

PROJECT REPORT

BIRD LIFE AT ANDERSON MARSH STATE PARK, 1983-84

Part I  
April - June, 1983

by  
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This report deals with the first three months of a year-long study initiated by a local society formed to promote the establishment and development of Anderson Marsh State Park.

The Friends of Anderson Marsh

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REPORT

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## OBJECTIVES

The major objectives of this study are:

1. To record the nature of the bird life at Anderson Marsh during the period of establishment of the Anderson Marsh State Park.
2. To ascertain the habitats and localities in the park where essential avian activities are carried out.
3. To seek indications as to sensitivity, i.e. susceptibility to disturbance from human use, of the wildlife, habitats, and localities within the State Park.

## METHODS

### How and when birds were observed.

The kinds of birds were determined by sight or sound in frequent periodic visits to the marsh as well as immediately adjacent grasslands and woodlands within the boundaries (actual and proposed) of the State Park. Observations began on April 12, 1983 and will continue through one complete year. On different trips observations were made at all hours from 5 AM to 9 PM. Dates of field trips were April 12, 13, 22; May 4, 10, 13, 16, 25; June 3, 6, 29. Results of work done subsequently will be reported separately.

The numbers of each kind of bird were recorded by tally of individuals seen during the walks and boat rides throughout the park. Duplicate sightings within a given field trip were eliminated from trip totals when recognized. Totals from each trip were added together to produce monthly and quarterly totals without further omission of duplications. Age classes and sex classes were recorded when distinguished.

When birds were under observation, their activities were noted and recorded in order to reveal resources being utilized in the various habitats. Brief indications were given in the field notes of actions seen in foraging and feeding, sheltering, territorial activities, and nesting, etc. All observations were later sorted out and entered into species files, so that all information for each species was filed together,

These indications of activities provided a basis for assessing the relative importance of the habitat types for the different birds. An expression of "importance of habitat" was devised from the total numbers of instances in which activities were observed at each habitat. For example, the Western Grebe was seen carrying on normal activities in three habitats: EMV, MAR, and OWA. Nine instances of activity were recorded in the first of these, seven in the second, and four in the third as summarized from Table 3. Thus, the "importance of habitat" rating becomes EMV-9, MAR-7, OWA-4. The three habitat types useful to

the Western Grebe at this time are revealed, and their relative importance for the grebe by the ratio, 9:7:4.

The common names of birds used in this report are from the checklist of North American Birds, 6th edition, by the American Ornithologists' Union, 1983.

#### Designation of Bird Habitats.

After an initial inspection April 12 and 13 of the Anderson Marsh Park area, including the McVicar Audubon Tract and the proposed acquisition area, Garner Island, habitats significant to birds were identified and sketched out on a base map (Figure 1). All habitat boundary lines shown are tentative approximations and not based on measurements.

Bird habitat designations are;

##### Open water. (Symbol: OWA)

Clear, open water usually more than 50 feet out from shore beyond emergent vegetation.

##### Emergent vegetation. (EMV)

Offshore, watery areas requiring access by boat and where tules or other marsh vegetation projected above the surface. In early spring the depth of water was as much as six feet in some places.

##### Marsh. (MAR)

Watery, muddy, or damp ground supporting dense growth of rushes, sedges, grasses, and forbs. Applied to border marshes along the shores of The Bay and the channels of Cache Creek, as well as the extensive central marsh of The Bay (aquatic marsh) when the water dropped below higher flood levels.

##### Grassland. (GRA)

Vegetation, predominantly grasses and forbs, may include mixtures with rushes, sedges, shrubs, and occasional trees.

Shore. (SHO)

Stream or lake shores, typically muddy, with little or no vegetation. Mud flats and eroding, low bluffs are prominent.

Riparian. (RIP)

Woodland type of vegetation near shore of creek or lake and under influence of abundant water supply. Often with dense or at least tangled understory. Larger trees include willows, cottonwood, and white oak.

Oak woodland, modified. (OWM)

Woodland of predominantly oak trees but with understory greatly modified from original by 120 years of ranching use.

Coniferous-broadleaf woodland. (CBW)

Largely unmodified white oak-digger pine woodland with understory of tall, brushy shrubs; gives over into patches of chaparral locally. Other trees and shrubs include California bay tree, California buckeye, interior live oak, California redbud, madrone, manzanita, scrub oak, chamise, and elderberry.

Names used for localities.

The practice was followed of referring to areas and localities at Anderson Marsh by geographic, or locality, names. Some of these are on maps, others were given to me by William Beat, and several were simply appropriate descriptive terms. All of these names are entered on an accompanying map (Fig. 2).

The use of these names in the bird records permitted the placing of records at specific parts of Anderson Marsh without resorting to a grid system with symbols of letters or numbers.

## RESULTS

### Numbers and distribution of birds, April-June, 1983.

The birds seen from April through June are listed in Table 1. The number of species confidently identified was 85. The grand total of 2,804 individual birds tallied represents the total number of birds identified in 60 hours of observation. Almost all species listed were observed several to many times.

The occurrence of each species is summarized in Table 1 by month according to its observed presence (X), its inferred presence (©), and its scarcity or absence (0). The total number shown is a rough indication of abundance vs. scarcity or of conspicuousness vs. secretiveness.

The bird species can be arranged into classes possessing different degrees of abundance or conspicuousness. This permits us to see to what extent many individuals of a few species versus few individuals of many species were supported at Anderson Marsh in the spring months. In Fig. 3 the species totals are graphed in classes with increments of 50 individuals.

In a slightly different approach, we can group the 85 species by similarity of numbers of individuals observed. The 15 bird species seen in greatest numbers (60 to 327) are listed first:

American Coot (327)	Great Blue Heron (96)
California Gull (ca 240)	Cliff Swallow (79)
Tree Swallow (226)	Yellow-headed Blackbird (77)
Mallard (155)	Common Raven (71)
Western Grebe (154)	Pied-billed Grebe (67)
Red-winged Blackbird (120)	Eurasian Starling (64)
Song Sparrow (116)	Turkey Vulture (60)
Bonaparte's Gull (100)	

The 18 species of next lower abundance or frequency of record (20-50 individuals seen) were:

American Crow	(50)	Western Kingbird	(26)
Double-crested Cormorant	(50)	Plain Titmouse	(26)
Black-headed Grosbeak	(46)	Northern Oriole	(26)
Barn Swallow	(41)	House Finch	(26)
Western Bluebird	(30)	Yellow-rumped Warbler	(24)
Brown-headed Cowbird	(30)	Nuttall's Woodpecker	(22)
California Quail	(29)	Marsh Wren	(22)
Killdeer	(29)	Common Yellowthroat	(22)
Acorn Woodpecker	(28)	Scrub Jay	(20)

A third level of conspicuousness or abundance (6-19 individuals seen) were these 23 species:

		Rufous Sided Towhee	(9)
Green-backed Heron	(18)	Bushtit	(9)
American Bittern	(18)	White-breasted Nuthatch	(9)
Mourning Dove	(17)	Warbling Vireo	(9)
Cinnamon Teal	(16)	Western Meadowlark	(9)
Lesser Goldfinch	(14)	Great Egret	(8)
Northern Flicker	(12)	Lark Sparrow	(8)
Ash-throated Flycatcher	(12)	Cedar Waxwing	(8)
Northern Rough-winged Swallow	(12)	Caspian Tern	(7)
		Virginia Rail	(7)
Anna's Hummingbird	(11)	Western Wood-Pewee	(7)
American Goldfinch	(11)	Ring-necked Pheasant	(6)
Rock Dove	(10)		

At the lowest level of abundance or conspicuousness were 28 species with merely 1-5 individuals recorded:

Red-shouldered Hawk	(5)	Dark-eyed Junco	(2)
Great Horned Owl	(5)	White-crowned Sparrow	(2)
Brown Towhee	(4)	Bewick's Wren	(2)
Black Phoebe	(4)	American Robin	(2)
Red-tailed Hawk	(3)	Swainson's Thrush	(2)
Spotted Sandpiper	(3)	Yellow-breasted Chat	(2)
Willow Flycatcher	(3)	Western Flycatcher	(2)
Violet-green Swallow	(3)	Ruddy Duck	(1)
Orange-crowned Warbler	(3)	Cooper's Hawk	(1)
Yellow Warbler	(3)	Osprey	(1)
Western Tanager	(3)	American Kestrel	(1)
Gadwall	(2)	Ruby-crowned Kinglet	(1)
Bald Eagle	(2)	House Sparrow	(1)
Band-tailed Pigeon	(2)	Brewer's Blackbird	(1)

One must remember that these rough totals are not presented as formal census results but merely as field tallies (see Methods). Some distortion could be expected in the monthly and quarterly totals; for example, Red-shouldered Hawks and Great Horned Owls were seen on more than one field trip giving five of each for the quarter. Obviously there could have been fewer individuals involved.

#### Seasonal shifts in bird distribution among habitats.

Proportions of the different species of birds present in any habitat were often seen to change from month to month. Some were presumably due to causes operating beyond Anderson Marsh, while others followed from changes taking place in the habitats and still others from alterations in the birds' behavior. The situation in each habitat is summarized below, while data are to be seen in Table 5.

### Open Water.

The number of individuals tallied for OWA was large in April but much smaller in May (Table 2), while no tallies were made at all in June. Several factors may account for this downward trend. Some are the lowering of water level, reducing the area of OWA, the growth of emergent vegetation changing the classification of the habitat from OWA to EMV, and changes of behavior in the birds, e.g., in the response to diminishing fish carrion food, to increases of foods elsewhere, to need for greater secretiveness in nesting, or to withdrawal of some species for breeding elsewhere.

The total number of species recorded declined similarly, as did also the average number of species recorded per visit. Absence of tallies for June may reflect less observation time for the OWA habitat; nevertheless, the decline between April and June is real. Reasons given above apply.

### Emergent vegetation.

The same pattern of decline occurred for EMV as seen in the OWA habitat (Table 2). In April, protruding plants were scanty and only inches above the water. Although EMV gradually claimed area from OWA, numbers of individuals tallied and species recorded diminished smartly. Still, species levels declined slightly less than in open water.

