

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #1 Before the Field Season

Version 1.01

May 2, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.01

This Standard Operating Procedure (SOP) describes pre-season procedures for monitoring landbirds in the Northern Colorado Plateau Network (NCPN). Landbird monitoring in the NCPN is based on the Rocky Mountain Bird Observatory (RMBO)'s Monitoring Colorado's Birds program. Before conducting surveys, observers should review the entire NCPN protocol narrative and SOPs, including attachments and appendices. This SOP describes general pre-season preparation, scheduling considerations, and supplies and equipment needs.

General Preparation and Review

Prior knowledge of species likely to be encountered in the NCPN park units selected for monitoring will be key in preparing for the birding season. Observers should review the list of bird species by NCPN park unit in Attachment A of this SOP. Copies of species lists can be used in the field for reference.

Waypoints for each point-count station on a transect or for a riparian transect must be loaded into the GPS unit prior to the start of the field season. Waypoints are the X and Y coordinates for each point-count station, and are used to navigate to their location. Waypoints for transects also will be stored as part of the project metadata (see SOP #7).

The following reference manuals should be reviewed for background information on conducting bird surveys and habitat measures:

- Elmore, F.H. 1976. Shrubs and Trees of the Southwest Uplands. Southwest Parks and Monuments Association, Globe, Arizona.
- National Geographic. 1987. Field Guide to Birds of North America, 3rd Edition. Washington, D.C.: National Geographic, 480 pages.
- Robbins, C.S., B. Bruun, and H.S. Zim. 1983. Golden: A Guide to Field Identification of North American Birds. Racine, Wi.: Western Publishing Company, Inc. 360 pages.
- Stokes, D.W., and L.Q. Stokes. 1995. Stokes Field Guide to Birds: Western Region. New York: Little, Brown and Company. 519 pages.
- Welsh, S.L., N.D. Atwood, S. Goodwich, and L.C. Higgins. 1993. A Utah Flora. Second Edition. Brigham Young University, Provo, Utah. 986 pp.
- Williams, D. 2000. A Naturalist's Guide to Canyon Country. A Falcon Guide. Guilford, Conn.: Globe Pequot Press.

All observers must attend a training workshop each year (see SOP #2).

Scheduling Field Work

1. Breeding bird surveys will be conducted during the period that coincides with the peak breeding activity of most birds (May, June, and into July for higher elevation habitats). Specific survey dates may vary slightly because of weather, but will be within a three-week period established for each transect. Sampling dates should be scheduled, and logistics organized prior to the start of each field season.
2. Three observers are required to sample 15 transects in each of three habitat types each year. Each observer is to complete up to two 15-point transects each field day. This includes collecting habitat data at each point (where applicable) before beginning the bird count. To ensure completion of surveys, it is imperative to schedule survey times prior to the field season. When two transects must be completed on the same day, transects separated by the least amount of distance should be selected.

Organizing Supplies and Equipment

1. Equipment (see table below) should be organized and made ready several weeks before the field season.

Field equipment list, based on the *Monitoring Colorado's Birds* program (see Appendix C of the NCPN Landbird Monitoring Protocol Narrative).

Number required	Description
	Bird surveys

1	Timepiece with countdown timer and a chime
1	Binoculars
1	Rangefinder and extra batteries
1	Declination-adjustable compass with sighting capability (i.e., a mirror)
1	Fahrenheit thermometer
1	GPS unit for navigating to bird plots
1	Master list of four-letter bird codes for all species likely to be encountered, specifically noting the low-density target species
1	Master list of weather and habitat codes, taped to the clipboard
1	Random numbers table, if establishing a new transect
as needed	Data forms (copied onto write-in-rain paper)
2–3	At least two writing utensils, in case you lose one (pencil or indelible ink pen)
1	Clip boards for recording data and carrying data sheet
1	Cruising vest for carrying equipment (backpack and hip packs may be substituted)
as needed	Reference books for bird and plant identification
1	Insect repellent
1	Sunscreen
1	First aid kit

Attachment A. Bird species determined to be migrants and breeders in NCPN park units

Information source is the current version (2.2) of the NPSpecies Inventory and Monitoring Database. Species lists were developed using data that has not been through the QA/QC certification process. Park unit acronyms are defined in Attachment B.

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Pipilo aberti</i>	ABTO	179307	Abert's towhee																X
<i>Recurvirostra americana</i>	AMAV	176721	American avocet			X	X				X	X				X			
<i>Botaurus lentiginosus</i>	AMBI	174856	American bittern													X			
<i>Fulica americana</i>	AMCO	176292	American coot	X			X	X			X	X	X		X				
<i>Corvus brachyrhynchos</i>	AMCR	179731	American crow	X	X		X			X	X	X	X		X	X		X	
<i>Cinclus mexicanus</i>	AMDI	178536	American dipper	X	X		X	X	X		X	X				X		X	X
<i>Spinus tristis</i>	AMGO	179249	American goldfinch	X	X		X	X	X	X	X	X			X	X		X	X
<i>Falco sparverius</i>	AMKE	175622	American kestrel	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Anthus rubescens</i>	AMPI	554127	American pipit	X			X	X			X					X			X
<i>Setophaga ruticilla</i>	AMRE	178979	American redstart	X			X				X	X			X	X			
<i>Turdus migratorius</i>	AMRO	179759	American robin	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Anas americana</i>	AMWI	175094	American wigeon	X	X	X	X	X			X	X				X			
<i>Myiarchus cinerascens</i>	ATFL	178316	ash-throated flycatcher	X	X		X	X		X	X	X		X	X	X	X	X	X

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<i>Spizella arborea</i>	ATSP	179432	American tree sparrow	X				X	X	X	X	X						X	
<i>Dendroica auduboni memorabilis</i>	AUWA	- 501489	Audubon's warbler												X	X			X
<i>Pelecanus erythrorhynchos</i>	AWPE	174684	American white pelican			X	X	X		X	X	X				X			X
<i>Haliaeetus leucocephalus</i>	BAEA	175420	bald eagle	X	X	X	X	X		X	X	X			X	X		X	X
<i>Bucephala islandica</i>	BAGO	175144	Barrow's goldeneye		X		X				X	X							
<i>Riparia riparia</i>	BANS	178436	bank swallow	X			X	X		X	X	X			X			X	
<i>Hirundo rustica erythrogaster</i>	BARS	178449	barn swallow	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Calidris bairdii</i>	BASA	176655	Baird's sandpiper								X					X			
<i>Pica pica</i>	BBMA	179720	black-billed magpie	X	X		X	X		X	X	X	X	X	X			X	X
<i>Pluvialis squatarola</i>	BBPL	176567	black-bellied plover			X					X								
<i>Parus atricapillus</i>	BCCH	178699	black-capped chickadee	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Archilochus alexandri</i>	BCHU	178033	black-chinned hummingbird	X	X		X	X	X	X	X	X		X	X	X		X	
<i>Nycticorax nycticorax</i>	BCNH	174832	black-crowned night-heron	X			X				X	X				X			
<i>Leucosticte australis</i>	BCRF	179223	brown-capped rosy-finch								X	X			X				
<i>Spizella atrogularis</i>	BCSP	179448	black-chinned sparrow																X
<i>Vireo atricapillus</i>	BCVI	554455	black-capped vireo															X	
<i>Ceryle alcyon</i>	BEKI	178119	belted kingfisher	X	X		X	X		X		X						X	X

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<i>Toxostoma bendirei</i>	BETH	178636	Bendire's thrasher	X			X								X				
<i>Vireo bellii</i>	BEVI	179003	Bell's vireo																X
<i>Thryomanes bewickii</i>	BEWR	178562	Bewick's wren	X	X		X	X		X	X	X			X	X	X	X	X
<i>Poliophtila caerulea</i>	BGGN	179853	blue-gray gnatcatcher	X	X		X	X		X	X	X			X	X		X	X
<i>Dendragapus obscurus</i>	BGSE	175860	blue grouse		X			X		X	X	X	X			X		X	X
<i>Molothrus ater</i>	BHCO	179112	brown-headed cowbird	X	X		X	X		X	X	X	X	X	X	X	X	X	X
<i>Pheucticus melanocephalus</i>	BHGR	179140	black-headed grosbeak	X	X		X	X		X	X	X	X		X	X		X	X
<i>Guiraca caerulea</i>	BLGR	179145	blue grosbeak	X			X	X		X	X	X			X	X		X	X
<i>Sayornis nigricans</i>	BLPH	178330	black phoebe				X	X								X			X
<i>Leucosticte atrata</i>	BLRF	179222	black rosy-finch		X						X	X							
<i>Cypseloides niger</i>	BLSW	177997	black swift		X						X								X
<i>Chlidonias niger</i>	BLTE	176959	black tern								X								
<i>Tyto alba pratincola</i>	BNOW	177852	barn owl		X						X								X
<i>Himantopus mexicanus</i>	BNST	176726	black-necked stilt			X	X	X			X	X				X			X
<i>Larus philadelphia</i>	BOGU	176839	Bonaparte's gull								X					X			
<i>Bombycilla garrulus</i>	BOWA	178529	Bohemian waxwing					X		X	X	X						X	
<i>Euphagus cyanocephalus</i>	BRBL	179094	Brewer's blackbird	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Certhia americana</i>	BRCR	178803	brown creeper	X	X		X	X	X	X	X	X	X					X	X

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<i>Spizella breweri</i>	BRSP	179440	Brewer's sparrow	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Toxostoma rufum</i>	BRTN	178627	brown thrasher	X			X	X			X	X							
<i>Poliophtila melanura</i>	BTGN	179857	black-tailed gnatcatcher				X												
<i>Quiscalus major</i>	BTGR	179108	boat-tailed grackle													X			
<i>Selasphorus platycercus</i>	BTLH	178038	broad-tailed hummingbird	X	X		X	X	X	X	X	X				X		X	
<i>Columba fasciata</i>	BTPI	177065	band-tailed pigeon	X	X			X											X
<i>Amphispiza bilineata</i>	BTSP	179395	black-throated sparrow	X	X		X	X		X		X			X	X	X	X	X
<i>Dendroica nigrescens</i>	BTYW	178896	black-throated gray warbler	X	X		X	X	X	X	X	X				X		X	X
<i>Bucephala albeola</i>	BUFF	175145	bufflehead				X	X			X	X				X			
<i>Icterus bullockii</i>	BUOR	554267	Bullock's oriole		X					X	X	X		X	X		X	X	X
<i>Athene cunicularia</i>	BUOW	177946	burrowing owl	X			X	X			X	X	X	X					
<i>Psaltriparus minimus</i>	BUSH	178764	bushtit	X	X		X	X		X	X	X			X	X	X	X	X
<i>Anas discors</i>	BWTE	175086	blue-winged teal	X		X	X	X			X	X				X			X
<i>Bubulcus ibis</i>	CAEG	174803	cattle egret	X			X									X			X
<i>Carpodacus cassinii</i>	CAFI	179190	Cassin's finch	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Branta canadensis</i>	CAGO	174999	Canada goose	X	X	X	X	X			X	X		X		X		X	X
<i>Larus californicus</i>	CAGU	176829	California gull			X	X				X		X	X		X		X	

[illegible]

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<i>Dendroica tigrina</i>	CMWA	178887	Cape May warbler									X							
<i>Empidonax occidentalis</i>	COFL	554255	Cordilleran flycatcher	X	X		X	X	X	X	X		X		X	X		X	X
<i>Bucephala clangula</i>	COGO	175141	common goldeneye	X	X		X	X			X	X						X	X
<i>Quiscalus quiscula</i>	COGR	179104	common grackle					X			X	X				X			
<i>Accipiter cooperii</i>	COHA	175309	Cooper's hawk	X	X		X	X		X	X	X	X		X	X		X	X
<i>Calypte costae</i>	COHU	178035	Costa's hummingbird																X
<i>Gavia immer</i>	COLO	174469	common loon	X			X	X			X	X				X			
<i>Mergus merganser</i>	COME	175185	common merganser	X	X	X	X	X			X	X						X	X
<i>Chordeiles minor</i>	CONI	177979	common nighthawk	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Phalaenoptilus nuttallii</i>	COPW	555544	common poorwill	X			X	X		X	X	X	X	X	X	X		X	X
<i>Corvus corax</i>	CORA	179725	common raven	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Carduelis flammea</i>	CORE	179230	common redpoll	X														X	
<i>Capella gallinago</i>	COSN	176586	common snipe	X		X		X			X	X	X	X		X		X	
<i>Geothlypis trichas</i>	COYE	178944	common yellowthroat	X			X	X			X	X				X		X	X
<i>Phalacrocorax auritus</i>	DCCO	174717	double-crested cormorant								X	X			X	X			
<i>Picoides pubescens</i>	DOWO	178259	downy woodpecker	X	X		X	X		X	X	X	X			X		X	X
<i>Calidris alpina</i>	DUNL	176661	dunlin								X								
<i>Podiceps nigricollis</i>	EAGR	174485	eared grebe	X		X	X	X			X	X				X			X

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<i>Tyrannus tyrannus</i>	EAKI	178279	eastern kingbird	X						X	X	X		X				X	
<i>Sturnus vulgaris</i>	EUST	179637	European starling	X	X		X	X		X	X	X	X	X	X	X	X	X	X
<i>Hesperiphona vespertina</i>	EVGR	179175	evening grosbeak		X			X	X	X	X	X	X		X	X		X	X
<i>Buteo regalis</i>	FEHA	175377	ferruginous hawk	X		X	X	X				X	X		X	X		X	X
<i>Otus flammeolus</i>	FLOW	177878	flamulated owl		X		X	X				X						X	X
<i>Passerella iliaca</i>	FOSP	179464	fox sparrow								X		X					X	X
<i>Sterna forsteri</i>	FOTE	176887	Forster's tern			X	X				X	X							
<i>Larus pipixcan</i>	FRGU	176838	Franklin's gull			X	X				X	X	X			X			
<i>Anas strepera</i>	GADW	175073	gadwall	X		X	X	X			X	X				X			X
<i>Lophortyx gambelii</i>	GAQU	175887	Gambel's quail				X	X		X					X		X		X
<i>Ardea herodias</i>	GBHE	174773	great blue heron	X	X		X	X		X	X	X		X		X			X
<i>Regulus satrapa</i>	GCKI	179865	golden-crowned kinglet	X			X	X		X	X	X	X					X	X
<i>Leucosticte tephrocotis</i>	GCRF	179215	gray-crowned rosy-finch		X						X	X							
<i>Zonotrichia atricapilla</i>	GCSP	179461	golden-crowned sparrow	X							X								X
<i>Junco hyemalis</i>	GHJU	179410	gray-headed junco	X	X		X	X	X	X			X		X	X		X	X
<i>Aquila chrysaetos canadensis</i>	GOEA	175408	golden eagle	X	X		X	X	X	X	X	X	X	X	X	X		X	X
<i>Perisoreus canadensis</i>	GRAJ	179667	gray jay				X			X	X					X		X	
<i>Dumetella carolinensis</i>	GRCA	178625	gray catbird		X	X	X			X	X	X						X	
<i>Ardea alba</i>	GREG	554135	great egret								X								

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<i>Empidonax wrightii</i>	GRFL	178347	gray flycatcher	X	X		X	X		X	X	X	X		X	X		X	X
<i>Butorides virescens</i>	GRHE	174793	green heron								X								
<i>Perdix perdix</i>	GRPA	175915	gray partridge											X					
<i>Geococcyx californianus</i>	GRRO	177836	greater roadrunner																X
<i>Ammodramus savannarum</i>	GRSP	179333	grasshopper sparrow									X							
<i>Vireo vicinior</i>	GRVI	179008	gray vireo	X	X		X	X		X					X	X		X	X
<i>Dendroica graciae</i>	GRWA	178909	Grace's warbler				X	X								X			X
<i>Tringa melanoleuca</i>	GRYE	176619	greater yellowlegs			X	X				X	X							
<i>Quiscalus mexicanus</i>	GTGR	179109	great-tailed grackle													X			X
<i>Pipilo chlorurus</i>	GTTO	179310	green-tailed towhee	X	X		X	X		X	X	X	X		X	X		X	X
<i>Centrocercus minimus</i>	GUSG	- 503934	Gunnison sage-grouse		X						X								
<i>Empidonax hammondi</i>	HAFL	554254	Hammond's flycatcher		X	X	X	X	X	X	X	X	X			X		X	X
<i>Zonotrichia querula</i>	HASP	179454	Harris's sparrow	X				X			X	X							
<i>Picoides villosus</i>	HAWO	178262	hairy woodpecker	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Larus argentatus</i>	HERG	176824	herring gull								X								
<i>Catharus guttatus</i>	HETH	179779	hermit thrush	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Carpodacus mexicanus frontalis</i>	HOFI	179192	house finch	X	X		X	X		X	X	X	X	X	X	X	X	X	X
<i>Podiceps auritus</i>	HOGR	174482	horned grebe				X				X					X			

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<i>Eremophila alpestris</i>	HOLA	554256	horned lark		X		X	X		X	X	X	X	X	X	X		X	X
<i>Lophodytes cucullatus</i>	HOME	175183	hooded merganser		X						X								X
<i>Icterus cucullatus</i>	HOOR	179070	hooded oriole																X
<i>Passer domesticus</i>	HOSP	179628	house sparrow	X	X			X		X	X	X		X	X		X	X	X
<i>Wilsonia citrina</i>	HOWA	178972	hooded warbler										X						
<i>Troglodytes aedon</i>	HOWR	178541	house wren	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Passerina cyanea</i>	INBU	179150	indigo bunting	X	X		X	X		X	X	X			X	X			X
<i>Baeolophus ridgwayi</i>	JUTI	- 501459	juniper titmouse	X	X		X			X	X	X			X	X		X	X
<i>Charadrius vociferus</i>	KILL	176520	killdeer	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Calcarius lapponicus</i>	LALO	179526	Lapland longspur								X								
<i>Calamospiza melanocorys</i>	LARB	179312	lark bunting	X						X		X							
<i>Chondestes grammacus</i>	LASP	179371	lark sparrow	X	X		X	X		X	X	X		X	X	X		X	X
<i>Numenius americanus</i>	LBCU	176593	long-billed curlew	X				X			X	X		X				X	
<i>Limnodromus scolopaceus</i>	LBDO	176679	long-billed dowitcher	X		X	X				X								
<i>Egretta caerulea</i>	LBHE	174827	little blue heron								X								
<i>Picoides scalaris</i>	LBWO	178260	ladder-backed woodpecker				X												X
<i>Spinus psaltria</i>	LEGO	179254	lesser goldfinch		X		X	X		X	X	X			X	X		X	X

