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Conservation Assessment for the Eastern Screech-Owl in the Black Hills National Forest, South Dakota and Wyoming

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INTRODUCTION

This report assesses the biology and conservation status of the eastern screech-owl (*Otus asio*) in the Black Hills National Forest (BHNF) of South Dakota and Wyoming. The goal of this assessment is to assimilate historical and current literature on the eastern screech-owl and to provide managers and the general public an objective overview of this species' status within the Black Hills. In general, peer-reviewed scientific literature was used in this report; however, use of unpublished federal and state government reports, as well as academic documents (Master's theses), and monographs provided additional valuable insight.

Literature on the eastern screech-owl is virtually absent from the Black Hills region of South Dakota and Wyoming. Therefore, extrapolation of information from elsewhere was necessary. This extrapolation assumed that behavior and biology of these owls were similar across geographic regions. Efforts were made to use literature that was based on geographic areas as close to South Dakota and Wyoming as possible.

Areas Of Uncertainty

The eastern screech-owl and western screech-owl (*Otus kennecottii*) were considered conspecific until 1983 (American Ornithologists' Union 1983). Because of this separation, exact limits of breeding and nonbreeding ranges are not clearly understood, especially between western screech-owls and the subspecies *O. a. maxwelliae*, the western-most subspecies of the eastern screech-owl. Range maps for the western screech-owl show only slight infiltration of the species into western and southern Wyoming (Johnsgard 1988). Fitton (1993) surveyed specifically for western screech-owls in Wyoming and only confirmed two responses, both on the west slope of the Wind River Mountains in Sublette County. We have found no evidence to suggest that western screech-owls occur as far east as the Black Hills, where even eastern screech-owls are considered uncommon (South Dakota Ornithologists' Union 1991). Further uncertainty in this species assessment is caused by a lack of data on the subspecies *O. a. maxwelliae*. Eastern screech-owl literature generally addresses the biology and ecology of other subspecies; therefore, inference is needed to address *O. a. maxwelliae*. We have also extrapolated information across all species lines and have included descriptions of the western screech-owl to address biology and ecology of the eastern screech-owl at the western periphery of its range.

CURRENT MANAGEMENT SITUATION

Management Status

The eastern screech-owl is not listed by either the Federal government or the Wyoming Game and Fish Department as having special management status (Luce et al. 1997, B. Rogers pers. comm.). The South Dakota Breeding Bird Atlas (SDBBA) lists the species as fairly common and widespread throughout the state and shows eastern screech-owl occurrences in nearly every county in South Dakota (Peterson 1995). The eastern screech-owl is given no special management status in Montana; however, more information is needed on the species (Bergeron et al. 1992, Montana Partners in Flight 2001). Montana Partners in Flight (PIF) gives the eastern

screech-owl a Priority III rating, meaning that the screech-owl is of local concern, but is not at imminent risk.

REVIEW OF TECHNICAL KNOWLEDGE

Systematics/Taxonomy

Eastern and western screech-owls are parapatric forms of one superspecies. The two owls are generally widely separated geographically; however, there are several areas in the western United States where they are narrowly separated (OK panhandle), are slightly sympatric (Colorado Springs, CO), or broadly overlap (parts of Texas)(Marshall 1967, Gehlbach 1995). Five subspecies of the eastern screech-owl are recognized:

Otus asio asio is found throughout the eastern United States, south from Maine, to North Carolina, east to Missouri and north to Minnesota.

O. a. floridanus resides in the southeastern United States from Florida to North Carolina and west to Louisiana and Arkansas.

O. a. mccallii is limited to southern Texas and eastern Mexico.

O. a. hasbrouckii is found in the south-central United States from east and north Texas, western Arkansas, Oklahoma and southern Kansas.

O. a. maxwelliae lives in the Midwest ranging into Kansas, eastern Colorado, Nebraska, eastern Wyoming, South Dakota, North Dakota and eastern Montana and is the focus of this assessment.

The eastern screech is a small owl with ear tufts. Two distinct color morphs, gray and red, may occur in the same population. Gray is considered the more common morph in the Great Plains, whereas red is more common in the mideastern states (Sibley 2000). In gray morphs, the back is brownish-gray to grayish, vermiculated with fine dark or black streaks. The breast shows faint buffy tones and is lightly streaked with cross barring (Marshall 1967, Sibley 2000). The face has a prominent black-rimmed facial disk, with large, round, yellow eyes. Marshall (1967) called *O. a. maxwelliae* the palest and least marked of the subspecies. Red-morph *O. a. maxwelliae* make up only about 7% of the whole population, and 6% are intermediate in color between gray and red morphs (Marshall 1967). Wing cord averages 165 mm. Male wing cord ranges from 150-170 mm and female wing cord ranges from 160-180 mm. The bill is yellow to pale greenish-gray. Feather coat is dense and includes feathering of the feet. Compared to the western screech-owl, ear tufts are long and can be seen even when not raised (Marshall 1967). Though eastern and western screech-owls are only known to overlap in the Texas panhandle region, one method of distinguishing between the races is by bill color (Johnsgard 1988). Western screech-owl bills are almost always black, with a white tip. However, the more northern species of *O. k. bendirei* retains the greenish-grayish bill similar to the eastern screech-owl (Kaufman and Bowers 1989, Johnsgard 1988, Fitton 1993, Dorn and Dorn 1994). Vocalization is another method of distinguishing eastern and western screech-owls. Eastern owls sing a long monotonous, rolled trill dropping off into a quavering whinny, while western birds tend to exhibit a “bouncing ball” call that starts slowly and rapidly speed up (Marshall 1967).