### Marsh.

In MAR habitat, individuals were recorded in large numbers at all times (Table 2). The high total tally seen in May is perhaps partly the result of intensive observation in search for evidence of nesting carried out in that month. The amount of MAR habitat available to the birds increased as the water level of the lake receded and as seasonal growth of the marsh plants progressed to provide taller and denser cover. The trend is one of increase in individuals and species, but for individuals most markedly so between April and May. The source of the individuals would seem to be the EMV and OWA habitats. It also seems likely that new adults would have been recruited from Clear Lake beyond Anderson Marsh with the onset of the nesting season.

### Grassland.

Grassland habitat rather consistently hosted substantial numbers of individuals and species (Table 2). Nevertheless, the data appear to sag in May. I think this effect is realistic and not to be explained as a mere artifact of sampling, as all habitats were well covered in May. No clear shift in bird numbers as spring advances are revealed.

### Shore.

A strong declining trend here in parallel to that seen in OWA and EMV habitats (Table 2). In some areas this was a habitat type continually shifting in location, for water levels continually receded and vegetation grew and covered exposed areas. Relatively little, or at least very brief, use was made of this habitat in June and by few species.

### Riparian woodland.

The riparian habitat received increasing use as the spring progressed into early summer (Table 2). This was probably true in respect to both individuals and species. A particularly large increase in numbers of individuals tallied in May can be explained on the basis of seasonal changes in behavior, e.g., the Tree Swallows and European Starlings searching for nest cavities. The lower figure for individuals in June appears to be a result of less observation in riparian for that month.

### Oak woodland modified.

A spectacular increase in number of individuals tallied, amounting to a nearly four-fold increase, occurred April to May (Table 2). Also, the number of species nearly doubled. This sharp rise could result from arrival of late migrants and settling in of species on their nesting grounds, as see in the Tree Swallow (none tallied at OWM in April, 66 in May). The high numbers probably continued for a time in June, but they are not reflected in the data of Table 2, as most field work was done in marsh habitats in that month.

### Coniferous-broadleaf woodland.

This woodland tract with mostly dense understory merging into chaparral yielded low tallies in May and June, when field work was insufficient to record all the birds there.

Accounts of bird species at Anderson Marsh, April-June, 1983

The species accounts to follow mention, so far as data permits:

1. Ratings for "importance-of-habitat" based on records of activities.
2. The uses made of the habitats, including avian activities noted in the habitats (table 3) as well as presence of the birds themselves.
3. The timing of the birds' movements and of events in their nesting cycles.

Pied-billed Grebe. A crude rating for "importance-of-habitat" was revised by counting the entries of habitat code letters as used in the columns of table 3 and considering each total a score. Thus, the rating for Pied-billed Grebe was MAR-18, EMV-3 (major habitat underlined). This grebe was almost exclusively inhabiting the marshy places. The border marshes everywhere in the park had their Pied-billed Grebes. These grebes, in much smaller numbers, went into the deeper-watered central Aquatic Marsh in June. Only very few were found to be in emergent vegetation (deeper water and sparse tule tops) in April or May. All observed types of activities (table 3) were carried out in the border marshes. The nest observed in the border marsh rushes was over water 2-3 ft. deep.

April 12 through June 29. Heard "kowp.. .kowp..." call every visit; this is a call given by males in the breeding areas (Cogswell) Water Birds of California. U. of Calif. Press, 1977, p. 67).

May 13. Nest with 3 eggs. Also saw one lone young about 3/4-size.

June 6. Made a conservative estimate of number of Pied-billed Grebe territories based on distribution of male "kowp" calls over the marsh as heard from the North End Tract from 5:00-7:40 a.m. The estimated number was 12 territories. It follows that 24 adult Pied-billed Grebes would be

present on these territories at Anderson Marsh early in the breeding season as a conservative estimate,

Western Grebe. MAR-7, EMV-9, OWA-4. These ratings pertain collectively to the months April, May and June. Some shifting of habitat utilization over this three-month period can be seen from inspection of table 3. As the flood water level receded, the marsh waters became shallower and the Western Grebes used open water far less. Later in the period, the waters of the EMV habitat became sufficiently shallow (less than 3 1/2 ft.) that the habitat was then considered to be MAR, hence the use of EMV declined in favor of MAR. The special activities here recognized were carried out in these three habitats. Nesting itself, however, was done in the EMV and MAR habitats.

The marsh habitat used for feeding, shelter, and courtship is spread widely around all shores and also makes up the interior of the Aquatic Marsh. All nests we found, however, were placed in the interior. We saw about six nests placed approximately 50 ft. apart in a semi-colonial arrangement. During nesting, Western Grebes were seen widely scattered in the border marshes, which became much used feeding and weaning areas.

Interestingly, an apparent pair of Western Grebes watched by the Parkers maintained position at Cache Creek by the "Long Island" through June. Then in July, two tiny young were seen with them. This is almost 1/4 mile away from the shortest route to the Aquatic Marsh. Possibly a feeding territory had been maintained in the Cache Creek border marsh and was frequented often by the adults, and ultimately the young brought there. Unfortunately, these individuals were not marked, and actual events were not known. No Western Grebe nest was found along Cache Creek.

April 12 and 13. Adults giving a variety of screechy calls, doing

posturing with head and neck-turning and laying head to one side, preening momentarily, etc. No race-dances were seen.

April 22, May 4 Race-dancing seen.

May 13. Saw two adults head-bowing.

May 25. One nest with two eggs placed over 3 1/2 ft. water; nest with at least two eggs; a nest mound of tule but no rotted vegetation or eggs. More nests located May 26.

June 3. Saw 1/3 to 1/2 sized young with adult.

Double-crested Cormorant. MAR-3, SHO-2, OWA-1. These birds were present in April and May, but by June they no longer appeared at Anderson Marsh, although they continued to frequent a marshy shore in the northwest corner of Clear Lake. The cormorants often rested on fence posts protruding from the water at Anderson Flat.

American Bittern. MAR-5. Bitterns were observed, aurally mostly, only in marsh habitat, except for visual records of overhead flight. Marsh areas inhabited included most border marshes of the North End Tract and Garner Island as well as the north central area of the Aquatic Marsh. This distribution is based on both aural and visual records. The "pumping" or "oong-ga-chunk" call, said by Cogswell (loc. cit. p. 104) to be given by males on breeding grounds, was very frequently heard on June 6, from 5:10-7:40 a.m., and on other dates occasionally during later morning and mid-day hours.

Great Blue Heron. MAR-7, OWM-9, SHO-3, GHA-1, RIP-1. More than half of the eight habitats at Anderson Marsh were used, oak woodland as a site for nesting and resting; and marsh, where most feeding was done were of high importance. All nesting activity was carried on at Slater Island at the west end of the oak grove where 11 nests were occupied, indicating at least 22 adults were concerned in nesting. All marshes and shores in the

park were used for feeding.

April 12. Adults present on nests? whether incubating or brooding not determined.

May 4. Adults arriving at nests sometimes carried twigs.

May 13. Heads protruding above nests were some adult, some juvenal.

May 25. Herons present at or near nests in the oak trees.

June 3. Young stretching-wings at nests. Two adults left nests after 8:00 p.m. as if to seek roosting sites elsewhere.

June 29- Both adult and young herons fed in marsh near shore (eight birds in all); thus, at least some young had left the nests.

Great Egret. MAR-2, SHO-1. The egrets were seen in very low numbers on April 13 and again on June 29. None were seen in the interval between. Obviously none remained at Anderson Marsh during the season of their nesting. Individuals seen in April and June were on foraging grounds.

Green-backed Heron. MAR-3, RIP-2, GRA-1. Border marshes along Cache Creek channels and willow-cottonwood riparian woodland were utilized. Most feeding occurred in the border marshes, while much resting, sheltering, and probably some aspect of nesting occurred in the riparian.

Mallard. MAR-15, EMV-4, GRA-3, OWA-2, RIP-1. Marsh was of first importance, with several adjacent habitats collectively of secondary importance. Marsh was used throughout the three-month period for foraging and feeding as well as for shelters rest and escape. Marsh was the site of many activities of both male and female adults early in the nesting cycle. It was also the habitat in which ducklings were led to their feeding places. Two nests were made in dense grass about two ft. high Just back of the rush zone on the 2nd Cache Creek island on May 13, one nest with six eggs, the other with eight.

Cinnamon Teal. MAR-7, EMV-2. After the brightly colored males disappeared, the small brown females on the water became more difficult to identify in brief glimpses at a distance. On the basis of size and of lack of features characteristic of Mallard females, they were thought to be Cinnamon Teals; however, in one case, on June 29, blue wing-patches were seen. On May 13, two male Cinnamon Teals were seen together at Cache Creek near the "first" island; an hour later a small, brown female was seen on the creek followed by three small ducklings.

Gadwall. MAR-2. A pair, male and female, was seen in the marsh of Garner Island on April 22. Gadwalls were not recorded at Anderson Marsh during May or June. It is safe to say they, as expected, did not nest there.

Wood Duck. RIP, MAR. None seen until July. although they may have been nesting in the Cache Creek riparian, as young were seen in July.

Ruddy Duck. EMV. A drake was seen, April 13.

Turkey Vulture. MAR-4, GRA-4, RIP-1. In April and May, feeding and resting activities were carried on at marshy and grassy places, where the vultures could stand on sufficiently solid substrate. The food taken was primarily carp carrion. When rapidly receding waters stranded many large carp, up to a dozen vultures could be seen on a given day in the field. After stabilization of water at lower levels in June, the number seen dropped markedly. A great deal of feeding was done at the marshy shores of Anderson Flat, Lewis Ridge and the North End Tract.

Osprey. OWA-1, EMV-1. Seen foraging over open water and emergent vegetation on April 13, but not again until August 9. Ospreys, however, nested at the northwest corner of Clear Lake in April and May using an old willow snag in the border marsh.

Bald Eagle. OWA-1. Seen over South Cove, between Audubon Tract and Lewis Ridge, about April 24 (Reeves).

Cooper's Hawk. OWM. One sighting at Lewis Ridge, May 15 (Reeves).

Red-shouldered Hawk. RIP-4, OWM-3, GRA-1. During our visits in April and May, screams came from Red-shouldered Hawks perching in riparian cottonwoods or oaks at the North End Tract or, once, in the McVicar Audubon Tract. Flights possibly of foraging nature occurred in grassland and in woodlands. Not recorded in June.

Red-tailed Hawk. GRA-3, OWM-2, RIP-1, MAR-1. Most soaring noted was over grassland, perching was in oak woodland; other habitats were included in foraging flights.

American Kestrel. MAR-1, OWM-1. One sighted in flight over Ranch House at Anderson Flat, May 15 (Reeves).