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<i>Chordeiles acutipennis</i>	LENI	177988	lesser nighthawk				X												X
<i>Asio otus</i>	LEOW	177932	long-eared owl	X	X		X	X		X	X	X	X	X	X			X	
<i>Calidris minutilla</i>	LESA	176656	least sandpiper	X		X					X								
<i>Aythya affinis</i>	LESC	175134	lesser scaup			X	X	X			X	X							X
<i>Melanerpes lewis</i>	LEWO	178196	Lewis's woodpecker	X	X		X	X		X		X	X			X		X	X
<i>Tringa flavipes</i>	LEYE	176620	lesser yellowlegs			X					X	X			X	X			
<i>Melospiza lincolni</i>	LISP	179484	Lincoln's sparrow	X			X	X	X		X		X			X			X
<i>Lanius ludovicianus</i>	LOSH	178515	loggerhead shrike	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Vermivora luciae</i>	LUWA	178866	Lucy's warbler	X			X									X			X
<i>Limosa fedoa</i>	MAGO	176686	marbled godwit								X								
<i>Eugenes fulgens</i>	MAHU	178050	magnificent hummingbird								X								
<i>Cistothorus palustris</i>	MAWR	178608	marsh wren	X			X	X											X
<i>Falco columbarius</i>	MERL	175613	merlin	X	X	X	X				X	X							X
<i>Oporornis tolmiei</i>	MGWA	178940	Macgillivray's warbler	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Sialia currucoides</i>	MOBL	179811	mountain bluebird	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Parus gambeli</i>	MOCH	178718	mountain chickadee	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Zenaida macroura</i>	MODO	177125	mourning dove	X	X		X	X		X	X	X	X	X	X	X	X	X	X
<i>Vermivora ruficapilla</i>	NAWA	178861	Nashville warbler	X		X	X	X	X							X		X	X

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Accipiter gentilis atricapillus</i>	NOGO	175301	northern goshawk	X	X		X	X		X	X	X			X	X		X	X
<i>Circus cyaneus</i>	NOHA	175430	northern harrier	X	X	X	X	X		X	X	X	X	X	X	X		X	X
<i>Mimus polyglottos</i>	NOMO	178620	northern mockingbird	X			X	X		X	X	X		X	X	X		X	X
<i>Anas acuta</i>	NOPI	175074	northern pintail	X		X	X	X			X	X				X			X
<i>Glaucidium gnoma</i>	NOPO	177902	northern pygmy-owl		X		X	X	X	X	X	X			X	X		X	X
<i>Seiurus noveboracensis</i>	NOWA	178931	northern waterthrush				X				X								X
<i>Stelgidopteryx serripennis</i>	NRWS	178443	northern rough-winged swallow	X			X	X	X	X	X	X	X	X	X	X		X	X
<i>Anas clypeata</i>	NSHO	175096	northern shoveler			X	X	X			X	X				X			X
<i>Aegolius acadicus</i>	NSWO	177942	northern saw-whet owl	X	X		X	X		X	X	X			X			X	
<i>Vermivora celata</i>	OCWA	178856	orange-crowned warbler	X	X	X	X	X		X	X	X	X	X	X	X		X	X
<i>Junco hyemalis</i>	ORJU	179410	Oregon junco	X			X								X	X			
<i>Nuttallornis borealis</i>	OSFL	178369	olive-sided flycatcher	X	X		X	X	X	X	X	X						X	X
<i>Pandion haliaetus</i>	OSPR	175590	osprey	X	X		X				X	X							X
<i>Myioborus pictus</i>	PARE	178986	painted redstart																X
<i>Podilymbus podiceps</i>	PBGR	174505	pied-billed grebe				X	X			X	X				X			
<i>Falco peregrinus anatum</i>	PEFA	175605	peregrine falcon	X	X		X	X	X	X	X	X			X	X		X	X

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Calidris melanotos</i>	PESA	176653	pectoral sandpiper								X								
<i>Phainopepla nitens</i>	PHAI	179877	phainopepla				X												X
<i>Pinicola enucleator</i>	PIGR	179205	pine grosbeak					X		X	X	X						X	
<i>Gymnorhinus cyanocephalus</i>	PIJA	179748	pinyon jay	X	X		X	X	X	X	X	X			X	X		X	X
<i>Spinus pinus pinus</i>	PISI	179247	pine siskin	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Vireo solitarius plumbeus</i>	PLVI	179013	plumbeous vireo	X	X		X				X	X			X	X		X	X
<i>Falco mexicanus</i>	PRFA	175603	prairie falcon	X	X		X	X	X	X	X	X	X	X	X	X		X	X
<i>Empidonax difficilis</i>	PSFL	178348	pacific-slope flycatcher									X							
<i>Progne subis</i>	PUMA	178464	purple martin					X										X	
<i>Sitta pygmaea</i>	PYNU	178788	pygmy nuthatch		X				X	X	X	X	X			X		X	X
<i>Pheucticus ludovicianus</i>	RBGR	179139	rose-breasted grosbeak	X				X		X									X
<i>Larus delawarensis</i>	RBGU	176830	ring-billed gull			X	X				X		X			X		X	
<i>Mergus serrator</i>	RBME	175187	red-breasted merganser								X								
<i>Sitta canadensis</i>	RBNU	178784	red-breasted nuthatch	X	X		X	X	X	X	X	X	X			X		X	X
<i>Sphyrapicus ruber</i>	RBSA	178212	red-breasted sapsucker													X			
<i>Regulus calendula</i>	RCKI	179870	ruby-crowned kinglet	X	X		X	X	X	X	X	X	X			X		X	X
<i>Aimophila ruficeps</i>	RCSP	179377	rufous-crowned sparrow												X				X

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Loxia curvirostra</i>	RECR	179259	red crossbill		X				X		X	X	X			X		X	X
<i>Aythya americana</i>	REDH	175125	redhead			X		X			X	X				X			
<i>Vireo olivaceus</i>	REVI	179021	red-eyed vireo															X	
<i>Melanerpes erythrocephalus</i>	RHOW	178186	red-headed woodpecker															X	
<i>Buteo lagopus</i>	RLHA	175373	rough-legged hawk			X	X	X			X	X	X	X		X		X	X
<i>Aythya collaris</i>	RNDU	175128	ring-necked duck			X	X	X			X	X				X			
<i>Phalaropus lobatus</i>	RNPH	176735	red-necked phalarope			X					X			X		X			
<i>Sphyrapicus varius nuchalis</i>	RNSA	178205	red-naped sapsucker	X	X		X	X		X	X	X	X			X		X	X
<i>Columba livia</i>	RODO	177071	rock dove	X	X		X	X		X	X	X	X			X			
<i>Salpinctes obsoletus</i>	ROWR	178614	rock wren	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Phasianus colchicus</i>	RPHE	175905	ring-necked pheasant	X			X	X		X		X		X					X
<i>Colaptes cafer</i>	RSFL	- 501479	red-shafted flicker																X
<i>Buteo jamaicensis</i>	RTHA	175350	red-tailed hawk	X	X		X	X	X	X	X	X	X	X	X	X		X	X
<i>Oxyura jamaicensis</i>	RUDU	175175	ruddy duck					X			X	X				X			
<i>Bonasa umbellus</i>	RUGR	175790	ruffed grouse										X					X	
<i>Selasphorus rufus</i>	RUHU	178040	rufous hummingbird	X	X					X	X	X						X	X
<i>Agelaius phoeniceus</i>	RWBL	179045	red-winged blackbird	X	X		X	X		X	X	X	X		X	X		X	X
<i>Grus canadensis</i>	SACR	176177	sandhill crane		X		X			X	X	X	X	X					

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Amphispiza belli</i>	SAGS	179402	sage sparrow	X			X	X		X	X	X	X		X	X		X	X
<i>Calidris alba</i>	SAND	176669	sanderling								X								
<i>Sayornis saya</i>	SAPH	178333	Say's phoebe	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Oreoscoptes montanus</i>	SATH	178654	sage thrasher	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Passerculus sandwichensis</i>	SAVS	179314	savannah sparrow	X			X	X		X	X	X	X			X			X
<i>Junco hyemalis</i>	SCJU	179410	slate-colored junco	X			X									X			
<i>Icterus parisorum</i>	SCOR	179082	Scott's oriole	X			X	X		X					X	X		X	X
<i>Asio flammeus</i>	SEOW	177935	short-eared owl	X				X		X	X	X	X	X	X			X	
<i>Charadrius semipalmatus</i>	SEPL	176506	semipalmated plover								X								
<i>Calidris pusilla</i>	SESA	176667	semipalmated sandpiper								X								
<i>Plectrophenax nivalis</i>	SNBU	179532	snow bunting								X							X	
<i>Egretta thula</i>	SNEG	174813	snowy egret	X		X	X	X			X	X		X	X	X			X
<i>Porzana carolina</i>	SORA	176242	sora	X		X	X	X			X								
<i>Tringa solitaria</i>	SOSA	176615	solitary sandpiper	X			X				X				X	X			
<i>Melospiza melodia</i>	SOSP	179492	song sparrow	X	X		X	X		X	X	X	X		X	X		X	X
<i>Vireo solitarius</i>	SOVI	179010	solitary vireo					X		X									X
<i>Strix occidentalis</i>	SPOW	177925	spotted owl				X					X							X
<i>Actitis macularia</i>	SPSA	176612	spotted sandpiper	X	X	X	X	X	X		X	X	X		X	X			X
<i>Pipilo maculatus</i>	SPTO	554380	spotted towhee	X	X		X		X	X	X	X	X	X	X	X		X	X
<i>Accipiter striatus velox</i>	SSHA	175305	sharp-shinned hawk	X	X		X	X		X	X	X	X		X	X		X	X

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Pedioecetes phasianellus</i>	STGR	175840	sharp-tailed grouse							X									
<i>Cyanocitta stelleri</i>	STJA	179685	Steller's jay		X		X	X	X	X	X	X	X		X	X		X	X
<i>Calidris himantopus</i>	STSA	554145	stilt sandpiper								X								
<i>Piranga rubra</i>	SUTA	179888	summer tanager																X
<i>Melospiza georgiana</i>	SWSP	179488	swamp sparrow	X															
<i>Catharus ustulatus</i>	SWTH	179788	Swainson's thrush	X		X		X				X	X			X		X	X
<i>Vermivora peregrina</i>	TEWA	178855	Tennessee warbler			X		X											
<i>Myadestes townsendi</i>	TOSO	179824	Townsend's solitaire	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Dendroica townsendi</i>	TOWA	178897	Townsend's warbler	X	X	X	X	X			X	X				X			
<i>Tachycineta bicolor</i>	TRES	178431	tree swallow	X	X		X	X		X	X	X	X			X		X	X
<i>Picoides tridactylus</i>	TTWO	178251	three-toed woodpecker						X			X				X		X	
<i>Cathartes aura teter</i>	TUVU	175268	turkey vulture	X	X		X	X		X	X	X	X		X	X		X	X
<i>Catharus fuscescens</i>	VEER	179796	veery							X								X	
<i>Pooecetes gramineus</i>	VESP	179366	vesper sparrow	X	X		X	X	X	X	X	X	X	X	X	X		X	X
<i>Tachycineta thalassina</i>	VGSW	178427	violet-green swallow	X	X		X	X	X	X	X	X	X	X	X	X		X	X
<i>Rallus limicola</i>	VIRA	176221	Virginia rail	X			X												X
<i>Vermivora virginiae</i>	VIWA	178864	Virginia's warbler	X	X		X	X		X	X	X			X	X		X	X
<i>Vireo gilvus swainsoni</i>	WAVI	179025	warbling vireo	X	X		X	X	X	X	X	X	X		X	X		X	X

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Sitta carolinensis</i>	WBNU	178775	white-breasted nuthatch	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Zonotrichia leucophrys</i>	WCSP	179455	white-crowned sparrow	X	X		X	X	X	X	X	X	X	X	X	X		X	X
<i>Sialia mexicana occidentalis</i>	WEBL	179808	western bluebird	X	X		X	X	X	X	X	X			X	X		X	X
<i>Aechmophorus occidentalis</i>	WEGR	174503	western grebe	X			X				X	X				X			
<i>Tyrannus verticalis</i>	WEKI	178287	western kingbird	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Sturnella neglecta</i>	WEME	179039	western meadowlark	X	X		X	X		X	X	X	X	X	X	X		X	X
<i>Calidris mauri</i>	WESA	176668	western sandpiper			X					X					X			X
<i>Aphelocoma ultramarina</i>	WESJ	179707	western scrub-jay		X						X	X	X					X	X
<i>Otus kennicottii</i>	WESO	555388	western screech-owl	X			X	X		X		X			X			X	X
<i>Piranga ludoviciana</i>	WETA	179882	western tanager	X	X		X	X	X	X	X	X	X			X		X	X
<i>Contopus sordidulus</i>	WEWP	178360	western wood-pewee	X	X		X	X	X	X	X	X	X		X	X	X	X	X
<i>Plegadis chihi</i>	WFIB	174926	white-faced ibis	X		X	X	X			X	X				X			
<i>Empidonax traillii</i>	WIFL	178341	willow flycatcher	X			X	X		X	X	X						X	X
<i>Catoptrophorus semipalmatus</i>	WILL	176638	willet				X	X			X	X		X	X	X			X
<i>Phalaropus tricolor</i>	WIPH	176736	Wilson's phalarope			X		X			X	X			X	X			
<i>Sphyrapicus thyroideus</i>	WISA	178208	Williamson's sapsucker		X		X	X								X		X	X
<i>Meleagris gallopavo</i>	WITU	176136	wild turkey		X					X		X							X

Scientific name	BBL 4-letter code	TSN #	Common name	ARCH	BLCA	BRCA	CANY	CARE	CEBR	COLM	CURE	DINO	FOBU	GOSP	HOVE	NABR	PISP	TICA	ZION
<i>Wilsonia pusilla</i>	WIWA	178973	Wilson's warbler	X	X		X	X		X	X	X	X		X	X		X	X
<i>Troglodytes troglodytes</i>	WIWR	178547	winter wren					X											X
<i>Aix sponsa</i>	WODU	175122	wood duck								X								X
<i>Zonotrichia albicollis</i>	WTSP	179462	white-throated sparrow	X				X			X								X
<i>Aeronautes saxatalis</i>	WTSW	178014	white-throated swift	X	X		X	X	X	X	X	X	X		X	X		X	X
<i>Icteria virens</i>	YBCH	178964	yellow-breasted chat	X	X		X	X			X	X			X	X		X	X
<i>Coccyzus americanus</i>	YBCU	177831	yellow-billed cuckoo					X				X							X
<i>Sphyrapicus varius</i>	YBSA	178202	yellow-bellied sapsucker							X					X	X		X	X
<i>Xanthocephalus xanthocephalus</i>	YHBL	179043	yellow-headed blackbird	X			X	X		X	X	X			X	X			X
<i>Dendroica petechia</i>	YWAR	178878	yellow warbler	X	X		X	X	X	X	X	X	X			X		X	X

Attachment B. Acronyms of NCPN park units

Park unit	Acronym	State
Arches National Park	ARCH	UT
Black Canyon of the Gunnison National Park	BLCA	CO
Bryce Canyon National Park	BRCA	UT
Canyonlands National Park	CANY	UT
Capitol Reef National Park	CARE	UT
Cedar Breaks National Monument	CEBR	UT
Colorado National Monument	COLM	CO
Curecanti National Recreation Area	CURE	CO
Dinosaur National Monument	DINO	CO/UT
Fossil Butte National Monument	FOBU	WY
Golden Spike National Historic Site	GOSP	UT
Hovenweep National Monument	HOVE	CO/UT
Natural Bridges National Monument	NABR	UT
Pipe Spring National Monument	PISP	AZ
Timpanogos Cave National Monument	TICA	UT
Zion National Park	ZION	UT

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #2 Training Observers

Version 1.01

May 2, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.01

This Standard Operating Procedure (SOP) summarizes the training workshop conducted prior to the field season . Observers surveying Northern Colorado Plateau Network (NCPN) park units must participate in the training. Additionally, supplemental information of value to observers working in the NCPN park units is provided.

Procedures

1. In early May of each year training is conducted for the upcoming field season for all observers. Training includes the following topics:
 - Identification of birds by sight and vocalizations
 - Estimating distances to birds seen or heard
 - Collecting habitat data
 - Using a GPS unit
 - Detailed explanation of the protocol

Supplemental reference manuals for bird surveys and habitat-collection procedures are listed below, and should be reviewed by observers working in NCPN park units:

- Elmore, F.H. 1976. Shrubs and Trees of the Southwest Uplands. Southwest Parks and Monuments Association, Globe, Arizona.
- National Geographic. 1987. Field Guide to Birds of North America, 3rd Edition. Washington, D.C.: National Geographic, 480 pages.
- Robbins, C.S., B. Bruun, and H.S. Zim. 1983. Golden: A Guide to Field Identification of North American Birds. Racine, Wi.: Western Publishing Company, Inc. 360 pages.

