FUNCTIONS AND VALUES OF RIPARIAN HABITAT TO WILDLIFE IN ARIZONA
A LITERATURE REVIEW

By
Robert D. Ohmart and Cindy D. Zisner
Center for Environmental Studies
Arizona State University
Tempe, AZ 85287-3211

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Phoenix, AZ 85023

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INTRODUCTION

This report is a compilation of references examined during a literature search focusing on features of riparian habitats that are important to wildlife. An example of a feature important to wildlife is deciduous trees, i.e., cottonwoods and willows providing shade, cover, and supporting insects as food for many species of wildlife. Insects are provided a home and food resources in leaves, bark, and rotting wood of the trees. In turn, some birds, amphibians, reptiles, small mammals, and fish prey on the insects. The trees' roots also help stabilize the banks of a stream preventing erosion. Willows are extremely important to many species from birds for nesting and foraging to large ungulates for foraging and cover. Even dead trees are important for nesting and foraging sites. Riparian areas are important migratory corridors for birds and bats and travel corridors for large mammals such as elk and deer. Continuity of riparian vegetation is important for small vertebrates and when disrupted it causes reductions in population densities, terminates gene flow and can lead to species extinction. Fragmented riparian habitats can also lead to isolated populations of animal species preventing both population expansion and gene flow.

Fishes are obligate riparian species because of their need for permanent water. Streamside vegetation, in the form of trees, help shade the water to reduce high temperatures and maintain oxygen levels. Trees and shrubs also drop leaves into the stream which eventually, through aquatic invertebrates, become food for fish. Overhanging vegetation and banks along streams create nursery areas and cover for fish. The fibrous roots of grasses, sedges, rushes, and woody vegetation help stabilize banks. In colder, higher elevations grasses, sedges, and rushes also insulate and keep streamside soils from fracturing from ice crystals. Streamside vegetation also filters and traps sediments thereby improving water quality.

The first part of the report is a table treating major taxa such as birds, amphibians and reptiles, mammals, and fishes. A species was included if it used riparian habitats in any way for breeding, foraging, cover, or during migration. Each species is first listed by **COMMON/SCIENTIFIC NAME** followed by **RIPARIAN INFORMATION**. **RIPARIAN INFORMATION** contains data about where each animal is usually found, i.e., elevation, ponds, rivers, etc., the type of vegetation associated with it, nesting, and foraging areas. Not all information was found for all species. The third column of the table contains **REFERENCES**. Each list was compiled using the specific references mentioned at the beginning of each major taxa table. The **REFERENCES** column cites studies (chronologically and then alphabetically) which either directly or indirectly provided information on the species.

All citations in the **REFERENCES** column may be found in the second section of the report in an annotated bibliography. Every citation in the table is included in the bibliography. There are additional references in the bibliography which were not cited in the table. For ease in finding references in the bibliography it is divided in the same manner as the table and is in the same order. An annotated citation may appear on more than one list because some publications contained information in more than one category. Authors are then listed alphabetically and chronologically within each section. Each reference contains a complete citation, an abstract, location (state where study conducted), and key words.

Our efforts in compiling these data and references is the best we could do in the allotted time. The user should keep this in mind and add any important references that may have been overlooked.

TABLES

RIPARIAN REQUIREMENTS OF BIRDS IN ARIZONA

Nearly every species of bird in Arizona may be found in riparian habitat. The following table lists birds that are definitely known to occur in these habitats either for breeding, foraging, in migration, or wintering. A superscript B appears on some of the names and is ONLY indicative of the bird breeding in Arizona, not necessarily in riparian habitats. References used to compile the list were Bent (1962-1968), Phillips et al. (1964), Monson and Phillips (1981), American Ornithologists' Union (1983), Farrand (1983), and Rosenberg et al. (1991). Other references are listed which provide additional information.

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Red-throated Loon *Gavia stellata*	Open, deep water; forages for fish in protected areas and along shorelines; also eats crustaceans, amphibians, and aquatic insects	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Pacific Loon *Gavia arctica*	Open, deep water; forages for fish in protected areas and along shorelines; also eats crustaceans, amphibians, and aquatic insects	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Common Loon *Gavia immer*	Open, deep water; forages for fish in protected areas and along shorelines; also eats crustaceans, amphibians, and aquatic insects	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Least Grebe[B] *Tachybaptus dominicus*	Freshwater lakes, streams, ponds, dense marsh vegetation; eats mainly aquatic insects and larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988
Pied-billed Grebe[B] *Podilymbus podiceps*	Nests in marshy lakes and backwaters on floating mat of vegetation anchored to emergent vegetation; canals; eats fish, frogs, tadpoles, aquatic invertebrates	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Horned Grebe *Podiceps auritus*	Open, deep water; eats small fish, aquatic invertebrates, and amphibians	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Red-necked Grebe *Podiceps grisegena*	Rivers, lakes, large ponds with reeds or sedges at edges; eats mainly aquatic insects, small fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988
Eared Grebe *Podiceps nigricollis*	Marshes, ponds, lakes, canals; eats mainly aquatic insects and larvae	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Western Grebe[B] *Aechmophorus occidentalis*	Open water; protected coves with marshy shoreline for breeding; nest is floating mat of dead reeds anchored to bulrush; eats fish and other aquatic animals	Ohmart and Anderson 1978, 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Clark's Grebe[B] *Aechmophorus clarkii*	Open, deep water; eats fish and other aquatic animals	Ohmart et al. 1988
American White Pelican *Pelecanus erythrorhynchos*	Open water; eats primarily fish but also other aquatic vertebrates like tadpoles; usually only in migration	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Brown Pelican *Pelecanus occidentalis*	Open water; eats mainly fish; usually only in migration	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Speich 1986 Ohmart et al. 1988
Double-crested Cormorant[B] *Phalacrocorax auritus*	Rivers, ponds, canals, large lakes; flooded snags or riparian trees for nesting; primarily eats fish	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Olivaceous Cormorant *Phalacrocorax olivaceous*	Rivers, lakes, marshes; only in area of Nogales and lower Colorado River Valley; primarily eats fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
American Bittern[B] *Botaurus lentiginosus*	Fresh and brackish water marshes or wet riparian areas, generally in tall emergent vegetation, i.e., cattails; ground-dwelling; eats mainly fish, amphibians, and small animals	Brown et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988
Least Bittern[B] *Ixobrychus exilis*	Cattail, reed, or bulrush marshes; eats mainly fish, amphibians, and small aquatic animals	Brown et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988
Great Blue Heron[B] *Ardea herodias*	Fresh and brackish water marshes, along lakes, rivers, ponds, agricultural fields, canals; tall riparian trees required for nesting; forages for fish and small aquatic animals	Hensley 1954 Wauer 1977 Davis 1982 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Haywood and Ohmart 1986 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Great Egret[B] *Casmerodius albus*	Marshes, along streams, backwaters; requires tall riparian trees for nesting; nests with Great Blue Herons and may displace them at specific sites; forages in shallow water for fish, frogs, snakes, rodents, and grasshoppers; is listed as state endangered	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 (*Ardea alba*) Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Snowy Egret[B] *Egretta thula*	Marshes, lakes, ponds, backwaters; requires bushes or trees for nesting (sometimes with other herons), willow thickets in marshes; forages in	Gavin and Sowls 1975 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	shallow water for mainly fish, amphibians, and large insects	Clark 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Cattle Egret *Bubulcus ibis*	Often found with large-hoofed mammals as egrets eat the insects and other prey disturbed by the animals' movements, agricultural land, wet pastures; seldom seen on riverbanks or marshes with other herons; recent invaders to lower Colorado River Valley	Ohmart and Anderson 1982 Rea 1983 (*Ardea ibis*) Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Green-backed Heron[B] *Butorides striatus*	Ponds, rivers, lakes, marshes; requires riparian trees for nesting, dense willows are preferred; often perches in trees; eats fish and small aquatic animals	Hensley 1954 Wauer 1977 (Green Heron) Ohmart and Anderson 1982 Rea 1983 (*Ardeola virescens*) Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Black-crowned Night-Heron[B] *Nycticorax nycticorax*	Marshes, ponds, lakes, rivers, streams; roosts and nests in dense riparian trees (including mature tamarisks) or occasionally cattail marshes, forages at night for fish and small aquatic animals	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
White Ibis *Eudocimus albus*	Marshes, backwaters; casual visitor from Mexico; eats mainly crayfish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
White-faced Ibis *Plegadis chihi*	Marshes, ponds, shallow backwaters, rivers, flooded agricultural fields; eats mainly crayfish, other invertebrates, and small fish; listed federally as a candidate species (Category 2)	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Wood Stork *Mycteria americana*	Marshes, irrigated fields, canal banks; feeds on tadpoles, aquatic insects, some fish, and seeds	Hensley 1954 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Fulvous Whistling-Duck *Dendrocygna bicolor*	Shallow fresh and brackish waters, prefers protected marshes, irrigated fields; eats mainly seeds and vegetation	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Brown 1985 Ohmart et al. 1988
Black-bellied Whistling-Duck[B] *Dendrocygna autumnalis*	Freshwater and brackish marshes, woodland streams and ponds; regularly perches in trees	Ohmart and Anderson 1982 Brown 1985
Tundra Swan *Cygnus columbianus*	River channels and marshes; feed on vegetative material; in Alaska show a preference for small beaver ponds; prefers relatively slow-moving water that promotes emergent vegetation growth; eats mainly vegetation, some aquatic animals	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Greater White-fronted Goose *Anser albifrons*	Migrants seen flying over lakes and rivers, occasionally rest on sandbars; eats mainly seeds and vegetation	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Brown 1985 Ohmart et al. 1988
Snow Goose *Chen caerulescens*	Winter visitor; protected marshes and sandbars; forages on roots and shoots of bulrushes and marsh grasses but have adapted to eating cultivated grain	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Brown 1985 (*Anser caerulescens caerulescens*) Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Ross' Goose *Chen rossii*	Winters on lakes, sewage ponds, river; forages in grassy areas, grain fields, lawns; feeds mainly on seeds	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Brown 1985 (*Anser rossii*) Eng 1986a Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Brant *Branta bernicla*	Winter visitor to Colorado River Valley since 1965	Brown 1985 Ohmart et al. 1988
Canada Goose *Branta canadensis*	During winter, large protected lakes, marshes; although they chose many types of nest sites, those on islands seem to be preferred; are grazers and have adapted to foraging in agricultural fields; eats mainly seeds and other vegetation	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Wood Duck *Aix sponsa*	Wooded ponds, protected backwaters, marshes, along streams; recent records at Prescott-Camp Verde, Peck's Lake, upper Eagle Creek, and on Verde below Horseshoe Dam; nests in tree cavities and nest boxes; eats mainly seeds	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Green-winged Teal[B] *Anas crecca*	Lakes, marshes, ponds, pools, and shallow streams; nests in grasslands of White Mountains and San Francisco Plateau; forages on mud flats, shallow marshes, lake borders and occasionally irrigated fields for aquatic vegetation and seeds, insects, and shelled invertebrates	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Ohmart et al. 1988
Mallard[B] *Anas platyrhynchos*	Shallow waters such as ponds, lakes, marshes, flooded fields, lowland areas with large trees (cottonwood-willow) and perennial water; forages on vegetation and seeds, shelled invertebrates, and insects	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Eng 1986a Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Northern Pintail[B] *Anas acuta*	Lakes, rivers, marshes, and ponds; forages exclusively on vegetation, mainly seeds	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Blue-winged Teal *Anas discors*	Marshes, ponds, lakes, and sluggish streams, river; groups feed on aquatic plants in shallow marshes or mud flats	Hensley 1954 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Cinnamon Teal[B] *Anas cyanoptera*	Marshes, shallow lake margins, ponds, streams, marshy canals; eat mainly seeds, vegetation, insects, shelled invertebrates	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Northern Shoveler *Anas clypeata*	Shallow freshwater areas, marshes, unchannelized river; eats mainly aquatic vegetation and seeds, some mollusks	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Eng 1986a Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Gadwall[B] *Anas strepera*	Marshes, grassy areas, ponds, lakes; eats mainly aquatic vegetation	Gavin and Sowls 1975 Ohmart and Anderson 1982 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
American Wigeon *Anas americana*	River, large marshes and lakes, ponds; forages mostly on aquatic vegetation and seeds, followed by some insects and shelled invertebrates	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Canvasback *Aythya valisineria*	Winters on large lakes and deep rivers with abundant aquatic plants; nests near small ponds more often; eats mainly shellfish and vegetation	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Redhead *Aythya americana*	Winters on large open lakes and rivers; favors deep, large bodies of water for nesting; forages on aquatic plants more than other diving ducks	Hensley 1954 Ohmart and Anderson 1982 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Ring-necked Duck[B] *Aythya collaris*	Ponds, protected river channels, marshes, canals; dense vegetation; forages on vegetation, insects, gastropods, and mollusks	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Greater Scaup *Aythya marila*	Below dam spillways, large lakes; forages on aquatic invertebrates and vegetation	Hensley 1954 Ohmart and Anderson 1982 Anderson and Ohmart 1984a, 1988 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988
Lesser Scaup *Aythya affinis*	Below dam spillways, coves of large lakes, along unchannelized river, generally in sheltered areas; forages on aquatic invertebrates and vegetation	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Oldsquaw *Clangula hyemalis*	Deep, open water of lakes and rivers; eats mainly mollusks, crustaceans, and insects	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988
Surf Scoter *Melanitta perspicillata*	Lakes and rivers; eats mainly mollusks, small fish, and small invertebrates	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Brown 1985 Eng 1986a Ohmart et al. 1988
White-winged Scoter *Melanitta fusca*	Open water of lakes and rivers; eats mainly mollusks, small fish, and small invertebrates	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Brown 1985 Eng 1986a Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Common Goldeneye *Bucephala clangula*	Deep open lakes and channelized river; eats mainly insects and other invertebrates	Ohmart and Anderson 1982 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Barrow's Goldeneye *Bucephala islandica*	Winters on lakes and rivers; eats mainly insects, other invertebrates, some fish	Ohmart and Anderson 1978, 1982 Anderson and Ohmart 1984a, 1988 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988
Bufflehead *Bucephala albeola*	Deep channelized river, lakes, near dam spillways, ponds, canals; secondary cavity-nesting species; eats primarily insects, some mollusks	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Hooded Merganser *Lophodytes cucullatus*	Small ponds, large lakes, dam spillways; nests in tree cavities along secluded woodland ponds and streams; eats small fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Common Merganser[B] *Mergus merganser*	Lakes and rivers, nests in tree cavities, nest boxes or cliff crevices; eats fish	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Red-breasted Merganser *Mergus serrator*	Large lakes and rivers; eats small fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a, 1988 Maser et al. 1984 Brown 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Ruddy Duck[B] *Oxyura jamaicensis*	River, lakes, small canals, nests in marshes with dense emergent vegetation; eats mainly seeds, other plant material	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a, 1988 Clark 1984 Maser et al. 1984 Brown 1985 Piest and Sowls 1985 Eng 1986a Ohmart et al. 1988 Sullivan and Richardson 1993
Osprey[B] *Pandion haliaetus*	Along rivers, lakes, backwaters, near dams; eats fish almost exclusively; hunts from perches overlooking water	Merriam and Stejneger 1890 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Kochert 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Mississippi Kite[B] *Ictinia mississippiensis*	Breeds along southeastern Arizona rivers; favors cottonwood trees ≥15 m for nesting; eats insects, mice, lizards, frogs, bats, cicadas; listed as state candidate species	Gavin and Sowls 1975 Ohmart and Anderson 1982 Glinski and Ohmart 1983 Kochert 1986 Hunter et al. 1987b Ohmart et al. 1988 Sullivan and Richardson 1993
Bald Eagle[B] *Haliaeetus leucocephalus*	Protected backwaters, marshes, lakes, rivers; nests in mature cottonwood trees or on cliffs; eats mainly fish, birds, mammals, and carrion; listed as endangered by both federal and state	Brown et al. 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Haywood and Ohmart 1986 Kochert 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Northern Harrier[B] *Circus cyaneus*	Breeds in marshes, but is a more open-country species; eats mainly rodents and other mammals; formerly called Marsh Hawk	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Kochert 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Sharp-shinned Hawk[B] *Accipiter striatus*	Breeds at very high elevations in conifers and mixed conifers-aspen-birch forests; in migration and winter may occur in almost any habitat with trees including riparian habitat; prey is small and medium-sized birds and rodents	Merriam and Stejneger 1890 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Kochert 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Cooper's Hawk[B] *Accipiter cooperii*	Nests in cottonwood, willow, sycamore, alder; forages mainly on birds and rodents	Merriam and Stejneger 1890 Hensley 1954 Gavin and Sowls 1975 Stamp 1976, 1978 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Kochert 1986 Hunter et al. 1987b Ohmart et al. 1988 Sullivan and Richardson 1993
Common Black-Hawk[B] *Buteogallus anthracinus*	Along permanent streams and rivers, mostly in canyons; requires tall cottonwoods, willows for nesting; forages from low perches over running water for fish, amphibians, and other small animals; state candidate species	Brown et al. 1977 Stamp 1976, 1978 Wauer 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Hunter 1987 Hunter et al. 1987b Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Harris' Hawk[B] *Parabuteo unicinctus*	Desert scrub and mesquite, usually not far from marshes and large bodies of water; forages mainly on reptiles, rodents, and other animals	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Szaro and Jakle 1985 Kochert 1986 Hunter et al. 1987b Ohmart et al. 1988
Gray Hawk[B] *Buteo nitidus*	Cottonwoods, sycamores, and willows along permanent streams for nesting; San Pedro and Santa Cruz rivers, Peck's Lake, and Tavasci Marsh; listed as threatened by state	Brown et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Kochert 1986 Sullivan and Richardson 1993
Zone-tailed Hawk[B] *Buteo albonotatus*	Nests in tall deciduous trees along streams; preys mainly on lizards, frogs, and small fish	Gavin and Sowls 1975 Brown et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Kochert 1986 Hunter 1987 Ohmart et al. 1988 Sullivan and Richardson 1993
Ferruginous Hawk[B] *Buteo regalis*	Open country species, but nests in tall trees near streams; feeds mainly on rabbits and rodents; listed as federal candidate species (Category 2) and state threatened	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Kochert 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
American Kestrel[B] *Falco sparverius*	Cavity-nesting falcon; along Colorado only where cotton-wood or snags remain; south-eastern Arizona attracted to sycamore; forages mainly on insects, sometimes rodents and small birds	Merriam and Stejneger 1890 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Kochert 1986 Ohmart et al. 1988 Sedgwick and Knopf 1990 Strong and Bock 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Gambel's Quail[B] *Callipepla gambelii*	Mesquite, cottonwood; riparian edge and adjacent desert washes and upland; forages mostly on seeds but some ants and other insects taken	Hensley 1954 Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Wauer 1977 Davis 1982 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Szaro and Jakle 1985 Eng 1986b Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Black Rail[B] *Laterallus jamaicensis*	Lower Colorado River Valley, marshes with shallow water and cattails and California bulrush; nests in marshes, nest composed of fine grasses; eats mainly insects, some plants	Brown et al. 1977 Repking and Ohmart 1977 Ohmart and Anderson 1978, 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Clapper Rail[B] *Rallus longirostris*	Marshes with moderately dense cattail and bulrush, also reed; water depth and mats of marsh vegetation important; mainly eats invertebrates, crayfish dominant, also insects and amphibians; *R. l. yumanensis* is federally listed as endangered, and state listed as threatened	Brown et al. 1977 Ohmart and Tomlinson 1977 Ohmart and Anderson 1978, 1982 Rea 1983 Anderson and Ohmart 1984a, 1985 Connors 1986 Hunter et al. 1987a Ohmart et al. 1988 U.S. Fish and Wildlife Service 1991
Virginia Rail[B] *Rallus limicola*	Marsh habitats, mostly in cattails, reeds, and tall grasses; eats mainly worms, insect larvae, other invertebrates	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988 Sullivan and Richardson 1993
Sora[B] *Porzana carolina*	Cattail/bulrush marshes, small ponds, canals with marsh vegetation; sometimes forages	Hensley 1954 Ohmart and Anderson 1982 Rea 1983

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	on open mud flats for mollusks, other invertebrates, aquatic plants and seeds	Anderson and Ohmart 1984a Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988 Sullivan and Richardson 1993
Common Moorhen[B] *Gallinula chloropus*	Marshes, lakes, ponds with emergent vegetation and shallow water; nests are made of reeds, usually placed at edges of water; eats mainly seeds, vegetation, and some invertebrates	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Ohmart et al. 1988 Sullivan and Richardson 1993
American Coot[B] *Fulica americana*	Marshes, small ponds, canals, lakes, rivers; nests usually hidden in cattails and bulrushes; feeds on aquatic vegetation, some seeds, and invertebrates	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Haywood and Ohmart 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Sandhill Crane *Grus canadensis*	Marshes, edges of lakes and ponds, riverbanks, protected sandbars; eats mainly plant materials, some animals	Perkins and Brown 1981 Davis 1982 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Ohmart et al. 1988
Black-bellied Plover *Pluvialis squatarola*	Mud flats, shores of ponds or lakes; eats grasshoppers, beetles, and insect larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Lesser Golden-Plover *Pluvialis dominica*	Shorelines and mud flats; eats grasshoppers, other insects and larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Connors 1986 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Snowy Plover[B] *Charadrius alexandrinus*	Ponds, rivers, alkali ponds; eats flies, beetles, other insects, and larvae	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Connors 1986 Ohmart et al. 1988
Semipalmated Plover *Charadrius semipalmatus*	Mud flats, shallow marshes, shorelines of ponds and lakes	Ohmart and Anderson 1982 Maser et al. 1984 Connors 1986 Ohmart et al. 1988
Killdeer[B] *Charadrius vociferus*	Anywhere near open water; throughout state; nests in fields and on bare, gravelly ground; eats mainly insect larvae, grasshoppers, and beetles	Hensley 1954 Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Black-necked Stilt[B] *Himantopus mexicanus*	Shallow water areas, marshes, irrigated fields, secondary sewage effluent ponds; usually nest along shoreline, grassy, or unvegetated flats near freshwater, brackish or alkaline marshes and ponds; eats mainly aquatic insects, larvae, and other invertebrates	Ohmart and Anderson 1978, 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
American Avocet *Recurvirostra americana*	Lowland marshes, mud flats, ponds, alkaline lakes, sandbars, marshy shorelines, secondary sewage effluent ponds; usually nest along shoreline, grassy, or unvegetated flats near freshwater, brackish or alkaline marshes and ponds; forages for seeds, aquatic insects, and small crustaceans	Ohmart and Anderson 1978, 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Greater Yellowlegs *Tringa melanoleuca*	Marshes, ponds, lakes, stream edges, muddy or sandy flats; forages on aquatic insects, larvae, and some fish	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Lesser Yellowlegs *Tringa flavipes*	Marshes, ponds, wet meadows, lakes, mud flats, backwaters; eats aquatic insects, larvae, and crustaceans	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Solitary Sandpiper *Tringa solitaria*	Ponds, stream edges, temporary pools, more commonly in wooded areas in slow-moving water; feeds on insects, larvae, and crustaceans	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Willet *Catoptrophorus semipalmatus*	Open marshes, sandbars, lakeshores; usually nest near prairie marshes surrounded by grassland, either permanent or semipermanent water, fresh or brackish; prefers taller grasses for nesting; feeds on aquatic insects, crustaceans, mollusks, and small fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Spotted Sandpiper[B] *Actitis macularia*	Along stream, river and lake shores; grass nests located back from shoreline; eats various insects, larvae, crustaceans, and small fish	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Whimbrel *Numenius phaeopus*	Marshes, flooded fields; eats mainly grasshoppers, beetles, spiders, and other invertebrates	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Long-billed Curlew *Numenius americanus*	Lakeshores, mud flats, sandbars, marshes; eats various larvae and worms; federal candidate species (Category 2)	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Marbled Godwit *Limosa fedoa*	Marshes, mud flats, sandbars, islands, dam spillways; usually nest near prairie marshes surrounded by grassland, either permanent or semipermanent water, fresh or brackish; eats mollusks, crustaceans, insects, and larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Sanderling *Calidris alba*	Exposed sandbars, river channels below dams, lakeshores; eats crustaceans, insects, and larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Connors 1986 Ohmart et al. 1988
Western Sandpiper *Calidris mauri*	Pond and lake shores, sandbars; eats mainly insects, larvae, and other invertebrates	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Least Sandpiper *Calidris minutilla*	Canals, marshes, sandbars, mud flats, shores of pools and lakes; eats various insects and larvae	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Baird's Sandpiper *Calidris bairdii*	Grassy marshes, dry grassy areas near lakes and ponds; eats insects, larvae, and amphipods	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988
Pectoral Sandpiper *Calidris melanotos*	Wet meadows, mud flats, shores of ponds and pools; continuous marshes after hatching chicks; eats mainly	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	flies, amphipods, other insects, and plant material	Connors 1986 Ohmart et al. 1988
Dunlin *Calidris alpina*	Exposed mud flats or gravel bars, lake and pond shores; eats mollusks, worms, crustaceans, insects, and spiders	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Connors 1986 Ohmart et al. 1988
Short-billed Dowitcher *Limnodromus griseus*	Mud flats, shallow marshes, pools, ponds; eats mainly insects and larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Long-billed Dowitcher *Limnodromus scolopaceus*	Exposed mud flats, backwaters, shallow marshes, sandbars, canals; eats insects, larvae, and other invertebrates	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Common Snipe *Gallinago gallinago*	Wet meadows, marshy banks of rivers and lakes, dirt-lined canals; hides in low vegetation; nests in marshes in northern states; eats mainly worms, insect larvae, and insects	Hensley 1954 Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Hunter et al. 1987a Ohmart et al. 1988 Sullivan and Richardson 1993
Wilson's Phalarope *Phalaropus tricolor*	Shallow lakes and ponds; nests in ponds and marshy wetlands, both fresh and saline; eats mainly flies, aquatic bugs, and beetles	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Red-necked Phalarope *Phalaropus lobatus*	Ponds, large reservoirs, lakes, open marshes; eats aquatic insects and larvae	Ohmart and Anderson 1982 Rea 1983 (Northern Phalarope) Anderson and Ohmart 1984a Maser et al. 1984 Connors 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Red Phalarope *Phalaropus fulicaria*	Large lakes, ponds, marshes; eats crustaceans, insects, and tiny fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Connors 1986 Ohmart et al. 1988
Ring-billed Gull *Larus delawarensis*	Dams, large reservoirs or lakes; omnivorous	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
California Gull *Larus californicus*	Dams, lakeshores; omnivorous	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Herring Gull *Larus argentatus*	Dams, large lakes; rests on sandbars; omnivorous	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988
Sabine's Gull *Xema sabini*	Open water in lakes, reservoirs, river; eats mainly insects, small fish, and crustaceans	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Speich 1986 Ohmart et al. 1988
Caspian Tern *Sterna caspia*	Lakes, marshes, rivers; forages mainly on small fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Common Tern *Sterna hirundo*	Lakes, rivers, marshes; eats primarily small fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Speich 1986 Ohmart et al. 1988
Forster's Tern *Sterna forsteri*	Open water, sandbars, shallow marshes, backwaters, ponds, rivers, lakes; eats mainly insects, other aquatic animals	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Black Tern *Chlidonias niger*	Marshy shores of lakes, ponds, rivers; eats insects and small fish	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Speich 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Band-tailed Pigeon[B] *Columba fasciata*	Mountain forests, primarily oak; mixed conifer-deciduous forests; eats seeds and fruit	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Eng 1986b Ohmart et al. 1988 Sullivan and Richardson 1993
White-winged Dove[B] *Zenaida asiatica*	Nests in mesquite, screwbean mesquite, saltcedar, athel tamarisk, sycamore; nests are loosely constructed of sticks and placed 3-6 m high in trees; riparian interior and edge habitats more often than desert wash and upland; eats primarily seeds (agricultural)	Neff 1940 Hensley 1954 Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Brown et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Bock and Bock 1984 Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987a Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Mourning Dove[B] *Zenaida macroura*	Nests are loosely constructed of sticks and in mesquite, screwbean mesquite, saltcedar, sycamore, any other tree or shrub, even on ground, but is generally always near water; eats seeds	Merriam and Stejneger 1890 Hensley 1954 Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977 Brown et al. 1977 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Bock and Bock 1984 Clark 1984 Maser et al. 1984

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
		Szaro and Jakle 1985 Eng 1986b Haywood and Ohmart 1986 Hunter et al. 1987a, 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Common Ground-Dove[B] *Columbina passerina*	Willow and mesquite favored for nesting; nests are well built of twigs and grasses; eats seeds	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Ohmart et al. 1988
Yellow-billed Cuckoo[B] *Coccyzus americanus*	Mature stands of cottonwood and willows near water preferred; isolated cottonwoods or willows mixed with tall mesquite sometimes used for nesting; nests are platforms of sticks, 4.5-14 m above ground; forages in smaller mesquite and saltcedar for mainly large insects, but occasionally lizards and tree frogs; tend to forage by hovering or hawking in all structural layers of cottonwood on outer canopy on smaller branches and leaves; listed by state as threatened	Gavin and Sowls 1975 Stamp 1976, 1978 Brown et al. 1977 Anderson and Ohmart 1977, 1984a Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rosenberg et al. 1982 Anderson et al. 1983 Rea 1983 Clark 1984 Maser et al. 1984 Hunter 1987, 1988 Hunter et al. 1987a, 1987b, 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Common Barn-Owl[B] *Tyto alba*	Found statewide in a variety of habitats; nest in cavities of large riparian trees, cliffs along rivers and streams; roosts in willow and cottonwood trees; eats mainly rodents and birds	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Kochert 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Flammulated Owl[B] *Otus flammeolus*	Ponderosa pine, particularly oaks; eats mainly insects	Merriam and Stejneger 1890 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Kochert 1986

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Western Screech-Owl[B] *Otus kennicottii*	Native riparian trees, especially cottonwood, willow, screwbean and honey mesquite; nests in cavities of these trees	Gavin and Sowls 1975 Ohmart and Anderson 1982 Clark 1984 Kochert 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Whiskered Screech-Owl[B] *Otus trichopsis*	Upper Sonoran woodlands; usually nests in riparian habitats and dense stands in cavities	Kochert 1986
Great Horned Owl[B] *Bubo virginianus*	Variety of habitats; often uses large nests of other species, in cottonwoods, on cliffs, sycamore, walnut; forages mainly on rabbits and rodents	Merriam and Stejneger 1890 Gavin and Sowls 1975 Stamp 1976, 1978 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Kochert 1986 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Northern Pygmy-Owl *Glaucidium gnoma*	Coniferous forests and riparian woodlands	Ohmart and Anderson 1982 Maser et al. 1984 Kochert 1986
Ferruginous Pygmy-Owl[B] *Glaucidium brasilianum*	Shady riparian forests, cottonwood, mesquite	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Hunter et al. 1987b
Elf Owl[B] *Micrathene whitneyi*	Desert and riparian areas; nests in woodpecker cavities in cottonwood, willow, mesquite or saguaros; eats mainly insects	Ligon 1967 Gavin and Sowls 1975 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Kochert 1986 Hunter et al. 1987b Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Long-eared Owl[B] *Asio otus*	Dense stands of tall riparian trees; little known about breeding in state; eats mainly rodents	Gavin and Sowls 1975 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Kochert 1986 Ohmart et al. 1988
Short-eared Owl *Asio flammeus*	Open grassland, marshes, fields; eats mainly rodents	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Kochert 1986
Lesser Nighthawk[B] *Chordeiles acutipennis*	Nests on the ground; forages over riparian vegetation and water, but not restricted to it for flying insects such as beetles, moths, and ants	Hensley 1954 Austin 1970 Gavin and Sowls 1975 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Hunter et al. 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Vaux's Swift *Chaetura vauxi*	In migration, forages for flying insects over rivers, lakes, marshes, riparian vegetation	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Broad-billed Hummingbird[B] *Cynanthus latirostris*	Desert mountain canyons, riparian woodlands, especially sycamore, cottonwood, willow, and mesquite; attracted to tree tobacco, eats nectar	Wauer 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Violet-crowned Hummingbird[B] *Amazilia violiceps*	Riparian trees and moist canyons in southeastern Arizona	Wauer 1977
Blue-throated Hummingbird[B] *Lampornis clemenciae*	Moist canyons of southeastern Arizona, favors shady streamsides in mountains	Brown et al. 1977 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Magnificent Hummingbird[B] *Eugenes fulgens*	Moist canyons of southeastern Arizona, favors shady streamsides in mountains, also drier open pine forests	Clark 1984 Strong and Bock 1990
Anna's Hummingbird *Calypte anna*	Cottonwood and other deciduous trees; feeds on nectar and insects	Stamp 1976, 1978 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988
Black-chinned Hummingbird[B] *Archilochus alexandri*	Riparian woodland; riparian interior, edge and adjacent desert washes and upland; prefers dense willows, cottonwoods, and sycamores for nesting; nest is made of willow, down, and spider webs; forages at tree tobacco and other flowering trees and shrubs for nectar and small insects and spiders	Stamp 1976, 1978 Anderson et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Broad-tailed Hummingbird[B] *Selasphorus platycercus*	Found at higher elevations, among deciduous trees along streams of Upper Sonoran zone; females are attracted to willow thickets in high mountain meadows for mating where males display, but nest elsewhere in dense trees such as Arizona cypress and alpine firs; forages for nectar	Brown et al. 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Blakesley and Reese 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Elegant Trogon[B] *Trogon elegans*	Found mostly among oak or oak-pine mountain canyons and sycamores, walnuts, and cottonwood along canyon streams; nests in cavities	Strong and Bock 1990

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Belted Kingfisher *Ceryle alcyon*	Along streams, rivers, lakes, canals, creeks; forages on fish; is a state candidate species	Hensley 1954 Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Acorn Woodpecker[B] *Melanerpes formicivorus*	Oak woodlands, either monotypic or mixed with conifers; cavity nester, on Mogollon Rim prefers aspen for nesting; stores acorns in holes it drills; forages on seeds, ants, and other insects	Merriam and Stejneger 1890 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1983 Ohmart et al. 1988 Li 1989 Strong and Bock 1990 Sullivan and Richardson 1993
Lewis' Woodpecker[B] *Melanerpes lewis*	Riparian woodlands or any area with tall trees and snags; stores acorns and nuts in natural cavities; eats grasshoppers, beetles, and other insects	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Gila Woodpecker[B] *Melanerpes uropygialis*	Nests in large trees such as cottonwood-willow, mesquite, or saguaro; use adjacent desert wash and upland habitat as well; are opportunistic feeders, i.e., insects, worms, fruit, lizards, eggs; forage primarily on bark of larger branches and inner portions of trees	Hensley 1954 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983 Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1987b Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Yellow-bellied Sapsucker[B] *Sphyrapicus varius*	Cottonwood, willow, and athel tamarisk along Colorado; drills holes in broad-leaved trees, i.e., cottonwood, willow, walnut,	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	aspen; eats tree sap, ants, beetles, and larvae	Clark 1984 Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988 Sullivan and Richardson 1993
Red-naped Sapsucker *Sphyrapicus nuchalis*	Tall riparian trees, especially cottonwood, willow, athel tamarisk along Colorado; cavity-nester; on Mogollon Rim prefers nesting in aspen; eats tree sap, ants, beetles, and larvae	Anderson and Ohmart 1984a Ohmart et al. 1988 Li 1989 Sullivan and Richardson 1993
Red-breasted Sapsucker *Sphyrapicus ruber*	Tall riparian trees, especially cottonwood, willow along Colorado; also clumps of athel tamarisk; eats tree sap, ants, beetles, and larvae	Anderson and Ohmart 1984a Ohmart et al. 1988
Ladder-backed Woodpecker[B] *Picoides scalaris*	Occurs in most terrestrial habitats; more found in riparian habitats with cottonwood, sycamore, and willow trees or snags, also use mesquite, saltcedar, various desert species; forages primarily on bark of larger branches and in portions of trees on bark-dwelling insects and larvae, i.e., termites, beetles, ants	Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983 Bock and Bock 1984 Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1988 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Downy Woodpecker[B] *Picoides pubescens*	Riparian woodland; limited to deciduous trees; cavity nester; prefers aspen along Mogollon Rim for nesting	Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Maser et al. 1984 Li 1989
Hairy Woodpecker[B] *Picoides villosus*	Variety of habitats, including riparian; require large trees from conifers to deciduous trees; cavity nester, along	Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Maser et al. 1984

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	Mogollon Rim prefers aspen for nesting	Li 1989 Sullivan and Richardson 1993
Strickland's Woodpecker[B] *Picoides stricklandi*	Extreme southeastern Arizona, in oak-pine woodland in mountains; maple sycamore	Strong and Bock 1990
Three-toed Woodpecker[B] *Picoides tridactylus*	Higher elevations; occasionally found in willow thickets along streams	
Northern Flicker[B] *Colaptes auratus*	Variety of habitats, both deciduous and coniferous forests, open situations with scattered trees and snags, riparian woodland, pine-oak association; along Colorado nests in cavities of saguaro, cottonwood, willow, or honey mesquite, 3-8 m high from the ground, at higher elevations along Mogollon Rim prefer aspens; forages by pecking and probing fallen, rotting trees or in soil for insects, mainly ants; also, on inner portions of trees on bark	Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977 (Common Flicker) Anderson and Ohmart 1977, 1984a Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 (Common Flicker) Rosenberg et al. 1982 Rea 1983 Clark 1984 Maser et al. 1984 Hunter et al. 1987a, 1987b, 1988 Hunter 1988 Ohmart et al. 1988 Li 1989 Sedgwick and Knopf 1990 Strong and Bock 1990 Sullivan and Richardson 1993
Northern Beardless-Tyrannulet[B] *Camptostoma imberbe*	Cottonwood, dense mesquite and hackberry, sycamore-live oak-mesquite in southeastern part of state; obligated to healthy riparian habitat; flycatches in summer, gleans in winter	Gavin and Sowls 1975 Wauer 1977 (Beardless Flycatcher) Ohmart and Anderson 1982 (Beardless Flycatcher) Hunter 1987 Hunter et al. 1987b
Greater Pewee[B] *Contopus pertinax*	Pine and pine-oak woodlands of mountains and deciduous trees (sycamore) in southeastern Arizona; feeds on flying insects	Ohmart and Anderson 1982 (Coues' Flycatcher) Anderson and Ohmart 1984a (Coues' Flycatcher) Clark 1984 Ohmart et al. 1988 Strong and Bock 1990

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Western Wood-Pewee[B] *Contopus sordidulus*	Riparian woodland, walnut-ash-sycamore, cottonwoods; nest material is plant down, cobwebs, and lichens; feeds mainly on flies, wasps, bees, and beetles	Gavin and Sowls 1975 Stevens et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Bock and Bock 1984 Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Willow Flycatcher[B] *Empidonax traillii*	Any riparian woodland, but especially willows near water; breeds in dense willow and buttonbush, usually next to water; mean nest height 2 m; used tamarisk in Grand Canyon; consistently associated with abundance, density and coverage of willow; eats mainly wasps, bees, beetles, and flies; *E. t. extimus* is a federal candidate (Category 1) species	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1987b Blakesley and Reese 1988 Hunter 1988 Ohmart et al. 1988 Brown and Trosset 1989 Sedgwick and Knopf 1992 Sullivan and Richardson 1993
Dusky Flycatcher[B] *Empidonax oberholseri*	Breeds in dense willows; forages over low bushes and between small trees or shrub for small flying insects	Brown et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Blakesley and Reese 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Gray Flycatcher[B] *Empidonax wrightii*	Winters in mesquite, usually near water; forages from low perches for small flying insects	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Pacific-slope Flycatcher[B] *Empidonax difficilis*	Seeks dense shade; nests along streams with in cavities of cliffs, walls, earthen banks, trees; along Mogollon Rim prefers aspen, but also uses maple, conifers, oak, and locust	Hensley 1954 (Western Flycatcher) Wauer 1977 (Western Flycatcher) Ohmart and Anderson 1982 (Western Flycatcher)

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	for nesting; feeds mainly on wasps, flies, and beetles	Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Li 1989 (Western Flycatcher)
Buff-breasted Flycatcher[B] *Empidonax fulvifrons*	Riparian woodland; in Mexico, forages in open grassy areas among trees, sycamores	Strong and Bock 1990
Black Phoebe[B] *Sayornis nigricans*	Usually near water; nests low above water on overhanging limbs, rocks, bridges; nests are constructed with mud; forage for insects over water, fly to ground, or perch on bank to pick insects from water's edge	Hensley 1954 Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Hunter et al. 1987a Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Eastern Phoebe *Sayornis phoebe*	Winters along permanent ponds and streams; feeds mainly on wasps, bees, beetles, and grasshoppers	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Ohmart et al. 1988
Say's Phoebe[B] *Sayornis saya*	More often in open country and agricultural areas, but does forage in cottonwood and willow along Colorado and in southeastern Arizona in ash, cottonwood, desert willow; nest is of mud usually plastered to a rockface or manmade structure; eats mainly grasshoppers, flies, wasps, beetles, and earwigs	Merriam and Stejneger 1890 Gavin and Sowls 1975 Anderson and Ohmart 1977, 1984a Brown et al. 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Vermilion Flycatcher[B] *Pyrocephalus rubinus*	Mesquite, cottonwood, willow, sycamore-ash-cottonwood associations, always near water; nests on horizontal branches, 2-11 m above ground; forages from tops of trees or perches on low	Hensley 1954 Gavin and Sowls 1975 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Hunter 1988 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	branches in shade for mainly bees, wasps, and flies	Strong and Bock 1990 Sullivan and Richardson 1993
Dusky-capped Flycatcher[B] *Myiarchus tuberculifer*	Higher Lower Sonoran areas of Santa Cruz River drainage; dense evergreen oaks, pine-oak woodlands, maple, sycamore, ash; forages on flies, beetles, and insect larvae	Anderson and Ohmart 1984a Clark 1984 Ohmart et al. 1988 Strong and Bock 1990
Ash-throated Flycatcher[B] *Myiarchus cinerascens*	Usually a desert species, also inhabits screwbean and honey mesquite, sparse willow and open oak or juniper woods; along Colorado nests in cavities in snags of live mesquite and dead willow snags along edge of grove, nest height 4.5-8 m above ground; forages mainly by hovering in all layers of canopy on smallest branches and leaves of the outer portion of trees for mainly beetles, cicadas, caterpillars, grasshoppers, and wasps	Hensley 1954 Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983 Bock and Bock 1984 Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1988 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Brown-crested Flycatcher[B] *Myiarchus tyrannulus*	Nests in saguaro, sycamore, cottonwood, willow, and other tall trees in old woodpecker cavities; forages mainly by hovering from mid- and upper canopies on smallest branches and leaves of the outer portion of trees, occasionally descending to lower shrubs; also found in adjacent desert wash and upland habitats; feeds on large insects, particularly cicadas and grasshoppers, occasionally small lizards	Stamp 1976, 1978 Anderson and Ohmart 1977, 1984a (Wied's Crested Flycatcher) Wauer 1977 (Wied's Crested) Ohmart and Anderson 1982 (Wied's Crested Flycatcher) Rosenberg et al. 1982 Rea 1983 Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1987b Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Sulphur-bellied Flycatcher[B] *Myiodynastes luteiventris*	Sycamore-walnut canyons; cavity nester	Brown et al. 1977 Strong and Bock 1990
Tropical Kingbird[B] *Tyrannus melancholicus*	Nests in open cottonwoods or other tall trees next to ponds and flowing streams; feeds on aerial insects and larvae, some fruit	Wauer 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988
Cassin's Kingbird[B] *Tyrannus vociferans*	Found from desert riparian areas to openings in ponderosa pines and along major streams; prefers tall trees, i.e., sycamore, and open spaces; eats grasshoppers, bees, and other insects	Merriam and Stejneger 1890 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Bock and Bock 1984 Clark 1984 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Thick-billed Kingbird[B] *Tyrannus crassirostris*	Riparian woodland of sycamore, cottonwood, willow, mesquite in southeastern Arizona; eats wasps, beetles, and other insects	Wauer 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Hunter et al. 1987b Ohmart et al. 1988
Western Kingbird[B] *Tyrannus verticalis*	Nests primarily in broad-leaved trees, i.e., cottonwood, willow, sycamore, mesquite, other tall trees with open areas; stays away from dense woods; eats flying insects such as beetles, grasshoppers, moths, and cicadas; forages by both sallying and hovering	Hensley 1954 Gavin and Sowls 1975 Anderson et al. 1977 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Schulz 1983 Bock and Bock 1984 Clark 1984 Maser et al. 1984 Hunter 1988 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Rose-throated Becard[B] *Pachyramphus aglaiae*	Nests in cottonwood, sycamore, willow; unique oblong nest of woven plant material suspended from branch, having one small opening	Brown et al. 1977 Wauer 1977 Hunter et al. 1987b

