FINAL REPORT

Bureau of Wildlife Diversity Conservation

Project:	Avian Biological Surveys
Study:	**Survey of breeding American oystercatcher (*Haematopus palliatus*) populations in Florida**
Period Covered:	1 July 1999 - 31 December 2001
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Abstract: The status of the breeding population of American oystercatchers in Florida was known only from local surveys. Aerial and ground survey techniques were tested for efficacy. A statewide survey was conducted in 2001 using boats, personal watercraft, and all terrain vehicles. A total of 1,014 individuals, including 391 pairs, were documented. Breeding was confirmed for 213 pairs. Oystercatchers were concentrated in 6 regions around the state. Ninety-one % of the birds were documented on the Gulf coast. Fifty-two % of birds and 71% of breeding pairs were found on manmade substrates.

INTRODUCTION

The American oystercatcher (*Haematopus palliatus*) is sparsely distributed along Florida's sandy coastlines, typically nesting on bare or lightly vegetated beaches and dunes (Bent 1929). Their nests are typically shallow depressions in the substrate, occasionally lined with shells or other debris. Oystercatchers are generally solitary or loosely colonial during the breeding season, and are occasionally associated with colonial nesting species such as black skimmers (*Rynchops niger*) and least terns (*Sterna antillarum*) (Johnsgard 1981, Nol et al. 1984).

There is little published information about how American oystercatchers cope with the rapid changes occurring in many coastal systems, either natural or man-induced. They are reported to require extensive beaches and mudflats for their nesting, roosting, and feeding activities (Below 1996). However, oystercatchers have been noted utilizing non-traditional habitats such as spoil islands covered by Australian pine (*Casuarina equisetifolia*) (Toland 1992), salt marshes (Frohling 1965, Lauro and Burger 1989, Shields and Parnell 1990), and gravel-covered rooftops (Douglass and Gore 2001).

Although oystercatchers were apparently numerous in Florida in the 1800s (Audubon 1840, Scott 1889), the current population status of the American oystercatcher in Florida is poorly understood. The literature offers conflicting information on population trends. In *The Birds of North America* (Nol and Humphrey 1994) population estimates for American oystercatchers in Florida are conspicuously absent. Below (1996) stated that available information indicated that the population was stable over the previous 9 years but concluded that oystercatchers had been completely eliminated from portions of their Florida range by coastal development and, consequently, their numbers must be declining. Toland (1992, 1999) described oystercatchers in Florida as rare and locally distributed and concluded that development had contributed to their decline. Degange (1978) reported that intensive coastal development and human recreational activities had precipitated a rapid population decline. Paul and Below (1991), Robertson and Woolfenden (1992), and Stevenson and Anderson (1994) suggested that the Florida population was increasing following an historical low in the mid 1900s.

The statewide breeding population has been estimated at 300-350 pairs (Paul and Below 1991; Davis et al. 2001) concentrated in 4 major population centers: Apalachicola Bay, Citrus County, Tampa Bay, and the Indian River/Mosquito Lagoon. However, a systematic statewide survey had not been conducted to confirm these estimates or to provide a baseline for future monitoring efforts. In this study we looked at the efficiency and efficacy of ground versus aerial survey techniques and then used what we learned to design and implement a statewide survey of breeding American oystercatchers.

OBJECTIVES

The goal of this project was to determine the number of breeding pairs of American oystercatchers in Florida. Our specific objectives were to:

1. Summarize available information on breeding American oystercatchers in Florida from published and unpublished sources.

2. Develop an efficient survey technique to locate and census nesting American oystercatchers.

3. Conduct a statewide survey for breeding American oystercatchers and produce a statewide population estimate.

4. Identify the breeding distribution and key nesting areas for American oystercatchers throughout Florida.

STUDY AREA

The study area consisted of portions of coastal Florida with suitable habitat and within the known breeding range of the American oystercatcher (**Fig. 1-5**).

METHODS

Objective 1. Summarize available information on breeding American oystercatchers in Florida from published and unpublished sources.

All available published and unpublished accounts of American oystercatchers in Florida were compiled into a database compatible with the Florida Fish and Wildlife Conservation Commission's (FWC) Wildlife Observation Database (WILDOBS). Data sources reviewed included the Florida Field Naturalist reports, Breeding Bird Atlas, Christmas Bird Count, and WILDOBS. The database includes all available information for 14 variables: county, latitude, longitude, site name, habitat, date, # adults, # eggs, # chicks, # fledged, township/range/section, site number, notes, observer. Each Regional Wildlife Diversity Conservation Biologist (RWDCB) was provided with county maps of their region depicting locations of all historical (prior to 2001) occurrence records.

Objective 2. Develop an efficient survey technique to locate and census nesting American oystercatchers.

We evaluated the use of aerial surveys in relation to surveys conducted at ground level by comparing personnel time, cost, and efficacy in detecting oystercatchers in vegetated (spoil islands with an overstory of *Casurina sp.*) and un-vegetated habitats (oyster bars, beach, rock/shell spoil islands). Boats were chosen to assess the relative costs of ground level surveys because the locations surveyed were best accessed by water. In April 2000, delineated areas with known oystercatcher populations in Tampa Bay and the Indian River Lagoon were surveyed from a helicopter and a boat by independent observers. The RWDCB, South Region, surveyed the Indian River Lagoon by helicopter on 19 April, while the Assistant RWDCB, South Region, along with a volunteer, conducted a boat survey of that area on 18 and 22 April. The RWDCB, Southwest Region, conducted the helicopter survey of the Tampa Bay area on 19 April while staff of Audubon of Florida conducted the boat surveys of this same area on 19 and 20 April. The personnel time, transportation costs, and numbers of birds detected at each location were recorded. The number of individual oystercatchers observed from the air was recorded on a map. The latitude/longitude was recorded in degrees and decimal minutes by a hand-held Global Positioning System unit (Datum WGS84) for each individual or pair observed from the ground. The cost/hour, number of birds detected/hour, and the cost/detected bird were calculated. The cost of the aerial surveys was calculated as the cost of contracting a helicopter and pilot (@ $350/hour) plus the salary of the observer (Biological Scientist IV @ $18.00/hour). The costs of the boat surveys were calculated as the salary of 2 observers at each location (Biological Scientist IV @ $18.00/hour; OPS technician @

$10.00/hour) plus an estimated boat use fee ($50/day).

We conducted a qualitative assessment of various ground survey methods. We considered the relative equipment operating costs, availability of equipment, time efficiency, effectiveness in detecting birds, and versatility in accessing habitats of pedestrian surveys, and surveys conducted from all-terrain vehicles (ATV), airboats, canoes and kayaks, motor boats, and personal watercraft (PWC).

Objective 3. Conduct a statewide survey for breeding American oystercatchers and produce a statewide population estimate.

In 1993, regional staff conducted aerial surveys of the coastline to identify potential shorebird nesting habitat for a previous study. Local resource managers were consulted for occurrence data. Regional biologists used this information and personal knowledge of the region, combined with the maps of historical records, to prioritize limited survey time. Efforts were concentrated in areas with suitable habitat and within the known breeding range of American oystercatchers. We obtained corroborative data for some areas from R. T. and A. F. Paul, Managers of the Audubon of Florida's Coastal Islands Sanctuaries, who conduct annual surveys of nesting American oystercatchers along the Gulf Coast from Citrus through Sarasota counties using very similar observational techniques. Because they were able to survey these areas multiple times during the nesting season to obtain more accurate estimates of breeding pairs, their data were used as a barometer to measure the effectiveness of our survey techniques in detecting oystercatchers and to augment our data in areas where we were not able to survey due to time or access restrictions, i.e. Passage Key and Egmont Key of Tampa Bay.

While water depth was a limiting factor and portions of some bays, creeks, and marshes were not accessible by watercraft or other ground survey methods, every effort was made to search all accessible portions of the coast known to have suitable habitat. Survey routes were planned using NOAA nautical charts (1:40,000 or 1:80,000) or Florida Atlas maps (1:150,000) (DeLorme 1997). Surveys were conducted from mid-April through mid-June and augmented by volunteer observations of breeding activity into early July using predominantly PWC, motor boats, and ATVs.

In general, survey routes were run from PWC or motorboats. In areas where oystercatchers were expected to occur, surveys were conducted at idle speeds or the vessel was anchored and the shoreline was visually scanned using binoculars. Occasionally the surveyor left the vessel and walked the shoreline to locate the nest. Oystercatchers were located by stopping or slowing the vessel and listening for vocalizations along highly developed shorelines or in areas where nesting habitat was not immediately adjacent to the shore (i.e. behind breakwaters, on roofs, adjacent to airport runways, etc.). In areas within the known breeding range but with poor quality habitat, routes were run at higher speeds, with the surveyor visually scanning the shoreline. When oystercatchers were detected, the surveyor would stop the vessel to observe the birds' behavior and record data (see below). Observation periods ranged from <2 minutes when both adults were readily visible and activities such as incubating were obvious to >15 minutes in areas with multiple pairs or in areas where visibility was limited. Birds on rooftops required extensive periods (15 to 30 minutes) of observation to confirm breeding activity.

Buildings that were visible from the water were visually scanned for presence of oystercatchers in the course of surveying for ground nesting birds. All buildings with previous reports of roof-nesting oystercatchers (Douglass et al. 2001) were visited. Roof-nesting oystercatchers were identified by observing adults and/or young perched on the edge of the roof or flying to and from a roof, or observing recently fledged young with one or both parents at the base of a suitable building when no other suitable habitat was available. All roof-nesting observations were made from the ground level with the exception of 2 rooftop nests, which were surveyed by climbing onto the roof, or viewed from an adjacent, higher building.

ATVs were used along several extensive stretches of barrier island beaches. Observers continually scanned ahead of the ATV and stopped the vehicle to observe the birds as soon as they were detected.