- Stokes, D.W., and L.Q. Stokes. 1995. Stokes Field Guide to Birds: Western Region. New York: Little, Brown and Company. 519 pages.
 - Welsh, S.L., N.D. Atwood, S. Goodwich, and L.C. Higgins. 1993. A Utah Flora. Second Edition. Brigham Young University, Provo, Utah. 986 pp.
 - Williams, D. 2000. A Naturalist's Guide to Canyon Country. A Falcon Guide. Guilford, Conn.: Globe Pequot Press.
2. The NCPN may provide a recreational GPS unit to observers working in park units. Instructions on using a recreational GPS unit are provided in SOP #3.

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #3 Using Global Positioning System (GPS) Units

Version 1.01

May 2, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.01

This Standard Operating Procedure (SOP) explains the procedures and considerations that all observers should follow when collecting geospatial data or navigating to locations. This SOP is written for use with recreational-grade GPS units, such as those manufactured by Garmin or Magellan. These units are far less expensive than mapping-grade units (e.g., Trimble GeoExplorer), yet they are effective for obtaining point information at a level of spatial accuracy that is required for this project. Recreational-grade GPS units do not have the capability of a data dictionary for storing attribute information with point locations.

This SOP assumes that each observer is familiar with the operation and function of the GPS unit to be used for this project. This SOP is intended to complement, not replace, the operations manual accompanying the GPS unit. Each observer should be familiar with the use of their particular GPS unit before entering the field to collect data or navigate to points.

This SOP does not require the use of a specific type or brand of GPS unit; however, the unit is required to meet the minimum standards listed below. The Northern Colorado Plateau Network (NCPN) has used primarily Garmin units, specifically, the eTrex, III Plus, and 76 models. Detailed instructions relating to the Garmin 76 model and this protocol are included in Attachment A. Functions other than those associated with this protocol are not explained in this document.

Procedures

1. The minimum GPS receiver standards for navigating and mapping are:

- Capable of storing date, time, and coordinates of features collected.
- Capable of exporting features collected to a format that can be used by a GIS
- Capable of maintaining an EHE (Estimate of Horizontal Error) of less than or equal to 12 meters. Maintaining an EHE (or EPE – Estimate of Positional Error) of 12 meters or less meets the National Map Accuracy Standard.
- Capable of tracking a minimum of 4 satellites
- Capable of collecting real-time differentially-corrected positions (DGPS)

2. Required equipment

- GPS unit
- One set of extra batteries
- Operation manual
- Compass
- Rangefinder
- USGS 1:24,000-scale topographic map
- Personal computer for downloading data from the GPS unit. DNR Garmin (freeware, available at <http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions.html>) should be installed on the computer to facilitate the data download.

3. GPS unit setup before leaving the office (see Attachment A)

- Set GPS unit standards

Name	Standard
Projection (displayed coordinates)	UTM
Datum	NAD 27 CONUS
WAAS	Enabled (on)

- Upload background data (MapSource)
- Upload existing waypoints to the GPS unit (if necessary)

4. Navigation to an existing location

When the observer needs to revisit the points that make up the transects, the observer can relocate those points using the GPS unit. Navigation to the point is best accomplished by using background maps that have been loaded onto the GPS unit, in addition to using hard-copy USGS 1:24,000-scale topographic maps.

- Select the waypoint you wish to navigate towards and follow the pointer displayed on the unit.
- In order to navigate, the GPS unit must be moving

5. Collecting new location data

Once the observer has navigated to the beginning of a transect, a series of 15 waypoints will be taken to represent each transect.

- Take (or mark) a waypoint, and identify it with a unique ID that matches the location identifier recorded on the field sheet: Transect number (2 letter habitat code and 2 digit transect number) and 2 digit point number. Ex. MS0112 Montane Shrub, 01 Transect, Point # 12. Space permitting, the NCPN recommends adding a GPS unit ID letter to the end of the waypoint ID (MS0112C would indicate GPS unit “C” was used).
- Record waypoint UTM coordinates that are displayed on the GPS unit on field sheet

Collection of Access Points can be accomplished in the same manner. A suggested waypoint ID for access points is the letter “A”, a 2 digit number, and 2 letter habitat code. Ex. A01MS would indicate this point is Access Point #1 for a Montane Shrub transect. These access waypoint IDs should be included in the notes under “Directions to Access Point” on the UTM Data Sheet.

6. Downloading data from GPS unit (see Attachment A)

The data from the GPS unit are downloaded to a personal computer daily, or after each field stint. Frequent, regular downloads will safeguard against any loss of data.

NCPN recommends the use of the DNR Garmin extension. This tool facilitates the communication between ArcView and Garmin Brand GPS units by allowing users to download and upload waypoints (and tracks) as text files, shapefiles and/or graphics. DNR Garmin is freeware, and is available at <http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions.html>)

- Connect the GPS unit to the personal computer using a USB or serial cable.
- Download GPS data (.txt files) into appropriate folders (Figure 3-1). Fields required from a unit download are: ident (waypoint), lat, long, y_proj, x_proj, comment, altitude, and model.
- Review the downloaded data for accuracy and completeness.

Text files are required as part of the download. GIS shapefiles can be created at the same time. See Attachment A for additional information on shapefile creation. NCPN recommends that during the field season downloads be limited to text files, with a single set of GIS shapefiles created at the conclusion of the field season.

Downloaded GPS text files will be appended to the Land Bird database at the time of data entry (see SOP # 7). At this time, all GIS data will be converted to the NPS standard projection of UTM NAD83. Both NAD27 and NAD83 coordinates will be preserved in the database. Spatial files will be maintained in NAD83.

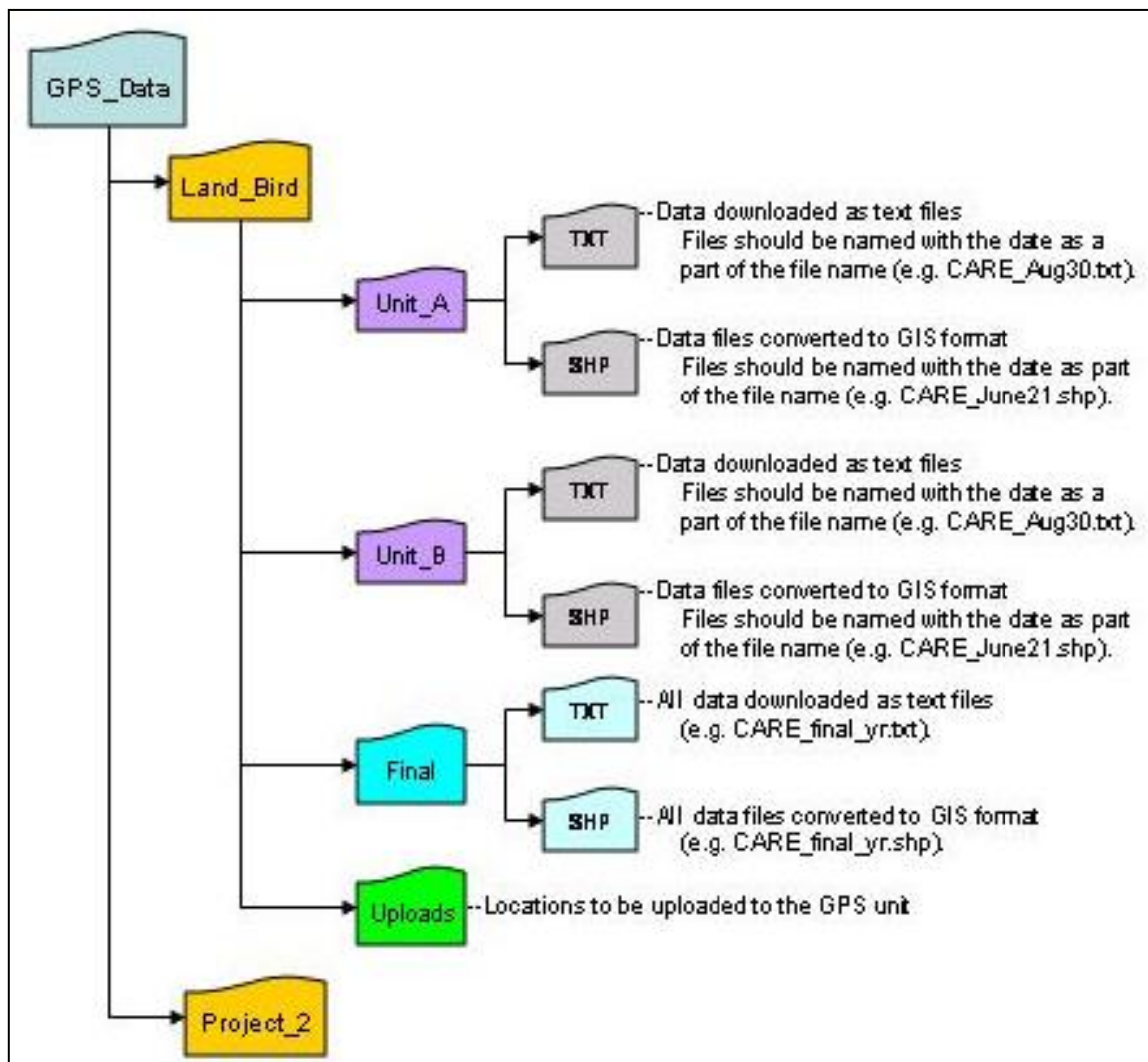


Figure 3-1. Recommended directory structure for data downloaded from GPS unit.

Attachment A. GPS unit use

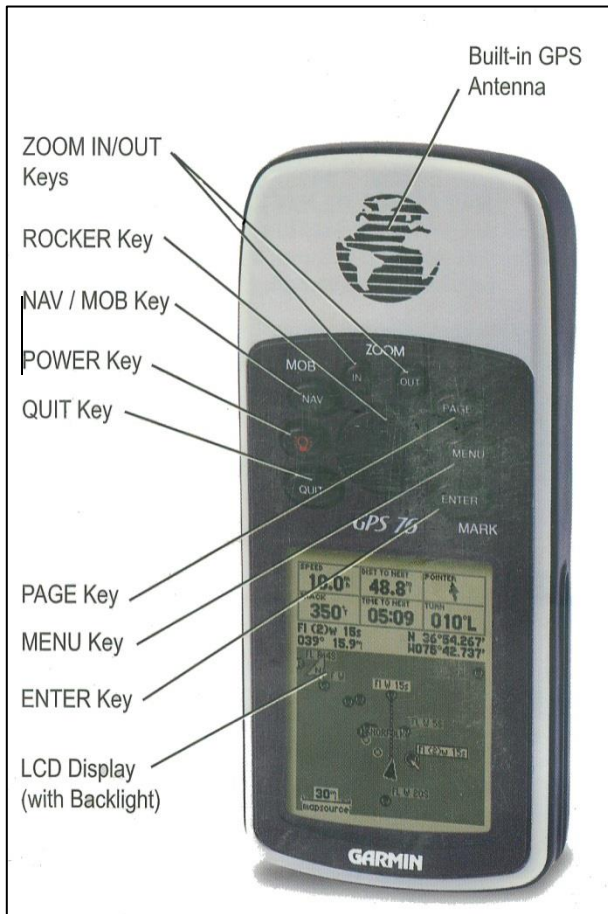
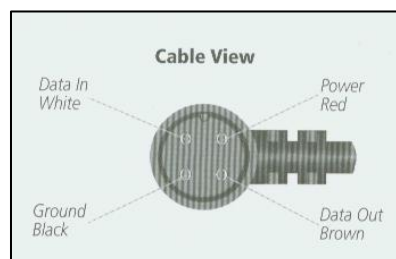


Figure 3-2. This graphic demonstrates the keys and functions of a Garmin 76 GPS unit, and their functions. These keys are referred to in the following instructions.

1. To connect GPS to computer

- Either a serial or USB port cable will accompany the GPS unit. This is the cable that connects the GPS receiver to your workstation computer, allowing the uploading and downloading of waypoints.
- The serial or USB end of the cable attaches to your workstation computer. The other cable end (below) inserts into the Garmin GPS unit (lift bottom of black flap on the back of the GPS unit).



2. To change the displayed map projection

- Turn on the unit by depressing the POWER key
- Set Projection
 1. Access the Main Menu (press the MENU key twice)
 2. Using the rocker key, scroll down to Setup and press the ENTER key
 3. There are several tabs listed (General, Time, Units, Location, Alarms & Interface) – using the rocker key, scroll over to the Location tab. Scroll down with the rocker key to Location Format and press the ENTER key.
 4. Scroll down the list of formats to UTM UPS, make sure this choice is highlighted, and press the ENTER key.
 5. Scroll down to Map Datum, press the ENTER key. Scroll down through the Map Datum choices, press the ENTER key when NAD 27 CONUS is highlighted.
 6. Press the PAGE key to get back to the “GPS Information” screen. (If the GPS Information screen is not showing, press the PAGE key; it will cycle through the screens). The bottom of the screen should now be displaying coordinates as UTM.

3. Set GPS to log differentially correct data

- If not already on, power up the GPS
- Enable WAAS
 1. Access the Main Menu (press the MENU key twice)
 2. Using the key, scroll down to Setup and press the ENTER key
 3. There are several tabs listed (General, Time, Units, Location, Alarms & Interface) – using the rocker key, scroll over to the Location tab. Scroll down with the rocker key to General and press the ENTER key.
 4. Scroll down to WAAS, press ENTER, highlight Enabled, and press ENTER
 5. Press the PAGE key to exit Setup

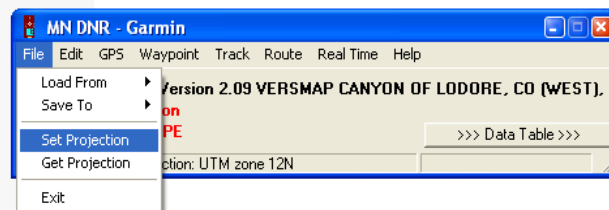
4. In the field

- Collect (or mark) a waypoint
 1. When at the observation location, check the GPS Information page for number of satellites (4 or more needed) and accuracy (12 meters or less)
 2. Press and hold the ENTER/MARK key until the Mark Waypoint Page is displayed.
 3. Using the Rocker key, change the waypoint ID to Transect, point #, optional GPS letter
 4. Using the Rocker key, highlight “OK” and press ENTER
- Navigation
 1. Press the NAV key

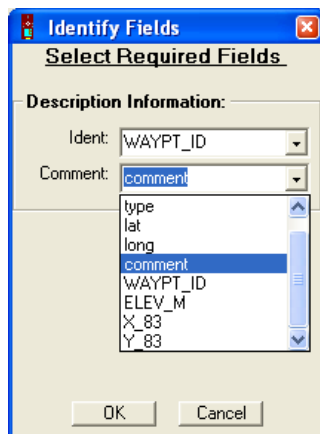
2. Select 'Go To Point' then press the ENTER key
3. Select 'Waypoints' then press the ENTER key
4. Select 'your point' then press the ENTER key
5. Highlight the 'GoTo' button, press ENTER
6. As you start walking, the Pointer will point to your destination

5. Upload background data

- Upload background maps from MapSource (proprietary software) if needed
- Upload waypoints using DNR Garmin
 1. Connect GPS to the computer
 2. Turn GPS on, then open DNR Garmin, it will connect to the computer
 3. When the MN DNR – Garmin window opens, make sure that the projection is set to NAD27, UTM, zone 12N (unless at CURE or BLCA, which are zone 13N). Go to File, then Set Projection to change projection.

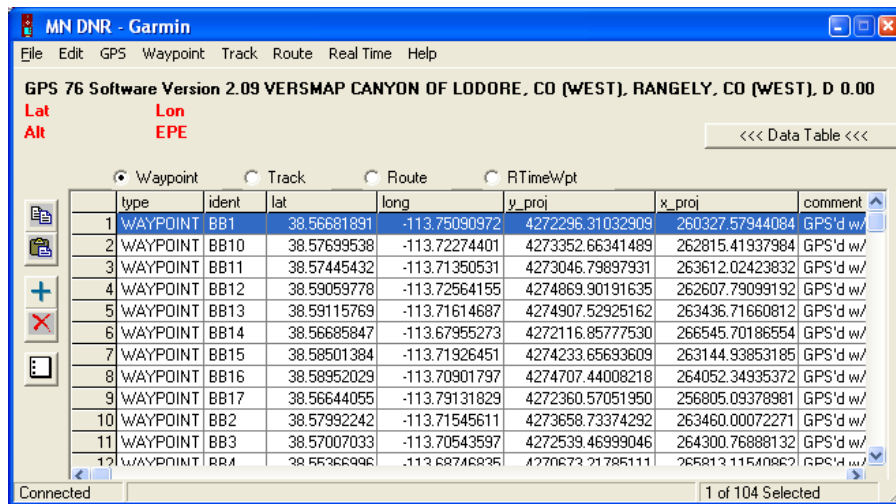


4. Click on File, then Load From. You can upload a .txt file, .dbf file or a shapefile. Navigate to the file you wish to upload and click Open.
5. A window will open prompting you select description information. Choose appropriate fields for Ident (ID) and Comment and click OK.



