

An Overview of Black Bear Roadkills in Florida 1976-1995

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May 8, 1996**

Introduction

Since 1936, Florida's human population increased from 1.7 to over 14 million people, and habitat loss due to this development is recognized as the most important cause in the decline of the state's wildlife populations (Kautz 1993). This rapid human population growth has increased the use of existing highways, and created a demand for upgrading those highways or constructing new roads (Southall 1991, Florida Department of Transportation 1992). Aside from the outright loss of habitat from actual construction, highways are barriers to normal wildlife movement. New or improved highways can also result in increased human access to historically rural areas, and urban sprawl due to secondary development can further degrade the habitat values of wild lands. Fragmentation and isolation of large habitat systems is fast becoming a factor that could threaten the long-term survival of several wildlife species in the state.

Our agency began collecting data on black bear roadkills in 1976. For each roadkill, the distance of the kill to the nearest highway landmark was recorded, and the carcass was retrieved for determination of age, sex, weight and other life history information. This report provides (1) a short summary and analysis of the black bear roadkill data, (2) identifies statewide locations of chronic highway problem areas for bear roadkills, and (3) discusses various measures our agency uses to provide more protection for the black bear in Florida.

Seasonality and Distribution of Roadkills

The Florida black bear (*Ursus americanus floridanus*) occurs in Florida, southern Alabama, and southern Georgia. It listed by our agency as a threatened species, and is a candidate for listing by the U.S. Fish and Wildlife Service as a federally threatened species. The primary cause of the black bear's precarious status is habitat loss, but the mortality and habitat fragmentation caused by highways are increasingly being recognized as significant long-term threats to the species in Florida.

Roadkill Seasonality and location data are summarized in Tables 1-4 and Figures 1-8 (Appendix). During the period from 1976 through 1995, 463 black bear roadkills were documented in 43 of the state's 67 counties (Table 1). Seventy percent of the deaths were in the following 7 counties: Lake, Collier, Marion, Jefferson, Gulf, Highlands, and Hernando. Roadkills occurred most often during the Fall (Figure 1), and November, October, and December represent, in descending order, individual months when the highest numbers of roadkills occurred (Figure 2).

The statewide range of the black bear in Florida has been divided into eight distinct populations (Figure 3) in order to better address specific management problems associated with particular geographic regions (Florida Game and Fresh Water Fish Commission 1993). The Ocala, Apalachicola, and Big Cypress bear populations have accounted for the highest number of roadkills (Figure 4), totaling 77.3 percent of the vehicle kills recorded during the past 20 years. Table 2 lists the counties which contain the geographic range of each bear population, and lists in descending order the roadkill totals by county and population.

Roadkills and Traffic Levels

Since the late 1970's, there has been an increasing statewide trend in the total number of black bears reported killed each year by vehicles on the state's highways (Figure 5). We made a general comparison

of bear roadkills and traffic level data which have been systematically collected within four areas of the state during the past 20 years. Data on traffic levels were obtained for 10 highways (Richard Reel, FDOT, personal communication) in the 5 counties that have accounted for over 60 percent of the total bear roadkills recorded statewide during this period. These particular highways were selected based on their bear roadkill history, and the availability of continuous traffic data during the past 20 years at highway monitoring locations within those rural areas where the kills were recorded. The counties selected include Lake, Marion, Collier, Hernando, and Jefferson, which represent portions of the Ocala, Big Cypress, Chassahowitzka, and Apalachicola bear population areas located in the north central, southwest, west central, and northwest parts of the state. The two graphs in Figure 6, which depict bear roadkill totals and the average daily vehicle trips, illustrate similar trends in traffic levels and roadkills. The data do not demonstrate cause and effect, however we believe that the increase in the number of roadkills is partly due to an increase in traffic levels, an increase in the bear population in some regions, and a more consistent and systematic effort to document bear deaths.

Chronic Black Bear Roadkill Problem Areas

Statewide, the five highways with the highest black bear roadkills (Table 3), in descending order within individual or contiguous counties, include SR-40 (Lake and Marion), SR-19 (Lake and Marion), SR-84 (Collier), SR-46 (Lake), and US-41 (Collier). The bear roadkill totals for the 11 highways presented in Table 3 account for about 45 percent of the total statewide roadkill mortality recorded from 1976 through 1995.

The bear roadkills are not randomly distributed, but occur most often in relation to defined habitat features that tend to concentrate bear crossings along particular sections of a highway. The locations of bears killed on state roadways from 1976 through 1995 were digitized and plotted as an overlay over the state highway network to identify roadkill concentrations and chronic problem areas. We defined a problem area as a highway location with a close grouping of at least 8 or more bear roadkills within approximately 7.0 roadway miles, and identified 12 distinct problem areas statewide (Table 4). Five of these areas were located in Lake County, four in Marion County, while Hernando, Jefferson, and Gulf counties accounted for one area each. Figure 7 depicts three of the roadkill problem areas which were identified in Lake County and shows the bear roadkill history at those locations on SR-46, SR-44, and CR-42. Collectively, the 12 problem areas accounted for 142 roadkills, or about 31 percent of the total highway bear kills recorded statewide over the past 20 years. Overall, the bear roadkill groupings represented at the problem sites ranged from a low of 8 kills to a high of 23 kills, with a mean of 11.8 roadkills per site. In addition, eleven of the 12 problem areas have a roadkill history dating back at least 10 years.

