

UPLAND SANDPIPER ASSESSMENT

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ENDANGERED AND THREATENED SPECIES GROUP

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INTRODUCTION

Since 1968, the Maine Department of Inland Fisheries and Wildlife (MDIFW) has developed and refined wildlife species assessments to formulate management goals, objectives, and strategic plans. Assessments are based upon available information and the judgments of professional wildlife biologists responsible for individual species or groups of species. This document represents the first planning effort undertaken by MDIFW for upland sandpipers, a species designated as “Threatened” in Maine.

Assessments provide the background for species planning initiatives. A “Natural History” section reviews biological characteristics of the species useful to understanding its status. The “Management” section recaps previous actions, strategic plans, relevant rules, and regulatory authority. Historic, current, and projected future conditions for the species are discussed individually for “Habitat,” “Population,” and “Use and Demand” analyses. The major points of an assessment appear in a “Summary and Conclusions.”

Owing to the relative scarcity of upland sandpipers in the East and limited information about them, this assessment draws heavily on research from other regions, particularly from the Midwest and prairie states. However, upland sandpipers in Maine and other eastern states and provinces have unique habitat associations and status relative to species’ “norms” elsewhere across their broad range. This assessment summarizes what is known, as well as what is not known, about the population status and natural history of upland sandpipers breeding in Maine.

I gratefully acknowledge Barry Van Dusen for permission to use his line drawing of an upland sandpiper (Figure 1, page 5).

NATURAL HISTORY

Description

The upland sandpiper, *Bartramia longicauda* (Bechstein), formerly known as the upland plover (and variously as Bartramian sandpiper, grass plover, prairie pigeon, and quailie (Knight 1908)), is a medium-sized shore bird of upland grasslands and barrens. Its long, thin neck, short bill, small head with prominent dark eye, and long tail are diagnostic (Figure 1). Length from tip of bill to end of tail is 28-33 cm; weight is 170-200 g; and wingspan is 53-58 cm (converted to metric from Forbush 1929). Legs are yellow and the slightly down-curved bill (2.7-3.0 cm) is yellow with dark upper mandible. Females are slightly larger than males, and may be distinguished during nesting season with 85% accuracy by measuring wing chord and tail length (Peterson 1983).

Plumage of adults is scaly brown dorsally, grading to white ventrally. The crown is dark with a buffy white medial stripe. The throat is white, while the neck and breast have a buff wash and are heavily streaked brown. The belly and vent are white, with brown chevrons lining the lower breast and flanks. The tail extends beyond the tips of folded wings. Plumage of juveniles is similar to that of adults, but with a heavier buff wash of the neck and breast, and less distinct flank markings (Forbush 1929, Hayman et al. 1986).

In flight, the wings are long and pointed. Distal portions of wings (i.e. primary flight feathers) appear dark, while basal portions are lighter brown. Under sides of wings are white with fine, dark barring. The rump is dark, and white margins of the



Figure 1. Upland sandpiper, adult. Artwork by Barry Van Dusen, reproduced with permission from the artist

rump and tail may be visible (Forbush 1929, Hayman et al. 1986). Upland sandpipers often hold wings extended over the back during landing

Vocalizations

Upland sandpipers often can be heard when they can't be seen. At least 4 vocalizations have been described:

Alarm call - "quip-ip-ip-ip-ip" (Bent 1929) - is often associated with nest or young.

Song - "whe-e-e-e-e-e-e-e-e-e-o-o-o-o-o-o-o-o" (Knight 1908) - is a prolonged, rolling whistle that rises, then falls. It is given on the breeding grounds in courtship flight or from ground or elevated perches.

Trill call - "tre-e-e-e-e-e, tre-e-e-e-e-e-e-e-p" (Bent 1929) - is given during flight, while running, or perching. It is used both on breeding grounds and during migration.

Call - "qua-a-ily" (Bent 1929) - from which came its nickname "quailie", is used both on the breeding grounds and during migration.

Distribution

The upland sandpiper breeds in North America in central Alaska and northern Yukon, southern Northwest Territories, northern British Columbia, Alberta, southern Saskatchewan and Manitoba to the Great Lakes; east through southern Ontario and Quebec to the Maritime provinces (Erskine 1992); south to Virginia, Ohio, Indiana, Illinois, Missouri, northern Texas, Colorado, Idaho, eastern Oregon and eastern Washington (Bent 1929, Forbush 1929, American Ornithologists' Union 1983, van den

Driessche et al. 1994). The highest nesting densities are in the northern prairie states, Saskatchewan, and Manitoba. The species' presence in the British Isles and continental Europe has been considered "casual or accidental" (American Ornithologists' Union 1983).

Relative to the prairies, eastern Canada and northeastern U.S. host a small proportion of breeding upland sandpipers. Surveys conducted throughout New York and the New England states in 1997 yielded a conservative estimate of 328 territorial pairs, of which 45% were in Maine (Figures 2 and 3) (Shriver et al. 1998, Weik 1999a). Fewer than 50 pairs breed in the Maritime provinces (Erskine 1992). During surveys in Quebec from 1984-1989, upland sandpipers were reported on 12.6% (311 of 2464) of 10km x 10km atlas blocks (Yank and Breton 1996), the majority of which are in the Saint Lawrence Plain and Ottawa Valley.

