Distribution and habitat preference of the Upland Sandpiper (*Bartramia longicauda*) in Wisconsin

Breeding concentrations are found where present-day landscape features resemble the historic short-grass prairie habitat

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In his *Sand County Almanac* Aldo Leopold (1966) appropriately devotes his essay on "May" to a discussion of the Upland Sandpiper:

> When dandelions have set the mark of May on Wisconsin pastures. . . Sit down on a tussock. . . 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.

The association between the bird, the season, and the habitat are as strong as the Upland Sandpiper is an animation of grace.

The distribution and population of the Upland Sandpiper in North America have fluctuated over the last several centuries. Before European settlement, this species populated shortgrass prairie, with some observers reporting the bird "in profusion on prairies of the interior" (Coues, 1903). As forests were converted into farms, the Upland Sandpiper was able to extend its range eastward and to increase its numbers owing to great acreage in pasture and meadow (Grimm, 1953). Then, in the late nineteenth and early twentieth centuries, heavy market hunting brought this bird close to extinction. With the protection offered by the Migratory Birds Convention Act of 1916, the Upland Sandpiper eventually began to recover (Mitchell, 1967). Over the last 40 years, however, research has suggested that land uses such as prairie cultivation, wetland drainage, and heavy grazing have decreased habitat suitable for the bird (Ailes, 1980; Kirsch and Higgins, 1976; Hine, 1973). Today, the Upland Sandpiper is on several endangered species lists (*e.g.*, Illinois and Ontario) and has been Blue-listed for the past seven years (1975-1981) with expression of concern in at least seven states (Tate, 1981).

This paper presents information on the distribution and preferred habitat of the Upland Sandpiper in Wisconsin. It adds to a data base for monitoring future changes in the numbers and habitat selection of the species, and thus contributes to the design of a management program for maintaining Upland Sandpiper populations. It also serves to illustrate the ability of a bird to adapt to human activity and land use change.

METHODS

The distribution of the Upland Sandpiper in Wisconsin was determined from several sources: Wisconsin

