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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TECHNICAL NOTE

U.S. DEPARTMENT OF THE INTERIOR – BUREAU OF LAND MANAGEMENT

NON-GAME BIRDS OF THE WEST
An Annotated Bibliography

THE ECOLOGY & LIFE HISTORIES OF SEVEN ORDERS

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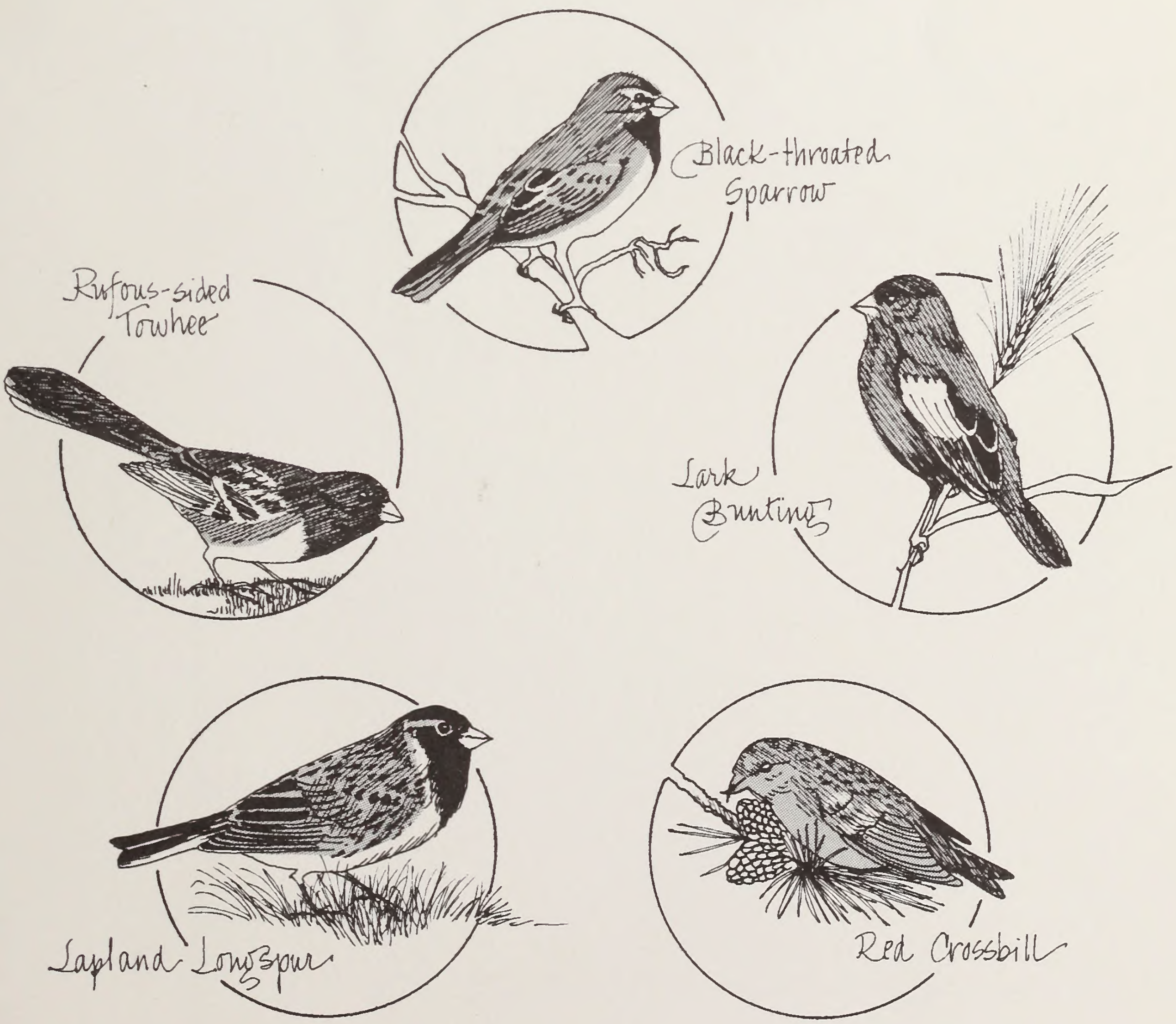

Cover Illustration:

These five birds constitute one notable example of evolution of ecological diversity by a single family -- in this case, the Fringillidae.

Tundra	:	Lapland longspur (*Calcarius lapponicus*)
Coniferous forest	:	Red crossbill (*Loxia curvirostra*)
Woodland-Bushland	:	Rufous-sided towhee (*Pipilo erythrophthalmus*)
Desert	:	Black-throated sparrow (*Amphispiza bilineata*)
Grassland	:	Lark bunting (*Calamospiza melanocorys*)

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INTRODUCTION

Historically, and naturally, wildlife biologists managing the Federal lands have emphasized game species. But man's responsibilities grow ever wider as his impact on the land intensifies. BLM therefore has compiled this bibliography dealing with seven orders of non-game birds. We hope this work will help decision-making biologists both in and out of BLM by providing quick access to basic research. As wildlife populations plummet while human populations soar, concern for the aesthetic and ecologic values of the non-game, less visible species grows accordingly. To wildlife biologists belong both the unique knowledge and the major responsibility to maintain and direct this concern, and to urge awareness of easily overlooked ecological niches critical to the survival of ecosystems.

Although far from complete, the volume cites much available information, and abstracts many recent, to the point, or comprehensive references. We've covered only the following orders: cuckoos (Cuculiformes), goatsuckers (Caprimulgiformes), swifts and hummingbirds (Apodiformes), trogons (Trogoniformes), kingfishers (Coraciiformes), woodpeckers (Piciformes), and perching birds (Passeriformes). Cited references deal only with those species commonly occurring in the western United States. The West is defined here as the BLM West: Alaska, Washington, Oregon, California, Montana, Idaho, Nevada, Wyoming, Utah, Arizona, Colorado, and New Mexico. When useful, we've included references to other states of similar ecological aspect.

The thirty-two families of our seven orders that occur in these states contain 271 separate species, excluding accidentals. These birds live and breed successfully in every habitat from the arid hills of the Sonoran Desert to the tundra flats north of the Brooks Range, from the salt marshes of the Pacific coast to the alpine summits of the high Sierra. Most birds adapt to life within a specific life form, such as grass, shrub, or tree. The distribution of most North American birds parallels the distribution of the various forms of climatic climax vegetation. The overall aspect, or life form of the vegetation, seems to act as the primary limiting factor, not the species of plant or the temperature zone (Odum, 1945). For example, the range of the Steller's jay spans the entire length of coniferous forest from boreal Alaska south into Mexico. Whether pine, spruce, or fir dominates, that forest makes little difference. Since the life form of the vegetation both reflects the major features of climate and determines the structural nature of the habitat for animals, it provides a sound basis for a natural ecological classification (Clements and Shelford, 1939). Birds, then, may be grouped according to their habitat preferences. This fact, combined with the interest of the BLM wildlife biologist in habitat, suggested the emphasis and organizational scheme of this bibliography.

We have avoided the traditional reliance on taxonomy as the sole organizing principle. Instead, the biotic community which each bird prefers determines its place in the bibliography. Distinctive communities of plants and animals characterize each of the five major biomes of the West that constitute the major classifications. These five units are Tundra, Coniferous Forest, Woodland-Bushland, Desert, and Grassland. Additional life-form indexing units have been added when necessary and useful.

The bibliography emphasizes the ecology, life history, habitat, and behavior of each species. We have included morphological and physiological literature dealing with adaptations to specific environments. Nomenclature, taxonomy, and short records of occurrence received little attention. Short journal articles labelled "General Notes" also received little emphasis. We've based many annotations on published abstracts (i.e. Wildlife Review) and author's summaries.

The biome concept encompasses all the physical factors (climate, soils, etc.) interacting with the biota of a region. Large, easily recognizable community units result from these interactions. The maps in Figure One and Figure Two misleadingly indicate sharp boundaries between biomes. Actually, elements of adjacent biomes interfinger, creating transitional zones, or ecotones. Biomes are plant formations with the animal constitutents integrated. (Plant formations are the plant ecologist's term for the largest vegetational subdivisions of the earth, such as grassland and deciduous forest.) Many of "our" birds occur distinctively in the biome within which they are classed; others vary in habitat geographically and seasonally. Still others occur in a single community within a biome. An example clarifies these variations.

The gray-headed chickadee inhabits scrub forest at the northern limit of the coniferous forest biome, at the very edge of the Arctic; boreal chickadees occupy the boreal forest, mountain chickadees the montane forests of the Rockies. In the Chiricahuas and nearby desert ranges, the Mexican chickadee resides. And the chestnut-backed chickadee is nearly restricted to the moist Northwest coastal forest. The black-capped chickadee ranges throughout these forests, generally at lower elevations. But the coniferous forest ecological niche that each one of these chickadees fills remains the same throughout the biome. The dominant life form--the coniferous tree--and the trunk-foraging niche of the chickadee interact; both contribute equally to definition of the biome. Just as existence of the evergreen-tree life form is more important than the species of conifer, the species of chickadee matters less than the filling of the niche. Temperature, perhaps, determines species distribution. But unique habitat provided by the life form determines not only the essence of "chickadee-ness," but the geographical limits of the niche that controls chickadee distribution.

To classify literature consistently, we used three narrowly defined criteria. These rules of assignation follow, in order of priority:

1. Where (and why) was the research done?

2. Where does the species typically breed in the BLM West?

3. Which breeding habitat frequented by this species occurs most widely (and is most "typical") in the BLM West?

Answers to these question define the position of a reference in the bibliography. For example, research on any bird carried out in the montane coniferous forest appears under the heading, Coniferous Forest. We cite a paper on the water economy of the house finch, a bird widespread in the West, under Desert since such research pertains specifically to the species' adaptations to the desert environment. The section on Woodland-Bushland contains any laboratory studies of the plain titmouse, since this species breeds almost exclusively in pinon-juniper woodland. When we have resorted to the third criterion (by far the most subjective), we've indicated our somewhat arbitrary choice in the index of species beginning on page 7 . Also included in the master species list is a key to all biomes under whose headings the user of the bibliography may find literature dealing with each species.

Each biome classification lumps several smaller communities. For example, the broad heading Coniferous Forest includes the boreal forest of the North, the montane forest of the Rockies and Sierra, the moist coniferous forest of the Pacific coast, and the alpine tundra. Bird-life in each of these subunits does not differ enough to separate them for the purposes of this bibliography, although some ecologists split the biome into these discrete communities. We have classified alpine tundra under Coniferous Forest, rather than Arctic Tundra, primarily because a BLM district containing alpine tundra likely manages montane forest as well. Arctic tundra, of more limited distribution, merits a separate category.

Each of the eight major ecological classifications begins with a brief introduction defining the characteristics and range of the community and its birds. Besides the five biomes, additional major classifications include: Marshes and Shores (birds widespread in the West which nearly always breed in marshes), Riparian Communities (widespread along freshwater streams), Associates of Man (widespread in cities, towns, and farms), General (broad geographic or taxonomic categories), and references arranged by States. Within each major heading, references follow taxonomic order, when possible. The community introductions further clarify the organization plan of the bibliography.

Note on sources:

(The following four authorities form the foundation of all information presented in the general introduction and biome summaries; to avoid redundance, we've cited them only at this time. But our dependence on these essential volumes should be emphasized).

BLM. Oil and Gas Programmatic: Description of the Environment.

Odum, Eugene P. 1971. Fundamentals of ecology (3rd ed.). W. B. Saunders Co., Phil. - London-Toronto. 574 p.

Shelford, Victor E. 1963. The ecology of North America. Univ. Ill. Press, Urbana. 610 p.

Welty, Joel Carl. 1962. The life of birds. W. B. Saunders Co., Phil. & London. 546 p.

Literature cited:

Clements, F. E. and V. E. Shelford. 1939. Bioecology. John Wiley and Sons, Inc., New York.

Odum, E. P. 1945. The concept of the biome as applied to the distribution of North American birds. Wilson Bull. 57:191-201.

Note: The bibliography includes no references published after March 1, 1974.

USING THE BIBLIOGRAPHY

Each of the 271 bird species included in this bibliography appears in the following master list. All common and scientific names agree with the American Ornithologists' Union (A.O.U.) Check-list of North American Birds (Wetmore, 1957) and the 32nd supplement to the Check-list (Eisenmann, 1973). The arrangement of families and species in the master list, as well as in all separate biome lists and the bibliography itself, follows the taxonomic sequence of the Check-list. Although this grouping may not seem inherently logical, the A.O.U. bases this order on the entire body of literature on ornithologic systematics.

To avoid confusion, we briefly summarize the changes in standard nomenclature made by the A.O.U. in the recently published 23nd supplement. The authorities have abolished long-familiar names, and made obsolete nearly every bird book in print.

Ornithologists now view the red-shafted, yellow-shafted, and gilded flickers as races of a single species -- the common flicker. The A.O.U. has split Traill's flycatcher, an "old" designation for a single species, into two species -- the alder and willow flycatchers, distinguishable primarily by differences in song. They have lumped the common bushtit and black-eared bushtit; these birds now constitute populations of a single species known simply as, the bushtit. Likewise, the myrtle and Audubon's warblers now exist only as races of one species -- the yellow-rumped warbler. All birds formerly known as Baltimore and Bullock's orioles are now northern orioles. The grackles of the Southwest, previously regarded as several subspecies of the boat-tailed grackle, now merit their own species classification -- the great-tailed grackle. The eastern races make up a separate species, the boat-tailed grackle, that does not occur in the BLM West.

And finally, the birder need no longer agonize over the fine distinctions between the white-winged, slate-colored, and Oregon juncos; these birds now belong to the single species, the dark-eyed junco. A few other nomenclatural changes, less drastic and less confusing, have been incorporated in our list, but need no emphasis. Some of the original research documenting the validity of these taxonomic decisions appears in this bibliography. These papers, and the supplement itself, should clear any remaining confusion for the interested reader. But they cannot diminish the sadness resulting from the loss of such long-cherished and mellifluent names as the yellow-shafted flicker and the Baltimore oriole, names with infinitely more character than common flicker and northern oriole.

Two columns of numbers accompany each species entry on the master list. The first number codes the habitat (according to the biomes of the West) in which the species breeds. If we have assigned this habitat designation arbitrarily, choosing one of several breeding habitats for the species, the habitat code number appears in parentheses. (See also: Criterion Number Three, p. 3 in the Introduction). This habitat code often identifies that ecological section of the bibliography containing most of the references dealing with a species.

To add to the usefulness of the bibliography, a comprehensive key to literature on each species appears in the right-hand column of the master list. This key codes every reference title or abstract that mentions a species by name. For example, if one finds papers on the house wren under the Woodland-Bushland and Associates of Man habitat classifications, as well as the General: Taxonomic Categories and Arizona sections, the key codes these various citations: 0, 3, 8, A.

To search for information on a particular species, first locate the coded list of bibliographic sections next to the species names on the master list. Within each of these sections, first look through the list of references on the appropriate family, then the group of general references. For example, the key indicates that at least one paper on the house wren is somewhere in the section, Woodland-Bushland. Such a paper appears in the wren family category, Troglodytidae, if it discusses only members of this family. If the reference title or abstract names members of other families, the paper appears in the "General" section of the biome.

Many of the general papers, particularly annotated lists dealing with the birds of a single biome, contain valuable information on many species. But if the literature citation or abstract does not name a species, the master species key does not code it. Therefore, one may accumulate much additional data for each species by thoroughly surveying the list of uncoded general references on each of the biomes within which the bird occurs.

A simple cross-referencing system exists within the bibliography. If an abstract refers to another paper within the same heading of the Table of Contents, we cite only the author and date. If the cited reference appears somewhere else in the bibliography, the citation includes the relevant category code.

Literature cited:

Eisenmann, E. (Comm. Chairman). 1973. Thirty-second supplement to the American Ornithologist's Union Check-list of North American birds. Auk 90: 411-419.

Wetmore, A. (Comm. Chairman). 1957. Check-list of North American birds, 5th ed. American Ornithologist's Union. Lord Baltimore Press, Baltimore. 691 p.

MASTER SPECIES LIST AND INDEX

Classification Code

X General: Bird biology
(Physiology, Morphology, Behavior and Theory)

O General: Orders and families
(Large taxonomic categories)

T General: Techniques

The Biomes:

1 Tundra
2 Coniferous forest
3 Woodland-bushland
4 Desert
5 Grassland
6 Marshes and shores
7 Riparian communities
8 Associates of man

The States:

A Arizona
C California
L Colorado
W Washington
(Note: Only these states contain references that name species, and thus require code symbols.)

CUCULIFORMES (Cuckoos and allies)		Habitat	Key
* Cuculidae (Cuckoos)			
Yellow-billed cuckoo	Coccyzus americanus	7	2,7
Black-billed cuckoo	Coccyzus erythropthalmus	5	5
Roadrunner	Geococcyx californianus	4	4
CAPRIMULGIFORMES (Goatsuckers and allies)			
* Caprimulgidae (Goatsuckers)			
Ridgway's whip-poor-will	Caprimulgus ridgwayi	3	3
Whip-poor-will	Caprimulgus vociferus	3	3
Poor-will	Phalaenoptilus nuttallii	(4)	3,4
Common nighthawk	Chordeiles minor	(4)	2,4
Lesser nighthawk	Chordeiles acutipennis	(4)	4

APODIFORMES (Swifts and hummingbirds)

* Apodidae (Swifts)

		Habitat	Key
Black swift	Cypseloides niger	2	2,6
Chimney swift	Chaetura pelagica	8	X,8
Vaux's swift	Chaetura vauxi	2	2
White-throated swift	Aeronautes saxatalis	(4)	3,4

* Trochilidae (Hummingbirds)

Lucifer hummingbird	Calothorax lucifer	4	0
Ruby-throated hummingbird	Archilochus colubris	5	0,2,5
Black-chinned hummingbird	Archilochus alexandri	3	0,3,4
Costa's hummingbird	Calypte costae	4	0,3
Anna's hummingbird	Calypte anna	3	3
Broad-tailed hummingbird	Selasphorus platycercus	2	2,3
Rufous hummingbird	Selasphorus rufus	(2)	0,2,3
Allen's hummingbird	Selasphorus sasin	3	0,3
Calliope hummingbird	Stellula calliope	2	2
Rivoli's hummingbird	Eugenes fulgens	3	0,3
Blue-throated hummingbird	Lampornis clemenciae	3	3
Violet-crowned hummingbird	Amazilia verticalis	3	3
White-eared hummingbird	Hylocharis leucotis	3	0,3
Broad-billed hummingbird	Cynanthus latirostris	(4)	0,3

TROGONIFORMES (Trogons)

* Trogonidae (Trogons)

Coppery-tailed trogon	Trogon elegans	3	

CORACIIFORMES (Kingfishers and allies)

* Alcedinidae (Kingfishers)

Belted kingfisher	Megaceryle alcyon	7	7
Green kingfisher	Chloroceryle americana	7	

PICIFORMES (Woodpeckers and allies)

* Picidae (Woodpeckers)

Common flicker	Colaptes auratus	(2)	X,2,3,4,5,8
Pileated woodpecker	Dryocopus pileatus	2	2,8
Gila woodpecker	Centurus uropygialis	4	3,4
Red-headed woodpecker	Melanerpes erythrocephalus	5	5,8
Acorn woodpecker	Melanerpes formicivorus	3	3,8
Lewis' woodpecker	Asyndesmus lewis	2	2,5,L

		Habitat	Key
Yellow-bellied sapsucker	Sphyrapicus varius	2	2
Williamson's sapsucker	Sphyrapicus thyroideus	2	2
Hairy woodpecker	Dendrocopos villosus	2	2,3
Downy woodpecker	Dendrocopos pubescens	2	2,3
Ladder-backed woodpecker	Dendrocopos scalaris	(4)	3,8
Nuttall's woodpecker	Dendrocopos nuttallii	3	3
Arizona woodpecker	Dendrocopos arizonae	3	3
White-headed woodpecker	Dendrocopos albolarvatus	2	2
Black-backed three-toed woodpecker	Picoides arcticus	2	2
Northern three-toed woodpecker	Picoides tridactylus	2	2

PASSERIFORMES (Perching birds)

* Cotingidae (Cotingas)

Rose-throated becard	Platypsaris aglaiae	3	3

* Tyrannidae (Tyrant flycatchers)

Eastern kingbird	Tyrannus tyrannus	(5)	5,C
Thick-billed kingbird	Tyrannus crassirostris	3	0,3,C
Tropical kingbird	Tyrannus melancholicus	3	0,C
Western kingbird	Tyrannus verticalis	(5)	0,3
Cassin's kingbird	Tyrannus vociferans	3	0,3
Scissor-tailed flycatcher	Muscivora forficata	5	5,C
Sulphur-bellied flycatcher	Myiodynastes luteiventris	3	3
Wied's crested flycatcher	Myiarchus tyrannulus	(3)	3
Ash-throated flycatcher	Myiarchus cinerascens	(4)	
Olivaceous flycatcher	Myiarchus tuberculifer	3	3
Eastern phoebe	Sayornis phoebe	5	0,5,C
Black phoebe	Sayornis nigricans	7	0,4,7
Say's phoebe	Sayornis saya	(4)	0,3,4,7
Alder flycatcher	Empidonax alnorum	2	2
Willow flycatcher	Empidonax traillii	2	2
Least flycatcher	Empidonax minimus	3	2,3
Hammond's flycatcher	Empidonax hammondii	2	0,2
Dusky flycatcher	Empidonax oberholseri	2	0,2,3
Gray flycatcher	Empidonax wrightii	(4)	0,3,4
Western flycatcher	Empidonax difficilis	2	2
Buff-breasted flycatcher	Empidonax fulvifrons	3	3
Coue's flycatcher	Contopus pertinax	(3)	0,3
Western wood pewee	Contopus sordidulus	(3)	3
Olive-sided flycatcher	Nuttallornis borealis	2	0,2
Vermillion flycatcher	Pyrocephalus rubinus	4	4
Beardless flycatcher	Camptostoma imberbe	4	4

* Alaudidae (Larks)

Horned lark	Eremophila alpestris	(5)	1,2,4,5

		Habitat	Key
* Hirundinidae(Swallows)			
Violet-green swallow	Tachycineta thalassina	(3)	2,3,4,8
Tree swallow	Iridoprocne bicolor	7	7,8
Bank swallow	Riparia riparia	7	7
Rough-winged swallow	Stelgidopteryx ruficollis	7	7
Barn swallow	Hirundo rustica	8	X,3,5,6,8
Cliff swallow	Petrochelidon pyrrhonota	(7)	3,7,8
Cave swallow	Petrochelidon fulva	3	3
Purple martin	Progne subis	(8)	2,4,8
* Corvidae (Jays and crows)			
Gray jay	Perisoreus canadensis	2	1,2
Blue jay	Cyanocitta cristata	5	X,0,2,5
Steller's jay	Cyanocitta stelleri	2	0,2,3,8
Scrub jay	Aphelocoma coerulescens	3	0,2,3,8
Mexican jay	Aphelocoma ultramarina	3	0,3
Black-billed magpie	Pica pica	(5)	2,5,7,W
Yellow-billed magpie	Pica nuttalli	(5)	5
Common raven	Corvus corax	(2)	1,2,4
White-necked raven	Corvus cryptoleucus	(4)	4 5
Common crow	Corvus brachyrhynchos	(5)	X,4,5,8
Northwestern crow	Corvus caurinus	6	6
Pinon jay	Gymnorhinus cyanocephalus	3	2,3
Clark's nutcracker	Nucifraga columbiana	2	2,3,8
* Paridae (Titmice)			
Black-capped chickadee	Parus atricapillus	2	X,0,2
Mexican chickadee	Parus sclateri	(2)	
Mountain chickadee	Parus gambeli	2	2,A
Gray-headed chickadee	Parus cinctus	2	
Boreal chickadee	Parus hudsonicus	2	
Chestnut-backed chickadee	Parus rufescens	2	2,3
Plain titmouse	Parus inornatus	3	3
Bridled titmouse	Parus wollweberi	3	3
Verdin	Auriparus flaviceps	4	4
Bushtit	Psaltriparus minimus	3	3
* Sittidae (Nuthatches)			
White-breasted nuthatch	Sitta carolinensis	2	2
Red-breasted nuthatch	Sitta canadensis	2	2
Pygmy nuthatch	Sitta pygmaea	2	2
*Certhiidae (Creepers)			
Brown creeper	Certhia familiaris	2	2,A

		Habitat	Key
* Chamaeidae (Wrentits)			
Wrentit	Chamaea fasciata	3	3
* Cinclidae (Dippers)			
Dipper	Cinclus mexicanus	2	2
* Troglodytidae (Wrens)			
House Wren	Troglodytes aedon	(8)	0,3,8,A
Brown-throated wren	Troglodytes brunneicollis	3	A
Winter wren	Troglodytes troglodytes	2	2
Bewick's wren	Thryomanes bewickii	3	3
Cactus wren	Campylorhynchus brunneicapillus	4	4
Long-billed marsh wren	Telmatodytes palustris	6	6
Canon wren	Catherpes mexicanus	(3)	3,7
Rock wren	Salpinctes obsoletus	(3)	3,4,C
* Mimidae (Mockingbirds and thrashers)			
Mockingbird	Mimus polyglottos	(4)	3,4,5
Gray catbird	Dumetella carolinensis	(7)	X,0,7
Brown thrasher	Toxostoma rufum	5	X,5
Bendire's thrasher	Toxostoma bendirei	4	4
Curve-billed thrasher	Toxostoma curvirostre	4	4
California thrasher	Toxostoma redivivum	3	3
Le Conte's thrasher	Toxostoma lecontei	4	4
Crissal thrasher	Toxostoma dorsale	4	
Sage thrasher	Oreoscoptes montanus	4	4
* Turdidae (Thrushes)			
American robin	Turdus migratorius	(8)	X,2,3,5,8
Varied thrush	Ixoreus naevius	2	2
Hermit thrush	Catharus guttatus	2	2
Swainson's thrush	Catharus ustulatus	2	2
Gray-cheeked thrush	Catharus minimus	2	2
Veery	Catharus fuscescens	7	2,7
Eastern bluebird	Sialia sialis	5	5
Western bluebird	Sialia mexicana	2	8
Mountain bluebird	Sialia currucoides	2	2
Wheatear	Oenanthe oenanthe	1	
Bluethroat	Luscinia svecica	1	
Townsend's solitaire	Myadestes townsendi	(2)	2

		Habitat	Key
* Sylviidae (Gnatcatchers and kinglets)			
Arctic warbler	Phylloscopus borealis	1	
Blue-gray gnatcatcher	Polioptila caerulea	3	3
Black-tailed gnatcatcher	Polioptila melanura	4	4
Golden-crowned kinglet	Regulus satrapa	2	2
Ruby-crowned kinglet	Regulus calendula	2	2,3
* Motacillidae (Wagtails and pipits)			
White wagtail	Motacilla alba	1	1
Yellow wagtail	Motacilla flava	1	1
Water pipit	Anthus spinoletta	(1)	1,2
Sprague's pipit	Anthus spragueii	5	5
* Bombycillidae (Waxwings)			
Bohemian waxwing	Bombycilla garrulus	2	2
Cedar waxwing	Bombycilla cedrorum	2	2,4
* Ptilogonatidae (Silky flycatchers)			
Phainopepla	Phainopepla nitens	(4)	4
* Laniidae (Shrikes)			
Northern shrike	Lanius excubitor	(2)	1,2,5
Loggerhead shrike	Lanius ludovicianus	(4)	0,4,5
* Sturnidae (Starlings)			
Starling	Sturnus vulgaris	8	T,3,8
* Vireonidae (Vireos)			
Hutton's vireo	Vireo huttoni	3	3
Bell's vireo	Vireo bellii	7	0,5,7
Gray vireo	Vireo vicinior	3	0,3
Solitary vireo	Vireo solitarius	(2)	0,3
Red-eyed vireo	Vireo olivaceus	2	2,7
Warbling vireo	Vireo gilvus	2	2,3
* Parulidae (Wood warblers)			
Black-and-white warbler	Mniotilta varia	2	2
Tennessee warbler	Vermivora peregrina	2	2
Orange-crowned warbler	Vermivora celata	(3)	3
Nashville warbler	Vermivora ruficapilla	2	2
Virginia's warbler	Vermivora virginiae	3	3

		Habitat	Key
Lucy's warbler	Vermivora luciae	4	4
Olive warbler	Peucedramus taeniatus	2	2
Yellow warbler	Dendroica petechia	7	2,6,7
Magnolia warbler	Dendroica magnolia	(5)	
Yellow-rumped warbler	Dendroica coronata	2	2
Black-throated gray warbler	Dendroica nigrescens	3	0,3
Townsend's warbler	Dendroica townsendi	(2)	0
Hermit warbler	Dendroica occidentalis	2	0,2
Grace's warbler	Dendroica graciae	3	3
Blackpoll warbler	Dendroica striata	2	
Ovenbird	Seiurus aurocapillus	5	0,2,5
Northern waterthrush	Seiurus noveboracensis	2	0,2
MacGillivray's warbler	Oporornis tolmiei	2	2
Common yellowthroat	Geothlypis trichas	6	6,7
Yellow-breasted chat	Icteria virens	7	7
Red-faced warbler	Cardellina rubrifrons	2	2
Wilson's warbler	Wilsonia pusilla	7	7
American redstart	Setophaga ruticilla	(7)	4,7
Painted redstart	Setophaga picta	3	3

* Ploceidae (Weaver finches)

House sparrow	Passer domesticus	8	X,T,2,4,8,C,W

* Icteridae (Blackbirds and orioles)

Bobolink	Dolichonyx oryzivorus	5	5
Eastern meadowlark	Sturnella magna	5	0,5
Western meadowlark	Sturnella neglecta	5	5,6
Yellow-headed blackbird	Xanthocephalus xanthocephalus	6	T,6,C
Red-winged blackbird	Agelaius phoeniceus	6	T,2,5,6,8
Tricolored blackbird	Agelaius tricolor	6	T,6
Orchard oriole	Icterus spurius	5	5
Hooded oriole	Icterus cucullatus	(4)	4,8
Scott's oriole	Icterus parisorum	(4)	4
Northern oriole	Icterus galbula	(5)	5
Rusty blackbird	Euphagus carolinus	2	7
Brewer's blackbird	Euphagus cyanocephalus	5	4,5,6
Great-tailed grackle	Cassidix mexicanus	5	5
Common grackle	Quiscalus quiscula	8	X,T,6,8
Brown-headed cowbird	Molothrus ater	5	X,T,3,5
Bronzed cowbird	Tangavius aeneus	4	4,5

* Thraupidae (Tanagers)

Western tanager	Piranga ludoviciana	2	3
Hepatic tanager	Piranga flava	2	
Summer tanager	Piranga rubra	7	7

* Fringillidae (Grosbeaks, finches, sparrows and buntings)

		Habitat	Key
Cardinal	Cardinalis cardinalis	3	X,0,3,4
Pyrrhuloxia	Pyrrhuloxia sinuata	4	3,4
Rose-breasted grosbeak	Pheucticus ludovicianus	5	5
Black-headed grosbeak	Pheucticus melanocephalus	3	3,5
Blue grosbeak	Guiraca caerulea	(7)	7
Indigo bunting	Passerina cyanea	5	5
Lazuli bunting	Passerina amoena	(4)	5
Varied bunting	Passerina versicolor	7	
Painted bunting	Passerina ciris	7	7
Dickcissel	Spiza americana	5	5
Evening grosbeak	Hesperiphona vespertina	2	X,2
Purple finch	Carpodacus purpureus	2	0,2
Cassin's finch	Carpodacus cassinii	2	0,2
House finch	Carpodacus mexicanus	(8)	0,T,2,3,4,8
Pine grosbeak	Pinicola enucleator	2	2
Gray-crowned rosy finch	Leucosticte tephrocotis	(2)	2
Black rosy finch	Leucosticte atrata	2	2
Brown-capped rosy finch	Leucosticte australis	2	2
Hoary redpoll	Acanthis hornemanni	1	X,1
Common redpoll	Acanthis flammea	1	X,1
Pine siskin	Spinus pinus	2	2
American goldfinch	Spinus tristis	(7)	7
Lesser goldfinch	Spinus psaltria	3	3
Lawrence's goldfinch	Spinus lawrencei	3	3
Red crossbill	Loxia curvirostra	2	2,3
White-winged crossbill	Loxia leucoptera	2	2
Green-tailed towhee	Chlorura chlorura	3	3
Rufous-sided towhee	Pipilo erythrophthalmus	3	T,2,3,5
Brown towhee	Pipilo fuscus	3	3,4
Abert's towhee	Pipilo aberti	4	3,4
Lark bunting	Calamospiza melanocorys	5	5
Savannah sparrow	Passerculus sandwichensis	5	1,4,5,6
Grasshopper sparrow	Ammodramus savannarum	5	5
Baird's sparrow	Ammodramus bairdii	5	5
Le Conte's sparrow	Ammospiza leconteii	6	6
Sharp-tailed sparrow	Ammospiza caudacuta	6	6
Vesper sparrow	Pooecetes gramineus	(4)	4,5
Lark sparrow	Chondestes grammacus	5	
Rufous-winged sparrow	Aimophila carpalis	4	0,4
Rufous-crowned sparrow	Aimophila ruficeps	3	0
Botteri's sparrow	Aimophila botterii	5	0,5
Cassin's sparrow	Aimophila cassinii	5	0,5
Black-throated sparrow	Amphispiza bilineata	4	4
Sage sparrow	Amphispiza belli	4	4
Dark-eyed junco	Junco hyemalis	2	0,2,3,4,8
Gray-headed junco	Junco caniceps	2	2
Yellow-eyed junco	Junco phaeonotus	(3)	3
Tree sparrow	Spizella arborea	1	0,1,2
Chipping sparrow	Spizella passerina	(3)	0,3,5

		Habitat	Key
Clay-colored sparrow	Spizella pallida	5	5
Brewer's sparrow	Spizella breweri	(4)	0,4
Field sparrow	Spizella pusilla	5	0,5
Black-chinned sparrow	Spizella atrogularis	(3)	
Harris' sparrow	Zonotrichia querula	2	2
White-crowned sparrow	Zonotrichia leucophrys	2	X,1,2,3,8
Golden-crowned sparrow	Zonotrichia atricapilla	2	2,3,8
White-throated sparrow	Zonotrichia albicollis	3	X,0,2,3
Fox sparrow	Passerella iliaca	2	2
Lincoln's sparrow	Melospiza lincolnii	2	2
Swamp sparrow	Melospiza georgiana	6	6
Song sparrow	Melospiza melodia	(6)	0,4,6,7
McCown's longspur	Calcarius mccownii	5	5
Lapland longspur	Calcarius lapponicus	1	1
Smith's longspur	Calcarius pictus	1	1
Chestnut-collared longspur	Calcarius ornatus	5	5
Snow bunting	Plectrophenax nivalis	1	1,5
McKay's bunting	Plectrophenax hyperboreus	1	

Note: The relevant code symbol appearing in the upper right corner of most pages in the bibliography facilitates fast use of this key.

GENERAL: BIRD DISTRIBUTION AND IDENTIFICATION
(Field guides, habitat distribution, checklists, and handbooks)

Aiken, C.E.H. (E.R. Warren, ed.). 1937. Birds of the Southwest. Colorado College Publ. (General Series) 212:1-73.

Itinerary and list of birds observed on a trip from Colorado to Arizona in 1876.

Aldrich, John W. 1945. Bird distribution and ecological concepts. Wilson Bull. 57:243-248.

Includes discussions of grassland and coniferous forest.

American Birds. 1971. On building a basic ornithological library (updated). Author, 950 3rd Ave., N.Y., N.Y. 10022. 16 p. ($1.25)

A guide to the most important general works, field guides, special subject books, regional books, and literary masterpieces.

__________. 1972. Recordings of bird songs: A current catalog. American Birds 26(5):917-919.

A complete listing of records and tapes of bird sounds currently available from sources in the United States and Canada.

Bailey, Florence M. 1902. Handbook of birds of the western United States, including the Great Plains, Great Basin, Pacific Slope, and lower Rio Grande Valley. Houghton-Mifflin Co., Boston.

The original Western field guide, this book remains valuable both for its early data on distribution and habitat and its illustrations by L.A. Fuertes.

__________. 1940. Birds in southwestern Indian life. Kiva 5(5): 17-20.

A good summary: includes Arizona, Utah and New Mexico.

Banks, R. C., M. H. Clench, and J. C. Barlow. 1973. Bird collections in the United States and Canada. Auk 90:136-170.

The authoritative list of available specimens.

Beidleman, R. G. 1956. Ethnozoology of the Pueblo Indians in historic times, Part II: Birds. Southwestern Lore 22:17-28.

A summary, with references.

Blackford, J. L. 1940. Vertical birding: Highlights of western life zones. Bird-Lore 42:405-413.

___________. 1956. Western wonderlands: A guide to bird habitats of the western United States. Vantage Press, New York. 120 p.

A short introduction to avian ecology in the West precedes the main body of this useful book, which consists of bird-lists for eighteen western habitats. Prominent plant species in each habitat define the communities.

Bogert, Charles M. 1959. Recording the sounds of nature. Natural History 68:362, 364, 366, 368, 416, 418.

An index to nature phonograph records, includes a list of 31 foreign and domestic albums of bird, amphibian and insect songs.

Booth, Ernest S. 1942. A field guide to the birds of eastern Washington, eastern Oregon, and Idaho. Walla Walla College, Wash. 43 p.

___________. 1950. Birds of the West. Stanford Univ. Press. 402 p. (Also published by Outdoor Pictures, 1960).

The author has arranged this very useful field guide by keys - to families, followed by keys to genera and species - so that any unknown bird may be keyed out to species level with no prior knowledge of birds. Information on nests and distribution accompanies each species description in the keys. The book illustrates nearly all species.

Borror, D. A. 1968. Common bird songs. Dover Press.

A manual with 12-inch l.p. record.

Brown, Vinson, Charles Yocum, and Aldene Starbuck. 1958. Wildlife of the Intermountain West. Naturegraph Co., San Martin, Calif. 144 p.

This field guide presents the common plants and animals, including the birds, of each vegetation community of the Palouse Prairie and the Great Basin plateau province.

Bruun, Bertel. 1973. Birds of North America. Hamlyn.

Discusses birdlife by ecosystem -- from arctic tundra to city garden.

Burleigh, T. D. 1951. The fall migration in the Palouse - Northern Rocky Mountains. Aud. Field Notes 5:29-30.

Clarke, H. and A. Small. 1972. Birds of the West. A. S. Barnes.

Cockrum, E. L. 1952. A check-list and bibliography of hybrid birds in North America north of Mexico. Wilson Bull. 64:140-149.

Cornell Laboratory of Ornithology. A field guide to western birdsongs. 3 records. Houghton-Mifflin.

Arranged to accompany, page by page, Peterson's "Field Guide to Western Birds" (1969).

Coues, E. 1874. Birds of the Northwest: a hand-book of the ornithology of the region drained by the Missouri River and its tributaries. U. S. Geological Surv. of the Terr. Wash. Misc. Publ. 3:1-79.

__________. 1878. Birds of the Colorado Valley: A repository of scientific and popular information concerning North American ornithology. U. S. Geological Surv. of the Terr. Wash. Misc. Publ. 11:1-807.

__________. 1903. Key to North American birds (5th ed.). Dana Estes Co., Boston

The last edition of an early classic.

Dickey, F. V. 1935. Familiar birds of the Pacific Southwest. Stanford Univ. Press.

Eaton, T. H., Jr., and G. Smith. 1937. Birds of the Navajo country. Project 6677-Y, Nat. Youth Administration, Berkeley, Calif. 75 p.

Description, habitat, nests and eggs of spp. in the cold desert, pinon-juniper woodland, and grassland.

Eisenman, E. (comm. ch.). 1973a. Thirty-second supplement to the American Ornithologist's Union check-list of North American birds. Auk 90:411-419.

Updates the 1957 checklist (Wetmore, 1957).

__________. 1973b. Corrections and additions to the "Thirty-second supplement to the check-list of North American birds." Auk 90:887.

Eliot, W. A. 1923. Birds of the Pacific Coast. NY & London. 211 p.

Federal Committee on Research Natural Areas (compiler). 1968. A directory of research natural areas on Federal lands of the United States of America. 129 p.

This booklet lists more than 300 natural areas set aside on federal lands for scientific and educational purposes. The book inventories already established areas, both to stimulate suggestions for additionally needed areas from the scientific community and Federal land managers, as well as to serve as an announcement of availability to scientists and educators. These areas represent examples of forest, range and aquatic communities and geologic features in natural or near-natural conditions.

Ficker Records. Birds from the Great Plains to the Atlantic (2 vols). Author, Old Greenwich, Conn.

This company also produces other records of bird songs.

Gruson, E. S. 1972. Words for birds: A lexicon of North American birds with biographical notes. Quadrangle Books, New York. 305 p.

This book traces the etymology of common and scientific names, and offers translations of scientific names and biographical sketches of people for whom birds have been named.

Headstrom, Richard. 1951. Birds' nests of the West, a field guide. Ives Washburn, Inc., N.Y. 177 p.

__________. 1970. A complete field guide to nests in the United States, including those of birds, mammals, insects, fishes, reptiles, and amphibians. I. Washburn, N.Y. 451 p.

Hoffman, R. 1955. Birds of the Pacific States. Houghton Mifflin Co., Boston.

An important book for Oregon, California and Washington.

Houston, Douglas B. 1971. Ecosystems of National Parks. Science 172: 648-651.

Jaques, Harry E. and M. J. Cuthbert. 1970. How to know the land birds (2nd ed.). Wm. C. Brown.

Laird, Edith M. (ed.). 1967. Conservation & wildlife: Bibliography I. Field Res. Projects Nat. Areas Studies #3. 157 p.

__________. 1968a. Bib. II. #6. 160 p.

__________. 1968b. Bib. III. #9. 329 p.

All vols. available from: Field Research Projects, Coconut Grove, Fla. All vols. include endangered species, disappearing habitats, wildlife mgmt., and ethics of wildlife conservation.

MacArthur, Robert H. 1959. On the breeding distribution pattern of North American migrant birds. Auk 76:318-325.

In a variety of undisturbed habitats throughout the continent, the density of breeding individuals of species migrating to the Neotropics seems to correlate with the contrast between winter and summer food supply in their habitat. In undisturbed northern habitats, populations of migrants to the Neotropics average higher than species which do not make this journey. This situation reverses in southern habitats.

____________. 1964. Environmental factors affecting bird species diversity. Amer. Nat. 98:387-397.

The author tested theoretical results in the Chiricahuas and at Tucson, but obtained ambiguous results.

____________ and John W. MacArthur. 1961. On bird species diversity. Ecology 42:594-598.

The authors compare bird censuses from a variety of areas to determine which aspects of environmental variation control bird species diversity.

Marshall, D. B. 1973. Familiar birds of Northwest forests, fields, and gardens. Portland Audubon Society. 84 p.

This book covers the common birds of the region west of the Cascades from Northern California into Southern B. C., exclusive of salt-water and alpine species. The book emphasizes identification, man-bird relationships, and attraction of birds to the home.

Murphy, Robert C. and Dean Amadon. 1953. Land birds of America. McGraw-Hill. 240 p.

National Audubon Society. 1900-1974. Christmas bird counts. Bird-lore (1900-1940), Audubon Mag. (1941-1946), Audubon Field Notes (1947-1970), American Birds (1971-present).

These periodicals provide rich sources of distribution data--through both Christmas counts (conducted in representative habitats Westwide yearly since 1900) and winter bird studies. This bibliography includes few individual articles referenced separately, but we emphasize here the importance of these publications as a major source of distributional data.

Odum, Eugene P. 1945. The concept of the biome as applied to the distribution of North American birds. Wilson Bull. 57:191-201.

One of the primary sources supporting biome control of the distribution of North American birds.

Peters, James L. and others. 1931-1970. (E. Mayr, J. C. Greenway, Jr., and R. A. Paynter, Jr., eds.) Check list of birds of the world. (15 vols.) Museum of Comparative Zool., Cambridge, Mass.

These volumes, not even yet complete, constitute the authoritative, comprehensive check list.

Peterson, Roger T. 1942. Life zones, biomes or life forms? Audubon 44:21-30.

The author discusses these three concepts as factors in control of bird distribution.

__________. 1969. A field guide to western birds/Field marks of all species found in North America west of the 100th meridian, with a section of the birds of the Hawaiian Islands (2nd ed., revised and enlarged). Houghton Mifflin Co., Boston. 336 p.

Profusely illustrated, with sections on field marks, similar species, voice, range, habitat, nest, and eggs for each species. The book includes almost 600 spp., exclusive of Hawaiian birds, with notes on 104 accidental or marginal species appended. Slower for field use than Robbins, et al (1966), but contains more information.

Pettingill, Olin S., Jr. 1953. A guide to bird finding west of the Mississippi. Oxford Univ. Press. 709 p.

State by state, locality by locality, this useful book outlines the places and habitats most productive for bird finding in the west. It also serves as a useful inventory of abundance and distribution for western species.

Phillips, A. R. 1968. The instability of the distribution of land birds in the southwest. In A. H. Schroeder (ed.).Collected papers in honor of Lyndon Lane Hargrave. Papers Archeol. Soc. New Mex. 1:129-162.

This important critical paper includes a bibliography of 85 titles.

Phillips, J. C. 1928. Wild birds introduced or transplanted in North America. USDA Tech. Bull. 61. 64 p.

Pitelka, Frank A. 1941. Distribution of birds in relation to major biotic communities. Am. Midland Nat. 25:113-137.

One of the first papers relating bird distribution to ecology.

Pough, R. H. 1949. Audubon bird guide: Small land birds of eastern and central North America from southern Texas to central Greenland. Doubleday & Co. Inc., Garden City, N.Y. 312 p.

__________. 1957. Audubon western field guide/Land, water and game birds/Western North America, including Alaska, from Mexico to Bering Strait and the Arctic Ocean. Doubleday & Co., Garden City, N. Y. 316 p.

Of the 614 species that occur in the area, the book gives full treatment to the 203 exclusively western birds. For the other 411 the book provides only range statements with references to Pough's eastern guides.

Rand, Austin L. 1971. Birds of North America. Doubleday & Co., Inc., N. Y. 256 p.

Field guide and account of behavior.

Reed, C. A. 1904. North American bird's eggs. Doubleday, Page and Co., N. Y. 356 p. (reprinted by Dover (1965) and Peter Smith.)

Reilly, Edgar M., Jr. 1968. The Audubon illustrated handbook of American birds. McGraw-Hill Book Co., New York. 524 p.

This desk reference includes information on appearance, voice, range and status, habitat, seasonal movements, biology and suggested reading for all birds commonly found north of Mexico.

Ridgway, Robert and H. Friedmann. 1901-1950. The birds of North and Middle America. Parts I-XI U. S. Natl. Mus. Bull.

Robbins, Chandler S., B. Bruun and H. S. Zim. 1966. Birds of North America. Golden Press, N. Y. 340 p.

The most useful field guide available. Illustrations of nearly all birds occurring north of Mexico. Not as much information offered as Peterson (1969), but easier to use for field identification.

____________ and Willet T. VanVelzen. 1969. The breeding bird survey 1967 and 1968. USF&WS Spec. Sci. Rept-Wildl. #124. 107 p.

This volume offers an analysis of 982 survey routes - continentwide, and includes breeding range maps and records of comparative abundance for each species. These early years establish an index for yearly comparisons of each species to more recent surveys, now published annually in the December issue of American Birds.

Ross, C. Chandler. 1963. Albinism among North American birds (annotated list). Cassinia 47:2-21.

Saunders, Areta S. 1959. A guide to bird songs. Doubleday, N. Y.

This field guide offers brief descriptions of most eastern land birds, and diagrams their calls and songs. Not as precise as the sonograms in Robbins, <u>et al</u> (1966) and elsewhere, but very useful, and perhaps easier to use.

Scheffer, Paul M. 1967. Exotic non-game bird introductions - pro and con. Proc. 47th Ann. Conf. W. Assoc. State Game & Fish Comm.:113-122.

Thirty-eight of 56 introduced species are non-game species. The author considers 26 of these well-established.

Shelford, V. E. (ed.). 1926. Naturalists' guide to the Americas. Williams and Wilkins Co., Baltimore. 761 p.

The predecessor of Shelford (1963), this book includes chapters on the natural history of all areas north of the Amazon. Contains many details on North America not included in the later book.

__________. 1945. The relative merits of the life zone and biome concepts. Part 6 in a symposium: Bird distribution and ecological concepts. Wilson Bull. 57:248-252.

__________. 1963. The ecology of North America. Univ. of Ill. Press, Urbana. 610 p.

Comprehensive summary of our knowledge of the biomes of North America.

Stevenson, Elmo. 1942. Key to the nests of Pacific Coast birds. Oregon State Coll. Studies in Zool. 4:1-71.

Terres, John K. (compiler). 1961. Available field check-lists of birds - Canada and the United States. Audubon Mag. 63 (Jan-Feb): 44-47.

Lists local check lists by state, and their prices and availability.

Udvardy, M.D.F. 1958. Ecological and distributional analysis of North American birds. Condor 60:50-66.

__________. 1960. Distributional geography of the North American bird fauna. Year Book Am. Philos. Soc. 1959:262-263.

__________. 1963. Bird faunas of North America. Proc. 13th Intern. Ornithol. Cong. 2:1147-1167.

The author groups North American passerines into seventeen faunal groups, based on distributional data and ecologic relationships. Since distribution at times overrides ecology, some of these groups differ considerably from biome groupings. The author believes that the ecological and faunal history of a geographic area is best described by its ecogeographic faunal patterns.

U.S.D.A. 1969. Wildlife habitat improvement handbook. USDA, Forest Service FSH 2609.11. 292 p.

Details habitat improvement methods used by the Forest Service. Includes stream, lake, wetland, and upland improvements.

U. S. Fish & Wildlife Service. National Wildlife Refuge publications.

Complete listing available from BSF&W, Wash. Office. Publications include bird lists for each wildlife refuge in the western states, often applicable to surrounding BLM areas.

VanVelzen, Willet T. 1964. Tabulations of bandings reported each banding year 1950 to 1953. Bird-Banding Notes 5:5-18.

The first issue released in this series since August, 1950, includes a grand total for all birds handled through 1950, in addition to the yearly totals. In Bird-Banding Notes 4 (3), S. H. Low presented a tabulation of bandings reported from 1942 to 1949.

____________. 1965. Summaries of non-game species banded from 1954 through 1962. Bird-Banding Notes 5:3-27.

Includes summaries of birds banded during the period 1954-1962, and grand totals of these figures combined with the previous grand totals tabulated in VanVelzen (1964).

Wauer, Roland H. 1969. Recent bird records for the Virgin River Valley of Utah, Arizona and Nevada. Condor 71:331-335.

Notes on 46 spp. in pinon-juniper and desert.

Wetmore, Alexander (comm. chairman). 1957. Check-list of North American birds (5th ed.). Am. Ornithol. Union Lord Baltimore Press, Baltimore. 691 p.

The authoritative check-list. Ranges of all species north of Mexico including Baja, California, Greenland and Bermuda. The standard authority for vernacular names and latin binomials. Updated by Eisenmann (1973).

Woodbury, Angus M. and Henry Norris Russell, Jr. 1945. Birds of the Navajo country. Bull. Univ. Utah Biol.Ser. 9(1):1-160.

Cold desert, pinon-juniper woodland and grassland in SE Utah and NE Arizona.

Yocom, Charles, William Weber, Richard Beidleman and Donald Malick. 1969. Wildlife and plants of the Southern Rocky Mountains (revised ed.). Naturegraph Publ., Healdsburg, Calif. 132 p.

Field guide to the common wild animals and plants of the forest and woodland of the mountain areas of Utah, Colorado, New Mexico and Arizona.

Zimmerman, Dale A. 1961. Field list of birds of southwestern New Mexico and southeastern Arizona. Author, 1011 West Florence Street, Silver City, New Mexico.

____________. 1966. Bird-finding localities in southwestern New Mexico and southeastern Arizona. New Mexico Ornithological Society, Box 277, Cedar Crest, New Mexico 87008. 16 p.

GENERAL: BIRD BIOLOGY
(Physiology, morphology, behavior and theory)

Amadon, Dean. 1966. Avian plumages and molts. Condor 68:263-278.

The author expresses dissatisfaction with the classification of plumages and molts proposed by P. S. Humphrey and K. C. Parkes and proposes new classification more similar to the system proposed by J. Dwight, Jr., in 1900 and generally used since.

Armstrong, E. A. 1963. A study of bird song. Oxford Univ. Press, London.

Barker, Elliott S. 1939. Grashopper plagues and bird conservation. New Mexico 17 (June):31.

Bird control of grasshoppers.

Bent, Arthur Cleveland. 1939. Life histories of North American woodpeckers. Smithsn. Inst., U.S. Natl. Mus. Bull. 174. 334 p.

The series by Bent provides nearly complete life history data (at the time of writing) for all birds included in this bibliography. A major work and standard reference. Note: Dover Press and Peter Smith have reprinted the entire Bent life history series.

__________. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds and their allies. Smithsn. Inst., U.S. Natl. Mus. Bull. 176. 506 p.

Includes parrots, trogons, kingfishers, swifts.

__________. 1942. Life histories of North American flycatchers, larks, swallows and their allies. Smithsn. Inst., U.S. Natl. Mus. Bull. 179. 555 p.

__________. 1946. Life histories of North American jays, crows and titmice. Smithsn. Inst., U.S. Natl. Mus. Bull. 191. 495 p.

__________. 1948. Life histories of North American nuthatches, wrens, thrashers and their allies. Smithsn. Inst., U.S. Natl. Mus. Bull. 195. 475 p.

Includes creepers, wren-tit, dipper.

__________. 1949. Life histories of North American thrushes, kinglets and their allies. Order Passeriformes (Families Turdidae and Sylviidae). Smithsn. Inst., U.S. Natl. Mus. Bull. 196. 439 p.

__________. 1950. Life histories of North American wagtails, shrikes, vireos and their allies. Smithsn. Inst., U.S. Natl. Mus. Bull. 197. 411 p.

Includes pipits, waxwings, phainopepla, starlings.

____________. 1953. Life histories of North American warblers. Smithsn. Inst., U.S. Natl. Mus. Bull. 203. 734 p.

____________. 1958. Life histories of North American blackbirds, orioles, tanagers and allies. Smithsn. Inst., U.S. Natl. Mus. Bull. 211. 549 p.

____________ and Oliver L. Austin, Jr. (compiler). 1968. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows and allies. Order Passeriformes (Family Fringillidae). Smthsn. Inst., U.S. Natl. Mus. Bull. 237. 1889 p. (in three volumes). $8.25 from Supt. Doc.

This 21st volume in the life history series completes the work begun by Bent in 1910.

Bernard, R. F. Field and laboratory studies on the effects of DDT on birds. Ph.D. thesis. Mich. St. Univ. of Agr. and Applied Science. (University Microfilms, Order No. 62-4420).

Bond, R. M. 1947. Bitter cherry and serviceberry as food for birds. Condor 49:37.

At Portland

Borell, A. E. 1951. Russian olive as a wildlife food. J. Wildl. Mgmt. 15:109-110.

Songbirds used the fruits as food in New Mexico.

Boyd, Elizabeth M. 1951. The external parasites of birds: A review. Wilson Bull. 63:363-369.

Boykins, E. A. 1964. DDT residues in the food chains of birds. Ph. D. thesis. Michigan St. Univ. of Agr. and Applied Science. (University Microfilms, Order No. 65-1714).

Calder, W. A. and K. Schmidt-Nielsen. 1968. Panting and blood carbon dioxide in birds. Amer. J. Physiol. 215:477-482.

Choate, E. A. 1973. The dictionary of American bird names. Gambit, Inc., Boston. 261 p.

Includes a dictionary of common and scientific names providing much information on origins, derivations, vivid anecdotes, and colloquial names.

Chute, H. L. and D. C. O'Meara. 1957. A bibliography of avian mycosis (partially annotated). Me. Agr. Exp. Sta. Misc. Publ. 631, Orono. 81 p.

More than 521 articles pertaining to fungus diseases of birds.

Clark, Gordon Marston and Louis N. Locke. 1964. Multiple parasitism in fledgling birds: case reports. Avian Diseases 8:315-316.

Pox virus (Plasmodium elongatum) and intestinal coccidia in a towhee; Aspergillus, Plasmodium relictum and Trypanosoma in a cardinal; and Haemoproteus, Trypanosoma, coccidia and a fungus in a grackle. The heavy haemosporidian infections may have eventually killed all three birds.

Cooke, W. W. 1915. Bird migration. U.S.D.A., Biol. Surv. Bull. 185. 47 p.

Summarizes and indexes Cooke's many other works on bird migrations in North America.

Collias, N. E. 1960. An ecological and functional classification of animal sounds. pp. 368-391. In W. E. Lanyon and W. N. Tavolga (eds.) . Animal Sounds and Communications. Amer. Inst. Biol. Sci., Washington.

Cottam, Clarence, Cecil S. Williams and Clarence A. Sooter. 1942. Flight and running speeds of birds. Wilson Bull. 54:121-131.

Observations on 58 forms, mostly western birds.

Cox, George W. 1968. The role of competition in the evolution of migration. Evolution 22:180-192.

The author reviews and rejects most traditionally accepted theories on the development of migration. He proposes a simple initiator of migration: escape from competition. When seasonally favorable habitat lies adjacent to a high-density area, it proves highly adaptive to escape from the competition by migration. Considerably decreased adaptive radiation in the form of the beaks of migrant species supports this theory. Migration allows these species to successfully remain generalists in food habits. In contrast, selection, powered by competition, in resident populations, has forced adaption to specific niches to utilize food sources not subject to intense interspecific competition.

Curtis, Steve. 1969. Weather patterns and spring migration. Passenger Pigeon 30:151-159.

Observations during spring migration in 1963, 1964 and 1966 indicate that the majority of species tend to respond similarly to a given weather situation. The birds tend to migrate through the clear skies and southerly winds that occur to the west of a high pressure center.

Dana, Richard H. (chairman) 1970. Proceedings: Fourth Vertebrate Pest Conference, March 3-5, 1970. 240 p.

Copies can be obtained from W. D. Fitzwater, Univ. California, Davis, CA 95616. $5.00

Davis, J. D. and others (eds.). 1971. Infectious and parasitic diseases of wild birds. Iowa St. Univ. Press, Ames. 344 p.

Dorst, Jean. 1972. Life of birds (2 vols.). Universe.

Emerson, K. C. 1953. New North American Mallophaga. Jour. Kansas Entomol. Soc. 26:132-136.

Includes birds as hosts.

Faddoul, George P., Gordon W. Fellows and James Baird. 1966. A survey on the incidence of Salmonellae in wild birds. Avian Diseases 10:89-94.

A Salmonella infection occurred in 12 of the first 100 wild bird consignments submitted during a one-year survey. Eight infections of S. typhimurium broke out in brown-headed cowbirds in scattered areas. Seven of these outbreaks occurred during winter. Cowbirds may harbor an incidence of Salmonella high enough to merit further investigation. The authors also detected two outbreaks of S. typhimurium in house sparrows and one infection in a white-throated sparrow.

Farner, D. S. and B. K. Follett. 1966. Light and other environmental factors affecting avian reproduction. J. Animal Science 25:90-118.

This survey of the parameters that control annual reproductive cycles gives primary consideration to the white-crowned sparrow, but includes other species.

________ and J. R. King (eds.). 1971. Avian biology. Academic Press, New York. Vol. I. 586 p.

________ and ________. 1973 a. Vol. II. 612 p.

________ and ________. 1973 b. Vol. III. 573 p.

Replaces Marshall (1961) as the standard compendium of reviews of the biology of birds. The authors present a review of established facts as well as recent advances in each discipline. Vol. I covers systematics, population biology and ecology. Vol. II deals with avian anatomy and physiology. Vol. III contains chapters on the endocrine system and sensory systems.

George, J. C. and A. J. Berger. 1966. Avian myology. Academic Press, New York.

The authoritative text on the structure of the muscular system of birds.

Grant, Chapman. 1945. Drone bees selected by birds. Condor 47:261-263.

This paper summarizes observations in California and elsewhere concerning birds that eat bees, and indicates proportions of drones consumed.

Greenewalt, Crawford H. 1968. Bird song: acoustics and physiology. Smiths. Inst. Press, Wash. D. C. 194 p.

The author presents a detailed account of the production of sounds by the two independently controllable acoustic sources of a bird's syrinx. Birds can modulate these sounds with extraordinary rapidity. The author classes bird songs as harmonic or whistled. The syringeal embellishments characteristic of the Oscines (songbirds) do little more than allow singing over a greater frequency range, for the actual presence or absence of intrinsic syringeal muscles seems to matter more than the number of pairs present. The bird needs only its membranes and clavicular sac pressure for vocalization. Frequency discrimination in birds resembles that of humans; time discrimination is more than 50 times better, permitting perception of rapid modulations.

Halloran, Patricia O'C. 1955. A bibliography of references to diseases of wild mammals and birds. Am. J. Vet. Res. 16(61 pt. 2) 465 p.

Hardy, James L. 1967. Arboviruses of wildlife and their role in the epidemiology of disease. Trans. 32nd N. Am. Wildl. & Nat. Resources Conf.: 386-396.

Twenty of the arboviruses in North America infect wildlife. Ten of these produce a clinical disease. This article summarizes present knowledge of host and life cycles, including information concerning the role of birds in the mosquito-bird-mosquito cycle of encephalitis.

Henny, Charles Joseph. 1971. An analysis of the population dynamics of selected avian species. Ph. D. thesis. Oreg. State Univ. 201 p.

__________. 1972. An analysis of the population dynamics of selected avian species with special reference to changes during the modern pesticide era. U.S.D.I., Fish and Wildl. Serv., BSF&W, Wildl. Research Rept. 1, Washington. 99 p.

Includes effects of pesticides on populations of barn swallow, chimney swift, blue jay, black-capped chickadee, cardinal and robin since 1946. No significant changes in mortality rate or reproductive success have occurred for any of these species. Those species exhibiting decreased reproductive success consume mostly fish, reptiles, amphibians or birds.

Hickey, J. J. 1972. Survival studies of banded birds (rev. ed.) U. S. Fish & Wildl. Serv., Spec. Sci. Rept. 15. 177 p.

The classic study (originally issued in 1952) describing methods for the study of avian populations through birdbanding.

Hicks, Ellis A. 1959. Check-list and bibliography on the occurrence of insects in bird's nests. Iowa State Coll. Press, Ames. 681 p.

Contains huge amounts of information in both entomological and ornithological check-lists. Large bibliography.

__________. 1962. Check-list and bibliography on the occurrence of insects in bird's nests/Supplement 1. Iowa State J. Sci. 36:233-348

Entomological and ornithological sections plus bibliography.

Hinde, R. A. (ed.). 1969. Bird vocalizations: their relations to current problems in biology and psychology; essays presented to W. H. Thorpe. Cambridge Univ. Press, London. 394 p.

Johnson, Harold Norlin. 1960. Public health in relation to birds: Arthropod - borne viruses. Trans. 25th N.A. Wildl. Conf.: 121-133.

Western equine, eastern equine, St. Louis, Japanese B, West Nile and Sindbis viruses have occurred in wild birds. All of these viruses may infect man, and the first four have caused encephalitis epidemics in man. These viruses exist in nature as wildlife parasites. An intermittent cycle involving bird-mosquito-bird transmission serves as a source of the virus for human infection. Blackbirds move western equine and St. Louis viruses from natural foci to the sites of epidemic activity. The house sparrow serves as an important host in the epidemic cycle of western equine virus. The author suggests that scientists aim control work at the mosquito vector.

Kenager, Eugene E. 1965. Are birds increasing in numbers? Bull. Entomol. Soc. Am. 11:81-83.

The author disagrees with Marvin (1964): Christmas bird counts may not function as a statistically reliable indicator of trends in the total bird population in the United States between 1949 and 1962.

Kendeigh, S. C. 1934. The role of environment in the life of birds. Ecol. Monog. 4:299-417.

__________. 1939. The relation of metabolism to the development of temperature regulation in birds. J. Exptl. Zool. 82:419-438.

__________. 1969. Tolerance of cold and Bergmann's rule. Auk 86:13-25.

Cold temperatures affect non-passerines more than passerines, small species more than large species, and southern species more than northern species. Northern species also have greater feather insulation and greater capacities for higher rates of metabolism than southern species.

__________. 1970. Energy requirements for existence in relation to size of bird. Condor 72:60-65.

The author calculated energy requirements for existence metabolism for 18 spp. of birds. Body size and the insulative properties of the plumage determine the efficiency of body temperature regulation.

__________. and George C. West. 1965. Caloric values of plant seeds eaten by birds. Ecology 46:553-555.

Seeds of Graminae contain relatively few calories, those of Leguminosae and Malvaceae an intermediate number, and those of Umbelliferae and Compositae relatively high numbers of usable calories.

King, J. R. 1970. Photoregulation of food intake and fat metabolism in relation to avian sexual cycles. Edition Centre Natl. Recherche Sci. 172:365-385.

A useful review paper.

__________. and D. S. Farner. 1961. Energy metabolism, thermoregulation, and body temperature. pp 215-288 In A. J. Marshall (ed.). Biology and comparative physiology of birds (Vol. II). Academic Press, New York.

__________ and __________. 1965. Studies of fat deposition in migratory birds. Ann. New York Acad. Sci. 131:422-440.

A useful review paper.

Klopfer, P. H. and J. P. Hailman. 1965. Habitat selection in birds. Advance Stud. Behav. 1:279-303.

__________ and R. H. MacArthur. 1960. Niche size and faunal diversity. Amer. Nat. 94:293-300.

The proportion of non-passerines in the avifauna decreases with increasing northerly distance from the tropics. The number of individuals per species for a given area decreases toward the tropics for the passerines but not for the non-passerines. At all latitudes, however, non-passerines are less abundant than passerines. The phylogenetically older non-passerine species may thus lack sufficient plasticity in niche requirements to successfully colonize temperate areas, their original tropical niches being smaller and less subject to change.

Lack, David. 1954. The natural regulation of animal numbers. Clarendon Press, Oxford. 343 p.

__________. 1968. Ecological adaptations for breeding in birds. Methuen, London. 409 p.

______. 1971. Ecological isolation in birds. Harvard Univ. Press, Cambridge. 404 p.

Lasiewski, R. C. and W. R. Dawson. 1967. A re-examination of the relation between standard metabolic rate and body weight in birds. Condor 69:13-23.

Lederer, R. J. 1972. The role of avian rictal bristles. Wilson Bull. 84:193-197.

Experts have proposed several possible functions for rictal bristles. They may serve as tactile organs, as an insect scoop, or as protection for other facial feathers. This paper demonstrates by analysis of motion pictures that the Tyrannidae, at least, do not utilize rictal bristles in prey capture.

Lewis, R. Alan. 1967. "Resting" heart and respiratory rates of small birds. Auk 84:131-132.

Contains data for yellow-shafted flicker, blue jay, gray catbird, brown thrasher, and American robin.

Lowery, George H., Jr., and Robert J. Newman. 1966. A continentwide view of bird migration on four nights in October. Auk 83:547-586.

Less migration traffic occurred in the western U.S. than east of the Rockies. More homogeneity in migration flights existed over large areas in this eastern zone than in the western zone. Birds directed movement at a given site in more nearly random fashion than in spring movements. Many migrants detoured around the Great Lakes and the Gulf of Mexico and did not follow rivers.

Lucas, A. M. and P. R. Stettenheim. 1972. Avian anatomy: Integument. GPO, Washington, D. C. Agr. Handbook 362. (2 vols.) 750 p.

Though emphasizing domestic species, this work constitutes the standard reference on the feathers and skin of birds.

Malcolmsen, Richard O. 1960. Mallophaga from birds of North America. Wilson Bull. 72:182-197.

This work lists 800 spp. of Mallophaga and about 500 spp. of birds on which they occur. The paper also gives instructions for collecting and for preserving these lice.

Marler, P. R. and W. J. Hamilton III. 1966. Mechanisms of animal behavior. John Wiley and Sons, New York.

An important theoretical text.

Marshall, A. J. (ed.). 1961. Biology and comparative physiology of birds. (2 vols.). Academic Press, N.Y. and London. 986 p.

An important review of the biology of birds. In each chapter a world authority covers a different area of ornithology and provides an impressive bibliography. Updated by Farner and King (1971, 1973).

Martin, A. C., H. S. Zimm, and A. L. Nelson. 1951. American wildlife and plants. Dover Publ. Inc., N.Y. (reprint). 500 p.