Within Maine, upland sandpipers have been reported historically from 79 sites in 13 counties (Table 1) (Knight 1908, Palmer 1949, BCD), although currently their breeding distribution includes 11 counties. Two-thirds of recently occupied (post 1989) sites were reported from Washington and Hancock Counties (Weik 1999a).

Upland sandpipers winter in the Pampas region of Argentina, Uruguay, Paraguay, and southern Brazil (Bent 1929, Forbush 1929, Hayman et al. 1986, White 1988). Lesser numbers winter in eastern Venezuela and Surinam (Haverschmidt 1966, White 1988).

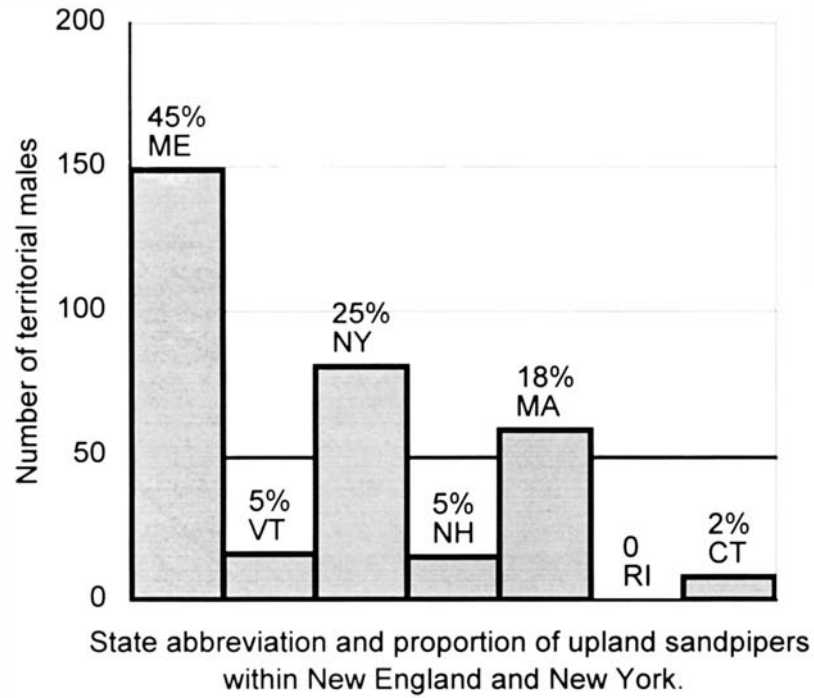


Figure 2. Distribution of upland sandpipers among New England and New York, by state, surveyed during June-July 1997. Data courtesy of Maine Department of Inland Fisheries and Wildlife and Massachusetts Audubon Society.



Figure 3. Distribution of upland sandpiper in New York and New England surveyed during 1997. Data courtesy of Maine Department of Inland Fisheries and Wildlife and Massachusetts Audubon Society.

Table 1. Historical status and number of modern (post 1989) summer (breeding season) records for upland sandpipers among counties in Maine.

County	Historic (from Knight 1897)	Since 1989
Androscoggin	"common summer resident"	1
Aroostook	"common"	7
Cumberland	"common summer resident"	2
Franklin	"common summer resident"	0
Hancock	"common summer resident"	8
Kennebec	"common summer resident"	3
Knox	"occurs"	2
Lincoln	no record	0
Oxford	no record	0
Penobscot	"common summer resident"	3
Piscataquis	"common summer resident"	0
Sagadahoc	no record	0
Somerset	"common summer resident"	3
Waldo	"common"	1
Washington	"common summer resident"	41
York	"common summer resident"	2
Total:		73

Taxonomy

Upland sandpiper is the only species of the Genus *Bartramia*, in the Family Scolopacidae. The species is included in the curlew Tribe Numeniini. No subspecies have been recognized (American Ornithologists' Union 1983).

Habitat and Diet

Upland sandpipers require large areas of grasslands for breeding. Their principal habitat is the shortgrass prairies of the northern plains states and prairie provinces (Higgins and Kirsch 1975, Kirsch and Higgins 1976, Bowen and Kruse 1993). Upland sandpipers also inhabit hay meadows, lightly grazed livestock pastures (Ailes 1976, Bowen 1976, Bowen and Kruse 1993) and other agricultural fields (White 1983), airports (Osborne and Peterson 1984, Vickery et al. 1994), lowbush blueberry fields, and were recently discovered using large peatlands in Quebec (Calme and Haddad 1996) and Maine (P. deMaynadier pers. commun., Weik and Purtell 2000). In southern and eastern Maine grassland-barren sites (largely commercial blueberry fields), upland sandpipers were uncommon on sites <50 ha and reached a 50% incidence on sites of about 200 ha (Vickery et al. 1994).

