I&M Protocols
NABat Survey Protocol
Julia Butler Hansen Refuge for the Columbian White-tailed Deer &
Lewis and Clark National Wildlife Refuge
Willapa National Wildlife Refuge Complex

I. Purpose

The North American bat monitoring program (NABat) was created as a continent-wide program to monitor bats at local to range-wide scales and to provide reliable data on bat populations. This information is needed to promote effective conservation decision making and to maintain the long-term viability of bat populations across the continent.

Basic information is needed to assess population and distribution shifts that may occur over time. The lack of data before the arrival of white-nosed syndrome in the eastern U.S. highlighted a significant problem with the conservation of any wildlife resource. That is, it is impossible to fully assess the effects of a disease (any major conservation issue) if few data are available prior to the event. These data are essential in assessing the scope, trajectory, and consequences of conservation issues at local and global scales.

NABat is an international, multiagency program. It relies on acoustic surveys at stationary points to gather monitoring data. Acoustic surveys are one of the only methods available for assessing distribution and occupancy for species that have small and inconspicuous colonies or don't form colonies at all. Stationary point surveys involve bat detectors placed for multiple nights at various features across the landscape and will be the method used by the Julia Butler Hansen Refuge for Columbian White-tailed Deer (JBH) and Lewis and Clark National Wildlife Refuge (L&C).

II. Procedure

Refuge monitoring will follow the NABat survey protocol (Loeb *et. al.* 2015). This plan established 100 km^2 grids throughout North America, one of which fell on JBH and L&C (figure 1). Three monitoring sites were selected within this grid (figure 2).

Set up instructions have been standardized for the acoustic array (figure 3). The external microphone will be attached with zip ties to the underside of the aluminum angle so it juts out approximately ¼" beyond the aluminum. Excess microphone cord, the external battery (if used), and bat detector will be stored in the tackle box at the base of the pole.

To set up the Pettersson D500X Bat Detector's, remove the metal panel on top of the detector and install 4 "C" batteries or attach an external "6V" battery to the appropriate port. Remove the metal plate on the bottom and ensure power is in the "off" (center) position. Insert 1-4 formatted and labeled Compact Flash (CF) cards into the slots in the appropriate order (top left, bottom left,

top right, and bottom right). Record on the Deployment Data Form (figure 4) the CF card that went into each slot. Put the power switch to "INT" for internal if "C" batteries were used and "EXT" for external if a "6V" battery was used and replace the metal plate.

Turn the power on. Once the cards are analyzed, the ready screen will appear. Press ESC to reach the Ready Screen. Verify date and time are correct and battery power is sufficient at the bottom of the screen. Press F1 to get to the Settings Screen. Highlight 1-USER PROFILES and press ENTER. Ensure the PROFILE being used has a SAMP. FREQ=500, PRETRIG=OFF, and REC. LEN=5. Press left or right to view different profiles. Press ENTER twice to return to the Ready Screen. Press REC to display the Record Setting screen. Ensure INPUT GAIN=80, TRIG LEV=120, and INTERVAL=0. Press ENTER to confirm settings, place the detector into recording mode, and to turn off screen. Record the ON TIME and OFF TIME from the Power Down screen. An LED light will flash every 5 seconds when the detector is set to automatically record.

For further guidance on more specific settings adjustments please use the R1 – Pettersson D500X Quick Start Guide (figure 5) or the D500X User's Manual (Pettersson Elektronik AB, 2013).

Be sure to fill in the rest of the spaces on the data form (figure 4) at deployment including: refuge, site name, date of deployment, detector ID, GPS locations in both decimal degrees and degrees, minutes, seconds, observers, and habitat type. Be sure to also take pictures of the site and record the date of retrieval.

