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Conservation Plan for Henslow's Sparrow (*Centronyx henslowii*) Breeding Populations in North Carolina

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Figure 1 Henslow Sparrow (Centronyx henslowii)

DECEMBER 2, 2021

NC WILDLIFE RESOURCES COMMISSION

9 **Conservation Plan for Breeding Henslow’s Sparrow**
10 **(Centronyx henslowii) Populations in North Carolina**
11 **DRAFT Version 1.0**

12
13 Cover photo by John P. Carpenter

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40 **EXECUTIVE SUMMARY**

41 The Henslow's Sparrow (*Centronyx henslowii*) is considered one of the most vulnerable non-game
42 avian species in eastern North America. A state-listed endangered species during the breeding
43 season, they are limited by a lack of suitable habitat at both landscape and local scales. They
44 currently breed at only two locations in North Carolina – Voice of America (VOA) Game Land
45 (formerly Site A) and VOA Site B – each a contiguous >1200-ha grassland habitat historically
46 maintained with annual mowing. The NC Wildlife Resources Commission (NCWRC) acquired
47 VOA Game Land in 2016 and has begun managing its habitat with prescribed fire; this population
48 has been steadily increasing since consistent monitoring began in 2011. Site B remains a federally
49 owned facility managed with mowing, and evidence suggests that this population is experiencing a
50 severe population decline, although dedicated monitoring is urgently needed. The success of the
51 species' conservation will depend heavily on the use of recurring disturbance, preferably prescribed
52 fire, to control woody stem encroachment, as well as acquisition or long-term protection of
53 additional sites to buffer the isolated populations from catastrophic events. Consistent population
54 monitoring and research investigating the effects of fire on behavior and nesting phenology are
55 necessary to help determine appropriate timing and intensity of management actions. The objective
56 of this plan – to protect and increase abundance and distribution of breeding Henslow's Sparrow
57 populations and grassland habitats in North Carolina – will be achieved using a combination of
58 consistent habitat management, population monitoring, research, and land protection and
59 management using several approaches (e.g., acquisition, conservation easements, tax reduction
60 incentives, and partnerships).



61 *Adult Henslow's Sparrow, Voice of America Game Land, April 2016. Photo by J.P. Carpenter.*

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66 **BIOLOGICAL INFORMATION**

67 The Henslow's Sparrow (HESP) currently breeds across the Great Lakes region of the eastern
68 United States and southern Ontario (Canada), to New York, south to Maryland, across northern
69 Virginia, West Virginia, and Kentucky, and west to eastern portions of Oklahoma and Kansas. The
70 HESP is found in North Carolina year-round. Currently, only two breeding populations are known
71 to exist, one each in Beaufort and Pitt counties, east of Greenville, North Carolina. During winter,
72 HESP are distributed across a greater number of sites, occupying a gradient of habitats structurally
73 similar to where they breed, including longleaf pine forests. The focus of this conservation plan is
74 solely on the state-listed breeding population of HESP; however, we expect that conservation efforts
75 will benefit many other plants and animals that also depend on similar habitats. Our objectives will
76 be achieved using a combination of consistent habitat management, population monitoring, novel
77 research, and land acquisition.

78 **Listing Status**

79 State

- 80 • Endangered¹
- 81 • Species of Greatest Conservation Need²
- 82 • S1B, Critically Imperiled³

83 Federal/Global

- 84 • Bird of Management Concern⁴
- 85 • Species of Continental Concern, Yellow Rank (not declining but vulnerable)⁵
- 86 • Least Concern⁶

87

88 **Description and Taxonomic Classification**

89 The HESP is small (10-13 cm, 11-15 g), short-tailed with a large head, thick bill, thin but dark stripes
90 on the breast, an olive-green cast to the supercilium and nape, and rufous-red edges to wing coverts;
91 a dark spot is visible on the posterior margin of the ear coverts (Rising 1996). They are sexually
92 monomorphic with males measuring slightly larger than females.