Buss and Hawkins (1939) summarized early work on the feeding habits of upland sandpipers. Aughey (1878) found an average of 37 locusts and 16 other insects in upland sandpipers (n = 22) collected in Nebraska, and Howell (1907) found various species of weevils (Curculioninae) in 48 upland sandpipers collected in Texas. McAtee and Beal (1912) examined 163 stomachs collected from unspecified locations and habitats in North America. Approximately 97% of the contents consisted of animal

matter; the remaining 3% consisted of seeds of various grasses and forbs. Upland sandpipers consume a wide variety of invertebrate life. Grasshoppers, crickets, and weevils composed nearly 50% of foods. Adult and larval forms of several species of leaf-beetles, click beetles, and moths, as well as a variety of Diptera, Hymenoptera, Hemiptera, centipedes, millipedes, spiders, snails, and earthworms composed nearly half the volume.

In Maine blueberry fields, upland sandpipers are suspected to feed on several agricultural pests, including grasshoppers (*Melanoplus* spp., *Camnula* sp.), crickets, and caterpillars of the blueberry spanworm (*Itame argillacearia*); however, no research has been conducted on the feeding habits of upland sandpipers occupying blueberry fields.

Breeding Ecology

Upland sandpipers are monogamous, and are thought to arrive on their breeding grounds already paired (Buss and Hawkins 1939, Higgins and Kirsch 1975, Ailes 1976). They sometimes nest colonially, but may also nest as isolated pairs (Buss and Hawkins 1939, Bowen 1976). Upland sandpipers arrive on their breeding grounds in Maine in late April in York County to mid May in Aroostook County.

The courtship behavior, presumably of males, includes a flight display in which one or more (presumably) males fly with short bursts of rapid wing beats alternating between long gliding stretches, in a circular or elliptical path approximately 0.5-2.0 km in diameter, as high as several hundred feet (~200 m) above the grassland-barren. This flight may be accompanied by a prolonged, rolling whistled song which rises, then falls, or by a trill call. Both vocalizations may also be given from ground or elevated perches.

The mobility and intermingling of courting sandpipers causes difficulty for observers trying to accurately estimate numbers of breeding pairs.

Limited data on return rates of marked adults suggest that upland sandpipers are somewhat philopatric. In Kansas, Bowen (1976) recaptured 15% of birds banded as adults (n=20) on their breeding grounds the following year, and Ailes (1976) found that 33% of banded adults (n=15) returned to the same breeding site in southern Wisconsin the year after initial capture. However, birds banded as juveniles were not resighted on their natal grasslands in subsequent years in Kansas (n=39; Bowen 1976), nor in Wisconsin (n=60; Ailes 1976).

Upland sandpipers select nest sites in vegetation that provides adequate concealment. In a study of nest site characteristics of ground-nesting birds in the prairie pothole region of North and South Dakota, Montana, and Manitoba, most upland sandpiper nests had 100% visual obstruction at less than 15 cm horizontal distance - in other words, they select very dense patches of vegetation for nesting (Kantrud and Higgins 1992). Nests are usually placed among grasses and forbs, and sometimes shrubs, 10 to 40 cm tall (Kantrud and Higgins 1992, Buhnerkempe and Westemeier 1988, Ailes 1976, Kirsch and Higgins 1976).

Nest site selection by upland sandpipers in blueberry fields, the major habitat for upland sandpipers in Maine, has not been studied. Biennial pruning (some combination of mowing, burning, and herbicide application) is practiced on commercial blueberry fields before and during the early stages of the growing season. Vegetative cover in pruned, nonbearing-year fields may not offer adequate nest concealment during the

early nesting season, and thus, biennial pruning may influence selection of nesting habitat.

Nest densities vary considerably across sites and years. Nest densities in North Dakota were 8-22/100 ha (Bowen and Kruse 1993), and 8-17/100 ha (Kirsch and Higgins 1976). In South Dakota nest density was 5/100 ha (Lokemoen and Duebbert 1974), and in Wisconsin, Buss and Hawkins (1939) estimated a nest density of 25-75/100 ha. There are no nest density estimates for upland sandpipers in Maine; however, Vickery (1993) calculated pair densities of 0.4-1.2 pairs/10 ha (equivalent to 4-12 pairs/100 ha) for upland sandpipers at Kennebunk Plains in York County. Factors that limit nest density (e.g., food or nesting cover, territoriality) are poorly understood.

Clutch size is typically 4 eggs (range 3-5 eggs) (Bent 1929, Ailes 1976). Complete clutches found during studies in North Dakota (Higgins and Kirsch 1975; n=189) and in Wisconsin (Buss and Hawkins 1939; n=47) all contained 4 eggs. The time interval between laying of successive eggs ranges from 24-49 hours (Higgins and Kirsch 1975, Ailes 1976).

Incubation begins with the laying of the last egg, and may last 21-27 days (Buss and Hawkins 1939, Higgins and Kirsch 1975, Ailes 1976). Both adults share incubation duties, with the male doing the larger portion as hatch approaches. Pipping and hatching may span 18 hours to 3 days (Buss and Hawkins 1939); in North Dakota 58% of clutches (n=12) hatched 24-48 hours after the first egg pipped (Higgins and Kirsch 1975).