The highway problem areas ranged from 3.3 to 7.0 miles in length. Eleven of the 12 chronic problem areas were on two-lane roads. U.S. 98 in Hernando County represented the only roadkill problem area on a four-lane highway. Ten of the twelve roadkill problem areas were either totally or partially bounded by land which is in public ownership.

CONCLUSIONS AND DISCUSSION

Since the late 1970's, there has been an increasing statewide trend in the total number of black bears killed annually by vehicles in Florida. Furthermore, the total recorded bear roadkills represent a minimum number of actual kills since all animals struck by vehicles are not reported, or the injured animal leaves

the roadway and the carcass is not recovered. In the future, if total roadkill numbers continue to escalate to a level where they begin to represent a significant mortality factor, highways could have an increasingly adverse effect on some black bear populations. Continued monitoring and analysis of bear roadkill levels and locations by our agency will provide the data necessary to assess and address these impacts.

We believe that roadkills are probably symptomatic of the much larger and more serious problem of habitat loss and fragmentation. Wooding and Maddrey (1994), estimated that 209 acres of habitat is lost to bears for every mile of roadway due to the right-of-way footprint, and the avoided zone adjacent to the highway due to human use of the road. We believe that the continued fragmentation and isolation of large habitat systems by highways, coupled with associated secondary development, poses real long-term threats to the persistence of black bear populations in some parts of the state.

Our preliminary work, including field visits and a review of our computerized Landsat land cover maps, shows that bear roadkills are not randomly distributed, but often occur in relation to defined habitat or landscape features which tend to concentrate bear crossings along particular sections of a highway. These landscape features include large forested areas which many times are wooded wetlands associated with basin swamps, intermittent drainage ways, or defined streams and their floodplains. Furthermore, bears show an apparent preference or fidelity for these sites as crossings in an effort to access and utilize major blocks of habitat which occur on either side of the highway. Therefore, these particular areas may represent important travelways which serve as critical habitat connectors, especially for those bears whose home range is bisected by the roadway. For example, Figure 8 shows an apparent regional pattern of 9 of the 12 chronic roadkill areas which occur throughout bear habitat in Lake and Marion counties from the Ocala National Forest to the Wekiva River Basin. These problem areas are associated with the wooded wetlands of Blackwater Creek, Blackwater Swamp, and adjacent to the streams associated with Fern Hammock Springs, Sweetwater Springs, Salt Springs, Morman Branch, and other minor and unnamed wetland landscape features.

Our agency is working in several major areas in an attempt to protect habitat and increase the survival potential of the black bear in the state. One important method is the collection, analysis, and dissemination of habitat information on the black bear which can be used in making land use decisions. Our section recently completed a land cover map of Florida's 34 million acres, and modeling was performed to identify habitat needs of the bear and many other focal species on public and private land (Cox et. al. 1994). This information is being used by state and local planners in making land use decisions, and by our agency in habitat protection efforts associated with our review of land development projects. We also use this information to guide our agency's land acquisition recommendations on the state's Conservation and Recreational Lands (CARL) program, which is administered by the Florida Department of Environmental Protection. Florida's program is recognized as one of the most ambitious land acquisition efforts in the country, resulting in the purchase of 882,314 acres of public land since 1974 through the CARL, Environmentally Endangered Lands, and P-2000 programs at a cost of 1.2 billion dollars (Department of Environmental Protection 1996).

Our agency also provides technical assistance to the Florida Department of Transportation and performs in-depth reviews of highway projects during the planning, design, and permitting phases, to determine ways to avoid, minimize, or mitigate impacts to black bear populations as well as other listed wildlife species. Our biologists have participated in the justification, design, siting, and research associated with the construction of 24 wildlife underpasses on I-75 in southwest Florida, and experimental underpasses installed on SR-46 in Lake County and SR-29 in Collier County. These structures have proven to be generally successful in reducing roadway mortality of the bear and Florida panther. We also

perform annual statewide reviews of new or replacement bridge projects planned within natural areas in an effort to insure that those bridges are designed to span major portions of floodplains to maintain habitat connectivity of these important wildlife movement corridors for bears and other wildlife species. In addition, our primary focus in addressing the impacts of large highway projects is directed toward creating large contiguous tracts of public land to increase the potential for successful habitat protection and management on a regional scale. Recent examples include the 1,600-acre Platt Branch site in Highlands County, which is managed by our agency, and the purchase of 10,500 acres of land adjacent to existing public lands in Hillsborough, Pasco, and Hernando counties which will serve as partial mitigation for a proposed turnpike project in west central Florida.

In conclusion, our experience has shown that the appropriate siting of wildlife underpasses at key locations is one useful tool in reducing bear roadkill mortality, and maintaining habitat connectivity in very site-specific situations. However, we believe that wildlife underpasses are but one tool, and cannot be viewed as the ultimate panacea in terms of mitigating future adverse effects of roadways on black bears and other wildlife.

The projected human population increase in the state during the next 20 to 30 years, and the resulting proliferation of highways, will severely test the ability of natural resource agencies to protect the viability of our remaining wild lands. Protection of these large habitat systems is especially important for wide ranging species such as the black bear. An important objective in our agency's Strategic Plan to protect Florida's wildlife communities is to prevent any reduction in the size of the 39 roadless areas in Florida that are larger than 100,000 acres in size (Florida Game and Fresh Water Fish Commission 1993).

In the future, improved highway planning on a regional or statewide basis for proposed new roadways or multi-laning projects will be an absolutely essential element if we are to successfully protect and prevent further degradation of the state's large contiguous habitat systems on public and private lands. Long-term transportation planning should shift traffic patterns away from important natural areas in order to minimize habitat loss, reduce roadkills, and avoid adverse impacts to the black bear and other wildlife populations.