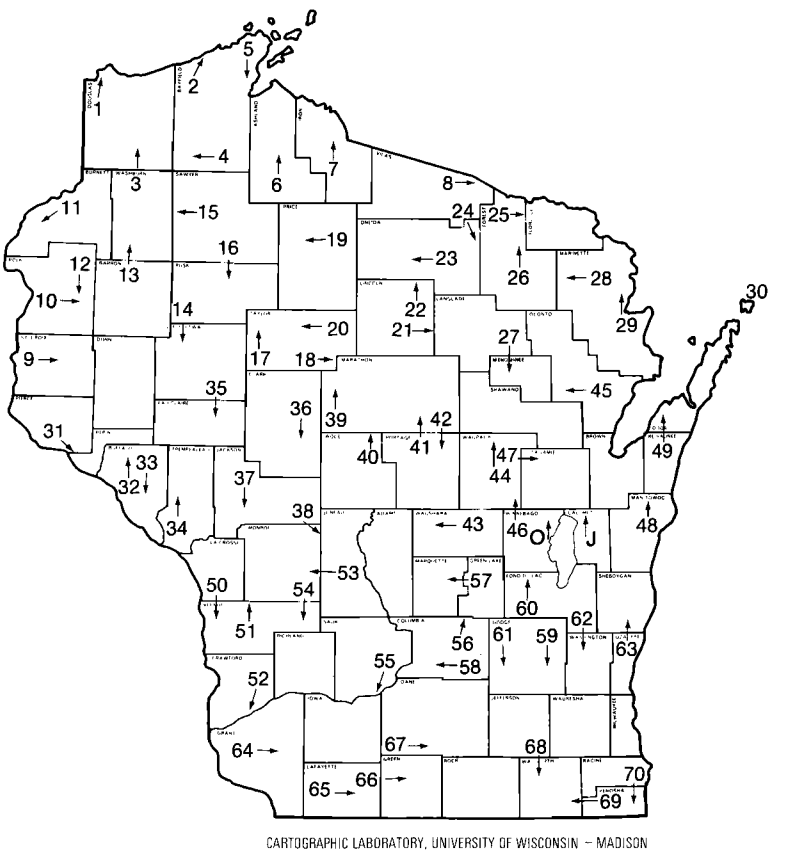


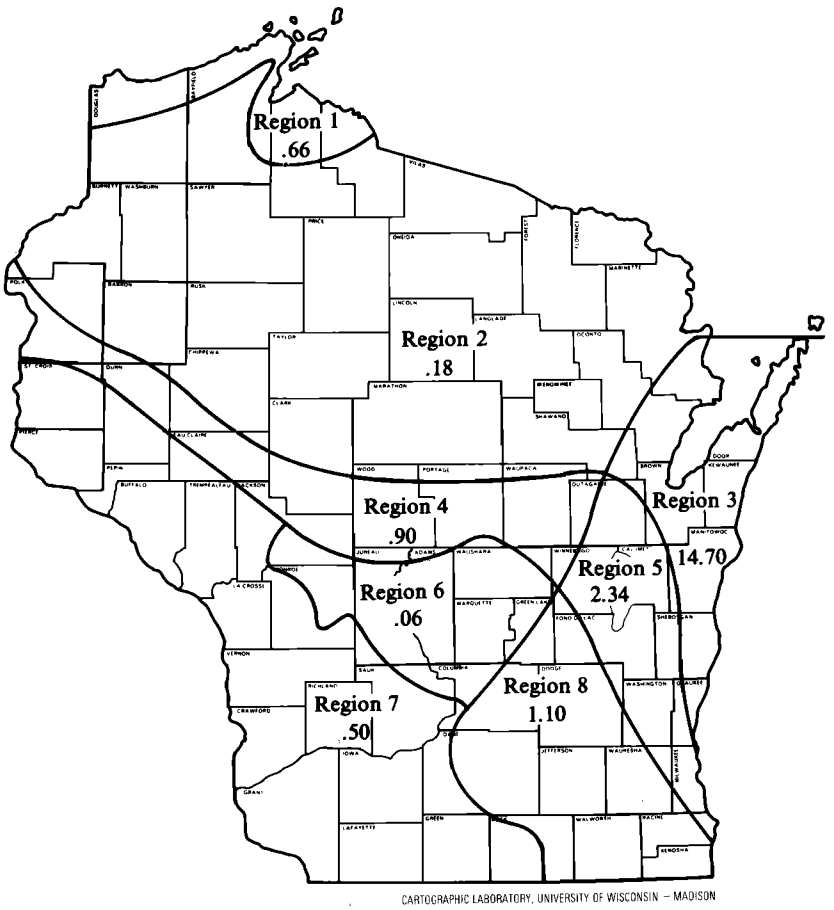
Figure 1. Wisconsin degree blocks and location of B.B.S. routes; Routes 49, 62, O, and J were censused for this study in 1979.

Department of Natural Resource (W D N.R.) employees, Wisconsin Society for Ornithology (W.S.O.) members, Breeding Bird Survey (B.B.S.) data, and my own 1979 census data. The W D N.R. and W.S.O. reports have been recorded since 1973, and were available in the form of observation cards and a map of these observations plotted by township. The B.B.S. data for Wisconsin provided records of Upland Sandpipers heard or seen along 70 road routes run by automobile once each breeding season since 1966 (Figure 1) Briefly, this technique involves 24.5 mile (39.5 km) routes with 3-minute stops every one-half mile (0.8 km) for a total of fifty stops. Each route is started 30 minutes before sunrise and takes about four hours to complete. (For details of this survey technique and North American coverage see Robbins and Van Velzen 1967 and 1969). Robbins (1977) divided the state and its B.B.S. routes into eight biogeographical regions using a combination of divisions proposed by Martin (1965) and Curtis (1959), this regionalization permits an easy portrayal of patterns of species abundances (Figure 2).

My 1979 data consisted of four survey routes, censused with the B.B.S. method eight times each between April 21 and June 24. Two of these routes were established B.B.S. routes (Route 49 in Region Three and Route 62 in Region Five), the remaining two were chosen to cover areas with reports of Upland Sandpipers by W.D.N.R.-W.S O. members but not previously covered by a B.B.S. route (Route O and J in Region Five—Figure 1). Three additional routes were censused in Region Five one time only. This increased route coverage of Region Five from a single B B S route to six routes in 1979.

HABITAT PREFERENCE of the Upland Sandpiper in Wisconsin was determined by evaluating two summaries of land use, townships and survey routes, and by summarizing habitat characteristics in locales where nests have been reported. First, agricultural land uses of townships with and without Upland Sandpipers were summarized using data collected by assessors for the Wisconsin Rural Resources Crop and Livestock Reporting Service. I also analyzed the history of land use in the Faville Grove Wildlife Area, an area which was reported to have 25 nesting pairs of Upland Sandpipers in 1938 (Buss and Hawkins, 1939) and none in 1979. Second, 21 survey routes were chosen to represent extremes in both high and low Upland Sandpiper counts (based on past B.B.S. data). A habitat classification system similar to that of Weber and Theberge (1971) was devised and applied to each of the routes. Agricultural and non-agricultural land uses (pasture, corn, oats, hay, and forests) and other environmental features (habitat edge, presence of wooden fence posts, topography) thought to be important to good Upland Sandpiper habitat were assessed.