Equipment

For each site an extendable painter's pole (6'-12') with attached 90 degree bent aluminum angle, rebar (18-24"), 8-12 zip ties (non-Velcro), 3 guy lines, 3 tent stakes, hammer, duct tape, Pettersson D500x Bat Detector, external microphone cord, 6 C-batteries or external 6V battery and cord, 4 formatted compact flash cards, external microphone, plastic weatherproof toolbox, GPS, camera, quick start guide (figure 3), deployment data form (figure 4), and the deployment guide (figure 5). Equipment is provided by the US Fish and Wildlife Service (USFWS) Region 1 and shared between JBH and Willapa NWR (and potentially other future sites or refuges).

Survey Times and Dates

Surveys will be conducted once a year for four consecutive nights. Sampling will occur between 1 June and 15 July before young become volant.

Weather Conditions

Surveys should be planned carefully around forecasted weather to avoid high winds, cold temperatures and moderate to heavy rain in the evenings. Driving transects should only be conducted during a new or quarter moon.

Personnel

Surveys can be done with a single surveyor, although two people are suggested for island sites. This will allow one person to man the boat while the other can set up or retrieve the detection equipment.

Data Storage and Analysis

Compact flash drives containing call files will be submitted to designated personnel in the U. S. Fish and Wildlife Service's. Call files of sufficient quality will be identified to species or species group using at least two methods. Response variables will be detection/ nondetection of each species for both mobile transects and stationary point surveys and the number of bat passes per species along a given transect for mobile transects. In addition, indices of activity can be calculated for stationary point surveys that may be valuable indicators in future analyses. A copy of the results will be kept on file at JBH. It may be entered into an Excel Spreadsheet or an Access database and stored on the Willapa server for further refuge analyses.

III. Literature Cited

Loeb, S.C., T.J. Rodhouse, L.E. Ellison, C.L. Lausen, J.D. Reichard, K.M. Irvine, T.E. Ingersoll, J.T.H. Coleman, W.E. Thogmartin, J.R. Sauer, C.M. Francis, M.L. Bayless, T.R. Stanley, and D.H. Johnson. 2015. A plan for the North American Bat Monitoring Program (NABat). Gen. Tech. Rep. SRS-208. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station.

Pettersson Elektronik AB. 2013. D500X User's Manual. Upsala, Sweden.

Figure 1: 100 km^2 grid selected for JBH and L&C refuges by the NABat monitoring program.

