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Bureau of Laboratories, Tampa**

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**Arbovirus Surveillance:
Annual Summary Report
2006**

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Annual Arbovirus Surveillance Summary Report: 2006

Surveillance efforts by the Florida Department of Health Bureau of Laboratories, Tampa, include the statewide Sentinel Chicken program as well as assay of dead bird and mammal tissue and mosquitoes (virus detection and isolation) and wild bird serology. Our longstanding laboratory experience with arboviruses and this multi-agency collaborative surveillance program continues to place Florida among the top states in the nation for Arbovirus control.

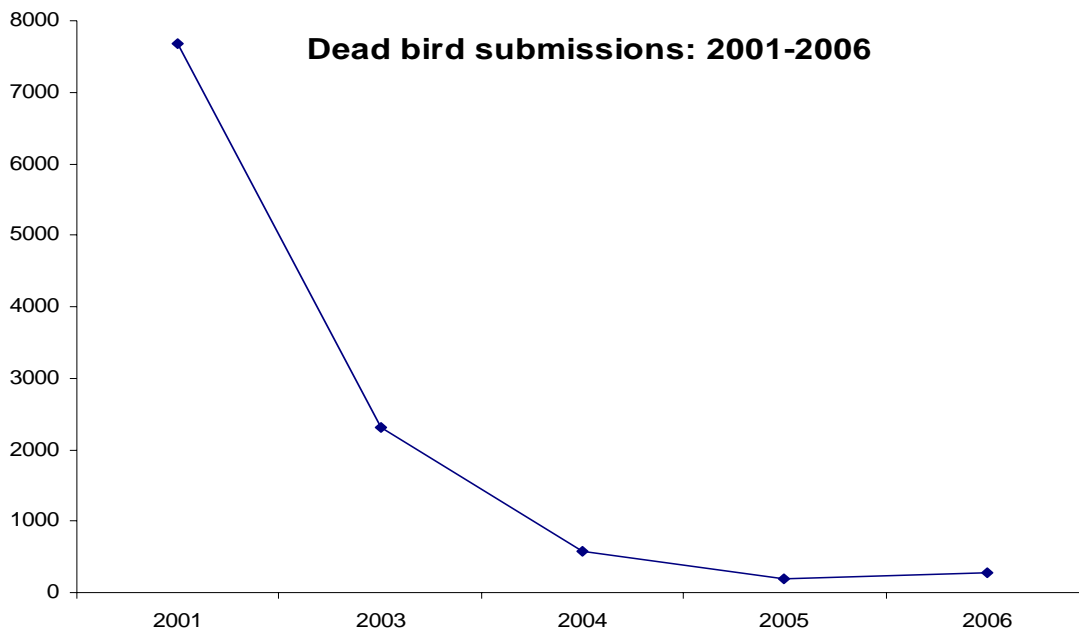
West Nile virus (WN) is a flavivirus, closely related to SLE but, unlike SLE, birds infected with WNV often die. Virus may be detected in the tissues of those birds. The first infected bird in Florida was detected on July 3, 2001, in a crow submitted from Jefferson County. At this time the virus is present throughout Florida, although level of activity varies throughout the state.

Effective arbovirus surveillance entails a concerted, coordinated effort over an extended time period. Sampling must be routinely and regularly performed in order for baseline activity to be recognized. Thus, increases above the historical levels of activity indicate increased risk of spread to the human population, risk that may be reduced by appropriate interventions. Mosquito activity and arbovirus transmission was extraordinarily low during 2006 due to the impact of the protracted spring drought.

Numbers of dead bird submissions have fallen dramatically since 2001 (Figure 1). Nevertheless, there was an increase from 184 dead bird submissions in 2005 to 286 in 2006. All of the submitted animals were screened for WNV by molecular assays (TaqMan RT-PCR). They were also inoculated onto VERO cell culture for detection of other arboviruses and to increase detection sensitivity for WNV. Molecular methods are highly sensitive, but only assay a very small amount of sample; cell culture is also a very sensitive technique and allows for the testing of a much larger sample volume.

A total of 404 specimens: 286 dead birds, 38 mammal tissues and 80 avian cloacal swabs were received for virological assay during 2006. This is an increase of 55% over 2005. Submissions were made from 39 counties. Wild Bird Rehabilitators submitted 80 cloacal swabs from birds with clinical signs of central nervous system illness. Mammals included: 33 horses, 1 alpaca, 1 deer, 1 llama, 1 rabbit, and 1 zebra. WNV was not detected in any of these specimens. EEE virus was detected in 2 horses. A California group virus was detected in a hawk from Gilchrist County.

Figure 1: Trend in submissions of dead birds for WNV detection.



The greatest numbers of birds, 171 (159 dead, 12 cloacal swabs), including 55 doves, were submitted by Dade County. Specimens were submitted from 66 species of birds. Arbovirus detection (1 positive bird, 0.6%) was significantly lower than that for previous years (2003, 20.4%; 2002, 10.8%; 2001, 14.2%). Data on submissions and WN test results for 2006 by county is presented in Table 1.

Table 1. Dead bird/mammal and live bird cloacal swab submissions for detection of arbovirus, by county, 2006

County	dead birds	cloacal swabs	mammals	Cal +	EEE+
Alachua	9	2	4		
Brevard			2		
Broward			2		
Citrus	9				
Clay	1				
Dade	159	12			
Dixie	2				
Duval	2		3		1 horse
Franklin	1				
Gilchrist	1			1 hawk	
Hernando	18				
Hillsborough	26		4		
Holmes	1		1		
Indian River	2				
Jackson	2				

County	dead birds	cloacal swabs	mammals	Cal +	EEE+
Jefferson	1		1		
Lake		2			
Lee	1				
Leon	2				
Levy	3		1		1 horse
Madison	4				
Manatee		26			
Marion	1		5		
Martin	1				
Monroe	11				
Okeechobee			2		
Orange	11	18			
Osceola		6	2		
Palm Beach	2				
Pasco	2		1		
Pinellas	3				
Polk			2		
Seminole	3	10			
St Johns	1				
Sumter	1		3		
Suwannee			2		
Volusia	5	4	1		
Walton	1				
Washington			2		
totals	286	80	38	1	2

During 2006, 1253 traditional pools of mosquitoes were submitted from 13 counties across the state. Molecular (TaqMan) assays for WNV were performed on all submitted pools. It is important to determine whether the virus detected in a mosquito is viable (i.e., multiplies in cell culture) as part of ascertaining vector potential of the various species. Additionally, extracts of some mosquitoes seem to contain inhibitors of RT-PCR, resulting in false negative molecular assays. Thus VERO cell cultures were also inoculated with homogenized pools.

Commercial assays for WNV antigen in mosquito pools (RAMP) were used by some mosquito control agencies. They sent residual samples from 8 RAMP tests to TBL for confirmation. Because these samples are inactivated, they can be tested only by RT-PCR; cell culture is not possible. None of these samples were confirmed positive for WN. Although 22% more mosquito pool specimens were submitted in 2006 than in 2005, there were no isolations of WN or EEE (4 and 10 respectively during 2005). Seven isolates identified as members of the California virus group were detected during 2006 (6 during 2005). Two isolates are still pending identification. Submissions and numbers of positive pools are presented in table 2. Table 3 lists positive results by species and collection dates.

Table 2. Mosquitoes submitted for arbovirus testing.

County	# traditional					#RAMP
	submitted	# WN	# EEE	#CAL	unidentified	submitted
Citrus	30					
Escambia	50				1	
Flagler	118					
Manatee	33					
Monroe						7
Okaloosa	9					
Palm Beach	196					
Pinellas	48			1	1	
Santa Rosa	6					
Sarasota	687			6		1
St Johns	7					
Volusia	54					
Walton	15					
totals	1253	0	0	7	2	8

Table 3. Arboviruses detected in mosquito pools by county and collection date.

agent	species	#/pool	county	collection date
CAL	<i>An. crucians</i>	50	Sarasota	02/23/06
CAL	<i>An. crucians</i>	50	Sarasota	03/02/06
CAL	<i>An. crucians</i>	50	Sarasota	03/22/06
CAL	<i>An. crucians</i>	50	Sarasota	04/05/06
CAL	<i>An. crucians</i>	26	Pinellas	05/31/06
pending	<i>Cx. salinarius</i>	50	Escambia	06/26/06
pending	<i>Cx. nigripalpus</i>	17	Pinellas	06/30/06
CAL	<i>Oc. atlanticus</i>	50	Sarasota	07/12/06
CAL	<i>An. crucians</i>	50	Sarasota	08/30/06

The “Sentinel Chicken” surveillance program has long been a mainstay of arbovirus surveillance in Florida. Mosquito control agencies or County Health Departments within participating counties maintained small flocks of chickens at various sites in their area. The birds were bled at specified intervals, and the samples sent to our laboratory. All specimens received in the lab by 12 noon on Wednesday were processed and assayed in that week's test. The hemagglutination inhibition test (HAI) was used to ascertain the presence of antibody to Flavivirus (SLE/WNV) and to Alphavirus (EEE/HJ) viruses. Reports were expeditiously faxed to the submitters each Friday afternoon. Summary reports were also compiled and e-mailed to County Health Departments, Mosquito Control Agencies and other interested stakeholders. The Department of Health uses this data in its determination of whether to issue/call off Medical Alerts.

The HAI test used in this laboratory is a broadly reactive screening test, and detects total antibodies developed to WN, SLE, EEE and HJ viruses. An additional advantage of the HAI

assay, is that serum from any vertebrate species can be analyzed by this method. Thus, our surveillance program is capable of detecting the presence of all these arboviruses in sentinel chickens, wild birds, mammals and reptiles. Nevertheless, to ascertain which virus is present requires additional testing.

The IgM Elisa assay provides a means to distinguish between antibody to SLE or to WN with sera from humans or chickens, but not other animals; some cross-reactions may occur in this assay. Sentinel sera which reacted with SLE antigen in the HAI test were deemed “flavivirus positive” and if sufficient residual serum was available, were assayed by the Chicken IgM Elisa for antibody to SLE and to WN antigens, the week following the HAI test, with results reported on Tuesday. Additionally, sera that were reactive with EEE antigen were deemed “alphavirus positive” and were tested for antibody to EEE by the IgM Elisa. Since IgM in chickens appears to be of short duration (few weeks), ELISA negative or equivocal sera were then re-tested using a serum neutralization assay to confirm the presence of specific antibody.

The most specific test to distinguish between antibodies developed to these viruses is the serum neutralization assay. This quantitative assay uses infectious virus of each type to challenge the test serum. Cell cultures are then inoculated with the serum-virus mixture and the protective effect of the serum, that is, its ability to neutralize the lethality of the virus, is calculated. The serum neutralization assay is complex, hazardous and requires a significant amount of technologist time. Sera from animals other than chickens, e.g., from wild birds or mammals, are confirmed by the SN assay. Flavivirus positive sera are assayed against both WN and SLE viruses; alphavirus positive sera are assayed against both EEE and HJ viruses.

During 2004, Highlands J (HJ) virus was added to the SN protocol based on the MSPH thesis work of staff member Christy Ottendorfer. HJ virus cross-reacts to a limited extent with EEE in the HAI assay, however, it is not known to be a human pathogen. Thus, a positive test for HJ does not indicate the same risk of disease as does a positive EEE result and control measures would not be as critical. Both viruses frequently co-circulate. During 2006, 93% of alphavirus seroconversions were due to EEE virus, however, during 2005, only 76% was due to EEE.