The area covered by each of the five habitat types within a 0 25 mile (0 5 km) radius of each of the 50 stops on a given route was estimated to the nearest ten per cent Data for each of the fifty stops were totaled for each route. The three environmental features were handled individually. A habitat edge rating, from zero to two, was assigned to each stop. A two was assigned whenever forest was present, indicating an abundance of forest-nonforest edge. A rating of one was assigned to the stop if hedgerows of scattered trees were present, and a zero was assigned if the fields were unbroken within the 0.25 mile radius. The possible maximum edge rating of 100 for any given route would signify a route with small, broken fields. The presence of wooden fence posts was noted by assigning one point for each stop with such a post within the 0.25 mile radius. Thus, a route



Region 1:	**Lake Superior Lowland (3 routes)**	**Region 5:**	**Tension Zone East (1 route)**
Region 2:	**Northern Highland (30 routes)**	**Region 6:**	**Central Sand Area (3 routes)**
Region 3:	**Lake Michigan Lowland (3 routes)**	**Region 7:**	**Western Upland (15 routes)**
Region 4:	**Tension Zone West and Central (8 routes)**	**Region 8:**	**Southeastern Cropland (7 routes)**

Figure 2. Eight biogeographical regions of Wisconsin; numbers on the map are the average number of Upland Sandpipers counted per regional routes.

with fence posts at all stops received a rating of fifty, a route with fence posts at only ten stops received a rating of ten, and so on. For topography, a value between zero and four was assigned to each side of the road at each stop. For example, a flat route would have zeros assigned to both sides of the road at each of the 50 stops for a rating of zero, and a route with maximum relief would have fours assigned to both sides of the road at each of the fifty stops for a rating of 400. These values for stops were summed in the final analysis. The final method to determine habitat preference focused on nest data. Habitat types were summarized for 89 Upland Sandpiper nests reported by the Laboratory of Ornithology at Cornell University and 46 nests reported in the literature.

RESULTS AND DISCUSSION

Distribution

THE DISTRIBUTION OF the Upland Sandpiper in Wisconsin is scattered, with birds found in counties all over the state (Figure 3). The northern, heavily forested counties have few reports of breeding pairs. Concentrations occur in scattered locations in the central and southern parts of the state. The greatest concentration of birds is in eastern Wisconsin, in Robbins' (1977) Region Three and a lesser concentration in Region Five. Using B.B.S. routes alone, Region Three has an average of 14.7 birds per route (averaged over three routes for fourteen years). When the 1979 survey data is added to the B B.S. counts, Region Five has an average of 2.3 birds per route (averaged over one route censused for 14 years, five routes surveyed in 1979 only). All other B B.S. regions have an average of only 0 to 1.1 birds per route (Figure 2).

Population Trends

FOR THE STATE as a whole, the Upland Sandpiper count peaked in 1971 and was lowest in 1979 (Figure 4). The total count decreased in both 1978 and 1979, the only two-year decline between 1966 and 1979. The numbers of birds for the years before 1966, the reasons for the fluctuations, and whether the most recent decline is a short term fluctuation or long term trend are unknowns.

At the regional level, all regions except Region Three have low but fairly constant Upland Sandpiper sightings for the 14-year period 1966-1979 (Figure 4). Region Three has more fluctuation but it is the only region with birds reported for every census year on all three routes and in numbers exceeding five birds per route.