Ring-necked pheasant. GRA-2, MAR-2. In early June, cock pheasants were seen or heard calling from grassland and drier marsh of the North End Tract.

California quail. CBW-3, RIP-3, OWM-2. Groups of quail were typically present in the drier woodlands of the McVicar Audubon Tract in May and June, A pair, male and female, were seen in RIP at the East Side Strip, May 16.

Virginia Rail. MAR-6. Seen and heard in bulrushes in April, May and June at west end of the North End Tract, Garner Island, and the levee area of the Aquatic Marsh.

American Coot. MAR-9, EMV-5. Marsh and emergent vegetation were the only habitats in which we saw feeding, sheltering, territorial aggression, and nesting activities. On May 25, five nests were found on bulrush platforms in 3 1/2 ft. of water. Eggs were present in four, and four new hatchlings and one egg in the fifth. These nests were located in the central area of the Aquatic Marsh.

Killdeer. CVO-8, MAR-4. Killdeer made much use of the open grassland of the North End Tract and Garner Island in April and May and may have nested there in May. In June they shifted to muddy flats exposed by receding waters around the shores of The Bay.

Spotted Sandpiper. RIP. Seen only one in April along Cache Creek. Secretive or absent in May and June.

Bonaparte's Gull. A shoal of approximately 100 Bonaparte's Gulls was seen over the Aquatic Marsh and Main Channel in mid-April; not seen again in our spring or summer field work.

California Gull. MAR-4, GHA-2. On April 13, a group of perhaps 150 gulls, most of which were certainly California Gulls, was in flooded grassland of central Anderson Flat. In subsequent weeks, numbers diminished. Carp carrion was one of the foods sought.

Caspian Tern. MAR. Not seen until June 29, but frequently thereafter. Four were flying over the marsh or standing at waters edge. Not seen diving for fish, but one standing Caspian Tern dipped its bill into shallow water a few times as if taking food or perhaps water,

Rock Dove. MAR-1, OWM-1. A small flock circled over North End Tract, June 3.

Band-tailed Pigeon. CBW-1. Two sighted in flight low over the Audubon Tract hillside, May 10 (Reeves).

Mourning Dove. RIP-4, OWM-2, GRA-1. Feeding was done in riparian vegetation, grassland and oak woodland. The "coo" calls, given by the male seeking a mate, were heard from riparian and oak woodland habitats from April 13 to May 13. Nesting may have occurred in any of these habitats.

Great Horned Owl. RIP-4. We found two large young, still downy, sitting in a large Oak tree in the oak grove of Slater Island, May 13. One adult had been seen there in this riparian woodland, May 4.

Anna's Hummingbird. RIP-5, GBW-3. Feeding occurred in riparian woodland and also in coniferous-broadleaf mixed woodland. On May 13, two young perched on RIP willow were fed by an adult female at the North End Tract.

Acorn Woodpecker. OWM-4, RIP-2, CBW-2. More activity noted in oak woodland than in riparian and broadleaf-coniferous mixed.

Nuttall's Woodpecker. OWM-5, RIP-3, CBW-2. Oak and riparian provided resources for all types of activities, including breeding behavior. All localities.

Northern Flicker. OWM-5, RIP-3, CBW-3. Activities were carried out in all types of woodland, with oak prominent in importance.

Western Wood Pewee. RIP-6. A pair seen June 6 in riparian cottonwoods of North End Tract, nest apparently present (as young appeared July 21). Otherwise seen foraging in RIP woodland.

Willow Flycatcher. RIP-2. Seen foraging from small willow on Slater Island, May 13, and from willow thicket on Garner Island, May 16.

Western Flycatcher. RIP-2. Seen and heard at riparian perches, including redbud (*Cercis*) at east arm of Audubon tract, May 10.

Black Phoebe. MAR-2, SHO-2, RIP-2. Riparian trees and shrubs, boulders at shore, and low perches in marsh were used in hawking activity. North End Tract, East Side Strip, and Cache Creek oxbows were localities frequented.

Ash-throated Flycatcher. OWM-4, RIP-2, MAR-2. Foraging, feeding, and perching, were done at oak and riparian woodland. Marsh border habitat was a source of insects. Lewis Ridge, east arm of Audubon Tract, Slater Island, and North End Tract were used.

Western Kingbird. GRA-4, OWM-3, RIP-2. Much feeding behavior occurred at grassland habitat, where the kingbirds used fencelines or stiff weed, stalks, such as curly dock (*Rumex*) for perches. Foraging was also done from tree and

shrub perches in woodland habitat and at marsh. One caught a dragonfly at the marsh, June 29, and retreated to an oak tree to eat it.

Swallows. Cliff, Barn, and Tree Swallows were present throughout the period, April through June. Violet-green Swallows were seen in small numbers in April and May, once at Lewis Ridge on an oak stub, a potential nesting site. Rough-winged Swallows were present April 22, foraging over marsh at Garner Island, and the North End Tract. Tree Swallows were abundant and highly conspicuous in May. They foraged widely over open areas, and they engaged in nesting activities in the trees of oak and riparian woodland, especially in late April and early June. Cliff and Barn Swallows foraged over all open areas and nested on structures along Cache Creek, obtaining mud from creek shores and marsh.

Scrub Jay. OWM-4, CBW-4, RIP-4. Consistently present in all woodland habitats with oak. On territories and probably nesting.

American Crow. RIP-5, MAR-4, GRA-1. Never abundant, a few were seen at grassland or marsh occasionally in each month. One crow appeared to be carrying a crustacean or clam in its bill, May 10.

Common Raven. RIP-5, MAR-4, GRA-1. In April and most of May ravens were numerous and conspicuous. Much of the time they were seen in flight singly or in groups of two to four. Occasionally in May a group of up to 15 ravens were seen to circle and wheel about socializing or sporting over the Aquatic Marsh or adjacent woodlands. When feeding, these birds were at marsh or grassland along the shores of Anderson Flat and North End Tract, where they ate carp carrion. In late May and June, carp carrion was less easily available, and visits by ravens diminished in numbers. A group of seemingly independent young ravens were squalling in tall oak trees with deeper-voiced adults croaking around them, June 29, at Audubon Tract.

Plain Titmouse. RIP-6, CBW-4, OWM-4. The titmouse is a territorial hole-nester in woodland habitats. These birds were regularly seen in the Audubon Tract, at Lewis Ridge, Slater Island, and Cache Creek.

Bushtit. OWM-4, RIP-4. Seen occasionally in small flocks in brushy woodlands in each month. North End Tract, Lewis Ridge, east arm of the Audubon Tract.

White-breasted Nuthatch. OWM-5, CBW-1, RIP-1. Regularly present in woodlands. Seen and heard at Audubon Tract, Lewis Ridge, Seigler Creek. Nesting indirectly indicated but not observed.

Bewick's Wren. CBW-2, RIP-2. Heard calling at Audubon Tract and Slater Island.

Marsh Wren. MAR-5, EMV-1, CBW-1. Foraging, territorial singing, and nest building were conspicuous in tules of wet marsh. Two to four pairs were seen at the levee area of the Aquatic Marsh on May 25, and eight to ten nests, some of which must have been dummy nests. The wrens seemed less conspicuous in June.

Ruby-crowned Kinglet. OWM. Seen only April 13, a spring migrant at North End Tracts in oak.

Western Bluebird. OWM-7, GRA-4, MAR-3. Nested in oak woodland; fed in grassy areas in woodland, grassland and drier parts of marsh. Nested on Lewis Ridge in oak and seen only in that area.

Swainson's Thrush. RIP-2, GBW-2. Seen and heard May 16 at Audubon Tract in riparian and adjacent broadleaf-coniferous woodland.

American Robin. RIP-2, OWM-2. Seen in early May at Cache and Seigler Creeks.

Cedar Waxwing. OWV. Seen in early May at Cache and Seigler Creeks, in oak.

European Starling. OWM-12, RIP-8, GRA-5, SHO-2. Much feeding activity occurred in open habitats such as grassland, shore and drier aspects of marsh. Intensive foraging was seen in May and June when nestlings were being fed. Nesting activities in large oak trees of the oak and riparian woodlands were especially conspicuous during the peak of feeding young in the second and third weeks of May. Open habitats of Anderson Flat and North End Tract were much used for feeding, and woodland spots of Lewis Ridge, Audubon Tract, Slater Island and all other places were occupied for nesting.

Warbling Vireo. OWM-4, RIP-2. Probably nested in these habitats.

Orange-crowned Warbler. RIP-4, OWM-2, CBW-2. Heard or glimpsed in trees or brush.

Yellow Warbler. RIP-1. Seldom encountered.

Yellow-rumped Warbler. OWM-4, RIP-2. Seen in April and early May. Foraged and sheltered usually in oak woodland. Widely spread over North End Tract, Audubon Tract, and Lewis Ridge.

Common Yellowthroat. MAR-5, RIP-3, OWM-2, GRA-2. The yellowthroat's song was frequently heard from marsh or riparian vegetation. Nesting material was being manipulated in the marsh habitat, June 6. Foraging was done widely in all four habitats listed. These birds were present in all localities supporting marsh-riparian habitat.

Yellow-breasted Chat. RIP-2. Seen in lakeshore riparian habitat of North End Tract, May 13; heard at east arm of Audubon Tract, May 16.

Western Tanager. RIP-2, OWM-2. Infrequently seen in woodland.

Black-headed Grosbeak. RIP-9, OWM-4, CBW-3, MAR-1. Sang conspicuously all spring from riparian and other woodlands. Fed at oak flowers in April and sometimes fed in open, marshy spots. Nested in RIP (juvinal seen July 16 at North End Tract). Seen at every locality in the state park supporting

woodland.

Rufous-sided Towhee. CBW-3, RIP-3, OWM-2. Seen in all brushy woodlands of the state park; fed in thickets of riparian, oak and mixed woodlands; probably nesting in same habitats. Regularly occurred at Audubon Tract, North End Tract, Cache Creek, Slater Island, and Garner Island.

Brown Towhee. CBW-2, RIP-2. Less common than Rufous-sided Towhee, but consistently seen in similar habitat,

Lark Sparrow. OWM-4, GRA-2. Seen consistently at Lewis Ridge in open, grassy woodland; probably nested there.

Savannah Sparrow. GRA-1. Saw one individual May 4, at Anderson Flat. Presumed to be spring migrant. None seen again until Sept. 6, a fall migrant.