93 The Henslow's Sparrow belongs to the order Passeriformes, family Passerellidae, and genus
94 *Centronyx* (Chesser et al. 2021). Currently, two weakly differentiated subspecies that intergrade
95 broadly are recognized – *C. h. henslowii* [western form] and *C. h. susurrans* [eastern form] –
96 distinguished most notably by bill size and plumage color (Browning 1990, Pyle 1997). Extirpated
97 populations from Texas, *C. h. houstonensis*, and South Dakota, *C. h. occidentalis*, were overall darker
98 and paler in appearance, respectively; however, lack of morphological differences and a high degree
99 of individual variation in plumage characteristics precluded classification of additional subspecies
100 (Arnold 1983, Browning 1990).

¹ NC Wildlife Resources Commission, Protected Wildlife Species of North Carolina, 2017

² NC Wildlife Resources Commission, NC Wildlife Action Plan, 2015

³ NC Natural Heritage Program, List of Rare Animal Species of North Carolina, 2018

⁴ US Fish & Wildlife Service, Status Assessment and Conservation Plan for the Henslow's Sparrow, 2012

⁵ Partners in Flight, Landbird Conservation Plan, 2016

⁶ BirdLife International, The International Union of Conservation Red List, 2019

101 **Life History and Habitat**

102 The life history and habitat needs of this species in North Carolina have received little attention. As
103 a result, related information from other parts of the breeding range is referenced to help understand
104 and anticipate its needs in North Carolina. The HESP is often described as secretive and
105 inconspicuous with an unobtrusive song (Burhans 2002). Both sexes spend significant time on the
106 ground, but males sing prominently from exposed perches while defending a territory. Nocturnal
107 singing occurs in some populations; for instance, males from Jasper County, Illinois sang more often
108 at night than sunrise (Walk et al. 2000). Their song is described as “tse-zlik” and under ideal
109 conditions may be heard at a distance up to nearly 200 m (JPC, pers. obs., Bajema et al. 2001).



Voice of America Game Land, May 2018. This unit last burned August 2016. Photo by J.P. Carpenter.

110 Birds arrive on their breeding grounds from late March to April (Herkert 2002). Depending on
111 latitude, nesting begins late April with early clutches completed in 15 to 20 days, and nesting
112 activities continue into August (Hyde 1939, Burhans 2002). Nests are built in 4-6 days (Hyde 1939)
113 with early egg laying dates ranging from 30 April (Indiana) to 2 June (Ontario) and late egg laying
114 from 18 July (Iowa) to 24 August (Ontario) (Peck and James
115 1987, Melde and Koford 1996, Herkert et al. 2002); we expect
116 that HESP in North Carolina begin nesting much earlier.
117 Females attempt two broods with clutch size ranging from 2-5
118 eggs and incubation lasting 11-12 days (Hyde 1939, Burhans
119 2002, Herkert et al. 2002). Females alone incubate and brood,
120 but both sexes feed young and dispose of fecal sacs (Robins
121 1971, Herkert et al. 2002). Weighted average (by sample size) of
122 published apparent and Mayfield nest success was 51% and
123 29%, respectively (Giocomo et al. 2008).

124 Henslow’s Sparrows select grasslands with a well-developed
125 litter layer, relatively high cover of standing dead residual
126 vegetation, tall, dense vegetation, generally low woody stem
127 densities, and a high percentage of grass cover and scattered
128 forbs for song perches (Herkert 2002, Herkert et al. 2002). They
129 have no apparent preference for native, warm-season or exotic,
130 cool-season grasses in Illinois or Missouri (Herkert 1994b, Jaster



Juvenile Henslow's Sparrow, VOA Game Land, July 2018. Photo by J.P. Carpenter.

131 et al. 2013). In North Carolina, habitat use is related to abundance of *Carex stricta* (straight sedge)
132 and *Sorghum halepense* (Johnsongrass); areas dominated by *Arundinaria gigantea* (giant cane) were
133 avoided (Mangun and Kolb 2000). At Voice of America Game Land (VOAGL), males used habitat
134 with greater cover of graminoids and standing dead vegetation but fewer woody stems compared to
135 unused areas (NCWRC, unpub. data). Structural characteristics of microhabitat, field size (>30 ha,
136 Range = 10-1084 ha), and patch isolation are the most important components of use. In regions with
137 many large and contiguous patches of habitat, HESP can occupy smaller sites because their life
138 requisites are met by this optimal habitat (Burhans 2002). However, HESP avoid nesting in habitat
139 adjacent to tree lines (O’Leary and Nyberg 2000, Ellison et al. 2013).