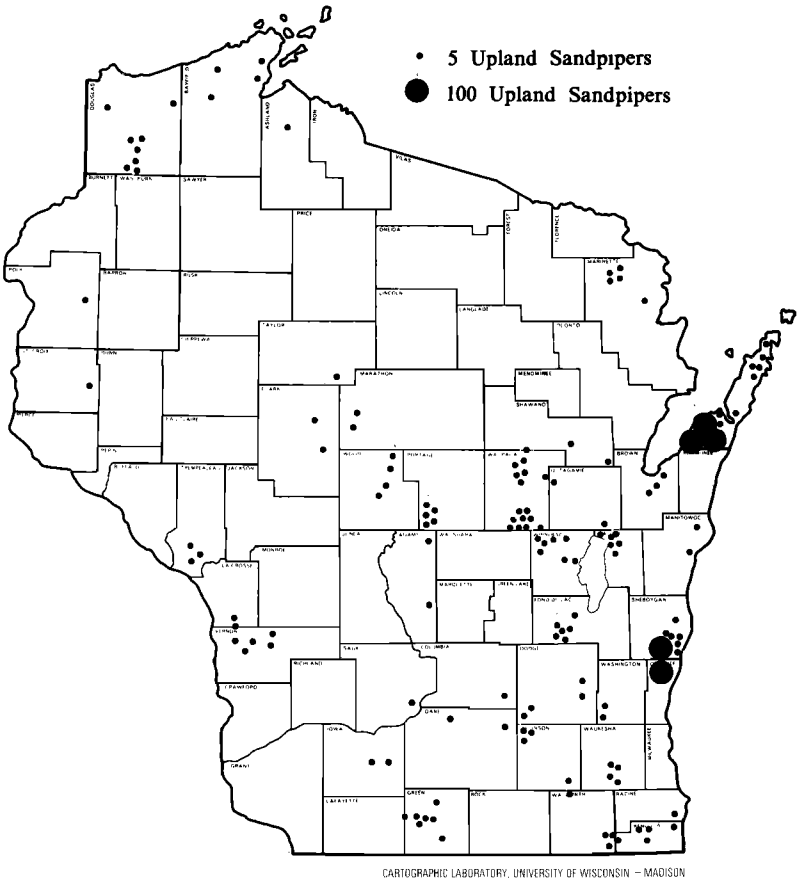


Figure 3. Distribution of the Upland Sandpiper in Wisconsin; W.D.N.R.-W.S.O. observations (1973-1979), B.B.S. data (1966-1979), and census data (1979).

Many routes had Upland Sandpipers in only one or two of the 14 years of recorded census. A comparison of the years of Upland Sandpiper presence on these routes with the general population trend for the state shows a tendency for birds to be found on these routes either during a population peak or an upward trend in the state's sandpiper population (Table 1). Apparently the bird uses more locations, perhaps seeking out less-than-optimal habitat, during times when its population is high.

Habitat Preference

AGRICULTURAL LAND use summaries show that townships with Upland Sandpipers have more land in hay and oats and less land in corn than townships without Upland Sandpipers

Table 1. Wisconsin B.B.S. routes with Upland Sandpipers in one or two years only

Route number	*Region*	*Year (s)*	*Number of birds*	*Wisconsin population trend**
9	7	1967	1	up
13	2	1967	1	up
16	2	1969,1977	1,1	up,peak
21	2	1974	1	up
26	2	1969,1970	1,1	up,up
35	2	1973	1	up
45	2	1970,1971	1,1	up,peak
53	7	1977	1	peak
54	7	1970,1972	1,2	up,down
57	6	1969,1973	1,1	up,up
61	8	1966	2	unknown**
62	5	1970	2	up
64	7	1971	2	peak
65	7	1966,1967	1,1	unknown**,up
67	7	1966	2	unknown**

*based on B.B.S. data 1967-1969. **first year of census.

(Table 2) Door County's townships alone, with considerably more reports of Upland Sandpipers than any other townships in the state, have more than half of their assessed land in hay, 29% in oats, and only 18% in corn. From these data we might assume that Upland Sandpipers are choosing townships with high hay and oats and low corn acreages, a supposition that would seem to be consistent with the bird's natural habitat.

In the temporal comparison of land use in the Faville Grove Wildlife Area, an area with a marked decline of Upland Sandpipers, corn acreages had the largest increase of 24% and oats the largest decrease of 22% (Table 3). Hay also increased by 8.3%. The association of few birds with large corn and small oats acreage coincides with the previous township assessment report. The increase in hay would seem to be a change that would result in larger numbers of Upland Sandpipers, but the large increase in corn and decrease in oats seems to be overriding factors when land use alone is considered. Statewide there has been a similar trend in the land supporting corn and oats; between 1967 and 1979 corn acreages increased 47%, oats decreased 44%. In addition, some farmers may be using prepared feed for their cattle all year, replacing summer pasture—an important breeding habitat for Upland Sandpipers (Table 6)—with cornfields. Thus, in the Faville Grove Wildlife Area in particular and the entire state in general, there is a trend toward less acreage in short grass and therefore less nesting habitat available for Upland Sandpipers.

