

THE SPRING MIGRATION PATTERN AT FORTINE, MONTANA

WINTON WEYDEMEYER

Fortine, Montana 59918

The purpose of this paper is to summarize spring bird migration dates recorded at Fortine, Montana, over a period of 50 years and to examine several features of the arrival pattern illustrated by this long period of observation. Particular attention will be given to wide variations in arrival dates of nearly all species, which may stimulate more professional analysis by students of bird migration.

Records for a number of earlier years of the period were filed with the then Bureau of Biological Survey. The remainder have not been placed on record, and are included here only in summary form.

Specifically, the records summarized here are: observations on a few species in 1920, and on all species observed in 1921, 1922, and 1923; continuous records from 1927 through 1970, except that, for the years 1960–64, dates were not obtained for some of the regular breeding birds and migrants. Dates for 1922 and 1923 were recorded by my brother, D. R. Weydemeyer; all others are the result of my own observations.

STUDY AREA

The center of the study area is my ranch near Fortine, in extreme northwestern Montana 15 miles S of the Canadian border and 54 miles E of the Montana-Idaho line. It is a forested valley lying between mountain ranges in the heavily glaciated Rocky Mountain Trench, it contains deep central deposits, extensive drumlins, moraines, and country rock hills, and there are numerous small woodland lakes. Scattered areas of the central portion of the valley have been cleared for agriculture.

All of the lakes remain frozen until early March to mid-April, and the arrival dates of waterfowl vary somewhat correspondingly. Several species of ducks that normally winter on Flathead Lake, 60–88 miles to the southeast, are not present in the Fortine area until ice on the local lakes is thawing.

Although the valley is located within the continent's longest geological trench, a feature extending from northwestern Montana nearly to Alaska, it does not appear to be a definite migration "route" for many species of birds. Only rarely, and in the case of a very few species, have "waves" of migrants been noted.

ARRIVAL PATTERNS

Records of observers elsewhere indicate a fairly uniform general pattern of spring arrival on the part of most bird species. Many local

lists pinpoint arrival of certain species by specific weeks of named months. Commenting on proof offered by extended periods of time, Wetmore (1930) states: "Through years of observation average dates of spring arrival and autumn departure have been established for many localities, and birds come and go with surprising regularity on their appointed dates. Arrival in spring is particularly punctual with the majority, and unusual is the season when the first of the travellers fail to put in their appearance within a few days of the average date."

In marked contrast to this principle is the information presented in table 1. A wide yearly variation in arrival dates for nearly all species is shown, indicating that, at least in the locality studied, the arrival dates of birds cannot be neatly cataloged nor can the order of their appearance be forecast. Of the 99 species for which dates include 10 or more years, the variation among years ranges from 16 days for the Wilson's Phalarope (*Steganopus tricolor*) and Red-eyed Vireo (*Vireo olivaceus*) to 94 days for the Pine Siskin (*Spinus pinus*); the average for all species is 36.6 days.

Because yearly variations in arrival are not uniform among species, the order of spring appearance in different years also varies widely. As a typical example, the position of the Tree Swallow (*Iridoprocne bicolor*) in my annual arrival lists has varied from 4th to 28th place.

At this point it is desirable to substantiate the validity of the assembled data. The wide variation in spring arrival dates for nearly all species shown in table 1 may suggest that in many cases birds of named species had actually been present for some time before being noted. True, it is highly unlikely that in an area of varied habitats any observer, even if in the field continually during migration, could possibly record the first occurrence of every species. However, 67 of the 105 species listed as local, breeding birds, nest within 100 rods of my ranch house; an area covered nearly every day in the course of farm and woods operations. Of these, 19 species nest regularly or frequently about the yards and buildings, and many return year after year to a specific nesting site. All except 6 of the remaining 38

TABLE 1. Status of species, years of record, arrival dates, yearly variations.

Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
Common Loon <i>Gavia immer</i>	B	25	22 Apr	6 Apr -16 May	40	
Red-necked Grebe <i>Podiceps grisegena</i>	B	10	3 May	15 Apr -19 May	34	
Horned Grebe <i>Podiceps auritus</i>	B	18	25 Apr	4 Apr - 9 May	35	
Eared Grebe <i>Podiceps nigricollis</i>	B	23	28 Apr	13 Apr -13 May	30	
Western Grebe <i>Aechmophorus occidentalis</i>	B	5	24 Apr	28 Mar - 9 May	42	
Pied-billed Grebe <i>Podilymbus podiceps</i>	B	7	11 May	1 May-19 May	18	
Great Blue Heron <i>Ardea herodias</i>	V(WO)	9	4 May	27 Mar -27 May	61	
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	Cas	1		27 May		
American Bittern <i>Botaurus lentiginosus</i>	B	29	10 May	23 Apr -29 May	36	
Whistling Swan <i>Olor columbianus</i>	M	16	9 Apr	24 Mar - 2 May	39	
Canada Goose <i>Branta canadensis</i>	B	21	6 Apr	16 Mar -13 May	58	
Snow Goose <i>Chen caerulescens</i>	M	11	10 Apr	22 Mar -29 Apr	38	
Pintail <i>Anas acuta</i>	B(WO)	25	10 Apr	1 Mar - 5 May	65	
Green-winged Teal <i>Anas crecca (carolinensis)</i>	B(WO)	22	16 Apr	2 Apr -29 Apr	27	
Blue-winged Teal <i>Anas discors</i>	B	10	6 May	15 Apr -19 May	34	
Cinnamon Teal <i>Anas cyanoptera</i>	B	9	14 May	3 May-24 May	21	
American Widgeon <i>Anas americana</i>	B	31	8 Apr	14 Mar -26 Apr	43	
Shoveler <i>Anas clypeata</i>	B	20	20 Apr	12 Apr -30 Apr	18	
Wood Duck <i>Aix sponsa</i>	M	6	22 Apr	15 Apr - 1 May	16	
Redhead <i>Aythya americana</i>	B	22	23 Apr	5 Apr -17 May	42	

TABLE 1. *Continued.*

Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
Ring-necked Duck <i>Aythya collaris</i>	B(WO)	4	14 Apr	25 Mar - 30 Apr	36	
Canvasback <i>Aythya valisineria</i>	B	15	21 Apr	5 Apr - 19 May	44	
Lesser Scaup <i>Aythya affinis</i>	M(BO)	20	19 Apr	6 Apr - 5 May	29	
Common Goldeneye <i>Bucephala clangula</i>	B(WF)	19	7 Apr	18 Mar - 26 Apr	39	
Barrow's Goldeneye <i>Bucephala islandica</i>	B(WO)	20	8 Apr	21 Mar - 26 Apr	36	
Bufflehead <i>Bucephala albeola</i>	B(WO)	26	14 Apr	6 Mar - 27 Apr	52	
Oldsquaw <i>Clangula hyemalis</i>	Cas	1		12 May		
Ruddy Duck <i>Oxyura jamaicensis</i>	B	28	29 Apr	19 Mar - 13 May	55	
Hooded Merganser <i>Lophodytes cucullatus</i>	B(WO)	12	12 Apr	6 Mar - 2 May	57	
Common Merganser <i>Mergus merganser</i>	B	17	6 Apr	6 Mar - 23 Apr	48	
Sharp-shinned Hawk <i>Accipiter striatus</i>	B(WO)	20	7 Apr	4 Mar - 28 Apr	55	
Cooper's Hawk <i>Accipiter cooperii</i>	B(WO)	27	9 Apr	26 Feb - 1 May	64	
Red-tailed Hawk <i>Buteo jamaicensis</i>	B	38	2 Apr	6 Mar - 2 May	57	
Swainson's Hawk <i>Buteo swainsoni</i>	V	12	8 Apr	26 Mar - 5 May	40	
Ferruginous Hawk <i>Buteo regalis</i>	V	3	18 Apr	17 Apr - 20 Apr	3	
Marsh Hawk <i>Circus cyaneus</i>	V	24	17 Apr	20 Mar - 18 May	59	
Osprey <i>Pandion haliaetus</i>	B	16	25 Apr	10 Apr - 15 May	35	
Pigeon Hawk <i>Falco columbarius</i>	B(WO)	7	8 Apr	19 Mar - 24 Apr	37	
Sparrow Hawk <i>Falco sparverius</i>	B(WO)	40	10 Apr	14 Mar - 23 Apr	40	
Sora <i>Porzana carolina</i>	B	4	18 May	2 May - 28 May	26	