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Acknowledgments

We would like to sincerely thank the following individuals who assisted us in the preparation of this report: Jack Butler and Richard Reel, FDOT Transportation Statistics section furnished traffic data for selected state, county, and federal highways; GFC biologists, Jeff McGrady, Arlo Kane, Daryl Land, Mike Abbott, Mark Banker, and Jayde Roof provided detailed bear roadkill locations; GFC Biologist Ted Hoehn plotted the 1994-95 bear roadkill data and offered helpful suggestions on the report; Alan Shopmyer, Will Rice, Doug Hallman, and Khaleda Hatim of FDOT's Topographic section digitized the bear roadkill locations, and produced the roadkill maps; Gary Evink and David Ziegler of FDOT's Environmental Management cooperated with our agency on this project; biologists Brian Barnett, Randy Kautz, Tom Shupe, and Brad Hartman of the GFC, and Parks Small of DEP reviewed and provided suggestions on the preparation of this report.

APPENDIX

Table 1. Florida Black Bear Roadkill Totals By County From 1976 Through 1995.

County	Number Killed	County	Number Killed
Lake	100	Liberty	3
Collier	72	Calhoun	3
Marion	65	Clay	3
Jefferson	26	Flagler	2
Gulf	23	Nassau	2
Highlands	23	Polk	2
Hernando	16	Charlotte	2
Volusia	14	Bradford	2
Putnam	10	Hendry	2
Bay	10	Escambia	2
Franklin	10	Taylor	2
St Johns	9	Lee	2
Okaloosa	8	Citrus	1
Seminole	7	Walton	1
Columbia	6	Leon	1
Orange	5	Washington	1
Santa Rosa	5	Alachua	1
Glades	4	Osceola	1
Sumter	3	Gadsden	1
Duval	3	Hamilton	1
Baker	3		
Wakulla	3		
Pasco	3		

Table 2. Roadkills By Counties Within Black Bear Populations From 1976 Through 1995.

POPULATION	COUNTY	TOTAL ROADKILLS	POPULATION ROADKILL TOTAL
Ocala	Lake	100	143
	Marion	65	
	Putnam	10	
	Seminole	7	
	Orange	5	
Big Cypress	Collier	72	76
	Lee	2	
	Hendry	2	
Apalachicola	Jefferson	26	81
	Gulf	23	
	Bay	10	
	Franklin	10	
	Wakulla	3	
	Calhoun	3	
	Liberty	3	
	Taylor	2	
Leon	1		
St Johns	Volusia	14	28
	St Johns	9	
	Duval	3	
	Flagler	2	
	Brevard	0	
Chassahowitzka	Hernando	16	20
	Pasco	3	
	Citrus	1	
Highlands	Highlands	23	27
	Glades	4	
Eglin	Okaloosa	8	14
	Santa Rosa	5	
	Walton	1	
Osceola	Columbia	6	12
	Baker	3	
	Nassau	2	
	Hamilton	1	

Table 3. Top 7 Counties and 11 Highways For Bear Roadkills In Florida From 1976 through 1995.

County	Highway											TOTAL
	SR40	SR19	SR84	SR46	US27	US98	US41	SR44	SR71	SR42	US19	
Lake	15	15		22				12		9		73
Collier			25				14					39
Marion	22	20										42
Jefferson					10	11						21
Gulf						5			9			14
Hernando											8	8
Highlands					9							9
Totals:	37	35	25	22	19	16	14	12	9	9	8	206

Table 4. Chronic Highway Roadkill Problem Areas For Black Bear In Florida.

County	Site	Highway	Number Of Kills	Highway Length In Miles	Name of Nearest Landmark	Largest Public Land Tract Within 10 Miles
Lake	L-1	SR-40	15	5.6	Astor Park FL	Ocala National Forest
	L-2	SR-19	12	7.0	Shockley Heights FL	Ocala National Forest
	L-3	CR-42	11	5.1	Black Water Swamp	Ocala National Forest
	L-4	SR-44	11	6.0	Black Water Creek	Wekiwa GEO Park Complex
	L-5	SR-46	23	3.3	Wekiwa River	Wekiwa GEO Park Complex
Marion	M-1	SR-19	9	3.9	Salt Springs	Ocala National Forest
	M-2	SR-19	13	4.1	Sweetwater Springs	Ocala National Forest
	M-3	SR-40	14	4.9	Juniper Springs	Ocala National Forest
	M-4	SR-40	9	3.8	Lynne	Ocala National Forest
Hernando	H-1	US-19	8	4.0	Chassahowitzka Swamp	Chassahowitzka NWR
Jefferson	J-1	US-98	9	6.5	Aucilla River	Aucilla WMA
Gulf	G-1	SR-71	8	6.2	White City FL	Apalachicola National Forest