Song Sparrow. MAR-8, RIP-7, GRA-3, OWM-1. Open habitats of marsh and grassland had a combined rating of 11, versus woodlands with a combined rating of 8. Feeding, singing, and movement from plant perch to plant perch were all conspicuous activities of these birds. Nesting occurred; fledgling seen May 13, in border marsh. Abundant in all localities with the wetter habitats listed, fewer in drier phases.

White-crowned Sparrow. OWM-1. Seen April 12 but not thereafter until September 21. Anderson Flat.

Dark-eyed Junco. RIP-4, MAR-2. Seen feeding in open at marshy edge of riparian vegetation, and in brush in late spring. Audubon Tract.

Red-winged Blackbird. MAR-15, GRA-10, RIP-5, EMV-1. While marsh was the most important habitat, a great deal of activity occurred in grassland and riparian vegetation. Nests were found in grassland and riparian situations and not at all in the wet marsh tule habitat occupied by Yellow-headed Blackbirds. Eggs in a nest were found as early as May 4. Widespread in park.

Western Meadowlark. GRA-7. All activities observed were in grassland habitat. Singing was conspicuous in May; lone oak tree often used for perch, Seen at Anderson Flat and North End Tract.

Yellow-headed Blackbird. MAR-15, EMV-2, GRA-2. A wet phase of marsh habitat was the nearly exclusive habitat used. Some birds went to sparse emergent vegetation (bulrushes) while the water level was high. When water had receded considerably, some feeding was done in dry type marsh and in grassland. Our data give the following chronology: April 22 - Two males seen at the Aquatic Marsh. May 4 - Males spread well over central Aquatic Marsh; some females now present; the male:female ratio appeared to be about 2:1. May 13 - Males on territories in Aquatic Marsh; females were with them on the territories generally; the male:female ratio in the marsh appeared to be approximately 1:1; two nests seen but they had not yet received eggs; females seen with nest-building materials. May 25 - Birds were seen in border marsh of North End Tract as well as in Aquatic Marsh; nest in border marsh with three eggs; one female carrying food as if to nestlings; male seen chasing female as in mating. June 29 - Females seen carrying food in a Cache Creek border marsh and at North End Tract.

Brewer's Blackbird. RIP-1. This species was not noticed at Anderson Marsh in April, May and June.

Brown-headed Cowbird. GRA-4, RIP-4, MAR-3. Fed in grassland or drier marsh habitat. Females seen often in riparian woodland probably in egg-laying activity.

Northern Oriole. RIP-7, OWM-4, GRA-1, CBW-1. Present generally in woodlands, except for feeding forays to grassy or marshy places. Widespread in park.

House Finch. GRA-6, OWM-5, CBW-2. Feeding was conspicuous in grassy places where plants bore seed heads. Perching and presumably nesting were done in oak woodland habitat. House Finches were frequently observed at the North End Tract, Lewis Ridge, and Slater Island.

Lesser Goldfinch. OWM-4, CBW-2, RIP-2, GRA-2. Fed in grassy or weedy open places as well as in trees. Consistently present in open parts of oak, riparian and mixed woodland habitats. Audubon Tract, Anderson Flat, Garner Island, Slater Island, North End Tract.

American Goldfinch. GRA-2, MAR-2, RIP-2, CBW-2. Much time spent in feeding at weedy stalks in grassy and marshy places. Birds visited and perched in trees a great deal. North End Tract, Audubon Tract, Cache Creek.

House Sparrow. Seen only once, May 33, on snag in Cache Creek near housing area.

## DISCUSSION

### General character of bird life at Anderson Marsh State Park.

We now examine the structure of the avian community as seen at the park in the spring months of 1983. The birds with similar requirements comprise functional groups. The park is a friendly environment holding the resources sought by each group. The groups are defined according to type of occurrence shown by the bird species. The more conspicuous, regularly-occurring and abundant species at Anderson Marsh State Park in spring, 1983, can be assigned among three categories:

Breeders and nesters. Those present in the breeding season and nesting or seeking nesting habitat.

Visitants. Species seeking seasonal foods with most other requirements satisfied elsewhere; non-breeding immatures of species breeding elsewhere; subpar or out-of-phase individuals.

Spring migrants. Transients on passage from wintering to summer breeding areas and remaining at Anderson Marsh only briefly; winter residents approaching the time of departure.

For the many species observed only once up to several times, it may be safer now to refrain from making definite allocations. When actions have been observed over several years, encompassing a variety of conditions, the patterns for each species will become more evident. Nevertheless, tentative, low resolution listings of the less well observed birds may be useful for discussion. Tentative groupings, then, are:

Breeders and nesters. Prominent species include the majority of marsh birds: Western Grebe, Pied-billed Grebe, Great Blue Heron, American Bittern, Green Heron, Mallard, American Coot, Yellow-headed Blackbird, Red-winged Blackbird, and Marsh Wren. Many conspicuous territorial birds of woodland habitats also qualify: Tree Swallow, Great Horned Owl, Northern Flicker, Mourning Dove, Nuttall's Woodpecker, White-breasted Nuthatch, Western Bluebird, Black-headed Grosbeak, Common Yellowthroat, Song Sparrow, House Finch, Western Kingbird, and many others. It is possible that up to 60 or more (about 70 percent) of the bird species recorded at Anderson Marsh in spring, 1983, belong to this functional group.

Visitants. Species attracted by seasonal foods include the Turkey Vulture, Common Raven, and California Gull, which frequented Anderson Marsh in considerable numbers feeding on the large, fleshy carcasses of carp from April into early June. A few species seeking mainly food were catchers of live fish: Osprey, Belted Kingfisher, Bald Eagle (may have taken either or both live or dead fish), and Caspian Tern appearing in the last week of June. Red-tailed and Red-shouldered Hawk frequently hunted over the grassland. Band-tailed Pigeons were believed to have sought Madrone berries, while the Downey Woodpecker took arboreal insects. Probably up to 20 species of birds were present for those foods, and were not known to be nesting within the State Park. In the case of the two hawks, however, nesting was likely either undetected in the park or in woodland not far removed. Nesting did not occur, as far as known, in a very small number of individuals or a few species present at Anderson Marsh and not on their usual breeding grounds: e.g., Ruddy Duck, Gadwall, Lesser Scaup. Perhaps for all birds in this group, Anderson Marsh offered limited important resources, but not the full range of resources required by them during the breeding cycle.

Spring migrants. Several bird species were transient through the park area, probably remaining only a few hours, days, or weeks, during their spring migratory periods; a few were winter residents at the park or its immediate vicinity, and were seen briefly as they began their movement northward. Bonaparte's Gull, Northern Rough-winged Swallow, Ruby-crowned Kinglet, Swainson's Thrush, and Savannah Sparrow were members of the spring migrant group.

### Ranking the sensitivity of habitat.

How likely is it that a given habitat, subject to the impact of essential park development and management practices, will diminish to support its normal complement of bird life? Since the State Parks Department has requested input on this matter as this agency undertakes planning for the future of the park, the question is examined in the light of data presented above.

How do we tell about sensitivity to damage in wildlife values of a habitat? We seek a criterion for determining the degree of vulnerability of the habitat. For our present inquiry we may consider the number of functions wildlife carry out on the habitat. Further, it appears a reasonable assumption that the fewer habitats used for a given essential function, the greater is the sensitivity of the habitat so used. We will wish to employ data on avian activities obtained in the project field work as a basis for assessing sensitivity.

For this purpose we use the habitat designation MAR to cover all the area assuming marshy character during the course of a year. We combine, therefore, all those data which before pertained separately to MAR, OWA, EMV, and SHO. Perhaps it would be reasonable to combine the woodland and grassland habitats into a single terrestrial designation, but it appears more useful to maintain the distinctions already established for RIP, OMW, CBW, and GRA.

Let us turn to the data on bird activities noted in the different habitats. We shall consider each species of bird to belong primarily to that habitat in which most of its activities were tallied. Then we can see what proportion of its activities took place in its primary habitat versus the proportion of its activities occurring in its secondary habitats. Lumping the species with same primary habitats (Table 4), we find that MAR supports a higher proportion of activities (72 per cent) of the marsh bird group than woodland (51 per cent) or grassland (47 per cent) do for their groups of birds (Table 5). It could be said that MAR provides more of the essential resources for birds with primary affinity for marsh than the other habitats do for birds with primary affinities in those habitats.

It may then be presumed that damage to marsh habitat would result in relatively great harm to marsh birds. Damage to other habitats would probably have, on the whole, less drastic consequences for their own groups of birds, since a larger proportion of resources for these birds are supplied by secondary habitats. On these grounds little doubt arises as to marsh being the most sensitive habitat for birds at Anderson Marsh. The relative sensitivity of the other four habitats is seen decreasing in the order in which the habitats are listed in Table 5, except, of course, that the woodland habitats came out with identical ratings by this criterion.

In order to gain finer resolution of the sensitivity problem in the riparian and oak woodlands, a second approach may be made. This would involve assessing the number of bird species and individuals in the two habitats. The following figures derive from our data in respect to the RIP and OWM habitats:

	<u>No. of bird species with primary affinity for habitat</u>	<u>No. of individuals summed over all these species</u>
RIP	19	539
OWM	15	49

More species and more individuals would be hurt from degradation of riparian than oak woodland. Thus, although birds obtained equal support for their needs in these two woodlands, the numbers of species and individuals served by one was greater than the other. Thus, by this second criterion, for avian wildlife values at Anderson Marsh State Park, riparian woodland is shown to be more sensitive than modified oak woodland in the spring months.

Another point can be made using both of the criteria together. In the section on numbers and distribution of birds, data were given which can be arranged to show that of 17 species with largest numbers of individuals present at Anderson Marsh in spring, 13 species have their primary affinity with MAR, three with RIP, and one with OWM. This places MAR far ahead of all other habitats in sensitivity, with RIP in second place and OWM in last (of the three).

## Vulnerability of localities at Anderson Marsh State Park.

In this section we will look at each locality in the park to review the nature of the bird life it supports and see its role in maintaining the bird community. It would be assumed that severe disturbance or alteration of environment in each locality would result in change, probably unfavorable, for the bird community. Dangers from human usage might be anticipated by considering effects of park procedures and usage discussed in the following section.