Data collected at each location where oystercatchers were observed included: date, observer(s), survey type, site name, latitude, longitude, time, category, number of birds, activity, general habitat, nest location habitat, notes and disturbance (**Fig. 6**). *Survey Type* was based on the mode of transportation such as PWC or pedestrian. *Site Name* was assigned by the observer and generally consisted of a descriptive name based on the location and/or an identifying landmark. *Latitude* and *longitude* were recorded using a hand-held GPS unit and recorded as degrees and decimal minutes. Locations were recorded as close as possible to the observed birds without flushing them. Locations made from vessels were taken offshore, usually at a distance of 5 to 30 meters from the birds. Records indicating the presence of a nest with eggs were generally recorded at < 5 meters from the nest. *Category* was *individual* if seen singly, with no evidence of a mate nearby; a *pair* if seen with a mate or if evidence of a mate was confirmed (i.e. mate was heard calling but not directly visible to observer); a *probable pair* if only one bird was detected but behavior indicated that a mate was nearby; a *group* if multiple birds were seen at the same location and involved in non-breeding activities. The *Number of Birds* were recorded as the total number of individuals seen or represented. *General Habitat* was used to categorize the type of land mass with which the bird(s) or nest were associated. Habitat types were designated to broadly categorize marine/estuarine habitats typically used by oystercatchers into natural (mainland, barrier island, shell bar) or manmade (spoil islands, causeway, seawall, riprap). *Nest Location* was used to identify the habitat type in the immediate vicinity (within 2 meters) of the nest, when located. The activity of each bird(s) was recorded; activity codes were grouped into breeding and non-breeding categories. Unusual observations, predators, sources of disturbance, number of eggs or chicks, or other notes of interest were recorded. Results from the statewide survey are stored in *BWDC/field data/birds/amoy/ allamoydata2.mdb* and all occurrence records have been stored in WILDOBS.

In summarizing the data, **Pairs** refers to the sum of *Pairs* plus *Probable Pairs*. Because the relationship between the observation of a pair and actual breeding is unknown, **Breeding Pairs** was calculated as *Pairs* plus *Probable Pairs* for only those records with a breeding activity code.

Objective 4. Identify the distribution of and key nesting areas for American oystercatchers throughout Florida.

Results from the survey were analyzed using Microsoft Access for total number of oystercatchers observed; number of groups, individuals, and pairs (=pairs + probable pairs) of oystercatchers by county and region; total number of oystercatchers and number of breeding pairs on manmade vs. natural substrates; and number of roof-nesting pairs. Manmade substrates included spoil, sea walls, bulkheads, rip rap, and fill (including airports, power plants, and ports). The data were plotted on maps using ArcView GIS for visual analysis and to illustrate the distribution of oystercatchers. The relative density of nesting pairs was analyzed using a kernel density estimator in ArcGIS Spatial Analyst. The kernel density calculation sums the number of nests that fell within a 3 km search radius and divides this by the search area size, weighting those points lying near the center of the search area more heavily than those lying near the edge (McCoy 2002). A search radius of 3 km was chosen because it represents a typical maximum forage radius from the nest site as identified by Nol (1989).

RESULTS

Objective 1. The compilation of historical data on breeding American oystercatchers in Florida is stored as *BWDC/field data/birds/amoy/amoyhistorical2000.dbf*. It contains 571 records from 26 counties dating from 1975 through 2000.

Objective 2. The aerial survey detected only 29% of the oystercatchers observed by boat in Tampa Bay. None of the 13 birds observed by boat were detected from the helicopter in the Indian River Lagoon. Boat surveys were found to be both more effective at detecting oystercatchers and more efficient than aerial surveys (**Table 1**).

Site conditions such as location, habitat type, and accessibility, dictated which of the various ground survey methods was most appropriate and outweighed the other values considered (cost, availability, efficiency). Motorboats and PWCs were used most frequently to access oystercatcher habitat along the Florida coastline.

Objective 3. We documented 1,014 adult American oystercatchers in 20 counties, including 391 pairs (pairs + probable pairs) (**Table 2**).

Objective 4. Oystercatchers occurred in 6 relatively disjunct aggregations around the state (**Fig. 7**): eastern Bay through Wakulla counties in the **Panhandle**; birds associated with 3 clusters of islands (predominantly spoil) in Levy, Citrus, and Hernando counties of the **Big Bend** area; **Southwest Florida** from Pasco through Lee counties, including Tampa Bay; Coastal rivers of Nassau, Duval, and St. Johns counties in **Northeast Florida**; the Halifax and North Indian Rivers of **Volusia** County in east central Florida; and the **Indian River** in Indian River and St. Lucie Counties in southeast Florida. Ninety-one % (n= 927) of the total number of American oystercatchers and 90% (n=351) of the pairs (pairs + probable pairs) occurred in the 3 Gulf Coast regions of Florida (Southwest, Panhandle, Big Bend) during the 2001 breeding season (**Table 3**). Within those regions, oystercatchers were concentrated in 4 counties (Hillsborough, Franklin, Pinellas, and Citrus), which accounted for 69% (n=701) of the total number of oystercatchers and 73% (n=284) of the pairs (**Table 4**). Breeding was confirmed by the observation of copulation, an adult in incubating posture, a nest with eggs, or presence of flightless young for 213 pairs of oystercatchers. Oystercatchers nested in greater numbers and in greater densities along the west coast of Florida (**Fig. 8-12**). Nine sites along the west coast were identified as areas of highest nesting concentration.

Fifty-two % of all birds were observed on manmade substrates. Seventy-one percent (n=151) of confirmed breeding pairs were recorded on manmade substrates, predominately spoil islands (**Table 5**). Nesting in the Indian River, Southwest, and Big Bend regions occurred predominantly on manmade substrates (100%, 90%, 88% respectively) (**Fig. 13**). There was very limited use of manmade substrates for nesting in the remaining regions (< 8%). In the county with the largest number of confirmed breeding pairs (Hillsborough), 98% (n=77) occurred on manmade substrates. Roof nesting was documented in 3 counties: Pinellas (11 pairs), Hillsborough (2 pairs), and Sarasota (1 pair).

Nesting was initiated earlier than expected. Nests with young were found on the first date of the survey in the Panhandle (4/19) and Southwest (4/23) regions. Incubating adults were found on the first day of the survey in the other regions: Northeast (4/20), Big Bend (4/24), Volusia (5/2), and Indian River (5/2). Incubation was observed as late as 7/4 in the Tampa Bay region.

DISCUSSION

Survey Techniques

In order to detect oystercatchers from a helicopter, the aircraft must operate at an altitude of <30 meters and a speed of <40 knots. This combination of altitude and speed is considered high-risk and is not recommended for safety reasons (Captain Lance Ham, FWC, Personal Communications). Both the cost per survey hour and cost per detected bird indicated that boat surveys are significantly more cost effective than aerial surveys, even when the comparison was conducted assuming number of birds detected from the air was equal to the number of birds detected from the boat. There was a higher hourly rate of detection using aerial counts (23.8 birds/hour) vs. boat counts (16.7 birds/hour) in Tampa Bay. This was a function of speed and coverage. However, the overall low level of detection at both locations, high safety risk associated with this kind of flying, and considerably higher cost of aerial surveys clearly supports the use of boat or ground surveys over aerial surveys under most conditions. The use of aerial surveys may be considered when no other form of access is available for an area of high interest.

Pedestrian surveys were useful on a limited basis in areas that were not easily accessible by other means. While having the lowest equipment related costs, they are the least efficient use of observer time and are not practical for covering extensive terrain. Additionally, oystercatchers are more sensitive to approach by pedestrians than they are to tangential movement of watercraft (R. T. Paul, Audubon of Florida, personal communication).

ATVs were useful in areas where access by water was limited. They are relatively efficient for covering extensive terrain. We observed oystercatchers to be more sensitive to approaching ATVs than to watercraft, which required the observer to continually search for birds at a greater distance. Operating costs are moderate.

Airboats were not utilized in this survey due to limited access to trained operators and because of the significant flushing distances associated with propeller noise (Rodgers and Schwikert 2003). However, because of their speed and extremely shallow draft, airboats may be an effective tool in surveying large stretches of otherwise inaccessible coast for presence/absence data where the probability of encountering oystercatchers is low, as is the case in the Big Bend region north of the Citrus County spoil islands. More work is needed to determine oystercatcher-specific flushing distances before efficacy can be adequately assessed. Use of airboats in open coastal waters is weather-limited for safety reasons. Operating costs are moderate.

Canoes and kayaks offer the shallowest draft and least intrusive means of surveying oystercatchers but are not practical for covering large areas. Like pedestrian surveys, they are not an effective use of observer time. They may be useful in areas where no other access is available, where volunteer assistance is plentiful, or in areas where motorized vessels are prohibited. Operating costs are minimal.

Shallow-draft outboards and PWCs have similar drafts at idle speeds. At planing speeds, PWCs are fast, highly maneuverable, and have extremely shallow draft, making them most effective at surveying long stretches of shallow coastline. They are also easier to operate in the surf than motor boats when observers need to approach a high energy coastline closely. However, they are cumbersome to work from (unstable for binocular use, poor storage capacity), tend to soak the operator and exposed equipment even under very calm conditions, cannot be operated for extended periods of time at idle speed, have low fuel capacity, and are very loud. While the oystercatchers did not appear to be significantly more sensitive to the approach of these vessels than motor boats, the engine noise made it difficult to detect birds by vocalizations. Motor boats were more effective in areas with extensive idle-speed-only zones such as the Inter Coastal Waterway and in areas where birds were most readily detected by vocalizations. Operating costs for both of these vessels are moderate.

