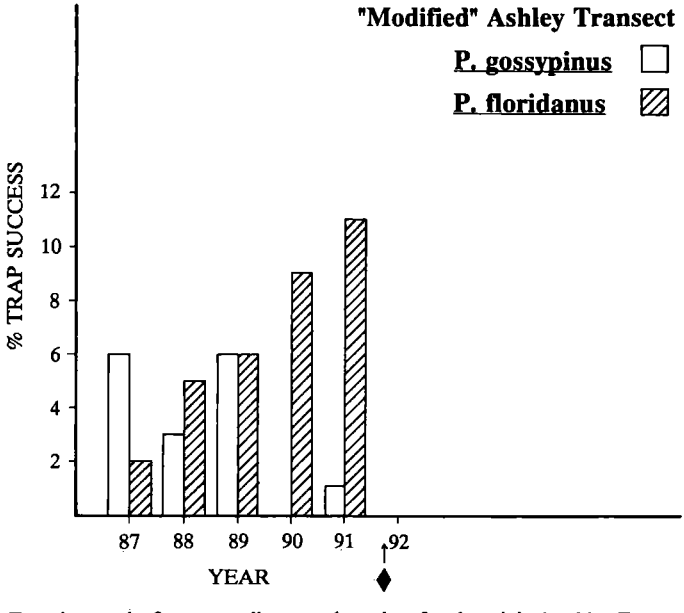


Figure 2. Trapping results for two small mammal species after the original Ashley Transect was modified to include six gopher tortoise burrow systems (1987-1992). ♦ = Ashley Lake and marsh went dry in November 1991 (see also Table 3).

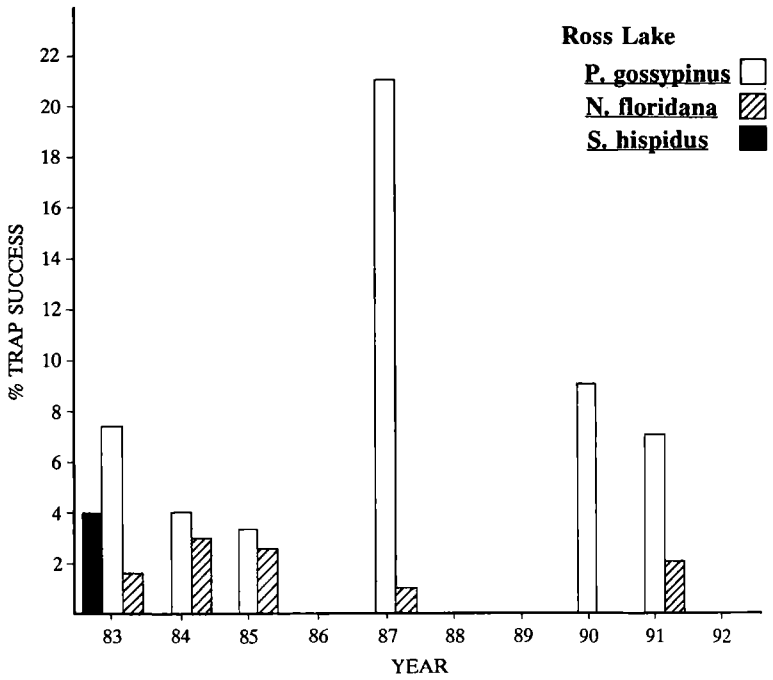


Figure 3. Trapping results from the Ross Lake array during the interval 1983-1992. Not trapped in 1986, 1988, and 1989. Note *Sigmodon hispidus* disappears in 1983. *Neotoma floridana* maintains low numbers but also absences. *Peromyscus gossypinus* prevails but oscillates from 0 to 21% trap success (see Table 3).