140 The dynamic nature of this habitat type necessitates frequent disturbance to prevent succession of
141 woody vegetation (Reinking 2002). Breeding populations elsewhere are found on pastures and hayed
142 prairies managed without fire (Swengel 1996, Burhans 2002). In the mid-west, HESP are generally
143 absent in the first growing season following a fire, reaching their highest densities 2-3 years after the
144 last burn (Herkert 2002). Recent evidence from North Carolina suggests that habitat burned in the
145 spring will not be used for breeding the summer immediately following the burn (Mangun and Kolb
146 2000), but habitat can be used for breeding following a late summer burn conducted the preceding
147 year (NCWRC, unpub. data.). Occupancy at VOAGL may also be tied to soil type and topography,
148 i.e., lower, wetter sites are preferred.

149

150 **Distribution and Population Status**

151 Before clearing of old-growth forests by European colonists, populations of HESP along the Atlantic
152 Coast inhabited, and were possibly limited to, edges of coastal marshes (Hyde 1939). The earliest
153 records for North Carolina are from 1932 of a small breeding population near Chapel Hill in a
154 swampy meadow (Coker 1933, Odum and Taylor 1934, Hyde 1939). Encounters increased in
155 coastal North Carolina counties in the mid to late 1980s, attributed to birds occupying recently
156 harvested pocosin swamps and pine plantations (Lynch and LeGrand 1985). Sightings of this
157 magnitude have since ceased, and no HESP have been counted on a Breeding Bird Survey (BBS)
158 route in North Carolina since 1995 (Fig. 1, Pardieck et al. 2018).

159 Henslow’s Sparrows now occupy an extremely restricted breeding range in North Carolina with
160 only two known breeding populations: VOAGL (formerly VOA Site A) and VOA Site B, both east
161 of Greenville, North Carolina in Beaufort and Pitt counties, respectively (Fig. 2). Unpublished
162 USFWS records suggest that the VOA sites, each nearly 1200 ha, support the largest breeding
163 populations east of the Mississippi River (Cooper 2007).