In 2006, 47,132 sera from 2,901 individual sentinel birds were assayed by HAI. Sera from 1868 non-sentinel avians (26 species, 1872 sera) were also assayed in (HAI, SN) assays for the detection of antibody to WNV. Data are presented in table 4. It must be noted that this is prevalence data and not necessarily an indicator of incident (recent) infection. Of these birds, 7.2% had alphavirus antibody detected in the HAI test to and 2.4% had flaviviruses antibody (2005: 24.2% and 2.1% respectively). Eight birds had antibody to both WN and EEE.

Table 4. Non-sentinel avian serum assayed during 2006.

County	# submitted		alphavirus		flavivirus	
	Birds	sera	# HAI +	% +	# HAI +	% +
Duval	1	4	0	0.0%	0	0.0%
Hillsborough	11	11	0	0.0%	2	18.2%
Okeechobee	1	1	1	100%	0	0.0%
Orange	2	2	0	0.0%	0	0.0%

County	# submitted		alphavirus		flavivirus	
	Birds	sera	# HAI +	% +	# HAI +	% +
Osceola	1	1	0	0.0%	0	0.0%
Pinellas	1	1	0	0.0%	1	100%
Polk	1	1	1	100%	1	100%
Putnam	2	2	0	0.0%	0	0.0%
Volusia	1	2	1	50.0%	0	0.0%
Okaloosa	527	527	60	11.4%	6	1.1%
Santa Rosa	373	373	34	9.1%	10	2.7%
Walton	513	513	20	3.9%	15	2.9%
Washington	434	434	18	4.1%	10	2.3%
Total	1868	1872	135	7.2%	46	2.5%

Figures 2a and 3a depict numbers of monthly positive sentinel seroconversions since 1988, for Alphavirus (EEE/HJ) and Flavivirus (SLE/WNV) respectively. Figures 2b and 3b depict rates of seroconversion. As the numbers of sentinels has changed significantly over the years, for a meaningful interpretation of the data, it is essential that rates of seroconversion rather than just numbers of positive birds be compared.

Of the 67 counties in Florida, 34 submitted sera for arbovirus surveillance last season. This is an increase from 27 counties participating in 2001. Degree of participation varied amongst the regions. Figure 4a depicts the # of sentinels exposed in each region of the state by month, 4b the number of sentinel sera submitted.

Table 5 compares annual seroconversions by region with the regional historical means. Due to small numbers of historical data points, the North and Panhandle regions have been combined and the Mean Annual Seroconversion Rate (MASR) computed for the combined regions. Arbovirus transmission activity was significantly below historic levels during 2006. The protracted drought reduced mosquito levels statewide. These data stand in contrast to 2005, when EEE activity (19% seroconversion) was significantly above the MASR for the North and Panhandle and WN activity was significantly elevated in Central Florida (8.7 % seroconversion) and in the North/Panhandle regions (9.29%).

Table 5. Mean annual seroconversions rates (MASR) by region, 2006 and 2005.

	South	Central	<i>North</i>	<i>Panhandle</i>	North & Panhandle
EEE: 2006	0.0	0.1	<i>4.0</i>	<i>7.9</i>	5.0
HJ: 2006	0.0	0.0	<i>0.4</i>	<i>0.5</i>	0.4
Alphavirus: 2006	0.0	0.12	<i>4.36</i>	<i>8.42</i>	5.45
Alphavirus: MASR	0.4	2.0			10.0
Alphavirus: MASR 95% CI	0.03-0.43	0.46-3.48			7.92-12.16
SLE: 2006	4.0	1.7	<i>0.3</i>	<i>0.0</i>	0.2
WN: 2006	0.2	0.9	<i>1.0</i>	<i>2.7</i>	1.5
Flavivirus: 2006	4.17	2.56	<i>1.27</i>	<i>2.72</i>	1.66
Flavivirus: MASR	19.0	11.8			3.0
Flavivirus: MASR 95% CI	11.11-26.97	5.59-17.99			0.8-5.24

Figures 5, 6, 7, 8, 9, 10 and 11 show, respectively, for each county: the numbers of surveillance sites maintained, the total number of susceptible chickens exposed during 2006, the number of serum samples which were submitted from exposed birds, the number of sentinel birds which seroconverted to EEE, the number of birds which seroconverted to HJ, the number of birds which seroconverted to SLE and the number of birds which seroconverted to WNV during 2006.

There are still substantial areas of the state that are not monitored. Sampling is clustered, primarily in the “traditional SLE belt” across the central and northern regions of the state and hence, the distribution of virus activity appears clustered both in space and time. Counties initiate and terminate annual surveillance activity at various times during the year and thus there is a risk of missing detection of critical early season viral amplification. It would be of value for our understanding and future control of arbovirus outbreaks, if these currently underrepresented areas of the state could be encouraged to develop an appropriate surveillance program.

Table 6a provides a listing of the counties which participated during 2006, the numbers of sites and birds they maintained, the number of sera they submitted, the numbers of sentinels which seroconverted to EEE, HJ, SLE and WN viruses and the percent of exposed birds which seroconverted. Seroconversion dates are given in table 13b.

Figures 12, 13, 14 and 15 depict the rate of seroconversions to EEE, HJ, SLE and WNV, respectively, by month, for the four state regions. For comparative purposes, 2005 data is also shown. Warm, wet winters may result in an extended arbovirus transmission season, indicating a need for year-round surveillance in much of the state.

Seroconversions to alphavirus (EEE and HJ) occurred every month of year, except for May. Seroconversions in the panhandle exhibited a bimodal pattern with an early peak in February and an elevated rate again in August. Seroconversion in the north region was only slightly elevated in June and September, peaking in July. There was essentially no EEE activity in the central region during 2006. Highlands J virus activity was more limited than during 2005, detected only in the north and panhandle regions January and not again until August, September and October.

The annual regional seroconversion rates for all arboviruses were significantly below each regional historical mean. For the first year since WN appeared in Florida (2001), seroconversions to SLE surpassed seroconversions to WN virus. Antibody response to SLE began in August in the southern region and peaked in October, which is the historical peak month. Activity in the central region also began in August, was elevated in October, negligible in November and peaked in December. Also during December, seroconversions occurred in the northern region. WNV activity was very low statewide, unlike previous years. Transmission occurred in the panhandle region of the state in January indicating virus transmission during the north Florida winter. It then occurred sporadically, primarily in the northern and panhandle region throughout the year, except for March and December.

The data suggest that the upsurge in SLE activity this year occurred in part because WN virus transmission was greatly reduced during the crucial spring amplification season. Historical seroconversion rates show that, since 2001, transmission of WN has begun in June and peaked during September, one month earlier than SLE. Since this year, WN did not

intensify in June, leaving the vertebrate amplifying hosts that are used by both flaviviruses susceptible to infection by SLE.

Reflecting the low rate of activity seen with sentinel surveillance, there were no indigenous human arbovirus cases detected in 2006. Three cases of WN in Florida residents were all acquired out of state. In previous years, however, the sentinel program was demonstrably effective in reducing the numbers of cases that could have occurred had there been no active early-warning sentinel system. In 2005, human cases were fewer than in 2004 (21 vs. 41). This may be related to the location of the epicenter of human activity. In 2005, it was in central Florida; 86% of the cases occurred in Pinellas County. This area has a long history of participation in sentinel surveillance and when early season data suggested that west-central Florida was going to be the epicenter for a significant outbreak of WNV, mosquito control acted appropriately on surveillance data, the Department of Health released appropriate prevention messages in a timely manner and the press, primarily in areas with surveillance activities, disseminated them. In 2004, 62% of the cases (24) occurred in areas new to or not participating in the sentinel surveillance program. The 2004 season was mercifully cut short by our extraordinary hurricane activity.

A total of 100,596 HAI, 1,759 ELISA and 1,716 SN tests were performed on field specimens for arbovirus studies. This includes both the sentinel flock incidence studies, and wild bird sera submitted for prevalence studies. An average of 967 sera were assayed by HAI each week.

During 2006, development began on a new method, the Microbead Immunoassay (MIA), with the goal of eventually replacing the HAI assay. This assay uses the Bioplex Instrument and is adapted from a CDC developed assay for clinical sera. The basic protocol for the flaviviruses (SLE, WN) with chicken sera was developed by Logan Haller, as her MSPH thesis project. Validation tests will continue during 2007. During 2007 we will start to develop the assay for the alphaviruses. When validated, these assays should reduce turn-around-time for reporting confirmed sentinel seroconversions.

It must be noted that this very effective Arbovirus Sentinel Surveillance program is a success because of the efforts of its two full time technical staff, Maribel Casteneda and Rita Judge. They directed and trained OPS staff working on Arbovirus grants and student volunteers in the HAI protocol, while maintaining test quality control. Eddie Tensley, is responsible for the production of goose erythrocytes used each week as the indicator red blood cell in the HAI assay by both the Tampa and Jacksonville laboratories, and assists in specimen preparation. Ann Mitulinsky, Christy Ottendorfer/Jason Ambrose, Logan Haller/Anxhela Gyjushi, Susan Lukas/Myrna Veguilla (OPS, ELC grant) performed HAI, Elisa, SN, dead bird and mosquito assays. Jazmine Mateus/Priscila Iwakawa performed data management tasks. The Arbovirus Surveillance Team by working together in such a productive manner has enhanced our ability to provide useful data in a timely manner to a variety of concerned agencies.

We would like to also acknowledge the many individuals in County Health Departments, Mosquito Control Districts, FMEL, PHEREC, universities, zoos and wildlife rehabilitation who collect and submit the samples we assay. Fieldwork during the Florida summer is difficult, but their perseverance contributes greatly to this comprehensive surveillance system.

Figure 2a. Numbers of sentinel chicken seroconversions to Alphavirus (EEE/HJ) by month: 1988 to 2006

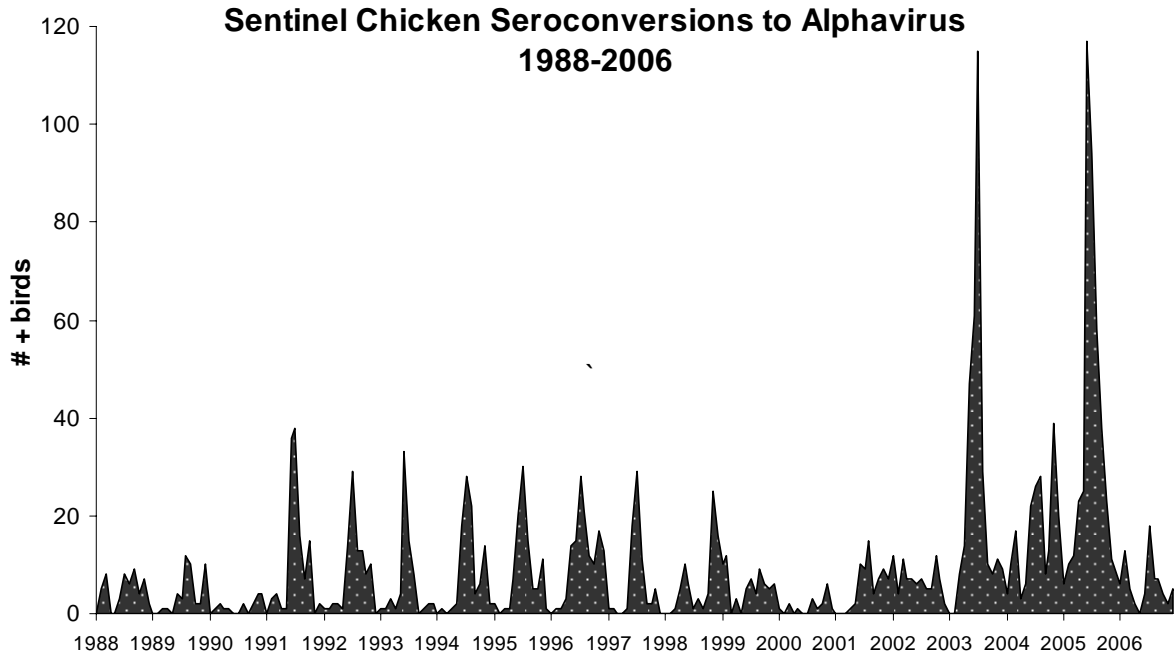


Figure 2b. Rate of sentinel chicken seroconversion to Alphavirus (EEE/HJ) by month: 1988 to 2006