Nesting success (% of nests in which ≥ 1 egg hatch) by upland sandpipers is high relative to that of other ground nesting birds. Upland sandpipers had “apparent” (i.e. not

counting undetected nest losses) nesting success of 66% (n=47) in Wisconsin (Buss and Hawkins 1939), 65% (n=178) in North Dakota (Kirsch and Higgins 1976), 59% (n=27) in Kansas (Bowen 1976), and 50% (n=24 nests) in Illinois (Buhnerkempe and Westemeier 1988). Kantrud and Higgins (1992) used a statistical method that accounts for nests destroyed before they can be detected, to calculate (discrete Green estimator, Johnson 1991) 48% nesting success (n=617) for upland sandpipers in North and South Dakota, Montana, and Manitoba during 1963-1991; this estimate corresponds to an apparent nesting success of 67%. Nesting success by upland sandpipers in Maine, where they occupy a unique cover type (i.e. blueberry barrens) relative to the species' "norms" elsewhere across their broad range, has not been studied.

Hatching success (% of eggs that hatch) among successful nests is also quite high. Hatching success ranged from 91% (n=32 eggs) in Illinois (Buhnerkempe and Westemeier 1988), to 94% (n=400) in North Dakota (Higgins and Kirsch 1975), to 97% (n=101) in Wisconsin (Buss and Hawkins 1939). There are no estimates of hatching success for upland sandpipers nesting in Maine.

Renesting by upland sandpipers that have lost the first clutch has not been documented, but is suggested by a second peak of hatching (Buss and Hawkins 1939, Higgins and Kirsch 1975, Ailes 1976). During 1997-1999, broods (n=15) in Aroostook, Washington, and York counties, Maine, hatched as early as 15 June and as late as 10 July (A. Weik, MDIFW, unpublished data).

The young, being precocial, leave the nest within 24 hours of hatching and are typically attended to by one parent, usually the male. Parents may act aggressively toward other upland sandpipers that approach within close proximity of a young brood;

however, distress cries of young and adults resulting from an interspecific encounter may elicit strong mobbing behavior by other adults (Weik, unpublished observations). Newly hatched young weigh approximately 14-17 grams and attain near-adult weight of approximately 140 grams in 30-34 days (Buss and Hawkins 1939, Ailes 1976). Young are capable of sustained flight by 30-34 days old, at which time they are abandoned by the parents. Upland sandpiper broods disperse and may join mixed age flocks in August, and begin their southern migration by early September.

Survival and Longevity

Survival rates for upland sandpipers have not been estimated, due to low banding effort. During 1914-1998, 1160 individuals were banded and 11 bands have been recovered (USGS Bird Banding Laboratory website, 1999). The longevity record for upland sandpipers is 8 years and 11 months as determined from banding. Survival of pre-fledging young has not been investigated.

Migration

Migration by upland sandpipers seems to be relatively protracted. White (1988) found that records of South American specimens spanned August through May, indicating the migration period lasts 3-4 months in the spring and in the fall. Some birds may migrate rapidly from breeding grounds to wintering sites in southern South America, while others may linger in Central America and northern South America, and actually spend as little as 2 months on the wintering grounds (White 1988). Significant stopover sites have not been identified.

During spring, upland sandpipers migrate north through Central America. According to Bent (1929), some birds cross from Yucatan to Cuba and Florida, and migrate up the Atlantic seaboard.

During fall migration, upland sandpipers pass through interior North America, Central America and the Caribbean, and South America east of the Andes Mountains (A.O.U. 1983, White 1988). The migration path of upland sandpipers from the Northeast is not known.

Wintering

The principal wintering grounds are largely confined to grasslands in the Pampas region of Argentina and Uruguay, although numbers of birds observed since 1920 have been low (Wetmore 1926, White 1988). White (1988) noted a shift in the distribution of winter records around 1930. After 1930, upland sandpiper numbers apparently declined in Uruguay and in the province of Buenos Aires, Argentina, and increased to the north and west of Buenos Aires. Habitat loss and widespread pesticide use are thought to be largely responsible for the low numbers wintering birds observed and their change in distribution, but this is not well documented (White 1988); hunting and predation are considered of little importance. Wintering birds are rare elsewhere, although Haverschmidt (1966) reported small flocks regularly wintering in Surinam. Winter habitat used by upland sandpipers is similar to that commonly used during the breeding season in North America - short- and tall-grass sites in livestock pastures and rangeland (White 1988).

MANAGEMENT

Regulatory Authority

The first law regulating take of upland sandpipers in Maine was passed by the Maine Legislature in 1880. Chapter 50, “an act for the protection of Game and Birds” (Section 12) prohibited the killing, possession (except alive), or attempted sale of any “plover”, between 1 May and 1 September. Upland sandpipers were known as upland plovers until well into the 1900’s. The penalty for infractions of this law was “not less than five nor more than ten dollars for each bird...” Chapter 50 also prohibited the take or destruction of nests, eggs, or unfledged young, except for the purpose of preserving as specimens (Section 15; penalty of \$1 to \$10 per nest, egg, or bird), and the transportation of plovers (among others) during the closed season for that species (Section 16; penalty of \$5 per bird).

Upland sandpipers are protected from take and harassment by the Migratory Bird Treaty Act of 1918. Enforcement responsibility of this federal statute lies with the U.S. Fish and Wildlife Service.