TABLE 1. *Continued.*

Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
American Coot <i>Fulica americana</i>	B	32	22 Apr	3 Apr -20 May	47	
Killdeer <i>Charadrius vociferus</i>	B(WO)	46	9 Mar	18 Feb -24 Mar	34	
Long-billed Curlew <i>Numenius americanus</i>	M	2		23 Apr -26 Apr	3	
Spotted Sandpiper <i>Actitis macularia</i>	B	34	16 May	27 Apr -29 May	32	
Solitary Sandpiper <i>Tringa solitaria</i>	M	8	4 May	30 Apr - 5 May	5	
Greater Yellowlegs <i>Tringa melanoleucus</i>	M	6	23 Apr	13 Apr -11 May	28	
Lesser Yellowlegs <i>Tringa flavipes</i>	M	4	25 Apr	12 Apr - 1 May	19	
Baird's Sandpiper <i>Calidris bairdii</i>	M	2		4 May-17 May	13	
Least Sandpiper <i>Calidris minutilla</i>	M	3	8 May	4 May-15 May	11	
Semipalmated Sandpiper <i>Calidris pusillus</i>	M	1		6 May		
Marbled Godwit <i>Limosa fedoa</i>	Cas	1		21 May		
Hudsonian Godwit <i>Limosa haemastica</i>	Cas	1		10 May		
American Avocet <i>Recurvirostra americana</i>	M	3	7 May	21 Apr -30 May	39	
Wilson's Phalarope <i>Steganopus tricolor</i>	B	12	11 May	3 May-19 May	16	
Northern Phalarope <i>Lobipes lobatus</i>	M	1		17 May		
Black Tern <i>Chlidonias niger</i>	B	9	18 May	12 May-23 May	11	
Mourning Dove <i>Zenaidura macroura</i>	B(WO)	37	10 May	12 Apr -26 May	44	
Common Nighthawk <i>Chordeiles minor</i>	B	45	5 Jun	28 May-18 Jun	21	
Black-chinned Hummingbird <i>Archilochus alexandri</i>	B	3	30 May	21 May- 6 Jun	16	

TABLE 1. *Continued.*

Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
Rufous Hummingbird <i>Selasphorus rufus</i>	B	36	16 May	5 May–30 May	25	
Calliope Hummingbird <i>Stellula calliope</i>	B	20	19 May	6 May–27 May	21	
Belted Kingfisher <i>Megasceryle alcyon</i>	B(WO)	20	8 Apr	20 Mar–27 Apr	38	
Common Flicker <i>Colaptes auratus (cafer)</i>	B(WO)	37	21 Mar	23 Feb – 8 Apr	44	
Lewis' Woodpecker <i>Asyndesmus lewis</i>	B	34	6 May	4 Apr–23 May	49	
Yellow-bellied Sapsucker <i>Sphyrapicus varius</i>	B	42	20 Apr	27 Mar–18 May	52	
Eastern Kingbird <i>Tyrannus tyrannus</i>	B	46	21 May	11 May– 2 Jun	22	
Western Kingbird <i>Tyrannus verticalis</i>	B	23	19 May	30 Apr–13 Jun	44	
Say's Phoebe <i>Sayornis saya</i>	Cas	1		7 Apr		
Willow Flycatcher <i>Empidonax traillii</i>	B	37	30 May	18 May– 8 Jun	21	
Dusky Flycatcher <i>Empidonax oberholseri</i>	B	38	10 May	2 May–20 May	18	
Western Flycatcher <i>Empidonax difficilis</i>	B	1		14 May		
Western Wood Pewee <i>Contopus sordidulus</i>	B	37	23 May	11 May– 2 Jun	22	
Olive-sided Flycatcher <i>Nuttallornis borealis</i>	B	21	21 May	4 May–31 May	27	
Horned Lark <i>Eremophila alpestris</i>	M	17	22 Mar	13 Feb –29 Apr	75	
Violet-green Swallow <i>Tachycineta thalassina</i>	B	34	8 Apr	2 Mar – 5 May	64	
Tree Swallow <i>Iridoprocne bicolor</i>	B	46	25 Mar	29 Feb –15 Apr	45	

TABLE 1. *Continued.*

Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
Bank Swallow <i>Riparia riparia</i>	B	11	12 May	11 Apr - 3 May	22	
Rough-winged Swallow <i>Stelgidopteryx ruficollis</i>	B	39	26 Apr	6 Apr - 22 May	46	
Barn Swallow <i>Hirundo rustica</i>	B	40	9 May	26 Apr - 28 May	32	
Cliff Swallow <i>Petrochelidon pyrrhonota</i>	B	34	15 May	27 Apr - 3 Jun	37	
Common Crow <i>Corvus brachyrhynchos</i>	B	44	16 Mar	15 Feb - 10 Apr	54	
Red-breasted Nuthatch <i>Sitta canadensis</i>	B(WF)	8	9 Apr	16 Mar - 28 Apr	43	
House Wren <i>Troglodytes aedon</i>	B	34	6 May	9 Apr - 31 May	52	
Long-billed Marsh Wren <i>Telmatodytes palustris</i>	B	7	5 May	12 Apr - 1 Jun	50	
Catbird <i>Dumetella carolinensis</i>	B	34	25 May	14 May - 2 Jun	19	
American Robin <i>Turdus migratorius</i>	B(WO)	46	7 Mar	18 Feb - 18 Mar	28	
Varied Thrush <i>Ixoreus naevius</i>	B	35	27 Mar	14 Mar - 29 Apr	46	
Swainson's Thrush <i>Catharus ustulatus</i>	B	41	25 May	15 May - 10 Jun	26	
Veery <i>Catharus fuscescens</i>	B	8	31 May	26 May - 2 Jun	7	
Western Bluebird <i>Sialia mexicana</i>	B	18	18 Mar	6 Mar - 2 Apr	27	
Mountain Bluebird <i>Sialia currucoides</i>	B	46	13 Mar	1 Mar - 29 Mar	28	
Townsend's Solitaire <i>Myadestes townsendi</i>	B(WO)	11	7 Apr	6 Mar - 26 Apr	51	
Ruby-crowned Kinglet <i>Regulus calendula</i>	B	44	14 Apr	30 Mar - 1 May	32	