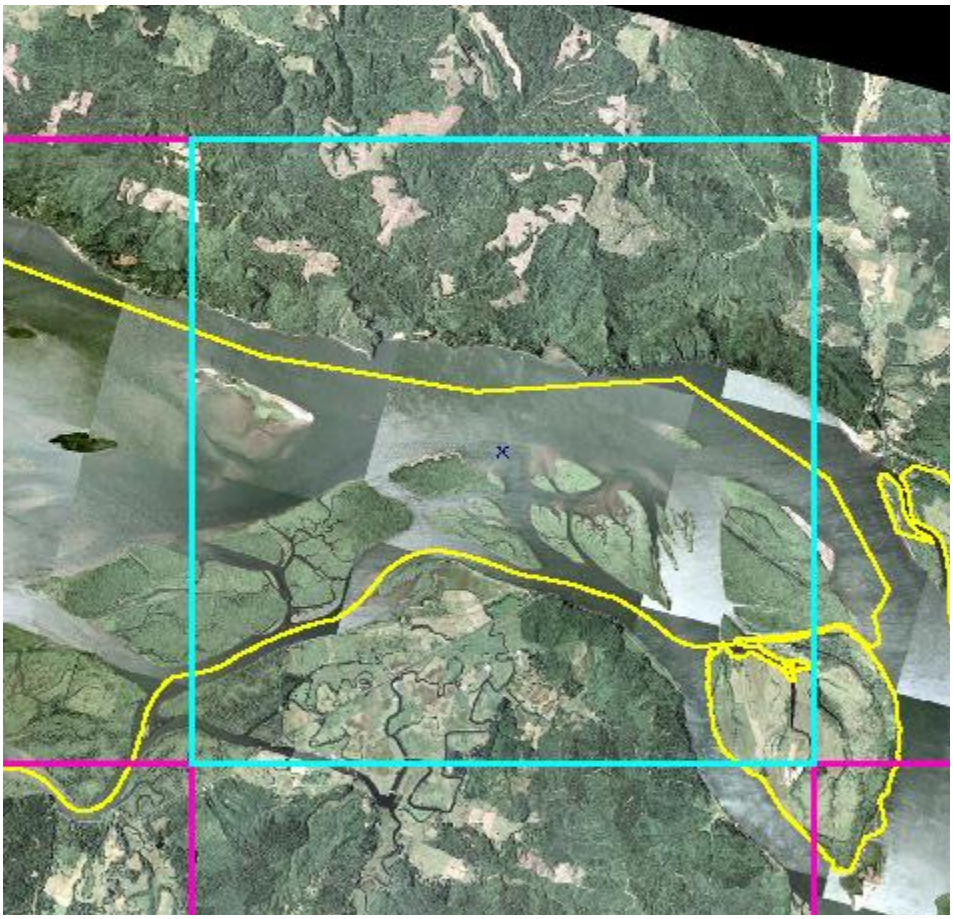

Figure 2: Stationary point count sights selected for NABat monitoring.

Figure 3: Diagram, steps, and photos of the setup for bat detectors and equipment.

Figure 4: US Fish and Wildlife Service's acoustic bat detector deployment data sheet.

R1 –ACOUSTIC BAT WORK

BAT DETECTOR DEPLOYMENT

Complete this for each bat detector deployment and send with the CF cards. Place all CF cards from a single deployment in a separate envelope with this form. Do not mix CF cards from different deployments.

For Analyst only

Data Folder _____ _____Dpl ID _____

Software Version/Filter _____

Refuge _____ Site Name _____

Date Deployed _____ Date Retrieved _____

10k BG Cell ID *(CONUS_10k)* _____ Detector ID _____

GPS Coordinates (Latitude) _____._____ (Longitude) _____._____

(In Decimal Degrees!!)

Degrees, Min, seconds _____ _____

(For automatic timer on D500x)

CF Card ID: Slot 1 _____ Slot 2 _____ Slot 3 _____ Slot 4 _____

Photographs _____

Timer Settings: ON:_____ OFF:_____

Detector Settings (verify that settings are as follows):

f = 500 _____; PRE = OFF _____; LEN = 5.0 _____;
INPUT GAIN = 80 _____; TRIG LEV = 120 _____; INTERVAL = 0_____

Observer _____ Habitat Type _____

Notes:

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Figure 5: US Fish and Wildlife's Region 1 quick start guide for deployment with the Pettersson D500X bat detector.

R1 – PETTERSSON D500X QUICK START GUIDE:
Post-2013 model used for NABat

Equipment:
Petterson D500x Bat detector and accessories
(See the equipment list in the "Deployment Setup" document.)

POWER
1. Install 4 "C" batteries in the unit. Use fresh batteries for every NABat deployment.

ADDING/REPLACING CF CARDS
1.Remove metal plate on back of D500x by unscrewing the 2 large screws. **Confirm "power" toggle switch is in the "off" (center) position.** Insert CF card(s) beginning with top left slot. Additional CF cards are added in sequence: (2) bottom left, (3) top right, and (4) bottom right. *(Cards go in label up, facing you; holes on front edge of card go into the detector)*

Rear Panel Overview

2. Switch "power" toggle switch to INT for "internal power".
NOTE: At this point the detector will power up, "D500x" will show briefly on the screen, the "Analyzing CF Cards", then a screen which shows the ID, size, and free space if every CF card in the unit.

3. CF cards should be formatted and free of data when you get them from the ZIMB. If not, follow instructions for formatting cards, below.