Distribution And Abundance

Overall Distribution

The eastern screech-owl is distributed across the eastern United States and occurs in extreme southern Quebec, Ontario, Manitoba, Saskatchewan, and Alberta, Canada. Western limits of the eastern screech-owl include the northern border of Montana with Saskatchewan and Alberta, Canada, the Bighorn Mountains of Wyoming, eastern Colorado, and west-central Texas. Eastern and western screech-owl ranges nearly overlap in Oklahoma and do overlap in the Big Bend region of Texas.

Local Distribution And Abundance

Eastern screech-owls are considered common and widespread throughout eastern South Dakota and are uncommon in the west (South Dakota Ornithologists' Union 1991). Wyoming considers the eastern screech-owl uncommon throughout the state; however, there is a breeding record in the Black Hills (Luce et al. 1997). Abundance estimates for the BHNF are not available.

Population Trends

Population trends reported by the Breeding Bird Survey (BBS) are not reliable for eastern screech-owls due to poor regional credibility and inadequate sample sizes (Sauer et al. 2000). Little has been published on eastern screech-owl population trends probably because so little information is available. Populations at the periphery of their range probably tend to be low; however, this does not necessarily reflect the status of the population as a whole. For example, in Wyoming and Montana, screech-owls are considered rare or uncommon, while in parts of Colorado, Levad (1989) wondered if western screech-owls weren't "the most abundant raptor" in his study area. Gehlbach (1995) suggests that population cycles and local movements may be confused with declines and that long-term negative human impacts on the species are doubtful.

Broad-Scale Movement Patterns

Eastern screech-owls are primarily sedentary permanent residents and do not exhibit broad-scale migrations south. Extra-home range movements and abnormally long natal dispersal may occur under extraordinary circumstances of severe weather (Gehlbach 1995).

Habitat Characteristics

Eastern screech-owls inhabit a wide variety of environments throughout their range. General screech-owl habitat has been described as forested landscapes either naturally or anthropogenically modified, from early successional to mature forest, in valleys or on mountain slopes mostly below 1500 m (Gehlbach 1995, Del Hoyo et al. 1999). Boreal and montane coniferous forest is considered marginal habitat. Within the Rocky Mountain west, riparian deciduous habitat, urban and suburban yards, parks and green belts are probably optimum habitat types (Gehlbach 1995, Kingery 1998). Studies describing eastern screech-owl habitat use and selection at the western periphery of their range are not available.

It is inferred that descriptions of western screech-owl habitat use may apply to eastern screech-owls (*O. a. maxwelliae*) at the western edge of its range. In general screech-owls use open

forests with an abundance of prey and available nest cavities (Johnsgard 1988). In Idaho, western screech-owls had the narrowest macrohabitat niche of five forest owls studied, restricting themselves to deciduous habitats at low elevations (Hayward and Garton 1988). Specifically, western screech-owls used riparian habitat with abundant deciduous cover at the 4-8 m height class. Roosts were concentrated along stream bottoms as well, and the majority of screech-owls perched directly next to the bole of the roost tree. Roost height averaged 4.6 m above the ground and roost trees averaged 21.2 m high with a diameter at breast height of 54 cm (Hayward and Garton 1984).

As secondary cavity nesters, eastern screech-owls either depend on other species to excavate nest holes, or use natural tree cavities. No selection for height or directional orientation is reported (Belthoff and Ritchison 1990, Gehlbach 1995). *O. a. maxwelliae* in Kansas chose nest trees where cavities were 2-10 m high (average 5.5 m), with a cavity depth ranging between 30-96 cm (average 49.3 cm). The most common trees used in the Kansas study were box elder (*Acer negundo*), elm (*Ulmus* spp.) and cottonwood (*Populus* spp.) respectively (Gelbach 1995). Distance to nearest neighboring nest increases with decreasing tree density, but may be as close as 30 m in suburban settings (Gehlbach 1995). Northern flickers (*Colaptes auratus*) are common providers for both eastern and western screech-owl nest cavities. In Kentucky eastern screech-owl nest cavities were often created by red-bellied woodpeckers (*Melanerpes carolinus*), pileated woodpeckers (*Dryocopus pileatus*) and northern flickers and the holes were often enlarged by eastern gray squirrels (*Sciurus carolinensis*) (Belthoff and Ritchison 1990).

Western screech-owls in California most commonly used oak (*Quercus* sp.) and sycamore trees (*Plantanus* sp.). Nest height averaged 5.3 m, and the diameter at breast height of the trees averaged 58.6 cm (Feusier 1989). Though tree cavities are preferred nest sites, unusual nest sites have been recorded. In southwestern Idaho, a western screech-owl nested in a black-billed magpie (*Pica hudsonia*) nest in a willow (*Salix* sp.) 2.9 m above the ground (Marks 1983). A screech-owl egg was found in a crow's nest in California; however, there was no evidence to suggest that the egg was laid there (Hall 1947).

Food Habits

Eastern screech-owl diet is broader than any other North American owl, containing at least 138 vertebrate species and likely as many invertebrate species (Gehlbach 1995, Del Hoyo et al. 1999). Diet is less diverse in the northern part of the range. In general, more rodents are preyed upon in the winter, while more birds, reptiles and insects are taken during nesting.

VanCamp and Henny (1975) found at least 53 species of songbirds, 8 species of small mammals, 1 species of frog, 3 species of fishes and 2 species of invertebrates to constitute eastern screech-owl diet in northern Ohio. Food storing was also observed. Forty dead songbirds were found stored in a single nest box with four young owls.

