

**WILDLIFE HABITAT VALUES OF LESLIE SALT CO. PROPERTY
AROUND SAN FRANCISCO BAY**

Summaries of 54 Studies

Prepared for the Leslie/Interagency Group

**California Environmental Trust
December, 1987**

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Leslie Salt Co.
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U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
National Marine Fisheries Service
San Francisco Bay Conservation and Development Commission
San Francisco Bay Regional Water Quality Control Board
California Department of Fish and Game
Association of Bay Area Governments
Save San Francisco Bay Association
Sierra Club (San Francisco Bay Chapter)
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INTRODUCTION

This report summarizes 54 studies of the wildlife habitat values of various Leslie Salt Co. properties around San Francisco Bay. The report presents, for the first time in one document, synopses of work done by researchers over the past 30 years. We believe it will be a unique and valuable compilation of information for anyone concerned with the past, present, and future of the 40,000 acres of property that Leslie owns.

The report was prepared by the California Environmental Trust, a nonprofit California foundation, at the request of the Leslie/Interagency Group. This is an informal assembly of representatives of three different entities, all with strong interests in the Leslie property: (1) the Leslie company itself, (2) the governmental agencies with regulatory responsibilities that affect Leslie's salt-making operations; and (3) the many conservation organizations that seek to protect and enhance the wildlife values of the Leslie property.

This three-part group has been meeting for several months to discuss two general objectives: first, insuring that salt production continues, and second, insuring that it does so in an environmentally-sound manner.

Leslie's salt-making provides multiple benefits: harvesting salt through solar evaporation is an economically-valuable and productive use of property diked off from San Francisco Bay. In addition, the ponds provide wildfowl habitat of international significance (during parts of the year, the ponds are used by migratory birds on the Pacific Flyway between Canada and Mexico). The ponds also provide year-round habitat for a wide diversity of bird species. Early in the work of the Leslie/Interagency Group, it became clear that discussions of important habitat issues would be greatly helped if all available information could be compiled in one place. The Trust, which convenes the meetings of the group and provides support services for its work, agreed to prepare the report. The group directed that habitat studies be listed and summarized as objectively as possible, with no judgments drawn as to the accuracy or thoroughness of the information they contain. We have tried fully to comply with this directive.

The Trust contracted with CEIP Fund, Inc., the California Environmental Intern Program, to provide the researchers who compiled the data. They worked under the Trust's supervision. A grant to pay expenses of the study was made by Leslie.

We followed several criteria in compiling the information:

- We listed only documents that are publicly-available and we tried to list all of those studies. Each summary in the report explains where the study can be read.
- We listed studies of all three kinds of Leslie property: (1) property owned by Leslie and used for salt production; (2) property Leslie has conveyed to the San Francisco Bay National Wildlife Refuge under terms that allow contin

ued use for salt production; and (3) property Leslie owns but is not now using in its salt operations.

- We did not include the many studies that have been made of areas adjacent to Leslie's property, such as sloughs and other tidal areas. These are not owned or controlled by Leslie. We have, however, included a list of some of these studies in the bibliography.
- We obtained reports from the open files and libraries of the U.S. Fish and Wildlife Service and the California Department of Fish and Game; from the libraries of the South San Francisco Bay Bird Observatory; from libraries of the University of California, Berkeley; and from the writings of teachers, consultants, and others who have made their work available to us.
- We included a wide variety of studies. They range from simple records of bird counts to the massive detail assemble for Environmental Impact Reports. We included works in progress, with the permission of their authors.

Studies in this report are numbered in the order in which they were made available to our researchers. We explored other numbering systems, but none would totally satisfy all users. Some readers will want at least to skim all of the study summaries; others will be interested in particular geographic areas or in studies of specific clusters of salt ponds; still others will be most interested in the studies made of a particular wildlife species, such as the California clapper rail. The next section, "How to Use This Report", explains how you can most easily locate the information it contains.