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Horned Lark[B] *Eremophila alpestris*	Normally open grasslands, occasionally winters on barren shores of rivers and lakes; nests are rounded hollows in the ground, usually in open areas; eats weed seeds, beetles and other insects	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Purple Martin[B] *Progne subis*	Marsh edges, agricultural areas, near open water; cavity-nesting species; eats mainly wasps, ants, bees, and flies	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Tree Swallow *Tachycineta bicolor*	Winters in open situations near water, including streams, ponds, lakes, marshes, rivers; eats mainly flies, beetles, and ants	Hensley 1954 Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Violet-green Swallow[B] *Tachycineta thalassina*	Nests along cliffs and forages over open water and marsh vegetation on Colorado; sycamore in southeastern Arizona; eats bugs, flies, and winged ants	Merriam and Stejneger 1890 Hensley 1954 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Northern Rough-winged Swallow[B] *Stelgidopteryx serripennis*	Only Arizona swallow that nests in dirt banks near water; forages over open water for flies, ants, and beetles	Hensley 1954 Gavin and Sowls 1975 Stamp 1976, 1978 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Bank Swallow *Riparia riparia*	Migrant; forages over open water, marsh vegetation, and fields; usually in flocks; feeds mainly on flies, ants, and beetles	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Ryder 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Cliff Swallow[B] *Hirundo pyrrhonota*	Nest along cliffs, dams, canal gates, under bridges; nests are constructed of mud; forages over open water, fields, desert for mainly beetles, bugs, and flies	Emlen 1954 Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ryder 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Barn Swallow[B] *Hirundo rustica*	Ash, sycamore, cottonwood in southeastern Arizona; in migration found near water; nests made with mud; forages over open water, marshes and fields in flocks for flies, wasps, ants, and beetles	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Steller's Jay[B] *Cyanocitta stelleri*	Open pine forests with a few sycamore; eats mainly seeds nuts, and some insects	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Scrub Jay[B] *Aphelocoma coerulescens*	Mostly along streams of central Arizona, but in other habitats as well in other portions of state; eats seeds, nuts and some insects	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Gray-breasted Jay[B] *Aphelocoma ultramarina*	Evergreen oaks, pine-oak woodland, and adjacent riparian forests	Strong and Bock 1990

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Black-billed Magpie[B] *Pica pica*	Open country, scattered trees, riparian woodland, cottonwood; extreme northeastern Arizona	Wauer 1977 Ohmart and Anderson 1982 Maser et al. 1984
American Crow[B] *Corvus brachyrhynchos*	Restricted mostly to riparian forest and adjacent areas in arid regions; roosts in riparian woodland; omnivorous, eats seeds, fruits, insects, and carrion	Ohmart and Anderson 1982 (Common Crow) Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Chihuahuan Raven[B] *Corvus cryptoleucus*	Normally arid, open grasslands, but prefers areas with water	Gavin and Sowls 1975 Ohmart and Anderson 1982 (White-necked Raven) Clark 1984
Mountain Chickadee[B] *Parus gambeli*	Montane coniferous forests, primarily pine, spruce-fir, pinyon-juniper; cavity-nestin species, along Mogollon Rim prefers aspen for nesting; nonbreeding season in cottonwood-willow riparian woodland; eats small insects, spiders, and seeds	Merriam and Stejneger 1890 Gavin and Sowls 1975 Stevens et al. 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Li 1989 Sullivan and Richardson 1993
Bridled Titmouse[B] *Parus wollweberi*	Oak woodland and pine-oak association, but also in cottonwood-willow-mesquite and sycamore riparian habitat; observed foraging in sycamore; eats mainly insects, larvae, and eggs	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Bock and Bock 1984 Clark 1984 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Verdin[B] *Auriparus flaviceps*	Common in desert, prefers mesquite, palo verde, and brushy thorn scrub as well as cottonwood and brushy riparian woodland; forages by gleaning in all layers, usually on smaller branches and leaves on outer portions of trees and shrubs; eats mainly small caterpillars, bugs, and spiders	Hensley 1954 Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rosenberg et al. 1982

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
		Rea 1983 Clark 1984 Hutto 1985 Hunter et al. 1987a, 1988 Hunter 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Bushtit[B] *Psaltriparus minimus*	Scrub, oak woodland, and mixed deciduous habitat; forages in outer branches of small trees or in understory vegetation for mainly small bugs, larvae, and spiders	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
White-breasted Nuthatch[B] *Sitta carolinensis*	Normally higher elevation species, but has occurred in cottonwood and sycamore riparian areas; cavity nester, along Mogollon Rim prefers aspen; observed foraging in sycamore; eats bark-inhabiting insects and spiders, some seeds	Merriam and Stejneger 1890 Gavin and Sowls 1975 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Bock and Bock 1984 Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Li 1989 Strong and Bock 1990 Sullivan and Richardson 1993
Brown Creeper[B] *Certhia americana*	Normally higher elevation species, but has occurred in cottonwood and mesquite riparian areas; cavity nester, along Mogollon Rim prefers mainly aspen but does use some conifers; eats bark-inhabiting bugs, insects, and spiders	Gavin and Sowls 1975 Anderson and Ohmart 1977, 1984a Ohmart and Anderson 1982 Rea 1983 (*C. familiaris*) Clark 1984 Maser et al. 1984 Hunter et al. 1987a, 1988 Ohmart et al. 1988 Li 1989
Cactus Wren[B] *Campylorhynchus brunneicapillus*	Desert areas at low elevations with abundant cacti, also fairly common in riparian brush and in desert residential areas; ash and desert willow, southeastern	Austin 1970 Anderson et al. 1977 Anderson and Ohmart 1977, 1984a Wauer 1977

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	Arizona; nest is a covered dome of sticks in tree or cactus; eats mainly flies, beetles, grasshoppers, and spiders, occasionally lizards	Ohmart and Anderson 1982 Rea 1983 Rice et al. 1983 Clark 1984 Hunter 1988 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Canyon Wren[B] *Catherpes mexicanus*	Restricted to areas with major rock formations which are sometimes near water; nests are usually on cliff ledges or crevices; eats mainly beetles, ants, and spiders	Merriam and Stejneger 1890 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Bewick's Wren[B] *Thryomanes bewickii*	Mesquite, willow, cottonwood, ash, sycamore, maple, walnut, desert willow riparian habitat; nests in cavities in stumps, snags or live trees; eats mainly spiders, ants, beetles, and bugs	Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1988 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
House Wren[B] *Troglodytes aedon*	Along Colorado, common in dense riparian woodland, especially willow and saltcedar; sycamore in southeastern Arizona; along Mogollon Rim prefers aspen for nesting; cavity nester, requires riparian thickets for nesting; eats mainly beetles, insect larvae and pupae, bugs, and ants	Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988 Chadde 1989 Li 1989 Sedgwick and Knopf 1990 Strong and Bock 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Winter Wren *Troglodytes troglodytes*	Winter resident in densest brush of riparian areas along permanent streams; dense cottonwood-willow and saltcedar at Bill Williams Delta; ground forager in litter and rotting logs for mainly small beetles, bugs, and ants	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988
Marsh Wren[B] *Cistothorus palustris*	Found in extensive marshes with dense cattails and bulrushes, less often in reeds; nest is compact ball of vegetation intertwined with stems or cattail blades; eats mainly beetles, insect larvae, bugs, and spiders	Ohmart and Anderson 1982 (Long-billed Marsh Wren) Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988 Sullivan and Richardson 1993
American Dipper[B] *Cinclus mexicanus*	Montane streams, primarily cold and swift-flowing, less often around mountain ponds and lakes; nests made of moss; dives into stream to forage for insect larvae and small fish	Brown et al. 1977 Ohmart and Anderson 1982 Maser et al. 1984 Ohmart et al. 1988
Golden-crowned Kinglet[B] *Regulus satrapa*	Winters in riparian woodland along streams, especially willows, saltcedar, and athel tamarisk; eats mainly bugs, beetles, and flies	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Hutto 1985 Ohmart et al. 1988
Ruby-crowned Kinglet[B] *Regulus calendula*	Breeds at high elevations in fir; very numerous in winter along Colorado River, in any riparian vegetation, but highest densities in cottonwood-willow habitats; always seek tallest or densest vegetation in any habitat; observed foraging in sycamore; eats mainly bugs, beetles, and flies	Merriam and Stejneger 1890 Gavin and Sowls 1975 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Stevens et al. 1977 Laurenzi et al. 1982 Ohmart and Anderson 1982 Rea 1983 Bock and Bock 1984 Clark 1984 Maser et al. 1984 Hutto 1985 Szaro and Jakle 1985 Hunter et al. 1987a, 1988 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Blue-gray Gnatcatcher[B] *Polioptila caerulea*	Winters in lower elevation river valleys; along Colorado, most common in screwbean mesquite close to the river, favors taller denser vegetation than Black-tailed Gnatcatcher; forages in trees and brushy understory for mainly bugs, flies, beetles, spiders, and insect larvae	Merriam and Stejneger 1890 Stevens et al. 1977 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Black-tailed Gnatcatcher[B] *Polioptila melanura*	Widely distributed at lower elevations, desert, uplands, and all but the densest riparian habitats; along Colorado prefers honey and screwbean mesquite; nest is an elaborate cup in a branch fork or mistletoe clump, is a frequent host of the Brown-headed Cowbird; forages mainly for bugs, beetles, insect larvae, and eggs	Austin 1970 Anderson et al. 1977 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Hutto 1985 Szaro and Jakle 1985 Hunter 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Black-capped Gnatcatcher[B] *Polioptila nigriceps*	Scrubby riparian areas and dense thorn scrub on hillsides, washes, and canyons; mesquite in extreme southeastern Arizona; nests in sycamore and hackberry; nest of spider webs, hair, twigs, leaves	Groschupf 1992
Eastern Bluebird[B] *Sialia sialia*	Evergreen oaks, pine, cottonwoods, desert willow, sycamore, walnut	Ohmart and Anderson 1982 Hunter et al. 1988 Strong and Bock 1990
Western Bluebird[B] *Sialia mexicana*	Open coniferous, deciduous and mixed forests, partly open situations with trees, riparian woodland; winters in honey mesquite with mistletoe and other berry-producing shrubs; cavity-nesting species; along Mogollon Rim prefers aspen snags for nesting; forages on	Merriam and Stejneger 1890 Stevens et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	fruit (mistletoe berries) and insects	Li 1989 Sullivan and Richardson 1993
Mountain Bluebird[B] *Sialia curricoides*	Pinyon-juniper woodland; winters in open berry-producing areas of Upper Sonoran zone; eats mainly grasshoppers, beetles, other insects, also mistletoe berries	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Townsend's Solitaire[B] *Myadestes townsendi*	Breeds at higher elevations in a small grass cup nest on the ground in dirt banks or beneath roots or fallen logs; winters in berry-producing desert and riparian woodlands in Upper and Lower Sonoran zones; eats mistletoe berries and some insects	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Veery[B] *Catharus fuscescens*	Moist deciduous and mixed woodlands; willow-dogwood association	Ohmart and Anderson 1982 Maser et al. 1984
Swainson's Thrush *Catharus ustulatus*	In migration, found in dense riparian habitat, especially cottonwood-willow, alder; eats mainly beetles, ants, insect larvae, and berries	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988
Hermit Thrush[B] *Catharus guttatus*	Open coniferous and mixed coniferous-deciduous forests and edges; in migration dense riparian woodland, especially willow; eats mainly beetles, ants, and insect larvae	Gavin and Sowls 1975 Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter et al. 1987a, 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Rufous-backed Robin *Turdus rufopalliatus*	Winters in deciduous tree situations, especially fruiting hackberries; riparian woodland; eats various insects and fruit	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
American Robin[B] *Turdus migratorius*	Variety of habitats at higher elevations, both coniferous and deciduous; sycamore; grazed open areas; winters in riparian woodland, especially mesquite with mistletoe, are strongly frugivorous; eat mistletoe, beetles, and insect larvae	Hensley 1954 Gavin and Sowls 1975 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 (Northern Robin) Anderson and Ohmart 1984a Bock and Bock 1984 Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Schulz and Leininger 1991 Sullivan and Richardson 1993
Varied Thrush *Ixoreus naevius*	Generally in heavy riparian woodland; eats ground-dwelling insects, spiders, and worms	Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988
Gray Catbird[B] *Dumetella carolinensis*	Dense willow-brush associations in Upper Sonoran zone; eats various insects, fruit, and seeds	Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Northern Mockingbird[B] *Mimus polyglottos*	Variety of habitats including riparian areas; nests in bushes, small trees, or tangled vines; strongly frugivorous and attracted to mistletoe; eats mistletoe, other berries and beetles	Hensley 1954 Austin 1970 Gavin and Sowls 1975 Wauer 1977 Ohmart and Anderson 1982 Meents et al. 1983 Rea 1983 Rice et al. 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter 1988 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Curve-billed Thrasher[B] *Toxostoma curvirostra*	Desert, brushy riparian, and residential areas; eats mainly beetles, ants, and insect larvae	Hensley 1954 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Szaro and Jakle 1985 Ohmart et al. 1988 Strong and Bock 1990
Crissal Thrasher[B] *Toxostoma crissale*	Dense, tall brush along rivers and larger washes of Lower Sonoran zone; favors sandy soils, honey mesquite; nest of twigs, 0.5-2.0 m above ground, usually well concealed in mesquite; ground-forager for insects, mainly beetles, ants, and larvae	Hensley 1954 Austin 1970 Stamp 1976, 1978 Anderson et al. 1977 Anderson and Ohmart 1977, 1984a Brown et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Hunter et al. 1987b, 1988 Hunter 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
American Pipit[B] *Anthus rubescens*	Breeds above timberline in San Francisco and White mountains; generally found along water edges; eats mainly bugs, beetles, flies, and insect larvae	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Phainopepla[B] *Phainopepla nitens*	Found statewide in varying habitats depending on season; desert washes and riparian areas; marshy areas with elderberry; breeds in mistletoe found in mesquite habitats; feeds heavily on mistletoe berries; insectivorous during breeding season on beetles and flies	Hensley 1954 Austin 1970 Gavin and Sowls 1975 Anderson and Ohmart 1977, 1978, 1984 Brown et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Anderson et al. 1983 Rea 1983 Rice et al. 1983 Clark 1984 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Loggerhead Shrike[B] *Lanius ludovicianus*	Breeds in sparse riparian woodland and desert washes; southeastern Arizona, open with low stature riparian vegetation; eats mainly rodents, small birds, beetles, grasshoppers, and wasps; is a federal candidate species (Category 2)	Merriam and Stejneger 1890 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ryder 1986 Hunter 1988 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
European Starling[B] *Sturnus vulgaris*	A variety of habitats statewide, cottonwood; cavity-nesting species, non-native invader competing for nest sites of native bird species; eats seeds, beetles, grasshoppers, and millipedes	Gavin and Sowls 1975 Stamp 1976, 1978 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 (Common Starling) Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter et al. 1987a, 1988 Hunter 1988 Ohmart et al. 1988 Sedgwick and Knopf 1990 Sullivan and Richardson 1993
Bell's Vireo[B] *Vireo bellii*	Dense brush, mesquite, cottonwood, elderberry, desert hackberry, willow, saltcedar, streamside thickets, riparian edge habitat as well; nests are hanging cups; frequently a host of Brown-headed Cowbird brood parasitism; eats mainly bugs, insect larvae, grasshoppers, and beetles	Hensley 1954 (Least Vireo) Austin 1970 Gavin and Sowls 1975 Anderson et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Hutto 1985 Szaro and Jakle 1985 Hunter 1987, 1988 Hunter et al. 1987b Ohmart et al. 1988 Brown and Trosset 1989 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Gray Vireo[B] *Vireo vicinior*	Mesquite and riparian woodlands, also thorn scrub, oak-juniper, pinyon-juniper; eats mainly bugs, beetles, and insect larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Hutto 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Solitary Vireo[B] *Vireo solitarius*	Winters in cottonwood-willow, dense mesquite, saltcedar; ash, maple, walnut, sycamore in southeastern Arizona; eats mainly insect larvae, moths, and bugs	Merriam and Stejneger 1890 Hensley 1954 Gavin and Sowls 1975 Stevens et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Szaro and Jakle 1985 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Hutton's Vireo[B] *Vireo huttoni*	Pine-oak association, oak woodland, riparian woodland; eats mainly bugs, insect larvae, and beetles	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Hutto 1985 Ohmart et al. 1988
Warbling Vireo[B] *Vireo gilvus*	Willows, alders, maples, dense box elders, especially aspen at higher elevations for breeding; most often found in tall riparian woodland; eats mainly beetles, insect larvae, and bugs	Stevens et al. 1977 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Hutto 1985 Szaro and Jakle 1985 Ohmart et al. 1988 Chadde 1989 Sullivan and Richardson 1993
Orange-crowned Warbler[B] *Vermivora celata*	Dense deciduous riparian vegetation, cottonwood, especially willow; eats mainly bugs, beetles, and insect larvae	Gavin and Sowls 1975 Anderson et al. 1977 Brown et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
		Hutto 1985 Hunter et al. 1987a Ohmart et al. 1988 Sullivan and Richardson 1993
Nashville Warbler *Vermivora ruficapilla*	In migration, riparian woodland or other tall trees; eats mainly beetles, insect larvae, and eggs	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Hutto 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Virginia's Warbler[B] *Vermivora virginiae*	Scrubby brush in pinyon-juniper woodland, ponderosa pine, fir, spruce as well as riparian willow and alder thickets, maple and walnut; eats various insects and larvae	Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Hutto 1985 Strong and Bock 1990 Sullivan and Richardson 1993
Lucy's Warbler[B] *Vermivora luciae*	Riparian areas, washes, ponds, well-vegetated desert; restricted to riparian at higher elevations; dense mesquite, cottonwood-willow, ash-walnut-sycamore-live oak; is a cavity-nesting species; nests in cavities or behind bark or debris in dense saltcedar and mesquite along the lower Colorado River; eats mainly insect larvae, beetles, and bugs	Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Stevens et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Meents et al. 1983 Rea 1983 Clark 1984 Hutto 1985 Bock and Bock 1984 Szaro and Jakle 1985 Hunter et al. 1987b Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Yellow Warbler[B] *Dendroica petechia*	Willow, cottonwood, box elder, sometimes sycamore; dense riparian vegetation; tamarisk habitat in Grand Canyon; riparian interior, edge, and adjacent desert wash; select nest sites concealed from	Hensley 1954 Gavin and Sowls 1975 Anderson et al. 1977 Brown et al. 1977 Wauer 1977 Stamp 1976, 1978 Stuaffer and Best 1980

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	predators and brood parasites; eats mainly ants, beetles, bugs, and larvae	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Szaro and Jakle 1985 Hunter et al. 1987b Hunter 1988 Ohmart et al. 1988 Brown and Trosset 1989 Strong and Bock 1990 Knopf and Sedgwick 1992 Sullivan and Richardson 1993
Yellow-rumped Warbler[B] *Dendroica coronata*	Winters in deciduous riparian habitat; highest densities in cottonwood-willow and lowest in mesquite along Colorado; observed foraging in sycamores southeastern Arizona; eats mainly bugs, beetles, insect larvae, flies, and wasps	Hensley 1954 Gavin and Sowls 1975 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Bock and Bock 1984 Clark 1984 Maser et al. 1984 Terrill and Ohmart 1984 Hutto 1985 Szaro and Jakle 1985 Hunter et al. 1987a Ohmart et al. 1988 Sullivan and Richardson 1993
Black-throated Gray Warbler[B] *Dendroica nigrescens*	Oak woodland preferred, pinyon-juniper second; winters in cottonwood-willow and other tall riparian trees; eats insect larvae and various insects	Merriam and Stejneger 1890 Gavin and Sowls 1975 Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Townsend's Warbler *Dendroica townsendi*	Winters along Colorado in tall riparian woodland; eats bugs, ants, wasps, and beetles	Merriam and Stejneger 1890 Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Grace's Warbler[B] *Dendroica graciae*	Southeastern Arizona, in open pine with a few sycamores; eats insect larvae and various insects	Anderson and Ohmart 1984a Hutto 1985 Strong and Bock 1990 Ohmart et al. 1988 Sullivan and Richardson 1993
Hermit Warbler *Dendroica occidentalis*	In migration, along Colorado in tall riparian woodland; eats small spiders, larvae, beetles, and other insects	Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Hutto 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Black-and-white Warbler *Mniotilta varia*	In migration, tall riparian woodland along Colorado; forages by bark gleaning for beetles, larvae, ants, and spiders	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Ohmart et al. 1988
American Redstart *Setophaga ruticilla*	In migration, tall riparian woodland and other tall trees along Colorado; eats a wide variety of insects and larvae	Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988
Prothonotary Warbler *Protonotaria citrea*	In migration, prefers moist swampy habitats; eats ants, other insects, and larvae	Rea 1983 Anderson and Ohmart 1984a Clark 1984 Ohmart et al. 1988
Northern Waterthrush *Seiurus noveboracensis*	Winters in wet riparian woodland and marshes; forages on the ground near standing water; eats mainly aquatic insects, beetles, and larvae	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
MacGillivray's Warbler[B] *Oporonis tolmiei*	Dense understory of open montane forests, brushy mountain hillsides, and *Ribes*-willow thickets; eats mainly beetles, other insects, and larvae	Merriam and Stejneger 1890 Gavin and Sowls 1975 Brown et al. 1977 Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Ohmart et al. 1988 Sullivan and Richardson 1993
Common Yellowthroat[B] *Geothylpis trichas*	Marshes (especially cattail), thickets near water; weedy, brushy, swampy places; tamarisk habitat in Grand Canyon; southeastern Arizona, ash, cottonwood, sycamore, willow; nests on or near the ground in emergent vegetation; forages mostly by gleaning in understory on small branches and leaves of both inner and outer portions of trees for small insects, aquatic larvae, and spiders	Merriam and Stejneger 1890 Hensley 1954 Gavin and Sowls 1975 Stauffer and Best 1980 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1987a Hunter 1988 Ohmart et al. 1988 Brown and Trosset 1989 Strong and Bock 1990 Sullivan and Richardson 1993
Wilson's Warbler *Wilsonia pusilla*	Shrubby and brushy areas (especially near water), willow and alder; low trees, brush, weeds and mesquite of open country; seldom more than 3 m from the ground; eats a wide variety of insects and larvae	Hensley 1954 Gavin and Sowls 1975 Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hutto 1985 Szaro and Jakle 1985 Ohmart et al. 1988 Schulz and Leininger 1991 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Red-faced Warbler[B] *Cardellina rubifrons*	Streamside canyons and open montane forests; eats various insects and larvae by flycatching, gleaning, and passively	Bulmer 1966 Anderson and Ohmart 1984a Hutto 1985 Strong and Bock 1990
Painted Redstart[B] *Myioborus pictus*	Common in moist mountain canyons; evergreen oaks for breeding; somewhat concentrated along flowing streams; dense overstories, thick understories, and permanent or semipermanent water sources; eats various insects and larvae	Marshall and Balda 1974 Anderson and Ohmart 1984a Clark 1984 Hutto 1985 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Yellow-breasted Chat[B] *Icteria virens*	Dense mesquite, willow, seepwillow, arrowweed, deciduous brush along streams; nests are low in thickets of willow or other shrubs along Colorado; southeastern Arizona, cottonwood; eats small and large insects including ants, grasshoppers, and cicadas	Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1987b, 1988 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Hepatic Tanager[B] *Piranga flava*	Pine-oak, oak woodlands; monotypic pine, oak, and pinyon-juniper near streams; eats mainly insects, some fruit	Anderson and Ohmart 1984a Ohmart et al. 1988 Strong and Bock 1990
Summer Tanager[B] *Piranga rubra*	Cottonwood-willow; rather uncommon in sycamore-walnut; mesquite and saltcedar in eastern Arizona; nests in sycamore but forages elsewhere; forages by hawking, hovering, and gleaning on the ground and in all layers of vegetation on outer portions of trees for large insects such as	Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Brown et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	wasps, cicadas, and grasshoppers	Bock and Bock 1984 Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1987b, 1988 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Western Tanager[B] *Piranga ludoviciana*	Open coniferous forests, also mixed deciduous forests; always frequents trees; eats mainly wasps, bugs, beetles, and fruit	Merriam and Stejneger 1890 Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Northern Cardinal[B] *Cardinalis cardinalis*	Scrub, riparian thickets, woodlands, dense brushy undergrowth, cottonwood, mesquite; eats insects, seeds, and fruit	Gavin and Sowls 1975 Stamp 1976, 1978 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987b Hunter 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Pyrrhuloxia[B] *Cardinalis sinuatus*	Arid brush, thorn scrub, weedy fields, riparian thickets; eats insects, seeds, and fruit	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Hunter et al. 1988 Ohmart et al. 1988
Rose-breasted Grosbeak[B] *Pheucticus ludovicianus*	Moist woodlands, especially around creeks and deciduous thickets; combination of thick shrubs and brush with large trees and open areas; eats seeds, fruit, and insects	Anderson and Ohmart 1977, 1984a Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 (Common Grosbeak) Maser et al. 1984 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Black-headed Grosbeak[B] *Pheucticus melanocephalus*	Deciduous forest and riparian woodland; diverse vegetation and open edges; eats seeds, fruit, and insects	Merriam and Stejneger 1890 Hensley 1954 Gavin and Sowls 1975 Anderson and Ohmart 1977, 1984a Stevens et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Blue Grosbeak[B] *Guiraca caerulea*	Willow, cottonwood, mesquite; dense shrubby understory and a few tall trees; breeds in saltcedar along Colorado; nest is open cup concealed 1-3 m high in a dense shrub; eats large insects, particularly grasshoppers and cicadas, also seeds	Gavin and Sowls 1975 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Hunter et al. 1987a, 1987b, 1988 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Lazuli Bunting[B] *Passerina amoena*	Willow, brush, dense vegetation; open or burned riparian woodland along Colorado; eats various seeds and insects	Stevens et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Blakesley and Reese 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Indigo Bunting[B] *Passerina cyanea*	Along Colorado, in willow and saltcedar regenerated after burn, cottonwood edge, open screwbean mesquite and arrowweed, and river edge; eats grasshoppers, other insects, and seeds	Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 (Common Bunting) Anderson and Ohmart 1984a Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Green-tailed Towhee[B] *Pipilo chlorurus*	Thickets, chaparral, shrublands, and riparian scrub, low deciduous brush; ground-foraging species for various seeds and insects	Merriam and Stejneger 1890 Gavin and Sowls 1975 Stevens et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Rufous-sided Towhee[B] *Pipilo erythrophthalmus*	Dense broad-leafed brush, especially willow and other dense vegetation, including marshes; ground-foraging species for mainly beetles, insect larvae, and some seeds	Gavin and Sowls 1975 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Canyon Towhee[B] *Pipilo fuscus*	Open areas with low-statured riparian vegetation	Brown et al. 1977 (Brown Towhee) Ohmart and Anderson 1982 (Brown Towhee) Rea 1983 Clark 1984 (Brown Towhee) Strong and Bock 1990 Sullivan and Richardson 1993
Abert's Towhee[B] *Pipilo aberti*	Desert scrub, especially near water; dense undergrowth of willow-cottonwood, mesquite, saltcedar; forages mostly by gleaning on the ground and the innermost portions of trees on the bark for beetles, seeds and insect larvae year round; in summer mainly grasshoppers and cicadas	Austin 1970 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Wauer 1977 Meents et al. 1981 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983 Clark 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1987b Hunter 1988 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
		Strong and Bock 1990 Sullivan and Richardson 1993
Botteri's Sparrow *Aimophila botterii*	Open areas with low-statured riparian vegetation	Ohmart and Anderson 1982 Strong and Bock 1990
Rufous-crowned Sparrow *Aimophila ruficeps*	Open areas with low-statured riparian vegetation	Ohmart and Anderson 1982 Rea 1983 Clark 1984 Strong and Bock 1990
Lark Sparrow[B] *Chondestes grammicus*	Found in sycamore riparian habitat; nested in sycamore but foraged elsewhere; eats mainly grasshoppers, other insects, and seeds	Gavin and Sowls 1975 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Bock and Bock 1984 Clark 1984 Maser et al. 1984 Hunter 1988 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Black-throated Sparrow[B] *Amphispiza bilineata*	Mesquite, sparse riparian woodland, desert washes; nests on or near the ground in shrub or mesquite; eats mainly seeds with some insects and larvae	Gavin and Sowls 1975 Stamp 1976, 1978 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter 1988 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Sage Sparrow[B] *Amphispiza belli*	Along Colorado shows strong association for honey mesquite with inkweed or saltbush; eats mainly seeds with some beetles, bugs, and grasshoppers	Anderson and Ohmart 1977, 1984a Meents et al. 1982 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Five-striped Sparrow[B] *Amphispiza quinquestriata*	Dense brushy vegetation and grasses on hillsides, especially acacia, mesquite, or riparian vegetation	Ohmart and Anderson 1982
Savannah Sparrow[B] *Passerculus sandwichensis*	Open, wet grasslands, such as mountain meadows, marshes, streamsides; eats mainly weed seeds, also insects and their larvae	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Baird's Sparrow *Ammodramus bairdii*	Moist meadows and grasslands	Ohmart and Anderson 1982
Fox Sparrow *Passerella iliaca*	Dense riparian woodland or marsh, willows; eats weed seeds, fruit, and some insects	Ohmart and Anderson 1982 Anderson and Ohmart 1984a Blakesley and Reese 1988 Ohmart et al. 1988
Song Sparrow[B] *Melospiza melodia*	Dense reeds, sedges, cattails, arrowweeds, willows along water; basically, dense cover above or close to water; nests are within 1 m of the ground in a shrub or marsh vegetation; forages mainly by gleaning on the ground and outer portions of trees for mainly insect larvae, beetles, earwings, and seeds	Gavin and Sowls 1975 Anderson et al. 1977, 1983 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983 Rice et al. 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1987a Hunter 1988 Ohmart et al. 1988 Chadde 1989 Blakesley and Reese 1988 Sullivan and Richardson 1993
Lincoln's Sparrow[B] *Melospiza lincolnii*	Willow thickets, dense wet understory of riparian woodlands, marshes, canals; eats mainly seeds, bugs, flies, and spiders	Merriam and Stejneger 1890 Gavin and Sowls 1975 Brown et al. 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
		Schulz and Lieninger 1991 Sullivan and Richardson 1993
Swamp Sparrow *Melospiza georgiana*	Winter visitor, emergent vegetation along water, marshes, wet meadows; eats mainly beetles, wasps, and seeds	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Hunter et al. 1988 Ohmart et al. 1988
White-crowned Sparrow[B] *Zonotrichia leucophrys*	Stunted trees and shrubs, wet meadows with willows, nearly all brushy places, mesquite and quail bush; in winter, dominant species in low places with high vegetation volume along Colorado; eats seeds and other plant material, ants, other insects, and larvae	Merriam and Stejneger 1890 Hensley 1954 Gavin and Sowls 1975 Anderson and Ohmart 1977, 1984a Brown et al. 1977 Stevens et al. 1977 Ohmart and Anderson 1982 Anderson et al. 1983 Rea 1983 Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Yellow-eyed Junco *Junco phaeonotus*	Open pine with scattered sycamore	Strong and Bock 1990
Red-winged Blackbird[B] *Agelaius phoeniceus*	Marshes used for nesting and roosting; in southeastern Arizona in cottonwood, willow, desert willow; nests in cattails, willows, mesquite, elderberry; eats mainly seeds, insect larvae, and beetles	Gavin and Sowls 1975 Anderson and Ohmart 1977, 1984a Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Clark 1984 Maser et al. 1984 Hunter et al. 1987a Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Eastern Meadowlark *Sturnella magna*	Southeastern Arizona, open areas with low-statured riparian vegetation; eats mainly insect larvae, beetles and grasshoppers	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Ohmart et al. 1988 Strong and Bock 1990

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Western Meadowlark[B] *Sturnella neglecta*	Wet, poorly drained meadows in river valleys; nests in low grass in a depression or concealed by thick grass; eats mainly beetles, earwigs, insect larvae, and seeds	Hensley 1954 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Yellow-headed Blackbird[B] *Xanthocephalus xanthocephalus*	Reedy lakes and marshes for nesting and roosting; along Colorado, nests clumped in most shaded and densely vegetated cattails, 10 cm above water; eats insect larvae, beetles, grasshoppers, and various seeds	Hensley 1954 Anderson and Ohmart 1977, 1984a Ohmart and Anderson 1982 Rea 1983 Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Rusty Blackbird *Euphagus carolinus*	Along edges of rivers, reservoirs, and ponds; willows; eats mainly beetles, grasshoppers, and other insects	Anderson and Ohmart 1984a Ohmart et al. 1988
Brewer's Blackbird[B] *Euphagus cyanocephalus*	Shrubby, brushy riparian woodland, marshes; eats mainly seeds, earwigs, beetles, and bugs	Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Great-tailed Grackle[B] *Quiscalus mexicanus*	Partly open areas with scattered trees, along watercourses, marshes; requires tall trees for nesting; eats mainly grasshoppers, earwigs, beetles, and wasps	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984 Clark 1984 Ohmart et al. 1988 Sullivan and Richardson 1993
Bronzed Cowbird[B] *Molothrus aeneus*	Open riparian areas, residential lawns, irrigated fields; is a brood parasite, its most frequent host along the Colorado is the Hooded Oriole; eats mainly grain and other seeds and a few insects	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Brown-headed Cowbird[B] *Molothrus ater*	All riparian woodland habitats, human habitations, marshes, deciduous forests, mesquite, cottonwood; brood parasite on small- or medium-sized open-nesting passerines, i.e., Bell's Vireo, Black-tailed Gnatcatcher, Lucy's Warbler, Common Yellowthroat, Northern Oriole, Abert's Towhee, Song Sparrow, and Willow Flycatcher; eats mainly seeds and insect larvae, bugs, and other insects	Hensley 1954 Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977 Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1987a, 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Hooded Oriole[B] *Icterus cucullatus*	Riparian woodland, palm groves, mesquite, willow, cottonwood, walnut, sycamore; nest is a woven basket; eats insects, nectar, and fruit	Hensley 1954 Gavin and Sowls 1975 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Hunter 1988 Ohmart et al. 1988 Sullivan and Richardson 1993
Streak-backed Oriole *Icterus pustulatus*	Rare visitor from Mexico, found in brushy thorn forests and riparian areas	
Northern Oriole[B] *Icterus galbula*	Cottonwood-willow, honey and screwbean mesquite; nest is woven cup suspended from a branch; nested in sycamore but foraged elsewhere in southeastern Arizona; forages mainly by gleaning in all layers on small branches and leaves on the outer portions of trees for caterpillars and large insects such as cicadas and grasshoppers	Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977, 1983 Anderson and Ohmart 1977, 1984a Brown et al. 1977 (*I. bullocki*) Wauer 1977 Stauffer and Best 1980 Ohmart and Anderson 1982 Rosenberg et al. 1982 Rea 1983 Bock and Bock 1984 Clark 1984 Maser et al. 1984

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
		Hunter et al. 1987a, 1987b, 1988 Hunter 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
House Finch[B] *Carpodacus mexicanus*	Variety of habitats, less dense vegetation; eats almost entirely seeds and other plant parts	Merriam and Stejneger 1890 Hensley 1954 Austin 1970 Gavin and Sowls 1975 Stamp 1976, 1978 Anderson et al. 1977 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Lesser Goldfinch[B] *Carduelis psaltria*	Deciduous trees and brush (especially cottonwood and willow), mesquite, saltcedar; in southeastern Arizona, showed strong affinity for sycamore; granivore	Gavin and Sowls 1975 Stamp 1976, 1978 Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Clark 1984 Maser et al. 1984 Szaro and Jakle 1985 Hunter et al. 1988 Ohmart et al. 1988 Strong and Bock 1990 Sullivan and Richardson 1993
Lawrence's Goldfinch[B] *Carduelis lawrencei*	Along Colorado, cottonwood-willow breeding habitat; wintering in open mesquite with scattered shrubs, especially inkweed; granivore	Wauer 1977 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
American Goldfinch *Carduelis tristis*	Weedy fields, riparian woodlands, edges; observed feeding on seed balls in sycamore in southeastern Arizona; granivore	Stuaffer and Best 1980 Ohmart and Anderson 1982 Rea 1983 Anderson and Ohmart 1984a Bock and Bock 1984 Maser et al. 1984 Ohmart et al. 1988 Sullivan and Richardson 1993

AMPHIBIANS AND REPTILES IN RIPARIAN HABITATS OF ARIZONA

All amphibians spend at least part of their life cycle in water. Reptiles are not as restricted to water as amphibians but are often found not far from it. All amphibians and reptiles listed are from Stebbins (1966).