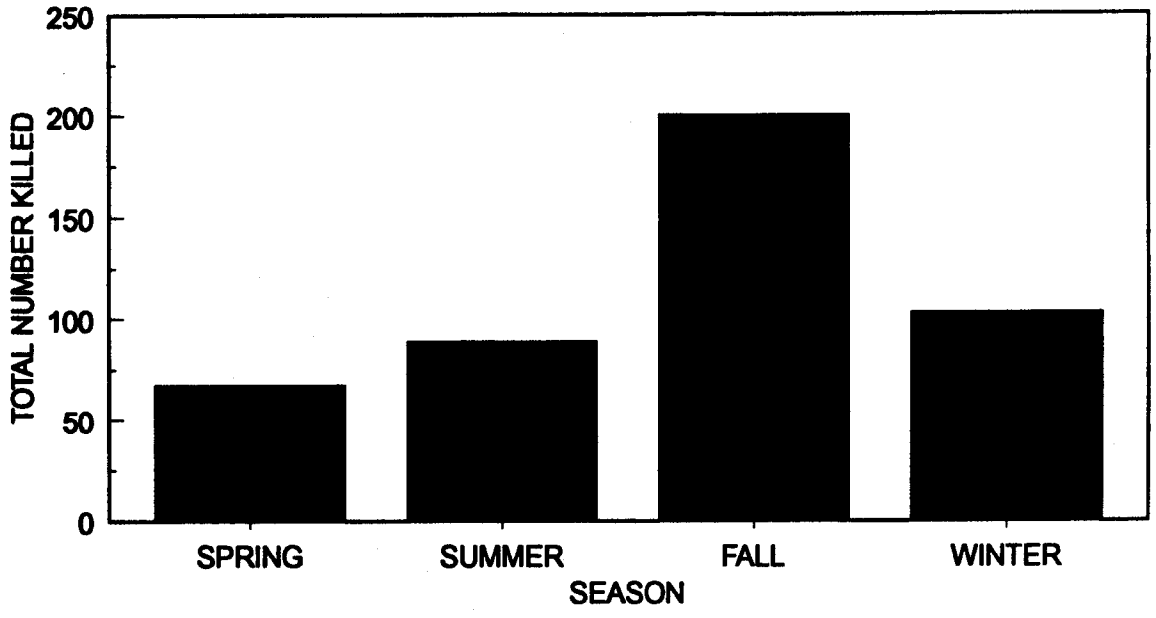


Figure 1. Black Bear Roadkills By Season 1976-1995.

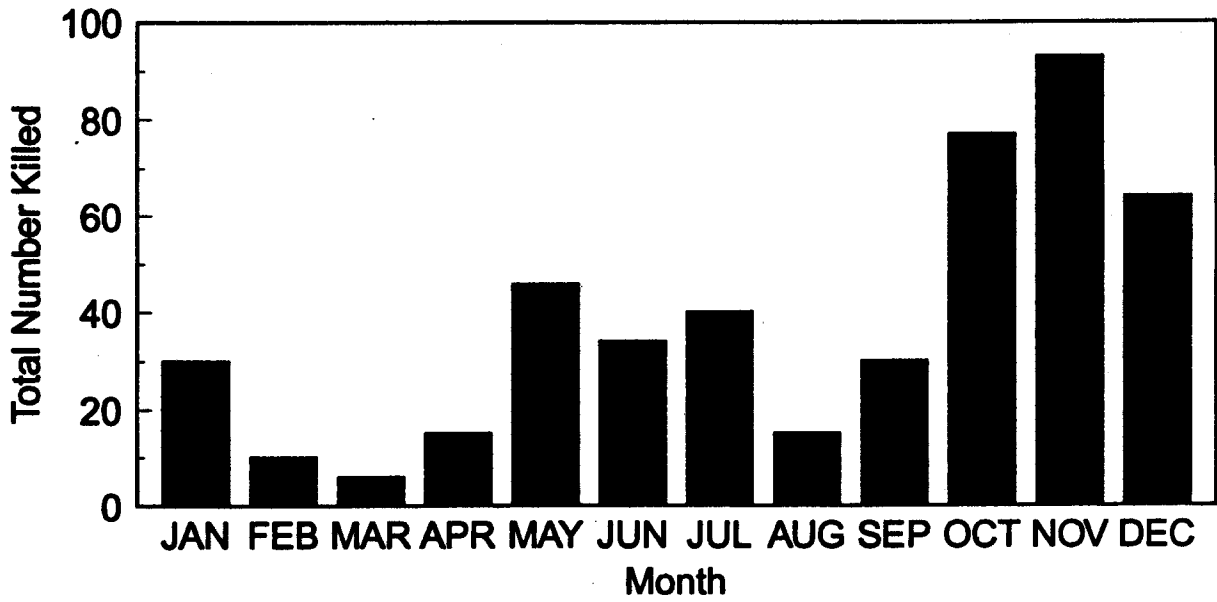


Figure 2. Black Bear Roadkills By Month 1976-1995.