Upland sandpipers in Maine are also protected by Maine’s Endangered Species Act of 1975. Upland sandpipers were classified as Threatened by the Maine State Legislature in 1997. MDIFW is responsible for enforcing prohibitions of take and harassment under this state statute.

In 1988, the State Legislature amended the Endangered Species Act to authorize MDIFW to designate Essential Habitat that is critical to the conservation of Endangered or Threatened species, and to develop guidelines for the protection of Essential Habitat.

Any project which occurs partially or wholly within a designated Essential Habitat, and is permitted, licensed, funded, or carried out by a state agency or municipal government, must be approved by MDIFW before project activities can take place. Essential Habitat has not been designated for upland sandpipers.

Past Goals and Objectives

There are no goals and objectives for managing this species.

Past and Current Management

Upland sandpipers have benefited from habitat management for grasshopper sparrows, a state Endangered species, at 3 sites in southern Maine: Brunswick Naval Air Station (BNAS) in Cumberland County; Kennebunk Plains Wildlife Management Area (KPWMA) in York County; and Sanford Municipal Airport (SMA) in York County. Vegetation management for grasshopper sparrows includes periodic mowing or burning to promote bunch grasses and forbs, while discouraging encroachment by woody vegetation. Suggested vegetation management at these sites includes the suspension of mowing in designated areas between 1 May and 31 August. Managers of BNAS and SMA have employed periodic (every 1 to 3 years) mowing, while controlled burns have been used to maintain habitat conditions at KPWMA. Numbers of upland sandpipers at the 4 grasshopper sparrow breeding sites in southern Maine also have been monitored during annual monitoring efforts for grasshopper sparrows (Weik 1999b).

MDIFW has tracked upland sandpiper breeding season occurrences in the Natural Heritage Biological Database since 1996. In 1989, Pierce and Melvin (1991)

surveyed grassland birds on 37 blueberry barrens and airports, and reported presence of upland sandpipers in relation to habitat characteristics. In 1996, MDIFW began preliminary field surveys for upland sandpipers in Somerset, Penobscot, Hancock, and Washington Counties (Weik 1996).

During 1997-1999, MDIFW collaborated with Massachusetts Audubon Society and Maine Chapter of The Nature Conservancy in a field survey of grassland breeding birds statewide in Maine, as well as in the other New England states and New York (Shriver et al. 1998, Weik 1999a, Weik and Purtell 2000). The coordinated region-wide effort revealed the importance of Maine to the conservation of upland sandpipers in the region (Figures 2 and 3). In particular, the blueberry fields of Washington County seem to be the center of distribution for upland sandpipers breeding in the northeastern U.S. (Figure 3).

Short of a true census, an index of the population size is valuable in monitoring population trends. Although the exact population size may be unknown, it is useful to know whether the population is stable, rising, or falling. The North American Breeding Bird Survey is an important tool for monitoring population trends of many birds across the continent. However, it does not sample upland sandpipers intensively enough in Maine to adequately monitor their population trends within the State. Weik and Purtell (2000) modeled several population monitoring alternatives for upland sandpipers in an attempt to develop a statistically valid strategy to monitor trends in Maine. They considered a monitoring program adequate if it could detect an annual population trend of $\geq 3\%$ with a power of ≥ 0.90 . An annual 3% negative trend equates to a population reduction of 26% in 10 years, or 46% in 20 years. Of the 7 alternatives modeled for

upland sandpipers (Table 2), only the strategy of 30 sites surveyed once per year over a 15 year period met this criterion. Over a 10 year period, surveying 3 times per year (on 22 sites) yields nearly-adequate results (power = 0.86). A monitoring program for upland sandpipers in which 22-30 sites are surveyed 3 times per year for 10 years, and once annually thereafter, will detect a 3% negative annual trend with power > 0.85. Any refinements in methodology that reduce the coefficient of variation among upland sandpiper counts would enhance the power of the monitoring program to detect trends, or permit a less intensive or less extensive monitoring effort (Weik and Purtell 2000).

There have been no studies of life history, productivity, or demographics of upland sandpipers in Maine, New England, or eastern Canada. The lack of this vital information hampers informed management of this species in eastern habitats.

Table 2. Power of various monitoring strategies to detect trends in an upland sandpiper (*Bartramia longicauda*) population surveyed at 22 blueberry fields and barrens in eastern Maine. Power estimates were generated in program MONITOR version 6.3 (Copyright 1995, James P. Gibbs).