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Tiger salamander *Ambystoma tigrinum*	Frequents quiet ponds, reservoirs, lakes, temporary pools, and streams; adults found under objects near water or crawling at night; prefers still waters with muddy bottoms	Merriam and Stejneger 1890 Gehlbach 1967 Ohmart and Anderson 1978 Vitt and Ohmart 1978 Collins 1981 Jones 1988a Ohmart et al. 1988
Couch's spadefoot *Scaphiopus couchi*	Shortgrass, mesquite, creosote, and other areas with low rainfall; needs water for breeding	Wasserman 1970 Vitt and Ohmart 1978 Ohmart and Anderson 1982 Jones 1988a Ohmart et al. 1988 Sullivan and Richardson 1993
Western spadefoot *Scaphiopus hammondi*	Frequents washes, floodplains, alluvial fans, playas, alkali flats; prefers open areas and shortgrass, sandy or gravelly soil; breeds in quiet streams and temporary pools	Ohmart and Anderson 1982
Great Basin spadefoot *Scaphiopus intermontanus*	Northern Arizona, sagebrush, pinyon-juniper, spruce-fir; permanent or semipermanent water	Ohmart and Anderson 1982
Plains spadefoot *Scaphiopus bombifrons*	Plains, hills, riverbottoms in shortgrass, agricultural areas; loose sandy or gravelly soil; frequents both permanent and semipermanent water; sometimes hybridizes with Western spadefoot	Ohmart and Anderson 1982
Sonoran Desert (Colorado River) toad *Bufo alvarius*	From mesquite-creosote to oak-sycamore-walnut; usually found near permanent water of springs, reservoirs, and streams	Fouquette 1970 Vitt and Ohmart 1978 Ohmart and Anderson 1982 Jones 1988a Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Woodhouse's toad *Bufo woodhousei*	Variety of habitats; prefers sandy areas; breeds in quiet water of streams, marshes, lakes, pools, irrigation ditches	Vitt and Ohmart 1978 Ohmart and Anderson 1982 Maser et al. 1984 Jones 1988a Ohmart et al. 1988 Sullivan and Richardson 1993
Southwestern toad *Bufo microscaphus*	Washes, streams; breeds in brooks or streams, does not depend directly on rainfall; pine-oak; rocky sites	Vitt and Ohmart 1978 Jones 1988a Ohmart et al. 1988 Sullivan and Richardson 1993
Red-spotted toad *Bufo punctatus*	Desert oases, open grassland, rocky canyons and washes; most often associated with rocks on which it climbs; breeds in springs, reservoirs and temporary pools in intermittent streams; rocky sites	Merriam and Stejneger 1890 Vitt and Ohmart 1978 Ohmart and Anderson 1982 Jones 1988a, 1988b Ohmart et al. 1988 Sullivan and Richardson 1993
Great Plains toad *Bufo cognatus*	Prairies and deserts, creosote bush, mesquite woodland; breeds in shallow temporary pools or quiet water of streams and irrigation ditches; sandy, shrubby sites	Vitt and Ohmart 1978 Ohmart and Anderson 1982 Jones 1988a Ohmart et al. 1988 Sullivan and Richardson 1993
Green toad *Bufo debilis*	Arid and semi-arid areas; without trees or with scattered trees, shrubs, and grass for breeding; breeds in temporary streams and pools; hides in clumps of grass; sandy, grassy places	Ohmart and Anderson 1982 Jones 1988a
Sonoran green toad *Bufo retiformes*	Mesquite grassland or creosote bush; breeds in rainwater sumps or wash bottoms bordered by fresh grass and scattered shrubs; sandy, grassy sites	Ohmart and Anderson 1982 Jones 1988a
Chorus frog *Pseudocris triseriata*	Grassy pools, lakes, marshes of mountains; breeds in shallow temporary pools, but also uses deep permanent water in forest	Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Lowland burrowing treefrog *Pternohyla fodiens*	Open grassy areas, mesquite grassland in extreme southeastern Arizona; breeds in temporary pools after rains	Trueb 1969 Ohmart and Anderson 1982
Canyon treefrog *Hyla arenicolor*	Often found in small niches on the side of boulders or streambanks never far from water; prefers intermittent or permanent streams with rocky pools; requires first substrate and proximity to quiet water; rocky sites generally occupied by trees and large amounts of vegetation debris	Merriam and Stejneger 1890 Brown et al. 1977 Vitt and Ohmart 1978 Collins et al. 1981 Jones 1988a Ohmart et al. 1988 Sullivan and Richardson 1993
Arizona treefrog *Hyla wrightorum*	Meadows in oak-pine and pine-fir forests, generally higher than 5,000 feet; usually near grassy shallow pools and along slower parts of stream	Vitt and Ohmart 1978
Tarahumara frog *Rana tarahumarae*	Extreme southern Arizona; oak woodland along rocky, gravelly streams grown to willows and sycamores; stream dweller, prefers moving water but will go to quiet pools in dry weather; reportedly now extirpated from state	Zweifel 1968 Ohmart and Anderson 1978 Clarkson and Rorabaugh 1989
Leopard frog *Rana pipiens*	Springs, creeks, rivers, ponds, canals, reservoirs, wherever permanent water and cattails or other aquatic vegetation; may forage in damp meadows away from water; state candidate species	Ohmart and Anderson 1978, 1982 Vitt and Ohmart 1978 Collins et al. 1981 Maser et al. 1984 Clarkson and Rorabaugh 1989 Sullivan and Richardson 1993
Lowland leopard frog *Rana yavapaiensis*	Extirpated from southwestern Arizona and Imperial Valley, California; federal candidate species (Category 2) and state candidate species	Ohmart et al. 1988 Schwalbe and Rosen 1988 Clarkson and Rorabaugh 1989 Sullivan and Richardson 1993
Rio Grande leopard frog *Rana berlandieri*	Introduced from New Mexico	Ohmart et al. 1988 Schwalbe and Rosen 1988 Clarkson and Rorabaugh 1989

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Chiricahua leopard frog *Rana chiricahuensis*	Still in western New Mexico, but missing from interior Arizona; state listed as threatened	Clarkson and Rorabaugh 1989 Sullivan and Richardson 1993
Bullfrog *Rana catesbeiana*	Highly aquatic, stays near permanent water; frequents marshes, ponds, lakes, reservoirs, streams usually in quiet water with dense cattails or other aquatic vegetation; 50% bank cover of reeds and/or 50% open bank; very predaceous on other frogs, fish, insects, young birds, young muskrat, garter snakes, small mammals	Ohmart and Anderson 1978, 1982 Vitt and Ohmart 1978 Maser et al. 1984 Minckley 1985 Clarkson and deVos 1986 Ohmart et al. 1988 Schwalbe and Rosen 1988 Clarkson and Rorabaugh 1989 Sullivan and Richardson 1993
Great Plains narrow-mouthed toad *Gastrophryne olivacea*	Damp burrows, crevices and under rocks near streams, springs, and rain pools; oak woodland to mesquite grassland in extreme southern Arizona; on sandy grass sites	Jones 1988a
Snapping turtle *Chelydra serpentina*	Marshes, ponds, lakes, rivers, and slow streams, especially where aquatic vegetation present; feeds on crayfish, snails, insects, fish, frogs, salamanders, reptiles, birds, mammals, and aquatic plants; distribution map showed extreme eastern Arizona	
Yellow mud turtle *Kinosternon flavescens*	Highly aquatic; semi-arid grasslands and open woodlands; permanent and intermittent streams; prefers mud bottoms; *K. f. arizonensis* confined to lowland areas between 200 and 800 m elevation; prefers temporary ponds and pools, eats adult and larval anurans, dytiscid, hydrophilid, and other aquatic beetles, dragonfly nymphs, tadpoles and fairy shrimp; spends much time buried	Ohmart and Anderson 1978, 1982 Vitt and Ohmart 1978 Iverson 1989

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Sonoran mud turtle *Kinosternon sonoriense*	Most abundant aquatic turtle in Arizona; frequents ponds, springs, creeks, pools of intermittent streams; emergent vegetation for hiding places; found at 5,500 ft and below and south of Mogollon Rim (occurs at higher elevation, i.e., 7,000 ft in New Mexico)	Hulse 1974 Brown et al. 1977 Ohmart and Anderson 1978, 1982 Vitt and Ohmart 1978 Collins et al. 1981 Minckley 1985 Jones 1988a Ohmart et al. 1988 Schwalbe and Rosen 1988 Iverson 1989 Sullivan and Richardson 1993
Spiny softshell *Trionyx spiniferus*	Turtle of primarily rivers with quiet water and mud, sand, or gravel bottoms; also ponds, canals, irrigation ditches but avoids temporary water; feeds on earthworms, snails, crayfish, insects, fish, frogs, tadpoles, occasionally aquatic plants	Lowe 1964 Hulse 1974 Ohmart and Anderson 1978, 1982 Vitt and Ohmart 1978 Jones 1988a Ohmart et al. 1988 Sullivan and Richardson 1993
Banded gecko *Coleonyx variegatus*	Under rocks, debris; particularly in outcrops of lower slopes and bottoms of canyons near intermittent or permanent streams	Vitt and Ohmart 1978 Ohmart and Anderson 1982 Jones 1988b Ohmart et al. 1988 Sullivan and Richardson 1993
Desert iguana *Dipsosaurus dorsalis*	Normally, open, sparsely vegetated creosote bush habitat (eats creosote bush buds); most common in sandy habitat but may also occur along rocky streambeds, floodplains; primarily vegetarian, active later in day	Vitt and Ohmart 1978 Ohmart and Anderson 1982 Jones 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Lesser earless lizard *Holbrookia maculata*	A Plains lizard, most common in sand or gravel; frequents washes, sandy stream banks, shortgrass, mesquite, agricultural areas	Merriam and Stejneger 1890 Ohmart and Anderson 1982 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Greater earless lizard *Holbrookia texana*	Mid-elevations, avoids desert lowlands and high mountains; prefers sandy gravelly soil of flats, washes, intermittent streambottoms where plants are sparse and there are open areas	Sullivan and Richardson 1993
Zebra-tailed lizard *Callisaurus draconoides*	Along Colorado River was very abundant on sandy beaches, in sandy washes, on sand dunes, and open desert; also in arrowweed-saltcedar, but not where saltcedar was dense; prefer brushy, open habitats for ambushing prey, moves to shade to thermoregulate	Vitt and Ohmart 1978 Ohmart and Anderson 1982 Jones 1986, 1988b Ohmart et al. 1988 Sullivan and Richardson 1993
Yarrow's spiny lizard *Sceloporus jarrovi*	Mountain species, mostly above 5,000 ft (up to 10,700 ft in Graham Mts.); rocky canyons and hillsides in oak-pine; on lower slopes usually near streams, pools, or damp sand	
Desert spiny lizard *Sceloporus magister*	Plains and lower slopes of mountains, avoids high elevations; Joshua tree, creosote bush, and shadscale deserts; juniper, mesquite woodland, and along rivers with cottonwood and willow; seen foraging in dense saltcedar along lower Colorado; avoids temperature extremes by entering crevices in trees or mammal burrows or nests; found in trees of all sizes but forages primarily on trunks, large limbs, and on ground; highly correlated with presence of vegetative debris	VItt and Ohmart 1978 Vitt et al. 1981 Tinkle and Dunham 1983 Jones 1988a, 1988b Ohmart et al. 1988 Sullivan and Richardson 1993
Clark's spiny lizard *Sceloporus clarki*	Lower mountain slopes, pine-oak; well-developed riparian woodlands; on trees and adjacent rocks	Merriam and Stejneger 1890 Lowe 1964 Ohmart and Anderson 1982 Tinkle and Dunham 1983 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Striped plateau lizard *Sceloporus virgatus*	Extreme southeastern Arizona, mixed pine-oak from 5,300 to 7,000 ft, but found higher to conifers and lower along streams to 4,900 ft; most abundant in rocky and sandy intermittent streams where there is shade and water or damp soil	Cole 1968
Side-blotched lizard *Uta stansburiana*	Along lower Colorado, in every habitat, highest densities in man-made rock piles along river; greater food abundance occurs along the river; insectivorous	Merriam and Stejneger 1890 Vitt and Ohmart 1978 Ohmart and Anderson 1982 Maser et al. 1984 Jones 1988b Ohmart et al. 1988 Sullivan and Richardson 1993
Long-tailed brush lizard *Urosaurus graciosus*	Requires loose sand, scattered bushes and trees; more heat tolerant than tree lizard and can live in more open spaces; uses shade on tree trunks; occurs in relatively small trees and forages in outer canopy; along Colorado used smoke, ironwood, palo verde, and cottonwood trees	Vitt and Ohmart 1975, 1978 Vitt et al. 1981 Ohmart and Anderson 1982 Ohmart et al. 1988 Sullivan and Richardson 1993
Tree lizard *Urosaurus ornatus*	Spends most of time in trees and on rocks; frequents mesquite, oak, pine, juniper, alder, cottonwood, and nonnative species; especially attracted to riparian habitat; avoids extreme temperatures by entering crevices in trees, mammal borrows or nests; found more often on large trees and forages on trunks and large limbs; highly correlated with presence of vegetative debris; tree size, spacing, and canopy cover may be important	van Lobel Sels 1976 Vitt and Ohmart 1978 Vitt et al. 1981 Ohmart and Anderson 1982 Tinkle and Dunham 1983 Jones 1988a, b Ohmart et al. 1988 M'Closkey et al. 1990 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Great Plains skink *Eumeces obsoletus*	Semi-arid canyons, mesas, and mountains where grass and shrub present; rock outcrops near thickets along permanent or intermittent streams are favored	Ohmart and Anderson 1982 Sullivan and Richardson 1993
Many-lined skink *Eumeces multivirgatus*	Variety of habitats from shortgrass to mountains; creosote to dense streamside growth; arid to moist; most abundant where there is water or moist subsoil	Ohmart et al. 1988 Sullivan and Richardson 1993
Western skink *Eumeces skiltonianus*	Frequents grassland, woodland, and forest; prefers rocky habitat near streams with abundant plant cover, but also found far from water on dry hillsides	Ohmart and Anderson 1982 Maser et al. 1984 Sullivan and Richardson 1993
Gilbert's skink *Eumeces gilberti*	Frequents grassland, woodland, and forest; prefers rocky habitat near streams with abundant plant cover, but also found far from water on dry hillsides; cottonwood-willow habitat at lower elevations; large amounts of vegetation debris, medium to high canopies, and rock substrates	Jones 1986, 1988a, 1988b Sullivan and Richardson 1993
Giant spotted whiptail *Cnemidophorus burti*	Extreme southeastern and southern Arizona; mountain canyons, washes, mesas; found in dense shrubby vegetation often among rocks near permanent or intermittent streams and in desert grassland and evergreen woodland	
Desert grassland whiptail *Cnemidophorus uniparens*	Desert and mesquite grassland, but follows rivers into mountains where found in evergreen oak woodland, i.e., Oak Creek	Ohmart and Anderson 1982

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Plateau whiptail *Cnemidophorus velox*	Mountains in pinyon-juniper, oak, lower edges of ponderosa pine; at lower elevations frequents broad-leaved riparian habitat along permanent and semipermanent streams	
Western whiptail *Cnemidophorus tigris*	Arid and semi-arid habitats with sparse vegetation; also found in woodland and streamside growth; avoids dense grassland and dense shrubs	Tinkle and Dunham 1983 Ohmart and Anderson 1982 Maser et al. 1984 Jones 1988a, 1988b Sullivan and Richardson 1993
Arizona alligator lizard *Gerrhonotus kingii*	Frequents chaparral, oak woodland, and pine-fir forests in rocky places near permanent or temporary streams; also broadleaf riparian habitats in desert and grassland; under logs, rocks, leaf litter, dense plant growth; large amounts of vegetation debris, medium to high canopies, and rock substrates	Webb 1970 Brown et al. 1977 Tinkle and Dunham 1983 Jones 1986, 1988a Sullivan and Richardson 1993
Gila monster *Heloderma suspectum*	Lower slopes of mountains in arid and semi-arid regions; canyon bottoms or washes with permanent or intermittent streams; seeks shelter in dense thickets and scattered bushes	Porzer 1981 Ohmart and Anderson 1982 Ohmart et al. 1988 Brown and Carrmony 1991 Sullivan and Richardson 1993
Rosy boa *Lichanura trivirgata*	Rocky brushlands and desert; is attracted to permanent or intermittent streams but does not require permanent water	Ohmart and Anderson 1982 Ohmart et al. 1988
Ringneck snake *Diadophis punctatus*	Moist habitats; restricted to mountains and water courses in arid areas; usually found under bark, logs, debris, etc.	Tinkle and Dunham 1983 Ohmart and Anderson 1982 Jones 1988b Ohmart et al. 1988 Sullivan and Richardson 1993
Western hognosed snake *Heterodon nasicus*	Southeastern Arizona is extreme western edge of range; may be found in broadleaf deciduous riparian habitat	Ohmart and Anderson 1982

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Striped whipsnake *Masticophis taeniatus*	Brushlands, grasslands, sagebrush, pinyon-juniper, open pine-oak; attracted to rocky stream courses, both permanent and intermittent	Ohmart and Anderson 1982 Maser et al. 1984 Sullivan and Richardson 1993
Green rat snake *Elaphe triaspis*	Extreme southeastern Arizona; wooded, rocky canyons near streams; pine, oak, sycamore, walnut, cottonwood, wild grape, willow	
Sonora mountain kingsnake *Lampropeltis pyromelana*	Mountains from pinyon-juniper to chaparral to pine-fir; frequents both brushland and coniferous forest, usually near water	Ohmart et al. 1988
Narrow-headed garter snake *Thamnophis rufipunctatus*	Ranges from pinyon-juniper and pine-oak to ponderosa pine along clear, permanent or semipermanent streams; highly aquatic and prefers well-light areas; usually hides in stream; feeds on fish, frogs, tadpoles, salamanders	Ohmart and Anderson 1978 Sullivan and Richardson 1993
Wandering garter snake *Thamnophis elegans vagrans*	Great variety of habitats; often in damp environments near water; occasionally far from water; grazing sensitive	Ohmart and Anderson 1978, 1982 Maser et al. 1984 Szaro and Rinne 1988 Sullivan and Richardson 1993
Black-necked garter snake *Thamnophis cyrtopsis*	Variety of habitats; frequents permanent and intermittent streams; restricted to sites with water in a large number of habitats; use aquatic habitats more in spring and summer; at night exposed roots along stream, rodent burrows, crevices in stream bank and rock, and vegetative debris piles used for cover; feeds on frogs, toads, and tadpoles	Ohmart and Anderson 1978, 1982 Collins et al. 1981 Tinkle and Dunham 1983 Jones 1988a, 1988b Jones 1989 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Mexican garter snake *Thamnophis eques*	Pine-oak, mesquite grassland, desert; usually found in or near water where it feeds on frogs	Ohmart and Anderson 1978, 1982 Ohmart et al. 1988 Schwalbe and Rosen 1988 Sullivan and Richardson 1993
Checkered garter snake *Thamnophis marcianus*	Ponds, springs, streams, rivers in arid and semi-arid regions; coexists with wandering garter snake; only aquatic snake known to occur in lower Colorado River region; restricted to sites with water, especially with mesquite; feeds on frogs, toads, salamanders and their larvae	Ohmart and Anderson 1978, 1982 Vitt and Ohmart 1978 Jones 1988a Ohmart et al. 1988 Schwalbe and Rosen 1988 Sullivan and Richardson 1993
Western ground snake *Sonora semiannulata*	Arid and semi-arid regions, usually with sand and some subsurface moisture; frequents river bottoms, desert flats, sand hummocks, and rocky hillsides; vegetation scant, but along lower Colorado occurs in thickets of mesquite, arrowweed, and willow	Vitt and Ohmart 1978 Ohmart and Anderson 1982 Maser et al. 1984 Jones 1988b Sullivan and Richardson 1993
Vine snake *Oxybelis aeneus*	Rare; chiefly inhabits brush-covered hillsides and stream bottoms with sycamore, oak, walnut, and wild grape; extreme southern Arizona	
Black-tailed rattlesnake *Crotalus molossus*	Mountains with rockslides, outcrops, cliffs, and rocky stream courses; avoids barren desert; from palo verde-cactus to pine-oak	Ohmart and Anderson 1982 Sullivan and Richardson 1993
Arizona black rattlesnake *Crotalus viridis cerberus*	Variety of habitats; rock outcrops, talus, rocky stream courses, and ledges are favored	Ohmart and Anderson 1982

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Arizona ridge-nosed rattlesnake *Crotalus willardi willardi*	High mountains of pine-oak and pine-fir; frequents canyon bottoms with alder, box elder, maple, oak, and other broadleaf deciduous trees; candidate for listing by state	US Fish and Wildlife Service 1991
New Mexico ridge-nosed rattlesnake *Crotalus willardi obscurus*	High mountains of pine-oak and pine-fir; frequents canyon bottoms with alder, box elder, maple, oak; occurs in extreme southeastern Arizona; listed federally as threatened, endangered in New Mexico	U.S. Fish and Wildlife Service 1991

MAMMALS OF RIPARIAN AREAS IN ARIZONA

Mammal information is taken from Hoffmeister (1986).

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Arizona shrew *Sorex arizonae*	Found near springs, but in dry spots in litter and grass	Call 1986 Simons et al. 1990
Merriam's shrew *Sorex merriami*	Found in dry, cool meadows not far from water	Maser et al. 1984 Call 1986
Dusky shrew *Sorex monticolus*	Found in moist grassy meadows in thick, often tall grass; along mossy banks of small streams meandering through meadows	Call 1986 Triebold 1987
Dwarf shrew *Sorex nanus*	Found in ponderosa pine habitat type, not more than 8 m from water	Call 1986 Berna 1990
Water shrew *Sorex palustris*	Riparian obligate; closely associated with water, found in wet meadows; recent attempts have not found the water shrew, due to overgrazing of mountain streams by sheep	Call 1986
Desert shrew *Notiosorex crawfordi*	Found in riparian habitats in Huachuca Mountains, but not higher than 1583 m; along Colorado two specimens, in saltcedar and saltcedar-honey mesquite mix	Anderson and Ohmart 1984a Call 1986 Ohmart et al. 1988 (gray shrew) Simons et al. 1990
Ghost-faced bat *Mormoops megalophylla*	Only one specimen, but was caught over a waterhole in cottonwoods, sycamores, and willows	Cross 1986
Yuma myotis *Myotis yumanensis*	Found where water is present in streams so that they can forage for insects over it; i.e., Colorado River, Little Colorado River, irrigation canals, permanent ponds, streams, or creeks; along the Verde they have been found along cliffs in abandoned swallow nests	Maser et al. 1984 Cross 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Cave myotis *Myotis velifer*	Even though found in arid areas they are never far from a source of water; i.e., tanks, canals, or creeks	Cross 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Arizona myotis *Myotis occultus*	Maternity colonies occur along the Verde in cottonwoods, willows, and sycamores; use water to forage over as much as for drinking	Cross 1986 Sullivan and Richardson 1993
Southwestern myotis *Myotis auriculus*	Found in deciduous riparian habitat and forages over water	Cross 1986
Western pipistrelle *Pipistrellus hesperus*	Forages along canyons, streambeds, and waterholes not far from cliffs, canyon wall, or rocky outcrops where they roost; feed on swarms of insects — frequently leafhoppers, moths, flying ants, fruit flies, and mosquitos; prey item for Mississippi Kites	Glinski and Ohmart 1983 Maser et al. 1984 Cross 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Red bat *Lasiurus borealis*	Roosts in dense riparian trees such as cottonwood, sycamore, walnut, and pine-fir forests; is a state candidate for listing	Cross 1986 Sullivan and Richardson 1993
Hoary bat *Lasiurus cinereus*	Found in tree areas of the state in wooded areas; even in most xeric locations found where trees are; (35.5% of time found along or over perennial streams)	Maser et al. 1984 Cross 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Spotted bat *Euderma maculatum*	Found in cliff crevices and loose rock; riparian situations with cottonwood and arrowweed	Maser et al. 1984 Cross 1986
Allen's lappet-browed bat *Idionycteris phyllotis*	Most often in ponderosa pine, pinyon-juniper, and as low as desertscrub; usually along streams or over ponds where they forage for insects and drink; have been found in cottonwoods, willows and arrowweed	Cross 1986

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
American free-tailed bat *Tadarida brasiliensis*	Largest concentration has been in summer in a cave along Eagle Creek; (26.8% of the time found along or over perennial streams)	Cross 1986 Sullivan and Richardson 1993
Underwood's mastiff bat *Eumops underwoodi*	Found near reservoirs and ponds bordered by mesquite, willow, saguaro, cholla, etc.	Cross 1986
Arizona gray squirrel *Sciurus arizonensis*	Found in deciduous or mixed forests of canyon bottoms and streamsides; (28.6% of the time found along streams); chiefly in oak-pine forests	Brown et al. 1977 Davis 1982 Call 1986 Sullivan and Richardson 1993
Red squirrel *Tamiasciurus hudsonicus*	Densities appear to be highest in deciduous drainages on the Mogollon Rim	Uphoff 1990
Desert pocket mouse *Perognathus penicillatus*	Moderate densities in riparian woodland habitats; along Colorado prefer mesquite and mesquite-mixed vegetation in winter and more open habitats	Stamp and Ohmart 1979 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Call 1986 Ohmart et al. 1988
Beaver *Castor canadensis*	Riparian obligate; along most continuously flowing, low-gradient streams and numerous small mountain creeks; food consists of plant material, especially cottonwood, aspen, willow, tamarisk, mesquite, cattail, pond lily roots, and other tuberous plants; cottonwood is limiting factor along some streams	Merriam and Stejneger 1890 Ohmart and Anderson 1978, 1982 Davis 1982 Maser et al. 1984 Call 1986 Ohmart et al. 1988 Chadde 1989 Sullivan and Richardson 1993
Western harvest mouse *Reithrodontomys megalotis*	Grasses offer preferable cover; often found along streams, irrigation where sufficient moisture for thick grass; also found in dry fields; along lower Colorado captured in cottonwood-willow, honey and screwbean mesquite, saltcedar, and arrowweed; seed eaters	Ohmart and Anderson 1978 Geier and Best 1980 Anderson and Ohmart 1984a Maser et al. 1984 Call 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Fulvous harvest mouse *Reithrodontomys fulvescens*	Grassy slopes and alluvial fans, usually where scattered oaks or other deciduous trees are; grass is always a component of habitat; thick brushy riparian zones	Call 1986 Dickson 1989
Cactus mouse *Peromyscus eremicus*	Desert adapted but may use riparian woodland because offers more cover and food; along lower Colorado, favored saltcedar and saltcedar-honey mesquite mixes with little understory	Merriam and Stejneger 1890 (*Hesperomys eremicus* silky cliff mouse) Stamp and Ohmart 1979 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Call 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Mesquite mouse *Peromyscus merriami*	Mesquite bosques	Call 1986
Deer mouse *Peromyscus maniculatus*	Found in coniferous forest and riparian woodlands; along Colorado favored saltcedar in summer and arrowweed in winter	Geier and Best 1980 Ohmart and Anderson 1982 Anderson and Ohmart 1984a Maser et al. 1984 Call 1986 Triebold 1987 Ohmart et al. 1988 Sullivan and Richardson 1993
White-footed mouse *Peromyscus leucopus*	Mostly near or along the lower Little Colorado River in tamarisk clumps or rocks; also cottonwoods, damp ground, thick grass, alder, willow, walnut, and scrub oak; use trees for foraging and safe travel paths	Merriam and Stejneger 1890 (*Hesperomys leucopus sonoriensis*) Geier and Best 1980 Ohmart and Anderson 1982 Kaufman et. al 1985 Call 1986 Sullivan and Richardson 1993
Brush mouse *Peromyscus boylii*	Variety of habitats; abundant in oaks; found in pinyon, juniper, scrub oak; also riparian or wash habitat; cottonwood, grapes	Call 1986 Triebold 1987 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Southern grasshopper mouse *Onychomys torridus*	Normally desert species, but does utilize adjacent riparian woodland, possibly because the area offers an abundance of insects and cover; along lower Colorado captured in screwbean mesquite, saltcedar, and saltcedar-honey mesquite mix	Stamp and Ohmart 1979 Anderson and Ohmart 1984a Call 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Hispid cotton rat *Sigmodon hispidus*	Along Colorado and Gila in tall grass or good vegetative cover; captured in marshes, cottonwood-willow, screwbean mesquite, saltcedar, and saltcedar-honey mesquite mix along Colorado	Ohmart and Anderson 1978, 1982 Anderson and Ohmart 1984a Call 1986 Ohmart et al. 1988 Dickson 1989
Arizona cotton rat *Sigmodon arizonae*	Found in vegetative cover along rivers and in irrigated fields	Call 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Montane vole *Microtus montanus*	Found in damp to wet places and lives in thick grass along streams; never found far from water	Maser et al. 1984 Call 1986
Long-tailed vole *Microtus longicaudus*	Found in damp to wet places and lives in thick grass along streams; willows; never found far from water	Maser et al. 1984 Call 1986
Muskrat *Ondatra zibethicus*	Riparian obligate; needs waterways with stable and fairly constant sources of water as in larger streams and dirt-lined irrigation canals; lives in bank dens that lead into the water; needs cattails or other plant material for nests; food consists of grasses, roots, cattails, potamogeton, and seepwillow	Ohmart and Anderson 1978 Maser et al. 1984 Call 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
House mouse *Mus musculus*	Found throughout state; more dependent upon a source of water than other native rodents and this may be a limiting factor; along Colorado captured in cottonwood-willow, honey mesquite, saltcedar, and saltcedar-honey mesquite mix	Anderson and Ohmart 1984a Ohmart et al. 1988 Sullivan and Richardson 1993
Meadow jumping mouse *Zapus hudsonius*	Found in grassy areas and willows, damp meadows; sensitive to grazing pressure	Call 1986 Schulz and Leininger 1991
Porcupine *Erethizon dorsatum*	Most abundant in forested areas, especially conifers but also occurs in mesquite and cottonwoods	Davis 1982 Maser et al. 1984 Call 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Coyote *Canis latrans*	Lives in every habitat in state; along Colorado principal dietary items were mammals and screwbean and honey mesquite; scats were found most often in screwbean mesquite, which may make it a preferred foraging habitat along with honey mesquite	Merriam and Stejneger 1890 Davis 1982 Anderson and Ohmart 1984a Maser et al. 1984 Spowart and Samson 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Black bear *Ursus americanus*	Encinal woodland and coniferous forest; use riparian woodlands	Brown et al. 1977 Davis 1982 LeCount et al. 1984 Spowart and Samson 1986
Raccoon *Procyon lotor*	Somewhat obligate; lives along permanent streams; eats aquatic and nonaquatic invertebrates; nests in crevices and caves rather than in cottonwood	Ohmart and Anderson 1982 Davis 1982 Maser et al. 1984 Spowart and Samson 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Coati *Nasua nasua*	Usually found near a water source; uses trees as escape paths; omnivorous	Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Ring-tail cat *Bassariscus astutus*	Rocky walls of canyons and peaks, of rocks and caves; excellent climbers; not necessarily riparian but may be dependent on a water source	Merriam and Stejneger 1890 Ohmart and Anderson 1982 Spowart and Samson 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Long-tailed weasel *Mustela frenata*	Cool mountainous areas; presence of water nearby may be an important limiting factor, although not found along Colorado	Davis 1982 Maser et al. 1984 Spowart and Samson 1986 Triebold 1987
Striped skunk *Mephitis mephitis*	Usually found not far from water; natural cavities such as rock piles and crevices or previously dug burrows used	Ohmart and Aderson 1982 Maser et al. 1984 Spowart and Samson 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Hooded skunk *Mephitis macroura*	Found on rocky slopes, based of cliffs, rocky sides of arroyos in heavy shrub and weed growth; depend on riparian areas in arid regions	Spowart and Samson 1986 Sullivan and Richardson 1993
River otter *Lutra canadensis*	Riparian obligate; uses river for hunting, refuge, and travel; eats fish, frogs, turtles, crayfish, or other aquatic species	Brown et al. 1977 Davis 1982 Maser et al. 1984 Spowart and Samson 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Ocelot *Felis paradilis*	Lives in brushy or shrubby vegetation, especially along streams	Davis 1982
Bobcat *Felis rufus*	Variety of habitats from deserts, grasslands, or desert to riparian woodland in cottonwoods	Davis 1982 Spowart and Samson 1986 Ohmart et al. 1988 Sullivan and Richardson 1993
Collared peccary or javelina *Tayassu tajacu*	Desertscrub, especially in thickets along creeks or old streambeds, caves, crevices on rocky slopes; preferred food is prickly pear cactus which is a succulent source of water; do use free water if available for drinking and cooling by wallowing in wet sand	Davis 1982 Boyd et al. 1986 Day 1986 Sullivan and Richardson 1993

Arizona cotton rat *Sigmodon arizonae*	Found in vegetative cover along rivers and in irrigated	Call 1986 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Elk *Cervus elaphus*	During summer occupy mountain meadows and montane coniferous forests; in winter, pinyon-juniper, mixed conifer forests, grassland, or even desertscrub; preferred foods are grasses sedges, aster, goosefoot, bear grass, eriogonums, and other mountain plants; also are browsers; compete with livestock for forage, choose more closed forest when cattle on range	Davis 1982 Maser et al. 1984 Boyd et al. 1986 Wallace and Krausman 1987 Chadde 1989 Sullivan and Richardson 1993
Mule deer *Odocoileus hemionus*	Throughout most of state; found in pine forests to chaparral or even desert; most found in washes used for foraging, thermal cover, and travel lanes; need to have a free water source, especially during summer months; prefer areas not grazed by livestock, but will use same area with moderate grazing	Davis 1982 Ohmart and Anderson 1982 Maser et al. 1984 Krausman et al. 1985 Boyd et al. 1986 Hervert and Krausman 1986 Ordway and Krausman 1986 Wallace and Krausman 1987 Ohmart et al. 1988 Rautenstrauch and Krausman 1989 Ragotzkie and Bailey 1991 Sullivan and Richardson 1993
White-tailed deer *Odocoileus virginianus*	Found primarily in oak or oak-juniper-pinyon woodland; also ponderosa pine, desertscrub, deciduous forests, spruce-fir; when occurs with mule deer white-tailed deer usually at higher elevations	Brown et al. 1977 Davis 1982 Boyd et al. 1986 Sullivan and Richardson 1993
Pronghorn *Antilocapra americana*	Plains and meadows of shortgrass and deserts; availability of free water may be a critical factor to presence; *A. a. sonoriensis* listed as endangered by federal and state	Merriam and Stejneger 1890 Maser et al. 1984 Boyd et al. 1986 Ohmart et al. 1988 U.S. Fish and Wildlife Service 1991 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Bighorn sheep *Ovis canadensis*	Prefer rocky desert ranges; sometimes rocks act as natural catchment for rain; water is important whether it be from succulents, natural rainfall, water tanks, or permanent sources	Merriam and Stejneger 1890 Walker 1978 Seegmiller and Ohmart 1981 Davis 1982 Maser et al. 1984 Boyd et al. 1986 Ohmart et al. 1988

FISHES OF ARIZONA

Information on all fishes is from Minckley (1973) with support from other listings.

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
White sturgeon *Acipenser transmontanus*	Introduced to Colorado River in 1967 and 1968 near Lake Havasu; spawn over gravel or rocky bottoms	Minckley 1979
Machete (Tenpounder) *Elops affinis*	Native; Marine fish that sporadically entered lower Colorado River, probably no longer does so	Miller 1961 Minckley 1979, 1985 Ohmart et al. 1988 Rinne and Minckley 1991
Freshwater eel *Anguilla* sp.	One definitely identified from Lake Mead in 1972; not normally expected along Colorado, probably accidental introduction	
Threadfin shad *Dorosoma petenense*	Introduced as forage for game fish; prefer water warmer than 9°C; in streams and flowing waters attracted to moderate current, congregate below swift riffles, circular eddies, or open flowing pools; in larger reservoirs and rivers relatively deep water during day	Miller 1961 Minckley 1979 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Coho (silver) salmon *Oncorhynchus kisutch*	Introduced to Lake Mohave and Lake Mead to forage on threadfin shad which they did; natural reproduction the Colorado doubtful	
Gila trout *Oncorhynchus gilae*	Native, three or four high elevation streams; optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks; cannot coexist with other fish; endangered species both federal and state list	Miller 1961 Behnke and Zarn 1976 Brown et al. 1977 Behnke and Raleigh 1978 Minckley 1985 Platts and Rinne 1985 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Apache trout *Oncorhynchus apache*	Native; high elevations in small, clear, cold brooks; can coexist with other fish if habitat integrity is maintained; optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks; was endangered on federal list in 1967, status is now threatened without critical habitat	Behnke and Zarn 1976 Brown et al. 1977 Behnke and Raleigh 1978 Minckley 1985 Platts and Rinne 1985 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Rainbow trout *Oncorhynchus mykiss*	Introduced; optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks; feed on aquatic and terrestrial insects; serious competition from golden shiner	Miller 1961 (*Salmo gairdneri*) Behnke and Raleigh 1978 Keller et al. 1979 Minckley 1979 Van Velson 1979 Ohmart et al. 1988 Rinne and Minckley 1991 Blinn et al. 1993 Sullivan and Richardson 1993
Cutthroat trout *Oncorhynchus clarki*	Introduced; optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks; feed on aquatic and terrestrial insects; rare in Arizona streams	Miller 1961 Behnke and Raleigh 1978 Rinne and Minckley 1991 Sullivan and Richardson 1993
Golden trout *Oncorhynchus aquabonita*	Introduced from California; optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks; feed on aquatic and terrestrial insects	
Brown trout *Salmo trutta*	Introduced; optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks; feed on aquatic and terrestrial insects; can stand slightly warmer water than other trout; also grow large in small streams	Behnke and Raleigh 1978 Van Velson 1979 Wesche et al. 1987 Rinne and Minckley 1991 Sullivan and Richardson 1993
Brook trout *Salvelinus fontinalis*	Introduced; optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks; feed on aquatic and terrestrial insects;	Miller 1961 Behnke and Raleigh 1978 Keller et al. 1979 Minckley 1985 Platts and Rinne 1985

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	low tolerance for high water temperature and high tolerance of extremely cold water; not really trout but a char	Rhodes and Hubert 1991 Rinne and Minckley 1991
Arctic grayling *Thymallus arcticus*	Introduced; young fish eat bottom-dwelling dipteran larvae, older fish eat adult and larval insects; best water temperatures are below 12°C	
Northern pike *Esox lucius*	Introduced; predator on other fishes, frogs, large crustaceans, small mammals, birds, and even each other; spawn in marshy inlets, creek mouths, or weedy areas around lakes in very shallow water; occupies habitat used by Colorado squawfish	Culpin 1986 Rinne and Minckley 1991 Tyus 1992 Sullivan and Richardson 1993
Banded tetra *Astyanax fasciatus mexicanus*	Accidental introduction; very aggressive; theoretically capable of living at elevations below 1000 m, perhaps higher	
Common carp *Cyprinus carpio*	Introduced as a food fish; tolerant of a wide range of environmental conditions; rarely eat other fish but does eat other fish eggs and are carnivorous on benthic invertebrates; plankton major food of young; adults feed by plowing up bottom creating turbid waters and uprooted aquatic vegetation; Asiatic clam major food item in some parts of year; eggs are scattered along shorelines on submerged vegetation or debris; prey on young razorback suckers	Miller 1961 Minckley 1979, 1985 Culpin 1986 Ohmart et al. 1988 Rinne and Minckley 1991 Tyus 1992 Sullivan and Richardson 1993
Goldfish *Carassius auratus*	Introduced; similar to carp generally, but may depend on plankton more; in lakes found in shallow bays with open shorelines and in streams found in pools	Minckley 1979 Culpin 1986 Ohmart et al. 1988 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Grass carp *Ctenopharyngodon idellus*	Introduced; control for aquatic vegetation; highly tolerant of salinity and temperature extremesRinne and Minckley 1991	
Golden shiner *Notemigonus crysoleucus*	Introduced as bait; higher elevation impoundments and lakes; compete with young of salmonids and interact detrimentally with a native spinedace; found in shallow, mudbottomed, overflow ponds along creeks and rivers were they are native; are eaten by predaceous fish; young eat algae and zooplankton, adults eat insects, smaller fish, algae, higher aquatic insects, and sometimes clams, snails, and other invertebrates	Minckley 1979, 1985 Ohmart et al. 1988 Rinne and Minckley 1991
Utah chub *Gila atraria*	Colorado River, Utah-Arizona border; omnivorous, mainly vegetatin and invertebrates, sometimes plankton, other fish, fish eggs, and molluscs; spawn in spring in shallow water or a variety of bottom types; found between 1500 and 2800 m in cool springs, warm springs, and waters with seasonal variation; associated with aquatic vegetation along shore but does go to deeper water	
Bonytail chub *Gila elegans*	Native; essentially extinct from Colorado River and its large tributaries; found in swift, turbid mainsteam rivers; found in eddies and pools in Green River, UT, but adapted to flood conditions; federal and state listed endangered	Miller 1961 Holden 1979 Minckley 1979, 1985 Platts and RInne 1985 Culpin 1986 Ohmart et al. 1988 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Humpback chub *Gila cypha*	Native; turbulent waters of Colorado River and Little Colorado; fast current, deep	Holden 1979 Minckley 1985 Platts and Rinne 1985

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	pools, and boulders; adversely affected by channel catfish in Green River basin; listed as endangered by both state and federal	Culpin 1986 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991 Tyus 1992
Colorado River (roundtail) chub *Gila robusta*	Native; moderate to large rivers in Colorado River basin, but no longer in mainstem of Colorado itself; pools and eddies, concentrate in swift, swirling water below rapids, in smooth-flowing chutes to forage; eat aquatic and terrestrial insects, algae and when large, other fish	Miller 1961 Holden 1979 Minckley 1979, 1985 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Virgin River chub *Gila robusta seminuda*	Native; deeper, swift, but not turbulent waters; generally associated with boulders or other cover; sand and gravel bottoms in water colder than 30°C; very tolerant of high salinity and turbidity; listed as endangered by both federal and state	U.S. Fish and Willdife Service 1991
Gila chub *Gila intermedia*	Native; central and southern Arizona; smaller creeks, cienegas, some artificial impoundments; deeper water or near cover; tiny young in shallowest water among plants; eat mainly terrestrial and aquatic insects and filamentous algae	Miller 1961 (*G. robusta intermedia*) Minckley 1985 Griffith and Tiersch 1989 Rinne and Minckley 1991
Yaqui chub *Gila purpurea*	Native; Rio Yaqui drainage, extreme southeastern Arizona; deep pools of small streams near undercut banks and debris and also pools associated with springheads; state and federal listed as endangered	Minckley 1985 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Sonora chub *Gila ditaenia*	Native; only found in Sycamore Canyon, Arizona and Rios Altar and Magdalena, Mexico; deep, permanent pools near cliffs,	Minckley 1985 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	boulders, or cover in stream channels; eat terrestrial and aquatic insects and algae; threatened on federal list, endangered on state list	
Little Colorado River spinedace *Lepidomeda vittata*	Native; pools with flowing water entering them, most common over fine gravel bottoms and silt-mud; during drought persist in deep pools and spring areas; eat aquatic and terrestrial insects from the surface, also aquatic insect larvae and filamentous algae; listed as threatened by both state and federal	Minckley 1985 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991 Blinn et al. 1993
Virgin River spinedace *Lepidomeda mollispinis mollispinis*	Native; restricted to Virgin River system in Utah-Arizona-Nevada; cool, clear, moderately swift, water with scattered pools; eat aquatic insects but eat plant materials when animal food is scarce; larvae of *Euparyphus* and *Hydropsyche* were important in diet, also adult ephemeropterns and trichopterns; probably forage continuously during day	Minckley 1985 Angradi et al. 1991 Rinne and Minckley 1991
Spikedace *Meda fulgida*	Native; prefers slow-moving water <1 m deep most of the year; concentrate near downstream ends of riffles or in eddies; gravel and rubble substrates; eats aquatic and terrestrial insects; listed as threatened by both state and federal	Miller 1961 Minckley 1985 Minckley and Deacon 1968 Rinne 1991 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991 Sullivan and Richardson 1993
Woundfin *Plagopterus argentissimus*	Native; lower Colorado River basin; Virgin River, lower and middle Gila River; swift areas of silty streams, avoids clear water and seldom found in pools; tolerates high salinities and warm waters; federally listed as endangered	Miller 1961 Minckley and Deacon 1968 Minckley 1979, 1985 Platts and Rinne 1985 Ohmart et al. 1988 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Redside shiner *Richardsonius balteatus hydrophlox*	Introduced as bait; replacing Virgin River spinedace; spawn in riffles or other shallows; feed on plankton, aquatic invertebrates from the bottom; terrestrial insects, young and eggs of other fish and their own; trout eat it	Minckley 1985 Rinne and Minckley 1991
Colorado River squawfish *Ptychochelius lucius*	Native; warm, swift, turbid water of major rivers of Colorado River basin; once very numerous, but now extirpated from lower basin, still in upper basin; young found in backwater areas; food in Green River was custaceans and aquatic dipteran larvae, aquatic and terrestrial insects in larger fish; both northern pike and channel catfish and other introduced fishes dominate habitat of young squawfish; listed as endangered by both federal and state	Miller 1961 Minckley and Deacon 1968 Holden 1979 Minckley 1979, 1985 Ohmart and Anderson 1982 Platts and RInne 1985 Culpin 1986 Ohmart et al. 1988 Rinne and Minckley 1991 Tyus 1991, 1992 U.S. Fish and Wildlife Service 1991 Rinne 1993 Sullivan and Richardson 1993
Longfin dace *Agosia chryogaster*	Native; inhabits from low, hot sandy-bottomed desert streams to clear, cooler brooks of coniferous forests; rarely in larger streams of above 1500 m elevation; after floods will persist in very shallow (mm) water by staying beneath moist debris and algal mats during day; adults concentrate in deep shaded areas when water temperatures exceed 25 to 28°C and young remain active in open water; feed on detrital materials and algae	Miller 1961 Ohmart and Anderson 1982 Minckley 1985 Griffith and Tiersch 1989 Rinne and Minckley 1991 Sullivan and Richardson 1993
Speckled dace *Rhinichythys osculus*	Native; rare below 1500 m; peak numbers between 2000 and 3000 m; swift, moderate-sized, pool-and-riffle creeks; usually in water <0.5 m deep, congregate below riffles and eddies; omnivorous, on algae,	Miller 1961 Ohmart and Anderson 1982 Baltz and Moyle 1984 Minckley 1985 Ohmart et al. 1988 Griffith and Tiersch 1989 Angradi et al. 1991

