I. 2017 KEY DEER INDEX
Results of the Key deer abundance indices, including the calculation of the average number of deer seen.

The Key deer road-count index value is the average count from multiple road-count surveys throughout the year on Big Pine Key and No Name Key. It has also been referred to as the Key deer "census," "road count," and "count index"; these labels are often used interchangeably. The road counts have previously been conducted once to bi-monthly with a single sunset survey, but the survey methodology was modified in response to major events requiring a more intensive survey regimen to assess potential effects to the Key deer population. These intensive surveys were also used to estimate population size on the core islands (Big Pine and No Name Keys) as well as estimate Key deer mortality after Hurricane Irma struck the Lower Florida Keys on September 10, 2017.

Year	Period Covered by Surveys	Survey Method	Number of Surveys	Average Deer Count
2010	January - December	Monthly sunset	10	57
2011	January - December	Monthly sunset	11	61
2012	January - December	Monthly sunset	10	59
2013	January - December	Bi-monthly sunset	5	68
2014	January - December	Bi-monthly sunset	6	67
2015	January - December	Bi-monthly sunset	5	52
2016	January - September	Bi-monthly sunset	5	54
2016	October - December (Screwworm Incident)	Intensive sunrise/sunset	26	53
2017	January - August	Intensive sunrise/sunset	45	97
2017	September –November (Post-Hurricane)	Intensive sunrise/sunset	29	43

Table 1. Summary of Key deer counts during road surveys and averages for 2010-2017.

II. KEY DEER MORTALITY SUMMARY
A summary of Key deer mortality information, including the calculation of the number of human-related deaths.

Another dataset collected on the Key deer population is the mortality index for the core area, *i.e.*, the number of deer deaths reported on Big Pine and No Name Keys. In 2017, the total mortality count on Big Pine and No Name Keys was 151. Of the reported deaths, 96 (64%) were attributed to deer-vehicle collisions (DVC). Five (3%) of Key deer deaths can be attributed to various human-involved (anthropogenic) causes other than motor vehicles such as poaching, entanglement, and dog attacks, bringing the total number of Key deer deaths related to human activities to 101 (67%). One poaching death was documented during 2017 on Little Torch Key (outside the scope of this report), which resulted from injuries sustained while being tied up in a vehicle and was not included in the mortality count. Deaths from natural causes such as

drowning, combat-inflicted injury, and disease accounted for 7 (5%) of reported deaths. Death directly attributed to Hurricane Irma included Key deer found during emergency response efforts, among or under storm debris, or in the water immediately after the storm, and accounted for 21 (14%) of the reported deaths. The remaining 20 (13%) of Key Deer deaths reported were assigned an undetermined cause due to lack of physical evidence identifying the cause of death.

	Cause of Death											
	Combat	Disease	Dog	Drowning	Entanglement	Human Misc	Screwworm	Poaching	Hurricane Irma	DVC	Undetermined	Total
2010	1	7	0	7	3	0		0		103	20	141
2011	2	12	6	3	3	2		0		131	16	175
2012	4	17	2	3	5	0		0		151	15	197
2013	0	8	0	5	2	0		0		109	27	151
2014	0	3	3	5	1	0		1		121	13	147
2015	1	6	1	2	2	0		4		75*	13	104
2016	0**	8	0	4	3	3	131	0		109	24	282
2017	0	2	1	5	3	1	2	0	21	96	20	151

Table 2. Summary of Key Deer deaths by cause reported from 2010 - 2017 for Big Pine and No Name Keys, including Little Palm Key and Big Munson Key.

DVC =Deer-vehicle collisions

*Variation in reported deer-vehicle collisions may be due to reporting error

**Screwworm infestation and fatalities occurred primarily in adult males during the fall of 2016

III.   KEY DEER INDEX AND MORTALITY DATA DISCUSSION
A discussion and interpretation of census and mortality data.

The Key Deer population has experienced stochastic events during the last two years, which has prompted a change in the intensity of survey efforts to monitor the population. These intensive surveys returned higher values for average deer counts than past surveys, given the increased frequency and number of observers. Average deer counts in the past have represented only the deer seen during sunset surveys, and while adequate for rough estimation of current population trends, it was determined by Key deer researchers that additional effort was needed to understand the impacts of these events on the population. The increased effort in surveying during this time caused variation in the count index dataset. This variation is visible in the increased deer counts due to the number of observers used for surveys during this time. Utilizing trends in key deer count data still provides valuable information on the general abundance of deer, as well as additional data used by experts to calculate population sizes and estimate mortality.

The January-August 2017 surveys documented an average of 86 deer seen during morning surveys and 107 deer seen during evening surveys, with an average of 97 deer per survey. Fall surveys are performed during the rut period when males vastly increase their territories, drive off competitors, and cause females to avoid grouping in conspicuous areas, while January-August surveys are performed over a time period where new fawns and post-partum females are more conspicuous in the observed population, and males are not spread out looking for reproductive opportunities. A decrease of 19% was detected in the average raw count of deer observed from fall 2016 to fall (post-Irma) 2017. This shift is likely due to a combination of effects, including a

loss of a portion of the herd to the recent hurricane, as well as changes in detection rates because of the presence of storm-related debris along the roadsides and changes in behavior of the deer during this time. As the road survey relies on these areas to count deer, the loss of forage and presence of debris piles have likely affected the tendency of deer to loiter in these areas and altered visibility of deer from the road, thus affecting the counts.

Reported mortality for 2017 has fallen back into the typical range of values, with reported roadkill deaths below 100. The 21 hurricane-related deer deaths reported may represent only a portion of the estimated potential loss (-22% average; range: -1.3% to -49.5%) of the Key deer population as reported by Texas A&M researchers. This is due to the difficulty in locating the physical remains of animals immediately after the hurricane and associating the deaths with conditions caused by the storm. The estimated population after Hurricane Irma was within the range, but on the lower end, of pre-storm numbers (Parker et al. 2017).

IV.   KEY DEER MORTALITY RATIO
An assessment of the ratio of the number of anthropogenic (human-caused) deaths to the average number of deer seen.

In 2017, the ratio of human-related deaths to the average number of deer seen was 1.33. This value was obtained with the value from the total surveys conducted in 2017. This value falls below the upper boundary of the 95% confidence interval (1.53) defined in the county HCP.

Year	Anthropogenic Deaths	Average Deer Seen	Ratio
2010	113	57	1.98
2011	145	61	2.38
2012	161	57	2.82
2013	116	68	1.71
2014	131	67	1.96
2015	84	52	1.62
2016	119	53	2.25
2017	101	76	1.33

Table 3. Ratio of anthropogenic (human-related) deaths to average deer count for entire years surveys.

V.   LOWER KEYS MARSH RABBIT ROAD MORTALITY
A summary of reported Lower Keys marsh rabbit road mortality.

No mortality was reported for the Lower Keys Marsh Rabbit during 2017. It is likely that the population on Big Pine saw a reduction as a result of the hurricane with damage to occupied critical habitat. Texas A&M University researchers are analyzing data from post-storm occupancy surveys and will inform the refuge on recommended management activities.

LITERATURE CITED

Parker, I. D., M. Grassi, R. R. Lopez, N. J. Silvy. 2017. Key deer Hurricane Irma report October 2017. National Key Deer Refuge, Big Pine Key, FL, USA. Available on the National Key Deer Refuge website.