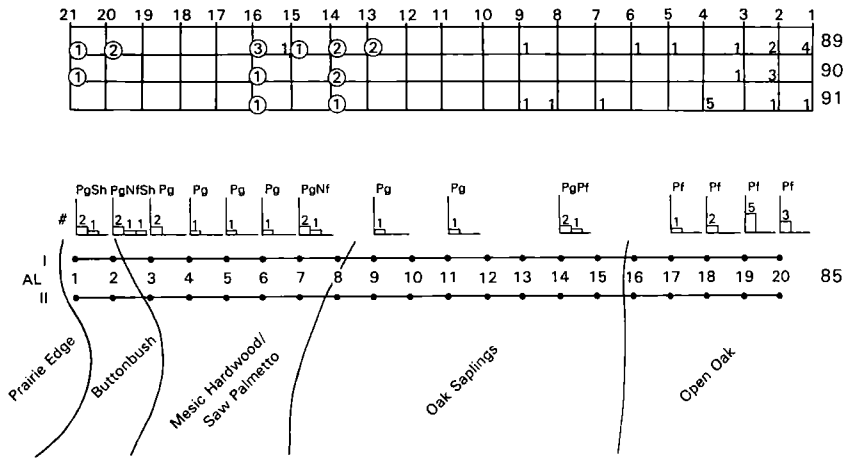


Figure 4. Bottom:Total trapping results from the thesis of S. Brand on Ashley Transect (1985). Pg = *Peromyscus gossypinus;* Nf = *Neotoma floridana*; Sh = *Sigmodon hispidus*; Pf= *Podomys floridanus.* Top:Trapping results 1989 to 1991 (see Table 3). A replicate re-trapping of the Brand transect demonstrates that during the drought *P. gossypinus* shifted range to closer to the dying marsh, and *P. floridanus* moved downslope to "new station" #15. Numbers in circles = *P. gossypinus*; numbers = *P. floridanus* (number caught per station).

Table 3. Trapping results from Ross Lake and Ashley Transect 1983-1993.

| Location | Season and Year | Trap Nights (TN) | Species as % (No./TN) x 100 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | *Pp* | *Pg* | *Pf* | *Sh* | *On* | *Nf** |
| Ross Lake | Spring/Summer 1983 | 161 | – | 7.4% | – | 3.8% | 0.4% | 1.2% |
| Ross Lake | Spring 1984 | 191 | – | 4.0% | – | – | – | 3.0% |
| Ross Lake | Spring 1985 | 330 | – | 3.3% | – | – | 0.3% | 2.6% |
| Ross Lake | Spring 1987 | 198 | – | 21.0% | – | – | – | 1.0% |
| Ross Lake | Spring 1990 | 58 | – | 9.0% | – | – | 2.0% | – |
| Ross Lake | Spring 1991 | 94 | – | 7.0% | – | – | 1.0% | 2.0% |
| Ross Lake | Spring 1992 | 72 | – | 4.0% | – | – | 1.0% | 2.0% |
| Ross Lake | Winter 1992 | 80 | – | 1.3% | – | – | – | – |
| Ross Lake | Spring 1993 | 20 | – | 1.0% | – | – | 1.0% | – |
| Ashley Transect | Spring/Summer 1983 | 163 | 0.4% | 6.8% | – | 0.8% | – | 1.8% |
| Ashley Transect | Spring 1985 | 40 | – | 13.0% | – | – | – | – |
| Ashley Transect** | Spring 1987 | 88 | – | 6.0% | 2.0% | 3.0% | – | 1.0% |
| Ashley Transect** | Spring 1988 | 37 | – | 3.0% | 5.0% | – | – | – |
| Ashley Transect** | Spring 1989 | 192 | – | 6.0% | 6.0% | – | – | 3.0% |
| Ashley Transect** | Spring 1990 | 127 | – | – | 9.0% | – | 2.0% | – |
| Ashley Transect** | Spring 1991 | 161 | – | 1.2% | 11.0% | – | 1.2% | – |
| Ashley Transect** | Spring 1992 | 204 | – | 1.4% | 14.0% | – | – | – |
| Ashley Transect** | Winter 1993 | 147 | – | 2.0% | 3.0% | – | – | – |
| Ashley Transect** | Spring 1993 | 170 | – | 2.0% | 3.0% | – | – | 1.0% |

* *Pp = Peromyscus polionotus; Pg = Peromyscus gossypinus; Pf = Podomys floridanus; Sh = Sigmodon hispidus; On = Ochrotomys nuttalli; Nf = Neotoma floridana.*

** Array of traps altered 1987-1993 to include more up-slope area.

Ashley Prairie and Harry's Prairie Wetlands dried out in 1988.
Ashley Lake went dry January, 1992.

## CONCLUSION

Responses of the small mammal populations to drought conditions highlights the dynamic aspect of the preserve's ecology. Population studies are a true challenge. A number of well motivated individuals have worked with some support from the staff on the Ordway-Swisher Tract: S. Brand, A. Kantola, and C. Gates were among the "originals." The following contributors to this volume address the questions that linger: (a) Ryser: What effects home range use by *Didelphis virginiana*?, (b) Jones: The habitat and effect of fire on *Podomys floridanus*, (c) HaySmith: The habitat of and effect of a drought on *Neotoma floridana*, and (d) Walker: The impact of high density raccoon, *Procyon lotor*, populations on other vertebrates living on the preserve.

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[2] Not all references are cited in text, but rather are offered as an outline to future efforts (JFE).

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