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	detritus, and smaller aquatic insects; often forages on bottom; adults can withstand flashfloods but young are carried downstream, usually to perish as pools dessicate; forage in morning and evening, important foods are larvae of *Euparyphus* and *Hydropsyche*, nymphs of ephemeropterans and ostracods	Rinne and Minckley 1991 Sullivan and Richardson 1993
Loach minnow *Tiaroga cobitis*	Native; gravelly riffles in smaller to moderate-sized streams; associated with beds of filamentous algae on swift, shallow reaches or along margins of rapids; has been documented as spawning in autumn, nests in holes and males guard nests; eats aquatic insect larvae, principally dipterans and mayflies; usually occurs with speckled dace	Miller 1961 Minckley 1985 Rinne 1989 Vives and Minckley 1990 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Red shiner *Notropis lutrensis*	Introduced; streams with decreased flow, calmer waters; rapidly colonize; are omnivorous, plankton, aquatic insects, algae, invertebrates (aquatic and terrestial), young of other fish	Miller 1961 Minckley and Deacon 1968 Holden 1979 Minckley 1979 Ohmart et al. 1988 Rinne 1991 Rinne and Minckley 1991 Sullivan and Richardson 1993
Beautiful shiner *Notropis formosus*	Native; Rio Yaqui drainage; only found at San Bernadino Ranch, at least until 1968 when it was extirpated from U.S.; listed as endangered by state and threatened by federal list	Minckley 1985 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Spottail shiner *Notropis venustus*	Introduced as bait; had been caught in 1968 from the Virgin River, Nevada; found in clearer, swifter water than red shiner	

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Sand shiner *Notropis stramineus*	Only collected once; inadvertently introduced with largemouth bass into East Clear Creek and Chevalon Creek	
Mexican stoneroller *Campostoma ornatum pricei*	Native; only in Rucker Canyon in Arizona; Rio Yaqui drainage; considered extinct in 1973; require gravelly bottomed riffles for spawning; found in deepest places and under boulders and debris in pools	Minckley 1985 Rinne and Minckley 1991
Fathead minnow *Pimephales promelas*	Introduced, popular bait fish: found in quiet, muddy streams; feed on microscopic detritus and algae and are often prey for other fish	Minckley 1979, 1985 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Bigmouth buffalo *Ictiobus cyprinellus*	Introduced; only on reservoirs on Salt River; feed on plankton predominantly, mostly algae and crustaceans	Miller 1961
Black buffalo *Ictiobus niger*	Introduced; most often near bottom, in deeper bays and inlets of lakes near cliffs and cover; eat benthic animals, i.e., clams, also benthic algae and crustaceans	
Smallmouth buffalo *Ictiobus bubalus*	Introduced; slightly shallower water than black buffalo and found most oftenover sand or silt bottoms; feed on dipteran larvae and clams	
Razorback sucker *Xyrachuen texanus*	Native; found in water deeper than 1 m, often more than 15 m in reservoirs, over sand, mud, or gravel bottoms; found in streams and large rivers with slow backwater areas; feeds on benthic floral and fauna, detritus, and plankton; carp prey on young; listed by Arizona, California, and federal as endangered	Miller 1961 (humpback sucker) Minckley and Deacon 1968 Holden 1979 Minckley 1979, 1985 Culpin 1986 Ohmart et al. 1988 Mueller 1989 Minckley et al. 1991a Rinne and Minbckley 1991 U.S. Fish and Wildlife Service 1991

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
		Tyus 1992 Rinne 1993 Sullivan and Richardson 1993
Flannelmouth sucker *Catostomus latipinnis*	Native; found in larger, stronger flowing streams of Colorado River basin; reportedly vegetarian, but known to eat invertebrates	Miller 1961 Minckley 1979, 1985 Ohmart et al. 1988 Rinne and Minckley 1991
Little Colorado sucker *Catostomus* species	Native; found primarily in pools with abundant cover; feeds on detrital material, algae and some higher vegetation, aquatic invertebrates	Minckley 1985 Rinne and Minckley 1991
Sonoran sucker *Catostomus insignis*	Native; Gila and Bill Williams River basin from 300 to 2000 m elevation; gravelly or rocky pools, deep, quiet waters; food depends on availability from aquatic insect larvae to plant debris, mud or algae; young feed along margins on tiny plants and animals; prey item for Bald Eagles along Salt and Verde	Miller 1961 Minckley 1985 Haywood and Ohmart 1986 Rinne and Minckley 1991 Sullivan and Richardson 1993
Yaqui sucker *Catostomus bernardini*	Native; now extinct but was found in San Bernardino Creek near Arizona-Sonora border; it had used was a single, shallow-bottomed, elongated pool surrounded by mesquite and willows and heavily grazed by cattle	Minckley 1985 Rinne and Minckley 1991
Desert mountain-sucker *Pantosteus clarki*	Native; tend to be in rapids more than pools, at least feed and spawn in them, but live in flowing pools by day; eat algae; prey item for Bald Eagles along Salt and Verde	Miller 1961 Minckley 1985 Haywood and Ohmart 1986 Rinne and Minckley 1991 Sullivan and Richardson 1993
Bluehead mountain-sucker *Pantosteus discobolus*	Native; tend to be in rapids more than pools, at least feed and spawn in them, but live in flowing pools by day; eat algae;	Minckley 1985 Rinne and Minckley 1991

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	in larger streams they eat aquatic invertebrates	
Rio Grande mountain-sucker *Pantosteus plebeius*	Native to New Mexico, possibly invaded Arizona; tend to be in rapids more than pools, at least feed and spawn in them, but live in flowing pools by day; eat algae	Minckley 1985 Rinne and Minckley 1991
Flathead catfish *Pilodictis olivaris*	Introduced; typically large river fishes; found in deep pools near cover; are relatively sedentary; usually feeds at night in clear water, but has done so in day time near dams during spring floods in highly turbid water; feeds on insect larvae, crayfish and other fish; prey item to Bald Eagles along Salt and Verde	Minckley 1979 Culpin 1986 Haywood and Ohmart 1986 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Channel catfish *Ictalurus punctatus*	Introduced; need protected nest sites for reproduction; forages in swift riffles at night; move inshore at night or cloudy days on lakes; young feed on aquatic insects, then become omnivorous or piscivorous; occupies habitat of Colorado squawfish and humpback chub; prey item to Bald Eagles along Salt and Verde	Miller 1961 Minckley 1979, 1985 Culpin 1986 Haywood and Ohmart 1986 Ohmart et al. 1988 Rinne and Minckley 1991 Tyus 1992 Sullivan and Richardson 1993
Blue catfish *Ictalurus furcatus*	Introduced to Colorado in 1972, no habitat or foraging data	Minckley 1979, 1985 Culpin 1986 Rinne and Minckley 1991
Yaqui catfish *Ictalurus pricei*	Native; Rio Yaqui drainage; moderate to large streams with medium to slow currents with sand/rock bottoms; extirpated from U.S.; listed as endangered by state and threatened by federal	Minckley 1985 Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Black bullhead *Ameiurus melas*	Introduced, prefers relatively quiet, turbid water and is rarely is in clear, rock-bottomed	Miller 1961 Minckley 1979 Culpin 1986

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	habitat; are omnivores but become carnivorous when animal foods are abundant	Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Yellow bullhead *Ameiurus natalis*	Introduced, found in clear, rocky-bottomed, intermediate-sized streams; fish, snails, crustaceans, with some vegetative material	Miller 1961 Minckley 1979 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Brown bullhead *Ictalurus nebulosus*	Mohave Valley division of the lower Colorado River (specimen); prey of Bald Eagles along Salt and Verde	Minckley 1979 Culpin 1986 Haywood and Ohmart 1986
"Walking" catfish *Clarias batrachus*	Introduced; only one specimen; unlikely to survive here	Minckley 1979
Rio Grande killifish *Fundulus zebrinus*	Native fish of New Mexico and Texas introduced to Arizona; shallow, saline, sandy-bottomed streams; feeds on bottom for midge larvae, mayflies, and rarely crustaceans	Minckley et al. 1991b
Desert pupfish *Cyprinodon macularius*	Native; springs, marshes, and flowing streams in shallow water below 1666 m; tolerates high temperatures and salinities; endangered due to habitat loss and introduction of exotic species; listed as endangered by both state and federal	Miller 1961 Minckley 1979, 1985 Ohmart and Anderson 1982 Ohmart et al. 1988 Minckley et al. 1991b Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Mosquitofish *Gambusia affinis*	Introduced; very adaptable and occurs in almost any habitat from clear, cool springs to turbid, hot stock tanks; probably the single most abundant freshwater fish in the world; feeds heavily on mosquito larvae, but also young fish of its own and other species	Miller 1961 Minckley and Deacon 1968 Minckley 1979, 1985 Platts and Rinne 1985 Ohmart et al. 1988 Minckley et al. 1991b Sullivan and Richardson 1993
Gila topminnow *Poeciliopsis occidentalis occidentalis*	Native; concentrates in shallows, especially near aquatic vegetation or debris; adults prefer moderate current,	Miller 1961 Minckley and Deacon 1968 Collins et al. 1981 Minckley 1985

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
	below riffles and along margins, sandy-bottomed, intermittent streams; currently isolated populations; eats bottom debris, vegetable material, and amphipod crustraceans, aquatic insect larvae; endangered due to habitat loss and predation by mosquitofish; listed as endangered by federal and threatend by state	Platts and Rinne 1985 Ohmart et al. 1988 Minckley et al. 1991b Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Yaqui topminnow *Poeciliopsis occidentalis sonoriensis*	Native; Rio Yaqui basin; concentrates in shallows, especially near aquatic vegetation or debris; adults prefer moderate current, below riffles and along margins, sandy-bottomed, intermittent streams; currently isolated populations; eats bottom debris, vegetable material, and amphipod crustaceans, aquatic insect larvae; endangered due to habitat loss and predation by mosquitofish; listed as endangered by federal and state	Minckley 1985 Minckley et al. 1991b Rinne and Minckley 1991 U.S. Fish and Wildlife Service 1991
Variable platyfish *Xiphophorus variatus*	Introduced aquarium fish; probably not established, lives in heavily vegetated slow-moving waters lateral to stream or in ponds and springs	Minckley 1979
Green swordtail *Xiphophorus helleri*	Introduced aquarium fish; not established but could in warmer, low elevation habitats	
Sailfin molly *Poecila latipinna*	Introduced aquarium fish; canals, wastewater ponds, salty waters; mainly herbivores, algae, leaves of higher aquatic plants, organic detritus	Minckley 1979 Ohmart et al. 1988
Mexican molly *Poecilia mexicana*	Introduced, aquarium fish; similar to sailfin but more active and ubiquitous in habitat requirements	Minckley 1979 Ohmart et al. 1988

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Guppy *Lebistes reticulatus*	Introduced, aquarium fish; generally in Phoenix canal system; tend to die out in winter but reestablish with reintroductions; shallow, warm, weedy, marginal habitats	Minckley 1979
Striped bass *Morone saxatalis*	Introduced; adaptable; large rivers and impoundments; young feed on crustaceans; adults feed on larger animals, primarily fishes	Minckley 1979, 1985 Ohmart et al. 1988 Rinne and Minckley 1991
White bass *Morone chrysops*	Introduced; best adapted to moderate-sized and large lakes and reservoirs; similar feeding habits to striped bass	Minckley 1979 Rinne and Minckley 1991
Yellow bass *Morone mississippiensis*	Introduced; may not be present; smaller than white bass but comparable in ecology and behavior; prey of Bald Eagles in Salt and Verde	Miller 1961 Haywood and Ohmart 1986 Rinne and Minckley 1991
Smallmouth bass *Micropterus dolomieui*	Introduced; in large rivers and lakes congregate over hard, stony bottoms, where current are present; smaller streams prefers established permanent pools; young feed on tiny crustaceans, shift to insects as they area, then to other fishes as an adult	Minckley 1979 Culpin 1986 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Spotted bass *Micropterus punctulatus*	Introduced; rare in 1973; habitat and feeding as for smallmouth	
Largemouth bass *Micropterus salmoides*	Introduced; lakes, ponds, reservoirs and slow-moving portions of large streams; are obligate carnivores and eat almost anything they can swallow	Miller 1961 Minckley 1979, 1985 Culpin 1986 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Warmouth *Chaenobryttus gulosus*	Introduced; lower Colorado River system; abundant along the mainstream, backwaters, and some large drains; also lakes of Salt River; eats aquatic linsects, crayfish, and smaller fishes	Minckley 1979 Ohmart et al. 1988
Green sunfish *Lepomis cyanellus*	Introduced; adaptable, but in rocky situations of lakes or streams most often; rare but present near cover such as brushy banks, cliffs, or piles of rubble; highly predaceous	Miller 1961 Minckley 1979 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Bluegill *Lepomis macrochirus*	Introduced; found commonly in any water below 2500 m, rarely in streams and rivers, more often in lakes, reservoirs, ponds; feed heavily on smaller invertebrates, zooplankton and aquatic insects, with insects more important to larger fish	Miller 1961 Minckley 1979, 1985 Culpin 1986 Ohmart et al. 1988 Rinne and Minckley 1991
Redear sunfish *Lepomis microlophus*	Introduced; generally feed and breed in deeper water than green sunfish	Minckley 1979 Ohmart et al. 1988 Rinne and Minckley 1991
Pumpkinseed *Lepomis gibbosus*	Introduced; probably hypothetical	
Rockbass *Ambloplites rupestris*	Introduced; lower Oak Creek, West Clear Creek; stream-dwelling	Sullivan and Richardson 1993
White crappie *Pomoxis annularis*	Introduced; like relatively high turbidity and perhaps warmer temperatures	Miller 1961 Minckley 1979 Rinne and Minckley 1991
Black crappie *Poxomis nigromaculatus*	Introduced; clear, cool, less vegetated, and less acidic water; attracted to submerged debris	Miller 1961 Minckley 1979 Ohmart et al. 1988 Rinne and Minckley 1991 Sullivan and Richardson 1993
Sacramento perch *Archoplites interruptus*	Native western sunfish, introduced to Arizona; probably now extirpated	

COMMON/SCIENTIFIC NAME	RIPARIAN INFORMATION	REFERENCES
Walleye *Stizostedion vitreum vitreum*	Introduced; central Arizona impoundments; found in upper 10 m of water column; concentrate at dams; feed on insects when young but fish, mostly threadfin shad, when larger	Culpin 1986 Rinne and Minckley 1991
Yellow perch *Perca flavescens*	Introduced; sporadically occurs; feeds on plankton and insects when small, but larger invertebrates and fish when larger	Miller 1961 Minckley 1979 Culpin 1986 Sullivan and Richardson 1993
Convict cichlid *Cichlosoma nigrofasciatum*	Introduced, aquarium fish; no major populations; could cause problems for sports fisheries and native species if became established	
Mozambique mouthbrooder *Oreochromis mossambica*	Introduced to lower Colorado and has spread; feeds extensively on vegetation but does eat animal foods; has higher minimum temperature tolerance and probably higher maximum and higher salinities than sunfish	Minckley 1979 Ohmart et al. 1988 (*Tilapia mossambica*) Rinne and Minckley 1991
Nile mouthbrooder *Oreochromis nilotica*	Introduced to lower Colorado and has spread; feeds extensively on vegetation but does eat animal foods; has higher minimum temperature tolerance and probably higher maximum and higher salinities than sunfish; can stand lower temperatures than Mozambique mouthbrooder	Rinne and Minckley 1991
Zill's tilapia *Tilapia zilli*	Introduced; southern Arizona; very resistant to lower temperatures	Minckley 1979 Ohmart et al. 1988 Rinne and Minckley 1991
Striped mullet *Mugil cephalus*	Native of tropical waters that traveled up lower Colorado River to Imperial Dam; quite abundant in mainstream and lateral canals	Miller 1961 Minckley 1979, 1985 Ohmart et al. 1988 Rinne and Minckley 1991

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Abell, D. L., technical coordinator. 1989. Protection, management, and restoration for the 1990's. Proceedings of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 544 pp.

The papers in this proceedings are aimed at resource managers, environmental consultants, researchers, landowners, environmental activists, and a variety of user groups. Some of the papers explain how streams interact with the plants and animals at their margins and with the land that they occupy to accomplish a range of important functions. These functions include bank stabilization, reducing the impacts of flooding, providing wildlife habitat, protecting instream habitat for fishes, producing livestock forage, and enhancing human lives. Biological diversity in Western lands is often directly related to riparian systems, which also serve as major routes for migratory birds. Special attention is given to the several threatened and endangered species that require riparian habitat, and to the response of riparian systems to disturbance, i.e., fire, logging, landslides, and diversion for power or water supply. A section deals with measures being taken to preserve and restore riparian lands, particularly along large rivers and in the cities. Special attention is given in some of these papers to revegetation techniques.

Location of Study: West
Keywords: Proceedings, Functions, Management, Habitat

American Ornithologists' Union. 1983. Check-list of North American birds. The species of birds of North America from the Arctic through Panama, including the West Indies and Hawaiian Islands. 6th edition, American Ornithologists' Union, printed by Allen Press, Inc., Lawrence, KS.

As the title states this is a listing of all the known bird species in North America. It lists the currently accepted scientific name, a brief description of habitat, where the species breeds, where it migrates to or where it is resident, and occasionally taxonomic notes.

Location of Study: Arizona, North America
Keywords: Habitat

Anderson, B. W., A. Higgins, and R. D. Ohmart. 1977. Avian use of saltcedar communities in the lower Colorado River Valley. Pp. 128-136 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Study of bird densities and bird species diversities in saltcedar stands along the lower Colorado River for 2.5 years. Comparisons were made between six saltcedar structural types and on a community level with other vegetation types. Results showed that saltcedar supported fewer birds than native plant

communities, although tall, dense stands were used by doves for nesting and rarer bird species along the lower Colorado River.

Location of Study: Arizona
Keywords: Saltcedar, Habitat, Structure, Vegetation, Doves, Cottonwood, Willow

Anderson, B. W., and R. D. Ohmart. 1977. Vegetation structure and bird use in the lower Colorado River Valley. Pp. 23-34 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Lower Colorado River data were used to discuss the relationships between birds and vegetation structure. Correlations between birds and plant structure varied seasonally. Habitat breadth for all species was narrowest in winter and broadest in summer. Winter visitors are more specialized with respect to vegetation structure than permanent residents and may be affected by loss of habitat more dramatically.

Location of Study: Arizona
Keywords: Vegetation, Structure, Habitat, Winter, Visitors, Residents

Anderson, B. W., and R. D. Ohmart. 1978. Phainopepla utilization of honey mesquite forests in the Colorado River Valley. Condor 80:334-338.

Study of Phainopeplas in the lower Colorado River Valley during fall, winter, and spring. These birds arrive in the valley in fall and remain through winter and breed in the spring, leaving the hot valley during the summer. While there they are strongly associated with honey mesquite forests as they are hosts to mistletoe. Mistletoe berries are important winter food for Phainopeplas. In spring they were associated with denser vegetation for nesting. Following nesting they were found in open, sparser habitats containing wolfberry; diet consisted mainly of wolfberry fruit and insects.

Location of Study: Arizona
Keywords: Phainopepla, Habitat, Food, Vegetation, Mesquite, Mistletoe, Structure, Functions

Anderson, B. W., and R. D. Ohmart, 1984a. Vegetation management study for the enhancement of wildlife along the lower Colorado River. Final report to US Bureau of Reclamation, Lower Colorado Region, Boulder City, NV.

A final report relating to data collected and analyzed along the lower Colorado River over a 10-year period. Includes information about field techniques and data analysis, bird species found there, avian use of riparian vegetation, avian community organization in cottonwood-willow, waterbird use of natural and modified portions of the river, biology of Gambel's Quail, small mammal life history and population data, relationships of rodents to riparian vegetation, coyote food habits, and final conclusions.

Location of Study: Arizona, California
Keywords: Techniques, Habitat, Vegetation, Structure, Coyote, Quail

Anderson, B. W., and R. D. Ohmart. 1984b. Avian use of revegetated riparian zones. Pp. 626-631 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Native cottonwood, willow, and quail bush were reintroduced on three plots along the lower Colorado River. Saltcedar was also cleared while any naturally occurring natives were left. Birds quickly recolonized these revegetated areas.

Location of Study: Arizona
Keywords: Vegetation, Structure, Habitat, Shrubs, Cottonwood, Willow, Mesquite, Saltcedar

Anderson, B. W., and R. D. Ohmart. 1985. Habitat use by Clapper Rails in the lower Colorado River Valley. Condor 87:116-126.

Study of Clapper Rail in marshy situations in the lower Colorado River valley in all seasons. High foliage density is an important component of Clapper Rail habitat. Also important to have high ground for nesting habitat so chicks do not drown. Require a dry interface between banks and water for walking and foraging. Clapper Rails eat mainly crayfish which were found in moderately dense to dense vegetation

Location of Study: Arizona
Keywords: Habitat, Food

Anderson, B. W., and R. D. Ohmart. 1988. Structure of the winter duck community on the lower Colorado River: patterns and processes. Pp. 191-236 *in* M. W. Weller, editor, Waterfowl in winter, University of Minnesota Press, Minneapolis, MN.

Food habits and habitat relationships were studied along the lower Colorado River over seven winters. Dabbling ducks tended to be found in areas with abundant submerged and emergent vegetation. Diving ducks were associated with areas immediately downstream from hydroelectric dams. This association is probably due to large numbers of hydropsychid insects and the Asiatic clam. Pochards were also associated with dams but not as strongly as diving ducks.

Location of Study: Arizona
Keywords: Ducks, Habitat, Food, Vegetation, Structure, Dams, Functions

Anderson, B. W., R. D. Ohmart, and J. Disano. 1978. Revegetating the riparian floodplain for wildlife. Pp. 318-331 *in* R. R. Johnson and J. F. McCormick, technical coordinators, Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

Revegetation study on lower Colorado River found that horizontal and vertical foliage diversity and presence of cottonwood and/or willow trees were positively correlated with birds in the area. Bird densities were enhanced by increasing horizontal foliage diversity and the presence of mistletoe, quail bush, and inkweed. Saltcedar was negatively associated.

Location of Study: Arizona
Keywords: Vegetation, Habitat, Structure, Cottonwood, Willow, Saltcedar

Anderson, B. W., R. D. Ohmart, J. K. Meents, and W. C. Hunter. 1984. Avian use of marshes on the lower Colorado River. Pp. 598-604 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Vegetation type and composition were used to classify marshes along the lower Colorado River into eight different types. Marshes that had high densities of cattail and bulrush had more Yuma Clapper Rails and insectivores. The interface between marshes and riparian areas were more important to terrestrial birds than wading and waterbirds.

Location of Study: Arizona
Keywords: Shorebirds, Waterbirds, Vegetation, Structure

Anderson, B. W., R. D. Ohmart, and J. Rice. 1983. Avian and vegetation community structure and their seasonal relationships in the lower Colorado River Valley. Condor 85:392-405.

Transect data for 78 transects along the lower Colorado River were examined to (1) isolate seasonal and spatial patterns in avian community variation; (2) determine relationships between attribute patterns in characteristics of birds and vegetation; and (3) evaluate the effects of the different levels of investigation. Foliage structure plays an important role in habitat selection and tree species may also be important.

Location of Study: Arizona
Keywords: Habitat, Structure, Vegetation, Seasons

Austin, G. T. 1970. Breeding birds of desert riparian habitat in southern Nevada. Condor 72:431-436.

Study in Nevada of desert riparian habitat dominated by mesquite. Was a greater relative density of birds in mesquite bosque, possibly due to greater foliage volume. Greater shade by taller screwbean

mesquite cooled the air by 5-6°. Nest site selection generally depended upon the availability of plant species. Mistletoe berries were an important component of the habitat.

Location of Study: Nevada
Keywords: Breeding, Mesquite, Mistletoe

Bent, A. C. 1962-1968. Life histories of North American birds. Dover Publications, New York, NY.

This is 20 volume series on American birds that was reprinted by Dover Publications. It contains very comprehensive information on birds throughout North America.

Location of Study: North America
Keywords: Breeding, Habitat, Distribution, Food, History

Blakesley, J. A., and K. P. Reese. 1988. Avian use of campground and noncampground sites in riparian zones. Journal of Wildlife Management 52(3):399-402.

Study of campground vs. noncampground sites in riparian areas in northern Utah. Compared use of these areas by 14 bird species; half were associated with each situation. Six of the seven noncampground-associated species were ground- or shrub-nesting, or ground-foraging species. There were differences in shrub and sapling density, litter depth, and amount of dead woody vegetation between the two habitats which may account for the differences in avian response.

Location of Study: Utah
Keywords: Campground, Habitat

Bock, C. E., and J. H. Bock. 1984. Importance of sycamore to riparian birds in southeastern Arizona. Journal of Field Ornithology 55(1):97-103.

Study of two streams, Lyle Creek and O'Donnell Creek, with and without sycamore trees, respectively; they were comparable otherwise in terms of adjacent upland vegetation. Censuses were conducted during summer and winter seasons. Sycamore provided a variety of functions to birds: American Goldfinches fed on fruit; several species foraged for insects by gleaning of excavating; flycatchers regularly foraged in or sallied from sycamores; cavity-nesters were nesting or roosting, and others used sycamore for nesting but foraged elsewhere.

Location of Study: Arizona
Keywords: Breeding, Sycamore, Food

Bottorff, R. L. 1974. Cottonwood habitat for birds in Colorado. American Birds 28(6):975-979.

Although cottonwood habitat in Colorado, as in Arizona, is relatively scare (0.2% of land in Colorado), it is used heavily by many avian species for breeding, feeding, and shelter. Cottonwood also functions to stabilize banks and provides shade which helps cool habitat.

Location of Study: Colorado
Keywords: Cottonwood

Brown, B. T., and R. R. Johnson. 1985. Glen Canyon Dam, fluctuating water levels, and riparian breeding birds: the need for management compromise on the Colorado River in Grand Canyon. Pp. 76-80 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Large water releases from Glen Canyon Dam in May and June are detrimental to riparian breeding birds along the Colorado River in the Grand Canyon. Need to release water at other times instead of during breeding season. Found Bell's Vireo, Common Yellowthroat, and Yellow-breasted Chats place their nests low to the ground and close to water.

Location of Study: Arizona
Keywords: Breeding, Vireo, Yellowthroat, Habitat

Brown, B. T., and M. W. Trosset. 1989. Nesting-habitat relationships of riparian birds along the Colorado River in Grand Canyon, Arizona. Southwestern Naturalist 34(2):260-270.

Study of 20-year tamarisk scrubland along Colorado River in Grand Canyon National Park to describe nesting-habitat relationships of riparian birds. Tamarisk habitat developed after completion of Glen Canyon Dam; associated plants were coyote and Goodding willows, arrowweed, and seepwillow. Pre-dam vegetation had been honey mesquite and catclaw which still persisted as a relict habitat. This tamarisk habitat may represent an ecological equivalent of native vegetation for some birds. Eleven species were studied.

Location of Study: Arizona
Keywords: Breeding, Tamarisk, Willow

Brown, D. E. 1985. Arizona wetlands and waterfowl. University of Arizona Press, Tucson, AZ.

Presents a general history, where wetlands occur in Arizona, waterfowl biology, waterfowl management, and species accounts. Covers ducks, geese, and swans in the state. Contains beautiful plates by Bonnie Swarbrick Morehouse of selected species.

Location of Study: Arizona
Keywords: Ducks, Geese, Swans, Habitat, Distribution, Biology

Brown, D. E., C. H. Lowe, and J. F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona. Pp. 201-211 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. Proceedings of the symposium July 9, 1977, Tucson, AZ. USDA Forest Service, General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Descriptions of the various riparian communities which exist in Arizona and the Southwest and their biotic importance. Some key riparian species are also mentioned and recommendations given for management of the streamside and watershed.

Location of Study: Arizona
Keywords: Habitat, Vegetation, Descriptions

Bulmer, W. 1966. Breeding biology of the Red-faced Warbler in the Santa Catalina Mountains. Unpublished Master's thesis, University of Arizona, Tucson, AZ.

Study of the breeding biology of Red-faced Warblers in the Santa Catalina Mountains. It is also found in the Huachuca, Chiricahua, and Santa Rita Mountains and Mt. Graham. Appears to be restricted by high elevation pine forests with steep streamside slopes. Information is provided on foraging behavior, intraspecific behavior, vocalizations, and breeding biology.

Location of Study: Arizona
Keywords: Habitat, Breeding, Food, Vegetation

Chadde, S. 1989. Willows and wildlife of the Northern Range, Yellowstone National Park. Pp.168-169 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Although this paper is not about Arizona habitats and wildlife, it does show the importance of willows to various species of wildlife. It also shows the impact of overgrazing, in this case by elk rather than cattle, on willows and ultimately stream bank conditions.

Location of Study: Montana
Keywords: Willow, Habitat, Management, Functions

Clark, T. O. 1984. Avifaunal studies in the Gila River complex, eastern Arizona. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

The Gila River and its tributaries in eastern Arizona were surveyed for avian species for almost five years. Nesting species numbers resembled those found in similar habitats. Wintering and migrant species, except raptors, were lower than in other areas. More species were found in riparian areas versus nonriparian areas. Riparian habitats contained more permanent resident species. More vegetational diversity and height and water attracted more species of birds. As broadleafed deciduous trees were added into the habitat more species occurred.

Location of Study: Arizona
Keywords: Vegetation, Structure, Habitat, Distribution

Cohan, D. R., B. W. Anderson, and R. D. Ohmart. 1978. Avian population response to salt cedar along the lower Colorado River. Pp. 371-382 *in* R. R. Johnson and J. F. McCormick, technical coordinators, Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

Study of avian use of saltcedar along lower Colorado River found that granivores, ground-foraging birds, or species that fed more in agricultural areas were found in saltcedar. Insectivores and frugivores were absent from saltcedar.

Location of Study: Arizona
Keywords: Vegetation, Habitat, Structure, Saltcedar

Conine, K. H., B. W. Anderson, R. D. Ohmart, and J. F. Drake. 1978. Responses of riparian species to agricultural habitat conversions. Pp. 248-261 *in* R. R. Johnson and J. F. McCormick, technical coordinators, Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

Study of agricultural conversion of riparian areas along lower Colorado River. Found that many bird species did not use agricultural lands at all; insectivores suffered severe losses but some flycatchers, fringillids, doves, and cowbirds used agriculture quite highly. The agricultural-riparian edge was beneficial to certain species.

Location of Study: Arizona
Keywords: Habitat, Vegetation, Structure

Conners, P. G. 1986. Marsh and shorebirds. Pp. 351-369 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter begins with an introduction which breaks habitat of marsh and shorebirds into four general categories: tundra, rangeland, shorelines, and marshes. All of these categories may fit anyone shorebird as these birds use different habitat for different seasons. A further description is provided of each of these habitat types which include the habitat features, physical features, vegetation, population monitoring techniques, and discussion.

Location of Study: West
Keywords: Marshbirds, Shorebirds, Techniques, Habitat, Functions

Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart, editors. 1986. Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Large volume intended as an aid to field biologists and managers in planning, organizing, and administering wildlife inventory and monitoring procedures. Covers current general procedures and some specific techniques. Is organized so that any one chapter may be read alone. Are six major sections, covering (1) general procedures for planning and organizing programs; (2) guidelines for monitoring particular habitats; (3) guidelines for monitoring particular animal groups; (4) techniques for measuring habitat variables; (5) special monitoring studies such as food habit determinations, climatological studies, movement and habitat use; and (6) techniques and procedures for analysis, interpretation, and presentation of data and results. This is an excellent guide and contains a great deal of valuable information.

Location of Study: West
Keywords: Techniques, Guidelines, Habitat, Functions

Davis, G. P., Jr. 1982. Man and wildlife in Arizona: the American exploration period 1824-1865. Edited by N. B. Carmony and D. E. Brown, Arizona Game and Fish Department, Phoenix, AZ.

Fascinating and detailed historical accounts of wildlife in Arizona. Information is compiled from surveys and reports of military expeditions, boundary surveys, and explorations of railroad routes between 1824 and 1865.

Location of Study: Arizona
Keywords: History, Distribution, Habitat

Emlen, J. T., Jr. 1954. Territory, nest building, and pair formation in the Cliff Swallow. Auk 71(1):16-35.

Study of Cliff Swallows in Wyoming to document their nesting, pair formation, and territory. Three essential items for nesting habitats are (1) an open foraging area, (2) a vertical substrate with an overhang for nest attachment, and (3) a source of mud to build the nest. Shorelines are favored foraging areas.

Location of Study: Wyoming
Keywords: Swallow, Habitat, Structure, Breeding

Eng, R. L. 1986a. Waterfowl. Pp. 371-386 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

This chapter contains information on ducks, geese, and swans. A brief introduction is followed by habitat features correlated with waterfowl, characteristics of winter habitat, population measurement techniques, and ends with a discussion.

Location of Study: West
Keywords: Ducks, Geese, Swans, Techniques, Habitat, Functions

Eng, R. L. 1986b. Upland game birds. Pp. 407-428 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter deals not only with nonmigratory game birds (partridge, grouse, turkey, quail) but also migratory game birds (pigeons and doves). Included in this chapter are habitat features correlated with species groups (table provided), each species covered, population measurement techniques, and a final discussion.

Location of Study: West
Keywords: Gamebirds, Techniques, Habitat, Functions

Engel-Wilson, R. W., and R. D. Ohmart. 1978. Floral and attendant faunal changes on the lower Rio Grande between Fort Quitman and Presidio, Texas. Pp. 139-147 *in* R. R. Johnson and J. F. McCormick, technical coordinators, Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

Historical information showed that the portion of the Rio Grande studied was once covered by cottonwood, willow, and screwbean mesquite. They have now been almost completely eliminated and replaced by saltcedar. Avian census data show higher bird densities and diversities in cottonwood-willow than in saltcedar.

Location of Study: Texas
Keywords: Vegetation, Structure, Cottonwood, Willow, Saltcedar

Farrand, J., Jr., editor. 1983. The Audubon Society master guide to birding. 1. Loons to sandpipers. 2. Gulls to dippers. 3. Old World warblers to sparrows. Alfred A. Knopf, Inc., New York.

A field guide for the identification of birds of North America. This three-volume set is cumbersome to take into the field, but has very good photographs and points out specific things to look for in species identification. Also gives brief descriptions of habitat, the bird itself, its voice, similar species, and ranges.

Location of Study: Arizona, North America
Keywords: Habitat

Finch, D. M., and R. M. Marshall. 1993. Bird use of riparian habitats in north-central Arizona during fall migration — results and recommendations. Pp. 212 *in* B. Tellman, H. J. Cortner, M. G. Wallace, L. F. DeBano, and R. H. Hamre, technical coordinators, Riparian management: common threads and shared interests. A Western regional conference on river management strategies. USDA Forest Service General Technical Report RM-226, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Study was designed to address need for data on bird use of Western riparian habitats during fall migration. Four sites were selected south of Flagstaff on the Coconino and Prescott National Forests — Dry Beaver Creek, West Clear Creek (2 sites east and west), and Walnut Creek. Mistnetting was conducted on these sites between 15 September and 5 November 1992 for a total of 1129 net-hours during which 273 birds of 39 species were captured. Offers recommendations on how to better capture neotropical migrant species.

Location of Study: Arizona
Keywords: Neotropical, Resident, Migrant

Garrison, B. A., R. W. Schlorff, J. M. Humphrey, S. A. Laymon, and F. J. Michny. 1989. Population trends and management of the Bank Swallow (*Riparia riparia*) on the Sacramento River, California. Pp. 267-271 *in* D. L. Abell, technical coordinator, Protection, management, and restoration for the 1990's. Proceeds of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

For nesting, Bank Swallows require vertical banks in silty, loamy, and sandy soils. The study area was in California along the Sacramento River between Chico Landing and Colusa. Riparian forest was dominated by cottonwood, red willow, black willow, box elder, and valley oak. Bank Swallow habitat is influenced by high flows and erosion which creates freshly exposed vertical riverbanks.

Location of Study: California
Keywords: Breeding, Swallow, Habitat

Gavin, T. A., and L. K. Sowls. 1975. Avian fauna of a San Pedro Valley mesquite forest. Journal of the Arizona Academy of Science 10(1):33-41.

This is the recording of all bird species present in a mesquite bosque for at least one year. Part of a general survey of vegetation and vertebrate animals of a mesquite bosque located along the San Pedro River. Mesquite bosque had a closed canopy 35-40 ft high with 60-75 ft tall ash, willow, and cottonwood. Below this was a shrub thicket layer and the herbaceous layer was mainly annual grasses and forbs. Was also a small shallow pond with emergent and aquatic vegetation present. More birds were present in mesquite bosque than in adjacent desert habitat.

Location of Study: Arizona
Keywords: Mesquite, Habitat, Vegetation

Glinski, R. L., and R. D. Ohmart. 1983. Breeding ecology of the Mississippi Kite in Arizona. Condor 85:200-207.

Extension of the Mississippi Kites distribution range into Arizona has taken place. Study was conducted along tributaries of the Gila River. Nesting habitat was in cottonwood with a saltcedar understory. This created a very structurally diverse habitat. Cicadas were the principal prey item and half of the noninsect prey deliveries (56) were of Western pipestrelle bats.

Location of Study: Arizona
Keywords: Kite, Habitat, Breeding, Vegetation, Structure, Food

Groschupf, K. 1992. A closer look: Black-capped Gnatcatcher. Birding 24(3):161-164.

Black-capped Gnatcatcher is a northwestern Mexico species which enters Arizona. Found in riparian woodland of mesquite and hackberry. Nests in mesquite, hackberry, and sycamore.

Location of Study: Arizona, Mexico
Keywords: Gnatcatcher, Mesquite, Sycamore, Hackberry

Haywood, D. D., and R. D. Ohmart. 1986. Utilization of benthic-feeding fish by inland breeding Bald Eagles. Condor 88:35-42.

Study of Bald Eagles along Salt and Verde rivers and their prey. Found that main prey items in Arizona were channel catfish, carp, suckers, coots, and black-tailed jackrabbits. Stream characteristics were also noted. Deep pools bounded by riffles and/or sandbars were common at all nest sites. These pools were deeper on one side and graded to shallows on the opposite side. The deep pool provided habitat for prey fish and the riffles and shallows immediately up or downstream from the pools provided foraging habitat for the fish. These foraging areas brought the fish closer to the surface, thus making it easier for the eagles to see and catch.

Location of Study: Arizona
Keywords: Eagle, Food, Habitat, Stream, Functions

Hensley, M. M. 1954. Ecological relations of the breeding bird population of the desert biome in Arizona. Ecological Monographs 24(2):185-207.

Study of the bird populations in Organ Pipe National Monument, Pima County, Arizona. Paper includes information on topography and geology, water supplies, climate, vegetation, breeding bird populations of the research areas, species composition and breeding densities of the intermountain plains, comparisons of populations and nesting activities, and other ecological information.

Location of Study: Arizona
Keywords: Habitat, Breeding, Vegetation

Hunter, W. C. 1987. Changes in riparian vegetation and subsequent changes in avifauna in a cattle-excluded portion of Lower Bonita Creek, Graham County, Arizona. A report on baseline data for vegetation and breeding birds. U.S. Bureau of Land Management, Safford Resource District, Safford, AZ.

This report provides baseline data and an interpretation of the condition of the riparian plant and bird communities along lower Bonita Creek following two floods (1978-79 and 1983) and install a cattle exclosure (1984). Data were collected both inside and outside of the exclosure in 1985 and 1986. Comparison are made between this study and others and discussed in terms of riparian management.

Location of Study: Arizona
Keywords: Breeding, Cattle, Mesquite, Cottonwood, Willow, Sycamore, Hackberry, Ash

Hunter, W. C. 1988. Dynamics of bird species assemblages along a climatic gradient: a Grinnellian niche approach. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

Study of avian species found in riparian habitats along an elevational gradient. The gradient was at four sites along the Gila River in Arizona. The study assessed the possible effects of climate on groups of birds in the Southwest, independent of vegetation. Mainly insectivorous birds were studied. Assemblages of insectivores among habitats, within sites, may be explained by the combination of relative climate at each site and each species' natural-history characteristics. The Grinnellian niche approach may be useful for answering questions about limitations and constraints on breeding success, habitat selection, and life-history theory. The extent to which a characteristic stays constant throughout a species' geographic distribution must be taken into account when interpreting data from one or a few local sites.

Location of Study: Arizona
Keywords: Insectivores, Distribution, Climate, Vegetation, Structure

Hunter, W. C., B. W. Anderson, and R. D. Ohmart. 1987a. Avian community structure changes in a mature floodplain forest after extensive flooding. Journal of Wildlife Management 51(2):495-502.

High water releases along the lower Colorado River flooded cottonwood-willow community along the Bill Williams River, Arizona, in 1976-1983. Ground- and canopy-nesting avian insectivores and cavity-nesting species decreased. Passerine marsh insectivores and rail-like avian species increased.

Location of Study: Arizona
Keywords: Habitat, Structure, Functions, Shorebirds, Waterbirds, Insectivores

Hunter, W. C., R. D. Ohmart, and B. W. Anderson. 1987b. Status of breeding riparian-obligate birds in Southwestern riverine systems. Western Birds 18:10-18.

An evaluation of riparian-obligate breeding birds using data from the upper and lower Verde River; the Colorado River through the Grand Canyon to the Mexican border; the middle Rio Grande south to Presido, Texas; the middle Pecos River; the lower Virgin River; the upper (mixed broadleaf habitats only) middle, and lower Gila River; the upper and lower San Pedro River; the lower Salt River; and the upper and lower Santa Cruz River. Qualitative conclusions on the status of these birds in their range below 1524 m elevation were made. Species are reviewed with respect to historical and present status and riparian habitat use within and among the above river systems.

Location of Study: Southwest
Keywords: Obligate, Habitat, Structure, Functions, Saltcedar, Mesquite

Hunter, W. C., R. D. Ohmart, and B. W. Anderson. 1988. Use of exotic saltcedar (*Tamarix chinensis*) by birds in arid riparian systems. Condor 90:113-123.

Study comparing the use of saltcedar by birds along the Pecos River, lower Colorado River, and the Rio Grande. Saltcedar was used more by birds on the Pecos River and Rio Grande than the lower Colorado River. East to west elevational gradients may influence the use of exotic habitat by bird species. As elevation lowers from east to west the temperatures rise and possibly migratory and midsummer breeding birds cannot use habitats that do not provide enough structural diversity to ameliorate the higher temperatures.

Location of Study: Southwest
Keywords: Habitat, Saltcedar, Cottonwood, Willow, Mesquite, Structure, Elevation

Hutto, R. L. 1985. Seasonal changes in the habitat distribution of transient insectivorous birds in southeastern Arizona: competition mediated? Auk 102:120-132.

Study was conducted along an elevational gradient in the Chiricahua Mountains in southeastern Arizona, during spring and fall migratory seasons. The distribution of 26 migratory insectivorous bird species were recorded. There were seven study sites along an elevational gradient and they ranged from low and simple to tall and complex in vegetation structure. The birds were separated into five groups of species with similar patterns of habitat use. Season-to-season and year-to-year differences in species composition and densities on a given plot may be the result of nonrandom food assessment processes like migration.