TABLE 1. *Continued.*

Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
Water Pipit <i>Anthus spinoletta</i>	B	39	20 Apr	15 Mar - 2 May	32	
Cedar Waxwing <i>Bombycilla cedrorum</i>	B	39	3 Jun	15 May - 20 Jun	36	
Loggerhead Shrike <i>Lanius ludovicianus</i>	M	4	15 May	5 May - 21 May	16	
Starling <i>Sturnus vulgaris</i>	B(WO)	16	13 Mar	26 Feb - 23 Mar	25	
Solitary Vireo <i>Vireo solitarius</i>	B	44	8 May	21 Apr - 28 May	37	
Red-eyed Vireo <i>Vireo olivaceus</i>	B	37	25 May	18 May - 3 Jun	16	
Warbling Vireo <i>Vireo gilvus</i>	B	37	19 May	5 May - 31 May	26	
Tennessee Warbler <i>Vermivora peregrina</i>	Cas	1		14 May		
Orange-crowned Warbler <i>Vermivora celata (orestera)</i>	B	24	13 May	29 Apr - 29 May	30	
Orange-crowned Warbler <i>Vermivora celata (lutescens)</i>	M	23	1 May	10 Apr - 9 May	29	
Nashville Warbler <i>Vermivora ruficapilla</i>	B	10	14 May	29 Apr - 29 May	30	
Yellow Warbler <i>Dendroica petechia</i>	B	42	12 May	1 May - 29 May	28	
Yellow-rumped Warbler <i>Dendroica coronata (auduboni)</i>	B	41	1 May	14 Apr - 19 May	35	
Townsend's Warbler <i>Dendroica townsendi</i>	B	13	16 May	5 May - 29 May	24	
Northern Waterthrush <i>Seiurus noveboracensis</i>	B	42	20 May	12 May - 29 May	17	
MacGillivray's Warbler <i>Oporornis tolmiei</i>	B	34	24 May	11 May - 8 Jun	26	

TABLE 1. *Continued.*

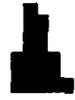
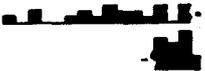
Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
Yellowthroat <i>Geothlypis trichas</i>	B	40	17 May	7 May - 29 May	22	
Wilson's Warbler <i>Wilsonia pusilla</i>	B	11	24 May	14 May - 1 Jun	18	
American Redstart <i>Setophaga ruticilla</i>	B	30	23 May	12 May - 5 Jun	24	
Bobolink <i>Dolichonyx oryzivorus</i>	B	29	26 May	15 May - 16 Jun	32	
Western Meadowlark <i>Sturnella neglecta</i>	B(WO)	44	13 Mar	27 Feb - 31 Mar	32	
Yellow-headed Blackbird <i>Xanthocephalus xanthocephalus</i>	B	17	7 May	23 Apr - 19 May	26	
Red-winged Blackbird <i>Agelaius phoeniceus</i>	B	42	8 Mar	13 Feb - 28 Mar	43	
Northern Oriole <i>Icterus galbula (bullockii)</i>	V	6	30 May	27 May - 31 May	4	
Brewer's Blackbird <i>Euphagus cyanocephalus</i>	B(WO)	42	11 Apr	28 Feb - 11 May	72	
Common Grackle <i>Quiscalus quiscula</i>	Cas	2	30 Apr	22 Apr - 8 May	16	
Brown-headed Cowbird <i>Molothrus ater</i>	B	32	17 May	25 Apr - 31 May	36	
Western Tanager <i>Piranga ludoviciana</i>	B	44	20 May	9 May - 30 May	21	
Black-headed Grosbeak <i>Pheucticus melanocephalus</i>	Cas	2		24 May - 4 Jun	11	
Lazuli Bunting <i>Passerina amoena</i>	B	20	1 Jun	19 May - 14 Jun	26	
Cassin's Finch <i>Carpodacus cassinii</i>	B	39	12 Apr	4 Mar - 12 May	69	
Pine Siskin <i>Spinus pinus</i>	B(WO)	38	28 Apr	25 Feb - 30 May	94	
American Goldfinch <i>Spinus tristis</i>	B(WO)	32	24 May	12 May - 3 Jun	22	