Hayward and Garton (1988) noted that "the food habits of the western screech-owl are not well documented, and prey of this species varies geographically such that generalizations would be more tenuous than for [other owl] species". Despite this, others suggest that western screech-owls may take prey in proportion to what is available to them (Barrows 1989). Several diet studies have taken place in Idaho. Marks and Marks (1981) observed that deer mice (*Peromyscus maniculatus*) accounted for 65% of prey items identified, and 62% of diet. The harvest mouse (*Reithrodontomys megalotis*), kangaroo rat (*Dipodomys ordii*), and montane vole

(*microtus montanus*) were the next most common prey items. In contrast, Rains (1997) found screech-owls preying most frequently on the harvest mouse (17.4%) and house mouse (*Mus musculus*) (17.4%), while the meadow vole (*Microtus pennsylvanicus*) (23.6%) and kangaroo rat (19.2%) accounted for the most biomass.

Breeding Biology

Breeding phenology is best described for eastern screech-owls in parts of the eastern and southern United States. A study in Ohio suggested that eastern screech-owls paired in late January (VanCamp and Henny 1975). Pairs were seen in nest boxes as early as 1 and 3 February. Eggs were laid about 15 March for most of the population with some probably laying 5 to 10 days earlier. Most eggs were hatched from 15 April to 5 May. Climatically, Ohio and the Black Hills may be similar enough that breeding phenology will be similar, however we do not know for certain. Jones (1998) reported that fledging dates in Colorado range between 15 May and 22 July.

Courtship Characteristics

Screech-owls may exhibit lifelong pair bonds; however, new mates are found after a death, and "divorce" occasionally occurs after an unsuccessful nest (Gehlbach 1995). Females being courted may exhibit begging and crouching behavior with wings extended and rasps as the male arrives with food. Males will often exhibit similar behavior toward the female and the pair will allopreen.

McQueen (1972) described a pair of screech-owls (probably western) sitting together in a tree while courting. Both birds called frequently (bouncing ball call) and preened each other. The male suddenly changed his call to a rapid tremulato repeating it more rapidly and at shorter intervals than the previous call. The female changed her call to a short high-pitched tremolo. All calling stopped when the male mounted the female and copulation lasted about two seconds. After copulation both birds flew to separate trees.

Nest Characteristics

Nest sites vary greatly according to habitat. In Kentucky it was found that eastern screech-owls showed no preference for nest tree species (Belthoff and Ritchison 1990). It was suggested that screech-owls in the study area selected nest cavities on the basis of depth (30 cm ± 3.7 cm), and to a lesser degree on cavity height (6.5 m ±0.5 m) and entrance size (height = 12.4 cm ± 0.8 cm, width = 11.0 cm ± 0.7 cm). Within nest trees, there was no preference for cavity orientation.

In the Rocky Mountain region, western screech-owls appear to prefer flicker holes in cottonwoods (*Populus* spp.) or large willows (Johnsgard 1988). Dorn and Dorn (1994) described optimum nest sites for eastern screech-owls in Wyoming as large diameter (> 50 cm) plains cottonwoods (*Populus deltoides*). Within the cavity itself, there is no nest construction; eggs are simply laid within a body depression in an old squirrel or bird nest or rotted woody debris (Gehlbach 1995, Del Hoyo et al. 1999). There does not appear to be selection of nest sites based on height or orientation (Gehlbach 1995).

Clutch Initiation And Size

Northern populations initiate clutches later than southern populations (Gehlbach 1995). Studies specific to clutch initiation for either eastern *O. a. maxwelliae* or the western screech-owls are rare in the literature. Del Hoyo et al. (1999) note a broad range of initiation dates probably due to the size of screech-owl range. Dates extend from February to July. In Colorado initiation probably occurs between mid-April and mid-May (Kingery 198). Similarly New England screech-owls initiate 12 April to 18 May (Gehlbach 1995), These dates are probably similar to screech-owls in the BHNF.

Clutch size may vary from north to south and east to west. Murray (1976) suggested that screech-owl clutch size increased in size to the north and decreased to the west, but averaged 3.42-4.01 eggs.

Parental Care

Incubation is entirely by the female (Gehlbach 1995). The female stays within the nest cavity for 6 days before laying and most females incubate immediately, lasting at least 26 days (Del Hoyo et al. 1999, Gehlbach 1995). The male stays near the nest during incubation and feeds the female. Both sexes feed the young, which fledge around 28 days (Gehlbach 1995). Fledglings depend on the parents for another 8-10 weeks (Del Hoyo et al. 1999).

Mate And Site Fidelity

Pair Bonding behavior in eastern screech-owls does not significantly differ from the western screech-owl (Johnsgard 1988). Screech-owls may exhibit lifelong pair bonds. New mates are found after a death, or "divorce" after an unsuccessful nest (Gehlbach 1995).

Males inhabit permanent home ranges, within which are multiple or polyterritories. Successful females *O. a. hasbrouckii* may reuse the same nest site 75% of the time (Gehlbach 1995). This result is from a single study in Texas however, and may not apply to the species throughout its range. Similar to switches in mates, switching territories is normally brought on by severe weather or loss of a previous mate.

Demography

Life History Characteristics

The majority of screech-owls (77-83%) nest as yearlings (Gehlbach 1995). Maximum longevity for *O. a. hasbrouckii* is 14 yrs 2 mo though only averages 1 yr for females. Maximum longevity for *O. a. asio* is 13 years, 6 months (Gehlbach 1995). No report of maximum longevity for *O. a. maxwelliae*.

Reproductive Success

Reproductive success in eastern screech-owls is reported for the Texas population. Generally, reproductive and fledgling success increases from rural to suburban areas, averaging from 35-86%. Numbers of fledglings per pair also increased from rural to suburban areas, from 1.0-1.9, and increases yearly up to five years. From ages 1-5 years, successful females averaged 2.3, 2.6, 3.1, 3.2, and 2.7 fledglings per year, respectively. As with proportions and numbers of fledglings, proportions of successful nests also increased from rural (32%) to suburban areas

(65%) in Texas (Gehlbach 1995).