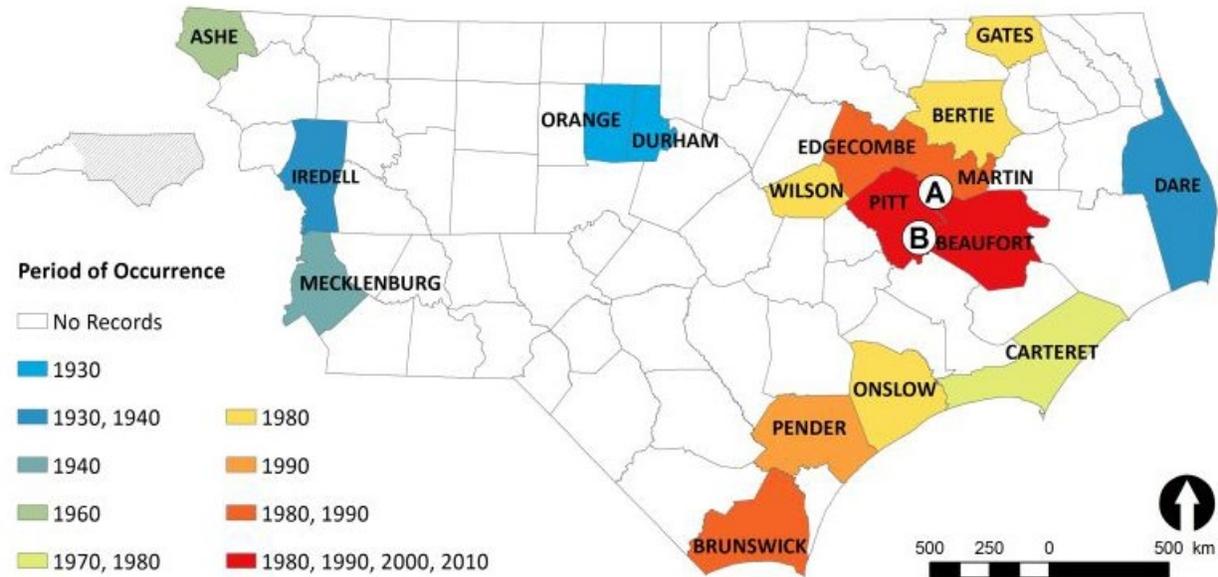


Figure 2. Breeding season records of Henslow's Sparrow in North Carolina by county per decade, including relative locations of (A) Voice of America Game Land and (B) Voice of America Site B (Coker 1933, Odum and Taylor 1934, Lynch and LeGrand 1985, Potter et al. 2006, NCWRC 2015, LeGrand et al. 2018, Pardieck et al. 2018)

164

165 John S. Wright (unpub. data, 1994-2000) reported a mean of 91.4 (SE \pm 10.2, range = 67-144) and
 166 58.0 (SE \pm 6.8, range = 31- 91) singing males at VOAGL and B, respectively. Wright noted that
 167 HESP were completely absent from large areas of the VOA sites and formed loose colonies, as
 168 described elsewhere (Cully and Michaels 2000). Mangun and Kolb (2000) examined male use in
 169 400- to 500-ha plots and estimated a mean of 49 territorial males at VOAGL but found only two
 170 males at Site B. NCWRC staff conducted standardized point count surveys (n = 45 survey points) at
 171 VOAGL from 2011-2018 during the breeding season. The mean number of males detected ($48.4 \pm$
 172 8.3 , Range = 17-78) and total number of stations with a detection (20.8 ± 2.4 , Range = 10-29) follow
 173 a positive trend over the eight years of surveys (Fig. 3). Point count surveys (n = 19 survey points)
 174 were established at Site B in 2015 and surveyed once; only two males were detected from a single
 175 location, but consistent monitoring is needed. NCWRC data provide an estimated breeding season
 176 density of 0.32 sparrows/ha (95% CI = 0.19-0.58) at VOAGL, which is lower than the mean
 177 estimate of 0.41 sparrows/ha (Range = 0.11-0.97) reported from other studies elsewhere in the
 178 HESP range (Wiens 1969, Robins 1971, Herkert 1994a, Winter and Faaborg 1999, Mangun and
 179 Kolb 2000, Bajema et al. 2001, Monroe and Ritchison 2005, Cooper 2007, 2012).

180 Male territory size at VOAGL is estimated to be 0.3 ha (Range = 0.2-0.5) compared to 0.45 ha
 181 (Range = 0.3-0.7) elsewhere (Wiens 1969, Robins 1971, Monroe and Ritchison 2005, Jaster et al.
 182 2013). Territory size can increase during the breeding season, possibly in response to density and
 183 habitat quality (Cooper 2012).

184 Additional targeted searches for HESP were conducted from 25 June to 14 July 2001 throughout the
 185 Albemarle-Pamlico Peninsula in high marsh, firebreak, and early successional pocosin and pine
 186 plantation habitats but resulted in no encounters (Paxton and Watts 2002). This outcome was
 187 attributed to a lack of suitable habitat, but singing can decrease significantly after pairing occurs
 188 (Leftwich and Ritchison 2000), thereby potentially making males more difficult to detect during their

189 sampling period. Males at VOAGL continue to sing into mid-July (NCWRC, unpub. data), which
 190 may be characteristic of its larger population.