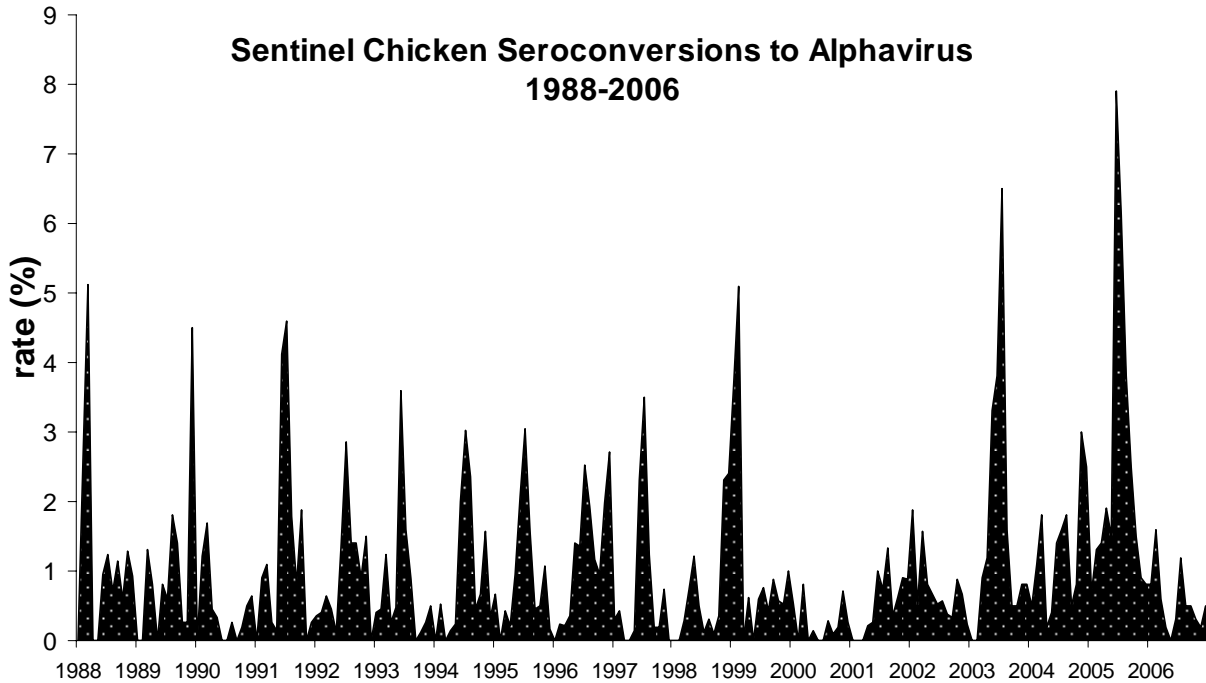


Figure 3a. Numbers of sentinel chicken seroconversions to Flavivirus (SLE/WN) by month: 1988 to 2006

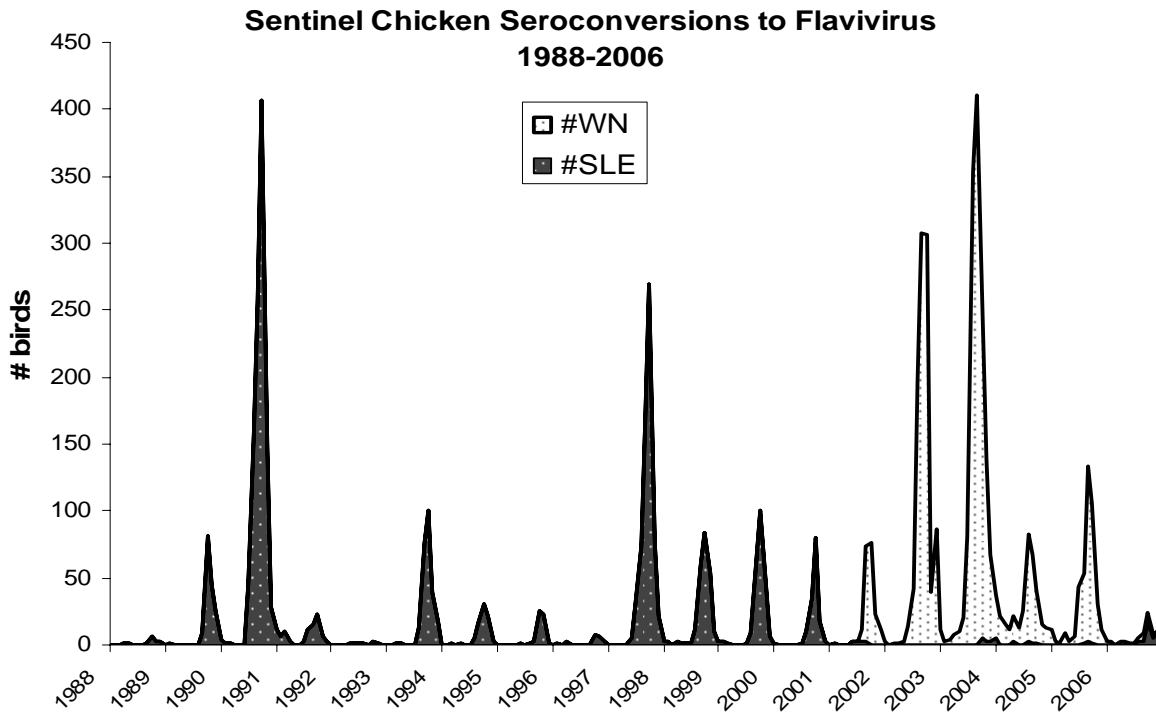


Figure 3b. Rate of sentinel chicken seroconversion to Flavivirus (SLE/WN) by month: 1988 to 2006