In each summary, we listed both the types of information compiled by the researcher and also any conclusions or recommendations contained in the study. We included any comments or special circumstances mentioned by the researchers in each study. Some authors noted that their work would have been more complete if Leslie had not limited their access to salt pond areas. Whatever past practices were, Leslie's current policy is generally to allow researchers to conduct their studies on the company's property, provided the results of the study are made available to the company and provided there is advance notification of the areas to be studied.

The summaries in this report were written by three Associates of the CEIP program. They are Flint Hughes, a 1987 graduate of Stanford University who worked in the University's conservation biology program; Sandy Morrill, who received her B.A. degree in environmental studies and biology from New College in Sarasota, Florida, in 1979, and has since worked as a consultant on a variety of wetland projects; and Ellen Lerner, who expects to receive her degree in human ecology in 1988 from College of the Atlantic in Bar Harbor, Maine, and who has worked on Audubon Society sanctuary projects.

The Trust is pleased to be able to assist the Leslie/Interagency Group in its efforts to seek agreement on important issues affecting the future of the Leslie property.

Joseph E. Bodovitz
President
California Environmental Trust
December, 1987

HOW TO USE THIS REPORT

This report has three principal sections: (1) maps of Leslie Salt Co. property, (2) summaries of the habitat studies, and (3) a chart that correlates the studies to specific salt pond areas.

Maps There are three maps. The first shows Leslie property in the Baumberg area on the east side of San Francisco Bay south of the Hayward-San Mateo Bridge. The second shows Leslie property in the south part of San Francisco Bay. The third is of Leslie property diked off from San Pablo Bay, in Napa and Solano Counties.

Study Summaries The 54 summaries comprise the major part of this report.

Pond—Study Correlation Chart This chart shows the studies of each specific salt pond area. For example, if you want information about habitat studies of salt ponds at the mouth of Mowry Slough in southern Alameda County south of the Dumbarton Bridge, the first step is to look at the map of the South San Francisco Bay ponds. On the map, find the salt ponds that most closely correspond to the area in which you are interested, e.g., ponds M1, M9, and M11. Then turn to the pond-study correlation chart and find the listing for these ponds. You will see that for pond M1, the following studies have been made: 8d, 11, 21, 24, 35, 37, 38, and 47. All you then have to do is find these studies by number in the listing of summaries.

Subject Index The report also includes a subject index, i.e., a list showing studies that have been made of individual species such as the California clapper rail, and also studies listed by other categories.

BAUMBERG SECTION SALT EVAPORATOR PONDS





KEY TO BIBLIOGRAPHY OF STUDIES CONCERNING WILDLIFE
HABITAT VALUE OF LESLIE SALT CO. PROPERTY

CALIFORNIA ENVIRONMENTAL TRUST 1987



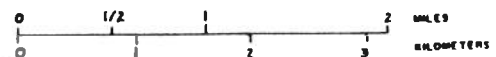
See South San Francisco Bay Map

POND LETTER PREFIXES REFER TO THE FOLLOWING GEOGRAPHIC SECTIONS:
 B = BAUMBERG
 SECTIONS EQUIVALENT TO LESLIE SALT COMPANY PLANTS
 NUMBERS DESIGNATE INDIVIDUAL SALT EVAPORATOR PONDS

 NON-PRODUCTIVE PARCELS	 MARSH
 LEVEE	 SALT EVAPORATOR

MAP SOURCES:

U.S. GOVERNMENT PRINTING OFFICE, FISH AND WILDLIFE SERVICE, 1981
 Additional Information added by H. L. Cogswell 1986