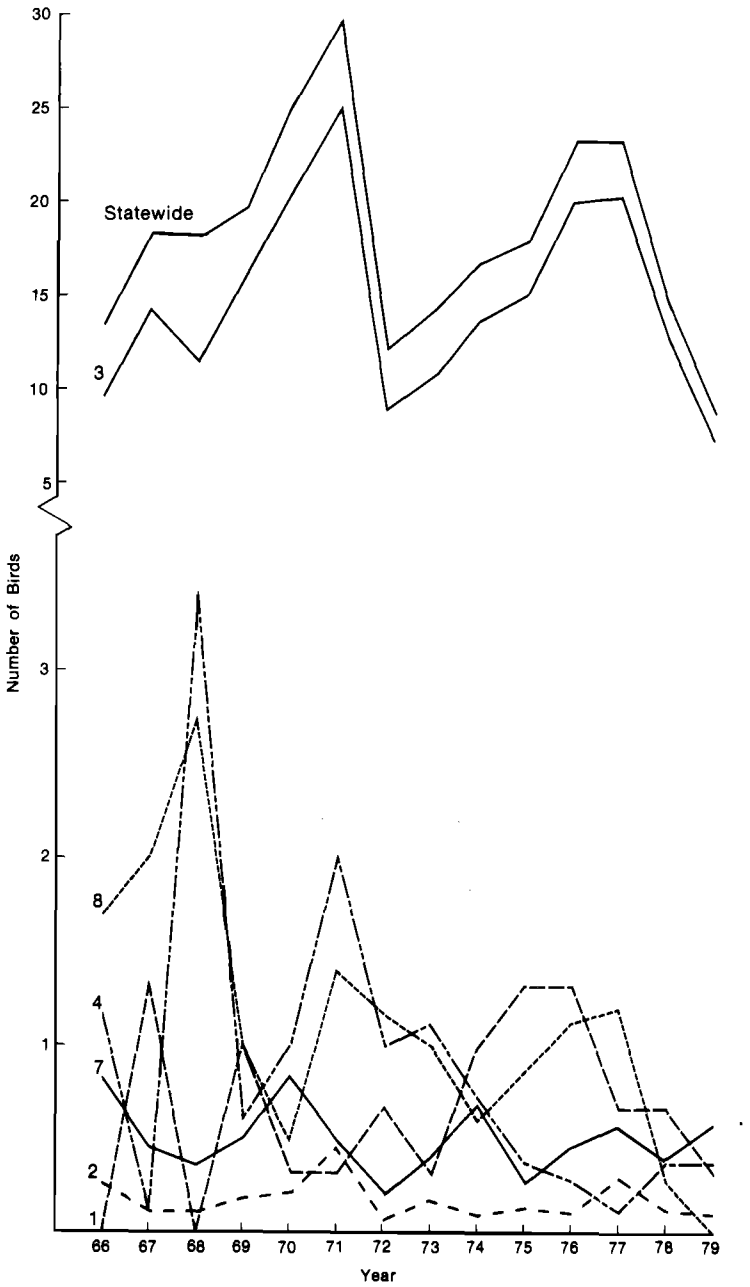


Figure 4. Numbers of Upland Sandpipers counted per routes censused in each B.B.S. region and statewide, 1966-1979. (Regions Five and Six had zero birds in most years and are not shown.)

Table 6. Percentage of Upland Sandpiper nests in specific land use types (values derived from 553 nest sightings from Cornell Laboratory nest records and surveyed literature).

Land use type	*Percentage*
Pasture:	38.2
grazed	12.1
ungrazed	2.2
burned	21.0
unburned	2.9
Prairie-Grassland	28.0
Idle Land: surburban fringe, stubble fields and highway right-of-ways	16.0
Hayfields	7.0
Clearings in woody growth	5.4
Tilled land and growing grain	3.1
Airfields and shooting ranges	1.8
Marsh	0.5

Factors other than simple land use acreages apparently influence population sizes. The habitat features for census routes with high Upland Sandpiper counts show that certain features are more important to sandpiper habitat than others. These features include not only high acreages in oats, hay, and pasture, but also little area in forest, lack of rugged topography, the presence of fence posts, and a low vegetation "edge" rating (meaning that the agricultural fields are large and unbroken). The presence and prevalence of these features on all B.B.S. routes are not always of equal importance. Route 49 rates outstanding for Upland Sandpipers habitat with high oats, high hay, low forest, level topography, and minimum edge (Figure 5), Route 63 rates high in sandpiper habitat with small forest percentages, level topography, and minimum edge. These two routes (both in Region Three) account for more of the Upland Sandpipers in Wisconsin's B.B.S counts than the state's other 68 transects. In contrast, B.B.S. Route 62 has only two Upland Sandpipers counted for the 14-year census period