Social Patterns For Spacing

Data for territory size and area defended are rare in the literature. Gehlbach (1995) reported that eastern screech-owls (*O. a. hasbrouckii*) defended 12-19 % of the mean distance to the nearest alternate cavity, depending on tree density. Distance defended increased with decreasing tree density. Johnsgard (1988) summarized several studies on western screech-owl territory sizes and proximity. In Arizona, territories averaged 275 m apart, except in mesquite where they averaged 45-90 m apart. Total home rang size in Idaho was estimated as being roughly a 1260 x 480 m rectangle along a riparian corridor (Hayward and Garton 1988). One California study found that the average distribution of western screech-owl territories was 2.1 territories per km of river channel with a minimum average distance of 420 m between nest sites (Feusier 1989). Another California study reported 0.4 pairs per ha in stands of canyon live oak (*Quercus chrysolepis*) and calling males were encountered 100 m apart (Noble 1990).

Local Density Estimates

No density estimates exist for eastern screech-owls in the BHNF. The South Dakota Ornithologists' Union considers the species fairly common and widespread throughout the eastern part of the state, but it is considered rare in the west including the Black Hills (South Dakota Ornithologists' Union 1991). Fitton (1993) surveyed for eastern screech-owls and received no response; however, Dorn and Dorn (1994) reported response in the Black Hills region. No density estimates are given. Dorn and Dorn (1994) suggest that eastern screech-owls exist east of the continental divide (BHNF) and western screech-owls are "rare, localized and possibly irregular west of the continental divide [in Wyoming]." In Boulder County, Colorado, eastern screech-owls approach one pair per linear mile along Boulder and South Boulder Creeks (Jones 1998).

Limiting Factors

From published accounts and inference regarding similarity of habitat use of *O. a. maxwelliae* and the western screech-owl, it is speculated that preferred habitat for eastern screech-owls in the BHNF is deciduous forest and riparian cover. Hardwood forest types (typically deciduous) only comprise about 4% of the BHNF (USFS 1996). Aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*) and bur oak (*Quercus macrocarpa*) are the most common deciduous trees in the BHNF (USFS 1996). For eastern screech-owls in the BHNF this small amount of suitable habitat is likely the largest limiting factor.

Community Ecology

Predators And Relation To Habitat Use

Larger owls and *Accipiter* hawks are probably the major predators on screech-owls. Mammalian predators include opossums (*Didelphis virginiana*) and raccoons (*Procyon lotor*). Though not specifically mentioned, in northern ranges the marten (*Martes americana*) is also a likely predator of screech-owls eggs and nestlings. Rural nests experience significantly higher predation rates than suburban nests (Gehlbach 1995).

Competitors

American kestrels (*Falco sparverius*), woodpeckers (*Picoides* sp.), and other cavity-nesting owls may compete with screech-owls for nest sites. Fox squirrels (*Sciurus niger*) and European starlings (*Sturnus vulgaris*) may also compete for nests sites.

The possibility exists for interspecific and intraspecific competition for prey items. For example in rural Texas, potential competitors (owls, hawks, corvids and nightjars) exceed screech-owl biomass by 10 times per km^2. In Idaho, western screech-owls and northern saw-whet owls (*Aegolius acadicus*) tend to occupy many of the same habitats. However, Rains (1997) found that the western screech-owl's diet is broader than that of the saw-whet, including more small mammal species and (though in small numbers) fish, lizards, and crayfish. The most frequently taken prey item for the screech-owl was harvest mice, while saw-whet owls most often preyed upon the house mouse.

Parasites And Disease

Eastern screech-owl nestlings can suffer from heavy infestations of fly eggs and mites and at least one nestling was know to have died of a heavy fly infestation (Gehlbach 1995). In 1986, a wild eastern screech-owl was admitted to a clinic for care to traumatic injury and died due to massive parasitic pneumonia caused by *Cyathostoma americana* (Hunter et al. 1987).

Risk Factors

Risk factors for eastern screech-owls in the BHNF may be difficult to identify. Suitable habitat appears to be limiting. As mentioned above, only about 4% of the Forest consists of deciduous, hardwood cover that may be suited to screech-owl use. Therefore, we can infer that disturbances to this small amount of habitat may have large repercussions to screech-owls using that habitat. The Forest has taken into account the critical role of riparian habitats for fish and wildlife species; however, and has implemented measures of protection. Therefore risks to habitat loss may be small.

Response To Habitat Changes

Management Activities

Timber Harvest

The 1996 Final Environmental Impact Statement (FEIS) for the BHNF states that "All [management] alternatives would maintain or enhance existing riparian area biodiversity, physical structure and size." (USFS 1996). The preferred management alternative (G) includes provisions for rehabilitating headwater streams to raise water tables and enhance native vegetation, and would also limit livestock grazing within riparian corridors.

Hardwood (deciduous) cover is also emphasized in the Forest Plan. Alternative G "would include hardwood restoration objectives of 10 percent or approximately a 6,000 acre increase in the hardwood land-base.

Based on protection of riparian areas and restoration of hardwood forest cover, as provided for in the FEIS, timber harvest should not impact eastern screech-owls to a great extent. However, if

riparian corridors are harvested, such that tree density falls below 50 trees per ha, the result would be loss of nest sites and suitable roosting and hunting cover (Gehlbach 1995). Alternatively, if timber harvest were implemented such that it increased hardwood deciduous species and cover, it would be beneficial to screech-owls.

