

**IMMUNOCONTRACEPTION OF WHITE-TAILED DEER AT
FIRE ISLAND NATIONAL SEASHORE**

**2006 Progress Report to Fire Island National Seashore
And
The New York State Department of Environmental Conservation**

**Submitted by
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I. INTRODUCTION

The first five-year phase (1993-1997) of the Fire Island deer immunocontraception project, conducted by the Humane Society of the United States (HSUS), was intended to test whether porcine zona pellucida (PZP) immunocontraception vaccine could be delivered effectively to deer in the field and whether vaccine efficacy under field conditions matched that in more controlled situations. This phase also examined the practicality of using local residents (deer monitors) to identify individual deer before delivering PZP treatments.

The five-year study confirmed that PZP vaccine could be delivered to large numbers of free-ranging, mostly habituated deer, but vaccine efficacy was lower than that seen in more controlled studies. The study also confirmed that vaccine efficacy increased with successive annual booster treatments and that after five successive years of treatments fawning rates decreased nearly 90%.

The study also showed that using deer monitors to identify individual deer for treatment was very effective, but extremely labor intensive (Kirkpatrick et al. 1997; Naugle et al. 2002).

The second five-year phase (1998-2002) of the Fire Island deer project conducted by the HSUS, Fire Island National Seashore (FIIS), National Park Service (NPS), and the United States Geological Survey (USGS) was intended to determine whether the PZP vaccine could be a useful deer management tool in a populated area. Specific objectives included the demonstration of a reduction in the deer population in the communities; the scaling back and eventual elimination of the labor intensive deer monitoring system; using a marking system to identify treated deer; the use of distance sampling methods to estimate population density and composition; reduction of the total amount of bait and bait stations used to attract deer for darting; shortening the time that bait is available; and the relocation of bait stations outside the communities to the extent consistent with effective and efficient vaccine delivery.

The study showed that comprehensive annual treatments of deer continued to significantly reduce fawning rates and that in a few areas, where deer had been treated for 10 years, that such localized deer populations had decreased significantly. The study also showed that deer could be darted with marker darts, marks remained visible long enough to complete treatments in each area, considerably less time was needed to dart individual deer, and that manipulating the time, duration, and location of bait stations could reduce bait usage while still allowing the majority of the deer to be darted annually.

In 2003, The HSUS, FIIS, NPS, and the USGS began the third five-year phase of the Fire Island deer project. The goals are to discover how deep a deer population reduction can be achieved on Fire Island using only immunocontraception, to continually monitor deer population trends across the island, to develop new vaccine delivery strategies to more effectively control deer populations in communities that have not yet shown clear reductions, and to hand over much of the responsibilities for the project to FIIS.

METHODS

Baiting: During January 23-February 22, 2006 deer treated with immunocontraceptives within Fire Island communities and in FIIS/NPS areas as follows: Corneille Estates, Ocean Beach, Seaview, Ocean Bay Park, Point O' Woods, and the Sailors Haven/Sunken Forest area. During August 29-September 30 female deer inhabiting the areas of the FIIS Lighthouse, Kismet, Seabay, Saltaire, Fair Harbor, Dunewood, Atlantique, Cherry Grove, Fire Island Pines, and FIIS/NPS areas in between was baited and darted. Winter bait stations were located at 2 approved sites in residents' yards and 3 FIIS sites. Fall sites were located at 4 approved sites in residents' yards and 4 FIIS sites.

Baiting was done during both periods using automatic feeders (n=10) or by hand (n=3) and was only done in areas deemed safe enough for shooting darts. Daily baiting began 1-2 weeks before darting began in each area to acclimate deer to the site. Automatic feeders were programmed to dispense 5-15 pounds of whole corn during either early morning or late afternoon depending on site accessibility and the number of deer treated at the site in previous years. At stations where bait was placed out by hand residents were responsible for baiting deer during the 1-2 weeks prior to scheduled darting time. Once darting began at each site darters dispensed bait when they arrived each day. The amount of corn used daily was 5-15 pounds and was dependent on the number of deer routinely observed at each site. Once darting was concluded at a site (>90% of deer marked) baiting was discontinued at that site.

In most areas deer were also darted as they were encountered while walking or riding bicycles along boardwalks, streets, or roadways. When a deer was encountered at a location that the darter deemed safe for darting, it was encouraged to remain in the area until darted by placing a small amount of corn on the ground.

Vaccine: In 2006 all deer on Fire Island were treated with 100µg porcine zona pellucida (PZP) in 0.5 ml phosphate buffered solution (PBS) emulsified in 0.5 ml Montanide ISA-50 adjuvant (Seppic, Inc.). Vaccine was supplied by the Science and Conservation Center at ZooMontana, Billings, MT and stored frozen until used in the field. As needed the vaccine was thawed in the field, mixed with adjuvant, and loaded into disposable Pneu-Dart, Inc. darts (Williamsport, PA).