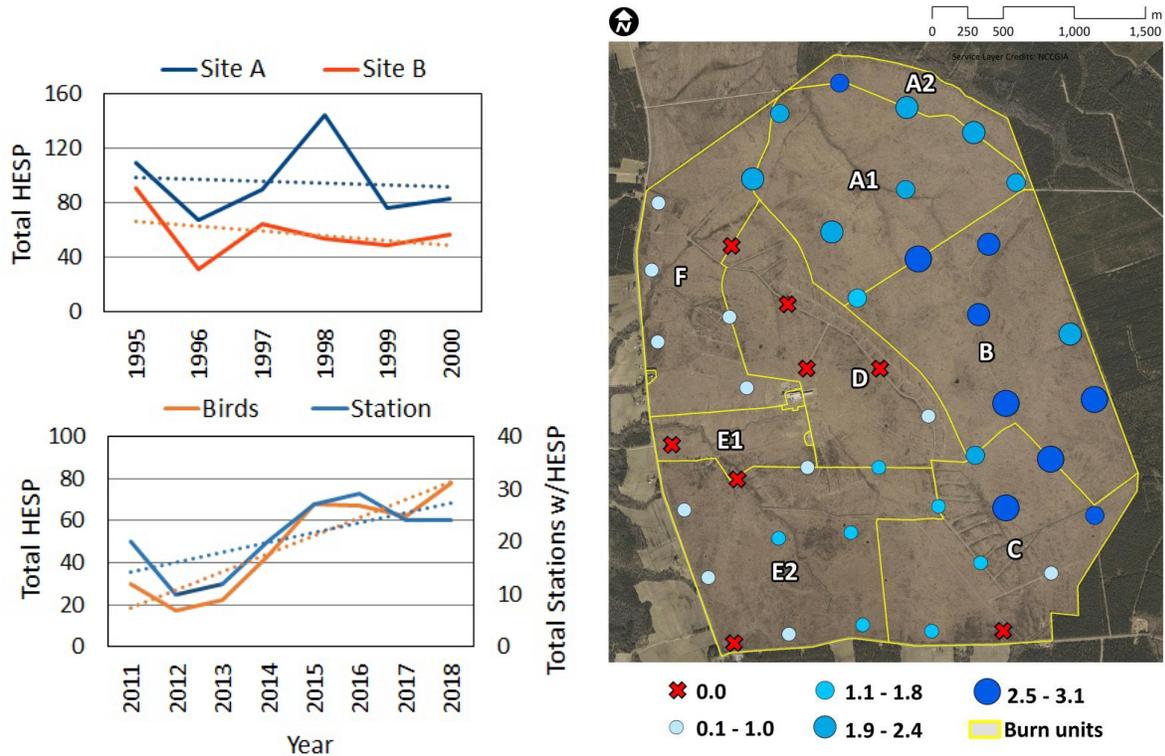


Figure 3. Total singing Henslow's Sparrows (HESP) in early surveys of both VOA sites (J. Wright, unpub. Data; top left graph) and from recent NCWRC point counts at VOAGL (bottom left graph). Survey methods differed between Wright and NCWRC. Average HESP (graduated by color) and total years found at a station (proportional by size), VOAGL, 2011-18 (right).

191

192 **THREAT ASSESSMENT**

193

194 **Reason for Listing**

195 The HESP is one of the most vulnerable non-game species in eastern North America (Burhans
 196 2002). In North Carolina, it is listed as endangered (breeding season only) and is a Species of
 197 Greatest Conservation Need (SGCN) in the NC Wildlife Action Plan (NCWRC 2015, 2017).

198 **Present and Anticipated Threats**

199 **Habitat requisites.**— The most deleterious threat to the HESP throughout its range is loss and
 200 degradation of grassland habitat from urban development, expansion of agricultural lands, and
 201 natural succession of vegetation due to fire suppression (Herkert 2002, Herkert et al. 2002). The
 202 HESP is limited by its need for large habitat patches, often >100 ha (247 ac) (Burhans 2002), which
 203 are extremely scarce in North Carolina where only 6.4% of the landscape in 2016 was classified as
 204 herbaceous or perennial grassland (U.S. Geological Survey 2016). Furthermore, it is unlikely that
 205 any ≥100-ha grassland area would be properly managed by private entities, without incentives, to
 206 sustain breeding populations for prolonged periods, primarily because such management is
 207 expensive and labor-intensive.