Aquatic Marsh (The Bay). The central region of the Aquatic Marsh was the only place discovered where Western Grebes nested locally in 1983. The breeding colony was well concealed in the interior of the extensive stand of tules (bulrushes); it was accessible by boat via a large channel opening to the west. Other birds nested in the central area as well, nests being found of American Coot, Pied-billed Grebe, Yellow-headed Blackbird, and Marsh Wren. American Bitterns were probably nesting there, too.

The northernmost part of the Aquatic Marsh (the Levee) was utilized by Virginia Rails, American Coots, Mallards, Marsh Wrens, Yellow-headed Blackbirds, Song Sparrows, and other species, and probably all of those named nested there.

The Aquatic Marsh was the only area where we know the yellow-headed Blackbird nested.

Cache Creek borders. The banks and adjacent flats of Cache Creek within Anderson Marsh State Park supported border marsh, riparian woodland, and forbs and grasses in transition to grassland (on Anderson Flat). Wood ducks, Green-backed Herons, Mallards, Cinnamon Teal, and a large number of other species of birds fed, sheltered and, in many cases, must have nested there.

Cache Creek islands. The four islands (two not completely cut off from Anderson Flat at present) are surrounded on the south, west, and north sides by oxbow channels, or "loops". These loops provided relatively undisturbed border marsh, and the islands supported some woodland and grassland. These secluded areas were ideal for Mallard and Pied-billed Grebe nests placed inland from the tules. A group of 20-30 Black-crowned Night Herons roosted in large willow trees on one of the islands in late summer.

Slater Island. The east end of Slater Island held riparian and oak woodland well understoried. This was a prime spot for song birds utilizing woodland. The central and west parts of the island had grassland and oak woodland, the latter holding the only nesting colony of Great Blue Herons in the park area in 1983. The isolation of this colony from intrusion by human visitors was most favorable for the herons. Great Horned Owls nested and raised young at the central oak woodland in '83, and many cavity-nesting birds of several species resorted to the large, old oak trees for their nesting sites.

Garner Island. The northern part of Garner has a small woodland of oak trees and large willow trees that host Nuttall's and other woodpeckers. Marsh at the northeast part has Virginia Rails, which probably nest there. The larger southern part of the island has an interior pond surrounded by tule marsh. Waterfowl, including Mallard, Cinnamon Teal, and Gadwall were seen here in the spring. Grassland with much forb growth occupies a broad swath and is an important feeding habitat for swallows, sparrows, finches, warblers, and flycatchers. The entire western shore of the island supports border marsh with a narrow riparian strip. Here the waters of the main channel and along the marshy shoreline elsewhere are feeding, resting, and refuge areas for Western and Pied-billed Grebes, as well as ducks, coots, gulls, herons, and sometimes cormorants, terns, and egrets. Garner Island is so placed as to give protection to the inner marsh regions of the Aquatic Marsh and surrounding border marshes of The Bay.

Indian Island should be mentioned also, although it was not visited in this study. Indian Island is also well situated for providing protection for Garner Island and Aquatic Marsh, and mouth of channels of Cache Creek, the inner marshes of the park, and, in addition, it shields the entrance to the main channel. The deeper water marsh between Indian Island, Garner Island and the North End Tract was usually seen to hold several kinds of marsh birds and waterfowl.

North End Tract. The relatively wide and vegetatively complex border marshes of the southern, western, and northern sides of the North End Tract were the best nesting area for American Bitterns. Other nesters were Pied-billed Grebe, American Coot, Common Yellowthroat, Yellow-headed

Blackbird, Marsh Wren, Song Sparrow, Red-winged Blackbird, and probably Mallard and Green-backed Heron. The extensive grassland habitat contained an abundance of forbs, which provided a large supply of seeds for many birds as summer came on. House Finches, American and Lesser Goldfinches, Song Sparrows, Red-winged and Brewer's Blackbirds, Black-headed Grosbeaks and others spent much time feeding there. High waters receding in spring exposed mud flats with much old plant debris, fish carrion, and newly sprouting plant growth. This was attractive for a variety of birds, especially swallows (5 species), Song Sparrows, Common Ravens, Turkey Vultures, and Great Blue Herons from the nearby Slater Island colony.

Anderson Flat. An expansive grassland habitat extends from the Ranch house westward to the Aquatic Marsh. Most of the westward part was inundated by winter high waters, which kept some temporary ponds in the spring. The drier parts of the flat nearer the highway and ranch house produced grass and forb growth early in spring. Green growth and seeds attracted several species of blackbirds, finches, sparrows, starlings, and swallows. Later, Western Kingbirds and Ash-throated Flycatchers fed over open places and used perches of fences and oak or willow trees. The wetter parts of the muddy grassland were visited by Turkey Vultures, Ravens, and Crows. Where shallow waters were still present in early spring, California Gulls fed in numbers, as well as Great Egrets, Great Blue Herons, Green-backed Herons, and probably American Bitterns. Transient White-crowned Sparrows and Savannah Sparrows were seen in early spring. As different species of forbs and grasses (curly dock, wild sunflower, smart-weed, star thistle, Spanish bayonet, i.e. Bidens; legumes, soap plant, teasel, cocklebur, sedges, rushes, grasses) matured and produced seeds, droves of seed-eating birds moved about over the productive parts of the grassland. Such birds were the goldfinches, house finches, song (and later Savannah) sparrows, three species of blackbird, cowbirds and starlings, meadowlarks. The grassland offered nesting and feeding grounds for birds of open spaces, such as the Western Meadowlark, Western Kingbird, Ash-throated Flycatcher, and Lark Sparrow.

Lewis Ridge. Oak woodland covering the crest and sides of Lewis Ridge supports numerous song birds, woodpeckers, and others. Western Bluebirds, Violet-green and Tree Swallows, White-breasted Nuthatches, Lark Sparrows, Plain Titmice, Black-headed Grosbeaks, Acorn Woodpeckers, Nuttall's Woodpeckers, and Northern Flickers were regularly found there, and Warbling Vireo's in late spring. Red-tailed Hawks, Ravens, and Turkey Vultures often flew overhead or came to tree or ground perches.

The western side of Lewis Ridge overlooks its own border marsh and the southern part of the large Aquatic Marsh. It is a good place from which to watch the activities of the Herons, Egrets, Coots, Ducks, Gulls, and Terns. One may watch vultures and ravens feeding, and occasionally Ospreys and Bald Eagles.

If the native understory of the oak woodland were to be encouraged to return and increase, the diversity of birdlife at Lewis Ridge might become even greater.

McVicar Audubon Tract. The two outstanding physical features of this tract are the gently sloping shore and the hillside above. The two arms of the tract form a protecting boundary on the south and west sides of The Bay (Aquatic Marsh). The shore supports an excellent, although narrow, strip of grass-forb vegetation giving into a tule border marsh. The hillside starts with a rich riparian - oak woodland and above becomes brushy and, in places, chaparral. Also the oak-pine-mixed woodland is prominent on the hillside.

The birds of the McVicar Audubon Tract are abundant and varied. The riparian woodland strip back of the shore is highly attractive to bird watchers. It is accessible and easy to walk through. The rich woodland understory is well-buffered and protected by natural woodland and walnut groves on privately owned land beyond it. A large variety of woodland birds appeared during the spring migratory period and many remained there in the late spring and early summer nesting period. Moreover, excellent views of close-by marsh birds may be had at the same time.

The hillside brushy woodland and chaparral (higher on the slope) is difficult to visit. The terrain is steep, rocky, and infested with rattlesnakes. It is rather dangerous to walk or climb through, as one is

continually tempted to put his hands on the rocks for support. It is jolting to hear the thin, dry rattling of snakes sheltering on the rock ledges a few inches from one's hand. The manzanita brush grows tall, but it is woody and dense, and of course the chaparral resists penetration. Despite these features this hillside natural area holds rewards for the visitor. The view over the Aquatic Marsh is stunning in color and beauty. One may see the water birds distributed over, the open spaces and around edges of the tule thickets. Close views may be had of the Bewick's Wren, Wrentit, Brown Creepers, and other avian inhabitants of the slope. Under foot, many native plants come into flower. It would appear the hillside vegetation all along the North Arm has remained ungrazed by domestic animals.

South Cove. This locality is the southeastern corner of The Bay (Aquatic Marsh) between Lewis Ridge and the easternmost part of the McVicar Audubon Tract. The shoreline there is flat with little slope at all. As the water recedes from high levels, rather broad strips of nearly bare mud become exposed to the air. Until the growth of new vegetation covers them, the bare stretches attract birds able to find food in this substratum. Blackbirds, swallows, shorebirds, (killdeer, later-coming sandpipers, snipe) crows, and others forage there. Black Phoebes move out from the riparian to perch on low plants and forage for insects flying over the mud. Later in the summer the South Cove showed up as the best place in the park to see migrating shorebirds. Substantial numbers of ducks also harbored there later in the summer.

North Cove. The small indentation in the shoreline at the north end of the McVicar Audubon Tract is conveniently referred to as the North Cove. It is large enough and deep enough to hold small aggregations of several species of waterfowl. The tule and sedge border marsh gives places for feeding and retreat. The isolation of this little cove from terrestrial, approach as well as from boats traveling the deeper channels, favors its use for feeding and loafing by ducks, coots, cormorants, gulls, herons, and egrets.

Hillside and Shore on West Side of the Main Channel. This hillside is not part of the Anderson Marsh State Park, yet it is of potential

importance to the marshes in the openings leading from Clear Lake into The Bay and Cache Creek. The more natural this hillside can remain, the better off the marsh will be. It would be of great importance to control the shore of this hillside as well as the waters of the mouth and access channels of the Aquatic Marsh.

Procedures and Uses that May Affect Bird Life at Anderson Marsh State Park.

Since each bird is on the park area in response to an internal need, we should ask what resource of the park is attracting the bird. Having identified the conditions essential to each type of wildlife, steps can be taken to assure the maintenance of these resources. Should the essential conditions not be perpetuated, reduction or loss of the wildlife components can be expected. It is well to review practices and usages in the park that by their nature affect specific conditions essential to wildlife. Of course, threats to habitat providing shelter, foods, and nesting sites come from natural processes as well as human activities.

Changes in Water Level. Both natural and directed changes in water levels may always occur from causes beyond control of the State Park. Perhaps these slow or rapid fluctuations rank right along with the weather cycle in influencing conditions to which wildlife must adapt in order to survive and thrive in the park environment. The extent of damage to wildlife must in some ways be susceptible to control by planned measures. If we cannot eliminate too drastic changes, or even control any aspect of water withdrawal, we can watch carefully and determine consequences. Then planning against future catastrophe to wildlife will be feasible. Therefore, a study of changes in habitat associated with fluctuations in water level is advisable.