POND-STUDY CORRELATION CHART

Baumberg Section Salt Evaporator Ponds

Baumberg Section

Pond	Entry #
B1	8b, 19, 21, 23, 25, 38, 47
B2	8b, 19, 21, 23, 25, 38, 47
B4	8b, 11, 19, 21, 23, 25, 38, 47
B5	8b, 11, 21, 23, 25, 38, 47
B6	8b, 21, 23, 25, 38, 47
B6A	1, 6, 8a, 9, 10, 11, 21, 23, 25, 26, 36, 38, 47
B6B	1, 6, 8a, 9, 10, 11, 21, 23, 25, 38, 47
B7	8b, 11, 21, 23, 25, 38, 47
B8	6, 8a, 9, 10, 11, 21, 23, 25, 38, 47
B8A	10, 11, 21, 23, 25, 31, 38, 47
B9	1, 6, 8a, 9, 10, 11, 21, 23, 25, 38, 47, 53
B10	6, 8a, 9, 10, 11, 21, 23, 25, 38, 47, 53
B11	1, 6, 8a, 9, 10, 11, 21, 23, 25, 36, 38, 47, 53
B12	1, 6, 8a, 9, 10, 11, 16, 21, 23, 25, 36, 38, 47, 53
B13	1, 6, 8a, 9, 10, 11, 21, 23, 25, 36, 38, 47, 53
B14	6, 8a, 9, 10, 11, 21, 23, 25, 38, 47, 53
B1C	21, 25, 23, 38, 47
B2C	8b, 11, 21, 25, 33, 38, 47
B3C	8b, 11, 21, 25, 33, 38, 47
B4C	8b, 11, 21, 25, 33, 38, 47
B5C	8b, 11, 21, 25, 33, 38, 47
B6C	8b, 11, 21, 23, 25, 38, 47

Baumberg Tract

1B-15B 1, 2, 4, 6, 8a, 9, 10, 11, 25, 34, 36, 47, 53

Perry Duck
Club 2, 25, 34, 36, 38, 39, 47, 50, 53

Mt. Eden
Creek 28, 38, 39, 47, 50, 53

Note: Areas not in salt production west of B8A, B9, B10 - #33.

South San Francisco Bay Salt Evaporator Ponds

Newark Section

N1	8c, 11, 21, 25, 37, 38, 47, 51
N2	8c, 11, 21, 25, 37, 38, 47, 51
N3	8c, 11, 21, 25, 37, 38, 44, 47
N4	11, 21, 25, 37, 38, 41, 44, 47, 51
N5	11, 21, 37, 38, 44, 47, 51
N6	11, 21, 25, 37, 38, 41, 44, 47, 51
N7	11, 21, 37, 38, 44, 47, 51
N8	11, 21, 37, 38, 44, 47, 51
N9	11, 21, 25, 37, 38, 41, 44, 47, 51
N10	21, 37, 38, 44, 47
NA1	11, 21, 31, 37, 38, 44, 47, 51
NA2	11, 21, 37, 38, 44, 47, 51
NA3	11, 21, 37, 38, 44, 47, 51
NA4	21, 37, 38, 44, 47, 51

Coyote Tract

CT1	22, 32, 34, 50, 54
CT2	22, 32, 34, 50, 54
CT3	32, 50, 54
CT4	8c, 22, 32, 34

Mowry Section

M1	8d, 11, 21, 24, 35, 37, 38, 47
M2	8d, 11, 21, 24, 33, 35, 37, 38, 47
M3	8d, 11, 21, 24, 33, 35, 37, 38, 47, 51
M4	8e, 11, 12, 21, 24, 25, 35, 37, 38, 47, 51
M5	8e, 11, 21, 24, 35, 37, 38, 47, 51
M6	8d, 21, 24, 35, 37, 38, 47, 51
M7	11, 21, 37, 38, 47, 51
M8	11, 21, 37, 38, 47, 51
M9	11, 18, 21, 37, 38, 47, 51
M10	11, 21, 34, 37, 38, 47, 51
M11	11, 21, 37, 38, 47, 51
M12	21, 37, 38, 47, 51
M13	8c, 21, 34, 37, 38, 47, 51