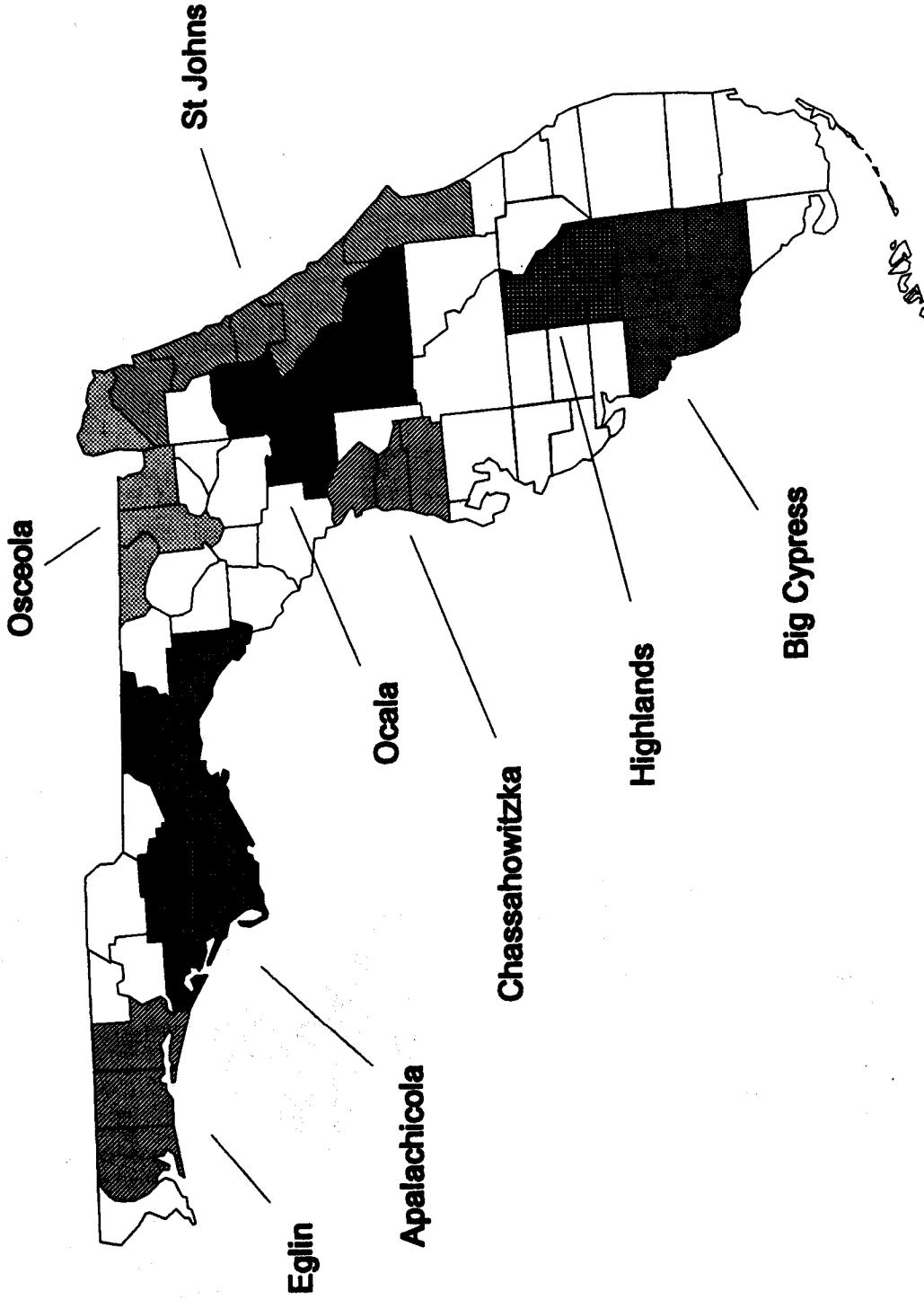


Figure 3. Range of Black Bear Populations in Florida

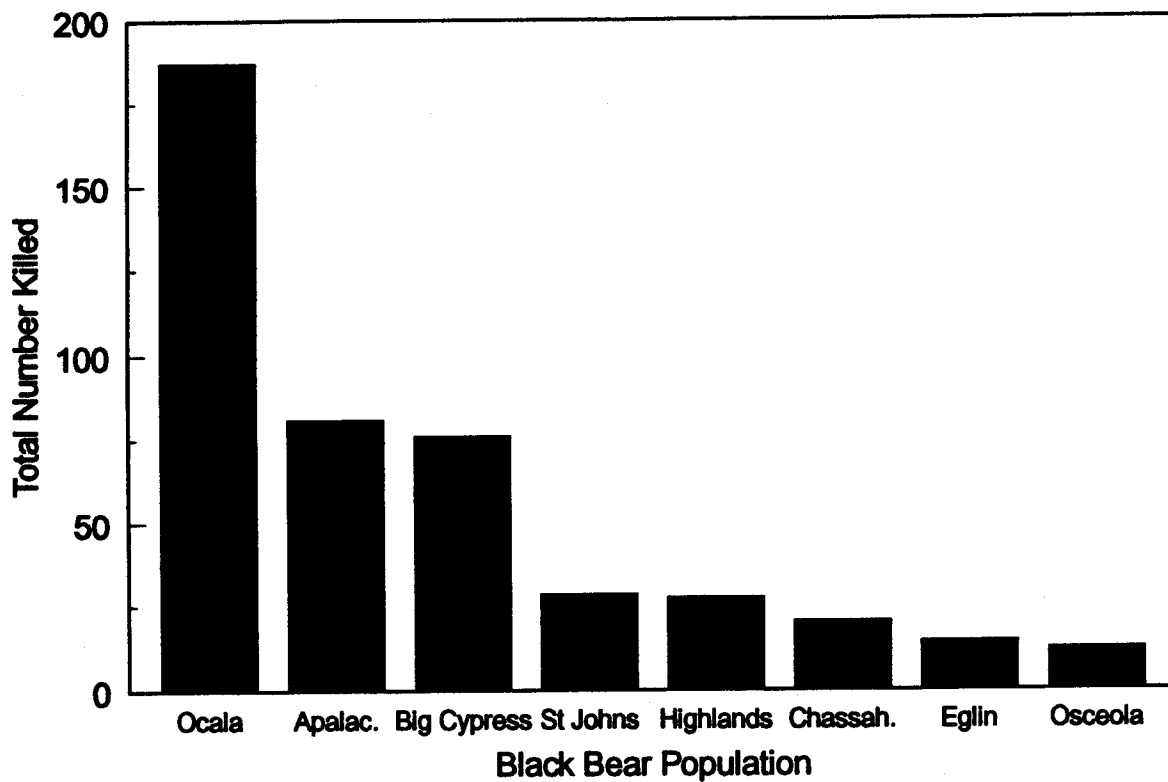


Figure 4. Black Bear Roadkills By Population 1976-1995.