Darting: Deer were darted with either combination 1cc/3cc vaccination/marketing darts with barbless 2.5 cm, 14 gauge needles or in a few instances with 1 cc Pneu-Dart barbless darts with 2.5 cm, 14 gauge needles. Darts were fired intramuscularly in the hip using Dan-Inject CO₂ Blotectors at distances usually not exceeding 15 meters. Vaccination/marketing darts were designed to hit an animal, inject vaccine, spray a brightly colored marking dye on the fur, and bounce out. The marking dye used was nontoxic Sharpmark red, liquid livestock marker concentrate (Nasco, Fort Atkinson, WI). The smaller 1 cc darts did not leave marks and were only used on deer with highly conspicuous markings or deer that received marks but did not receive complete vaccine injections from marker darts. After darting was completed, each deer was examined for marks and injuries and each dart was recovered. Darts were then inspected to determine complete or

incomplete injection and disposed of. All deer darted were at least one year old.

Each person designated to dart deer was certified in weapon safety and operation by NPS staff and qualified per NPS requirements. In most areas darters darted deer during the early morning hours (0600-0900) and late afternoon/evening hours (1530-1800). Darting took place during Monday through Friday and was concluded in each area once >90% of the female deer observed was marked.

RESULTS

During the winter darting session of January 23-February 22, 2006, 74 adult and yearling female deer inhabiting the areas between Corneille Estates and the eastern boundary of the Sunken Forest/Sailors Haven (the Mid-Island communities) were injected with PZP vaccine and ISA-50 adjuvant (Table 1). A total of 105 vaccines was used to dart the 74 deer.

Three (3) people spent a total of 17 days and 52.25 hours for a combined 124.25 person-hours to dart the 74 deer. An average of 7.3 person-hours was spent per day searching for deer and darting them averaging 4.3 deer/day and 1.8 person-hours/deer darted.

During late-summer/fall darting session of August 29-September 30, 2006, an additional 65 adult and yearling female deer inhabiting the areas between the FIIS Lighthouse and Atlantique, and Cherry Grove and Fire Island Pines (the West-End and East-End communities and intervening NPS land) were injected with PZP vaccine and ISA-50 adjuvant (Table 2). A total of 94 vaccines was used to dart the 65 deer.

Five (5) people spent a total of 10 days and 54.75 hours for a combined 187 person-hours to dart the 65 deer. An average of 18.7 person-hours was spent per day searching for deer and darting them averaging 6.5 deer/day and 2.9 person-hours/deer darted.

In summary, 139 deer were treated with PZP vaccine between the FIIS Lighthouse and Fire Island Pines in 2006 (Table 3). A total of 27 days and 107 hours for a combined 311.25 person-hours was spent searching for and darting the 139 deer. An average of 11.5 person-hours was spent per day averaging 3.1 deer/day and 2.2 person-hours/deer darted.

A total of 199 vaccines was used to dart the 139 deer of which 24 vaccines were lost due to misses, 31 vaccines were wasted in preparation and/or carried in darts too long, 4 antlerless males were inadvertently darted in the winter, and 1 female was mistakenly darted twice.

In 2006, an estimated 3250 pounds of corn were used to dart the 139 deer or 23.4 pounds/deer darted. An estimated \$5686 was spent on vaccine (\$4179), bait (\$357), darting supplies (\$700), and travel (\$450) at a cost of approximately \$ 41/deer treated (excluding personnel costs).

DISCUSSION AND CONCLUSIONS

Since 1998, when female deer in nearly all areas between the FIIS Lighthouse and Fire Island Pines began receiving PZP treatments, the number of deer darted annually has decreased approximately 40% (Table 3). Informal surveys by deer monitors and darters and more formal surveys by the USGS and FIIS confirm that the overall number of deer in the study area has also decreased significantly (Underwood 2005). Based on the number of deer darted annually the largest decrease (approximately 70%) has occurred in the West End communities. In the East End communities the number of deer darted annually has decreased approximately 50% and in the Mid-Island communities the overall number of deer darted annually has fluctuated since 1998, but over the past 3 years has risen (Table 3). Note that the high number of deer darted at the Seaview and Point O'Woods bait stations in 2006 compared to the low number darted in the Sunken Forest/Sailors Haven area (Table 1) suggest that feeding/baiting draws deer from considerable distances.

In the past 9 years feeding deer in most areas of Fire Island has been limited to the annual 1-3 week pre-baiting and 2-3 week darting periods. This method has proven very effective and is a necessary component of the project. Baiting allows darters to quickly locate and dart the maximum number of female deer each year in a relatively short time. However, after 13 years of annually darting deer on Fire Island we have seen that some older deer will no longer feed at a bait station when darters are present. As a result, over the past several years we have routinely walked and rode bicycles up and down community boardwalks and streets searching for deer. This method has also proven very effective. As seen in Table 4, since 2001, 48% of the deer darted on Fire Island have been darted along streets and boardwalks and 52% have been darted at bait stations.