A guide to wildlife food habits: the use of trees, shrubs, weeds and herbs by birds and mammals of the United States. Includes an annotated species list.

Marvin, Phillip H. 1964. Birds on the rise. Bull. Entomol. Soc. Am. 10:194-196.

The author bases nationwide population estimates on Christmas bird counts (Audubon Field Notes: 1949-1963) and concludes that bird populations in the U. S. have increased in the face of expanding use of insecticides. The average annual bird count (all species) increased from 8.6 million in 1949-1952 to 44.6 million in 1962, about a 5-fold increase during the decade. Although numbers of observers increased (5,160 in 1949-52 to 9,981 in 1962), the author feels that bird populations have increased about three-fold.

Matthews, G. V. 1968. Bird navigation (3rd ed.). Cambridge Univ. Press.

Mayr, E. 1946. History of the North American bird fauna. Wilson Bull. 38:3-41.

McAtee, W. L. 1947. Torpidity in birds. Amer. Midl. Nat. 38:191-206.

Menzie, Calvin M. 1969. Metabolism of pesticides. USF&WS Spec. Sci. Rept.-Wildl. #127. 487 p.

Metabolism and decomposition of nearly 300 pesticides. An updating of #96 of this series (1966).

Metcalf, R. L. 1957-1960. Advances in pest control research. III vols. Interscience Publ., N. Y.

Miller, Loye. 1957. Some avian flyways of western America. Wilson Bull. 69:164-169.

The author summarizes records of birds moving through mountain passes in California and Arizona. Pass classifications include fault-line and erosion gaps. He postulates that altitude affects the birds' metabolic economy during migration and possibly determines the migration route.

Morse, D. H. 1970. Ecological aspects of some mixed-species foraging flocks of birds. Ecol. Monog. 40:119-168.

Although dealing with deciduous forest birds, this paper offers some important ecological conclusions on avian flocking.

Murray, B. G., Jr. 1971. The ecological consequences of interspecific territorial behavior in birds. Ecology 52:414-423.

If similarly sized species occur in either narrow sympatry or wide sympatry but normally occupy different habitats, they both are interspecifically territorial and maintain mutually exclusive territories. If similarly sized species overlap widely in distribution and commonly occur in the same habitats, one species is usually interspecifically agressive and the other species flies away when chased. The author presents a model which explains not only these observations, but differences between sympatric species in foraging behavior and bill shape. Tradition classes these last phenomena as consequences of interspecific competition for food.

Murton, R. K. and E. N. Wright (eds.). 1968. The problems of birds as pests; proceedings of a symposium held at the Royal Geographical Society, London, 28-29 Sept. 1967. Academic Press, N.Y. 254 p.

National Geographic Society. 1971. Species index to Bent's "Life histories of North American birds." Published by, and available from, the Society.

An index of technical, common and colloquial names of all species in the complete series by Bent.

Nice, M. M. 1962. Development of behavior in precocial birds. Trans. Linn. Soc. N.Y. 8:1-211.

In this important theoretical monograph, the author classifies the state of maturity in hatchlings as precocial, semi-precocial, semi-altricial, or altricial. Passerines, classed as altricials (eyes closed, little or no down, unable to leave nest, fed by parents), receive secondary emphasis.

Norris, Robert A. 1963. A preliminary study of avian blood groups with special reference to the passeriformes. Bull. Tall Timbers Res. Sta. No. 4. 71 p.

The author used commercially prepared antisera designed for human blood grouping to test the blood of 658 birds of 94 spp. The red cells from some birds agglutinated, indicating that blood systems in these birds resemble those of man.

Odum, E. P. and C. E. Cornell. 1956. Lipid levels in migrating birds. Science 123:892-894.

____________, ____________, and H. L. Stoddard. 1961. Energy and estimated flight ranges of some migratory birds. Auk 78:515-527.

Orians, G. H. and M. F. Willson. 1964. Interspecific territories in birds. Ecology 45:736-745.

An important theoretical paper.

Pearson, O. P. 1960. Torpidity in birds. Harvard Mus. Comp. Zool. Bull. 124:93-103.

Pearson, Ronald. 1972. The avian brain. Academic Press, New York and London. 658 p.

Very technical, but highly informative.

Pettingill, O. S., Jr. 1970. Ornithology in laboratory and field (4th ed.) Burgess Publ. Co., Minneapolis. 524 p.

One of the primary sources for field and laboratory theories and techniques.

Post, George. 1951. A study of aldrin insecticide: Its effects on birds and other wildlife. Wyom. Wildl. 15 (Sept.):4-9, 32-36.

Spraying with aldrin for grasshopper control did not kill birds in Wyoming.

Renner, F. G. and others. 1938. A selected bibliography on management of western ranges, livestock and wildlife. USDA Misc. Pub. 281, 468 p.

The wildlife section (not restricted to the range) offered the most extensive bibliography of American wildlife management published up to 1951.

Ricklefs, Robert E. 1967. The significance of growth patterns in birds. Ph. D. thesis. Univ. Pa. 118 p.

External environmental factors, such as nesting mortality, exert strong selective forces and maintain growth patterns at physiological limits. But they play a small role in producing variation in the growth pattern. Physiological limitations whose variability depends on adaptation to feeding ecology exert primary control.

____________. 1968. Patterns of growth in birds. Ibis 110:419-451.

An important theoretical statement.

__________. 1969. An analysis of nesting mortality in birds. Smithsn. Contribution Zool. No. 9. 48 p.

First, the author identifies, characterizes, and quantifies the mortality factors acting on Temperate Zone altricial land birds. To these he compares nesting mortality in passerines of arctic North America, the humid tropics of Central America and South America, and the arid tropics of South America. Finally, he examines nesting mortality in groups other than passerines. He concludes by discussing the limits of mortality reduction through adaptation.

Rothschild, Miriam and Theresa Clay. 1957. Fleas, flukes and cuckoos (3rd ed.). MacMillan, N. Y. 305 p.

Contains much information on fleas and feather lice, endoparasites (such as worms and protozoans), and flies and mites.

Rudd, Robert L. and Richard E. Genelly. 1956. Pesticides: their use and toxicity in relation to wildlife. Calif. Dept. Fish & game, Game Bull. No. 7. 209 p.

Encyclopedic up to 1956. For each important pesticide the paper includes sections on use, toxicology and effects on all forms of wildlife. 50 p. bibliog.

Salt, G. W. 1963. Avian body weight, adaptation, and evolution in western North America. Proc. 13th Int. Ornith. Cong. 2:905-917.

Populations vary geographically in body weight.

__________. 1964. Respiratory evaporation in birds. Biol. Rev. Cambridge Phil. Soc. 39:113-136.

Scherer, W. F. 1963. The importance of birds in the ecology of arthropod-borne animal viruses. Living Bird 2:131-137.

Seibert, H. C. 1949. Differences between migrant and non-migrant birds in food and water intake at various temperatures and photoperiods. Auk 66:128-153.

Sibley, C. G. 1957. The evolutionary and taxonomic significance of sexual dimorphism and hybridization in birds. Condor 59:166-191.

An important theoretical paper; utilizes hummingbirds as an example.

__________. 1970. A comparative study of the egg-white proteins of passerine birds. Yale Univ., Peabody Mus. Nat. Hist. Bull. 32. 131 p.

__________ and Jon E. Ahlquist. 1972. A comparative study of the egg white proteins of non-passerine birds. Peabody Mus. Nat. Hist. Bull. 39. 276 p.

These two important monographs summarize Sibley's work thus far on the classification of birds according to variations in the proteins of egg albumen.

Stamm, Donald D. 1958. Studies on the ecology of equine encephalomyelitis. Am. J. Pub. Health 48:328-335.

Includes much information on the role of wild birds of various localities in the epidemiology of western and eastern equine encephalitis.

__________. 1966. Relationships of birds and arboviruses. Auk 83: 84-97.

The author gives examples of the impact of epidemics of arbovirus disease on human communities and pinpoints some ornithological information needed by virologists and epidemiologists.

Stewart, Robert E. and John W. Aldrich. 1950. A selected bibliography of ecological life history material on North American birds. Ecology 31:469-471.

Stickel, Lucille F. 1968. Organochlorine pesticides in the environment. U.S. F&WS Spec. Sci. Rept.-Wildl. #119. 32 p.

A selective review of the literature concerning the occurrence, distribution and effects of organochlorines in the environment.

Stratton, G. Burder (ed.). The zoological record. Zool. Soc., London.

A bibliography of many volumes.

Strong, Reuben, J. 1959. A bibliography of birds, with special reference to anatomy, behavior, biochemistry, embryology, pathology, physiology, genetics, ecology, aviculture, economic ornithology, poultry culture, evolution, and related subjects. Part 4-Finding Index. Field Mus. Nat. Hist. Zool. Series. 25:1-186.

The publication of this enormous work ends with this, the last volume in the set. The finding index presents one continuous alphabetically arranged list with references to the Subject Index. Parts 1 and 2, the Author catalogue appeared in 1939. Part 3, the Subject Index, in 1946.

Swartzman, G. S. 1969. A preliminary bird population dynamics and biomass model. IBP Grassland Biome Technical Report No. 3.

Thompson, A. Landsborough (ed.). 1964. A new dictionary of birds. McGraw-Hill, N. Y. 928 p.

Huge amounts of information concentrated in one book: a valuable, comprehensive reference work.

Thorpe, W. H. 1961. Bird song. Cambridge Univ. Press. 142 p.

Tucker, Richard K. and D. Glen Crabtree. 1970. Handbook of toxicity of pesticides to wildlife. USDI F&WS Resource Publ. No. 84. 131 p.

Compendium of toxicity of 108 pesticides to wildlife. Presents acute toxicity data and a list of the common symptoms observed for each pesticide.

Tucker, V. A. 1969. The energetics of bird flight. Sci Amer. 220:70-78.

Important and authoritative (along with later articles by the author.)

____________. 1971. Flight energetics in birds. Amer. Zool. 11:115-124.

____________ and Klaus Schmidt-Koenig. 1971. Flight speeds of birds in reaction to energetics and wind directions. Auk 88:97-107.

A system of double theodolites measures flight velocity vectors for helium baloons and a variety of birds. The calculated air velocities of the birds varied, although birds flying in a wind tunnel can minimize their rate of energy expenditure by flying at a constant speed. Birds tended to fly faster when flying in headwinds than in tailwinds. This phenomenon may result from errors in estimating wind velocity, but such behavior could maximize the range of a bird flying in windy conditions.

Van Tyne, Josselyn and Andrew J. Berger. 1959. Fundamentals of Ornithology. John Wiley and Sons, N.Y. 624 p.

Intended as a graduate text, this volume proves valuable as a standard reference as well. Emphasizes anatomy and physiology, taxonomy and behavior. (Also available in a Dover Press reprint.)

Welty, Joel Carl. 1962. The life of birds. Saunders, Philadelphia. 546 p.

An encyclopedic textbook of bird biology.

West, G. C. 1962. Responses and adaptations of wild birds to environmental temperatures. p 291-321. In J. P. Hannon and E. Viereck (eds.) Comparative physiology of temperature regulation: Part 3. Arctic Aeromed. Lab., Fort Wainwright, Alaska.

__________. 1965. Shivering and heat production in wild birds. Physiol. Zool. 38:111-120.

The author measured shivering responses in the evening grosbeak, redpoll, grackle, and crow. Shivering correlated linearly with oxygen consumption for all four species. The species correlations tend to be colinear with oxygen consumption expressed on a surface-area basis. No evidence exists for non-shivering thermogenesis. Shivering and muscular activity thus constitute the principal means of extra heat production in birds.

Wiens, J. A. and G. S. Innis. 1973a. Estimation of energy flow in bird communities: I. A population bioenergetics model. IBP Grassland Biome Preprint No. 66. 46 p.

__________ and __________. 1973 b. Estimation of energy flow in bird communities II. A simulation model of activity budgets and population bioenergetics. IBP Grassland Biome Preprint No. 73. 14 p.

Wolfson, Albert (comm. chairman). 1954. Unpublished theses in ornithology. Auk 71:191-197.

__________. 1955. Recent studies in avian biology. Univ. Ill. Press, Urbana. 429 p.

This book reviews a number of valuable contributions to bird biology, including migration.

__________. 1960. Role of light and darkness in the regulation of the annual stimulus for spring migration and reproductive cycles. Proc. 12th Intl. Ornithol. Congr., 1958. p. 758-789.

A useful review paper.

Wood, Sherwin F. and Carlton M. Herman. 1943. The occurrence of blood parasites in birds from southwestern United States. J. Parasitology 29:187-196.

GENERAL: ORDERS AND FAMILIES
(Large taxonomic categories)

*Caprimulgidae (Goatsuckers)

Armstrong, Joseph T. 1965. Breeding home range in the nighthawk and other birds; its evolutionary and ecological significance. Ecology 46:619-629.

Jenkinson, Marion Anne and Robert M. Mengel. 1970. Ingestion of stones by goatsuckers (Caprimulgidae). Condor 72:236-237.

Nine of 15 spp. ingest grit, presumably to aid in grinding the heavy chitonous bodies of beetles which form a large part of their diet.

*Apodidae (Swifts)

Emerson, K. C. and H. D. Pratt. 1956. The Menoponidae (Mallophaga) found on North American swifts. Jour. Kansas Entomol. Soc. 29:21-28.

Lack, D. 1956. A review of the genera and nesting habits of swifts. Auk 73:1-32.

*Trochilidae (Hummingbirds)

Banks, R. C. and N. K. Johnson. 1961. A review of North American hybrid hummingirds. Condor 63:3-28.

Cody, Martin L. 1968. Interspecific territoriality among hummingbird species. Condor 70:270-271.

Contains observations on 12 spp. of western hummers.

French, N. R. 1959. Torpidity in cave-roosting hummingbirds. Condor 61:223.

Grant, K. A. 1966. A hypothesis concerning the red coloration in California hummingbird flowers. Amer. Natur. 100:85-97.

__________ and V. Grant. 1968. Hummingbirds and their flowers. Columbia Univ. Press, N. Y. and London. 115 p.

This book presents detailed information on the pollination of flowers by hummingbirds, with emphasis on coevolution of the plants and birds. Ecological distribution of the birds and flowers in the western states is well delineated. The book includes thirty color plates of hummers of the West.

Greenewalt, C. H. 1960. Hummingbirds. Doubleday & Co., Garden City, N. Y.

This authoritative reference for hummingbirds includes a portfolio of seventy amazing photographs of North and South American species, and extensive, understandable discussions of hummingbird behavior and of the physics of feather color and iridescence and of flight. A very important book.

Lasiewski, Robert C. 1962a. Physiological responses to temperature in hummingbirds. Ph. D. thesis. Univ. Mich. 98 p.

__________. 1962b. The energetics of migrating hummingbirds. Condor 64:324.

Hummingbirds have a lower metabolic rate than previously supposed. Flight energetics calculations indicate that the migrating ruby-throated hummingbird can fly non-stop across the Gulf of Mexico.

__________. 1963. Oxygen consumption of torpid, resting, active and flying hummingbirds. Physiol. Zool. 36:122-140.

Metabolism-temperature curves for post-absorptive hummingbirds resting in the dark resemble those of obligatory homeotherms. At temperatures of 20° C the metabolic rates of torpid hummingbirds resemble those of torpid bats and small lizards. Torpidity does not occur every night, except in individuals with restricted energy reserves. Metabolism over 24-hour periods and the upper and lower limits of the ranges of daytime metabolism generally increase with decreasing ambient temperature. A Costa's hummingird hovering constantly for 35 minutes in a metabolism chamber used 42.4 cc O_2/gm.hr. Calculations based on these data suggest that the ruby-throated hummingbird has sufficient energy reserves to fly non-stop across the Gulf of Mexico. The energy cost of small size in hummingbirds is considerably less, and the rates of metabolism of torpid, resting, and flying birds obtained in this study considerably lower than previously reported figures.

__________. 1964. Body temperature, heart and breathing rate, and evaporative water loss in hummingbirds. Physiol. Zool. 37:212-223.

Pitelka, F. A. 1942. Territoriality and related problems in North American hummingbirds. Condor 44:189-204.

Scheithauer, W. 1967. Hummingbirds (trans., Gwynne Vevers). Thomas Y. Crowell, New York.

Primarily a guide to maintaining hummingbirds in captivity, the book offers much valuable life history information. Includes superb photographs of aviary birds, including rufous, lucifer and white-eared hummingbirds.

Short, Lester L. Jr. and Allan R. Phillips. 1966. More hybrid hummingbirds from the United States. Auk 83:253-265.

Hybrids between black-chinned x Costa's hummingbirds and Rivoli's x broad-billed hummingbirds.

Stiles, F. Gary. 1972. Age and sex determination in rufous and Allen hummingbirds. Condor 74:25-32.

Van Riper, W. 1958. Hummingbird feeding preferences. Auk 75:100.

On a scale of 10, hummers preferred syrups as follows: sucrose, 10; dextrose, 8; levulose, 5; galactose, 1; maltose, 0; saccharin, 0.

___________. 1960. Does a hummingbird find its way to nectar through a sense of smell? Sci. Am. 202:157-166.

Sight alone, not smell, guides a bird in its search for food.

Wolf, L. L. and F. R. Hainsworth. 1971. Environmental influence on regulated body temperatures in torpid hummingbirds. Comp. Biochem. Physiol. 41A:167-173.

* Picidae (Woodpeckers)

Beal, F. E. L. 1911. Food of the woodpeckers of the United States. U.S.D.A. Biol. Surv. Bull. 37:1-64.

Beeker, William J. 1953. Feeding adaptations and systematics in the avian order Piciformes. J. Wash. Acad. Sci. 43:293-299.

Burt, W. H. 1930. Adaptive modifications in the woodpeckers. Univ. Calif. Publ. Zool. 3:455-524.

Emerson, K. C. and J. C. Johnson, Jr. 1961. The genus Penenirmus (Mallophaga) found on North American woodpeckers. Jour. Kansas Entomol. Soc. 34:34-43.

PASSERIFORMES (Perching birds)

Andrew, R. J. 1961. The displays given by passerines in courtship and reproductive fighting: A review. Ibis 103a: 315-348 (Part I); 549-579 (Part II).

Components of display in passerine courtship fall into seven major groups: sexual, aggressive, fear, alert, nesting, parental, and begging responses. All may occur during reproductive fighting. However, in order to present the observational data reviewed, the author classified display components on the basis of form alone: bill raising and lowering, wing vibration, feather raising, components of the head-forward posture, lateral assymetry, components of the female precopulatory display, and song. He discusses systematic implications of distribution of the different components. 303 references.

Bailey, R. E. 1952 The incubation patch of passerine birds. Condor 54:121-136.

125 specimens from 12 families did not vary significantly in structure. Passerines have a single large incubation patch located in, and coincident in size with, the ventral apterium. In formation of the patch, the bird molts all the down feathers of the ventral apterium several days before egg-laying begins. Immediately after defeatherization, the size and number of blood vessels in the apterial dermis increase, the skin becomes slightly thickened owing to dermal edema, the feather papillae disappear, and the epidermis undergoes rapid cell division. Dermal muscles disappear. The birds maintain this condition through incubation and the first part of brooding. Edema and vascularity then begin to subside, until the skin returns to normal by the time the young fledge. Refeatherization of the patch occurs during the fall molt.

Borror, Donald J. 1961. Intraspecific variation in passerine bird songs. Wilson Bull. 73:57-78.

The author outlines song variation via analysis of tape recordings with a sound spectrograph. Individuals of some species have only one song pattern, others have two or more patterns. One lark sparrow had 58 patterns. The author discusses factors for and functions of such variations in song.

Brown, J. L. 1973. Some determinants of vocalization by electrical stimulation of the brain in passerine birds. In I. J. Goodman and M. W. Schein (eds.). The bird: Its brain and behavior. Academic Press, New York (in press).

Lanyon, Wesley F. and Vernia H. Lanyon. 1969. A technique for rearing passerine birds from the egg. Living Bird 8:81-93.

Detailed directions for incubating eggs, brooding young and feeding nestlings until they fledge. Includes: blue jays, house wrens, eastern meadowlarks and house finches.

Miskimen, M. 1961. Sound production in passerine birds. Auk 68:493-504.

Newman, J. D. 1970. Midbrain regions relevant to auditory communications in songbirds. Brain Res. 22:259-261.

Ricklefs, R. E. 1968. On the limitation of brood size in passerine birds by the ability of adults to nourish their young. Proc. Natl. Acad. Sci. 61:847-851.

The author proposes that the rate at which adults can provide food for their young serves as the primary determinant of brood size in open-nesting passerine birds.

Simmons, K. E. C. 1957. A review of the anting behavior of passerine birds. Brit. Birds. 50:401-424.

A critical review (with bibliography)of both active and passive anting.

Smith, S. M. 1973. Food manipulation by young passerines and the possible evolutionary history of impaling by shrikes. Wilson Bull. 85:318-322.

Aspects of the early food-manipulating behavior of young catbirds, blue jays and black-capped chickadees resemble developing impaling behavior in young loggerhead shrikes.

Verner, Jared and Mary F. Willson. 1966. The influence of habitats on mating systems of North American passerine birds. Ecology 47: 143-147.

In this important theoretical statement, the authors discuss two possible selective bases for the evolution of polygyny: (1) one male may make it advantageous for several females to mate with him by appropriating a large share of a limited number of nest sites. (2) When a species obtains a large share of the food for the young from the territory, local variations in food availability may influence the mating system. In this case, selection would favor a female pairing with a male on a better-supplied territory, even if this meant establishing a polygynous association. Fourteen of 291 species of North American birds are regularly polygynous or promiscuous. Thirteen of the 14 breed in marshes, prairies, or savannah-like habitats where productivity resulting from solar energy is concentrated into a narrow vertical belt. Thus, the density of productivity--and of avian food sources--is potentially much greater in marshes and prairies than in forests. Hence, marshes and prairies are more likely than forests to combine the minimum requisite food supply with sufficient variation in available food between territories for selection to favor polygyny.

__________ and __________. 1969. Mating systems, sexual dimorphism, and the role of male North American passerine birds in the nesting cycle. Am. Ornithol. Union:Ornithol. Monographs No. 9. 76 p.

This useful monograph consists primarily of a long table that (1) classifies 291 species as either sexually monomorphic or dimorphic (2) indicates what we know about their mating systems, and (3) reports the role of the male in the stages of reproduction from nest-building through the period of independence. The authors regard only 48 species as "reasonably well known." 1,585 reference bibliography.

Wetherbee, David K. 1957. Natal plumages and downy pterylosis of passerine birds of North America. Am. Mus. Nat. History Bull. 113:343-436.

Wetmore, A. 1936. The number of contour feathers in passeriform and related birds. Auk 53:159-169.

* Tyrannidae (Tyrant flycatchers)

Davis, L. Irby. 1961. Songs of North American Myiarchus. Texas J. Sci. 13:327-344.

The author describes in detail the songs of all North American crested flycatchers and provides spectrograms for seven of the songs. He also discusses evolutionary development of the different song patterns.

Hespenheide, Henry A. 1964. Competition and the genus Tyrannus. Wilson Bull. 76:265-281.

The following factors evidently prevent serious interspecific competition between the Cassin's and western kingbirds: (1) a high degree of spatial isolation and (2) the limiting of the populations of both species by (a) intraspecific competition for nest sites within each species and by (b) nesting by each species in only a small part of the available habitat while feeding in all of it. The thick-billed and tropical kingbirds remain nearly entirely isolated geographically from competition with the Cassin's and western, although are themselves sympatric over most of the thick-billed's range.

_____________. 1969. Niche overlap and the exploitation of flying insects as food by birds, with special reference to the Tyrannidae. Ph. D. thesis. Univ. Pa. 101 p.

Johnson, Ned K. 1963. Biosystematics of the sibling species of flycatchers in the Empidonax hammondii-oberholseri-wrightii complex. Univ. Calif. Publ. Zool. 66:79-238.

(Hammond's, Dusky, and Gray flycatchers.) Extensive and authoriatative; field observations included.

Lanyon, Wesley B. 1963. Experiments on species discrimination in Myriarchus flycatchers. Am. Museum Novitates 2126:1-16.

Each of four species discriminated between the vocal repertoires of five species of Myiarchus and reacted positively to only the repertoire of its own species. Each of the four species acted aggressively and even attacked mounted specimens of other species during playback of the vocal repertoire characteristic of the mounted species.

Smith, W. John. 1970. Song-like displays in Sayornis species. Behaviour 37:64-84.

Eastern, black and Say's phoebes.

Swarth, H. S. 1933. Relationships of Coue's and olive-sided flycatchers. Condor 35:200-201.

These two species may be congeneric.

* Hirundinidae (Swallows)

Moody, D. T. 1968. Niche differentiating mechanisms in two sympatric species of swallows. M.S. thesis. Central Wash. St. Coll., Ellensburg.

* Corvidae (Jays and crows)

Hardy, John William. 1961. Studies in behavior and phylogeny of certain New World jays (Garrulinae). Univ. Kans. Sci. Bull. 62:13-149.

An important paper. The blue jay is territorial and flocks loosely in the non-breeding season. The Mexican jay is highly social at all seasons; both the parents and other jays care for each brood. Whereas the congeneric blue and Steller's jays resemble one another in habits, most races of the scrub jay differ from the congeneric Mexican jay in that they are highly territorial and show no prominent age dimorphism in bill coloration (as does the Mexican jay). Also included are sections on phylogeny, systematics, and breeding and social behavior.

Turcek, F. J. and L. Kelso. 1968. Ecological aspects of food transportation and storage in the Corvidae. Comm. Behavioral Biol., Part A, 1:277-297.

* Paridae (Titmice)

Dixon, K. L. 1961. Habitat distribution and niche relationships in North American species of <u>Parus</u>. p. 179-216. <u>In</u> W. F. Blair (ed.). Vertebrate speciation, a University of Texas symposium. Univ. Tex. Press, Austin.

Myton, B. A. and R. W. Ficken. 1967. Seed-size preference in chickadees and titmice in relation to ambient temperature. Wilson Bull. 79: 319-321.

* Turdidae (Thrushes)

Hicks, David L. 1967. Adipose tissue composition and cell size in fall migratory thrushes (Turdinae). Condor 69:387-399.

Relative nonfat composition of adipose tissue in fall migrant thrushes remains stable, despite large changes in total body fat. Increases in cell size with increasing fat deposition together with only a small accompanying increase in nonfat tissue components constitute direct evidence for hypertrophy of fat cells as a major mechanism in premigratory fattening. The author attributes significant differences in iodine numbers between species to basic species differences. Since no consistent pattern exists, differences in iodine numbers between stages of fatness within a species may depend on differences in food available to migrating individuals originating in a wide area to the north.

* Laniidae (Shrikes)

Miller, A. H. 1931. Systematic revision and natural history of the American shrikes (Lanius). Univ. Calif. Publ. Zool. 38:11-242.

An important reference, this paper details the morphological variation upon which the author bases his taxonomy of the genus. The age composition of various shrike populations evidently varies with differences in the severity of the environmental conditions and with differences in the migratory habit. The territorial habits of shrikes prevail year-long. Subspeciation in the loggerhead shrike evidently depends on the combined effects of genetic isolation and climatic differences. Early nesting of the shrike during March to mid-May may serve to avoid competition since most breeding birds of its range nest later.

* Vireonidae (Vireos)

Barlow, Jon C., R. D. James and Nikki Williams. 1970. Habitat co-occupancy among some vireos of the subgenus Vireo (Aves:Vireonidae). Canadian J. Zool. 48:395-398.

In contrast to Hamilton (1962), this paper reports habitat co-occupancy for the first time between the gray vireo and Bell's vireo, and the former species and the solitary vireo, three species similar both in morphology and in foraging strategy. For central and northern Arizona both behavioral and vocal differences facilitate the association between the gray and Bell's vireos, but the gray and solitary vireos use only behavioral differences to ease competition. Gray and Bell's vireos vary distinctively in foraging techniques. The gray vireo secures most of its prey from twigs, branches and the trunks of smaller trees, while the Bell's vireo gleans prey from twigs and foliage. The two species differ in size, color and voice. The second pair, the gray and solitary vireos, exist in very similar habitat, subsist on similar diets, converge in color, pattern of plumage, and song. They maintain reproductive isolation by defending breeding territories from other males of both species.

Hamilton, Terrell H. 1958. Adaptive variation in the genus Vireo. Wilson Bull. 70:307-346.

The author outlines variation relative to the environment in members of the genus having wide North and Middle American distribution. He then comments on the adaptive value of such patterns.

____________. 1962. Species relationships and adaptations for sympatry in the avian genus Vireo. Condor 64:40-68.

Habitat co-occupancy rarely occurs in members of the genus Vireo. The few species of the genus that utilize the same habitat succeed by occupying different, but contiguous, layers of that habitat. Vireos use four methods to minimize interspecific competition between non-conspecific, congeneric individuals: adjustments in habitat selection, vocalizations, behavioral motions or postures, and plumage signals. Isolated populations tend to diverge in their adaptations. Thus, sympatric development of habitat co-occupancy or territorial overlap in territory-defending passerines generally occurs between relatively old and/or more diverged members of a genus. Relatively young and/or less diverged congeners tend to develop territorial exclusion or territorial separation.

* Parulidae (Wood warblers)

Austin, George T. 1971. On the occurrence of eastern wood warblers in western North America. Condor 73:455-462.

Species which breed west of the Rockies occur in the West at about the same time seasonally that migration takes place in eastern North America. These species may regularly use the West Coast as a migratory route. Species which breed exclusively east of the Rockies appear in the West more than three weeks after migration peaks in the east. Some of these seem to be regular transients; others appear to be vagrants concentrated by the Pacific Coast. Three species apparently use the desert flightline. Most fall vagrants are immatures. These may move westward across the southwestern states on airflows from the East.

Chapman, Frank M. 1968. Warblers of North America. 3rd ed. Dover.

Reprint of an old classic.

Eaton, S. W. 1949. The genus Seiurus: A comparative study of the species. Ph. D. thesis. Cornell Univ.

The ovenbird and northern waterthrush.

Federation of Ontario Naturalists. Warblers: Songs of warblers of Eastern North America. Published by author, Don Mills, Ontario.

400 songs of 38 species. 12-inch l.p. record.

Ficken, Millicent S. and Robert W. Ficken. 1962. The comparative ethology of wood warblers: A review. The Living Bird 1:103-122.

Griscom, Ludlow and Alexander Sprunt, Jr. (eds.). 1957. The warblers of America. Devin-Adair Co. 356 p.

Includes life history and behaviorial information on all wood warblers of North, Central,and South America.

Parnell, J. F. 1969. Habitat relations of the Parulidae during spring migration. Auk 86:505-521.

Important habitat analysis of warblers in North Carolina forest.

Stein, Robert C. 1962. A comparative study of songs recorded from five closely related warblers. Living Bird 1:61-71.

Guide to comparative plumage color, habitat, and song in Townsend's, hermit, and black-throated gray warblers.

* Icteridae (Blackbirds and orioles)

Beecher, W. J. 1950. Convergent evolution in the American orioles. Wilson Bull. 62;51-86.

* Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Borror, Donald J. 1971. Songs of Aimophila sparrows occurring in the United States. Wilson Bull. 83:132-151.

Songs of Bachman's, rufous-winged, and Botteri's sparrows resemble one another. But those of the Cassin's, rufous-crowned, and five-striped sparrows differ considerably from these first-named species. The six species differ in size of individual repertoires, use of the repertoires, singing rate, and in the matching of identical songs by separate individuals. (Note: five-striped sparrows (A. quinquestriata) occur as accidentals in S. Arizona.)

Dawson, W. R. and F. C. Evans. 1957. Relation of growth and development to temperature regulation in nestling field and chipping sparrows. Physiol. Zool. 30:315-327.

Federation of Ontario Naturalists. Finches: Songs of Fringillidae of eastern and central North America. Published by author, Don Mills, Ontario.

400 songs of 43 species. 12-inch l.p. record.

Manwell, Reginald D. 1955. The blood protozoa of seventeen species of sparrows and other Fringillidae. J. Protozool. 2:21-27.

Ohmart, Robert D. and E. Inwood Smith. 1970. Use of sodium chloride solutions by the Brewer's sparrow and tree sparrow. Auk 87:329-341.

Brewer's sparrows withstood greater water deprivation and higher concentrations of sodium chloride solutions than tree sparrows. The former possessed low water requirements and maintained body weight on salinities equaling that of sea water.

Pulliam, H. R. and F. Enders. 1971. The feeding ecology of five sympatric finch species. Ecology 52:557-566.

This paper deals with the cardinal, field sparrow, dark-eyed junco, song sparrow and white-throated sparrow inhabiting abandoned eastern agricultural land. Bill sizes differ with varying proportions of large seeds in the set of habitats within which each species forages. These differences do not reduce competition within habitats.

Salt, George W. 1952. The relation of metabolism to climate and distribution in three finches of the genus Carpodacus. Ecol. Monog. 22:121-152.

Adaptation of metabolism to differing climates influences the distribution of the three members of this genus, the purple, Cassin's and house finch. The purple finch metabolizes most efficiently at high humidities while the house finch functions best in a hot, dry climate. The Cassin's finch has adapted to the intermediate metabolic conditions of mild, dry climate. Statement of the breeding ranges of the species demonstrates the selective value of these varying metabolic efficiencies: the purple finch breeds in the moist Pacific coastal forest, the Cassin's finch in the drier interior forests and the house finch on the warmer, even drier plains and deserts. Feeding habits reinforce the differentiation.

Willson, Mary F. 1971. Seed selection in some North American finches. Condor 73:415-429.

The author tested preferences of eight species of North American finches of different bill size for eight types of commercially available seeds. All species showed distinct preferences, both in terms of numbers of seeds eaten and calories ingested. Although preferences at low temperatures differed from those at room temperature, the birds did not choose larger seeds, those containing more calories, or seeds providing maximum energy intake.

____________. 1972a. Seed size preference in finches. Wilson Bull. 84:449-455.

Cardinals did not select specific seed sizes and differed little in individual ability to handle seed sizes. Five smaller finch species usually preferred small (short and thin) seeds (sunflower seeds primarily) corresponding to their small bills and general inability to handle larger seeds. Bill force applied by the main portion of the bill depends more on bill depth, and perhaps width, than length.

____________. 1972b. Behavioural dominance and ecological segregation in sparrows. Passenger Pigeon 34:58-61.

__________ and J. C. Harmeson. 1973. Seed preferences and digestive efficiency of cardinals and song sparrows. Condor 75:225-234.

In laboratory tests at two temperatures, cardinals preferred hemp (*Cannabis sativa*) and foxtail (*Setaria faberi*). Sparrows chose foxtail and pigweed (*Amaranthus* sp.). Ease of handling determined preferences.

Winn, J. F. and E. E. Bennington. 1959. An attempt to recover western equine encephalitis from the nasal mites of sparrows. Proc. Soc. Exp. Biol. & Med. 10:135-136.

Thirty-six of 44 sparrows had antibodies neutralizing to WEE after 20 days of exposure.

GENERAL: TECHNIQUES

Bleitz, Don. 1970. Mist nets and their use. Inland Bird-Banding News. 42:43-56.

The author discusses the alternative sizes and weights of mist nets, their care and handling, and proper procedures in locating and erecting the nets.

Brewer, R. 1972. An evaluation of winter bird population studies. Wilson Bull. 84:261-277.

In evaluating the method of estimating winter bird populations utilized in Audubon Field Notes (now American Birds), the author concluded that the method inherently overestimates populations of very conspicuous birds and underestimates very inconspicuous birds.

Cochran, W. G. 1963. Sampling techniques. John Wiley and Sons, Inc., New York.

Davis, John. 1965. The "singing-male" method of censusing birds: a warning. Condor 67:86-87.

The author counted more rufous-sided towhees while covering a census route immediately after the start of singing in the morning than during return trips over the same route some 15-20 minutes later.

Deevey, Edward S. 1947. Life tables for natural populations of animals. Quart. Rev. Biol. 22:283-314.

A classic reference on this useful technique.

Eastwood, E. 1967. Radar Ornithology. Methuen and Co. Ltd., London.

Emlen, John T. 1971. Population densities of birds derived from transect counts. Auk 88:323-342.

The author reviews census methods for nonflocking land birds and describes a new method more efficient than the intensive plot methods yet comparable in accuracy. In the new method, applicable in all seasons, one makes foot transects and counts all detections, visual and aural, out to the limit of detectability. One then multiplies the count for each species by a conversion factor (coefficient of detectability) representing the percent of the population normally detected. The paper ends with a discussion of field procedures used in testing the new method and samples of preliminary results.

Friend, M. 1967. A review of research concerning eye-lens weight as a criterion of age in animals. N.Y. Fish and Game J. 14:152-165.

Giles, R. H. Jr., (ed) 1969. Wildlife Management Techniques (3rd ed., rev.). The Wildlife Society, Washington.

This standard reference includes much information on birds.

Hoyt, Sarah F. 1948. A reference book and bibliography of ornithological techniques. Ph.D. thesis. Cornell Univ.

Larsen, Kenneth H. 1970. A hoop-net trap for passerine birds. Bird-Banding 41:92-96.

This article presents construction details for a hoop-net trap for house finches utilizing a lowered entrance. This walk-in trap proved light weight, easy to erect, and compact.

Madsen, Ruth M. (compiler). 1967. Age determination of wildlife/ A Bibliography. USDI Library, Bibliography No. 2. 111 p.

Includes a section on birds, subdivided taxonomically.

Moody, David T. 1970. A method for obtaining food samples from insectivorous birds. Auk 87:579.

The author utilizes a 10-cc disposable plastic syringe filled with warm saline solution, and a flexible plastic tube, 16 cm long and 4mm in diameter, coated with vaseline. He inserts this gently into the esophagus until the tip rests against the stomach. The experimenter must hold the bird with a receptacle under the cloaca and its head downward to avoid drowning by filling the oral cavity with water.

Schafer, Edward W., Jr. and Ronald B. Brunton. 1971. Chemicals as bird repellents: Two promising agents. J. Wildl. Mgmt. 35:569-572.

Of 724 chemicals screened as repellents for red-winged blackbirds, only six satisfied criteria for high repellency and low toxicity. Of these, methiocarb and DRC-3324 consistently eliminated house sparrows, grackles, tri-colored blackbirds and brown-headed cowbirds.

____________ and Donald J. Cunningham. 1972. An evaluation of 148 compounds as avian immobilizing agents. U.S. Fish Wildl. Serv. Spec. Sci. Rept. Wildl. No. 150. 30 p.

From 1961-1969 workers tested 148 compounds for immobilization of red-winged blackbirds and starlings. 25 of these appeared effective enough to warrant testing on seven additional wild species: the common grackle, rock dove, house finch, house sparrow, mallard, pheasant, and yellow-headed blackbird. No single compound immobilized all nine species. Banol, Doweo 161, metomidate and metomidate HCl proved exceptionally active on three or more species. Redwings and house finches possessed highest sensitivities to the chemicals, pheasants the least.

Schladweiler, John L. and I. J. Ball Jr. 1968. Telemetry bibliography emphasizing studies of wild animals under natural conditions. Bell Museum Nat. Hist. Tech. Rept. No. 15. 31 p.

634 entries; essentially complete through April, 1968.

Will, Gary B. and Earl F. Patric. 1972. A contribution toward a bibliography on wildlife telemetry and radio tracking. N.Y. State Dept. Environ. Conserv. 58 p.

A bibliography of more than 600 references, including 200 research projects in telemetry and tracking under way at press time.

Wood, Merrill. 1969. A bird-bander's guide to determination of age and sex of selected species. Coll. Agr. Pa. State Univ. 181 p.

How to age and sex live birds. Concentrates on passerines occurring in the northeastern states.

TUNDRA

* Introduction

The tundra biome covers all of the treeless Arctic. Low precipitation (from four to eight inches in most areas) and low to extremely low temperatures combine in creating a very harsh environment. Except for the upper few inches during summer, the ground remains permanently frozen. Plants must adapt to an exceedingly brief growing season -- about 60 days. Low-growing mosses, sedges, grasses, lichens, and dwarf woody plants dominate in the tundra, and make the biome essentially a wet arctic grassland. Tundra subdivisions in Alaska include the low, continental tundra of the northern coastal plain, the high tundra of the Brooks Range and northern Rockies, the western Alaskan tundra along the shores of the Bering Sea, and the Aleutian tundra (atypical in its high precipitation and abundance of shrubs).

Widespread interspersion of land and water gives nesting birds security from those few predators present. Great numbers of shore birds and waterfowl breed in the tundra in summer, as well as a lesser number of other species, including larks and fringillids. Practically all of these birds escape the demanding environment of the tundra winter by migrating southward in the fall.

As an adaptation to the brief summer season, arctic birds have developed strikingly accelerated reproductive cycles characterized by quick nest building, short incubation periods, and rapid molting and development of precocial young. Without these adaptations, the closing in of winter would kill thousands of young birds unable either to migrate or to survive the arctic winter on their own. The abundant insect populations, coupled with the long northern days, enable most tundra species to raise unusually large broods. Resident birds of the tundra and other cold habitats have larger and more compact bodies than their temperate and tropical zone equivalents. This conserves heat, since a large body has relatively less heat-losing surface than a similar small one.

Typical birds of the Alaskan tundra include a number of old-world stragglers found nowhere else in North America. Fringillids dominate to a notable degree:

Horned lark	Yellow wagtail	Tree sparrow
Gray-headed chickadee	White wagtail	White-crowned sparrow
Gray cheeked thrush	Water pipit	Lapland longspur
Wheatear	Northern shrike	Smith's longspur
Bluethroat	Hoary redpoll	Snow bunting
Arctic warbler	Common redpoll	McKay's bunting

Note; Bird lists for each biome are based on Udvardy (1963), Shelford (1963), and Blackford (1956), cross-checked with Peterson (1969) and Robbins, Bruun, Zim, and Singer (1966). The range maps and statements in these last two books provide the most useful tool available for predicting the occurrence of a particular species in a particular area.

Literature cited:

Blackford, J. L. 1956. Western wonderlands: A guide to bird habitats of the western United States. Vantage Press, New York. 120 p.

Peterson, R. T. 1969. A field guide to western birds (2nd ed.). Houghton Mifflin Co., Boston. 366 p.

Robbins, C. S., B. Bruun, H. S. Zim, and A. Singer. 1966. Birds of North America. Golden Press, New York. 340 p.

Shelford, V. E. 1963. The ecology of North America. Univ. of Ill. Press, Urbana. 610 p.

Udvardy, M. D. F. 1963. Bird faunas of North America. Proc. 13th Intern. Ornithol. Congr. 2:1147-1167.

* General

Bailey, Alfred M. 1948. Birds of arctic Alaska. Colo. Mus. Nat. Hist. Pop. Ser. 8. 317 p.

This book summarizes Bailey's field investigations on the Arctic Slope in 1921-1922, and includes a compilation of all available information on arctic birds (as of 1948) in the form of an annotated bibliography. (We will reference none of Bailey's earlier publications on arctic birds).

Bee, James W. 1958. Birds found on the arctic slope of northern Alaska. Univ. Kansas Mus. Nat. Hist. 10:163-211.

An annotated list of 73 spp., with notes on numbers, weights, reproductive condition, nests, habitats, and behavior.

Brandt. H. 1943. Alaska bird trails. Bird Research Foundation, Cleveland. 464 p.

This book recounts a year-long ornithological expedition in the vicinity of Hooper Bay, along the coast of the Bering Sea. An annotated species list appended presents valuable breeding data.

Cade, Tom. 1952. Notes on the birds of Sledge Island, Bering Sea, Alaska. Condor 54:51-54.

Childs, Henry E., Jr. 1969. Birds and mammals of the Pitmegea River region, Cape Sabine, northwestern Alaska. Biol. Paps. Univ. Alaska 10;1-76.

The author observed 90 species of birds, 55 of which nested within the Pitmegea drainage. He classified the species according to five plant communities.

Collins, Henry B., Jr., Austin H. Clark, and Egbert H. Walker. 1945. The Aleutian Islands: Their people and natural history. Smithsn. Inst. 131 p.

Includes a species list and identification key.

Cullen, J. M. 1954. The diurnal rhythm of birds in the arctic summer. Ibis 96:31-46.

Dixon, Joseph S. 1938. Birds and mammals of Mount McKinley National Park, Alaska. USDI Natl. Park Serv. Fauna Ser. 3. 236 p.

Drury, William H., Jr. 1961. Studies of the breeding biology of horned lark, water pipit, Lapland longspur, and snow bunting on Bylot Island, NW Terr., Canada. Bird-Banding 32:1-46.

Detailed notes on the biology, ecology and behavior of these species.

Dutilly, Artheme. 1945. Bibliography of bibliographies on the Arctic Cath. Univ. 47 p.

Fay, Francis H. and Tom J. Cade. 1959. An ecological analysis of the avifauna of St. Lawrence Island, Alaska. Univ. Calif. Publ. Zool. 63:73-150.

During six summers of field observations, the authors analyzed an avian population consisting primarily of aquatic birds of the orders Anseriformes and Charadriiformes. Only three passerines commonly occurred: the common raven, snow bunting, and Lapland longspur. Of the 53 breeding species, most are either Panboreal in distribution or restricted to the Bering Sea - North Pacific region. An annotated list reviews avian species (119) observed on the island. Fourteen of these species are reported here for the first time.

Folk, G. Edgar, Jr. 1969. Physiological research in northern Alaska. Arctic 22:315-326.

Review paper on avian and mammalian physiological research.

Gibson, Daniel D. 1970. Recent observations at the base of the Alaska Peninsula. Condor 72:242-243.

Includes observations of 17 spp. of birds.

Grinnell, J. 1900. Birds of the Kotzebue Sound region, Alaska. Pacific Coast Avifauna 1.

The very first of the great regional studies by Grinnell, this paper provides much early data on the birds of the Bering Sea tundra.

___________. 1910. Birds of the 1908 Alexander Alaska Expedition. Univ. Calif. Publ. Zool. 5:361-428.

Harris, S. W. 1966. Summer birds of the lower Kashunuk River, Yukon-Kuskokwim Delta, Alaska. Murrelet 47:57-65.

Hines, John Q. 1963. Birds of the Noatak River, Alaska. Condor 65: 410-425.

The paper groups birds according to occupied habitat, and estimates the relative abundance of 80 spp.

Hohn, E. O. 1958. Observations on the behaviour of certain arctic birds. Arctic 11:93-101.

___________. 1965. Ornithological observations in the Askinuk Mountains and Scammon Bay area, Yukon Delta, Alaska. Arctic 18: 260-261.

Holmes, R. T. and G. P. Black. 1973. Ecological distribution of birds in the Kolomak River - Askinuk Mountain region, Yukon-Kuskokwin Delta, Alaska. Condor 75:150-163.

This paper discusses the birdlife of wet marsh and heath-tundra habitat abutting a low, isolated range of hills. Some passerines utilize the better-drained tundra of the hill slopes. A long, narrow zone of alder thickets along the base of the hills supports a variety of passerines not found elsewhere on the western part of the Delta. Extremely high densities of a very few species characterize the avifauna of this region.

Irving, Laurence. 1960. Birds of Anaktuvuk Pass, Kobuk, and Old Crow/ A study in arctic adaptation. U. S. Natl. Mus. Bull. 217. 409 p.

In the first two-thirds of this important book, the author discusses the environment of the three areas, and presents an annotated list of resident birds. He then analyzes the status and distribution of the birds of the three populations. The final one-third of the book centers on the metabolic and behavioral adaptations of birds to the harsh environment of the Arctic. Emphasis is on avian solutions to the problems of migration vs. residence and of the demands of tundra nesting.

___________. 1972. Arctic life of birds and mammals: Vol. II - Zoo - physiology and ecology. Springer-Verlag. 200 p.

___________ and J. Krog. 1956. Temperature during the development of birds in arctic nests. Physiol. Zool. 29:195-205.

____________ and S. Paneak. 1952. The weight and nutritional state of birds at the artic terminus of migration. Report presented at the Third Alaska Science Conference, Mt. McKinley National Park, Alaska.

____________ and ____________. 1954. Biological reconnaissance along the Ahlasuruk River east of Howard Pass, Brooks Range, Alaska, with notes on the avifauna. J. Wash. Acad. Sci. 44:201-211.

Jackson, Hartley H. T. and others. 1949. Literature on the natural history of the Arctic region, with special reference to Alaska and Canada. USDI, F&WS Wildlife Leaflet 317. 48 p.

Jehl, J. R., Jr. 1970. Patterns of hatching success in subarctic birds. Ecology 52:169-173.

The author tests Ricklefs' conclusions (1969, Bibliography Section: X) regarding patterns of nesting mortality in arctic birds using data from a single subarctic locality. These data support Ricklefs: arctic passerines have higher hatching success than Temperate Zone passerines. However, ground-nesting birds with precocial young and those with altricial young do not differ greatly in hatching success, nor do predator-induced nesting losses in arctic regions depend on density. Predation may cause nesting failure more often than Ricklefs acknowledged. Differing sampling methods of the two authors may account for differing conclusions. Future analyses of nesting mortality ideally should combine data from studies of selected species with those from original studies.

Johnston, David W. 1963. Heart weights of some Alaskan birds. Wilson Bull. 75:435-446.

The author presents body weights, heart weights, and body weight: heart weight ratios for 77 species, based on measurements of 563 individuals. Heart weight increases in arctic relative to tropical birds and in those birds flying frequently relative to those flying infrequently.

Karplus, Martin. 1952. Bird activity in the continuous daylight of arctic summer. Ecology 33:129-134.

Kenyon, Karl W. 1961. Birds of Amchitka Island, Alaska. Auk 78:305-326.

An annotated list of 69 species and a brief discussion of both the climate of the island and the effect of predators on its bird populations.

____________. 1964. Wildlife and historical notes on Simenof Island, Alaska. Murrelet 45:1-8.

A brief history of the island as well as annotated lists of birds and mammals.

__________ and Richard E. Phillips. 1965. Birds from the Pribilof Islands and vicinity. Auk 82:624-635.

Occurrence of 34 forms.

Kessel, Brina and Tom J. Cade. 1958. Birds of the Colville River, northern Alaska. Biol. Paps. Univ. Alaska 2. 75 p.

This important work on tundra birds reports on 87 spp. recorded along 400 miles of the Colville River. Where possible, the annotated list includes observations on distribution, abundance, migration, breeding and food habits of the species. The authors recognize eleven major avian habitats. Analysis of the geographical distribution of birds within the tundra biome of the Arctic Slope of Alaska shows three major avifaunal divisions. These correspond closely to the three physiographic provinces recognized by geologists: the Brooks Range province, Arctic Foothills province and Arctic Coastal Plain province.

__________, Heinrich K. Springer and Clayton M. White. 1964. June birds of the Kolomak River, Yukon-Kuskokwim Delta, Alaska. Murrelet 45:37-47.

Krog, John. 1953. Notes on the birds of Amchitka Island, Alaska. Condor 55:299-304.

Maher, William J. 1959. Habitat distribution of birds breeding along the Upper Kaolak River, northern Alaska. Condor 61:351-368.

This analysis of the nesting distribution of 34 spp. of birds and their occurrence in seven major northern Alaskan habitats includes information on breeding biology, density, and population trends.

Marshall, A. J. 1952. Non-breeding among arctic birds. Ibis 94:310-333.

Murie, A. 1946. Observations on the birds of Mount McKinley National Park, Alaska. Condor 48:253-261.

__________ and Walter A. Weber. 1953. Wildlife of Mt. McKinley National Park. Natl. Geog. Mag. 104(Aug.):249-270.

Murie, O. J. 1959. Fauna of the Aleutian Islands and Alaska Peninsula. North Am. Fauna 61. 406 p.

This book offers an introduction to the environment of the area and an annotated species list of birds, including Aleut, Russian, and Chukchi vernacular names. Much valuable life history and distributional data. Includes an extensive bibliography.

Musacchia, X. J. 1953. A study of the lipids in arctic migratory birds. Condor 55:305-312.

Narver, David W. 1970. Birds of the Chignik River drainage, Alaska. Condor 72:102-105.

Annotated list of more than 60 spp.

Norton, D. W. 1970. Avian populations and production. pp. 48-49. In J. Brown and G. C. West (eds.). Tundra biome research in Alaska. U. S. IBP Tundra Biome Report 70-1.

Osgood, W. H. 1904. A biological reconnaissance of the base of the Alaska Peninsula. North Am. Fauna 24. 86 p.

Lists 137 species of birds.

Preble, E. A. and W. L. McAtee. 1923. A biological survey of the Pribilof Islands, Alaska. North Am. Fauna 46. 255 p.

Contains a species list of 137 birds.

Rausch, Robert. 1958. The occurrence and distribution of birds on Middleton Island, Alaska. Condor 60:227-242.

The author recorded 45 species, most with affinities in the Prince William Sound region.

Reed, Edward B. 1956. Notes on some birds and mammals of the Colville River, Alaska. Can. Field Nat. 70:130-136.

Annotated list of 48 spp. birds.

Scholander, P. F., Vladimir Walters, Raymond Hock, and Laurence Irving. 1950. Body insulation of some arctic and tropical mammals and birds. Biol. Bull. 99:225-236.

Insulative capabilities of snow bunting and ptarmigan skins resembled those of lemmings and martens, respectively. An important adaptation of arctic birds involves tolerance of temperatures just above freezing in their feet and legs, minimizing heat transfer from those exposed areas.

__________, Raymond Hock, Vladimir Walters, Fred Johnson, and Laurence Irving. 1950. Heat regulation in some arctic and tropical mammals and birds. Biol. Bull. 99:237-258.

This paper summarizes experiments at Point Barrow in a respiration chamber at various air temperatures. The authors determined heat production by measuring oxygen consumption/carbon dioxide production. Gray jay metabolism stayed nearly stable at -20° and did not double in rate until temperatures dropped to -50°C. Snow buntings, which normally migrate south in the winter, doubled their metabolic rate at -20°C.

__________, __________, __________, and Laurence Irving. 1950. Adaptation to cold in arctic and tropical mammals and birds in relation to body temperature, insulation, and basal metabolic rate. Biol. Bull. 99:259-271.

Maintenance of constant body temperature in a homoiothermic animal depends upon a balance between heat production and heat dissipation. Thus, only three primary methods for climatic adaptation exist: (1) by body-to-air gradient, (2) by heat dissipation, and (3) by metabolic rated. No evidence exists of adaptive low body temperature in arctic birds. Birds can utilize body-to-air gradient only by means of behavioral thermoregulation. Exponential relation to size determines basal metabolic rate, a relation fundamental to most animals, whether warm-blooded or not. They therefore adapt to cold by regulating heat dissipation, notably through efficient feather and skin insulation.

Sealy, S. G., F. H. Fay, J. Bedard, and M.D.F. Udvardy. 1971. New records and zoogeographical notes on the birds of St. Lawrence Island, Bering Sea. Condor 73:322-336.

Twenty-five species from "our" orders occur on this tundra island. The dynamic avifauna of the island contains birds primarily of Transberingian affinity. Relative proximity of wooded habitats in neighboring Alaska and their remoteness in Siberia account for the greater abundance of Nearctic relative to Palearctic birds among the accidental visitants. However, a survey of breeding land and fresh-water birds along a transect from northeastern Siberia to western Alaska shows a gradual attenuation of continental faunas via the island rather than an imbalance or interruption at the sea "barrier."

Sladen, William J. L. 1966. Additions to the avifauna of the Pribilof Islands, Alaska, including five species new to North America. Auk 83: 130-135.

Notes on 22 spp.

Snyder, L. L. 1957. Arctic birds of Canada. Univ. Toronto Press. 310 p.

This guide provides detailed information on extreme northern Canada and the Arctic islands. The data on range, additional names, status , habitat, field characteristics, and life history apply equally to the Alaskan Arctic.

Swarth, H. S. 1934. Birds of Nunivak Island, Alaska. Pac. Coast Avi-fauna 22. 64 p.

Thompson, Charles F. 1967. Notes on the birds of the northeast cape of St. Lawrence Island and of the Punuk Islands, Alaska. Condor 69: 411-419.

Observations on 44 spp.

Thompson, Max C. and Robert L. DeLong. 1969. Birds new to North America and the Pribilof Islands, Alaska. Auk 86:747-749.

15 spp., four of which are new for North America: three shorebirds and the skylark, Alauda arvensis pekinensis.

Tremaine, Marie and others (eds.). 1953-1971. Arctic bibliography/prepared for and in cooperation with the Department of Defense under the direction of the Arctic Institute of North America. U.S. Dept. Defense. 15 vols.

Over 100,000 references have been included in this massive project through Volume XV. The work includes virtually all books and papers dealing with birds of the Alaskan Arctic.

Veghte, James H. and Clyde F. Herreid. 1965. Radiometric determination of feather insulation and metabolism of arctic birds. Physiol. Zool. 38:267-275.

Walkinshaw, L. H. and J. J. Stophlet. 1949. Bird observations at Johnson River, Alaska. Condor 51:29-34.

West, George C. and Clayton M. White. 1966. Range extensions and additional notes on the birds of Alaska's Arctic Slope. Condor 68:302-304.

Notes on 17 species.

Williamson, Francis S. L. 1957. Ecological distribution of birds in the Napaskiak area of the Kuskokwim River Delta, Alaska. Condor 59: 317-338.

Placing emphasis on the life-form of the vegetation, the author analyzes distribution of 62 spp. of birds of the spruce-tundra ecotone using 10 ecologic formations. An annotated bird list is included. Climate seems particularly influential in determining distribution.

__________, Max C. Thompson, and John Q. Hines. 1966. Avifaunal investigations. pp. 437-480 In Environment of the Cape Thompson region, Alaska. U. S. AEC, Oak Ridge, Tennessee.

* Motacillidae (Wagtails and pipits)

Irving, Laurence. 1960. Nutritional condition of water pipits on arctic nesting grounds. Condor 62:469-472.

On arriving at nesting grounds at Anaktuvuk Pass, Alaska, and Old Crow, Yukon Territory, male pipits weighed three grams more and contained more fat than just before nesting. While males lost weight during mating, females remained stable or gained weight until after laying.

Owen, D. F. 1969. The migration of the yellow wagtail from the Equator. Ardea 57:77-85.

Peyton, L. J. 1963. Nesting and occurrence of white wagtails in Alaska. Condor 65:232-235.

Smith, G. 1950. The yellow wagtail. London. 192 p.

An entire book on this arctic bird of old-world origins.

* Laniidae (Shrikes)

Cade, Tom J. 1962. Wing movements, hunting and displays of the northern shrike. Wilson Bull. 74:386-408.

Wing-flashing and tail movements of the shrike may startle prey into movement. In the case of predation on the shrike, these movements may serve to intimidate and distract the would-be captor.

__________. 1967. Ecological and behavorial aspects of predation by the northern shrike. Living Bird 6:43-86.

The author studied shrikes on their nesting grounds on the north slope of the Brooks Range. The northern shrike usually catches small birds in its feet, although sometimes it strikes them down first with its beak; it always attacks and kills rodents first with the beak before picking them up in the feet. The birds always kill vertebrate prey by a series of hard bites directed to the neck which severs the cervical vertebrae or damages the nerve cord in the spaces between vertebrae. In mountain locations in northern Alaska, microtine rodents comprise 20-30 per cent of all prey taken, while small birds - chiefly Lapland longspurs - constitute only 4-8 per cent. In the tundra foothills, these percentages are approximately reversed. Bumblebees make up a few per cent of the diet, as well. Pairs of shrikes are widely spaced in arctic Alaska, and do not stay within exact territorial boundaries. The relative unavailability of foods in winter probably constitutes the major limiting factor on numbers of shrikes.

* Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Baumgartner, A. M. 1937. Nesting habits of the tree sparrow at Churchill, Manitoba. Bird-Banding 8:99-109.

Tundra similar to arctic Alaska nesting habitat.

__________. 1938. Seasonal variations in the tree sparrow. Auk 55: 603-613.

Brooks, William S. 1968. Comparative adaptations of the Alaskan redpolls to the arctic environment. Wilson Bull. 80:253-280.

Adaptations in the common and hoary redpolls that differ from those in non-arctic passerines include:
(1) higher rate & quantity of gross energy intake at low temperatures
(2) selection of high-calorie foods
(3) ability to increase digestive efficiency at low temperatures
(4) plumage with a probable greater insulative value
(5) ability to continue activities at low light intensities.

Danks, H. V. 1971. A note on the early season food of arctic migrants. Canadian Field Nat. 85:71-72.

Includes data on the snow bunting

Dilger, W. C. 1960. Agonistic and social behavior of captive redpolls. Wilson Bull. 72:114-132.

Grinnell, L. I. 1943. Nesting of the common redpoll. Wilson Bull. 55: 155-163.

Heydweiller, A. M. 1935. A comparison of winter and summer territories and seasonal variations of the tree sparrow. (Spizella a. arborea) Bird-Banding 6:1-11.

Hussell, D. J. T. 1970. Factors affecting clutch size in arctic passerines. Ph.D. thesis. Univ. Mich., Ann Arbor. 198 p.

__________. 1972. Factors affecting clutch size in arctic passerines. Ecol. Monog. 42:317-364.

Dealing with snow buntings and Lapland longspurs, the author investigated Lack's hypothesis that increase in clutch size with latitude depends on the length of daylight available for adults to collect food for their young. He also tested Lack's conclusion (Lack, 1954; X) that the average maximum number of young for which the parents can find food determines clutch size. Hussell found that much of the variation in clutch size, including the increase with latitude, depends on environmental factors that influence the food-gathering potential of the adults. However, clutch size has not evolved to a limit set by the environmental food supply. For food-gathering behavior and related morphology have also evolved through natural selection. Clutch size must ultimately be determined, then, by increased survival value that changes in it and other aspects of reproductive strategy offer adults and their offspring.

Irving, Laurence. 1961. The migration of Lapland longspurs to Alaska. Auk 78:327-342.

During a ten-year period, great numbers of longspurs migrated north through Anaktuvuk Pass in May. Similar migrations proceed through other interior valleys of the Brooks Range taking vast numbers of longspurs toward the Arctic Tundra. South of the Alaska Range and on the Aleutian Islands, the early-season arrival of the breeding populations eliminates the possibility that migrants seen in Yukon Territory settle in these regions. Longspurs advance slowly northward through Alaska, but move faster as the northward component of migration diminishes and the westward component increases.

Jehl, Joseph R., Jr. 1968. The breeding biology of Smith's longspur. Wilson Bull. 80:123-149.

Johnston, David W. 1964. Ecologic aspects of lipid deposition in some postbreeding arctic birds. Ecology 45:848-852.

No individuals showed fat deposition in a group of 114 hoary and common redpolls and Lapland longspurs collected during the premigratory period of late summer.

Maher, William J. 1964. Growth rate and development of endothermy in the snow bunting (_Plectrophenax nivalis_) and Lapland longspur (_Calcarius lapponicus_) at Barrow, Alaska. Ecology 45:520-528.

Young of both species are ectothermic at hatching and achieve endothermy by their seventh day of life. Yound Lapland longspurs remain in the nest an average of 7.4 days and snow buntings 13.1 days. Despite the differences in nest dependence, weight curves and plumage development of the two species differ very little.

Martin, E. W. 1968. The effects of dietary protein on the energy and nitrogen balance of the tree sparrow (_Spizella arborea arborea_). Physiol. Zool. 41:313-331.

Nethersole-Thompson, D. 1966. The snow bunting. Oliver and Boyd, Edinburgh and London.

This species occurs in pan-Arctic, circumpolar distribution.

Oakeson, Barbara B. 1954. The Gambel's sparrow at Mountain Village, Alaska. Auk 71:351-365.

In this tundra locality 120 miles from the mouth of the Yukon, breeding Gambel's white-crowned sparrows compress the phases of reproduction during the short summer. Average nestling period appears to decrease slightly as one moves north in latitude. Absence of predators may account for the high percentage of broods fledged. Inherent endocrine rhythms seem to affect nutritional economy during migration more than environmental conditions.

Pinowski, Jan. 1965. Overcrowding as one of the causes of dispersal of young tree sparrows. Bird Study 12:27-33.

Sutton, G. M. and D. F. Parmalee. 1955. Summer activities of the Lapland longspur on Baffin Island. Wilson Bull. 67:110-127.

Typical tundra habitat.

Tinbergen, N. 1939. The behavior of the snow bunting in spring. Trans. Linn. Soc. N.Y. 5.95 p.

Based on arctic observations of nesting snow buntings, the author presents several territorial theories. In this paper, he defines territory as sexual territory; he terms the fighting reactions by which a bird settles a territorial dispute, sexual fighting. And he defines the song of territorial birds as advertising song. Territory functions in birds and in other animals as a defense against sexual competitors of something indispensable for reproduction. This something may be a territory, mate, or some other object. With most species, advertising song functions both to attract sex partners and warn off sexual competitors. Throughout the paper these thoughts are delineated and reinforced with the data on snow buntings.

Weeden, J. Stenger. 1965. Territorial behavior of the tree sparrow. Condor 67:193-209.

Total activity spaces used by breeding male tree sparrows ranged from 1.5 to 9.3 acres in area; size varied inversely with population density. Total activity spaces had central cores of maximum use and outer areas of decreasing use. Neighboring activity spaces overlapped, but overlapping did not depend on population density. Females utilized smaller activity spaces within the boundaries of male spaces. Birds concentrated activity around the center of the activity space early in the day. In general, daily activity spaces reached maximum size during courting.

____________. 1966. Diurnal rhythm of attentiveness of incubating female tree sparrows, (Spizella arborea) at a northern latitude. Auk 83: 368-388.

West, George C. 1960. Seasonal variation in the energy balance of the tree sparrow in relation to migration. Auk 77:306-329.

____________, Leonard J. Peyton and Laurence Irving. 1968. Analysis of spring migration of Lapland longspurs to Alaska. Auk 85:639-653.

Northward migrating Lapland longspurs follow three routes to their arctic and alpine tundra breeding grounds: a coastal route, an intermountain route, and a prairie route. The sex ratio changes gradually; males comprise 90 per cent of initial flocks, but only 25 per cent of final flocks. Thus one may determine the stage of migration by determining the sex ratio of migrating flocks. The advance of migrants seems driven by the physiological condition of individuals. Longspurs deposit fat when en route northward;one bird deposited 0.76 gm. per day for four days.

___________, ___________, and Susan Savage. 1968. Changing composition of a redpoll flock during spring migration. Bird-Banding 39:51-55.

Relative numbers of common and hoary redpolls in a local population.

Williams, Ralph B. 1946. Ixodes auritulus on a Savannah sparrow. Auk 63:590.

In Alaska.

Note: Since this biome occurs in the BLM West only in Alaska, the bibliography in Gabrielson and Lincoln's Birds of Alaska (1959), complete through 1956, should be consulted for most references prior to that date. We have included only a scattering here.

* * *

Any serious search for literature on the Tundra will soon lead to the Arctic Bibliography (M. Tremaine and others, eds.), which contains over 100,000 references dealing with all aspects of the arctic areas of the Earth.

CONIFEROUS FOREST

* Introduction

One image shall always be permanently linked with the romantic ideal of "The West": the vision of vast expanses of great, unbroken evergreen forests clothing the slopes of rugged mountains. The coniferous forest biome embraces a diversity of environments and species compositions, but the identifying life form throughout is the needle-leaved, evergreen tree. Spruces, firs, and pines predominate to form a relatively continous closed canopy. The resulting dense, year-round shade precludes development of extensive shrub and herb understory vegetation. This permanent aerial blanket of chlorophyll, however, contributes to an annual production rate 50 to 100 times higher than the tundra. ("Productivity" in a community measures the amount of radiant energy captured and transformed by producer organisms into organic substances usable as food.) Although winter temperatures may equal the tundra in severity, the summer growing season lasts longer and averages warmer. These factors combine to support a large year-round population of birds and other animals.

The western coniferous forest biome consists of three large, well-defined natural regions. To the north, the boreal forest (or taiga) spreads across interior Alaska; narrow fingers of this forest follow streams to the brink of the Arctic at timberline on the south slopes of the Brooks Range. The moist coniferous forest of the Northwest extends along the Pacific Coast from southern Alaska to northern California, through a region of higher temperatures, smaller seasonal differences, and high humidity. The relict hemlock-cedar forest of southeastern British Columbia and northern Idaho forms an ecotone between the moist coniferous forest of the coast and the inland montane forests. All the other mountain forests of the West, from the Sierra east to the Rockies, from the Cascades south to the ecotone with tropical forests deep in Mexico, belong to the montane forest community. We've also included the alpine areas of the western mountains in this section. Many of the limiting factors in the alpine tundra (snow accumulation, high altitude, intense sunlight, constant winds) resemble those of the high montane forest more strongly than those of the arctic tundra of the far north (permafrost, "abnormal" photoperiod, abundant bogs, necessity of long migration). Also found under this heading are those references that deal with the aspen groves of the western mountains.

