

Anesthesia Protocol

Use of Field Anesthesia in Free-Ranging White-tailed Deer at Fire Island National Seashore

White-tailed deer may occasionally need to be anesthetized for research or management purposes at Fire Island National Seashore. An Institutional Animal Care and Use Committee (IACUC) will review the anesthesia study protocol prior to implementation of anesthesia for research projects. This protocol may include anesthesia prior to euthanasia.

Lindsay Ries, park practitioner, will be the work leader for field anesthesia. She will be ultimately responsible to the attending veterinarian. Field anesthesia will be performed by qualified NPS staff (crews will be led by Lindsay Ries – Park Practitioner or Jordan Raphael – Park Biologist) and assistance from Kaetlyn Kerr – Biological Technician and one to two additional staff members using only approved techniques and protocols. Deviations from these protocols require approval from the attending veterinarian.

Drugs will be stored under double lock with access limited to Lindsay Ries and Jordan Raphael. Drug inventory sheets will be maintained by the park practitioner. Whenever drugs are used, capture forms will be completed. Capture forms will be forwarded to the attending veterinarian within 30 days of capture. Proper notification to the NPS Chief Ranger will be made prior to darting in the field. Radio contact and access to EMS will always be available.

Anesthesia & Reversal Options

Option A- Telazol/Xylazine (ANESTHESIA) and Yohimbine (REVERSAL)

- To obtain proper volume for administration: Mix 250 mg (2.5 ml) of Xylazine (100 mg/ml) into Telazol powder (~570 mg) and mix well = ~3ml.
 - Telazol concentration = ~190 mg/ml
 - Xylazine concentration = ~83 mg/ml
- Approximate dose will be 5.0 mg/kg Telazol + 2.2 mg/kg Xylazine per deer.
- If deer is not down in 20 minutes and shows no signs of sedation, administer another full dart. If showing signs of sedation administer ½ dart. If additional sedation is needed after immobilization give 0.25 ml TEL/XYL IV or 0.4 ml TEL/XYL IM.

- For ANESTHESIA administer:

Sex/age class	Weight (kg)	Dose (per deer)
Mature female	50 kg	1.3 ml TEL/XYL
Mature male	70 kg	1.8 ml TEL/XYL
Yearling (male/female)	40 kg	1.0 ml TEL/XYL
Fawn (male/female)	30 kg	0.8 ml TEL/XYL

- Approximate dose of Yohimbine for REVERSAL will be 0.2 mg/kg IV (preferred) or IM if a vein is not accessible.
 - Yohimbine concentration = 10 mg/ml

- Administer > 30 minutes after injection of last anesthetics.

- For REVERSAL administer:

Sex/age class	Weight (kg)	Dose (per deer)
Mature female	50 kg	1.0 ml YOH
Mature male	70 kg	1.4 ml YOH
Yearling (male/female)	40 kg	0.8 ml YOH
Fawn (male/female)	30 kg	0.6 ml YOH

- Deer should be monitored until recovered from anesthesia. Reversals can take up to 2 hours. An entire dose of YOH can be repeated if the deer has not fully recovered from anesthesia.
 - NOTE: TEL/XYL (once Telazol powder is mixed with Xylazine) must be used within 7 days or discarded. Dart has to be used within 24 hours if metal; non-metal darts are good for 48-72 hours. Unload darts and store TEL/XYL in plastic syringe when not in use.
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Option B – Butorphanol, Azaperone and Medetomidine (ANESTHESIA) and Atipamezole + Tolazoline (REVERSAL)

- Approximate dose for ANESTHESIA will be 0.50-0.62 mg/kg Butorphanol + 0.17-0.20 mg/kg Azaperone + 0.20-0.25 mg/kg Medetomidine per deer. BAM will come pre-mixed at the following concentrations.
 - Butorphanol concentration = 27.3 mg/ml
 - Azaperone concentration = 9.1 mg/ml
 - Medetomidine concentration = 10.9 mg/ml
- If deer is not down in 20 minutes, and shows no signs of sedation, administer another full dart. If showing signs of sedation administer ½ dart. If additional sedation is needed after immobilization give 0.5 ml of BAM IM to adult does and bucks; administer 0.25 ml of BAM IM to young deer and fawns.
- For ANESTHESIA administer:

Sex/age class	Weight (kg)	Dose (per deer)
Mature female	50 kg	0.9 to 1.1 ml BAM
Mature male	70 kg	1.3 to 1.6 ml BAM
Yearling (male/female)	40 kg	0.7 to 0.9 ml BAM
Fawn (male/female)	30 kg	0.5 to 0.7 ml BAM

- Approximate dose for REVERSAL
 - Atipamezole/Tolazoline IM
 - ~3 mg Atipamezole for every 1 mg Medetomidine + 2 mg/kg Tolazoline
 - Atipamezole concentration = 20 or 30 mg/ml
 - Tolazoline concentration = 100 mg/ml
- For REVERSAL administer:

Sex/age class	Weight (kg)	Dose (per deer)
Mature female	50 kg	2.0 ml ATI or 1.5 ml ATI + 1.0 ml TOL
Mature male	70 kg	2.5 ml ATI or 2.0 ml ATI + 1.4 ml TOL
Yearling (male/female)	40 kg	1.5 ml ATI or 1.0 ml ATI + 0.8 ml TOL
Fawn (male/female)	30 kg	1.0 ml ATI or 0.5 ml ATI + 0.6 ml TOL

- Administer Tolazoline IM 5 minutes prior to administering Atipamezole IM.
 - Deer should be monitored until recovered from anesthesia. Reversal should occur within 5-15 minutes.
 - NOTE: If an additional half or full dart is given, Atipamezole needs to be increased 50-100% to reverse Medetomidine. For example, if a mature female is shot with a dart and a half dart, give 3.0 ml (20 mg/ml) or 2.0 ml (30 mg/ml) of Atipamezole.
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Euthanasia Options

Authorized park staff will use a potassium chloride solution to euthanize deer. Alternatively, NPS law enforcement personnel may euthanize anesthetized deer via a gunshot to the brain, or, if CWD samples are needed, via a gunshot to the cervical spine or vitals (i.e. lower half of chest just behind shoulder). Potassium chloride solution can only be administered when deer is under a **deep surgical plane of anesthesia**. An additional full anesthetic dose can be delivered to achieve a deep plane of anesthesia. The desired dose for euthanasia is 4 g potassium chloride for every 50 kg of body weight. Approximately 10 ml of sterile water is needed to dissolve 2 grams of potassium chloride. Inject dose quickly via **intravenous or intracardiac means only**.

Administer: 10 ml per 50 lbs (23 kg). Repeat if death does not occur within 2 minutes of administration.

Human Safety

A Job Hazard Analysis (JHA) will accompany this drug use protocol and will address potential human health and safety issues including, but not be limited to, drug handling and disposition, animal handling, and handling and disposition of samples and carcasses. MSDS sheets for each drug to be used will be distributed to the Chief Ranger prior to implementation so they can be shared with NPS Park Rangers, Suffolk County, and local EMS.

All personnel who will participate in using remote delivery systems (RDS) will qualify annually with law enforcement personnel using their RDS.

Animal Monitoring

Monitoring of vital signs (pulse, respiration, body temperature) of anesthetized deer (except those for euthanasia) is required at 5-10 minute intervals. If body temperature exceeds 104 °F, cooling measures will be implemented. Cooling measures may include moving the animal out of sunlight, "fanning" the animal to increase air movement around the animal, immersing the

animal in water, wetting the groin and belly with water, wetting the groin and belly with isopropyl alcohol (rapid evaporation will assist cooling). If body temperature falls below 98 °F, warming measures will be implemented. Warming measures may include wrapping the animal in blankets or placing the animal on an insulated surface (blanket, foam mat, cardboard, etc.). Deer with body temperatures < 96 °F or > 106 °F will be reversed immediately.