Population Trend (%)	5 counts per year for 5 years*	1 count per year for 10 years*	2 counts/yr for 10 yrs*	3 counts/yr for 10 yrs*	1 count/yr for 15 yrs*	1 count biennially over 20 years*	1 count/yr on 30 plots	
							for 10 yrs	for 15 yrs
-10	0.96	0.97	0.99	1.00	1.00	1.00	0.99	1.00
-9	0.96	0.95	0.99	1.00	1.00	1.00	0.98	1.00
-8	0.92	0.93	0.99	1.00	1.00	1.00	0.98	1.00
-7	0.88	0.91	0.99	1.00	0.99	0.99	0.96	1.00
-6	0.80	0.87	0.98	0.99	0.99	0.99	0.95	1.00
-5	0.75	0.83	0.94	0.97	0.96	0.97	0.89	0.99
-4	0.66	0.71	0.88	0.92	0.93	0.94	0.77	0.97
-3	0.56	0.62	0.75	0.86	0.85	0.86	0.67	0.91
-2	0.43	0.52	0.61	0.68	0.70	0.74	0.51	0.74
-1	0.34	0.41	0.39	0.47	0.48	0.49	0.39	0.48
0	0.32	0.28	0.31	0.31	0.30	0.34	0.28	0.25
+1	0.42	0.39	0.43	0.48	0.49	0.57	0.34	0.56
+2	0.47	0.54	0.68	0.81	0.84	0.86	0.59	0.91
+3	0.63	.072	0.91	0.97	0.97	1.00	0.81	1.00
+4	0.72	0.89	0.96	0.99	1.00	1.00	0.92	1.00
+5	0.83	0.96	1.00	1.00	1.00	1.00	0.99	1.00
+6	0.91	0.99	1.00	1.00	1.00	1.00	1.00	1.00
+7	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00
+8	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
+9	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
+10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

MONITOR inputs: 22 plots monitored; number of counts/plot/survey variable; plot counts and plot variances from Table 2 in Weik and Purtell (2000); plots weighted by plot magnitudes; number of surveys (years) variable; occasions of surveys in time = annual or biennial; linear population model; variation in trends among plots = 0; significance level for trend detection = 0.1; 2-tailed test for significant trends; whole number rounding of counts; trend coverage = complete; 500 iterations performed.

HABITAT ASSESSMENT

Past Habitat

Upland sandpipers generally are associated with grasslands, often in the form of prairie, hay meadow, livestock pasture, and in Maine, grassland-barrens (lowbush blueberry). Historically, upland sandpipers in Maine typically used hay meadows and pastures (Forbush 1929, Knight 1908, Palmer 1949). Grasslands and grassland-barrens in the Northeast are not strictly an artifact of European settlement (see Askins 1997 for a thorough analysis). Agricultural clearings by Native Americans have influenced the landscape and were prominent in what is now New England long before the arrival of Europeans (Day 1954, Russell 1980). Early explorers (e.g., Champlain ca. 1604 and Weymouth ca. 1614) described meadows, fields, and regenerating hardwood scrub in lowlands from southern New England through central Maine (Day 1954, Russell 1980). Winne (1997) provided evidence that fire was important in the maintenance, and, likely, the creation, of the fire-adapted grassland-pine barren community of the Pineo Ridge barrens in western Washington County, which predated European settlement by at least several hundred years (Winne 1997). The Epping Plain, near Pineo Ridge, was described by a land surveyor in 1796 as “a plain two or three miles in diameter very poor and barren. The soil is perfectly barren and covered with a short kind of heath and no wood. It has the appearance of having been burned” (A. Baring *in* Fischer 1954). Currently, both the Pineo Ridge barrens and the Epping Plain are managed largely for commercial blueberry production, and upland sandpipers inhabit both sites during the breeding season.

The amount of open land increased through the 1800's as colonists cleared forest for farming. By 1880, one-third of the state was in farm land (Day 1954). Most land clearing occurred in southern and central Maine, areas of 13 counties in which Knight (1897) reported upland sandpipers as a "common" summer resident. During the 1880's through the turn of the century, many farms were abandoned and land began to revert to forest. Peak abundance of upland sandpiper habitat in Maine probably coincided with the high in farm area during the latter half of the 19th century.

Farmland, and probably more importantly for upland sandpipers, pasturage, have decreased steadily since 1930, when nearly one-fourth of the state was in agriculture (Table 3). Approximately 7% of the state was in agriculture in 1982, and by 1997 only 6.1% of the state was classified as farmland. From 1880 to 1997, pasture acreage decreased by 96%.

Table 3. Trends in selected agricultural land uses (1880-1997) in Maine. Data from Census of Agriculture, U. S. Bureau of Census.

	1997	1982	1930	1880
Land in farms (acres)	1,211,648	1,468,674	4,639,938	6,552,578
% of State total	6.1%	7.4%	24.3%	33.1%
Cropland used only for pasture (acres)	65,066	86,726	499,461	1,620,772
Land in wild and tame hay (acres)	148,402	161,925	N/A	N/A
Land in blueberries harvested:				
Maine (acres)	23,693	21,186		+10.6%
Hancock & Washington Counties (acres)	20,480	17,565		+14.2%

In addition to the decrease in quantity of farmland, particularly pasture and hay, there has likely been a decrease in the quality of these cover types as potential habitat

for upland sandpipers. Improvements in technology during the past 30 years have enabled farmers to harvest hay crops earlier, before nesting birds have completed incubation or young are sufficiently mobile to escape the mowing machinery, and thus production of young likely has been reduced.