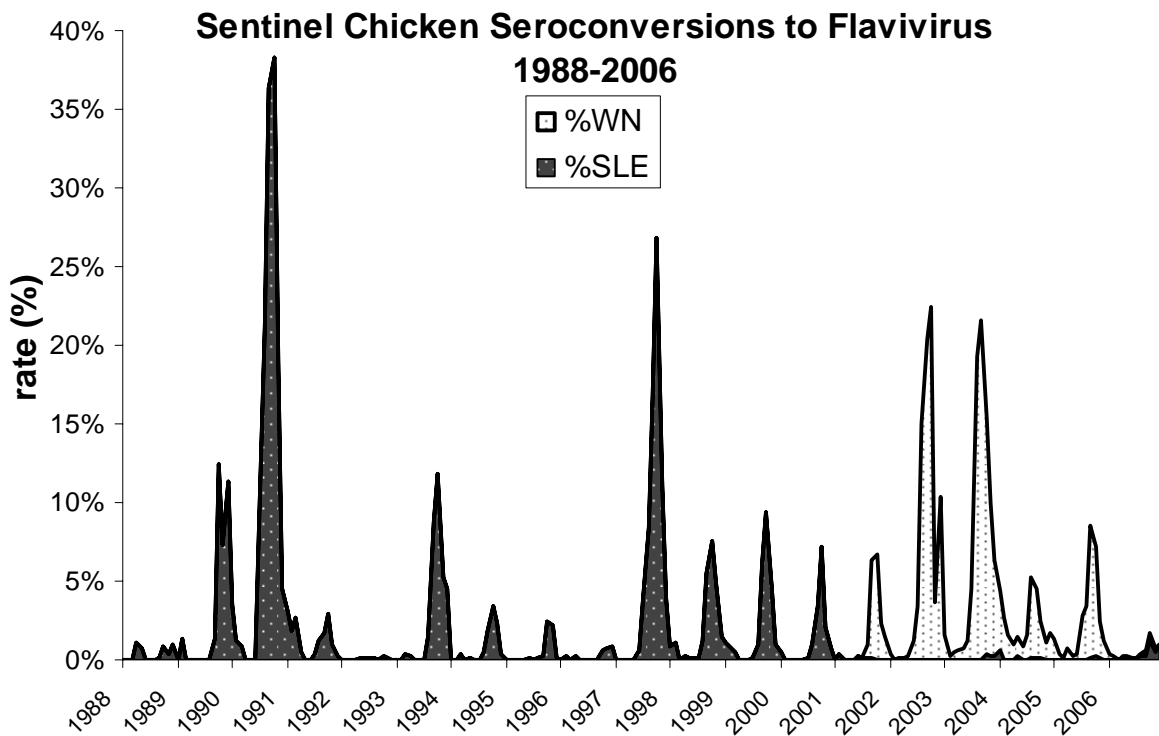


Figure 4a. Number of sentinels by region by month, 2006

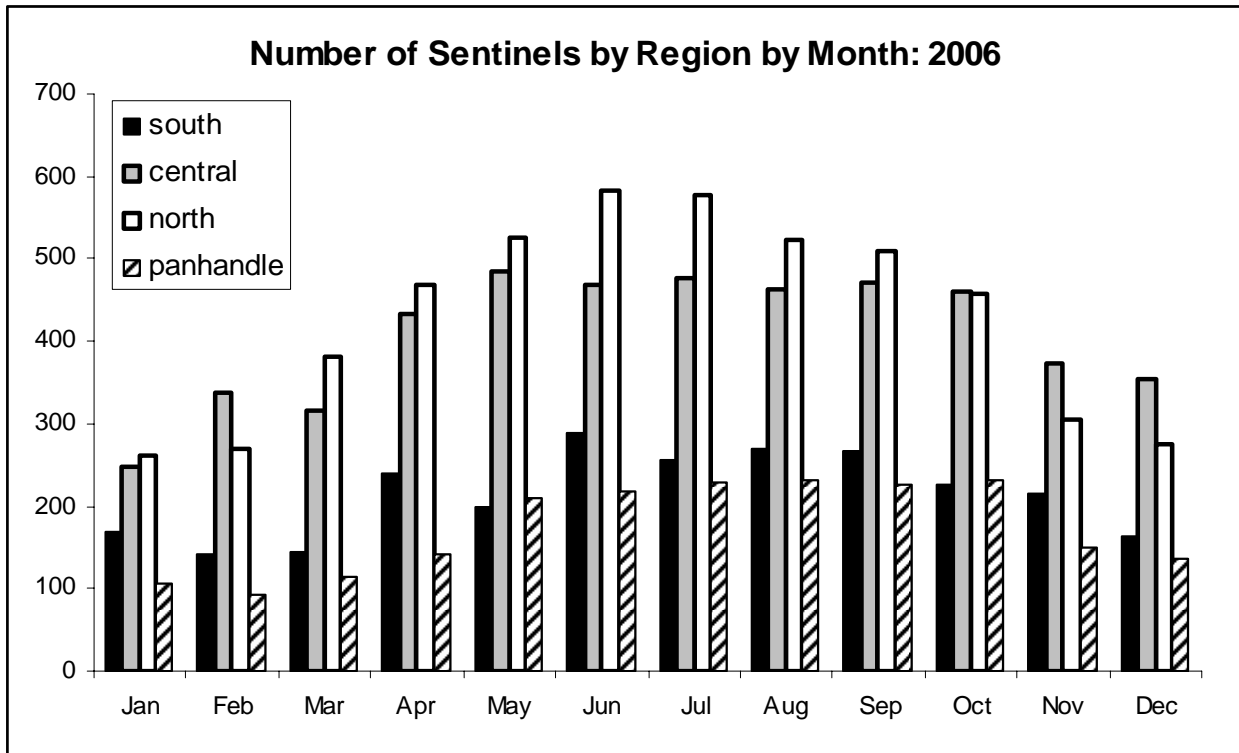


Figure 4b. Numbers of sentinel sera submitted by region by month, 2006

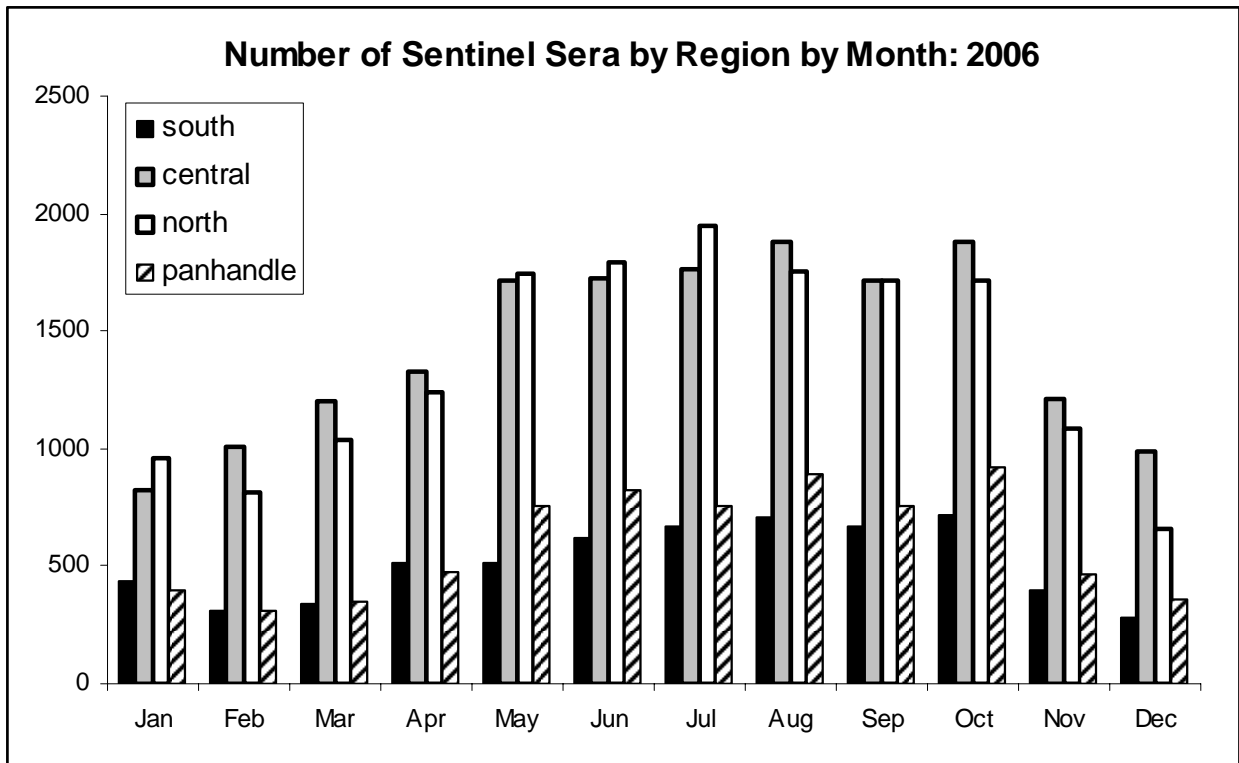


Figure 5. Number of sentinel sites by county, 2006.

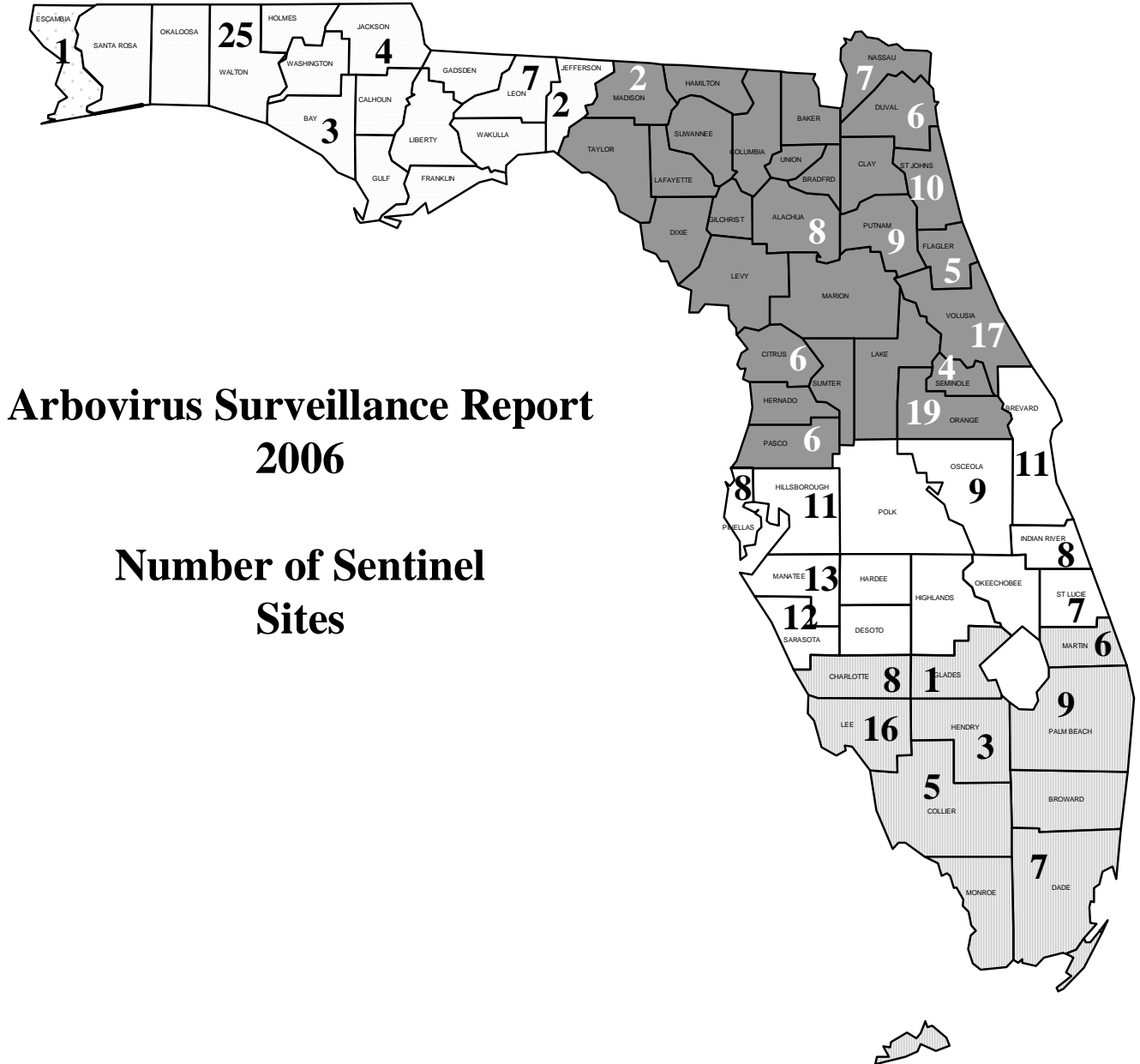
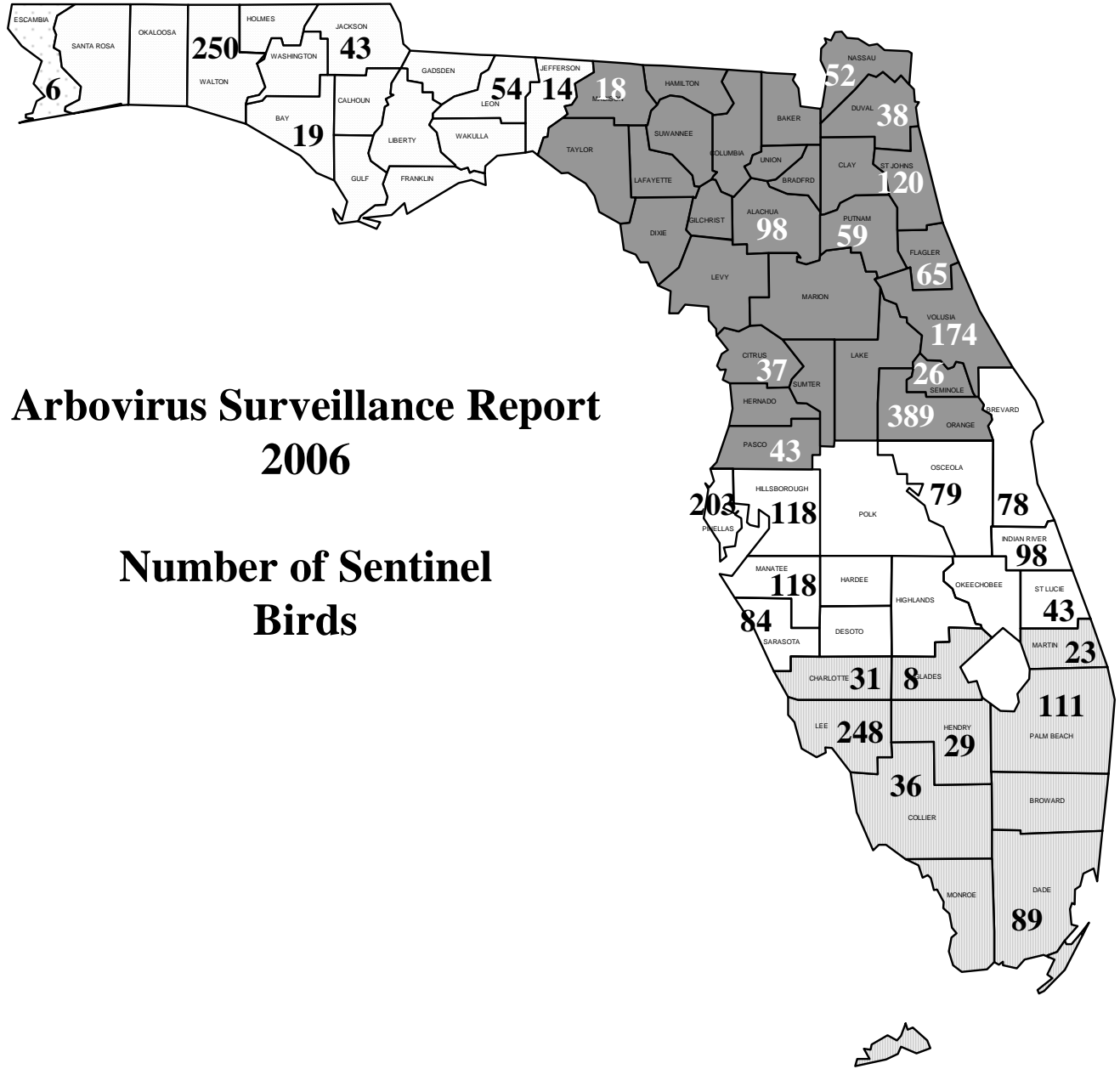


Figure 6. Number of sentinel birds by county, 2006.