TABLE 1. *Continued.*

Species	Status	No. years record	Mean arrival date	Range	No. days range	Yearly variation in arrival by 5-day periods
Rufous-sided Towhee <i>Pipilo erythrophthalmus</i>	M	5	6 Apr	29 Mar -20 Apr	22	
Savannah Sparrow <i>Passerculus sandwichensis</i>	B	39	18 Apr	27 Mar -13 May	47	
Vesper Sparrow <i>Poocetes gramineus</i>	B	45	27 Apr	17 Apr - 7 May	20	
Lark Sparrow <i>Chondestes grammacus</i>	M	5	24 May	9 May - 1 Jun	23	
Dark-eyed Junco <i>Junco hyemalis (oreganus)</i>	B(WO)	41	10 Mar	14 Feb - 2 Apr	47	
Chipping Sparrow <i>Spizella passerina</i>	B	39	10 May	22 Apr -24 May	32	
Field Sparrow <i>Spizella pusilla</i>	Cas	4	23 May	16 May - 2 Jun	17	
White-crowned Sparrow <i>Zonotrichia leucophrys</i>	B	42	28 Apr	18 Apr - 7 May	19	
Fox Sparrow <i>Passerella iliaca</i>	B	28	9 Apr	28 Mar -26 Apr	29	
Lincoln's Sparrow <i>Melospiza lincolni</i>	B	5	2 May	23 Apr -16 May	23	
Song Sparrow <i>Melospiza melodia</i>	B(WF)	33	13 Mar	26 Feb -25 Mar	27	
Chestnut-collared Longspur <i>Calcarius ornatus</i>	Cas	4	17 May	25 Apr -27 May	32	

Table 1 includes records for regularly occurring species for which meaningful dates have been obtained. Also included are several unusual records having value because of the infrequency of occurrence of the species in western Montana. A few of the "once-or-twice in 50 years" occurrences have previously been placed on record.

Abbreviations used under "Status" of the species are these: B, breeds in the near vicinity; V, spring visitor, breeds in north-western Montana but not in the Fortine locality; M, migrant, not known to breed; WO, occurs occasionally or irregularly in winter; WF, a few frequently winter; Cas, of casual or accidental occurrence.

Mean arrival dates are the average of all dates for the number of years stated in the preceding column.

The final histogram column, based on information in my files, depicts for each species the variation in its arrival dates in different years; each first 5-day period begins with the earliest date shown in the "range" column.

species nest within a radius of 3 miles of my home, an area visited frequently during migration. Not included are first observations in cases when I had reason to suspect that birds of that species had likely been present at an earlier date. Thus the accuracy of the arrival dates listed and those used in computations should rank rather high.

A necessary prerequisite to analysis of the data in table 1 is an examination of the time pattern shown. Do records for most species

show a central "peaking" pattern, with the wide range in dates resulting from unusually early and late arrivals? Or are dates scattered widely with no predominate period (peak) shown? Study of the final column shows that among the 99 species for which dates cover 10 or more years, only about one-fourth (mainly May arrivals) show a fairly definite "peaking" pattern, and even in most of these cases the peak period extends over two or three 5-day periods. Thus it can be concluded

that, in general, the figures for wide ranges in dates of arrival are valid and illustrate a normal characteristic.

DURATION OF MIGRATION

Table 2 gives the average time elapsing from first arrival date of a species in any one year until the birds are present in normal breeding numbers. These records are based on observations ranging from several to 25 years. While complete information is not presented here, the shortness of periods shown indicates that variations from the average number of days listed are not great.

Two conclusions seem justified from these data. First, although arrival dates for most of the species listed vary widely from year to year, in any given season individuals of a species are not greatly scattered as they move northward, or at least they are not as they reach the locality studied. Second, in general, the species arriving earlier show a more extended arrival pattern, with the time period growing progressively shorter as the season advances. This fact is related to some of the influences of migration to be discussed.

INFLUENCE OF WEATHER

The ornithological literature often describes the influence of weather on various phases of bird migration. Much of the information deals with weather effects on the time of initiation, the direction, and the rate and uniformity of speed of northward or southward flights. It is generally agreed that migration is affected more by particular than general weather factors and is favored by stable, warm weather and light rather than strong winds (see Lack 1960). However, in reporting on weather effects in the eastern portion of the continent, Raynor (1956) comments that such effects may be quite different in mountainous regions such as the Rockies.

This study, located in the Rockies, affords information on spring arrival dates at one geographic point, without correlative data on specific weather conditions encountered by the birds along their northward flights. However, other factors affecting arrival time due to weather conditions will be examined.

Because adverse or unseasonable weather encountered en route will tend to delay northward flight, and assuming that these weather conditions are more likely to occur during early rather than late spring (especially at terminal points), the conclusion has been reached that wider ranges in dates of appearance on breeding grounds can be expected with March and early April arrivals than with

TABLE 2. The average number of days elapsing after arrival of the first bird of a species before that species is present in usual breeding numbers.