Bird-life in the forests of the southern slopes of the Brooks Range obviously differs to some extent from the Chiricahua Mountain forests of southern Arizona. But the avian families characteristic of the biome remain conspicuous throughout the wide range of their evergreen tree habitat. Woodpeckers and jays, chickadees and nuthatches , and creepers and crossbills penetrate nearly all the western coniferous forest communities. The absence of nuthatches from the Alaskan forests constitutes one notable exception. The majority of these birds consume either insects, or seeds and nuts. Since most conifers retain their leaves over winter, they provide valuable shelter against the wind, and prevent the wind-packing of ground snow characteristic of the tundra. The trunks and stems of conifers and other woody plants expose seeds, nuts, berries, and fruits above the snow where they remain available for winter feeding. Insects occur in abundance during summers.

Alpine tundra shares many characteristics with the tundra of the Arctic: low-growing vegetation, cold nights, and a short growing season. But alpine communities also differ in several ways. The high altitude and exposed habitat demand successful adaptation to direct and intense sunlight (particularly ultraviolet), rarified air, and strong, desiccating winds. Drainage is much better than in the Arctic, and day length is of "normal" temperate-region length. Small birds build their nests in the shelter of rocks, crevices, and vegetation, and thereby avoid the winds. Birds of high altitudes have relatively larger hearts that help in coping with the great exertion characteristic of life on the mountaintops. To compensate for the low oxygen tension of mountain air, the blood of alpine birds evidently either contains more hemoglobin than that of lowland species, or possesses a more efficient oxygen dissociation curve to ease taking up oxygen readily at low pressures.

Species lists characteristic of each of the coniferous forest regions follow this introduction. The overlap so apparent explains their lumping under one heading in the bibliography.

Alaskan Boreal Forest

Common flicker (yellow-shafted)	Gray-cheeked thrush
Hairy woodpecker	Mountain bluebird
Downy woodpecker	Townsend's solitaire
Black-backed three-toed woodpecker	Ruby-crowned kinglet
Northern three-toed woodpecker	Bohemian waxwing
Alder flycatcher	Orange-crowned warbler
Hammond's flycatcher	Yellow-rumped warbler (myrtle)
Olive-sided flycatcher	Blackpoll warbler
Gray jay	Northern waterthrush
Steller's jay	Rusty blackbird
Common raven	Pine grosbeak
Black-capped chickadee	Gray-crowned rosy finch
Gray-headed chickadee	Pine siskin
Boreal chickadee	White-winged crossbill
Brown creeper	Dark-eyed junco (slate-colored)
Dipper	Tree sparrow
American robin	White-crowned sparrow
Varied thrush	Golden-crowned sparrow
Hermit thrush	Fox sparrow
Swainson's thrush	Lincoln's sparrow

Moist Coniferous forest

Vaux's swift
Rufous hummingbird
Allen's hummingbird
Pileated woodpecker
Yellow-bellied sapsucker
Hairy woodpecker
Western flycatcher
Western wood pewee
Olive-sided flycatcher
Gray jay
Steller's jay
Common raven
Clark's nutcracker
Mountain chickadee
Chestnut-backed chickadee
Red-breasted nuthatch
Brown creeper
Winter wren
American robin
Varied thrush
Hermit thrush
Swainson's thrush
Mountain bluebird
Townsend's solitaire
Golden-crowned kinglet
Ruby-crowned kinglet
Warbling vireo
Orange-crowned warbler
Yellow warbler
Townsend's warbler
Hermit warbler
Wilson's warbler
American redstart
Brewer's blackbird
Western tanager
Cassin's finch
Pine grosbeak
Gray-crowned rosy finch
Common redpoll
Pine siskin
Red crossbill
Savannah sparrow
Dark-eyed junco
Chipping sparrow
White-crowned sparrow
Golden-crowned sparrow
Fox sparrow
Song sparrow

Alpine Tundra

Horned lark
Common raven
Water pipit
Gray-crowned rosy finch
Black rosy finch
Brown-capped rosy finch
White-crowned sparrow

Montane Coniferous Forest

Common nighthawk
Black swift
Broad-tailed hummingbird
Rufous hummingbird
Calliope hummingbird
Common flicker(red-shafted)
Yellow-bellied sapsucker
Williamson's sapsucker
Hairy woodpecker
White-headed woodpecker
Northern three-toed woodpecker
Willow flycatcher
Hammond's flycatcher
Dusky flycatcher
Western flycatcher
Western wood pewee
Olive-sided flycatcher
Violet-green swallow
Purple martin
Gray jay
Steller's jay
Common raven
Clark's nutcracker
Mountain chickadee
White-breasted nuthatch
Red-breasted nuthatch
Pygmy nuthatch
Brown creeper
Dipper
House wren
Winter wren
Rock wren
American robin
Hermit thrush
Swainson's thrush
Mountain bluebird
Townsend's solitaire
Golden-crowned kinglet
Ruby-crowned kinglet
Solitary vireo
Warbling vireo
Nashville warbler
Yellow-rumped warbler
Black-throated gray warbler
Townsend's warbler
MacGillivrays warbler
Western tanager
Evening grosbeak
Purple finch
Cassin's finch
Pine grosbeak
Pine siskin
Red crossbill
Dark-eyed junco
Gray-headed junco
Yellow-eyed junco
White-crowned sparrow
Fox sparrow
Lincoln's sparrow

* General

Adams, L., et al. 1949. The effects on fish, birds, and mammals of DDR used in the control of forest insects in Idaho and Wyoming. J. Wildl. Mgmt. 13:245-254.

Alcock, John. 1971. Interspecific differences in avian feeding behavior and the evolution of Batesian mimicry. Behavior 40:1-9.

Black-capped chickadees and white-crowned sparrows responded to a series of 24 pairs of Batesian models and mimics after initial presentation of the emetic model (a half mealworm adulterated with quinine sulphate and with a black dot painted on it). Chickadees attacked many mimics (unaltered half mealworms) and a few models. Sparrows attacked few mimics and no models.

Anderson, S. H. 1970. Ecological relationships of birds in forests of western Oregon. Ph. D. thesis. Oregon State Univ. 147 p. (Univ. Microfilms 70-27,021).

Seasonal analysis of Coast Range avifauna.

Bagg, Aaron M. 1970. A summary of the 1969 fall migration season, with special attention to eruptions of various boreal and montane species and an analysis of correlations between wind flows and migration. Audubon Field Notes 24:4-13.

Bailey, F. M. 1917. Birds of the humid coast. Condor 19:8-13, 46-54, 95-101.

Baker, William H., Earl J. Larrison, Charles Yocom, and Iain J. W. Baxter. 1961. Wildlife of the Northern Rocky Mountains/Including common wild animals and plants. Am. Wildlife Region Ser. 6. 112 p. Naturegraph Co., Healdsburg, California.

Includes common birds, assigned to type habitat within each of Merriam's life zones.

Baldwin, P. H. 1968. Predator-prey relationships of birds and spruce beetles. Proc. N. Cent. Branch Entomol. Soc. Amer. 23:90-99.

Bannerman, D. A. 1953. Birds of the British Isles. Oliver and Boyd, Edinburgh.

Includes accounts of several northern North American species, including:

Bohemian waxwing	pp.	253-263 (Vol II)
White-winged crossbill	pp.	203-206.
Brown creeper	pp.	154-160.

Behle, W. H. 1941. A collection of birds from the La Sal Mountain region of southeastern Utah. Wilson Bull. 53:181-184.

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Five to eight years after a forest fire, birds occurred in the same density on both the old burn and a nearby unburned area. But numbers of species differed: 26 spp. on the burned and 23 on the unburned area. Biomass on the burn was much greater than on the unburned area.

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Juncos, mt. chickadees, and house sparrows ate snow in Grand Canyon N.P.

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Collister, Allegra. 1970. Birds of Rocky Mountain National Park. Denver Museum Nat. History Pictorial #18. 64 p.

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Fichter, Edson. 1942. A preliminary study of the animal ecology of Wyoming spruce-fir forest with special reference to stratification. Ph. D. thesis. Univ. Nebr.

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Flack, J. A. Douglas. 1970. Bird populations of aspen forests in western North America. Ph.D. thesis, Univ. Wisc. 257 p. (Univ. Microfilms No. 70-24,690).

The author quantitatively measured breeding bird population in 41 aspen stands between Arizona and Wyoming, and from S.W. Alberta to Manitoba. Numbers of species and relative abundance decreased similarly in both montane and parkland regions as tree density increased or average tree diameter decreased. Birds reached their highest populations in parkland forests.

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The authors investigated predation by nine species of forest birds on the large-larval and pupal stages of black-headed budworm. Response curves obtained from collection data and gizzard analyses showed changes in consumption relative to changes in prey size, density, and other seasonally-changing characteristics. Percentage predation varied from 3 to 14 per cent over three years. Birds thus act in a density dependent manner.

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Logging caused a definite increase in bird population size and a marked change in species composition. Greatest increases occurred 3 years after cutting. Important seed eaters which invaded logged areas to forage on the ground included junco, varied thrush, rufous-sided towhee, golden-crowned sparrow, and fox sparrow. Logging affected many other species. Tan oak and madrone acted as buffers, greatly influencing the degree of bird depredation on Douglas-fir seed.

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___________. 1952. Alpine biotic communities of the Uinta Mountains, Utah. Ecol. Monog. 22:93-120.

This paper summarizes detailed research on the ecology of the alpine communities of the central Rockies, including the birds.

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Horvath, O. 1963. Contributions to nesting ecology of forest birds. M.S. thesis, Dept. Zool. & Faculty of Forestry. Univ. Brit. Columbia. 181 p.

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Annotated list with observation on regional status of 27 spp.

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Reports observations on about 35 spp.

Kilgore, Bruce M. 1968. Breeding bird populations in managed and unmanaged stands of *Sequoia gigantea*. Ph.D. thesis. Univ. Calif., Berkeley. 96 p.

Numbers of bird species decreased as foresters removed the lower layer of foilage. Total numbers of pairs of birds and biomass of birds changed little.

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Foresters created considerable new open area in the lower vegetation zone through cutting, piling and burning 22 tons of living and dead trees per acre in the brush or sapling layer. Thickets of small trees proved the least important vegetation for bird feeding and nesting, while the upper canopy and understory proved most important. Ground and trunk categories were intermediate. Three species (rufous-sided towhee, hermit thrush, Nashville warbler) disappeared after treatment. Each requires brush, chaparral, or dense and shady vegetation as part of its habitat. Nesting western wood pewees and robins increased in numbers. Compared to areas where wildfires or logging have changed cover type substantially and set succession back severely, this degree of habitat modification resulted in relatively small avifaunal changes.

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Larrison, E. J. 1947. Field guide to the birds of King County, Washington. Seattle Audubon Soc. 66 p.

Lawrence, William H., Nelson B. Kverno, and Harry D. Hartwell. 1961. Guide to wildlife feeding injuries on conifers in the Pacific Northwest. Western Forestry & Conserv. Assoc., Portland. 44 p.

This guide aids in field identification of wildlife-caused injuries: cone and seed losses, seedling and sapling injuries, and mature tree injuries.

The book includes injury identification keys, as well as range, habitat, and characteristics of damaging animals.

MacNab, James A. 1944. Faunal aspection in the Coast Range mountains of northwestern Oregon. Ph.D. thesis. Univ. Nebr.

Manuwal, David A. 1968. Breeding bird populations in the coniferous forest of western Montana. M.S. thesis. Univ. Mont.

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Massey, C. L. and N. D. Wygant. 1954. Biology and control of the Engelmann spruce beetle in Colorado. USDA Circ. 944. 35 p.

Merriam, C. Hart. 1899. Results of a biological survey of Mount Shasta, California. USDA, Biol. Surv. No. Amer. Fauna 16. 179 p.

Meyer, Arthur B. (ed.). 1962. Forest-wildlife relationships. J. Forestry 60 (pt. 1):1-84.

An entire issue devoted to the values of wildlife, liabilities created by management for wildlife, and research on methods for alleviating the harmful effects of logging.

Miller, R. C. 1935. Birds of the San Juan Islands, Washington. Murrelet 16:51-65.

Miller, S., C. W. Erickson, R. D. Taber, and C. H. Nellis. 1972. Small mammal and bird populations on Thompson site, Cedar River: parameters for modeling. p. 199-207 In Proc.-Research on Coniferous Forest Ecosystems - A symposium. Pac. NW. For. and Range Exp. Sta., Portland.

The authors Estimated avian abundance and biomass in second growth Douglas-fir forest in the Cascade Range, Washington. Birds occurring in abundance in summer included Swainson's thrush, winter wren, dark-eyed junco, black-throated gray warbler, chestnut-backed chickadee, brown-headed cowbird, and MacGillivray's warbler. In winter only two birds were common: winter wren and golden-crowned kinglet.

Mook, L. J. 1963. Birds and the spruce budworm. In The dynamics of epidemic spruce budworm populations. Mem. Entomol. Soc. Canada 31:268-272.

Norris, R. A. and F. S. Williamson. 1955. Variation in relative heart size of certain passerines with increase in altitude. Wilson Bull. 67:78-83.

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___________ and J. Moffitt. 1971. Birds of the Lake Tahoe region. Calif. Acad. Sci., San Fran. 150 p.

This book includes a historical review (up to 1930), a description of the major plant associations, and accounts of 195 species. Since the book bases distribution on the years before 1940, it remains of more historic interest than present usefulness.

Osgood, W. H. 1901. Natural history of the Queen Charlotte Islands, British Columbia; and natural history of the Cook Inlet region, Alaska. North Amer. Fauna 21.87 p.

Includes a list of 78 species with annotations.

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Preece, S. J. 1950. Floristic and ecological features of the Raft River Mtns. of northwestern Utah. M.S. thesis. Univ. Utah. 103 p.

Pugh, E. A. 1954. The status of birds in the Mt. Elden area. Plateau 26:117-123.

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Portland Audubon Society. 1966. List of birds of northwest Oregon. Published by author.

Rasmussen, D. I. 1941. The biotic communities of Kaibab Plateau, Arizona. Ecol. Monog. 11:230-275.

A classic reference; includes 131 spp. birds.

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Woodpeckers, nuthatches, and creepers have adapted to their common trunk-foraging niche via similar modifications of the legs and feet. Maximum resemblance of adaptations exists when methods of feeding and climbing resemble one another in detail. Those birds which use the tail for support in climbing share more structural adaptations than do trunk-foraging birds in general. Minimum parallel adaptation for trunk foraging exists between the creepers and nuthatches. Creepers seem less perfectly adapted to trunk-foraging than do woodpeckers (specifically, the downy). All these adaptations involve modification of bone, muscle, claw, bill and/or tail feather. The long tongue of most woodpeckers suits them well for feeding on wood-boring insects. The long tongue of the flicker, though ideal for feeding on ants, probably was pre-adapted for such use.

Robinson, M. D. 1968. Summer aspect of a high coniferous forest in the Chiricahua Mountains, Arizona. M.S. thesis. Univ. Ariz. 55 pp.

Elevational distribution of 23 spp. birds.

Salt, George Wm. 1957. An analysis of avifaunas in the Teton Mountains and Jackson Hole, Wyoming. Condor 59:373-393.

This paper analyzes census results with emphasis on the relationship of biomass to stage of succession. Avifaunal size and efficiency in energy metabolism may reflect ecosystem functions accurately enough to serve as indices of the metabolism and efficiency of the entire biotic community. Finally, the author anlayzes birds of six ecologic communities on the basis of feeding habits.

Shelford, V. E. and S. Olson. 1935. Sere, climax and influent animals with special reference to the transcontinental coniferous forest of North America. Ecology 16:375-402.

Skinner, M. P. 1925. The birds of Yellowstone National Park. Roosevelt Wildlife Bull. Syracuse Univ., NY St. Coll. of Forestry 3(1). 192 p.

Smith, Clarence F. 1943. Relationship of forest wildlife to pine reproduction. J. Wildl. Mgmt. 7:124-125.

Lists birds known to feed on seeds of _Pinus ponderosa_, _P. jeffreyi_, and _P. lambertiana_.

__________ and S. E. Aldous. 1947. The influence of mammals and birds in retarding artifical and natural reseeding of coniferous forests in the United States. J. Forestry 45:361-369.

37 spp. of birds eat conifer seeds. They distribute and plant, as well as destroy.

Snyder, Dana P. 1947. Bird and mammal populations in a coniferous forest biome. Thesis. Univ. Illinois.

__________. 1950. Bird communities in the coniferous forest biome. Condor 52:17-27.

Census of breeding birds in 3 communities in the Colorado Rockies.

Stallcup, Patrick L. 1968. Spatio-temporal relationships of nuthatches and woodpeckers in ponderosa pine forests of Colorado. Ecology 49:831-843.

Throughout the year, pygmy nuthatches foraged most extensively in the foilage of live pine. White-breasted nuthatches focused feeding activities on the trunks and large branches of pine. All nuthatches normally foraged in mutually exclusive zones. Foraging zones of hairy woodpeckers and Williamson's sapsuckers overlapped in the breeding season. Hairy woodpeckers fed on arthropods on the surface of trunks and branches of living trees, but even more on the subcortical arthropods of dead trees, stumps and logs. Williamson's sapsuckers foraged almost exclusively for ants on trunks of living pines. In the non-breeding season, hairy woodpeckers fed primarily on phloem of trunks of living pines. Red-shafted (common) flickers confined foraging to the ground, and thus remained segregated from the feeding niches of other woodpeckers.

Stang, David A., D. P. Garber, and George A. Roether. 1973. Threatened and endangered wildlife of Six Rivers Natl. Forest, Calif. Eureka, California.

Includes notes on the local status of the Calif. yellow-billed cuckoo and pileated woodpecker.

Stebbins, C. A. and R. C. Stebbins. 1962. Birds of Yosemite National Park. Yosemite Nat. Hist. Assoc. 76 p.

Steel, Paul E., Paul D. Dalke, and Elwood G. Bizeau. 1956. Annotated list of the avifauna in and around Gray's Lake, Idaho. Murrelet 37:4-10.

Area description; status and spring arrival dates for 145 spp.

Stewart, R. E. and J. W. Aldrich. 1951. Removal and repopulation of breeding birds in a spruce-fir forest community. Auk 68:471-482.

Sturges, Franklin Wright. 1957. Habitat distributions of birds and mammals in Lostine Canyon, Wallowa Mountains, northeast Oregon. Ph.D. thesis. Ore. State Coll. 136 p.

The author discusses the history and ecology of the area, and the ecological preferences and relative abundance of the common birds and mammals. He compares various systems of life-zone classification to methods used in this study.

Sumner, Lowell and Joseph S. Dixon. 1953. Birds and mammals of the Sierra Nevada. Univ. Calif. Press. 484 p.

This book replaces the now out-of-print Grinnell's "Animal Life in the Yosemite" as the standard reference for Sierra wildlife. Much of the life history information emphasizes Sequoia-Kings Canyon Natl. Parks.

Swarth, H. S. 1904. Birds of the Huachuca Mts., Arizona. Pac. Coast Avi. 4:1-70

196 spp.; annotated.

___________. 1922. Birds and mammals of the Stikine River region of northern British Columbia and southeastern Alaska. Univ. Calif. Publ. Zool. 24:125-314.

___________. 1936. Origins of the fauna of the Sitkan District, Alaska. Proc. Calif. Acad. Sci. 23:59-78.

Tatschl, John L. 1967. Breeding birds of the Sandia Mountains and their ecological distribution. Condor 69:479-490.

An annotated list of 154 spp. including 92 breeding species.

Taylor, Dale L. 1973. Some ecological implications of forest fire control in Yellowstone National Park, Wyoming. Ecology 54:1394-1396.

In lodgepole pine communities, numbers of bird species increased during the first 25 years after a fire, and decreased in older communities.

Taylor, W. P. 1927. Mammals and birds of Mt. Rainier Natl. Park. USDI. 249 p.

___________. 1932. A test of some rodent and bird influences on western yellow pine reproduction at Fort Valley, Flagstaff, Arizona. J. Mamm. 13:218-223.

Verner, J. 1953. Birds of Laird Park, Latah County, Idaho. Murrelet 34 (1):6-8.

Wadsworth, Carl Eugene. 1970. The effects of herbicide applications on the animal populations of aspen communities. Ph.D. thesis, Brigham Young Univ. 109 p.

A study of the effects of herbicide application to approximately 475 acres of aspen, oak brush, and grass-forb-shrub communities. Bird populations decreased in the treated area during the nesting season (June), increased in the treated area during July and August, and remained nearly the same in both treated and untreated areas during September.

Weatherill, Ronald G. and Lloyd B. Keith. 1969. The effects of livestock grazing on an aspen forest community. Alberta Dept. Lands & Forests., Fish and Wildl. Div. Tech. Bull. #1. 31 p.

White-throated sparrow populations decreased slightly with increased grazing, but grazing had little effect on ovenbirds, least flycatchers and red-eyed vireos.

Webster, J. P. 1950a. Notes on the birds of Wrangell and vicinity, southeastern Alaska. Condor 52:32-38.

__________. 1950b. Altitudinal zonation of birds in southeastern Alaska. Murrelet 31:23-26.

Wetmore, A. 1920. Observations on the habits of birds at Lake Burford, New Mexico. Auk 37:221-247; 393-412.

Weydemeyer, W. 1973. The spring migration pattern at Fortine, Montana. Condor 75:400-413.

This useful paper summarizes spring migration for 138 species during 50 years of observations in northwestern Montana. Only about one-fourth of the 99 most intensively studies species show a definite "peaking" of arrival date. Most species arrive over a wide range of dates. The influence of weather conditions on progress of migration varies little seasonally, although migrants respond to unusually mild local weather by arriving unusually early. Food availability during northward flight has general effects rather than specific.

Williamson, Francis S. L. and L. J. Peyton. 1962. Faunal relationships of birds in the Iliamna Lake area, Alaska. Biol. Paps. Univ. Alaska. 5. 73 p.

Field work in the northeastern-most limit of moist coniferous forest detected 103 species classified in 12 ecological formations. This paper also analyzes avifauna by geographical affinity.

__________, __________, and Malcom E. Isleib. 1965. New distributional and overwintering records of birds from south-central Alaska. Condor 67:73-80.

With notes on 26 spp. chiefly from the region around Cook Inlet.

Wright, John T. and Jerome S. Horton. 1951. Checklist of the vertebrate fauna of San Dimas Experimental Forest. U.S. For. Serv. Calif. Exp. Sta., Misc. Pap. No. 7. 15 p.

Yeager, Lee E. 1961. Classification of North American mammals and birds according to forest habitat preference. J. Forestry 59:671-674.

Classifies species or groups of mammals and birds according to their forest-dwelling affinities. Of 714 species of birds, 195 prefer forest or brushland while 201 show a secondary preference for such communities.

Yocom, Charles F. 1963a. Birds of the Tetlin Lake-Tok Junction-Northway area, Alaska. Murrelet 44:1-6.

Observations on 66 sp.

__________. 1963b. July bird life in the Copper River Delta country/ Alaska, 1962. Murrelet 44:28-34.

__________. 1964. Noteworthy records of birds from the Fort Yukon area and the Yukon Flats, Alaska. Murrelet 45:30-36.

An annotated list of summer birds.

__________ and Vinson Brown. 1971. Wildlife and plants of the Cascades. Naturegraph Publ., Healdsburg, Calif. 293 p.

Field guide to mammals, birds, reptiles, amphibians, fish, and common plants.

__________ and Raymond Dasmann. 1957. The Pacific Coastal wildlife region. Its common wild animals and plants. Naturegraph Co., San Martin, California. 112 p.

A field guide that includes birds in the region from southern British Columbia to Monterey County, California, classified according to habitat preference.

__________ and S. W. Harris. 1973. Status, habitats, and distribution of birds of northwestern California. M.S. thesis. Calif. State Univ. Humboldt, Arcata.

__________ and G. Iris. 1946. Summer birds observed at Conkling Park, Kootenai County, Idaho, 1943. Murrelet 27(1):10-12.

Zwinger. Ann H. and Beatrice E. Willard. 1972. Land above the trees: A guide to American alpine tundra. Harper & Row, N.Y./Evanston/San Francisco/London.

This comprehensive book on the ecology of the alpine tundra contains a few notes on tundra birds: Steller's jays, Clark's nutcrackers, horned larks, water pipits, common ravens, rosy finches, and white-crowned and white-throated sparrows.

*Caprimulgidae (Goatsuckers)

Bowles, J. H. 1921. Nesting habits of the nighthawk at Tacoma, Washington. Auk 38:203-17.

Rust, H. J. 1947. Migration and nesting of nighthawks in northern Idaho. Condor 49:177-188.

In this summary of 36 years of observations around Coeur d'Alene, the author describes foraging habits and food items.

*Apodidae (Swifts)

Baldwin, Paul H. and William F. Hunter. 1963. Nesting and nest visitors of the Vaux's swift in Montana. Auk 80;81-85.

The status of the Vaux's swift in Montana; its breeding biology, growth rate, and visits to the nest by individual Vaux's swifts other than the nesting pairs.

____________ and Nick K. Zaczkowski. 1963. Breeding biology of the Vaux swift. Condor 65:400-406.

Booth, E. J. 1931. Observations on the black swifts. Murrelet 12:82-83.

Davis, W. B. 1937. A Vaux swift and its young. Condor 37:222-23.

Hunter, William F. and Paul H. Baldwin. 1962. Nesting of the black swift in Montana. Wilson Bull. 74:409-416.

Nesting failures appear common in this species.

Knorr, Owen N. 1961. The geographical and ecological distribution of the black swift in Colorado. Wilson Bull. 73:155-170.

The author located twenty-seven active breeding colonies of black swifts from 1949-1958 in the Colorado mountains. Five physical ecological factors determined nesting location: the presence of water, "high relief", inaccessibility to terrestial marauders, darkness, and absence of flyway obstructions near the nest.

Michael, C. W. 1927. Black swifts nesting in Yellowstone National Park. Condor 29:89-97.

Murphy, John A., Jr. 1951. The nesting of the black swift. Natural History 60:446-449.

Primarily a photographic record.

Rathbun, S. F. 1925. The black swift and its habits. Auk 42:497-516.

Stager, Kenneth E. 1965. An exposed nocturnal roost of migrant Vaux swifts. Condor 67:81-82.

A cluster of Vaux's swifts roosted on the outside of a tree trunk. The birds appeared lifeless soon after sunrise, but flew when plucked from the tree and thrown into the air. Temperature during the preceding night had dipped to 37-38° F. The entire flock of swifts took flight within 2 hours after sunrise.

Udvardy, M. D. F. 1954. Summer movements of black swifts in relation to weather conditions. Condor 56:261-267.

*Trochilidae (Hummingbirds)

Armitage, K. B. 1955. Territorial behavior in fall migrant rufous hummingbirds. Condor 57:239.

Austin, George T. 1970. Interspecific territoriality of migrant calliope and resident broad-tailed hummingbirds. Condor 72:234.

Barash, David P. 1972. Lek behavior in the broad-tailed hummingbird. Wilson Bull. 82:202-203.

Three broad-tailed hummingbirds conducted their display performances while separated from each other by about 7m. The birds occupied identical locations on each of four consecutive days. A female approached but did not associate directly with any of the males.

Calder, William A. 1971. Temperature relationships and nesting of the calliope hummingbird. Condor 73:314-321.

The calliope hummingbird incubates its eggs when exposed to night temperatures near freezing. In northwestern Wyoming, nest sites and construction which minimize heat loss increase nesting success. The incubating calliope does not become torpid at night.

____________. 1973a. Microhabitat selection during nesting of hummingbirds in the Rocky Mountains. Ecology 54:127-134.

Broad-tailed and calliope hummingbirds locate nests in sites minimizing heat loss in the Colorado Rockies and at Jackson Hole.

____________. 1973b. The timing of maternal behavior of the broad-tailed hummingbird preceding nest failure. Wilson Bull. 85:283-290.

The author classified nesting failures as early and late, the former due to infertile eggs and death of chick. The latter seemed related to declining food supply.

____________ and J. Booser. 1973. Hypothermia of broad-tailed hummingbirds during incubation in nature with ecological correlations. Science 180:751-753.

Dubois, A. D. 1938. Observations at a rufous hummingbird's nest. Auk 55:629-641.

Grant, K. A. and V. Grant. 1967. Records of hummingbird pollination in the Western America Flora: III. Arizona records. Aliso 6:107-110.

Lists several species in mt. areas.

Hall, E. R. 1938. Broad-tailed hummingbird attracted to food of the red-naped sapsucker. Condor 40:264.

Horvath, O. H. 1964. Seasonal differences in rufous hummingbird nest height and their relation to nest climate. Ecology 45:235-241.

Though spring and summer macroclimates differ in the British Columbian coniferous forest, rufous hummingbird nest site macroclimate remains similar during both these seasons. Variation in nest height placement accomplishes this moderation of seasonal extremes. Conifer stands reduce the ambient temperature more efficiently at low nest sites protected from climatic extremes than do higher nest sites in deciduous trees. But radiation increases in summer relative to spring, and results in climatic extremes near the ground and decreased benefits from low nesting. Hummingbirds build their nests at low levels in conifers in spring. But in summer, the birds build nests in the crown of deciduous trees, and thus benefit from the temperature reducing effects of the intensive evapotranspiration of the trees. Such nest placement effectively protects nestlings from the heat - protection impossible at spring nest site levels.

Jewett, S. G. 1930. The broad-tailed hummingbird in Washington State. Murrelet 11:73-74.

*Picidae (Woodpeckers)

Amman, Gene D. and Paul H. Baldwin. 1960. A comparison of methods for censusing woodpeckers in spruce-fir forests of Colorado. Ecology 41:699-706.

The author compared nine woodpecker census methods in 3 areas of spruce-fir forest on the basis of field operation, completeness of count, and variation in results. The variable-width-strip method proved best with moderately large woodpecker populations. This method utilized the greatest distance of each species for half the width of strip censused, summing the 3 separate population estimates for a total population estimate.

Baldwin, P. H. 1968. Woodpecker feeding on Engelmann spruce beetle in windthrown trees. U.S. For. Serv. Res. Pap. RM-105. Rocky Mt. For. and Range Exp. Sta., Ft. Collins, Colo. 4 p.

Blackford, J. L. 1941. Woodpecker of the Sequoias. Audubon 43 (May) :265-269.

White-headed woodpecker.

__________. 1955. Woodpecker concentration in burned forest. Condor 57:28-30.

Bock, Carl Elliott. 1968. The ecology and behavior of the Lewis woodpecker (Asyndesmus lewis). Ph.D. thesis. Univ. Calif. (Berkeley). 237 p.

__________. 1970. The ecology and behavior of the Lewis woodpecker (Asyndesmus lewis). Univ. Calif. Publ. Zool. 92. 91 p.

The primarily insectivorous Lewis woodpecker depends upon stored acorns and almonds during winter. Storage sites form the basis for winter territorial behavior. Breeding birds concentrate in areas where free-living insects occur in abundance.

Compton, D. M. 1930. A study of the downy woodpecker, Dryobates pubescens medianus. M.S. thesis. Cornell Univ.

Danforth, C. G. 1938. Some feeding habits of the red-breasted sapsucker. Condor 40:219-224.

Yellow-bellied sapsucker - Pacific Coast race.

Dehnel, Paul A. 1948. Analysis of variation in some western races of the hairy woodpecker, Dendrocopos villosus. M.A. thesis. Univ. Calif.

Devillers, Pierre. 1970. Identification and distribution in California of the Sphyrapicus varius group of sapsuckers. Calif. Birds 1:47-76.

Yellow-bellied sapsucker.

England, E. G. 1940. A nest of the arctic three-toed woodpecker. Condor 42:242-245.

Black-backed 3-toed woodpecker.

Foster, W. L. and J. Tate, Jr. 1966. The activities and coactions of animals at sapsucker trees. Living Bird 5:87-113.

Insects, birds, and mammals consistently visited yellow-bellied sapsucker trees in lower Michigan. The ruby-throated hummingbird occurred in greater numbers than the sapsucker itself. Social hierarchy developed among the visitors.

Happ, G. R. 1935. A study of the flicker, Colaptes auratus (Linnaeus). M.S. thesis. Cornell Univ.

Yellow-shafted race of the common flicker.

Howell, T. R. 1952. Natural history and differentiation in the yellow-bellied sapsucker. Condor 54:237-282.

Life histories of all four subspecies resemble one another. All can interbreed, producing fertile offspring. The four differ in homing and migratory tendencies and select their mates on the basis of color. These differences may limit interbreeding.

__________. 1953. Racial and sexual differences in migration in <u>Sphyrapicus varius</u>. Auk 70:118-126.

Yellow-bellied sapsucker.

Hoyt, Sally F. 1957. The ecology of the pileated woodpecker. Ecology 38:246-256.

This paper compiles observations made by J.S.Y. Hoyt in 1948, and other workers since, in drawing a detailed picture of feeding, reproductive and roosting behavior of the species. In some danger of extinction at one time, the pileated woodpecker has since adapted successfully to life in second growth forest.

Hutchison, Frank T. 1951. The effects of woodpeckers on the Engelmann spruce beetle. <u>Dendroctonus engelmanni</u> hopkins. M.A. thesis. Colo. A&M Coll. 73 p.

Jackson, Jerome A. 1970a. Character variation in the hairy woodpecker. <u>Dendrocopos villosus</u>. Ph.D. thesis. Univ. Kansas. 205 p.

__________. 1970b. Some aspects of the population ecology of downy woodpeckers in relation to a feeding station. Iowa Bird Life 40:27-34.

Use of the station depends on energy demands and availability of natural food, differential seasonal movements, and territoriality of the sexes. Interactions occur between downy woodpeckers as well as between downies and other species of birds. Male downies generally dominate females; larger birds usually dominate downies. The mutual tolerance observed between downies and black-capped chickadees may stem from association of the species in winter foraging flocks.

__________. 1970c. A quantitative study of the foraging ecology of downy woodpeckers. Ecology 51:318-323.

Intersexual partitioning of the foraging niche occurs. Foraging varies seasonally in both the relative frequency of the modes of foraging and in use of live and dead trees. Feeding methods also vary on live versus dead trees.

Kilham, Lawrence. 1959a. Early reproductive behavior of flickers. Wilson Bull. 71:323-336.

________. 1959b. Behavior and methods of communication of pileated woodpeckers. Condor 61:377-387.

Pileated woodpeckers drum throughout the year, the male much more often than the female. Different calls serve to attract mates, keep the pair together, and act as alarm calls. Other gestures indicate nervousness, agressiveness, or intimacy between a pair.

________. 1960. Courtship and territorial behavior of hairy woodpeckers. Auk 77:259-270.

A detailed study of one pair of hairy woodpeckers that includes comparisons with other species.

________. 1962a. Breeding behavior of yellow-bellied sapsuckers. Auk 79:31-43.

Sapsuckers have bounded breeding territories that they may use for several successive years. Males arrive first in spring, and drum more than females. Males also take the lead in a courtship that centers on the nesting site. Copulatory behavior begins as the excavation approaches completion. Male sapsuckers roost in excavations as soon as they have enough room. Excavating may continue in sporadic fashion during egg laying, incubation, and the rearing of young. Nestling sapsuckers vocalize almost incessantly, starting at an early age.

________. 1962b. Reproductive behavior of downy woodpeckers. Condor 64:126-133.

Breeding behavior (described in detail) begins in late March, when females take the lead in drumming or tapping to attract males to nest sites. Some sexual behavior occurs in fall and on warm winter days, but birds generally remain solitary during the winter.

________. 1965. Differences in feeding behavior of male and female hairy woodpeckers. Wilson Bull. 77:134-145.

Elms dying of Dutch elm disease attracted only female hairy woodpeckers to the bark beetle food source - practically no other birds utilized the beetles. Male/female differences in feeding behavior indicate that the females have specifically adapted to feeding on bark beetles.

________. 1966a. Reproductive behavior of hairy woodpeckers: I. Pair formation and courtship. Wilson Bull. 78:251-265.

The breeding season begins in January, when the male starts visiting the female's territory, where nesting will eventually occur after nearly three months of preliminary courtship. Courtship activities vary in extent and pattern from pair to pair. Basic forms include precopulatory behavior, intimate notes, display flights, duets of drumming, and tapping before symbolic or potential nest sites, in all of which the female often takes the lead. As nest holes near completion in late April, males take the lead in copulatory behavior, often drumming to attract their mates. A description of two neighboring pairs clarifies individual differences. Final discussion centers on comparative behavior of woodpeckers.

__________. 1966b. Nesting activities of black-backed woodpeckers. Condor 68:308-310.

Black-backed three-toed woodpeckers communicated via three vocalizations plus a greeting display. Females exhibited greater "nervousness", and spent longer periods of time near the nest. Nestlings acted unusually aggressively. Like hairy woodpeckers, females fed the young most frequently (three times as much as males), and males performed nearly all nest sanitation. In contrast to hairys, the mated pair in this species appear indifferent, at times even hostile, toward one another.

__________. 1968. Reproductive behavior of hairy woodpeckers: II. Nesting and habitat. Wilson Bull. 80:286-305.

__________. 1969. Reproductive behavior of hairy woodpeckers: III. Agnostic behavior in relation to courtship and territory. Wilson Bull. 81:169-183.

Agnostic behavior of hairy woodpeckers relating to courtship and territory takes place on favorable days in winter. Neighboring males, attended by their mates, seek encounters along a section of territorial borders held in common. Males repeatedly act more aggressively in spring conflicts. The hairy woodpecker shows considerable individuality in agnostic and other behavior.

__________. 1971. Reproductive behavior of yellow-bellied sapsuckers: I. Preference for nesting in *Fomes* - infected aspens and nest hole interrelations with flying squirrels, raccoons and other animals. Wilson Bull. 83:159-171.

Sapsuckers prefer nest trees with straight trunks 20-25 cm. in diameter when they bear mature conks of *Fomes igniarius*. Such trees offer maximum protection from raccoon predation. This sapsucker excavates new cavities in the same tree for successive nests more often than other woodpeckers.

__________. 1974a. Copulatory behavior of downy woodpeckers. Wilson Bull. 86:23-34.

__________. 1974b. Play in hairy, downy and other woodpeckers. Wilson Bull. 86:35-42.

Kingsbury, E. W. 1932. A study of the hairy woodpecker, Dryobates villosus villosus. M. A. thesis. Cornell Univ.

Now "Dendrocopos."

Knight, F. B. 1958. The effects of woodpeckers on populations of the Engelmann spruce beetle. J. Econ. Entomol. 51:603-607.

Koch, Robert F., Armand E. Courchesne, and Charles T. Collins. 1970. Sexual differences in foraging behavior of white-headed woodpeckers. Bull. S. Calif. Acad. Sci. 69:60-64.

Koplin, James Ray. 1967. Predatory and energetic relations of woodpeckers to the Engelmann spruce beetle. Ph. D. thesis. Colo. State Univ. 202 p.

Every aspect of the predator-prey system between woodpeckers and the Engelmann spruce beetle, except the number of larvae destroyed, conforms to general theory. This predator destroys more of its prey than any other known vertebrate predator/invertebrate prey pair.

__________. 1969. The numerical response of woodpeckers to insect prey in a subalpine forest in Colorado. Condor 71:436-438.

Woodpeckers increased in density fifty times in response to an increased population of insect prey in fire-killed trees. Drift and aggregation caused this woodpecker increase, not increased reproduction - for nesting densities did not differ significantly from one breeding season to the next.

__________. 1972. Measuring predator impact of woodpeckers on spruce beetles. J. Wild. Mgmt. 36:308-320.

The author formulated a deterministic model incorporating data on food requirements of free-living woodpeckers, average number of prey per woodpecker stomach, population density of woodpeckers, and air temperature. The model yielded number of prey consumed as output, and thus enabled calculation of the predicted predatory impact of three individual species of woodpeckers on endemic, epidemic, and pan-epidemic populations of larval spruce beetles (Dendroctonus obesus). Model predictions matched field data: of picid predators, northern three-toed woodpeckers prey most effectively and downy woodpeckers least effectively on larval spruce beetles.

__________ and Paul H. Baldwin. 1970. Woodpecker predation on an endemic population of Engelmann spruce beetles. Am. Midland Nat. 83:510-515.

Northern three-toed and hairy woodpeckers consumed 2 to 26 percent of the brood of an endemic population of the Engelmann spruce beetle. Predation, restricted to the second year brood, decreased survival of this age class by 13 to 25 percent. The paper outlines factors accounting for the disproportionate loss to picid predation of first and second-year broods in the endemic population and for differential loss of broods from the endemic and epidemic populations.

Lawrence, L. deK. 1967. A comparative life-history study of four species of woodpeckers. A.O.U. Ornithol. Monog. No. 5.

An important study which includes the yellow-bellied sapsucker.

Ligon, J. D. 1968. Sexual differences in foraging behavior in two species of Dendrocopos woodpeckers. Auk 85:203-215.

___________. 1973. Foraging behavior of the white-headed woodpecker in Idaho. Auk 90:862-869.

In ponderosa pine forest, no sexual differences in feeding behavior existed.

Massey, C. L. and N. D. Wygant. 1973. Woodpeckers: most important predators of the spruce beetle. Colo. Field Ornith. 16:4-8.

In Colorado, the northern three-toed, hairy and downy woodpeckers prey most effectively on the beetles.

McAtee, W. L. 1911. Woodpeckers in relation to trees and wood products. U.S.D.A. Biol. Surv. Bull. 39:1-99.

Oliver, William W. 1970. The feeding pattern of sapsuckers on ponderosa pine in northeastern California. Condor 72:241.

Red-breasted (yellow-bellied) and Williamson's sapsuckers concentrated drilling in the bark of trees they had attacked earlier, except at low feeding pressures. Bole wounds attracted the sapsuckers.

Ramp, Warren K. 1965. The auditory range of a hairy woodpecker. Condor 67:183-185.

A hairy woodpecker heard sounds of frequencies ranging from 30 to 18,500 cycles per sec.

Robinson, G. 1957. Observations of pair relations of white-headed woodpeckers in winter. Condor 59:339-340.

Selander, R. K. 1965. Sexual dimorphism in relation to foraging behavior in the hairy woodpecker. Wilson Bull. 77:416.

Shaw, Elmer. 1958. The bark bug's enemy. Colo. Outdoors 7:24-25.

Woodpeckers do not injure healthy trees, but forage on those infected by beetles. Spruce beetles provided 99% of woodpecker food in winter and 65% in summer. In one heavily infested area, woodpeckers occurred

at a density of 9 per acre. In these areas of heavy woodpecker activity, the birds consumed 98% of the beetles. In areas of light woodpecker activity, beetles decreased by about 50%. In high-density populations, woodpeckers fed in a degree roughly proportional to the number of beetles.

Sherman. A. 1910. At the sign of the northern flicker. Wilson Bull. 22:135-171.

Yellow-shafted race of the common flicker.

Shigo, A. L. 1964. Sapsucker damage to forest trees. Forest Notes 82:3-6.

Shook, Roland S. and Paul H. Baldwin. 1970. Woodpecker predation on bark beetles in Engelmann spruce logs as related to stand density. Canadian Entomol. 102:1345-1354.

Woodpeckers can reduce spruce beetle populations more efficiently in selectively logged areas than in clearcut or uncut areas.

Short, Lester L., Jr. 1965. Hybridization in the flickers (Colaptes) of North America. Bull. Am. Mus. Nat. Hist. 129:article 4, 428 p.

Skutch, A. F. 1937. The male flicker's part in incubation. Bird-Lore 39:112.

Nesting behavior of the yellow-shafted race of the common flicker.

Snow, Rex B. 1941. A natural history of the Lewis woodpecker *Asyndesmus lewis* (Gray). M.S. thesis. Univ. Utah.

Spring, Lowell, W. 1965. Climbing and pecking adaptations in some North American woodpeckers. Condor 67:457-488.

Concentrating on the yellow-bellied sapsucker, hairy woodpecker and black-backed three-toed woodpecker, the author analyzes existing functional and anatomical modifications for the delivery of hard blows. Functional adaptations include a pecking stance in which the whole body is held far from the tree trunk, a decreased contribution of the neck to blow delivery, and development of maximum blow momentum through efficient use of the regions of the body posterior to the neck. Anatomical modifications include a shortening in the relative length of the distal leg bones, a heightening and wider spacing of the thoracic neural spines, an anterior shift in the position of the foramen magnum, and the loss of a hallux in the genus *Picoides*.

The downy and northern three-toed woodpeckers possess relatively longer legs than the larger members of their respective genera. This fact probably correlates with greater climbing ability in the smaller species. Ability to deliver forceful blows decreases as smoothness and energetic efficiency of climbing increase. The phenomenal development of the mandible protractor muscle accounts for most of the necessary shock-absorbance.

Spurlock, G. M. and John T. Emlen Jr. 1942. Hypodectes chapini N. Sp. (Acarina) from the red-shafted flicker. J. Parasitol. 28:341-344.

In California.

Staebler, A. E. 1949. A comparative life history study of the hairy and downy woodpeckers (Dendrocopos villosus and Denodrocopos pubescens). Ph. D. thesis. Univ. Mich.

Stallcup, Patrick L. 1969. Hairy woodpeckers feeding on pine seeds. Auk 86:134-135.

This species foraged for pine seeds about 2/3 of the time.

Tate, J., Jr. 1973. Methods and annual sequence of foraging by the sapsucker. Auk 90:840-856.

An analysis of the food tap holes drilled by the yellow-bellied sapsucker.

Taylor, N. H. 1920. Habits of a red-breasted sapsucker. Condor 22:158.

Pacific Coast race, yellow-bellied sapsucker.

Warren, Edward R. 1912. Some north-central Colorado bird notes. Condor 14:81-104.

Northern three-toed woodpeckers.

Weatherly, Norman P. and A. G. Canaris. 1961. Some parasites of Oregon and Washington vertebrates. J. Parasitol. 47:230.

Includes records for red-shafted flickers and hairy woodpeckers.

West, A. S., Jr. 1947. The California flathead borer (Melanophila Californica Van dyke) in ponderosa pine stands of northeastern California. Can. J. Res., Sec. D. 25:97-118.

Woodpeckers (particularly the black-backed three-toed) destroy many overwintering prepupal larvae.

Yaeger, Lee E. 1955. Two woodpecker populations in relation to environmental change. Condor 57:148-153.

*Tyrannidae (Tyrant flycatchers)

Aldrich, J. W. 1951. A review of the races of Traill's flycatcher. Wilson Bull. 63:192-197.

Allen, F. H. 1952. The song of the alder flycatcher. Wilson Bull. 64:107-109.

Bowles, J. H. 1927. A comparative field study of Wright's and Hammond's flycatchers. Auk 54:524-528.

The dusky and Hammond's flycatchers.

Davis, D. E. 1954. The breeding biology of Hammond's flycatcher. Auk 71:164-171.

At Flathead Lake, Montana, these birds inhabit moderately tall, dense, mixed vegetation. Both sexes emit a position note and alarm call. The male has a flight song. The female (primarily) builds the nest about 30 feet above the ground in a maintained territory. The female alone incubates the three-egg (average) clutch, but both adults feed the young. This species differs from other Empidonax species primarily in habitat; breeding biology is similar.

Davis, John, George F. Fisler, and Betty S. Davis. 1963. The breeding biology of the western flycatcher. Condor 65:337-382.

Johnson, Ned K. 1965. Differential timing and routes of the spring migration in the Hammond flycatcher. Condor 67:423-437.

__________. 1966. Morphologic stability versus adaptive variation in the Hammond's flycatcher. Auk 83:179-200.

__________. 1970. Fall migration and winter distribution of the Hammond flycatcher. Bird-Banding 41:169-190.

Based on examination of museum specimens, the author calculated the time of migration through various locations in the Southwest.

__________. 1974. Molt and age determination in western and yellowish flycatchers. Auk 91:111-131.

Kellogg, P. P. and R. C. Stein. 1953. Audio-spectrographic analysis of the songs of the alder flycatcher. Wilson Bull. 65:75-80.

King, J. R. 1955. Notes on the life history of Traill's flycatcher (Empidonax traillii) in southeastern Washington. Auk 72:148-173.

Manuwal, David A. 1970. Notes on the territoriality of Hammond's flycatcher (Empidonax hammondi) in western Montana. Condor 72:364-365.

The territories consisted of tall, dense conifers and dense broadleaf vegetation broken up by numerous canopy openings. Territory size varied from 1.5 to 3.8 acres.

McCabe, R. A. 1951. The song and song flight of the alder flycatcher. Wilson Bull. 63:89-98.

Phillips, A. R. 1937. A nest of the olive-sided flycatcher. Condor 39:92.

Near Flagstaff, Arizona.

___________. 1948. Geographic variation in Empidonax traillii. Auk 65:507-514.

Intensive study of Traill's flycatcher.

Stein, R. C. 1958. Two populations of the alder flycatcher. NYS Mus. and Sci. Serv. Bull. 371. 63 p.

___________. 1963. Isolating mechanisms between populations of Traill's flycatchers (Empidonax:Aves). Proc. Am. Phil. Soc. 107:21-50.

The genus Empidonax depends on sound, specifically song, as the primary species-isolating mechanism. This paper investigated two Empidonax species, the willow and alder flycatchers, at the time of their lumping taxonomically as Traill's flycatcher. Evidence presented here helped determine that two species did, indeed, exist.

Turdik, Genevieve M. 1971. Pendulum display by olive-sided flycatcher. Auk 88:174.

Weydemeyer, W. 1973. Singing habits of Traill's flycatcher in northwestern Montana. Wilson Bull 85:276-282.

53 yrs. of observations on the alder flycatcher.

*Alaudidae (Larks)

Verbeek, Nicolaas A. M. 1967. Breeding biology and ecology of the horned lark in alpine tundra. Wilson Bull. 79:208-218.

On the Beartooth Plateau, Wyoming, most horned larks located their alpine meadow nests in dry habitat. Territories averaged 1.5 hectares. All nests faced away from the prevailing wind. Only the female incubated the one clutch (average: 3.1) per season. Incubation lasted 11 days. Young developed rapidly, leaving the nest after about 10.2 days (when they weighed 20 g.), even before they could fly. Nesting mortality factors included predation by deer mice and blowfly larvae.

*Hirundinidae (Swallows)

Edson, J. M. 1942. A study of the violet-green swallow. Murrelet 23:5-10.

In Washington state.

__________. 1943. A study of the violet-green swallow. Auk 60:396-403.

*Corvidae (Jays and crows)

Aldrich, J. W. 1943. Relationships of the Canada jays in the Northwest. Wilson Bull. 55:217-222.

Bailey, A. M. and R. J. Niedrach. 1932. Domain of the camp robber. Am. Forests 38:492.

The gray jay in Colorado.

Bock, W. J., R. P. Balda and S. B. VanderWall. 1973. Morphology of the sublingual pouch and tongue musculature in Clark's nutcracker. Auk 90:491-519.

This corvid harvests, transports and stores pine seeds. The birds carry the seeds in an expandable sublingual pouch, unique in the family, whose morphology the authors detail.

Bowles, J. H. 1930. The ravens of the state of Washington. Condor 32:192-201.

Bradbury, W. C. 1917. Notes on the nesting habits of the Clarke nutcracker in Colorado. Condor 19:149-55.

Braly, J. C. 1931. Nesting of the pinon jay in Oregon. Condor 33:29.

The species nested in ponderosa pines.

Brown, D. E. 1930. Nesting habits of the Steller jay, Cyanocitta stelleri stelleri, in western Washington. Murrelet 11:68-69.

Brown, Jerram L. 1963a. Aggressiveness, dominance, and social organization in the Steller jay. Condor 65:460-484.

__________. 1963b. Ecogeographic variation and introgression in an avian visual signal: the crest of the Steller's jay Cyanocitta stelleri. Evolution 17:23-39.

____________. 1964. The integration of agonistic behavior in the Steller's jay, Cyanocitta stelleri (Gmelin). Univ. Calif. Publ. Zool. 60:223-328.

The central nervous system coordinates and correlates the various concurrent behavior patterns of the species. For example, the angle of the erected crest of a dominant jay determines the intensity of resistance in another jay which he attacks. The author correlated the crest angle of the dominant bird with those physiological parameters associated with increased activity in the attacked jay, such as heart rate, blood pressure and localized vasomotor effects.

____________. 1973. Behavior elicited by electrical stimulation of the brain of the Steller's jay. Condor 75:1-16.

The author stimulated the mid-brain and anterior brain stem to determine functional organization of agonistic behavior.

Davis, John and Laidlaw Williams. 1957. Irruptions of the Clark nutcracker in California. Condor 59:297-307.

Irruptions occurred in 1898, 1919, 1935, 1950, and 1955. This paper discusses the invasion of the Monterey Bay region in 1955 and the behavior of the invaders. Since nutcrackers depend on pine cones for winter food, California irruptions appear to occur when an unusually large population has low food supplies on its winter range. Irruptions occur when cone crops fail after 2 or more years of large crops permitting population increase.

____________ and ____________. 1964. The 1961 irruption of the Clark's nutcracker in California. Wilson Bull. 76:10-18.

Movement of this species from mountain to coastal areas in California depends on the cone crop in the mountains. The authors conclude that food acts as the proximate factor in motivating irruptions of Clark's nutcrackers. The physiological mechanism triggering movements of this species must differ from that triggering movements of "ordinary" migrants.

Dow, Douglas D. 1965. The role of saliva in food storage by the gray jay. Auk 82:139-154.

Jays of the genus Perisoreus possess large mandibular salivary glands. Gray jays evidently use salivary secretions in forming boli and in cementing the boli to the leaves and bark of trees. The jays later relocate the boli at times of scarce food resources. These food-storing adaptations may enable gray jays to winter in boreal regions.

French, N. R. 1955. Foraging behavior and predation by Clark nutcracker. Condor 57:61-62.

Hurlbutt, Catherine A. 1932. At home with the camp robber. Bird-Lore 34:383-385.

Gray jay.

Irving, L. 1955. Nocturnal decline in the temperature of birds in cold weather. Condor 57:362-365.

Daily body temperature changes in subarctic Alaskan magpies resemble variation in temperate-zone birds. At night, in cold weather, the magpies' temperature dropped from 42.5°C to 40.0°.

Larsen, Kenneth W. and John H. Dietrich. 1970. Reduction of a raven population on lambing grounds with DRC-1339. J. Wildl. Mgmt. 34:200-204.

A dosage of 5.6 mg/kg of DRC-1339 kills half the common ravens who receive the chemical. DRC-1339 poisoned meat reduced a flock of 200 ravens by 90 percent on a ranch in northwest Oregon. The procedure also reduced a population of about 300 common crows in the area by the same proportion. A different treatment, DRC-1339 solution injected into the eyes of sheep carcasses, appeared promising for the control of small raven populations.

Lawrence, L. deK. 1947. Five days with a pair of nesting canada jays. Can. Field Nat. 61:1-12.

__________. 1968. Notes on hoarding nesting material, display, and flycatching in the gray jay. Auk 85:139.

Manwell, Reginald D. 1951. Acute malaria in the Canada jay of the high Rockies. J. Parisitol 37:322.

Gray jay.

Merriam, F. A. 1899. Clark's crows and Oregon jays on Mt. Hood. Bird-Lore 1:46-48, 72-76.

Clark's nutcrackers and gray jays.

Mewaldt, L. R. 1948. Nesting habits and some general notes on Clark's nutcracker (Nucifraga columbiana). M. A. thesis. Mont. State Univ.

__________. 1956. Nesting behavior of the Clark nutcracker. Condor 58: 3-23.

This species varies considerably in breeding behavior. One paired male defended a 2.1 acre territory. The pair obtained some nest material and most food for the young outside the territory. Both sexes gathered nest material, but the female built the nest. Both sexes developed incubation patches, and incubated the young, for about 18 days. Adult attentiveness approached 100 percent during the first nine days of the altricial period. Nestling food consisted almost entirely of shelled ponderosa pine nuts, supplemented by some insects late in the altricial period.

____________. 1958. Pterylography and natural and experimentally induced molt in Clark's nutcracker. Condor 60:165-187.

Includes much information on differences between adults and first year birds; and comparisons to other corvids.

Ouellet, Henri. 1970. Further observations on the food and predatory habits of the grey jay. Canadian J. Zool. 48:327-330.

The gray jay feeds on items ranging from a variety of animal carcasses to axle grease and dried fruits. It also preys on nests and young of several bird species and on certain small mammals of the coniferous forest. Predatory and scavenging functions of the species deserve more attention than they have traditionally received.

Rutter, Russel J. 1969. A contribution to the biology of the gray jay (Perisoreus canadensis). Canadian Field-Naturalist 83:300-316.

Skinnes, M. P. 1916. The nutcrackers of Yellowstone Park. Condor 18:62-64.

Stevenson, James. 1934. Comments upon systematics of Pacific Coast jays of the genus Cyanocitta. Condor 36:72-78.

Steller's jay.

Tyrrell, W. B. 1945. A study of the northern raven. Auk 62:1-7.

Veghte, J. H. 1964. Thermal and metabolic responses of the grey jay to cold stress. Physiol. Zool. 37:316-328.

Warren, O. B. 1899. A chapter in the life of the Canada jay. Auk 16:12-19.

Gray jay.

Williams, O. and P. Wheat. 1971. Hybrid jays in Colorado. Wilson Bull. 83:343-346.

Hybrids between Steller's and blue jays occurred along the foothills of the Colorado Rockies.

*Paridae (Titmice)

Behle, W. H. 1956. A systematic review of the mountain chickadee. Condor 58:51-70.

Butts, W. K. 1931. A study of the chickadee and white-breasted nuthatch by means of marked individuals, part 2: the chickadee. Bird-Banding 2:1-26.

Black-capped chickadees moved 640 m. to another feeding site after food disappeared for several weeks at the original feeding site.

Dixon, Keith L. 1965. Dominance - subordination relationship in mountain chickadees. Condor 67:291-299.

In winter, mountain chickadees travelled in small flocks that exhibited peck-right dominance. The birds acted more hostilely in interflock encounters than intraflock encounters. Interflock contests resembled "peck-dominance", but achieved results similar to territorial defense. The author questions continued use of the term "peck-dominance" owing to its unproven occurrence as a form of internal organization in unconfined groups of vertebrates.

__________. 1970. Attack calls and territorial behavior of the mountain chickadee. XV Int. Orinthol. Congr. Proc. (Abstr.).

__________ and John D. Gilbert. 1964. Altitudinal migration in the mountain chickadee. Condor 66:61-64.

Mountain chickadees remained largely sedentary after their first nesting season, but many young birds moved both up and down the mountain slope in their first summer and fall.

__________, Raymond A. Stefanski and F. Neil Folks. 1970. Acoustic signals in the mating of mountain and black-capped chickadees. Auk 87:322-328.

__________ and __________. 1970. An appraisal of the song of the black-capped chickadee. Wilson Bull. 82:53-62.

Singing in this species attracted rivals rather than repelled them. Males sang weak songs when approaching their nests or when leading their mates or fledglings. Females also sang softly in similar contexts of intrapair signalling.

Finley, W. L. 1906. The chickadee at home. Condor 8:63-67.

Grinnell, J. 1904. The origin and distribution of the chestnut-backed chickadee. Auk 21:364-382.

Hamerstrom, F. 1942. Dominance in winter flocks of chickadees. Wilson Bull. 54:32-42.

The size of the flock increases during winter feeding. Fighting increases as flock size increases. Rank in dominance hierarchy does not affect ability to feed (at a feeder) and seems to have no survival value, except during periods of large flock size or scarcity of food.

Hartzler, Jon. 1970. Winter dominance relationships in black-capped chickadees. Wilson Bull. 28:427-434.

Kluyver, H. N. 1961. Food consumption in relation to habitat in breeding chickadees. Auk 78:532-550.

Black-capped chickadees in Massachussets nested no closer than 55 meters apart. Clutch size (6-8 eggs) decreased as the breeding season progressed. About 1/3 of the broods failed completely; egg pilfering by house wrens caused more than half such failures. About 80% of hatched birds fledged. Caterpillars and spiders (in order of importance) comprised the main foods of nestlings. Parents stopped feeding nestlings 10-25 days after the young left the nest. Immediately after juveniles became independent, family parties disintegrated and juveniles spread over a large area.

Knowlton, G. F. 1944. Some insect food of the chickadee. Bull. Brooklyn Entomol. Soc. 39:85.

In Utah.

Minock, Michael Edward. 1971a. Some behavioral relationships between black-capped and mountain chickadees in an area of year-round sympatry. Ph. D. thesis. Utah State Univ. 100 p.

____________. 1971b. Social relationships among mountain chickadees. Condor 73:118-120.

Male A maintained dominance over Male B during two winters. Male A occupied most of the winter feeding range during breeding season, while Male B used fringe areas. Male A retained dominance at all feeding sites, including those on Male B's territory of the previous summer.

____________. 1972 Interspecific aggression between black-capped and mountain chickadees at winter feeding stations. Condor 74:454-461.

Black-capped chickadees usually, but not always, dominated mountain chickadees. Factors most effective in determining the outcome of an encounter included: sex of the participants, individual differences in birds, and site of encounters in relation to black-cap winter ranges. Interspecific experience in combination with length of time on the area acted as a secondary influence.

Mueller, E. 1973. Chickadees at adjacent feeding sites: the effects of food deprivation. Auk 90:520-532.

Black-capped chickadee individuals maintain bounded winter ranges.

Odum, Eugene P. 1941-1942. Annual cycle of the black-capped chickadee:

Part I: Pair formation and territory. Auk 58:314-333.
Part II: Nest construction and egg-laying. Auk 58:518-535.
Part III: Flock organization and general behavior. Auk 59:499-531.

An intensive study of the species. Birds establish territories after pairing and do not make themselves conspicuous on it. The second part of the report details breeding biology. The author lists among behavioral traits, sixteen distinguishable vocalizations. A thorough summary is located at the end of the third paper. (Auk 59:525-530).

Robins, Jerome D. and Arlo Raim. 1970. Late winter movements and social behavior of the black-capped chickadee. Jack-Pine Warbler 48:66-72.

Smith, Susan M. 1967a. An ecological study of winter flocks of black-capped and chestnut-backed chickadees. Wilson Bull. 79:200-207.

In an even mixture of deciduous and coniferous trees, the author observed black-capped chickadees in deciduous trees 76% of the time, and chestnut-backed chickadees in conifers 83% of the time. She most frequently observed black-capped chickadees less than five feet above the ground and chestnut-backed chickadees 45-50 feet above the ground.

__________. 1967b. A case of polygamy in the black-capped chickadee. Auk 84:274.

One male had two mates on mests 100 yds. apart.

__________. 1967c. Seasonal changes in the survival of the black-capped chickadee. Condor 69:344-359.

Survival of young approached 100% until family break-up. Each pair produced five young. Adult losses did not occur steadily throughout the year, but in a sharp population decline at the time of change from flocking to territorial behavior in the spring. The decline presumably resulted from mortality, emigration or both.

Speirs, J. Murray. 1963. Survival and population dynamics with particular reference to black-capped chickadees. Bird-Banding 34:87-93.

The first year mortality of chickadees averages 89%. The chance of a given chickadee egg hatching and the hatchling surviving to breeding age do not exceed 1 in 10.

Stefanski, Raymond A. 1967. Utilization of the breeding territory in the black-capped chickadee. Condor 69:259-267.

Chickadees established breeding territories gradually. Average pre-nesting and nest-building territories averaged 2.2 and 2.3 hectares, respectively. The birds spent 42% of their time in territorial defense during the pre-nesting stage and 31% during the nest-building stage. When feeding nestlings, the adult birds used only 22% of the area used during nest-building.

Sturman, William A. 1968. The foraging ecology of *Parus atricapillus* and *P. rufescens* in the breeding season, with comparisons with other species of *Parus*. Condor 70:309-322.

Chestnut-backed chickadees forage higher in the trees and more often near the ends of branches than black-capped chickadees. When both forage on branches at the same height, the black-capped chickadee collects food from the bottoms of the branches, while the chestnut-backed chickadee collects food from the tops of the branches. When foraging on hardwood trees, the black-cap uses a hanging stance more often than the chestnut-backed.

__________. 1968b. Description and analysis of breeding habitats of the chickadees, *Parus atricapillus* and *P. rufescens*. Ecology 49:418-431.

Chestnut-backed chickadee abundance depended on the percentage of conifers in the upper story canopy volume and on the average canopy height. Black-capped chickadee abundance depended on the volume of trees in the middle story canopy.

__________. 1969. The responses of the chestnut-backed chickadee, *Parus rufescens*, to a latitudinal vegetation gradient. Ph.D. thesis. Univ. Washington. 105 p.

The author investigated habitat occupancy and foraging behavior to determine species responses to latitudinal gradient.

Telford, Allan D. and Steven G. Herman. 1963. Chickadee helps check insect invasion. Audubon 65:78-81.

Chickadees feed heavily on lodgepole needle miner moth in California and help control these insects. This paper calls attention to the importance of research on the mountain chickadee and other native avian insectivores. We know little of the role of such avian predation during sub-outbreak conditions.

Wallace, G. J. 1941. Winter studies of color-banded chickadees. Bird-Banding 12:49-67.

* Sittidae (Nuthatches)

Aldrich, J. W. 1944. Notes on the races of the white-breasted nuthatch. Auk 61:592-604.

Allen, A. A. 1939. The golden plover and other birds. Comstock, Ithaca, N. Y. p. 95-104.

Popular account of the white-breasted huthatch.

Banks, Richard C. 1970. Molt and taxonomy of red-breasted nuthatches. Wilson Bull. 82:201-205.

Individuals sometime differ by as much as 2 months in the stage of their molts. This paper delineates racial subdivisions.

Bock, Carl E. 1969. Intra- vs. interspecific aggression in pygmy nuthatches, white-breasted nuthatches, and mountain chickadees. Ecology 50:903-905.

Foraging behavior and aggressive interactions in pygmy nuthatches, white-breasted nuthatches, and mountain chickadees.

__________ and Larry W. Lepthein. 1972. Winter eruptions of red-breasted nuthatches in North America, 1950-1970. Am. Birds 26(June):558-561.

During the past 21 years, red-breasted nuthatches have irrupted southward into the central and southern United States on a regular schedule of alternate, or in two cases, paired, years of non-eruption followed by invasion.

de Kiriline, L. 1952. Red-breast makes a home. Audubon 54:16-21.

Red-breasted nuthatch.

__________. 1954. Irrepressible nuthatch. Audubon 56:264-267.

Until Kilham (1973), these two articles by de Kiriline offered the best information available on red-breasted nuthatch courtship.

Kilham, Lawrence. 1968. Reproductive behavior of white-breasted nuthtaches. I. Distraction display, bill sweeping, and nest hole defense. Auk 85:477-492.

Nuthatches participate in bill sweeping by brushing the nest cavity and the surrounding tree surfaces with crushed insects, vegetative matter, bits of fur, or with the empty bill. The nuthatch appears to utilize the chemical defense secretions of insects to divert or distract tree squirrels. The distraction display, in which the nuthatch assumes a spread wing position and sways slowly back and forth, resembles the trancelike state of the oppossum.

____________. 1971. Roosting habits of white-breasted nuthatch. Condor 73:113-114.

This species regularly removes its accumulated feces from the roost hole at dawn. A close interchange of roost sites occurs between the nuthatch and downy woodpecker. In spring, the female nuthatch assumes dominance over the male in claiming roosting holes for nest sites.

____________. 1972. Reproductive behavior of white-breasted nuthatches. II. Courtship. Auk 89:115-129.

Courtship song (main breeding song) peaks during the first 1/2 hour of activity on winter mornings. Intimate "hit-tuck" notes may be exchanged between members of a pair thousands of times daily in winter and early spring. A "phee-oo" note conveys a high pitch of sexual emotion. Of the three types of courtship feeding, two appear similar to techniques used in feeding nestlings. The female initiates copulatory behavior. Several behaviors indicative of emotional harmony occur. With an economy built around widespread storage of food, and a large year-round territory, the nuthatches appear to have ample time for winter-long courtship.

____________. 1973. Reproductive behavior of the red-breasted nuthatch. Auk 90:597-609.

A description of courtship in field and aviary with comparisons to the white-breasted nuthatch.

Knorr, Owen A. 1957. Communal roosting of the pygmy nuthatch. Condor 59:398.

Mugaas, John N. and James R. Templeton. 1970. Thermoregulation in the red-breasted nuthatch (Sitta canadensis). Condor 72:125-132.