Recreation

Human presence will probably not greatly impact eastern screech-owls as they commonly live in suburban and urban areas and easily habituate to people (Gehlbach 1995). However, human activities do have the potential to impact screech-owl habitats. Within riparian habitats in the BHNF, recreation has resulted in vegetation reduction, soil loss, lack of downstream woody material, and stream bank damage by campers, anglers and hikers (USFS 1996). All alternatives of the FEIS provide for wetland protection (including riparian corridors), ensuring that new roads, campgrounds and buildings will not detrimentally affect wetlands (USFS 1996).

Livestock Grazing

Cattle should have little affect on eastern screech-owls. As stated in the FEIS "under all alternatives, management and protection of riparian areas and wetlands are emphasized." This is accurate for cattle grazing as well. Strategies should be implemented that restrict cattle grazing or move cattle off of riparian habitats to disperse them more evenly across the forest. The FEIS suggests building watering facilities on upland sites may draw cattle and big game species off of riparian sites allowing for rest from grazing. In general livestock should not affect eastern screech-owls within the BHNF.

Mining

A study was conducted along the Coeur d'Alene River, Idaho, to determine if several hawk and owl species were bioaccumulating lead downstream from a mining site. Western screech-owls were shown to have increased blood lead levels; however, lead levels were not high enough to cause reproductive failure (Henny et al. 1994). Owls were picking up lead from mice and voles along the river. American kestrels were found to have the highest levels of lead in the blood. Lead collects in the bones of the rodents that were preyed on by hawks and owls. Owls do not digest bones, thus reducing their overall exposure to the lead (Henny et al. 1994).

Lead, South Dakota, has supported a large underground gold mine for over 123 years. Between 1920 and 1977, approximately 250,000 tons of arsenic were discharged into Whitewood Creek in the form of arsenopyrite (Custer et al. 2001). Concomitantly, elevated arsenic levels were detected in house wrens (*Troglodytes aedon*) along the same creek. It is conceivable that eastern screech-owls could pick up arsenic by consuming birds and insects associated with the creek. However, like the Coeur d'Alene River study, owls may be at reduced risk of picking up contaminants such as arsenic that accumulate in the bones of prey species.

The FEIS (USFS 1996) remarks that, "Most National Forest System land is open for mineral entry under all alternatives unless formerly withdrawn or controlled by some other congressional action." It is also stated that oil and gas are the only known leasable minerals on the BHNF. Thus, there is the possibility that areas containing eastern screech-owls could be explored and eventually exploited of minerals. Because it has been shown that animals are picking up contaminants downstream from several mining sites across the west, and in South Dakota, it is

possible that mining along rivers or streams in the BHNF may negatively impact eastern screech-owls and their habitat.

Prescribed Fire

Prescribed fire has the potential to positively or negatively impact eastern screech-owls. Throughout their range screech-owls use a variety of habitat types, though riparian habitats and deciduous cover appear especially important. Hayward and Garton (1988) found that western screech-owls in Idaho selected for riparian habitat with abundant deciduous cover at the 4-8 m height class. Similarly in British Columbia, western screech-owls sought out riparian habitats dominated by water birch (*Betula occidentalis*) and black cottonwood (*Populus trichocarpa*) (Cannings and Angell 2001). Riparian zones can sometimes be very narrow however and screech-owls may forage in nearby open forest habitats such as ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*). Prescribed burning has the potential to reduce important riparian breeding and roosting habitat, which is used by the birds year round. Specifically, a fire that burns through a riparian zone may not cause permanent damage, but could render it useless for owls immediately preceding the burn. Conversely prescribed burning also has the potential to enhance open forest settings where screech-owls may be foraging, by thinning underbrush and litter.

Fire Suppression

Ponderosa pine forests are characterized as having surface fires every 5-25 years, cleaning out understory, killing young trees and usually sparing larger trees (Knight 1994). These "frequent" fires keep fuel loads down, keeping future fires cooler. Under a fire suppression regime fuel loads build leading to large, out of control fires. Fire suppression has several far-reaching consequences apart from wildfire. Forest stands become dense and begin to invade meadows and grasslands. Increased tree density may also affect the water table and riparian zones with increased amounts of evapotranspiration (Knight 1994). Fire suppression may have several far-reaching detrimental effects on screech-owls and other plant and animal species within the forest. In particular, aspen may rely on fire to increase vigor of stands (Knight 1994). It was previously mentioned that prescribed fire could have negative effects on riparian vegetation, which screech-owls use. These would be short-term effects however as riparian vegetation such as willows will regrow with increased vigor the following growing season. In the event of hotter fires however, some riparian tree species may die off (Busch 1995), while others such as aspen may increase in vigor (Knight 1994).

Non-Native Plant Establishment And Control

The affect of non-native plants on eastern screech-owls in the BHNF has not been studied.

Fuelwood Harvest

The largest negative effect to eastern screech-owls from fuelwood harvest is the potential loss of nest snags. Reports for optimal nest sites in Wyoming suggest that snags or nest trees greater than 50 cm diameter at breast height are preferred. Therefore with respect to removal of standing dead trees, larger trees should be kept off limits, particularly within riparian zones. Most fuelwood harvest occurs within coniferous stands; therefore it would probably have little impact on screech-owls viability in the BHNF. Removal of coarse woody debris should also

have little impact on screech-owls.

Natural Disturbance

Insect Outbreaks

The insect with the most potential to affect the BHNF is probably the mountain pine beetle (*Dendroctonus ponderosae*). An outbreak of this beetle has the potential to kill up to 80% of trees within an infested stand (USFS 1996). Eastern screech-owls may be less affected by pine beetles because they prefer riparian and deciduous habitats, which would not be heavily impacted by the insect. If ponderosa pine are present near riparian zones and are killed by pine beetles, the trees may then serve as nest trees in the future.