208 **Small population size, isolation, and restricted distribution.**— Such characteristics as these
209 increase susceptibility of VOA sparrows to catastrophic events, such as wildfires, and climate change
210 (DeWan et al. 2010). However, high levels of dispersal estimated by genetic, bio-acoustic, and stable
211 isotope methods (Ibargüen 2004) suggest that inbreeding at these two sites would not be a concern
212 following traditional one-migrant-per-generation principles (Mills and Allendorf 1996, Vucetich and
213 Waite 2000).



Example of woody stem encroachment at VOA Game Land in 2014. Pole marked in 1-ft. increments would not be visible today due to extensive growth if there was no disturbance from burning or other management. Photo by J.P. Carpenter.

Brood parasitism and predation.— The Henslow's Sparrow is an infrequent cowbird host with low to moderate parasitism frequencies (Peck and James 1987, Winter 1999, Reinking et al. 2000). Predators of HESP include mammals and snakes, which take both adults and nestlings (Hyde 1939, Robins 1971). This is considered a non-significant threat at this time and will not be addressed.

Contaminants.— Bartuszevige et al. (2000) reported common avian grassland associates with detectable levels of organochlorine pesticide contamination; birds that frequented moist grassland habitats had significantly higher levels of these compounds. It is unknown if chemical contaminants affect HESP in North Carolina. This is considered a non-significant threat at this time and will not be addressed.

Disease.— Limited study of disease is available (Burhans 2002). Red mites (*Trombicula bisignata*) have been found on breeding specimens from Michigan (Hyde 1939). In Wisconsin, a 6.1% prevalence of pox-like lesions was reported and evidence of missing digits (9.7%) – potential sign of current or past infections of *Avipoxvirus* – which could be linked to temperature (Ellison et al. 2014). Ticks (Ixodidae) have been detected on two of fourteen males (14.2%) captured at VOAGL in 2016 and 2018, and one

236 additional male was missing a portion of its right hallux (hind toe). This is considered a non-
237 significant threat at this time and will not be addressed.

238 **Collisions.**— Mortality from collisions with man-made structures, such as wind turbines and
239 communication towers, during migration is poorly understood but does occur (Longcore et al.
240 2013). This is considered a non-significant threat at this time and will not be addressed.

241 **Historic and Ongoing Conservation Efforts**

242 NCWRC acquired VOA Site A in February 2016 from the Federal Lands to Parks program. The
243 property was officially opened to the public as Voice of America Game Land in August in 2017 and
244 designated for permit hunts only. The HESP and maintenance of early successional grassland
245 habitat are the focal points of management.

246 Voice of America Site B remains an active broadcasting, federally owned facility. Mowing continues
247 biannually in its primary area (approx. 440 ha) and annually in the secondary areas (IBB station
248 manager, pers. comm.). Henslow's Sparrows are found only in the secondary areas. Specific timing
249 of this practice is unclear but has commenced as early as July in recent years.

250 CONSERVATION GOAL, OBJECTIVES, and ACTIONS

251

252 Conservation Goal

253 The overarching conservation goal for the HESP is to protect and increase abundance and
254 distribution of breeding populations and their associated grassland habitats in North Carolina.

255 Conservation Objectives

- 256 1. Acquire, protect, and manage early successional, grassland **habitat** in North Carolina.
- 257 2. Estimate **population** carrying capacity of VOA Game Land using best available estimates
258 from annual surveys and HESP response to habitat management.
- 259 3. Engage with **Voice of America Site B** to promote conservation of HESP and early
260 successional habitat.
- 261 4. Conduct studies to increase understanding of HESP needs in North Carolina.