4.DO NOT remove a CF card from the detector when it is writing data to a file. Always be sure to stop the recording session manually by pressing the POWER button once, then again and hold it down until READY screen appears

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TO POWER D500x UP:
•Press ON/OFF key once, then press again and hold until READY screen appears.

TO POWER D500x DOWN:
•Press ESC until READY screen appears
•Press and hold POWER button
•Press ENTER

•Press ESC one or more times to reach READY screen.

•READY screen provides access to setting and arming functions

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TO CHANGE SETTINGS:
•Press the F1 key to access list of settings. •Press Up/Down to scroll through list. •Press Enter to select highlighted item. •Press Left/Right arrow keys to change value of highlighted item. •Press ENTER to execute changes. •Press ESC to return to previous screen.

SETTINGS TO CHANGE DURING PROJECT:
3-Timers; 4- Time Settings.

•RELATIVE TIMERS: turn unit on and off according the sunset/sunrise times calculated from LAT/LONG settings programed in TIME SETTINGS.
•Set RELATIVE TIMER ON/OFF to match project guidelines. Timer setting uses a 24-hour clock.
•Set RTIMER1 to ON = -00:15; OFF = +00:15 run (15 minutes before sunset to 15 minutes after sunrise)

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(*Enabled* timers show time or 00:00 in ON/OFF Columns. *Disabled* timers show --:-- in ON/OFF columns) •To *enable* or *disable*, highlight timer then press ON/OFF key

NOTE: make sure all unused timers are DISABLED!

4. Change DATE/TIME if incorrect **(Note time is in European Format: YY/MM/DD)**
(watch detectors shared between refuges in 2 different time zones!)

5. Change ZONE (Pacific = -08, Mountain = -07) Change LAT and LONG to the coordinates where unit is deployed. Use Degrees, Minutes, Seconds, WGS 84. DST should be set to USA.

NOTE: the relative timer will automatically adjust to daylight savings time, but the clock will NOT. Clock needs to be changed when the time changes

The D500x will be sent from the Zone Inventory and Monitoring Biologist (ZIMB) with settings set to project specifications and the latest firmware installed. Settings are provided here for your information, but should not need to be changed:
NOTE: *If settings are inadvertently changed, selecting USER PROFILE 0 should reset them to project specifications.*

1- USER 0: "f" = 500; "PRE" = off; "LEN" = 5; HP = YES, "Auto-record" = YES; "TS" = 4 (very low) (Don't confuse "USER 0 with PROFILE 0)

2- Recording settings (will be fine-tuned during deployment). Start with:
INPUT GAIN = 80
TRIG LEV = 120
INTERVAL = 0

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5 DISPLAY. Recommend "OFF", but "AUTO" can be used if you will be watching D500x to see if recording. Do not use "ON" – it will drain batteries

RECORDING IN THE FIELD

•Press ON/OFF key once, then press again and hold until READY screen appears.

•Press REC. NOTE: at this time "RECORDING SETTINGS" screen will appear, allowing INPUT GAIN, TRIG LEVL, and INTERVAL to be confirmed, tested, and changed if field conditions require it.

These settings should work for most situations:
Input Gain = 80
Trig Lev = 120
Interval = 0

•If RECORDING SETTINGS are good, press ENTER.

NOTE: "SYSTEM POWER DOWN" appears briefly. Then if TIMER ON is not met, D500x is waiting and the LED under REC and ON will not blink. If TIMER ON is met, D500x is armed and the LEDS under REC and ON icons will blink.

•To stop recording manually before TIMER OFF time is met, hit then hold "POWER" button until READY screen appears

CARD FORMATTING
If cards are unformatted or have data on them: follow instructions on-screen for formatting.

A potential bottle-neck in this project is the time it takes to mail CF cards to me for downloading and reformatting. Mail CF cards to ZIMB ASAP.

Place used CF cards in padded envelope and mail to my home address:

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