6. A window will open stating "File was loaded successfully from....", click OK

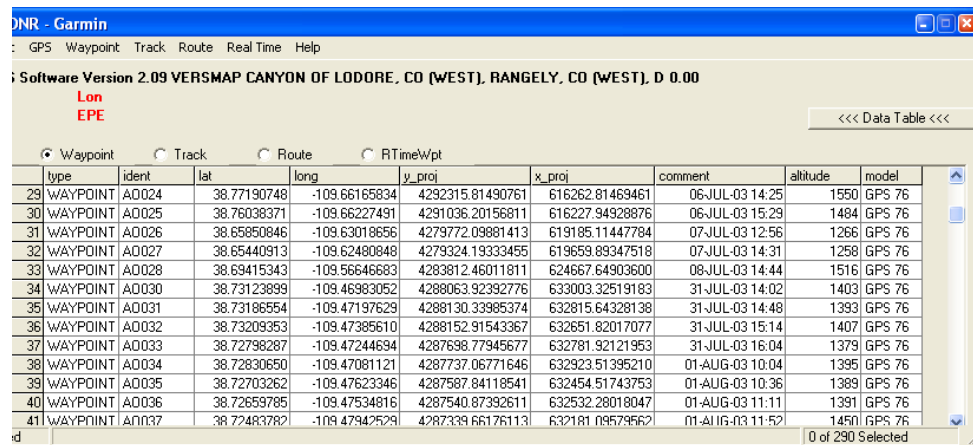
7. Points will be displayed in the MN DNR – Garmin window.



8. If the points are correct, click on WAYPOINT, then Upload
9. A window will pop up stating "Transfer Complete. # points uploaded"

6. Downloading waypoints

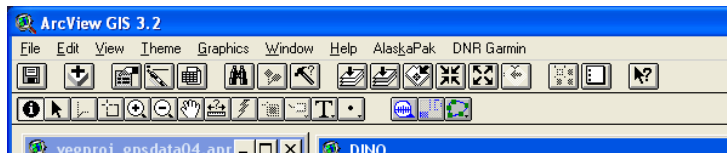
- Download waypoints using MN DNR Garmin freeware
 - Connect the GPS to the computer and turn on the GPS unit, then open the program DNR Garmin on the computer
 - From the DNR Garmin main menu, click on Waypoint, then Download. Your data will appear in the MN DNR Garmin window (see below). Elements to be included in the downloading process are: type, ident, lat, long, y_proj, x_proj, comment, altitude & model. These fields can be chosen by choosing Waypoint from the main menu, then Waypoint Properties and checking only those fields.



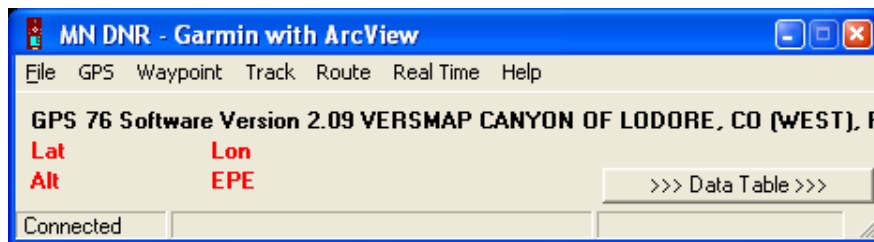
3. Click on File, then Save To. Navigate to the proper folder on the computer (see possible directory structure, Figure 3-1) There are several file types which you can

save the file as. The NCPN recommends saving the data as a Text File (Comma delimited)(*.txt) file. This is the default choice.

4. Name the file with the date of download in the file name (example: Peregrine_June10_05.txt) and click the Save button. A window will display “File successfully written to ...”
- Download waypoints using MN DNR Garmin and ArcView 3.x
 1. Connect GPS unit to workstation
 2. Open and activate the DNR Garmin extension in ArcView. A DNR Garmin dropdown menu will be added to ArcView.

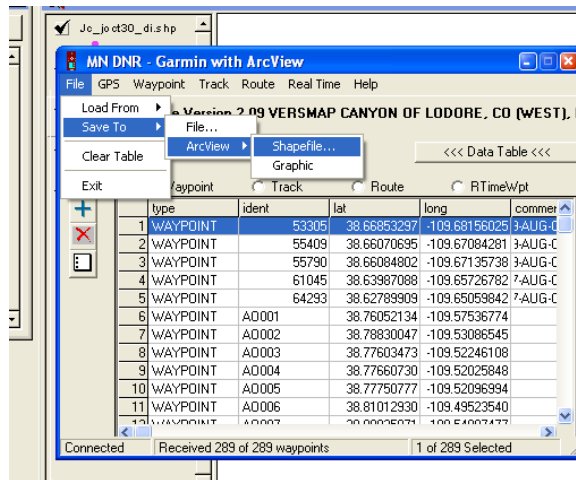


3. From the DNR Garmin menu, choose “Set Projection”. Choose UTM NAD27, and the appropriate zone (12 for all NCPN parks except CURE and BLCA which are 13)
4. From the DNR Garmin menu, choose “Open Garmin GPS”. The following window opens:



5. From this window, click on Waypoint, then Properties. Choose (check) the following fields: type, ident, lat, long, y_proj, x_proj, comment, altitude & model. Click OK to dismiss the Properties window
6. Click on Waypoint, then Download. All points collected will be downloaded.

7. Click on File, then Save To, then ArcView, then Shapefile.



8. Navigate to the appropriate folder, and click Save. The newly created shapefile will appear in the active ArcView view window. Notice that X & Y coordinates have been added to the shapefile.

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #4 Establishing and Marking Sampling Plots

Version 1.02

May 2, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/10/2007	S. L. Garman	Updated site selection procedures	To document 'final' site selection procedures	1.01
1.01	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.02

This Standard Operating Procedure (SOP) describes the procedures used to select monitored habitat patches for NCPN landbird monitoring, and for selecting and marking bird-survey transects. Landbird monitoring in the NCPN is based on the Rocky Mountain Bird Observatory (RMBO)'s Monitoring Colorado's Birds (MCB) program. The RMBO-MCB protocol is included as Appendix C of the NCPN Landbird Monitoring Protocol Narrative. Section IV and Appendix A in the RMBO-MCB protocol describe establishing and marking sampling plots.

Selecting Habitat Patches to Monitor

Sagebrush, pinyon-juniper, and riparian habitats were selected for monitoring in NCPN park units on the basis of region-wide concerns and issues related to habitat degradation and bird populations. Funding constraints limited the number of transects per habitat type to 15. Park units included in landbird monitoring were determined by the availability of target habitat. A combination of random selection and index sites were employed to identify areas for monitoring. All transects were established in the first year of monitoring (2005). Coordinates of each transect, and general directions to transects are recorded in Appendices G and H, respectively, of the protocol narrative, available to authorized personnel by request through the network.

Procedures

The selection of monitoring locations for the two upland habitat types (pinyon-juniper [PJ] and sagebrush) involves a 7-step process, outlined below.

1. An accessibility assessment for each park unit is performed. This involves using GIS to mask-out areas accessible only by traversing a $\geq 50\%$ slope, and areas corresponding to a $\geq 50\%$ slope. The output from this procedure is a map indicating the areas within a park unit that are accessible.
2. Land cover or vegetation maps are used to determine suitable habitat patches. For this version of the protocol, Southwest REGAP landcover maps were the basis for habitat types, with the exception of Zion and Capitol Reef national parks, for which interim versions of vegetation-association maps were available. For both map sources, all pinyon-juniper types are combined into an aggregate PJ type. The modified landcover or association map (hereafter both are referred to as a habitat map) is overlaid on the accessibility map, and inaccessible areas of the habitat map masked-out. The result from this overlay is a habitat map for only accessible areas.
3. A point sampling frame is used to determine the origin of monitoring transects. A 500-m inter-point spacing is employed to minimize the potential for selecting overlapping transects.
4. The point-based sampling frame is overlaid on the resulting map from step #2. Habitat patches and the associated frame points are extracted, and patches evaluated for suitable size and shape. If a patch is too small to accommodate a 3.5-km transect (15 monitoring stations with a 250-m inter-station distance), the patch and all associated frame points are discarded. Otherwise, the points are extracted and stored according to habitat type (e.g., PJ or sagebrush).
5. Procedures 1–4 are performed for all park units with PJ or sagebrush habitat.
6. For each of the upland habitat types, corresponding points from all park units are combined, and 30 points are randomly selected and ordered according to selection sequence. This ordering provides a sequential list for evaluating the suitability of points as monitoring transects.
7. Points are mapped onto topographic and habitat maps to double-check accessibility, patch size, and to determine if a transect originating from the point overlaps a transect of a previously selected point. Transects originating from previously selected points are estimated using ArcMap drawing and distance tools. If the three criteria are not met, the point is discarded and the next sequential point is evaluated. This is performed until 15 suitable transects are identified per habitat type.

Riparian habitats in the NCPN were limited to wadeable streams, which excluded the Green, Colorado, Gunnison, and Virgin rivers. Given the limited number of streams, riparian systems for monitoring were hand-picked. With exceptions noted below, the beginning location of a riparian transect was subjectively determined such that the resulting location would provide a suitable 3.5-km transect. The Southeast Utah Group (SEUG) has monitored landbirds along three streams in Arches National Park and in Canyonlands National Park, and two streams in Natural Bridges National Monument for up to 14 years. The monitoring of these streams was turned over to RMBO, who used the existing 10-station design, but added five more stations by extending the existing transects.

The final number of transects by habitat type is shown in the table below.

Number of landbird monitoring transects, by NCPN park unit and habitat.

Park unit	Habitat		
	PJ	Sagebrush	Riparian
Arches NP	1	-	3
Black Canyon of the Gunnison NP	1	1	-
Bryce Canyon NP	1	2	-
Canyonlands NP	2	-	3
Captiol Reef NP	2	-	2
Colorado NM	2	-	-
Curecanti NRA	-	5	-
Dinosaur NM	4	5	3
Fossil Butte NM	-	2	-
Natural Bridges NM	1	-	2
Zion NP	1	-	2

Establishing Sampling Plots

Park-based maps were generated showing the selected habitat patches. Maps included transportation networks to aid in navigating to possible access points. Aided by these maps, the following procedures were used to locate and document bird-monitoring transects.

Procedures

1. Determine an access point adjacent to or within the habitat patch to be surveyed that is easily recognizable, requires the least amount of driving to get to, and offers a safe parking place off of the road. For linear habitats, the access point is strategically placed near the end of the habitat to accommodate the entire length of a 15-point (requires approximately 4 km). Directions to the access point should be clear, detailed, and the UTM coordinates of its location should be recorded using a GPS unit. This information is recorded on the Rocky Mountain Bird Observatory – UTM Data Sheet (Attachment A). Instructions for recording this information are provided in Attachment B (SITE DATA).
2. The procedure for locating the first point-count station from the access point will vary depending on how close the access point is to the target habitat. For access points in or adjacent to the target habitat, a random number table is used for both the distance and the bearing for heading into the stand to get to the start of a transect. For access points far from the target habitat, walk the most direct bearing to the target habitat, and upon reaching it, establish the first point-count station.
3. Transect orientation follows the initial randomly selected bearing from the access point to the habitat patch. An exception is when monitoring linear habitats, such as riparian areas. In such cases, the transect is located in the middle of the habitat and follows the orientation of the

habitat. When the transect runs into another habitat or a barrier (e.g., cliff, private property), specific instructions are detailed in the protocol narrative for how to proceed (see Section IV, Part A in Appendix C). The 15 point-count stations should be spaced 250 m apart, using the “way-points” feature on the GPS unit to ensure the correct straight-line distance. Use of straight-line distance will result in actual walking distances through meandering linear habitats to be >250 m. Pacing will give a reasonable estimate of distance while hiking between points, but should not replace the use of a GPS unit to establish the exact point location. The UTM coordinates of each point-count station should be recorded in the GPS (see SOP #3 for GPS instructions) and on the UTM Data Sheet (Attachment A) following the instructions listed in Attachment B (TRANSECT DATA – UTM data).

Marking Sampling Plots

The MCB protocol does not call for permanent marking of transects. Observers rely on a GPS unit to re-locate UTM coordinates for the survey points, as well as between-point narrative accounts describing topography, habitat, landmarks, or other notable features of the landscape to help identify the point.

Directions to Access Point										Used existing directions? (check if Y)										Transect description _____ m @ _____ ° to point 1;																			
Zone										Easting										Northing																			
Access point UTM										1 0																													

Date, Time, Weather	Date																	Sky:											
	Time																	Wind:											
	Weather																	Temp:											

Transect notes																			

UTM data										Habitat data													
Point #	Zone	Easting	Northing	Point #	Zone	Easting	Northing	Point #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
01	1	0		08	1	0																	
02	1	0		09	1	0																	
03	1	0		10	1	0																	
04	1	0		11	1	0																	
05	1	0		12	1	0																	
06	1	0		13	1	0																	
07	1	0		14	1	0																	
				15	1	0																	

Habitat data		Point #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Within 100m of road (Y/N)?																	
On private land (Y/N)?																	
Bearing to point																	
Best habitat classification																	
Best habitat seral stage																	
Next best habitat classification																	
Next best habitat seral stage																	
Primary understory class.																	
Primary understory %																	
Secondary understory class.																	
Secondary understory %																	

Rocky Mountain Bird Observatory, 14500 Lark Bunting Ln., Brighton, CO 80603 303-659

Attachment B. Explanation of Field Form and Data Codes

(From RMBO's Point Transect Protocol for Monitoring Colorado's Birds, Appendix A)

These instructions apply to Appendix A of this document, the Rocky Mountain Bird Observatory UTM Data Sheet.

SITE DATA (top of page 1)

Transect #: Enter the **four-character** transect number using the **correct habitat codes** as described below (e.g., MS01, for Montane Shrubland #01, **not** MS1);

Observer: Enter your first two initials *and your full last name*

Map coord.: Enter the map coordinates for the transect Access Point, using either or both the *DeLorme* or *Roads of Colorado* atlases

Directions to access point (VERY IMPORTANT!): Provide **explicit directions** to the access point from some nearby town, major intersection, or geographical feature readily found on a *DeLorme* or *Roads of Colorado* atlas. Provide mileages from intersections or other landmarks using your odometer. **If the observer last year did not provide adequate directions to your site, please provide better directions this year.** For new sites (*or for those lacking Access Point UTM coordinates*), take GPS readings and record **UTM coordinates** (and stored GPS waypoint#) for each access point. Also, **be explicit in your description about the exact location of the access point** (e.g., “the right post of the green metal gate” or “the NE corner of the bridge”).

Example: MS02: From jct. of Highway 61, head East on Happy Canyon Rd for 8.4 miles to jct. with 420 Rd. Head South on 420 Rd through narrow canyon for 2.1 miles, cross over wooden bridge and park in 1st pullout on right. Access point is the tall wooden post at the SW corner of the bridge.

Transect description: Provide the **distance** and **bearing from the access point to the first point** (do not provide bearing from first point back to the access point). Then, provide *between-point accounts*, describing the topography, habitat, landmarks and/or other features that you pass prior to arriving at the next count station, with sufficient detail so that future observers can follow the same route that you are establishing. **It is especially important that you record any turns, changes in bearings, or other deviations that you make from the original transect bearing.** Also, provide a brief description of the area surrounding the count station, or any noticeable features of the landscape at each point, again so future observers will know when they have reached the area of the point-count station. *As this is a long-term monitoring program, the importance of providing detailed directions/descriptions for each transect cannot be overstated!* GPS locations alone are not sufficiently reliable as the accuracy of GPS locations can be changed significantly by the U.S. Government (as happened after Sept. 11). Please provide the transect description information in the general format and detail as described in the following example.

Example: Pt#6: From pt 5, turn to 356 ° and head down steep drainage. Stay on bearing, passing ~45 m to the right of drainage bottom, where drainage meets larger valley. Continue through small stand of aspen; cross dirt 2-track at ~175 m; cross small creek at ~225 m. After creek, head up small hill with tall spruce trees on top. Point is on top of this hill, ~3 m south of largest-diameter spruce.

TRANSECT DATA (middle of page 1)

Date: Enter the date in the format: MM-DD-YY

Time: Enter start and stop times for entire transect (not individual points) using 24-hour clock

Sky (start and end): Enter one-digit codes at beginning and end of transect (not at points)

Code	Sky condition
0	0–15% cloud cover
1	16–50% cloud cover
2	51–75% cloud cover
3	76–100% cloud cover
4	fog
5	
6	drizzle

You shouldn't conduct counts in any other conditions!

Wind (start and end): Enter one-digit codes at beginning and end of transect

Code	Wind condition
0	Less than 1 mph; smoke rises vertically
1	1–3 mph; smoke drift shows wind direction
2	4–7 mph; leaves rustle, wind is felt on face
3	8–12 mph; leaves, small twigs in constant motion; light flag extended
4	13–18 mph; raises dust, leaves, loose paper; small branches in motion

You shouldn't conduct counts in any other conditions!

Temperature (start and end): Use °F (no thermometer?, estimate to nearest 5°).

Transect notes: Enter information relevant to the site, good camp sites, cool scenery, or other tidbits that either don't really fit in other places or that future surveyors might find interesting.

UTM data: Enter the UTM coordinates (**using the NAD27 CONUS datum** in navigation setup) for each point-count station associated with a **new** site (for established sites, only take a GPS reading if you are moving the count station; in these cases, provide new directions to the count station as well).

Be sure that the GPS reading is essentially stable before recording the UTM location. **Record all *new* UTM coordinates in the appropriate spaces provided on the field form and save all *new* UTM coordinates in the GPS units using the “Mark Waypoint” feature.** *Record the stored waypoint number, as indicated on the GPS unit, under “WP#”, next to each UTM coordinate, respectively.* The stored UTM coordinates can then be uploaded to a PC, and thus you won’t have to enter UTM coordinates as part of your data entry duties. However, each unit can only store 500 waypoints, so you will need to delete some of the established sites from the GPS unit (*after completing the transect!*) before you input additional locations. Whatever the situation, *make sure that **all new** UTM coordinates get recorded on the field forms as well as in the GPS units!*

HABITAT DATA (bottom of page 1)

Within 100m of road (Y/N): Enter “Y” for yes and “N” for no for **EACH** point based on your best knowledge of the site. For our purposes, a “road” must be substantial enough so that it either causes a significant disruption of the understory vegetation OR a break in the canopy. For example, a grassy 2-track running through an open meadow should not be considered a road, whereas a gravel or dirt road that forms a 3 to 4-m wide break in the grass cover would be considered a road. Similarly, an old, pine needle-covered logging track in an open forest situation should not be considered a road, whereas a logging road that causes a clear and wide break in the woody understory vegetation, or in the forest canopy, should be considered a road. This topic will be covered more thoroughly during the training session.