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**Number of Sentinel
Birds**

Figure 7. Number of sentinel sera by county, 2006.

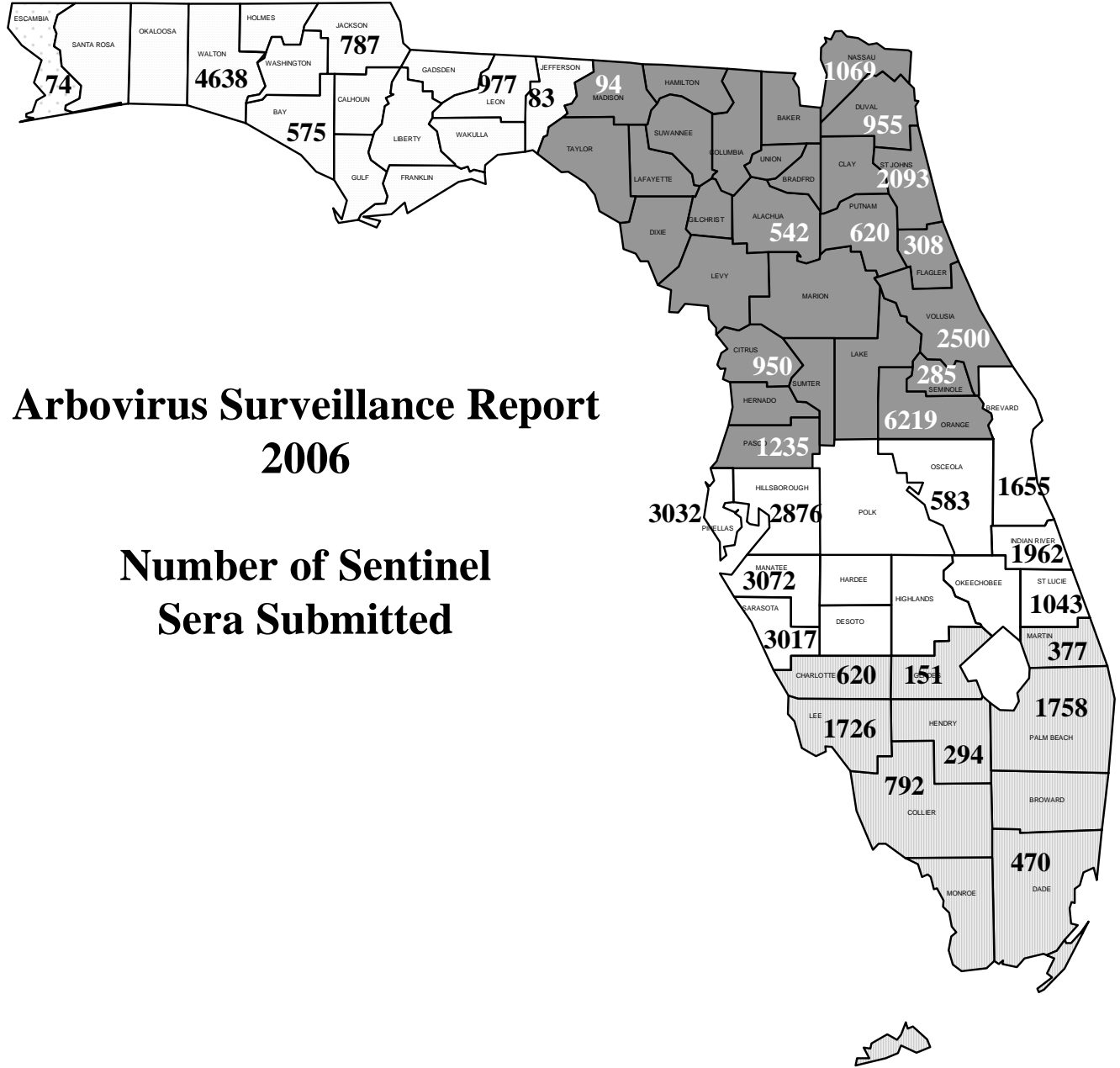


Figure 8. Number of sentinel seroconversions to EEE virus by county, 2006

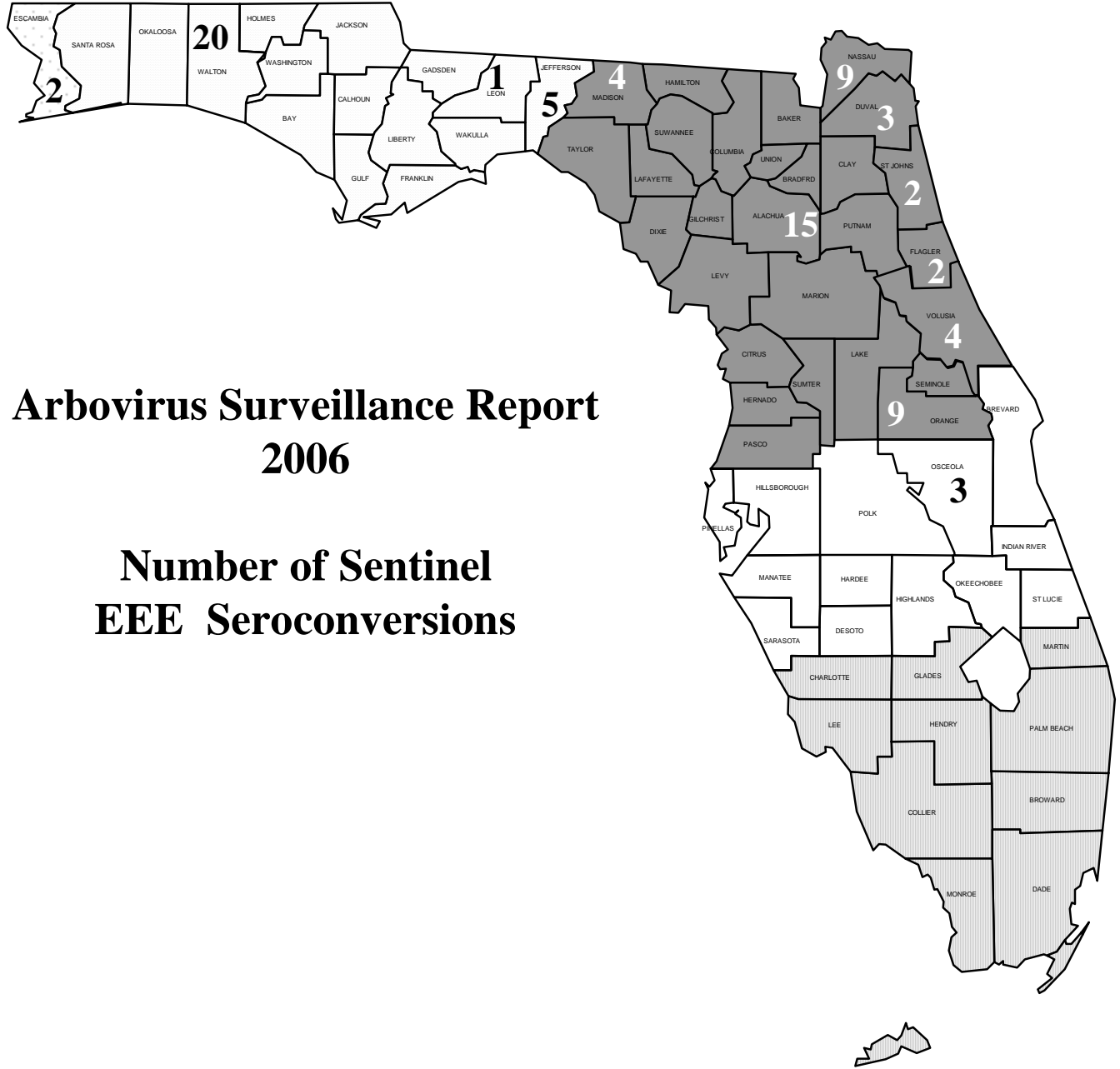
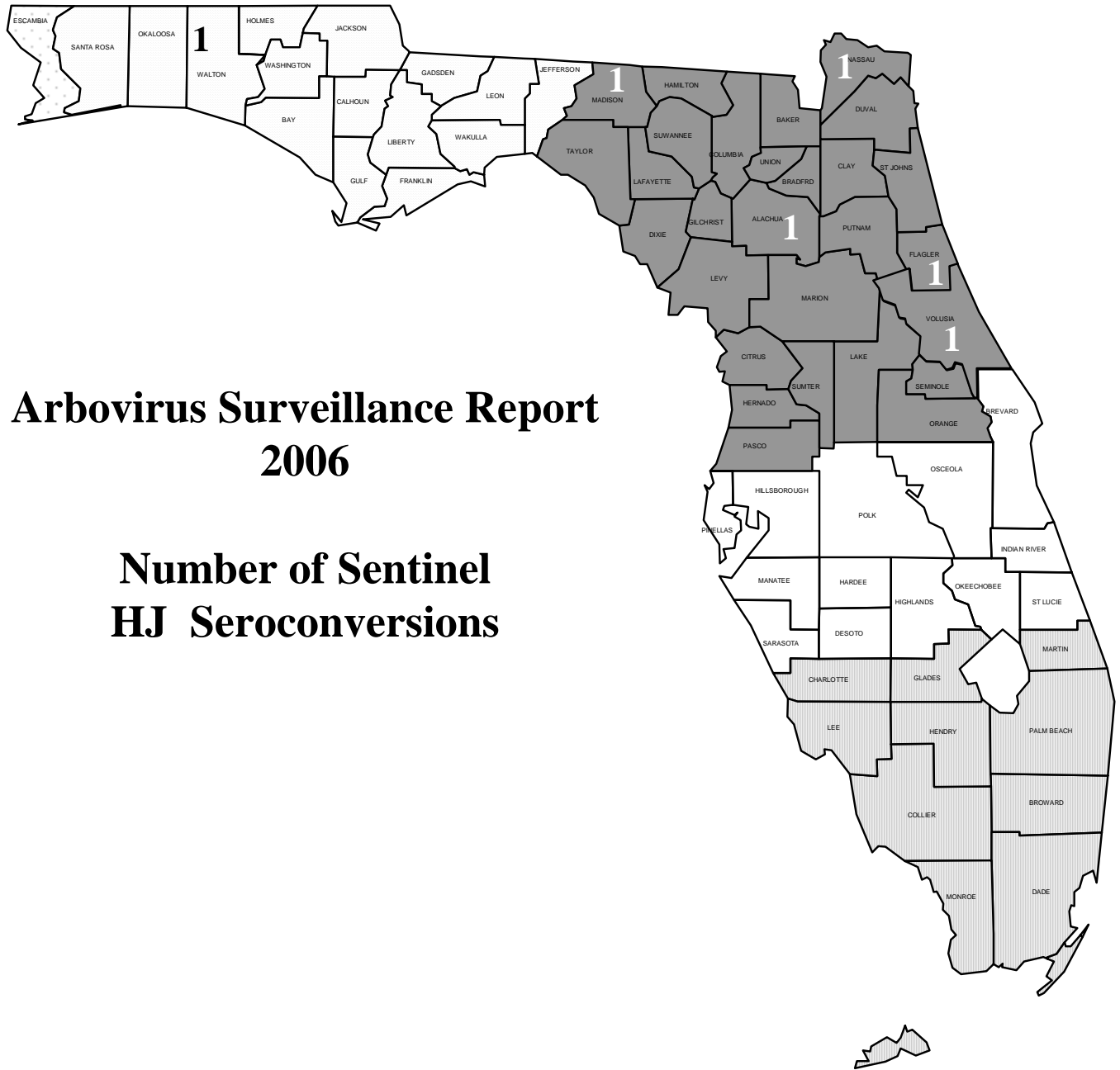