Location of Study: Arizona
Keywords: Habitat, Vegetation, Migration, Insectivores

Johnson, R. R., and D. A. Jones, technical coordinators. 1977. Importance, preservation and management of riparian habitat: a symposium. Proceedings of symposium, 9 July 1977, Tucson, Arizona. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The proceedings of this symposium include papers on the importance of riparian habitats, their values, and management of riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., and J. F. McCormick, technical coordinators. 1978. Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

The proceedings of this symposium include papers on characteristics, values, and management of floodplain wetlands and other riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators. 1985. Riparian ecosystems and their management: reconciling conflicting uses. Proceedings of the First North American Riparian Conference, April 16-18, 1985, Tucson, AZ. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 523 pp.

These proceedings include papers on: physical characteristics, hydrology, and ecology of riparian ecosystems; riparian resources of recreation, agriculture, wildlife, livestock use, birds, fisheries, amphibians, and reptiles; multiple-use planning and management; legal and institutional needs; and riparian ecosystems in arid zones of the world.

Location of Study: General
Keywords: Proceedings, Functions, Management, Habitat

Keller, C., L. Anderson, and P. Tappel. 1979. Fish habitat changes in Summit Creek, Idaho, after fencing the riparian area. Pp. 46-52 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Summit Creek had a high water table, constant streamflow, deep soil, low stream gradient, and moderate temperatures which helped in its rapid recovery after two years of cattle removal. Fish habitat was protected by fencing. The use of fencing negated the need for artificial structures in the stream, in fact, some of these structures should be removed because of silt and sediment trapping. Terrestrial wildlife have also used the area more, i.e., mink, Marsh Hawks, Sandhill Cranes, American Bitterns, and Great Blue Herons.

Location of Study: Idaho
Keywords: Trout, Habitat, Cattle, Management, Vegetation, Functions

Knopf, F. L. 1985. Significance of riparian vegetation to breeding birds across an altitudinal cline. Pp. 105-112 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Six elevational sites in the Platte River drainage, Colorado, were studied to determine if there were any differences in numbers of birds and species in riparian versus upland habitats along an elevational gradient. Concluded that (1) more birds occurred in riparian vegetation; (2) locally, riparian areas were more diverse at low elevations and are in general more stable with less turnover between years; (3) regionally, upland bird communities strongly influence riparian communities; (4) faunal interchange across an elevational gradient is greater among riparian sites than upland sites; and (5) bird communities are more unique at extreme ends of the elevational continuum, i.e., floodplains at low elevations and spruce-fir uplands at high elevations.

Location of Study: Colorado
Keywords: Habitat, Elevation

Knopf, F. L., and J. A. Sedgwick. 1992. An experimental study of nest-site selection by Yellow Warblers. Condor 94:734-742.

Three-year study of Yellow Warblers in north-central Colorado on the Arapaho National Wildlife Refuge. First year nests were located, marked, measured, and after birds left bushes were cut to ground level so next year birds would have to select new sites. Second year, again located nests in bushes and measured variables. Third year, located nests and measured variables. Conclude that Yellow Warblers

select nests sites primarily on patterns of bush distribution within a vegetation patch and not on factors associated with the nest bush itself.

Location of Study: Colorado
Keywords: Breeding, Warbler, Willow

Kochert, M. N. 1986. Raptors. Pp. 313-349 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

This chapter provides the necessary information to design a raptor inventory and monitoring project, habitat features correlated with species groups, population measurement techniques, systems for correlating habitat variables with population measurements, and a final discussion. An excellent table including selected raptors shows vegetation; physical features; nesting (characteristics and substrate), foraging, and wintering habitat; and references.

Location of Study: West
Keywords: Raptors, Techniques, Habitat, Functions

Laurenzi, A. W., B. W. Anderson, and R. D. Ohmart. 1982. Wintering biology of Ruby-crowned Kinglets in the lower Colorado River Valley. Condor 84:385-398.

Ruby-crowned Kinglets were studied for four years along the lower Colorado River. They were most often in cottonwood-willow and least often in arrowweed. Generally occurred in areas of tall, dense vegetation. Foraged generally in the upper third of trees and shrubs in honey mesquite and in the middle third of trees and shrubs in cottonwood-willow. Diet was almost exclusively on arthropods obtained by gleaning, hovering, and hawking. Paper also contains other ecological information.

Location of Study: Arizona
Keywords: Kinglet, Habitat, Cottonwood, Willow, Mesquite, Saltcedar, Vegetation, Structure

Laymon, S. A., and M. D. Halterman. 1989. A proposed habitat management plan for Yellow-billed Cuckoos in California. Pp. 272-277 *in* D. L. Abell, technical coordinator, Protection, management, and restoration for the 1990's. Proceeds of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

Study in Kern and Inyo counties, California, and in Arizona along the Bill Williams River. Cottonwood-willow habitat is used by Yellow-billed Cuckoo for nesting. Optimum habitat size is >80 ha being >600 m wide in cottonwood-willow. Cuckoos may occupy mesquite if cottonwood-willow are saturated.

Location of Study: California, Arizona
Keywords: Cuckoo, Cottonwood, Willow

Li, P. 1989. Nest site selection and nesting success of cavity-nesting birds on the Mogollon Rim, Arizona. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

Cavity-nesting birds were studied in drainages along the Mogollon Rim in Arizona. They were studied for nest-site selection and the relationships between nest sites and nesting success. Characteristics of the habitat were also compared. Cavity-nesting species preferred to nest in aspens, especially aspen snags, even though aspen only constituted about 12% of all trees in the plots. Birds nested more in aspen and foraged in nearby conifers. Maples were not used as much as aspen.

Location of Study: Arizona
Keywords: Cavities, Nesting, Vegetation, Habitat, Structure, Foraging

Ligon, J. D. 1967. The biology of the Elf Owl, *Micrathene whitneyi*. Dissertation, Department of Zoology, University of Michigan, Printed by University Microfilms, Inc., Ann Arbor, MI.

Elf owls were studied in southern Arizona. These owls are totally dependent upon woodpeckers for nest sites which vary greatly in height above ground. Insects are the major food eaten by Elf Owls but other arthropods including poisonous scorpions are also taken. The owl's territory is small and centered around the nest tree (sycamore, walnut, and pine in Cave Creek Canyon). A variety of habitats are used from pine-oak woodland up to 7,000 feet to the low desert. The abundance of insects, arthropods and nest sites are prominent in selected habitats.

Location of Study: Arizona
Keywords: Owl, Habitat, Vegetation, Biology, Breeding, Distribution

Lowe, C. H., editor. 1964. The vertebrates of Arizona. University of Arizona Press, Tucson, AZ. 270 pp.

Contains information about Arizona's habitats and how they are described and defined. Checklists of fishes, amphibians and reptiles, birds, and mammals of Arizona with brief descriptions of each species habitat and where its found in Arizona.

Location of Study: Arizona
Keywords: Habitat

Marshall, J., and R.. P. Balda. 1974. The breeding ecology of the Painted Redstart. Condor 76(1):89-101.

The Painted Redstart was studied in Oak Creek Canyon, Coconino County, Arizona which is at the northern edge of its breeding range. The breeding, nesting, foraging, vocal, and territory activities were

observed. Foraged by glenaing, hawking, and hovering. Nests were located on ground, on steep banks, or in rock walls, generally with protective overhangs sheltering the nest. Nesting habitat has high plant diversity, topographic relief, substrate type, and climatic conditions.

Location of Study: Arizona
Keywords: Habitat, Breeding, Vegetation, Structure

Maser, C., J. M. Geist, D. M. Concannon, R. Anderson, and B. Lovell. 1979. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: geomorphic and edaphic habitats. USDA Forest Service, General Technical Report PNW-99, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Geomorphic and edaphic habitats in rangelands provide specialized habitats for some species of wildlife. These habitats and how they function as specialized habitat features are discussed. The relationships of Great Basin wildlife to these features are discussed. Even though this article is about Great Basin some of the information is comparable to Arizona; i.e., cliffs provide nest sites for birds, roosts for bats, etc. Very detailed appendix relating each species to its specialized habitat.

Location of Study: Oregon
Keywords: Habitat, Functions, Values, Geomorphology

Maser, C., J. W. Thomas, and R. G. Anderson. 1984. Wildlife habitats in managed rangelands — the Great Basin of southeastern Oregon. The relationships of terrestrial vertebrates to plant communities and structural conditions. USDA Forest Service, General Technical Report PNW-172: Part 1 of 2 and 2 of 2. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Habitats and their structural conditions provide different conditions that are important to different species of wildlife. Niches are created that are usually the result of the interaction between the plant community, its structure, and other environmental factors such as soil type, moisture, microclimate, slope aspect, elevation, and temperature.

Location of Study: Oregon
Keywords: Habitat, Vegetation, Structure

Meents, J. K., B. W. Anderson, and R. D. Ohmart. 1981. Vegetation characteristics associated with Abert's Towhee numbers in riparian habitats. Auk 98:818-827.

Study of Abert's Towhee along the lower Colorado River. Towhee numbers were positively correlated with horizontal patchiness, foliage density, and foliage height diversity. Also studied population cycles of the towhee and its seasonal relationships with riparian vegetation.

Location of Study: Arizona
Keywords: Towhee, Habitat, Structure, Functions, Cottonwood, Willow, Saltcedar, Mesquite

Meents, J. K., B. W. Anderson, and R. D. Ohmart. 1982. Vegetation relationships and food of Sage Sparrows wintering in honey mesquite habitat. Wilson Bulletin 94(2):129-138.

Sage Sparrows winter along the lower Colorado River in most riparian habitats, but is most often found in mesquite-dominated vegetation. These birds also tended to concentrate in areas where inkweed was present within the mesquite habitats. Inkweed is actively selected by wintering Sage Sparrows along the lower Colorado River.

Location of Study: Arizona
Keywords: Sparrow, Inkweed, Vegetation, Habitat

Meents, J. K., B. W. Anderson, and R. D. Ohmart. 1984. Sensitivity of riparian birds to habitat loss. Pp. 619-625 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Along the lower Colorado River much of the native riparian vegetation has been altered by loss of cottonwood, willow, and mesquite and replaced by saltcedar and arrowweed. Avian species were studied and their association with riparian vegetation. Most were found in cottonwood, willow or mesquite; saltcedar supported no birds with narrow habitat breadths.

Location of Study: Arizona
Keywords: Vegetation, Structure, Cottonwood, Willow, Mesquite, Saltcedar, Habitat, Functions

Meents, J. K., J. Rice, B. W. Anderson, and R. D. Ohmart. 1983. Nonlinear relationships between birds and vegetation. Ecology 64(5):1022-1027.

Statistical tests were conducted on bird and vegetation data from the lower Colorado River Valley to determine if there were nonlinear relationships. Linear relationships were definitely dominant, but often a curvilinear relationship also existed. Sometimes when there was no linear relationship there was a curvilinear one. Considering only linear relationships may not present the entire picture. Examples are given, e.g., statistically, Lucy's Warbler were associated with high densities of honey mesquite and high numbers of saltcedar at either end of a continuum. Along the lower Colorado, these birds do indeed nest in areas of dense saltcedar and mesquite.

Location of Study: Arizona
Keywords: Habitat, Model, Vegetation, Structure

Merriam, C. H., and L. Stejneger. 1890. Results of a biological survey of the San Francisco Mountain region and the desert of the Little Colorado, Arizona. USDA Division of Ornithology and Mammalogy, Government Printing Office, Washington, D.C.

Results of a biological survey in Arizona with species accounts and maps. Documentation of the Life Zones on the San Francisco Mountains.

Location of Study: Arizona
Keywords: Distribution, Habitat, Vegetation

Mills, G. S., J. B. Dunning, Jr., and J. M. Bates. 1991. The relationship between breeding bird density and vegetation volume. Wilson Bulletin 103(3):468-479.

Four separate studies, conducted in Southwestern habitats both in Arizona and New Mexico, showed that an index of total vegetation volume was strongly correlated with breeding bird densities. Winter bird density was not as strongly correlated but authors believe that breeding birds respond strongly to the resources associated with the vegetation. This response may explain high avian breeding densities in riparian habitats and patterns of the edge effect.

Location of Study: Arizona, New Mexico
Keywords: Breeding, Vegetation

Monson, G., and A. R. Phillips. 1981. Annotated checklist of the birds of Arizona. Second edition, revised and expanded. University of Arizona Press, Tucson, AZ.

This is an updated list of the birds of Arizona from a 1964 list by these authors. Gives sightings, records of specimens, and often habitat types on each species.

Location of Study: Arizona
Keywords: Habitat

Neff, J. A. 1940. Notes on nesting and other habits of the Western White-winged Dove in Arizona. Journal of Wildlife Management 4(3):279-290.

Doves were found most abundantly in valleys of the Colorado and Gila rivers, and the Salt, Verde, Hassayampa, Santa Cruz, and San Pedro rivers. Dense river-bottom thickets of mesquite (preferred), tamarisk or other vegetation favored for nesting. In mountain canyons oaks were preferred. Nests usually built high in trees from 5 to 40 feet.

Location of Study: Arizona
Keywords: Breeding, Dove, History

Ohmart, R. D., and B. W. Anderson. 1978. Wetland functions and values: the state of our understanding. Pp. 278-295 *in* P. E. Greeson, J. R. Clark, and J. E. Clark, editors, Proceedings of the National Symposium on Wetlands, American Water Resources Association, Minneapolis, MN.

Historical information about changes of rivers and wetlands. Information on how wetlands function in the Southwest for wildlife. Detailed information on values of lower Colorado River and Salton Sea to birds.

Location of Study: Arizona, California, New Mexico, Texas
Keywords: Functions, Values, Marsh, Vegetation

Ohmart, R. D., and B. W. Anderson. 1982. North American desert riparian ecosystems. Pp. 433-479 *in* G. L. Bender, editor, Reference handbook on the deserts of North America, Greenwood Press, Westport CT.

This book chapter discusses desert riparian systems. Included are physical characteristics (geomorphology), characteristic vegetation, general description of each North American desert and characteristic fauna (fishes, amphibians, reptiles, birds, mammals) within each desert. The authors emphasize information bird use of desert riparian areas and avian relationships with vegetation structure and function. Give descriptions of how some plant and animal species have co-evolved. Also a section concerning the importance and modification of riparian habitat by man. An appendix is included listing riparian birds, amphibians, and reptiles.

Location of Study: West
Keywords: Management, Vegetation, Functions, Values, Characteristics

Ohmart, R. D,. and B. W. Anderson. 1986. Riparian habitat. Pp. 169-199 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter provides an overview of riparian habitat, classification systems, important functions and values to wildlife, data collection priorities, and effects of land management activities on riparian systems.

Location of Study: West
Keywords: Functions, Habitat, Management, Classification, Vegetation, Structure

Ohmart, R. D., B. W. Anderson, and W. C. Hunter. 1988. The ecology of the lower Colorado River from Davis Dam to the Mexico-United States international boundary: a community profile. US Fish and Wildlife Service Biological Report 85(7.19).

This is a report that covers the lower Colorado River system from Davis Dam south to Mexico. It is a compilation of information describing the ecology of the river and its adjacent riparian ecosystem. It contains historical information about the river and its past management. How wildlife and riparian vegetation interact is addressed, as well as how vegetation is affected by flooding.

Location of Study: Arizona, California, Nevada, Mexico
Keywords: Ecology, Habitat, Functions, Vegetation, History

Ohmart, R. D., and R. E. Tomlinson. 1977. Foods of Western Clapper Rails. Wilson Bulletin 89(2):332-336.

Population of lower Colorado River Clapper Rails were sampled to determine a racial distinction. Food habits were also investigated because they were not known. Major food items were invertebrates with little vegetative material. The dominant prey item was crayfish. Insects, fish, clams, spiders, leeches, and prawns were also taken. The establishment of more marsh and crayfish may have accounted for range expansion of the Clapper Rail.

Location of Study: Arizona
Keywords: Rail, Food, Distribution

Perkins, D. L., and D. E. Brown. 1981. The Sandhill Crane in Arizona. Arizona Game and Fish Department, Special Publication No. 11, Accelerated Research Program 14-16-009-79-003, Phoenix, AZ. Published under provisions of Federal Aid Project W-53-R-32, Work Plan 1, Job 4.

Wintering Sandhill Cranes were censused along the lower Colorado River, lower Gila River, and Sulphur Springs Valley, Arizona. Roost sites, loafing habitats, and cropland feeding areas were identified and described. Shallow water was required by the cranes for open, secluded roosts; preferred food item was waste corn.

Location of Study: Arizona
Keywords: Crane, Distribution, Food, Habitat

Phillips, A. R., J. Marshall, and G. Monson. 1964. The birds of Arizona. University of Arizona Press, Tucson, AZ. 212 pp.

Book on the birds found in Arizona, their distributions, habitats, and specific site locations. Ecological information is also presented.

Location of Study: Arizona
Keywords: Habitat, Distribution

Piest, L. A., and L. K. Sowls. 1985. Breeding duck use of a sewage marsh in Arizona. Journal of Wildlife Management 49(3):580-585.

In 1979, an agreement between state, federal and local government officials allowed for the creation of Pintail Lake from municipal sewage to provide waterfowl habitat. Pintail Lake was studied in 1980-82 and over that time duck nests increased each year. Dense vegetation on islands attracted ducks for placement of nests and cover. Water used was secondarily treated effluent and analysis for contaminants showed no hazards to wildlife. Nutrient-rich water supported an abundance of aquatic invertebrates which the nesting hens and ducklings need to satisfy their protein requirements.

Location of Study: Arizona
Keywords: Ducks, Habitat, Effluent, Function, Reproduction

Rea, A. M. 1983. Once a river: bird life and habitat changes on the middle Gila. University of Arizona Press, Tucson, AZ.

Book about the middle Gila and its historic and present bird life. Also refers to reasons for decline in habitat by human interactions. Provides historical information about area, birds, and Indian culture.

Location of Study: Arizona
Keywords: Historical, Distribution, Habitat

Repking, C. F., and R. D. Ohmart. 1977. Distribution and density of Black Rail populations along the lower Colorado River. Condor 79:486-489.

Survey of Black Rail populations from 1973-1984 along lower Colorado from Davis Dam to Mexican border. Most birds were found around Imperial Dam. The most preferred habitat appeared to be immediately below the dam. Water level appeared to be a critical factor in habitat selection. Black Rails need lower water levels as they are small, and they also have a strong preference for habitats with only moist surfaces or very shallow water. Closely associated with three-square bulrush stands, shallow water, gently sloping shorelines, and minimum water fluctuations.

Location of Study: Arizona
Keywords: Rail, Habitat, Vegetation, Distribution

Rice, J., B. W. Anderson, and R. D. Ohmart. 1984. Comparison of the importance of different habitat attributes to avian community organization. Journal of Wildlife Management 48(3):895-911.

Investigation of the importance of individual tree species in avian habitat selection. This was accomplished by comparing tree species contributions to contributions of horizontal and vertical patchiness and density of the vegetation. Discovered that riparian birds frequently chose a particular species of tree rather than avoiding another. Tree species composition is important to riparian birds. Paper emphasizes need to collect comprehensive data sets.

Location of Study: Arizona
Keywords: Habitat, Structure, Functions

Rice, J., R. D. Ohmart, and B. W. Anderson. 1983. Habitat selection attributes of an avian community: a discriminant analysis investigation. Ecological Monographs 53(3):263-290.

Use of discriminant analysis to determine what habitat attributes birds in the lower Colorado River Valley selected for in all seasons. Birds tended to select for an attribute more often than avoiding it. Important attributes were foliage height diversity (FHD). FHD was also important in conjunction with proportions of mesquite, cottonwood, and willow. Study emphasizes need for large-scale, long-term ecological studies.

Location of Study: Arizona
Keywords: Habitat, Vegetation, Model, Structure

Rosenberg, K. V., R. D. Ohmart, and B. W. Anderson. 1982. Community organization of riparian breeding birds: response to an annual resource peak. Auk 99:260-274.

Study of insectivorous birds in a cottonwood-willow riparian habitat along the Bill Williams River. Spatial distribution, foraging behavior, and diets were measured in response to a summer resource peak. There were eight species that preyed heavily on cicadas and they timed fledging of their young to occur when cicadas were most abundant. Cicada numbers exceeded the metabolic needs of the birds by tenfold. Propose that because of this superabundance of the cicadas the eight bird species are able to coexist and utilize the same resource.

Location of Study: Arizona
Keywords: Insectivores, Habitat, Cottonwood, Willow, Food, Structure, Breeding

Rosenberg, K. V., R. D. Ohmart, W. C. Hunter, and B. W. Anderson. 1991. Birds of the lower Colorado River Valley. University of Arizona Press, Tucson, AZ.

Summarizes status, distribution, and ecology of birds in the lower Colorado River Valley. Provides historical and ecological information about the lower Colorado River Valley and contains birding maps, bar graphs of seasonal status and habitats of each species plus detailed species accounts. Species accounts are for more than 400 birds and include patterns of distribution, habitat affinities, breeding biology, and food habits.

Location of Study: Arizona
Keywords: Breeding, Distribution, Food, Habitat

Ryder, R. A. Songbirds. Pp. 291-312 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp. Songbirds in this chapter include not only perching birds, but also cuckoos, nighthawks, swifts, hummingbirds, trogons, kingfishers, and woodpeckers. Habitat features correlated with species groups and various population measurement techniques are also discussed.

West

Location of Study: Birds
Keywords:

Sanders, S. D., and M. A. Flett. 1989. Montane riparian habitats and Willow Flycatchers: threats to a sensitive environment and species. Pp. 262-266 *in* D. L. Abell, technical coordinator, Protection, management, and restoration for the 1990's. Proceeds of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

Study in California along Little Truckee River, Sierra County, at 2010 m elevation. Wet meadow dominated by grasses, rushes, and sedges, riparian zone with willow shrubs, and lodgepole pine forest surrounding meadow. Large meadow size, water, and willows are critical components of habitat for Willow Flycatchers. The birds nest in willows and use willows for foraging (leaf and twig gleaning) singing perches, and for cover. Willows at least 2 m tall with 50-70% foliage density were used most. Nests were approximately 1 m from the ground with about 1 m of foliage above the nest. Other willow-nesting species found were Yellow and Wilson's Warbler, White-crowned Sparrow, Song Sparrow, and Red-winged Blackbird. Ground-nesting birds found in the mountain meadow were Canada Goose, Mallard, Cinnamon Teal, Virginia Rail, Sora, Killdeer, Spotted Sandpiper, Common Snipe, Wilson's Phalarope, Savannah Sparrow, and Lincoln's Sparrow.

Location of Study: California
Keywords: Willow, Montane

Schulz, T. D. 1983. Opportunistic foraging of Western Kingbirds on aggregations of tiger beetles. Auk 100:496-497.

Short communication on observations of foraging Western Kingbirds. The kingbirds used two dramatically different foraging modes which depended upon the prey distribution. First were observed sallying from perches to capture beetles, but when beetles clumped together on pond edge the kingbirds changed to hovering. This hovering flushed beetles out and made them easier to capture.

Location of Study: Arizona
Keywords: Kingbirds, Beetles, Foraging

Schulz, T. T., and W. C. Lenininger. 1991. Nongame wildlife communities in grazed and ungrazed montane riparian sites. Great Basin Naturalist 51(3):286-292.

Study was conducted on Sheep Creek, northwest of Fort Collins, Colorado, at 2500 m elevation. Wilson's Warbler and Lincoln Sparrows were commonly found in ungrazed areas with abundant willows. Wilson's Warblers breed in willow habitats along mountain streams. Exclosures had more Western jumping mice, but the quality and type of vegetation was more important than proximity to water. Only one year of sampling. Deer mouse was found more in grazed areas. Exclosures had nearly twice as much litter buildup and willow canopy was 8.5 times greater than grazed areas. American Robin was found more in grazed areas.

Location of Study: Colorado
Keywords: Breeding, Cattle, Willow, Warbler, Sparrow

Sedgwick, J. A., and F. L. Knopf. 1990. Habitat relationships and nest site characteristics of cavity-nesting birds in cottonwood floodplains. Journal of Wildlife Management 54(1):112-124.

Study in Colorado along South Platte River to examine habitat relationships and nest site characterization for six cavity nesting birds (American Kestrel, Northern Flicker, Red-headed Woodpecker, Black-capped Chickadee, House Wren, and European Starling). Most important habitat variables were large tree density, length of dead limbs, and cavity density. Dead limb length, diameter at breast height, and species were the most important tree variables. Cavity variables that were most important were cavity height, entrance diameter and whether or not the cavity was in living or dead substrate. A lack of cottonwood regeneration may lead to a decline in cavity-nesting species along the South Platte.

Location of Study: Colorado
Keywords: Habitat, Cottonwood, Function, Cavity, Snags

Sedgwick, J. A., and F. L. Knopf. 1992. Describing Willow Flycatcher habitats: scale perspectives and gender differences. Condor 94:720-733.

Study of Willow Flycatchers in north--central Colorado on the Arapaho National Wildlife Refuge. Woody vegetation was dominated by various species of willows. Measured habitat use at three scales — microplot, mesoplot, and macroplot measuring use of song perches, nest sites, and unused sites. Regardless of scale, Willow Flycatchers were consistently associated with the abundance, density and coverage of willows. Also studied gender-based selection of song perches versus nest site selection. Studies should include territories of both sexes because they do choose differently.

Location of Study: Colorado
Keywords: Breeding, Flycatcher, Willow

Smith, D. E., technical coordinator. 1975. Proceedings of the symposium on management of forest and range habitats for nongame birds. USDA Forest Service General Technical Report WO-1, Washington, D.C.

Purpose of the symposium was to initiate communication between resource managers and avian ecologists. Includes papers on birds and their habitat, management of deciduous forest habitats, management of range habitats, management of coniferous habitats, and management of nongame birds in policy and decision making.

Location of Study: General
Keywords: Proceedings, Management, Habitat, Values

Speich, S. M. 1986. Colonial waterbirds. Pp. 387-405 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Introduction defines colonial waterbirds as any bird that predominately feeds in aquatic systems (marine or freshwater) and tends to nest in groups; i.e., Great Blue Heron, Double-crested Cormorant, grebes, egrets. Chapter contains an excellent table providing habitat, nest type and substrate, and nest location by family and species of bird. Biology of colonial waterbirds, population measurement criteria, measurement techniques, disturbance, and discussion and conclusions complete the chapter.

Location of Study: West
Keywords: Waterbirds, Techniques, Habitat, Functions

Stamp, N. E. 1976. Breeding birds of riparian habitat in south-central Arizona. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

Mesquite and cottonwood riparian communities were studied along the lower Verde River in Arizona. The highest number of species, highest bird species diversity, and a high density were found on the cottonwood plot. Mesquite also showed high values compared to other mesquite habitats. Fluctuations in bird species diversity from year to year on study areas lead to the suggestion that breeding birds be censused for consecutive years with seasonal measurements of foliage height diversity, foliage volume, fruit crops, and other resources.

Location of Study: Arizona
Keywords: Breeding, Cottonwood, Mesquite

Stamp, N. E. 1978. Breeding birds of riparian woodland in south-central Arizona. Condor 80:64-71.

Study of mesquite and cottonwood sites along lower Verde River and the relationship between vegetation structure of these habitats and their use by birds. Study showed that cottonwood had a high number of species, high density, and high bird species diversity, probably due to high tree-understory

density and high foliage volume. Mesquite also had high values, possibly due to tree height and presence of permanent water nearby. Stressed the importance of studying breeding birds for several consecutive years because of seasonal fluctuations

Location of Study: Arizona
Keywords: Breeding, Cottonwood, Mesquite

Stauffer, D. F., and L. B. Best. 1980. Habitat selection by birds of riparian communities: evaluating effects of habitat alterations. Journal of Wildlife Management 44(1):1-15.

Iowa riparian communities were studied in late spring and early summer for avian communities. A habitat gradient from hayfields to closed-canopy woodlands made up the 28 study plots. Soft snags were preferred by cavity-nesting species. Floodplain woodlands supported the highest densities of breeding birds.

Location of Study: Iowa
Keywords: Habitat, Vegetation, Function, Structure

Stevens, L. E., B. T. Brown, J. M. Simpson, and R. R. Johnson. 1977. The importance of riparian habitat to migrating birds. Pp. 156-164 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Riparian habitat provides an important source of food and cover for migrating bird species and by eliminating these habitats the migrant bird populations are also threatened. Stopover habitat selection by migrants occurs commonly in the Southwest. Important factors contributing to use of habitat include specific habitat preferences by the bird species, floral components (diversity and species composition), location of habitat and its accessibility, and the quality of adjacent habitat.

Location of Study: Arizona
Keywords: Migrants, Habitat, Passerines, Vegetation

Stolzenburg, W. 1993. A river floods through it. Nature Conservancy May/June:23-27.

Article written about the importance of flooding to natural systems in Southwest. Is about the Hassayampa River and occurrence of 10-year flood in 1991. Is a nice illustration depicting the stages of a stream's life. Not a scientifically written, peer-reviewed article, but interesting.

Location of Study: Arizona
Keywords: Cottonwood, Willow, Flood, Functions, Vegetation

Strong, T. R., and C. E. Bock. 1990. Bird species distribution patterns in riparian habitats in southeastern Arizona. Condor 92:866-885.

Study in Huachuca Mountains of southeastern Arizona. Twenty-five riparian habitats were defined based on dominant riparian tree species, the size of the stand, and the type of adjacent upland vegetation. The dominant tree species influenced bird species richness and total density during the breeding season. Cottonwood had the greatest species richness and both cottonwood and sycamore had high densities. Upland vegetation was more important to wintering species and their richness and abundance. Grassland had the highest richness and density. Stand size did not prove to be a good predictor in either season. Birds that shared similar density distributions in summer were associated with specific riparian habitats. In winter species were not specifically related to certain riparian habitats, but rather were either wooded or open upland vegetation. This paper has an appendix showing how 87 different species of birds related to specific habitats using multivariate statistics.

Location of Study: Arizona
Keywords: Cottonwood, Sycamore, Ash, Mesquite, Desert Willow, Walnut

Sullivan, M. E., and M. E. Richardson. 1993. Functions and values of the Verde River riparian ecosystem and an assessment of adverse impacts to these resources. Report to US Environmental Protection Agency, Region IX, San Francisco, CA. US Fish and Wildlife Service, Arizona Ecological Services Office, Phoenix, AZ.

An evaluation of the functions and values of the Verde River based on the Wetland Evaluation (WET) technique, Vols. I and II. Volume II was not used because it did not allow flexibility to adjust the system to arid Southwestern characteristics. The Verde is a major perennial stream in the state and provides fish and wildlife habitat and recreational opportunities. Direct threats to the river include sand and gravel operations, agricultural irrigation diversions, grazing activities, increased urbanization, and recreational activities. The purpose of ADID (Advanced Identification) is to facilitate protection of a specific aquatic ecosystem. Covered 125 miles of Verde from Sullivan Lake to Horseshoe Dam. Divided river into seven reaches and also included tributaries.

Location of Study: Arizona
Keywords: Verde, Functions, Habitat, Soils, Structure, Vegetation

Swanson, G. A., technical coordinator. 1979. The mitigation symposium: a national workshop on mitigating losses of fish and wildlife habitats. Proceedings of the symposium, 16-20 July 1979, Fort Collins, CO. USDA Forest Service, General Technical Report RM-65, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Nine private organizations and eight federal agencies cosponsored the symposium, which consisted of 133 papers. Topics included: coastal zone wetlands; inland wetlands; economic considerations; mining, oil and gas; planning, evaluation, and inventory; surveys; power projects; terrestrial management; aquatic management; legal and political considerations; transportation systems; and state perspectives.

Location of Study: General
Keywords: Proceedings, Mitigation, Wildlife, Habitat

Szaro, R. C., and M. D. Jakle. 1985. Avian use of a desert riparian island and its adjacent scrub habitat. Condor 87:511-519.

Study conducted on Queen Creek, Tonto National Forest, central Arizona. Found 10 species exclusively in riparian habitat and 13 exclusively in desert scrub. Riparian bird species contributed substantially to both total bird density and species richness in adjacent desert habitat. Desert birds made almost no use of riparian stand and no impact on riparian bird community. Summer residents were most important density component in all habitats.

Location of Study: Arizona
Keywords: Desert

Szaro, R. C., and J. N. Rinne. 1988. Ecosystem approach to management of Southwestern riparian communities. Transactions of the 53rd North American Wildlife and Natural Resources Conference 1988:502-511.

Five-year study of riparian areas of upper, intermediate, and low elevations in the Southwest. Rio de las Vacas, New Mexico was upper elevation; Mogollon Rim, Arizona, was intermediate elevation; and Queen Creek, Arizona, was low elevation. Study was conducted to show need of long-term ecosystem approach. Data were collected on fish, amphibians, reptiles, birds, and small mammals in grazed and ungrazed areas. Management decisions should not be based on only a year or two of data.

Location of Study: Arizona, New Mexico
Keywords: Management, Habitat, Cattle

Terrill, S. B., and R. D. Ohmart. 1984. Facultative extension of fall migration by Yellow-rumped Warblers (*Dendroica coronata*). Auk 101:427-438.

Study of migratory birds from riparian sites that were isolated and surrounded by Sonoran Desert. Many nocturnally migrating birds show some degree of winter site fidelity. This study concluded that birds will winter as far north as physiologically feasible, but if conditions become unfavorable they still orient correctly if necessary to move on.

Location of Study: Arizona
Keywords: Migration, Insectivores, Habitat

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979a. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: riparian zones. USDA Forest Service, General Technical Report PNW-80, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Riparian areas are the most critical wildlife habitats in managed rangelands. More wildlife depends entirely on or spends disproportionately more time in riparian habitat than in others. Riparian areas are also important for grazing, recreation, timber, fisheries, roads, and water quality and quantity. The importance to wildlife is examined and recommendations provided for management.

Location of Study: Oregon
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979b. Riparian zones in managed rangelands—their importance to wildlife. Pp. 21-30 *in* O. B. Cope, ed., Proceedings of the forum — grazing and riparian/stream ecosystems, 3-4 November 1978. Trout Unlimited, Inc.

Discusses the importance of riparian habitats to wildlife. Some reasons include: the actual presence of water for drinking; availability of water to plants which in turn provide food and cover to many species, riparian habitats with deciduous vegetation may provide different habitats dependent upon season of the year; provide nesting habitat; thermal cover and microclimate; migration routes for wildlife; and serve as connectors between habitats. Paper also covers riparian habitat sensitivity to disturbance and management considerations.

Location of Study: West
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

U.S. Fish and Wildlife Service. 1991. Endangered and threatened species of Arizona. With 1992 Addendum. Summer 1991. Ecological Services Field Office, U.S. Fish and Wildlife Service, Phoenix, AZ.

This is a listing of federally listed plants and animals of Arizona compiled by the Phoenix Office. Each listing provides a sketch of the plant or animal, an Arizona distribution map, its status, species description, habitat, range, reasons for decline/vulnerability, land management/ownership and notes.

Location of Study: Arizona
Keywords: Endangered, Threatened

Warner, R. E., and K. M Hendrix, editors. 1984. California riparian systems: ecology, conservation, and management. University of California Press, Berkeley and Los Angeles, CA.

Proceedings of a conference held in Davis, CA to bring together a wide range of riparian interests. Conference goals were to define major riparian concepts, problems and opportunities; promote discussion and information exchange among riparian interests; and to establish a technical and

communicative base for long-term, riparian planning. Papers were not only from California but 10 other states and Washington, D.C. Broad topics included biogeography and dynamics of change in riparian systems; structure, status and trends in the condition of riparian systems; hydrologic and hydraulic considerations in structure, function, and protection of riparian systems; aquatic/riparian interactions; riparian/upland interactions with special reference to wildlife and agriculture; economic and social values; riparian systems and the law; classification, inventory, and monitoring of riparian systems; national and regional trends; riparian restoration; riparian systems and water diversion projects; problems and opportunities of riparian vegetation on levee systems; ecology of birds in riparian systems; coastal zone riparian systems; unique and ecological problems of California desert riparian systems; sustained yield production in riparian systems; cultural, ecological, recreational, and aesthetic values; integrated approaches; local riparian initiatives; Rivers and Harbors Act, Section 404, and riparian system conservation; ecology on nonavian wildlife in riparian systems; and developing management strategies.

Location of Study: General
Keywords: Proceedings, Habitat, Functions, Values, Wildlife

Wauer, R. H. 1977. Significance of Rio Grande riparian systems upon the avifauna. Pp. 165-174 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

An important migration and emigration route exists in west Texas along the Rio Grande. There are 38 species known to nest in riparian habitat there. A total of 94 species are known to breed in riparian systems in the Southwest. Habitat for 40% of these species is found along the Rio Grande. Discusses nine different species as indicators of change.

Location of Study: Texas
Keywords: Habitat, Migration, Vegetation, Distribution

Berna, H. J. 1990. Observations on the dwarf shew (*Sorex nanus*) in northern Arizona. Great Basin Naturalist 50(2):1611-165.

Range extension of dwarf shrews at Fracas Lake, Arizona, Kaibab Plateau. Shrews were captured in a previously unreported habitat type (Rocky Mountain montane conifer forest) and were all within 8 m of water. Ponderosa pine was the dominant tree with very little understory. All 23 shrews caught were in pitfall traps that were being used to study tiger salamanders.

Location of Study: Arizona
Keywords: Shrew, Habitat, Salamander

Brode, J. M., and R. B. Bury. 1984. The importance of riparian systems to amphibians and reptiles. Pp. 30-36 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

In California, 83% of the amphibians and 40% of the reptiles are found in riparian habitats in varying degrees. Riparian systems provide travel and dispersal corridors and provide an environment that allows certain species to use otherwise unsuitable habitat.

Location of Study: California
Keywords: Habitat, Functions, Salamander, Frog, Turtle, Snake, Lizard

Brown, D. E., and N. B. Carmony. 1991. Gila monster: facts and folklore of America's Aztec lizard. High-Lonesome Books, Silver City, NM.

An easily read and understood book about the Gila monster. Contains information about its natural history including description, habitat, food, reproduction, predators, and population status. The second part of the book deals with the myths and legends surrounding the Gila monster. Excellent reference section provided.

Location of Study: Southwest
Keywords: Habitat, Breeding, Distribution

Brown, D. E., C. H. Lowe, and J. F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona. Pp. 201-211 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. Proceedings of the symposium July 9, 1977, Tucson, AZ. USDA Forest Service, General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Descriptions of the various riparian communities which exist in Arizona and the Southwest and their biotic importance. Some key riparian species are also mentioned and recommendations given for management of the streamside and watershed.

Location of Study: Arizona
Keywords: Habitat, Vegetation, Descriptions

Clarkson, R. W., and J. C. deVos, Jr. 1986. The bullfrog, *Rana catesbeiana* Shaw, in the lower Colorado River, Arizona-California. Journal of Herpetology 20(1):42-49.

Study of bullfrog was to collect baseline information on its ecology to be able to predict biological effects on it of changes in discharge and hydrology of the lower Colorado River. Found most often on transects with 50% or more of the bank covered by reeds and/or less than 50% open bank.

Location of Study: Arizona, California
Keywords: Bullfrog, Habitat, Ecology, Crayfish

Clarkson, R. W., and J. C. Rorabaugh. 1989. Status of leopard frogs (*Rana pipiens* complex: Raniidae) in Arizona and southeastern California. Southwestern Naturalist 34(4):531-538.

Literature survey and status survey to locate leopard frogs in Arizona and Imperial Valley, California.

Location of Study: Arizona, California
Keywords: Frogs, Distribution

Cole, C. J. 1968. *Sceloporus virgatus*. Catalogue of American Amphibians and Reptiles Report 72.1-72.2.

An account of the striped plateau lizard. The lizard's description, references as to its description, distribution, pertinent literature, and nomenclatural history are provided.

Location of Study: General
Keywords: Distribution

Collins, J. P. 1981. Distribution, habitats, and life history variation in the tiger salamander, *Ambystoma tigrinum*, in east-central and southeast Arizona. Copeia 1981(3):666-675.

Two taxa of tiger salamander occur in Arizona, *A. t. nebulosum* and *A. t. mavortium*. *A. t. nebulosum* is native and is commonly associated with natural and artificial aquatic habitats in montane conifer forests, interior chaparral, and subalpine grasslands at elevations >1500 m in both lotic and lentic habitats. The

other taxa is probably introduced and was collected in artificial lentic habitats in Sonoran desertscrub and semi-desert grassland at elevations <1600 m.

Location of Study: Arizona
Keywords: Salamander, Habitat, Distribution

Collins, J. P., C. Young, J. Howell, and W. L. Minckley. 1981. Impact of flooding in a Sonoran Desert stream, including elimination of an endangered fish population (*Poeciliopsis o. occidentalis*, Poeciliidae). Southwestern Naturalist 26(4):415-423.

Results of a winter flood in 1977-1978 on Tule Creek, Arizona, eliminated a reintroduced population of Sonoran topminnow that had persisted for 10 years and a population of leopard frogs. It introduced canyon treefrogs and saltcedar to the system. Flooding is a natural process but in a system that has been altered by water diversion and dams the extent of damage can be extensive.

Location of Study: Arizona
Keywords: Flood, Vegetation, Structure, Endangered, Habitat

Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart, editors. 1986. Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Large volume intended as an aid to field biologists and managers in planning, organizing, and administering wildlife inventory and monitoring procedures. Covers current general procedures and some specific techniques. Is organized so that any one chapter may be read alone. Are six major sections, covering (1) general procedures for planning and organizing programs; (2) guidelines for monitoring particular habitats; (3) guidelines for monitoring particular animal groups; (4) techniques for measuring habitat variables; (5) special monitoring studies such as food habit determinations, climatological studies, movement and habitat use; and (6) techniques and procedures for analysis, interpretation, and presentation of data and results. This is an excellent guide and contains a great deal of valuable information.

Location of Study: Westl
Keywords: Techniques, Guidelines, Habitat, Functions

Davis, G. P., Jr. 1982. Man and wildlife in Arizona: the American exploration period 1824-1865. Edited by N. B. Carmony and D. E. Brown, Arizona Game and Fish Department, Phoenix, AZ.

Historical accounts of wildlife in Arizona. Information is compiled from surveys and reports of military expeditions, boundary surveys, and explorations of railroad routes between 1824 and 1865.

Location of Study: Arizona
Keywords: History, Distribution, Habitat

Dickson, J. G. 1989. Streamside zones and wildlife in southern U.S. forests. Pp. 131-133 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Strips of mature trees were left along intermittent streams after of stands were cut and replanted as pine. Study was conducted to determine wildlife use of strips. Almost no squirrels were found in strips <50 m wide; amphibians and reptiles were common in medium and wide strips characterized by a canopied overstory, shaded understory, and litter, but low in dense brushy narrow zones with logging slash; small mammals were found most often in the dense brushy narrow zones. This paper is not well related to Arizona, but does show the necessity of riparian habitats for wildlife.

Location of Study: Texas
Keywords:

Fouquette, M. J., Jr. 1970. *Bufo alvarius*. Catalogue of American Amphibians and Reptiles Report 93.1-93.4

An account of the Colorado River toad. The toad's description, references as to its description, distribution, fossil record, pertinent literature, and nomenclatural history are provided.