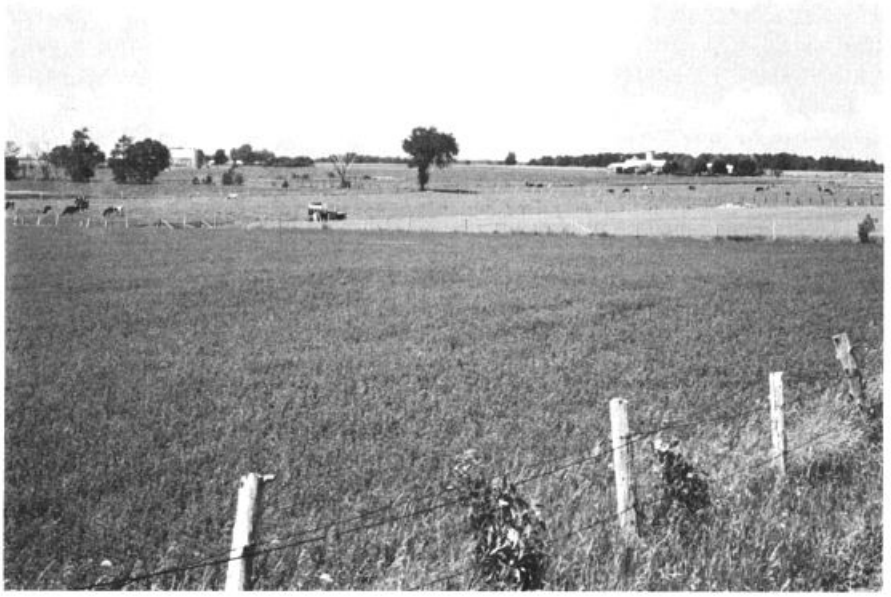


Figure 5. Route 49 in B.B.S. Region Three—high acreages in oats and hay, low acreage in forest, level topography, and minimum edge.

and yet had a habitat composition of high hay acreage and low corn (Table 4). The most striking difference between this route and routes with birds is the topography rating. Route 62, situated just west of the Northern Kettle Moraine State Park, has many kames and drumlins with a topography three times as rugged as the route in Door County. The lack of flat land and associated large open fields on Route 62 seems to be the best explanation for its lack of Upland Sandpipers.

In a second example, B.B.S. Route 66 has a high topography rating as well as a fairly high average count for Upland Sandpipers. Wooden fence posts, found on 47 stops, are an important feature in Upland Sandpiper display. This feature however, has possibilities of substitutions (rock piles, tree stumps) and it is unlikely that fence posts alone are essential to the bird. Also present on this route are a small forest percentage, high field percentage, and a low edge rating—all translating to an environment of large, open fields. When combined with the fence posts, this route is favorable for Upland Sandpiper presence. In addition, while Route 66 is found in Region Seven, which is the most highly dissected part of the state (the Driftless Area), this route is one of the flattest routes, with the lowest edge rating of the six routes summarized for habitat in this region. Thus, when sandpipers are found in areas which appear to be less suitable (when compared to the optimal routes in Region Three) they are found on the flatter, most open field areas available on suboptimal routes. As a final example, Route One in B.B.S. Region One, has Upland Sandpipers present but less than 50% acreage in fields (Table 4). At the time of habitat summary for this region, areas of tree cutting and farm extension were noted (Figure 6). This route may be an example of habitat expansion of the species into an area where forest is being cleared and the land converted to pasture.

To be certain that the sandpipers were using some discretion in habitat selection I used a test which allowed emphasis of some habitat features over others. The percentages of pasture, corn, oats, hay and forest and the categories for vegetation edge, topography and fence posts were included in a habitat suitability index for all stops (n = 150) on three of the 1979 census routes. The higher the index of a stop the greater the number of features present which attract Upland Sandpipers (Table 5). Stops with and without Upland Sandpipers present were divided into three suitability index levels: low index (0-29), medium index (30-39) and high index (40+). The results show that the sandpipers are not selecting nesting habitat at random; stops with Upland Sandpipers on these three routes are significantly different from stops without birds at the 0.001 level ($x^2 = 16.89$, greater than 13.815 with 2 degrees of freedom).

A review of nest habitat actually used by the Upland Sandpiper was the final method for determining habitat preference of this species. Pasture was the most frequently used habitat type with 38% of the total nests; 21% of these nests were found in burned pasture (Table 7). Prairie-grassland habitat contained 28% of the total nesting sites, while idle land, including suburban fringe, stubble fields and highway rights-of-way was associated with 16% of the total nests. Hayfields provided only 7% of the nest locations.