On private land (Y/N): Enter “Y” for yes and “N” for no for **EACH** point. Be sure that you have permission to conduct counts that are on private land!

Bearing to point: Enter the true bearing (do not use magnetic bearings) you followed from the last point (or access point) to arrive at the current point.

Best habitat classification: Enter the two-letter code of the habitat that BEST describes the habitat surrounding the point count station. Consider the entire landscape around the count station from which you are picking up birds and select *the dominant habitat type that occupies the greatest amount of this area.*

Habitat classification codes:

Code	Habitat
AS	Aspen
AT	Alpine Tundra
CR	Cliff/Rock
GR	Grassland
HR	High-elevation Riparian
LP	Lodgepole Pine

LR	Low-elevation Riparian
MC	Mixed Conifer
MR	Mid-elevation Riparian
MS	Montane Shrubland
PJ	Piñon-Juniper
PP	Ponderosa Pine
RA	Rural/Agriculture
SA	Sage Shrubland
SB	Shore/Bank
SE	Semi-desert Shrubland
SF	Spruce-Fir
WE	Wetland

Best habitat seral stage and canopy closure: Enter one-digit code of seral stage (see Appendix D for habitat-specific seral stage accounts) of habitat used in best habitat classification, followed by a one-letter code for canopy closure:

Code	Classification
Seral stage	
1	grass-forb
2	shrub-seedling
3	sapling-pole
4	mature
5	old growth
Canopy closure	
a	<40%
b	40–70%
c	>70%

Next-best habitat classification: Enter two-letter code of habitat that NEXT best describes the habitat surrounding the point. Consider the entire landscape from which you are picking up birds and select the next-most dominant habitat type occupying the greatest amount of this area **OR** *select the habitat that is contributing the most birds to the point count* (if different than the Best Habitat).

Next-best habitat seral stage and canopy closure: Enter one-digit code of seral stage and one-letter code for canopy closure of habitat used in next-best habitat classification.

Primary understory classification: Enter two-letter code for primary understory vegetation type that best describes the understory within a 50-m radius of the point:

Code	Understory class
BG	bare ground
GF	grass/forb
GO	Gambel's oak
MM	mountain mahogany
NS	not sage or willow
SA	sage
SN	snowberry
SV	serviceberry
WI	willow

Primary understory percentage: Estimate the percent coverage of the primary understory type within a 50-m radius of point and enter the 1-digit code:

Code	Understory percentage
1	1–20%
2	21–40%
3	41–60%
4	61–80%
5	81–100%

Secondary understory classification: Enter two-letter code for secondary understory type that NEXT BEST describes the understory within a 50-m radius of the point, as described above.

Secondary understory percentage: Estimate the percent coverage of the secondary understory type within a 50-m radius of point and enter the 1-digit code, as described above.

(These instructions apply to the bird count data page of the Rocky Mountain Bird Observatory Point-Transsect Form)

POINT-COUNT DATA

Point #: Enter number of point (01–15) on the transect; **NOTE:** for entries of target species *between points* enter "99" (see text on Transect counts).

Species: Enter **CORRECT** four-letter code for birds (see Appendix C); PLEASE, PLEASE use correct codes, as it makes data entry and analysis easier. Species that cause particular problems for observers include: **Northern Shoveler** (NSHO, not NOSH), **Ring-necked Pheasant** (RINP, not RNPH), **Western Wood-Pewee** (WEWP, not WWPE), **Gray Jay** (GRAJ, not GRJA), **Tree Swallow** (TRES, not TRSW), **Bank Swallow** (BANS, not BASW), **Barn Swallow** (BARS, not BASW), **MacGillivray's Warbler**

(MGWA, not MAWA), **Yellow Warbler** (YWAR, not YEWA), **Yellow-rumped Warbler** (AUWA - for Audubon's Warbler, MYWA for Myrtle's Warbler, not YRWA), **Lark Bunting** (LARB, not LABU), **Sage Sparrow** (SAGS, not SASP), **Savannah Sparrow** (SAVS, not SASP), **Lazuli Bunting** (LAZB, not LABU) and **Red-winged Blackbird** (RWBL, not RWBB).

Radial distance: Measure radial distance (estimate only when necessary) to *each* bird (that is, direct distance from point to bird), using a binocular rangefinder, in one-meter units (when estimating, **DO NOT** round off to five- or ten-meter units). If beyond a kilometer (1,000 meters), fit number in the three spaces provided as best you can.

Bearing: When recording low-density target species on point counts and in between points, use your declination-adjusted compass to site in the direction of the bird and record the true bearing (as opposed to magnetic) to the bird.

How: Enter code for how each individual was **detected**:

Code	Classification
C	calling
S	singing
D	drumming
O	other aural cue
V	visual
F	flyover
K	flock

Sex: Enter code for sex: M=male, F=female, U=unknown

VERY IMPORTANT: Skip a line between entries for individual points and/or individual legs of the transect. That is, all individual birds on a particular point (or transect leg) should be bunched together on the form; then you should leave a blank line before starting entries for the next transect leg (or point).

OTHER IMPORTANT REMINDERS:

Before leaving your transect sites, don't forget to:

- ***enter transect and page #'s at the bottom of EACH page!***
- record the end of transect data (time, temp, sky, wind, transect notes) IMMEDIATELY UPON COMPLETING THE TRANSECT!
- ***go through your data sheets carefully to make sure that you have not forgotten to record any data. Your work is not done until you've reviewed your data from the morning!***
- ***provide clear and explicit directions to the access point, if you have not already done so!***

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #5 Conducting the Survey

Version 1.01

May 2, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.01

This Standard Operating Procedure (SOP) summarizes the procedures for conducting landbird monitoring surveys in the Northern Colorado Plateau Network (NCPN). Landbird monitoring in the NCPN is based on the Rocky Mountain Bird Observatory (RMBO)'s Monitoring Colorado's Birds program. Observers should read the RMBO Protocol (Appendix C of the NCPN landbird monitoring protocol narrative) for a complete, detailed description of survey methods. This SOP summarizes procedures for (1) collecting bird-observation data, (2) filling in the Rocky Mountain Bird Observatory UTM Data Sheet, and (3) filling in the front and back of the Rocky Mountain Bird Observatory Point-Transect Form.

General Survey Considerations

Procedures

1. **Seasonal timing.** Surveys must be conducted within a three-week window after all migratory species have returned to an area. Appropriate survey times for each transect in the NCPN will be determined and provided by RMBO.
2. **Monitoring methods.** Monitoring employs a combination of point-count and transect distance sampling. Observations for the more common species are collected at 15 point-count stations (i.e., variable circular plots) distributed along a transect. Observations are made during a 5-minute period. Observations of low-density target species are continuously collected along the line transect while walking between point-count stations. Distance measures are recorded for all observed individuals. A list of low-density target species by habitat will be provided by RMBO (also see Appendix C of the protocol narrative), and will be updated to reflect the habitats monitored in the NCPN.

3. ***Permissible weather conditions.*** Surveys should only be conducted in weather conditions that allow for birds to be adequately heard and seen. Counts should be stopped if winds exceed 13–18 mph (raising dust, leaves, loose paper; small branches in motion) and if precipitation exceeds a drizzle.
4. ***Time of day.*** Surveys begin approximately one half hour before sunrise and end no later than 10:00 am.
5. ***Transect documentation.*** For each established transect, directions to the access point, distance and bearing to the start of a transect, and waypoint coordinates (if appropriate) must be recorded on the Rocky Mountain Bird Observatory – UTM Data Sheet (Attachment A) prior to entering the field. This information is supplied by RMBO; the NCPN also stores this information (see SOP #7). For new transects, areas selected for monitoring (i.e., habitat patches or riparian corridors) are provided, and during the first visit, an access point, and the distance and bearing to the start of a transect must be determined and recorded (see SOP #4).

Five-Minute Point Counts

Procedures

1. If a new transect, the habitat patch or riparian corridor to monitor is provided along with park maps showing roads and trails, and suggested access points. You must determine the most appropriate access point, record directions to this point, and record the bearing and distance from the access point to the start of the transect. This information is recorded on the Rocky Mountain Bird Observatory – UTM Data Sheet form (Attachment A). Instructions for recording this information are provided in Attachment C - SITE DATA). UTM coordinates for all point-count stations also must be determined and recorded on this form (see Attachment C – TRANSECT DATA). Detailed instructions for locating and documenting a new transect are provided in SOP #4.
2. If an established transect, navigate to the access point, then to the start of the transect following the recorded directions. Always verify the directions and correct as necessary. Also, verify the recorded UTM coordinates of each point-count station.
3. At each point-count station, record habitat data before recording bird observations. Instructions and data forms are provided in SOP #6.
4. After recording habitat data (where applicable), start the timepiece and begin recording the following information for all birds detected during a 5-minute count:
 - radial distance from you to the bird
 - how the bird was detected
 - sex of the bird (if known)
 - the bearing from you to the bird, if a low-density target species

Observations are recorded on the Rocky Mountain Bird Observatory Point-transect Form (Attachment B) following the instructions provided in Attachment C (POINT-COUNT DATA).

Line Transect Component of the 5-Minute Point Counts

Conduct a continuous transect count between the first and last points of the transect, recording all detections of low-density target species. It is important to note that low-density target species also are recorded at point-count stations.

Procedures

For each low-density target species detected, record:

- radial distance from you to the bird
- bearing from you to the bird
- how the bird was detected
- sex of the bird (if known)

Observations are recorded on the Rocky Mountain Bird Observatory Point-Transect Form (Attachment B) following the instructions provided in Attachment C (POINT-COUNT DATA).

Potential Problems

Observers should pay specific attention to the following topics when reviewing the RMBO protocol (see Appendix C of the protocol narrative):

- how to distinguish flyovers
- how to determine the correct distance measure for birds which move during the survey
- how to estimate radial distances, especially for birds heard but not seen
- why not to round distance estimates
- how to adjust bearings for proper declination
- the need to avoid recording birds seen or heard previously
- sources of observer error (see Section VII in Appendix C)

Attachment A. Rocky Mountain Bird Observatory – UTM Data Sheet

Directions to Access Point		Used existing directions? (check if Y)		Transect description _____ m @ _____ ° to point 1;	
Zone Easting Northing					
Access point UTM		1	0		

Date,	Date		Sky:	Start		End		
	Time,	Time	Start	0	End	Wind:	Start	
Weather	End		Temp:	Start	°F	End	°F	

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(Observer initials - all three)

(Year)

(prog - BH,CO,NM,WY)

(Transect #, e.g., AS04)

Transect description and notes:

How: V=visual; S=singing; C=calling; D=drumming; O=other aural detection. Sex: M=male; F=female; U=unknown.

Between points, point # = 99.

[illegible]

Attachment C. Explanation of Field Form and Data Codes

(From RMBO's Point Transect Protocol for Monitoring Colorado's Birds, Appendix A)

These instructions apply to Appendix A of this document, the Rocky Mountain Bird Observatory UTM Data Sheet.

SITE DATA (top of page 1)

Transect #: Enter the **four-character** transect number using the **correct habitat codes** as described below (e.g., MS01, for Montane Shrubland #01, **not** MS1);

Observer: Enter your first two initials *and your full last name*

Map coord.: Enter the map coordinates for the transect Access Point, using either or both the *DeLorme* or *Roads of Colorado* atlases

Directions to access point (VERY IMPORTANT!): Provide **explicit directions** to the access point from some nearby town, major intersection, or geographical feature readily found on a *DeLorme* or *Roads of Colorado* atlas. Provide mileages from intersections or other landmarks using your odometer. **If the observer last year did not provide adequate directions to your site, please provide better directions this year.** For new sites (*or for those lacking Access Point UTM coordinates*), take GPS readings and record **UTM coordinates** (and stored GPS waypoint#) for each access point. Also, **be explicit in your description about the exact location of the access point** (e.g., “the right post of the green metal gate” or “the NE corner of the bridge”).

Example: MS02: From jct. of Highway 61, head East on Happy Canyon Rd for 8.4 miles to jct. with 420 Rd. Head South on 420 Rd through narrow canyon for 2.1 miles, cross over wooden bridge and park in 1st pullout on right. Access point is the tall wooden post at the SW corner of the bridge.

Transect description: Provide the **distance** and **bearing from the access point to the first point** (do not provide bearing from first point back to the access point). Then, provide *between-point accounts*, describing the topography, habitat, landmarks and/or other features that you pass prior to arriving at the next count station, with sufficient detail so that future observers can follow the same route that you are establishing. **It is especially important that you record any turns, changes in bearings, or other deviations that you make from the original transect bearing.** Also, provide a brief description of the area surrounding the count station, or any noticeable features of the landscape at each point, again so future observers will know when they have reached the area of the point-count station. *As this is a long-term monitoring program, the importance of providing detailed directions/descriptions for each transect cannot be overstated!* GPS locations alone are not sufficiently reliable as the accuracy of GPS locations can be changed significantly by the U.S. Government (as happened after Sept. 11). Please provide the transect description information in the general format and detail as described in the following example.

Example: Pt#6: From pt 5, turn to 356 ° and head down steep drainage. Stay on bearing, passing ~45 m to the right of drainage bottom, where drainage meets larger valley. Continue through small stand of aspen; cross dirt 2-track at ~175 m; cross small creek at ~225 m. After creek, head up small hill with tall spruce trees on top. Point is on top of this hill, ~3 m south of largest-diameter spruce.

TRANSECT DATA (middle of page 1)

Date: Enter the date in the format: MM-DD-YY

Time: Enter start and stop times for entire transect (not individual points) using 24-hour clock

Sky (start and end): Enter one-digit codes at beginning and end of transect (not at points)

Code	Sky condition
0	0–15% cloud cover
1	16–50% cloud cover
2	51–75% cloud cover
3	76–100% cloud cover
4	fog
5	
6	drizzle

You shouldn't conduct counts in any other conditions!

Wind (start and end): Enter one-digit codes at beginning and end of transect

Code	Wind condition
0	Less than 1 mph; smoke rises vertically
1	1–3 mph; smoke drift shows wind direction
2	4–7 mph; leaves rustle, wind is felt on face
3	8–12 mph; leaves, small twigs in constant motion; light flag extended
4	13–18 mph; raises dust, leaves, loose paper; small branches in motion

You shouldn't conduct counts in any other conditions!

Temperature (start and end): Use °F (no thermometer?, estimate to nearest 5°).

Transect notes: Enter information relevant to the site, good camp sites, cool scenery, or other tidbits that either don't really fit in other places or that future surveyors might find interesting.

UTM data: Enter the UTM coordinates (**using the NAD27 CONUS datum** in navigation setup) for each point-count station associated with a **new** site (for established sites, only take a GPS reading if you are moving the count station; in these cases, provide new directions to the count station as well).

Be sure that the GPS reading is essentially stable before recording the UTM location. **Record all *new* UTM coordinates in the appropriate spaces provided on the field form and save all *new* UTM coordinates in the GPS units using the “Mark Waypoint” feature.** *Record the stored waypoint number, as indicated on the GPS unit, under “WP#”, next to each UTM coordinate, respectively.* The stored UTM coordinates can then be uploaded to a PC, and thus you won’t have to enter UTM coordinates as part of your data entry duties. However, each unit can only store 500 waypoints, so you will need to delete some of the established sites from the GPS unit (*after completing the transect!*) before you input additional locations. Whatever the situation, *make sure that **all new** UTM coordinates get recorded on the field forms as well as in the GPS units!*

HABITAT DATA (bottom of page 1)

Within 100m of road (Y/N): Enter “Y” for yes and “N” for no for **EACH** point based on your best knowledge of the site. For our purposes, a “road” must be substantial enough so that it either causes a significant disruption of the understory vegetation OR a break in the canopy. For example, a grassy 2-track running through an open meadow should not be considered a road, whereas a gravel or dirt road that forms a 3 to 4-m wide break in the grass cover would be considered a road. Similarly, an old, pine needle-covered logging track in an open forest situation should not be considered a road, whereas a logging road that causes a clear and wide break in the woody understory vegetation, or in the forest canopy, should be considered a road. This topic will be covered more thoroughly during the training session.

On private land (Y/N): Enter “Y” for yes and “N” for no for **EACH** point. Be sure that you have permission to conduct counts that are on private land!

Bearing to point: Enter the true bearing (do not use magnetic bearings) you followed from the last point (or access point) to arrive at the current point.

Best habitat classification: Enter the two-letter code of the habitat that BEST describes the habitat surrounding the point count station. Consider the entire landscape around the count station from which you are picking up birds and select *the dominant habitat type that occupies the greatest amount of this area.*

Habitat classification codes:

Code	Habitat
AS	Aspen
AT	Alpine Tundra
CR	Cliff/Rock
GR	Grassland
HR	High-elevation Riparian
LP	Lodgepole Pine

LR	Low-elevation Riparian
MC	Mixed Conifer
MR	Mid-elevation Riparian
MS	Montane Shrubland
PJ	Piñon-Juniper
PP	Ponderosa Pine
RA	Rural/Agriculture
SA	Sage Shrubland
SB	Shore/Bank
SE	Semi-desert Shrubland
SF	Spruce-Fir
WE	Wetland

Best habitat seral stage and canopy closure: Enter one-digit code of seral stage (see Appendix D for habitat-specific seral stage accounts) of habitat used in best habitat classification, followed by a one-letter code for canopy closure:

Code	Classification
Seral stage	
1	grass-forb
2	shrub-seedling
3	sapling-pole
4	mature
5	old growth
Canopy closure	
a	<40%
b	40–70%
c	>70%

Next-best habitat classification: Enter two-letter code of habitat that NEXT best describes the habitat surrounding the point. Consider the entire landscape from which you are picking up birds and select the next-most dominant habitat type occupying the greatest amount of this area **OR** *select the habitat that is contributing the most birds to the point count* (if different than the Best Habitat).