Figure 9. Number of sentinel seroconversions to HJ virus by county, 2006



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Number of Sentinel HJ Seroconversions

Figure 10. Number of sentinel seroconversions to SLE virus by county, 2006

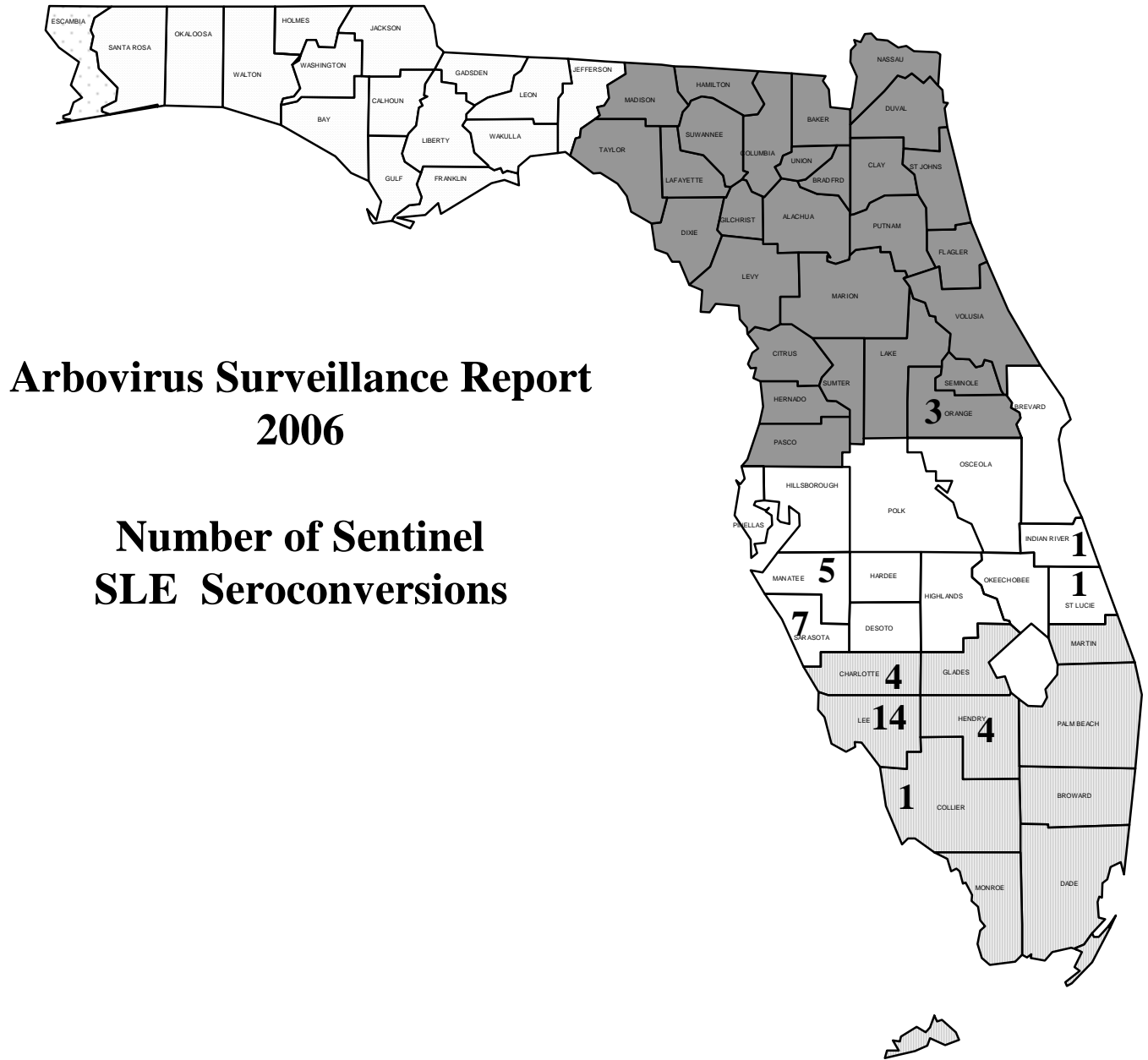


Figure 11. Number of sentinel seroconversions to WN virus by county, 2006

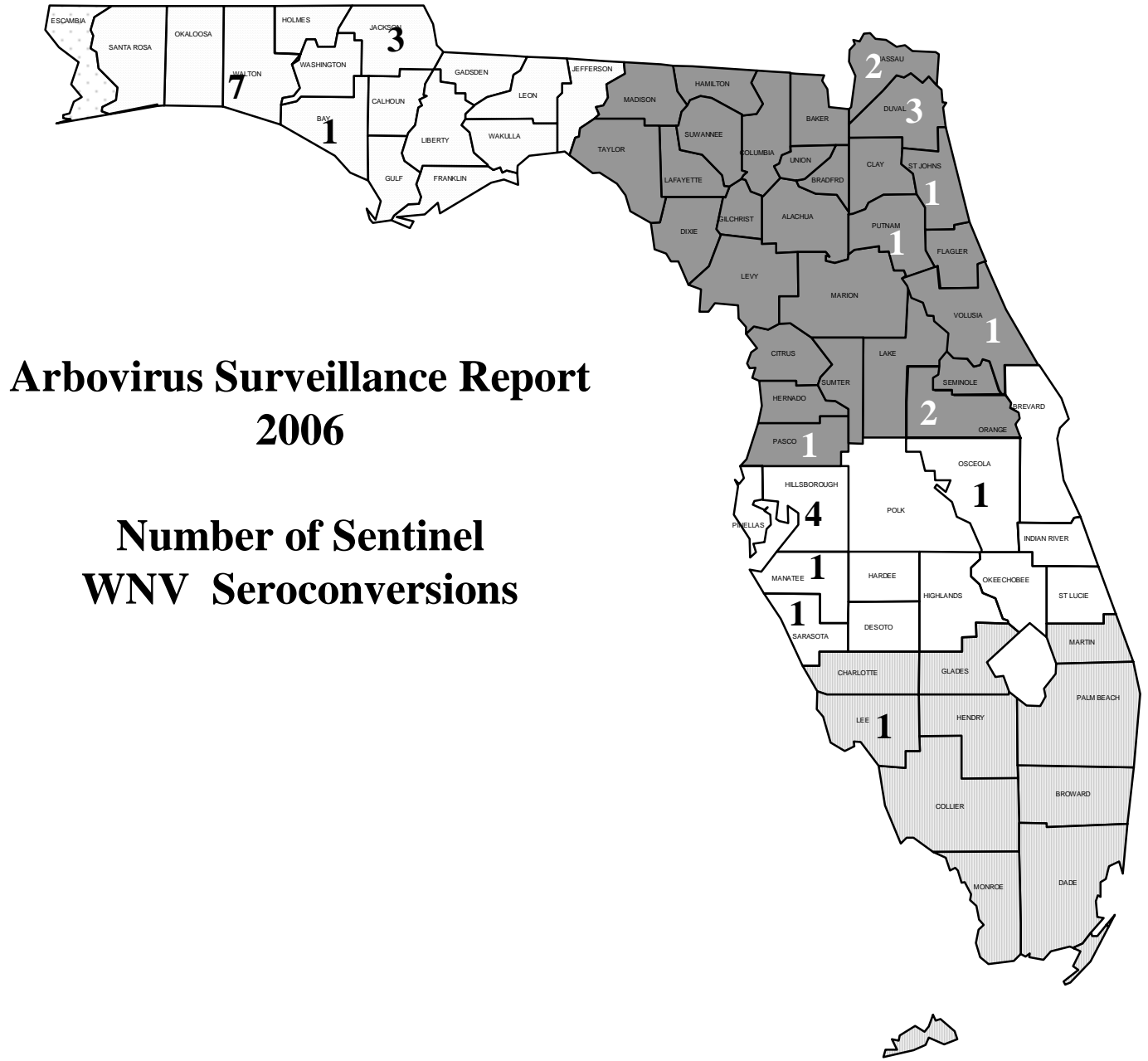


Table 6a. ARBOVIRUS SURVEILLANCE REPORT: Sentinel flock activity by county-

County	# of Sites Monitored	# of Susceptibles Examined	# of Sera from Susceptibles Examined	# of Sentinels Seroconverting				(%) Percent of Sentinels Seroconverting			
				EEE	HJ	SLE	WN	EEE	HJ	SLE	WN
Alachua	8	98	542	15	1	0	0	15.3	1.0.0	0.0	0.0
Bay	3	19	575	0	0	0	1	0.0	0.0	0.0	5.3
Brevard	11	78	1655	0	0	0	0	0.0	0.0	0.0	0.0
Charlotte	98	31	620	0	0	4	0	0.0	0.0	12.9	0.0
Citrus	6	3.7	650	0	0	0	0	0.0	0.0	0.0	0.0
Collier	5	36	792	0	0	1	0	0.0	0.0	0.0	0.0
Dade	7	89	470	0	0	0	0	0.0	0.0	0.0	0.0
Duval	6	38	955	3	0	0	3	7.9	0.0	0.0	7.9
Escambia	1	6	74	2	0	0	0	33.3	0.0	0.0	0.0
Flagler	5	65	308	2	1	0	0	3.1	1.5	0.0	0.0
Glades	1	8	151	0	0	0	0	0.0	0.0	0.0	0.0
Hendry	3	29	294	0	0	4	0	0.0	0.0	13.8	0.0
Hillsborough	11	118	2876	0	0	0	4	0.0	0.0	0.0	3.4
Indian River	8	98	1962	0	0	1	0	0.0	0.0	1.0	0.0
Jackson	4	43	787	0	0	0	3	0.0	0.0	0.0	7.0
Jefferson	2	14	83	5	0	0	8	35.7	0.0	0.0	0.0
Lee	16	248	1726	0	0	14	1	0.0	0.0	5.2	0.4
Leon	7	54	977	1	0	0	0	1.9	0.0	0.0	0.0
Madison	2	18	94	4	1	0	0	22.2	11.1	0.0	0.0
Manatee	13	118	3072	0	0	5	1	0.0	0.0	4.2	0.8
Martin	6	23	377	0	0	0	0	0.0	0.0	0.0	0.0
Nassau	7	52	1069	9	1	0	2	17.3	1.9	0.0	3.8
Orange	19	389	6219	9	0	3	2	2.3	0.0	0.8	0.5
Osceola	9	79	583	3	0	0	1	3.8	0.0	0.0	1.3
Palm Beach	9	111	1758	0	0	0	0	0.0	0.0	0.0	0.0
Pasco	6	43	1235	0	0	0	0	0.0	0.0	0.0	0.0
Pinellas	8	203	3032	0	0	0	0	0.0	0.0	0.0	0.0
Putnam	9	59	620	0	0	0	1	0.0	0.0	0.0	1.7
Sarasota	12	84	3017	0	0	7	1	0.0	0.0	8.3	1.2
Seminole	4	26	285	0	0	0	0	0.0	0.0	0.0	0.0
St. Johns	10	120	2093	2	0	0	1	1.7	0.0	0.0	0.8
St. Lucie	7	43	1043	0	0	1	0	0.0	0.0	2.3	0.0
Volusia	17	174	2500	4	1	0	1	2.3	0.6	0.0	0.6
Walton	25	250	4638	20	1	0	7	7.2	0.4	0.0	2.8
Totals	277	2901	47132	79	6	40	30				