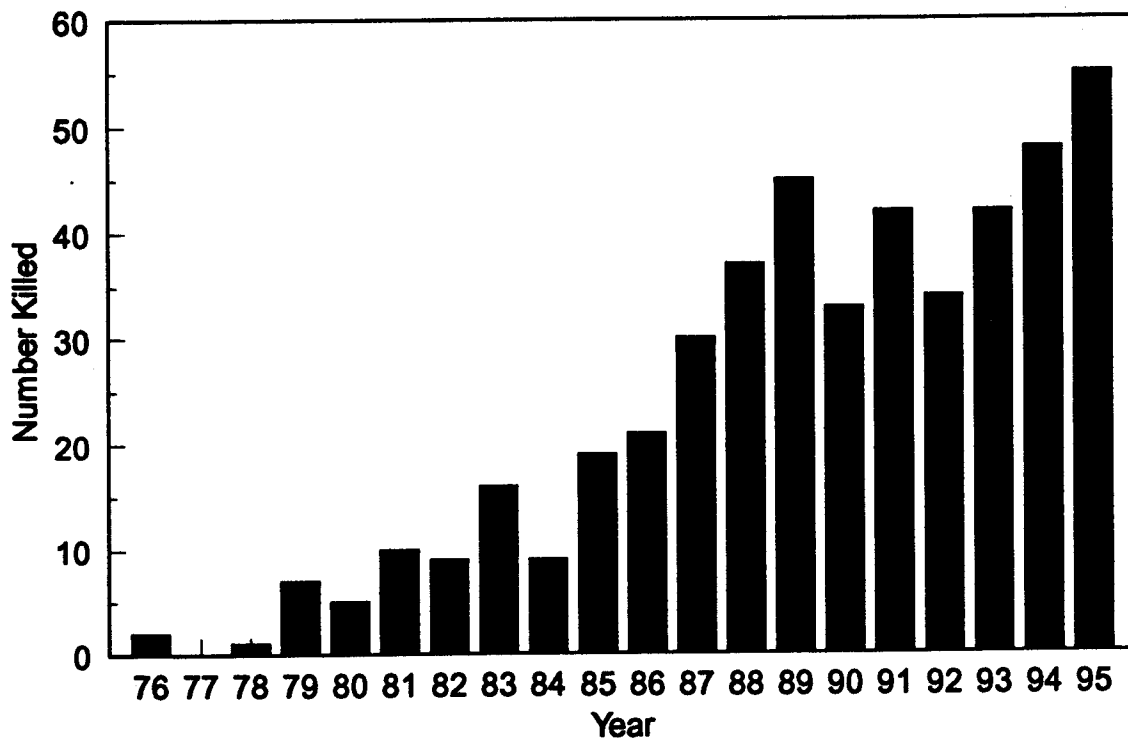


Figure 5. Black Bear Roadkills Statewide By Year 1976-1995

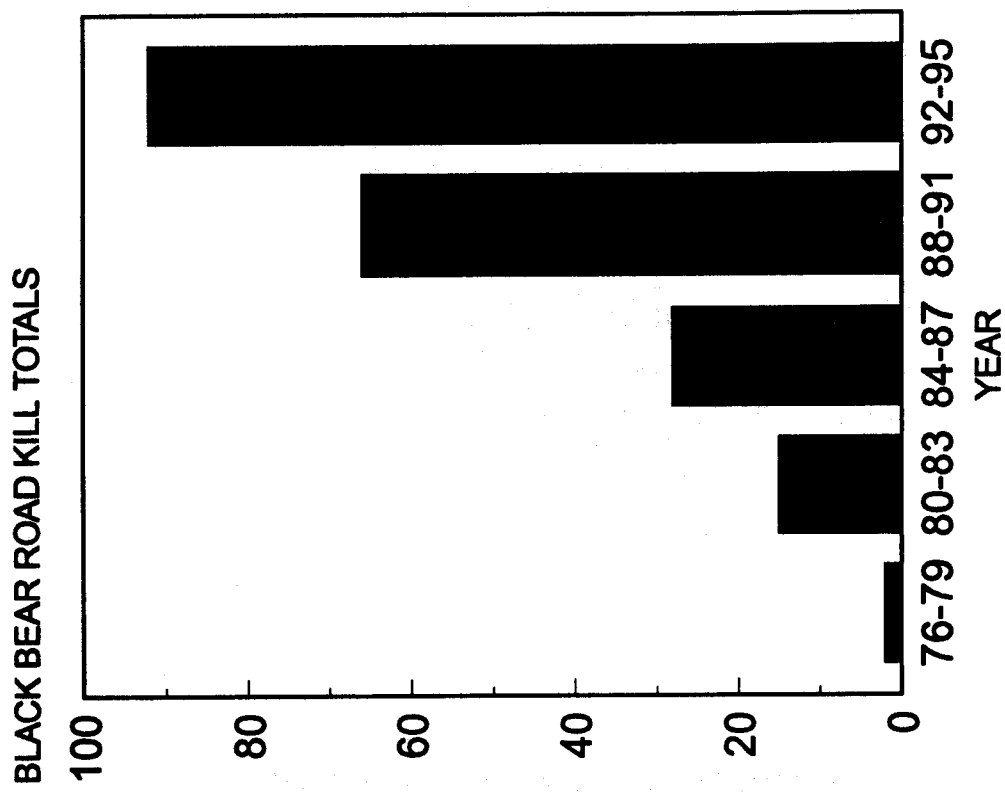
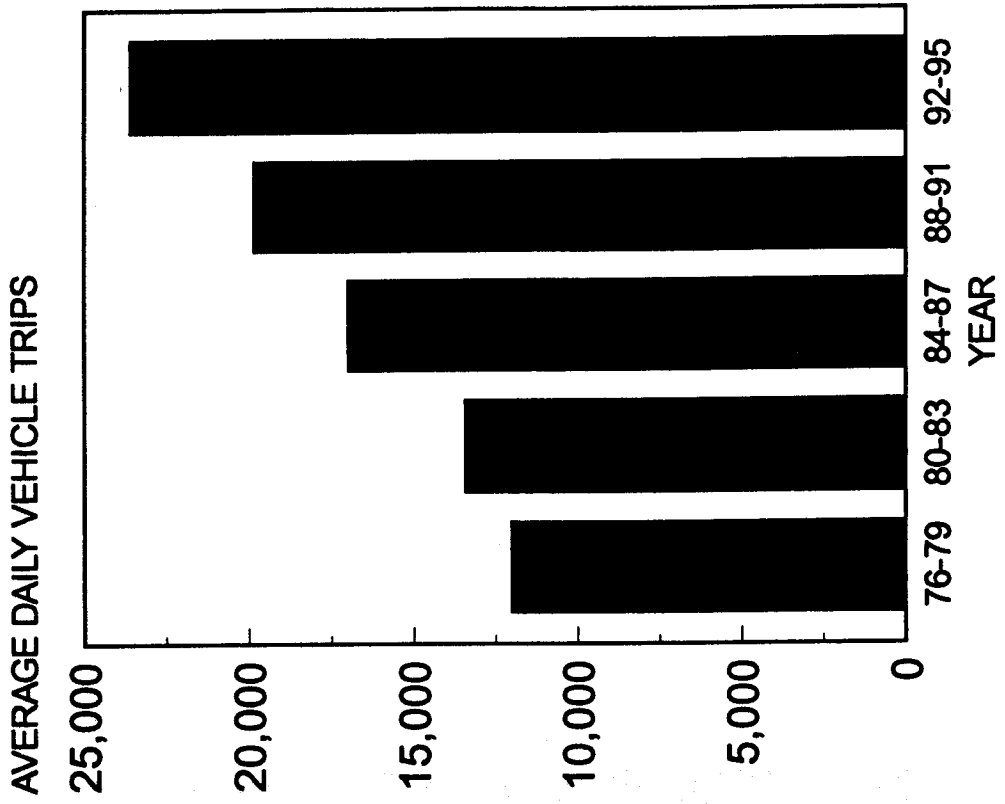