Next-best habitat seral stage and canopy closure: Enter one-digit code of seral stage and one-letter code for canopy closure of habitat used in next-best habitat classification.

Primary understory classification: Enter two-letter code for primary understory vegetation type that best describes the understory within a 50-m radius of the point:

Code	Understory class
BG	bare ground
GF	grass/forb
GO	Gambel's oak
MM	mountain mahogany
NS	not sage or willow
SA	sage
SN	snowberry
SV	serviceberry
WI	willow

Primary understory percentage: Estimate the percent coverage of the primary understory type within a 50-m radius of point and enter the 1-digit code:

Code	Understory percentage
1	1–20%
2	21–40%
3	41–60%
4	61–80%
5	81–100%

Secondary understory classification: Enter two-letter code for secondary understory type that NEXT BEST describes the understory within a 50-m radius of the point, as described above.

Secondary understory percentage: Estimate the percent coverage of the secondary understory type within a 50-m radius of point and enter the 1-digit code, as described above.

(These instructions apply to the bird count data page of the Rocky Mountain Bird Observatory Point-Transsect Form)

POINT-COUNT DATA

Point #: Enter number of point (01-15) on the transect; **NOTE:** for entries of target species *between points* enter "99" (see text on Transect counts).

Species: Enter **CORRECT** four-letter code for birds (see Appendix C); PLEASE, PLEASE use correct codes, as it makes data entry and analysis easier. Species that cause particular problems for observers include: **Northern Shoveler** (NSHO, not NOSH), **Ring-necked Pheasant** (RINP, not RNPH), **Western Wood-Pewee** (WEWP, not WWPE), **Gray Jay** (GRAJ, not GRJA), **Tree Swallow** (TRES, not TRSW), **Bank Swallow** (BANS, not BASW), **Barn Swallow** (BARS, not BASW), **MacGillivray's Warbler**

(MGWA, not MAWA), **Yellow Warbler** (YWAR, not YEWA), **Yellow-rumped Warbler** (AUWA - for Audubon's Warbler, MYWA for Myrtle's Warbler, not YRWA), **Lark Bunting** (LARB, not LABU), **Sage Sparrow** (SAGS, not SASP), **Savannah Sparrow** (SAVS, not SASP), **Lazuli Bunting** (LAZB, not LABU) and **Red-winged Blackbird** (RWBL, not RWBB).

Radial distance: Measure radial distance (estimate only when necessary) to *each* bird (that is, direct distance from point to bird), using a binocular rangefinder, in one-meter units (when estimating, **DO NOT** round off to five- or ten-meter units) -- if beyond a kilometer (1000 meters), fit number in the three spaces provided as best you can.

Bearing: When recording low-density target species on point counts and in between points, use your declination-adjusted compass to site in the direction of the bird and record the true bearing (as opposed to magnetic) to the bird.

How: Enter code for how each individual was **detected**:

How: Enter code for how each individual was **detected**:

Code	Classification
C	calling
S	singing
D	drumming
O	other aural cue
V	visual
F	flyover
K	flock

Sex: Enter code for sex: M=male, F=female, U=unknown

VERY IMPORTANT: Skip a line between entries for individual points and/or individual legs of the transect. That is, all individual birds on a particular point (or transect leg) should be bunched together on the form; then you should leave a blank line before starting entries for the next transect leg (or point).

OTHER IMPORTANT REMINDERS:

Before leaving your transect sites, don't forget to:

- ***enter transect and page #'s at the bottom of EACH page!***
- record the end of transect data (time, temp, sky, wind, transect notes) IMMEDIATELY UPON COMPLETING THE TRANSECT!
- ***go through your data sheets carefully to make sure that you have not forgotten to record any data. Your work is not done until you've reviewed your data from the morning!***

- ***provide clear and explicit directions to the access point, if you have not already done so!***

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #6 Documenting Habitat Variables

Version 1.01

May 2, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.01

This Standard Operating Procedure (SOP) summarizes habitat-data collection procedures for monitoring landbirds in the Northern Colorado Plateau Network (NCPN). Landbird monitoring in the NCPN is based on the Rocky Mountain Bird Observatory (RMBO)'s Monitoring Colorado's Birds program. Habitat data are collected only at point-count stations on upland transects. Data are collected upon reaching a point-count station prior to bird counts. Habitat data are collected annually. Two sets of habitat data are collected according to protocols developed in 2000 and in 2004. Data forms and detailed instructions are included in this SOP as attachments.

Procedures

1. The 2000 protocol requires collecting habitat data at both the landscape scale and within a 50-m radius circular plot centered on a point-count survey point. Specific instructions are provided in Appendix A, part 3, and Appendix E of the RMBO *Point Transect Protocol for Monitoring Colorado's Birds* (see Appendix C of the NCPN landbird monitoring protocol narrative). The habitat data section of the Rocky Mountain Bird Observatory UTM Data Sheet (Attachment A) records landscape and 50-m radius habitat information. Following RMBO instructions for the data sheet (Attachment B – HABITAT DATA) and the guidelines for classifying habitat (Attachment C), record the following attributes:
 - Landscape Attributes
 - Dominant habitat: type, seral stage, canopy closure
 - Next-most dominant habitat: type, seral stage, canopy closure

- 50-m Radius Plot Attributes
 - Primary understory: classification, percent cover
 - Secondary understory: classification, percent cover
- 2. The 2004 protocol requires collecting seral-stage and canopy-cover data within a 50-m radius circular plot centered on a bird-survey point. This information is recorded in the habitat page of the Rocky Mountain Bird Observatory Point-Transect Form (Attachment D). Specific instructions are provided in Attachment E of this SOP. Following RMBO instructions, record the following habitat attributes at each bird-survey point:
 - Overstory
 - seral (structural) stage
 - canopy closure
 - canopy tree height
 - dominant tree species (up to 5)
 - relative percent of overstory occupied by each dominant species
 - additional habitats present
 - Sub-canopy/ mid-story
 - foliage mass (volume) of middle vertical third of the forest
 - distinct sub-canopy tree species
 - Shrub layer
 - foliage mass (volume) of all woody shrubs and seedling trees
 - mean height of the shrub layer
 - shrub and tree seedling species (up to 5)
 - relative percent of total shrub layer occupied by each species
 - Ground cover
 - absolute percent of ground cover in each of 4 categories: woody, herbaceous, grass, bare ground.

Attachment A - Rocky Mountain Bird Observatory UTM Data Sheet

Directions to Access Point		Used existing directions? (check if Y)			
Access point UTM		1	0	0	0
		Zone	Easting	Northing	

Transect description					

Date,	Date							Sky:	Start		End	
	Time,	Time	Start	0				Wind:	Start		End	
	Weather		End					Temp:	Start		°F	End

Transect notes			

UTM data												
Point #	Zone	Easting	Northing	Point #	Zone	Easting	Northing	Point #	Zone	Easting	Northing	Point #
01	1	0		08	1	0		15	1	0		
02	1	0		09	1	0						
03	1	0		10	1	0						
04	1	0		11	1	0						
05	1	0		12	1	0						
06	1	0		13	1	0						
07	1	0		14	1	0						
				15	1	0						

Habitat data		Point #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Within 100m of road (Y/N)?																	
On private land (Y/N)?																	
Bearing to point																	
Best habitat classification																	
Best habitat seral stage																	
Next best habitat classification																	
Next best habitat seral stage																	
Primary understory class.																	
Primary understory %																	
Secondary understory class.																	
Secondary understory %																	

Attachment B. Explanation of Field Form and Data Codes

(From RMBO's Point Transect Protocol for Monitoring Colorado's Birds, Appendix A)

These instructions apply to Appendix A of this document, the Rocky Mountain Bird Observatory UTM Data Sheet.

SITE DATA (top of page 1)

Transect #: Enter the **four-character** transect number using the **correct habitat codes** as described below (e.g., MS01, for Montane Shrubland #01, **not** MS1);

Observer: Enter your first two initials *and your full last name*

Map coord.: Enter the map coordinates for the transect Access Point, using either or both the *DeLorme* or *Roads of Colorado* atlases

Directions to access point (VERY IMPORTANT!): Provide **explicit directions** to the access point from some nearby town, major intersection, or geographical feature readily found on a *DeLorme* or *Roads of Colorado* atlas. Provide mileages from intersections or other landmarks using your odometer. **If the observer last year did not provide adequate directions to your site, please provide better directions this year.** For new sites (or for those lacking Access Point UTM coordinates), take GPS readings and record **UTM coordinates** (and stored GPS waypoint#) for each access point. Also, **be explicit in your description about the exact location of the access point** (e.g., “the right post of the green metal gate” or “the NE corner of the bridge”).

Example: MS02: From jct. of Highway 61, head East on Happy Canyon Rd for 8.4 miles to jct. with 420 Rd. Head South on 420 Rd through narrow canyon for 2.1 miles, cross over wooden bridge and park in 1st pullout on right. Access point is the tall wooden post at the SW corner of the bridge.

Transect description: Provide the **distance** and **bearing from the access point to the first point** (do not provide bearing from first point back to the access point). Then, provide *between-point accounts*, describing the topography, habitat, landmarks and/or other features that you pass prior to arriving at the next count station, with sufficient detail so that future observers can follow the same route that you are establishing. **It is especially important that you record any turns, changes in bearings, or other deviations that you make from the original transect bearing.** Also, provide a brief description of the area surrounding the count station, or any noticeable features of the landscape at each point, again so future observers will know when they have reached the area of the point-count station. *As this is a long-term monitoring program, the importance of providing detailed directions/descriptions for each transect cannot be overstated!* GPS locations alone are not sufficiently reliable as the accuracy of GPS locations can be changed significantly by the U.S. Government (as happened after Sept. 11). Please provide the transect description information in the general format and detail as described in the following example.

Example: Pt#6: From pt 5, turn to 356 ° and head down steep drainage. Stay on bearing, passing ~45 m to the right of drainage bottom, where drainage meets larger valley. Continue through small stand of aspen; cross dirt 2-track at ~175 m; cross small creek at ~225 m. After creek, head up small hill with tall spruce trees on top. Point is on top of this hill, ~3 m south of largest-diameter spruce.

TRANSECT DATA (middle of page 1)

Date: Enter the date in the format: MM-DD-YY

Time: Enter start and stop times for entire transect (not individual points) using 24-hour clock

Sky (start and end): Enter one-digit codes at beginning and end of transect (not at points)

Code	Sky condition
0	0–15% cloud cover
1	16–50% cloud cover
2	51–75% cloud cover
3	76–100% cloud cover
4	fog
5	
6	drizzle

You shouldn't conduct counts in any other conditions!

Wind (start and end): Enter one-digit codes at beginning and end of transect

Code	Wind condition
0	Less than 1 mph; smoke rises vertically
1	1–3 mph; smoke drift shows wind direction
2	4–7 mph; leaves rustle, wind is felt on face
3	8–12 mph; leaves, small twigs in constant motion; light flag extended
4	13–18 mph; raises dust, leaves, loose paper; small branches in motion

You shouldn't conduct counts in any other conditions!

Temperature (start and end): Use °F (no thermometer?, estimate to nearest 5°).

Transect notes: Enter information relevant to the site, good camp sites, cool scenery, or other tidbits that either don't really fit in other places or that future surveyors might find interesting.

UTM data: Enter the UTM coordinates (**using the NAD27 CONUS datum** in navigation setup) for each point-count station associated with a **new** site (for established sites, only take a GPS reading if you are moving the count station; in these cases, provide new directions to the count station as well).

Be sure that the GPS reading is essentially stable before recording the UTM location. **Record all *new* UTM coordinates in the appropriate spaces provided on the field form and save all *new* UTM coordinates in the GPS units using the “Mark Waypoint” feature.** *Record the stored waypoint number, as indicated on the GPS unit, under “WP#”, next to each UTM coordinate, respectively.* The stored UTM coordinates can then be uploaded to a PC, and thus you won’t have to enter UTM coordinates as part of your data entry duties. However, each unit can only store 500 waypoints, so you will need to delete some of the established sites from the GPS unit (*after completing the transect!*) before you input additional locations. Whatever the situation, *make sure that all new UTM coordinates get recorded on the field forms as well as in the GPS units!*

HABITAT DATA (bottom of page 1)

Within 100m of road (Y/N): Enter “Y” for yes and “N” for no for **EACH** point based on your best knowledge of the site. For our purposes, a “road” must be substantial enough so that it either causes a significant disruption of the understory vegetation OR a break in the canopy. For example, a grassy 2-track running through an open meadow should not be considered a road, whereas a gravel or dirt road that forms a 3 to 4-m wide break in the grass cover would be considered a road. Similarly, an old, pine needle-covered logging track in an open forest situation should not be considered a road, whereas a logging road that causes a clear and wide break in the woody understory vegetation, or in the forest canopy, should be considered a road. This topic will be covered more thoroughly during the training session.

On private land (Y/N): Enter “Y” for yes and “N” for no for **EACH** point. Be sure that you have permission to conduct counts that are on private land!

Bearing to point: Enter the true bearing (do not use magnetic bearings) you followed from the last point (or access point) to arrive at the current point.

Best habitat classification: Enter the two-letter code of the habitat that BEST describes the habitat surrounding the point count station. Consider the entire landscape around the count station from which you are picking up birds and select *the dominant habitat type that occupies the greatest amount of this area.*

Habitat classification codes:

Code	Habitat
AS	Aspen
AT	Alpine Tundra
CR	Cliff/Rock
GR	Grassland
HR	High-elevation Riparian
LP	Lodgepole Pine

LR	Low-elevation Riparian
MC	Mixed Conifer
MR	Mid-elevation Riparian
MS	Montane Shrubland
PJ	Piñon-Juniper
PP	Ponderosa Pine
RA	Rural/Agriculture
SA	Sage Shrubland
SB	Shore/Bank
SE	Semi-desert Shrubland
SF	Spruce-Fir
WE	Wetland

Best habitat seral stage and canopy closure: Enter one-digit code of seral stage (see Appendix D for habitat-specific seral stage accounts) of habitat used in best habitat classification, followed by a one-letter code for canopy closure:

Code	Classification
Seral stage	
1	grass-forb
2	shrub-seedling
3	sapling-pole
4	mature
5	old growth
Canopy closure	
a	<40%
b	40–70%
c	>70%

Next-best habitat classification: Enter two-letter code of habitat that NEXT best describes the habitat surrounding the point. Consider the entire landscape from which you are picking up birds and select the next-most dominant habitat type occupying the greatest amount of this area **OR** *select the habitat that is contributing the most birds to the point count* (if different than the Best Habitat).

Next-best habitat seral stage and canopy closure: Enter one-digit code of seral stage and one-letter code for canopy closure of habitat used in next-best habitat classification.

Primary understory classification: Enter two-letter code for primary understory vegetation type that best describes the understory within a 50-m radius of the point:

Code	Understory class
BG	bare ground
GF	grass/forb
GO	Gambel's oak
MM	mountain mahogany
NS	not sage or willow
SA	sage
SN	snowberry
SV	serviceberry
WI	willow

Primary understory percentage: Estimate the percent coverage of the primary understory type within a 50-m radius of point and enter the 1-digit code:

Code	Understory percentage
1	1–20%
2	21–40%
3	41–60%
4	61–80%
5	81–100%

Secondary understory classification: Enter two-letter code for secondary understory type that NEXT BEST describes the understory within a 50-m radius of the point, as described above.

Secondary understory percentage: Estimate the percent coverage of the secondary understory type within a 50-m radius of point and enter the 1-digit code, as described above.

(These instructions apply to the bird count data page of the Rocky Mountain Bird Observatory Point-

Transect Form)

POINT-COUNT DATA

Point #: Enter number of point (01-15) on the transect; **NOTE:** for entries of target species *between points* enter "99" (see text on Transect counts).

Species: Enter **CORRECT** four-letter code for birds (see Appendix C); PLEASE, PLEASE use correct codes, as it makes data entry and analysis easier. Species that cause particular problems for observers include: **Northern Shoveler** (NSHO, not NOSH), Ring-necked Pheasant (RINP, not RNPH), **Western Wood-Pewee** (WEWP, not WWPE), **Gray Jay** (GRAJ, not GRJA), **Tree Swallow** (TRES, not TRSW), **Bank Swallow** (BANS, not BASW), **Barn Swallow** (BARS, not BASW), **MacGillivray's Warbler** (MGWA, not MAWA), **Yellow Warbler** (YWAR, not YEWA), **Yellow-rumped Warbler** (AUWA - for Audubon's Warbler, MYWA for Myrtle's Warbler, not YRWA), **Lark Bunting** (LARB, not LABU), **Sage Sparrow** (SAGS, not SASP), **Savannah Sparrow** (SAVS, not SASP), **Lazuli Bunting** (LAZB, not LABU) and **Red-winged Blackbird** (RWBL, not RWBB).

Radial distance: Measure radial distance (estimate only when necessary) to *each* bird (that is, direct distance from point to bird), using a binocular rangefinder, in one-meter units (when estimating, **DO NOT** round off to five- or ten-meter units) -- if beyond a kilometer (1000 meters), fit number in the three spaces provided as best you can.

Bearing: When recording low-density target species on point counts and in between points, use your declination-adjusted compass to site in the direction of the bird and record the true bearing (as opposed to magnetic) to the bird.