Norris, Robert A. 1958. Comparative biosystematics and life history of the nuthatches Sitta pygmaea and Sitta pusilla. Univ. Calif. Publ. Zool. 56:119-300.

Anatomy, taxonomy, and field studies of the habits and behavior of pygmy and brown-headed nuthatches. Norris concludes that the species are distinct and would not interbreed even if sympatric.

Tyler, W. M. 1916. A study of the white-breasted nuthatch. Wilson Bull. 28:18-25.

Vaurie, C. 1951. Adaptive differences between two sympatric species of nuthatches (Sitta). Proc. Int. Ornithol. Cong. 19:163-166.

A classic statement of the phenomena of divergence in sympatry and generalization in allopatry.

* Certhiidae (Creepers)

Bradbury, W. C. 1919. Nesting notes on the Rocky Mountain creeper. Condor 21:49-52.

Brown creeper.

* Cinclidae (Dippers)

Bakus, G. J. 1957. The life history of the dipper on Rattlesnake Creek. M.S. thesis. Univ. of Montana. 119 p.

_____. 1959a. Observations on the life history of the dipper in Montana. Auk 76:190-207.

Diving dippers used their wings extensively, remaining submerged up to 15-20 seconds and diving as deep as four feet They foraged primarily on Plecoptera and Ephemeroptera. Singing peaked from December to early April, while pairing occurred in March. Dippers often utilized the same nesting site for several years. Clutches averaged 4-5 eggs; incubation averaged 16 days, and the nestling period 24-25 days. Fledglings remained at the nesting area 4-15 days.

_____. 1959b. Territoriality, movements, and population density of the dipper in Montana. Condor 61:410-425.

Dippers established winter territories in November and defended them most strongly from Nov.-Feb. In June, the birds tended to move upstream to nest. They exhibited little territorialism both at this time and during nesting. Considerable distance separated most breeding pairs. Dippers moved a maximum of 350 yards while breeding. Population densities varied from 1 bird per 0.197 stream mile to 1 bird per 0.481 road-stream mile.

Goodge, Wm. Russell. 1957. Structural and functional adaptations for aquatic life in the dipper (Cinclus mexicanus). Ph. D. thesis. Univ. Wash. 197 p.

Study of underwater locomotion, appendicular anatomy, and vision. One can discern various adaptations, but these number fewer than expected. Eye structure indicates that dippers see relatively well under water.

____________. 1959. Locomotion and other behavior of the dipper. Condor 61:4-17.

On the water surface, the dipper swims with its feet in a paddling motion and uses its wings occasionally. Underwater, the birds move vertically and horizontally with the wings held partly open. The dipper cannot walk underwater along the bottom without the aid of its wings.

Hann, Harry W. 1950. Nesting behavior of the American dipper in Colorado. Condor 52:49-62.

Sullivan, John O. 1965. "Flightlessness" in the dipper. Condor 67:535-536.

The dipper molts all of its flight feathers at the same time, and thus has a flightless period similar to that of waterfowl.

Thut, Rudolph N. 1970. Feeding habits of the dipper in southwestern Washington. Condor 72:234-235.

The majority of the food items in the dipper's diet came from slow-moving water.

* Troglodytidae (Wrens)

Armstrong, E. A. 1955. The wren. MacMillan, N.Y. 312 p.

Winter wren.

* Turdidae (Thrushes)

Aldrich, John W. 1967. Population characteristics and nomenclature of the hermit thrush. Proc. U. S. Nat. Museum 124:1-33.

Borror, Donald J. and K. C. Halaloff. 1969. Notes on song structure in the Townsend's solitaire. Wilson Bull. 81:163-168.

Tonal fractions of from 1/2 to 1/9 tone occur in the solitaire's song; conventional musical scores cannot represent such elements of bird song. A sonogram with notes of the musical scale superimposed on it probably comes closest to musical representation of a bird's song.

Bowles, J. H. 1927. Nesting habits of the Townsend's solitaire. Murrelet 8:12-13.

Canaris, Albert G. 1966. Occurrence of Collyriclum faba (Trematoda) in a varied thrush with notes on a single bird's internal parasites. Auk 83:139.

In addition to 10 Collyriclum faba, a varied thrush contained 10 Brachylaime pellucidum, 12 Lutztrema monenteron, 25 Leucochloridium spp., 13 tapeworms, and 1 Acanthocephalan.

Cochran, W. W., G. G. Montgomery, and R. R. Graber, 1967. Migratory flights of Hylocichla thrushes in spring: A radiotelemetry study. Living Bird 6:213-225.

Hylocichla thrushes migrate in spring entirely at night at air speeds between 25 and 35 mph and at altitudes of 2,000 to 6,000 feet. The authors point out that researchers using radio tags must recognize that the radio attached to the bird influences its behavior. They include three species in their data: the veery, Swainson's thrush, and gray-cheeked thrush.

Dernson, William A. 1965. Adaptation of heart and lung weight to high altitude in the robin. Condor 67:215-219.

Hearts and lungs weighed more in both adult and immature montane American robins (Turdus migratorius propinquus) than in lowland robins (T.m. migratorius).

Dilger, W. C. 1956a. Adaptive modifications and ecological isolating mechanisms in the thrush genera Catharus and Hylocichla. Wilson Bull. 68:171-199.

Although each of these species differs uniquely in habitat requirements, they share general habitats with adjacent species. Differences in feeding niches have developed in response to selective pressures presumably stemming from competition for feeding areas. These species follow a typical order of replacement from south to north or from lower altitudes to higher ones: veery, hermit thrush, Swainson's thrush, and gray-cheeked thrush. Differences in feeding niches involve both the height at which foraging takes place and the location with respect to forest-edge or forest-interior sites. By a simple alternation of these foraging sites, the birds accomplish a maximum amount of ecological diversification with a minimum of "effort". Adaptive modification of the bill, hind limbs, and wings enables each species to occupy a specific feeding niche. These adaptations coupled with largely allopatric distribution have achieved ecological isolation that allows the four species to occur sympatrically in broad overlap areas.

___________. 1956b. Hostile behavior and reproductive isolating mechanisms in the avian genera Catharus and Hylocichla. Auk 73:313-353.

Another of Dilger's important papers on these thrushes.

Haecker, F. W. 1948. A nesting study of the mountain bluebird in Wyoming. Condor 50:216-219.

Keith, Allan R. 1968. A summary of the extralimital records of the varied thrush, 1848-1966. Bird -Banding 39:245-276.

132 records of at least 142 individuals have occurred at extralimital sites.

Knowlton, G. F. and F. C. Harmston. 1946. Insect food of the mountain bluebird. Econ. Entomol. 39:384.

In Utah.

Martin, Stephen G. 1970. The agonistic behavior of varied thrushes (Ixoreus naevius) in winter assemblages. Condor 72:452-459.

At a feeder, varied thrushes dominated all other species except California quail, scrub jay, and robin. Varied thrushes initiated most encounters with species other than robins.

* Motacillidae (Wagtails and pipits)

Knowlton, G. F. 1944. Pipits eat injurious insects. Auk 61:137-138.

In Utah

Pickwell, G. 1946. The American pipit in its Arctic-Alpine home. Auk 64:1-14.

Verbeek, N.A.M. 1965. Breeding biology, behavior, and ecology of the water pipit (Anthus spinoletta). M.S. thesis. Univ. Montana.

___________. 1970. Breeding ecology of the water pipit. Auk 87:425-451.

Upon arriving in spring on the alpine tundra of the Beartooth Plateau, Wyoming, pipits occupied snow-free areas having tussocks, tilted rocks, or eroded places. Population density averaged 0.5 pair per hectare, mean territory, 1,810 square meters. The nest entrance faced away from prevailing winds. Only the female incubated, for a mean period of 14 days, 10 hours. During incubation the male fed her at some distance from the nest. The short alpine summer precludes renesting consequent to loss of brood. Productivity of young averaged 56 percent; predation caused most losses of young--primarily to deer mice and long-tailed weasels. Both parents fed the nestlings using insects only.

__________. 1973. Pterylosis and timing of molt of the water pipit. Condor 75:287-292.

Breeding and molt partly overlap.

* Bombycillidae (Waxwings)

Lea, R. B. 1942. A study of the nesting habits of the cedar waxwing. Wilson Bull. 54:225-237.

Putnam, L. S. 1949. The life history of the cedar waxwing. Wilson Bull. 61:141-182.

Rothstein, S. I. 1971. High nest density and non-random nest placement in the cedar waxwing. Condor 73:483-485.

__________. 1972. Eggshell thickness and its variation in the cedar waxwing. Wilson Bull. 84:469-474.

Eggs from small clutches have thicker shells than eggs from large clutches. Embryonic development results in a thinning of the shell. Recent eggs are 3.2% thinner than eggs collected before 1920.

__________. 1973. Variation in the incidence of hatching failure in the cedar waxwing and other species. Condor 75:164-169.

Saunders, A. A. 1911. A study of the nesting of the cedar waxwing. Auk 28:323-329.

*Laniidae (Shrikes)

McNicholl, Martin K. 1972. The use of hovering as a search method by the northern shrike. Blue Jay 30 (June): 96-97.

Stegman, L. C. 1959. The northern shrike. N.Y. State Conserv. 14(3):27-28.

White, Clayton M. 1963. Unusual behavior of the northern shrike. Wilson Bull. 75:459-460.

A shrike struck and killed a pine grosbeak and then left to attack a sharp-tailed grouse. The author did not determine if the shrike actually made contact with the grouse.

*Vireonidae (Vireos)

Dunham, David W. 1964. Reproductive displays of the warbling vireo. Wilson Bull. 76:170-173.

Lawrence, L. deK. 1953. Nesting life and behavior of the red-eyed vireo. Can. Field Nat. 67:47-77.

Lemon, Robert E. 1971. Analysis of song of red-eyed vireos. Canadian J. Zool. 49:847-854.

Nolan, Val, Jr. 1962. The swaying display of the red-eyed and other vireos. Condor 64:273-276.

Vireos rarely participate in swaying or bowing of the head and body. This display may function primarily as an appeasement that prevents attack without provoking escape. The usual type of hostile motivation seems to stimulate use of the display.

Southern, W. E. 1958. Nesting of the red-eyed vireo in the Douglas Lake region, Michigan. Jack-Pine Warbler 36:105-130, 185-207.

An important contribution to our knowledge of the breeding biology of the species.

McCabe, T. T. and E. B. McCabe. 1932. Preliminary studies of western hermit thrushes. Condor 34:26-40.

Miller, R. C. 1958. Morning and evening song of robins in different latitudes. Condor 60:105-107.

Timing of song in birds from Berkeley, Calif., north to Alaska.

Morse, Douglass H. 1972. Habitat differences of Swainson's and hermit thrushes. Wilson Bull. 84:206-208.

The hermit thrush socially dominates the Swainson's thrush. Social interactions may determine which of these two species will occupy a given habitat.

Peabody, P. B. 1935. Rim rock and solitaire. Wilson Bull. 47:257-265.

Townsend's solitaire in the Bear Lodge Mountains, Wyoming.

Power, Harry W., III. 1966. Biology of the mountain bluebird in Montana. Condor 68:351-371.

Stanwood, C. J. 1913. The olive-backed thrush at his summer home. Wilson Bull. 25:118-137.

Swainson's thrush.

*Sylviidae (Gnatcatchers and kinglets)

Bowles, J. H. 1904. Nesting of the western golden-crowned kinglet in western Washington. Condor 6:163-165.

Leberman, Robert C. 1970. Pattern and timing of skull pneumatization in the ruby-crowned kinglet. Bird-Banding 41:121-124.

Skull ossification in this species may follow one of two different patterns. One cannot safely separate first-year birds on the basis of a completely pneumatized skull after September.

Rea, A. M. 1970. Winter territoriality in the ruby-crowned kinglet. Western Bird-Bander 45:4-7

Van Rossem, A. J. 1945. The golden-crowned kinglet of southern California. Condor 47:77-78.

*Parulidae (Wood warblers)

Barlow, C. 1899. Nesting behavior of the hermit warbler in the Sierra Nevada Mtns. California. Auk 16:156-161.

Bowdish, B. S. and P. B. Philipp. 1916. The Tennessee warbler in New Brunswick. Auk 33:1-8.

Contains useful life history information.

Dietrich, E. J. 1914. Some notes on MacGillivray's warbler. Oologist 31:105-111.

Ficken, Millicent S. and Robert W. Ficken. 1966. Behavior of myrtle warblers in captivity. Bird-Banding 37:273-279.

The agonistic displays of myrtle warblers resembled those reported for other species of Dendroica.

Ficken, R. W., M. S. Ficken, and D. H. Morse. 1968. Competition and character displacement in two sympatric pine-dwelling warblers (Dendroica, Parulidae). Evolution 22:307-314.

George, W. G. 1963. Phylogenetic riddle. Nat. Hist. 72:45-47.

Discussion of the olive warbler.

Hebard, F. V. 1961. Yellow warblers in conifers. Wilson Bull. 73:394-395.

Hubbard, John P. 1969. The relationships and evolution of the Dendroica coronata complex. Auk 86:393-432.

The author traces the history of the yellow-rumped warbler, traditionally known as the two species, Audubon's and myrtle warblers. He proposes an ancestral population inhabiting western North America, and later split along the Rocky Mountain axis by the advancing glaciers of the late Pleistocene. These two populations diverged, one adapting to the boreal forest (myrtle), the other to the montane forest (Audubon's). As the glaciers receded, the ranges changed, and the two populations again came into contact, interbreeding freely. We now classify the two populations as races of a single species, the yellow-rumped warbler.

Lawrence, L. deK. 1948. Comparative study of the nesting behavior of chestnut-sided and Nashville warblers. Auk 65:204-219.

MacArthur, R. H. 1958. Population ecology of some warblers of northeastern coniferous forests. Ecology 39:599-619.

Although dealing with several eastern species, this paper presents important data on the subtle niche differentiation among warblers. Slight, but selectively important, variations in feeding habits, nest location and breeding territory, timing of clutch, and volume and density of suitable foraging habitat have all minimized interspecific competition.

McCabe, T. T. and A. H. Miller. 1933. Geographic variation in northern waterthrushes. Condor 35:192-197.

Mengel, Robert M. 1964. The probable history of species formation in some northern wood warblers (Parulidae). Living Bird 3:9-43.

In this important paper the author concludes that speciation in at least a third of the wood warblers of North America depended in great part on the successive advances of the glaciers during the Pleistocene. Glacial advances often divided the range of ancestral forms into two disjunct populations, which then evolved into separate species.

Michelbacher, A. E. and Stephen Hitchcock. 1956. Calico scale on walnuts. Calif. Agr. 10:6.

The authors credit Audubon's warbler and a parasitic wasp with effective control of a potentially damaging scale insect in California. Control ranged from 96% to 100%.

Morse, Douglass H. 1968. A quantitative study of foraging of male and female spruce-woods warblers. Ecology 49:779-784.

Males of four congeneric species of wood warblers foraged at their singing heights; females of the same species foraged at their lower nest heights.

Power, Dennis M. 1971. Warbler ecology: Diversity, similarity, and seasonal differences in habitat segregation. Ecology 52:434-443.

A re-analysis of data presented in Parnell (1969, Code: 0).

Price, W. W. 1888. Nesting of the red-faced warbler (Cardellina rubrifrons) in the Huachuca Mtns., southern Arizona. Auk 5:385-386.

__________. 1895. The nest and eggs of the olive warbler (Dendroica olivacea). Auk 12:17-19.

In the Huachucas, Chiricahuas, Graham, and White Mtns.

Roberts, J. O. L. 1971. Survival among some North American wood warblers. Bird-Banding 42:165-184.

An average of 64 percent of 6 spp. of adult warblers survived annually. Average annual fledgling production ranged from 1.5 to 3.0 per pair. North American wood warblers normally average 60 percent in annual survival rate.

Smith, W. P. 1934. Observations on the nesting habits of the black-and-white warbler. Bird-Banding 5:31-36.

Webster, J. D. 1962. Systematic and ecological notes on the olive warbler. Wilson Bull. 74:417-425.

Willard, F. C. 1910. The olive warbler (Dendroica olivacea) in southern Arizona. Condor 12:104-107.

Observations on nesting.

* Icteridae (Blackbirds and orioles)

Meanley, Brooke. 1966. Red-winged blackbirds searching beneath pine bark for insects in winter. Auk 83:480-481.

The birds removed the bark from the branches of pine trees.

* Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Adams, Lowell. 1947. Food habits of three common Oregon birds in relation to reforestation. J. Wildl. Mgmt. 11:281-282.

Oregon junco, white-crowned sparrow, and rufous-sided towhee fed on Douglas-fir seed.

Aldrich, Elmer C. 1939. Notes on the salt-feeding habits of the red crossbill. Condor 41:172-173.

Anderson, Stanley H. 1970. Water balance of the Oregon junco. Auk 87:160-163.

During a 24-hour period Oregon juncos lost 16% of their body weight through respiratory water loss and 30% through excretory loss.

Bailey, A. M., R. J. Niedrach, and A. L. Baily. 1953. The red crossbills of Colorado. Denver Mus. Nat. Hist. Pictorial No. 9.

In this detailed and profusely illustrated study of the species, the authors describe two seasons of extensive crossbill nesting in Colorado. Breeding evidently occurs in coincidence with a plentiful coniferous seed supply. During years with poor cone crops, breeding decreases significantly.

Banks, Richard C. 1964. Geographic variation in the white-crowned sparrow. Univ. Calif. Publ. Zool. 70. 123 p.

__________. 1970. The fox sparrow on the west slope of the Oregon Cascades. Condor 72:369-370.

Habitat changes from logging operations apparently have encouraged range expansions by two separate populations, Passerella iliaca fulva and P. i. megarhyncha.

Batts, H. L., Jr. 1953. Siskin and goldfinch feeding at a sapsucker tree. Wilson Bull. 65:198.

Behle, W. H. and R. K. Selander. 1951. The systematic relationships of the fox sparrows (Passerella iliaca) of the Wasatch Mtns., Utah, and the Great Basin. J. Wash. Acad. Sci. 41:364-367.

Blake, Charles H. 1970 Purple finch populations. Inland Bird-Banding News 42:16-17.

Measurements of three widely separated populations of purple finches indicate probable discrete origins. However, only poor chances exist for assigning a single individual to one of the populations by their measurements.

Blanchard, Barbara D. 1939. Environment and annual cycle in the white-crowned sparrows (Zonotrichia leucophrys) of the Pacific seaboard. Ph. D. thesis. Univ. Calif.

_________. 1941. The white-crowned sparrows (Zonotrichia leucophrys) of the Pacific seaboard; environment and annual cycle. Univ. Calif. Publ. Zool. 46:1-178.

In this important paper, the author examines the comparative reproductive physiology of the two West Coast races of the white-crowned sparrow, pugetensis and nuttalli. She emphasizes environmental control of the annual behavioral cycle, particularly the use of the male reproductive cycle as a "slow and exquisitely precise timekeeper" for individual, racial and environmental comparisons.

_________ and Mary M. Erickson. 1949. The cycle of the Gambel sparrow. Univ. Calif. Publ. Zool. 47:255-318.

White-crowned sparrow.

Bridgwater, Donald Dean. 1964. Winter movement and habitat use by Harris' sparrow. M.S. thesis.Okla. State Univ. 46 p.

Carothers, S.W. 1968. The relation between diurnal and nocturnal respiratory metabolism and temperature in two birds of the genus Junco. Jour. Ariz. Acad. Sci. 5, proc. suppl.:16.

Abstract of paper read at 12th annual meeting of the Ariz. Acad. Science at Flagstaff.

Cortopassi, A.J. and L.R. Mewaldt. 1965. The circumannual distribution of white-crowned sparrows. Bird-Banding 36:141-169.

Coues, E. 1879. History of the evening grosbeak. Bull. Nuttall Ornithol. Club 4:65-75.

Cushing, J. E., Jr. 1938. The status of the fox sparrow in southwestern Oregon. Condor 40:73-76.

Dawson, W. L. 1922. The leuco nestings of 1922. J. Mus. Comp. Zool. 2:19-26.

Rosy finches.

Dawson, William R., V. H. Shoemaker, H. B. Tordoff and Arieh Borut. 1965. Observations of metabolism of sodium chloride in the red crossbill. Auk 82:606-623.

Red crossbill ad libitum intake of tap water equalled 22% of body weight/day. Fluid intake rate increased so that birds daily ingested more than their body weight of salt water. Birds maintained body weight on a maximum concentration of 0.2 M. Red crossbills did not prefer distilled water to 0.100 M NaCl, but they did prefer water to 0.200 NaCl.

__________ and H. B. Tordoff. 1959. Relation of oxygen consumption to temperatures in the evening grosbeak. Condor 61:388-396.

The authors studied the effect of temperature upon oxygen consumption and body and skin temperatures to determine how small birds cope with extreme cold. The grosbeak can equalize heat loss with minimal heat production down to 16° C. At lower temperatures they increase heat production by increasing food intake. Social foraging habits, strong flight, well developed crops, use of shelter at night, and ability of young to thrive on vegetable matter help the grosbeak to survive and breed in a cold climate.

__________ and __________. 1964. Relation of oxygen consumption to temperature in the red and white-winged crossbills. Auk 81:26-35.

Since lower critical temperatures of crossbills greatly exceed average winter temperatures, they must somehow augment their heat production at this season. The birds must consume maximum amounts of food when daylength reaches its minimum. Their social foraging habits and strong flight may facilitate location and exploitation of food. Their well-developed crop enables them to store rather large amounts of food at nightfall. Roosting under shelter may dissipate the full impact of cold nights.

DeLong, Mrs. W. C. 1971. Harris' sparrow banding project. Inland Bird Banding News 43(1):16-19.

Presentation of survival tables for banded Harris' sparrows.

De Wolfe, Barbara Blanchard. 1967. Biology of white-crowned sparrows in late summer at College, Alaska. Condor 69:110-132.

Gambel's white-crowned sparrows on the breeding ground in late summer, before beginning any migratory behavior, are not necessarily exclusively birds which bred there. Unusual nesting cycle timing, lack of correlation between changes in body weight and amount of fat, and lack of precision in timing of autumnal fat deposition appear typical for this species when breeding at this northern latitude (64° 49'N). Atypical population characteristics found at College include timing of molt, length of molt, and behavior indicative of oncoming migration.

__________, G. C. West, and L. J. Peyton. 1973. The spring migration of Gambel's sparrows through southern Yukon territory. Condor 75:43-59.

Flock characteristics and geographic pattern of travel of Gambel's white-crowned sparrows on their migration to Alaska.

Dixon, J. B. 1936. Nesting of the Sierra Nevada rosy finch. Condor 38:3-8.

Farner, Donald S. 1964. The photoperiodic control of reproductive cycles in birds. Am. Scientist. 52:137-156.

A literature review showed that day-length controls the reproductive cycle of the Gambel's white-crowned sparrow. Cites nearly 100 references.

Farrar, R. B., Jr. 1966. Lean dry weight and water balance in slate-colored juncos. Auk 83:616-622.

The average slate-colored junco had a wing length of 76 mm. and a nonfat dry weight of 5.3g. A 1.0 mm increase in wing length produced a 0.1 g increase in lean dry weight. The juncos lost nonfat dry weight and water rapidly during the first several days of captivity. These parameters then returned to a point slightly below normal.

French, N. R. 1959a. Distribution and migration of the black rosy finch. Condor 61:18-29.

In winter, black rosy finches migrate to lower elevations and at least 300 miles southward. Lack of water in alpine areas may stimulate this movement downward. Lack of habitat insures the separation of breeding black rosy finches from breeding brown-capped rosy finches in Colorado and southeastern Wyoming. But the black rosy finch intergrades with the gray-crowned rosy finch in both the Bitterroot Mtns. of the Montana-Idaho border and the Seven Devils Mtns. on the Idaho-Oregon border. Aridity, decreased available habitat, and/or absence of precipitous cliffs for nesting seem to prevent the species from populating several isolated mountainous areas farther south and west of the present breeding range.

__________. 1959b. Life history of the black rosy finch. Auk 76:159-180.

Territory centers around the female, whom males outnumber six to one. The female alone builds the nest and incubates the 4-5 egg clutch. Both parents feed the young. Family groups join together after fledging to form flocks. Wintering flocks utilize the same caves or buildings for roosting year after year.

Fretwell, Steve. 1969. Dominance behavior and winter habitat distribution in juncos (<u>Junco hyemalis</u>). Bird-Banding 40:1-25.

The author related adrenal weight, wing length, and social dominance to field feeding of flocks versus woods feeding of individuals or small groups.

Gashwiler, Jay S. and A. Lorin Ward. 1966. Western red cedar seed; A food of the pine siskins. Murrelet 47 (3):73-75.

__________ and __________. 1968. Oregon junco foods in coniferous forests. Murrelet 49 (3):29-36.

Griscom, L. 1937. A monographic study of the red crossbill. Proc. Boston Soc. Nat. Hist. 41(5):77-210.

An important and extensive study.

Gwinner, Eberhard G., Fred W. Turek, and Susan D. Smith. 1971. Extra-ocular light perception in photoperiodic responses of the white-crowned sparrow (Zonotrichia leucophrys) and of the golden-crowned sparrow (Z. atricapilla). Z. Vgl. Physiol. 75(3):323-331.

Hadley, Neil F. 1969a. Microenvironmental factors influencing the nesting sites of some subalpine fringillid birds in Colorado. Arctic Alpine Res. 1:121-126.

Gray-headed juncos, white-crowned sparrows and Lincoln's sparrows.

__________. 1969b. Breeding biology of the gray-headed junco in the Colorado Front Range. Colo. Field Ornith. 5:15-21.

Hardy, James L., Don R. Roberts and Richard C. Banks. 1965. The composition of a wintering population of white-crowned sparrows in Kern County, Calif. Condor 67:90-91.

A 1:1 ratio existed for both first year to adult birds and males to females.

Helms, Carl W., William H. Aussiker, Edward B. Bower and Stephen D. Fretwell. 1967. A biometric study of major body components of the slate-colored junco. Condor 69:560-578.

Herman, Steven G. 1971. The functional and numerical responses of the Cassin finch to epidemic numbers of the lodgepole needleminer (Coleotechnites milleri (Busck)). Wasmann J. Biol. 29(1):71-80.

Hespenheide, Henry A. 1966. The selection of seed size by finches. Wilson Bull. 78:191-197.

Slate-colored juncos had relatively smaller bills than white-throated sparrows and selected relatively smaller seeds.

Johnson, Richard F. 1965. Reproductive activities of rosy finches, with special reference to Montana. Auk 82;190-205.

Gray-crowned rosy finches built seven nests in Glacier N.P. in cliff sites offering protection from falling rock and rodent predation. A literature review summarized reproductive data for the species. Clutch size increases with latitude. After nesting and brooding, adults and young move up from the breeding grounds to the mountain tops in late August, returning to the meadows near the nest sites only during storms.

Kemper, T. 1959. Notes on the breeding cycle of the red crossbill in Montana. Auk 76:181-189.

King, James R. and Donald S. Farner. 1959. Pre-migratory changes in body weight and fat in wild and captive male white-crowned sparrows. Condor 61:315-324.

Males deposit extensive layers of body fat each spring, doubling their fat reserves. This occurs during a span of about 10 days immediately preceding northward migration. Captivity exaggerates the magnitude of the reserves accumulated, probably because of an abundance of food coupled with curtailment of muscular activity. Vernal fat deposition typically begins abruptly, develops quickly, and exhibits precise timing.

____________ and ____________. 1966. The adaptive role of winter fattening in the white-crowned sparrow with comments on its regulation. Am. Nat. 100:403-418.

____________, ____________ and L. Richard Mewaldt. 1965. Seasonal sex and age ratios in populations of the white-crowned sparrows of the race gambelli. Condor 67:489-504.

____________, ____________ and Martin L. Morton. 1965. The lipid reserves of white-crowned sparrows on the breeding ground in central Alaska. Auk 82:236-252.

Lipid reserves of white-crowned sparrows accounted for 3-4% of total body weight until shortly before autumn migration. At this time, they increased to an average of 8% and a maximum of 16%. Summer/autumn variation in total body weight does not correlate well with variation of lipid reserves.

____________ and Eugene E. Wales, Jr. 1964. Observations on migration, ecology, and population flux of wintering rosy finches. Condor 66:24-31.

__________ and __________. 1965. Photoperiodic regulation of testicular metamorphosis and fat deposition in three taxa of rosy finches. Physiol. Zool. 38:49-68.

Two races of the gray-crowned rosy finch deposit fat equally in spring and when exposed to long photoperiods, but the black rosy finch tends to gain slightly less. These differences lack statistical significance. The authors propose that this metabolic adaptation originally evolved in response to selection pressures favoring early seasonal occupancy of a calorically demanding alpine nesting environment. Migratory status apparently has exerted only a secondary effect.

Kontogiannis, John E. 1968. Effect of temperature and exercise on energy intake and body weight of the white-throated sparrow _Zonotrichia albicollis_. Physiol. Zool. 41:54-64.

Energy cost of exercise increased at lower temperatures. Sparrows tolerated temperatures no lower than -29°C, and no higher than +40°C (or +35-36°C, with exercise).

Konishi, Masakazu. 1964. Song variation in a population of Oregon juncos. Condor 66:423-436.

Songs vary in number of syllables, song duration, length of intervals between syllables, syllable duration and maximum and minimum frequency (pitch) of song.

Lack, D. 1944. Correlation between beak and food in the crossbill, _Loxia curvirostra_ Linnaeus. Ibis 86:552-553.

Adaptive radiation in the red crossbill.

Leffingwell, D. J. and A. M. Leffingwell. 1931. Winter habits of the Hepburn rosy finch at Clarkston, Washington. Condor 35:140-147.

Gray-crowned rosy finch.

Lewis, Robert Alan. 1971. The temporal organization of reproductive and associated cycles of the Puget Sound white-crowned sparrow, _Zonotrichia leucophrys pugetensis_. Ph.D. thesis. Univ. Wash 173 p.

Linsdale, J. M. 1928. Variations in the fox sparrow (_Passerella iliaca_) with reference to natural history and osteology. Univ. Calif. Publ. Zool. 30:251-392.

MacMillen, Richard E. and John C. Snelling. 1966. Water economy of the white-crowned sparrow and its use of saline water. Condor 68:388-395.

Gambel's white-crowned sparrows preferred the least concentrated of saline solutions and lost weight on hypertonic saline solutions. Water-deprived birds lost weight at the rate of 9% of initial body weight per day and survived a maximum of seven days.

Marler P. and M. Tamura. 1962. Song "dialects" in three populations of white-crowned sparrows. Condor 64:368-377.

Song patterns in three populations (two close together and one distant) showed considerable homogeneity within each population. In one case, the patterns remained similar over two consecutive breeding seasons. Song patterns of the three populations differ consistently and distinctively. Those separated by the greatest distance diverge most. These data constitute one of the clearest existing examples of "dialects" in bird song. Such song variations may indicate incipient speciation.

McCabe, T. T. and E. B. McCabe. 1933. Notes on the anatomy and breeding habits of crossbills. Condor 35:136-147.

Meier, Albert H., Donald S. Farner and James R. King. 1965. A possible endocrine basis for migrating behavior in the white-crowned sparrow, Zonotrichia leucophrys gambelli. Animal Behaviour 13:453-465.

Mewaldt, L. R. 1964. Calif. sparrows return from displacement to Maryland. Science 146:941-942.

Resident Calif. white-crowned and golden-crowned sparrows returned to California after release in Baton Rouge, Louisiana and Laurel, Maryland.

___________, Sally S. Kibby and Martin L. Morton. 1968. Comparative biology of Pacific coastal white-crowned sparrows. Condor 70:14-30.

Weight, molt, gonadal activity, and activity cycles of Pacific Coast races.

___________, Martin L. Morton, and Irene L. Brown. 1964. Orientation of migratory restlessness in Zonotrichia. Condor 66:377-417.

Caged birds concentrated spring activity in northern sectors and fall activity in southern sectors of the cage, behavior typical for migratory birds in the northern hemisphere. They concentrated nighttime, but not daytime, activity in the sector of the cage appropriate to seasonal migratory movements. In spring, most night restlessness occurred prior to midnight; in fall, most occurred between midnight and dawn. Birds derive visual orientation information from the clear but moonless night sky. High levels of night restlessness and strong directional choice were not always associated. Night activity persisted beyond spring migration time but decreased during molt.

Michael, Enid. 1941. California evening grosbeak. Yosemite Nature Notes 20:86-87.

Includes food habits.

Miller, A. H. 1936. The identification of juncos banded in the Rocky Mountain States. Bird-Lore 38:429-433.

____________. 1939a. Status of the breeding Lincoln's sparrows of Oregon. Auk 56:342-343.

____________. 1939b. The breeding <u>Leucostictes</u> of the Wallowa Mountains, Oregon. Condor 41:34-35.

Rosy finches.

____________. 1940. The pine grosbeak of the Cascade Mountains, Washington. Auk 57:420-21.

____________. 1941. Speciation in the avian genus <u>Junco</u>. Univ. Calif. Publ. Zool. 44:173-434.

Although obsolete taxonomically, the methods and reasoning of this work constitute one of the classic studies on bird speciation.

Miller, F. W. 1925. The nest and eggs of the black rosy finch. Condor 27:3-7.

Milligan, M. M. 1966. Vocal responses of white-crowned sparrows to recordings of their own and other species. Anim. Behav. 14:356-361.

____________ and J. Verner. 1971. Inter-populational song dialect discrimination in the white-crowned sparrow. Condor 73:208-213.

While both males and females responded to native and non-native dialects, both consistently responded more strongly to the native dialect. Exposure to the native dialect enhanced responsiveness to later playback of a non-native dialect within the limited time period of the residual effect. Conversely, initial exposure to a non-native dialect depressed responsiveness to later playback of the native dialect.

Morton, Martin L. 1967a. Diurnal feeding patterns in white-crowned sparrows. Condor 69:491-512.

Just prior to migration, individuals begin to feed consistently throughout the day, rather than primarily in early morning and late afternoon. Increased midday food intake may be the primary source of extra energy accumulated as fat. Cyclic stimuli strongly affected by day length may control neural centers regulating caloric intake.

__________. 1967b. The effects of insolation on the diurnal feeding pattern of white-crowned sparrows (Zonotrichia leucophrys gambelli) Ecology 48:690-694.

Wild flocks decrease feeding activities at sunrise, before the air temperature starts to increase. Birds eat less on warm, clear days than on cold, cloudy days. The feeding pattern of captives held outdoors changes during exposure to direct isolation. Sunshine inhibits the birds' food intake. Birds held indoors and exposed to levels of short-wave infrared radiation submaximal in the field resemble control birds in food habits at a constant air temperature of 20°C. When air temperature drops to 7°C, irradiated birds eat significantly less than the control birds.

__________, J. L. Horstmann, and C. Carey. 1973. Body weights and lipids of summering mountain white-crowned sparrows in California. Auk 90:83-93.

Seasonal changes and sexual differences in lipid reserves on breeding grounds in the Sierra.

__________, __________, and Janet M. Osborn. 1972. Reproductive cycle and nesting success of the mountain white-crowned sparrow (Zonotrichia leucophrys oriantha) in the central Sierra Nevada. Condor 74:152-163.

Environmental conditions strongly affected the timing, length and success of the reproductive cycle. Storms and snowpack controlled dates of clutch starts. Heavy snowpack allowed a long growing season, and increased sparrow productivity. Clutch size averaged 3.93 eggs. Three major causes of nest failure existed: predation, weather, and human interference. The Belding ground squirrel proved the most important predator. Sparrows preferred building nests on the ground. Following the loss of a clutch or brood, renesting nearly always occurred.

__________, James R. King and Donald S. Farner. 1969. Postnuptial and postjuvenal molt in white-crowned sparrows in central Alaska. Condor 71:376-385.

The authors examined phenology of the postnuptial and postjuvenal molts in 500 free-living birds near Fairbanks. Seventeen captive adults exposed to natural temperature and photoperiod provided comparative data on postnuptial molt. Free living and captive birds did not differ significantly.

__________. J. E. Orejuela, and S. M. Budd. 1972. The biology of immature mountain white-crowned sparrows (Zonotrichia leucophrys oriantha) on the breeding ground. Condor 74:423-430.

During the short alpine Sierra summer, the authors studied growth and development of energy reserves necessary for successful migration prior to the arrival of winter. This subspecies fledges early (9.5 days) - perhaps owing to its migratory habit or high altitude breeding habitat. Females feed broods more than males. After further development, autumnal fattening and postjuvenal molt (controlled independently) prepare the immature birds for migration.

__________ and D. E. Welton. 1973. Postnuptial molt and its relation to reproductive cycle and body weight in mountain white-crowned sparrows (Zonotrichia leucophrys oriantha). Condor 75:184-189.

In the Sierra Nevada, feeding of young and postnuptial molt do not overlap in time.

Mowbray, Vincent. 1940. Food and feeding habits of the Sierra Nevada rosy finch. Yosemite Nature Notes 19:5-6.

Oakeson, Barbara Blanchard. 1956. Liver and spleen weight cycles in non-migratory white-crowned sparrows. Condor 58:45-50.

Olyphant, Mrs. Murray, Jr. 1968. Returns, recoveries and foreign retraps of purple finches. Inland Bird-Banding News 40:53-59.

Data for 1959-67 on more than 6,400 individuals.

Parks, G. H. and H. C. Parks. 1963. Notes on a trip to an evening grosbeak nesting area. Bird-Banding 34:22-30.

Peyton, Leonard J. and Barbara B. DeWolfe. 1968. A distinctive song pattern in Gambel's white-crowned sparrow. Condor 70:385-386.

Ralph, C. John and Carol A. Pearson. 1971. Correlation of age, size of territory, plumage, and breeding success in white-crowned sparrows. Condor 73:77-80.

Older males held larger territories and more often bred successfully than younger males. Age and territory size therefore correlate with breeding success and regulation of the population. Among breeding first-year birds, many of which had only partially acquired adult plumage, males had more black in their crowns than females. Also among first year birds, successfully breeding birds had less black in their crowns than unsuccessful birds. Early spring increases in levels of reproductive hormones may inhibit the prenuptial molt and stimulate breeding activity.

Rising, James D. 1968. The effect of temperature variation on the metabolic activity of the Harris' sparrow. Comp. Biochem. Physiol. 25:327-333.

Metabolic patterns probably respond to manipulated experimental temperatures on the basis of environmental selection rather than phylogenetic relationships.

Robertson, F. D. 1957. The flocking habits of the golden-crowned sparrows in a winter society. News from the Bird-Banders 32:29-31.

Sabine, Winifred S. 1955. The winter society of the Oregon junco: The flock. Condor 57:88-111.

Winter flocks remain stable till spring break-up. Restriction of individual birds to a common feeding circuit precedes integration into a stable flock. Two neighboring flocks may join permanently. Feeding increases as temperature decreases. When food supplies decrease, visiting individuals may temporarily join the flock. Transients in migration feed more frequently than the permanent members of a flock that they temporarily join. Dispersal of a flock of winter residents at the beginning of the migratory season takes place through a series of abrupt disappearances. The emergence of an intense and special intolerance on the part of a dominant male and his mate may affect the dispersal of a flock of resident birds.

___________. 1956. Integrating mechanisms of winter flocks of juncos. Condor 58:338-341.

Winter flocking functions as a spacing device to distribute the population over the available suitable territory. Another possible function: the necessity to develop a definite, well-experienced homing goal in the individual birds (analogous to the breeding territory surrounding the nest) serving to focus migratory flights.

___________. 1959. The winter society of the Oregon junco: Intolerance, dominance, and the pecking order. Condor 61:110-135.

The order of dominance between any two birds in a winter flock of juncos is, as a rule, permanent. Intolerance serves as a spacing device which leaves to each bird an area of privacy maintained both by the pecking of the dominant bird and by avoidance on the part of the subordinate. Intolerance decreases under crowded feeding conditions. Intolerance and dominance differ in that intolerance (like territoriality) functions as an aspect of the bird's utilization of space. Dominance, however, depends on genetic effects modified by the effects of familiarity with territoriality. The dominant-subordinate pair relations in a winter junco flock form a smooth linear scale of dominance with some triangular irregularities. Dominance hierarchy does not serve as a flocking mechanism. Prior occupancy or familiarity with territory affects position in the hierarchy.

Schultz. R. 1970. Closed field behavior of the wild white-crowned sparrow, _Zonotrichia leucophrys nuttalli_. J. Comp. Physiol. Psychol. 70:424-430.

Semple, J. B. and G. M. Sutton. 1932. Nesting of Harris's sparrow at Churchill, Manitoba. Auk 49:166-183.

Shaw, W. T. 1936. Winter life and nesting studies of Hepburn's rosy finch in Washington. Auk 53:9-16, 133-149.

Gray-crowned rosy finch.

Short, Lester L., Jr. and Stephen W. Simon. 1965. Additional hybrids of the slate-colored junco and the white-throated sparrow. Condor 67:438-442.

Detailed descriptions of 3 hybrids.

Smith, Robert W., Irene L. Brown, and L. Richard Mewaldt. 1969. Annual activity patterns of caged non-migratory white-crowned sparrows. Wilson Bull. 81:419-440.

Body weight in caged birds increased as the mean environmental temperature decreased. Circadian locomotor activity patterns peaked in the morning and to a lesser degree, in evening. During spring, four immatures and two adults showed considerable night locomotion activity. Peaks of night activity correlated strongly with brightly moonlit nights.

Stewart, Robert M. and Kate Darling. 1972. Winter social hierarchy of white-crowned sparrows. Point Reyes Bird Observ. Newsletter 22:2-3.

Swarth, H. S. 1920. Revision of the avian genus _Passerella_, with special reference to the distribution and migration of the races in California. Univ. Calif. Publ. Zool. 21:75-224.

Fox sparrow.

Swenk, M. H. and O. A. Stevens. 1929. Harris's sparrow and the study of it by trapping. Wilson Bull. 41:129-177.

Taylor, W. P. 1923. The Hepburn rosy finch in the Olympic Mountains, Washington. Condor 25:32-33, 69-70.

Gray-crowned rosy finch.

Thayer, Mrs. M. R. 1912. Some nesting habits of the Oregon junco. Bird-Lore 14:212-15.

Thorne, Oakleigh, II. 1956. Differences between the common house finch and Cassin's purple finch of the genus Carpodacus. Thorne Ecol. Res. Sta. Bull. 3. 4 p.

Tordoff, Harrison B. 1954. Social organization and behavior in a flock of captive non-breeding red crossbills. Condor 56:346-358.

Crossbills have beaks highly specialized for feeding on the seeds of conifers. They insert the partly opened bill with the tips of the mandibles nearly opposed under the scales of the cones. They then raise the scales by lateral abduction of the lower mandible toward the side to which the mandible is deflected. The tips of the bill hold the scales apart while the tongue removes the seeds. These birds possess jaw musculature more powerfully developed on the side to which the lower mandible points.

__________ and William R. Dawson. 1965. The influence of daylength on reproductive timing in the red crossbill. Condor 67:416-422.

The red crossbill breeds erratically, suggesting a lack of dependence on daylength as a breeding stimulus. Maturation of the gonads may depend on availability of suitable food.

Twining, Harold. 1938. The significance of combat in male rosy finches. Condor 40:246-247.

__________. 1940. Foraging behavior and survival in the Sierra Nevada rosy finch. Condor 42:64-72.

The gray-crowned rosy finch in Yosemite.

Verner, J. and M. M. Milligan 1971. Responses of male white-crowned sparrows to playback of recorded songs. Condor 73:56-64.

Sparrows habituated to playback; most ceased responding after their third or fourth exposure. Those with dependent young responded differently than those without. Sparrows with dependent young responded differently in the morning than the afternoon.

Weaver, R. L. and H. L. West. 1943. Notes on the breeding of the pine siskin. Auk 60:492-503.

West, G. C. and L. J. Peyton. 1972. The spring migration of the tree sparrow through southern Yukon Territory. Bird-Banding 43:241-256.

Weydemeyer, Winton. 1971. Nesting habits of the Oregon junco in Montana. Wilson Bull.; 103-104.

A substantial decline in population has occurred since 1928.

Wheeler, R. 1940. Nesting habits of the leucosticte. Condor 42:133-139.

Rosy finches.

Willard, F. C. 1910. Nesting of the western evening grosbeak (Hesperiphona vespertina montana). Condor 12:60-62.

In the Santa Catalina Mtns. and Huachuca Mtns., Arizona.

Willoughby, Ernest J. 1971. Drinking responses of the red crossbill to solutions of Nacl, $MgCl_2$, and $CaCl_2$. Auk 88:828-838.

Crossbills drank less with increased concentration of available salt solutions, and chose distilled water over salt solutions. Birds could maintain body weight on concentrations of $CaCl_2$ and $MgCl_2$ of 107 and 125 mM respectively. They maintained weight when drinking NaCl concentrations in excess of 175 mM.

Wilson, A. C. and Donald S. Farner. 1960. The annual cycle of thyroid activity in the white-crowned sparrows of eastern Washington. Condor 62:414-425.

Thyroid activity peaked in autumn and winter, decreased in spring, and dropped to minimum levels in summer. Most passerine histological evidence has not indicated high thyroid activity in cold winters. Considerable variation exists in theories concerning the role of thyroid activity in passerine molt, reproductive activity, and migration.

Wolfson, A. 1942. Regulation of spring migration in juncos. Condor 44:237-263.

WOODLAND-BUSHLAND

* Introduction

Woodland-bushland occurs discontinuously in widely separated regions of the West. Except for the California chaparral, biological islands of this vegetative life form exist at higher elevations within the grassland and desert biomes, or in ecotones between desert or grassland and coniferous forest. Three distinctive plant associations cover the areas included in this ecological division: pine-oak woodland and bushland, broad sclerophyll (oak;chaparral), and pinon-juniper woodland. Some controversy exists regarding the status of these communities -- whether, indeed, each is no more than a community, or each distinctive enough to rank as a separate biome. Shelford (1963) bestows full biome status only on the chaparral. Odum (1971) assigns both chaparral and pinon-juniper woodland biome ranking. Owing to similarities in birdlife, we have placed all these communities under one heading in compiling this bibliography. No final decision on biome status is intended.

The so-called California chaparral possesses the most easily delineated boundaries of the three communities. The oak forest, woodland, and chaparral contained within these boundaries extends from central Oregon through the California coastal mountains and Sierra foothills into northern Baja California. Nearly all the climax species of plants in this community have hard, thick, evergreen leaves. The associations merge with one another without forming distinct regions showing plant successional relationships. Two limiting factors seem to determine the distributional boundaries of this community. First, a mild, temperate climate with abundant winter rainfall coupled with dry summers seems necessary. And second, cyclic recurrence of fire sustains the shrub-dominated chaparral sub-climax at the expense of trees.

Variations in chaparral vegetation are determined by local variations in habitat. Sclerophyll forest generally occurs on north slopes. Scattered trees or woodland types dominate with an understory of grass, chaparral, or sagebrush. An oak woodland/grass community surrounds the California prairie, extends northeast along the coast range, and occurs in other scattered areas. Many vertebrates living in these areas evolve small size and dull coloration to match the dwarf forest. Population densities of breeding birds and insects peak as the growing season comes to a close, and then decrease as the vegetation dries out in late summer. Perhaps the most characteristic birds of the chaparral are the wrentit, green-tailed towhee and black-chinned sparrow.

The dry interior valleys of the Willamette, Umpqua, and Rogue Rivers in Oregon constitute a particularly complex region. Highly altered by man's activities, the life-forms now present comprise a mosaic of oak woodland, coniferous forest stands, and grassland/pasture land/cropland. These areas appear in the biome map (Fig. One) as Woodland-Bushland.

The two remaining woodland-bushland communities occur in the foothills of both the eastern and western cordilleras from Montana south into Mexico. In southern Arizona and New Mexico oak-juniper and pine-oak woodlands cover the lower slopes of the desert mountain ranges. As one moves north in the Rockies, a deciduous shrub-dominated oak bushland gradually replaces oak woodland at elevations between 5000 and 8000 feet. Much of the birdlife of the southern Arizona pine-oak canyons shows marked Mexican affinity (Example: coppery-tailed trogon). In the Rocky Mountain oak bushland to the north, avifaunal species composition more closely resembles the adjoining pinon-juniper woodland and montane coniferous forest.

Pinon-juniper woodland, whether viewed as a biome or simply as a plant community, maintains a characteristic appearance throughout its range. Pinon pine (Pinus edulis) and several species of Juniperus dominate in various combinations to produce an orchard-like, but irregular, arrangement of low short-trunked trees with a scattered growth of shrubs and herbs beneath. Ranging from 5000 to 7000 feet, the community extends from southern California through the Great Basin to the northern plateaus and the Colorado Front Range of the Rockies as well as south through Texas. One finds plain titmice and pinon jays largely restricted to the pinon-juniper. Other resident birds include more widespread shrub-preferring species, as well as birds whose distribution extends upward into montane forests and downward onto plains and deserts.

Many of the birds characteristic of the woodland-bushland communities permeate the large, continuous biomes as well. One possible reason: the ecotonal nature of these communities allows birds more typical of adjacent biomes to successfully range into the separating woodland-bushland areas. Birds of these communities appear in the lists that follow.

Broad Sclerophyll (Chaparral; Oak woodland)

Roadrunner
Poor-will
Black-chinned hummingbird
Costa's hummingbird
Anna's hummingbird
Allen's hummingbird
Acorn woodpecker
Nuttall's woodpecker
Western kingbird
Cassin's kingbird
Gray flycatcher
Scrub jay
Yellow-billed magpie
Common crow
Plain titmouse
Bushtit
Wrentit
Mockingbird
California thrasher
Hermit thrush
Black-tailed gnatcatcher
Ruby-crowned kinglet
Loggerhead shrike
Hutton's vireo
Gray vireo
Warbling vireo
Orange-crowned warbler
Yellow-rumped warbler(Audubon's)
Northern oriole (Bullock's)
Brewer's blackbird
House finch
Lesser goldfinch
Lawrence's goldfinch
Green-tailed towhee
Rufous-sided towhee
Brown towhee
Lark sparrow
Rufous-crowned sparrow
Sage sparrow
Black-chinned sparrow
White-crowned sparrow
Golden-crowned sparrow
Fox sparrow

Pinon-Juniper Woodland

Broad-tailed hummingbird	Bushtit
Common flicker (Red-shafted)	Bewick's wren
Ladder-backed woodpecker	Cactus wren
Cassin's kingbird	American robin
Ash-throated flycatcher	Mountain bluebird
Least flycatcher	Blue-gray gnatcatcher
Gray flycatcher	Gray vireo
Western wood pewee	Virginia's warbler
Violet-green swallow	Black-throated gray warbler
Steller's jay	Scott's oriole
Scrub jay	Black-headed grosbeak
Common crow	Rufous-sided towhee
Pinon jay	Brown towhee
Mountain chickadee	Dark-eyed junco
Plain titmouse	Chipping sparrow

Oak Bushland

Common flicker (Red-shafted)	Gray vireo
Steller's jay	Virginia's warbler
Scrub jay	Evening grosbeak
Black-capped chickadee	House finch
Mountain chickadee	Pine grosbeak
American robin	Pine siskin
Townsend's solitaire	Rufous-sided towhee
Bohemian waxwing	Dark-eyed junco
Cedar waxwing	White-crowned sparrow

Pine-Oak Woodland

Whip-poor-will	Steller's jay
Poor-will	Mexican jay
Rivoli's hummingbird	Mexican chickadee
Blue-throated hummingbird	Plain titmouse
Violet-crowned hummingbird	Bridled titmouse
White-eared hummingbird	Bushtit
Coppery-tailed trogon	Brown-throated wren
Acorn woodpecker	Bewick's wren
Arizona woodpecker	Blue-gray gnatcatcher
Rose-throated becard	Hutton's vireo
Thick-billed kingbird	Black-throated gray warbler
Tropical kingbird	Grace's warbler
Cassin's kingbird	Painted redstart
Sulphur-bellied flycatcher	Scott's oriole
Wied's crested flycatcher	Hepatic tanager
Ash-throated flycatcher	Cardinal
Olivaceous flycatcher	Varied bunting
Buff-breasted flycatcher	Rufous-crowned sparrow
Coue's flycatcher	Yellow-eyed junco
Western wood pewee	

* General

Anderson, Stanley H. 1970. The avifaunal composition of Oregon white oak stands. Condor 72:417-423.

The author censused five white oak stands in the western Willamette Valley. During the winter, seed eaters occurred in large numbers. The proportion of seed eaters decreased during late spring and summer owing to influx of insect eaters.

Antevs, A. 1948. Behavior of the Gila woodpecker, ruby-crowned kinglet, and broad-tailed hummingbird. Condor 50:91-92.

Woodland at Globe, Arizona.

Arnold, J. R. 1937. Birds of the Coalinga area, Fresno County, Calif. Condor 39:31-35.

Chaparral.

Austin, George T. and E. L. Smith. 1972. Winter foraging ecology of mixed insectivorous bird flocks in oak woodland in southern Ariz. Condor 74:17-24.

Birds of several species in the Santa Catalina Mountains maintain spatial separation via differences in the vegetation in which they forage. Methods and position of feeding also differ significantly. Titmice and bushtits modify their behavior in the presence of both each other and other species. These modifications apparently reduce interspecific contact. They also may account for the low level of interspecific aggression and absence of a social hierarchy. A mixed flock size of 10-17 birds seems optimal for post-breeding, insectivorous, temperate-region birds. Flocks at middle elevations in the Southwest differ in several ways from other temperate-zone flocks. Unusually large flock percentages of bushtits may account for these unique characteristics.

Balda, R. P. 1969. Foilage use by birds of the oak-juniper woodland and ponderosa pine forest of southeastern Arizona. Condor 71:399-412.

The author correlates height distribution and volume of foilage in the two plant communities with vertical distribution, density, and species distribution of the bird population.

__________. 1970. Effects of spring leaf-fall on composition and density of breeding birds in two southern Arizona woodlands. Condor 72:325-331.

Loss of tree foilage decreased breeding success of foilage nesting birds in oak woodland. Birds nested in higher densities in sites other than tree foilage. The oak-juniper-pine woodland attracted fewer species of foilage nesters, but supported a higher over-all density.

Banks, Richard C. 1966. Terrestrial vertebrates of Anacapa Is., Calif. Trans. San Diego Soc. Nat. Hist. 14:175-188.

Island fauna includes 69 bird species, 35 here first reported, and 28 of them breeding species.

Bartholomew, George A., Thomas R. Howell, and Tom J. Cade. 1957. Torpidity in the white-throated swift, Anna hummingbird and poor-will. Condor 59;145-155.

Reduced body temperature and torpor constitute means of energy conservation associated respectively with high metabolic rates during activity (hummingbirds) or survival during long periods of fasting (swifts and poor-will). Calculations show that a torpid poor-will could survive for at least 100 days on the energy derived from only 10 gm. of fat.

Beidleman, Richard G. and James H. Enderson. 1964. Starling-pinon jay associations in southern Colorado. Condor 66:437.

Mixed flocks of pinon jays and starlings foraged together in a "rolling" pattern.

Benson, S. B. 1935. A biological reconnaissance of Navajo Mtn., Utah. Univ. Calif. Publ. Zool. 40:439-455.

Brandt, H. 1937. Some Arizona bird studies. Auk 54:62-64.

Six spp. in the Huachuca Mtns.

Bruner, S. C. 1926. Notes on the birds of the Baboquivari Mtns., Ariz. Condor 28:231-238.

Account of 103 species.

Campbell, Arthur S. 1961. Birds of St. Mary's (Berkeley) College area. Available from author, 3011 Regent St., Berkelev, Calif.

Cronemiller, F. P. 1942. Chaparral. Madrono 6:199.

Ecology of the biome.

Diamond, J. M. 1969. Avifaunal equilibria and species turnover rates on the Channel Islands of California. Proc. Nat. Acad. Sci. U. S. 64:57-63.

This important study in island chaparral outlines the dynamics of an island equilibrium.

Grinnell, J. and J. M. Linsdale. 1936. Vertebrate animals of Point Lobos Reserve, 1934-35. Carnegie Inst. Wash., Pub. 481. 159 p.

Avian ecology and annotated lists.

Haldeman, J. R. and A. B. Clark. 1969. Walnut Canyon: An example of relationships between birds and plant communities. Plateau 41:164-177.

An annotated list contains first seen and last seen dates, and indicates nesting species.

Hardy, Ross. 1937. Birds of pinon and shadscale near Price, Utah. M. S. thesis, Univ. Utah.

___________. 1945. Breeding birds of the pigmy conifers in the Book Cliff region of eastern Utah. Auk 62:523-542.

The classic study of pinon-juniper woodland, this paper discusses the ecology of permanent and summer-resident birds. The three permanent, breeding species are the pinon jay, plain titmouse and bushtit.

Hayward, C. Lynn. 1948. Biotic communities of the Wasatch chaparral, Utah. Ecol. Monog. 18:473-506.

Another classic study - on the oak bushland in the mountains of north-central Utah. This paper deals with the birds of the community in detail.

Howard, H. 1929. The avifauna of Emeryville Shellmound. Univ. Calif. Publ. Zool. 32:301-394.

In the coastal chaparral, the author discusses birds of an Indian shellmound near Oakland, Calif.

Howell, A. B. 1917. Birds of the islands off the coast of southern Calif. Pac. Coast Avifauna 12. 127 p.

Johnson, N. K. 1972. Origin and differentiation of the avifauna of the Channel Islands, Calif. Condor 74:295-315.

Of 41 species of land birds which breed in the Channel Islands, 13 (32%) have evolved into 18 endemic subspecies. Several common and conspicuous residents of mainland California chaparral and oak woodland do not occur in the islands even though appropriate habitat seems abundant.

Johnson, R. R. 1960. The biota of Sierra Ancha, Gila County, Arizona. M. S. thesis Univ. Ariz. 114 p.

Includes accounts of 127 spp. of birds in woodland N. of Roosevelt Res.

Lamont, Mrs. G. P. 1961. List of the birds of Monterey Peninsula Region. The Monterey Peninsula Audubon Society, Route 3, Box 882, Carmel, Calif. 10¢ each.

Lawrence, George E. 1966. Ecology of vertebrate animals in relation to chaparral fire in the Sierra Nevada foothills. Ecology 47:278-291.

Numbers of birds and mammals that normally prefer chaparral habitat decreased substantially following burning. Some birds that normally prefer grassland or oak woodland increased in number. The fire resulted in an overall increase in densities of nesting birds. No originally occurring species disappeared completely.

Lee, D. T. 1969. Winter bird-population study: Riparian woodland: Oak-juniper association. Aud. Field Notes 23:538.

In Madera Canyon, Pima and Santa Cruz counties, Arizona.

Ligon, J. David. 1968. Starvation of spring migrants in the Chiricahua Mtns., Arizona. Condor 70:387-388.

During an unusually cold period in early May, several insectivorous species (including the western tanager and black-headed grosbeak) apparently starved.

__________ and R. P. Balda. 1968. Recent data on summer birds of the Chiricahua Mtns. area, southeastern Arizona. Trans. San Diego Soc. Nat. Hist. 15:41-50.

An annotated list of 167 spp.

Lincoln, F. C. 1917. Some notes on the birds of Rock Canyon, Arizona. Wilson Bull. 29:65-73.

Remarks on 66 forms from the Santa Catalina Mtns. area.

Linsdale, Jean M. 1947. A ten-year record of bird occurrence on the Hastings Reservation. Condor 49:236-241.

Observations on 1,600 acres in the Santa Lucia Mtns., Monterey Co., California.

Marshall, Joe T., Jr. 1957. Birds of the pine-oak woodland in southern Arizona and adjacent Mexico. Pac. Coast Avi. 32. 125 p.

This major work analyzes ecological factors governing numbers and distribution of birds in the pine-oak zone. The author tabulates bird habitat preferences and concludes that geographical rather than altitudinal factors determine races. He also discusses interspecific competition and includes accounts of the biology of each pine-oak species.

__________. 1963. Fire and birds in the mountains of southern Arizona. Proc. Tall Timbers Fire Ecology Conf. 2:134-142.

The effects of fire on bird distribution in Arizona and northern Mexico.

McCaskie, R. G. and R. C. Banks. 1964. Occurrence and migration of certain birds in southwestern California. Auk 81:353-361.

Observations of less common birds during the 1962 fall migration.

McKee, E. D. 1945. Oak Creek Canyon. Plateau 18:25-32.

Includes birds.

Metcalf, T. Nelson. 1967. Birds of the Santa Barbara Region: An annotated list including habitats, seasonal distribution, frequency, field trips, maps. Santa Barbara Mus. Nat. Hist. Occas. Paps. #8. 36 p.

Annotated list of 374 spp. found within 50 miles of Santa Barbara, Calif. in chaparral country.

Miller, Alden H. 1946. Vertebrate inhabitants of the pinon association in the Death Valley region. Ecology 27:54-60.

Niles, D. M. 1966. Observations on the summer birds of the Animas Mtns., New Mexico. N. Mex. Ornithol. Soc. Publ. #2. 23 p.

Annotated list of 85 bird species in pine-oak-juniper woodland.

Parker, R. H. 1949. A bioecological study of the pinon pine-juniper association at Juan Tabo in the Sandia Mtns. of New Mexico. M.S. thesis. Univ. New Mex.

Pequegnat, W. E. 1942. A report upon the biota of the Santa Ana Mtns. Ph. D. thesis. Univ. Calif.

__________. 1944. (Same title). J. Ent. and Zool. 36:1.

Chaparral.

Phillips, A. R. 1933. Further notes on the Baboquivari Mtns., Arizona. Condor 35:228-230.

44 spp.

Phillips, F. J. 1910. The dissemination of junipers by birds. For. Q. 8:60-73.

Reynolds, H. G., W. P. Clary, and P. Folliott. 1970. Gambel oak for southwestern wildlife. J. Forestry 68:545-547.

Browse, mast, and cover produced by Gambel oak in the southwest contribute substantially to wildlife sustenance. These facts increase the value of maintaining Gambel oak in multiple-use ponderosa pine forests by management compromise with timber, water, and livestock interests.

Root, R. B. 1966. The avian response to a population outbreak of the tent caterpillar Malacosoma corstrictum (Stretch). Pan-Pacific Entomologist 42:48-53.

Several species of insectivorous birds in California oak forest failed to breed successfully after reduction of the canopy arthropod fauna following severe local defoliation by the tent caterpillar. Although superabundant, the birds rarely took the caterpillar adult or imago for food.

Roth, Vincent P. 1971. Unusual predatory activities of Mexican jays and brown-headed cowbirds under conditions of deep snow in southeastern Arizona. Condor 73:113.

Both species attacked small birds, including juncos.

Santa Barbara Museum of Natural History. 1961. Field check-list of the birds of Santa Barbara County, California. Available from author, 2559 Priesta del Sol, Santa Barbara, California.

Oak-chaparral.

Scheldt, Robert Steve. 1969. Ecology and utilization of mountain mahogany in Idaho. M. S. thesis. Univ. Idaho.

Smith, E. L. 1969. Winter bird-population study: Evergreen-oak woodland. Aud. Field Notes 23:537-538.

In Molino Basin picnic area in the Santa Catalina Mtns. - 22 miles N. E. Tucson.

____________ and K. M. Horn. 1970. (Same title). Aud. Field Notes 24:554.

Wauer, Roland. 1961. Checklist of birds of Pinnacles National Monument, San Benito County, California. Available from Park Naturalist, Death Valley, California.

In chaparral country.

Willard, F. C. 1908. Huachuca notes. Condor 10:206-207.

Elevations of nests of some species of birds differ from the east to west side of the range.

____________. 1913. Late nesting of certain birds in Arizona. Condor 15:227.

Observations on 7 spp. in the Huachuca Mtns.

Willett, George. 1933. A revised list of the birds of southwestern Calif. Cooper Orn. Club, Pac. Coast Avifauna 21. 204 p.

Woodbury, A. M. 1933. Biotic relationships of Zion Canyon, Utah, with special reference to succession: A survey of the geological, botanical, and zoological interrelationships within a part of Zion National Park, Utah. Ecol. Monogr. 3:147-246.

____________. 1947. Distribution of pigmy conifers in Utah and northeastern Arizona. Ecology 28:113-126.

Yensen, E. and D. T. Lee. 1970. Riparian woodland: Oak-juniper association - winter bird population study. Aud. Field Notes. 24:553-554.

Zimmerman, D. A. 1962. Where to go. When to go. What to see. Audubon Mag. 64:216-218.

The birds of Guadalupe Canyon, Ariz.-N. Mexico.

* Caprimulgidae (Goatsuckers)

Blackford, J. L. 1953. Breeding haunts of the Stephens whip-poor-will. Condor 55:281-286.

Photographs of nest, eggs, and incubating birds in the Chiricahuas, Arizona.

Culbertson, A. E. 1946. Occurrences of poor-wills in the Sierran foothills in winter. Condor 48:158-159.

Torpidity of poor-wills in oak-pine woodland.

Levy, S. H. 1962. The Ridgway whip-poor-will in Arizona. Condor 64: 161-162.

In Guadalupe Canyon.

Raynor, G. S. 1941. The nesting habits of the whip-poor-will. Bird-Banding 12:98-104.

* Apodidae (Swifts)

Bradbury, William C. 1918. Notes on the nesting behavior of the white-throated swift in Colorado. Condor 20:103-110.

Hanna, W. C. 1917. Further notes on the white-throated swifts of Slover Mtn. Condor 19:3.

The author suggests that white-throated swifts hibernate during cold weather when food becomes unavailable.

* Trochilidae (Hummingbirds)

Aldrich, E. C. 1945. Nesting of the Allen hummingbird. Condor 47:137-148.

___________. 1956. Pterylography and molt of the Allen hummingbird. Condor 58:121-133.

Breninger, G. F. 1899. A nest of the blue-throated hummingbird. Osprey 3:86.

In the Huachuca Mtns.

Collias, N. E. and E. C. Collias. 1968. Anna's hummingbirds trained to select different colors in feeding. Condor 70:273-274.

Hamilton, W. J., III. 1965. Sun-oriented display of the Anna's hummingbird. Wilson Bull. 77:38-44.

This species always orients its aerial display into the sun on clear days. On overcast days the birds do not orient dives towards the sun. Shadows may determine dive orientation.

Howard, O. W. 1900. Nesting of the Rivoli hummingbird in southern Arizona. Condor 2:101-102.

In the Huachuca Mtns.

Howell, T. R. and W. R. Dawson. 1954. Nest temperatures and attentiveness in the Anna hummingbird. Condor 56:93-97.

Lasiewski, R. C. and R. J. Lasiewski. 1967. Physiological responses of the blue-throated and Rivoli's hummingbirds. Auk 84:34-48.

An examination of the metabolism of the two largest U. S. hummingbirds. Oxygen consumption during torpor decreased markedly below homeothermic levels. Torpid heart rates dropped considerably below homeothermic levels, and decreased with decreasing temperature. Evaporative water loss also decreased during torpidity. Torpidity is thus important in both water and energy conservation. Rates of entry into and emergence from torpor are inversely related to body weight. A bird weighing 80-100 g would require 12 hours merely to lower its body temperature to 20°C and then arouse again to homeothermic levels.

Levy, S. H. 1958. A possible United States breeding area for the violet-crowned hummingbird. Auk 75:350.

In Guadalupe Canyon.

Lusk, R. D. 1921. The white-eared hummingbird in the Catalina Mtns., Arizona. Condor 23:99.

Moore, R. T. 1939a. Habits of the white-eared hummingbird in northern Mexico. Auk 56:442-445.

Important study applicable to similar habitat in U. S.

__________. 1939b. The Arizona broad-billed hummingbird. Auk 56: 313-319.

Orr, R. T. 1939. Observations on the nesting of the Allen hummingbird. Condor 41:17-24.

Ortiz-Crespo, F. I. 1971. Winter occurrences of Selasphorus hummingbirds in the San Francisco Bay region. Bird-Banding 42:290-292.

Rufous and Allen hummingbirds occurred in Berkeley, Calif. as late in winter as January 1.

Pearson, O. P. 1950. The metabolism of hummingbirds. Condor 52:145-152.

Allen and Anna hummingbirds have a higher rate of oxygen consumption during daytime resting than any other animal tested in comparable conditions. Both species help counterbalance this high rate with a period of torpidity at night during which body temperature falls. Metabolism at 24°C environmental temperature drops as low as 0.84 cc O_2/g/hr. Captive birds recovered spontaneously from torpidity before daybreak. Young Anna hummers did not become torpid. The rate of metabolism of hovering Allen hummingbirds averaged 85ccO_2/g/hr., about six times the resting rate. Metabolism of Anna hummers averaged 5 1/2 times resting rate. During one 50 minute period of much activity one Allen consumed oxygen at an average rate of 41cc/g/hr.