In areas of overlap, where we could compare results from this survey to those from the Audubon survey, we found detection rates to be similar (R.T. and A.F. Paul, personal communication). The Audubon data were generally collected slightly later in the season. Thus, we were able to use these data to confirm nesting activity for some suspected breeders, to augment our data set, and to sort out some confusing records in several areas of high nesting density such as the Citrus County spoil islands, and the Tampa Bay islands of Alafia Banks and 2D. While multiple site visits would have provided more complete coverage, comparisons with the Audubon data and historical records indicated that this survey was fairly comprehensive and provides a relatively accurate estimate of the actual population.

Breeding Population Estimate

Florida most likely supports the largest population of breeding American oystercatchers on the east coast of North America. Using Davis et al.'s (2001) minimum estimate for the number of oystercatchers breeding along the Atlantic Coast (Nova Scotia to Florida) and the Gulf Coast of Florida (n=1,624 pairs), Florida (n=391 pairs) may support as much as 24% of this breeding population.

Because Florida supports a significant proportion of the breeding population, reproductive success rates in Florida may influence the stability of this population. Toland (1999) summarized nest success (percent of pairs to fledge at least one young) reported in studies published between 1964-1994 as ranging from 34% to 80%. Nol (1989) reported a mean reproductive success of 14% during a three-year study in Virginia. Davis et al. (2001) reported a 5% nest success at Cape Lookout National Seashore, N.C. In a study of American oystercatcher behavior conducted from 1986 to 1996 in Indian River County, Florida, 57% of nesting attempts were successful in fledging at least one young (Toland 1999). Gore (unpublished data) reported a success rate of 11% for pairs nesting in Franklin County, Florida between 1995 and 1996. Toland (1999) documented a lower nesting success by oystercatchers using islands with a tradition of regular recreational use by humans (33%) than those that nested on islands with little or no human disturbance (77%). Nest success was not assessed as part of this survey. However, incidental observations indicated that reproductive success is extremely low in some habitat types. While colonial beach nesters rely on mobbing defenses, and smaller, solitary beach nesters such as snowy plovers rely heavily on camouflage, oystercatchers are relatively large, conspicuous birds that frequently nest in the most open stretches of beach where they are quite visible. They depend on earlier detection of potential predators and quicker evasive action than many other beach nesters. This cryptic behavior renders them particularly vulnerable to disturbance. Furthermore, they frequently nest just above the wrack line, where human traffic on the beach tends to be heaviest. Florida Park Service personnel who manage several barrier island parks on the southwest coast indicated a 100% nest failure rate due to predation by raccoons and disturbance by people. Barrier islands, which were undoubtedly the oystercatcher's preferred habitat historically, are heavily targeted for development and recreational use. In addition to direct disturbance by people and their pets, recreational use of these islands results in increased populations of terrestrial predators such as rats and raccoons, which are attracted to refuse left by people and which gain easier access to the islands when they are connected to the mainland. Davis et al. (2001) reported that 77% of nest losses were due to predation. Seventy-nine % of the identified predators were raccoons and 21% were feral house cats. Severe weather and overwash are the other frequently cited causes of nest failure. Research is needed to determine if there is a difference in nest success between habitat types and to determine what factors affect reproductive success in Florida.

Dependence on manmade substrates, particularly for nesting, is very high and is likely increasing (Paul 1991, Douglass et al. 2001, Toland 1999). Although their ability to adapt to manmade nesting substrates has allowed them to take advantage of newly created habitats, it has also subjected them to other anthropogenic impacts. On the spoil islands of Hillsborough Bay, among the densest nesting sites for oystercatchers in the state, a single boat wake from a passing ship was observed over-washing numerous nests, undoubtedly contributing to nesting failure (R. T. Paul, personal communications).

In Virginia, oystercatchers with large nearby feeding areas laid earlier, had larger eggs, and had higher fledging success than those with no nearby feeding areas (Nol 1989) Also, flight time to distant feeding areas was negatively correlated with egg size. Nol concluded that the increase in fledging success for pairs with large nearby feeding areas was a function of the adults ability to remain vigilant over the young while foraging. Similarly, A. Paul (personal communications) observed that, on the Hillsborough spoil islands, the nests that produced the most young annually and the most consistently successful nests from year to year were those of pairs whose nesting territories contained a proximate food source (oyster beds) and that these birds were always the earliest nesters. She observed that pre-fledged young with a food source in their natal territory were able to augment their diet by foraging for themselves while young who did not have a forage base within their natal territory were at a disadvantage, especially when parents had to fly considerable distances to obtain food. While additional work is needed to assess the relationship between proximity of food source and reproductive success, these observations may provide insight into a potential new management technique for enhancing productivity of American oystercatchers under certain conditions.

Management actions that may benefit American oystercatchers in Florida include:

1. Providing nesting habitats which are free from human-related disturbance by restricting human access during the nesting season, educating recreational users of nesting habitat, and controlling predator populations in areas where they are anthropogenically enhanced;

2. Controlling erosion on occupied spoil islands and augmenting those that have eroded;

3. Creating new spoil islands;

4. Educating building owners and occupants on protection of roof-nesting oystercatchers;

5. Managing vegetation where exotics or growth rates reduce nesting habitat availability.

CONCLUSIONS

The estimate of Florida's breeding season population of American oystercatchers from this survey is similar to earlier estimates. However, lack of historical surveys prevents us from definitively assessing the stability of the population. Their relatively low numbers, sensitivity to disturbance, and dependence on manmade habitats render this species biologically vulnerable. Additional work is needed to ascertain population trends for this species in Florida and to develop solid management and conservation strategies.

Recommendations

1. Conduct needed research on factors affecting reproductive success, survival, and longevity and incorporate these findings into management actions. Following is a list of some of the highest priority research needs:
    A. Productivity rates and factors affecting productivity among the different regions and habitat types, including a comparison of various manmade and natural habitats.
    B. Factors affecting adult and juvenile survival rates

C. Seasonal movements and migrations
D. Longevity
E. Affects of proximity of food sources to natal territories
F. Design specifications for creating or restoring nesting and feeding habitats

2. Develop and implement a conservation plan for American oystercatchers in Florida.
Conservation efforts should be focused on three areas: the Tampa Bay portion of the Southwest Region, the Cedar Keys and islands, and Citrus County spoil islands in the Big Bend Region, and Apalachicola Bay in the Panhandle Region. Well over half of oystercatchers statewide and the majority of oystercatchers in the Southwest, Indian River, and Big Bend regions occurred on manmade structures; the importance of this habitat type cannot be underestimated. Management plans for these three regions need to focus specifically on spoil islands and other manmade habitats. Plans should address disturbance problems (existing and potential) and detail erosion control and beneficial uses of dredge material to enhance eroded islands through interagency cooperative agreements. Conservation of oystercatchers in the Panhandle should focus on protection of natural habitats and prevention of human-related disturbance that is likely to increase based on human demographic projections.
3. Repeat this breeding season survey in 10 years to monitor population trends.

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Table 1. Number of American oystercatchers detected, survey hours, total cost ($), cost per survey hour ($/hour), cost per oystercatcher detected ($/bird), and detection rate (birds/hour) for boat vs. aerial surveys in Tampa Bay and Indian River Lagoon, Florida in April 2000.

Site	Method	Birds detected	Survey hours	Total cost ($)	Cost per survey hour ($/hour)	Cost per detected bird ($/bird)	Detection rate (birds/hour)
Tampa Bay							
	Boat	146	8.75	345.00	39.43	2.36	16.7
	Aerial	43	1.8	920.00	511.11	21.40	23.8
						6.30[a]	
Indian R. Lagoon							
	Boat	13	14.5	506.00	34.90	38.92	0.89
	Aerial	0	4.0	1,472.00	368.00	-	-
						113.23[a]	

[a] Hypothetical cost/detected bird if number of birds detected by air equal to number of birds detected by boat.

Table 2. Numbers of individual American oystercatchers and pairs observed in Florida during the 2001 breeding season.

County	No. of birds	No. of Pairs
Hillsborough	260	107
Franklin	179	50
Pinellas	157	75
Citrus	105	52
Lee	55	10
Wakulla	42	16
Gulf	35	7
Levy	32	8
St. Johns	32	12
Sarasota	23	9
Volusia	17	10
Duval	16	7
Manatee	13	4
Nassau	12	6
Pasco	10	5
Indian River	8	4
Hernando	6	3
Charlotte	6	3
Bay	4	2
St. Lucie	2	1
Total	1014	391

Table 3. Number of American oystercatchers and number of American oystercatcher pairs (pairs + probable pairs) recorded in 3 regions of Florida (Southwest, Panhandle, Big Bend) during the 2001 breeding season.

Region	No. of birds	No. of Pairs
Southwest	514	208
Panhandle	260	75
Big Bend	143	63
Total/statewide	917/1014 =91%	346/391=89%

Table 4. Number of American oystercatchers and number of American oystercatcher pairs (pairs + probable pairs) recorded in 4 counties (Hillsborough, Franklin, Pinellas, and Citrus) in Florida during the 2001 breeding season.

County	No. of birds	No. of Pairs
Hillsborough	258	106
Franklin	179	50
Pinellas	159	76
Citrus	105	52
Total/statewide	701/1014=69%	284/391=73%

Table 5. Number of confirmed breeding pairs of American oystercatchers using manmade vs. natural nesting substrates by region in Florida, 2001.

	Natural			**Manmade**				
	Shell Bar	**Barrier Island**	**Mainland**	**Roof**	**Riprap/ Breakwall**	**Dredge Spoil**	**Causeway**	**TOTAL**
Panhandle	8	15	1		1	1		26
Big Bend		5				36		41
Southwest	1	11		11		96	3	122
Northeast	11	2	1					14
East Central	7							7
Southeast						3		3
Total	27	33	2	11	2	133	4	213

Figure 1. Portions of the central east coast of Florida surveyed for American oystercatchers, 2001.

Figure 2. Portions of the northeast coast of Florida surveyed for American Oystercatchers, 2001.

Figure 3. Portions of the southwest coast of Florida surveyed for American oystercatchers, 2001.