Species	Mean arrival date of first bird	No. days to breeding nos.
American Robin	7 Mar	10
Red-winged Blackbird	8 Mar	4
Killdeer	9 Mar	8
Mountain Bluebird	13 Mar	8
Western Meadowlark	13 Mar	6
Common Crow	16 Mar	4
Western Bluebird	18 Mar	4
Common Flicker	21 Mar	5
Tree Swallow	25 Mar	7
Red-tailed Hawk	2 Apr	6
Sparrow Hawk	10 Apr	6
Brewer's Blackbird	11 Apr	4
Cassin's Finch	12 Apr	9
Savannah Sparrow	18 Apr	4
Yellow-bellied Sapsucker	20 Apr	3
Water Pipit	20 Apr	4
American Coot	22 Apr	7
Pine Siskin	28 Apr	2
Lincoln's Sparrow	2 May	4
Lewis' Woodpecker	6 May	3
House Wren	6 May	3
Solitary Vireo	8 May	4
Barn Swallow	9 May	2
Dusky Flycatcher	10 May	4
Chipping Sparrow	10 May	4
Cliff Swallow	15 May	3
Rufous Hummingbird	16 May	4
Yellowthroat	17 May	3
Brown-headed Cowbird	17 May	4
Calliope Hummingbird	19 May	2
Northern Waterthrush	20 May	3
American Redstart	23 May	3
MacGillivray's Warbler	24 May	3
Catbird	25 May	3
Cedar Waxwing	3 Jun	3
Common Nighthawk	5 Jun	3

those coming later. This is affirmed by Allen (1930): "... May birds are extremely regular in their appearance and disappearance. One can soon learn just when to expect each species, and, if the weather is normal, it will arrive on the day set. The earlier birds . . . which come during March, are much less regular because of the idiosyncrasies of the weather." More recently, Van Tyne and Berger (1971) confirm as "apparently valid" the conclusion that early spring migrants are influenced greatly by the weather; late spring migrants, only a little. The breeding birds of the Fortine locality did not show this tendency during my half-century of observation.

Table 3, based on information presented in table 1, lists the average range in arrival dates of the 99 species for which records total 10

TABLE 3. Relationship in arrival dates of date to range.

Average arrival period	No. of species	Average range in arrival dates (days)
7-13 March	8	33.0
16-27 March	5	43.2
2- 9 April	13	48.6
10-19 April	12	48.7
20-30 April	16	41.4
1- 9 May	8	37.4
10-19 May	19	29.4
20-29 May	13	22.6
30 May-5 June	4	26.0

or more years, and is divided into approximately 10-day seasonal groups. While the figures show a slight decrease in variation of arrival dates for May birds, the difference is not great. All May groups show an average range in arrival dates of more than 3 weeks. The eight species having the earliest arrival dates (7-13 March) show, as a group, a smaller range than the April and early May arrivals. Presumably this is because most of the species arrive from wintering grounds not far to the south.

It is true that some species show a smaller range in dates than the group averages. Of those included in table 3, approximately 36% of the March arrivals, 10% of the April arrivals, and 58% of those coming in May or early June show a range of fewer than 30 days. Yet of the May and June species, only six have a range of fewer than 20 days, 16 being the minimum number.

RELATION OF FEEDING HABITS TO ARRIVAL

It has been stated that, in general, "the spring migration of each species appears to be so timed that the birds arrive on their breeding grounds at almost the earliest moment that they have a reasonable chance of surviving there" (Lack 1960). If weather conditions en route and at terminal points have contributed substantially to the variation in arrival dates under discussion, it would seem logical to assume that the delay in arrival would be increased by low food supplies because of unfavorable weather. Thus lingering wintry conditions or unseasonable storms have minimal effect upon food supplies in unfrozen lakes and streams, or upon availability of seeds of the previous season's growth of grasses, forbs, herbs, and tree cones. Bad weather may, however, severely limit the available supply of insects, particularly those taken by birds in the air. It therefore seems log-

TABLE 4. Relationship in arrival dates of feeding habits to range.

Species groups based on principal food classes	No. of species	No. days range in arrival dates
Arboreal or terrestrial insectivores	20	30
Aerial insectivores	13	32
Aquatic feeders	30	38
Seed eaters	11	39
Omnivorous feeders	19	39
Raptors	8	48

ical to assume that wider ranges in arrival dates would result among insect-eating birds than among those relying mainly upon seeds or aquatic foods. Yet, as shown in table 4, just the reverse has occurred over a 50-year period at Fortine. Although the differences in range of dates are not great, they do not support the described assumption. A detailed study of data for individual species, however, would probably disclose some food-arrival relationships.