During times of higher levels, various feeding opportunities exist for different birds. Scavengers (Turkey Vultures, Common Raven, American Crow), fish-eaters (Double-crested Cormorants, California Gulls), predators (American Kestrel), and seed and insect eating birds (Red-winged

and Brewer's Blackbirds, European Starlings, Song Sparrows, Marsh Wrens, Black Phoebes) may all be seen using perches close to the waters or emergent rushes where food attracts them. Removal of posts, poles, snags, fences, or remains of structures needed as perches at inundated grassland and marsh handicap some birds by hindering their use of an otherwise favorable feeding or resting area.

Raccoons and Other Predators. Some predators, e.g. raccoons, and skunks, may inhabit wetlands. Human disturbances may result in increase in these predators. Or it may cause heightening in effects of their predation. For example, these mammals will follow human foot tracks to nests of recently visited marsh birds.

At the Aquatic Marsh it was noted that two raccoons in company cut, as soon as the water receded enough to permit it, to the central part of the tule beds where nesting had recently occurred. This was in summer, when young coots and other birds would still be present and vulnerable to predation by animals.

If raccoons and skunks were found increasing from human factors, control or other protective practices could be considered.

Maintenance Practices on Cache Creek. Modifications made to wild or unkempt-looking habitat, especially the riparian, might include clearing out of underbrush, removing broken down branches, snags or trees, installing trails, roads or structures, making drainage modifications and dredging. Removing the trees can reduce the nesting, roosting and sheltering places for the hole-nesting birds, e.g. woodpeckers, flickers, titmice, nuthatches, swallows, kestrels, flycatchers, kingbirds, and starlings. They also may remove roosting or hunting perches for herons, owls, and hawks.

About 60 species of birds were found using riparian resources in the period April through August. Colorful birds with strong ties to this habitat are Green-backed Heron, Wood Duck, Great Horned Owl, Spotted Sandpiper, Willow Flycatcher, Tree Swallow, and Yellow-breasted Chat. All of these regularly nest in this riparian. The value of riparian at Anderson Marsh for these species could be easily reduced by such disturbances as reducing the width of the habitat strip, fragmenting the strip, reducing the density of the understory, and removing trees, or parts of trees.

Carelessly Conducted Visitor Activities. Speeding boats on Cache Creek may have caused some damage to grebe, coot, bittern, and rail nests by strong waves in the shallow water border marsh. Fisherman use resulted in trampled rushes and creation of openings for foot trails reducing the shelter value of the marsh. Dumping of refuse or leaving of litter at the North End Tract supplanted good plants and created harbor for scavengers. A fire in grassland under oak trees damaged trees and shrubs.

Establishment of control, setting of rules, and education of visitors to environmental values should correct the past misuse of the Park property.

Unleashed Dogs. Unleashed dogs accompanying fishermen or perhaps joggers were often seen at border marshes of the North End Tract and Garner Island. One dog with propensity to chase marsh birds was seen sicked onto a Killdeer by a fisherman, apparently oblivious to wildlife values. Birds nesting (actually or potentially) in the places ranged by the more aggressive and mobile dogs included Pied-billed Grebes, Mallards, American Bitterns, Virginia Rails, Cinnamon Teals, American Coots, Green-backed Herons, Red-winged Blackbirds, Song Sparrows, Yellow-headed Blackbirds, Marsh Wrens, and Common Yellowthroats.

Bow Hunter Activity. In late May, when nesting of Western Grebe was at its height, bow hunters staged a vigorous event, resulting in careless penetration of the central tule beds of the Aquatic Marsh. At this time there were also nests of American Coot, Marsh Wren, and Yellow-headed Blackbird in the disturbed area.

Waterfowl Hunting. Shooting at the ducks certainly has an immediate effect on the waterfowl population. Just what the issues might be of this activity are not clear to me now. Some control of hunting would seem desirable. A situation of conflict in use of the park occurred in October, 1983, when an Audubon bird group inadvertently scheduled a field trip to the McVicar Tract on the first day of duck hunting season. A boat with three hunters was present in The Bay, and shooting was done most of the morning.

Birds that might be encouraged at Anderson Harsh State Park.

Certain spectacular birds at Anderson Marsh are failing to nest at all or may not be breeding up to full potential. For two such birds proven means are available for promoting more nesting. Those two are the Osprey and the Wood Duck.

Osprey. No Osprey nests were made or used at Anderson Marsh in 1983, although Ospreys did nest elsewhere at Clear Lake in 1983. In recent years, artificial nesting platforms placed on top of 20-25 foot poles have attracted Ospreys to make nests and rear young at Eagle Lake, California, in Lassen County, the birds preferring the platforms to the natural tree sites. (References to this situation are: J. R. Koplín, 1980, Reproductive Performance of Fish-eating Birds at Eagle Lake, California, National Geographic Society Research Reports, 12:427-443. Also Garber, D.P., Koplín, J. R., and Kahl, J. R. 1974. Osprey Management on the Lassen National Forest, California. Proc. Conf. Raptor Conserv. Techniques, Raptor Res. Rpt. 2:119-122.)

Dr. Koplín is Professor of Wildlife Biology at Humboldt State University, Arcata. He has offered to come to Anderson Marsh State Park to look at the situation, if the State Park is interested. It would be most desirable to have his authoritative opinion and advice on the feasibility of Osprey encouragement here. He could also address problems with our other fish-eating birds, especially grebes and herons.

Wood Duck. At least one brood of fairly large young Wood Ducks was seen in the "first" Cache Creek loop, July 21, 1983. It seems possible the successful nest may have been located in the riparian woodland habitat of Cache Creek. In any event, Wood Ducks are known to nest currently at Cache Creek approximately one mile below the State Park boundary. It may be desirable to consider encouragement of Wood Duck nesting within the State Park. Probably the situation should be assessed by a waterfowl biologist to check on adequacy of habitat as to food supply, type of predators present, need for additional nesting cavities, etc.

Detailed discussion with plans for three types of nest boxes appropriate for differing situations, as well as management suggestions are given in: Bellrose, F.C., 1980. Ducks, Geese and Swans of North America. Wildlife Management Institute, pp 189-192.

Double-crested Cormorant. This is a species that may not be occupying and utilizing the Anderson Marsh to its full potential. These cormorants feed on fish which they catch under water. They may rest or loaf on the surface at times, but they also need perches over the water or very near it. These perches are used for a special behavior characteristic of the cormorant family, namely wing-spreading, a posture in which the wings are held out from the body and the feathers spread. A recent review of the functions of wing-spreading (Bernstein and Maxson, Auk, 99:588-589, July 1982) indicates probable advantages in both thermo-regulation and in hydrodynamics for the cormorants. In other words, wing-spreading is one of the essential, adaptive behaviors contributing to success in the life of cormorants.

Unfortunately, perches suitable for resting and wing-spreading are becoming scarce at Anderson Marsh. Apparently the only suitable perch available at the marsh during this past summer was the small, above-water remains of a large willow snag that toppled in 1983. On most days during late summer one could see up to 6 or 8 cormorants resting here, with some individuals doing wing-spreading in the sun. Earlier, in spring of 1983, when much of Anderson Flat was flooded, old fence lines with wooden posts were protruding from wide sheets of water. Cormorants would sit on every post for a length of the fence. Later, when the posts were no longer surrounded by water, the cormorants ceased using them. It appears for cormorant management, a good supply of suitable, above-water perches should be maintained.

Another aid to cormorants has been initiated by P.G. & E. in certain lakes in California. Large poles placed vertically in shallow waters were provided with old wooden cross-arms, with tiers at right angles. These structures have been accepted by cormorants as roosting

and nesting supports, according to an article in the October, P.G. & E. Progress, Vol. 60., No. 10. Editor: Stan Turnbull, P.G. & E. Co., Rm. 1715, 77 Beale St., San Francisco, Ca. 94106). Since old nesting snags disappear in time, renewal by artificial nesting snags may be well worth investigating.

Grebes and Coots. Dr. Koplín (Koplín, 1980, pp. 435-438) shows, on the basis of data obtained at Eagle Lake, the adverse effect of human disturbance on Western Grebes, Pied-billed Grebes and American Coots in an environment uncomfortably similar to that of Anderson Marsh State Park. This is best seen in a direct quotation, as cited above:

"However, loss of vegetation is only secondary to the influence of the presence of humans in these areas. No grebe or tern nests were found within 100 yards of four boat ramps along the west and south shores; even the tolerant coots (*Fulica americana*) did not nest within 50 yards of the boat ramps. Also, human activities were so intensive in the campgrounds and the marina along the south shore that approximately 2.5 miles of habitat apparently suitable for nesting sites was avoided almost totally by grebes and terns. In addition, approximately 2.25 miles of similar habitat along the west shore was largely avoided by grebes and terns apparently in response to intensive human activities associated with housing tracts, campgrounds, and marinas."

"Grebes and terns did not appear to be bothered by fishermen and boaters entering beds of emergent vegetation. However, penetration of the beds of emergent vegetation by boaters and fishermen was fairly infrequent during our studies; more frequent use of the vegetation undoubtedly would cause avoidance of these areas in the same way that more frequented areas adjacent to boat ramps, marinas, etc., were avoided. Western grebes did not frequent areas of open water used heavily by boaters; since western grebes foraged in open water, intensive and sustained boating activity could account, at least in part, for the observed reproduction inhibition of western grebes."

Several other highly pertinent points are made as the discussion continues. However, the above suffices to show that further information will be needed on the marsh wildlife and its environment. In order to provide adequately for the help it appears may be required by the Western Grebe, and others, as the human disturbances factor in Clear Lake intensifies in future, the park will do well to obtain advice from persons with special knowledge at this opportune time.

Table 1. Birds present at Anderson Marsh, April-June, 1983

Symbols: **X** Seen at least once during month.