Location of Study: General
Keywords: Distribution

Gehlbach, F. R. 1967. *Ambystoma tigrinum*. Catalogue of American Amphibians and Reptiles Report 52.1-52.4.

An account of the tiger salamander including seven subspecies. The salamander's description, references as to its description, distribution, fossil record, and pertinent literature are provided. Each subspecies is defined and remarked upon.

Location of Study: General
Keywords: Distribution

Hulse, A. C. 1974. An autecological study of *Kinosternon sonoriense* LeConte (Chelonia: Kinosternidae). Unpublished dissertation, Arizona State University, Tempe, AZ.

Three-and-one-half year study of Sonoran mud turtle (*Kinosternon sonoriense*) in central and southern Arizona. Preferred habitat in Arizona is slow-moving stream with numerous quiet pools and weed-filled ponds with abundant aquatic invertebrates. Does not occur in fast-moving streams or main stream

currents of large rivers. Is carnivorous but tends toward omnivory when benthic aquatic invertebrates are scarce. Reproductive strategies, growth rates, diet, and density were also compared between the two populations studied.

Location of Study: Arizona
Keywords: Turtle

Iverson, J. B. 1989. The Arizona mud turtle, *Kinosternon flavescens arizonense* (Kinosternidae), in Arizona and Sonora. Southwestern Naturalist 34(3):356-368.

Study of Arizona mud turtles in Arizona and Sonora, Mexico. Discusses habitat, location, distribution.

Location of Study: Arizona, Mexico
Keywords: Turtles, Habitat, Distribution

Jakle, M. D., and T. A. Gatz. 1985. Herpetofaunal use of four habitats of the middle Gila River drainage, Arizona. Pp. 355-358 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Desert wash habitats showed the highest density and equaled upland habitats in abundance of herpetofauna. Mesquite bosque had well-developed herbaceous and shrub layers and saltcedar did not because of its dense canopy. It is possible that this dense canopy disallowed light penetration to provide basking sites for lizards.

Location of Study: Arizona
Keywords: Lizards, Habitat, Vegetation, Mesquite, Saltcedar

Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators. 1985. Riparian ecosystems and their management: reconciling conflicting uses. Proceedings of the First North American Riparian Conference, April 16-18, 1985, Tucson, AZ. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 523 pp.

These proceedings include papers on: physical characteristics, hydrology, and ecology of riparian ecosystems; riparian resources of recreation, agriculture, wildlife, livestock use, birds, fisheries, amphibians, and reptiles; multiple-use planning and management; legal and institutional needs; and riparian ecosystems in arid zones of the world.

Location of Study: General
Keywords: Proceedings, Functions, Management, Habitat

Jones, K. B. 1986. Amphibians and reptiles. Pp. 267-290 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter provides an introduction of how amphibians and reptiles are generally overlooked but are an integral part of riparian systems, important habitat features with table showing each, population measurement techniques, and a general discussion.

Location of Study: West
Keywords: Techniques, Habitat, Functions

Jones, K. B. 1988a. Distribution and habitat associations of herpetofauna in Arizona: comparisons by habitat type. Pp. 109-128 *in* Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium July 19-21, 1988, Flagstaff, AZ. USDA Forest Service, General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Extensive surveys of 16 different habitat types of Arizona's herpetofauna on Bureau of Land Management land. Paper discusses results of these surveys. Certain habitats were known to have greater diversity, i.e., riparian, and these habitats were given priority in sampling.

Location of Study: Arizona
Keywords: Habitat, Distribution, Vegetation, Structure

Jones, K. B. 1988b. Comparison of herpetofaunas of a natural and altered riparian ecosystem. Pp. 222-227 *in* Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium July 19-21, 1988, Flagstaff, AZ. USDA Forest Service, General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Abundance and diversity of reptiles were greater on an altered riparian ecosystem than on an altered site. There were species on the unaltered site that are usually upland species and the altered site had only species from the adjacent Sonoran Desert. Certain microhabitat distribution and abundance may account for the differences between habitats.

Location of Study: Arizona
Keywords: Habitat, Cottonwood, Willow, Structure, Functions

Jones, K. B. 1990. Habitat use and predatory behavior of *Thamnophis cyrtopsis* (Serpentes: Colubridae) in a seasonally variable aquatic environment. Southwestern Naturalist 35(2):115-122.

Study of the black-headed garter snake along two desert streams in western Arizona to determine predatory behavior and habitat use. In the desert Southwest, black-headed garter snakes are aquatic habitat specialists.

Location of Study: Arizona
Keywords: Snake, Habitat, Distribution

Jones, K. B., and P. C. Glinski. 1985. Microhabitats of lizards in a Southwestern riparian community. Pp. 342-346 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Study of microhabitats along the Hassayampa. The greater earless lizard and Arizona skink were the only species limited to riparian habitat. Five other species were found on adjacent upland habitat but also used the riparian habitat. Also found were five snakes, one turtle, and three amphibians. The skink was there probably due to the moderating effects of the deciduous trees, perennial water, and large debris heaps and leaf litter. Packrats and desert shrew also used the debris heaps for cover. Tree lizards and desert spiny lizards were common throughout the area and abundant in tree and surface log macrohabitats. Earless and side-blotched lizards were trapped in areas of cobble and gravel; zebra-tailed lizards in areas of sand substrate and little canopy; and Western whiptails in low shrubs, leaf litter, and open canopy.

Location of Study: Arizona
Keywords: Lizard, Skink, Habitat, Vegetation, Canopy

Kephart, D. G., and S. J. Arnold. 1982. Garter snake diets in a fluctuating environment: a seven-year study. Ecology 63(5):1232-1236.

Studied the diet of the terrestrial garter snake (*Thamnophis elegans*) over seven years at Eagle Lake, California. Showed the snake varied its diet by what prey was available, their diet fluctuated from year to year as did the abundance of their prey.

Location of Study: California
Keywords: Snake, Food

Lowe, C. H. 1955. The salamanders of Arizona. Transactions of the Kansas Academy of Science 58(2):237-251.

Taxonomic work of tiger salamander in Arizona. Provides some habitat information.

Location of Study: Arizona
Keywords: Salamander, Distribution, Habitat

Lowe, C. H., editor. 1964. The vertebrates of Arizona. University of Arizona Press, Tucson, AZ. 270 pp.

Contains information about Arizona's habitats and how they are described and defined. Checklists of fishes, amphibians and reptiles, birds, and mammals of Arizona with brief descriptions of each species habitat and where its found in Arizona.

Location of Study: Arizona
Keywords: Habitat

Lowe, C. H. 1985. Amphibians and reptiles in Southwest riparian ecosystems. Pp. 339-341 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

In southern Arizona and adjacent Sonora, Mexico, there are two native turtles and four native snakes that are riparian obligates (Yellow mud turtle, Sonoran mud turtle, Mexican garter snake, checkered garter snake, narrow-headed garter snake). All amphibians need water for breeding but not all are riparian obligates.

Location of Study: Arizona, Mexico
Keywords: Turtle, Snake, Distribution

M'Closkey, R. T., R. J. Deslippe, C. P. Szpak, and K. A. Baia. 1990. Tree lizard distribution and mating system: the influence of habitat and food resources. Canadian Journal of Zoology 68:2083-2089.

Study of tree lizards in Saguaro National Monument. Lizards used dry washes with mesquite more often than flatland habitat with dead mesquite and saguaro. Differences in lizard numbers may be related to structural differences between habitats.

Location of Study: Arizona
Keywords: Lizard, Habitat, Vegetation, Structure, Breeding

Maser, C., J. M. Geist, D. M. Concannon, R. Anderson, and B. Lovell. 1979. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: geomorphic and edaphic habitats. USDA Forest Service, General Technical Report PNW-99, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Geomorphic and edaphic habitats in rangelands provide specialized habitats for some species of wildlife. These habitats and how they function as specialized habitat features are discussed. The

relationships of Great Basin wildlife to these features are discussed. Even though this article is about Great Basin some of the information is comparable to Arizona; i.e., cliffs provide nest sites for birds, roosts for bats, etc. Very detailed appendix relating each species to its specialized habitat.

Location of Study: Oregon
Keywords: Habitat, Functions, Values, Geomorphology

Maser, C., J. W. Thomas, and R. G. Anderson. 1984. Wildlife habitats in managed rangelands — the Great Basin of southeastern Oregon. The relationships of terrestrial vertebrates to plant communities and structural conditions. USDA Forest Service, General Technical Report PNW-172: Part 1 of 2 and 2 of 2. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Habitats and their structural conditions provide different conditions that are important to different species of wildlife. Niches are created that are usually the result of the interaction between the plant community, its structure, and other environmental factors such as soil type, moisture, microclimate, slope aspect, elevation, and temperature.

Location of Study: Oregon
Keywords: Habitat, Vegetation, Structure

Merriam, C. H., and L. Stejneger. 1890. Results of a biological survey of the San Francisco Mountain region and the desert of the Little Colorado, Arizona. USDA Division of Ornithology and Mammalogy, Government Printing Office, Washington, D.C.

Results of a biological survey in Arizona with species accounts and maps. Documentation of the Life Zones on the San Francisco Mountains.

Location of Study: Arizona
Keywords: Distribution, Habitat, Vegetation

Ohmart, R. D., B. W. Anderson, and W. C. Hunter. 1988. The ecology of the lower Colorado River from Davis Dam to the Mexico-United States international boundary: a community profile. US Fish and Wildlife Service Biological Report 85(7.19).

This is a report that covers the lower Colorado River system from Davis Dam south to Mexico. It is a compilation of information describing the ecology of the river and its adjacent riparian ecosystem. It contains historical information about the river and its past management. How wildlife and riparian vegetation interact is addressed, as well as how vegetation is affected by flooding.

Location of Study: Arizona, California, Nevada, Mexico
Keywords: Ecology, Habitat, Functions, Vegetation, History

Ohmart, R. D., and B. W. Anderson. 1978. Wetland functions and values: the state of our understanding. Pp. 278-295 *in* P. E. Greeson, J. R. Clark, and J. E. Clark, editors, Proceedings of the National Symposium on Wetlands, American Water Resources Association, Minneapolis, MN.

Historical information about changes of rivers and wetlands. Information on how wetlands function in the Southwest for wildlife. Detailed information on values of lower Colorado River and Salton Sea to birds.

Location of Study: Arizona, California, New Mexico, Texas
Keywords: Functions, Values, Marsh, Vegetation

Ohmart, R. D., and B. W. Anderson. 1982. North American desert riparian ecosystems. Pp. 433-479 *in* G. L. Bender, editor, Reference handbook on the deserts of North America, Greenwood Press, Westport CT.

This book chapter discusses desert riparian systems. Included are physical characteristics (geomorphology), characteristic vegetation, general description of each North American desert and characteristic fauna (fishes, amphibians, reptiles, birds, mammals) within each desert. The authors emphasize information bird use of desert riparian areas and avian relationships with vegetation structure and function. Give descriptions of how some plant and animal species have co-evolved. Also a section concerning the importance and modification of riparian habitat by man. An appendix is included listing riparian birds, amphibians, and reptiles.

Location of Study: West
Keywords: Management, Vegetation, Functions, Values, Characteristics

Ohmart, R. D,. and B. W. Anderson. 1986. Riparian habitat. Pp. 169-199 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter provides an overview of riparian habitat, classification systems, important functions and values to wildlife, data collection priorities, and effects of land management activities on riparian systems.

Location of Study: West
Keywords: Functions, Habitat, Management, Classification, Vegetation, Structure

Porzer, L. M. 1981. Movement, behavior, and body temperature of the Gila monster (*Heloderma suspectum*) in Queen Creek, Pinal County, Arizona. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

Gila monsters were studied near Queen Creek, Arizona. The habitat was well-drained, fine sandy loam soils characterized by creosote bush flats with palo verde, mesquite, and desert willow along washes. Gila monsters were found above ground for a relatively short period, mostly during April-June. They exhibited a relatively narrow range of preferred body temperature.

Location of Study: Arizona
Keywords: Habitat, Behavior, Temperature

Schwalbe, C. R., and P. C. Rosen. 1988. Preliminary report on effect of bullfrogs on wetland herpetofaunas in southeastern Arizona. Pp. 166-173 *in* Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium July 19-21, 1988, Flagstaff, AZ. USDA Forest Service, General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The distribution of bullfrogs was negatively correlated with the distribution of leopard frogs and garter snakes in southeastern Arizona. These species are becoming prey for the bullfrog and being extirpated because of it.

Location of Study: Arizona
Keywords: Bullfrog, Snake, Habitat, Native

Stebbins, R. C. 1966. A field guide to Western reptiles and amphibians. Houghton Mifflin Company, Boston, MA.

As the title states this is a field guide for reptiles and amphibians throughout Western North America (US and Canada). The area covered includes Alberta, Alaska, Arizona, British Columbia, California, Colorado, District of Mackenzie, Idaho, Montana, Nevada, New Mexico, Oregon, Saskatchewan, Washington, Wyoming, Utah, and Yukon. Includes capture and care techniques, field identification procedures, and species accounts. Each account includes identification characteristics, range, and sometimes taxonomic information and similar species.

Location of Study: North America
Keywords: Habitat

Sullivan, M. E., and M. E. Richardson. 1993. Functions and values of the Verde River riparian ecosystem and an assessment of adverse impacts to these resources. Report to US Environmental Protection Agency, Region IX, San Francisco, CA. US Fish and Wildlife Service, Arizona Ecological Services Office, Phoenix, AZ.

An evaluation of the functions and values of the Verde River based on the Wetland Evaluation (WET) technique, Vols. I and II. Volume II was not used because it did not allow flexibility to adjust the system to arid Southwestern characteristics. The Verde is a major perennial stream in the state and provides fish and wildlife habitat and recreational opportunities. Direct threats to the river include sand and

gravel operations, agricultural irrigation diversions, grazing activities, increased urbanization, and recreational activities. The purpose of ADID (Advanced Identification) is to facilitate protection of a specific aquatic ecosystem. Covered 125 miles of Verde from Sullivan Lake to Horseshoe Dam. Divided river into seven reaches and also included tributaries.

Location of Study: Arizona
Keywords: Verde, Functions, Habitat, Soils, Structure, Vegetation

Swanson, G. A., technical coordinator. 1979. The mitigation symposium: a national workshop on mitigating losses of fish and wildlife habitats. Proceedings of the symposium, 16-20 July 1979, Fort Collins, CO. USDA Forest Service, General Technical Report RM-65, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Nine private organizations and eight federal agencies cosponsored the symposium, which consisted of 133 papers. Topics included: coastal zone wetlands; inland wetlands; economic considerations; mining, oil and gas; planning, evaluation, and inventory; surveys; power projects; terrestrial management; aquatic management; legal and political considerations; transportation systems; and state perspectives.

Location of Study: General
Keywords: Proceedings, Mitigation, Wildlife, Habitat

Szaro, R. C., S. C. Belfit, J. K. Aitkin, and J. N. Rinne. 1985. Impact of grazing on a riparian garter snake. Pp. 359-363 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Study was conducted in New Mexico on wandering garter snake. This snake was rarely observed >25 m from the stream's edge. High canopy and accumulated organics provide microhabitat for faunal prey items and expanded foraging, substrate, and cover for the snake.

Location of Study: New Mexico
Keywords: Snake, Vegetation, Function, Cattle

Szaro, R. C., and S. C. Belfit. 1986. Herpetofaunal use of a desert riparian island and its adjacent scrub habitat. Journal of Wildlife Management 50(4):752-761.

Riparian habitat island created by restriction of water flow in Queen Creek in 1959. Herpetofauna of the riparian interior, edge, desert wash, and upland habitats were sampled. There was little use by herpetofauna from the surrounding desert habitat. Even riparian species were absent, possibly due to isolation rather than structural and physical conditions of the riparian area.

Location of Study: Arizona
Keywords: Habitat, Lizard, Toad, Snake

Szaro, R. C., and J. N. Rinne. 1988. Ecosystem approach to management of Southwestern riparian communities. Transactions of the 53rd North American Wildlife and Natural Resources Conference 1988:502-511.

Five-year study of riparian areas of upper, intermediate, and low elevations in the Southwest. Rio de las Vacas, New Mexico was upper elevation; Mogollon Rim, Arizona, was intermediate elevation; and Queen Creek, Arizona, was low elevation. Study was conducted to show need of long-term ecosystem approach. Data were collected on fish, amphibians, reptiles, birds, and small mammals in grazed and ungrazed areas. Management decisions should not be based on only a year or two of data.

Location of Study: Arizona, New Mexico
Keywords: Management, Habitat, Cattle

Szaro, R. C., K. E. Severson, and D. R. Patton, technical coordinators. 1988. Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium, 19-21 July 1988, Flagstaff, Arizona. USDA Forest Service General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Symposium held to bring scientists and manager together for the exchange of knowledge and ideas on habitat requirements, management needs, and other information on amphibians, reptiles, and small mammals. Topics include habitat models, habitat requirements, sampling designs and problems, community dynamics, and management recommendations.

Location of Study: General
Keywords: Proceedings, Habitats, Distributions, Models, Management

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979a. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: riparian zones. USDA Forest Service, General Technical Report PNW-80, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Riparian areas are the most critical wildlife habitats in managed rangelands. More wildlife depends entirely on or spends disproportionately more time in riparian habitat than in others. Riparian areas are also important for grazing, recreation, timber, fisheries, roads, and water quality and quantity. The importance to wildlife is examined and recommendations provided for management.

Location of Study: Oregon
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979b. Riparian zones in managed rangelands—their importance to wildlife. Pp. 21-30 *in* O. B. Cope, ed., Proceedings of the forum — grazing and riparian/stream ecosystems, 3-4 November 1978. Trout Unlimited, Inc.

Discusses the importance of riparian habitats to wildlife. Some reasons include: the actual presence of water for drinking; availability of water to plants which in turn provide food and cover to many species, riparian habitats with deciduous vegetation may provide different habitats dependent upon season of the year; provide nesting habitat; thermal cover and microclimate; migration routes for wildlife; and serve as connectors between habitats. Paper also covers riparian habitat sensitivity to disturbance and management considerations.

Location of Study: West
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

Tinkle, D. W., and A. E. Dunham. 1983. Demography of the tree lizard, *Urosaurus ornatus*, in central Arizona. Copeia 1983(3):585-598.

Life history and demography study of tree lizard in central Arizona, along Sycamore Creek near Sunflower. Competition from other lizards may be an important factor in forming life history traits.

Location of Study: Arizona
Keywords: Lizard, Habitat, Distribution

Trueb, L. 1969. *Pternohyla, P. dentata, P. fodiens*. Catalogue of American Amphibians and Reptiles Report 77.1-77.4.

An account of the burrowing treefrog. The upland and lowland burrowing treefrogs' description, references as to its description, distribution, fossil record, pertinent literature, and nomenclatural history are provided.

Location of Study: General
Keywords: Distribution

U.S. Fish and Wildlife Service. 1991. Endangered and threatened species of Arizona. With 1992 Addendum. Summer 1991. Ecological Services Field Office, U.S. Fish and Wildlife Service, Phoenix, AZ.

This is a listing of federally listed plants and animals of Arizona compiled by the Phoenix Office. Each listing provides a sketch of the plant or animal, an Arizona distribution map, its status, species description, habitat, range, reasons for decline/vulnerability, land management/ownership and notes.

Location of Study: Arizona
Keywords: Endangered, Threatened

van Loben Sels, R. C. 1976. Reproductive biology of the iguanid lizard, *Urosaurus ornatus*, in a riparian habitat. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

Study of reproductive biology of tree lizards found along the Verde River. Also provides some general ecological information about the species including distribution, morphology, identification, and thermal relations. Males undergo a distinct annual cycle in testes weight and it is regular from year to year. Females deposit eggs generally from mid-June to late September. An inverse correlation exists between fat body weight, liver weight, and reproductive activity. Weights increased as activity ceased.

Location of Study: Arizona
Keywords: Lizards, Habitat, Reproduction

Vitt, L. J., and R. D. Ohmart. 1975. Ecology, reproduction, and reproductive effort of the iguanid lizard *Urosaurus graciosus* on the lower Colorado River. Herpetologica 31(1):56-65.

Along lower Colorado River, the long-tailed brush lizard was strictly arboreal. It was found in mesquite, smoke tree, and ironwood; a few adults were in cottonwood and some juveniles in creosote bush and other small shrubs. The lizard foraged for insects in the outer canopy of vegetation.

Location of Study: Arizona
Keywords: Lizard, Habitat, Food, Reproduction, Vegetation, Structure

Vitt, L. J., and R. D. Ohmart. 1978. Herpetofauna of the lower Colorado River: Davis Dam to the Mexican border. Western Foundation of Vertebrate Zoology 2(2):35-72.

Species accounts with distribution information and ancedotal habitat information on herpetofauna of the lower Colorado River valley.

Location of Study: Arizona, California
Keywords: Distribution, Habitat

Vitt, L. J., R. C. van Loben Sels, and R. D. Ohmart. 1981. Ecological relationships among arboreal desert lizards. Ecology 62(2):398-410.

Three arboreal desert lizards occur in close association with riparian habitats in central Arizona. Study was to determine patterns of resource utilization. Long-tailed brush lizard used small trees and foraged in the canopy, tree lizard used large trees and foraged on trunks and large limbs, and desert spiny lizard used all sized trees, foraged on trunks and large limbs as well as on the ground.

Location of Study: Arizona
Keywords: Habitat, Lizard, Vegetation, Structure

Warner, R. E., and K. M Hendrix, editors. 1984. California riparian systems: ecology, conservation, and management. University of California Press, Berkeley and Los Angeles, CA.

Proceedings of a conference held in Davis, CA to bring together a wide range of riparian interests. Conference goals were to define major riparian concepts, problems and opportunities; promote discussion and information exchange among riparian interests; and to establish a technical and communicative base for long-term, riparian planning. Papers were not only from California but 10 other states and Washington, D.C. Broad topics included biogeography and dynamics of change in riparian systems; structure, status and trends in the condition of riparian systems; hydrologic and hydraulic considerations in structure, function, and protection of riparian systems; aquatic/riparian interactions; riparian/upland interactions with special reference to wildlife and agriculture; economic and social values; riparian systems and the law; classification, inventory, and monitoring of riparian systems; national and regional trends; riparian restoration; riparian systems and water diversion projects; problems and opportunities of riparian vegetation on levee systems; ecology of birds in riparian systems; coastal zone riparian systems; unique and ecological problems of California desert riparian systems; sustained yield production in riparian systems; cultural, ecological, recreational, and aesthetic values; integrated approaches; local riparian initiatives; Rivers and Harbors Act, Section 404, and riparian system conservation; ecology on nonavian wildlife in riparian systems; and developing management strategies.

Location of Study: General
Keywords: Proceedings, Habitat, Functions, Values, Wildlife

Warren, P. L., and C. L. Schwalbe. 1985. Herpetofauna in riparian habitats along the Colorado River in Grand Canyon. Pp. 347-355 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Substrate preferences for lizards caught were as follows. Side-blotched lizard was common, found on open sites with rocks <1 m diameter on bare soil but never >1 m from cover of rocks and shrubs. Western whiptail found on bare soil or in litter. Desert spiny lizards were usually in boulders >1 m in diameter, usually with cracks and fractures. They utilized a strong vertical component, i.e., large boulders or trees. Tree lizards were associated with a strong vertical component with a preference for sheer, vertical rock faces on cliffs or large boulders. Shoreline densities were higher than in riverine riparian vegetation; possibly due to higher food availability on plants and debris at water's edge.

Location of Study: Arizona
Keywords: Habitat, Substrate

Wasserman, A. O. 1970. *Scaphiopus couchii.* Catalogue of American Amphibians and Reptiles Report 85.1-85.4.

An account of the Couch's spadefoot toad. The toad's description, references as to its description, distribution, fossil record, pertinent literature, and nomenclatural history are provided.

Location of Study: General
Keywords: Distribution

Webb, R. G. 1970. *Gerrhonotus kingii.* Catalogue of American Amphibians and Reptiles Report 97.1-97.3.

An account of the Sonoran alligator lizard. The lizard's subspecies, description, references as to its description, distribution, pertinent literature, and nomenclatural history are provided.

Location of Study: General
Keywords: Distribution

Williams, J. E., D. B. Bowman, J. E. Brooks, A. A. Echelle, R. J. Edwards, D. A. Hendrickson, and J. J. Landye. 1985. Endangered aquatic ecosystems in North American deserts with a list of vanishing fishes of the region. Journal of the Arizona-Nevada Academy of Science 20(1):1-61.

Endangered habitats throughout the Southwest and Mexico are identified along with the fishes, amphibians, reptiles, and invertebrates that are also disappearing. Fifteen different ecosystems are discussed.

Location of Study: Southwest, Mexico
Keywords: Habitat, Threatened, Endangered

Zweifel, R. G. 1968. *Rana tarahumarae.* Catalogue of American Amphibians and Reptiles Report 66.1-66.2.

An account of the Tarahumara frog. The frog's description, references as to its description, distribution, fossil record, and pertinent literature are provided.

Location of Study: General
Keywords: Distribution

Abell, D. L., technical coordinator. 1989. Protection, management, and restoration for the 1990's. Proceedings of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 544 pp.

The papers in this proceedings are aimed at resource managers, environmental consultants, researchers, landowners, environmental activists, and a variety of user groups. Some of the papers explain how streams interact with the plants and animals at their margins and with the land that they occupy to accomplish a range of important functions. These functions include bank stabilization, reducing the impacts of flooding, providing wildlife habitat, protecting instream habitat for fishes, producing livestock forage, and enhancing human lives. Biological diversity in Western lands is often directly related to riparian systems, which also serve as major routes for migratory birds. Special attention is given to the several threatened and endangered species that require riparian habitat, and to the response of riparian systems to disturbance, i.e., fire, logging, landslides, and diversion for power or water supply. A section deals with measures being taken to preserve and restore riparian lands, particularly along large rivers and in the cities. Special attention is given in some of these papers to revegetation techniques.

Location of Study: West
Keywords: Proceedings, Functions, Management, Habitat

Anderson, B. W., and R. D. Ohmart, 1984a. Vegetation management study for the enhancement of wildlife along the lower Colorado River. Final report to US Bureau of Reclamation, Lower Colorado Region, Boulder City, NV.

A final report relating to data collected and analyzed along the lower Colorado River over a 10 year period. Includes information about field techniques and data analysis, bird species found there, avian use of riparian vegetation, avian community organization in cottonwood-willow, waterbird use of natural and modified portions of the river, biology of Gambel's Quail, small mammal life history and population data, relationships of rodents to riparian vegetation, coyote food habits, and final conclusions.

Location of Study: Arizona, California
Keywords: Techniques, Habitat, Vegetation, Structure, Coyote, Quail

Berna, H. J. 1990. Observations on the dwarf shew (*Sorex nanus*) in northern Arizona. Great Basin Naturalist 50(2):1611-165.

Range extension of dwarf shrews at Fracas Lake, Arizona, Kaibab Plateau. Shrews were captured in a previously unreported habitat type (Rocky Mountain montane conifer forest) and were all within 8 m of water. Ponderosa pine was the dominant tree with very little understory. All 23 shrews caught were in pitfall traps that were being used to study tiger salamanders.

Location of Study: Arizona
Keywords: Shrew, Habitat, Salamander

Boyd, R. J., A. Y. Cooperrider, P. C. Lent, and J. A. Bailey. 1986. Ungulates. Pp. 519-564 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Ungulates occupy a great diversity of habitats throughout North America. All ungulates require water in their habitat for survival, even though a few like the desert bighorn sheep may go for extended periods without it. This chapter presents some general information about ungulates, habitat requirements (i.e., food, water, cover), population measurement techniques, and major ungulate species descriptions (javelina or collared peccary, elk, mule and white-tailed deer, pronghorn, bison, bighorn sheep, etc.) and their requirements.

Location of Study: West
Keywords: Ungulates, Deer, Javelina, Elk, Pronghorn, Bighorn, Techniques, Habitat, Functions

Brown, D. E., C. H. Lowe, and J. F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona. Pp. 201-211 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. Proceedings of the symposium July 9, 1977, Tucson, AZ. USDA Forest Service, General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Descriptions of the various riparian communities which exist in Arizona and the Southwest and their biotic importance. Some key riparian species are also mentioned and recommendations given for management of the streamside and watershed.

Location of Study: Arizona
Keywords: Habitat, Vegetation, Descriptions

Call, M. Y. 1986. Rodents and insectivores. Pp. 429-452 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Rodents and insectivores (shrews and voles) are found in almost every habitat nationwide. Some are common and widespread whereas others are restricted to habitats; i.e., beavers and muskrat are restricted to riparian habitat. Habitat features correlated with species groups and population measurement techniques are discussed followed by a summary.

Location of Study: West
Keywords: Rodents, Shrew, Vole, Techniques, Habitat, Functions

Chadde, S. 1989. Willows and wildlife of the Northern Range, Yellowstone National Park. Pp.168-169 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Although this paper is not about Arizona habitats and wildlife, it does show the importance of willows to various species of wildlife. It also shows the impact of overgrazing, in this case by elk rather than cattle, on willows and ultimately stream bank conditions.

Location of Study: Montana
Keywords: Willow, Habitat, Management, Functions

Chapman, J. A. 1986. Lagomorphs. Pp. 453-473 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Lagomorphs are important in the western United States because they supply the base of many carnivore food chains. In the West, lagomorphs include hares, jackrabbits, cottontails, and pikas. Chapter introduces lagomorphs, presents habitat features correlated with species groups, distribution maps, table of plant species associated with lagomorphs, population measurement techniques, and finally a discussion.

Location of Study: West
Keywords: Hares, Jackrabbits, Cottontails, Techniques, Habitat, Functions

Christiansen, K. M. 1985. The linear interval method for determining habitat selection of riparian wildlife species. Pp. 101-104 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Study of river otter on Verde River, West Clear Creek, and East Verde River to study microhabitat differences. Vegetated banks correlated positively on all three streams, along with pools and groundcover with a canopy.

Location of Study: Arizona
Keywords: Otter, Vegetation, Canopy

Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart, editors. 1986. Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Large volume intended as an aid to field biologists and managers in planning, organizing, and administering wildlife inventory and monitoring procedures. Covers current general procedures and some specific techniques. Is organized so that any one chapter may be read alone. Are six major sections, covering (1) general procedures for planning and organizing programs; (2) guidelines for monitoring particular habitats; (3) guidelines for monitoring particular animal groups; (4) techniques for measuring habitat variables; (5) special monitoring studies such as food habit determinations, climatological studies, movement and habitat use; and (6) techniques and procedures for analysis, interpretation, and presentation of data and results. This is an excellent guide and contains a great deal of valuable information.

Location of Study: Westl
Keywords: Techniques, Guidelines, Habitat, Functions

Cross, S. P. 1986. Bats. Pp. 497-517 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Bats are not often included in wildlife inventories, but are important in the ecosystem. Most bats must have open water for drinking to survive. This chapter provides an overview of bats, habitat features related to bats, population measurements, and a discussion.

Location of Study: West
Keywords: Bats, Techniques, Habitat, Functions

Davis, G. P., Jr. 1982. Man and wildlife in Arizona: the American exploration period 1824-1865. Edited by N. B. Carmony and D. E. Brown, Arizona Game and Fish Department, Phoenix, AZ.

Fascinating and detailed historical accounts of wildlife in Arizona. Information is compiled from surveys and reports of military expeditions, boundary surveys, and explorations of railroad routes between 1824 and 1865.

Location of Study: Arizona
Keywords: History, Distribution, Habitat

Day, G. I. 1986. Javelina: research and management in Arizona. Arizona Game and Fish Department, Phoenix, AZ. 127 pp.

This book contains everything from historical distribution, habitat, reproduction, food, etc. of javelina to how to cook its meat. It is a knowledgeable accumulation of 20+ years of study by the author. Two most important habitat types are desertscrub and desert grassland. Javelina use riparian deciduous forest when it occurs in their range for sources of water, food, and cover. Three-Bar individuals used surface water to some extent year round, but more so in summer hot months. Also rest areas and bedding grounds may occur in shaded, moist cooler habitat such as that offered by riparian habitat.

Location of Study: Arizona
Keywords: Javelina, Life History, Habitat

Dickson, J. G. 1989. Streamside zones and wildlife in southern U.S. forests. Pp. 131-133 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Strips of mature trees were left along intermittent streams after of stands were cut and replanted as pine. Study was conducted to determine wildlife use of strips. Almost no squirrels were found in strips <50 m wide; amphibians and reptiles were common in medium and wide strips characterized by a canopied overstory, shaded understory, and litter, but low in dense brushy narrow zones with logging slash; small mammals were found most often in the dense brushy narrow zones. This paper is not well related to Arizona, but does show the necessity of riparian habitats for wildlife.

Location of Study: Texas
Keywords:

Geier, A. R., and L. B. Best. 1980. Habitat selection by small mammals of riparian communities: evaluating effects of habitat alterations. Journal of Wildlife Management 44(1):16-24.

Small mammals in riparian habitats of Iowa were studied to determine their reactions to habitat alterations. Alterations included grazing, timber removal, and stream channel realignment. Species diversity was highest in channelized habitats and lowest in dry floodplains. Alterations affect species differently; i.e., removal of woody debris from area would adversely affect white-footed mice, Eastern chipmunks, and shrews whereas those preferring treeless areas might benefit.

Location of Study: Iowa
Keywords: Rodents, Habitat, Structure, Vegetation, Function

Glinski, R. L., and R. D. Ohmart. 1983. Breeding ecology of the Mississippi Kite in Arizona. Condor 85:200-207.

Extension of the Mississippi Kites distribution range into Arizona has taken place. Study was conducted along tributaries of the Gila River. Nesting habitat was in cottonwood with a saltcedar understory. This created a very structurally diverse habitat. Cicadas were the principal prey item and half of the noninsect prey deliveries (56) were of Western pipestrelle bats.

Location of Study: Arizona
Keywords: Kite, Habitat, Breeding, Vegetation, Structure, Food

Haywood, D. D., and R. D. Ohmart. 1986. Utilization of benthic-feeding fish by inland breeding Bald Eagles. Condor 88:35-42.

Study of Bald Eagles along Salt and Verde rivers and their prey. Found that main prey items in Arizona were channel catfish, carp, suckers, coots, and black-tailed jackrabbits. Stream characteristics were also noted. Deep pools bounded by riffles and/or sandbars were common at all nest sites. These pools were deeper on one side and graded to shallows on the opposite side. The deep pool provided habitat for prey fish and the riffles and shallows immediately up or downstream from the pools provided foraging habitat for the fish. These foraging areas brought the fish closer to the surface, thus making it easier for the eagles to see and catch.

Location of Study: Arizona
Keywords: Eagle, Food, Habitat, Stream, Functions

Hervert, J. J., and P. R. Krausman. 1986. Desert mule deer use of water developments in Arizona. Journal of Wildlife Management 50(4):670-676.

Does watered once a night in July (when temperatures were high), but at other times frequency and amount were lower. Could not predict when males would water. Found alternative water sources when denied access to ones in their home ranges.

Location of Study: Arizona
Keywords: Deer, Habitat

Hoffmeister, D. F. 1986. Mammals of Arizona. Arizona Game and Fish Department and University of Arizona Press, Tucson, AZ.

Book on mammals of Arizona based on 35 years of study by the author. Species accounts of the mammals of the state include comprehensive description of the genus, species, and subspecies; identification of skulls based on teeth; distribution maps; specimens examined; additional records; and life history information.

Location of Study: Arizona
Keywords: Habitat, Distribution

Johnson, R. R., and D. A. Jones, technical coordinators. 1977. Importance, preservation and management of riparian habitat: a symposium. Proceedings of symposium, 9 July 1977, Tucson, Arizona. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The proceedings of this symposium include papers on the importance of riparian habitats, their values, and management of riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., and J. F. McCormick, technical coordinators. 1978. Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

The proceedings of this symposium include papers on characteristics, values, and management of floodplain wetlands and other riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators. 1985. Riparian ecosystems and their management: reconciling conflicting uses. Proceedings of the First North American Riparian Conference, April 16-18, 1985, Tucson, AZ. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 523 pp.

These proceedings include papers on: physical characteristics, hydrology, and ecology of riparian ecosystems; riparian resources of recreation, agriculture, wildlife, livestock use, birds, fisheries, amphibians, and reptiles; multiple-use planning and management; legal and institutional needs; and riparian ecosystems in arid zones of the world.

Location of Study: General
Keywords: Proceedings, Functions, Management, Habitat

Jones, K. B. 1988a. Distribution and habitat associations of herpetofauna in Arizona: comparisons by habitat type. Pp. 109-128 *in* Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium July 19-21, 1988, Flagstaff, AZ. USDA Forest Service, General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Extensive surveys of 16 different habitat types of Arizona's herpetofauna on Bureau of Land Management land. Paper discusses results of these surveys. Certain habitats were known to have greater diversity, i.e., riparian, and these habitats were given priority in sampling.

Location of Study: Arizona
Keywords: Habitat, Distribution, Vegetation, Structure

Jones, K. B. 1988b. Comparison of herpetofaunas of a natural and altered riparian ecosystem. Pp. 222-227 *in* Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium July 19-21, 1988, Flagstaff, AZ. USDA Forest Service, General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Abundance and diversity of reptiles were greater on an altered riparian ecosystem than on an altered site. There were species on the unaltered site that are usually upland species and the altered site had only species from the adjacent Sonoran Desert. Certain microhabitat distribution and abundance may account for the differences between habitats.

Location of Study: Arizona
Keywords: Habitat, Cottonwood, Willow, Structure, Functions

Kaufman, D. W., M. E. Peak, and G. A. Kaufman. 1985. *Peromyscus leucopus* in riparian woodlands: use of trees and shrubs. Journal of Mammalogy 66(1):139-143.

Study of white-footed mouse in riparian woodlands in Kansas. Mice may use trees for foraging and safe travel pathways. Needs further study.

Location of Study: Kansas
Keywords: Mouse, Vegetation, Structure, Habitat

Keller, C., L. Anderson, and P. Tappel. 1979. Fish habitat changes in Summit Creek, Idaho, after fencing the riparian area. Pp. 46-52 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Summit Creek had a high water table, constant streamflow, deep soil, low stream gradient, and moderate temperatures which helped in its rapid recovery after two years of cattle removal. Fish habitat was protected by fencing. The use of fencing negated the need for artificial structures in the stream, in fact, some of these structures should be removed because of silt and sediment trapping. Terrestrial wildlife have also used the area more, i.e., mink, Marsh Hawks, Sandhill Cranes, American Bitterns, and Great Blue Herons.

Location of Study: Idaho
Keywords: Trout, Habitat, Cattle, Management, Vegetation, Functions

Krausman, P. R., K. R. Rautenstrauch, and B. D. Leopold. 1985. Xeroriparian systems used by desert mule deer in Texas and Arizona. Pp. 144-149 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

In Arizona, most deer were located in washes which were used for foraging, thermal cover, and travel lanes.

Location of Study: Arizona, Texas
Keywords: Deer, Washes

LeCount, A. L., R. H. Smith, and J. R. Wegge. 1984. Black bear habitat requirements in central Arizona. Arizona Game and Fish Department, Special Report No. 14, Federal Aid in Wildlife Restoration Project W-78-R, Work Plan 4, Job 18, Research Branch, Phoenix, AZ.

This paper reports the results of a seven-year study on black bear habitat use in central Arizona. Describes habitat requirements, points out important habitat components, and makes recommendations for preservation and management of bear habitat. Bears utilize riparian habitat to meet a portion of their food and cover requirements and all their water requirements. They also use drainageways for travel corridors.

Location of Study: Arizona
Keywords: Bear, Habitat

Lowe, C. H., editor. 1964. The vertebrates of Arizona. University of Arizona Press, Tucson, AZ. 270 pp.

Contains information about Arizona's habitats and how they are described and defined. Checklists of fishes, amphibians and reptiles, birds, and mammals of Arizona with brief descriptions of each species habitat and where its found in Arizona.

Location of Study: Arizona
Keywords: Habitat

Maser, C., J. M. Geist, D. M. Concannon, R. Anderson, and B. Lovell. 1979. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: geomorphic and edaphic habitats. USDA Forest Service, General Technical Report PNW-99, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Geomorphic and edaphic habitats in rangelands provide specialized habitats for some species of wildlife. These habitats and how they function as specialized habitat features are discussed. The relationships of Great Basin wildlife to these features are discussed. Even though this article is about Great Basin some of the information is comparable to Arizona; i.e., cliffs provide nest sites for birds, roosts for bats, etc. Very detailed appendix relating each species to its specialized habitat.

Location of Study: Oregon
Keywords: Habitat, Functions, Values, Geomorphology

Maser, C., J. W. Thomas, and R. G. Anderson. 1984. Wildlife habitats in managed rangelands — the Great Basin of southeastern Oregon. The relationships of terrestrial vertebrates to plant communities and structural conditions. USDA Forest Service, General Technical Report PNW-172: Part 1 of 2 and 2 of 2. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Habitats and their structural conditions provide different conditions that are important to different species of wildlife. Niches are created that are usually the result of the interaction between the plant community, its structure, and other environmental factors such as soil type, moisture, microclimate, slope aspect, elevation, and temperature.

Location of Study: Oregon
Keywords: Habitat, Vegetation, Structure

Merriam, C. H., and L. Stejneger. 1890. Results of a biological survey of the San Francisco Mountain region and the desert of the Little Colorado, Arizona. USDA Division of Ornithology and Mammalogy, Government Printing Office, Washington, D.C.

Results of a biological survey in Arizona with species accounts and maps. Documentation of the Life Zones on the San Francisco Mountains.

Location of Study: Arizona
Keywords: Distribution, Habitat, Vegetation

Ohmart, R. D., B. W. Anderson, and W. C. Hunter. 1988. The ecology of the lower Colorado River from Davis Dam to the Mexico-United States international boundary: a community profile. US Fish and Wildlife Service Biological Report 85(7.19).

This is a report that covers the lower Colorado River system from Davis Dam south to Mexico. It is a compilation of information describing the ecology of the river and its adjacent riparian ecosystem. It contains historical information about the river and its past management. How wildlife and riparian vegetation interact is addressed, as well as how vegetation is affected by flooding.

Location of Study: Arizona, California, Nevada, Mexico
Keywords: Ecology, Habitat, Functions, Vegetation, History

Ohmart, R. D., and B. W. Anderson. 1978. Wetland functions and values: the state of our understanding. Pp. 278-295 *in* P. E. Greeson, J. R. Clark, and J. E. Clark, editors, Proceedings of the National Symposium on Wetlands, American Water Resources Association, Minneapolis, MN.

Historical information about changes of rivers and wetlands. Information on how wetlands function in the Southwest for wildlife. Detailed information on values of lower Colorado River and Salton Sea to birds.

Location of Study: Arizona, California, New Mexico, Texas
Keywords: Functions, Values, Marsh, Vegetation

Ohmart, R. D., and B. W. Anderson. 1982. North American desert riparian ecosystems. Pp. 433-479 *in* G. L. Bender, editor, Reference handbook on the deserts of North America, Greenwood Press, Westport CT.