The gypsy moth (*Lymantria dispar*) may pose a more serious threat to the habitat of the eastern screech-owl. If this moth becomes established in the BHNF it could seriously alter riparian, aspen and other hardwood communities (USFS 1996). Thus if a serious outbreak of gypsy moths occurs, much of the habitat preferred by screech-owls could be destroyed.

Wildfires

Large, hot fires that burn through riparian communities have the potential to kill *Populus* sp. and set back *Salix* sp. until the next growing season (Busch 1995). Screech-owls need sufficiently sized trees for roosting and nesting and prefer thick deciduous cover at the 4-8 m height class (Hayward and Garton 1988). Though organisms within the BHNF have evolved with wildfire, they have not evolved with fire suppression. Wildfire, in contemporary terms, is potentially more destructive today than it historically was because of increased fuel loads. Thus, wildfire after a previous regime of fire suppression will potentially destroy whole expanses of riparian vegetation, which would detrimentally impact eastern screech-owls on the Forest.

Wind And Other Weather Events

Severe winter weather is unlikely to affect screech-owls to a great extent as they are heavily insulated birds. Though non-migratory, screech-owls may respond to extraordinary weather events by dispersing long distances to find more suitable habitat and weather conditions (Gehlbach 1995). Voous (1989) reports on differential survival between red and gray morph screech-owls in inclement weather conditions. Under laboratory conditions at -5° C and -10° C red phase owls had significantly higher metabolic requirements than gray phase owls. Also, oxygen consumption increased by 28% and 16% respectively. In the field, differential mortality was observed after a sever winter in northern Ohio. Of a population of 760 screech-owls, the percentage of red phase owls dropped from 23.3% to 14.7% and did not recover in the following years (Voous 1989). Thus, severe weather in the BHNF could have similar effects on screech-owls present.

SUMMARY

The eastern screech-owl is a common resident from the Great Plains eastward. Currently there are five recognized subspecies of the eastern screech-owl, which range from New England and southern Canada, across the Midwest and south to western Mexico. Within the United States,

eastern screech-owls are generally present east of the continental divide. Screech-owls exploit a variety of habitat types; however, riparian and deciduous forests appear to be preferred. As secondary cavity nesters, screech-owls have some dependence on woodpeckers to provide nest holes for them. Nest boxes have been successfully used in areas that lack adequate natural cavities.

Prey items generally consist of small mammals such as deer mice and harvest mice. Screech-owls will also pursue birds. Illustrating the wide variety of prey taken; however, screech-owls are known to glean worms off of roadways, take a variety of insect species (especially beetles and moths) and even take fish and aquatic invertebrates like crayfish.

Within their range, eastern screech-owls are permanent residents that do not migrate. Prolonged severe weather may cause them to disperse to more favorable climes and may have differential mortality effects based on color morphs of the owl. Young owls disperse medium distances from their original birth territory.

Factors most limiting to eastern screech-owls in the BHNF are suitable nesting and roosting habitats. Only about 4% of the Forest supports riparian, deciduous cover that would be favored by eastern screech-owls. Hunting habitat may be plentiful as screech-owls will forage in open ponderosa pine stands.

Human impacts on screech-owls in the BHNF should be minimal because they easily habituate to the presence of people as illustrated by populations in suburban and urban settings. The largest impact people may have is alteration of riparian and hardwood habitat through timber harvest, grazing of riparian areas and fuelwood harvest. However, these threats are presumably mitigated through the Forest's protection of riparian areas through all alternatives of the Forest Plan. Also county, and primary roads within the Forest may cause some mortality to screech-owls as they forage along roads (Loos and Kerlinger 1993).

We do not believe that fire would be a useful management tool for eastern screech-owls in the BHNF. It is likely that the preferred habitat is riparian/hardwood forest. Riparian vegetation such as willow will regenerate after fire, but because fire will remove most of the vegetation, it could cause the habitat to be unsuitable until the following growing season. Hardwoods such as aspen and bur oak will respond favorably to fire, however the short-term impact of removing these trees will be deleterious. The BHNF does not support a large area of riparian or hardwood cover types thus, it is important to minimize impacts to these areas.

REVIEW OF CONSERVATION PRACTICES

Management Practices

Specific management recommendations for the eastern screech-owl are not available in the literature. Gehlbach (1995) reported eastern screech-owl use of artificial nest sites (boxes). Cannings and Angell (2001) suggest that western screech-owls use nest boxes if placed in appropriate habitats. Nest boxes should be placed 4-6 m high, and no closer than 23 m to 109 m to the nearest natural cavity or alternate nest box according to the density of the surrounding habitat (Gehlbach 1995).

Models

No models were found specifically for eastern screech-owls; however, Belthoff and Dufty (1997) constructed a dispersal model for western screech-owls. They tested whether interactions among hormonal changes, body condition, and activity patterns predicted when western screech-owls dispersed. Most important in the model was whether corticosterone increased in blood plasma prior to dispersal under endogenous and exogenous influences, which mediated locomotor activity that preceded dispersal. Their model showed that owls in better body condition would disperse earlier than less healthy birds.

Hayward and McDonald (1997) call for use of matrix models, which they suggest can help researchers decide how to: (1) focus field efforts toward measuring the most important demographic parameters, and (2) focus on those habitat characteristics with the greatest effect on population dynamics.