262 CONSERVATION ACTIONS

263 1. Habitat Protection and Management

264 A. Voice of America Game Land

- 265 1. Prohibit development, such as additional infrastructure or impervious surfaces,
266 but not activities required for habitat management, on eastern half of property.
267 Restrict development elsewhere until sufficient evidence indicates activities will
268 not adversely impact colonization of remaining areas.
- 269 2. Maintain rotational disturbance of vegetation, including but not limited to
270 prescribed burning, that will promote and enhance native vegetation.
 - 271 a. Avoid disturbing occupied habitat during the nesting season, April-July,
272 unless fire is needed to maintain the early successional habitat.
- 273 3. Apply mechanical or chemical treatments to eliminate pockets of dense or large
274 woody stems.
 - 275 a. Seek alternate funding sources for tree control treatments beyond
276 prescribed burning to enable contracting for less WRC staff commitment.
- 277 4. Restore native grasses known to provide necessary structural characteristics,
278 especially in areas where they are currently deficient or have been degraded.

279 B. Other Sites

- 280 1. Continue to support and collaborate with public agencies and private landowners
281 to acquire or manage early successional habitats, especially those near
282 established populations.
- 283 2. Restore and protect longleaf pine savannah forests, which HESP require during
284 the non-breeding season, to increase annual survivorship and recruitment of
285 migrants into breeding population gene pool.

286 2. Population Management

287 A. Surveys and monitoring

- 288 1. Continue annual point count surveys of singing males at VOAGL to provide
289 coarse abundance, trend, and distributional information. Modeling efforts using
290 these data may indicate less frequent surveys are needed.
- 291 2. Initiate similar, recurring surveys at VOA Site B.

- 292 3. Support efforts to expand surveys to locate new breeding populations in
293 potentially suitable habitat, such as large abandoned or fallow farm fields, clear-
294 cuts, and peripheries of tactical landing zones on military installations, using site
295 visits and remotely sensed data.

296 **3. Voice of America Site B**

- 297 1. Revisit unsigned Memorandum of Understanding; help develop plan to stabilize and
298 grow HESP population.
299 2. Confirm that Henslow's sparrow habitat continues to receive annual mowing during
300 the non-breeding season.
301 3. Work with site managers to propose using prescribed fire or lengthening the current
302 mowing rotation in all or a portion of the secondary area.
303 4. Identify alternative funding sources or more affordable approaches to offset
304 management costs while protecting transmission lines.
305 5. As permitted, apply management prescriptions and guidelines used at VOAGL.
306 6. Prepare for potential future offering and transfer to the state of North Carolina.

307 **4. Conduct Research**

- 308 1. Determine if unoccupied areas on VOAGL (based on surveys and monitoring of
309 HESP and of habitat conditions relative to management activities) are unsuitable
310 because of management strategy or other environmental or man-made conditions,
311 e.g., soil type, hydrology, elevation profile, edge effects.
312 2. Examine genetic markers using novel and modern techniques to provide context to
313 the HESP's evolutionary history and examine signatures of gene flow and changes in
314 the breeding population size over time.
315 3. Quantify peak occupancy and detectability using repeated visits throughout breeding
316 season.
317 4. Determine impacts of disturbance type and frequency on behavior, including nesting
318 phenology and success.
319 5. Estimate territory size to assist with abundance estimates.
320 6. During capture and handling of HESP for research purposes, examine and sample
321 for *Avipoxvirus* infection and ectoparasite infestation to confirm assumption of disease
322 as an insignificant population effect.

323 **Incentives (Tax break, Cost-sharing)**

324 *Private landowners play a vital role in all species conservation plans by creating or enhancing habitat.*
325 *The following programs are available to encourage meaningful and long-term habitat protection*
326 *occurring on private property:*

327 **Wildlife Conservation Land Program.** Reduces tax assessment for landowners with 20-800
328 qualifying acres, including early successional habitat, managed under a written wildlife habitat
329 conservation agreement that addresses needs of species designated as state endangered,
330 threatened, or special concern. Administered by NCWRC.

331 **Present-Use Value.** Lowers classification from assessed market value for landowners with at
332 least one 10-acre tract of agricultural land that produced \$1,000 average gross income over three
333 preceding years. Administered by NC Department of Revenue.

334 **Conservation Easement.** Provides federal tax benefits to landowners who donate conservation
335 agreements on properties that protect natural habitats for fish, wildlife, and plants and preserve
336 land for public outdoor recreation, educational opportunities, or as historically significant.
337 Administered by non-profit Land Trusts.