COMPARISON OF MARCH ARRIVAL DATES

Table 5 compares variation in arrival dates during a 10-year period of the 13 species with average arrival dates during March. Data on these early spring migrants should best disclose the effects, if any, of unseasonable weather, availability of food, and perhaps other factors upon time of appearance at the locality studied. Some uniformity among species in reaction to favorable or unfavorable conditions seems logical.

Lack of such uniformity among species in "average" years is shown for 1933, 1935, and 1936. A similar variation between early and late appearance occurred in 1930 and 1932—despite cold winds, snowstorms, and zero weather.

Although the data in table 5 are restricted to 10 successive years, and only general weather conditions are considered, correlation of the relationships discussed with those shown for other seasons during the 50-year study period leads to this general conclusion: unseasonably cold or stormy weather during early spring at Fortine, and in northwestern Montana in general, did not markedly delay the arrival of most species. It must be noted, however, that the accuracy of this conclusion could be checked only by correlation of data used with arrival records for identical years at points southward along the migration routes of the various species, if these were accurately known.

In contrast with the apparent failure of un-

TABLE 5. Variations from average in the arrival dates for March species.

	1930		1931		1932		1933		1934		1935		1936		1937		1938		1939	
	E	L	E	L	E	L	E	L	E	L	E	L	E	L	E	L	E	L	E	L
American Robin		4		5		7		5		0		5		6		2		0		0
Red-winged Blackbird	17			0		13	10			2		1		5		3		0		10
Killdeer		2		7		12		3		6		11		6		3		2		9
Dark-eyed Junco		7		7		2		5		2		1		2		2		24		9
Mountain Bluebird		2		9		1	11			3		1		7		10		6		1
Song Sparrow		7		1		2	0			2		4		0		11		6		5
Western Meadowlark		1		7		2	11			3		3		5		5		5		5
Common Crow		1		1		0	3			11		3		14		4		1		2
Western Bluebird		7		9		1	6			8		4		5		4		4		0
Common Flicker		8		7		2	6			6		16		5		7		3		3
Horned Lark		5		9		26	3			39								10		21
Tree Swallow		1		3		6	10			13		9		6		17		7		6
Varied Thrush		3		0		2	15			10		12		8		32		6		7
		C		C		C	N			W		N		N		W		N		C

E: no. days earlier.
 L: no. days later.
 March weather: N: near average; C: cold; W, warmer than average.

favorable weather to delay arrival, table 5 data illustrate a definite relationship between unusually mild weather in February and March and early arrival of most migrants during this period.

In 1934, the weather was comparatively mild from January through March, and 11 of the 13 species with average arrival dates in March appeared earlier, especially those species usually arriving during the second half of the month. In 1937, when January was unusually cold, February was about average, and March was milder than usual, some of the earlier birds arrived much ahead of average dates. However, four were 2 or 3 days later.

Of special interest are the figures for 1931. March weather, especially during the latter half of the month, was unusually cold and unfavorable, and yet all species arrived on or before their average dates. However, the last half of February was unseasonably mild. It can be surmised that favorable weather along migration routes during February accelerated northward progress and that this progress was not later slowed by unfavorable March weather.

ARRIVAL PATTERN OF THE TREE SWALLOW

The Tree Swallow was selected for a more detailed individual study of possible factors responsible for the wide range in arrival dates shown for nearly all species. Among the March group most likely influenced by weather and food, the Tree Swallow is the earliest to arrive. It has a rather distantly removed winter range and depends largely upon aerial feeding. The 45-day range in arrival dates and the variation in its place in the se-

quence of arrival from 4th to 28th are not exceptional, the figures being exceeded by several other species in the March and early April listing.

Data on Tree Swallow arrivals show that warm weather influences the progress of migration. In fact, effects of weather appear to be greater than with other early species. The earliest arrival date recorded during the 50-year period was 29 February 1968. That year the weather had been unusually mild throughout February, and most species arrived earlier than expected. Only three species preceded the Tree Swallow, which on the average ranks in 12th place. The second earliest date was 8 March 1937 when, during a moderately mild spring, the Tree Swallow was the fourth species to appear. The third earliest date was 12 March 1934, a fairly warm season when most other early species arrived at more nearly average dates.

It is possible that Tree Swallows which breed in the Fortine area use a different migration route from that of most other early species, swinging eastward from a warmer longitude closer to the Pacific Coast. This is suggested by the fact that arrival appears to be earlier than in southern Montana and at central Rocky Mountain points, dates comparing more nearly with those for Washington and Oregon (see Bent 1942). If this is true, it might explain the apparent greater influence of mild February and early March weather than is shown by other early species.