Figure 4. Portions of the Big Bend region of Florida surveyed for American oystercatchers, 2001.

Figure 5. Portions of the panhandle of Florida surveyed for American oystercatchers, 2001.

Figure 6. Data sheets used to record American oystercatcher observations during the 2001 Florida statewide breeding season survey.

Figure 7. Oystercatchers occurred in 6 regions of Florida during the 2001 breeding season survey.

Figure 8. Relative density of nesting American oystercatchers in the Panhandle Region of Florida, 2001. Sites supporting the highest concentrations of nesting birds are noted.

Figure 9. Relative density of nesting American oystercatchers in the Big Bend Region of Florida, 2001. Sites supporting the highest concentrations of nesting birds are noted.

Figure 10. Relative density of nesting American oystercatchers in the Southwest Region of Florida, 2001. Sites supporting the highest concentrations of nesting birds are noted.

Figure 11. Relative density of nesting American oystercatchers in the Northeast Region of Florida, 2001.

Figure 12. Relative density of nesting American oystercatchers in the Volusia and Indian River Regions of Florida, 2001.

Figure 13. Nesting substrates (natural vs. manmade) used by 213 pairs of American oystercatchers in 18 counties in Florida, 2001.

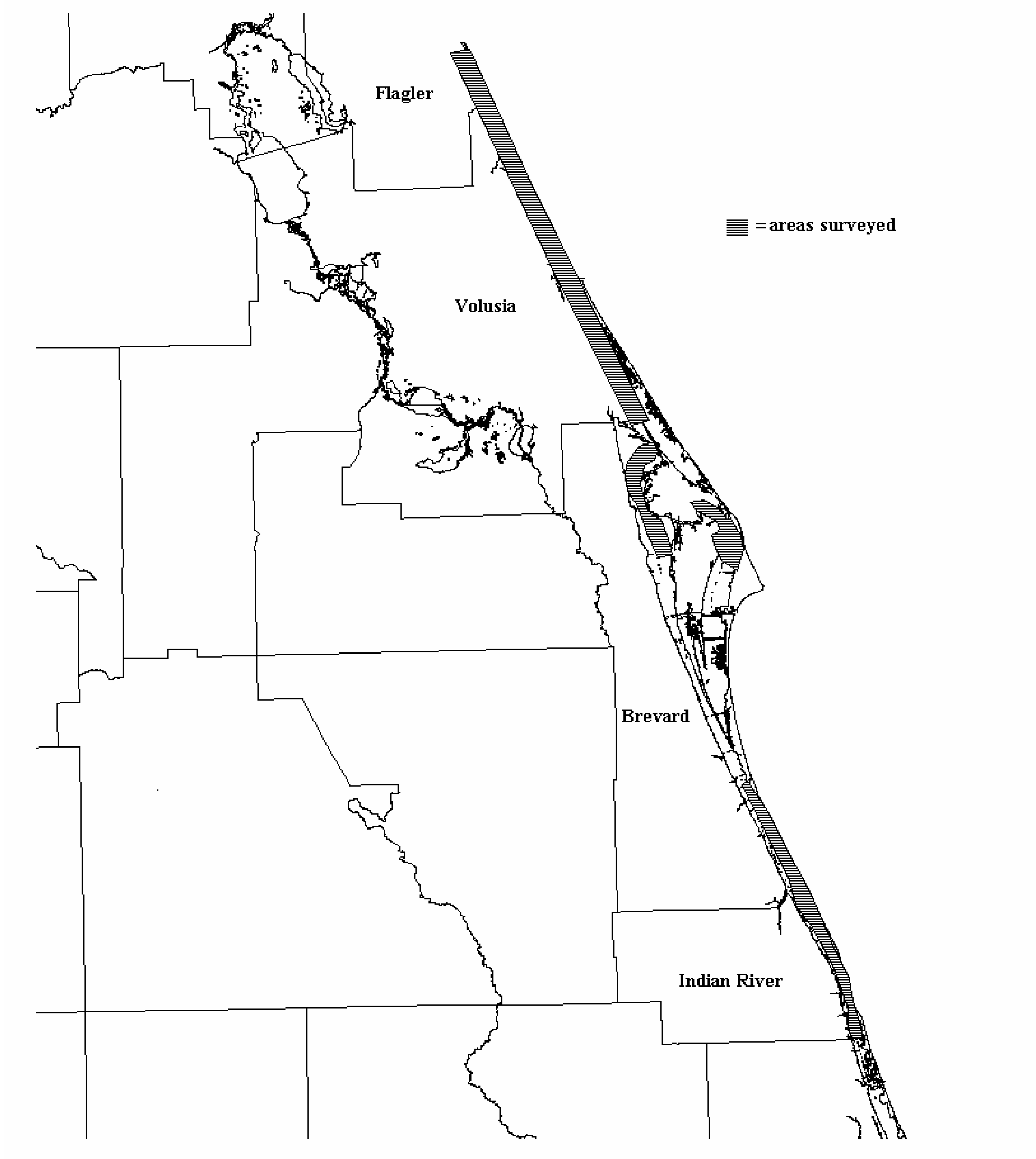

Fig. 1. Portions of the central east coast of Florida surveyed for American oystercatchers, 2001.

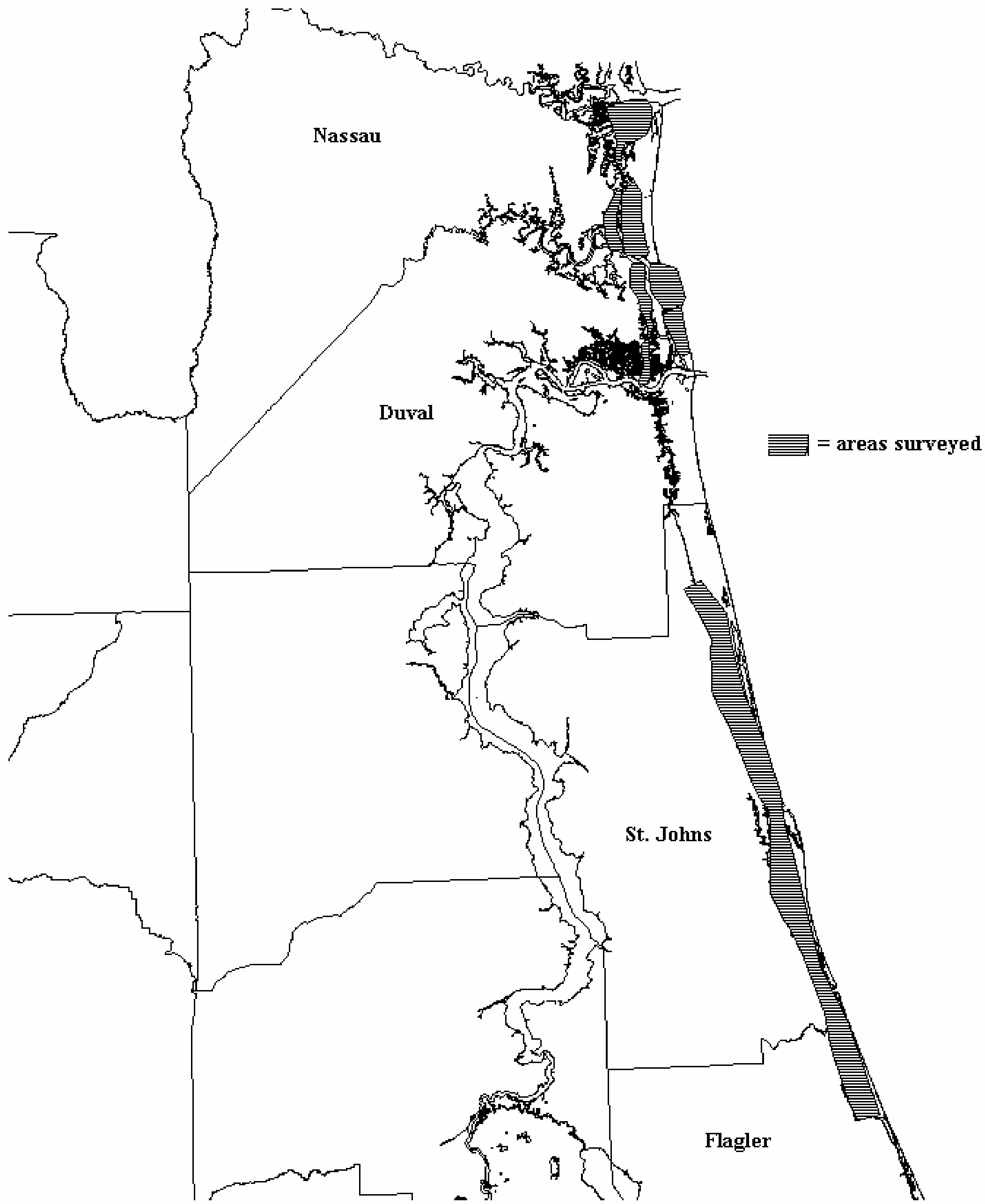

Fig. 2. Portions of the northeast coast of Florida surveyed for American Oystercatchers, 2001.