Despite a long term decline in farm area in Maine, recent expansion of wild blueberry cultivation may have provided upland sandpipers with additional habitat. From 1987 to 1997, area of blueberry fields harvested increased 10.6% statewide; the increase in area of harvested blueberry fields within Washington and Hancock Counties, where upland sandpipers are most abundant, was 14.2% during this period. Further, the quality of some blueberry fields as upland sandpiper habitat may improve, as many existing blueberry fields have been enlarged by clearing adjacent forest in recent (1996-1999) years (A. Weik, MDIFW, personal observation); upland sandpipers are area-sensitive, preferring larger area sites (Vickery et al. 1994, Weik 1999a).

Current Habitat

In Maine, upland sandpipers primarily use managed or reverting blueberry fields, and also use grass portions of runways at several airports. Breeding season use of hay fields and pastures is uncommon, but annually occurs on at least two traditional sites. The first breeding season occurrence of upland sandpipers on a peatland in Maine was documented in 1999 (Weik and Purtell 2000).

Upland sandpipers require a large-area grassland-barren. Vickery and others (1994) reported upland sandpipers in southern and eastern Maine grassland-barrens were uncommon on sites <50 ha and reached a 50% incidence on sites of about 200

ha. Estimated areas of managed and reverting blueberry fields, and grassed air strips provide an index to potential upland sandpiper habitat, although it is unlikely that many of the smaller (<50 ha) sites are suitable. Estimated areas of hay meadows and livestock pastures, cover types formerly important to this species in Maine, would drastically overstate the amount of habitat available to upland sandpipers.

In 1997 there were 23,693 acres of commercial lowbush blueberry fields harvested in Maine, 86% of which were in Hancock and Washington Counties (Bureau of Census 1999). These figures reflect approximately half of the commercial blueberry lands, as lowbush blueberries are managed to produce a crop biennially. As of 1998, upland sandpipers occupied 7 airports and one state-owned wildlife management area (Kennebunk Plains).

Habitat Projection

Whether area of blueberry cultivation continues to increase will depend on the demand for Maine wild blueberries, future costs associated with blueberry production (including availability of irrigation), and availability of suitable land for conversion to blueberry fields. All indications are the area in blueberry cultivation will continue to increase beyond the 1997 level, but this increase may be tempered by uncertainty associated with future availability of water for irrigation (Bangor Daily News: July 10-11, 1999).

Improvements in vegetation management at airports may increase the quality of these sites for upland sandpipers. However, the number of airports with suitable habitat is not predicted to change in the next 10 years.

POPULATION ASSESSMENT

Past Population

The abundance, or even existence, of upland sandpipers and several other common grassland birds in the Northeast before colonization and forest clearing by Europeans is unclear. Upland sandpipers and other grassland birds were documented by the first ornithologists to systematically identify and record birds along the east coast of North America, but this was approximately 100 years after much land in the East had been cleared, and so it is possible that some Midwest prairie birds invaded newly-cleared eastern grasslands long before they were first documented (Askins 1997).

During the late 1800's, Knight (1897, *in* Palmer 1949) indicated that upland sandpipers could be found in all 16 of Maine's counties: a "common summer resident" in 13 counties, "common" in Waldo and Aroostook Counties, and also recorded in Knox County. Several authors reported a rapid decrease in upland sandpipers across their range from Maine to the Midwest during the 1890's, the result of over-gunning by market hunters (Forbush 1929, Buss and Hawkins 1939, Palmer 1949). Within just several years, Knight (1908) wrote: "Though this species formerly occurred commonly during the migrations and was not rare as a summer resident of various parts of the State, it is now decidedly less common and the number of breeding birds which occur in the State are very few."

Upland sandpipers gained federal protection from take in 1918 with passage of the Migratory Bird Treaty Act. Palmer (1949) reported that records of upland sandpipers in the State were few until after 1920. Numbers apparently "increased

slowly” and the species reestablished itself on sites in Cumberland, Androscoggin, Kennebec, and Penobscot Counties (Palmer 1949). Weik (1999a) found upland sandpipers during the breeding season in 9 counties. The species has been recorded regularly on the BBS (Sauer et al. 1996), as well as in the Maine Breeding Bird Atlas (Adamus 1984).

Current Population

Upland sandpiper populations are notoriously difficult to estimate accurately, due in large part to our lack of understanding of their movements, home range, habitat use, behavior, and intra- and interspecific interactions during the breeding season. They may nest colonially or as isolated pairs. Several pairs may use one large grassland-barren, or one pair may use several smaller, disjunct sites in close proximity to one another. Courtship flights can be difficult to interpret due to the high altitude and large area sometimes covered by displaying birds. Incomplete understanding of upland sandpiper behavior, coupled with limited access to breeding habitat by observers, have precluded an accurate estimate of their population size.

Survey work to date (Pierce and Melvin 1991; Weik 1996, 1999a; Weik and Purtell 2000) has provided information on species occurrence, distribution, and relative abundance. Weik (1997) conservatively estimated approximately 148 pairs of upland sandpipers occupied 59 grassland-barrens and airports in 9 counties; Pierce and Melvin (1991) recorded at least 12 individuals on 5 additional sites in Hancock and Kennebec Counties. Three additional breeding season observations of upland sandpipers were recorded in 1999 (Weik and Purtell 2000). The total number of breeding pairs of upland

sandpipers in Maine during the 1990's was likely in excess of 160 pairs, although the exact number is unknown and undoubtedly varies annually.