In contrast to the influence of mild weather, there is little evidence that unseasonably cold weather in spring has a particular influence on arrival dates of Tree Swallows. In

TABLE 6. Relation of winter ranges of swallows to arrival dates.

Species	Principal winter range	No. years record	Average arrival date	No. days range in dates	Order of arrival 19 years record no. years ^a				
					1st	2nd	3rd	4th	5th
Tree Swallow	Southern states	46	25 March	45	18	1			
Violet-green Swallow	Southern California, Central America	34	8 April	64	1	14	4		
Rough-winged Swallow	Southeastern states, Mexico, Central America	26	26 April	46		4	11	3	1
Barn Swallow	Panama, northern and central South America	32	9 May	32			4	10	5
Bank Swallow ^b	Northern and central South America	11	12 May	22					
Cliff Swallow	Central South America	34	15 May	37			2	5	12

^a Equal rating given to two species arriving on the same date.

^b Not included in the order of arrival rating.

many years the first birds have appeared during periods of cold winds, snowstorms, and even subzero temperatures. Often they arrive during more moderate periods which, within a day or two, revert to wintry conditions. In 1969 the first birds arrived on 20 March (5 days earlier than average) when the fields and woods were still covered with 12–16 inches of snow.

In the case of this species, there seems to be no definite relation between late appearance and local cold weather. Thus the latest arrival date was 15 April 1922, a year during which most species arrived at relatively average dates. And in 1921, when other early species arrived prior to their average dates, Tree Swallows did not appear until 6 April—more than a week later than average.

RELATION OF WINTER RANGE TO ARRIVAL TIME

A definite relationship between winter ranges of birds and season of arrival in northern states has been established. Species wintering successively farther south arrive in the north at successively later dates. Since Fortine arrival dates show an unusual variation for nearly all species, I examined my records to see if they nonetheless illustrated this winter range relationship. Swallows were chosen as birds that depend upon similar food supplies but have different winter ranges.

A summary of the results is given in table 6. The position columns are based upon records for 19 years for which accurate dates are available for all species compared. Despite the wide range in arrival dates shown by all five species compared, the time-of-arrival ratings are fairly uniform from year to year. Whereas in 3 of the 19 years Violet-green Swallows arrived at an earlier date than the

latest Tree Swallow arrival dates, they preceded the Tree Swallows in only one season (by 1 day).

SUMMARY

A summary of spring migration dates recorded at Fortine, Montana, during 48 years of the 1920–70 period is presented.

Records are shown for 138 species of breeding and migrant birds. Data for each species include: its status as a migrant, breeding bird, or visitor; number of years its presence was recorded; average, earliest, and latest arrival dates and the range in days; and seasonal variation in arrival dates by 5-day periods.

An unusual range in arrival dates for nearly all species is noted. For the 99 species for which dates include 10 or more years, the variation between extreme dates ranges from 16 to 94 days, the average being 36.6 days.

The arrival dates for only about one-fourth of the 99 species show a definite “peaking” pattern for a central period. For the remaining species, the wide range in dates of arrival reflect a fairly equal distribution during the period of arrival and are not the result of records made at extreme early and late dates.

In general, the season of arrival appears to have little effect on the range in arrival dates, indicating that the influence of weather conditions on progress of migration does not vary greatly according to season. Ranges in dates were greatest during late March and April, somewhat less in early March and early May, and least in late May and early June.

Comparison of ranges in arrival dates with feeding habits shows no particular relationship, indicating that the effect of food availability on northward flight is general rather than specific.

Data on 13 species having average arrival dates during March indicate that, in the locality studied, unseasonably cold or stormy weather locally has little delaying effect upon time of arrival; but in contrast, unusually mild weather during February and March has resulted in early arrival of several or all of the March species.

A study of arrival dates for Tree Swallows supports the above general conclusions with respect to the relationship of weather variables to arrival times, indicating that the response of this species to favorable weather has been greater than that of other species arriving in March.

Comparison of arrival dates of six species of swallows shows general conformity with an accepted finding that species wintering suc-

cessively farther south arrive in northern states at correspondingly successive later dates.

LITERATURE CITED

- ALLEN, A. A. 1930. *The book of bird life*. D. Van Nostrand Co., Inc.
- BENT, A. C. 1942. *Life histories of North American flycatchers, larks, swallows, and their allies*. U.S. Natl. Mus., Bull. 179.
- LACK, D. 1960. The influence of weather on Passerine migration. A review. *Auk* 77:171-209.
- RAYNOR, G. S. 1956. Meteorological variables and the northward movements of nocturnal land bird migrants. *Auk* 73:153-175.
- VAN TYNE, J., AND A. J. BERGER. 1971. *Fundamentals of ornithology*. Dover Publications.
- WETMORE, A. 1930. *The migrations of birds*. Harvard Univ. Press.

Accepted for publication 7 May 1972.