This book chapter discusses desert riparian systems. Included are physical characteristics (geomorphology), characteristic vegetation, general description of each North American desert and characteristic fauna (fishes, amphibians, reptiles, birds, mammals) within each desert. The authors emphasize information bird use of desert riparian areas and avian relationships with vegetation structure and function. Give descriptions of how some plant and animal species have co-evolved. Also a section concerning the importance and modification of riparian habitat by man. An appendix is included listing riparian birds, amphibians, and reptiles.

Location of Study: West
Keywords: Management, Vegetation, Functions, Values, Characteristics

Ohmart, R. D,. and B. W. Anderson. 1986. Riparian habitat. Pp. 169-199 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter provides an overview of riparian habitat, classification systems, important functions and values to wildlife, data collection priorities, and effects of land management activities on riparian systems.

Location of Study: West
Keywords: Functions, Habitat, Management, Classification, Vegetation, Structure

Ordway, L. L., and P. R. Krausman. 1986. Habitat use by desert mule deer. Journal of Wildlife Management 50(4):677-683.

Study was in southern Arizona Sonoran Desert for one and one-half years. Both sexes used and preferred mountainous vegetative associations, but males also used nonmountainous vegetation. Both sexes were found closer to water during early and late summer compared to winter and spring.

Location of Study: Arizona
Keywords: Deer, Habitat

Ragotzkie, K. E., and J. A. Bailey. 1991. Desert mule deer use of grazed and ungrazed habitats. Journal of Range Management 44(5):487-490.

Deer tended to prefer ungrazed dry washes, followed by grazed dry washes, and finally uplands. Study was done during an exceptionally wet year and forage was abundant. Deer used pastures, but preferred ungrazed ones. Authors weren't sure if this was an avoidance of cattle or more attractive forage in ungrazed pastures.

Location of Study: Arizona
Keywords: Deer, Habitat, Cattle

Rautenstrauch, K. R., and P. R. Krausman. 1989. Influence of water availability and rainfall on movements of desert mule deer. Journal of Mammalogy 70(1):197-201.

Migratory deer had permanent water in their home ranges only during the summer dry months. Deer moved to these ranges from 30 days to 10 days after the summer dry season began.

Location of Study: Arizona
Keywords: Deer, Habitat

Schulz, T. T., and W. C. Lenininger. 1991. Nongame wildlife communities in grazed and ungrazed montane riparian sites. Great Basin Naturalist 51(3):286-292.

Study was conducted on Sheep Creek, northwest of Fort Collins, Colorado, at 2500 m elevation. Wilson's Warbler and Lincoln Sparrows were commonly found in ungrazed areas with abundant willows. Wilson's Warblers breed in willow habitats along mountain streams. Exclosures had more Western jumping mice, but the quality and type of vegetation was more important than proximity to water. Only one year of sampling. Deer mouse was found more in grazed areas. Exclosures had nearly twice as much litter buildup and willow canopy was 8.5 times greater than grazed areas. American Robin was found more in grazed areas.

Location of Study: Colorado
Keywords: Breeding, Cattle, Willow, Warbler, Sparrow

Schwalbe, C. R., and P. C. Rosen. 1988. Preliminary report on effect of bullfrogs on wetland herpetofaunas in southeastern Arizona. Pp. 166-173 *in* Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium July 19-21, 1988, Flagstaff, AZ. USDA Forest Service, General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The distribution of bullfrogs was negatively correlated with the distribution of leopard frogs and garter snakes in southeastern Arizona. These species are becoming prey for the bullfrog and being extirpated because of it.

Location of Study: Arizona
Keywords: Bullfrog, Snake, Habitat, Native

Seegmiller, R. F., and R. D. Ohmart. 1981. Ecological relationships of feral burros and desert bighorn sheep. Wildlife Monographs No. 78.

Study occurred in the Bill Williams Mountains, Arizona. Movements and distributions of burros and bighorn were restricted to close proximity of permanent water and riparian and cultivated vegetation from May through October. When weather was cooler both species moved farther away from the river. Both utilize fresh green growing vegetation, but burros may be able to better digest more woody plant tissue. Bighorn preferred more rugged terrain. There is a high degree of dietary and habitat overlap between the burro and bighorn.

Location of Study: Arizona
Keywords: Burro, Bighorn, Habitat, Overlap, Vegetation, Food

Simons, L. H., R. C. Szaro, and S. C. Belfit. 1990. Distribution of *Notiosorex crawfordi* and *Sorex arizonae* along an elevational gradient. Journal of Mammalogy 71(4):634-640.

Studied desert shrew and Arizona shrew along an elevational gradient. Both were found in riparian habitats although desert shrew was also found in others. Desert shrew was not found in riparian habitat higher than 1583 m and Arizona shrew was not found lower than 1575 m. Desert shrew occurred in riparian habitats more in the summer.

Location of Study: Arizona
Keywords: Shrew, Habitat, Distribution

Spowart, R. A., and F. B. Samson. 1986. Carnivores. Pp. 475-496 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Carnivores are a very diverse group of predatory mammals; many are even omnivorous or herbivorous. They are habitat generalists and specialists; some are very adaptable to any habitat, i.e., coyote, whereas others are restricted to specific habitats, i.e., river otter. This chapter provides habitat features correlated with species groups, population measurement techniques, and an overall discussion.

Location of Study: West
Keywords: Carnivore, Mink, Otter, Raccoon, Skunk, Techniques, Habitat, Functions

Stamp, N. E., and R. D. Ohmart. 1979. Rodents of desert shrub and riparian woodland habitats in the Sonoran Desert. Southwestern Naturalist 24(2):279-289.

Study of four rodent species in desert shrub habitat and adjacent riparian woodland habitat. Environmental extremes may be ameliorated by riparian woodland and those rodents which used riparian woodland were making use of habitat available to them. Desert pocket mouse was the only heteromyid that occurred in moderate densities in riparian woodland. Cactus mouse, an omnivore, and Southern grasshopper mouse, eats mainly arthropods, were also in riparian woodland which offered cover as well as abundant insects.

Location of Study: Arizona
Keywords: Rodents, Desert, Habitat, Functions

Sullivan, M. E., and M. E. Richardson. 1993. Functions and values of the Verde River riparian ecosystem and an assessment of adverse impacts to these resources. Report to US Environmental Protection Agency, Region IX, San Francisco, CA. US Fish and Wildlife Service, Arizona Ecological Services Office, Phoenix, AZ.

An evaluation of the functions and values of the Verde River based on the Wetland Evaluation (WET) technique, Vols. I and II. Volume II was not used because it did not allow flexibility to adjust the system to arid Southwestern characteristics. The Verde is a major perennial stream in the state and provides fish and wildlife habitat and recreational opportunities. Direct threats to the river include sand and gravel operations, agricultural irrigation diversions, grazing activities, increased urbanization, and recreational activities. The purpose of ADID (Advanced Identification) is to facilitate protection of a specific aquatic ecosystem. Covered 125 miles of Verde from Sullivan Lake to Horseshoe Dam. Divided river into seven reaches and also included tributaries.

Location of Study: Arizona
Keywords: Verde, Functions, Habitat, Soils, Structure, Vegetation

Swanson, G. A., technical coordinator. 1979. The mitigation symposium: a national workshop on mitigating losses of fish and wildlife habitats. Proceedings of the symposium, 16-20 July 1979, Fort Collins, CO. USDA Forest Service, General Technical Report RM-65, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Nine private organizations and eight federal agencies cosponsored the symposium, which consisted of 133 papers. Topics included: coastal zone wetlands; inland wetlands; economic considerations; mining, oil and gas; planning, evaluation, and inventory; surveys; power projects; terrestrial management; aquatic management; legal and political considerations; transportation systems; and state perspectives.

Location of Study: General
Keywords: Proceedings, Mitigation, Wildlife, Habitat

Szaro, R. C., and S. C. Belfit. 1987. Small mammal use of a desert riparian island and its adjacent scrub habitat. USDA Forest Service Research Note RM-473, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Study (only 1 season) of small mammals of a riparian island (15-ha) in Queen Creek. The island resulted from restriction of water flow by Whitlow Ranch Dam, Pinal County, Arizona. Small mammals in the riparian interior, riparian edge, desert wash, and upland habitats were sampled to determine relationships between species abundance and vegetation, compare use between riparian and desert scrub, and the effects of a flood control dam on a small mammal community. Only six species caught in study: desert shrew, pallid bat, Arizona pocket mouse, Bailey's pocket mouse, cactus mouse, and white-throated woodrat.

Location of Study: Arizona
Keywords: Shrew, Bat, Mouse, Woodrat, Habitat

Szaro, R. C., and J. N. Rinne. 1988. Ecosystem approach to management of Southwestern riparian communities. Transactions of the 53rd North American Wildlife and Natural Resources Conference 1988:502-511.

Five-year study of riparian areas of upper, intermediate, and low elevations in the Southwest. Rio de las Vacas, New Mexico was upper elevation; Mogollon Rim, Arizona, was intermediate elevation; and Queen Creek, Arizona, was low elevation. Study was conducted to show need of long-term ecosystem approach. Data were collected on fish, amphibians, reptiles, birds, and small mammals in grazed and ungrazed areas. Management decisions should not be based on only a year or two of data.

Location of Study: Arizona, New Mexico
Keywords: Management, Habitat, Cattle

Szaro, R. C., K. E. Severson, and D. R. Patton, technical coordinators. 1988. Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium, 19-21 July 1988, Flagstaff, Arizona. USDA Forest Service General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Symposium held to bring scientists and manager together for the exchange of knowledge and ideas on habitat requirements, management needs, and other information on amphibians, reptiles, and small mammals. Topics include habitat models, habitat requirements, sampling designs and problems, community dynamics, and management recommendations.

Location of Study: General
Keywords: Proceedings, Habitats, Distributions, Models, Management

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979a. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: riparian zones. USDA Forest Service, General Technical Report PNW-80, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Riparian areas are the most critical wildlife habitats in managed rangelands. More wildlife depends entirely on or spends disproportionately more time in riparian habitat than in others. Riparian areas are also important for grazing, recreation, timber, fisheries, roads, and water quality and quantity. The importance to wildlife is examined and recommendations provided for management.

Location of Study: Oregon
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979b. Riparian zones in managed rangelands—their importance to wildlife. Pp. 21-30 *in* O. B. Cope, ed., Proceedings of the forum — grazing and riparian/stream ecosystems, 3-4 November 1978. Trout Unlimited, Inc.

Discusses the importance of riparian habitats to wildlife. Some reasons include: the actual presence of water for drinking; availability of water to plants which in turn provide food and cover to many species, riparian habitats with deciduous vegetation may provide different habitats dependent upon season of the year; provide nesting habitat; thermal cover and microclimate; migration routes for wildlife; and serve as connectors between habitats. Paper also covers riparian habitat sensitivity to disturbance and management considerations.

Location of Study: West
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

Triebold, C. L. 1987. Effects of area and habitat on numbers of small mammal species of high elevation forest habitat. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

This study examined environmental correlates of small mammal species numbers in high-altitude riparian drainages. The effects of area, plant composition (type, abundance, and species), and various habitat measurements were examined. Found that habitat features and complexity were poor predictors of numbers of small mammals. Size of the drainage was a better predictor. All of the vegetation species appeared to be important to small mammals in the studied habitats.

Location of Study: Arizona
Keywords: Habitat, Distribution, Drainages

U.S. Fish and Wildlife Service. 1991. Endangered and threatened species of Arizona. With 1992 Addendum. Summer 1991. Ecological Services Field Office, U.S. Fish and Wildlife Service, Phoenix, AZ.

This is a listing of federally listed plants and animals of Arizona compiled by the Phoenix Office. Each listing provides a sketch of the plant or animal, an Arizona distribution map, its status, species description, habitat, range, reasons for decline/vulnerability, land management/ownership and notes.

Location of Study: Arizona
Keywords: Endangered, Threatened

Uphoff, K. C. 1990. Habitat use and reproductive ecology of red squirrels (*Tamiasciurus hudsonicus*) in central Arizona. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

Study of red squirrels was conducted by examining the distribution of female and male territories with respect to vegetation composition, intersexual differences in choice resulting from differences in required resources during the reproductive season, and habitat suitability based on resource distribution and intraspecific interactions influencing the resource availability. Densities were highest in association with deciduous drainages, but female versus male territories were distributed along a topographical gradient. Females were lower in drainages than males. During the reproductive season, 8 of the 13 food types eaten were associated with riparian habitat and were only available seasonally.

Location of Study: Arizona
Keywords: Squirrels, Habitat, Reproduction, Vegetation

Walker, M. T. 1978. Ecological similarities between feral burros and desert bighorn sheep, Black Mountains, northwestern Arizona. Unpublished Master's thesis, Department of Zoology, Arizona State University, Tempe, AZ.

Study was to examine the ecological differences between burros and bighorn sheep in the Black Mountains of northwestern Arizona; data was also gathered on cattel and mule deer. All species were found nearer permanent water supplies during warmer months of the year. Distributions were greatest in cooler seasons. There was ecological overlap between burros and bighorn and a moderate dietary overlap between cattle and burros, and cattle and sheep.

Location of Study: Arizona
Keywords: Cattle, Burro, Deer, Bighorn, Distribution, Habitat, Food

Wallace, M. C., and P. R. Krausman. 1987. Elk, mule deer, and cattle habitats in central Arizona. Journal of Range Management 40(1):80-83.

Study of elk and mule deer use of habitat with reintroduction of cattle. Elk and deer both were reduced in numbers. Elk tended to shift foraging from open mesic situations to more closed forests after introduction of cattle. Deer use did not change when cattle were introduced.

Location of Study: Arizona

Keywords: Elk, Deer, Cattle, Habitat

Warner, R. E., and K. M Hendrix, editors. 1984. California riparian systems: ecology, conservation, and management. University of California Press, Berkeley and Los Angeles, CA.

Proceedings of a conference held in Davis, CA to bring together a wide range of riparian interests. Conference goals were to define major riparian concepts, problems and opportunities; promote discussion and information exchange among riparian interests; and to establish a technical and communicative base for long-term, riparian planning. Papers were not only from California but 10 other states and Washington, D.C. Broad topics included biogeography and dynamics of change in riparian systems; structure, status and trends in the condition of riparian systems; hydrologic and hydraulic considerations in structure, function, and protection of riparian systems; aquatic/riparian interactions; riparian/upland interactions with special reference to wildlife and agriculture; economic and social values; riparian systems and the law; classification, inventory, and monitoring of riparian systems; national and regional trends; riparian restoration; riparian systems and water diversion projects; problems and opportunities of riparian vegetation on levee systems; ecology of birds in riparian systems; coastal zone riparian systems; unique and ecological problems of California desert riparian systems; sustained yield production in riparian systems; cultural, ecological, recreational, and aesthetic values; integrated approaches; local riparian initiatives; Rivers and Harbors Act, Section 404, and riparian system conservation; ecology on nonavian wildlife in riparian systems; and developing management strategies.

Location of Study: General
Keywords: Proceedings, Habitat, Functions, Values, Wildlife

Abell, D. L., technical coordinator. 1989. Protection, management, and restoration for the 1990's. Proceedings of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 544 pp.

The papers in this proceedings are aimed at resource managers, environmental consultants, researchers, landowners, environmental activists, and a variety of user groups. Some of the papers explain how streams interact with the plants and animals at their margins and with the land that they occupy to accomplish a range of important functions. These functions include bank stabilization, reducing the impacts of flooding, providing wildlife habitat, protecting instream habitat for fishes, producing livestock forage, and enhancing human lives. Biological diversity in Western lands is often directly related to riparian systems, which also serve as major routes for migratory birds. Special attention is given to the several threatened and endangered species that require riparian habitat, and to the response of riparian systems to disturbance, i.e., fire, logging, landslides, and diversion for power or water supply. A section deals with measures being taken to preserve and restore riparian lands, particularly along large rivers and in the cities. Special attention is given in some of these papers to revegetation techniques.

Location of Study: West
Keywords: Proceedings, Functions, Management, Habitat

Andradi, T. R., J. S. Spaulding, and E. D. Koch. 1991. Diel food utilization by the Virgin River spinedace, *Lepidomeda mollispinis mollispinis*, and speckled dace, *Rhinichthys osculus*, in Beaver Dam Wash, Utah. Southwestern Naturalist 36(2):158-170.

Late winter food habits, diel feeding chronologies, and resource partitioning were studied and documented for the Virgin River spinedace and speckled dace. Both species as adults were primarily insectivorous and did eat some of the same insects, but differed in certain life stages of ephemeropterans. Speckled dace stomach contents showed more drift and benthos than the spinedace. Virgin River spinedace fed continuously during day and speckled dace fed more morning and evening.

Location of Study: Utah
Keywords: Native, Habitat, Food

Baltz, D. M., and P. B. Moyle. 1984. The influence of riparian vegetation on stream fish communities of California. Pp. 183-187 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Paper presents the direct and indirect influences of riparian vegetation on fish. Information on energy exchange, flow regime, cover, and temperature is discussed. Energy exchange proceeds from plants to insects (or as detritus) to fish. Vegetation slows flows during floods and provides refugia for fish. Cover

is provided by vegetation with cools water temperatures and often times overhanging banks with vegetation provides hiding places.

Location of Study: California
Keywords: Vegetation, Structure, Functions, Values

Behnke, R. J. 1979. Values and protection of riparian ecosystems. Pp. 164-167 *in* G. A. Swanson, technical coordinator, The mitigation symposium: a national symposium on mitigating losses of fish and wildlife habitats. USDA Forest Service, General Technical Report RM-65, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The riparian ecosystem has highly concentrated values associated with fish, wildlife, recreation, and water quality. Discusses need for proper multiple-use management and necessity of protecting riparian areas.

Location of Study: General
Keywords: Trout, Values, Cattle

Behnke, R. J., and R. F. Raleigh. 1978. Grazing and the riparian zone: impact and management perspectives. Pp. 263-267 *in* R. R. Johnson and J. F. McCormick, technical coordinators, Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

Overgrazing of riparian areas can lead to: widening and shallowing a stream, gradual channel trenching or braiding, silt degradation, loss of vegetative cover, increased water temperatures and velocities, decreased terrestrial food input, and a three to four fold decrease in trout biomass. Optimal trout habitat is cool, slow, and deep water with abundant cover typical of undercut banks. Removal of livestock can restore area within a few years.

Location of Study: West
Keywords: Trout, Cattle, Canopy, Vegetation, Habitat

Behnke, R. J., and M. Zarn. 1976. Biology and management of threatened and endangered Western trouts. USDA Forest Service General Technical Report RM-28, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Discusses taxonomy, reasons for decline, life history and ecology, and recommendations for preservation of six native trout of western North America. Provides meristic characters, distribution and status, habitat requirements and limiting factors, protective measures, and recommendations are presented for each trout.

Location of Study: Arizona, New Mexico, California, Nevada, Colorado

Keywords: Habitat, Native, Trout, Threatened, Endangered

Beschta, R. L., and W. S. Platts. 1986. Morphological features of small streams: significance and function. Water Resources Bulletin 22(3):369-379.

Morphological features of small streams include riffles, pools, bed material, and channel banks. Pools are important areas for fish rearing habitat. Riffles are storage places for bed material and are used by fish for spawning. The particle size and distribution of bed material influences channel characteristics, food for fish, bedload transport, spawning conditions, cover, and rearing habitat. Riparian vegetation helps stabilize banks and contributes to fish productivity in various ways.

Location of Study: General
Keywords: Habitat, Structure, Functions, Riffles, Pools, Banks, Substrate

Binne, N. A., and F. M. Eiserman. 1979. Evaluation of fluvial trout habitat in Rocky Mountain streams. Pp. 361-364 *in* G. A. Swanson, technical coordinator, The mitigation symposium: a national symposium on mitigating losses of fish and wildlife habitats. USDA Forest Service, General Technical Report RM-65, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

A Habitat Quality Index was developed to quantify fluvial trout habitat. The Index as used to quantify the deterioration of trout habitat and populations in Wyoming for mitigation purposes.

Location of Study: Wyoming
Keywords: Trout, Habitat, HQI, Model, Mitigation

Blinn, D. W., C. Runck, D. A. Clark, and J. N. Rinne. 1993. Effects of rainbow trout predation on Little Colorado spinedace. Transactions of the American Fisheries Society 122:139-143.

Field experiment was conducted by creating an exclosure in the stream to see if rainbow trout preyed on Little Colorado spinedace enough to change its behavior and spatial distribution. The spinedace showed almost no predator avoidance in the presence of the trout. Rainbow trout may have a significant impact on the habitat use, behavior, and distribution of Little Colorado spinedace and may be, in part, responsible for its current disjunct distribution.

Location of Study: Arizona
Keywords: Trout, Spinedace, Predation, Habitat

Brown, D. E., C. H. Lowe, and J. F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona. Pp. 201-211 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium.

Proceedings of the symposium July 9, 1977, Tucson, AZ. USDA Forest Service, General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Descriptions of the various riparian communities which exist in Arizona and the Southwest and their biotic importance. Some key riparian species are also mentioned and recommendations given for management of the streamside and watershed.

Location of Study: Arizona
Keywords: Habitat, Vegetation, Descriptions

Collins, J. P., C. Young, J. Howell, and W. L. Minckley. 1981. Impact of flooding in a Sonoran Desert stream, including elimination of an endangered fish population (*Poeciliopsis o. occidentalis*, Poeciliidae). Southwestern Naturalist 26(4):415-423.

Results of a winter flood in 1977-1978 on Tule Creek, Arizona, eliminated a reintroduced population of Sonoran topminnow that had persisted for 10 years and a population of leopard frogs. It introduced canyon treefrogs and saltcedar to the system. Flooding is a natural process but in a system that has been altered by water diversion and dams the extent of damage can be extensive.

Location of Study: Arizona
Keywords: Flood, Vegetation, Structure, Endangered, Habitat

Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart, editors. 1986. Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Large volume intended as an aid to field biologists and managers in planning, organizing, and administering wildlife inventory and monitoring procedures. Covers current general procedures and some specific techniques. Is organized so that any one chapter may be read alone. Are six major sections, covering (1) general procedures for planning and organizing programs; (2) guidelines for monitoring particular habitats; (3) guidelines for monitoring particular animal groups; (4) techniques for measuring habitat variables; (5) special monitoring studies such as food habit determinations, climatological studies, movement and habitat use; and (6) techniques and procedures for analysis, interpretation, and presentation of data and results. This is an excellent guide and contains a great deal of valuable information.

Location of Study: Westl
Keywords: Techniques, Guidelines, Habitat, Functions

Crane, J. H. 1988. Relationships between palustrine wetlands of forested riparian floodplains and fishery resources: a review. U.S. Fish and Wildlife Service Biological Report 88(32).

Paper is the proceedings of a workshop held to identify priority information needs for nontidal, freshwater palustrine and riverine wetlands. One need was to document the values of fish of palustrine wetlands that are generally tree- and shrub-dominated floodplains of streams that flow to coastal areas of the eastern United States. Although the workshop concentrated on the eastern part of the U.S., many of the same principles apply to the West. Wetlands moderate the effects of flooding, maintain and improve water quality, provide fish and wildlife habitat, support food chains, and have aesthetic and heritage values.

Location of Study: General
Keywords: Habitat, Hydroperiod, Flooding, Floodplain, Functions, Values

Cuplin, P. 1986. Fish. Pp. 257-266 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter aimed at assisting biologists in identifying information needed to inventory and monitor fish-producing waters. Covers techniques employed in the West and inland fisheries investigations, particularly for salmonids and smaller streams and ponds in arid areas. Important aquatic habitat features, habitat of important fish families, population measurement techniques, and habitat inventory and monitoring systems are discussed.

Location of Study: West
Keywords: Techniques, Habitat, Functions

Davis, G. P., Jr. 1982. Man and wildlife in Arizona: the American exploration period 1824-1865. Edited by N. B. Carmony and D. E. Brown, Arizona Game and Fish Department, Phoenix, AZ.

Fascinating and detailed historical accounts of wildlife in Arizona. Information is compiled from surveys and reports of military expeditions, boundary surveys, and explorations of railroad routes between 1824 and 1865.

Location of Study: Arizona
Keywords: History, Distribution, Habitat

Griffith, J. S., and T. R. Tiersch. 1989. Ecology of fishes in Redfield Canyon, Arizona, with emphasis on *Gila robusta intermedia*. Southwestern Naturalist 34(1):131-164.

Redfield Canyon in southern Arizona is relatively free of impacts of human activities. This paper is the result of a class field ecology project which assessed species composition and abundance in typical habitat, examined habitat selection by each species (with emphasis on *Gila robusta*), assess age and growth of the population, and describe the diet over a 24-hour period.

Location of Study: Arizona
Keywords: Diet, Habitat, Age

Hawkins, C. P., M. L. Murphy, N. H. Anderson, and M. A. Wilzbach. 1983. Density of fish and salamanders in relation to riparian canopy and physical habitat in streams of the northwestern United States. Canadian Journal of Fisheries and Aquatic Sciences 40:1174-1185.

Study conducted on Oregon and northern California streams. Objective was to examine streams with greater levels of fine sediment (up to 80%), while retaining a study design that allowed examination of effects associated with riparian canopy. Streams with little or no shading have more abundant vertebrate populations than similar but shaded streams. These results were also primarily from riffle areas and not pools, which supports riffle habitats as being more primary food-producing areas for salmonids. Caution against opening a canopy along a stream because it will not necessarily always result in a more productive stream, other factors need to be considered.

Location of Study: Oregon, California
Keywords: Canopy, Substrate

Haywood, D. D., and R. D. Ohmart. 1986. Utilization of benthic-feeding fish by inland breeding Bald Eagles. Condor 88:35-42.

Study of Bald Eagles along Salt and Verde rivers and their prey. Found that main prey items in Arizona were channel catfish, carp, suckers, coots, and black-tailed jackrabbits. Stream characteristics were also noted. Deep pools bounded by riffles and/or sandbars were common at all nest sites. These pools were deeper on one side and graded to shallows on the opposite side. The deep pool provided habitat for prey fish and the riffles and shallows immediately up or downstream from the pools provided foraging habitat for the fish. These foraging areas brought the fish closer to the surface, thus making it easier for the eagles to see and catch.

Location of Study: Arizona
Keywords: Eagle, Food, Habitat, Stream, Functions

Hill, M. T., W. S. Platts, and R. L. Beschta. 1991. Ecological and geomorphological concepts for instream and out-of-channel flow requirements. Rivers 2(3):198-210.

Methodology designed to measure instream, channel maintenance, riparian maintenance, and valley maintenance flows of a stream. Purpose is to protect fish and their habitat.

Location of Study: Idaho
Keywords: Models, Geomorphology, Vegetation

Holden, P. B. 1979. Ecology of riverine fishes in regulated stream systems with emphasis on the Colorado River. Pp. 57-74 *in* J. V. Ward and J. A. Stanford, editors, The ecology of regulated

streams. Proceedings of the international symposium on regulated streams, held 18-20 April 1979 in Erie, Pennsylvania, Plenum Press, New York and London.

Generally, the impact of dams on obligate riverine fishes is negative. Sixty percent of the threatened or endangered species are obligate riverine fishes (in 1979). There are both immediate and delayed impacts on these fishes. Immediate impacts include: blocking migration routes, habitat alteration, temperature changes, turbidity and chemical changes, reduced flows, and daily fluctuations. Delayed impacts include: habitat change after reduced flows, fine sediments below dams are reduced, predation or competition from introduced species, and buildups of toxic gases or depletion of required gases.

Location of Study: West
Keywords: Dams, Management, Habitat, Threatened, Impacts

Hubert, W. A., R. P. Lanka, T. A. Wesche, and F. Stabler. 1985. Grazing management influences on two brook trout streams in Wyoming. Pp. 290-294 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Abundance of riparian shrubs, overhanging vegetation, and overhanging bank cover correlated with instream habitat variables (depth and pool quality) in influence trout abundance.

Location of Study: Wyoming
Keywords: Trout, Vegetation, Canopy

Johnson, R. R., and D. A. Jones, technical coordinators. 1977. Importance, preservation and management of riparian habitat: a symposium. Proceedings of symposium, 9 July 1977, Tucson, Arizona. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The proceedings of this symposium include papers on the importance of riparian habitats, their values, and management of riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., and J. F. McCormick, technical coordinators. 1978. Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

The proceedings of this symposium include papers on characteristics, values, and management of floodplain wetlands and other riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators. 1985. Riparian ecosystems and their management: reconciling conflicting uses. Proceedings of the First North American Riparian Conference, April 16-18, 1985, Tucson, AZ. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 523 pp.

These proceedings include papers on: physical characteristics, hydrology, and ecology of riparian ecosystems; riparian resources of recreation, agriculture, wildlife, livestock use, birds, fisheries, amphibians, and reptiles; multiple-use planning and management; legal and institutional needs; and riparian ecosystems in arid zones of the world.

Location of Study: General
Keywords: Proceedings, Functions, Management, Habitat

Keller, C., L. Anderson, and P. Tappel. 1979. Fish habitat changes in Summit Creek, Idaho, after fencing the riparian area. Pp. 46-52 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Summit Creek had a high water table, constant streamflow, deep soil, low stream gradient, and moderate temperatures which helped in its rapid recovery after two years of cattle removal. Fish habitat was protected by fencing. The use of fencing negated the need for artificial structures in the stream, in fact, some of these structures should be removed because of silt and sediment trapping. Terrestrial wildlife have also used the area more, i.e., mink, Marsh Hawks, Sandhill Cranes, American Bitterns, and Great Blue Herons.

Location of Study: Idaho
Keywords: Trout, Habitat, Cattle, Management, Vegetation, Functions

Knight, A. W., and R. L. Bottorff. 1984. The importance of riparian vegetation to stream ecosystems. Pp. 160-167 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Vegetation is very important in determining structure and function of riparian systems. Many wildlife species either directly or indirectly use vegetation. Removal of vegetation affects stream organisms by decreasing food (detritus input); increasing the potential for primary productivity in plants; increasing summer temperatures of the water; changing the water quality and quantity; and decreasing terrestrial habitat for adult insects.

Location of Study: General
Keywords: Structure, Functions, Values, Vegetation

Lowe, C. H., editor. 1964. The vertebrates of Arizona. University of Arizona Press, Tucson, AZ. 270 pp.

Contains information about Arizona's habitats and how they are described and defined. Checklists of fishes, amphibians and reptiles, birds, and mammals of Arizona with brief descriptions of each species habitat and where its found in Arizona.

Location of Study: Arizona
Keywords: Habitat

Mahoney, D. L., and D. C. Erman. 1984. The role of streamside bufferstrips in the ecology of aquatic biota. Pp. 168-176 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Riparian vegetation is important as food to stream organisms, as cover and shade over small-order streams, and as bank stabilizers. Is most important as a food source on headwater streams and as shade and cover. As streams widen, the influence of vegetation changes to different functions. It still provides food in the form of drifting detritus, but algae begins to play more of a role. In wide streams vegetation acts as a bank stabilizer.

Location of Study: General
Keywords: Vegetation, Structure, Functions, Values

Maser, C., J. M. Geist, D. M. Concannon, R. Anderson, and B. Lovell. 1979. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: geomorphic and edaphic habitats. USDA Forest Service, General Technical Report PNW-99, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Geomorphic and edaphic habitats in rangelands provide specialized habitats for some species of wildlife. These habitats and how they function as specialized habitat features are discussed. The relationships of Great Basin wildlife to these features are discussed. Even though this article is about Great Basin some of the information is comparable to Arizona; i.e., cliffs provide nest sites for birds, roosts for bats, etc. Very detailed appendix relating each species to its specialized habitat.

Location of Study: Oregon
Keywords: Habitat, Functions, Values, Geomorphology

Maser, C., J. W. Thomas, and R. G. Anderson. 1984. Wildlife habitats in managed rangelands — the Great Basin of southeastern Oregon. The relationships of terrestrial vertebrates to plant communities and structural conditions. USDA Forest Service, General Technical Report PNW-172: Part 1 of 2 and 2 of 2. Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Habitats and their structural conditions provide different conditions that are important to different species of wildlife. Niches are created that are usually the result of the interaction between the plant community, its structure, and other environmental factors such as soil type, moisture, microclimate, slope aspect, elevation, and temperature.

Location of Study: Oregon
Keywords: Habitat, Vegetation, Structure

Meehan, W. R., F. J. Swanson, and J. R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. Pp. 137-145 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. Proceedings of a symposium, July 9, 1977, Tucson, Arizona. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Riparian vegetation has important influences on the stream ecosystem. Shade and organic detritus from the vegetation control the food base of the stream and woody debris can affect channel morphology. Vegetation also acts as a filter to prevent sediment and debris from entering the stream. Roots of woody and herbaceous plants provide streambank stabilization and help create overhanging banks, which are an important component of salmonid fish habitat.

Location of Study: West
Keywords: Trout, Salmon, Vegetation, Functions

Miller, R. R. 1961. Man and the changing fish fauna of the American Southwest. Papers of the Michigan Academy of Science, Arts, and Letters XLVI:365-404.

Many native Western fish species have either become extinct or are endangered because of the changes that have occurred to river systems. Streams have gone from clear, permanent-flowing to intermittent flows subject to flash floods carrying heavy loads of silt. As a result of this, vegetation has been lost which has lead to increased temperatures of the water. Small streams, creeks, and marshes have disappeared. Along with vegetation destruction has been pollutant introduction, deep channelization, and gully erosion on hillsides. Paper provides historical evidence and documentation of fish faunal changes.

Location of Study: Southwest
Keywords: Habitat, Destruction, Vegetation, Function, Endangered, Introductions

Minckley, W. L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix, AZ.

Book addresses habitat of fishes in Arizona and how to identify the fishes. Provides information on collection and preservation. Species accounts are given for all the fish.

Location of Study: Arizona
Keywords: Habitat, Status

Minckley, W. L. 1979. Aquatic habitats and fishes of the lower Colorado River, southwestern United States. Final report to US Bureau of Reclamation, Lower Colorado Region, Boulder City, NV.

Study of the lower Colorado River conducted to (1) identify and quantify aquatic habitats; (2) to obtain data on relative abundances of aquatic organisms, mainly fishes, in those habitats; (3) to identify the food web relations within the fauna; and (4) to determine contributions of defined habitats to maintenance of the ecosystem.

Location of Study: Arizona, California
Keywords: Habitat, History, Channel, Characteristics

Minckley, W. L. 1985. Native fishes and natural aquatic habitats in U.S. Fish and Wildlife Service Region II west of the Continental Divide. A review of population and habitat status and evaluation of survival potentials for native freshwater fishes, with recommendations for management to perpetuate the indigenous regional fauna. Final report to U.S. Fish and Wildlife Service, Albuquerque, NM. Department of Zoology, Arizona State University, Tempe, AZ.

Report covers historical perspectives of ecological changes, status of regional aquatic habitats, and management needs, potentials, and plans. Accounts of regional fishes are given by those of the Mexican watershed and the lower Colorado River basin. Accounts of habitats are also presented.

Location of Study: Arizona, New Mexico, Utah, Colorado, Mexico
Keywords: Habitat, History, Management, Status

Minckley, W. L., and J. E. Deacon. 1968. Southwestern fishes and the enigma of "endangered species." Science 159:1424-1432.

Description of what endangered means and status of selected fishes are discussed. Declines of populations of native fish in the Southwest are largely due to habitat changes caused by man.

Location of Study: Southwest
Keywords: History, Habitat, Status, Endangered

Minckley, W. L., P. C. Marsh, J. E. Brooks, J. E. Johnson, and B. L. Jensen. 1991a. Management toward recovery of the razorback sucker. Pp. 303-357 *in* W. L. Minckley and J. E. Deacon, editors, Battle against extinction: native fish management in the American West. University of Arizona Press, Tucson, AZ.

This chapter tells about efforts to re-establish the razorback sucker. Historical information is presented to show why decline occurred. Biological information on the razorback is included in the chapter. A recovery plan is presented and how the plan was derived.

Location of Study: West
Keywords: Razorback, Habitat, Distribution, Endangered, Management, Characteristics

Minckley, W. L., G. K. Meffe, and D. L. Soltz. 1991b. Conservation and management of short-lived fishes: the cyprinodontoids. Pp. 247-282 *in* W. L. Minckley and J. E. Deacon, editors, Battle against extinction: native fish management in the American West. University of Arizona Press, Tucson, AZ.

Chapter provides a general overview of four families of fish (Cyprinodontidae, Goodeidae, Fundulidae, and Poeciliidae) found in western North America. Discusses their biology and management, lists the species and their status, and provides specific examples of declines and recovers. Endangered species conservation is also discussed in general.

Location of Study: West
Keywords: Pupfish, Mosquitofish, Killifish, Topminnow, Habitat, Characteristics, Management, Extinctions

Modde, T., and T. B. Hardy. 1992. Influence of different microhabitat criteria on salmonid habitat simulation. Rivers 3(1):37-44.

Papers examines differences in predicted habitat using the Physical Habitat Simulation (PHABSIM) system given Suitability Index (SI) curves determined from three classes of macrohabitat versus composite curves using all the data. It is suggested that combining all microhabitat values into a composite suitability curve is less representative of a population than one constructed by stratifying use by macrohabitat type.

Location of Study: Wyoming
Keywords: Models, Trout, PHABSIM, SI, Habitat

Moore, K. M. S., and S. V. Gregory. 1989. Geomorphic and riparian influences on the distribution and abundance of salmonids in a Cascade Mountain stream. Pp. 256-261 *in* D. L. Abell, technical coordinator, Protection, management, and restoration for the 1990's. Proceeds of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

Study occurred in Cascade Mountains, Oregon, on fourth-order stream. Trout occurred in unconstrained reaches in greater abundance. This greater abundance was related to habitat structure, the influence of riparian canopy on stream productivity, and stream morphology on stream hydraulics. Landforms are the major determinants of stream complexity and habitat structure. Constrained reaches had Douglas fir and Western hemlock vegetation and unconstrained streamside vegetation was dominated by willow and red alder. Because the canopy was more open on unconstrained reaches, there was more light available for increased prey production of macroinvertebrates.

Location of Study: Oregon
Keywords: Trout, Vegetation, Canopy

Mueller, G. 1989. Observations of spawning razorback sucker (*Xyrauchen texanus*) utilizing riverine habitat in the lower Colorado River, Arizona-Nevada. Southwestern Naturalist 34(1):147-149.

Notes on observations of razorback sucker spawning downstream from Hoover Dam in the lower Colorado River. Searches for spawning beds were made by divers using scuba equipment. Spawning behavior was similar to that reported in reservoirs, however males appeared to be less mobile in the river. It is possible that the riverine conditions discovered may be more like what the habitat was before man's influence on the system.

Location of Study: Arizona, Nevada
Keywords: Reproduction, Habitat, Substrate

Ohmart, R. D., B. W. Anderson, and W. C. Hunter. 1988. The ecology of the lower Colorado River from Davis Dam to the Mexico-United States international boundary: a community profile. US Fish and Wildlife Service Biological Report 85(7.19).

This is a report that covers the lower Colorado River system from Davis Dam south to Mexico. It is a compilation of information describing the ecology of the river and its adjacent riparian ecosystem. It contains historical information about the river and its past management. How wildlife and riparian vegetation interact is addressed, as well as how vegetation is affected by flooding.

Location of Study: Arizona, California, Nevada, Mexico
Keywords: Ecology, Habitat, Functions, Vegetation, History

Ohmart, R. D., and B. W. Anderson. 1982. North American desert riparian ecosystems. Pp. 433-479 *in* G. L. Bender, editor, Reference handbook on the deserts of North America, Greenwood Press, Westport CT.

This book chapter discusses desert riparian systems. Included are physical characteristics (geomorphology), characteristic vegetation, general description of each North American desert and characteristic fauna (fishes, amphibians, reptiles, birds, mammals) within each desert. The authors emphasize information bird use of desert riparian areas and avian relationships with vegetation structure

and function. Give descriptions of how some plant and animal species have co-evolved. Also a section concerning the importance and modification of riparian habitat by man. An appendix is included listing riparian birds, amphibians, and reptiles.

Location of Study: West
Keywords: Management, Vegetation, Functions, Values, Characteristics

Ohmart, R. D,. and B. W. Anderson. 1986. Riparian habitat. Pp. 169-199 *in* A. Y. Cooperrider, R. J. Boyd, and H. R. Stuart, editors, Inventory and monitoring of wildlife habitat. U.S. Department of the Interior, Bureau of Land Management Service Center, Denver, CO. 858 pp.

Chapter provides an overview of riparian habitat, classification systems, important functions and values to wildlife, data collection priorities, and effects of land management activities on riparian systems.

Location of Study: West
Keywords: Functions, Habitat, Management, Classification, Vegetation, Structure

Platts, W. S. 1979. Livestock grazing and riparian/stream ecosystems — an overview. Pp. 39-45 *in* O. B. Cope, ed., Proceedings of the forum — grazing and riparian/stream ecosystems, 3-4 November 1978. Trout Unlimited, Inc.

Article presents historical information about livestock grazing, fisheries needs, effects of livestock grazing, and what should be done. Streamside vegetation along with undercut banks and streamside debris provide cover for fish. It also provides habitat for terrestrial insects that are part of the fishes' diet. Vegetation also shades the stream to ameliorate temperatures and protects the stream banks from erosive energy.

Location of Study: West
Keywords: Cattle, Trout, Vegetation, Channel, Structure, Function

Platts, W. S. 1989. Compatibility of livestock grazing strategies with fisheries. Pp. 103-110 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Livestock grazing has been managed to improve upland habitats. However, grazing in stream-riparian habitats has not been managed. Management strategies must determined that will be able to provide forage while at the same time not destroy the stream-riparian habitat. Several examples of grazing plans are given and are rated as to providing good fisheries habitat.

Location of Study: West
Keywords: Habitat, Cattle, Management

Platts, W. S., and R. L. Nelson. 1985. Stream habitat and fisheries response to livestock grazing and instream improvement structures, Big Creek, Utah. Journal of Soil and Water Conservation 49(4):374-379.

Habitat for fishes was compared between an area that was heavily grazed and one that had been rested from grazing for 11 years. Riparian vegetation improved dramatically on the ungrazed area and with streambanks and stream channel conditions. However, because of upstream influences, onsite improvement structures that trapped sediment, and the artificial nature of the fishery the fish populations did not respond to the habitat improvements in such a small livestock exclosure.

Location of Study: Utah
Keywords: Trout, Habitat, Vegetation, Cattle, Management

Platts, W. S., and R. L. Nelson. 1989a. Stream canopy and its relationship to salmonid biomass in the Intermountain West. North American Journal of Fisheries Management 9:446-457.