__________. 1954. The daily energy requirements of a wild Anna hummingbird. Condor 56:317-322.

A male flew about 18.7 percent of the time. His calculated energy exchange for 24 hours of normal life in the wild was 7.55 calories (assuming torpidity at night) or 10.32 calories (assuming sleep at night). During his 12 hours and 52 minutes of activity per day, energy expenditure consisted of: perching - 3.81 calories (56 percent); nectar flights - 2.46 (36 percent); insect-catching flights - .09 (1.3 percent); and defense of territory - .30 (4.5 percent). The nectar secretion of about 1022 Fuchsia blossoms can supply this daily need.

Pitelka, F. A. 1951a. Ecologic overlap and interspecific strife in breeding populations of Anna and Allen hummingbirds. Ecology 32: 641-661.

In chaparral country east of Berkeley, Calif., the two species maintained slightly overlapping territories. Allen's often established territories in areas of willows peripheral to or within the upland territories of Anna hummers. Mutual, but unbalanced, depression of population levels occurred in successive years, at least in males. Anna hummers occupied about 80% of potential territorial sites, Allen's less than 48%.

__________. 1951b. Breeding seasons of hummingbirds near Santa Barbara, Calif. Condor 53:198-201.

The permanent resident Anna's hummingbird has the longest breeding season of breeding hummers in this area. Summer residents include Allen's, Costa's, and black-chin. The latter two breed later than either Anna's or Allen's. Overlap in nesting periods occurs only from mid-April through June. Anna, Allen and black-chinned hummingbirds overlap in habitat distribution as well, preferring oak woods along a canyon stream. In a given species, the nearest neighbors will more likely be the same species than either of the other two species. Costa's hummingbird prefers deserts and dry, broken chaparral, and may not occur in this oak-woodland locality at all.

Ray, R. C. 1925. Discovery of a nest and eggs of the blue-throated hummingbird. Condor 27:49-51.

In the Huachuca Mtns.

Rising, J. D. 1965. Notes on behavioral responses of the blue-throated hummingbird. Condor 67:352-354.

A description of the agonistic behavior of three individuals in the Chiricahuas, Arizona.

Stiles, F. Gary, III. 1970. Food supply and the annual cycle of the Anna hummingbird. Ph. D. thesis. Univ. Calif. L. A. 239p.

Males show both breeding and feeding territoriality. The author details the behavioral characteristics of each. Juveniles show precocious territorial behavior. Winter breeding in the species may enable some juveniles to become established at good nectar sources before most spring migrants arrive. Females often nest near a good nectar source. Their defense of this nectar source early in the nesting cycle resembles male feeding territoriality. Nesting commences following the appearance of male breeding territoriality and the blooming of suitable flowers in nesting areas.

__________. 1971. Time, energy and territoriality of the Anna hummingbird (*Calypte anna*). Science 173:818-821.

The male Anna hummingbird accomodates seasonal changes in energy demands by varying its distribution of time and energy among different activities. Total energy expenditures change relatively little. Increased feeding efficiency owing to the availability of very nectar-rich flowers makes possible augmented territorial defense during the breeding season.

__________. 1972. Food supply and the annual cycle of the Anna hummingbird. Univ. Calif. Publ. Zool. 97.

Verbeek, Nicolaas A. M. 1971. Hummingbirds feeding on sand. Condor 73:112-113.

A female Anna's hummingbird visited two sandy places hourly. The author cites instances of sand ingestion in this and other female hummingbirds. The two feeding sites contained 23,500 and 10,250 ppm of calcium. Only one of ten nearby randomly selected sites yielded higher calcium content.

Willard, F. C. 1899. Notes on *Eugenes fulgens*. Osprey 3:65-66.

Rivoli's hummingbird nesting in the Huachuca Mtns., Ariz.

__________. 1909. Behavior of a young Rivoli hummingbird. Condor 11:102-103.

In the Huachuca Mtns., Arizona.

__________. 1911. The blue-throated hummingbird. Condor 13:46-49.

Breeding in the Huachuca Mtns., Arizona.

Williamson, Francis S. L. 1956. The molt and the testis cycle of the Anna hummingbird. Condor 58:342-366.

Males molt between breeding seasons from June to January, coincident with the dry season decrease in available food. Recrudescence of the testis starts during the molt period and is well underway by August. All population members reach breeding condition in early December. Thus, molt and the early stages of testis development overlap considerably. Increases in winter rain and food sources, completion of molt, and perhaps the presence of females all probably exert control on the testis cycle. Defense of territory increases with increased volume of testis.

__________. 1957. Hybrids of the Anna and Allen hummingbirds. Condor 59:118-123.

* Picidae (Woodpeckers)

Leach, Frank A. 1925. Communism in the California woodpecker. Condor 27:12-19.

The acorn woodpecker.

Ligon, J. D. 1968a. Observations on Strickland's woodpecker, *Dendrocopos stricklandi*. Condor 70:83-84.

Includes observations on the Arizona woodpecker in Arizona.

__________. 1968b. Sexual differences in foraging behavior in two species of *Dendrocopos* woodpeckers. Auk 85:203-215.

Each sex of the Arizona woodpecker forages in different parts of trees, with some overlap. Differences in beak size may relate to differences in foraging techniques: the two sexes may utilize the same portions of trees in different ways.

MacRoberts, M. H. 1970a. Notes on the food habits of the acorn woodpecker. Condor 72:196-204.

__________. 1970b. Notes on the food habits and food defense of the acorn woodpecker. Condor 72:196-204.

Instead of subsisting almost entirely on stored, dried acorns, the birds eat immature and mature green acorns, flycatch, and sapsuck. They probably do very little boring or gleaning for insects and insect larvae, but do eat something associated with oak blossoms, and occasionally eat fruit, bird's eggs and lizards.

Miller, A. H. and C. E. Bock. 1972. Natural history of the Nuttall woodpecker at the Hasting's reservation. Condor 74:284-294.

This species forages primarily in oaks, but nests in sycamores and willows. Most foraging appears aimed at surface and subsurface insects. Permanent pairs occupied and defended year-round ranges of 0.5 miles in average diameter, centered along drainage patterns. Nesting occurred from mid-April to mid-June. Incubation lasted about 14 days, time till fledging, 29 days. Males excavated the nests and incubated and brooded the young at night. Males also performed most diurnal incubation and nest sanitation. The sexes shared diurnal brooding and feeding activities. Interspecific aggression indicated a high level of competition for nest sites.

Ritter, W. E. 1921. Acorn-storing by the California woodpecker. Condor 23:3-14.

Acorn woodpecker.

____________. 1938. The California woodpecker and I. Univ. Calif. Press. 340 p.

Life history information on the acorn woodpecker, plus rambling philosophy.

Short, L. L. 1971. Systematics and behavior of some North American woodpeckers, genus Picoides (Aves). Bull. Amer. Mus. Nat. History 145:1-118.

This paper emphasizes the relations between the Nuttall and ladder-backed woodpeckers (which Short places in this genus) in southern California.

* Cotingidae (Cotingas)

Levy, S. H. 1958. A new United States nesting area for the rose-throated becard. Auk 75:95.

Guadalupe Canyon, Cochise Co., Arizona.

Phillips, A. K. 1949. Nesting of the rose-throated becard in Arizona. Condor 51:137-139.

* Tyrannidae (Tyrant flycatchers)

Banks, R. C. and R. G. McCaskie. 1964. Distribution and status of the Wied crested flycatcher in the lower Colorado River Valley. Condor 66:250-251.

Breninger, G. F. 1897. Coue's flycatcher. Osprey 2:12.

A nest in the Huachuca Mtns.

Craig, W. 1943. The song of the wood pewee. NYS Mus. Bull. 334. 186 p.

Davis, D. E. 1959. The breeding flycatchers. Wilson Bull. 71:73-85.

Territorial behavior of least flycatcher.

Howard, O. W. 1899. Some of the summer flycatchers of Arizona. Bull. Cooper Ornith. Club 1:103-107.

The sulphur-bellied, olivaceous, and buff-breasted flycatchers.

____________. 1904. The Coues flycatcher as a guardian of the peace. Condor 6:79-80.

Its breeding habits in the Huachuca Mtns.

Johnson, N. K. 1966. Bill size and the question of competition in allopatric and sympatric populations of dusky and gray flycatchers. Syst. Zool. 15:70-87.

Lanyon, W. E. 1963. Experiments on species discrimination in Myiarchus flycatchers. Amer. Mus. Novit. 2126:1-16.

At Portal, Arizona, in the Chiricahuas.

Levy, S. H. 1959. Thick-billed kingbird in the United States. Auk 76:92.

In Guadalupe Canyon.

Ligon, J. David. 1971. Notes on the breeding of the sulphur-bellied flycatcher in Arizona. Condor 73:250-252.

Arriving in late May or early June in 1964, the species completed egg laying by June 18. The female alone builds the nest and incubates. Incubation lasts 16 days. The nest often crowns a platform of large twigs and sticks and is composed primarily of leaf petioles and pine needles. The young hatch at irregularly scattered intervals. At one nest, the last-hatched chick starved. Nestling period lasts 16-18 days. Recently fledged young fly weakly and may remain at one perch for long periods.

Lusk, R. D. 1901. In the summer home of the buff-breasted flycatcher. Condor 3:38-41.

In the Chiricahuas and Santa Ritas.

MacQueen, P. M. 1950. Territory and song in the least flycatcher. Wilson Bull. 62:194-205.

Miller, L. 1962. High noon songs. Condor 64:75-76.

Whisper song of the Cassin kingbird heard in the Pajarito Mtns., Ariz.

Nice, M. M. and N. E. Collias. 1961. Nesting of the least flycatcher. Auk 78:145-149.

Phillips, A. R. 1955. The history of Say's phoebe at Flagstaff. Plateau 28:25-28.

Smith, W. J. 1966. Communication and relationships in the genus Tyrannus. Nuttall Ornith. Club Publ. 6:1-250.

Western, Cassin's and thick-billed kingbird in S. Arizona.

Willard, F. C. 1923. The buff-breasted flycatcher in the Huachucas. Condor 25:189-194.

Nest & eggs.

* Hirundinidae (Swallows)

Baker, James K. 1962. Associations of cave swallows with cliff and barn swallows. Condor 64:326.

Association of cave swallows with barn swallows occurs commonly, cave swallow-cliff swallow association much less commonly. But because the latter do associate occasionally without conflict, they do not seem to compete as Selander and Baker (1957) suggest, even though closely related taxonomically.

Combellack, C.R.B. 1954. A nesting of violet-green swallows. Auk 71:435-442.

In this June nesting in Oregon, only the female incubated the four egg clutch. The male never spent a night in the nest.

Edson, J. M. 1942. A study of the violet-green swallow. Murrelet 23:5-10.

__________. 1943. (Same title). Auk 60:396-403.

Kincaid, E. and R. Prasil. 1956. Cave swallow colony in New Mexico. Condor 58:452.

In Eddy County.

Selander, R. K. and J. K. Baker. 1957. The cave swallow in Texas. Condor 59:345-363.

This important paper on the species includes nesting, behavior, vocalizations, and comparisons with cliff swallow.

*Corvidae (Jays and crows)

Balda, R. P. and Gary C. Bateman. 1971. Flocking and annual cycle of the pinon jay. Condor 73:287-302.

Feeding as a unit during non-breeding months, the jay flock maintained a well-defined home range of about eight square miles. The flock spent much of the time in ponderosa pine forest. A shortage of pinon nuts forced an exit from the home range in search of food. Few intraflock aggressive encounters occurred. A well developed sentinel system added to flock protection. In early spring, pairs courted in relative isolation from the flock. Nest-building began in late February to mid-March. Nesting occurred within a traditional 230 acre breeding ground. Communal feeding of young began 16 days after hatching. In late summer the flock gathered on the breeding grounds to cache pinon nuts.

__________ and __________. 1972. The breeding biology of the pinon jay. Living Bird 11:5-42.

Early courtship, complex and highly ritualized, usually occurred at some distance from the flock. The pair used twigs and sticks in prenesting activities. Courtship feeding occurred often, proportional in intensity to the supply of ponderosa and pinon pine seeds. The birds, synchronized in their nest building, placed over 85 per cent of all nests in the southern half of the tree canopy. Such placement provided metabolic savings to the incubating female in this early nesting species. Each year the main flock nested in the same area, apparently dependent on the cached stores of pine seeds. Birds in the center of the colony laid eggs sooner and with greater synchrony than birds on the periphery. Jays built nests in clusters rather than in random distribution. Such scattering evidently minimized the conflict between that spacing which provides protection from predators by adjacent pairs and the spacing that reduces conspicuousness due to clustering.

__________ and __________. 1973. Unusual mobbing behavior by incubating pinon jays. Condor 75:251-252.

___________, ___________ and G. F. Foster. 1972. Flocking associates of the pinon jay. Wilson Bull. 84:60-76.

The hairy woodpecker, downy woodpecker, red-shafted flicker, Clark's nutcracker and starling formed interspecific flocks with the highly gregarious pinon jay. The general noisiness and restlessness of the jay flock together with the drab coloration of its members probably attracted the associate species. Year-round maintenance of the jay flock offered attendant species an opportunity to participate in mixed flocking all year. A strong positive correlation existed between forage site diversity of the jays and frequency of the associations. Similarities in feeding strategies and in size of individuals promote the association. Associated species benefit from this interspecific flocking through increased efficiency in total food resource utilization. This results indirectly from effective protection from predators while feeding and directly from the increased ability of numerous individuals to locate scattered, but locally abundant, sources of food.

Bateman, G. C. and R. P. Balda. 1973. Growth, development and food habits of young pinon jays. Auk 90:39-61.

Eggs require 17 days of heat application to hatch. Staggered hatching of eggs within a single clutch suggests that food for nestlings is a critical factor limiting nest success. Comparisons of growth data indicate that pinon jays have a "normal" passerine growth rate. Adaptations in nestlings that facilitate reproductive success during periods of climatic adversity include: dark skin of young, placement of nest on southerly exposures to aid absorption of solar radiation, and development of dorsal plumage faster than ventral plumage (to afford insulative protection where the nest does not). Efficiency of the adults probably increases nestling success more than any specific adaptations of the young. The adults' opportunistic collection of food and their ability to carry large amounts on each feeding trip increase nestling survival chances. After fledging communal care of young and increased protection from predators afforded by flocking further ease survival problems.

Brown, Jerram L. 1963. Social organization and behavior of the Mexican jay. Condor 65:126-153.

Jays maintained mutually exclusive flock areas in both winter and spring, without overtly defending them. In the Santa Rita Mountains of Arizona, individuals of adjoining flocks did not intermix. Although a specific pair always bears primary responsibility for each nest, considerable communal participation existed in nest affairs. Mexican jays lack several of the aggressive and threat behaviors of scrub jays. Correlated with this lack are an increased role of the flock, less conspicuous territoriality, less intense general activity and excitability, less striking plumage, larger size, and delayed attainment of adult coloration.

____________. 1970. Cooperative breeding and altruistic behavior in the Mexican jay, Aphelocoma ultramarina. Animal Behaviour 18:366-378.

A population of jays formed flocks--typically of eight to twenty individuals--dispersed evenly through appropriate jay habitat. Most flocks consisted of two or more breeding pairs of adults plus a variable number of non-breeding yearlings and adults. All flock members shared in the feeding of nestlings. Parents made only 38 to 53 percent of the total number of feeding visits to their young. While their young remained in the nest, parents preferred feeding their own nestlings. After they left the nest, all flock members shared in feeding the young, the parents themselves contributing only about 26 percent of the food. Altruistic jays, both unmated and from other "family" units, executed the remainder of the feeding duties. Parents did not feed their own fledglings any more frequently than those of other pairs.

Cowles, R. B. 1945. Snail-eating by the California jay. Condor 47:296.

Scrub jay.

Erickson, M. M. 1937. A jay shoot in California. Condor 39:111-115.

A team shoot covering 200 sq. miles killed about 600 scrub and Steller's jays - about 5% of the jay population.

Fauquet, Edna D. 1930. The behavior and feeding habits of the California jay, Aphelocoma californica. M. A. thesis. Univ. Calif.

Scrub jay.

Gross, A. O. 1949. Nesting of the Mexican jay in the Santa Rita Mtns., Arizona. Condor 51:241-249.

Extensive notes on nest building, incubation, and growth of young.

Hardy, J. W. 1961. Studies in behavior and phylogeny of certain New World jays (Garrulinae). Univ. Kansas Sci. Bull. 42:13-149.

A very important monograph; includes much data on Mexican jays in the Chiricahua Mtns.

Henderson, Junius. 1920. Migrations of the pinyon jay in Colorado. Condor 22:36.

Jensen, J. K. 1926. The pinon jay (Cyanocephalus cyanocephalus). Oologist's Record 6:41-43.

Johnson, H. C. 1902. The pinyon jay. Condor 4:14.

Ligon, J. David. 1971. Late summer-autumnal breeding of the pinon jay in New Mexico. Condor 73:147-153.

Pinon jay breeding biology in SW New Mexico appears similar to that of the red crossbill: breeding may occur irregularly in response to certain environmental cues - particularly changes in food supply. Climatic conditions occurring at the site in February or August have little influence independent of other factors.

Michener, Harold and Josephine R. Michener. 1945. California jays, their storage and recovery of food, and observations at one nest. Condor 47:206-210.

Scrub jay.

Pase, C. P. 1969. Survival of *Quercus turbinella* and *Q. emoryi* seedlings in an Arizona chaparral community. S. W. Natur. 14:149-155.

At Sierra Ancha Experimental Forest, scrub jays fed on and cached acorns.

Pitelka, Frank A. 1946. Speciation and ecologic distribution in American jays of the genus *Aphelocoma*. Ph. D. thesis. Univ. Calif.

____________. 1951. Speciation and ecologic distribution in American jays of the genus *Aphelocoma*. Univ. Calif. Publ. Zool. 50:195-464.

In this classic examination of phylogenetic relationships within a genus, the author examines the evolutionary history of scrub jays and Mexican jays. He links the spread of Mexican sclerophyll woodland and chaparral assemblages into the Southwest and the Gulf and South Atlantic coastal regions in the early Pliocene with the dispersal of the scrub jay in North America. The southward spread of eastern mesic forests initiated differentiation of the four northern subdivisions of this species, isolating the Floridian race. Uplift of the Sierra Nevada subdivided the Pliocene biomes further, and created three environmentally different areas from a previously homogeneous mass. Thus, three race groups of scrub jays have appeared: a West Coast group, a Great Basin-Rocky Mtn. group, and a Mexican group. The racial characters evolved in each group represent adjustments, through environmental selection, to regional differences in humidity and rainfall, temperature, structure and density of vegetation, and prevalent types of food.

Schulz, Terry A. and Paul D. Budwiser. 1970. Scrub jay possibly feeding on ectoparasites of a black-tailed deer. Calif. Fish & Game 56:71.

Stewart, R. M., M. Stewart, S. Long, and K. Darling. 1972. Watching a scrub jay nest. Point Reyes Bird Observatory Newsletter #22 (June): 4 - 5.

Report of observations of a nest for 85 hours during 21 days.

Westcott, P. W. 1962. The scrub jay in Arizona: Behavior and interactions with other jays. M. S. thesis. Univ. Ariz. 33 p.

Chiefly around Oracle, Pinal Co.

__________. 1964. Invasion of Clark nutcrackers and pinon jays into southeastern Arizona. Condor 66:441.

__________. 1969. Relationships among 3 species of jays wintering in southeastern Arizona. Condor 71:353-359.

Common feeding techniques and food sources facilitate flocking of first-year scrub and Steller jays and of first-year and adult Mexican jays in oak-grassland. Slight ecological separation of these jays in this habitat probably depends on ecologically isolated breeding habitats. Dominant-subordinant reactions among the species probably reduce fighting at times of contact, but they normally maintain a minimal interspecific distance.

Whitney, N. R. 1963. Results of pinon jay banding in South Dakota. Bird-Banding 34:219.

Of 95 pinon jays banded at Rapid City, S. C. in 8 years, 14 were recovered more than 3 months after banding. Seven of the birds had travelled short distances north or south, but one had travelled northwest 400 miles.

Wilson, Leo K. 1923. The natural history of the California jay. M. A. thesis. Univ. Calif.

Scrub jay.

* Paridae (Titmice)

Adams, E. 1898. Notes on the plain titmouse. Osprey 3:81-82.

Addicott, A. R. 1938. Behavior of the bush-tit in the breeding season. Condor 40:49-62.

Betts, M. M. 1955. The food of titmice in oak woodlands. J. Anim. Ecol. 24:282-323.

Dixon, Keith L. 1949. Behavior of the plain titmouse. Condor 51:110-136.

In Alameda Co., Calif.

__________. 1950. Notes on the ecological distribution of plain and bridled titmice in Arizona. Condor 52:140-141.

__________. 1954. Some ecological relations of chickadees and titmice in central California. Condor 56:113-124.

The chestnut-backed chickadee, recently established as a breeder in the area just east of San Francisco Bay, occurs in habitats not sharply separated from those of the long-time resident, the plain titmouse. Foraging sites in winter, however, overlap only partially. Food items differ in size, at least when feeding fledglings. The two species maintain mutually exclusive territories, and demonstrate interspecific territorial behavior. The smaller, invading chickadee makes all territorial "concessions".

__________. 1956. Territoriality and survival in the plain titmouse. Condor 58:169-182.

Stable, year-round territories may limit population density and increase adult survival rates.

__________. 1969. Patterns of singing in a population of the plain titmouse. Condor 71:94-101.

The author distinguished 17 spectrographically distinct song-types in a group of 12 males. Countersinging males sang virtually identical songs. The themes reappear over a span of years, resulting in a local "dialect" of shared song-types.

Finley, W. L. 1909. The bush-tit. Bird-Lore 11:225-228.

Grinnell, J. 1903. Call notes of the bush-tit. Condor 5:85-87.

__________. 1923. The present state of our knowledge of the gray titmouse in California. Condor 25:135-137.

Plain titmouse.

Miller, R. C. 1921. The flock behavior of the coast bush-tit. Condor 23:121-127.

Root, Richard B. 1964. Ecological interactions of the chestnut-backed chickadee following a range extension. Condor 66:229-238.

The chestnut-backed chickadee has recently extended its range into areas already occupied by the plain titmouse. These species exploit the same situations and do not maintain exclusive territories. Individuals of both species seem mutually tolerant. They maintain niche separation through differences in the efficiency with which they exploit portions of a common range of situations.

van Rossem, A. J. 1936. The bush-tit of the southern Great Basin. Auk 53:85-86.

* Chamaeidae (Wrentits)

Bowers, D. E. 1960. Correlation of variation in the wrentit with environmental gradients. Condor 62:91-120.

Where high humidity and other climatic factors combine to produce dense chaparral habitat dark in color, dark-colored wrentits occur. Conversely, where low humidity in connection with other climatic factors produces sparse chaparral light in color, light-colored wrentits occur.

Erickson, Mary M. 1935. Territory, behavior, and numbers in a population of wrentits (Chamaea fasciata). Ph. D. thesis. Univ. Calif.

____________. 1938. Territory, annual cycle, and numbers in a population of wrentits (Chamaea fasciata). Univ. Calif. Publ. Zool. 42:247-334.

A comprehensive life history of the species.

* Troglodytidae (Wrens)

Bibbee, Paul C. 1947. The Bewick's wren, Thryomanes bewickii (Audubon). Ph. D. thesis. Cornell Univ.

Brooks, M. 1947. Interrelations of house wren and Bewick's wren. Auk 64:624.

Hendee, R. W. 1929. Notes on birds observed in Moffat Co., Colorado. Condor 31:24-32.

Bewick's wren.

Kroodsma, Donald E. 1972. Bigamy in the Bewick's wren? Auk 89:185-187.

The number of unmated males and the number of "bigamists" indicated a mating system similar to that of the house wren.

____________. 1973. Coexistence of Bewick's wrens and house wrens in Oregon. Auk 90:341-352.

The two species appear to diminish intense competition in oak woodland largely by varying habitat preferences and timing of the breeding season.

Martin, Robert F. 1971. The canon wren raiding food storage of a trypoxylid wasp. Auk 88:677.

Wrens removed spiders from nests of mud-dauber wasps (Sceliphron cementarium) before the cells were sealed.

Miller, Edwin V. 1941. Behavior of the Bewick wren. Condor 43:81-99.

Root, R. B. 1969. Interspecific territoriality between Bewick's and house wrens. Auk 86:125-127.

Bewick's wrens regularly move into habitats left vacant when house wrens migrate in autumn. The Bewick's wrens defend and build nests in such areas during the spring. When the house wrens return they normally displace the Bewick's wrens, which then move into adjacent habitats that often have less timber and fewer brush piles. When house wren populations are low, Bewick's wrens continue to occupy the territories that have been left vacant.

Tramontano, J. P. 1964. Comparative studies of the rock wren and the canyon wren. M.S. thesis. Univ. Ariz. 59 p.

In the Santa Catalina Mtns., Arizona.

*Mimidae (Mockingbirds and thrashers)

Michener, Josephine R. 1951. Territorial behavior and age composition in a population of mockingbirds at a feeding station. Condor 53:276-283.

At Pasadena, Calif., 1936-40.

Sargent, G. I. 1940. Observations on the behavior of color-banded California thrashers. Condor 42:49-60.

* Turdidae (Thrushes)

Maclean, Stephen F., Jr. 1970. Social stimulation modifies the feeding behavior of the American robin. Condor 72:499-500.

In apparent response to the foraging style of cedar waxwings, robins attempted to hover by a juniper tree and feed on the berries.

* Sylviidae (Gnatcatchers and kinglets)

Hargrave, L. L. 1933. The western gnatcatcher also moves its nest. Wilson Bull. 45:30-31.

The blue-gray gnatcatcher in N. Arizona.

Nice, M. M. 1932. Observations on the nesting of the blue-gray gnatcatcher. Condor 34:18-22.

Root, Richard B. 1964. Niche organization in the blue-gray gnatcatcher. (Polioptila caerulea). Ph. D. thesis. Univ. Calif., Berkeley. 146 p.

__________. 1967. The niche exploitation pattern of the blue-gray gnatcatcher. Ecol. Monographs 37:317-350.

Habitat selection depends on the abundance of food and nest sites in potential habitats. Territory boundaries shift according to changes in dispersion of optimal food resources. Absence of nesting synchrony in the species allows different broods to utilize particularly productive areas at different times. Adults expend huge amounts of energy feeding the brood; an abundance of food is critical during the nesting period. The author coins a term for a group of species that exploits the same class of environmental resources in a similar way: an ecological "guild". Members of the forage-gleaning guild--to which the gnatcatcher belongs--overlap in their foraging repertoires, foraging beats, and diets. They maintain niche segregation by differences in the efficiency with which they can exploit portions of a common range of situations, a difference reinforced by varying morphology.

__________. 1969. The behavior and reproductive success of the blue-gray gnatcatcher. Condor 71:16-31.

In coastal California, gnatcatchers first establish territories with both sexes present. Males patrol the 4.6 acre territories regularly, participating in frequent combat. Both members of the pair cooperate in nest site selection and nest building. Adults harrass small vertebrates that approach the nest. Some pairs attempt as many as seven nestings in one season and still fledge no young, while others fledge two broods. Scrub jay predation significantly decreases nest success. Mites, tent caterpillar defoliation of oaks, and cowbird parasitism also decrease success. The birds may require large territories to insure sufficient availability of space--a necessity for successful emergency alteration of their habitat utilization patterns in response to temporal changes in the dispersion of food and cover.

* Vireonidae (Vireos)

Scott, W. E. D. 1885. On the breeding habits of some Arizona birds, 4th paper: *Vireo vicinior*. Auk 2:321-326.

Gray vireo in Pinal Co.

Van Fleet, C. C. 1919. A short paper on the Hutton vireo. Condor 21: 162-165.

Willard, F. C. 1908. Three vireos: nesting notes from the Huachuca Mtns. Condor 10:230-234.

Solitary, Hutton's, and warbling vireos.

* Parulidae (Wood warblers)

Bailey, A. M. and R. J. Neidrach. 1938. Nesting of Virginia's warbler. Auk 55:176-178.

Finley, W. L. 1904. Two Oregon warblers. Condor 6:31-35.

Includes black-throated gray warbler.

Foster, Mercedes S. 1967. Molt cycles of the orange-crowned warbler. Condor 69:169-200.

Marshall, J. and R. P. Balda. 1974. The breeding ecology of the painted redstart. Condor 76:89-101.

Pine-oak woodland.

McDiarmid, Mercedes Foster. 1969. Synchronized life cycles in the orange-crowned warbler and its mallophagan parasites. Ecology 50: 315-323.

Breeding of the mallophagans Ricinus picturatus and Menacanthus spp. coincides with breeding in this host warbler. The parasite lays no eggs during winter or during the host's molt. The warbler's reproductive hormones seem to control breeding of the parasite.

Webster, J. D. 1961. Revision of Grace's warbler. Auk 78:554-566.

Wible, M. 1967. Wing and tail flashing of painted redstart. Wilson Bull. 79:246.

Near Payson, Arizona.

* Fringillidae (Grosbeaks, finches, buntings, and sparrows)

Alcock, John. 1970. Punishment levels and the response of white-throated sparrows to 3 kinds of artificial models and mimics. Anim. Behav.18: 733-739.

Antevs, A. 1947. Towhee helps cardinal feed their fledglings. Condor 49:209.

At Globe, Ariz.

Banks, R. C. 1959. Development of nestling white-crowned sparrows in central coastal California. Condor 61:96-109.

Baumann, S. A. 1959. The breeding cycle of the rufous-sided towhee (Pipilo erythrophthalmus (Linnaeus)) in central California. Wasmann J. Biol. 17:161-220.

Beltz, Joan D. 1964. An analysis of vocalizations of the rufous-sided towhee, Pipilo erythrophthalmus oregonus (Bell). Ph. D. thesis Oreg. State Univ. 87 p.

Bendire, C. E. 1890. Notes on Pipilo fuscus mesoleucus and Pipilo aberti, their habits, nests, and eggs. Auk 7:22-29.

Brown and Abert's towhees.

Blake, Charles H. 1971a. Primary molt in juvenile cardinals. Bird-Banding 42:269-274.

Cardinals begin postjuvenal quill molt later than the usual passerine postnuptial molt. The slow primary molt continues long after completion of the body molt.

__________. 1971b. Wear and wing length in the cardinal. Bird-Banding 42:295.

Cardinal wings decreased 2 mm in length from April to August.

Borror, D. J. 1959. Songs of the chipping sparrow. Ohio J. Sci. 59:347-356.

Analysis of 58 songs from 5 states proved the "simple trill" more complex and variable than formerly supposed. The author obtained no supporting evidence for geographic patterns of variation.

__________ and William W. H. Gunn. 1965. Variation in white-throated sparrow songs. Auk 82:26-47.

Relatively few patterns exist in the song of the white-throated sparrow; the observer can usually recognize variations in the field.

Coutlee, Ellen. 1966. The comparative behavior of Lawrence's and lesser goldfinches. Ph. D. thesis. Univ. Calif. (Los Angeles) 125 p.

__________. 1968a. Comparative breeding behavior of lesser and Lawrence's goldfinches. Condor 70:228-242.

As mixed winter flocks disintegrate, pairs form, and they then establish territories after choosing a nest site. Females dominate males, at least early in the breeding cycle. Lawrence's usually builds nests higher above ground than the lesser. Lesser females collect nest materials while perched in bushes or trees, while Lawrence females collect on the ground. Courtship feeding maintains a strong pair bond. Mutually exclusive, the territories differ in size: the lesser's averages 30 meters in diameter, about twice that of the Lawrence's. Songs and calls are species specific. The lesser dominates the Lawrence. Agonistic displays resemble those of the American goldfinch, from which the lesser may have evolved as a desert form.

__________. 1968b. Maintenance behavior of lesser and Lawrence's goldfinches. Condor 70:378-384.

These two highly social species often occur together in flocks. The lesser consistently dominates the Lawrence goldfinch. Feeding behavior of the lesser centers on flying about actively and perching intermittently at the food source. Lawrence's goldfinch exhibits comparatively longer periods of feeding alternated with periods of quiet perching.

__________. 1971. Vocalizations in the genus Spinus. Anim. Behav. 19:556-565.

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This detailed histological and behavioral analysis correlates singing behavior with seasonal changes in gonads. The author conducted research on the Hastings Reservation, California.

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Competition for food lessened because sparrows subsisted in large part on sprouting annuals. At the Hastings Reservation, Calif., juncos ranged along field borders. Sparrows stayed in thickets.

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Differences in food density and dispersion determined differences in foraging repertoire. Territoriality does not regulate population density. The author devised a time-energy model to predict the ecological distribution of any species. Towhee data support the basic assumption of the model: that different patches of the environment offer different potentials for a species to accumulate net energy per unit of foraging time.

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In Utah.

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Kroodsma, Donald E. 1971. Song variations and singing behavior in the rufous-sided towhee, Pipilo erythrophthalmus oregonus. Condor 73:303-308.

A male towhee may have nine song types. Songs of neighboring birds are similar, but change structure over distance. Individuals can respond similarly to song types. This behavior is typical of passerine species in which young males learn songs and perpetuate local or dialect patterns.

Laskey, A. R. 1944. A study of the cardinal in Tennessee. Wilson Bull. 56:27-44.

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Song duration varied little, decreasing as syllable duration increased. Song frequency varied widely in different birds, and in the same bird at different times. Each individual sang several types of introductory and trill syllables. Songs of a single bird varied almost as much as those of the whole population.

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The authors selected this species for its lack of individual variation. They traced the extent of variation in a large sample of songs of one bird and then compared these data to smaller samples from seven individuals. All songs analyzed for syllable structure showed similar patterns of multiple, evenly spaced overtones. Significant individual differences, which might determine individual recognition, occurred in the number of syllables per second, and, possibly, in syllable duration and minimum frequency. The authors describe a new device for modifying the sonograph to make frequency/amplitude sections serially through a syllable.

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DESERT

* Introduction

The arid climatic conditions of the desert--usually less than ten inches of irregularly occurring rainfall--force animals and plants to adapt both physiologically and behaviorally. Only those organisms that adapt successfully survive. The desert landscape has thus developed a most distinctive appearance, characterized by land with much bare ground exposed between evenly spaced bushes. The desert birdlife is evolving unique adaptations as well.

Chronic lack of cloud cover causes extreme temperature fluctuations that often range from freezing temperatures by night to intolerably hot temperatures by day. These temperature differences form the basis for defining two general types of deserts, hot and cold. Hot deserts generally remain warm throughout the year, and become very hot in summer. Cold desert residents, however, must withstand very cold winters.

In the West, the cold desert covers most of the Great Basin. Shadscale (*Atriplex* spp.) and sagebrush (*Artemisia* spp.) occur throughout. Cold desert vegetation blankets Nevada north of 36° 30' north latitude, most of western Utah and southwestern Wyoming, and much of the Snake and Columbia River basins of Idaho, Oregon, and Washington. Each of the surrounding states also contains areas of cold desert (see Figure One). Biomes that surround, interfinger with, or occur as islands within the sagebrush desert include the hot desert to the south, ponderosa pine forest, pinon-juniper woodland, and grassland.

The hot deserts of the Southwest center around two river drainages--the lower Colorado and the Rio Grande. Jaeger (1957) subdivides the hot desert into regions of ecological importance based upon the distribution of certain succulent plants and associated animals, differences in taxonomic composition of the biota, and differences in the abundance and uniformity of occurrence of the principal species. Astride the Colorado River are the Mojave, Colorado, and Arizona-Sonora deserts. The Chihuahuan desert extends northward in New Mexico along the Rio Grande and Pecos Rivers, and into the Tularosa Basin. Creosote bush (*Larrea* spp.) is a widespread dominant.

Most desert birds probably need at least an occasional drink from dew or other sources. Hence, birds occur in greatest variety near water or ample succulent food. In the desert, seed-eating birds decrease in abundance relative to insect-eaters. But races of at least five species of birds can exist on a diet of dry seeds, drinking no free water at all. These birds include the horned lark, savannah sparrow, vesper sparrow, black-throated sparrow, and Brewer's sparrow (Bartholomew, 1972).

As in the grassland, many birds have developed cursorial habits. Plumage commonly matches the sandy or stony ground, cryptic coloration perhaps useful as camouflage. Alternatively, such paleness may develop from partial depigmentation that somehow is associated with hot, dry air (Leopold, 1961; p. 77), paleness now having become a fixed genetic character. Some ground-dwelling South American desert birds have horny opercula over their nostrils, an adaptation preventing inhalation of dust and sand.

Presumably as protection against both the intense sun and violent winds, birds utilize the shelter of shrubs and rocks for nesting and resting sites. They generally confine their activities to the cooler times of the day. Hollows in cacti provide protected habitat for woodpeckers and other cavity-nesting birds. Breeding birds closely match their reproductive cycles to the season of rains; when there is no rain at all, the birds ordinarily fail to breed.

Bird lists of important species for these two types of deserts overlap considerably. For this reason, the bibliography merges hot and cold desert communities under the one heading, Desert. Some distinctions are possible, however.

Birds particularly indicative of the cold deserts of the West include:

Poor-will	Common raven
Common nighthawk	Sage thrasher
Western kingbird	Loggerhead shrike
Say's phoebe	Green-tailed towhee
Gray flycatcher	Vesper sparrow
Horned lark	Black-throated sparrow
Violet-green swallow	Sage sparrow
Cliff swallow	Brewer's sparrow
Black-billed magpie	

Typical birds of the hot deserts include:

Yellow-billed cuckoo
Roadrunner
Poor-will
Lesser nighthawk
Costa's hummingbird
Broad-billed hummingbird
Common flicker (gilded)
Gila woodpecker
Ladder-backed woodpecker
Western kingbird
Cassin's kingbird
Wied's crested flycatcher
Vermillion flycatcher
Horned lark
Purple martin
Common raven
White-necked raven
Verdin
Cactus wren
Canon wren
Mockingbird
Bendire's thrasher
Curve-billed thrasher
California thrasher
LeConte's thrasher
Crissal thrasher
Black-tailed gnatcatcher
Phainopepla
Loggerhead shrike
Lucy's warbler
Hooded oriole
Scott's oriole
Bronzed cowbird
Cardinal
Pyrrhuloxia
Blue grosbeak
House finch
Lesser goldfinch
Brown towhee
Abert's towhee
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Analyzes gross damage to vegetation, and kinds and numbers of active nests found during the 3-year period following a nuclear detonation series ending September 1957. The nest location nearest to the detonation point was about 0.2 miles from ground zero. Elimination of shrubby vegetation appears to modify the community in favor of horned larks. Horned larks occur year-long in higher numbers on the disturbed area than in the adjacent shrub-dominated vegetation.

Ricklefs, Robert E. 1966. Behavior of young cactus wrens and curve-billed thrashers. Wilson Bull. 78:47-56.

In the Tucson region.

Russell, S. M., P. J. Gould and E. L. Smith. 1973. Population structure, foraging behavior and daily movements of certain Sonoran desert birds. US/IBP Desert Biome Res. Memorandum RM 73-27. 20 p.

__________, E. Smith, P. Gould, and G. Austin. 1972. Studies on Sonoran birds. US/IBP Desert Biome Res. Memorandum RM 72-31. 13 p.

Schmidt-Nielsen, Knut. 1964. Desert animals: Physiological problems of heat and water. Oxford Univ. Press.

In this book, one of the pioneer desert biologists reviews the status of research on the physiology of desert animals as of 1964. The book concentrates on mammals.

Serventy, D. L. 1971. Biology of desert birds. p. 287-339. In D. S. Farner and J. R. King (eds.). Avian Biology: Vol I. Academic Press, N. Y. and London.

This paper and Bartholomew (1972) provide the most up-to-date inventories of our knowledge on the adaptations of birds to the desert.

Sidwell, Robert W., David L. Lundgren and Bert D. Thorpe. 1964. Psittacosis complement-fixing antibodies in sera from fauna of the Great Salt Lake Desert. Am. J. Trop. Med. Hyg. 13:591-594.

Smith, G. T. 1956. Birds of the southwestern desert. Doubleshoe Publ., Scottsdale, Ariz. 68 p.

Contains distributional data.

Smyth, Michael and George A. Bartholomew. 1966. The water-economy of the black-throated sparrow and the rock wren. Condor 68:447-458.

Black-throated sparrows drank water in daily amounts equivalent to 30% of their body weight when water was available, but survived indefinitely when deprived of water. Sparrows maintained body weight when drinking 0.4 M NaCl solutions but lost weight on solutions of 0.5 M. Under water deprivation, water content of the excreta of black-throated sparrows (normally about 81%) decreased to 57%. Their insectivorous habits and habitat preferences enable rock wrens to survive in the desert without any physiological adjustment.

__________ and Harry N. Coulombe. 1971. Notes on the use of desert springs by birds in California. Condor 73:240-243.

At two desert water holes in Riverside County, several resident bird species did not drink at air temperatures up to 4°C. They were all insectivorous, carnivorous, or fructivorous. Some species of birds of similar diet did drink occasionally. Granivorous birds drank regularly. Most birds, if they drank, did so first at mid-morning, probably after feeding. Few, if any, desert birds normally bathed in water. The low osmotic concentration of water from several desert springs contrasted with one spring, nearly iso-osmotic with avian blood. (The paper also outlines field methods for estimating water consumption).

Soule, O. H. 1964. The saguaro tree-hole microenvironment in southern Arizona:II-Summer. M.S. thesis. Univ. Ariz. 75 p.

See Krizman, 1964.

Stanford, J. S. 1969. An annotated check-list of birds of Cache Valley, Utah-Idaho. Proc. Utah Acad. Sci. Arts. Lett. 46:134-141.

Steenburgh, W. F. and C. H. Lowe, Jr. 1969. Critical factors during the first years of life of the saguaro (Cereus gigantus) at Saguaro National Monument, Arizona. Ecology 50:825-834.

Impact of seed removal by curve-billed thrasher, cactus wren, and brown towhee.

Stone, D. D. 1933. An Arizona apartment tree. Ool. 50:110-111.

Seven spp. in one mesquite tree at Casa Grande, Arizona.

Sutton, George Miksch. 1968. Young curve-billed thrasher attended by adult brown towhees. Auk 85:127-128.

An adult brown towhee fed a fledgling thrasher.

Tainter, F. R. 1965. 29th breeding bird census in cholla-palo verde-sahuaro foothill forest in Lower Sonoran zone. Aud. Field Notes 19:610-612.

Near Tucson.

Tomoff, Carl Stephen. 1971. Breeding bird diversity in the Sonoran Desert creosote bush association. Ph. D. thesis. Univ. Ariz. 58 p.

The author's model combines aspects of foilage-height diversity and physiognomic diversity to provide greater accuracy and wider applicability for predicting breeding bird species diversity.

Van Rossem, A. J. 1911. Winter birds of the Salton Sea region. Condor 13:129-137.

Viers, C. E. and L. Sileo. 1969. Winter bird-population study: Cholla cactus-creosote bush desert. Aud. Field Notes 23:544-545.

Near Tucson.

Vorhies, C. T. 1945. Water requirements of desert animals in the southwest. Univ. Ariz. Tech. Bull. No. 107.

Wauer, Roland. 1961. Check-list of birds: Death Valley National Monument, Inyo County, California. Order from Park Naturalist, Death Valley, California. 10¢ each.

____________. 1962. A survey of the birds of Death Valley. Condor 64: 220-233.

232 species have been reported in the areas below sea level from 1893 to 1961. 15 species reside permanently and 16 species nest. During 1957-1961, 214 species occurred in the area below sea level. Of the total of 232, 7% are permanent, 23% are winter visitants, 20% are summer visitants, 41% are migrants and 9% are transients or vagrants. This paper reports 51 species for the first time in the below-sea-level region of Death Valley.

Welles, Philip. 1960. Meet the southwest deserts. Dale Stuart King, Globe, Ariz. 82 p.

A popular introduction to desert life; includes birds common below 4,500 ft.

Wright, J. T. 1959. Desert wildlife. A research study. Ariz. Game & Fish Dept., Wildl. Bull. No. 6. 78 p.

The topography, history, climate, flora, and fauna of west-central and S.W. Arizona. A chapter on water development for wildlife habitat improvement describes and evaluates rainwater catchments, wells and windmills, earth reservoirs, retention dams, and natural tanks.

Zimmerman, Dale A. 1970. Roadrunner predation on passerine birds. Condor 72:475-476.

Observations of predation on Oregon junco and house sparrow.

* Cuculidae (Cuckoos)

Anderson, A. H. 1933. A tail-less roadrunner. Bird-Lore 35:95-96.

Brief notes on a nest at Tucson.

Bendire, C. 1878. Breeding habits of Geococcyx californianus. Bull. Natl. Ornithol. Club 3:39.

Bryant, H. C. 1916. Habits and food of the roadrunner in California. Univ. Calif. Publ. Zool. 17:21-50.

Calder, William A. 1966. Temperature regulation and respiration in the roadrunner and the pigeon. Ph. D. thesis. Duke Univ. 108 p.

____________. 1967. Breeding behavior of the roadrunner. Auk 84:597-598.

Courtship and copulation of caged birds and rearing of young in captivity.

____________. 1968a. The diurnal activity of the roadrunner. Condor 70:84-85.

Birds foraged for food chiefly before 10:30 a.m. and after 3:30 p.m. on the Santa Rita Exp. Range, Arizona.

____________. 1968b. Nest sanitation: A possible factor in the water economy of the roadrunner. Condor 70:279.

Urine and feces of nestlings contain more water than does adult roadrunner excreta. Thus, in consuming fecal material during nest sanitation, the parent birds satisfy 7.5% of their daily water requirements.

____________ and P. J. Bentley. 1967. Urine concentrations of two carnivorous birds, the white pelican and roadrunner. Comp. Biochem. Physiol. 22:607-609.

____________ and K. Schmidt-Nielsen. 1967. Temperature regulation and evaporation in the pigeon and the roadrunner. Amer. Jour. Physiol. 213:883-889.

Dobie, J. Frank. 1939. The roadrunner in fact and folk-lore. Texas Game, Fish and Oyster Comm. 31 p.

Finley, W. L. and I. Finley. 1915. With the Arizona roadrunners. Bird-Lore 17:159-165.

Notes on habits, with photographs from the Tucson region.

Geluso, K. N. 1970. Feeding behavior of a roadrunner in winter. Bull. Okla. Ornith. Soc. 4:32.

Harrison, C. J. O. 1971. The sunbathing of the roadrunner. Avicult. Mag. 77:128.

Holland, Henrietta. 1946. El paisano, the roadrunner. Fauna 8(2):34-36.

Kavanau, J. Lee and J. Ramos. 1970. Roadrunners: Activity of captive individuals. Science 169:780-782.

Two individuals readily accepted an activity wheel as an outlet for locomotor activity. The strictly diurnal birds peaked in activity in the pre-dusk hours. Less activity occurred on partly overcast days than on clear days. Dim light and darkness strongly inhibited activity, even during daytime hours; bright light stimulated activity, even during nighttime hours. These findings provide data for quantitative comparative studies of the influences of environmental factors on the activity of cursorial birds.

Lowe, C. H. and D. S. Hinds. 1969. Thermoregulation in desert populations of roadrunners and doves(Abstract). p. 113 In C. C. Hoff and M. L. Riedesel (eds.). Physiological systems in semiarid environments. Univ. New Mexico Press, Albuquerque.

Nestlings require shading by adults.

Michael, Edwin D. 1967. Behavioral interactions of birds and white-tailed deer. Condor 69:431-432.

Roadrunners, turkeys and vultures all benefit from deer. Turkeys and deer warn each other of approaching danger; roadrunners feed on insects flushed by deer; vultures feed on dead deer.

Ohmart, R. D. 1972. Salt-secreting nasal gland and its ecological significance in the roadrunner. Comp. Biochem. Physiol. 43a:311-316.

__________. 1973. Observations on the breeding adaptations of the roadrunner. Condor 75:140-149.

Roadrunners in southern Arizona usually place their platform nest in round-stemmed cholla cactus. Such a nest site receives direct sunlight while providing scattered bands of shade. Nesting coincides with the period of maximum food abundance. Clutch size seems to depend on food supply during the egg laying period. Both adults must be free from brooding or shading the young to hunt whiptail lizards (the main nestling food item) during the lizard's short period of activity (07:00 to 13:00). Nestling food demands peak when the youngest nestling reaches 7-8 days of age. (Since incubation begins with the laying of the first egg, nestlings of different ages result). Temperature regulation depends on tolerance of increased body temperature, gular flutter, and alignment in the bands of shade. By the age of 4-5 days, such regulation in the black-skinned young enables the parents to hunt in the early morning. A salt-secreting nasal gland counterbalances water loss through gular and cutaneous evaporation. The adults shade the young during early afternoon. Should the food supply diminish during the nesting period, the adults consume the youngest nestlings.

__________, T. E. Chapman and L. Z. McFarland. 1970. Water turnover in roadrunners under different environmental conditions. Auk 87:787-793.

Captive roadrunners lost an average of 41.8 ml of water per day under moderate moisture conditions; they reduced the mean loss to 26.2 ml per day in simulated desert conditions.

__________ and Robert C. Lasiewski. 1971. Roadrunners:Energy conservation by hypothermia and absorption of sunlight. Science 172:67-69.

Roadrunners sunning in artificial sunlight consume oxygen at normal levels through ambient temperatures as low as 9.0°C. Energy savings of sunning roadrunners averaged 551 calories per hour. In the dark, birds may undergo hypothermia. Hypothermic roadrunners can elevate their body temperatures to normal levels by sunning, at reduced metabolic cost.

Rand, A. L. 1941. Courtship of the roadrunner. Auk 58:57-59.

Near Tucson.

Sutton, G. M. 1936. "Titania and Oberon". p. 7-31. In Birds in the wilderness. MacMillan, N. Y.

Popular, informative account of the roadrunner.

* Caprimulgidae (Goatsuckers)

Austin, G. T. 1970. Experimental hypothermia in a lesser nighthawk. Auk 87:372-374.

Includes comments on Marshall (1955).

__________ and W. G. Bradley. 1969. Additional responses of the poor-will to low temperatures. Auk 86:717-725.

A Mohave County, Arizona, bird.

Bartholomew, G. A., J. W. Hudson, and T. R. Howell. 1962. Body temperature, oxygen consumption, evaporative water loss, and heart rate in the poor-will. Condor 64:117-125

At ambient temperatures above the critical point of 35°C, body temperatures in the poor-will rise conspicuously. Thermal neutrality extends at least to 44°C. Basal metabolic rate (0.8cc O_2/gm/hr) reaches only one-third the value predicted on the basis of body size. Evaporative water loss increases with increasing ambient temperature above 25°C. By vigorous gular flutter the bird can dissipate a quantity of heat equal to more than 160 percent of its metabolic heat production - the greatest efficiency of evaporative cooling known for a bird. Heart rate drops to minimum (200 beats/min.) in the thermal neutral zone - about half the rate of a passerine of comparable size. Heart rate increases to 500 beats/min. in a non-torpid bird at 15°C. Heart rate decreases during entry into torpor and varies directly with body temperature during torpor. The very low basal metabolic rate of the poor-will facilitates tolerance of sustained high environmental temperatures and contributes to the remarkable efficiency of its evaporative cooling.

Brauner, J. 1952. Reaction of poor-wills to light and temperature. Condor 54:152-159.

Latest and earliest activity dates in Tucson were December 1 and February 4. Onset and cessation of poor-will activity at dusk and dawn coincided with a light intensity usually lower than one foot-candle. Phases of the moon and weather evidently limit activity. Neither exposure to cold during daylight, shortened days with and without reduced temperatures, nor reduced diet caused torpidity in a captive poor-will. Gular flutter accomplishes cooling.

Caccamise, Donald Francis. 1971. Competitive relationships of the common and lesser nighthawks. Ph. D. thesis. New Mexico State Univ. 95 p.

__________. 1974. Competitive relationships of the common and lesser nighthawks. Condor 76:1-20.

Cowles, R. B. and W. R. Dawson. 1951. A cooling mechanism of the Texas nighthawk. Condor 53:19-22.

Lesser nighthawk.

de Laubenfels, M. W. 1925. Unusual notes of Texas nighthawk. Condor 27:210.

"Lesser" at Phoenix.

Evans, Raymond N. 1967. Nest site movements of a poor-will. Wilson Bull. 79:453.

A poor-will adult moved nestlings as much as 35 ft. under pressure from human disturbances.

Gramza, Anthony F. 1967. Responses of brooding nighthawks to a disturbance stimulus. Auk 84:72-86.

Observations on the distances and directions that incubating nighthawks moved from their nests when flushed by an approaching observer.

Howell, Thomas R. 1959. A field study of temperature regulation in young least terns and common nighthawks. Wilson Bull. 71:19-32.

___________ and George A. Bartholomew. 1959. Further experiments on torpidity in the poor-will. Condor 61:180-185.

The authors experimentally induced torpor in a poor-will. The bird entered torpor at low (2° to 4°C) to moderate (19°C) air temperatures. Several hours of slightly depressed body temperatures preceded entry into torpor, which began with a steady and rapid decline in body temperature and oxygen consumption. During torpor, environmental and body temperatures were nearly identical for long intervals, though the bird remained capable of some movement if disturbed. Arousal occurred upon increasing the ambient temperature. Body temperature increased passively until about 15°C, when an active phase of arousal commenced marked by strong shivering, increased respiration, and a steep rise in body temperature and oxygen consumption. This continued until the bird reached normal body temperature.

Jaeger, E. C. 1948. Does the poor-will hibernate? Condor 50:45-46.

___________. 1949. Further observations on the hibernation of the poor-will. Condor 51:105-109.

The original papers on torpidity of poor-wills.

___________. 1953. Poorwill sleeps away the winter. Nat. Geog. Mag. 103:273-280.

Lasiewski, R. C. 1969. Physiological responses to heat stress in the poor-will. Amer. J. Physiol. 217;1504-1509.

__________ and George A. Bartholomew. 1966. Evaporative cooling in the poor-will and the tawny frogmouth. Condor 68:253-262.

Some mechanisms of evaporative cooling in the poor-will. This bird flutters the gular area at high ambient temperatures.

__________ and William R. Dawson. 1964. Physiological responses to temperature in the common nighthawk. Condor 66:477-490.

An inverse relation exists between heart rate and ambient temperature. The heart pumps 125 beats per minute at 37°C and 330 at 4°C. Common nighthawks possess the physiological capacity to enter and arouse from torpor, but only after prolonged starvation.

Ligon, J. David. 1970. Still more responses of the poor-will to low temperatures. Condor 72:496-498.

One bird became torpid at weights of 52.8 and 51.3 g when exposed to low ambient temperatures. Poor-wills experienced spontaneous arousal and re-entry into torpor at ambient and body temperatures well below 15°C. At an ambient temperature of -12°C, body temperature in a torpid bird without fat reserves quickly dropped to 0.1°C. The author removed the bird to room temperature, where it appeared fully recovered 21 hours later.

Marshall, Joe T., Jr. 1955. Hibernation in captive goatsuckers. Condor 57:129-134.

These early experiments on torpor in the lesser nighthawk and poor-will suggested that decreasing daylength induced torpor, at least in the nighthawk. Timing seemed linked to periods of scarce food. The poor-will experiments proved inconclusive; the author attributed observed torpor to meager fat reserves and, thus, insufficient fuel to support activity on cold mornings.

Mengel, Robert M., Roger S. Sharpe and Glen E. Woolfenden. 1972. Wing clapping in territorial and courtship behavior of the chuck-will's-widow and poor-will (Caprimulgidae). Auk 89:440-444.

Both species associate wing-clapping with territorial defense rather than courtship.

Miller, A. H. 1937. The nuptial flight of the Texas nighthawk. Condor 39:42-43.

Near Tucson: the lesser nighthawk.

Pickwell, G. and E. Smith. 1938. The Texas nighthawk in its summer home. Condor 40:193-215.

Selander, Robert K. 1954. A systematic review of the booming nighthawks of western North America. Condor 56:57-82.

Important and authoritative paper on the common nighthawk.

Weller, M. W. 1958. Observations on the incubation behavior of a common nighthawk. Auk 75:48-59.

* Apodidae (Swifts)

Arnold, L. W. 1942. The aerial capture of a white-throated swift by a pair of falcons. Condor 44:280.

In the vicinity of the Castle Dome Mtns., Arizona.

* Trochilidae (Hummingbirds)

Bene, F. 1940. Rhythm in the brooding and feeding routine of the black-chinned hummingbird. Condor 42:207-212.

At Phoenix.

____________. 1941. Experiments on the color preference of black-chinned hummingbird. Condor 43:237-242.

At Phoenix, red did not attract the birds more than any other color.

__________. 1945. The role of learning in the feeding behavior of the black-chinned hummingbird. Condor 47:3-22.

At Phoenix.

____________. 1947. The feeding and related behavior of hummingbirds with special reference to the black-chin, <u>Archilochus alexandri</u> (Bourcier and Mulsant). Mem. Bos. Soc. Nat. Hist. 9:395-478.

Demaree, Salome Ross. 1970. Nest building, incubation period, and fledging in the black-chinned hummingbird. Wilson Bull. 82:225.

At Phoenix.

* Picidae (Woodpeckers)

Anderson, A. H. 1934. Food of the Gila woodpecker (Centurus uropygialis uropygialis). Auk 51:84-85.

This species feeds on gall insects at Tucson.

Braun, Eldon J. 1969. Metabolism and water balance of the Gila woodpecker and gilded flicker in the Sonoran Desert. Ph. D. thesis. Univ. Ariz. 106 p.

Both species used the saguaro tree-hole to escape the harshest aspects of their desert environment during the summer and winter.

Gilman, M. F. 1915. Woodpeckers of the Arizona lowlands. Condor 17:151-163.

Notes on 8 species along the Gila River.

* Tyrannidae (Tyrant flycatchers)

Anderson, A. H. and A. Anderson. 1948. Notes on two nests of the beardless flycatcher near Tucson, Arizona. Condor 50:163-164.

Bendire, C. E. 1873. Nest, eggs, and breeding habits of the vermillion flycatcher (Pyrocephalus rubineus var. mexicanus). Amer. Nat. 7:170-71.

In southern Arizona.

De Benedictis, Paul. 1966. The flight song display of two taxa of vermillion flycatcher, genus Pyrocephalus. Condor 68:306-307.

Comparison of flight songs includes data on vermillion flycatchers from the lower Colorado valley.

Phillips, A. R. 1944. Some differences between the Wright's and gray flycatchers. Auk 61:293-294.

Emphasizes Arizona (Wright's=kiskadee).

Russell, H. N., Jr. and A. M. Woodbury. 1941. Nesting of the gray flycatcher. Auk 58:28-37.

In NE Arizona.

Smith, W. John. 1967. Displays of the vermillion flycatcher. Condor 69:601-605.

__________. 1970a. Courtship and territorial displaying in the vermillion flycatcher (Pyrocephalus rubinus). Condor 72:488-491.

__________. 1970b. Displays and message assortment in Sayornis species. Behaviour 37:85-112.

Black and Say's phoebes.

Taylor, Walter Kingsley and Hugh Hanson. 1970. Observations on the breeding biology of the vermillion flycatcher in Arizona. Wilson Bull. 82:315-319.

Vermillion flycatchers directed hostile behavior during territorial defense at other vermillions as well as other species. The authors distinguished four distinct vocalizations; only the male produced a true song. The paper summarizes nesting data for three pairs.

* Alaudidae (Larks)

Dubois, A. Dawes. 1936. Habits and nest life of the desert horned lark. Condor 38:49-56.

Kelso, Leon. 1931. Some notes on young desert horned larks. Condor 33:60-65.

Trost, Charles Henry. 1968. Adaptations of horned larks to stressful environments. Ph. D. thesis. Univ. Calif. (Los Angeles). 97 p.

__________. 1972. Adaptations of horned larks (Eremophila alpestris) to hot environments. Auk 89:506-527.

The author compares the behavioral and physiological adaptations of two subspecies - a Mojave Desert form and a California inland valley form. Horned larks have a low standard metabolic rate (2.28 ccO_2/g/hr) and a high thermoneutral zone (ca. 35°C.), both of which indicate adaptation to a warm, open environment. At night their body temperature drops 2.0° to 2.5°C., they reduce their metabolic rate, extend thermoneutrality to near 20°C, and halve evaporative water loss. Behavior reinforces such physiological energy and water saving mechanisms: at night, larks select or create a roost hole microclimate less stressful than the macroclimate. Having water requirements not exceptionally low for small birds, the larks must rely on versatile behavior to survive under stressful conditions. Desert larks possess temperature regulatory abilities superior to valley larks, probably a physiological result of behavioral differences.

*Hirundinidae (Swallows)

Allen, Robert W. and Margaret M. Nice. 1952. A study of the breeding biology of the purple martin (Progne subis). Am. Midl. Nat. 47:606-665.

Includes observations on nesting in Arizona.

Anderson, A. H. 1933. Electrocution of purple martins. Condor 35:204.

Near Tucson.

__________ and A. Anderson. 1946. Notes on the purple martin roost at Tucson, Arizona. Condor 48:140-141.

Cater, M. B. 1944. Roosting habits of martins at Tucson, Arizona. Condor 46:15-18.

Lasiewski, Robert C. and Henry J. Thompson. 1966. Field observation of torpidity in the violet-green swallow. Condor 68:102-103.

The authors found three violet-green swallows apparently dead on the surface of a sand dune. About 45 min. after the sun's rays first struck the dunes, the swallows revived and flew away.

*Corvidae (Jays and crows)

Aldous, S. E. 1942. The white-necked raven in relation to agriculture. U.S. Fish and Wildl. Serv. Res. Rept. No. 5. 56 p.

Knowlton, G. F. 1943. Raven eats mormon cricket eggs. Auk 60:273.

In Utah.

Nelson, A. L. 1934. Some early summer food preferences of the American raven in southeastern Oregon. Condor 36:10-15.

Richards, G. L. 1971. The common crow, Corvus brachyrhynchos, in the Great Basin. Condor 73:116-118.

Crows in the Great Basin breed almost entirely in riparian habitats. The drainages of the Bear River in Utah, and the Humboldt River, Reese River, and Marys River in Nevada, support some of the largest populations of breeding crows. In Nevada, however, crows also inhabit small "oases" surrounded by desert shrub. Crows exhibit two winter distribution patterns. Heavy concentrations along the Wasatch Front in Utah characterize the first, and few concentrations in Nevada, the second.

Vorhies, C. T. 1934. The white-necked raven, a change of status? Condor 36:118-119.

The ravens disappeared when man removed garbage dumps.

*Paridae (Titmice)

Bailey, F. M. 1923. Fifteen Arizona verdin's nests. Condor 25:20-21.

An account of roosting nests at the foot of the Santa Rita Mtns.

Goldstein, R. B. 1974. Relation of metabolism to ambient temperature in the verdin. Condor 76:116-119.

Taylor, Walter Kingsley. 1967. Breeding biology and ecology of the verdin Auriparus flaviceps (Sundevall). Ph. D. thesis. Ariz. State Univ. 228 p.

__________. 1970. Molts of the verdin, Auriparus flaviceps. Condor 72:493-496.

*Troglodytidae (Wrens)

Anderson, A. H. 1934a. Notes on the rock wren. Bird-Lore 36:173-174.

Near Tucson.

__________. 1934b. A cactus wren roosting in a verdin's nest. Bird-Lore 36:366.

At Tucson.

__________ and Anne Anderson. 1957. Life history of the cactus wren. I. Winter and pre-nesting behavior. Condor 59:274-296.

This series of papers summarizes twenty years of observations in creosote bush-cholla habitat. A loose group of wintering wrens did not flock and did not migrate. All wrens required a covered roosting nest in all months of the year, commonly in chollas. Nests of the male and female of the resident pair were seldom far apart. The nest usually resembled a pouch with an entrance at one end, facing outward from the cholla. Incomplete nests indicate difficulty in choosing a site. Wrens occupied nests from one to six days after construction began. A simple song and six calls facilitate communication. Territorial intolerance began in January; females drove out females and males repelled males. Sex discrimination depends on behavior, such as female cowering.

__________ and __________. 1959. Life history of the cactus wren. Part II. The beginning of nesting. Condor 61:186-205.

Cactus wrens colonized new creosote bush habitat as cholla invaded, furnishing nest sites. The wrens maintained definite territorial boundaries. Disputes occurred whenever a pair or the other detected an apparent intrusion on its territory. Disputes involved fighting as well as threats, and displacement behavior often followed an encounter. The female defended the year-round territory only in the presence of her mate. Autumn roosting nests seldom remained intact until construction of the next year's breeding nest began. Nest destruction and change of nests occurred frequently. After failure of a nesting attempt, the next egg appeared in 6-7 days. Human activities bring more food and favor the wrens, whose only habitat requirement seems to be chollas for nest sites. Rising spring temperatures normally stimulate breeding. Wrens nested early after mild winters with rainfall adequate for new spring plant growth. Delays in nesting occurred subsequent to failure to find a mate, loss of mate, or nest destruction.

__________ and __________. 1960. Life history of the cactus wren. Part III. The nesting cycle. Condor 62:351-369.

Females roosted in their breeding nests as many as 7 to 11 nights before laying the first egg. They deposited the average clutch of 3.41 eggs by laying one egg each day. Although wrens lay as many as six clutches in one year, they can raise a maximum of only three broods. Failure of clutches increased rapidly after the second clutch. Only females participated in the 16-day incubation period. Male courtship feeding of the female occurred 3-4 times per day. On the day before the first egg hatched, one female incubated 50% of the time. Hatching occurred over 2-3 days. Adults feed nestlings small, fresh insects; they do not feed by regurgitation. Singing of the male apparently stimulated the young to leave the nest. The first egg of the second clutch appeared in the nest about a week after first-clutch fledging. Laying to fledging intervals averaged 38.4 days. Each year began with a minimum of two roosting nests. Both adults constructed the first breeding nest. While the female incubated the eggs the male began construction of one or more secondary nests, for use as later breeding nests or as roosts for male, female, or fledglings.

__________ and __________. 1961. Life history of the cactus wren. Part IV. Development of nestlings. Condor 63:87-94.

At hatching, down patchily covers the wrens. By the age of 7 days, all the feather tract sheaths have pierced the skin. In another day they have begun breaking open at the ends. Nestlings probably cannot see effectively until about 8 days of age. Reversal in relative lengths of upper and lower mandible is complete by 9 days. Peeping may occur on the second day, and evolves to the normal begging-note by fledging time. Wrens did not show fear reactions (such as backing up in reaction to an object suddenly placed before a bird) until 11 days. Temperature regulation becomes effective at about 6 days. The smallest nestling at hatching weighed 2.6 g.

__________ and __________. 1962. Life history of the cactus wren. Part V. Fledging to independence. Condor 64:199-212.

Young cactus wrens reached the average adult weight of 38.9 g at the age of about 38 days. Adult wrens always attempted to lead their fledglings to a roosting nest in the evening; those that failed to arrive before dark were often lost. Fledglings began moving into separate nests at ages ranging from 52 to 70 days. Adults shared feeding duties until the female began incubating her next clutch of eggs. Self-feeding began at about 35 days. Day old fledglings used the buzz danger note; the alarm note, the staccato _tck_, came soon afterwards. Dust bathing is apparently innate. Adults broke up the family bond by gradually ignoring the begging fledglings. Fledglings started new nests at the average age of 116.5 days.

__________ and __________. 1963. Life history of the cactus wren. Part VI. Competition and survival. Condor 65:29-43.

Cactus wrens avoided extremely high summer ground temperatures by seeking shade. In hot weather they opened their bills slightly and raised their wings to permit free air circulation. Water drinking by adult wrens occurred chiefly in fall and winter. Immatures drank during summer. Daytime nest temperatures varied with the thickness of the nest roof; shaded, ventilated nests approximated air temperature. Wrens retired at light intensities about twenty times as great as the intensity at which they left the nest in the morning. Competition existed with curve-billed thrashers for cholla nest sites. Conflicts occurred frequently as thrashers destroyed roosting nests of wrens. Although the thrasher defended its own territory successfully, its productivity never matched that of the wrens. House cats were the most dangerous predator. Banded males averaged 737 days in age (7 birds); 16 females averaged 493 days. Forty-one of 55 banded nestlings had disappeared 45 days after fledging. Hostility, as in weaning, probably forced them out.