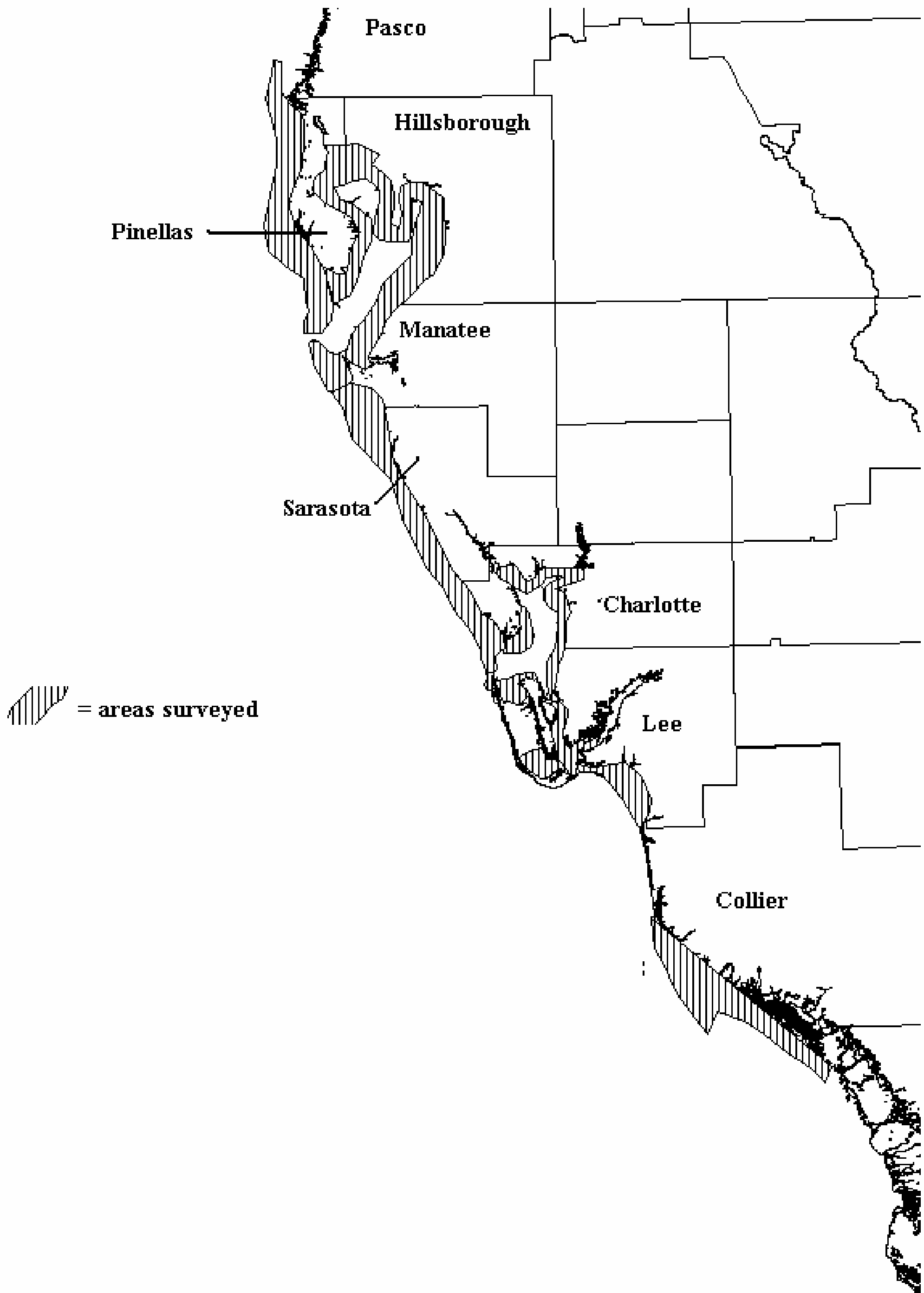

Fig. 3. Portions of the southwest coast of Florida surveyed for American oystercatchers, 2001.

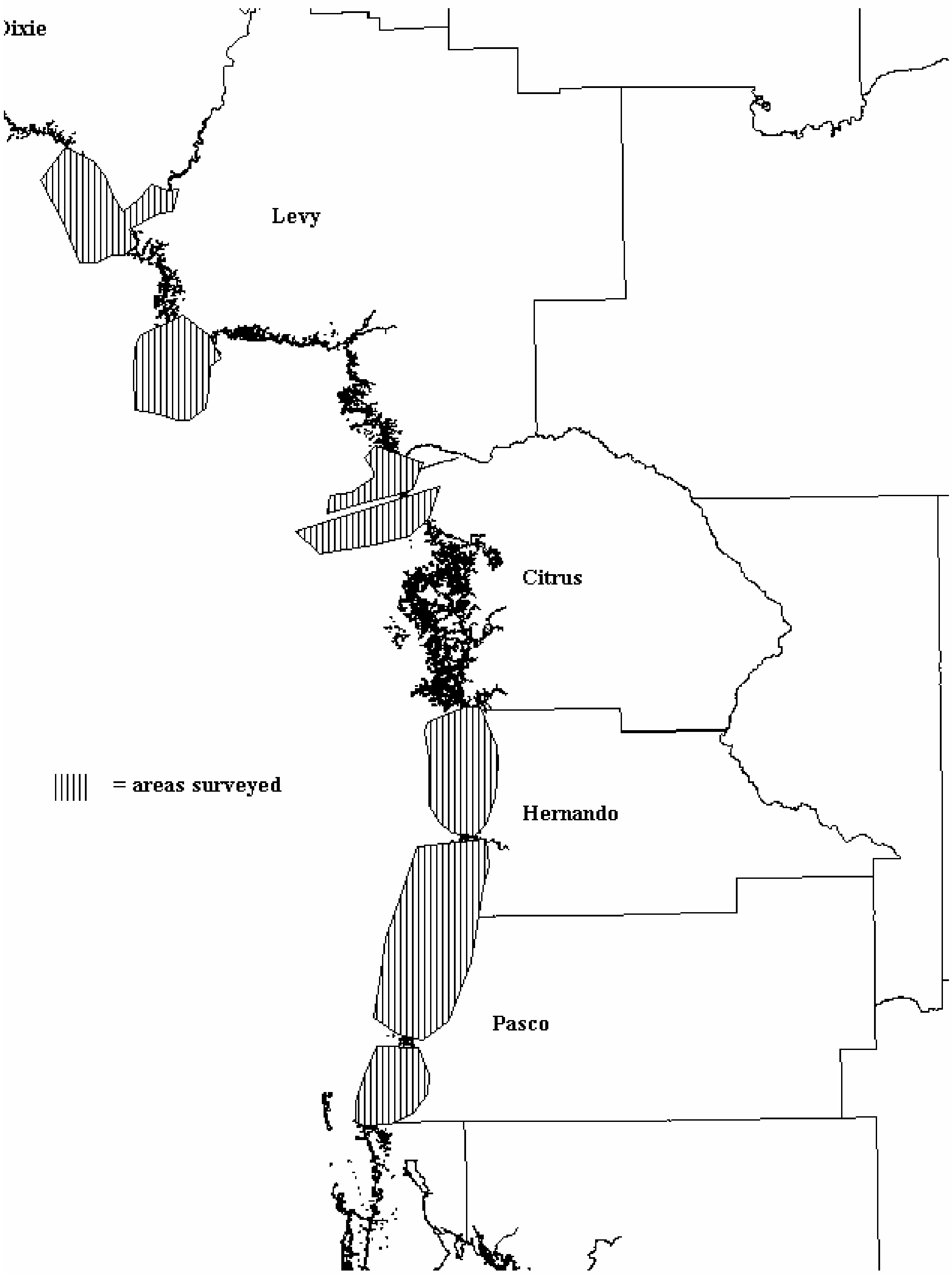

Fig. 4. Portions of the Big Bend region of Florida surveyed for American oystercatchers, 2001.

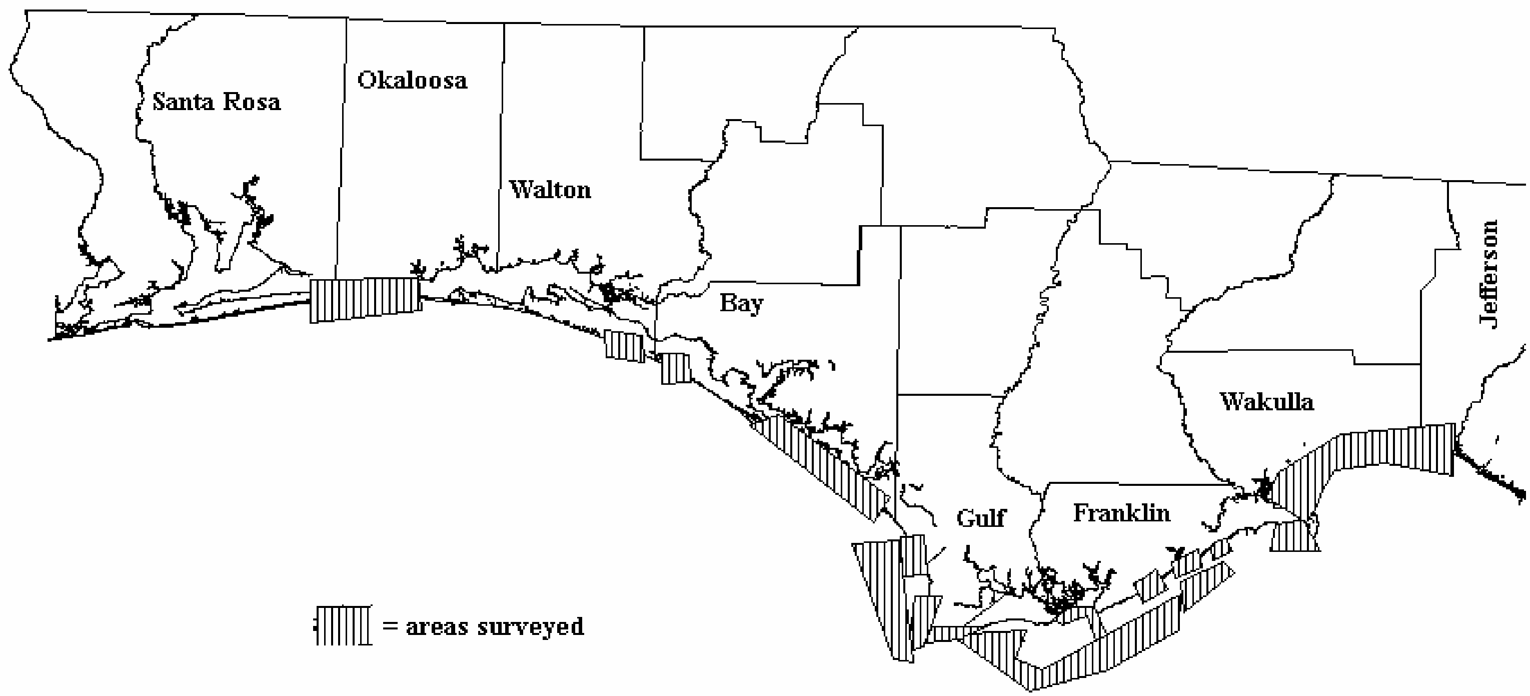

Fig. 5. Portions of the panhandle of Florida surveyed for American oystercatchers, 2001.