**0** Not seen in month and perhaps absent?

**\*** Not seen but probably there on basis of strong indirect evidence.

**?** Tentative identification.

<b>Species</b>	<b>April</b>	<b>May</b>	<b>June</b>	<b>No. of individuals</b>
<b>Pied-billed Grebe</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>67</b>
<b>Western Grebe</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>154</b>
<b>Double-crested Cormorant</b>	<b>X</b>	<b>X</b>	<b>0</b>	<b>50</b>
<b>American Bittern</b>	<b>X</b>	<b>*</b>	<b>X</b>	<b>18</b>
<b>Great Blue Heron</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>96</b>
<b>Great Egret</b>	<b>X</b>	<b>0</b>	<b>X</b>	<b>8</b>
<b>Green-backed Heron</b>	<b>0</b>	<b>X</b>	<b>X</b>	<b>18</b>
<b>Mallard</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>155</b>
<b>Cinnamon Teal</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>16</b>
<b>Gadwall</b>	<b>X</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>Ruddy Duck</b>	<b>X</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>Turkey Vulture</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>60</b>
<b>Osprey</b>	<b>X</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>Bald Eagle</b>	<b>X?</b>	<b>0</b>	<b>X</b>	<b>2</b>
<b>Cooper's Hawk</b>	<b>0</b>	<b>X</b>	<b>0</b>	<b>1</b>
<b>Red-shouldered Hawk</b>	<b>X</b>	<b>X</b>	<b>0</b>	<b>5</b>
<b>Red-tailed Hawk</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>3</b>
<b>American Kestrel</b>	<b>0</b>	<b>X</b>	<b>0</b>	<b>1</b>
<b>Ring-necked Pheasant</b>	<b>0</b>	<b>0</b>	<b>X</b>	<b>6</b>
<b>California Quail</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>29</b>

Table 1 continued

Species	April	May	June	No. of individuals
Virginia Rail	X	X	0	7
American Coot	X	X	X	327
Killdeer	X	X	X	29
Spotted Sandpiper	X	X	0	3
Bonaparte's Gull	X	0	0	100
California Gull	X	X	X	241
Caspian Tern	0	0	X	7
Rock Dove	0	0	X	10
Band-tailed Pigeon	0	X	0	2
Mourning Dove	X	X	X	17
Great Horned Owl	*	X	0	5
Anna's Hummingbird	X	X	X	11
Acorn Woodpecker	X	X	X	28
Nuttall's Woodpecker	X	X	X	22
Northern Flicker	X	X	X	12
Western Wood-Pewee	0	X	X	7
Willow Flycatcher	0	X	0	3
Western Flycatcher	0	X	0	2
Black Phoebe	0	X	X	4
Ash-throated Flycatcher	0	X	X	12
Western Kingbird	X	X	X	26
Tree Swallow	X	X	X	226
Violet-green Swallow	X	X	0	3
Northern Rough-winged Swallow	X	0	0	12

Table 1 Continued

Species	April	May	June	No. of individuals
Cliff Swallow	*	X	X	79
Barn Swallow	X	X	*	41
Scrub Jay	X	X	X	20
American Crow	X	X	X	50
Common Raven	X	X	X	71
Plain Titmouse	X	X	X?	26
Bushtit	X	X	0?	9
White-breasted Nuthatch	X	X	X	9
Bewick's Wren	0	X	*	2
Marsh Wren	0	X	*	22
Ruby-crowned Kinglet	X	0	0	1
Western Bluebird	X	X	X	30
Swainson's Thrush	0	X	0	2
American Robin	0	X	0	2
Cedar Waxwing	X	0	0	8
European Starling	X	X	X	64
Warbling Vireo	0	X	X?	9
Orange-crowned Warbler	X	X	X	3
Yellow Warbler	0	X	0	3
Yellow-rumped Warbler	X	X	0	24
Common Yellowthroat	X	X	X	22
Yellow-breasted Chat	0	X	0	2
Western Tanager	0	X	0	3
Black-headed Grosbeak	X	X	X	46

Table 1 Continued

<b>Species</b>	<b>April</b>	<b>May</b>	<b>June</b>	<b>No. of individuals</b>
Rufous-sided Towhee	X	X	*	9
Brown Towhee	X	X	0	4
Lark Sparrow	X	X	X	8
Song Sparrow	X	X	X	116
White-crowned Sparrow	X	0	0	2
Dark-eyed Junco	X	X	0	2
Red-winged Blackbird	X	X	X	120
Western Meadowlark	X	X	X	9
Yellow-headed Blackbird	X	X	X	77
Brewer' s Blackbird	0	X	0	1
Brown-headed Cowbird	X	X	X	30
Northern Oriole	X	X	X	26
House Finch	X	X	X	26
Leaser Goldfinch	X	X	0	14
American Goldfinch	X?	X	X	11
House Sparrow	0	X	0	1

Table 2. Seasonal shift in numbers and in habitat occupancy by birds

<b>Habitat</b>	<b>Number individuals seen</b>			<b>Number species seen</b>			<b>Average number species seen per visit</b>		
	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>Apr</b>	<b>May</b>	<b>June</b>
<b>Open water</b>	315	58	0	15	6	0	8	3	0
<b>Emergent vegetation</b>	277	84	0	11	9	0	8	4	0
<b>Marsh</b>	174	432	321	23	26	27	13	14	17
<b>Grassland</b>	250	93	224	20	22	25	14	7	14
<b>Shore</b>	103	81	30	15	16	1	10	4	1
<b>Riparian woodland</b>	48	282	65	15	47	21	8	16	10
<b>Oak -woodland modified</b>	66	253	62	20	38	15	12	15	6
<b>Coniferous-broadleaf woodland</b>	50	35	2	18	9	2	10	8	1

Table 3. Habitats in-which selected activities occurred, April-June, 1983.

<u>Types of Activity</u>		<u>Location of activity</u>
I	Foraging, eating	a = Activity occurred in OWA
II	Escape, shelter, rest	b = Activity occurred in EMV
III	Territory proclaimed, defended	c = Activity occurred in MAR
IV	Paired; courtship dance or feeding.	d = Activity occurred in GRA
V	Nesting material handled	e = Activity occurred in SHO
VI	Active nest present	f = Activity occurred in RIP
VII	Eggs present	g = Activity occurred in OWM
VIII	Nestlings present; downy young	h = Activity occurred in CBW
IX	Carrying food to young	
X	Calls associated with nesting season	
XI	Fledged juvenals; independent young	

Each letter in the Table 3 columns  
(see next pages) represents one  
record of the activity in the  
habitat.







Table 4. Distribution of activities of birds with primary affinity for-each habitat.

*Marsh*

Species	OWA	EMV	MAR	GRA	SHO	RIP	OWM	CBW
Pied-billed Grebe		3	18					
Western Grebe	4	9	7					
Double-crested Cormorant	1		3		2			
American Bittern			5					
Great Blue Heron			7	1	3	1	9	
Great Egret			2		1			
Mallard	2	4	15			1		
Cinnamon Teal		2	7					
Turkey Vulture			4	4		1		
American Coot		5	9					
Black Phoebe			2		2	2		
Violet-green Swallow			2	2				
Northern Rough-winged Swallow			2	2				
Cliff Swallow			6	6	2			
Barn Swallow			6	6	2			
Song Sparrow			8	3		7	1	
Yellow-headed Blackbird		2	15	2				
Red-winged Blackbird		1	15	10		5		
<b>Totals</b>	<b>7</b>	<b>26</b>	<b>133</b>	<b>36</b>	<b>12</b>	<b>17</b>	<b>10</b>	<b>0</b>

*Grassland*

Species	OWA	EMV	MAR	GRA	SHO	RIP	OWM	CBW
Red-tailed Hawk			1	3		1	2	
Western Kingbird				4		2	3	
Western Meadowlark				7				
Brown-headed Cowbird			3	4		4		
House Finch				6			5	2
American Goldfinch			2	2		2		2
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>26</b>	<b>0</b>	<b>9</b>	<b>10</b>	<b>4</b>

## *Riparian*

Species	OWA	EMV	MAR	GRA	SHO	RIP	OWM	CBW
Red-shouldered Hawk				1		4	3	
Mourning Dove				1		4	2	
Great Horned Owl						4		
Western Wood-Pewee						6		
Willow Flycatcher						2		
Western Flycatcher						2		
Tree Swallow			6			8	9	
American Crow			4	1		5		
Common Raven			4	1		5		
Plain Titmouse						6	4	4
Bewick's Wren						2		2
American Robin						2	2	
Orange-crowned Warbler						4	2	2
Dark-eyed Junco			2			4		
Northern Oriole				1		7	4	1
American Goldfinch			2	2		2		2
Totals	0	0	18	7	0	67	26	11