338 **Conservation Reserve Program.** Yearly rental payments with 10- to 15-year contracts to private
339 landowners who remove environmentally sensitive land from agricultural production, and plant
340 species that improve environmental health and quality. Recent increases in breeding populations
341 in other parts of the Henslow's Sparrow range appear to be associated with creation of
342 undisturbed grassland habitat through this program (Herkert 2007). Administered by Farm
343 Service Agency.

344 **Environmental Quality Incentives Program.** Financial assistance covers partial costs associated
345 with implementing conservation practices on cropland, rangeland, pastureland. Administered by
346 Natural Resources Conservation Service.

347 **Partners for Fish and Wildlife.** Cost-sharing reimbursement to landowners who implement a
348 cooperative agreement, including native grass and forb planting, that benefits rare, threatened
349 and endangered species. Administered by U.S. Fish and Wildlife Service.

350 Education and Outreach

- 351 1. Provide routine status updates targeting various outlets,
352 such as professional journals, Carolina Bird Club, NC
353 Partners in Flight, Cape Fear Arch Conservation
354 Collaboration, Onslow Bight Conservation Forum, and
355 other interested academic and citizen groups.
- 356 2. Register VOAGL with the NC Coastal Birding Trail
357 and the National Audubon Society's Important Bird
358 Areas Program.
- 359 3. Develop a bird checklist for VOAGL.
- 360 4. Encourage birders to enter observations into eBird
361 (www.ebird.org).

362 Regulations

363 No state regulations are proposed at this time. Henslow's
364 Sparrows are protected under the Migratory Bird Treaty Act
365 (MBTA) of 1918 (16 U.S.C. §§ 703–712), and is a state listed
366 endangered species [15A NCAC 10I .0103(b)(2)(D)].

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Nearly 25 miles of paved roads and firelines provide potential public access to enjoy various parts of VOA Game Land. Photo by J.P. Carpenter.

371 **GLOSSARY**

372 **Avipoxvirus:** A viral infection characterized by proliferative lesions of the skin and diphtheric
373 membranes of the respiratory tract, mouth and oesophagus, which affects over 232 species in 23
374 orders of birds.

375 **Conservation easement:** A restriction placed on a piece of property to protect its associated
376 resources. The easement is either voluntarily donated or sold by the landowner and constitutes a
377 legally binding agreement that limits certain types of uses or prevents development from taking place
378 on the land in perpetuity while the land remains in private hands.

379 **Cool-season grass:** Types of grasses that grow more slowly during a longer period and make most of
380 their active growth during fall and spring months when the minimum daily temperature is
381 approximately 40° F. These species can grow in dense mats that are almost impenetrable by wildlife
382 and consequently are poor providers of nesting and escape cover for many species.

383 **Grassland:** Any upland habitat in which the principal vegetation is grasses.

384 **Habitat:** A physical location with the resources and conditions present that produce occupancy–
385 including survival and reproduction, or both–by a given organism.

386 **Litter:** Dead or decomposing plant material, including leaves, bark, needles, and twigs, that have
387 fallen and accumulate on the ground.

388 **Microhabitat:** Small-scale physical and vegetation requirements of an organism or a community of
389 organisms.

390 **Monomorphic:** Having the same basic appearance throughout the life cycle.

391 **Population:** Group of individuals of a single species in a defined area.

392 **Prescribed fire:** A planned fire used to meet habitat management objectives; also referred to as a
393 “controlled burn”.

394 **Subspecies:** A population of species in which individuals show the same structurally definable
395 variation from other populations of the same species but are normally separated geographically or by
396 habitat use.

397 **Territory:** Any area defended and used by an organism.

398 **Warm-season grass:** Types of grasses that grow more rapidly during a relatively short period of
399 time with photosynthetic potential much higher than that of cool-season grasses. They make most of
400 their active growth when minimum daily temperatures reach approximately 60° F and are dormant
401 during autumn and winter. Once established, they are drought tolerant and almost completely
402 disease free.

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