__________ and __________. 1965. The cactus wrens on the Santa Rita Experimental Range, Arizona. Condor 67:344-351.

The authors obtained data on the cholla desert of the Experimental Range, for comparison with the authors' six-part life history study conducted near Tucson. Cactus wrens on the Range, 900 feet higher than Tucson, laid eggs a month later, perhaps owing to the slower onset of spring temperatures. Thrashers destroyed many of the wren roosting nests, but probably had little effect on the total population. Five to eight nests normally existed on a 60-acre area.

__________ and __________. 1972. The cactus wren. Univ. Ariz. Press, Tucson. 226 p.

A whole book on the cactus wren. Based on 30 yrs. of research.

Antevs, A. 1947. Cactus wrens use "extra" nest. Condor 49:42.

Near Globe, Arizona.

Bailey, F. M. 1922. Cactus wrens' nests in southern Arizona. Condor 24:163-168.

A detailed account of roosting nests, their sites and construction at the north base of the Santa Rita Mtns.

Knowlton, G. F. and F. C. Harmston. 1942. Insect food of the rock wren. Great Basin Nat. 3:22.

In Utah.

Ricklefs, R. E. 1967. A case of classical conditioning in nestling cactus wrens. Condor 69:528-529.

__________. 1968. The survival rate of juvenile cactus wrens. Condor 70:388-389.

Recently fledged cactus wrens had approximately the same survival rate as nestlings.

__________ and F. Reed Hainsworth. 1967. The temporary establishment of dominance between two hand-raised juvenile cactus wrens (*Campylorhynchus brunneicapillus*). Condor 69:528.

__________ and __________. 1968a. Temperature dependent behavior of the cactus wren. Ecology 49:227-233.

Cactus wrens select cooler microhabitats with increasing ambient temperature. Their activity decreases after the minimum temperature increases above a critical level.

____________ and ____________. 1968b. Temperature regulation in nestling cactus wrens: The development of homeothermy. Condor 70:121-127.

Thermogenic responses develop later and more slowly in cactus wrens than in species with shorter nestling periods. Very young nestlings do not respond to cold temperatures. But they do respond to heat stress by open-mouth breathing and increased respiration, as do older nestlings. Regulatory capability appears complete by the 13th day after hatching. High surface-volume ratio and absence of insulating plumage aid in avoidance of thermolysis in very young nestlings.

____________ and ____________. 1969. Temperature regulation in nestling cactus wrens: The nest environment. Condor 71:32-37.

The enclosed nest of the cactus wren aids temperature regulation during cold weather by retaining heat within the insulated nest cavity. During hot weather the nest protects the young from direct sunlight but also impedes dissipation of heat produced by the nestlings. Evaporation of water from fecal material within the nest cavity may diminish this problem. Wrens orient nest entrances so that they avoid winds during the cooler part of the breeding season and face them during the hot part.

Smith, E. Linwood. 1970. Cactus wrens attack ground squirrel. Condor 72:363-364.

In Saguaro N.M., Arizona.

Wolford, M. J. 1969. Vocal repertoire of the cactus wren (<u>Campylorhynchus brunneicapillus</u>). M.S. Thesis. Univ. Ariz. 46 p.

Includes sonograms.

*Mimidae (Mockingbirds and thrashers)

Ambrose, J. E., Jr. 1963. The breeding ecology of <u>Toxostoma curvirostre</u> and <u>T. bendirei</u> in the vicinity of Tucson, Arizona. M.S. thesis. Univ. Ariz. 40 p.

Bendire's thrasher, unsuccessfully competing with the curve-billed thrasher, is decreasing in numbers.

Brown, H. 1901. Bendire's thrasher. Auk 18:225-231.

Describes habitat, nests, and eggs.

Engels, W. 1940. Structural adaptations in thrashers (Mimidae: genus Toxostoma) with comments on interspecific relationships. Univ. Calif. Publ. Zool. 42:341-400.

Thrashers of the genus Toxostoma exhibit two marked behavioral tendencies: toward ground behavior and toward running rather than flying as primary locomotion. Bill curvature increases with increase in the digging habit. Musculature has adapted to digging, as well. Reduction in flight frequency has resulted in a reduction of the wings, although the genus is far from flightlessness.

Gilman, M. F. 1907. Migration and nesting of the sage thrasher. Condor 9:42-44.

____________. 1909. Among the thrashers in Arizona. Condor 11:49-54.

Observations of 5 spp. on the Pima Ind. Res.

Grinnell, J. 1933. The Le Conte thrasher of San Joaquin. Condor 35:107-114.

Hailman, Jack P. 1963. The mockingbird's "tail-up" display to mammals near the nest. Wilson Bull. 75:414-417.

Mockingbirds gave tail-up displays to 4 spp. of mammals: dog, cat, human, and squirrel. Recently fledged mockingbirds gave the display, but calling and posturing of the adults (rather than the presence of the mammal) appeared to elicit the young birds' responses.

Horwich, Robert H. 1969. Behavioral ontogeny of the mockingbird. Wilson Bull. 81:87-93.

Kennedy, C. H. 1911-12. Notes on the fruit-eating habits of the sage thrasher in the Yakima Valley. Auk 28:225-228. Auk 29:224-226.

In Washington.

Killpack, Merlin L. 1970. Notes on sage thrasher nestlings in Colorado. Condor 72:486-488.

Growth rates of nestlings.

Knowlton, G. F. and F. C. Harmston. 1942. Insect food of the sage thrasher. Condor 44:76-77.

In Utah.

Laskey, A. R. 1962. Breeding biology of mockingbirds. Auk 79:596-606.

McCaskie, G. 1965. The curve-billed thrasher in California. Condor 67:443-444.

Merriam, C. H. 1895. The Le Conte thrasher, _Harporhynchus lecontei_. Auk 12:54-60.

Distribution and nesting.

Michener, H. and J. R. Michener. 1935. Mockingbirds, their territories and individualities. Condor 37:97-140.

An important reference on the species.

Miller, L. 1938. The singing of the mockingbird. Condor 40:216-219.

Rand, A. L. 1941. Development and enemy recognition of the curve-billed thrasher (_Toxostoma curvirostre_). Bull. Amer. Mus. Nat. Hist. 78: 213-242.

At Tucson.

Ricklefs, Robert E. 1965. Brood reduction in the curve-billed thrasher. Condor 67:505-510.

Two strategies exist for adjustment of brood size to food availability: evaluation and brood reduction. Evaluation proves most useful when birds can accurately predict food availability at that future time when nestlings will require feeding. They must accomplish this from an evaluation of food availability, or other environmental conditions, prior to egg-laying. Brood reduction proves advantageous when the food supply is unstable and its fluctuations unpredictable, or when the bird lays its eggs before the female can meaningfully evaluate the season's food availability.

Smith, Ernest Linwood. 1971. The effects of heat and aridity on reproductive success of the curve-billed thrasher. Ph. D. thesis. Univ. Ariz. 66 p.

Stafford, E. F. 1912. Notes on Palmer's thrasher (_Toxostoma curvirostre palmeri_). Auk 29:363-368.

The curve-billed thrasher nesting near Tucson.

Tanner, V. M. 1936. The western mockingbird in Utah. Proc. Utah Acad. Sci., Arts and Letters. 8:185-187.

The species apparently breeds only in the Lower Sonoran zone - not the Upper.

Wildenthal, Joyce L. 1965. Structure in primary song of the mockingbird (Mimus polyglottos). Auk 82:161-189.

This paper chiefly considers syllable patterns. About 80% of song phrases consist of renditions of the same syllable pattern, about 3% of renditions of syllable patterns each of which differs, and about 17% of syllable patterns any one of which may be rendered more than once.

*Sylviidae (Gnatcatchers and kinglets)

Smith, E. L. 1967. Behavioral adaptations related to water retention in the black-tailed gnatcatcher (Polioptila melanura). M.S. thesis. Univ. Ariz. 43 p.

Activity decreases during the hottest part of the day.

*Bombycillidae (Waxwings)

Anderson, A. H. and A. Anderson. 1946. Notes on the cedar waxwing at Tucson, Ariz. Condor 48:279-280.

*Ptilogonatidae (Silky flycatchers)

Crouch, James E. 1938. Studies on the life history of Phainopepla nitens lepida Van Tyne and correlated changes in the testes. Ph. D. thesis. Univ. S. Calif.

________. 1943. Distribution and habitat relationships of the phainopepla. Auk 60:319-333.

This paper outlines the distribution of the species in the Southwest, state by state. Although primarily a bird of the Sonoran Desert, the bird ranges into foothill live oak and sycamore, as well as erratically up into coniferous forest. In the desert, the species strongly prefers mesquite and ironwood infested with mistletoe. The phainopepla has adapted to man-altered environments, and commonly nests in orange groves and apricot orchards.

Huey, L. M. 1935. A pair of phainopeplas. Bird-Lore 37:401-404.

Nesting notes from Yuma County, Arizona.

Rand, A. L. and R. M. Rand. 1943. Breeding notes on the phainopepla. Auk 60:333-341.

Breeding birds arrived at Tucson in two influxes, one in February and one in March. Males established and visually advertised territories and started building nests before they attracted mates. If the male had finished a nest before securing a mate, he built another nest. But normally the female contributed her efforts to nest completion. Only after a period of displaying and nest building, following which he still remained mateless, did a male sing. Both sexes usually shared nest duties.

Scott, W. E. D. 1885. On the breeding habits of some Arizona birds; 3rd paper: Phainopepla nitens. Auk 2:242-246.

Phainopepla in Pinal Co.

*Laniidae (Shrikes)

Balda, R. P. 1965. Loggerhead shrike kills mourning dove. Condor 67:359.

In SE Arizona.

Crockett, R. M. 1936. Shrike craftiness. Condor 38:88.

A shrike imitated house finch calls at Phoenix.

Knowlton, G. F. and F. C. Harmston. 1944. Food of white-rumped shrikes. Auk 61:642-643.

In Utah; loggerhead shrike.

Smith, Susan May. 1969. Behavioral adaptations for predation in the loggerhead shrike (Lanius ludovicianus L.). Ph. D. thesis. Univ. Wash. 68 p.

The author studied attack behavior and its development within a single shrike. Both impaling and exhibition of precise attack behavior toward large prey have apparently evolved to overcome the morphological absence of talons. Through these adaptations shrikes can exploit prey too large to be swallowed whole.

__________. 1972. The ontogeny of impaling behavior in the loggerhead shrike (Lanius ludovicianus L.). Behaviour 42:232-246.

__________. 1973a. A study of prey-attack behavior in young loggerhead shrikes, Lanius ludovicianus L. Behaviour 44:113-141.

Hand-reared shrikes develop prey-attack behavior in about 37 days; prior experience with small food may hasten the appearance of this behavior by up to ten days. Eventual development takes place regardless of experience. All shrikes 40 days or older display the entire behavior, which involves directing pecks to the back of the neck of large prey.

__________. 1973b. An aggressive display and related behavior in the loggerhead shrike. Auk 90:287-298.

The flutter display functions in shrike territorial defense, and may indicate high attack tendency. The display bears strong superficial resemblance to general passerine sexual behavior. Flutter behavior may have evolved as a means of escape from sexual situations posing real physical danger to pair members in this predatory species. Shrikes may have ritualized the behavior as a threat display, while modifying sexual behavior to least resemble the flutter display during periods when invasion seems most likely.

Wemmer, C. 1969. Impaling behavior of the loggerhead shrike. Z. Tierpsychol. 26:208-224.

*Parulidae (Wood warblers)

Austin, George T. 1970. Migration of warblers in southern Nevada. Southwestern Nat. 15:231-237.

Definite patterns exist, with spring migration concentrated in the lowlands and fall migration in the lowlands and mountains. Some species take part in one migration but not the other. Lowland fall migration occurs after the late summer heat. The author suggests that some species cannot withstand the extreme heat of the desert in early fall.

Gilman, M. F. 1909. Nesting notes on the Lucy Warbler. Condor 11:166-168.

Along the Gila River, Arizona.

Pulich, W. M. and A. R. Phillips. 1953. A possible desert flight line of the American redstart. Condor 55:99-100.

*Ploceidae (Weaver finches)

Phillips. A. R. 1948. Survival of birds at high temperatures. Amer. Nat. 82:331-334.

Arizona temperatures did not prove lethal to house sparrows.

*Icteridae (Blackbirds and orioles)

Horn, H. S. 1968. The adaptive significance of colonial nesting in the Brewer's blackbird (Euphagus cyanocephalus). Ecology 49:682-694.

Research in sagebrush desert in eastern Washington. More widely spaced nests in linear colonies, but more closely spaced nests in round colonies seem to minimize predation and maximize foraging efficiency. Blackbirds probably first concentrated nests in a colony for efficient exploitation of a food supply variable in space and time. This initial concentration of nests proved of more selective value than territoriality. For it allowed the birds to take advantage of each other's luck in foraging and resulted in a high degree of overlap of areas defended by each pair against predators.

Huey, L. M. 1944. Nesting habits of the hooded oriole. Condor 46:297.

In Organ Pipe N.M., Arizona.

Johnson, R. R. and B. Roer. 1968. Changing status of the bronzed cowbird in Arizona. Condor 70:183.

The cowbird has increased in numbers and extended its range downward.

La Rivers, Ira. 1944. Observations on the nesting mortality of the Brewer blackbird Euphagus cyanocephalus. Am. Midland Nat. 32:417-437.

Near Reno, Nev.

Neff, J. A. 1943. Homing instinct in the dwarf cowbird in Arizona. Bird-Banding 14:1-6.

The brown-headed cowbird near Phoenix.

Scott, W. E. D. 1885a. On the breeding habits of some Arizona birds; 1st paper: Icterus parisorum. Auk 2:1-7.

Scott's oriole in Pinal Co.

____________. 1885b. On the breeding habits of some Arizona birds; 2nd paper: Icterus cucullatus. Auk 2:159-165.

Hooded oriole in Pinal Co.

*Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Anderson, Anders H. 1965. Notes on the behavior of the rufous-winged sparrow. Condor 67:188-190.

Emphasizes singing behavior; singing occurred during every month of the year.

____________ and A. Anderson. 1944. 'Courtship feeding' by the house finch. Auk 61:477-478.

At Tucson.

____________ and ____________. 1946. Late nesting of the pyrrhuloxia at Tucson, Arizona. Condor 48:246.

Austin, G. T. and E. L. Smith. 1974. Use of burrows by brown towhees and black-throated sparrows. Auk 91:167.

At midday, in the desert.

Bartholomew, George A. and Tom J. Cade. 1956. Water consumption of house finches. Condor 58:406-412.

Relative water consumption decreases directly with increasing body size and resembles the curve of respiratory water loss versus weight. Most desert birds have probably not evolved special mechanisms of water conservation. The smallest birds need surface water most acutely, or failing that, at least a succulent diet.

____________ and ____________. 1958. Effects of sodium chloride on the water consumption of house finches. Physiol. Zool. 31:304-310.

Bendire, C. E. 1882. The rufous-winged sparrow. Ornith. and Ool. 7(16):121-122.

An account of its habits near Tucson.

Best, Louis B. 1972. First-year effects of sagebrush control on two sparrows. J. Wildl. Mgmt. 36:534-544.

Best examined the effects of sagebrush control on Brewer's and vesper sparrows. Five spray treatments (total kill spray, strip spray, partial kill spray, defer control, and open control) resulted in varying amounts of sagebrush eradication, increased grass coverage, and reduced forb abundance. Only on the total kill spray plot did Brewer's sparrows decline (54%) after spraying. No significant change in pairs of vesper sparrows occurred after spraying.

Bryant, L., Jr. 1931. Some notes on the breeding of the vesper sparrow. Bird-Banding 2:178-184.

Cody, Martin L. 1971. Finch flocks in the Mojave Desert. Theor. Pop. Biol. 2:142-158.

Crossin, R. S. 1965. The history and breeding status of the song sparrow near Tucson, Arizona. Auk 82:287-288.

Dawson, Wm. R. 1958. Relation of oxygen consumption and evaporative water loss to temperatures in the cardinal. Physiol. Zool. 31:37-48.

____________ and F. L. Evans. 1960. Relation of growth and development to temperature regulation in nestling vesper sparrows. Condor 62:329-340.

Gould, P. J. 1960. Territorial relationships between cardinals and pyrrhuloxias. M.S. thesis. Univ. Ariz. 40 p.

____________. 1961. Territorial relationships between cardinals and pyrrhuloxias. Condor 63:246-256.

Considerable similarity exists between territorial behavior and other aspects of the life of the cardinal and pyrrhuloxia in southern Arizona. Their territorial songs, nesting cycle, and habitats are very similar. The pyrrhuloxia's ability to nest in open situations may reduce competition between the two species. Territories of the birds, often coincident and not mutually exclusive, differ in size and shape as a function of the local population density. The considerable resemblance of the life histories of the two species supports the theory that they belong to the same genus.

Grinnell, J. 1910. The savannah sparrow of the Great Basin. Univ. Calif. Publ. Zool. 5:312-316.

Heckenlively, Donald B. 1967. Role of song in territoriality of black-throated sparrows. Condor 69:429-430.

Vocal signals contributed more to territorial defense than visual or physical contacts.

__________. 1970. Song in a population of black-throated sparrows. Condor 72:24-36.

Songs of black-throated sparrows vary more than songs of other emberizines in song duration and frequency range. Such variation may result from the absence of closely related sympatric species and the lack of avian diversity in desert scrub habitat. Large territories appear to encourage selection for variation in overall pattern and for acoustical territorial defense.

Knowlton, G. F. and W. P. Nye. 1946. Some insect food of the sage sparrow. J. Kansas Ent. Soc. 19:139.

In Utah.

__________ and __________. 1948. Insect food of the vesper sparrow. J. Econ. Ent. 41:821.

In Utah.

Kroodsma, Donald E. 1972. Variations in songs of vesper sparrows in Oregon. Wilson Bull. 84:173-178.

Vesper sparrow song in Oregon consists of a whistled introductory phrase followed by as many as seven different trills. One individual had a repertoire of 43 different trill types, and sang 218 different trill sequences in 400 songs. Similarities in trills among neighboring males and consistent differences in the introductory whistled notes suggest that the birds learn at least a portion of their songs from adult conspecifics. One male had a reduced song repertoire and sang like a Bewick's wren; insufficient exposure to songs of adult conspecifics could cause such interspecific learning.

Locke, Louis N. 1965. Pyrrhuloxia feeding on cactus fruits. Condor 67:190.

A male and a female pyrrhuloxia fed on fruit of christmasberry cholla (<u>Opuntia leptocollis</u>).

Marshall, J. T., Jr. 1960. Interrelations of Abert and brown towhees. Condor 62:49-64.

These two species utilize in similar ways both the edges and interior of mesquite riverbottom woodland near Tucson. Abert's prefers the interior of the woods more than the brown, and probably scratches for food more than the latter. Even though their territories may be superimposed, with nests no more than 30 feet apart, interspecific antagonism rarely occurs.

Moldenhauer, Ralph Roy. 1969. The water economy of the sage sparrow, *Amphispiza belli nevadensis* (Ridgway). Ph. D. thesis. Oreg. State Univ. 67 p.

__________ and John A. Wiens. 1970. The water economy of the sage sparrow, *Amphispiza belli nevadensis*. Condor 72:265-275.

Captive sage sparrows on a dry diet without drinking water gradually lost weight and died in about eight days. However, the species maintained body weight when provided with only succulent foods as a source of water. Birds reduced daily cloacal water loss from 4.9 g/day to 1.8 g/day when placed on this restricted diet. Sage sparrows did not excel in their renal capacity for concentrating electrolytes. This species, intermediate in its adaptations to the desert environment, probably relies on use of succulent foods and on temperature-dependent behavioral responses for survival.

Moore, R. T. 1946. The rufous-winged sparrow: Its legends and taxonomic status. Condor 48:117-123.

Ohmart, Robert D. 1969. Physiological and ethological adaptations of the rufous-winged sparrow (*Aimophila carpalis*) to a desert environment. Ph. D. thesis. Univ. Ariz. 68 p.

Rainfall stimulates breeding.

__________ and E. Linwood Smith. 1971. Water deprivation and use of sodium chloride solutions by vesper sparrows. Condor 73:364-366.

Vesper sparrows survived on a seed and commercial mash diet containing 7 percent moisture for a 21-day test period at temperatures of 20-21°C and water vapor pressure of 12-14.8 mm Hg. The unwatered birds reduced fecal water loss, but apparently did not reduce their food intake. Low water requirements, combined with a diet of insects and seeds, apparently allow the vesper sparrow to exist without free water, at least in the absence of temperature stress.

Peterson, James G. 1942. Salt feeding habits of the house finch. Condor 44:73.

Poore, J. T. 1969. The effects of water deprivation on the hypothalamic-hypophysial neurosecretory system of the black-throated sparrow, Amphispiza bilineata. M.S. thesis. Univ. Ariz. 19 p.

Poulson, Thomas L. and George A. Bartholomew. 1962. Salt utilization in the house finch. Condor 64:245-252.

Osmotic pressure and chloride concentration of house finch serum did not depend on the salinity of the drinking solution. However, maximum instability in these functions occurred in birds drinking 0.3 M NaCl. Both urine chloride concentration and urine osmotic pressure increased directly with the amount of NaCl ingested. For the concentration of NaCl tested, the mean level of activity varied inversely with the concentration of NaCl in the drinking solution. No evidence supported extra-renal excretion of salt.

Schroeder, Max H. 1972. Vesper sparrow nests abandoned after snow. Wilson Bull. 84:98-99.

GRASSLAND

* Introduction

The temperate grassland is the largest and most climatically varied of the North American biomes. Every western state, except Alaska, originally included extensive grasslands, although desert scrub has since invaded many vast areas disturbed by man and his livestock. Grasslands develop where precipitation is insufficient to support the forest life form, but is higher than that which results in deserts. Changes in both vegetational and geographic characters outline the regions of the biome.

The foothills of the Rockies abruptly define the western boundary of the short grass prairie of the Great Plains. The mesquite, or desert, grassland (the southern temperate grassland) lies in the highlands of southern Arizona and New Mexico. Bunchgrass dominates elsewhere in the drier regions where grassland grades into desert, between the northern Rockies and the Pacific Coast ranges, and between the Sierras and the coastal mountains farther south. Bunchgrass prairies of particular note include the California prairie of the Central Valley, and the Palouse prairie of the remaining undisturbed parts of the Columbia and Snake River basins. Uniformly occurring perennial grasses and large populations (at least, originally) of grazing and burrowing animals characterize and dominate all these areas.

Rain often comes in pronounced seasonal cycles that produce luxuriant vegetation, and therefore extensive forage, in the spring and summer. The subsequent searing autumnal dry season forces many animals to migrate. Frequently occurring fires perpetuate the grassland by favoring grass in competition with woody plants, but cause recurrent problems for animals. The flat or slightly rolling open plains typical of the biome generally lack trees or rocks which might provide shelter against the sun, rain, and winter storms. Skimpy natural cover and pronounced seasonal cycles have combined to precipitate distinctive adaptations in grassland birds.

Having little incentive to leave the ground except for annual migrations, many birds, even though they may fly well, have become cursorial. Some grassland birds have so accentuated adaptations for running that their ability to fly has been lost completely (for example, the emus, ostriches, and rheas of the Australian, African, and South American plains). Birds of the grassland commonly acquire the flocking habit, which provides protection necessary in this open habitat. In an environment lacking high perches, many grassland birds give their territorial and courtship songs on the wing. Scarcity of cover also accounts for the typically ground-nesting habits of grassland birds.

The high annual turnover of net primary production in most grassland communities establishes a food base for large numbers of animals, including birds. Those species present occur in abundance, but species diversity compares poorly to some other biomes. One might predict such a decrease, given the rather invariant life-form available as habitat in the grassland. Low-growing grasses do not allow the "layering" of ecological niches found in the forest. On the other hand, those birds that do prefer the open habitat of the grassland seem particularly distinctive. Combine the sensory impressions of the trill of a meadowlark, the black and white flash of a lark bunting, and the flutter of great flocks of horned larks, and no doubt remains as to one's whereabouts.

Species appearing in the following list of grassland birds include several birds of the southern mesquite grassland which also occur commonly in the deserts. Several birds of the eastern deciduous forest range into the West only on the Great Plains along wooded streams and in farm groves. Research on these birds appears under the Grassland classification, as indicated in the species index.

Characteristic Grassland Birds:

Common nighthawk (South temperate)	Dickcissel
Lesser nighthawk (South temperate)	Lark bunting
Western kingbird	Savannah sparrow
Horned lark	Grasshopper sparrow
Black-billed magpie	Baird's sparrow
Common crow	Vesper sparrow
Mockingbird	Lark sparrow
Sprague's pipit	Botteri's sparrow (S. temperate)
Loggerhead shrike	Black-throated sparrow (S. temperate)
Bobolink	Clay-colored sparrow
Western meadowlark	Brewer's sparrow
Brewer's blackbird	McCown's longspur
Great-tailed grackle	Smith's longspur
Brown-headed cowbird	Chestnut-collared longspur

* General

Anderson Bertin Walter. 1969. Hybridization in flickers, grosbeaks, and orioles in South Dakota. Ph.D. thesis. Univ. So. Dakota. 149 p.

This thesis documents the extent of hybridization between eastern and western forms of three genera in South Dakota: Colaptes, Pheucticus, and Icterus. The author defines major avenues of gene flow across the state and assesses man's role in increasing or decreasing genetic exchange.

__________. 1971. Man's influence on hybridization in two avian species in South Dakota. Condor 73:342-347.

Recent changes in South Dakota habitats have influenced hybridization of flickers and northern orioles. These changes include increased tree planting (increased habitat) and creation of reservoirs (decreased habitat).

Baldwin, P.H. 1970. The feeding regime of granivorous birds in shortgrass prairie of Colorado. International Biological Program, Working Group on Granivorous Birds - PT Section (Warszawa). 4(1):26-30. (Abstr.)

__________. 1971. The feeding regime of granivorous birds in shortgrass prairie in Colorado. IBP Grassland Biome Preprint No. 16. 19 p.

__________ and P.D. Creighton. 1972. Feeding ecology and nesting behavior of grassland birds at the Pawnee site, 1971. IBP Grassland Biome Technical Report 185. 38 p.

At Pawnee National Grassland, Colorado.

Beidleman, R.G. 1948. The vertebrate ecology of a Colorado plains cottonwood river bottom. M.A. thesis. Univ. Colo.

Biswell, H.H. 1956. Ecology of California grasslands. J. Range Mgmt. 9:19-24.

Cameron, E.S. 1907. The birds of Custer and Dawson Counties, Montana. Auk 24:389-406.

Great Plains grassland.

Carpenter, J. Richard. 1940. The grassland biome. Ecol. Monog. 10:617-684.

Includes associations and relationships of birds.

Childs, Henry E., Jr. and Walter E. Howard. 1955. The vertebrate fauna of the San Joaquin Experimental Range. U.S. For. Serv., Calif. For. & Range Exp. Sta. (Berkeley), Misc. Pap. No. 19. 20 p.

Includes an annotated list of birds, emphasizing status and habitat. The range is in the San Joaquin Valley, Madera Co., Calif.

Clark, G.W. and B. Swinehart. 1966. Blood protozoa of passerine birds of the Sacramento (Calif.) region. Bull. Wildl. Disease Assoc. 2:53-54.

Cody, M.L. 1966a. Spatial and associated patterns in grassland bird communities. Ph.D. thesis. Univ. Penn.

__________. 1966b. The consistency of intra- and inter-continental grassland bird species counts. Am. Natur. 100:371-376.

__________. 1968. On the methods of resource division in grassland bird communities. Am. Naturalist 102:107-147.

Resident members of avian communities in simple grassland habitats coexist successfully through differences in habitat preferences and feeding behavior. In very tall vegetation they depend on differences in feeding height. The sum of these ecological differences is constant for all communities. Using only two habitat indexes, vegetation height and its standard deviation, one can predict 1) # species, 2) differences in their feeding ecology, and 3) their relative habitat separation in the community. This paper constitutes a very important theoretical statement on grassland avian ecology.

Cowan, J.B. (comp.). 1967. Birds of Gray Lodge Waterfowl Management Area, Gridley, Calif. Resources Agency, Dept. Fish & Game. 8 p.

(Butte Co.) Central Valley grassland.

Creighton, P.D. 1971. Progress report, work on bird feeding and nesting behavior at the Pawnee site. IBP Grassland Biome Technical Report No. 67. 40 p.

Crouch, Glenn Leroy. 1961. Wildlife populations and habitat conditions on grazed and ungrazed bottomlands in Logan County, Colorado. M.S. thesis. Colo. State Univ.

Davis, D.E. 1955. Determinate laying in barn swallows and black-billed magpies. Condor 57:81-87.

Dice, L.R. 1918. The birds of Walla Walla and Columbia counties, southeastern Washington. Auk 35:40-51,, 148-161.

Palouse grassland and farmland.

Dubois, A. Dawes. 1935. Nests of horned larks and longspurs on a Montana prairie. Condor 37:56-72.

Eng, R.L. 1952a. A 2-summer study of the effects on bird populations of chlordane bait and aldrin spray as used for grasshopper control. M.S. thesis. Montana State Univ. 27 p.

__________. 1952b. A 2-summer study of the effects on bird populations of chlordane bait and aldrin spray as used for grasshopper control. J. Wildlife Mgmt. 16:326-337.

In Montana.

Evenden, Fred. 1961. Checklist of birds of Sacramento and vicinity. Sacramento Audubon Society, 1717 Professional Drive, Sacramento, Calif.

25¢ each.

Giezentanner, J.B. 1970a. Avian distribution and population fluctuations on the shortgrass prairie of north central Colorado. IBP Grassland Biome Technical Report No. 62. 113 p.

____________. 1970b. Avian distribution and population fluctuations on the shortgrass prairie of north central Colorado. M.S. thesis. Colo. State Univ., Ft. Collins. 113 p.

____________ and R.A. Ryder. 1969. Avian distribution and population fluctuations, Pawnee Site. IBP Grassland Biome Technical Report No. 28.

Harris, Bruce K. 1964. Recent bird records from southeastern New Mexico. Condor 66:159-161.

6 years of observations on status of 25 less common species.

Johnston, R.F. 1964. The breeding birds of Kansas. Univ. Kans. Publ., Mus. Nat. Hist. 12:575-655.

Analyzes 176 spp. of breeding birds according to habitat and breeding seasons.

____________. 1965. Directory to the bird-life of Kansas. Univ. Kans. Mus. Nat. Hist., Misc. Publ. No. 41. 67 p.

Brief notes on the occurrence, distribution and habitat of the 383 species occurring in Kansas and the Great Plains.

Judd, S.D. 1898. Food of shrikes: Cuckoos and shrikes in their relation to agriculture. U.S.D.A., Div. Biol. Surv. Bull. 9:15-26.

Kendeigh, S.C. 1941. Birds of a prairie community. Condor 43:165-174.

Kennedy, C.H. 1914. The effects of irrigation on bird life in the Yakima Valley, Washington. Condor 16:250-255.

Irrigated grassland.

Klaas, Erwin Eugene. 1970. A population study of the eastern phoebe, Sayornis phoebe, and its social relationships with the brown-headed cowbird, Molothrus ater. Ph.D. thesis. Univ. Kansas. 177 p.

Krehbiel, Adolf J. 1961. Checklist of the birds of Clayton, New Mexico, vicinity. Order from author, 221 Jefferson St., Clayton, NM.

25¢ each. Great Plains grassland.

Montgomery, V.A. 1969. Bird-finding localities in the vicinity of Roswell, New Mexico. New Mexico Ornithological Society, Box 277, Cedar Crest, New Mexico 87008. 10 p.

South temp. grassland.

Neff, Johnson A. and C.C. Wilson. 1941. The influence of birds on local grasshopper outbreaks in California. Trans. N.A. Wildl. Conf. 5:189-195.

Crows, yellow-billed magpies, and blackbirds consumed more grasshoppers than other species.

Overmire, Thomas G. 1963. The effects of grazing upon habitat utilization of the dickcissel (Spiza americana) and Bell's vireo (Vireo bellii) in north central Oklahoma. PH.D. thesis. Okla. State Univ. 65 p.

Owing to reduction of nesting sites, populations of each of these species numbered 50% less on grazed than ungrazed land. Dickcissels built nests early in the season on or near the ground; they built later nests in shrubs or low tree branches. 29% of 75 dickcissel nests and 30% of 79 Bell's vireo nests succeeded. Neither grazing nor the degree of nest concealment affected nest success in either species. 11% of the male dickcissels were polygamous.

Owens, R.A. and M.T. Myres. 1973. Effects of agriculture upon populations of native passerine birds of an Alberta fescue grassland. Can. J. Zool. 51:697-713.

Native fescue grasslands in southern Alberta, undisturbed for 3 years, supported a passerine community consisting of Baird's sparrow, Sprague's pipit, savannah sparrow, clay-colored sparrow, and western meadowlark. Incomplete disturbance by mowing for hay or grazing by cattle reduced or eliminated Baird's sparrow and Sprague's pipit, but permitted ingress of horned lark and chestnut-collared longspur. Total elimination of the native grassland, by plowing and cultivation for cereal crops, eliminated all passerine species except the horned lark. Peripheral disturbed areas resulting from cultivation, such as field boundaries and roadside ditches, may have benefited several species that tend to occur in ecotonal habitats: the savannah sparrow, clay-colored sparrow, and vesper sparrow.

Pieper, R.D., M.E. Ellstrom, E. Staffeldt, and R. Raitt. 1972. Primary producers, invertebrates, birds and decomposers on the Jornada site, 1971. IBP Grassland Biome Technical Report 200. 73 p.

Pulich, Warren M. 1969. Unusual feeding behavior of 3 species of birds. Wilson Bull. 81:472.

Blue jays fed on wasps (Polistes exclamans). Meadowlarks fed on a road-killed striped skunk. Boat-tailed grackles soaked dry dog food before eating it.

Rapp, W.F., Jr., J.L.C. Rapp, N.E. Baumgarten, and R.A. Moser. 1958. Revised checklist of Nebraska birds. Occas. Papers Nebr. Ornithol. Union 5:45 p.

Best available data for this region of the Great Plains.

Ryder, R.A. 1972. Avian population studies on the Pawnee site, 1968-1971. IBP Grassland Biome Technical Report 171. 62 p.

At Pawnee National Grassland, Colorado.

Sooter, Clarence A. and others. 1951. Encephalitis in Midwest IV: Western equine encephalitis virus recovered from nestling wild birds in nature. Proc. Soc. for Exp. Biol. and Med. 77:393-394.

Red-winged blackbirds and a magpie in Weld Co., Colorado.

Stewart, R.E. and H.A. Kantrud. 1972. Population estimates of breeding birds in North Dakota. Auk 89:766-788.

In this grassland state, the most plentiful species, in decreasing numerical order, included: horned lark, chestnut-collared longspur, red-winged blackbird, western meadowlark, lark bunting, and savannah sparrow. Estimated statewide populations for these six species ranged from 2,726,000 to 1,140,000 pairs. Collectively, they constituted 45% of the total breeding bird population in North Dakota.

Strong, M.A. 1971. Avian productivity on the shortgrass prairie of north central Colorado. M.A. thesis. Colorado State Univ., Ft. Collins.

________ and R.A. Ryder. 1971. Avian productivity on the Pawnee site in north central Colorado. IBP Grassland Biome Technical Report No. 82. 54 p.

Sutton, George M. 1967. Oklahoma birds: Their ecology and distribution, with comments on the avifauna of the southern Great Plains. Univ. of Okla. Press, Norman. 674 p.

This book, of value in BLM areas elsewhere in the Great Plains, consists primarily of an annotated list of about 400 species. Excellent introductions to families and orders contain much life-history information. The author also emphasizes the changes in avifaunal composition consequent to large water impoundment developments.

Taylor, Robert R. 1966. Summary of the first eight years of the prairie nest records scheme. Blue Jay 24:180-181.

Tordoff, H.B. 1956. Checklist of the birds of Kansas. Univ. Kans. Publ., Mus. Nat. Hist., Lawrence, 8:307-359.

This and Johnston (1960, 1964) summarize available ornithological information for Kansas.

Whitney, N.R. 1965. Checklist of South Dakota birds. South Dakota Bird Notes 17:80-83.

Wiens, John Anthony. 1966. An approach to the study of ecological relationships among grassland birds. Ph.D. thesis. Univ. Wisc. 321 p.

The author investigated in detail the ecological relationships between bobolinks, eastern and western meadowlarks, savannah sparrows, grasshopper sparrows, Henslow's sparrows, and vesper sparrows on an 80-acre grassland in Wisconsin. His theoretical objective: to develop and test a method for describing and analyzing habitats useful in outlining relationships among grassland birds. An important paper.

__________. 1969. Same title. A.O.U. Ornithol. Monog. 8:1-93.

__________. 1970a. Habitat heterogeneity and the structure of avian communities in grasslands. Bull. Ecol. Sci. America 51(2):29. (Abstr.).

__________. 1970b. Avian populations and patterns of habitat occupancy at the Pawnee site, 1968-69. IBP Grassland Biome Technical Report 63. 47 p.

__________. 1971. Avian ecology and distribution in the comprehensive network, 1970. IBP Grassland Biome Technical Report 77. 49 p.

__________. 1972a. Habitat heterogeneity and avian community structure in North American grasslands. IBP Grassland Biome Preprint 45. 32 p.

__________. 1972b. Climatic instability and "the ecological saturation" of bird communities in grasslands. IBP Grassland Biome Preprint 42. 43 p.

__________, J.T. Rotenberry, and J.F. Ward. 1972. Avian populations at IBP Grassland Biome sites: 1971. IBP Grassland Biome Technical Report 205. 126 p.

Willard, F.C. 1908. An Arizona nest census. Condor 10:44-45.

Brief accounts of the nesting of 14 spp. in the desert grassland at Tombstone.

Wing, Leonard. 1949. Breeding birds of virgin Palouse prairie. Auk 66:38-41.

Near Pullman, Washington

*Cuculidae (Cuckoos)

Spencer, O.R. 1943. Nesting habits of the black-billed cuckoo. Wilson Bull. 55:11-22.

*Trochilidae (Hummingbirds)

Miller, R.S. and R.E. Miller. 1971. Feeding activity and color preference of ruby-throated hummingbirds. Condor 73:309-313.

The location of a food source has a stronger influence than its color when ruby-throats may choose between different colored foods of the same quality. Once they locate a food source, color may then act as an important discriminatory stimulus. But no evidence exists from this or other studies indicating that hummingbirds have an innate or strongly developed preference for one color, including red.

Pickens, A.L. 1936. Notes on nesting ruby-throated hummingbirds. Wilson Bull. 48:80-85.

*Picidae (Woodpeckers)

Bock, Carl E. 1971. Pairing in hybrid flicker populations in eastern Colorado. Auk 88:921-924.

Information presented supports conspecificity of red- and yellow-shafted flickers.

___________, Harlo H. Hadow, and Preston Somers. 1971. Relations between Lewis and red-headed woodpeckers in southeastern Colorado. Wilson Bull. 83:237-248.

Lewis and red-headed woodpeckers showed interspecific aggression in territorial defense when nesting close together. Such aggression results from competition for shared resources. The two species have functionally equivalent, and in some ways, structurally similar vocal repertoires.

Kilham, L. 1958a. Territorial behavior of wintering red-headed woodpeckers. Wilson Bull. 70:347-358.

___________. 1958b. Sealed in winter stores of red-headed woodpeckers. Wilson Bull. 70:107-113.

*Tyrannidae (Tyrant flycatchers)

Fitch, Frank W. 1950. Life history and ecology of the scissor-tailed flycatcher, Muscivora forficata. Auk 67:145-168.

This paper summarizes an 18-month study in Brazos Co., Texas, applicable to similar habitat in New Mexico. The species demonstrates strong territoriality during the breeding season. Females choose the nest, incubate the eggs, and attend the young more than the male. They lay three to five eggs in a nest placed six to 27 feet off the ground in an isolated tree. Grasshoppers make up the summer diet. Vocalizations include a spectacular courtship "flight song" and a "twilight song". Non-brooding birds gather nightly to roost in a specific tree. Breeding males defend the nesting territory during the day, but return to the communal roost at night. As many as 250 birds may roost in one of these trees. 80% of eggs laid hatch.

Merry, K. 1941. A study of the life history of the eastern phoebe -- Sayornis phoebe Latham. Ph.D. thesis. Cornell Univ.

Morehouse, E.L. and R. Brewer. 1968. Feeding of nestling and fledgling eastern kingbirds. Auk 85:44-54.

Adult insects made up most of the diet of nestlings. Feeding rate peaked 8-16 days after the young left the nest. A long decline followed, leading to the adults ceasing to feed the young at about 35 days after fledging. Kingbirds six days out of the nest consumed 5 g (27 Kcal) of insects. Fledglings can forage by flycatching eight days out of the nest and continue to improve in flying ability during the next month. The constant necessity for aerial foraging evidently accounts for postponement of fall molt in kingbirds until after southward migration. The necessity to migrate southward before food and weather conditions deteriorate follows soon after the great energetic demands of caring for the young through the long nesting season.

Ogburn, C., Jr. 1953. The redoubtable kingbird. Aud. Mag. 55:109-111.

Eastern kingbird.

Smith, W.J. 1969. Displays of Sayornis phoebe (Aves, Tyrannidae). Behaviour 33:283-322.

Description of eight calls and eight visual displays of the eastern phoebe.

*Alaudidae (Larks)

Beason, R.C. and E.C. Franks. 1973. Development of young horned larks. Auk 90:359-363.

Growth data on the prairie.

___________ and ___________. 1974. Breeding behavior of the horned lark. Auk 91:65-74.

Behle, Wm. H. 1942. Distribution and variation of the horned larks (Otocoris alpestris) of western North America. Univ. Calif. Publ. Zool. 46:205-316.

This important paper deals primarily with character variations in the western races of the species. In delineating each race, the author includes important information on the habitats of each subspecies.

___________. 1943. Weights of some western subspecies of horned larks. Auk 60:216-221.

Dwight, Jonathan, Jr. 1890. The horned larks of North America. Auk 7:138-158.

Garrett, Mary L. 1948. The life history of the prairie horned lark. M.S. thesis. Ohio State Univ.

McAtee, W.L. 1905. The horned larks and their relation to agriculture. U.S.D.A., Biol. Surv. Bull. 23. 37 p.

McBee, C.E. 1931. The dusky horned lark in eastern Washington. Murrelet 12:43-45.

Neff, Johnson A. 1948. Protecting crops from damage by horned larks in California. U.S.D.I., F&WS, Wildl. leaflet 308. 11 p.

Pickwell, G.B. 1931. The prairie horned lark. Trans. Acad. Sci. St. Louis 27. 160 p.

Based on extensive research, this long life-history contains many plates of nests and nestling development, as well as a 17 page summary of horned lark biology on the midwestern prairie.

Sealy, Spencer G. 1968. An addition to the avifauna of North America: Eremophila alpestris flava. Auk 85:511.

Taylor, W.P. 1925. The breeding and wintering of the pallid horned lark in Washington State. Auk 42:349-353.

*Corvidae (Jays and crows)

Alsager, Dale E., J.B. Stenrue, and R.L. Boyles. 1972. Capturing black-billed magpies with circular live traps. J. Wildlife Mgmt. 36:981-983.

A unique, circular, lightweight trap proved more efficient than conventional square traps, because magpies hesitate to round corners. Baiting the economical-to-build trap in advance of setting adds to its efficiency.

Arnold, J.R. 1938. The systematic position and natural history of the northern blue jay, Cyanocitta cristata bromia Oberholser. Ph.D. thesis. Cornell Univ.

Atwell, G.C. 1959. An evaluation of magpie predation on the ring-necked pheasant. M.S. thesis. Univ. Mont. 74 p.

Bergeson, W.R. and R.J. Greene. 1948. Experimental poisoning of magpies. Mont. F&G. P-R Quarterly Rept. Jan.-March:154-161.

Blackburn, Carol Finley. 1968. Yellow-billed magpie drowns its prey. Condor 70:281.

Brown, R.L. 1957a. The population ecology of the magpie in western Montana. M.S. thesis. Univ. Montana. 53 p.

____________. 1957b. Same title. Montana Fish & Game Dept. Info. Bull. No. 3. 4 p.

____________. 1959. Magpie ups and downs. Mont. Wildl. (Feb):17-20.

Magpie pre-breeding population in six square miles in the Bitterroot Valley held steady at about 700 birds for two years. In 1956, the colony laid 2,300 eggs, produced 1,300 nestlings and fledged 1,200 young. 1957 figures resembled these data closely. Predator activity, particularly farm people and great horned owls, diminished these numbers rapidly. Magpie bounties have failed, and Montana has abandoned them. The author recommends live trap use and describes a successful type.

Chamberlain, D.R. 1967. The vocalizations and syringeal anatomy of the common crow, Corvus brachyrhynchos. M.S. thesis. Virginia Polytechnic Inst., Blacksburg.

__________ and George W. Cornwell. 1971. Selected vocalizations of the common crow. Auk 88:613-634.

Description of the environmental and behavioral contexts associated with 23 distinct vocalizations of the crow.

Clark, Glen W. 1965. Schizogony and gametocyte development of leucocytozoon berestneffi in the yellow-billed magpie, Pica nuttalli. J. Protozool. 12:584-589.

Davis, Charles A. and James P. Griffing. 1972. Nesting of the white-necked raven in southeastern New Mexico. N.M. State Univ. Agr. Exp. Stat. Res. Rep. 231. 5 p.

In southeastern New Mexico mesquite grassland, ravens commonly nested in taller mesquite about 7 ft. above ground. They laid clutches averaging 4.7 eggs, and incubated about 20-22 days. 63% of the eggs hatched, and 38% resulted in fledged birds.

Dice, L.R. 1917. Habits of the magpie in southeastern Washington. Condor 19:121-124.

Emlen, J.T., Jr. 1940. The midwinter distribution of the crow in California. Condor 42:287-294.

__________. 1942. Notes on a nesting colony of western crows. Bird-Banding 13:143-153.

Erpino, Michael J. 1968. Nest-related activities of black-billed magpies. Condor 70:154-165.

Magpies rarely use nests from past seasons for initial nesting attempts, although they will renest in old nests from the same or past seasons. Old, durable, unoccupied nests may enhance nesting success by diverting the attention of predators. Near Laramie, Wyoming, nest-building lasted about 40 days, with activity peaking in March-April. Maximum ovarian development coincided with completion of the nest-bowl lining. Maximum testicular development preceded this by about 3 weeks. Nest building and social interaction between pair members during this period probably affect vernal gonadal development. The author noted no nest-related territoriality. Courtship feeding of the female, the sole incubator, continued throughout incubation.

__________. 1969. Seasonal cycle of reproductive physiology in the black-billed magpie. Condor 71:267-279.

Evenden, F.G., Jr. 1947. Nesting studies of the black-billed magpie in southern Idaho. Auk 64:260-266.

Fendinger, George S. 1952. A study of the parasites on the common crow, Corvus brachyrhynchos. M.S. thesis. Ohio State Univ.

Frings, H. and M. Frings. 1959. The language of crows. Sci. Am. 201:119-131.

Good, Ernest Eugene. 1952. The life history of the American crow, Corvus brachyrhynchos Brehm. Ph.D. thesis. Ohio State Univ. 203 p.

Activities of man favor the crow, which now occurs most abundantly in agricultural land. Great Plains birds migrate farther than any other U.S. crow population - up to 1,400 miles. The birds return to the same locality for nesting year after year. Very large late summer roosts may number several hundred thousand birds. Such flocks may inflict severe damage on croplands, but may also consume vast quantities of insect pests. Food habits vary greatly both geographically and seasonally, according to food-source availability. Sport hunting offers the best means of control of crows viewed as pests.

Hagen, Arthur F. and O. Wilford Olsen. 1957. Species and prevalence of parasites in the blood of the American magpie (Pica pica hudsoni (Sabine)) in northern Colorado. Proc. Helminth. Soc. Wash. 24:61-62.

Hibler, Charles P. 1961. Preliminary note on some Filarioids of the American magpie, Pica pica hudsonia (Sabine, 1823) and their intermediate hosts in northern Colorado. Wildl. Disease, #20. 2 p.

The genus, Splendidofilaria constituted three of the four species of filarioids found in magpies.

Jellison, W.L. 1933. Faunae of the magpie and crow in western Montana. Can. Entomologist 65:26-31.

Johnston, David W. 1961. The biosystematics of American crows. Univ. Wash. Press, Seattle. 119 p.

The most complete source for systematics of the common crow.

Jones, Robert E. 1960. Activities of the magpie during the breeding period in southern Idaho. M.S. thesis. Univ. Idaho.

___________ and Kenneth E. Hungerford. 1972. Evaluation of nesting cover as protection from magpie predation. J. Wildl. Mgmt. 36:727-732.

The authors evaluated protection afforded by nesting cover by planting 529 simulated nests in 9 vegetative covers. They detected 278 destroyed nests in 10 days of testing. 25% of all nests were destroyed in the first 24 hours; 36% remained intact throughout testing. Grain fields, cat-tail, bulrush, and irrigation ditch vegetation provided more protection (30% destroyed), than tall weeds, willows, sagebrush, or downy chess (80% destroyed). Alfalfa provided intermediate protection (40% destroyed). The black-billed magpie preyed most extensively on nests. A cover index that evaluated visibility of eggs from all four sides at the top proved heavier covers more protective than light ones.

Linsdale, Jean M. 1937. The natural history of magpies. Cooper Ornith. Club, Pac. Coast Avifauna 25. 234 p.

Detailed compilation of information about all magpies of the world.

Low, J.B. and G. Knowlton. 1958. Magpie control. Utah St. Agr. Ext. Serv. Leaflet 19.

Martin, M.D. 1942. Wyoming magpie control. Wyo. Wildlife 7(10):13-15.

Novak, C.A. 1956. A preliminary study of magpie predation on pheasant populations in Idaho. M.S. thesis. Univ. Idaho.

O'Halloran, Patrick L. 1961. Dynamics of a reduced magpie population. M.S. thesis. Univ. Mont. 78 p.

Parmalee, P.W. 1949. An analysis of development and behavior of the young crow. M.S. thesis. Univ. Ill.

___________. 1952. Growth and development of the nestling crow. Amer. Midl. Nat. 47:183-201.

Powell, R.W. 1972. Operant conditioning in the common crow. (Corvus brachyrhynchos). Auk 89:738-742.

Key-pecking behavior of crows on various schedules of reinforcement compared favorably to that of pigeons, rats, and monkeys.

Renken, Tim. 1969. Crow shooting. New Mex. Wildlife (Jan/Feb):2-3.

Discussion of techniques.

Ruff, R.L. 1963. A study of the predatory effects of a reduced magpie population on the ring-necked pheasant. M.S. thesis. Univ. Mont. 96 p.

Stevenson, Robert Eugene. 1971. Temperature acclimatization in the black-billed magpie (Pica pica hudsonia, Sabine). Ph.D. thesis. Mont. State Univ. 40 p.

The lethal combination of high ambient temperatures and high relative humidities may limit eastward distribution of the magpie.

Thompson, N.S. 1969. Caws and affect in the communication of common crows. Bull. Ecol. Soc. Amer. 50:142.

Todd, Kenneth S., Jr. 1968. Weights of black-billed magpies from southwestern Montana. Auk 85:508-510.

Adult magpies averaged 180 g in weight, juveniles 179.9 g. Males generally weighed more than females. No decrease in weight occurred during the severe winter months.

__________, John W. Ernst, and Datus M. Hammond. 1967. Parasites of the black-billed magpie from northern Utah. Bull. Wildl. Disease Assoc. 3:112-113.

Townsend, C.W. 1923. The voice and courtships of the crow. Bull Essex County Ornithol. Club 5:4-8.

Verbeek, Nicolaas A.M. 1970. The exploitation system of the yellow-billed magpie. Ph.D. thesis. Univ. Calif., Berkeley. 170 p.

Ecological and behavioral adaptations in the annual cycle of the yellow-billed magpie.

__________. 1972. Daily and annual time budget of the yellow-billed magpie. Auk 89:567-582.

Time spent feeding depends on temperature and food abundance and occupies 56.4% of the year. Magpies devote only 3.6% of their time annually to maintenance of the territory. Other significant activities include (in percentages of time occupied annually): preening (4.6%), flying time (2.7%), and reproduction (20%).

___________. 1973. The exploitation system of the yellow-billed magpie. Univ. Calif. Publ. Zool. 99:1-58.

In California grassland - oak savanna, adults maintain year-round territories in a loose colony. Magpies mate for life, apparently in the fall of their first year, although they do not breed until the age of two years. Each year the birds build a new nest, which lasts about six years. In territories connected by a continuous canopy, magpies built nests 31 m. apart at a mean height of 16.9 m. Territories reach maximum size (average: 1 hectare) and peak exclusivity during breeding season. They drop to minimum size in summer when the birds wander frequently. Early in incubation, the male obtains food primarily from the territory, but progressively procures more food away from it. At hatching almost all food comes from areas as far as 1 km from the nest. While the female continues to obtain food from these distant sources, the male slowly reverts to feeding on the territory. The beginning of male molt midway through the nesting season (earlier than females) coincides with this change in feeding habits. Distant food sources are found by individual exploration, and then mutally exploited - a behavior that may have stimulated evolution of semi-colonial nesting dispersion. The author also makes important comparisons to the nesting and exploitation systems of other corvids, particularly the scrub jay.

Wehr, Everett E. 1939. New genera and species of Filarioidea II. Quadriplotriaena dolichodemus N. Gen., N. Sp. Proc. Helminth Soc. Wash. 6:32-33.

From magpie in Montana.

Weisbrod, A.R. 1971. Grooming behavior of the blue jay. Living Bird 10:271-284.

Preening, bathing, sunning, and anting.

*Mimidae (Mockingbirds and thrashers)

Brazier, Frank H. 1964. Status of the mockingbird in the northern Great Plains. Blue Jay 22:63-75.

Erwin, W.G. 1935. Some nesting habits of the brown thrasher. Journ. Tenn. Acad. Sci. 10:179-204.

*Turdidae (Thrushes)

Clark, G.W. 1967. The occurrence of Hematozoa in robins of central Washington. Bull. Wildl. Disease Assoc. 3:69-71.

Hartshorne, J.M. 1962. Behavior of the eastern bluebird at the nest. Living Bird 1:131-149.

Courtship and nesting behavior.

Krieg, David C. 1971. The behavioral patterns of the eastern bluebird (Sialia sialis). N.Y. State Mus. Sci. Serv. Bull. 415. 139 p.

Twelve maintenance activities of the bluebird.

Ligon, J. David. 1969. Factors influencing breeding range expansion of the azure bluebird. Wilson Bull. 81:104-105.

Scarcity of nesting sites and open park-like forests as well as competition with western bluebirds may restrict northward extension of the range of the eastern bluebird, Sialia sialis fulva.

Peakall, David B. 1970. The eastern bluebird: Its breeding season, clutch size, and nesting success. Living Bird 9:239-255.

A computer analysis based on nest-record cards.

Slater, Robert L. 1967. Helminths of the robin, Turdus migratorius ridgway, from northern Colorado. Am. Midland Nat. 77:190-199.

A sample of 62 robins contained 11 spp. of parasites. The author summarizes pertinent literature as well as new host and geographical records.

*Laniidae (Shrikes)

Davis, David E. 1937. A cycle in northern shrike emigrations. Auk 54:43-49.

Chiefly from "Bird-Lore" Christmas censuses.

____________. 1949. Recent emigrations of northern shrikes. Auk 66:293.

____________. 1960. Recent emigrations of northern shrikes. Auk 77:347-348.

Porter, D.K. and R.A. Ryder. 1973. Nest ecology, productivity, and growth of the loggerhead shrike on the shortgrass prairie. J. Colo-Wyo. Acad. Sci. 7(4):43. (abstract).

____________, M.A. Strong, J.B. Giezentanner, and R.A. Ryder. 1973. Nest ecology, productivity, and growth of the loggerhead shrike on the shortgrass prairie. IBP Grassland Biome Preprint 53. 15 p.

Zimmerman, D.A. 1955. Notes on field identification and comparative behavior of shrikes in winter. Wilson Bull. 67:200-208.

*Parulidae (Wood warblers)

Hann, Harry W. 1937. Life history of the ovenbird in southern Michigan. Wilson Bull. 49:145-237.

A major reference for the species.

Stenger, J. 1958. Food habits and available food of ovenbirds in relation to territory size. Auk 75:335-346.

*Icteridae (Blackbirds and orioles)

Bryant, H.C. 1914. A determination of the economic status of the western meadowlark (<u>Sturnella neglecta</u>) in California. Univ. Calif. Publ. Zool. 11:377-510.

Creighton, P.D. and D.K. Porter. 1974. Nest predation and interference by western meadowlarks. Auk 91:177-178.

Dennis, J.V. 1948. Observations on the orchard oriole in lower Mississippi delta. Bird-Banding 19:12-21.

A major reference on the species.

Engels, W.L. 1962. Day-length and termination of photo-refractoriness in the annual testicular cycle of a transequatorial migrant <u>Dolichonyx</u> (the bobolink). Biol. Bull. 123:94-104.

____________. 1964. Further observations on the regulation of the annual testicular cycle in bobolinks (<u>Dolichonyx oryzivorus</u>). Auk 81:95-96.

14-hour photoperiods act as long photoperiods in maintaining refractoriness similar to that in temperate zone migrants when applied in the post-breeding phase of the annual cycle of bobolinks. But the same length photoperiods act as very short photoperiods in the succeeding, photosensitive phase (in contrast to temperate zone migrants). This adaptation serves to retard testicular recrudescence during the long days of the southern hemisphere summer.

Friedmann, H. 1929. The cowbirds: A study in the biology of social parasitism. Charles C. Thomas, Springfield, Ill. 421 p.

Although Friedmann (1963, 1971) has since updated the list of host species, this volume still contains much life history information unavailable elsewhere. The three references together comprise an authoritative account of the parasitic habits of the cowbirds, particularly the brown-headed cowbird.

___________. 1963. Host relations of the parasitic cowbirds. U.S. Nat'l Museum Bull. 233. 276 p.

This volume consists primarily of an authoritative, annotated list of bird species serving as hosts for cowbirds. It incorporates and supersedes the author's earlier publications on cowbird parasitism.

___________. 1971. Further information on the host relations of the parasitic cowbirds. Auk 88:239-255.

Additions to the list of hosts used by brown-headed cowbird and bronzed cowbird.

Gotie, R.F. and J.C. Kroll. 1973. Growth rate and ontogeny of thermoregulation in nestling great-tailed grackles, _Cassidix mexicanus prosopidicola_. (Icteridae). Condor 75:190-199.

Hamilton, William J., III. 1962a. Bobolink migratory pathways and their experimental analysis under night skies. Auk 79:208-233.

Examination of the migratory course taken by geographically displaced bobolinks suggests that the preferred migration direction depends upon a shifted timing mechanism. Both immature birds, which have never made a migration before, and adults apparently can make directional determinations by some feature of the clear night sky. They probably base directional choice on the stars and on their internal clock. While the stars constitute the major cue to directional choices at night, other orienting mechanisms exist. Contributing cues include terrain features, other birds of the same species, and perhaps, other species in flight at the same time.

___________. 1962b. Does the bobolink navigate? Wilson Bull. 74:357-366.

An adult female captured in North Dakota and transported to Berkeley, Calif. escaped a month later, in the fall. On the 3 nights prior to escape, this bird lived in a cage that automatically recorded directional components of night migratory activity. On the first night the preferred direction nearly coincided with the home direction; on the third night, the direction paralleled the natural migration route of the population from which the bird derived. The direction on the second night proved intermediate between the two others. The bird reappeared in North Dakota the following summer at its earlier capture site.

Hansen, E.L. and B.E. Carter. 1963. A nesting study of Brewer's blackbirds in Klamath County, Oregon. Murrelet 44:18-21.

First egg laying occurred May 1, while no young remained near the nest after July 5. Blackbirds built nests in the highest meadow foxtail (Alopecurus pratensis) available. All but one of 28 nests had grass cover on one or all sides. Dummy nests -- shallow depressions with the grass parted and a few stems of a few stems of Polygonum spp. scattered within -- outnumbered completed nests nearly four to one. Nesting success reached maximum in areas with the highest number of dummy nests. Blackbilled magpies and long-tailed weasels preyed on poorly concealed nests.

Horn, Henry S. 1966. Colonial nesting in the Brewer's blackbird (Euphagus cyanocephalus) and its adaptive significance. Ph.D. thesis. Univ. Wash. 96 p.

Brewer's blackbirds have evolved the colonial nesting habit in response to the variable nature of their food supply.

__________. 1970. Social behavior of nesting Brewer's blackbirds. Condor 72:15-23.

In choice habitat, Brewer's blackbird colonies consist of more than passive aggregations of birds. Although suitability of environment dominates reproductive activities, adjustments occur in both nesting site location and timing of breeding. Courtship and other behavior in one pair arouse similar behaviors in other nearby pairs. Such contagion of behavior helps synchronize breeding activities. Similar contagion may exist in recruitment to the colony.

Howell, T.R. and G.A. Bartholomew, Jr. 1952. Experiments on the mating behavior of the Brewer blackbird. Condor 54:150-151.

Males copulated with stuffed specimens readily. A dummy lacking wings and either a head or a tail still elicits a mating response. When present, the tail must incline at an angle above horizontal. Eye color is not important. A female head and neck on an otherwise male-colored dummy elicits a response from a male in a state of high sexual excitement. Females barely responded to dummies.

Johnston, R.F. 1960. Behavioral and ecologic notes on the brown-headed cowbird. Condor 62:137-138.

Kenyon, Karl W. 1941. A study of the old nest as a visual stimulus to the renesting of the Baltimore oriole, Icterus galbula Linnaeus, including supplementary life history observations. M.S. thesis. Cornell Univ.

Kingsbury, E.W. 1933. The status and natural history of the bobolink - Dolichonyx oryzivorus Linnaeus. Ph.D. thesis. Cornell Univ.

Knowlton, G.F. and D.R. Maddock. 1943. Insect food of the western meadowlark. Great Basin Nat. 4:101-102.

In Utah.

________ and P.E. Telford. 1946. Insects eaten by Brewer's blackbirds. Auk 63:589.

In Utah.

Kok, O.B. 1971a. Vocal behavior of the great-tailed grackle (Quiscalus mexicanus prosopidicola). Condor 73:348-363.

Adult males utilize 16 different patterns of sound; adult females have only five. The species' mating system, which involves intense and prolonged interaction between males, accounts for this disparity.

________. 1971b. Experience in banding boat-tailed grackles. Bird-Banding 42:106-109.

The author captured 26 grackles after they consumed food treated with alpa-chloralose.

________. 1972. Breeding success and territorial behavior of male boat-tailed grackles. Auk 89:528-540.

The author investigated the relationship between ultimate breeding success and behavior of male grackles. Although no single variable dominated, those males with the optimal balance of factors tended to breed most successfully.

Lanyon, W.E. 1957. The comparative biology of the meadowlarks (Sturnella) in Wisconsin. Publ. Nuttall Ornith. Club #1, Cambridge, Mass. 67 p.

The authoritative reference for the eastern meadowlark.

________. 1962. Specific limits and distribution of meadowlarks of the desert grassland. Auk 79:183-207.

One can consistently differentiate between the western and eastern meadowlarks by the extent of white on the tail rectrices and consistent differences in call-note and primary song. The two species differ distinctively in habitat requirements in the desert grassland. The western meadowlark prefers irrigated land, and the eastern, the more arid natural grassland. This reverses their usual ecological relationship elsewhere within the zone of sympatry.

Laskey, A.R. 1950. Cowbird behavior. Wilson Bull. 62:157-174.

Brown-headed cowbird breeding displays centered on elaborate bowing, particularly that bow given by one male to another. A single male dominated males, a single female dominated all females; these two birds then paired. The author suggested that the dominant female first selected her "domain" (not a true territory) and then accepted as her mate any male dominant in that area. The species seems monogamous.

Lustick, S. 1968. Energetics and water requirements in the cowbird. Ph.D. thesis. Univ. Calif., L.A.

Martin, Stephen George. 1971. Polygyny in the bobolink: Habitat quality and the adaptive complex. Ph.D. thesis. Oreg. State.Univ. 203 p.

McGeen, D.S. 1972. Cowbird-host relationships. Auk 89:360-380.

Two factors determine fledging success in the brown-headed cowbird: choice of host and "parasite pressure". Calculation of the latter involves quantification of incidence and intensity of parasitism. The yellow warbler and song sparrow have apparently adapted to brood parasitism as a well-regulated homeostatic mechanism. Cowbird fledging success with these two hosts reaches a maximum of 54% (with the song sparrow).

Mulford, A.S. 1937. Ecologic relations of the Brewer blackbird (Euphagus cyanocephalus minusculus). M.A. thesis. Univ. Calif.

Niles, David M. 1970. A record of clutch size and breeding in New Mexico for the bronzed cowbird. Condor 72:500-501.

From examination of developmental stages of ova the author predicted a clutch of four eggs.

Payne, Robert B. 1965. Clutch size and numbers of eggs laid by brown-headed cowbirds. Condor 67:44-60.

Cowbirds lay up to 15 eggs in a breeding season in clutches of 1-6 eggs. Intervals between clutches vary from a few days to a few weeks. The mean clutch size of 3.1 eggs has not increased in the evolution of the cowbird. Both follicular growth rate and atresia limit clutch size by regulating the numbers of oocytes that mature in the ovary.

____________. 1967. Gonadal responses of brown-headed cowbirds to long daylength. Condor 69:289-297.

Males and females exposed to 17 hours of light per day during winter developed enlarged testes and ovarian follicles, respectively. Female cowbirds in captivity did not develop mature ovaries. Neither sex responded to long daylengths in summer at the time of natural gonadal aggression.

____________. 1973. The breeding season of a parasitic bird, the brown-headed cowbird, in central California. Condor 75:80-99.

Cowbirds breed in late spring and early summer, and may be polygynous. The cowbird breeding season matches peak nesting of the best hosts. Increasing energy costs probably terminate the breeding season: the birds must balance energetic drains against decreased value of breeding after the peak of host nestings.

Phillips, A.R. 1950. The great-tailed grackles of the Southwest. Condor 52:78-81.

Rea, A.M. 1969. The interbreeding of two subspecies of boat-tailed grackle Cassidix mexicanus nelsoni and Cassadix mexicanus monsoni in secondary contact in central Arizona. M.S. thesis. Ariz. State Univ. 131 p.

Rohwer, Sievert A. 1971. Systematics and evolution of Great Plains meadowlarks, Genus Sturnella. Ph.D. thesis. Univ. Kansas. 152 p.

Roseberry, John L. and W.D. Klimstra. 1970. The nesting ecology and reproductive performance of the eastern meadowlark. Wilson Bull. 82:243-267.

All of 450 eastern meadowlark pairs built nests on the ground in cover 10-20 inches high. The birds made nests of rush, meadow fescue, cheat, and bluegrass. 17.3% of the nests were open on top, 44.5% partly roofed, and 38.2% fully roofed. Nearly 49% of the nests faced in a north-easterly direction. Birds laid no eggs prior to 14 April, and none later than 23 July. Laying peaked from 22 April to 12 May. Pairs built nests at densities of 20.9 (nests per 100 acres) in pastures, 12.6 in hayfields, 5.1 in soilbank fields, 4.8 in wheatfields, 3.8 in idle areas, and 2.0 in fallow fields. Clutches averaged 4.16 eggs; clutch size decreased as the season advanced. 37.4% of eggs laid hatched, and 30.5% of these birds fledged. The extent of overhead concealment of the nests controlled nesting success, and the percentage of successful nests increased as the season advanced.

Saunders, G.B. 1932. A taxonomic revision of the meadowlarks of the genus Sturnella Viellot and the natural history of the eastern meadowlark Sturnella magna magna (Linnaeus). Ph.D. thesis. Cornell Univ.

Scott, D.M. and A.L.A. Middleton. 1968. The annual testicular cycle of the brown-headed cowbird (Molothrus ater). Can J. Zool. 46:77-87.

Selander, R.K. 1958. Age determination and molt in the boat-tailed grackle. Condor 60:355-376.

__________. 1960. Sex ratio of nestlings and clutch size of the boat-tailed grackle. Condor 62:34-44.

Neither the primary nor the nestling sex ratio showed significant deviation from an expected 50:50 ratio. Clutch size in the Austin, Texas region averaged 3.45 ± 0.11. Hatching success probably never exceeds 75 per cent; no more than 77 per cent of hatched young fledge.