Figure 6. BLACK BEAR ROADKILL TOTALS AND TRAFFIC DATA FOR 5 COUNTIES 1976-1995

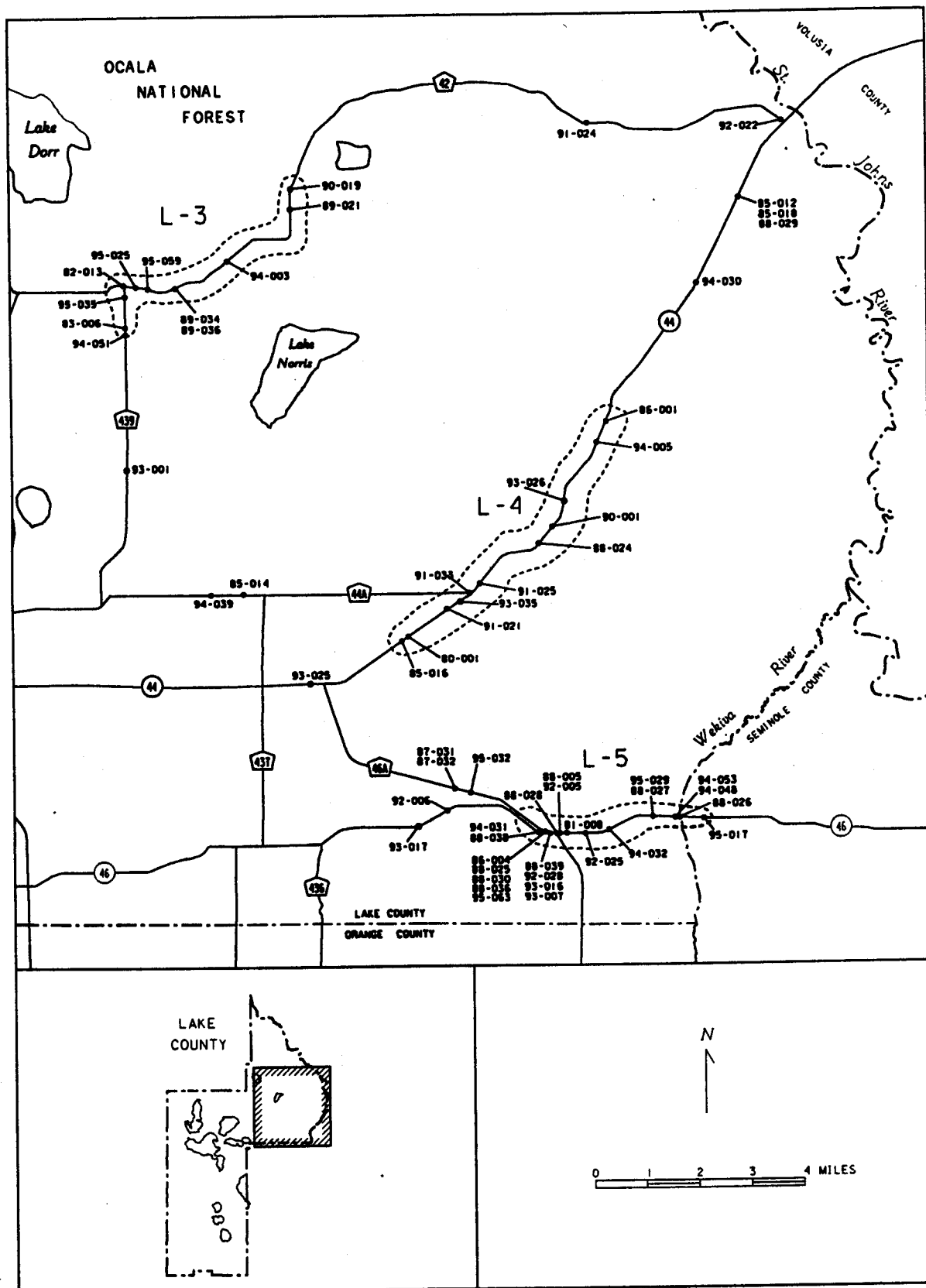


FIGURE 7; BEAR ROADKILL AREAS L-3 THROUGH L-5 