Regardless of these efforts to locate and dart as many deer as possible each year fawning rates and overall deer numbers are still relatively high in the Mid-Island communities. As seen in Table 4, approximately 47% of the deer darted during 2001-2006 were darted in these communities. The reasons these numbers are so high can most likely be attributed to three factors.

First, regardless of FIIS and HSUS efforts to limit feeding in the Mid-Island communities it still continues there year round. This routine feeding has unquestionably aided us in darting deer each year, but evidence from penned and non-penned deer studies (Ozoga and Verme 1982) have shown that when deer are fed high protein diets year round they are significantly healthier and have significantly higher fecundity rates than deer left to forage for themselves. Thus, where the vaccine fails, fecundity of deer may be higher. Even though numerous deer get treated annually in the Mid-Island communities, excessive feeding there may be limiting the effectiveness of the vaccine and the overall success of the project.

Second, over the past 7 years deer have been darted sporadically in Point O'Woods, primarily because residents there did not want deer darted in late-summer/fall when numerous people were

still in the community. As a result, numerous deer between Ocean Bay Park and the Sunken Forest (approximately ½ of the study area) did not get routine PZP treatments for many years, resulting in numerous fawns born annually. Unfortunately these fawns often disperse into new areas such as Ocean Bay Park and Seaview probably in part because feeding still goes on there year round.

Third, according to USGS/FIIS census data, numerous deer live in the Sunken Forest-Sailors Haven portion of the island, but only a small proportion of them are darted. For the most part these deer are relatively wild when compared to deer in the communities and many are reluctant to feed at bait stations. Others won't usually visit bait stations when darters are present, and when they do they are often nervous and very difficult to dart with the short range equipment used (i.e., CO₂ Blo-Jectors). We have tried darting deer in this area with longer-range weapons and marker darts but with limited success.

Based on these factors, we are considering darting deer with 1 cc barbless Pneu-Dart darts fired from Model 193 Pneu-Dart cartridge-fired rifles in the Sailors Haven/Sunken Forest area in 2007. Darting with longer range equipment may also be tried in areas of Point O' Woods and Oakleyville. Deer will not receive marks, and each time one is darted the precise location will be recorded along with any distinguishing marks on the deer, number and sex of deer it was with, any fawns associated with it, and any other data that will allow us to recognize it if encountered again. This method should allow us to dart at considerably longer ranges and insure that the maximum number of deer in these areas gets darted annually.

Based on the number of deer darted at bait stations in the Mid-Island communities (n=50) in the winter of 2006 compared to numbers darted in these areas in previous years during the fall (average=27) it is evident that deer rely heavily on supplemental feeding when available in the winter. Deer also appear to be more tolerant of darters at bait stations in the winter which should require less street roaming. However, since it is still unknown how effective winter darting will be on fawning rates we will only continue darting deer in the in the Mid-Island communities during winter 2007. If fawning rates are low in the summer of 2007 we will then consider winter darting in other areas starting in 2008.

In conclusion, FIIS has made good progress in handling all aspects of the baiting and darting procedures on the Fire Island deer immunocontraception project and in the process of assembling a team to carry out much of the fieldwork starting in 2007. The HSUS will continue to assist with various aspects of the fieldwork (training personnel, darting deer, etc.) and with writing and submitting annual reports. Questions or concerns over any aspect of the project can still be directed to The HSUS or FIIS.

LITERATURE CITED

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Table 1. Winter 2006 PZP treatments on Fire Island

Community/Area	Number of females darted
Corneille Estates	16
Ocean Beach	8
Seaview	26
Ocean Bay Park	7
Point O'Woods	15
Sunken Forest/Sailors Haven	2
Total	74

Table 2. Fall 2006 PZP treatments on Fire Island

Community/Area	Number of females darted
Lighthouse	4
Kismet/Seabay	12
Saltaire	14
Fair Harbor	6
Dunewood	3
Atlantique	6
Cherry Grove	3
Fire Island Pines	17
Total	65

Table 3. Overall number and location of deer treated with PZP immunocontraceptives on Fire Island (1998-2006)

	1998	1999	2000	2001	2002	2003	2004	2005	2006
West End Communities	113	114	89	70	48	40	46	33	35
Mid-Island Communities	90	72	75	81	74	59	55	62	72
East End Communities	37	39	33	30	27	30	30	24	20
West End NPS	-	-	15	12	34	31	11	19	4
Mid-Island NPS	6	6	2	2	5	0	0	10	6
East End NPS	-	-	11	13	11	20	12	1	2
Total	246	231	225	208	199	180	154	149	139

Table 4. Location and number of deer darted in Fire Island communities (2001-2006)

	West End		Mid-Island		East End		Total Bait	Total Street
	Bait	Street	Bait	Street	Bait	Street		
2001	57	13	26	55	6	24	89	92
2002	29	19	26	48	9	18	64	85
2003	16	24	26	33	14	16	56	73
2004	35	11	31	24	19	11	85	46
2005	18	15	25	37	8	16	51	68
2006	35	10	50	20	14	10	98	41