__________. 1961. Supplemental data on the sex ratio of nestling boat-tailed grackles. Condor 63:504.

__________ and D.R. Giller. 1961. Analysis of sympatry of great-tailed and boat-tailed grackle. Condor 63:29-86.

In the zone of sympatry in Texas and Louisiana, as well as elsewhere in its range, the boat-tailed grackle (Cassadix major) mainly occurs within the limits of coastal marshland in the breeding season. Great-tailed grackles (C. mexicanus) have wider ecological tolerance, occurring primarily in farmed prairie and other man-made habitat. Failure to interbreed validates their classification as two separate species, even though taxonomists have traditionally considered them conspecific.

__________ and R.J. Hauser. 1965. Gonadal and behavioral cycles in the great-tailed grackle. Condor 67:157-182.

__________ and C.J. LaRue, Jr. 1961. Interspecific preening invitation display of parasitic cowbirds. Auk 78:473-504.

__________, Suh Y. Yang, and Gilbert Cantu. 1969. Extension of zone of sympatry of Quiscalus mexicanus and Q. major. Condor 71:435-436.

The great-tailed grackle has gradually extended its range eastward in the southern United States, resulting in increased sympatry with the boat-tailed grackle.

Sibley, C.G. and L.L. Short, Jr. 1964. Hybridization in the orioles of the Great Plains. Condor 66:130-150.

This paper documents hybridization between the Baltimore and Bullock's orioles on the Great Plains. The major shift from Baltimore to Bullock characters occurs within a zone of hybridization 150-200 miles wide extending from North Dakota south through eastern Colorado into Texas. All but three of 138 individuals taken within the hybrid zone were hybrids. The author's proposal that these two forms be considered conspecific has since been accepted by the A.O.U.

Tutor, B.M. 1962. Nesting studies of the boat-tailed grackle. Auk 79: 77-84.

VanVelzen, Aldeen C., Wilbur B. Stiles and Lucille F. Stickel. 1972. Lethal mobilization of DDT by cowbirds. J. Wildl. Mgmt. 36:733-739.

Verbeek, N.A.M. 1964. A time and energy budget study of the Brewer blackbird. Condor 66:70-74.

As feeding time at low air temperatures increased in a flock of wintering blackbirds, time spent on other activities decreased. Given this inverse relationship, the combined effects of winter cold and day length may limit distribution of the species at the northern edge of its range.

Williams, Laidlaw. 1952. Breeding behavior of the Brewer blackbird. Condor 54:3-47.

The male blackbird does not focus his attention entirely on his mate (the "primary" female) during incubation, as he does during nest building, copulation, and egg-laying. He may become polygynous at this time by mating with an extra unguarded female, which then becomes the "secondary" female. Factors that may lead to polygny include: (1) an excess of females caused by a depressed male population or perhaps by non-breeding of a large number of yearling males, and (2) death of males or destruction of the nests of monogamists. Polygynous males fed nestlings less than monogamous males.

*Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Anderson, B.W. and R.J. Daugherty. 1974. Characteristics and reproductive biology of grosbeaks (Pheucticus) in the hybrid zone in South Dakota. Wilson Bull. 86:1-11.

Baldwin, P.H., J.D. Butterfield, and P.D. Creighton. 1969. Summer ecology of the lark bunting, Pawnee site. IBP Grassland Biome Technical Report No. 29.

Blankespoor, Gilbert Wayne. 1970. The significance of nest and nest site microclimate for the dickcissel. Ph.D. thesis. Kans. State Univ. 190 p.

Butterfield, J.D. 1969. Nest site requirements of the lark bunting in Colorado. M.S. thesis. Colo. State Univ. 59 p.

Cartwright, B.M., T.M. Shortt, and H.D. Harris. 1937. Baird's sparrow. Trans. Royal Can. Inst. 21:153-199.

Clark, George A., Jr. 1970. Apparent lack of the double-scratch in two species of Spizella. Condor 72:370.

Field and chipping sparrows.

Creighton, P.D. 1971. Nesting of the lark bunting in north-central Colorado. IBP Grassland Biome Technical Report No. 68. 17 p.

Dillery, D.G. 1961. Food habits of savannah and grasshopper sparrows in relation to foods available. Ph.D. thesis. Ohio St. Univ. 62 p.

Both species of sparrows consumed Orthoptera summer-long in proportion to the number present--the only order of insects eaten by both species in direct proportion to its population. During middle and late summer, only grasshopper sparrows consumed all insects in approximate proportion to their occurrence in the fields; at no time did savannah sparrows show similar behavior. No sexual differences in diet occurred. Savannah sparrows consumed mainly Coleoptera, Homoptera, and larvae. Grasshopper sparrow diet consisted mainly of Orthoptera, Coleoptera, larvae, and Hemiptera. Individual differences in diet preference within the same field proved small, but significant. The two species based food preferences on size, number, and speed of movement of prey species.

Dubois, A.D. 1937. Notes on coloration and habits of a chestnut-collared longspur. Condor 39:104-107.

____________. 1937. The McCown longspurs of a Montana prairie. Condor 39:233-238.

Duvall, A.J. 1943. Breeding savannah sparrows of the southwestern United States. Condor 45:237-238.

Emlen, S.T. 1969a. The development of migratory orientation in young indigo buntings. Living Bird 8:113-126.

Buntings evidently base migratory orientation on both instinct and experience. Possible factors in maturation of orientation behavior include selective responsiveness to star patterns, variation in the path of the sun, and differentiation between rates of rotation of stars.

____________. 1969b. Bird migration: Influence of physiological state upon celestial orientation. Science 165:716-718.

Photoperiod manipulation induced physiological states corresponding to spring and autumn migratory readiness in indigo buntings. Birds in spring condition oriented northward under a spring planetarium sky; those in autumnal condition, southward. Changes in the internal physiological state of the bird rather than differences in the external stimulus situation determine seasonal reversal of preferred migration direction in this species.

____________. 1972. An experimental analysis of the parameters of bird song eliciting species recognition. Behaviour 41:130-171.

The author examined the acoustical communication system of the indigo bunting by means of playback experiments. He compared results with data from four other species of passerines.

Fox, G.A. 1961. A contribution to the life history of the clay-colored sparrow. Auk 78:220-224.

Fretwell, Steve. 1968. Habitat distribution and survival in the field sparrow. Bird-Banding 39:293-306.

Field sparrows breed in the wintering area in higher densities than elsewhere, but raise fewer young per pair. Birds breeding in their wintering habitat weigh more and thus have better chances for survival than non-breeding birds.

____________, H.L. Lucas, and J.S. Calver. 1969. On territorial behavior and other factors influencing habitat distribution in birds: 1) Theoretical development; 2) Sex ratio variation in the dickcissel; 3) Breeding success in a local population of field sparrows. Acta. Biotheor. 19(1):16-52.

Gobeil, Robert E. 1970. Vocalizations of the savannah sparrow. Bird-Banding 41:18-21.

Primary vocalizations consist of a primary song, and four basic notes: alarm note, hostile note, call note, and food note.

Goldman, P. 1973. Song recognition by field sparrows. Auk 90:106-113.

Harper, F. 1930. A historical sketch of Botteri's sparrow. Auk 47:177-185.

Harris, R.D. 1944. The chestnut-collared longspur in Manitoba. Wilson Bull. 56:105-115.

In typical grassland habitat.

Holloway, Harry L., Jr. 1966. Notes on the life cycle of the indigo bunting. Raven 37:77-80.

Hyde, A.S. 1938. Grasshopper sparrow in the Palouse Country, eastern Washington. Murrelet 19:16-17.

Kroodsma, R.L. 1974. Species-recognition behavior of territorial male rose-breasted and black-headed grosbeaks (Pheucticus). Auk 91:54-64.

On the North Dakota plains.

McCaskie, G. 1966. The occurrence of longspurs and snow buntings in California. Condor 68:597-598.

Mickey, F.W. 1943. Breeding habits of McCown's longspur. Auk 60:181-209.

Moriarty, L.J. 1965. A study of the breeding biology of the chestnut-collared longspur (Calcarius ornatus) in northeastern South Dakota. S. Dak. Bird Notes 17:76-79.

Ohmart, R.D. 1969. Dual breeding ranges in Cassin sparrow (Aimophila cassinii). 105 p. (abstr.). In C.C. Hoff and M.L. Riedesel (eds.). Physiological systems in semiarid environments. Univ. New Mexico Press, Albuquerque.

Peters, J.L. and L. Griscom. 1938. Geographical variation in the savannah sparrow. Bull. Mus. Comp. Zool. 13:445-477.

Phillips, A.R. 1944. Status of Cassin's sparrow in Arizona. Auk 61:409-412.

Rice, J. O'Hara and W.L. Thompson. 1968. Song development in the indigo bunting. Animal Behaviour 16:462-469.

Salt, W.R. 1966. A nesting study of Spizella pallida. Auk 83:274-281.

(Clay-colored sparrow).

Schartz, R.L. 1969. A time budget of the male dickcissel (Spiza americana). M.S. thesis. Kansas St. Univ., Manhattan.

____________ and J.L. Zimmerman. 1971. The time and energy budget of the male dickcissel. Condor 73:65-76.

Foraging varied less than any other activity, changed little from day to day, and lacked any diurnal pattern. Physiological heat stress resulted in higher levels of resting. This shift in time budget caused a compensatory decrease in reproductive behavior, and led to an early cessation of breeding activities. Distant flight may function to assess population density and habitat suitability in other locations. Bio-energetic calculations demonstrated that the equivalent of 70 small to medium grasshoppers will satisfy the male dickcissel's energy demands during the breeding season.

Shiovitz, K.A. and W.L. Thompson. 1970. Geographic variation in song composition of the indigo bunting, Passerina cyanea. Animal Behaviour 18:151-158.

Indigo buntings vary geographically in song-figures. A limited number of figure types occurs within any given population. Average song length (in terms of the total number of figures and figure types) increases with population density, while figure repetition decreases. Birds may create new figures by altering old figures during learning. The large number of existing figure types suggests that each bird could have a unique song.

Sibley, C.G. and L.L. Short, Jr. 1959. Hybridization in the buntings (Passerina) of the Great Plains. Auk 76:443-463.

The indigo and lazuli buntings have recently shifted their ranges in reaction to human activity and general climatic changes. The two species now overlap in a zone extending across the plains of South Dakota, Nebraska, Colorado, and Wyoming. The buntings hybridize and backcross frequently. Even so, authorities have not yet lumped the two taxomonic forms in one species.

____________ and D.A. West. 1959. Hybridization in the rufous-sided towhees of the Great Plains. Auk 76:326-338.

A secondary post-Pleistocene contact between the eastern (unspotted) and western (spotted) populations of the rufous-sided towhee has occurred along Great Plains streams. A gradient now exists in the amount of spotting and in female color character.

Smith, R.L. 1963. Some ecological studies of the grasshopper sparrow. Wilson Bull. 75:159-165.

Swarth, H.S. 1936. Savannah sparrow migration routes in the Northwest. Condor 38:30-32.

Thompson, William L. 1970. Song variation in a population of indigo buntings. Auk 87:58-71.

Some spectrograms of 82 male buntings showed considerable individual variation.

Tramontano, John Philip. 1971. Summer foraging behavior of sympatric Arizona grassland sparrows. Ph.D. thesis. Univ. Ariz. 82 p.

Six species bred simultaneously in savannah-grassland. Each species differed in its combination of preferred habitat, foraging behavior, diet, and nest site selection.

Walkinshaw, L.H. 1935. Nesting of the field sparrow and survival of the young. Bird-Banding 10:107-114, 149-156.

___________. 1945. Field sparrow 39-54015. Bird-Banding 16:1-12.

West, D.A. 1962. Hybridization in grosbeaks (Pheucticus) of the Great Plains. Auk 79:399-424.

Rose-breasted and black-headed grosbeaks overlap (in secondary contact) along many of the river valleys in the central and northern plains. These two grosbeaks are geographically complementary forms. Habitat preferences, nests, eggs, plumage pattern, mensural characters, and vocalizations correspond closely. The two birds act as members of a polytypic species; they do not differ more than several geographically-variable single species, and they interbreed and backcross freely.

Wiens, John A. 1971. "Egg-dumping" by the grasshopper sparrow in a savannah sparrow nest. Auk 88:185-186.

A savannah sparrow nest contained five eggs of that species and two of the grasshopper sparrow.

___________. 1973. Interterritorial habitat variation in grasshopper and savannah sparrows. Ecology 54:877-884.

In a southern Wisconsin grassland.

Zimmerman, John Lester. 1963. The bioenergetics of the dickcissel (Spiza americana). Ph.D. thesis. Univ. Ill. 146 p.

___________. 1965a. Carcass analysis of wild and thermal stressed dickcissels. Wilson Bull. 77:55-70.

Body weights of males averaged significantly greater than females owing to higher water and protein content. Lipid and carbohydrate content did not differ in the two sexes. A night of migration reduced free water content in the birds. Lipid levels decreased during spring molt but not during fall molt. Birds dying under cold stress had neglible lipid content. Birds dying under heat stress had high lipid content but low water content.

___________. 1965b. Digestive efficiency and premigratory obesity of the dickcissel. Auk 82:278-279.

During the premigratory fattening period dickcissels somehow increase either the efficiency of digestion or absorption of food in the gut and thus augment energy storage.

___________. 1965c. Bioenergetics of the dickcissel (Spiza americana). Physiol. Zool. 38:370-389.

__________. 1966. Polygyny in the dickcissel. Auk 83:534-546.

In a dickcissel population having equal numbers of both sexes, 40% of the males were monogamous, 18% polygynous, and 42% bachelors. Males most often obtained additional mates while earlier mates incubated. Mated males had larger territories than unmated males, but monogamous and polygynous male territories did not differ in size. Territories of bachelor and mated males differed in features of vegetative cover. Seventy-eight percent of all nests contained brown-headed cowbird eggs, a factor responsible for failure of 16% of the nests.

__________. 1971. The territory and its density dependent effect in Spiza americana. Auk 88:591-612.

Availability of suitable song perches and of sufficiently dense vegetative cover controlled habitat selection in the dickcissel. At densities of 60 to 70 males per 100 acres, territory size decreased to a minimum of about 0.9 acre. High population densities forced males to defend territories of less suitable vegetation. This sub-optimal environment lowered sex ratios and densities of active nests. Productivity also decreased at high male densities. The possible critical factor in nesting: volume of vegetation providing protection from predation and/or moderation of the nest site microclimate.

MARSHES and SHORES

* Introduction

A number of birds preferentially inhabit the freshwater marshes of the West, a seral habitat occurring throughout the variety of biomes. The similar aspect of all marshes, regardless of location in surrounding communities, accounts for the wide distribution of several marsh-nesting birds. For this reason, we have established a separate classification for these species. We also include in this group those few birds on our list which frequent seacoasts, namely the northwestern crow and the salt-marsh races of the savannah and song sparrow.

These watery environments, part land and part water, yield unusually attractive habitat characterized by ample food and vegetation, unlimited drinking water, and protection from predation. But marshes and shores often follow a narrow, linear pattern as they wind along a stream, or edge the sea. Such limited space for establishing territories demands gregariousness from the birds inhabiting the area. Colonial nesting in these habitats is common. Unfortunately, food supplies may cease abruptly when the lakes and streams freeze in autumn; as colder weather begins, many marsh birds migrate south till spring. The daily cycle of the ocean requires shore birds to adapt their behavioral cycles quite specifically to the tides.

The following list consists of birds which characteristically inhabit the Western marshes:

Tree swallow	Tricolored blackbird
Long-billed marsh wren	Le Conte's sparrow (N. Great Plains)
Yellowthroat	Sharp-tailed sparrow (N. Great Plains)
Yellow-headed blackbird	Swamp sparrow
Red-winged blackbird	Song sparrow

* General

Bolen, Eric G. 1962. Ecology of spring-fed salt marshes. M.S. thesis. Utah State University. 124 p.

Higman, Harry W. and Earl J. Larrison. 1951. Union Bay: The life of a city marsh. Univ. Wash. Press. 315 p.

A marsh in Seattle.

Nelson, N. F. 1955. Ecology of Great Salt Lake marshes. Proc. Utah. Acad. Sci. 32:37-40.

Good brief survey of ecological factors and successions.

Phillips, A. R. 1933. Summer birds of an Arizona marsh. Condor 35:124-125.

8 spp.

Ricklefs, R. E. 1967. Relative growth, body constituents, and energy content of nestling barn swallows and red-winged blackbirds. Auk 84:560-570.

Weller, M. W. and C. S. Spatcher. 1965. Role of habitat in the distribution and abundance of marsh birds. Special Rept. No. 43, Iowa St. Univ., Ames. 31 p.

____________, B. H. Wingfield and J. B. Low. 1958. Effects of habitat deterioration on bird populations of a small Utah marsh. Condor 60:220-226.

Reduction of high density emergents decreased the abundance of marsh-nesting species.

Wilson, Mary F. 1967. Notes on the interspecific behavior relationships of marsh-nesting passerines. Auk 84:118-120.

Observations on interspecific interaction between red-winged blackbird, common grackle, long-billed marsh wren, swamp sparrow, song sparrow, yellow warbler, and yellowthroat. The author discusses the relations of overlapping vs. segregated habitat, nesting territories and forage areas, and the use of interspecific aggression to successfully maintain these species within the confines of a marsh.

Workman, G. W. 1963. An ecological study of the lettoral zone of Bear Lake. Ph.D. thesis. Utah State University. 95 p.

* Apodidae (Swifts)

Legg, Ken. 1956. A sea cave nest of the black swift. Condor 58:183-187.

In California.

* Corvidae (Jays and crows)

Brooks, A. 1942. The status of the northwestern crow. Condor 44:106-167.

* Troglodytidae (Wrens)

Kale, H. W., II. 1965. Ecology and bioenergetics of the long-billed marsh wren Telmatodytes palustris griseus (Brewsteri) in Georgia salt marshes. Publ. Nuttall Ornithol. Club 5.

A major study applicable to comparable western habitat.

Verner, Jared. 1963a. Aspects of the ecology and evolution of the long-billed marsh wren. Ph.D. thesis. Univ. Wash. 175 p.

___________ 1963b. Song rates and polygamy in the long-billed marsh wren. Proc. 13th Int. Ornithol. Congr., 1962: 299-307.

___________ 1964. Evolution of polygamy in the long-billed marsh wren. Evolution 18:252-261.

___________ 1965a. Breeding biology of the long-billed marsh wren. Condor 67:6-30.

Males were polygamous and attempted to attract additional mates to nests built throughout the breeding season. Laying occurred in early morning of successive days. Only females incubated. Attentive periods averaged 8.1 and inattentive periods 7.7 minutes. Incubation periods averaged 15.1 days in length and decreased with advance of the season. Each nestling received food approximately 3.8 times per hour in the a.m. and 3.9 times per hour in the p.m. Number of feedings per hour increased with age of young. Clutch-size differed significantly in closely related areas. Food availability at the time of egg-laying seems to determine clutch size.

___________ 1965b. Time budget of the male long-billed marsh wren during the breeding season. Condor 67:125-139.

Long-billed marsh wrens sang at dawn for a longer period after warm than after colder nights. They searched for food most often in early or mid-afternoon. Singing activity peaked 2-3 days before egg-laying. Adults ate small insects and carried larger ones to the nestlings. Males spent less time seeking food in June than in May, a reflection of increasing abundance of insects with advance of the season.

________ 1971. Survival and dispersal of male long-billed marsh wrens. Bird-Banding 42:92-98.

18.4% of adult male wrens and 12.1% of young birds survived after a year of observation. Distance between nests of adult males in successive years averaged 386 meters. Distance between hatching places and first year nesting sites averaged 1951 meters.

________ and Gay H. Engleson. 1970. Territories, multiple nest-building, and polygyny in the long-billed marsh wren. Auk 87:557-567.

This species practiced polygyny despite the existence of a 1:1 sex ratio. Females may select their mates on the basis of food availability.

Welter, W. A. 1935. The natural history of the long-billed marsh wren. Wilson Bull 97:1-34.

* Icteridae (Blackbirds and orioles)

Albers, Peter H. 1966. Analysis of morning departure patterns in the red-winged blackbird. M.S. thesis. Univ. Guelph, Canada. 61 p.

Allen, A. A. 1914. The red-winged blackbird: A study in the ecology of a cat-tail marsh. Proc. Linn. Soc. NY 24-25:43-128.

A classic early application of ecological concepts to a single species' life history.

Ammann, G. A. 1938. The life history and distribution of the yellow-headed blackbird. Ph.D. thesis. Univ. Mich.

Beer, J. R. and D. Tibbitts. 1950. Nesting behavior of the red-winged blackbird. Flicker 22:61-77.

Behle, W.H. 1940. Distribution and characters of the Utah red-wing. Wilson Bull. 52:234-240.

Bennett, E. V. 1961. Aspects of vocalization in the red=winged blackbird, Agelaius phoeniceus (Linnaeus) as determined by audiospectrographic analysis. Ph.D. thesis. Cornell Univ. 176 p.

Bird, R. D. and L. B. Smith. 1964. The food habits of the red-winged blackbird Agelaius phoeniceus, in Manitoba. Can. Field Nat. 78:179-186.

In a typical prairie marsh.

Brenner, F. 1966a. Energy and nutrient requirements of the red-winged blackbird. Wilson Bull. 78:111-120.

______.1966b. The influence of drought on reproduction in a breeding population of red-winged blackbirds. Amer. Midland Nat. 76:201-210.

______and William F. Malin. 1965. Metabolism and survival time of the red-winged blackbird. Wilson Bull. 77:282-289.

A blackbird had a mean metabolic rate of 6.31 ± 1.83 cc02/g-hr. while resting and 12.46 ± 2.08 cc02/g-hr. while active. After fasting 6 hours, roosting birds had a respiratory quotient of 0.722, which indicated significant fat metabolism.

Brown, Jerram L. 1965. Vocalization evoked from the optic lobe of a songbird. Science 149:1002-1003.

In a red-winged blackbird.

______.1971. An exploratory study of vocalization areas in the brain of the red-winged blackbird (Agelaius phoeniceus). Behaviour 39:91-127.

Case, Neil A. and Oliver H. Hewitt. 1963. Nesting and productivity of the red-winged blackbird in relation to habitat. Living Bird 2:7-20.

Within two weeks after arriving on the breeding grounds, males occupied and defended territories. Marsh territories averaged 0.17 acre in size; upland territories averaged 0.54 acre. Non-breeding of most yearling males produced a high ratio of females to breeding males (1.86:2.44). Females completed nest construction in six days without help from the male. Clutches averaged 3.5 eggs but ranged from one to five. Marsh nests averaged higher in success than upland nests.

Collier, Gerald. 1968. Annual cycle and behavioral relationships in the red-winged and tricolored blackbirds of southern California. Ph.D. thesis. Univ. Calif. 390 p.

The author studied ecological and behavioral factors affecting survival and co-existence in these two close avian relatives; he attempted to determine the behavioral cues by which each species achieves individual, populational, and interspecific recognition. Laboratory investigations analyzed food, gonadal histology, mensural morphology, and behavior. Extensive divergence in red-wing and tricolor has apparently precluded hybridization.

Collins, James M. 1968. The effects of environmental temperature on the rate of development of embryonic red-winged blackbirds. M.S. thesis. Univ. Guelph, Canada. 36 p.

Dyer, M. I. 1968. Respiratory metabolism studies on red-winged blackbird nestlings. Canadian J. Zool. 46:223-233.

Emlen, J. T., Jr. 1941. An experimental analysis of the breeding cycle of the tricolored redwing. Condor 43:209-219.

Fankhauser, D. P. 1964. Renesting and second nesting of individually marked red-winged blackbirds. Bird-Banding 35:119-121.

Fautin, Reed W. 1940. The establishment and maintenance of territories by the yellow-headed blackbird in Utah. Great Basin Nat. 1:75-91.

__________. 1941. Incubation studies of the yellow-headed blackbird. Wilson Bull. 53:107-122.

2 colonies near Provo, Utah.

Francis, W. J. 1971. An evaluation of reported reproductive success in red-winged blackbirds. Wilson Bull. 83:178-185.

Eight redwing nests differed in success between years, localities, ecological habitats, and vegetative form. Nest height, water depth, and timing of initiation of nesting did not significantly affect nest success.

Haigh, C. R. 1968. Sexual dimorphism, sex ratios, and polygyny in the red-winged blackbird. Ph.D. thesis. Univ. Wash. 116 p.

Hintz, Jacob V. 1968. Daily rhythms and seasonal changes in the quantity and calorific equivalents of food ingested by the adult red-winged blackbird. M.S. thesis. Univ. Guelph. 68p.

Holcomb, Larry C. 1970. Prolonged incubation behavior of red-winged blackbird incubating several egg sizes. Behaviour 36:74-83.

The paper summarizes new records for prolonged incubation of eggs and discusses the adaptive advantages of a period of incubation only a few days longer than the normal incubation period. Non-passerines tend to remain on unhatched eggs for a longer period of time relative to normal incubation length than do passerines. Experiments performed on incubating wild females determined some of the roles of the egg as a stimulus in prolongation of incubation.

__________. 1971. Nest building and egg laying by red-winged blackbirds in response to artificial manipulations. Auk 88:30-34.

Few birds abandoned nests that the author altered by removing or adding nest material. Most females accepted artificially completed nests. Redwing response resembled that of tricolored blackbirds (Emlen, 1941). The redwing appears to lay a clutch of determinate number.

__________ and G. Twiest, 1968a. Ecological factors affecting nest-building in red-winged blackbirds. Bird-Banding 39:14-22.

Nest building averaged three days in duration. A delay of one to five days separated nest completion and egg laying. The birds utilized twenty-three species of primary nest supports. Average height of nest-supporting vegetation varied seasonally. Nesting success increased with increased nest height: from 17.2% for nests built under 24 inches to 34.8% for those above 48 inches. Successful nests did not differ significantly in size from unsuccessful nests. Birds built deeper nests at elevations over 42 inches.

__________ and __________. 1968b. Red-winged blackbird nestling growth compared to adult size and differential development of structures. Ohio. J. Sci. 68:277-284.

__________ and __________. 1970. Growth rates and sex ratios of red-winged blackbird nestlings. Wilson Bull. 82:294-303.

Holm, C. H. 1973. Breeding sex ratios, territoriality, and reproductive success in the red-winged blackbird. Ecology 54:356-365.

Adaptive significance of polygyny and nest-site selection.

Knowlton, G. F. 1947. Some insect food of the yellow-headed blackbird. Auk 64:459.

In Utah.

Lack, D. and J. T. Emlen, Jr. 1939. Observations on breeding behavior in tricolored blackbirds. Condor 41:225-230.

Lewies, R. W. 1966. Respiratory metabolism in the red-winged blackbird (Agelaius phoeniceus) in relation to ambient temperature. M.S. thesis. Univ. Guelph, Canada. 32 p.

__________ and M. I. Dyer. 1969. Respiratory metabolism of the red-winged blackbird in relation to ambient temperature. Condor 71:291-298.

A curvilinear relationship existed between metabolism and ambient temperature in daytime conditions, and a linear relationship in nighttime. Daytime and nighttime standard metabolic rates differed significantly. Males had lower respiratory quotient values than females. This difference suggests a sexual difference in metabolism.

Linford, Jean H. 1934. The life history of the thick-billed red-winged blackbird. Agelaius phoeniceus fortis Ridgway in Utah. M.A. thesis. Univ. of Utah.

Meanley B. 1961. The distribution, ecology and population dynamics of blackbirds. Patuxent Wildlife Research Center, unpublished report (19 Jan).

__________ and Robert T. Mitchell. 1966. Selected bibliography on the red-winged blackbird. USF&WS, Spec. Sci. Rept.:Wild. 97. 12 p.

Lists (by author) 128 references on the life history, biology, economic status, and control of the red-winged blackbird.

Miller, R. S. 1968. Conditions of competition between red-wings and yellow-headed blackbirds. J. Anim. Ecol. 37:43-61.

Mott, Donald F., Richard R. West, John W. DeGrazio, and Joseph L. Guarino. 1972. Foods of the red-winged blackbird in Brown County, South Dakota. J. Wildl. Mgmt. 36:983-987.

The authors analyzed gizzard contents of 702 blackbirds collected from 1959-1965 during spring, summer and early fall in northeastern South Dakota. Seeds of bristle grass (Setaria spp.) occurred most frequently (68% of the gizzards) and in the largest quantity (23% volume). Birds ate corn more frequently (30%) and in larger amounts (11%) than all other cultivated grains. Other important foods included oats, wheat, and millet. Animal matter - mostly beetles (Coleoptera) - constituted 25% of the total volume consumed, and increased in incidence and volume (96% and 45% respectively) during the nesting period. Grit comprised 14% of the diet.

Nero, R. W. 1956. A behavior study of the red-winged blackbird: Part I. -- Mating and nesting activities; Part II -- Territoriality. Wilson Bull. 68:5-37, 129-150.

Males usually exposed and erected their red wing-coverts during display. "Song-spread" accompanied by loud vocalizations occurred often. Displays functioned in territorial defense and in sexual encounters between males and females. Pair formation began when the female entered the male's territory, and lasted only during the breeding period. Polygyny was common and averaged two females per male. In primary courtship behavior the male slowly flew away from the female down into the cattails, displaying with his wings over his back. He then crawled through the cattails bowing and picking at nesting material. Males defended territories (average: one-twelfth acre) from all redwings except their mate. Neighbors from previous years demonstrated the least aggression. Throughout the breeding period new males appeared and contested for vacated areas. Females formed sub-territories within the boundaries of their mate's territory, and showed variable seasonal persistence in nesting sites and choice of mates. Some frequently changed both.

__________. 1964. Comparative behavior of the yellow-headed blackbird, red-winged blackbird, and other Icterids. Wilson Bull. 75:376-413.

__________ and J. T. Emlen. 1951. An experimental study of territorial behavior in breeding red-winged blackbirds. Condor 53:105-116.

Males recognized sharp and stable territorial boundaries definable within a few feet. They defended their territories from intruding alien males, females, or fledglings except when the latter remained quiet. They tolerated the experimental introduction of alien nests. Males did not extend their aggressiveness beyond territorial boundaries even in defense of their mates or nests in neighboring territories. Females freely followed their nest when the authors moved them experimentally through the territory of the mate, but assumed a subordinate attitude and followed with difficulty when their nests were transported across territorial boundaries. Females took no part in defense of the male territory but opposed encroachment of alien females on their nest area. Males eventually accepted alien females which persistently invaded their territories to reach transported nests. Harem mates (female residents of a single male territory) tolerated each other at close quarters after nesting had begun but repulsed actual visits to the nest. Members of neighboring harems tolerated each other after a period of habituation.

Nice, M. M. 1950. Development of a redwing (Agelaius phoeniceus). Wilson Bull. 62:87-93.

Orians, G. H. 1960. Autumnal breeding in the tricolored blackbird. Auk 77:379-398.

_____________. 1961a. Social stimulation within blackbird colonies. Condor 63:330-337.

The nature of the marsh and its surrounding vegetation, rather than the size of the breeding population, determined varations in timing and synchrony in both California red-winged and tricolored blackbirds. Nesting success in both species did not depend on colony size. Group stimulation may operate in nomadic flocks in determining initiation of breeding. But the social stimulation theory fails to consider the selective value of changes in timing and synchrony and neglects important ecological aspects of the environment which may vary spatially and temporally.

_____________. 1961b. The ecology of blackbird (Agelaius) social systems. Ecol.Monographs 31:285-312.

This California study describes differences in social organization of the closely related and morphologically similar red-winged and tricolored blackbirds. Both species are highly gregarious. The red-wing is migratory, the tri-color non-migratory, but nomadic. Outside of the breeding season, redwings and tricolors commonly flock and roost together. The tricolor has a colonial nesting system, the redwing a territorial system. The tricolor forms immense nesting colonies often numbering 50,000-100,000 nests. Food supply determines the location and size of these nesting colonies, which thus may shift annually. Although both species begin nesting in late April and early May, the male redwing begins to establish territories in January, while the male tricolor defends a territory only during the week of nest building. Both male and female tricolors feed their young, while the female redwing rarely receives help from the male. Extreme synchrony characterizes most tricolor colonies; in redwing colonies nesting continues over long periods of time. The colonial system of the tricolor demands more energy but less time than the territorial system of the redwing. The redwing's territorial behavior strongly limits density, forcing part of the population into less suitable areas and probably totally preventing some individuals from breeding. Tricolored territories are uniformly small, unless low vegetation density precludes the normal high concentration of nests. Territorial behavior does not limit density. Instead, the important variable, colony size, changes with environmental conditions. The author concludes by discussing evolution of mating and social systems.

__________. 1966. Food of nestling yellow-headed blackbirds, Cariboo Parklands, British Columbia. Condor 68:321-337.

__________ and Gerald Collier, 1963. Competition and blackbird social systems. Evolution 17:449-459.

__________ and G. M. Christman. 1968. A comparative study of the behavior of red-winged, tricolored, and yellow-headed blackbirds. Univ. Calif. Publ. Zool. 84:1-83.

This paper analyzes the display and song upon which breeding colonies of these species base social organization. In these species males establish and maintain spacing between nests and signal the approach of disturbances. Accordingly, the males have more communication signals and use them more frequently. Males communicate most of the information responsible for coordination of breeding systems. Great seasonal differences exist in numbers of displays and vocalizations since communication needs decrease in the non-breeding season. The birds maintain only the most inconspicuous displays year-long. Selection thus has favored methods of communication which involve the least expenditure of energy by, and least risk to, the communicator at all times outside the breeding season.

__________ and Henry S. Horn. 1969. Overlapping foods and foraging of four species of blackbirds in the potholes of central Washington. Ecology 50:930-938.

Western meadowlarks and Brewer's, red-winged, and yellow-headed blackbirds specialized little and overlapped much in diet.

Parker, Glenn H. 1968. On the development of temperature regulation in red-winged blackbird (Agelaius phoeniceus) nestlings from two habitats. M. S. thesis. Univ. Guelph. 48 p.

Payne, Robert B. 1965. The breeding seasons and reproductive physiology of tricolored blackbirds and redwinged blackbirds. Ph.D. thesis. Univ. Calif., Berkeley. 284 p.

Breeding patterns in these two species differ in physiological control of sexual activity. Rainfall, abundance of food, and daylength apparently combine to control gonadal development and nesting in tricolored blackbirds. Redwings perceive rainfall and food as temporary features of the environment; these parameters thus have little value to redwings in predicting future environmental conditions. The abbreviated tricolor nesting schedule, from the beginning of gonadal development and courtship to hatching, takes considerably less time than the prolonged redwing breeding season.

__________. 1969. Breeding seasons and reproductive physiology of tricolored and redwinged blackbirds. Univ. Calif. Publ. Zool. 90.114 p.

(see Payne, 1965)

Peek, Frank W. 1971. Seasonal change in the breeding behavior of the male redwinged blackbird. Wilson Bull. 83:383-395.

Seasonal changes in the behavior of male red-wings correlate with seasonal changes in the difficulty the male experiences in maintaining territory.

__________, E. Franks, and O. Case. 1972. Recognition of nest, eggs, nest site, and young in female red-winged blackbirds. Wilson Bull. 84:243-249.

Females showed strong attachment to nest sites throughout nesting. They preferred to remain at original nest sites even after the authors replaced the nest, eggs, and young (under 7 days old) with counterparts from other redwing nests. When the authors displaced young older than 10 days from the nest site, females abandoned the site and followed the young. Females thus learn to recognize their young during the nestling stage. Females first showed signs of young-recognition on the seventh day after hatching. The location call emitted by older young may stimulate learning of recognition behavior.

Robertson, Raleigh J. 1971. Optimal niche space of the redwinged blackbird. Ph.D. thesis. Yale Univ.

__________. 1972. Optimal niche space of the redwinged blackbird (Agelaius phoeniceus):I. Nesting success in marsh and upland habitat. Canadian J. Zool. 50:247-263.

The author examined nesting success to determine survival value of marsh and upland habitats. Marsh populations suffered less predation and achieved greater success. Predation pressure decreased as water depth under the nest increased. Synchrony and density of nesting, determined by the structure and phenology of the marsh, had a swamping effect on predator populations. Territoriality limited the breeding density. Where sympatric, yellow-headed blackbirds excluded redwings from their optimal niche.

__________. 1973a. Optimal niche space of the redwinged blackbird: Spatial and temporal patterns of nesting activity and success. Ecology 54:1085-1093.

Colony size, synchronous nesting, and predation on marsh and upland habitats.

__________. 1973b. Optimal niche space of the redwinged blackbird:III. Growth rate and food of nestlings in marsh and upland habitat. Wilson Bull. 85:209-222.

Nesting in the two habitats resulted in the same mean weight at fledging. A higher absolute abundance of food in marshes makes possible large, dense, nesting colonies.

Royall, W. C. Jr., J. L. Guarino, and J. F. Besser. 1972. Movements of redwings color-marked in north-central Colorado in 1971. Colo. Field Ornith. 14:20-23.

__________, __________, J. W. DeGrazio, and A. Gammell. 1971. Migration of banded yellow-headed blackbirds. Condor 73:100-106.

Most yellow-heads leave the Dakotas in August and arrive in south-central Mexico in September. The birds return to the Dakotas from April through May. Banding data from other western states indicate that most birds winter in Mexico. None banded west of the Rockies were recovered farther south than Sinaloa and Chihuahua.

Smith, Douglas G. 1972. The role of the epaulets in the red-winged blackbird social system. Behaviour 41:251-268.

The author captured territorial male red-wings and blackened their epaulets with Nyanzol-D, a permanent black dye. 64% of the males with black epaulets lost their territories, while 8% of the control males lost theirs. Males with epaulets blackened prior to pair formation still "attracted" females and mated successfully. Epaulets thus function as a territoral threat between rival males but have little if any role in intersexual encounters. Epaulets probably evolved in response to intrasexual (epigamic) selection pressure.

Snelling, J. C. 1968. Overlap in feeding habits of red-winged blackbirds and common grackles nesting in a cattail marsh. Auk 85:560-585.

In the same marsh studied by Wiens (1965), the present author observed nesting asynchrony in grackles and redwings. They did not compete for food, since both are unspecialized feeders foraging on a diversity of plants and insects. Differing forage locations contributed to the lack of competition for food. The two species did compete for space, however.

Vandenburgh, J. G. and D. E. Davis. 1962. Gametocidal effects of triethylenemelamine on a breeding population of redwinged blackbirds. J. Wildl. Mgmt. 26:366-371.

Voigts, D. K. 1973. Food niche overlap of two Iowa marsh icterids. Condor 75:392-399.

Nestling red-winged and yellow-headed blackbirds consumed mostly invertebrates -- particularly aquatic insects. Diets responded to the changing rate of odonate emergence as the nesting season progressed. Terrestrial foods served as supplementary energy sources at low odonate emergence rates. Differences in habitat selection, foraging behavior, and evolution of mutually exclusive territories reduce niche overlap, and therefore competition.

Wallace J. H., and O. W. Olsen. 1966. Endoparasites of the red-winged blackbird (Agelaius phoeniceus L.) in Colorado. Bull. Wildl. Disease Assoc. 2:80.

Wiens, J. A. 1965. Behavioral interactions of red-winged blackbirds and common grackles on a common breeding ground. Auk 82:356-374.

These two species nested together in a cattail marsh -- typical, optimal habitat for redwings, and unusual and marginal habitat for grackles. Redwings initiated most interactions between the two species. They generally tolerated grackles on redwing singing perches at the marsh edge, but attacked or displayed to them on penetration of the marsh, especially, early in the season. Grackles rarely acted aggressively towards redwings, and their presence had no effect on redwing reproductive activities. Grackle nest location and approach catered to redwing territories; territories of the two species were mutually exclusive.

Willson, Mary F. 1964. Breeding ecology of the yellow-headed blackbird. Ph.D. thesis. Univ. Wash. 132 p.

__________. 1966. Breeding ecology of the yellow-headed blackbird. Ecol. Monographs 36:51-77.

Foraging areas and diurnal patterns in feeding rate of females feeding nestlings depended on activity patterns of the major prey, damselflies. Mortality of nestlings increased during cold and rainy weather; nestlings required increased food intake and/or increased brooding at these times. Males holding territories with a considerable length of vegetation/open water interface acquired more females than those with little "edge". Females nesting on small territories with proportionately less emergent vegetation fledged more young, on the average, than females on larger territories with larger, denser patches of vegetation. Polygynous adult males often fed nestlings, but their help did not increase fledgling success, perhaps owing to relaxation in attentiveness of their mate.

__________ and Gordon H. Orians. 1964. (The regulation of numbers in natural populations): Comparative ecology of red-winged and yellow-headed blackbirds during the breeding season. Proc. 16th Intern. Congr. Zool. 3:342-346.

Wright, P. L. and M. H. Wright. 1944. The reproductive cycle of the male red-winged blackbird. Condor 46:46-59.

* Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Anderson, Kathleen S., Robert J. Tonn, Elizabeth J. Randall, and Andrew Main. 1967. The swamp sparrow, Melospiza georgiana, as a host for longterm arbovirus studies. Bird-Banding 38:80.

The authors call attention to the value of swamp sparrows as indicator hosts for eastern and western encephalitis.

Cade, T. J. and G. A. Bartholomew. 1959. Sea water and salt utilization by savannah sparrows. Physiol. Zool. 32:230-238.

Harris, Margaret A. and Robert E. Lemon. 1972. Songs of song sparrows (Melospiza melodia): Individual variation and dialects. Canadian J. Zool. 50:301-309.

__________ and __________. 1974. Songs of song sparrows: Reactions of males to songs of different localities. Condor 76:33-44.

Johnston, R. F. 1954. Variation in breeding season and clutch size in song sparrows of the Pacific Coast. Condor 56:268-273.

__________. 1956a. Population structure in salt marsh song sparrows: Part I. Environment and annual cycle. Condor 58:24-44.

Environmental factors affecting time of breeding, clutch size, territorial behavior, sedentariness and dispersal of young.

__________. 1956b. Population structure in salt marsh song sparrows: Part II. Density, age structure, and maintenance. Condor 58:254-272.

Song sparrows at medium densities averaged about one pair per acre. Along the sloughs, where the birds spent all their time, density varied from 6-10 pairs per acre, depending on the absolute number of birds on the marsh and the complexity of vegetation. Minor shifts in density occurred, the largest a 24% annual increase. Density varied directly as a function of the preceding year's productivity. Natality rates varied from 7.5 to 9.1 total eggs per pair per season, independent of clutch size and productivity. Mortality rates varied from 56% during the first three weeks to about 80-85% during the 3rd to 52nd week, averaging 43% per year for adult birds. More than half of birds surviving to the age of one month had at least one sibling also surviving to that age. Clutch size did not determine probability of survival. Productivity varied from 2.0 to 5.8 fledglings per pair per season. Mortality factors for song sparrows included rodent predation, high tide water, death or desertion by the adults, infertility and embryonic death, and storms. Predation, tidal floods, and desertion caused about 80% of total mortality to eggs and nestlings.

Marshall, Joe T. 1948a. Ecologic races of song sparrows in the San Francisco Bay region. Ph.D. thesis. Univ. Calif.

__________. 1948b. Ecologic races of song sparrows in the San Francisco Bay region. Part I: Habitat and abundance. Condor 50:193-215.

Mulligan, James Anthony. 1963. Physical analysis of variation and development in the song of Melospiza melodia. Ph.D. thesis. Univ. Calif. 182 p.

__________. 1964. An experimental study of the development of song in the song sparrow. Proc. 16th Intern. Congr. Zool. 2:22.

Normal song development depends in part on the stimulus of adult song. A sensitive period of learning exists in the first few months of life during which auditory feedback is essential.

__________. 1966. Singing behavior and its development in the song sparrow. Univ. Calif. Publ. Zool. 81. 76 p.

Murray, Bertram G., Jr. 1967. A comparative study of the Leconte's and sharp-tailed sparrows with comments on the ecology of sympatric species. Ph.D. thesis. Univ. Mich. 127 p.

Tradition accounts for differences in habitat, bill size, and foraging behavior by regarding them as adaptations that permit sympatry and that result from interspecific competition for food (or some other resource than space). This paper proposes that these differences result from interspecific territoriality or aggression.

____________. 1968. The relationships of sparrows in the Genera Ammodramus, Passerherbulus, and Ammospiza with a description of a hybrid LeConte's x sharp-tailed sparrow. Auk 85:586-593.

Molt, plumage, and voice differences affecting relationship of the species.

____________. 1969. A comparative study of the LeConte's and sharp-tailed sparrows. Auk 86:199-231.

LeConte's sparrow is territorial, the sharp-tailed sparrow non-territorial. LeConte's acts aggressively towards the latter at all times. The non-territorial behavior adaptation of the sharp-tail permits it to breed successfully in habitats within which territorial LeConte's have already established territories.

Nice, M. M. 1937, 1943. Studies in the life history of the song sparrow. Part I: A population study of the song sparrow. Part II: The behavior of the song sparrow and other passerines. Trans. Linn. Soc. N.Y. 4:1-227; 6:1-329. (reprinted in 1964 by Dover Press in paperback).

A classic, major life history study that examines all phases of the biology of the species. Volume I deals with the song sparrow and its environment: its ecology, migration, territory, and reproduction and survival. Volume II examines the behavior of passerine birds in general, using the song sparrow as an example. The book follows the bird from hatching to maturity and through its own parental activities.

Poulson, T. L. 1965. Countercurrent multipliers in avian kidneys. Science 148:148.

In the salt marsh race of the Savannah sparrow, the kidney contains unusually large numbers of nephrons possessing loops of Henle. This facilitates efficient water-salt balance in a salty environment.

____________. 1969. Salt and water balance in seaside and sharp-tailed sparrows. Auk 86:473-489.

____________ and George A. Batholomew. 1962. Salt balance in the savannah sparrow. Physiological Zool. 35:109-119.

Two races of savannah sparrows differed in their abilities to obtain physiologically useful water from saline solutions. The beldingi race (restricted to salt marshes) voluntarily ingested 3.5 times as much salt as the brooksi race (which commonly winters in salt marshes but breeds in fresh-water marshes).

Suthers, R. A. 1960. Measurement of some lake-shore territories of the song sparrow. Wilson Bull. 72:232-237.

Swarth, H. S. 1936. Savannah sparrow migration routes in the Northwest. Condor 38:30-32.

Tompa, F. S. 1962. Territorial behavior: The main controlling factor of a local song sparrow population. Auk 79:687-697.

Walkinshaw, L. H. 1937. LeConte's sparrow breeding in Michigan and South Dakota. Auk 54:309-320.

RIPARIAN COMMUNITIES: Fresh-water streams, lakes and ponds

* Introduction

In arid regions, the strip of woodland and thicket along streamsides may provide the only dense, moist vegetation for miles around. A characteristic group of birds occurs throughout the West in these riparian groves. Adaptation to river-bottom habitat allows for wide distribution, yet such reliance on water and dense, water-dependent cover limits the range of these species within each biome. Even so, streams of deserts, mountains, or prairies can all meet the habitat requirements of these riparian community birds.

Birds from our orders included within this class involve three groups: thicket dwellers, insect feeders drawn to the streamside food supply, and truly water-dependent birds, a designation for which only the kingfishers qualify. We have classified research on riparian community birds that stay primarily within one biome under the appropriate biome classification. The species in the following list live along streams in many parts of the West:

Yellow-billed cuckoo	Swainson's thrush
Black-chinned hummingbird	Veery
Belted kingfisher	Bell's vireo
Common flicker	Yellow warbler
Lewis woodpecker	Yellowthroat
Eastern kingbird	Yellow-breasted chat
Black phoebe	Wilson's warbler
Tree swallow	American redstart
Bank swallow	Northern oriole
Rough-winged swallow	Brown-headed cowbird
Cliff swallow	Summer tanager
Black-billed magpie	Blue grosbeak
Common crow	Varied bunting
Gray catbird	Painted bunting
American robin	American goldfinch

* General

Beer, J. R., L. D. Frenzel, and N. Hansen. 1956. Minimum space requirements of some nesting passerine birds. Wilson Bull. 68:200-209.

The red-eyed vireo, yellow warbler, and song sparrow (particularly the latter) can successfully utilize a smaller space to raise their young when strictly physical barriers determine boundaries than when intraspecific conflict determines invisible boundaries. Song sparrows successfully nested on islands one-tenth the size of areas reported minimum for normal habitat.

Ingles, Lloyd G. 1950. Nesting birds of the willow-cottonwood community in California. Auk 67:325-332.

Martin, S.G., P.H. Baldwin, and E. B. Reed. 1974. Recent records of birds from the Yampa Valley, northwestern Colorado. Condor 76:113-116.

Newhouse, V. F. 1960. Birds of selected irrigated river valleys of west-central Idaho. Murrelet 41(1):1-6.

Sooter, C. A., E. E. Bennington, and L. B. Daniels. 1954. Multiple use of cliff swallows nests by bird species. Condor 56:309.

Say's phoebes, rosy finches, and canyon wrens utilized the mud nests, probably for shelter.

* Cuculidae (Cuckoos)

Preble, Norman A. 1957. Nesting habits of the yellow-billed cuckoo. American Midl. Nat. 57:474-482.

* Alcedinidae (Kingfishers)

Burland, Lee J. 1947. Air speed of belted kingfisher. Wilson Bull. 59:113.

Cornwell, George W. 1963. Observations on the breeding biology and behavior of a nesting population of belted kingfishers. Condor 65:426-431.

Eipper, Alfred W. 1956. Differences in vulnerability of the prey of nesting kingfishers. J. Wildl. Mgmt. 20:177-183.

Fish and crayfish remains occurred in equal abundance in food remains from each of 2 kingfisher nests. The two nests contained 325 and 462 prey types respectively. Rhinichthys spp. comprised 6% and Compostoma anomalum 54% of the fishes in the nest remains, but 77% and 5%, respectively, of fishes in the adajacent stream. All crayfish in the nest remains were Cambarus spp., whereas the stream population consisted of 27% Cambarus spp. and 73% Orconectes sp. Differences in prey vulnerability to kingfisher predation depended in part on prey size selected by foraging birds and in part on increased vulnerability of certain prey owing to their spawning or post-spawning behavior.

Maddock H. J. 1925. Nesting of the western belted kingfisher, Ceryle alcyon caurina, on Puget Sound, Washington. Murrelet 6:59-60.

Mousley, H. 1938. A study of the home life of the eastern belted kingfisher. Wilson Bull. 50:3-12.

Contains important life history information.

Salyer, J. C., II and K. F. Lagler. 1949. The eastern belted kingfisher, Megaceryle alcyon alcyon (Linnaeus), in relation to fish management. Trans. Amer. Fisheries Soc. 76:97-117.

Van Rossem, A. J. 1944. Report of kingfisher in Arizona catching a lizard. (in) Minutes of Cooper Club meetings. Condor 46:92.

* Tyrannidae (Tyrant flycatchers)

Kinsey, E. C. 1935. Parental instincts in black phoebes. Condor 37:277-278.

Oberlander, G. 1939. The history of a family of black phoebes. Condor 41:133-151.

* Hirundinidae (Swallows)

Austin, O. L., Jr. and S. H. Low. 1932. Notes on the breeding of the tree swallow. Bird-Banding 3:39-44.

Berger, L. K. 1938. Nest life of the bank swallow. Wilson Bull. 50:122-137.

Chapman, L. B. 1935, 1939, 1955. Studies of a tree swallow colony. Bird-Banding 6:45-57; 10:61-72; 26:45-70.

Definitive.

Emlen, J. T., Jr. 1952. Social behavior in nesting cliff swallows. Condor 54:177-199.

This detailed study of four colonies near Moran, Wyoming emphasizes positive and negative social responses and their balance in foraging, loafing, and nesting activities. Foraging aggregations contained members of all four colonies, drifting as a unit. The evolution of colonial nesting in the cliff swallow may have depended on the rather exacting requirements of the species for nesting sites and the scarcity of suitable situations before construction of bridges and other artifical sites by white man.

__________. 1954. Territory, nest building, and pair formation in the cliff swallow. Auk 71:16-35.

Small territory size (a few inches surrounding the opening of the mud nest), simultaneity of activities, and strong gregariousness in cliff swallows all intensify the importance of territory in pair formation. Essential features of nesting habitat appear to include (1) an open foraging area, (2) a vertical substrate with an overhang for nest attachment, and (3) a supply of mud suitable for nest construction. The author describes nests and nest construction in detail.

Farber, Harvey, 1972. Evidence of two tree swallow females sharing the same nest box. Wilson Bull. 84:204.

Two females and one male attended a nest in a tree swallow box. The nest contained eight eggs, and later, eight young.

Gaunt, Abbot Stott. 1963. Fossorial adaptations in the bank swallow, Riparia riparia (L.). Ph.D. thesis. Univ. Kansas. 96 p.

Kohls, Glen M. 1947. Notes on the tick, Ixodes howelli Cooley and Kohls, with descriptions. J. Parasitol. 33:57-61.

This tick occurred with other parasites on cliff swallows in California.

Kuerzi, R. G. 1941. Life history studies of the tree swallow. Proc. Linn. Soc. N.Y. 52-53:1-52.

Low, S.H. 1933. Further notes on the nesting of the tree swallow. Bird-Banding 4:76-87.

Lunk, W. A. 1962. The rough-winged swallow. Publ. Nutall. Ornith. Club 4. 155 p.

Covers 4 seasons of field work in Michigan.

Mayhew, Wilbur W. 1958. The biology of the cliff swallow in California. Condor 60:7-37.

An intensive study based on 8 years of research and 18,004 banded birds.

__________. 1963. Homing of bank swallows and cliff swallows. Bird-Banding 34:179-190.

Bank and cliff swallows did not fly immediately after release at a distance from the colony. Those returning apparently travelled at a leisurely speed. Cliff swallows released at night homed as well as those released in the daytime. Males and females did not differ in homing ability. Stage in the breeding cycle had no effect on an individual's performance.

Myres, M. T. 1957. Clutch size and laying dates in cliff swallow colonies. Condor 59:311-316.

Colonies at Moran, Wyoming and in British Columbia.

Peterson, Arnold J. 1955. The breeding cycle in the bank swallow. Wilson Bull. 67:235-286.

Ricklefs, R. E. 1972. Latitudinal variation in breeding productivity of the rough-winged swallow. Auk 89:826-836.

Immature to adult ratios peaked in the temperate-zone race, serripennis. The ratio increased fourfold from the equator to 40° N Latitude. Variation in productivity seems to depend on variation in nesting success, which decreases with latitude towards the equator. The author estimated minimum adult survival rate necessary to maintain the population at 33% per year at 40° N and 67% per year at the equator.

Sargent, Theodore, D. 1962. A study of homing in the bank swallow (Riparia riparia). Auk 79:234-246.

The author conducted three summers of homing experiments using color-marked bank swallows. Percentage returns decreased with increasing distances. Swallows released at distances less than 50 miles from home headed homeward at takeoff, while those released at distances beyond 50 miles showed a random scatter of initial takeoff headings. Upon release, birds showed no tendency to fly in any one compass direction. Homing velocities increased at shorter distances. The paper also discusses initial headings of birds with respect to wind direction and preferences for home direction in relation to visibility.

Speich, Steven. 1971. Collyriclum faba: A new host and distributional record from California. Auk 88:668-669.

Cliff swallows contained the trematode, C. faba, in subcutaneous cysts.

Stocek, R. F.. 1970. Observations on the breeding biology of the tree swallow. Cassinia 52:3-20.

Stoner, D. 1936. Studies on the bank swallow. Roosevelt Wildlife Ann. 9:122-233.

___________. 1945. Temperature and growth studies of the northern cliff swallow. Auk 62:207-216.

Storer, T. I. 1927. Three notable nesting colonies of cliff swallows in California. Condor 29:104-108.

* Corvidae (Jays and crows)

Jones, Robert E. 1960. Activities of the magpie during the breeding period in southern Idaho. Northwest Sci. 34 (1):18-25.

Magpies roosted in winter on islands and along the edges of Wilson Lake Reservoir in the taller clumps of willows. Winter activities ceased in late March; by the second week in April, practically no birds used the roosts. Birds built nests in February and March in willow trees and taller sagebrush. Hatching peaked about May 1. Magpies ate mostly insects and carrion. Soon after the young magpies left the nests, the birds left the nesting sites and formed foraging and roosting flocks.

* Mimidae (Mockingbirds and thrashers)

Darley, J. A., D. M. Scott, and N. K. Taylor. 1971. Territorial fidelity of catbirds. Canadian J. Zool. 49:1465-1478.

Nickell, W. P. 1965. Habits, territory and nesting of the catbird. American Midland Natur. 73:433-478.

Oelke, Hans and Peter H. Klopfer. 1970. Light as a stimulus factor in the selection of biotopes by catbirds (Dumetella carolinensis, Mimidae). J. Ornithol. 111(3/4):357-361. (In German w/English summ.).

Lab studies on habitat selection by catbirds proved varying intensities of light of less importance than size and shape of foilage.

Thompson, William L. and Paul L. Jane. 1969. An analysis of catbird song. Jack-Pine Warbler 47:115-125.

Catbirds have a large but limited vocal repertory. Five minutes of singing by one catbird included 170 syllable patterns; the complete repertory probably included at least 180 patterns. These patterns seem sung in random order.

* Turdidae (Thrushes)

Day, K. C. 1953. Home life of the veery. Bird-Banding 24:100-106.

* Vireonidae (Vireos)

Barlow, Jon C. 1962. Natural history of the Bell vireo, Vireo bellii Audubon. Univ. Kansas Museum Nat. Hist. Publ. 12:241-296.

Description of habitat, behavior, breeding biology and seasonal movements in Kansas.

____________. 1964. Swaying display of a female Bell's vireo. Auk 81:89-90.

First known occurrence of swaying behavior in females as well as males.

Hibbard, Edmund A. and Paul D. Kline. 1971. Nesting of Bell's vireo in North Dakota. Wilson Bull. 83:202-203.

* Parulidae (Wood warblers)

Behle, W. H. 1950. Clines in the yellowthroats of western North America. Condor 52:193-219.

Benson, M. H. 1939. A study of the American redstart (Setophaga ruticilla Swainson). M. S. thesis. Cornell Univ.

Borror, Donald J. 1967. Songs of the yellowthroat. Living Bird 6:141-161.

An analysis of the recorded songs of 411 yellowthroats representing 10 North American subspecies. Songs varied geographically in the number of notes per phrase, in complexity of notes and phrases, and in length of phrases.

Ewert, David N. and Wesley E. Lanyon. 1970. The first prebasic molt of the common yellowthroat (Parulidae). Auk 87:362-363.

The authors disagree with the traditional conclusion that the yellowthroat differs from other wood warblers in having a complete postjuvenal molt.

Ficken, Millicent S. 1960. Behavior of the American redstart, Setophaga ruticilla (Linnaeus). Ph.D. thesis. Cornell Univ. 166 p.

An analysis of maintenance activities and agonistic and sexual behavior of the American redstart. The author analyzes displays in terms of causation, function, and biological significance.

____________. 1962a. Maintenance activities of the American redstart. Wilson Bull. 74:153-165.

Discussion of feeding behavior of adults and ontogeny of stretching, scratching, and sleeping postures.

____________. 1962b. Agonistic behavior and territory in the American redstart. Auk 79:607-632.

The author describes two general categories of agonistic displays: defense of individual distance and defense of territory. Males defend an area against other males, while females defend against females and other small species. Males use both visual and vocal displays in territorial defense. Two main song types occur, with a frequency change during the reproductive season.

____________ and R. W. Ficken. 1962. Some aberrant characters of the yellow-breasted chat, Icteria virens. Auk 79:718-719.

____________ and ____________. 1965. Territorial display as a population-regulating mechanism in the yellow warbler. Auk 82:274-275.

Two nearby males displaced a singing male. The displaced male appeared unmated, and lacked a suitable singing perch. The trio of males did not fight; the displaced male succumbed to display alone.

____________ and ____________. 1966. Notes on mate and habitat selection in the yellow warbler. Wilson Bull. 78:232-233.

Male yellow warblers selected territories with and without low shrubbery. Males with low shrubbery in their territories obtained mates first.

Frydendall, Merrill J. 1967. Feeding ecology and territorial behavior of the yellow warbler. Ph.D. thesis. Utah State Univ. 100 p.

Harrison, H. H. 1951. Notes and observations on the Wilson's warbler. Wilson Bull. 63:143-148.

Hofslund, Pershing B. 1954. A life history study of the yellowthroat, Geothlypis trichas. Ph.D. thesis. Univ. Mich. 186 p.

____________. 1960. A life history of the yellowthroat, Geothlypis trichas. Proc. Minn. Acad. Sci. 27:144-174.

A careful 2-year study in Minnesota and Michigan.

Ickes, Roy A. and Millicent S. Ficken. 1970. An investigation of territorial behavior in the American redstart utilizing recorded songs. Wilson Bull. 82:167-176.

Before the male redstart mated, he defended the central area of his territory with maximum vigor; after mating, he defended all parts equally.

McCaskie, Guy. 1970. The American redstart in California. Calif. Birds 1:41-46.

Morse, D. H. 1967. The contexts of songs in the yellow warbler. Wilson Bull. 77:444-455.

Petrides, G. A. 1938. A life history study of the yellow-breasted chat. Wilson Bull. 50:184-189.

Schrantz, F. G. 1943. Nest life of the eastern yellow warbler. Auk 60:367-387.

An important life history.

Stewart, Robert E. 1953. A life history study of the yellowthroat. Wilson Bull. 65:99-115.

Stewart, Robert M. 1969. The Wilson's warbler at Point Reyes. Point Reyes Bird Observatory Bull. 12:2-9.

Data on 388 banded birds and 48 recaptures includes information on spring and fall migration, molt and fat development, breeding season, sex criteria, and wing measurements.

__________. 1973. Breeding behavior and life history of the Wilson's warbler. Wilson Bull. 85:21-30.

* Icteridae (Blackbirds and orioles)

Cade, T. J. 1953. Aerial feeding of the rusty blackbird on mosquitoes. Wilson Bull. 65:52-53.

In Alaska.

Kennard, F. H. 1920. Notes on the breeding habits of the rusty blackbird in northern New England. Auk 37:412-422.

Valuable information on the nesting of this typically northern Canada nester.

McCaskie, G. 1971. Rusty blackbirds in California and western North America. Calif. Birds 2:55-68.

* Thraupidae (Tanagers)

Fitch, H.S. and V. R. Fitch. 1955. Observations on the summer tanager in northeastern Kansas. Wilson Bull. 67:45-54.

Hamaher, J. I. 1936. Summer tanager (Piranga rubra) eating wasps. Auk 53:220-221.

Rea, Amadeo M. 1970. Status of the summer tanager on the Pacific Slope. Condor 72:230-233.

* Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Berger, A. J. 1968. Clutch size, incubation period, and nestling period of the American goldfinch. Auk 85:494-498.

Coutlee, Ellen L. 1963. Maintenance behavior of the American goldfinch. Wilson Bull. 75:343-357.

Detailed descriptions and analyses of postures used by the goldfinch in locomotion, feeding, drinking, bathing, preening, defecating, and sleeping.

__________. 1967. Agonistic behavior in the American goldfinch. Wilson Bull. 79:89-109.

Holcomb, Larry C. 1970. Growth of nestling American goldfinches depending on the number in the nest and hatching sequence. Bird-Banding 41:11-17.

Mean growth rates of American goldfinches did not depend on hatching sequence or number of young in nest, although nestlings tended to grow faster in nests containing few siblings.

Nickell, W. P. 1951. Studies of habitats, territory, and nests of the eastern goldfinch. Auk 68:447-470.

Parmalee, D. F. 1959. The breeding behavior of the painted bunting in southern Oklahoma. Bird-Banding 30:1-17.

Stabler, R. M. 1959. Nesting of the blue grosbeak in Colorado. Condor 61:46-48.

Stokes, A. W. 1950. Breeding behavior of the goldfinch. Wilson Bull. 62:107-127.

American goldfinch.

Storer, R. W. 1951. Variation in the painted bunting (<u>Passerina</u> <u>ciris</u>) with special reference to wintering populations. Occas. Papers Mus. Zool. Univ. Mich. 532:1-12.

ASSOCIATES OF MAN

* Introduction

Man's impact on the western landscape has been conspicuous indeed. Even in the seemingly vast expanse of open land remaining, few miles separate the towns, ranches, houses, and other constructions of man. Livestock have grazed much of the rest of those non-civilized intervening miles for decades and centuries. These man-made environments provide uniform habitat of wide distribution in which certain species thrive. The two species most successful as man's co-inhabitants of towns and farms are species not native to North America. The starling and house sparrow, longtime companions of urban man in Europe, have become man's constant associates in North America during the century since their introduction on the continent.

References classified within this section include numerous papers dealing with the two exotics mentioned above, as well as research on a number of other species partial to man's buildings as nesting sites and his gardens, parks, and fields as foraging sites. We have included all other research on birds in urban environments under this heading.

Birds characteristic of one of the altered environments of man -- cities, gardens, parks, fields, and farms -- include the following species:

Chimney swift	American robin
Ruby-throated hummingbird	Starling
Barn swallow	House sparrow
Purple martin	Common grackle
House wren	House finch

* General

Backyard wild birds of the Pacific Northwest & California. TFH Publications. (paper: $1.00)

Besser, J.F. 1962. Research on agricultural bird damage control problems in western United States. Unpublished ms. presented at 1st Bird Control Seminar, Bowling Green State Univ. 4 p.

__________, J. W. Degrazio and J. L. Guarino. 1968. Cost of wintering starlings and red-winged blackbirds at feedlots. J. Wildl. Mgmt. 32:179-180.

Buckheister, Carl W. 1960. Problem birds. Trans. 25th N. A. Wildl. Conf.:134-137.

North American starling populations have increased, but native blackbird populations probably have not. The author suggests that farming practices tend to bait the birds, increasing crop depredations by native species. Specialization of agricultural lands and reduction of biological diversity intensify the problem, and tend to destroy environmental stability. Government crop subsidies further confound the issue. Value of native birds lies chiefly neither in esthetic nor economic areas but rather in their ecological roles. Some birds pose problems locally and temporarily, but the only sensible approach consists of controlling the damage without eliminating or drastically reducing the species. The author concludes with a plea for research in agricultural practices that will avert depredations.

Emlen, John T., Jr. 1937. Bird damage to almonds in California. Condor 39:192-197.

The common crow, acorn woodpecker, scrub jay, and red-shafted flicker caused most damage on the University Farm at Davis.

Giltz, Maurice L. 1960. The nature and extent of bird depredations on crops. Trans. 25th N.A. Wildl. Conf.:96-99.

Depredations of birds generally occur when migrating or wintering birds accumulate near a crop in a stage of maturity susceptible to foraging by birds. At least 20 species of birds badly damage ten agricultural crops in parts of at least 20 states. These crops destroyed by birds amount to several million dollars worth of corn, rice, and sorghum. Individual farmers often lose over a thousand dollars.

Isenberg, A. H. and T.F. M. Williamson. 1946. The spectacled jay-thrush at liberty in California. Avicultural Mag. 52 (Mar-Apr):48-50.

This species is well established at Woodside, Calif.

Kozicky, E. L. and R. A. McCabe. 1970. Birds in pest situations. p. 58-82. In Principles of plant and animal pest control, Vol.5: Vertebrate pests: Problems and control. Natl. Acad. Sci., Washington, D.C.

A useful summary.

Meanley, B. and J. S. Webb. 1965. Nationwide population estimates of blackbirds and starlings. Atlant. Natur. 20:189-191.

Mewaldt, L. Richard. 1964. Effects of bird removal on a winter population of sparrows. Bird-Banding. 35:184-195.

Repopulation by the same species quickly occurred after removal of white-crowned sparrows, golden-crowned sparrows, Oregon juncos, and house sparrows from a suburban lot in Calif.

Pitelka, Frank A. 1942. High population of breeding birds within an artificial habitat. Condor 44:172-174.

Dillon Beach Calif., had 90 pairs on 7.5 acres.

* Apodidae (Swifts)

Dexter, Ralph W. 1969. Banding and nesting studies of the chimney swift, 1944-1968. Ohio J. Sci. 69:193-213.

Fischer, Richard B. 1958. The breeding biology of the chimney swift *Chaetura pelagica* (Linnaeus). N.Y. State Mus. & Sci. Serv. Bull. 368. 141 p.

Ramsey, Jed J. 1970. Temperature changes in chimney swifts (*Chaetura pelagica*) at lowered environmental temperatures. Condor 72:225-229.

Body temperatures of chimney swifts decreased directly with decreasing ambient temperature. Body temperatures dropped until eventually reaching a state of torpor.

* Picidae (Woodpeckers)

Dennis, John V. 1964. Woodpecker damage to utility poles: with special reference to the role of territory and resonance. Bird-Banding 35:225-253.