Kearns (1997) reported on a workshop that discussed models for owl populations. As a conclusion it was noted that there needed to be integration of population models with habitat suitability index models (HSI) presumably for more complete models. This conclusion implied that there were HSI's created for owls like the eastern screech-owl. The only such models available however are for the spotted owl (*Strix occidentalis*), and the barred owl (*Strix varia*).

Survey And Inventory Approaches

The most effective survey approach for screech-owls is with conspecific broadcast calls. Levad (1989) used call broadcasting to detect a large number of previously unknown western screech-owls in the Grand Valley of western Colorado. Surveys were conducted between December and March. Fitton (1993) and Dorn and Dorn (1994) also conducted call broadcasts in Wyoming to delineate screech-owl distribution within the state. Fitton specifically outlined the call sequence he used for broadcasting, which was one primary song ("bouncing ball"), three secondaries (double trill) and one primary in close succession.

Hardy and Morrison (2000) tested the factors that affected detection of western screech-owls when using broadcast calls. Increased detection rates were associated with decreased winds, temperature and cloud cover. Detection of screech-owls did not differ among moon phases or dates.

Monitoring

Call surveys and nest boxes are probably the best ways to monitor known populations of screech-owls. Because screech-owls are permanent residents they will be present year-round. Screech-owls will use nest boxes (Gehlbach 1995, Cannings and Angell 2001). Thus, checking previously used nest boxes will allow for population monitoring during the breeding season. Call broadcasting during winter and earlier pair bonding will allow for monitoring during non-nesting and winter seasons.

Takats et al. (2001) published guidelines for nocturnal owl monitoring in North America. The authors designed the guidelines for broadscale monitoring of relative abundance, distribution, habitat use, and changes in those parameters over time. The key elements that they developed included:

Routes should be selected using appropriate randomizations (if possible) to ensure that they are representative of the area being surveyed, within the constraints of a roadside survey.

Routes should consist of at least 10 stations, spaced at least 1.6 km apart, that can be surveyed in a single night.

Routes should be surveyed once per year at the time when the majority of species in the region are most active vocally.

The starting position and preferably all stations along a route should be georeferenced to allow linking of owl records to locations for habitat analysis.

The protocol at each station should start with a 2-minute silent listening period.

Optionally, playback may be used at a station if particular species of owls are being targeted that may respond well to playback.

The field data form should be designed so that the intervals in which each owl is detected (i.e. before or after playback of various species) are recorded.

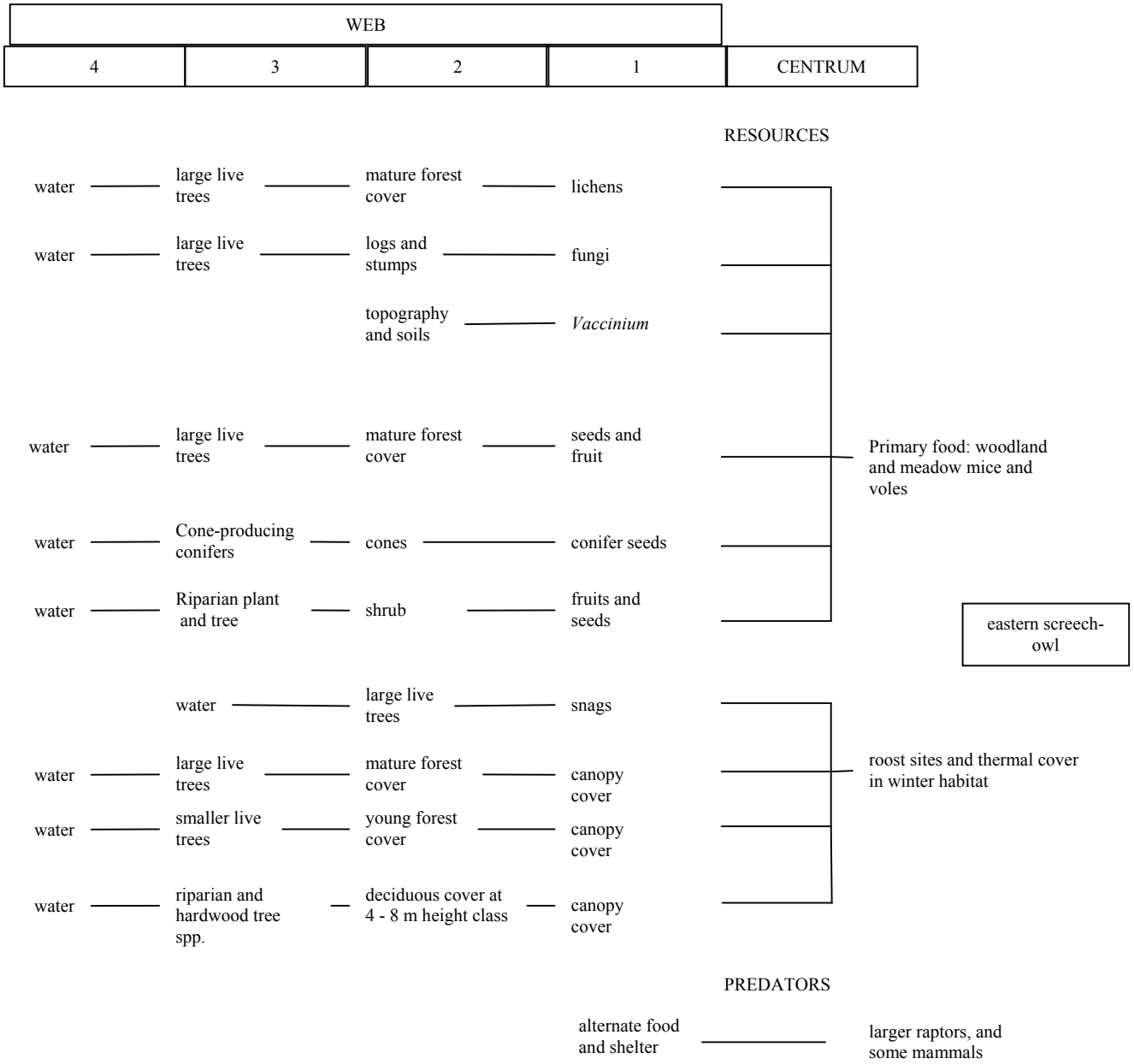
Record the approximate direction and distance to the first location where each owl was detected.