ON COUNTY ROAD 42 AND STATE ROADS 44 AND 46 IN LAKE COUNTY.

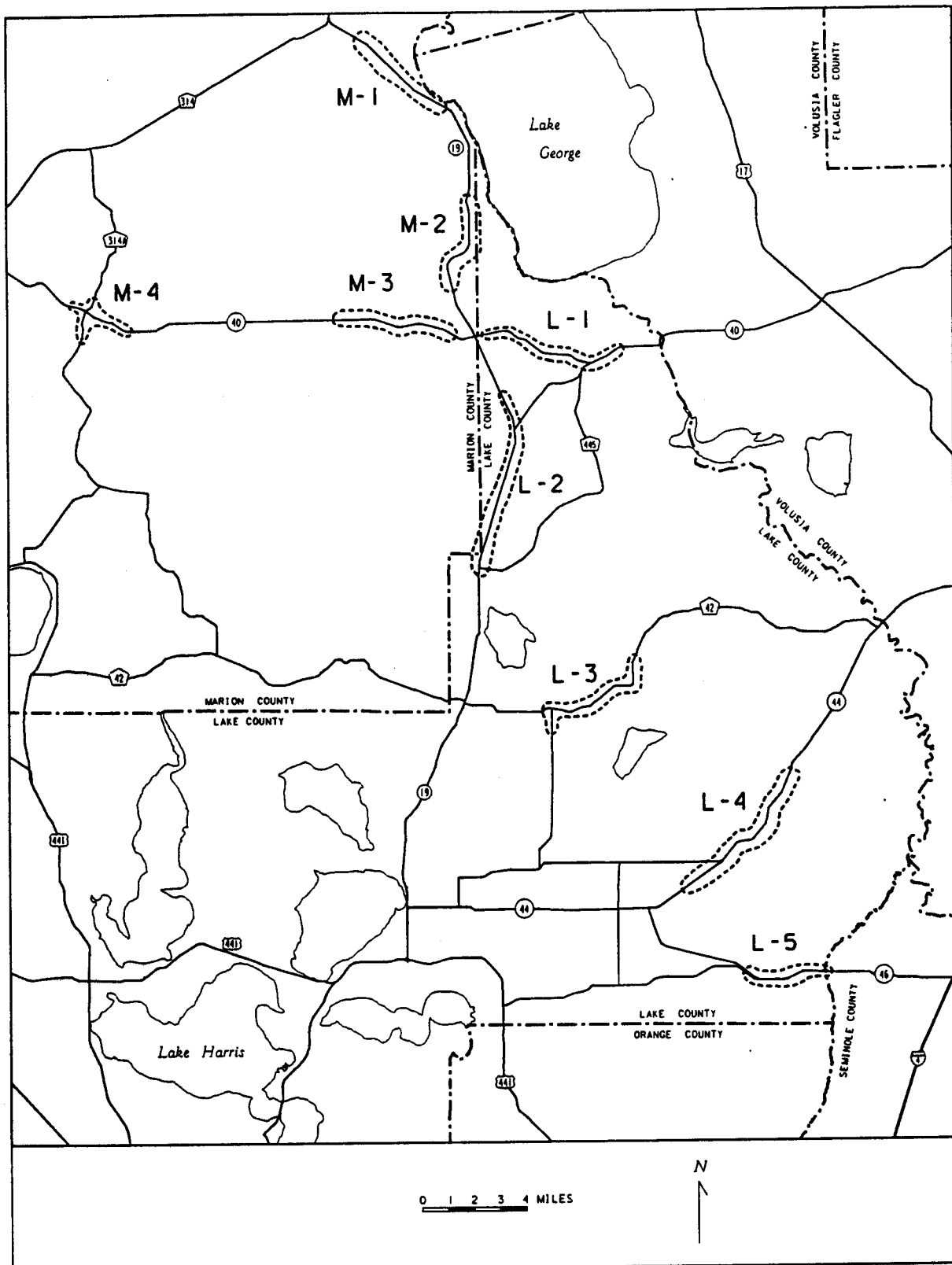


FIGURE 8. BEAR ROADKILL AREAS IN LAKE AND MARION COUNTIES, FLORIDA.