How: Enter code for how each individual was **detected**: C=calling, S=singing, D=drumming, O=other aural cue; V=visual; F=flyover; K=flock

Sex: Enter code for sex: M=male, F=female, U=unknown

VERY IMPORTANT: Skip a line between entries for individual points and/or individual legs of the transect. That is, all individual birds on a particular point (or transect leg) should be bunched together on the form; then you should leave a blank line before starting entries for the next transect leg (or point).

OTHER IMPORTANT REMINDERS:

Before leaving your transect sites, don't forget to:

- ***enter transect and page #'s at the bottom of EACH page!***
- record the end of transect data (time, temp, sky, wind, transect notes) IMMEDIATELY UPON COMPLETING THE TRANSECT!

- ***go through your data sheets carefully to make sure that you have not forgotten to record any data. Your work is not done until you've reviewed your data from the morning!***
- ***provide clear and explicit directions to the access point, if you have not already done so!***

Attachment C. Guidelines for Classifying Habitat, Seral Stage, and Canopy Closure

(From RMBO's Point Transect Protocol for Monitoring Colorado's Birds, Appendix E)

The following characteristics can generally define the various seral stages of the habitats listed below. However, they are intended to be used as a guide, not gospel. Variability among sites is to be expected depending on geographic location, elevation, aspect, slope, soil quality and other site characteristics. Therefore, you must still use your head when judging seral stage. All data regarding habitat should be recorded on page 1 of the field form *prior to beginning each point count*.

Estimating Canopy Closure

For all habitats (other than MG) in seral stages 2–5, canopy closure should also be assessed at each point count station using the following codes:

Code	Classification
a	<40%
b	40–70%
c	>70%

Canopy closure should be assessed based on the openness of the canopy for both the primary and secondary habitats selected at each point. Ex. = a mature stand of ponderosa pine with greater than 70% of sky obscured by canopy vegetation should be classified as '4c'.

Assessing Habitat and Seral Stage in Selected Habitats

Aspen (AS)

Habitat description

AS habitat consists of small or large forested stands dominated by quaking aspen. AS stands are generally not monotypic; other tree species that frequently occur within or adjacent to AS include, from lower to higher elevations, ponderosa pine, white fir, blue spruce, Douglas-fir, lodgepole pine, Englemann spruce, and subalpine fir. Some AS stands have a woody understory of a variety of species, depending upon location, elevation, and other factors. These understory species can include common juniper, mountain mahogany, big sage, snowberry, and serviceberry, among others. Other stands have only herbaceous under-stories.

Seral stage assessment

Code	Stage	Description
1	Grass-Forb	Grasses and forbs dominate; aspen suckers/saplings are absent.
2	Shrub-Seedling	Suckers/saplings are present, up to 2 inches dbh and 4 m in height. Stem density can vary from 5,000 to 40,000 stems per acre.
3	Sapling-Pole	Saplings between 2 and 8 inches dbh and up to 6–13 m in height on good sites; on poorer sites trees may never reach 8 inches dbh and may be shorter than 6 m, with crooked and twisted boles.
4	Mature	Trees > 8 inches dbh; on better sites, trees between 16–24 inches dbh and 28–33 m in height. Typically, there is a high density of grass, forbs and shrubs in the understory. Snags are also generally common in this stage.
5	Old-Growth	Large diameter trees and many snags are present, as are diseased trees and downed material. Snags may occur in large groups in this stage.

Ponderosa Pine (PP)***Habitat description***

PP habitat is forest dominated by, amazingly, Ponderosa Pine, often in pure stands, but there are often admixtures of aspen, white fir, Douglas-fir, and/or blue spruce and the habitat can intergrade at its upper elevational level with lodgepole pine. The habitat occurs primarily between 5500' and about 8500', though it can occur at slightly higher elevations in some places. In some places, particularly in South Park, ponderosa pine and limber pine co-occur. However, habitats designated PP should consist primarily of ponderosa pine; habitats with any significant admixture (>20%) of some other conifer should be called Mixed Conifer (MC). The habitat often has a well-developed woody under-story, though historic burn frequencies kept most stands fairly open with large, widely-spaced trees. In areas where fire has been excluded, a significant Gambel oak understory often develops and these areas can host large numbers of shrub-dependent species, e.g., green-tailed and spotted towhees and dusky flycatcher.

Seral stage assessment

Code	Stage	Description
1	Grass-Forb	Grasses and forbs dominate; pine seedlings and shrubs scarce or absent. This stage usually results from fire and/or logging.
2	Shrub-Seedling	Small pine saplings, <=1 inch dbh, and a variety of woody shrubs small deciduous trees are present, as well as herbs. Litter and downed material may exist.
3	Sapling-Pole	Trees 1–8 inches dbh, 3–17 m in height; age of stand 6–50 yrs old. Stands in this stage can be quite dense, normally exceeding 70% canopy closure, and are typically even aged. Some small diameter snags may be present.
4	Mature	Avg. dbh of trees >8 inches. Stand may be multi-layered, and snags suitable in size for most cavity-nesting birds should be present. Oak layer, if present, is usually well developed.
5	Old-Growth	Avg. dbh of dominant trees >8 inches, with some trees between 30 to 60 inches; stand typically of uneven age, woody understory is extensive and well-developed; canopy and stand structure generally open; numerous large snags, dying trees, and downfall present.

Spruce-Fir (SF)

Habitat description

SF habitat refers to areas dominated by Englemann spruce and subalpine fir. This habitat typically occurs at elevations above 8000'. This habitat often mixes with lodgepole pine (LP), so be careful about the particular tree species present. These stands can be monotypic, but usually have admixtures of aspen (AS).

Seral stage assessment

Code	Stage	Description
1	Grass-Forb	Primarily herbaceous plants; no trees or saplings; near complete absence of downed litter or snags.
2	Shrub-Seedling	Spruce saplings up to 1 inch dbh are present.
3	Sapling-Pole	Stems 1–7 inches dbh, and; snags and downfall present.
4	Mature	Avg. dbh of trees >8 inches. Stand may be multi-layered, and snags suitable in size for most cavity-nesting birds should be present.
5	Old-Growth	Avg dbh of dominant trees > 22 inches; forest is typically multi-layered, with trees of varying age/size, significant amounts of accumulated downfall and numerous, randomly distributed snags. Grasses and forbs are relatively scarce, but epiphytic vegetation (mosses & lichens) is prevalent.

Attachment D. Habitat Page from Rocky Mountain Bird Observatory Point-Transect Form

Rocky Mountain Bird Observatory Point-Transect Form

GPS info		Point info		Overstory												Additional								
Unit #		Point #		<100m to road?		Private property?		point to		Bearing														habitats present
Point #		Point #		Point #		Point #		Point #		Point #		Point #		Point #		Point #		Point #						
1																								
2																								
3																								
4																								
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6																								
7																								
8																								
9																								
10																								
11																								
12																								
13																								
14																								
15																								

Sub-canopy		Shrub layer												Ground cover					
List any species forming a distinct sub-canopy																			
Species																			
#1 #2 #3																			
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

Observer (F, MI, Last name)		Time		Sky		Wind		Temperature		"Roads of" al		Transect #	
Start		End		Start		End		Start		End		(prog: BH, CO, NM, or WY)	
C O		(e.g., ASD4)		(e.g., ASD4)		(e.g., ASD4)		(e.g., ASD4)		(e.g., ASD4)		(e.g., ASD4)	

Rocky Mountain Bird Observatory, 14500 Lark Bunting Lane, Brighton, CO 80603

Attachment E. Changes to the RMBO Monitoring Program Vegetation and Bird Count Protocols, 2004

Weather data

Please see clipboard sheet for explanations of the various weather data requested: sky code, wind speed, and temperature.

Atlas page and location

Enter the page number on which the Access Point of the current transect is located – putting this value in the correct set of boxes (either the De Lorme atlas or the “Roads of” atlas). Then enter the horizontal and vertical grid reference of the Access Point of the current transect. ALWAYS list the letter first, regardless of whether letters make up the X axis or the Y axis of the maps. You may use “half-grids” to indicate points approximately halfway between either two numbers OR two letters, e.g., A.5-2 or C-3.5; use a hyphen to separate the two components of the value. If you are using only whole grid references, e.g., B1 or D7, then do NOT use a hyphen to separate the components.

GPS info

Unit #: Write the last four digits of the GPS unit number (from the silver sticker affixed to the unit) in the appropriate space.

Point #: Enter the saved waypoint number referable to the point at which you are standing (from the GPS unit) in the appropriate space.

Point info

<100 m to road? Enter ‘Y’ here if the point at which you are standing is within 100 meters of a road; otherwise, enter ‘N’.

Private property? (Not for Wyoming program) Enter ‘Y’ if the point at which you are standing is on private property; otherwise, enter ‘N’.

Distance to edge: (For Wyoming program ONLY) Enter estimate or measured distance to nearest habitat edge.

Bearing to point: Enter the bearing (either from the Access Point or from the previous point) that you took to get TO the point at which you are standing.

Overstory

Seral (i.e., structural) stage: At each point-count station, identify and record the *average* structural stage of the overstory trees within a 50-m radius of the point-count station. Please use the following scale:

- grass-forb (i.e., no or very few overstory trees present)
- shrub-seedling (i.e., generally trees below head height)
- sapling-pole
- mature
- old-growth

Canopy closure: Estimate the percent closure of the canopy trees within a 50-m radius of the point-count station and select the best choice from the following categories:

Code	Classification
a	<40%
b	40–70%
c	>70%

Height: At each point-count station, estimate the average height of the canopy trees (in meters) within a 50-m radius circle to the nearest meter. Use a range finder to help gauge estimates.

Species composition: Identify the dominant tree species in the overstory and record the *relative* percent of the total overstory occupied by each species within a 50-m radius of each point-count station; as many as five species may be listed. Note that if only one tree species is present in the overstory, the relative percent should be 100% (9), regardless of how much of the circle is occupied by the tree species. Tree species should be recorded on the data forms using the correct 2-letter vegetation code provided in the list. Please use the following scale for recording relative abundance of each overstory tree species:

Code	Classification
0	01–09%
1	10–19%
2	20–29%
3	30–39%
4	40–49%
5	50–59%
6	60–61%
7	70–71%
8	80–81%

9	90–100%
---	---------

Additional Habitats

In some cases, additional distinct habitats may be present within the 50-m radius circle around the point-count station that do not get adequately characterized in any of the assessments of specific habitat components (e.g. overstory, shrub layer). For example, a meadow or riparian area may occur within the circle, along with the dominant forest or other habitat, but may contribute little to either the shrub layer, mid story or overstory.

Nonetheless, these minor habitats may be significant for the birds present within the 50- m circle. In these situations, list up to three additional habitats in the appropriate space, using the 2-letter habitat codes provided.

Subcanopy/mid-story

In forest, this category is intended to assess the foliage mass roughly in the middle vertical third, particularly if there is a distinct sub-canopy of a different species mix than that present in the overstory.

Volume: Estimate the foliage mass in the middle vertical third of the forest in 20% increments: 1 = 1-20%, 2 = 21-40%; 3 = 41-60%; 4 = 61-80%; and 5 = 81-100%. Note that it would be quite rare for this category to score greater than 3 and that many (most?) probably score less than 3.

Species: If, and only if, there is a distinct sub-canopy comprised of tree species different from that making up the overstory, enter as many as three species' 2-letter codes in the spaces provided. If there is no distinct sub-canopy, enter "N" in the Species #1 space.

Shrub Layer

This category is intended to estimate the amount and species makeup of any woody shrub (*including* seedling trees) layer present. Generally, shrubs are >0.5 meter high and <5.0 meters high. Anything taller than 5.0 meters should be considered part of the sub-canopy (e.g., very tall oaks or aspens that are of greater height); anything shorter than 0.5 meter should be considered in the ground cover category.

Volume: Estimate the foliage mass of all woody shrub species AND seedling trees present (see definition above) scored on a 10-point scale, for which, see Overstory/Species composition.

Mean height: Estimate the average height (to the nearest meter) of the shrub layer within a 50-m radius of the count station.

Species composition: Identify the shrub species (including seedling trees) present and record the *relative* percent of the total shrub layer occupied by each species within a 50- m radius of each point-count

station; as many as five species may be listed. Note that if only one shrub species is present, the relative percent should be 100% (9), regardless of how much of the circle is occupied by the species. Shrub species should be recorded on the data forms using the correct 2-letter vegetation code provided in the list. Please use the same 10-point scale as above, for recording relative abundance of each species.

Ground Cover

Ground cover is classified into four categories:

- woody vegetation below 0.5 m (roughly knee height),
- broad-leaved herbaceous plants (forbs),
- grass, and
- bare ground and/or leaf litter.

At each point-count station, estimate (to the nearest 10 percent) the total percent of ground cover within the 50-m radius circle around the point-count station that qualifies for each category. Please use the same 10-point scale as presented above, but note that for ground cover, this is an absolute scale, rather than a relative scale.

At each point count that is conducted, please put an “N” in the box for any category that is absent from the 50-m circle, rather than leaving it blank. It will be assumed that blank boxes represent point counts where the ground cover was not assessed, either because the count was not conducted or because you forgot to record it.

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #7 Data Management

Version 1.02
December 20, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.01
1.01	12/20/2016	H. Thomas	Edits made throughout document	To reflect current data management practices and changes to the database structure	1.02

This Standard Operating Procedure (SOP) describes how data collected as part of the NCPN landbird monitoring program are managed. Landbird monitoring in the NCPN is based on the Rocky Mountain Bird Observatory (RMBO)'s Monitoring Colorado's Birds program. NCPN relies on cooperators to collect landbird monitoring data. In addition to data collection, cooperators also manage the database and handle all entry, verification, and validation of the data. Therefore, this SOP focuses on archiving and metadata procedures, with a brief overview of database design and data processing.

Database Design and Data Processing

Landbird monitoring data are stored in a relational database that is maintained by a cooperator. Figure 1 shows the relationships between the primary database tables (all tables are not shown).

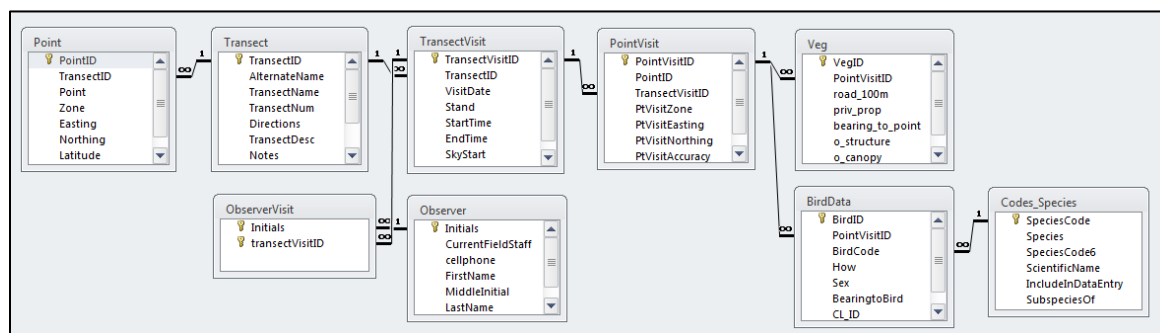


Figure 1 Data Model for NCPN Landbird Monitoring Database.

The *Transect* and *Point* tables contain location and other descriptive information associated with transects and points, respectively. The *TransectVisit* table, linked to the *Transect* table, contains visit information associated with each transect. Each transect visit has one or more observers, which are recorded in the linked tables *ObserverVisit* and *Observer*. Also linked to the *TransectVisit* table is the *PointVisit* table, which stores information recorded for each point associated with a transect. For each point visit record, bird observation data are recorded in the linked table *BirdData*, and vegetation and habitat data are recorded in the linked table *Veg*.

Data collected on field data sheets are entered into the database after a field survey is completed. Data verification immediately follows data entry and involves checking the accuracy of the computerized records against the original source. Data validation is then performed, which involves reviewing the data for range and logic errors.

At the end of each field season, after data have been entered, verified, and validated by the cooperator, a copy of the database is provided to NCPN. The original field data sheets are also provided to NCPN.

Archiving

Archiving is a critical step in ensuring the long-term preservation of data. Landbird monitoring data, data products, and associated records are archived on an annual basis, after the current year's data have been quality checked and the annual report completed. Digital files, including the database, digital copies of field data sheets, and reports, are archived on the NCPN read-only shared drive (R:) in the Landbirds archive folder (R:\Monitoring_Archive\Landbirds). The database is archived in its native format. In addition, a platform-independent copy of the database tables in ASCII format is also archived.

The official archival repository for all NCPN data is the Western Archeological and Conservation Center (WACC) in Tucson, Arizona. This facility provides temperature and humidity-controlled storage conditions and a professional archives staff, and it meets all NPS museum standards. On an annual basis, all hard copy landbird monitoring data and data products, including original field data sheets and archival copies of reports, are sent to WACC, along with an archival-standard CD or DVD containing all digital files.

Metadata Procedures

Metadata, which is defined as structured information about the content, quality, condition, and other characteristics of data, is a critical step toward ensuring that data sets are usable for their intended purposes well into the future. Metadata can take many different forms, including formal Federal Geographic Data Committee (FGDC)-compliant metadata and protocol version information.

Each table and field in the database is defined and documented in a data dictionary and/or in Section 5 of an FGDC-compliant metadata file. FGDC-compliant metadata are created for all spatial data.

The complete protocol for this project (Protocol Narrative and SOP #s 1–10) is an integral component of the project metadata. All narrative and SOP version changes are noted in the Master Version Table (MVT), which is maintained in SOP #9. Any time the narrative or SOP versions change, a new Version Key number (VK#) must be created and recorded in the MVT, along with the date of the change and the versions of the narrative and SOPs in effect. The Version Key number is essential for project information to be properly interpreted and analyzed. *The protocol narrative, SOPs, and data should not be distributed independently of this table.*

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #8 After the Field Season

Version 1.01

May 2, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/2/2016	A.W. Biel	Minor editorial	Publication preparation	1.01

This Standard Operating Procedure (SOP) provides a brief summary of post-season procedures for landbird monitoring in the Northern Colorado Plateau Network (NCPN) park units. Observers should be familiar with and follow these procedures after the field season is completed.