Seven North American species inflict most of the severe damage to utility poles: the ladder-backed woodpecker, red-headed woodpecker, golden-fronted woodpecker, acorn woodpecker, red-shafted flicker, yellow-shafted flicker, and pileated woodpecker. The latter carries out much of the serious damage. Woodpeckers detect shakes, hollow pith centers, and other resonance locations in the pole, and often excavate at these sites. Pole damage occurs in association with high-density woodpecker populations. Shortage of natural sites for roosting and nesting seldom accounts for woodpecker attack upon poles.

* Hirundinidae (Swallows)

Allen, R. W. and M. M. Nice. 1952. A study of the breeding biology of the purple martin. Amer. Midland Naturalist 47:606-665.

Bunch, Mrs. Carl H. 1964. Nesting of the western purple martin. Murrelet 45:10-11.

Purple martins in the West do not normally utilize nesting boxes. Such birds that have nested in nest boxes, however, occurred as isolated pairs rather than in colonies.

Davis, E. M. 1937. Observations on nesting barn swallows. Bird-Banding 8:66-73.

Finlay, J. C. 1971. Breeding biology of purple martins at the northern limit of their range. Wilson Bull. 83:255-269.

Gaunt, A. S. 1959. Behavior in the purple martin. Kansas Ornithol. Soc. Bull. 10:14-16.

Gullion, Gordon W. 1947. Use of artificial nesting sites by violet-green and tree swallows. Auk 64:411-415.

In western Oregon.

Hendricks, D. Paul and John W. Martin, Jr. 1972. Horse hair as a major mortality factor in nestling barn swallows. Southwestern Nat. 17(3):295.

Johnston, Richard F. 1966. The adaptive basis of geographic variation in color of the purple martin. Condor 68:219-228.

Purple martins from the southwestern deserts are pale and small; martins from the mountains and the north and east are darker and larger. Plumage color of females and first-year males appears valuable both for cryptic coloration and for regulation of heat flow between the bird and its environment.

____________. 1967. Seasonal variation in the food of the purple martin Progne subis in Kansas. Ibis 109:8-13.

____________ and John William Hardy. 1962. Behavior of the purple martin. Wilson Bull. 74:243-262.

Martins arrive on breeding grounds two months before laying eggs. They form pair-bonds without ritualizing behavior. The birds demonstrate aggression by a few simple postural and auditory mechanisms. Martins operate in groups at all times of the year. Social facilitation of reproductive activities appears insignificant.

Lee, J. A. 1967. Relative reproductive efficiency of adult and subadult purple martins. Chat 31:1-2.

Moss, W. Wayne and Joseph H. Camin. 1970. Nest parasitism, productivity, and clutch size in purple martins. Science 168:1000-1002.

Mean maximum nestling weight decreased with increase in brood size from three to five. Martins without acarine nest parasites produced heavier young than those with parasitized broods of the same size. In addition, unparasitized nestlings tended to reach a maximum weight equivalent to that of young in parasitized broods of one less member. Modal brood size for parasitized and unparasitized martins was four, but mite-free birds tended to produce broods of five, and parasitized parents broods of three. Nest parasitism may thus play an important role in the determination of clutch size in martins and other birds.

Niles, D. M. 1972. Molt cycles of purple martins (Progne subis). Condor 74:61-71.

Breeding and molt by purple martins do not seem to overlap temporally. Overwater migration and molt seem mutually exclusive.

Olmstead, R. 1955. Observations on purple martins. Bull. Kansas Ornithol. Soc. 6:8-10.

Richmond, S. M. 1953. The attraction of purple martins to an urban location in western Oregon. Condor 55:225-249.

Samuel, D. E. 1969. The ecology, behavior, and vocalizations of sympatric barn and cliff swallows in West Virginia. Ph.D. thesis. West Virginia Univ., Morgantown.

____________. 1971. Vocal repertoires of sympatric barn and cliff swallows. Auk 88:839-855.

Complex songs vary greatly in these species when nesting in the same barns and sheds. The exact roles and functions of their songs and call remains unknown. The two species probably maintain reproductive isolation through differences in pair formation and copulatory behavior and their associated vocalizations.

Smith, W. P. 1933. Some observations of the nesting habits of the barn swallow. Auk 50:414-419.

Stevenson, J. O. 1951. September nesting of the barn swallow in Arizona. Wilson Bull. 63:339-340.

At Springerville.

Utter, J.M. and E. A. Lefebvre. 1970. Energy expenditure for free flight by the purple martin (Progne subis). Comp. Biochem. Physiol. 35:713-719.

________ and ________. 1973. Daily energy expenditure of purple martins (Progne subis) during the breeding season: Estimate using D_2O^{18} and time budget methods. Ecology 54:597-604.

Wood, Harold B. 1937. Observations at a barn swallow's nest. Wilson Bull. 49:96-100.

* Corvidae (Jays and crows)

Gadd, Sam. 1973. Corvids in Colorado Springs in the winter of 1972-73: Results of a public appeal for information. Colo. Field Ornithol. 16:9-18.

The author noted increases of Clark's nutcracker and Steller's and scrub jays in an urban area following severe winter weather in nearby mountain habitat.

* Troglodytidae (Wrens)

Kendeigh, S. C. 1941. Territorial and mating behavior of the house wren. Ill. Biol. Monogr. 18:1-120; 22:1-356.

________. 1963. Regulation of nesting time and distribution in the house wren. Wilson Bull. 75:418-427.

The development of the gonads under the stimulus of changing photoperiods regulates seasonal onset of egg laying in this species. More precisely, the timing of return to the breeding grounds from spring migration regulates the time of month. And temperature variations dictate the precise day on which egg-laying begins. Low temperatures, particularly in May when gonadal development puts the birds in breeding condition, may limit the breeding range northward. High temperatures may limit the breeding range southward. Breeding range thus seems limited by lack of synchronization between the occurrence of favorable temperatures and photoperiods -- northward because favorable temperatures begin too slowly, southward because they begin too quickly.

__________. 1963. Thermodynamics of incubation in the house wren, Troglodytes aedon. Proc. XIIIth Internatl. Ornith. Congr.:884-904.

__________ and S. P. Baldwin. 1928. Development of temperature control in nestling house wrens. Am. Naturalist 62:249-278.

McCabe, R. A. 1961. The selection of colored nest boxes by house wrens. Condor 63:322-329.

* Turdidae (Thrushes)

Davis, Russell E. 1969. Food requirements and weights of robin nestlings. Inland Bird-Banding News 41:50-51.

Daily weight variation in eight nestlings from two nests, and measurements of food consumed by one hand-fed 10-day old nestling.

Deck, Robert E. 1966. Predator alarm calls of the American robin. M.S. thesis. Pa. State Univ. 70 p.

Gander, F. F. 1960. Western bluebirds in my garden. Audubon Mag. 62:70-71.

Heppner, Frank. 1965. Sensory mechanisms and environmental clues used by the American robin in locating earthworms. Condor 67:247-256.

American robins seem to locate earthworms exclusively by visual clues; they do not seem to use olfactory and auditory senses at all.

Hirth, David H., Albert E. Hester, and Frederick Greeley. 1969. Dispersal and flocking of marked young robins (Turdus migratorius) after fledging. Bird-Banding 40:208-215.

The authors observed 58% of 183 wing-tagged nestling robins subsequent to fledging. They typically remained in their parent's territory for about 3 weeks, then joined feeding flocks at nearby food sources. Little exchange took place between adjacent flocks.

Howell, J. C. 1942. Notes on the nesting habits of the American robin. Amer. Midland Nat. 28:529-603.

Hunt, L. Barrie. 1969. Physiological susceptibility of robins to DDT poisoning. Wilson Bull. 81:407-418.

Following elm spraying at the Univ. Wisc. at least 232 adult robins died of apparent DDT poisoning. Males died earlier and in greater numbers than females. Most dead and dying robins contained almost no subcutaneous fat, males averaging 69.4g. and females 72.8g. Seasonal loss of fat reserves in male robins appeared to increase their susceptibility to DDT poisoning. Fatter females showed greater tolerance.

__________ and Ronald J. Sacho. 1969. Response of robins to DDT and methoxychlor. J. Wildl. Mgmt. 33:336-345.

When exposed to DDT, robins suffered increased mortality and nearly total disruption of reproduction. Fewer robins died when exposed to methoxychlor. Comparisons of the two insecticides showed no methoxychlor residues in birds foraging within contaminated environments. Doses as high as 3,750 mg/kg did not produce methoxychlor poisoning consistently.

Kimball, James W. 1944. A fishy bird story. Auk 61:646-647.

Robins preyed on small, recently released trout in California.

Schantz, W. E. 1939. A detailed study of a family of robins. Wilson Bull. 51:157-169.

Young, H. 1955. Breeding behavior and nesting of the eastern robin. Amer. Midland Nat. 53:329-352.

Very complete; helpful in West as well.

* Sturnidae (Starlings)

Amadon, D. 1956. Remarks on starlings, family Sturnidae. Amer. Mus. Novit. 1803. 41 p.

Bailey, Edgar Preston. 1963. The ecology of starlings in winter in Box Elder County, Utah. M S. thesis. Utah State Univ. 97p.

__________. 1966. Abundance and activity of starlings in winter in northern Utah. Condor 68:152-162.

Observers first detected starlings in Utah in 1939. Within 10 years the species had increased in numbers to the nuisance stage. Winter flocks now (1966) contain 100,000 birds and cause increasing damage in orchards and cattle feedlots. Observers counted an average of 1211 starlings per day in roadside censuses, peak numbers occurring in December. Cold weather caused starling concentration in feedlots, resulting in higher counts. Observers found fewer birds in trees (and more on the ground) during windy weather than during calm weather. Cloudiness did not influence starling feeding activity. Feedlot use increased during snow and decreased during rain.

__________ and A. W. Stokes. 1964. What about Utah's starlings? Utah Farm Home Sci. 25:35, 48, 58-59.

Banks, Richard C. 1965. The nesting starling (Sturnus vulgaris) population in San Diego County, California. Bull. Southern Calif. Acad. Sci. 64:11-15.

Benson, W. W. and Joe Gabica. 1970. Insecticide residues in starlings in Idaho. Bull. Environmental Contamination and Toxicol. 5:243-246.

Boyd, Elizabeth M. 1946. A survey of the external parasites and the parasites of the digestive tract and its derivatives of the starling (Sturnus vulgaris L.) in North America. Ph.D. thesis. Cornell Univ.

__________. 1951. A survey of parasitism of the starling (Sturnus vulgaris L.) in North America. J. Parasitol. 37:56-84.

Brenner, Fred J. 1965. Metabolism and survival time of grouped starlings at various temperatures. Wilson Bull. 77:388-395.

The starling has not physiologically adapted to cold. The species may have evolved the flocking habit to reduce heat loss.

Brower, J. VanZ. and L. P. Brower. 1960. Experimental studies of mimicry. IV. -- The reactions of starlings to different proportions of models and mimics. Amer. Natur. 94:271-282.

Burger, J. W. 1953. The effect of photic and psychic stimuli on the reproductive cycle of the male starling, Sturnus vulgaris. J. Exp. Zool. 124:227-238.

Davis, David E. 1950. The growth of starling, Sturnus vulgaris, populations. Auk 67:460-465.

__________. 1958. Relation of clutch-size to number of ova ovulated by starlings. Auk 75:60-66.

DeHaven, R. W. and J. L. Guarino. 1969. A nest-box trap for starlings. Bird-Banding 40:48-50.

__________ and __________. 1970. Breeding of starlings using nest-boxes at Denver, Colorado. Colo. Field Ornith. 8:1-10.

Provides basic breeding data for the starling in Colorado for comparison to data obtained in other parts of its range.

__________ and P. J. DeHaven. 1973. A contribution toward a bibliography on the starling (Sturnus vulgaris). BSF&W Wildlife Research Center, Denver, CO, 80225. 92 p. (mimeo)

Contains 1,414 references.

Dunnet, G. M. 1955. The breeding of the starling, Sturnus vulgaris, in relation to its food supply. Ibis 97:619-662.

Elliot, H. Nelson. 1964. Starlings in the Pacific Northwest. Second Vert. Pest Control Conf. March 4,5 1964. Anaheim, Calif. p. 29-39.

The use of traps 6x8x6 feet proved useful for controlling starlings in Washington fruit-producing areas. Use of approximately 100 traps almost eliminated starling damage to cherries in the Yakima Valley in 1963.

Ellis, Charles, R. Jr. 1966. Agonistic behavior in the male starling. Wilson Bull. 78:208-224.

Recognizes 12 aggression-implying displays.

Hair, Jay D. and Donald J. Forrester. 1970. The helminth parasites of the starling (Sturnus vulgaris L.): A checklist and analysis. Am. Midland Nat. 83:555-564.

A list of helminth parasites of starlings with reference to their geographic location. 81 species of helminths, representing 51 genera, have been reported: 28 species of Trematoda, 14 of Cestoda, 39 of Nematoda, and 9 of Acanthocephala.

Hamilton, William J., III and William M. Gilbert. 1969. Starling dispersal from a winter roost. Ecology 50:886-898.

Hilton, F. K. 1958. Behavioral and biochemical aspects of the yearly gonadal cycle in male starlings. Ph.D. diss. Johns Hopkins Univ., Baltimore. 80 p.

Howard, Walter E. 1959. The European starling in California. Calif. Dept. Agr. Bull. 48:171-179.

An intensive examination of the biology of the species in the state, primarily by means of a thorough literature review.

Kessel, B. 1950. Observations on the polygamy and territorial behavior of a male starling (Sturnus vulgaris). Bird-Banding 21:112-114.

__________. 1953. Distribution and migration of the European starling in North America. Condor 55:49-67.

__________. 1957. A study of the breeding biology of the European starling (Sturnus vulgaris L.) in North America. Am. Midl. Nat. 58:257-331.

Males have lower mortality rates and outnumber adult females. First year mortality is 60%. Adult mortality rate averages 50% per year, but a few birds may live 5-6 years. About 20% of fledged young survive to breed.

Killpack, Merlin L. and Don N. Crittenden. 1952. Starlings as winter residents in the Uinta Basin, Utah. Condor 54:338-344.

At least some starlings remained in the area of Duchesne County winter-long. Starlings ate Russian olive fruits, grains, garbage and corn silage. On cold winter nights, the birds roosted with house sparrows in holes dug in the roof of open-fronted, straw-thatched cattle shelters.

Lloyd, James A. 1965a. Seasonal development of the incubation patch in the starling. Condor 67:67-72.

The author detected increases in the vascularity of skin removed from the ventral abdominal surface of females about one month before laying began. Marked increases in vascularity, development of edema, epithelial metaplasia, and loss of feathers occurred a few days before egg-laying, peaked about midway through incubation, and progressively declined after eggs hatched. In the male, incubation patch development followed a course similar to, but less intense, than that of the female. During breeding season, all females had an incubation patch, but only nesting males had incubation patches.

__________. 1965b. Effects of environmental stimuli on the development of the incubation patch in the European starling (Sturnus vulgaris). Physiol. Zool. 38:121-128.

Seasonal light change stimulates initiation of endocrine activity leading to patch development. Other stimuli enhance incubation patch development; these are not essential in the female but do appear necessary for patch development in males.

Martin, W. E. 1969. Organochlorine insecticide residues in starlings. Pesticides Monitoring Jour. 3:102-114.

Arizona specimens.

__________. 1972a. Mercury and lead residues in starlings-1970. Pestic. Monit. J. 6:27-32.

__________. 1972b. Organochlorine residues in starlings-1970. Pestic. Monit. J. 6:33-40.

__________. 1972c. The occurrence of mirex in starlings collected in 7 southeastern states - 1970. Pestic Monit. J. 6:41-42.

Monson, G. 1948. The starling in Arizona. Condor 50:45.

1st record - Nov. 16, 1946, from Parker.

Planck, Roy J. 1967. Nest site selection and nesting of the European starling in California. Ph.D. thesis. Univ. Calif., Davis. 124 p.

Royall, W. C., Jr. 1962. Starlings do damage to crops in Arizona. Prog. Agric. Ariz. 14(3):14-15.

Chiefly in the Phoenix area.

__________. 1966. Breeding of the starling in central Arizona. Condor 68:196-205.

__________, J. L. Guarino, A. Zajanc, and C. C. Siebe. 1972. Movements of starlings banded in California. Bird-Banding. 43:26-37.

Fall migration of starlings started in late October; spring migration lasted from early February to mid-March. Many banded starlings returned to California in successive winters, but a few remained north of the state in later years. Some migration occurred northeastward and southwestward across the mountains.

Schwab, Robert G. (ed). 1966. Starling control research in California, Progress Report for 1966. Univ. Calif. Agr. Expt. Sta., Bur. Sport Fisheries & Wildl., and Calif. Dept. Agr. 47 p.

13 papers on field studies, toxic properties and effects of sublethal doses of DRC-1339, and control by reproductive cycle interference.

__________ and Rex E. Marsh. 1967. Reliability of external sex characteristics of the starling in California. Bird-Banding 38:143-147.

Sexing starlings by iris and bill color proved 97.7% accurate for a sample of California birds.

Siebe, Charles C. 1964. Starlings in California. p. 40-42 In Proc. 2nd Vert. Pest Control Conf. March 4,5 1964, Anaheim, Calif. Univ. Calif. at Davis.

The authors describe a promising feedlot starling control method using baits treated with tetraethyl pyrophosphate. They also report banding of 27,105 starlings in California, as of Jan. 1, 1964.

Thompson, R. D., C. V. Grant, E. W. Pearson, and G. W. Corner. 1968. Differential heart rate response of starlings to sound stimuli of biological origin. J. Wildl. Mgmt. 32:888-893.

75 chamber-isolated single starlings underwent 10-second broadcasts of one of five sounds proposed for use as repellants. The sounds used included the human voice and four starling calls -- distress, escape, drug-induced, and feeding. The experimenters repeated these every five minutes until birds habituated and responding ceased. Heart-rate monitoring showed that the distress call constituted a strong fright-producing agent. The human voice, and escape and drug-induced calls produced intermediate effects; the feeding call constituted a nearly neutral stimulus.

Vandenburgh, John G. 1964. The effects of photo-period on testicular activity and aggressive behavior of starlings. J. Exptl. Zool. 156:323-329.

Starlings maintained under short days during the breeding season acted more aggressively than birds maintained on long days. Testes of the short-day birds were aspermic and showed little evidence of androgen production. These birds thus acted highly aggressively in the apparent absence of androgens. Gonadotropins, in response to photoperiodic stimulation, may directly regulate such aggressive behavior.

West, Richard R. 1968. Reduction of a winter starling population by baiting its preroosting areas. J. Wildl. Mgmt. 32:637-640.

A wintering population of a quarter million birds contributed flocks to 250 cattle feedlots in the South Platte Valley, Colo. Workers reduced the population by 60% through baiting a feedlot and pasture where birds gathered each evening before roosting. Poultry pellets containing starling lethal doses of DRC-1339 accomplished 94% of the kill during the first 7 weeks of baiting. 10% of 500,000 roost-sharing red-wings also died, but these were the only birds incidentally eliminated.

* Ploceidae (Weaver finches)

Barnett, Leland B. 1968. Seasonal changes in temperature acclimatization of the house sparrow (*Passer domesticus*). Ph.D. thesis. Univ. Ill. 57 p.

Barrows, W. B. 1889. The English sparrow (*Passer domesticus*) in North America, especially in its relations to agriculture. Div. Econ. Ornith. & Mamm., USDA. Bull. 1. 405 p.

Blackmore, Floyd H., Jr. 1966. The energy requirements and nitrogen balance of the house sparrow (*Passer domesticus*) during molt. Ph.D. thesis. Univ. Ill. 59 p.

Clark, Alice M. 1968. The English sparrow/Is he as villainous as this report indicates? Audubon Bull. 148:27-28.

Sparrows apparently pecked bluebird fledglings to death, and then buried them under the sparrow nest.

Calhoun, J. B. 1947. The role of temperature and natural selection in relation to the variations in the size of the English sparrow in the United States. Amer. Nat. 81:203-228.

Davis, Earle A. 1955. Seasonal changes in the energy balance of the English sparrow. Auk 72:385-411.

Davis, John and Betty S. Davis. 1954. The annual gonad and thyroid cycles of the English sparrow in southern California. Condor 56: 328-345.

Ernek E. and M. Lichard. 1964. Role of the English sparrow (*Passer domesticus*) in the circulation of tick-borne encephalitis virus. J. Hyg. Epidemiol. Microbiol. Immunol. 8:375-379.

Guberlet, John E. and H. H. Hotson. 1940. A fly maggot attacking young birds, with observations on its life history. Murrelet 21:65-68.

An English sparrow nestling died from infestation by 21 Protocalliphora maggots.

Hudson, J. W. and S. L. Kimzey. 1966. Temperature regulation and metabolic rhythms in populations of the house sparrow, *Passer domesticus*. Comp. Biochem. Physiol. 17:203-217.

Johnston, Richard F. 1966. Colorimetric studies of soil color-matching by feathers of house sparrows from the central United States. Kans. Ornithol. Soc. Bull. 17:19-23.

Pigments of breast feathers of female house sparrows taken in fall colorimetrically closely resemble soil pigments from places in which the birds dustbathe. Specifically, hue and chroma are the same for the two sets of pigments; they differ only in value (brightness). Natural selection via visually-oriented predators may encourage such color matching. Local differentiation in feather color can thus occur rapidly (within 90 generations) under sufficiently severe environmental pressures.

___________ and R. K. Selander. 1964. House sparrows: Rapid evolution of races in North America. Science 144:548-550.

Patterns of geographic variation in North American sparrows parallel those shown by native polytypic species, in conformity with Gloger's and Bergmann's ecogeographic rules. Racial differentiation of house sparrow populations may require no more than 111 generations, or 50 years. Previous estimates of the minimum time required for the evolution of races in birds ranged upward from about 4000 years.

___________ and ___________. 1971. Evolution in the house sparrow. II. Adaptive differentiation in North American populations. Evolution 25:1-28.

Kendeigh, S. C. 1944. Effect of air temperature on the rate of energy metabolism in the English sparrow. J. Exptl. Zool. 96:1-16.

___________. 1949. Effect of temperature and season on energy resources of the English sparrow. Auk 66:113-127.

___________. 1969. Energy responses of birds to their thermal environments. Wilson Bull. 81:441-449.

The author developed a mathematical physiological model applicable to all species, but based on laboratory metabolism of the widely distributed house sparrow. The model accounts for the interrelationships between food intake, standard metabolism, existence metabolism, productive energy, limits of tolerance, evaporative cooling, body temperature, and the thermal environment.

___________(chairman). 1973. A symposium on the house sparrow (Passer domesticus) and European tree sparrow (P. montanus) in North America. A.O.U. Ornithological Monograph 14.

Low, J. B. and G. Knowlton. 1957. English sparrow control. Utah Stat. Agr. Coll. Ext. Serv. Circular:Leaflet 18.

Minnock, Michael E. 1969. Salinity tolerance and discrimination in house sparrows. Condor 71:79-80.

House sparrows, when offered NaCl solutions of different concentrations, selected concentrations that minimized physiological stress.

Packard, Gary C. 1966. Evolution of North American house sparrows in relation to altitude and aridity. Ph.D. thesis. Univ. Kansas. 86 p.

Selander, Robert K. and Richard F. Johnston. 1967. Evolution in the house sparrow. I. Intrapopulation variation in North America. Condor 69:217-258.

The authors analyzed variation in external morphology of North American populations. These data provided background for their extensive studies of house sparrow evolution continued in succeeding papers: (Johnston and Selander: 1964, 1971). Color character varied more than any other morphological parameter. Northern and Pacific Coast birds were darker than their Old World counterparts, and those from the arid Southwest much lighter in color. Sparrows from Louisiana and Mexico exhibited a yellow wash on the underparts absent in other North American house sparrows.

Summers-Smith, D. 1963. The house sparrow. Collins, St. James' Place, London. 269 p.

Includes a summary of the species' introduction to and colonization of North America.

Threadgold, L. T. 1960. A study of the annual cycle of the house sparrow at various latitudes. Condor 62: 190-201.

* Icteridae (Blackbirds and orioles)

Burr, Richard and Deborah Stevens. 1969. Nesting activities of the common grackle (<u>Quiscalus quiscula</u>). Delmarva Ornithol. 6:5-7.

Observations of 43 active nests.

Clark, Gordon M. and Louis N. Locke. 1962. Case Report: Observations of pseudotuberculosis in common grackles. Avian Disease 6:506-510.

<u>Pasturella pseudotuberculosis</u> may have caused 2 cases of epizootic damage in eastern grackles. This disease damages tissues, particularly by the production of characteristic pseudotubercles in the liver, spleen, lungs, and muscle. Pseudotuberculosis may cause high mortality in icterid roosts during late winter.

Erskine, Anthony J. 1971. Some new perspectives on the breeding ecology of common grackles. Wilson Bull. 83:352-370.

The western range outlined in recent handbooks for this species is populated sparsely or locally. The main range does not overlap with ranges of other blackbirds placed in the genera Euphagus and Cassidix. Initiation of egg-laying generally correlates with temperature, and clutch size usually correlates with laying date. Birds may start nests in dense conifers earlier, and at lower temperatures, than in less protected sites.

Ficken, Robert W. 1960. Behavior of the common grackle (Quiscalus quiscula) (Linnaeus). Ph.D. thesis. Cornell Univ. 95 p.

Describes and provides ethological analysis of the grackle's behavior.

__________. 1963. Courtship and agonistic behavior of the common grackle (Quiscalus quiscula). Auk 80:52-72.

Discusses the possible derivation, biological significance, motivation, and function of displays. Based on field observations of two 15-20 pair colonies, and on observations of captive birds.

Maxwell, George Ralph, II. 1965. Life history of the common grackle. (Quiscalus quiscula) (Linnaeus). Ph.D. thesis. Ohio State Univ. 232 p.

The paper describes the nesting cycle with secondary notes on taxonomy and parasitism.

__________. 1970. Pair formation, nest building and egg-laying of the common grackle in northern Ohio. Ohio J. Sci. 70:284-291.

__________ and L. S. Putnam. 1972. Incubation, care of young, and nest success of the common grackle (Quiscalus quiscula) in northern Ohio. Auk 89:349-359.

Mott, D. F., J. L. Guarino, P. P. Woronecki, and W. C. Royall, Jr. 1972. Long-distance recoveries of common grackles banded in north-central Colorado. Colo. Field Ornith. 12:16-17 .

Peterson, A. and H. Young. 1950. A nesting study of the bronzed grackle. Auk 67:466-476.

Common grackle.

Ridsdale, Robert and Phillip Granett. 1969. Responses of caged grackles to chemically treated and untreated foods. J. Wildl. Mgmt.33:678-681.

Given free choice of five foods, caged grackles consumed significantly more poultry pellets than oats, chick scratch, cracked corn or soybeans. They preferred undyed cracked corn and cracked corn dyed yellow to cracked corn dyed blue, red, or green. Grackles preferred untreated poultry pellets to pellets containing triethylenemelamine -- a reproductive suppressant. They ate untreated cracked corn in preference to corn treated with the toxicant, DRC-1139.

Stophlet, J. J. 1958. Hooded oriole nesting under eaves of house. Auk 75:221-222.

Near Tombstone, Arizona.

Walley, W. W. 1965. The absorption, metabolism and elimination of DDT in the common grackle, Quiscalus quiscula. Ph.D. thesis. Miss. St. Univ. (University Microfilms Order No. 65-8347).

Willson, M. F., R. D. St. John, R. J. Lederer, and S. J. Muzor. 1971. Clutch size in grackles. Bird-Banding 42:28-35.

* Fringillidae (Grosbeaks, finches, sparrows, and buntings)

Enright, J. T. 1966. Influences of seasonal factors on the activity onset of the house finch. Ecology 47:662-666.

In laboratory experiments, cold environmental temperature (2°C) caused male house finches to awaken later, relative to "dawn", than warm temperatures (20°C) when day lengths (hours of light per cycle) remained constant. With temperature held constant, longer days also caused later awakening relative to "dawn". Seasonal changes in average temperature and daylength thus may exert opposite influences on awakening time: the long days of spring induce minimal "anticipation" of dawn, while warmer temperatures tend to counteract this influence. Reproductive maturity also may cause earlier awakening, relative to dawn, day length, and temperature held constant.

Evenden, F. G. 1957. Observations on nesting behavior of the house finch. Condor 59:112-117.

Results of 48 nesting attempts in the suburbs of Sacramento, Calif.

Fichter, E. and V. E. Jones. 1961. Nesting of the house finch at Pocatello, Idaho. Tebiwa 4:1-9.

Hamner, W. M. 1968. The photorefractory period of the house finch. Ecology 49:211-227.

Huey, L. M. 1962. Comparison of the weight lifting capacities of a house finch and a golden eagle. Auk 79:485.

Keėler, C. A. 1890. Observations on the life history of the house finch (*Carpodacus mexicanus*). Zoe 1:172-176.

Larsen, Kenneth H. and Donald F. Mott. 1970. House finch removal from a western Oregon blueberry planting. Murrelet 51:15-16.

Although the house finch occurred only rarely in the Portland area as late as 1940, it now occurs commonly. From June - September, 1968, workers trapped and removed birds from a 1-acre blueberry planting just outside the city limits. 97.9% were hatching-year birds.

Palmer, Thomas K. 1970. House finch (linnet) control in California. Proc. 4th Vertebrate Pest Conf:173-178.

Roessler, Elizabeth S. 1936. Viability of weed seeds after ingestion by California linnets. Condor 38:62-65.

Scarcely any seeds remained viable after digestion by house finches.

THE STATES

ALASKA

Allen, Arthur A. 1950. The bird fauna of Alaska. Proc. Alaskan Sci. Conf., Bull. Natural Resources Council No. 122, April, 1951:102-103.

Summary of a paper describing the importance of "invasion" of old-world species in Alaska.

Cade, Tom J. 1953. A syntoptic bibliography of Alaskan ornithology. Dept. of Zoology, University of California, Los Angeles. 76 p.

Cahalane, V. H. 1944. Birds of the Katmai region, Alaska. Auk 61:351-375.

Boreal spruce forest and tundra.

____________. 1959. A biological survey of Katmai National Monument. Smithsonian Misc. Collect. 138(5):1-246.

Gabrielson, Ira N. and Frederick C. Lincoln. 1951. The birds of Alaska. Stackpole Company, Harrisburg, Pennsylvania and Wildlife Management Institute, Washington. 922 p.

Includes about 800 pages of species accounts, emphasizing status and distribution in Alaska; 55 page bibliography. The essential book on Alaskan birds.

Hemming, James E. 1966. Notes on the status of some birds in south-central Alaska. Condor 68:163-166.

Jellison, William L. and Kenneth A. Neiland. 1965. Parasites of Alaskan vertebrates: Host-parasite index. Department of Army and the University of Oklahoma Research Institute. 73 p. (1 November)

Includes host-parasite list for land birds.

Johnson, Harry McC. 1955. Winter microclimates of importance to Alaskan small mammals and birds. Ph.D. thesis. Cornell University. 139 p.

Kessel, Brina. 1956. Patterns of bird and mammal distribution in Alaska. Sci. in Alaska, 1953:190-197.

Primarily a brief discussion of faunal origins and migration routes.

Van Cleave, Harley J. and Ralph B. Williams. 1951. Acanthocephala from passerine birds in Alaska. J. Parisitol. 37:151-159.

ARIZONA

Anderson, A. H. 1972. A bibliography of Arizona ornithology, annotated. University of Arizona Press, Tucson. 241 p.

The most complete source of literature for the state.

Bailey, Florence M. 1939. Among the birds in the Grand Canyon country. USDI, National Park Service. 211 p.

Popular account, with field key and checklist.

Balda, Russell P. 1967. Ecological relationships of the breeding birds of the Chiricahua Mountains, Arizona. Ph.D. thesis. University of Illinois. 240 p.

One hundred and three species nested in the area. Breeding species diversity peaked in the riparian canyon, where 45 species nested, and dipped lowest in the desert grassland, where four species nested. Populations varied from a low of 31 breeding pairs per 100 acres in desert grassland to a high of 380 breeding pairs in spruce-Douglas fir forest. Four distinct avian communities existed in desert scrub, grassland, woodland, and montane forest.

Brandt, Herbert. 1951. Arizona and its bird life: A naturalist's adventures with the nesting birds on the deserts, grasslands, foot-hills, and mountains of southeastern Arizona. Bird Res. Foundation 724 p.

Brown, H. 1900. The conditions governing bird life in Arizona. Auk 17:31-34.

Discusses drought and over-grazing.

Campbell, B. 1934. Bird notes from southern Arizona. Condor 36:201-203. Accounts of 32 species.

Carothers, S. W. 1968. Fauna of Rio de Flag: I. Birds. Plateau 40:101-111.

List of 75 species with brief comments on breeding species.

Demaree, Salome Ross. 1961. Salt River Valley, Arizona: Field checklist. Maricopa Audubon Society, 4619 East Arcadia Lane, Phoenix, Arizona.

____________, E. L. Radke, and J. L. Witzeman (compilers). 1972. Birds of Maricopa County, Arizona: Annotated Field List. Maricopa Audubon Society, 4619 East Arcadia Lane, Phoenix, Arizona 85018. 64 p. ($2.95)

Hot desert -- oak woodland-bushland.

Dickerman, R. W. 1954. An ecological survey of the Three-Bar Game Management Unit located near Roosevelt, Arizona. M. S. thesis. University of Arizona. 126 p.

Lists 51 spp. birds. Hot desert -- oak woodland-bushland.

Erling, H. G. 1956. Disease-parasite inspection of Arizona wildlife. Arizona Game and Fish Department. Completion Rep. Proj. No. W-53-R-6. Work plan 8, job. no. 1:1-5.

Hannum, Clair A. 1942. Nematode parasites of Arizona vertebrates. Ph.D. thesis. University of Washington.

Hastings, J. R. 1959. Vegetation change and arroyo cutting in southeastern Arizona. Jour. Arizona Acad. Sci. 1:60-67.

An important paper on early conditions that affected animal life.

Howard, O. W. 1899. Summer resident warblers of Arizona. Bull. Cooper Ornith. Club 1:37-40, 63-65.

Field observation on nine spp.

Hubbard, John P. 1972. Notes on Arizona birds. Nemouria Occas. Pap. Del. Mus. Nat. History No. 5. 22 p. (24 April)

Provides information supplemental to Phillips, Marshall, and Monson (1964) based primarily on material collected in the first quarter of this century.

Jenks, R. 1932. Ornithology of the life zones: Summit of San Francisco Mountains to bottom of Grand Canyon. USDI, National Park Service, Tech. Bull. 5. 31 p.

Lane, J. E. 1965. A birdwatcher's guide to southeastern Arizona. L & P Photography. 46 p.

(Available from L & P Photography, 2010 Hickory Street, Santa Ana, California, at $1.50.)

Law, J. E. 1929. A discussion of faunal influences in southeastern Arizona. Condor 31:216-220.

Disagrees with Swarth (1929).

Marshall, Joe T., Jr. 1956. Summer birds of the Rincon Mountains, Saguaro Nat. Mon., Arizona. Condor 58:81-97.

This paper examines the topography and habitats of the area, and the habitat distribution of birds. The Rincons are crucial to geographic variation in mountain chickadee, creeper, and house wren. The author proposes merging of the brown-throated wren and house wren. Habitats include pine-oak woodland, chaparral, pinon-juniper woodland, and pine-fir forest.

____________. 1962. Land use and native birds of Arizona. Jour. Arizona Acad. Sci. 2:75-77.

Advocates controlled burning of grass and forest litter to improve water capture and open the forest stands.

____________. 1963a. Land use and native birds of Arizona. Arizona Cattlelog 19(6):14-15.

____________. 1963b. Rainy season nesting in Arizona. Proc. 13th Int. Ornithol. Congr., 1962:620-622.

McKee, E. D. 1928. Bird life on the Tonto platform. Grand Canyon Nature Notes 3(1):2-3.

Hot desert -- oak woodland-bushland--con. forest.

Merriam, C. Hart and L. Stejneger. 1890. Results of a biological survey of the San Francisco Mountain region and the desert of the Little Colorado, Arizona. North Am. Fauna 3. USDA, Bur. Biol. Surv. 136 p.

The original work wherein Merriam proposes his famous system of life zones. Includes annotated lists of birds of the two regions (pp. 87-101).

Miller, A. H. 1932. The summer distribution of certain birds in central and northern Arizona. Condor 34:96-99.

Accounts of 34 spp.

Monson, Gale. 1937. Notes on the birds from Graham County, Arizona. Condor 39:254-255.

Twenty-three spp. Hot desert, grassland, oak-pine, coniferous forest.

____________. 1941. The effect of revegetation on the small bird population in Arizona. J. Wildl. Mgmt. 5:395-597.

Compares avifauna of a controlled and adjacent uncontrolled grazing area.

____________. 1942. Notes on some birds from southeastern Arizona. Condor 44:222-225.

Forty-seven spp.

____________. 1964. Ornithological aspects of Merriam's 1889 studies as viewed 75 years later. Plateau 37:56-60.

____________. 1968. The Arizona state bird list, 1964-67. Jour. Arizona Acad. Sci. 5:34-35.

Nine spp. added.

____________ and Allan R. Phillips. 1964. A checklist of the birds of Arizona. University of Arizona Press, Tucson. 74 p.

This paper contains information on 432 spp. recorded in Arizona and lists 30 additional spp. as hypothetical for the state.

Phillips, Alan R. 1939. The faunal areas of Arizona, based on bird distribution. M. S. thesis. University of Arizona. 62 p.

____________. 1946. The birds of Arizona. Ph.D. thesis. Cornell University. 498 p.

____________. 1951. Complexities of migration: a review with original data from Arizona. Wilson Bull. 63:129-136.

An important, critical paper.

____________. 1956. The migration of birds in northern Arizona. Plateau 29:31-35.

____________, Joe Marshall, and Gale Monson. 1964. The birds of Arizona. University of Arizona Press, Tucson. 220 p. $15.00.

The first comprehensive work on Arizona's birds concentrates on establishing records, describing typical habitat for each species and recording nesting seasons, differences in plumages, and some noteworthy behavioral traits. The authors assign a serial number to all 424 Arizona spp. represented by museum specimens; they include uncertain records unnumbered and in brackets. The major reference for the state.

Porter, Eliot. 1972. Arizona birds in color: Reproductions of photographs made in the field. (Reprint of the 1964 edition; paper $1.50). University of Arizona Press.

Reynolds, H. G. 1964. Habitat relations of vertebrates of the Sierra Ancha Experimental Forest. U.S. Forest Service Research Paper RM-4:1-16.

Includes a 125 spp. list of birds of pine-fir and ponderosa pine forests, chaparral, and desert grassland. The Experimental Forest is in the Sierra Ancha Mountains, Gila County, Arizona.

Scott, W. E. D. 1883. On the avi-fauna of Pinal County with remarks on some birds of Pima and Gila Counties, Arizona. Auk 5:159-168.

Sutton, M. 1954. Bird survey of the Verde Valley. Plateau 27:9-17.

One hundred seventy-nine forms

Swarth, H. S. 1914. A distributional list of the birds of Arizona. Pacific Coast Avi. 10:1-133.

362 sp. and ssp., hypothetical list, and bibliography.

____________. 1929. The faunal areas of southern Arizona: A study in animal distribution. Proc. Calif. Acad. Sci. (4th ser.) 18:267-383.

One hundred sixty-four sp. and ssp.

Tucson Audubon Society. 1964. Birds of southeastern Arizona. Tucson Audubon Society. 32 p.

Habitat and seasonal occurrence for 260 "regular" species and 82 accidental species.

Van Rossem, A. J. 1936. Notes on birds in relation to the faunal areas of south-central Arizona. Trans. San Diego Soc. Nat. Hist. 8:121-148.

Critical notes on 42 spp.

Willard, F. C. 1918. Evidence that many birds remain mated for life. Condor 20:167-170.

Gives many Arizona examples.

____________. 1923. Some unusual nesting sites of several Arizona birds. Condor 25:121-125.

Seventeen species nesting in desert, grassland, and farm country.

CALIFORNIA

Brown, Vinson, and H. G. Weston [S.F. Wallsen, ed.] 1965. Handbook of California birds (revised edition). Naturegraph Company, Healdsburg, California. 156 p.

Primarily useful for field identification, this volume contains black and white drawings of all but a few species plus several color plates reprinted from Booth's Birds of the West (1960), (General:Identification). Introductions to bird behavior and habitat and a key to bird sounds increase the usefulness of the book.

Burleigh, T. D. 1928. A brief glimpse of California bird life. Murrelet 9:39-42.

California Fish and Game Department. 1974. At the crossroads / A report on California's rare and endangered wildlife. 112 p.

Considerable information: description, distribution, status, protective measures taken, recommendations, and references. Photographs and maps included.

Davis, W. B. 1933. The span of the nesting season of birds in Butte County, California, in relation to their food. Condor 35:151-154.

Grassland - chaparral - coniferous forest.

Dawson, W. L. 1923. The birds of California. (Booklover's edition). South Moulton Company, San Diego / Los Angeles / San Francisco. 4 volumes. 2,121 p.

A classic; full of useful information.

Grinnell, J. 1909. A bibliography of California ornithology. Pacific Coast Avifauna 5. 166 p.

__________. 1912. A systematic list of the birds of California. Pacific Coast Avifauna 8. 25 p.

__________. 1915. A distributional list of the birds of California. Pacific Coast Avifauna 11. 217 p.

__________. 1924. Bibliography of California ornithology; 2nd installment. Pacific Coast Avifauna 16. 191 p.

__________. 1939. Bibliography of California ornithology; 3rd installment. Pacific Coast Avifauna 26. 235 p.

__________, J. Dixon, and J. M. Linsdale. 1930. Vertebrate natural history of a section of northern California through the Lassen Peak region. Univ. Calif. Publ. Zool. 35. 594 p.

One of the classic regional studies, this paper includes the sagebrush-pigmy rabbit-bitterbrush faciation, as well as the montane forest.

__________ and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna 27. 608 p.

An essential work for the state.

__________ and H. S. Swarth. 1913. An account of the birds and mammals of the San Jacinto area of southern California with remarks upon the behavior of geographic races on the margins of their habitats. Univ. Calif. Publ. Zool. 10:197-406.

Mixed coniferous forest - chaparral.

__________ and M. W. Wythe. 1927. Directory to the bird life of the San Francisco Bay region. Pacific Coast Avi. 18. 160 p.

Hall, H. M. and J. Grinnell. 1919. Life-zone indicators in California. Proc. Calif. Acad. Sci. 9:37-67.

Hardy J. W. 1973. Feral exotic birds in southern California. Wilson Bull. 85:506-512.

This paper summarizes the status of fourteen species establishing populations in the southwestern California area. Parrots, bulbuls, and fringillids are included.

Herman, Carlton M., W. C. Reeves, H. E. McClure, E. M. French, and W. McD. Hammon. 1954. Studies of avian malaria in vectors and hosts of encephalitis in Kern County, California. I. Infections in avian hosts. Am. J. Trop. Med. and Hyg. 3:676-695.

Grassland - desert - chaparral.

Herms, W. B. C. G. Kadner, P. Galindo, V. Armstrong, and D. F. Armstrong. 1939. Blood parasites of California birds. J. Parasitol. 25:511-512.

Ingles, L. B. 1929. The seasonal and associational distribution of the fauna of the upper Santa Ana River. Washington J. Ent. Zool. 21:1-48, 57-96.

Compares bird preferences for chaparral vs. sagebrush in San Bernadino Mountains, California.

Kadner, C. G. 1941. A survey of bird malaria in California and a study of its transmission. Ph.D. thesis. University of California.

Linsdale, Jean M. 1937. Preservation of birds in California. Condor 39:198-203.

Los Angeles Audubon Society. 1953. Annotated field list of the birds of southern California.

__________. 1961. A study list of the most commonly seen birds of southern California.

Order both from author, 7377 Santa Monica Boulevard, Los Angeles, California.

Mailliard, Joseph. 1927. The birds and mammals of Modoc County, California. Calif. Acad. Sci. Proc. (4th series) 16:261-359.

NE corner of California:sagebrush - conferous forest.

McCaskie, R. Guy and Richard C. Banks. 1966. Supplemental list of birds of San Diego County, California. Trans. San Diego Soc. Nat. Hist. 14:157-168.

Chaparral and hot desert.

__________, P. Devillers, A. M. Craig, C. R. Lyons, V. P. Coughran, and J. T. Craig. 1970. A checklist of the birds of California. California Birds 1:4-28.

__________, R. Stallcup, and P. DeBenedictis. 1966. Notes on the distribution of certain icterids and tanagers in California. Condor 68:595-597.

__________, __________, and __________. 1967a. The occurrence of certain flycatchers in California. Condor 69:85-86.

Observations on eastern kingbird, thick-billed kingbird, tropical kingbird, scissor-tailed flycatcher, and eastern phoebe.

__________, __________, and __________. 1967b. The distribution of certain Mimidae in California. Condor 69:310-311.

Status of five species.

__________, __________, and __________. 1967c. The status of certain fringillids in California. Condor 69:426-429.

Observations on regional status of nine spp.

McClure, H. Elliot. 1962. Ten years and 10,000 birds, Parts I and II. Bird-Banding 33:1-21, 69-84.

Banders trapped more than 12,300 individual birds of 75 spp. during 1946-1950 in Kern County, California. This report, written ten years after termination of the banding program, gives detailed information on banding and on available recoveries.

Miller, A. H. 1937. Biotic associations and life-zones in relation to the Pleistocene birds of California. Condor 39:248-252.

____________. 1951. An analysis of the distribution of birds of California. Univ. Calif. Publ. Zool. 50:531-643.

The most important reference on habitat preferences of California birds. The author classifies the California avifauna according to 21 ecologic situations. The greatest numbers of bird species occur in riparian woodland, montane forest, and oak woodland. The proportion of species showing exclusive or first preference for particular formations was highest for birds of fresh-water marsh, riparian woodland, and coniferous forest. Most birds range through or utilize two or three formations; only one-fourth adhere to one formation, a situation similar to that for life zone distribution. The author also analyzes origins of species in time and space.

Norman, Marion. 1961. Common birds of garden, park, forest, and chaparral of San Francisco Bay region. Sequoia Audubon Society, 656 Cedar Street, San Carlos, California. Ten cents each.

Price, John D. 1954. Familiar birds of the Stanford Campus (revised edition). Paper, $0.75. Stanford University Press.

Pyle, R. L. 1953. Annotated field list of the birds of southern California. Aud. Center of S. California. 40 p.

Contains information on abundance and seasonal occurrence.

Ralph, C. John. 1971. An age differential in migrants in coastal California. Condor 73:243-246.

Age composition differed significantly from the normal for three species of autumnal, long distance nocturnal passerine migrants on the central California coast. Ninety-five percent of captures were young birds. Immatures migrating along the coast may have non-adaptive genetically-based navigational tendencies. Not only have these birds wandered far from their normal migratory route, but they also must overcome the hazards of an overwater flight.

Reeves, W. C. and others. 1947. Recovery of western equine encephalomyelitis virus from wild bird mites (Liponyssus sylviavum) in Kern County, California. Science 105:411-412.

Mites from nests of yellow-headed blackbird and house sparrow.

Ruth, Ferd. S. 1960. Habitat checklist of the vertebrates of Contra Costa County, California. Diablo Valley College, Concord, California.

Grassland-chaparral.

Salt, G. W. 1953. An ecological analysis of three California avifaunas. Condor 55:258-273.

The author classifies birds of three ecosystems according to their feeding habits. The three sites are Boca Spring, Nevada County, (sagebrush-pine forest ecotone); Yosemite Valley (coniferous forest and montane meadow); and Glen Oaks Canyon, Los Angeles County (Chaparral and riparian oak woodland).

Sams, James R. and Ken Scott Jr. 1959. Birds of San Diego County, Calif.: An annotated checklist. Occa. Paps. San Diego Soc. Nat. Hist. 10. 49 p.

Chaparral and desert.

Small, Arnold. 1973. Birds of California. Winchester Press. $12.50.

A recent, comprehensive annotated list of over 500 species, with distribution, seasonal status, and habitat preference. 280 species illustrated.

Stewart, Robert M. 1972. A summary of bird surveys in California, 1947-1971. Point Reyes Bird Observ. Newsletter 21 (April):2-3.

Stoner, Emerson A. 1969. Bird-banding in California. California Fish and Game 55:4-11.

More than 1,200,000 birds have been banded in California since the beginning of banding at the start of this century. Although constituting only a small percentage of the birds banded, many banding recoveries and returns have occurred. The paper discusses a selected few of these recoveries.

Wauer, Roland H. 1964. Ecological distribution of the birds of the Panamint Mountains, California. Condor 66:287-301.

Of 144 species reported for the Panamints, 75 breed there. Three species nest in the valley alluvial fans, 16 species nest in the lower canyons. Eleven species nest in open sage flats and valley, 41 species nest in the pinon-juniper woodland, 19 species in the limber pine association, and 8 species in the bristlecone pine association. Only one species, the rock wren, nests in all zones. Forty-three species nest in only one zone.

Willett, G. 1912. Birds of the Pacific slope of southern California. Cooper Orn. Club, Pacific Coast Avifauna 7. 122 p.

Woods, R. S. 1927. The hummingbirds of California. Auk 44:297-318.

COLORADO

Aiken, C. E. H. and E. R. Warren. 1914. The birds of El Paso County, Colorado. Colorado College Sci. Series 12:455-603.

Covers the area around Colorado Springs, from the grassland of the Great Plains to the alpine tundra of 14,110 ft. Pikes Peak.

Bailey, Alfred M. and R. J. Niedrach. 1965. The birds of Colorado (2 volumes). Denver Museum of Natural History. 1175 p.

Extremely complete and well illustrated. Includes introductions to ornithology and Colorado ecology. Annotated bird list, gazetteer, 33 page bibliography.

____________ and ____________. 1967. Pictorial checklist of Colorado birds. Denver Museum of Natural History. 168 p.

Condensation of "Birds of Colorado": contains all the plates but a much shortened text.

Baker, Inez. 1961. Check-list of Colorado birds. Order from author, 411 Lincoln Street, Longmont, Colorado. Ten cents each.

Beidleman, R. G. 1951. Recent bird records from northwestern Colorado. Condor 53:260-261.

____________. 1955. Guide to the winter birds of Colorado. University of Colorado Mus. Leaflet 12. 62 p.

Betts, N. D. 1914. Birds of Boulder County, Colorado. University of Colorado Studies 10(4). 54 p.

From the grassland to the alpine tundra.

Bergtold, W. H. 1928. Guide to the birds of Colorado. Smith-Brooks Printing Company, Denver. 207 p.

Cary, Merritt. 1911. A biological survey of Colorado. North Am. Fauna 33. 256 p.

Colorado Bird Notes. 1953-1967. Bulletin of the Colorado Bird Club and Denver Field Ornithologists.

Contains records of species observations, yearly analyses of seasonal bird counts in the state, and brief articles about Colorado birds.

Colorado Field Ornith. No. 7. 1970.

Summarizes the state of ornithology in Colorado, including: Summer bird-finding, bird clubs, founders of Colorado ornith., Colorado type localities, Colorado bird collections, and Colorado bird-banding research.

Cooke, W. W. 1897. Birds of Colorado. State Agr. College (CSU) Agr. Exp. Station, Fort Collins. Bull. 37 (Tech Series). Smith-Brooks Printing Company, Denver. 144 p.

__________. 1898. Birds of Colorado: Further notes. Bull. 44 (Tech Series 4): 147-176. Agr. Exp. Stn., Published by Smith-Brooks.

__________. 1900. Birds of Colorado: Second appendix. Bull. 56 (Tech Series 5): 179-239. Agricultural Experiment Station, Fort Collins.

__________. 1909. Birds of Colorado: Third supplement. Auk 26:400-422.

Davis, W. A. 1969. Birds in western Colorado. Colorado Field Ornith.

Annotated field list and travel guides for finding the best birding spots. Available from Historical Museum and Institute of Western Colorado, 4th and Ute, Grand Junction, Colorado, 81501.

__________. 1970. Additions and corrections. Colorado Field Ornith. 8:30-32.

Hadow, H. H. 1973. Winter ecology of migrant and resident Lewis' woodpeckers in southeastern Colorado. Condor 75:210-224.

Competition, food habits, and migration in plains and foothills. (Grassland and woodland-bushland).

Keyser, Leander S. 1902. Birds of the Rockies. A. C. McClurg and Company. Chicago. 355 p.

Useful early account of Colorado birds. Contains much life history information and serves as a good source of early records.

Knorr, Owen A. 1956. The birds of El Paso County, Colorado. Ph.D. thesis. University of Colorado. 147 p.

__________. 1959. The birds of El Paso County, Colorado. University of Colorado Press, Boulder. 48 p.

The author compares birds of the county observed in 1947-1951 with those reported by Aiken and Warren, 1914. He analyzes the species according to life zone and faunal affinities. Since 1914, birds associated with aquatic habitats have increased owing to increased water storage in the county. Certain passerines have increased in connection with plantings about dwellings. Those species subject to hunting pressure and those affected by grazing and agriculture have decreased. Other unexplainable changes occurred.

Lane, James A. and H. R. Holt. 1973. A birder's guide to Denver and eastern Colorado. L&P Photography, Box 19401, Denver, Colorado, 80219. ($3.00).

Marsh, Thompson G. 1931. A history of the first records of all the birds reported to have been seen within the present boundaries of the state of Colorado prior to settlement. M.S. thesis. University of Denver.

Good source of information on earliest records.

Niedrach, R. J. and R. B. Rockwell. 1959. Birds of Denver and Mountain Parks. Denver Museum of Natural History, Popular Series 5, second edition. 203 p.

Except for rare species, an excellent handbook for the state.

Reddal, J., compiler. 1973. Official state list of the birds of Colorado, as of June 1, 1973. Colorado Field Ornith. 17:3-14.

Species records classified by specimen, photograph, or sight record.

Rockwell, R. B. 1908. An annotated list of the birds of Mesa County, Colorado. Condor 10:152-180.

Sclater, W. H. 1912. A history of the birds of Colorado. Witherby and Company, London. 576 p.

Contains much life history information; still very useful.

Stabler, Robert S. 1956. Check-list of birds of Colorado. Order from author, Colorado College, Colorado Springs, Colorado 80903. Ten cents each.

This field checklist includes those species likely to be seen east of the Continental Divide.

____________ and Nancy J. Kizmiller. 1970. Hematozoa from Colorado birds. III. Passeriformes. J. Parasitol 56:12-16.

The authors report hematozoa from 1,361 Passerines representing 101 species and 22 families from Colorado. They detected some parasitemia in 693 birds (51%). The parasites and their incidences were: Plasmodium (all species), 43 (3%); Haemoproteus, 229 (17%); Leucocytozoon, 273 (20%); Haemogregarines sensu lato (Hepatozoon and Lankesterella), 40 (2.9%); microfilaria, 174 (13%). Seventy-one new host-parasite associations occurred.

IDAHO

Arvey, M. Dale. 1947. A check-list of the birds of Idaho. University of Kansas Publ., Museum of Natural History 1 (10):193-216.

____________. 1950. Additions and corrections. Condor 52:275.

Burleigh, Thomas D. 1972. Birds of Idaho. The Caxton Printers, Ltd., Cadwell, Idaho. 467 p. ($17.50).

This volume brings together detailed information on the birds of the state, their identifying variations, distribution, movements, and habits. It also includes the results of a detailed survey of the birdlife of Idaho conducted by the U. S. Fish and Wildlife Service over a period of 11 years. A list of birds and a bibliography emphasize distribution and taxonomy at the expense of ecology.

Engles, C. H. 1938. A preliminary report on the birds of Moscow, Idaho and vicinity. M. S. thesis. University of Idaho. 35 p.

Johnston, David W. 1949. Populations and distribution of summer birds of Latah County, Idaho. Condor 51:140-149.

Larrison, E. J. et al. 1967. Guide to Idaho birds. Journal Idaho Acad. Sci. 5:1-220.

Levy, S. H. 1950. Summer birds in southern Idaho. Murrelet 31:2-8.

____________. 1962. Additional summer southern Idaho bird notes. Murrelet 43:10-14.

Lists 49 species new in southern Idaho since Levy (1950). The new total is 182 species.

Merriam, C. Hart and L. Stejneger. 1891. Results of a biological reconnaissance of south-central Idaho. North Am. Fauna 5. 132 p.

Moser, Edward. 1944. A preliminary check-list of the birds of Idaho. M. S. thesis. Cornell University.

Oring, L. 1962. Observations on the birds of southeastern Idaho. Murrelet 43(3):40-50.

Pitcher, K. W. 1968. Birds of the Fort Hall bottoms. M. S. thesis. Idaho State University. 50 p.

Rush, W. M. 1942. Wildlife of Idaho. Fish and Game Commission, Boise. 299 p.

Popular account for children. (p. 173-232 on birds).

Rust, H. J. 1915. An annotated list of the birds of Kootenai County, Idaho. Condor 17:118-129.

__________. 1916. Additional notes. Condor 18:81-82.

Coniferous forest - Palouse grassland.

__________. 1917. An annotated list of the birds of Fremont County, Idaho, as observed during the summer of 1916. Condor 19:29-43.

Northeast corner of Idaho: Sagebrush-coniferous forest.

MONTANA

Coatney, G. Robert and Wm. L. Jellison. 1940. Some blood parasites from Montana birds. J. Parasitol. 26:158-160.

Davis, C. V. 1963. Birds of Montana. Montana Wildlife(August):23-27.

Checklist with season of occurrence indicated.

Hoffman, Robert S. and Ralph L. Hand. 1962. Additional Notes on Montana birds. Murrelet 43:29-35.

Gives data on the local status of 31 less common species.

Mackie, Richard J. and Harley W. Yeager. 1966. A list of literature pertaining to wildlife research and management in Montana. Montana Fish and Game Department Game Res. Rept., Spec. Rept. 1. 75 p.

The list indexes all formal publications -- technical, semi-technical, and popular -- and all significant unpublished reports and materials. (Includes work in Yellowstone National Park.)

Mills, Harlow B. 1937. Some Montana birds, their relationship to insects and rodents. Montana Agricultural Experiment Station Circular 151. 48 p.

Economic relations of raptors, fish-eaters, and other birds.

Museum of Vertebrate Zoology. 1961. Montana bird list. Order from author, Montana State University, Bozeman, Montana.

Richmond, C. W. and F. H. Knowlton. 1894. Birds of south-central Montana. Auk 11:298-308.

Saunders, A. A. 1914. Birds of Teton and northern Lewis and Clarke Counties, Montana. Condor 16:124-144.

Grassland-coniferous forest.

__________. 1921. A distributional list of the birds of Montana, with notes on the migration and nesting of the better known species. Cooper Orn. Club, Pacific Coast Avifauna 14. 195 p.

This work still serves as a primary source on Montana birds.

Weydemeyer, Winton, K. D. Swan, and E. F. Rapraeger. 1940. List of the birds of western Montana. U.S. Forest Service Field Notes on Wildlife. 16 p.

NEVADA

Austin, George T. 1968. Additional bird records for southern Nevada. Auk 85:692.

Notes on six spp.

____________ and W. Glen Bradley. 1971. The avifauna of Clark County, Nevada. J. Arizona Acad. Sci. 6:283-303.

Desert and woodland-covered ranges.

Banks, R. C. 1968. Annotated bibliography of Nevada ornithology since 1951. Great Basin Naturalist 28:49-60.

This bibliography includes references published from 1951 - 1967 on the status and distribution of birds in Nevada.

Bradley, W. G. and J. E. Deacon. 1965. The biotic communities of southern Nevada. University of Nevada Desert Research Institute Preprint No. 9. 128 p. (including appendices).

This valuable paper analyzes the distribution and relative abundance of the avifauna of each biotic community in the area; desert scrub, pinon-juniper woodland, coniferous forest, alpine tundra, desert riparian, and marsh communities.

Gabrielson, Ira N. 1949. Bird notes from Nevada. Condor 51:179-187.

Notes on locality and seasonal occurrence of about 140 species, supplementing Linsdale (1936).

Johnson, Ned K. 1965. The breeding avifaunas of the Sheep and Spring Ranges in southern Nevada. Condor 67:93-124.

Observations on ecology and abundance of 69 spp. in the Spring Range and 62 spp. in the Sheep Range.

LaRivers, Ira. 1941. The Mormon cricket as food for birds. Condor 43:65-69.

Notes on 36 species of birds observed to feed on Anabrus simplex in Nevada in 1939.

Linsdale, J. M. 1936. The birds of Nevada. Pacific Coast Avifauna 23. 145 p.

The most complete work on the state.

Linsdale, Jean M. 1951. A list of the birds of Nevada. Condor 53:228-249.

Pulich, W. M. and A. R. Phillips. 1951. Autumn bird notes from the Charleston Mountains, Nevada. Condor 53:205-206.

Pinon-juniper / coniferous forest.

Van Rossem, A. J. 1936. Birds of the Charleston Mountains, Nevada. Pacific Coast Avifauna 24:1-65.

Pinon-jüniper / coniferous forest.

NEW MEXICO

Bailey, F. M. 1928. Birds of New Mexico. New Mexico Department of Game and Fish. 807 pp.

This classic source for the state contains much information not in Ligon (1961). Thirty-page bibliography.

Bailey, V. 1913. Life zones and crop zones of New Mexico. North Am. Fauna 35. 100 p.

___________. 1928. Animal life of the Carlsbad Cavern. Williams and Wilkins Company, Baltimore. 195 p. (Monograph of the American Society of Mammalogists #3).

This volume contains a 32-page chapter on the common birds of the region, with brief comments on a variety of behaviors. Data on nesting and abundance proves particularly useful.

Haas, Glenn E., Richard P. Martin, and Martha Swickard. 1972. Bird fleas (Siphonaptera) of New Mexico. Canadian Entomol. 104:881-883.

Hamilton, Michael. 1961. Checklist of the birds of Santa Fe, New Mexico. Order from author, Box 535, Santa Fe, New Mexico. (Fifty for $1.75).

Harris, Bruce K. 1965. More specimen records of birds unusual in New Mexico. Auk 82:648-650.

Occurrence records for 11 spp.

Hubbard, John P. 1963. Noteworthy records from New Mexico. Condor 65:236-239.

An annotated list of 33 spp. of less-common New Mexico birds now in the collection of the University of Michigan Museum of Zoology.

___________. 1970. Checklist of the birds of New Mexico. New Mexico Ornithological Society Publication No. 3. Cedar Crest, New Mexico. McLeod Printing Company. 103 p.

Distribution and seasonal status for each of 476 species. This is the authoritative checklist.

___________. 1971. The summer birds of the Gila valley, New Mexico. Nemouria, Occas. Pap. Del. Mus. Nat. Hist. 2. 35 p.

Annotated list of 143 spp. with a description of habitats. Hot desert / desert grassland / pinon-juniper / coniferous forest.

____________. 1972. Southwestern songbirds. p. 79-96 In Proc. symposium on rare and endangered species of the southwestern United States, September 1972. New Mexico Department of Game and Fish, Santa Fe. 167 p.

This volume discusses the less widespread and less numerous breeding songbirds of the Southwest, emphasizing New Mexico. It includes major distributional areas for New Mexico's rarer birds.

Gilman, M. F. 1908. Birds of the Navajo Reservation in New Mexico. Condor 10:146-152.

Desert / grassland / pinon-juniper.

Jensen, J. K. 1923. Notes on the nesting birds of northern Santa Fe County, New Mexico. Auk 40:452-469.

Grassland -- pinon-juniper.

Lamb, Samuel H. 1971. Woody plants of New Mexico and their value to wildlife. New Mexico Department of Game and Fish Bulletin 14. 80 p.

Includes tables of ecological groupings of animals and trees by life zones, and a discussion of the use of woody plants by wildlife.

Ligon, J. Stokley. 1961. New Mexico birds and where to find them. University of New Mexico Press, Albuquerque. 360 p. (Paper or cloth).

Intended to replace F. M. Bailey (1928), long out of print. Includes distribution and nesting records through 1958. Omits juvenile plumage description and Bailey's range maps, and shortens adult descriptions. Refuge checklists are appended, as well as notes on 36 bird-watching area. No bibliography.

Niles, David M. 1966. Additional distributional records from New Mexico. Condor 68:213-215.

Annotated list of 18 spp.

Smylie, Tom. (Undated). Field checklist of birds of the Sandia Mountains. Cibola National Forest, Sandia Ranger District, Albuquerque, New Mexico.

This checklist card indicates the abundance and status of 189 species of the coniferous forest and pinon-juniper woodland.

Wauer, Roland H. 1971. Ecological distribution of birds of the Chisos Mountains, Texas. Southwestern Naturalist 16:1-29.

Extensive observations of avian breeding habitat allowed identification of six distinct desert and woodland plant associations. Thirty species nested in the Arroyo-Mesquite-Acacia habitat, 13 in Lechuguilla - Creosotebush - Cactus, 32 in Sotol-Grass, 42 in Dedicuous Woodland, 32 in Pinon-Juniper-Oak Woodland, and 24 in Cypress-Pine-Oak. Eighty-one species nested in the Chisos. This information applies to similar areas of Chihuahuan desert and mesquite grassland elsewhere in the Southwest.

OREGON-WASHINGTON

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NOTES ON LITERATURE AVAILABILITY

Many of the articles cited in the bibliography are from just three journals: Auk, Condor, and Wilson Bulletin. Nearly all university and big-city public libraries have sets of these important periodicals.

You normally can order dissertations and theses from a specific university through your local library via interlibrary loan. Those theses not available for loan usually can be photocopied. Both the issuing university and commercial firms provide this service.

One of those commercial firms, Xerox University Microfilms, Ann Arbor, Michigan, 48106, publishes a monthly bulletin, Dissertation Abstracts, abstracting their most recent offerings. This firm already has microfilmed most theses written at American universities, and we've provided order numbers for some of the theses we have cited. Order microfilm copies of Ph.D. dissertations at Canadian universities directly from the National Library of Canada at Ottawa.

We have included a number of papers from the International Biological Program Biome Projects, primarily the Grassland project. Copies of these research memoranda, technical reports, preprints, etc. must be obtained from their respective authors. For further information and authors' addresses write to the appropriate IBP office:

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BIOME MAP EXPLANATION AND SOURCES

The two maps are the same scale (1:7,500,000) used in The National Atlas of the United States of America. 1970. U. S. Geological Survey, Washington, D. C. This increases the usefulness of the maps since the "Atlas" provides transparent Overlays for Maps of this scale. Separate overlays depict physical features and counties of the Western States and Alaska.

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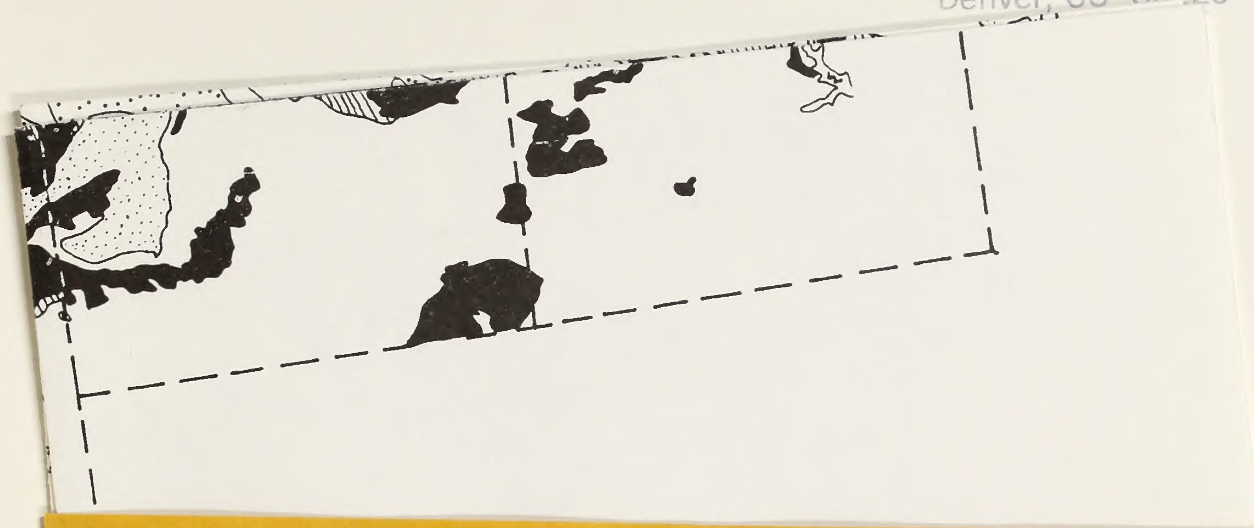

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