Population Projection

It would be reasonable to expect the population to fluctuate in relation to fluctuations in quantity and quality of habitat, as well as in response to varying survival and production. However, it is impossible to predict future populations without reliable information on current population size, survival rates, and productivity (number of young that reach flight age / breeding pair). Until a program to monitor population trends is instituted, it will be impossible to detect population growth or decline among upland sandpipers in Maine.

Limiting Factors

Limiting factors to population growth for upland sandpipers breeding in Maine are largely unknown. Upland sandpipers, which require large area mosaics of grassland-barrrens for reproduction, are likely limited by sufficient habitat suitable for breeding. Other potential limiting factors include mortality among adults on breeding grounds, wintering grounds, or during migration; mortality of eggs or nests (e.g., factors affecting fertility and nest attendance of adults, and nest predation); mortality of young on the breeding grounds; habitat quantity and quality on migration stop-over sites and on the wintering grounds; and availability and quality of food on the breeding grounds, during migration, and on the wintering grounds.

USE AND DEMAND ASSESSMENT

Historically, upland sandpipers were prized and much sought after for their meat. It is probable that over-gunning by market hunters during the 1890's led to a rapid decrease in upland sandpipers across their range from Maine to the Midwest (Forbush 1929, Buss and Hawkins 1939, Palmer 1949). Forbush, in Birds of Massachusetts and other New England States (1929), wrote of upland sandpipers: "The tale of the destruction of this lovely bird is a sad one. Harmless and eminently useful, it nevertheless is one of the most luscious morsels to delight the epicurean palate, and so the greed of man has almost swept it from the earth. The market demanded it and got it."

Several authors (Knight 1908, McAtee and Beal 1912) commented on upland sandpipers' usefulness to agriculture alluded to by Forbush (1929) in the preceding paragraph. Knight (1908) wrote: "It seems highly probable that the species in question is one of the most beneficial birds we have. They frequent uplands and fields and feed almost entirely on grasshoppers and crickets in late summer, consuming millions of them. They also eat various other species of insects and larvae". Although no research has been conducted on feeding habits in the East, upland sandpipers in Maine blueberry fields are suspected to feed on several agricultural pests, including grasshoppers, crickets, and caterpillars of the blueberry spanworm.

Upland sandpipers have long been appreciated for aesthetic qualities, and appear in popular literature as harbingers of spring (Forbush 1929, Spiller 1935, Leopold 1949). Aldo Leopold, in his classic A Sand County Almanac (1949), wrote of

the upland sandpiper: “When dandelions have set the mark of May on Wisconsin pastures, it is time to listen for the final proof of spring. Sit down on a tussock, cock your ears at the sky, dial out the bedlam of meadowlarks and redwings, and soon you may hear it: the flight-song of the upland plover, just now back from the Argentine”.

Wildlife observation, particularly birding, provides tremendous recreational opportunity and adds to the quality of life of many residents and visitors of Maine. Approximately 454,000 people spent 2.9 million days on trips to watch wildlife in Maine during 1996 (USDI 1996). Upland sandpiper is a species of special interest to birders in the State (Pierson et al. 1996). An estimated 46% of Maine residents 16 years old and older participated in wildlife watching, where the enjoyment of wildlife was the primary purpose of the activity (USDI 1996); of Maine residents who actively watched wildlife, 98% indicated bird watching was a focus.

Wildlife watching, including bird watching, adds considerably to Maine’s economy. Direct expenditures related to wildlife watching by residents totaled over \$98 million in 1996, and nonresidents spent approximately \$122 million on goods and services to watch wildlife in Maine (USDI 1996). However, the number of Mainers who traveled >1 mile away from home to watch wildlife during 1996 declined 35% since 1991, and wildlife watching related expenditures by Mainers were down 30% during the same period. The decline in wildlife watching participation among Mainers is consistent with a national trend during the same time period (1991-1996). Nonresidents continue to come to Maine to watch wildlife; during 1996, nonresidents watching wildlife in Maine numbered 321,000, unchanged from the 1991 survey, and their related expenditures were unchanged as well.

SUMMARY AND CONCLUSIONS

Upland sandpipers require large-area grassland-barrens, a cover type in Maine that has been dependent on human land use activities or wild fire since prehistoric times. The species was a common summer resident in most counties of the State during the latter half of the 19th century, a time when farmland area peaked, but unregulated market hunting caused widespread declines by 1900. Upland sandpipers gained federal protection in 1918 with enactment of the Migratory Bird Treaty Act. Since 1920, upland sandpipers have slowly increased and reoccupied former sites, even as farmland has declined.

Recent region-wide surveys have shown the center of distribution for upland sandpipers breeding in Maine, as well as in New York and New England, to be the blueberry barrens of Hancock and Washington Counties; airfields throughout the state also provide important habitat. A lack of basic natural history research of upland sandpipers in Maine cover types has precluded an accurate understanding of limiting factors, and has limited our ability to accurately estimate population size. Although habitat is projected to remain stable or increase in the next planning period (2001-2015), trends in the upland sandpiper population will be impossible to detect without instituting a monitoring program.

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