Support for depressed respiration (less than 5 breaths per minute) may include placing a needle in the nasal planum and twisting to stimulate the accupressure point. If this is not successful administer Doxapram (20 mg/ml) 1 mg/kg (approximately 3 ml), slowly IV. Doxapram may be repeated if necessary, up to 3 mg/kg.

Deer with other complications (e.g., severe respiratory depression, apparent shock) will be reversed immediately. Deer with severe injuries (e.g., broken spine or leg) that would result in chronic pain or severe impairment of function will be euthanized.

Supportive care including blindfold, eye ointment, and prophylactic antibiotics should be used. For antibiotics, use 20 mg/kg or approximately 7 ml of long-acting oxytetracycline (e.g., LA200) or use 40,000 IU/kg or approximately 10 ml long-acting penicillin (procaine and benzathine 300,000 IU/ml) administered subcutaneously.

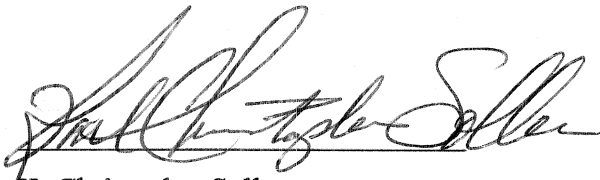
The withdrawal time of the antibiotics, anesthetic and reversal drugs is 45 days. If deer are anesthetized within 45 days of legal hunting seasons, or if they may enter the human food chain, they must be marked prior to release to avoid human consumption. This can be done by placing an eartag or collar with "Do not consume before (date 45 days from anesthesia)".

APPROVED FOR USE AT FIRE ISLAND NATIONAL SEASHORE



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27 JAN 2014 (Date)



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January 30, 2014 (Date)



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1/30/14 (Date)

Addendum: to FIIS White-Tailed Deer Anesthesia Protocol (1/2014)**February 10, 2015**

Our original protocol for reversing BAM anesthesia was:

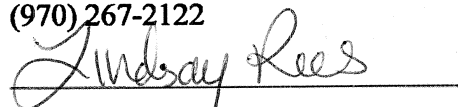
Sex/age class	Weight (kg)	Dose (per deer)
Mature female	50 kg	1) 1.0 ml TOL + 2) 2.0 ml ATI (20 mg/ml), or 1.5 ml ATI (30 mg/ml)
Mature male	70 kg	1) 1.4 ml TOL + 2) 2.5 ml ATI (20 mg/ml), or 2.0 ml ATI (30 mg/ml)
Yearling (male/female)	40 kg	1) 0.8 ml TOL + 2) 1.5 ml ATI (20 mg/ml), or 1.0 ml ATI (30 mg/ml)
Fawn (male/female)	30 kg	1) 0.6 ml TOL 2) 1.0 ml ATI (20 mg/ml), or 0.5 ml ATI (30 mg/ml)

During the course of field work in 2014 we found that increasing our reversal to 2.0 ml of 30 mg/ml atipamazole (60mg for a mature female) IM provided controlled, smooth reversal of BAM anesthesia. Additionally, atipamazole is now provided at 25 mg/ml rather than 20 or 30 mg/ml. Therefore we will change our reversal protocol to the following:

Sex/age class	Weight (kg)	Dose (per deer)
Mature female	50 kg	1) 1.0 ml TOL + 2) 2.5 ml ATI (25 mg/ml),
Mature male	70 kg	1) 1.4 ml TOL + 2) 3.0 ml ATI (25 mg/ml)
Yearling (male/female)	40 kg	1) 0.8 ml TOL + 2) 1.5 ml ATI (25 mg/ml)
Fawn (male/female)	30 kg	1) 0.6 ml TOL 2) 1.0 ml ATI (25 mg/ml)

ADDENDUM APPROVED FOR USE AT FIRE ISLAND NATIONAL SEASHORE9 March 2015 (Date)

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