Table 2. Land use composition of townships with and without Upland Sandpipers (percentages figured from total land in farms assessed by 1978 USDA Crop Reporting Service*).

Crop	*Door County townships*	*Townships with sandpipers*	*Townships without sandpipers*
Hay	53%	47%	44%
Corn	18	36	41
Oats	29	17	15

*Total land assessed: Door County townships = 55,257 acres, Townships with sandpipers = 237,570 acres, Townships without sandpipers = 231,919 acres.

Table 3. Land use change in Waterloo Township of Jefferson County (1938 to 1978). (Percentages figured from total land in farms assessed by 1938 and 1978 USDA Crop Reporting Service*).

Crop	*1938 (25 pairs)*	*1978 (0 pairs)*	*Change*	*Probable impact on sandpipers*
Hay	17.2	25.5	+8.3	+
Corn	34.8	58.8	+24.0	–
Oats	29.4	7.4	−22.0	–
Barley, Wheat, Rye	14.0	0.8	−13.2	–
Specialty (Peas, Soy, Potatoes)	4.6	7.5	−2.9	–

*Total land assessed: 1938 = 19,462 acres, 1978 = 15,921 acres.

Table 4. Habitat summaries for five B.B.S. routes (numbers in percentages).

Route	*49*	*63*	*62*	*66*	*1*
Region	*Three*	*Three*	*Five*	*Seven*	*One*
Field	87.6	90.0	86.4	91.4	27.8
Pasture	8.6	5.6	6.8	18.2	5.2
Vacant	6.2	5.6	10.4	7.2	19.4
Plowed	1.8	6.0	1.6	0.0	0.0
Corn	10.4	27.8	18.4	26.4	0.0
Oats	20.2	11.6	13.2	7.4	0.2
Wheat	0.0	2.0	0.2	0.0	0.0
Hay	40.4	26.8	35.8	32.2	3.0
Specialty	0.0	4.6	0.0	0.0	0.0
Forest	11.6	6.0	11.8	7.6	71.8
Lake/Marsh	0.8	0.0	1.8	0.0	0.4
Urban	0.0	4.0	0.0	1.0	0.0
Topography[1]	72	87	212	198	111
Edge[1]	75	69	85	76	100
Fence Posts[1]	43	37	11	47	15
# of Upland Sandpipers					
1979	14	7	0	—	0
Route Average	22.1	14.6	0.14	2.5	0.54
Total	265	204	2	33	7

[1]These 3 categories are *Index scores*.

An additional factor to note in this study of Upland Sandpiper habitat preference is that while these birds are more closely associated with hay at the township level, the amount of oat acreage is a more important association between census routes with and without Upland Sandpipers and in the temporal comparison of land use in the Faville Grove Wildlife Area. To explain this discrepancy a closer examination of the cropping system in this state is necessary.

A typical crop sequence for a Wisconsin farm usually includes an initial combined planting of oats and hay, the oats planted as a nurse crop to discourage weed growth in the slower-growing crop of alfalfa (Ron Jensen, Agr. Extension, U.W.-Madison, pers. comm.). The oat crop is then harvested in late May, allowing a stand of alfalfa to grow rapidly with increased sunlight and reduced competition from the oats. These first alfalfa crops are lower-yielding than coarse rank crops grown in the same fields in subsequent years. Oatfields then, indicate a subsequent presence of an alfalfa crop which will, in its initial year, closely resemble the shortgrass prairie to which the Upland Sandpiper is attracted. Therefore, some of the hay acreage recorded at the township level may have also been oatfields used by Upland Sandpipers in May but assessed as hay, hay being the primary crop.

Figure 6. Route 1 in B.B.S. Region One—an area of tree cutting and farm extension.

CONCLUSION

Explaining Upland Sandpiper Distribution

As this study has indicated, fields of hay, oats, pasture, and idle land are used for feeding or nesting by Upland Sandpipers. These cover types closely resemble the structure and morphology of the prairie-grassland vegetation associated with the Upland Sandpiper previous to increased agricultural activity. Acreages of hayfields at the township level and percentages of oatfields on census routes were high in areas where Upland Sandpiper densities were also high. Where corn, an agricultural crop which does not duplicate prairie-grassland vegetation in terms of structure, was abundant, there were fewer sandpipers and, in fact, a reported decline in the Faville Grove Wildlife Area.