Table 6b. ARBOVIRUS SURVEILLANCE REPORT: Sentinel flock activity by county

County	Week of Sero Conversion (Confirmed)
Alachua	EEE 6/26(2), 7/11(1), 7/25(5), 7/31(1), 9/11(3), 9/25(2), 10/10(1); HJ : 10/10(1)
Bay	WN : 11/16(1)
Brevard	
Charlotte	SLE : 8/25(1), 10/6(1), 11/3(2)
Citrus	
Collier	SLE : 9/18(1)
Dade	
Duval	EEE : 10/27(1), 11/6(2); WN : 5/1(1), 9/11(1), 9/25(1)
Escambia	EEE : 10/24(2)
Flagler	EEE : 5/5(1), 6/19(1); HJ : 9/11(1)
Glades	
Hendry	SLE : 10/13(1), 10/20(2), 11/3(1)
Hillsborough	WN : 2/21(1), 2/28(1), 11/14(2)
Indian River	SLE : 9/14(1);
Jackson	WN : 6/7(1), 9/18(1), 10/2(1)
Jefferson	EEE : 8/12(1); 8/18(4)
Lee	SLE : 8/14(1), 8/15(2), 10/10(3), 10/24(3), 10/31(2), 11/17(1), 11/20(1), 12/12(1); WN 8/21(1)
Leon	EEE : 8/2(1),
Madison	EEE : 8/12(1), 8/18(2), 9/2(1); HJ : 8/12(1)
Manatee	SLE : 12/27(5); WN : 4/10(1)
Martin	
Nassau	EEE : 4/3(1), 6/25(1), 7/9(1), 7/10(1), 7/23(1), 7/31(1), 8/28(2), 9/18(1); HJ : 9/1(1); WN : 9/25(2)
Orange	EEE : 2/20(1), 7/10(1), 7/14(1), 7/17(1), 7/21(2), 7/27(1), 7/31(1), 12/29(1); SLE : 1/2/07(3), WN : 9/28(1), 10/2(1)
Osceola	EEE : 2/23(1), 12/29(1), 1/4/07(1); WN : 7/5(1)
Palm Beach	
Pasco	WN : 5/1(1)
Pinellas	
Putnam	WN : 5/18(1)
Sarasota	SLE : 8/28(1), 9/25(1), 10/3(1), 10/9(1), 10/16(1), 10/23(1), 12/4(1); WN : 4/10(1)
Seminole	
St. Johns	EEE : 4/10(1), 6/5(1); WN : 10/23(1),
St. Lucie	SLE : 10/26(1)
Volusia	EEE : 1/9(1), 3/30(1); HJ : 1/17(1); WN : 10/23(1)
Walton	EEE : 1/3(1), 1/5(2), 1/18(2), 2/1(4), 2/6(2), 2/8(1), 2/9(2), 2/16(1), 2/17(1), 3/3(1), 3/13(1), 12/20(2) ; HJ : 1/6(1); WN : 1/3(1), 1/20(2), 4/12(1), 10/2(1), 10/24(2)

Figure 12. Rate of sentinel seroconversions to EEE virus by region by month, 2006 and 2005. "State" is the statewide rate for that month for 2006; "Avg. historical" is the average statewide rate from 1990 through 2006. Rate = number of seroconversions to EEE in a region divided by the number of susceptible birds exposed during the month in the region, expressed as %.

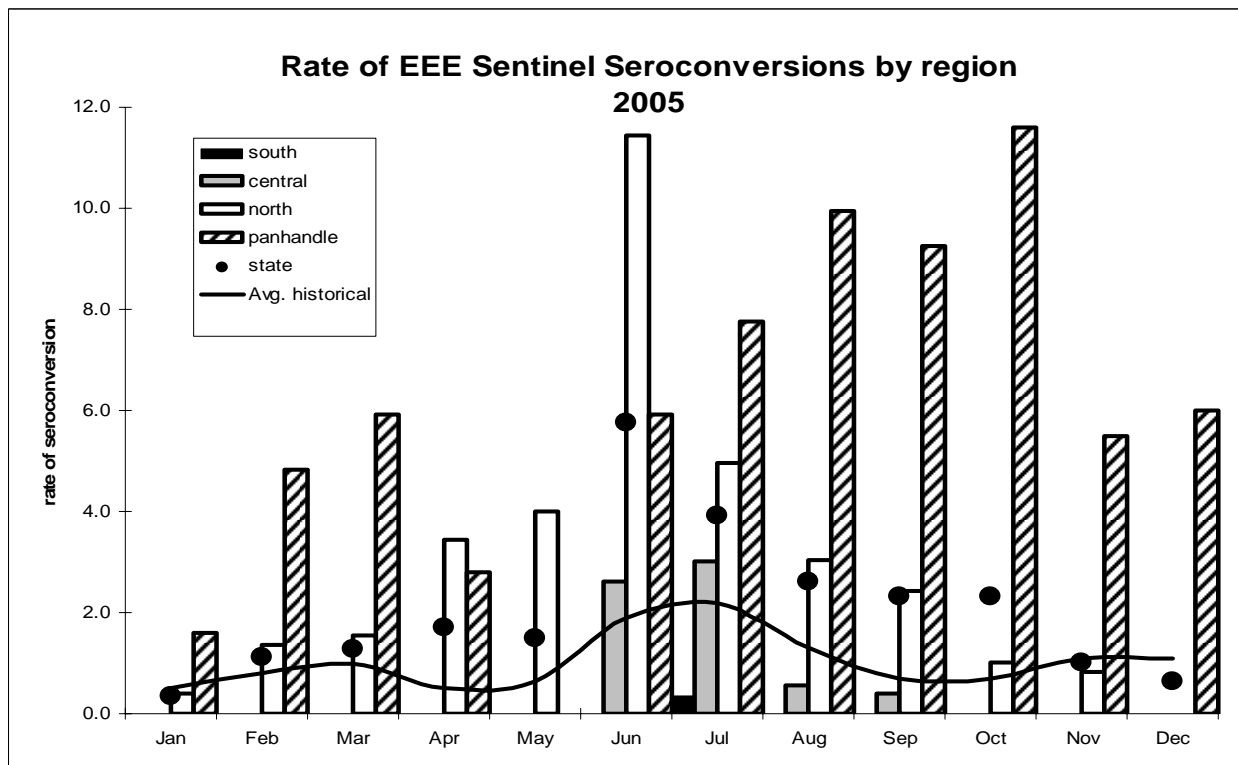
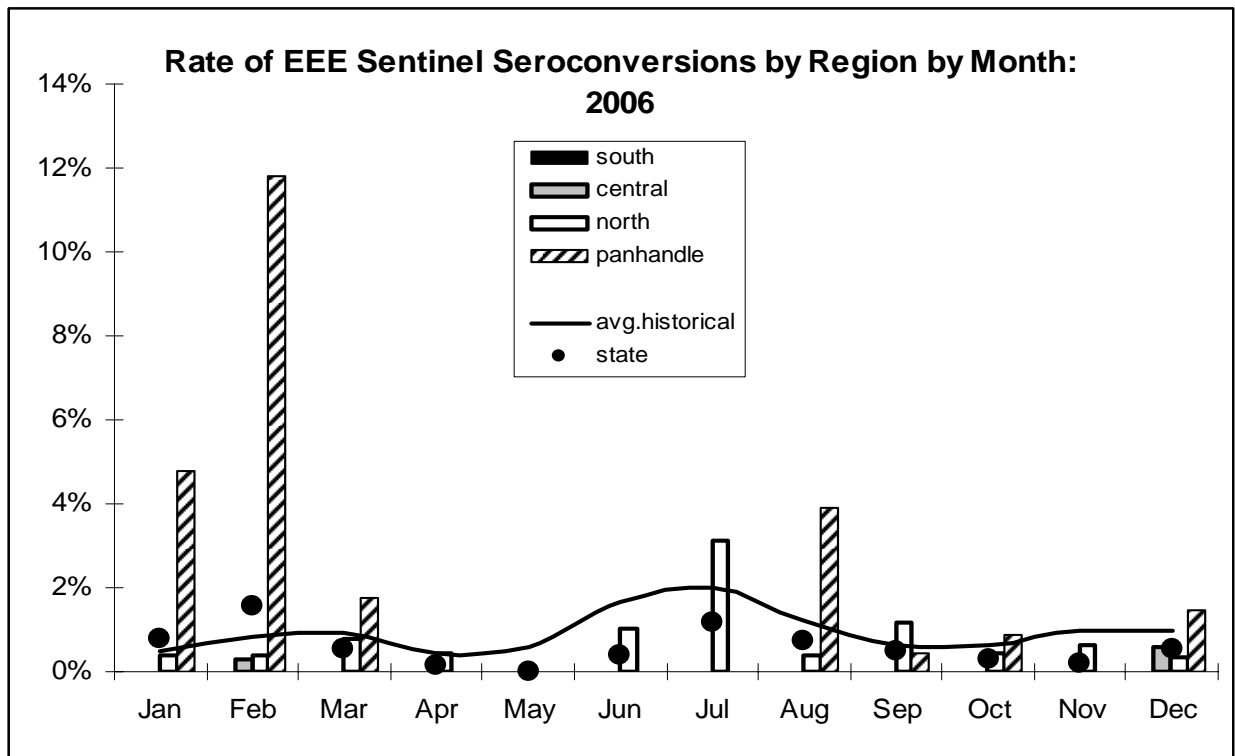


Figure 13. Rate of sentinel seroconversions to HJ virus by region by month, 2006 and 2005
 "State" is the statewide rate for that month for 2006; "Avg. historical" is the average statewide rate from 1990 through 2006. Rate = number of seroconversions to EEE in a region divided by the number of susceptible birds exposed during the month in the region, expressed as %.