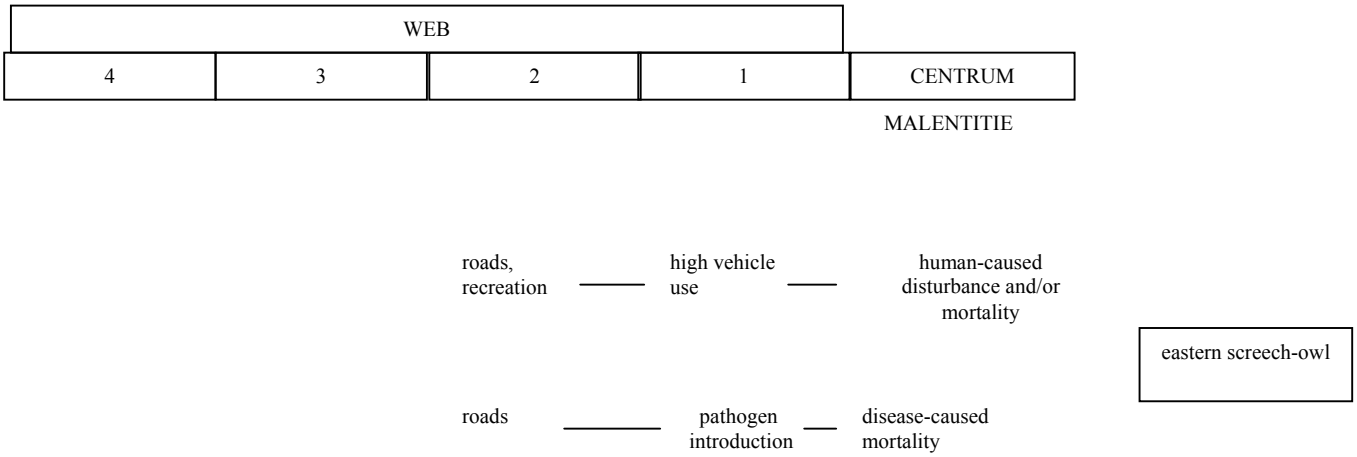
We believe the points raised by these guidelines should be considered by the BHNF.

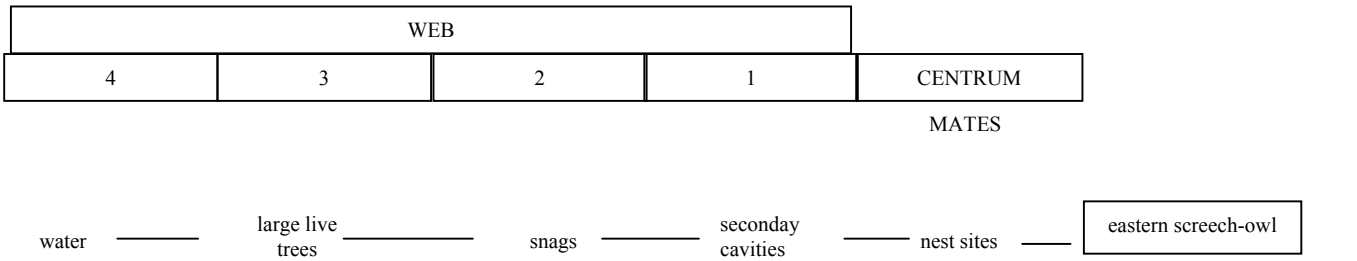
Additional Information Needs

After surveying for screech-owls across Wyoming, Dorn and Dorn (1994) concluded, "There is no verifiable evidence that eastern and western screech-owls [range] overlap in Wyoming." They stated further, "Western screech-owls are rare, localized, and possibly irregular west of the continental divide." A single eastern screech-owl response was recorded in the Black Hills region of Wyoming; however, no density estimates were calculated. The population is probably low because of lack of suitable habitat. No baseline information exists on eastern screech-owls in the Forest. Surveys need to be conducted to establish population estimates in the BHNF. Further, once it is established whether or not screech-owls persist in the BHNF more detailed study of habitat selection and use should be carried out. As Gehlbach (1995) mentions, the subspecies *O. a. maxwelliae* is poorly represented in eastern screech-owl literature. Therefore, birds identified and studied in the BHNF could add to our knowledge of biology, ecology, and management for this subspecies.

Figure 1. Envirogram for the eastern screech-owl in the Black Hills National Forest.




WEB
4
3
2
1
CENTRUM
MALENTITIE
roads, recreation
high vehicle use
human-caused disturbance and/or mortality
eastern screech-owl
roads
pathogen introduction
disease-caused mortality


WEB
4
3
2
1
CENTRUM
MATES
water
large live trees
snags
seconday cavities
nest sites
eastern screech-owl

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DEFINITIONS

Allopreen – preening of one individual by another.

Bioaccumulation – Successive accumulation and concentration of particular elements or compounds between trophic levels.

Conspecific – Belonging to the same species.

Polyterritories – Having several territories within a single homerange.

Secondary cavity nester – Species that rely on other species, or natural events to excavate nest holes for them.