2001 AMERICAN OYSTERCATCHER SURVEY

Date ________________ Observer(s) ____

Survey Type: Boat Pedestrian Aerial PWC ATV Other __________________

Site Name ____

Latitude ______________________ Longitude ________________________ Time _____________

INDIVIDUAL PAIR PROBABLE PAIR GROUP _________

Activity and Notes:____

Habitat: Mainland Barrier Island Dredge Spoil Causeway Shell Bar

Bare:	sand	gravel	shell	other____________________
Low Vegetation:	dune	marsh	other ________________________________	
Overstory:	mangrove	pine	other ________________________________	

Notes and Disturbance:

____

____

Activity Codes: **Nonbreeding**: 02 - loafing, 04 -feeding, 13 - standing, 17 - flying

Breeding: SH - seen in suitable habitat, T - territorial behavior, C - courtship or copulation, ON - on nest, NE - nest with eggs

Fig. 6. Data form used to record American oystercatcher observations during the 2001 Florida statewide breeding season survey.

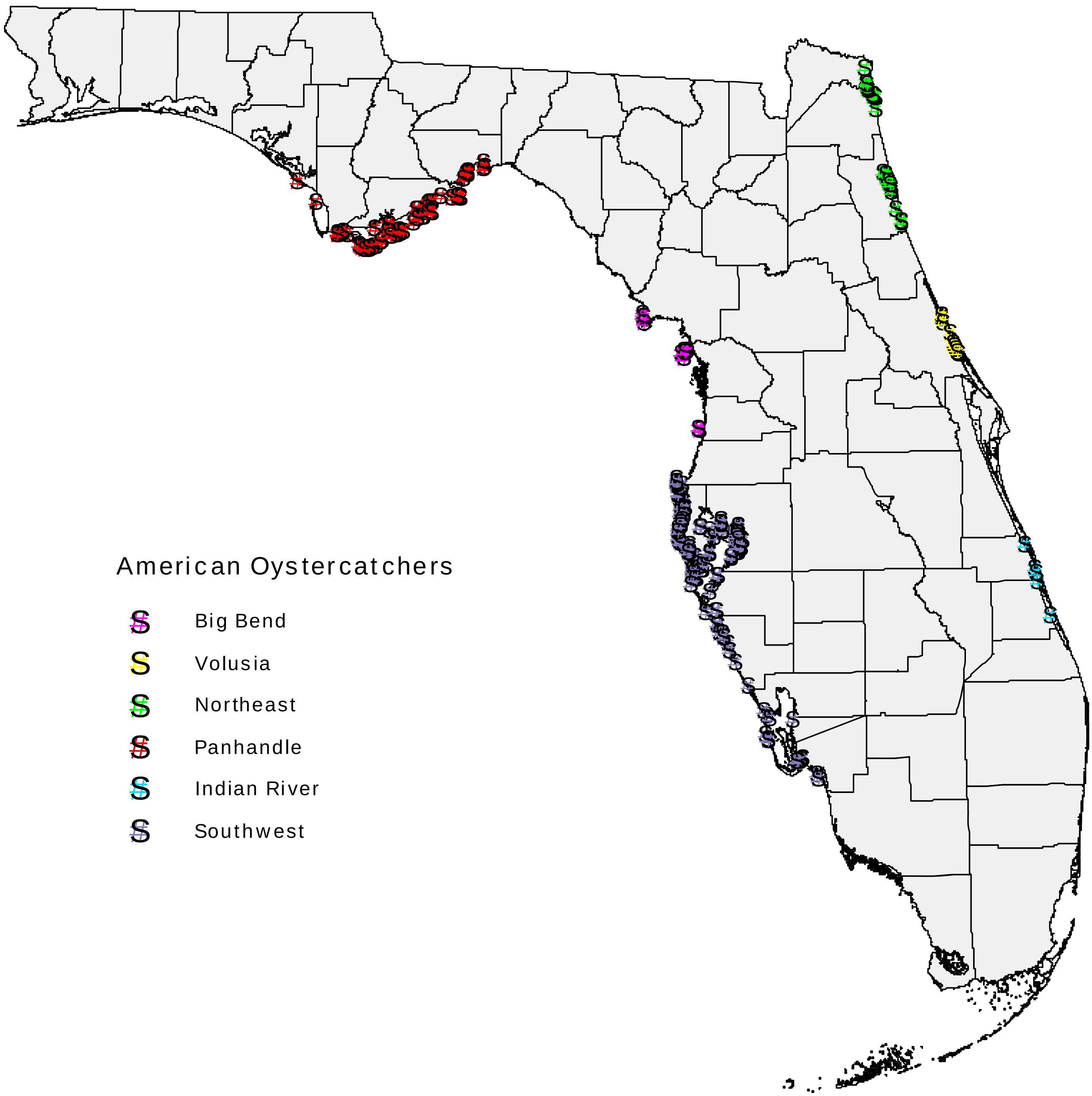

Fig. 7 Oystercatchers occurred in 6 regions of Florida during the 2001 statewide breeding season survey.

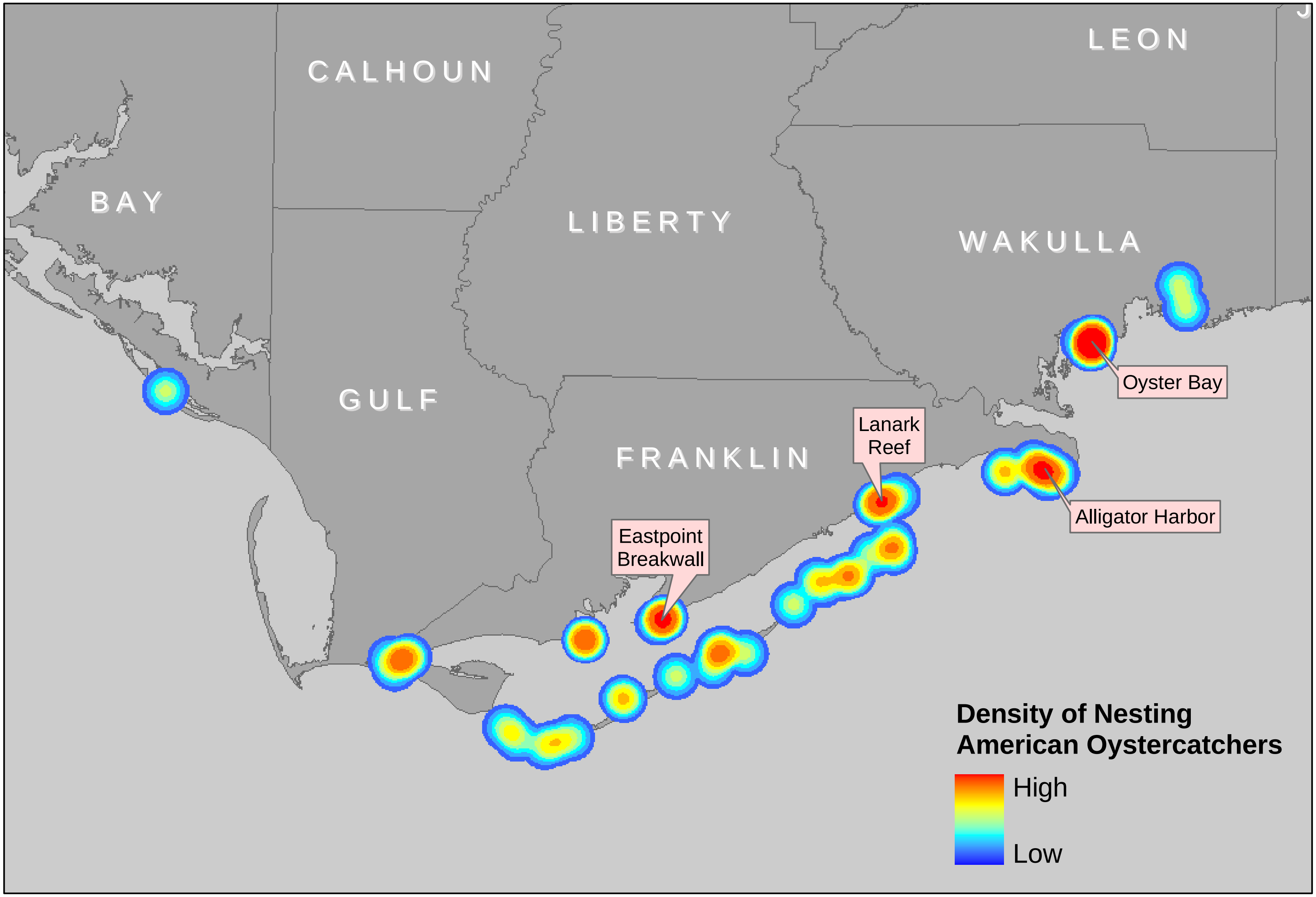

Fig. 8. Relative density of nesting American oystercatchers in the Panhandle Region of Florida, 2001. Sites supporting the highest concentrations of nesting birds are noted.