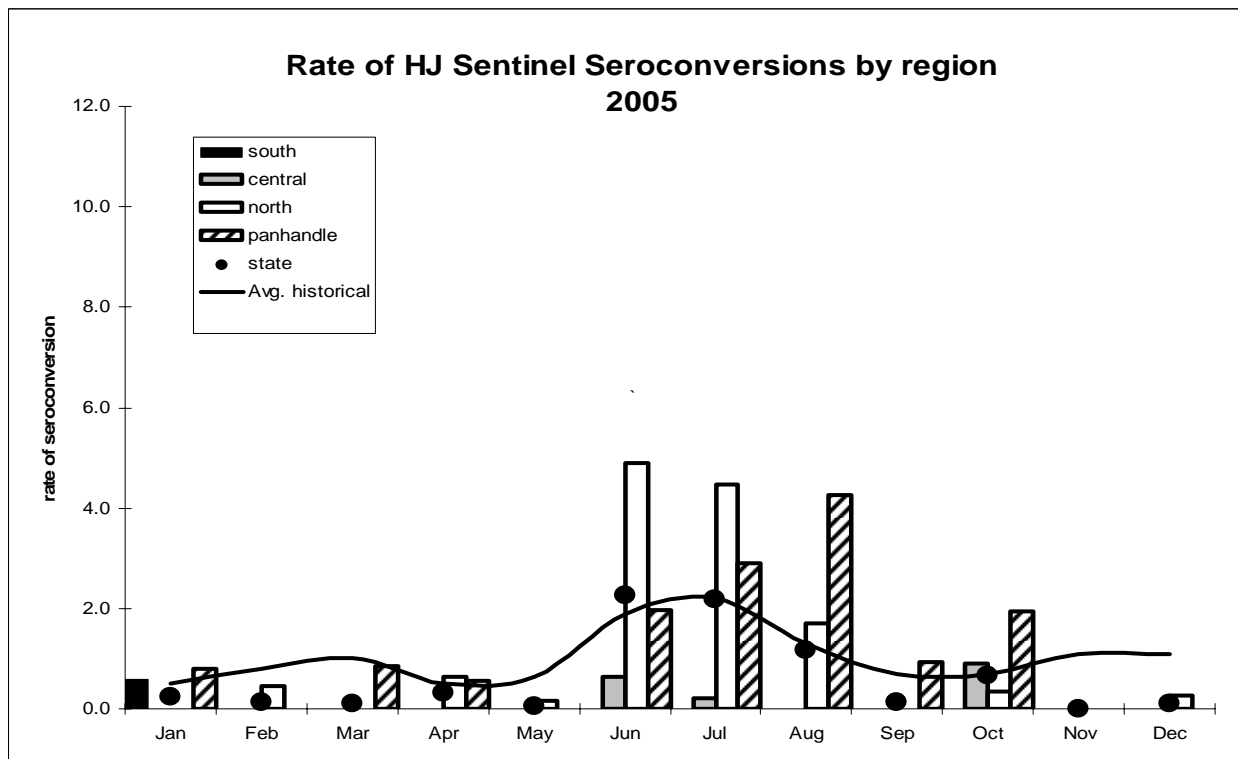
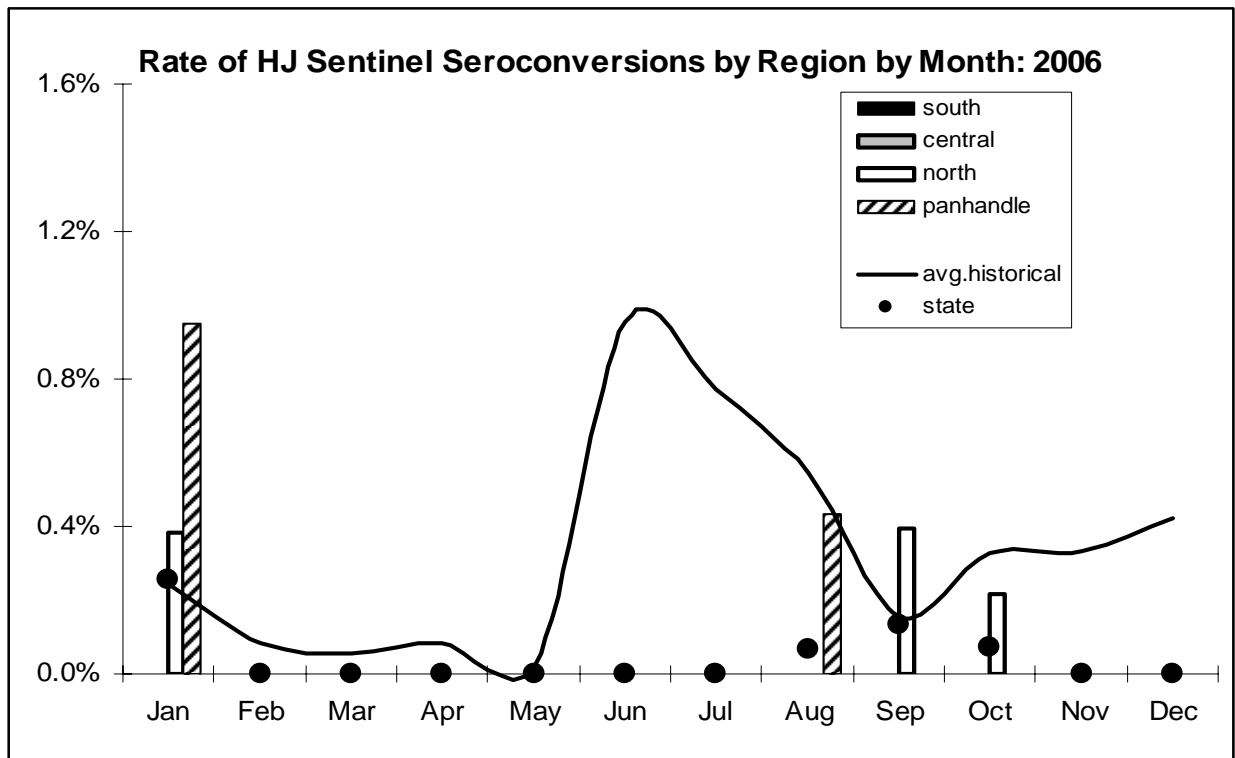


Figure 14. Rate of sentinel seroconversions to SLE virus by region by month, 2006 and 2005. "State" is the statewide rate for that month for 2006; "Avg. historical" is the average statewide rate from 1990 through 2006. Rate = number of seroconversions to SLEE in a region divided by the number of susceptible birds exposed during the month in the region, expressed as %.

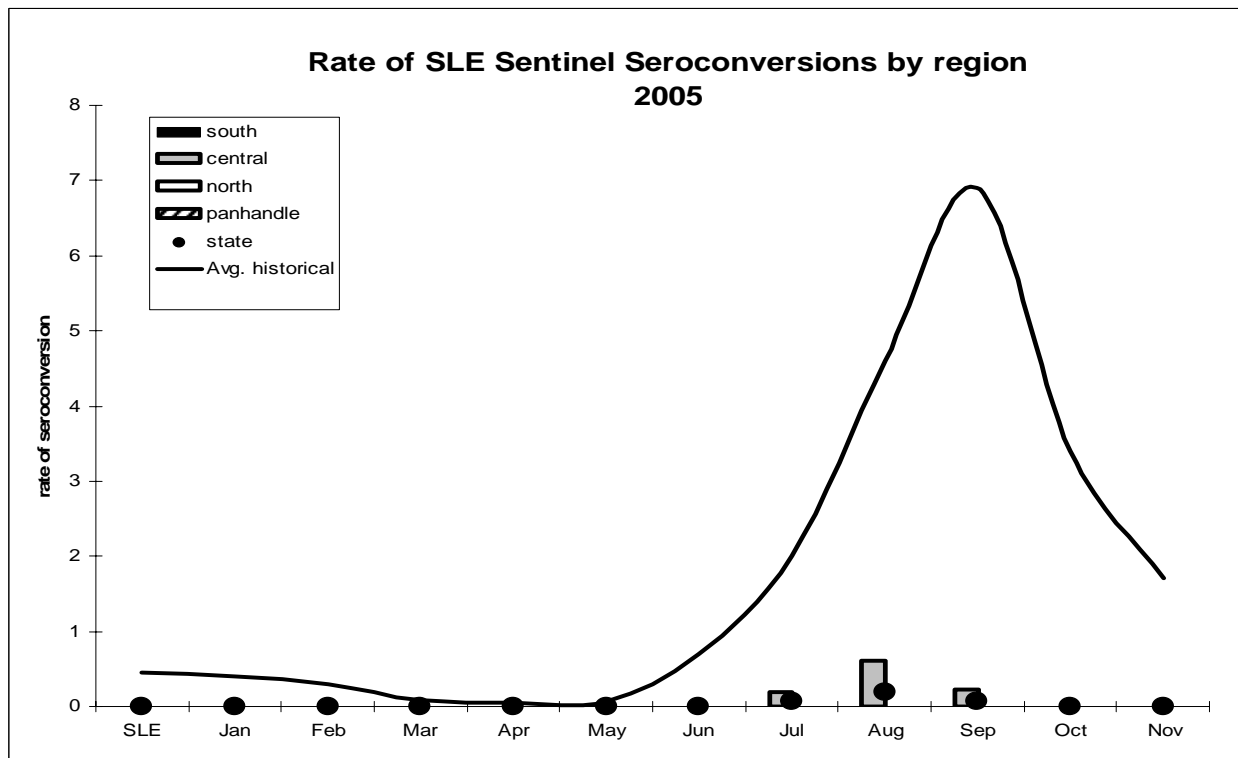
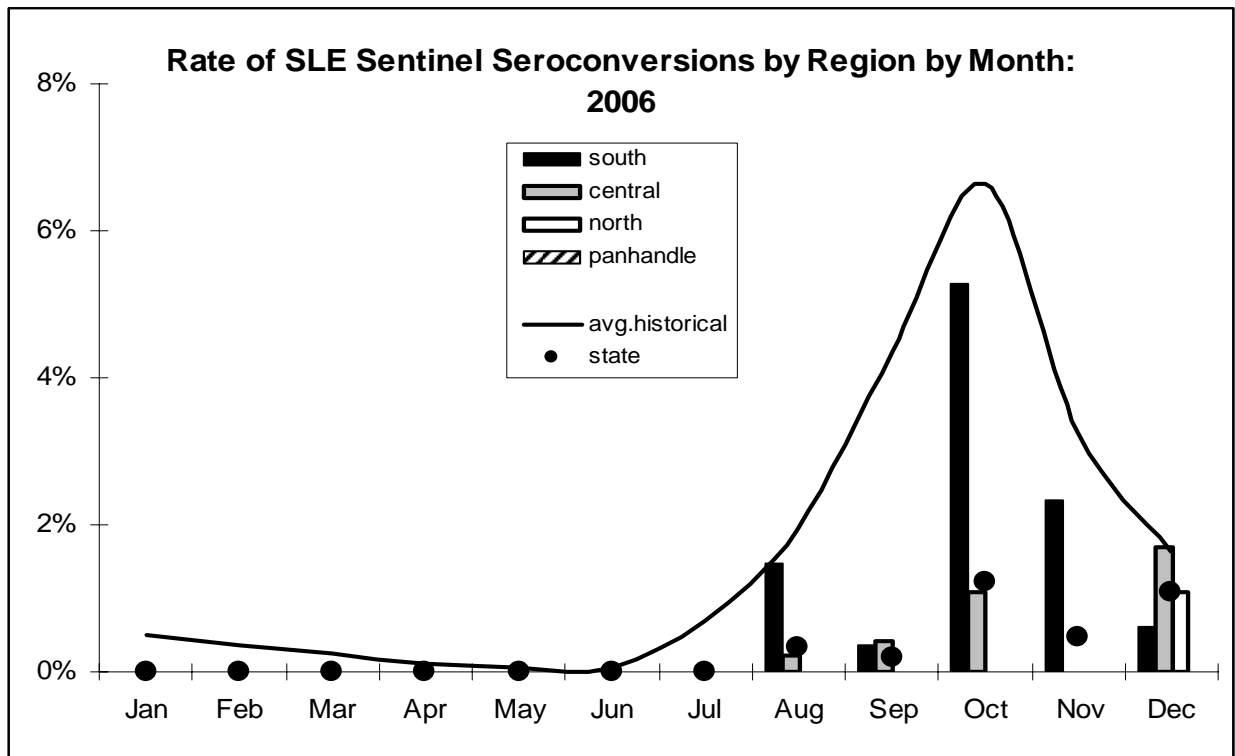


Figure 15. Rate of sentinel seroconversions to WN virus by region by month, 2006 and 2005. "State" is the statewide rate for that month for 2006; "Avg. historical" is the average statewide rate from 1990 through 2006. Rate = number of seroconversions to WN in a region divided by the number of susceptible birds exposed during the month in the region, expressed as %.