Upland Sandpipers have also been found nesting or feeding on football fields and airports (Stout, 1967; Haverschmidt, 1966; Beck 1942; Gardiner, 1932; and Weston, 1931). In 1979, I found sandpipers feeding at two airports in eastern Wisconsin. The Upland Sandpiper can apparently adapt to agricultural crops and additional human-made landscapes which retain a flat topography and grass vegetation similar in life form to the shortgrass prairie vegetation (Figure 7).

The present breeding population of the Upland Sandpiper for the state may also indicate this bird's adaptability. According to Franklin (1980) an average number of Upland Sandpipers recorded by W.D.N.R.-W.S.O. reports (1973-1979), B.B.S. data (1966-1979) and the 1979 census routes for any given year indicate that the Upland Sandpiper breeding population in Wisconsin is above a minimum effective population size. A more certain statement about the population status of the species cannot be made until more specific information is collected on breeding success and causes for the two-year population decline from 1978 to 1979.

Table 5. Sample table of habitat suitability indices for stops on survey routes

Route 49		*Pasture*	*Corn*	*Oats*	*Hay*	*Forest*	*Edge*		*Topography*	*Fence Posts*
Stop	*Up.S.*	*Index*								
31	1	46	5	10	10	5	10	5	0	1
32	0	36	5	10	5	0	10	5	0	1
33	4	36	10	10	5	5	5	0	0	1
34	8	51	5	10	5	10	10	5	5	1
35	3	36	5	5	10	5	5	0	5	1
36	2	51	5	10	10	10	10	5	0	1
37	0	41	0	10	10	5	10	5	0	1
38	0	31	5	0	0	5	10	5	5	1
39	4	46	10	5	5	5	10	5	5	1
40	0	51	5	10	10	10	10	5	0	1

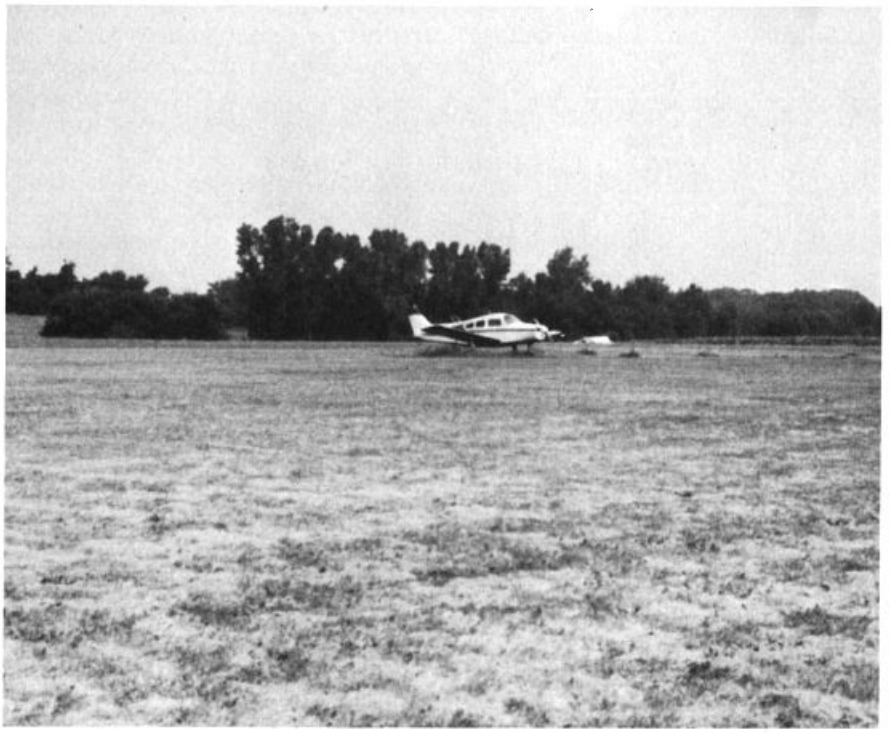


Figure 7. Short grassy airfield in B.B.S. Region Three.

In conclusion I propose that the Upland Sandpiper selects an optimal habitat in the eastern part of Wisconsin based on a combination of factors: (1) a vegetation structure and height similar to its historical habitat, short-grass prairie, and (2) an open air landscape. Other areas may be selected when the optimal habitats are densely populated. This alternative site selection is suggested when Upland Sandpipers are found on some routes only during years when the state's population is at its peak or increasing. These suboptimal sites do not exhibit all features of the optimal areas but may contain enough of the desired factors to produce reproductive success and periodic use.

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