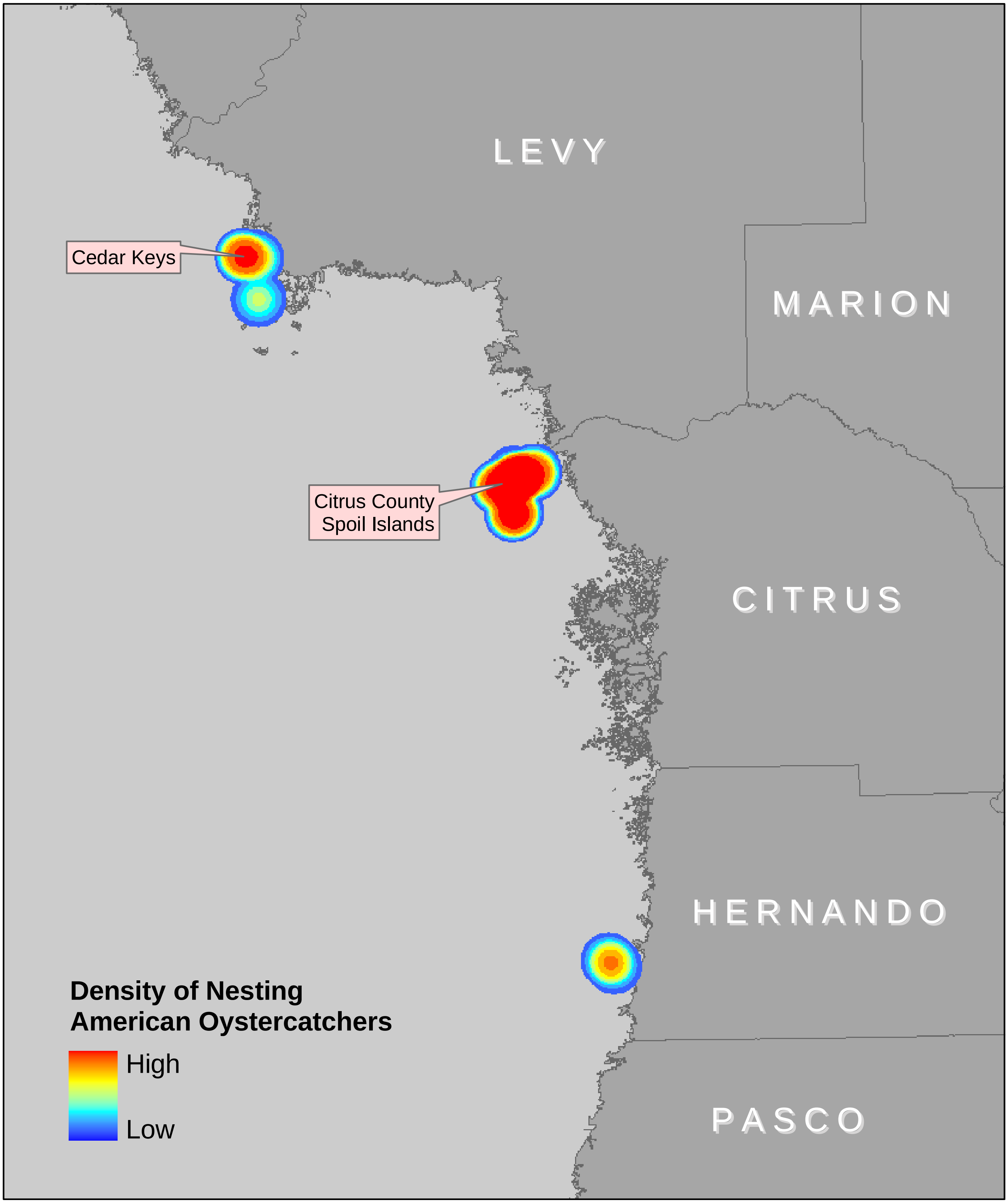

Fig. 9. Relative density of nesting American oystercatchers in the Big Bend Region of Florida, 2001. Sites supporting the highest concentrations of nesting birds are noted.

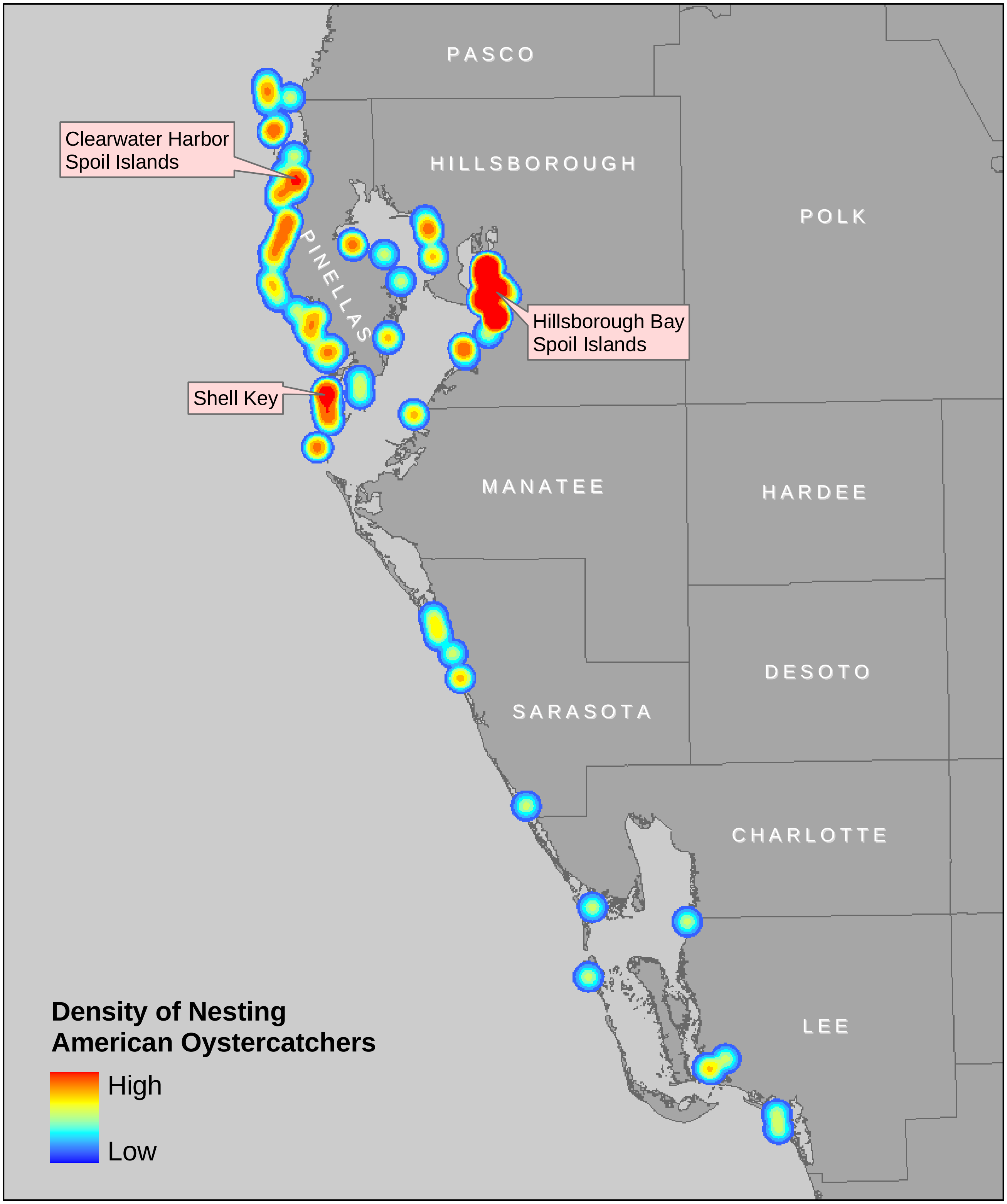

Fig. 10. Relative density of nesting American oystercatchers in the Southwest Region of Florida, 2001. Sites supporting the highest concentrations of nesting birds are noted.