Studied stream canopy conditions on streams in northern Rocky Mountains and the Great Basin. Measured several riparian habitat components including canopy density, light intensity, unobstructed sun arc, and average potential daily thermal input in grazed and ungrazed (rested) portions of each stream. The sun arc was significant and positively correlated with thermal input and was the best overall predictor of salmonid biomass per unit volume. Thermal input was a better predictor of salmonid biomass in the Great Basin versus Rocky Mountain. In both regions the data suggested that maintenance of adequate riparian overstory is critical if interior streams are to be good salmonid producers.

Location of Study: Idaho, Utah, Nevada
Keywords: Salmon, Trout, Vegetation, Canopy

Platts, W. S., and J. N. Rinne. 1985. Riparian and stream enhancement management and research in the Rocky Mountains. North American Journal of Fisheries Management 5(2A):115-125.

A review of stream enhancement research in the Rocky Mountains and how well it has worked. Recommendations for further research to improve the effectiveness of stream enhancement projects. The importance of vegetation to a stream is discussed. Fish are attracted to stable, well-vegetated banks because they provide cover, control water temperatures and velocities, and supply terrestrial food. Artificial stream enhancement should never be used to circumvent the real causes of stream degradation.

Location of Study: West
Keywords: Habitat, Vegetation, Function, Structure, Threatened, Management

Rhodes, H. A., and W. A. Hubert. 1991. Submerged undercut banks as macroinvertebrate habitat in a subalpine meadow stream. Hydrobiologia 213:149-153.

Comparison of macroinvertebrate samples from stream in Wyoming in riffles and pools and submerged undercut banks. Summer (July) samples had substantially more macroinvertebrates in submerged undercut banks than riffles and pools. In fall (September) there was little difference between areas. Submerged undercut banks serve not only as cover but as a source of food for fish in small streams.

Location of Study: Wyoming
Keywords: Habitat, Functions, Vegetation, Trout

Rinne, J. N. 1985. Livestock grazing effects on Southwestern streams: a complex research problem. Pp. 295-299 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Study conducted in New Mexico. Brown trout and Rio Grande chub were found most under cut banks and in pools. Paper stressed importance of long-term data collection to define natural variability.

Location of Study: New Mexico
Keywords: Trout, Chub, Habitat, Cattle

Rinne, J. N. 1989. Physical habitat use by loach minnow, *Tiaroga cobitus* (Pisces: Cyprinidae), in Southwestern desert streams. Southwestern Naturalist 34(1)_109-117.

The loach minnow is an obligate riffle-dwelling fish that inhabits shallow water with 30-40 cm/s current over gravel to cobble substrate. Different habitats were used depending stream size and availability and appeared to be related to fish size and response to the current. Loach minnow is widely adapted to physical habitat and loss of habitat has led to its demise.

Location of Study: Arizona
Keywords: Habitat, Characteristics

Rinne, J. N. 1991. Habitat use by spikedace, *Meda fulgida* (Pisces: Cyprinidae) in Southwestern streams with reference to probable habitat competition by red shiner *Notropis lutrensis* (Pisces: Cyprinidae). Southwestern Naturalist 36(1):7-13.

Study of habitat of the spikedace, a native fish species endemic to the Gila River basin. Spikedace preferred deeper, slower-moving waters that were characterized by eddying currents and shear zones associated with stream gradient adjustments. The introduced red shiner is a generalist and often becomes more abundant in degraded habitat. Red shiner is more tolerant of turbid water than spikedace.

Location of Study: Arizona
Keywords: Habitat, Competition, Characteristics, Substrate

Rinne, J. N. 1993. A wildlife viewpoint. Southwestern riparian-stream areas: habitats for fishes. Pp. 46-51 *in* B. Tellman, H. J. Cortner, M. G. Wallace, L. F. DeBano, and R. H. Hamre. Riparian management: common threads and shared interests. Proceedings of a Western regional conference on river management strategies, February 4-6, 1993, Albuquerque, New Mexico. USDA Forest Service, General Technical Report RM-226, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 419 pp.

Paper discusses the various components of riparian-stream areas and their importance to fish and the changes in Southwestern aquatic habitats. Trees provide shade, roots stabilize banks, and dead branches and leaves provide debris for cover. Alteration of flows of major rivers has caused declines in native fishes. Eighty percent of Arizona's native fishes and 60% of Southwestern fishes are endangered or sensitive species.

Location of Study: Arizona
Keywords: General, Vegetation, Structure, Habitat, Native

Rinne, J. N., and W. L. Minckley. 1991. Native fishes of arid lands: a dwindling resource of the desert Southwest. USDA Forest Service, General Technical Report RM-206, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Goal of publication to increase public awareness of endangered fishes. Covers historic aspects of the rivers and streams of the West. Provides life-history traits, species unique characters, and historic and present values.

Location of Study: Southwest
Keywords: History, Habitat, Trout, Vegetation, Functions

Rosgen, D. L. 1985. A stream classification system. Pp. 91-95 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Factors that can influence fisheries include riparian vegetation, organic debris and/or channel blockages, stream size (width), flow regimen (perennial, ephemeral, subterranean, intermittent channels, streamflow variations and sources; storm flow, snowmelt, glacial fed, etc.), depositional features, and meander patterns.

Location of Study: General
Keywords: Classification, Habitat, Functions

Stolzenburg, W. 1993. A river floods through it. Nature Conservancy May/June:23-27.

Article written about the importance of flooding to natural systems in Southwest. Is about the Hassayampa River and occurrence of 10-year flood in 1991. Is a nice illustration depicting the stages of a stream's life. Not a scientifically written, peer-reviewed article, but interesting.

Location of Study: Arizona
Keywords: Cottonwood, Willow, Flood, Functions, Vegetation

Stuber, R. J. 1985. Trout habitat, abundance, and fishing opportunities in fenced vs. unfenced riparian habitats along Sheep Creek, Colorado. Pp. 310-314 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Well-developed riparian vegetation provides cover, streambank stabilization, shading for temperature regulation, and as a source of allochthonous food input for salmonids. Depth is important in providing a combination of pools, cover, and instream movement areas for trout.

Location of Study: Colorado
Keywords: Trout, Cattle, Vegetation, Function

Sullivan, M. E., and M. E. Richardson. 1993. Functions and values of the Verde River riparian ecosystem and an assessment of adverse impacts to these resources. Report to US Environmental Protection Agency, Region IX, San Francisco, CA. US Fish and Wildlife Service, Arizona Ecological Services Office, Phoenix, AZ.

An evaluation of the functions and values of the Verde River based on the Wetland Evaluation (WET) technique, Vols. I and II. Volume II was not used because it did not allow flexibility to adjust the system to arid Southwestern characteristics. The Verde is a major perennial stream in the state and provides fish and wildlife habitat and recreational opportunities. Direct threats to the river include sand and gravel operations, agricultural irrigation diversions, grazing activities, increased urbanization, and recreational activities. The purpose of ADID (Advanced Identification) is to facilitate protection of a specific aquatic ecosystem. Covered 125 miles of Verde from Sullivan Lake to Horseshoe Dam. Divided river into seven reaches and also included tributaries.

Location of Study: Arizona
Keywords: Verde, Functions, Habitat, Soils, Structure, Vegetation

Swanson, G. A., technical coordinator. 1979. The mitigation symposium: a national workshop on mitigating losses of fish and wildlife habitats. Proceedings of the symposium, 16-20 July 1979, Fort Collins, CO. USDA Forest Service, General Technical Report RM-65, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Nine private organizations and eight federal agencies cosponsored the symposium, which consisted of 133 papers. Topics included: coastal zone wetlands; inland wetlands; economic considerations; mining, oil and gas; planning, evaluation, and inventory; surveys; power projects; terrestrial management; aquatic management; legal and political considerations; transportation systems; and state perspectives.

Location of Study: General
Keywords: Proceedings, Mitigation, Wildlife, Habitat

Szaro, R. C., and J. N. Rinne. 1988. Ecosystem approach to management of Southwestern riparian communities. Transactions of the 53rd North American Wildlife and Natural Resources Conference 1988:502-511.

Five-year study of riparian areas of upper, intermediate, and low elevations in the Southwest. Rio de las Vacas, New Mexico was upper elevation; Mogollon Rim, Arizona, was intermediate elevation; and Queen Creek, Arizona, was low elevation. Study was conducted to show need of long-term ecosystem approach. Data were collected on fish, amphibians, reptiles, birds, and small mammals in grazed and ungrazed areas. Management decisions should not be based on only a year or two of data.

Location of Study: Arizona, New Mexico
Keywords: Management, Habitat, Cattle

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979a. Wildlife habitats in management rangelands — the Great Basin of southeastern Oregon: riparian zones. USDA Forest Service, General Technical Report PNW-80, Pacific Northwest Forest and Range Experiment Station, Portland, OR.

Riparian areas are the most critical wildlife habitats in managed rangelands. More wildlife depends entirely on or spends disproportionately more time in riparian habitat than in others. Riparian areas are also important for grazing, recreation, timber, fisheries, roads, and water quality and quantity. The importance to wildlife is examined and recommendations provided for management.

Location of Study: Oregon
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979b. Riparian zones in managed rangelands—their importance to wildlife. Pp. 21-30 *in* O. B. Cope, ed., Proceedings of the forum — grazing and riparian/stream ecosystems, 3-4 November 1978. Trout Unlimited, Inc.

Discusses the importance of riparian habitats to wildlife. Some reasons include: the actual presence of water for drinking; availability of water to plants which in turn provide food and cover to many species, riparian habitats with deciduous vegetation may provide different habitats dependent upon season of the year; provide nesting habitat; thermal cover and microclimate; migration routes for wildlife; and serve as connectors between habitats. Paper also covers riparian habitat sensitivity to disturbance and management considerations.

Location of Study: West
Keywords: Habitat, Management, Cattle, Vegetation, Functions, Values

Tyus, H. M. 1991. Ecology and management of Colorado squawfish. Pp. 379-402 *in* W. L. Minckley and J. E. Deacon, editors, Battle against extinction: native fish management in the American West. University of Arizona Press, Tucson, AZ.

This chapter summarizes information about the Colorado squawfish. Current knowledge of the life cycle, status, and management options are all presented. Has been virtually eliminated from the lower Colorado River basin in California and Arizona. It is currently found in its largest numbers in the Green River sub-basin.

Location of Study: West
Keywords: Squawfish, Habitat, Distribution, Endangered, Management, Characteristics

Tyus, H. M. 1992. An instream flow philosophy for recovering endangered Colorado River fishes. Rivers 3(1):27-36.

Reports the status of the endangered, big-river fishes of the Colorado, compares two ideas about how instream flows should be determined and implemented, and recommendations on how to determine instream flows for endangered Colorado River fishes which will promote recovery and lessen the possibility of other fishes declining.

Location of Study: Southwest
Keywords: Colorado, Chub, Sucker, Squawfish, Catfish, Habitat, Instream

U.S. Fish and Wildlife Service. 1991. Endangered and threatened species of Arizona. With 1992 Addendum. Summer 1991. Ecological Services Field Office, U.S. Fish and Wildlife Service, Phoenix, AZ.

This is a listing of federally listed plants and animals of Arizona compiled by the Phoenix Office. Each listing provides a sketch of the plant or animal, an Arizona distribution map, its status, species description, habitat, range, reasons for decline/vulnerability, land management/ownership and notes.

Location of Study: Arizona
Keywords: Endangered, Threatened

U.S. Fish and Wildlife Service. 1992. Recovery plan for Sonora chub (*Gila ditaenia*). U.S. Fish and Wildlife Service, Region 2, Albuquerque, New Mexico. 50 pp.

The Sonora chub occurs in Arizona in the Sycamore Creek drainage of the Santa Cruz. Is listed as threatened by Fish and Wildlife Service since introduction of exotic fishes and their parasites and by potential mining in 1986. It is the only native fish in Sycamore Creek. Predators include coati, raccoon, Belted Kingfisher, herons garter snakes, giant water bugs and other large predaceous insects, and amphibians such as bullfrog and Tarahumara frog (now extirpated from U.S.). In Sycamore Creek the Sonora chub is found most in the largest, deepest permanent pools.

Location of Study: Arizona
Keywords: Chub, Threatened, Habitat

Valdez, R. A., P. B. Holden, and T. B. Hardy. 1990. Habitat Suitability Index curves for humpback chub of the Upper Colorado River basin. River 1(1):31-42.

Fourteen Habitat Suitability Index (SI) curves were developed for the humpback chub associating four life stages with three microhabitat parameters. These were developed in open workshops using the biological knowledge of experts. Emphasized that these curves are subject to refinement.

Location of Study: West
Keywords: Humpback, Chub, Models, PHABSIM, SI, Habitat

Van Velson, R. 1979. Effects of livestock grazing upon rainbow trout in Otter Creek, Nebraska. Pp. 53-55 *in* O. B. Cope, editor, Proceedings of the forum — grazing and riparian/stream ecosystems, 3-4 November 1978, Denver, CO. Published by Trout Unlimited, Inc.

Paper about how quickly a stream can recover after removal of cattle grazing. Nebraska Game and Parks Commission leased and fenced 114.2 acres in the upper 2 miles of Otter Creek. Within one year of fencing, vegetation began reestablishing itself and provided shade which cooled water temperatures 4°F. Grasses provided stability to banks, most of which were stabilized by end of summer. Willows were regenerating and the second year provided food and cover for deer. Watercress encroached into the water protecting the bank, which in turn, decreased the width of the stream and increased velocities. This increased velocity flushed out sand and silt to leave spawning gravel for trout. Other features returned to the stream as well.

Location of Study: Nebraska
Keywords: Trout, Habitat, Cattle, Management, Vegetation, Functions

Vives, S. P., and W. L. Minckley. 1990. Autumn spawning and other reproductive notes on loach minnow, a threatened cyprinid fish of the American Southwest. Southwestern Naturalist 35(4):451-454.

The loach minnow was studied in Aravaipa Creek. Two nest cavities were found that faced downstream and were located beneath rocks embedded in the bottom on their upstream sides and slightly elevated on the downstream sides. Previous studies in the same area had discovered nests located under rocks, in fine to coarse sand, with an average water depth of 10.8 cm. Summer floods have been suggested as a cue for reproductive activities in Southwestern fishes.

Location of Study: Arizona
Keywords: Habitat, Characteristics, Reproduction

Warner, R. E., and K. M Hendrix, editors. 1984. California riparian systems: ecology, conservation, and management. University of California Press, Berkeley and Los Angeles, CA.

Proceedings of a conference held in Davis, CA to bring together a wide range of riparian interests. Conference goals were to define major riparian concepts, problems and opportunities; promote discussion and information exchange among riparian interests; and to establish a technical and communicative base for long-term, riparian planning. Papers were not only from California but 10 other states and Washington, D.C. Broad topics included biogeography and dynamics of change in riparian systems; structure, status and trends in the condition of riparian systems; hydrologic and hydraulic considerations in structure, function, and protection of riparian systems; aquatic/riparian interactions; riparian/upland interactions with special reference to wildlife and agriculture; economic and social values; riparian systems and the law; classification, inventory, and monitoring of riparian systems; national and regional trends; riparian restoration; riparian systems and water diversion projects; problems and opportunities of riparian vegetation on levee systems; ecology of birds in riparian systems; coastal zone riparian systems; unique and ecological problems of California desert riparian systems; sustained yield production in riparian systems; cultural, ecological, recreational, and aesthetic values; integrated approaches; local riparian initiatives; Rivers and Harbors Act, Section 404, and riparian system conservation; ecology on nonavian wildlife in riparian systems; and developing management strategies.

Location of Study: General
Keywords: Proceedings, Habitat, Functions, Values, Wildlife

Wesche, T. A., C. M. Goertler, and C. B. Frye. 1985. Importance and evaluation of instream and riparian cover in smaller trout streams. Pp. 325-328 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Three components of cover in smaller streams are (1) instream rubble and boulders areas (substrate particle size ≥7.6 cm) with at least 15 cm of water; (2) overhead bank cover, including undercut banks, overhanging vegetation, logs, and debris jams having effective widths of ≥9 cm with water at least 15 cm deep; and (3) deep pools at least 45 cm deep. Riparian vegetation contributes significantly to cover

by creating quiet, shaded resting areas; contributing material to debris jams; and roots are important to the development and stability of undercut banks.

Location of Study: Wyoming
Keywords: Trout, Vegetation, Function, Structure

Wesche, T. A., C. M. Goertler, and C. B. Frye. 1987. Contributions of riparian vegetation to trout cover in small streams. North American Journal of Fisheries Management 7:151-153.

Cover is an important component of trout habitat that results from the geomorphologic characteristics of a stream channel, the interface of the stream bank with the riparian community, and the flow of the stream. Study showed that overhead bank cover, primarily by vegetation, explained the greatest amount of variation in trout population size.

Location of Study: Wyoming
Keywords: Trout, Vegetation, Cover, Functions

Williams, J. E., D. B. Bowman, J. E. Brooks, A. A. Echelle, R. J. Edwards, D. A. Hendrickson, and J. J. Landye. 1985. Endangered aquatic ecosystems in North American deserts with a list of vanishing fishes of the region. Journal of the Arizona-Nevada Academy of Science 20(1):1-61.

Endangered habitats throughout the Southwest and Mexico are identified along with the fishes, amphibians, reptiles, and invertebrates that are also disappearing. Fifteen different ecosystems are discussed.

Location of Study: Southwest, Mexico
Keywords: Habitat, Threatened, Endangered

Wilzbach, M. A. 1989. How tight is the linkage between trees and trout? Pp. 250-255 *in* D. L. Abell, technical coordinator, Protection, management, and restoration for the 1990's. Proceeds of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

Whether or not riparian vegetation provides an open or closed canopy is important to stream temperature. In summer, most heat is from direct solar radiation and a closed canopy reduces it as much as 85%. A closed canopy will stop heat loss in winter. Temperature is very important to trout — at cool temperatures trout were able to survive with a competitive species but at warmer temperatures trout could not compete as well. Open or closed canopy also affects food availability to trout. Light intensity affects foraging efficiency and plays a major role in determining the food resource base for the invertebrate prey community and its composition. A combination of turnover time of litter decomposition and whether or not the canopy is closed may predict the availability and productivity of the food base.

Location of Study: General
Keywords: Trout, Vegetation, Canopy

Arizona Riparian Council. 1990. Protection and enhancement of riparian ecosystems (an annotated bibliography). Protection and Enhancement Committee, Arizona Riparian Council, Center for Environmental Studies, Arizona State University, Tempe. AZ.

Annotated bibliography (selective and brief) on bank stabilization techniques; beavers; general information; influence of and protection from livestock; management; natural history; plant propagation; revegetation techniques; seedlings and regeneration; and vegetation management.

Location of Study: General
Keywords: Bibliography, Beaver, Cattle, Vegetation, Cottonwood, Willow

Bohn, C. 1989. Management of winter soil temperatures to control streambank erosion. Pp. 69-71 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Vegetation covering streambanks keeps soil temperatures warmer in winter, thus less ice is formed in the soil to weaken the internal structure of the banks. Weakened banks are less able to withstand flood flows. Good streambank vegetation insulates the soil and helps control frost-heaving and internal soil weakening.

Location of Study: Nevada
Keywords: Vegetation, Functions, Values, Management

Brown, S., M. M. Brinson, and A. E. Lugo. 1978. Structure and function of riparian wetlands. Pp. 17-31 *in* R. R. Johnson and J. F. McCormick, technical coordinators, Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

Study compared flowing water riparian areas and still water wetlands. Determined that flowing water areas had higher rates of gross primary productivity, respiration, litter fall, net biomass production, and organic matter export than still water areas. Riparian areas are highly productivity but when altered in some way (i.e., diking, damming, overgrazing, etc.) the system loses its vigor and rapidly deteriorates.

Location of Study: General
Keywords: Structure, Functions, Value

Crane, J. H. 1988. Relationships between palustrine wetlands of forested riparian floodplains and fishery resources: a review. U.S. Fish and Wildlife Service Biological Report 88(32).

Paper is the proceedings of a workshop held to identify priority information needs for nontidal, freshwater palustrine and riverine wetlands. One need was to document the values of fish of palustrine wetlands that are generally tree- and shrub-dominated floodplains of streams that flow to coastal areas of the eastern United States. Although the workshop concentrated on the eastern part of the U.S., many of the same principles apply to the West. Wetlands moderate the effects of flooding, maintain and improve water quality, provide fish and wildlife habitat, support food chains, and have aesthetic and heritage values.

Location of Study: General
Keywords: Habitat, Hydroperiod, Flooding, Floodplain, Functions, Values

Dahl, T. E. 1990. Wetland losses in the United States 1780's to 1980's. US Department of the Interior, Fish and Wildlife Service, Washington, D.C.

Wetlands in the entire country have shown a dramatic decrease from the 1780s to 1980s. Nearly one-third of all of the wetlands lost since our country was formed have been in the Midwest. Alaska is the only state where wetlands have not been substantially reduced. In Arizona, wetlands decreased 36% in the same time period according to this author. So many wetlands have been lost that not only wildlife but also humans are being threatened by losses of groundwater supplies, poor water quality, shoreline erosion, lack of floodwater storage and trapping of sediment, and climatic changes.

Location of Study: General
Keywords: Wetland, Loss

DeBano, L., and L. J. Schmidt. 1989. Interrelationships between watershed condition and health of riparian areas in southwestern United States. Pp. 45-53 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Paper about the importance of watershed condition and how riparian areas are dependent upon them. Information about watershed degradation from timber cutting, overgrazing, roads, etc. and other misuses. Stresses the importance of the balance between watershed and riparian. Provides some guidelines for improving watershed condition and riparian health with a table of conditions that threaten riparian areas and possible treatments to remedy degraded systems.

Location of Study: Southwest
Keywords: Vegetation, Watershed, Management

Erman, N. A. 1984. The use of riparian systems by aquatic insects. Pp. 177-181 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

A portion of nearly all aquatic insects' lives are spent in riparian areas. They are directly or indirect dependent on riparian vegetation at some stage in their life cycle. In small streams, vegetation provides shade as well as food for aquatic insects. Those insects in wider downstream areas depend on the same food that has been chewed and egested by those insects in the smaller portion of the stream. Aquatic insects feed on other insects and in turn fish, lizards, frogs, toads, etc. eat them. Some insect larvae actually leave the water and feed on streamside vegetation. Others leave the water to pupate in the soil or in rotting trees and logs or on live vegetation. Eggs are often laid on overhanging vegetation so that when they hatch the larvae have a way to enter the water.

Location of Study: California
Keywords: Vegetation, Caddisfly, Structure, Functions, Values

Glinski, R. L., and R. D. Ohmart. 1983. Breeding ecology of the Mississippi Kite in Arizona. Condor 85:200-207.

Extension of the Mississippi Kites distribution range into Arizona has taken place. Study was conducted along tributaries of the Gila River. Nesting habitat was in cottonwood with a saltcedar understory. This created a very structurally diverse habitat. Cicadas were the principal prey item and half of the noninsect prey deliveries (56) were of Western pipestrelle bats.

Location of Study: Arizona
Keywords: Kite, Habitat, Breeding, Vegetation, Structure, Food

Glinski, R. L., and R. D. Ohmart. 1984. Factors of reproduction and population densities in the Apache cicada (*Diceroprocta apache*). Southwestern Naturalist 29(1):73-79.

The Apache cicada occurred in dense populations from June through August, with peak density in July. Their reproduction was dependent upon the plant species used for oviposition. Cottonwood and willow had the greatest number of eggs per twig but saltcedar provided more sites because of its dense, branching growth form. Cicadas are an important food source for birds.

Location of Study: Arizona
Keywords: Reproduction, Cicadas, Vegetation

Gray, L. J. 1981. Species composition and life histories of aquatic insects in a lowland Sonoran Desert stream. American Midland Naturalist 106(2):229-242.

Sycamore Creek study collected 99 taxa of insects and 104 taxa of macroinvertebrates from July 1977 to November 1979. Organisms were primarily restricted to the Southwest, but were some Nearctic taxa. Drought and flooding influence life history; adaptations to both drought and flooding were shown.

Location of Study: Arizona
Keywords: Habitat, Adaptation, Macroinvertebrates, Drought, Flood, Stonefly, Caddisfly, Mayfly, Beetle

Green, D. M., and J. B. Kauffman. 1989. Nutrient cycling at the land-water interface: the importance of the riparian zone. Pp. 61-68 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

Riparian ecosystems are important areas for biogeochemical processes which affect the species composition and structure of the terrestrial and aquatic system. They are important for cycling nutrients. A major source of energy and nutrients is riparian vegetation. The vegetation reduces the speed and erosive action of overbank flows, thus allowing sediment deposition. It also provides shade to moderate water temperatures. Biogeographical processes influence water quality, the aquatic ecosystem, and the pattern and productivity of the riparian vegetation.

Location of Study: Oregon
Keywords: Nutrients, Functions, Values, Vegetation

Gregory, S. V., G. A. Lamberti, and K. M. S. Moore. 1989. Influence of valley floor landforms on stream ecosystems. Pp. 3-8 *in* D. L. Abell, technical coordinator, Protection, management, and restoration for the 1990's. Proceeds of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

Critical functions of riparian vegetation include shading, bank stabilization, uptake of nutrients, input of leaves, retention of particulate organic matter during high flows, and contribution of debris. The organic materials supplied by riparian vegetation provides a major portion of the food base for stream ecosystems. Deciduous leaves are more valuable than coniferous needs to aquatic invertebrates. Shading limits primary productivity in smaller headwater streams, but its effort diminishes downstream as the stream widens. Riparian areas are an interface between terrestrial and aquatic ecosystems and because of this are "one of the most physically complex and biologically diverse components of the landscape."

Location of Study: General
Keywords: Functions, Vegetation

Hawkins, C. P., J. L. Kershner, P. A. Bisson, M. D. Bryant, L. M. Decker, S. V. Gregory, D. A. McCullough, C. K. Overton, G. H. Reeves, R. J. Steedman, and M. K. Young. 1993. A hierarchical approach to classifying stream habitat features. Fisheries 18(6):3-12.

This is a classification system for stream habitats using three levels of definitions based on morphological and hydraulic properties of channel geomorphic units. These geomorphic units are considered to be areas of relatively homogeneous depth and flow bounded by sharp gradients in both depth and flow. The basic level is two categories of fast- or slow-moving water. Fast water is broken down into turbulent or nonturbulent with further subdivisions of each. Slow water is also broken down to scour pool and dammed pool, which are also broken down further. Important features of this system

are that a stream can be quickly evaluated visually, the flexibility of using hierarchical classification for different objectives, and being able to conduct statistically sound, large-scale surveys.

Location of Study: General
Keywords: Classification, Habitat, Stream, Geomorphology

Jackson, J. K., and V. H. Resh. 1989. Activities and ecological role of adult aquatic insects in the riparian zone of streams. Pp. 342-345 *in* D. L. Abell, technical coordinator, Protection, management, and restoration for the 1990's. Proceeds of the California Riparian Systems Conference September 22-24, 1988, Davis, CA. USDA Forest Service General Technical Report PSW-110, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.

Most adult aquatic insects live briefly in the nearby riparian zone. Adult activities, such as mating, dispersal, and feeding, influence their distribution in the terrestrial habitat. Adult aquatic insects are a primary food resource for many riparian insectivores. Canopy plays an important role in production of insects, i.e., an opening of the stream canopy can increase production of immature stages of aquatic insects in the stream, thus providing more forage for stream insectivores such as trout. More immatures would lead to more adults for riparian insectivores such as birds and bats. This can also have an adverse effect because of other factors involved such as temperature.

Location of Study: California
Keywords: Vegetation, Canopy

Jahn, L. R. 1978. Values of riparian habitat to natural ecosystems. Pp. 157-160 *in* R. R. Johnson and J. F. McCormick, technical coordinators, Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

Vegetation in riparian habitats stabilize soils and supply organic material that sustains aquatic communities. Floodwaters periodically deposit nutrient-rich silt which enrich the soils that support the vegetation. Quality waters support fish populations. Values include water resources (storage, recharge, quality), living resources (fish, wildlife, plants), cultural resources (recreation, archaeological and historical sites, education), and cultivated resources (agriculture, aquaculture, forestry).

Location of Study: General
Keywords: Functions, Values

Johnson, R. R., and D. A. Jones, technical coordinators. 1977. Importance, preservation and management of riparian habitat: a symposium. Proceedings of symposium, 9 July 1977, Tucson, Arizona. USDA Forest Service General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

The proceedings of this symposium include papers on the importance of riparian habitats, their values, and management of riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., and J. F. McCormick, technical coordinators. 1978. Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Proceedings of the symposium, December 11-13, 1978, Callaway Gardens, GA. USDA Forest Service, General Technical Report WO-12, Washington, D.C.

The proceedings of this symposium include papers on characteristics, values, and management of floodplain wetlands and other riparian ecosystems.

Location of Study: General
Keywords: Proceedings, Habitat, Values, Functions

Johnson, R. R., C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators. 1985. Riparian ecosystems and their management: reconciling conflicting uses. Proceedings of the First North American Riparian Conference, April 16-18, 1985, Tucson, AZ. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 523 pp.

These proceedings include papers on: physical characteristics, hydrology, and ecology of riparian ecosystems; riparian resources of recreation, agriculture, wildlife, livestock use, birds, fisheries, amphibians, and reptiles; multiple-use planning and management; legal and institutional needs; and riparian ecosystems in arid zones of the world.

Location of Study: General
Keywords: Proceedings, Functions, Management, Habitat

Kennedy, C. E. 1977. Wildlife conflicts in riparian management: water. Pp. 52-58 *in* R. R. Johnson and D. A. Jones, technical coordinators, Importance, preservation and management of riparian habitat: a symposium. Proceedings of the symposium July 9, 1977, Tucson, AZ. USDA Forest Service, General Technical Report RM-43, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Fishery resource is energy dependent on riparian vegetation and the watershed. Overgrazing can cause complete changes in the type of riparian vegetation along a stream and cause the channel to change. Lack of riparian vegetation causes less bank stabilization which broadens and causes streams to be more shallow.

Location of Study: Arizona, New Mexico
Keywords: Fishes, Cattle, Functions

Knight, A. W., and R. L. Bottorff. 1984. The importance of riparian vegetation to stream ecosystems. Pp. 160-167 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Vegetation is very important in determining structure and function of riparian systems. Many wildlife species either directly or indirectly use vegetation. Removal of vegetation affects stream organisms by decreasing food (detritus input); increasing the potential for primary productivity in plants; increasing summer temperatures of the water; changing the water quality and quantity; and decreasing terrestrial habitat for adult insects.

Location of Study: General
Keywords: Structure, Functions, Values, Vegetation

Knopf, F. L., R. R. Johnson, T. Rich, F. B. Samson, and R. C. Szaro. 1988. Conservation of riparian ecosystems in the United States. Wilson Bulletin 100(2):272-284.

Less than 1% of Western land in the U.S. is covered by riparian vegetation. It is very valuable habitat for breeding birds; i.e., 82% of all species in northern Colorado and 51% of all species in Southwestern states are dependent on riparian vegetation. Paper presents U.S. Government agency policies with regard to riparian habitat.

Location of Study: General
Keywords: Birds, Breeding, Policy, Conservation

Mahoney, D. L., and D. C. Erman. 1984. The role of streamside bufferstrips in the ecology of aquatic biota. Pp. 168-176 *in* R. E. Warner and K. M. Hendrix, editors, California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley and Los Angeles, CA.

Riparian vegetation is important as food to stream organisms, as cover and shade over small-order streams, and as bank stabilizers. Is most important as a food source on headwater streams and as shade and cover. As streams widen, the influence of vegetation changes to different functions. It still provides food in the form of drifting detritus, but algae begins to play more of a role. In wide streams vegetation acts as a bank stabilizer.

Location of Study: General
Keywords: Vegetation, Structure, Functions, Values

Minckley, W. L. 1979. Aquatic habitats and fishes of the lower Colorado River, southwestern United States. Final report to US Bureau of Reclamation, Lower Colorado Region, Boulder City, NV.

Study of the lower Colorado River conducted to (1) identify and quantify aquatic habitats; (2) to obtain data on relative abundances of aquatic organisms, mainly fishes, in those habitats; (3) to identify the food web relations within the fauna; and (4) to determine contributions of defined habitats to maintenance of the ecosystem.

Location of Study: Arizona, California
Keywords: Habitat, History, Channel, Characteristics

Ohmart, R. D., B. W. Anderson, and W. C. Hunter. 1988. The ecology of the lower Colorado River from Davis Dam to the Mexico-United States international boundary: a community profile. US Fish and Wildlife Service Biological Report 85(7.19).

This is a report that covers the lower Colorado River system from Davis Dam south to Mexico. It is a compilation of information describing the ecology of the river and its adjacent riparian ecosystem. It contains historical information about the river and its past management. How wildlife and riparian vegetation interact is addressed, as well as how vegetation is affected by flooding.

Location of Study: Arizona, California, Nevada, Mexico
Keywords: Ecology, Habitat, Functions, Vegetation, History

Platts, W. S., and R. L. Nelson. 1989b. Characteristics of riparian plant communities and streambanks with respect to grazing in northeastern Utah. Pp. 73-81 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

This was a study of grazed versus ungrazed streambanks and the vegetation composition of each. Riparian communities characterized by *Carex* spp. were able to maintain bank structure under grazing use, but others such as *Poa pratensis* did not hold up as well under grazing pressure.

Location of Study: Utah
Keywords: Vegetation, Functions, Values, Management

Rabeni, C. F., and G. W. Minshall. 1977. Factors affecting microdistribution of stream benthic insects. Oikos 29:33-43.

Microdistribution of stream insects in relation to current velocity, substratum, particle size, silt, and detritus was studied in field experiments. Addition of velocity along resulted in reduced numbers of four of five species, while a light coating of silt only reduced numbers of three species. The substratum-detritus interaction was most influential on microdistribution of stream insects.

Location of Study: Idaho
Keywords: Experiments, Substrate, Detritus, Habitat

Rhodes, H. A., and W. A. Hubert. 1991. Submerged undercut banks as macroinvertebrate habitat in a subalpine meadow stream. Hydrobiologia 213:149-153.

Comparison of macroinvertebrate samples from stream in Wyoming in riffles and pools and submerged undercut banks. Summer (July) samples had substantially more macroinvertebrates in submerged undercut banks than riffles and pools. In fall (September) there was little difference between areas. Submerged undercut banks serve not only as cover but as a source of food for fish in small streams.

Location of Study: Wyoming
Keywords: Habitat, Functions, Vegetation, Trout

Schaefer, J. M., and M. T. Brown. 1992. Designing and protecting river corridors for wildlife. Rivers 3(1):14-26.

Procedure to design and protect river corridors for wildlife based on integrating existing biological data into the decision-making process. The authors' methods include setting goals, determining species and their habitat needs, delineating corridors, establishing buffers, educating key audiences, selecting regulations and acquisition alternatives, determining compatibility of land uses, designing habitat management techniques, and evaluating the success of achieving these goals.

Location of Study: General
Keywords: Functions, Values, Protection

Schroeder, R. L. 1987. Community models for wildlife impact assessment: a review of concepts and approaches. U.S. Fish and Wildlife Service Biological Report 87(2). 41 pp

This document defines what communities are and what attributes of communities are measurable for impact assessment. Provides a description of several existing community models and how to decide which one to use for specific purposes. It is completed by having a summary of recommendations for implementation of concepts in wildlife community analyses.

Location of Study: General
Keywords: Models, HES, SCIES, WHAP, HSI, Wetland Evaluation, HEI, Arizona Guild, Indicator Species, Nutrient Retention, Primary Productivity

Schulz, T. D. 1983. Opportunistic foraging of Western Kingbirds on aggregations of tiger beetles. Auk 100:496-497.

Short communication on observations of foraging Western Kingbirds. The kingbirds used two dramatically different foraging modes which depended upon the prey distribution. First were observed sallying from perches to capture beetles, but when beetles clumped together on pond edge the kingbirds changed to hovering. This hovering flushed beetles out and made them easier to capture.

Location of Study: Arizona
Keywords: Kingbirds, Beetles, Foraging

Scott, J. M., F. Davis, B. Csuti, R. Noss, B. Butterfield, C. Groves, H. Anderson, S. Caicco, F. D'Erchia, T. C. Edwards, Jr., J. Ulliman, and R. Gerald Wright 1993. Gap analysis: a geographic approach to protection of biological diversity. Wildlife Monographs No. 123:1-41.

A model using geographic information systems (GIS) to identify gaps in the protection of biodiversity in areas managed for native species and natural ecosystems over a long term. Based on the use of vegetation types and butterfly species (or other taxa if enough distribution data is present) distribution as indicators of biodiversity. Gap analysis is a tool to help set land management priorities. It is limited by minimum unit size (small habitat patches can be missed), does not distinguish between seral stages, and does not indicate gradual ecotones. This is a coarse-filter approach to evaluation and should not be used strictly on its own, but in conjunction with additional studies.

Location of Study: General
Keywords: Model, Gap Analysis, GIS

Short, H. L. 1985. Management goals and habitat structure. Pp. 257-262 *in* R. R. Johnson, C. D. Ziebell, D. R. Patton, P. F. Ffolliott, and R. H. Hamre, technical coordinators, Riparian ecosystems and their management: reconciling conflicting uses. USDA Forest Service, General Technical Report RM-120, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Habitat structure, expressed as layers, provide a framework for developing management tools since many different land uses can be associated with layers of habitat. Vegetation structure of a riparian area, when expressed as layers, is a habitat criterion to aid in modeling and developing management strategies.

Location of Study: General
Keywords: Habitat, Vegetation, Structure

Skinner, Q. D., M. A. Smith, and T. A. Wesche. 1989. A survey of values associated with riparian conditions of a stream tributary to the Green/Colorado River. Pp. 175 *in* R. E. Gresswell, B. A. Barton, and J. L. Kershner, editors, Practical approaches to riparian resource management: an educational workshop. U.S. Bureau of Land Management, 222 N. 32nd Street, PO Box 36800, Billings, MO.

This is an expanded abstract and not a full paper. Salts and sediment contribute to nonpoint source pollution of streams. Often caused by accelerated erosion from overgrazed rangeland, downcut streams, and bank sloughing. Riparian vegetation is very important in filtering sediment from the stream.

Location of Study: Wyoming
Keywords: Vegetation, Functions

Smith, D. E., technical coordinator. 1975. Proceedings of the symposium on management of forest and range habitats for nongame birds. USDA Forest Service General Technical Report WO-1, Washington, D.C.

Purpose of the symposium was to initiate communication between resource managers and avian ecologists. Includes papers on birds and their habitat, management of deciduous forest habitats, management of range habitats, management of coniferous habitats, and management of nongame birds in policy and decision making.

Location of Study: General
Keywords: Proceedings, Management, Habitat, Values

Swanson, G. A., technical coordinator. 1979. The mitigation symposium: a national workshop on mitigating losses of fish and wildlife habitats. Proceedings of the symposium, 16-20 July 1979, Fort Collins, CO. USDA Forest Service, General Technical Report RM-65, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Nine private organizations and eight federal agencies cosponsored the symposium, which consisted of 133 papers. Topics included: coastal zone wetlands; inland wetlands; economic considerations; mining, oil and gas; planning, evaluation, and inventory; surveys; power projects; terrestrial management; aquatic management; legal and political considerations; transportation systems; and state perspectives.

Location of Study: General
Keywords: Proceedings, Mitigation, Wildlife, Habitat

Szaro, R. C., K. E. Severson, and D. R. Patton, technical coordinators. 1988. Management of amphibians, reptiles, and small mammals in North America. Proceedings of the symposium, 19-21 July 1988, Flagstaff, Arizona. USDA Forest Service General Technical Report RM-166, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Symposium held to bring scientists and manager together for the exchange of knowledge and ideas on habitat requirements, management needs, and other information on amphibians, reptiles, and small mammals. Topics include habitat models, habitat requirements, sampling designs and problems, community dynamics, and management recommendations.

Location of Study: General
Keywords: Proceedings, Habitats, Distributions, Models, Management

Tellman, B., H. J. Cortner, M. G. Wallace, L. F. DeBano, and R. H. Hamre. 1993. Riparian management: common threads and shared interests. Proceedings of a Western regional conference on river management strategies, February 4-6, 1993, Albuquerque, New Mexico. USDA Forest Service, General Technical Report RM-226, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 419 pp.

Purpose of the conference was to bring federal, state, and local agencies together with private sector interests to discuss strategies for an integrated approach to managing riparian areas that cross jurisdictional boundaries. Topics include: overview of rivers, different views of rivers, birds, beaver, vegetation, models, groundwater pumping, and many others.

Location of Study: West
Keywords: Proceedings, Function, Management, Habitat

U.S. Fish and Wildlife Service. 1991. Endangered and threatened species of Arizona. With 1992 Addendum. Summer 1991. Ecological Services Field Office, U.S. Fish and Wildlife Service, Phoenix, AZ.

This is a listing of federally listed plants and animals of Arizona compiled by the Phoenix Office. Each listing provides a sketch of the plant or animal, an Arizona distribution map, its status, species description, habitat, range, reasons for decline/vulnerability, land management/ownership and notes.

Location of Study: Arizona
Keywords: Endangered, Threatened

Warner, R. E., and K. M Hendrix, editors. 1984. California riparian systems: ecology, conservation, and management. University of California Press, Berkeley and Los Angeles, CA.

Proceedings of a conference held in Davis, CA to bring together a wide range of riparian interests. Conference goals were to define major riparian concepts, problems and opportunities; promote discussion and information exchange among riparian interests; and to establish a technical and communicative base for long-term, riparian planning. Papers were not only from California but 10 other states and Washington, D.C. Broad topics included biogeography and dynamics of change in riparian systems; structure, status and trends in the condition of riparian systems; hydrologic and hydraulic considerations in structure, function, and protection of riparian systems; aquatic/riparian interactions; riparian/upland interactions with special reference to wildlife and agriculture; economic and social values; riparian systems and the law; classification, inventory, and monitoring of riparian systems; national and regional trends; riparian restoration; riparian systems and water diversion projects; problems and opportunities of riparian vegetation on levee systems; ecology of birds in riparian systems; coastal zone riparian systems; unique and ecological problems of California desert riparian systems; sustained yield

production in riparian systems; cultural, ecological, recreational, and aesthetic values; integrated approaches; local riparian initiatives; Rivers and Harbors Act, Section 404, and riparian system conservation; ecology on nonavian wildlife in riparian systems; and developing management strategies.

Location of Study: General
Keywords: Proceedings, Habitat, Functions, Values, Wildlife

Williams, J. E., D. B. Bowman, J. E. Brooks, A. A. Echelle, R. J. Edwards, D. A. Hendrickson, and J. J. Landye. 1985. Endangered aquatic ecosystems in North American deserts with a list of vanishing fishes of the region. Journal of the Arizona-Nevada Academy of Science 20(1):1-61.

Endangered habitats throughout the Southwest and Mexico are identified along with the fishes, amphibians, reptiles, and invertebrates that are also disappearing. Fifteen different ecosystems are discussed.

Location of Study: Southwest, Mexico
Keywords: Habitat, Threatened, Endangered

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