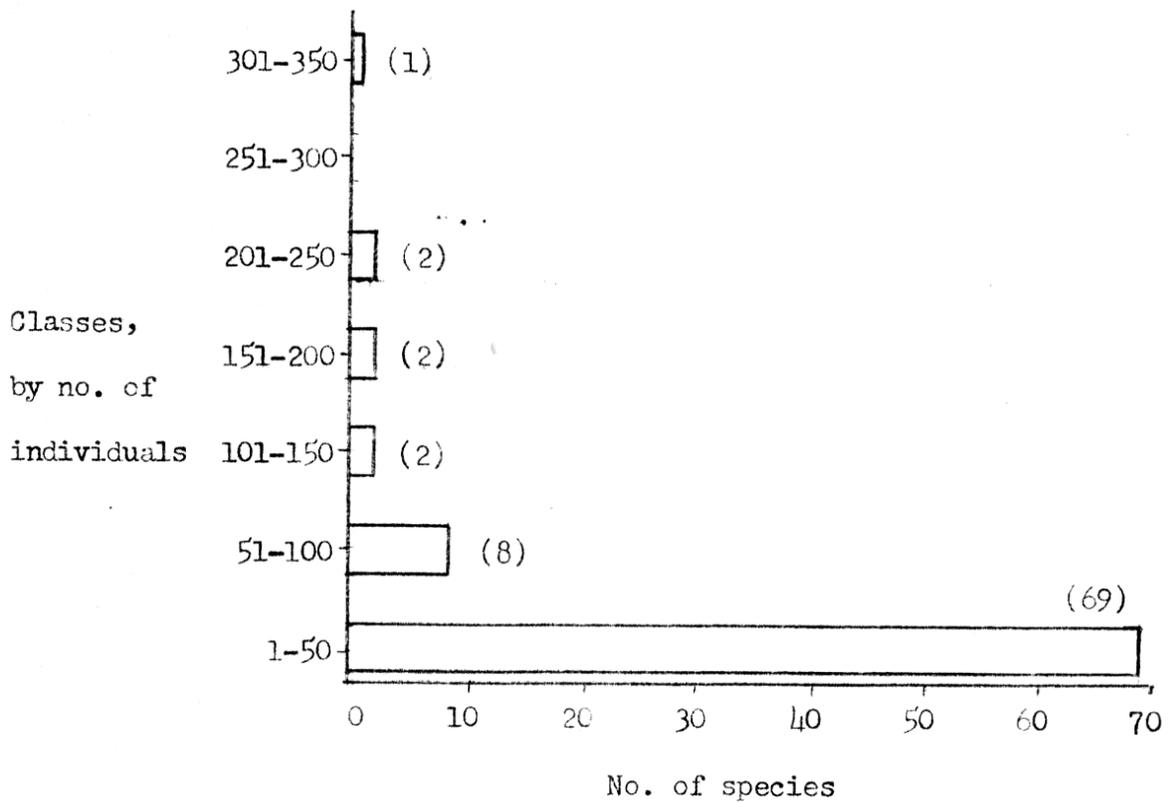
## *Oak woodland, modified*

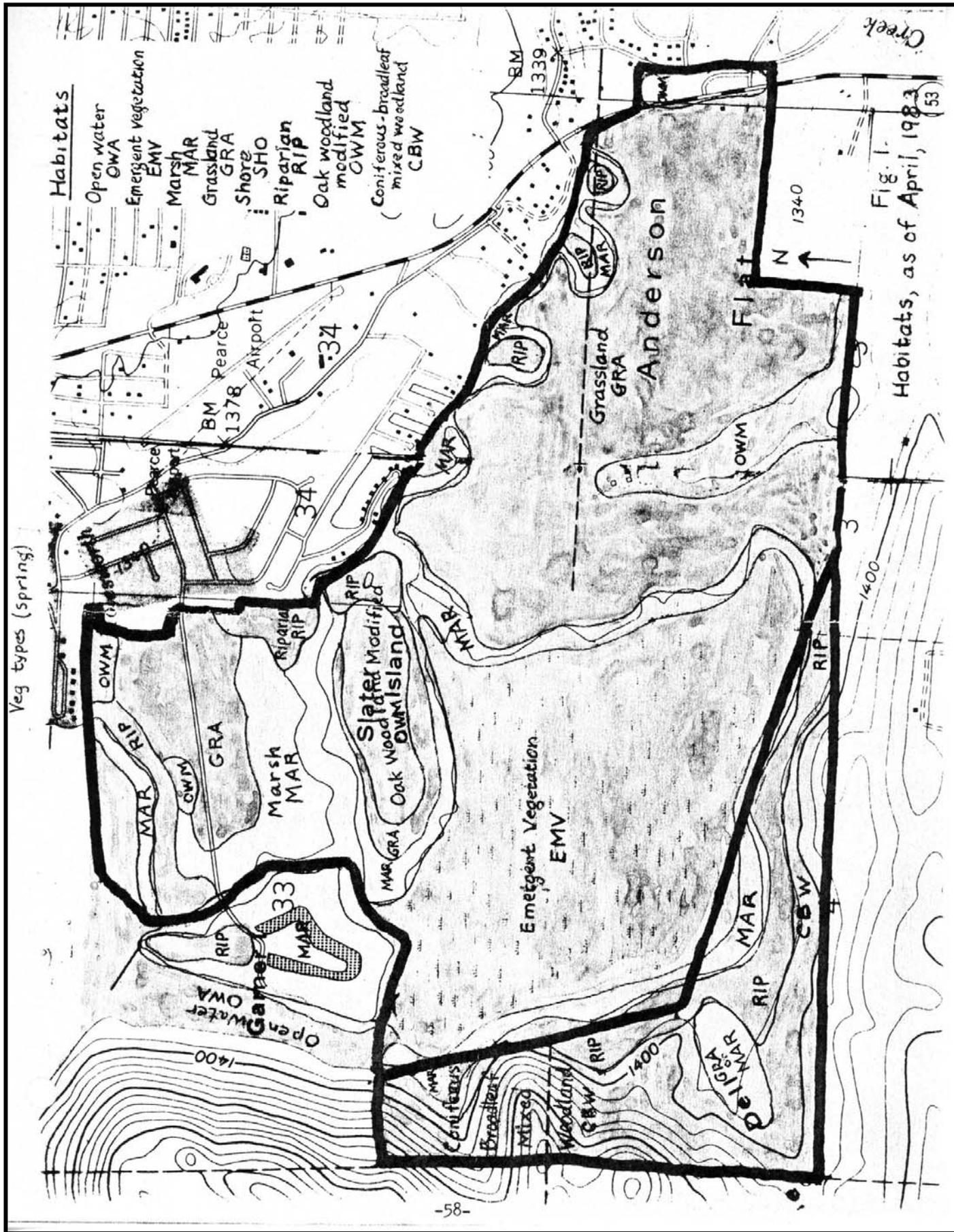
Species	OWA	EMV	MAR	GRA	SHO	RIP	OWM	CBW
Acorn Woodpecker						2	5	3
Nuttall's Woodpecker						3	5	2
Northern Flicker						3	5	3
Ash-throated Flycatcher			2			2	4	
Bushtit						4	4	
White-breasted Nuthatch						1	5	1
Western Bluebird			3	4			7	
European Starling				5	2	8	12	
Warbling Vireo						2	4	
Yellow-rumped Warbler						2	4	
Western Tanager						2	2	
Lark Sparrow							4	
Lesser Goldfinch						2	4	2
Totals	0	0	5	13	2	31	65	11

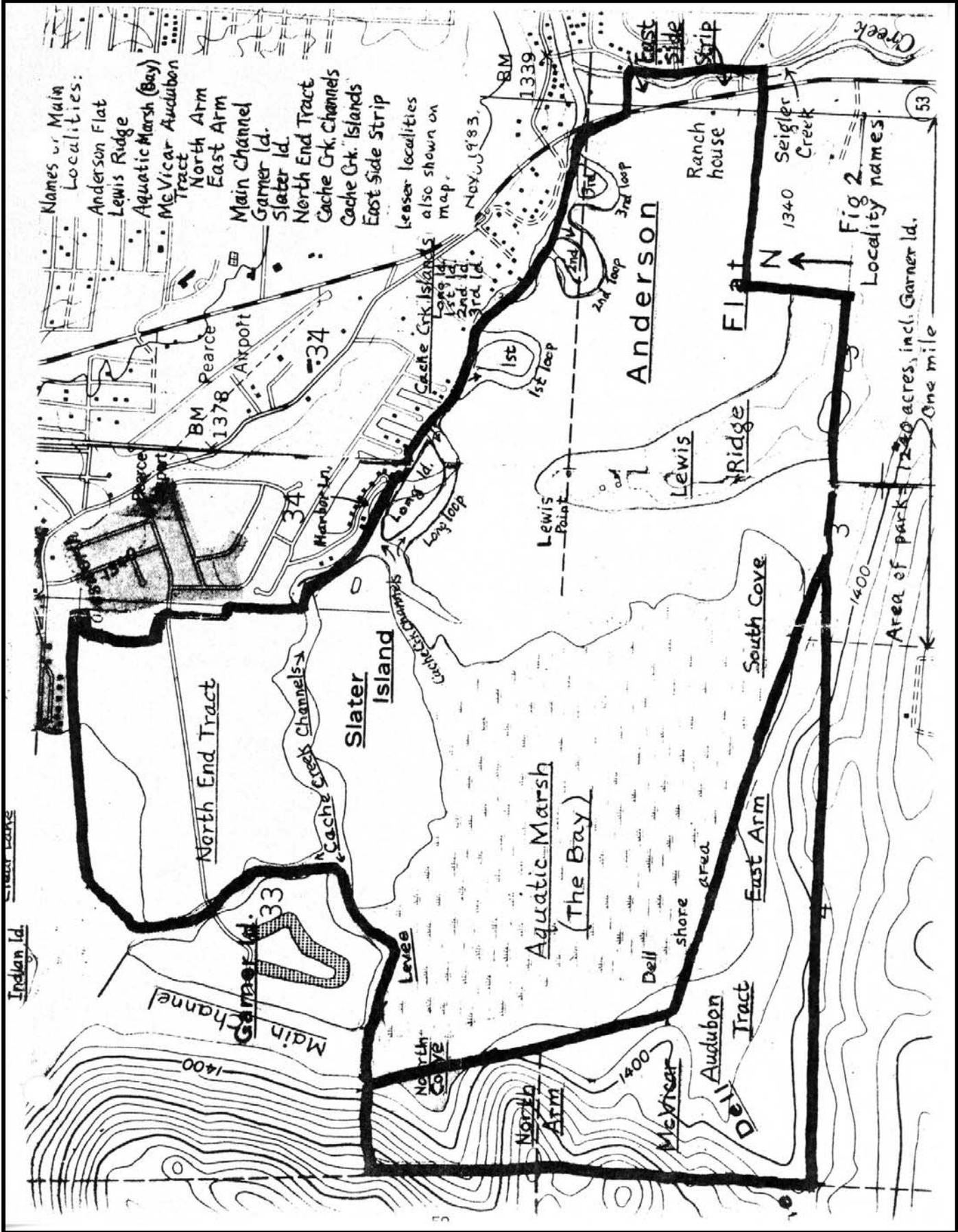
*Coniferous-broadleaf woodland*

Species	OWA	EMV	MAR	GRA	SHO	RIP	OWM	CBW
Band-tailed Pigeon								1
Scrub Jay						4	4	4
Swainson's Thrush						2		2
Rufous-sided Towhee						3	2	3
Brown Towhee								
<b>Totals</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>6</b>	<b>10</b>

Figure 3. Relation between numbers of individuals and numbers of species







- Names or Main Localities:
- Anderson Flat
  - Lewis Ridge
  - Aquatic Marsh (Bay)
  - McVicar Audubon Tract
  - North Arm
  - East Arm
  - Main Channel
  - Garner Id.
  - Slater Id.
  - North End Tract
  - Cache Crk. Channels
  - Cache Crk. Islands
  - East Side Strip
- Lesser localities also shown on map:
- Cache Crk. Islands (1st, 2nd, 3rd Id.)
  - Long Id.
  - Lowy loop
  - Lewis Point
  - Lewis Ridge
  - Anderson Flat
  - Lewis Ridge
  - Seigler Creek
  - Ranch house
  - East Side Strip
  - Strip
  - Creek

Fig 2  
Locality names

Area of park 1200 acres, incl. Garner Id.  
One mile