Procedures

1. Equipment must be cleaned, repaired, and returned to their proper storage areas. All references manuals, materials, and extra data sheets should be filed or re-shelved in their appropriate storage location. Clean the insides and outsides of all vehicles used in the field.
2. Field data sheets should be organized and checked to be sure that they have been filled out completely. Checking for completeness should generally be done before leaving the field.
3. All data collected in the field are maintained by the NCPN data manager.

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #9 Revising the Protocol Narrative and SOPs

Version 1.03
December 20, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	5/10/2007	S. L. Garman – NCPN Ecologist	Update MVT	Update MVT	1.01
1.01	2/26/2009	D. Perkins	Update MVT	Added SOP 10 for PISP bird monitoring program	1.02
1.02	5/2/2016 12/20/2016	A.W. Biel H. Thomas	Minor editorial Update MVT	Publication preparation To reflect narrative & SOP updates	1.03

This Standard Operating Procedure (SOP) explains how to make and track changes to the protocol narrative and associated SOPs for monitoring landbirds in the Northern Colorado Plateau Network (NCPN). Landbird monitoring in the NCPN is based on the Rocky Mountain Bird Observatory (RMBO)'s Monitoring Colorado's Birds program. Over time, the protocol narrative and SOPs may require modifications. The following procedures must be followed when making changes to ensure that previous data collection and processing procedures are clearly understood when using and interpreting historical data sets. Similarly, clearly articulating new methods is key to credible interpretation of data acquired since the implementation of changes. Personnel making changes must be familiar with this SOP to ensure that proper reviews are conducted, and that documentation standards are followed.

Procedures

1. Modifications must be reviewed for clarity and technical soundness. Small changes or additions to existing methods will be reviewed in-house by NCPN staff. An outside review will be encouraged by NCPN for whole-scale changes in methods. Regional and national staff of the National Park Service and experts outside of the Park Service with familiarity in bird monitoring and data analysis would be used to review major changes.

2. All changes must be documented, and updated protocol versions must be recorded in the Revision History Log that accompanies the protocol narrative and each SOP. Changes are recorded only in the Protocol Narrative or the SOP being modified. Version numbers increase incrementally by hundredths (e.g., version 1.01, version 1.02) for minor changes. Major revisions will be designated with the next whole number (e.g., version 2.0, 3.0, 4.0). Record the previous version number, date of revision, author of the revision, identify paragraphs and pages where changes are made, and the reason for the changes along with the new version number.
3. Narrative and SOP updates may occur independently. That is, a change in one SOP will not necessarily invoke changes in other SOPs: a narrative update may not require SOP modifications. All narrative and SOP version changes must be noted in the Master Version Table (MVT), which is maintained in this SOP. Any time a narrative or an SOP version change occurs, a new Version Key number (VK#) must be created and recorded in the MVT, along with the date of the change and the versions of the narrative and SOPs in effect. The VK number increments by whole integers (e.g., 1,2,3,4,5). Updates to the MVT also must be provided to the NCPN Data Manager for inclusion in the master version table database. The Version Key number is essential for project information to be properly interpreted and analyzed. *The protocol narrative, SOPs, and data should not be distributed independently of this table.*
4. New versions of the Protocol Narrative and SOPs must be posted on the NCPN web page. Previous versions of the Protocol Narrative and SOPs must be archived in the NCPN Landbird Protocol Library (R:\Monitoring_Archive\Landbirds\Protocol).

[illegible]

Landbird Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Standard Operating Procedure (SOP) #10 Pipe Spring National Monument Landbird Monitoring

Version 1.01

March 8, 2016

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #
1.00	3/8/2016	A.W. Biel	Minor editorial	Publication preparation	1.01

Pipe Spring National Monument (PISP) was originally slated to have invasive plants implemented as established in the NCPN Monitoring Plan (O'Dell et al. 2005). The NCPN conducted a program review in January 2008, and based on the findings of this review chose to refocus its effort on a reduced set of vital signs. During this time, each park directed which field protocols would be implemented at their park. PISP chose landbirds as the field protocol it would like to have implemented. Due to the small size of PISP (40 acres), an additional SOP was needed. PISP bird monitoring will use similar methods to the NCPN bird monitoring program but will have a reduced set of four point-count stations. In addition, because the reduced set of point-count stations will take less time to complete, and there will still be quality survey time left after completing the point counts, the observer will spend additional time walking a 1,200-m main visitor area transect. This is where most management actions will take place and PISP is interested in seeing how the bird community changes over time. These additional searches will also add secretive species to the park detection list.

Objectives

The objective of this PISP SOP is to:

1. Determine the status and trends in breeding-bird species density in PISP natural habitats (sagebrush and pinyon-juniper).
2. Determine how species richness in the main visitor area changes over time

Existing SOPs

The PISP monitoring program will continue to follow SOPs 1, 2, 3, 6, 7, 8, and 9 in the NCPN Bird protocol (Daw et al. 2004). This SOP will modify SOPs 4 and 5 for work at PISP only.

Establishing and Marking Sampling Plots and Area Transects

Four point-count stations will be established at PISP, as well as a 1,200-m main visitor area transect. Due to the small size of the park, point counts and transects will be placed systematically rather than randomly to ensure maximum coverage.

The protocol does not call for permanent marking of transects. Observers rely on a GPS unit to re-locate UTM coordinates for the point count stations and main visitor area transect, as well as between-point narrative accounts describing topography, habitat, landmarks, or other notable features of the landscape to help identify the point and transect.

1. The entire park was considered accessible. Point-count stations were placed at least 250 m apart from each other.
2. Park-based maps were generated showing the selected point count stations and the main visitor area transect (Figures 1 and 2). Aided by these maps and the pre-established points in the GPS, observers will locate and document bird-monitoring point count stations and main visitor area transect.
3. Directions will be developed based on the PISP Visitor Center as a starting point.
4. Use Attachments A and B in SOP 4 to fill out the UTM data sheet for each point count station and each 180 degree turn in the main visitor area transect.

General Survey Considerations

1. Seasonal Timing. Surveys must be conducted within a four-week window after all migratory species have returned to an area. Appropriate survey times for each transect in the NCPN will be determined and provided by RMBO.
2. Surveys will be conducted two times per year during the breeding season.
3. Monitoring Methods. Monitoring employs a combination of point-count and transect distance sampling. Observations are made for all common species at four point-count stations (i.e., variable circular plots) distributed throughout PISP. Observations are made during a five-minute period. Observations of low-density target species are continuously collected along the line transect while walking between point-count stations. Distance measures are recorded for all observed individuals. A list of low-density target species by habitat will be provided by RMBO (also see Appendix C of the NCPN landbird monitoring protocol narrative), and will be updated to reflect the habitats monitored in the NCPN.

4. **Permissible Weather Conditions.** Surveys should only be conducted in weather conditions that allow for birds to be adequately heard and seen. Counts should be stopped if winds exceed 13–18 mph (raising dust, leaves, loose paper; small branches in motion) and if precipitation exceeds a drizzle.
5. **Time of Day:** Surveys begin approximately one half hour before sunrise and end no later than 10:00 am.
6. **Point Count Station and Main Visitor Area Transect Documentation:** For each established point count station or transect, directions to the point or beginning of transect, distance and bearing to the next point count station, and waypoint coordinates (if appropriate) must be recorded on the Rocky Mountain Bird Observatory – UTM Data Sheet (Attachment A of SOP#5) prior to entering the field. This information is supplied by RMBO; the NCPN also stores this information (see SOP #7).

Five-Minute Point Counts

1. The location to monitor is provided along with PISP map showing roads and trails, and suggested access points (Figure 1). On the first visit, you must determine the most appropriate access point, record directions to this point, and record the bearing and distance from the access point to the survey point. This information is recorded on the Rocky Mountain Bird Observatory UTM Data Sheet form (Attachment A of SOP #5). Instructions for recording this information are provided in Attachment C - SITE DATA of SOP #5). UTM coordinates for all point-count stations and beginning location of the main visitor area transect also must be determined and recorded on this form (see Attachment C – TRANSECT DATA of SOP#5). If an established point count, navigate to the first point count station following the recorded directions. Always verify the directions and correct as necessary. Also, verify the recorded UTM coordinates of each point-count station.
At each point-count station or start of managed area transect, record habitat data before recording bird observations. Instructions and data forms are provided in SOP #6.
2. After recording habitat data (where applicable), start the timepiece and begin recording the following information for all birds detected during a 5-minute count:
 - radial distance from you to the bird
 - how the bird was detected
 - sex of the bird (if known)
 - the bearing from you to the bird, if a low-density target species
3. Observations are recorded on the Rocky Mountain Bird Observatory Point-transect Form (Attachment B of SOP#5) following the instructions provided in Attachment C (POINT-COUNT DATA of SOP#5).

Line Transect Component of the Five-Minute Point Counts

1. Conduct a continuous transect count between the first and last point count stations, recording all detections of species. It is important to note that low-density target species also are recorded at point count stations.
2. For each species detected, record:
 - radial distance from you to the bird
 - bearing from you to the bird
 - how the bird was detected
 - sex of the bird (if known)
3. Observations are recorded on the Rocky Mountain Bird Observatory Point-Transect Form (Attachment B) following the instructions provided in Attachment C (POINT-COUNT DATA of SOP#5).

Main Visitor Area Transect

Most bird survey methods provide good information for common species, but relatively sparse information for rare or secretive species. This does not mean the survey method is invalid; rather, it is a reflection of the difficulty of sampling rare and secretive species using general methods. Therefore, in addition to the point count stations, a 1,200-m main visitor area transect will be conducted after the point counts are completed to increase the chance of detecting rare and secretive species that occur in the park and to provide additional information about the main visitor area.

1. The location to monitor is provided along with a PISP map showing roads and trails (Figure 2). You must determine the most appropriate access point, record directions to this point, and record the bearing and distance from the access point to the transect beginning. This information is recorded on the Rocky Mountain Bird Observatory UTM Data Sheet form (Attachment A of SOP #5). Instructions for recording this information are provided in Attachment C - SITE DATA of SOP #5). UTM coordinates for the main visitor area transect also must be determined and recorded on this form (see Attachment C – TRANSECT DATA of SOP#5).
2. On subsequent visits, navigate to the start of the transect following the recorded directions. Always verify the directions and correct as necessary. Also, verify the recorded UTM coordinates of each point-count station.
3. At each 180 degree turn of the transect, stop and record habitat data before recording bird observations (Figure 2). Instructions and data forms are provided in SOP #6.
4. The observer will follow SOP#3, Using Global Positioning System Units, with one exception. At the beginning of the main visitor area transect, set the Between Feature Position (BFP) Setting to 5 m. BFPs allow electronic tracking of the user's route. In the

case of some Trimble units (GeoExplorer III, XM, and XT models) this option is called “Between-Feature” tracking. The GPS unit automatically generates these positions at a set distance.

5. Personnel walked the transect and recorded all species detected, record:
 - radial distance from you to the bird
 - bearing from you to the bird
 - how the bird was detected
 - sex of the bird (if known)
 - any observed breeding behavior (nests, carrying nesting material or food, observation of a fledgling)
6. In an effort to standardize yearly effort, the entire transect be completed in 45-60 minutes.
7. Observations are recorded on the Rocky Mountain Bird Observatory Point-Transect Form (Attachment B) following the instructions provided in Attachment C (POINT-COUNT DATA of SOP#5).

Potential Problems

Observers should pay specific attention to the following topics when reviewing the RMBO protocol (see Appendix C of the protocol narrative):

- how to distinguish flyovers
- how to determine the correct distance measure for birds which move during the survey
- how to estimate radial distances, especially for birds heard but not seen
- why not to round distance estimates
- how to adjust bearings for proper declination
- the need to avoid recording birds seen or heard previously
- sources of observer error (see Section VII in Appendix C in SOP#5)

Potential Analyses

In order to analyze sampling data using the DISTANCE program, it is necessary to have a minimum of 100 detections for each species for which you want to estimate density (number per area). It will be several years before we sample enough point counts to achieve the needed sample sizes, even for the most common species. Therefore, we will likely report the point count data and main visitor use area transect as species richness and the relative abundance, not the density of each species. The relative abundance reported consists of the total number of detections (all point counts combined for the entire breeding season) for each species. Species richness is defined as the total number of species per habitat.

To develop monitoring protocols to adequately monitor avian population trends for just PISP is difficult. Bird monitoring generally uses a larger area to provide population estimates and

trends. However, over time we will be able to follow general abundance and species richness from the four point count stations. In addition, there are some factors that can be monitored on a local scale that can contribute to the conservation of the local avian population. First, we can monitor the avian populations at the horse corrals, which have contributed to the increase in Brown-headed Cowbirds, a brood parasite that can affect the productivity of a number of nesting species at PISP. Second, we can monitor the numbers of House Sparrows and European Starlings within the PISP's main visitor area. Both of these species can greatly affect the nesting success of many other species, both local and long-distance migrants. Lastly, the springs and riparian vegetation at PISP constitute a uniquely moist habitat within the arid surrounding landscape that these migrants can utilize for food and cover. Johnson et al. (2004) found that this area was serving as an important migratory stopover area for many Neotropical and short distance migrants. While we are not conducting surveys during the migratory time for most species, information on the breeding species may be useful in understanding bird habitat quality. These are three very important local issues that can have huge effects on the avian population at PISP and the surrounding tribal lands (Johnson et al. 2004).



Figure 1. Approximate locations of four PISP point count stations. Final locations will be determined during the 2009 field season.

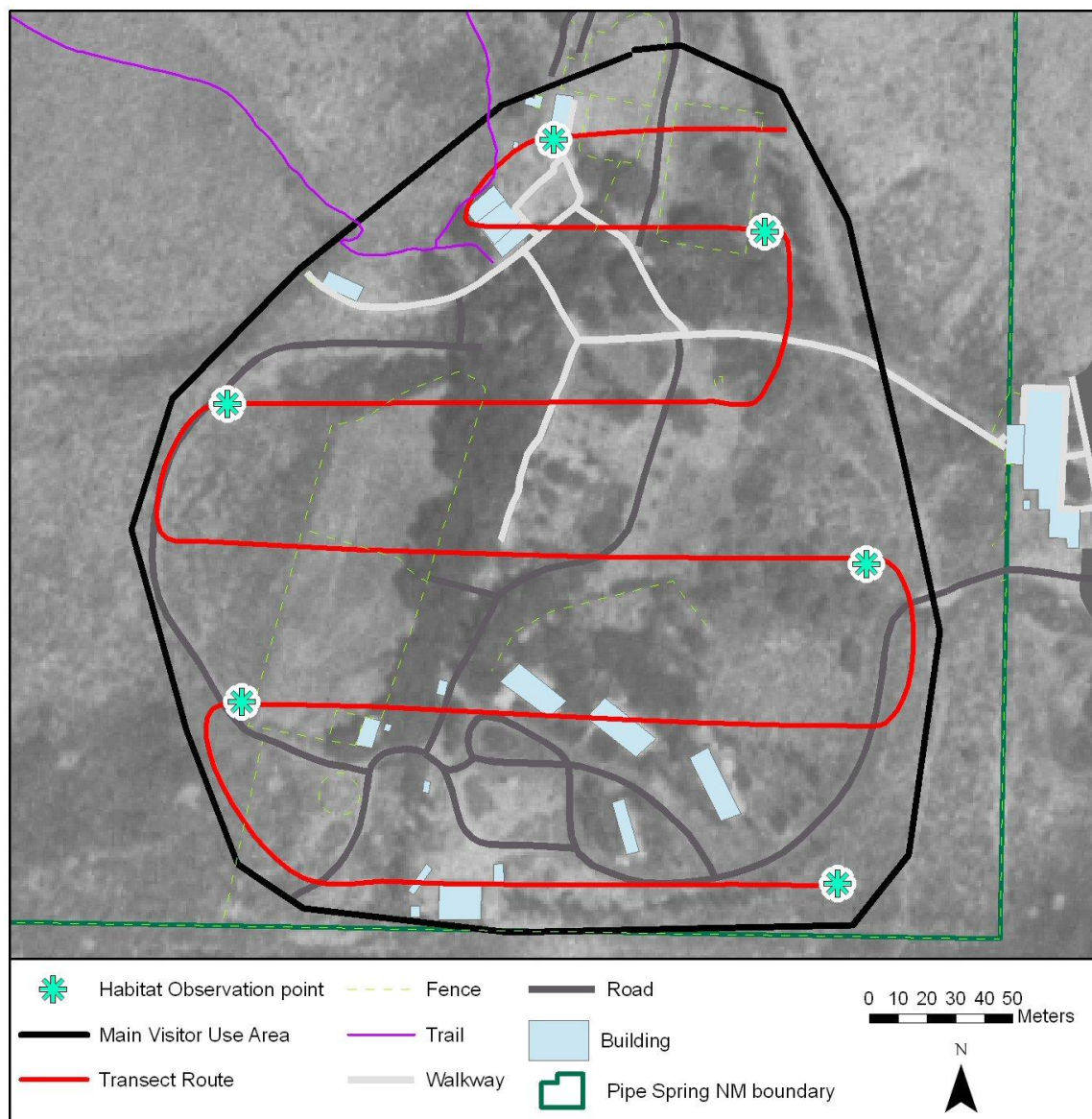


Figure 2. Location of main visitor use area and approximate location of the main visitor use area transect and locations to record habitat observations along the transect. Final locations will be determined during the 2009 field season.