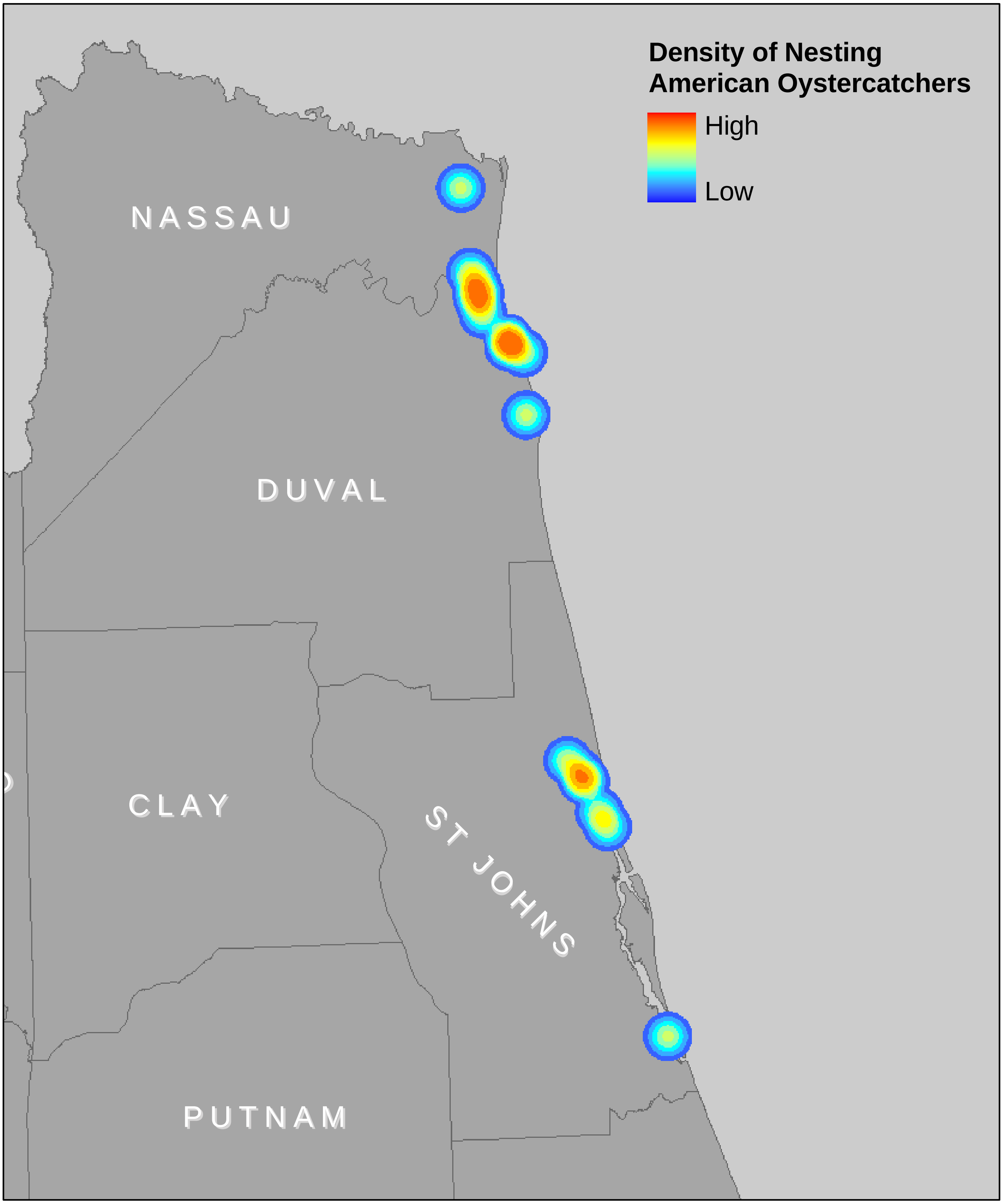

Fig. 11. Relative density of nesting American oystercatchers in the Northeast Region of Florida, 2001.

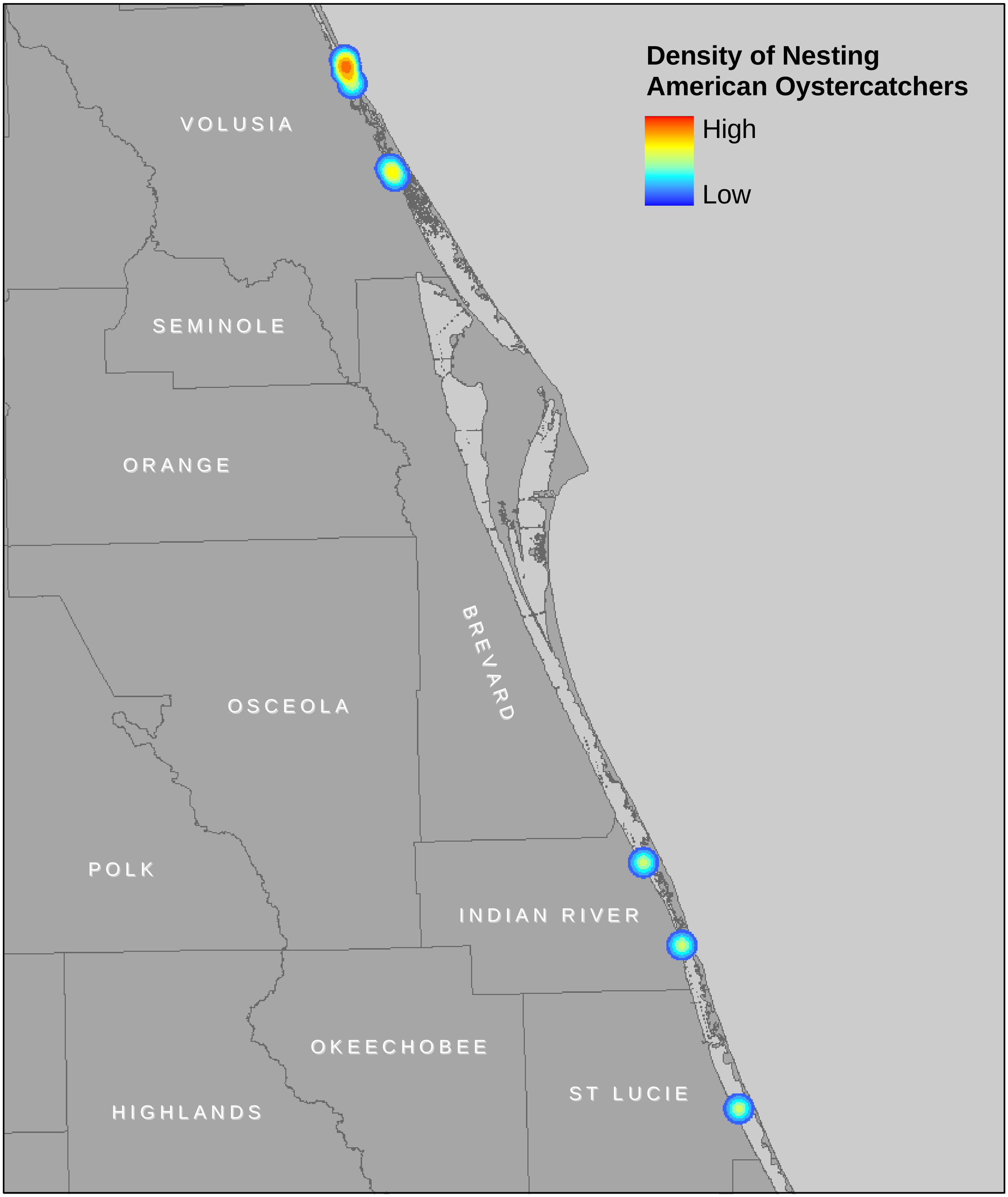

Fig. 12. Relative density of nesting American oystercatchers in the Volusia and Indian River Regions of Florida, 2001.

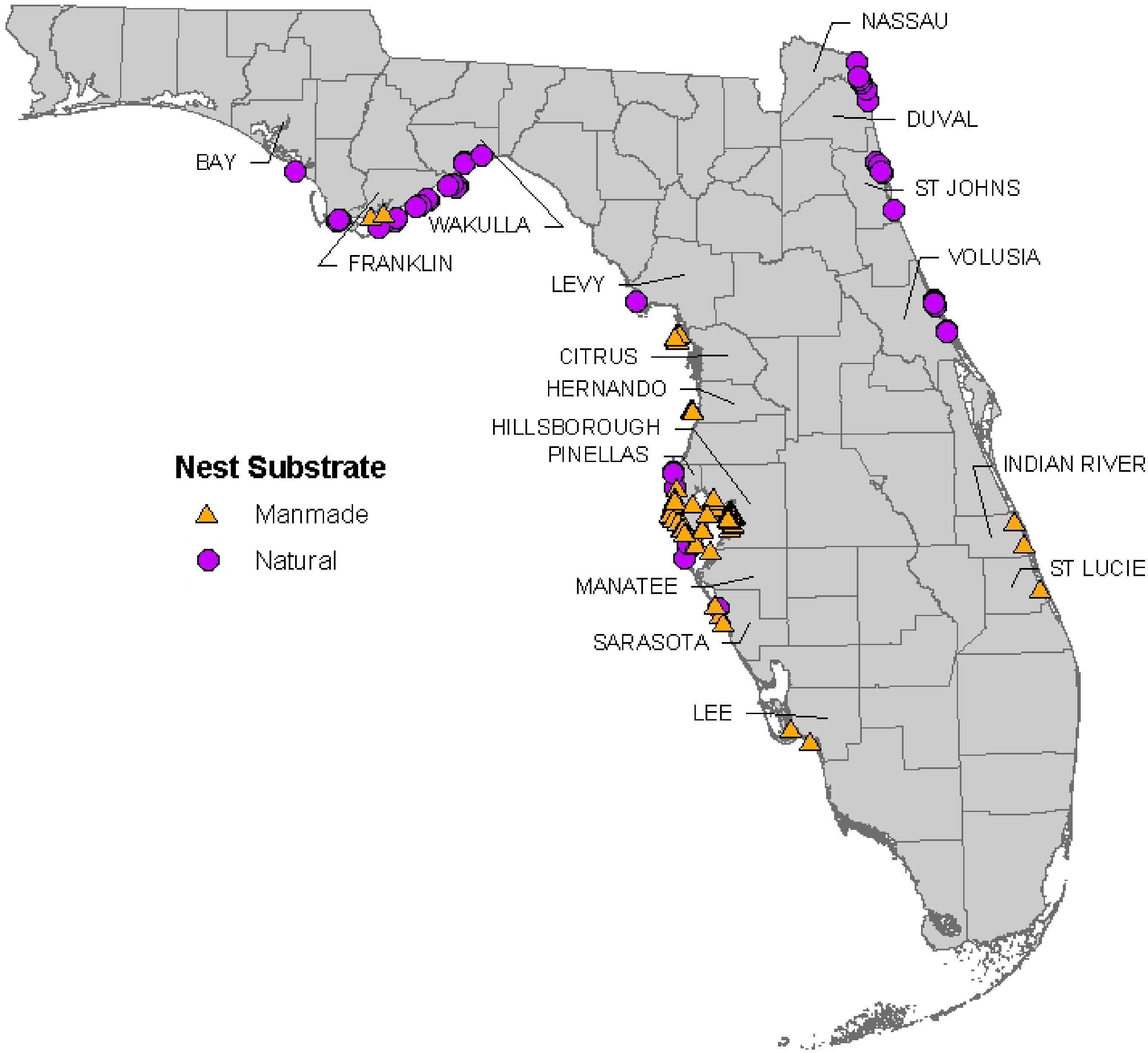

Fig. 13. Pairs of nesting American oystercatchers (n = 213) using manmade and natural habitats in Florida, 2001.