Hill Parcel 8c, 21

Alviso Section

A1	5, 7, 19, 21, 37, 38, 40, 47
A2	W 3, 7, 8l, 11, 19, 21, 37, 38, 40, 47
A2E	3, 11, 21, 37, 38, 47

A3W	7, 8l, 11, 21, 23, 30, 37, 38, 47
A3E	21, 23, 37, 38, 47
A3	21, 37, 38, 40, 47
A4	7, 8l, 21, 37, 38, 40, 47
A5	7, 8h, 11, 21, 37, 38, 40, 47
A6	7, 8h, 11, 21, 23, 37, 38, 47
A7	7, 8h, 11, 21, 37, 38, 47
A8	7, 8h, 11, 12, 13, 21, 37, 38, 47
A9	8g, 20, 21, 23, 25, 37, 38, 47
A10	8g, 20, 21, 23, 25, 37, 38, 47
A11	8g, 20, 21, 23, 25, 37, 38, 47, 51
A12	8g, 11, 20, 21, 23, 25, 37, 38, 47
A13	8g, 11, 20, 21, 23, 25, 37, 38, 47
A14	8g, 11, 20, 21, 23, 25, 37, 38, 47
A15	8g, 11, 20, 12, 21, 23, 25, 37, 38, 47
A16	8f, 11, 12, 21, 25, 37, 38, 47
A17	8f, 11, 12, 21, 33, 37, 38, 47
A18	8f, 11, 12, 21, 37, 38, 47
A19	8f, 11, 12, 21, 24, 37, 38, 47, 51
A20	8f, 11, 12, 21, 33, 37, 38, 47, 51
A21	8e, 11, 12, 21, 37, 38, 47, 51
A22	8f, 11, 21, 37, 38, 47, 51
A23	8f, 11, 21, 37, 38, 47, 51
B1	7, 8l, 11, 21, 23, 37, 38, 47
E2	7, 8l, 11, 21, 23, 37, 38, 47

Alviso Section (non-specific) 17, 39

Redwood City Section

R1	8j, 11, 21, 24, 25, 27, 37, 38, 47, 51
R2	8j, 11, 21, 24, 25, 27, 37, 38, 47, 51
R3	8j, 21, 27, 37, 38, 47
R4	8j, 21, 25, 27, 37, 38, 47
R5	21, 37, 38, 47
R6	21, 37, 38, 47
R7A	21, 37, 38, 47
R7B	21, 37, 38, 47
R7C	21, 37, 38, 47
R8	21, 37, 38, 47
SF2	8j, 21, 25, 37, 38, 47, 51

San Pablo Bay Section Salt Evaporator Ponds

SP1	12, 14, 15, 21, 33, 38, 46
SP2	12, 13, 14, 21, 33, 38, 42, 45, 46, 48, 49
SP3	12, 21, 46, 48

SP4	12, 21, 46
SP5	12, 21, 26, 28, 43, 46
SP6	21, 28, 46
SP7	12, 21, 42, 46, 48, 49
SP8	12, 21, 46
SP9	12, 21, 28, 46

China Slough - 28

SUBJECT INDEX

Baywide Studies: 8, 11, 12, 14, 21, 25, 26, 28, 30, 33, 34, 37, 38, 39, 42, 46, 47, 52.

Bird Surveys/Census Counts: 1, 2, 3, 4, 5, 6, 21, 22, 23, 24, 25, 27, 28, 30, 32, 34, 35, 36, 38, 41, 44, 48, 49, 53, 54.

Breeding Bird Surveys: 8, 11, 12, 26, 30, 37, 47, 51.

Environmental Assessments: 9, 10, 19, 29, 36, 41, 46, 54.

Hydrological Studies: 7, 14, 17, 18, 19, 20, 27, 29, 35, 40, 41, 44.

Brine Shrimp: (*Artemia* sp.): 7, 14, 27, 29, 35, 36, 40.

Salt Marsh Harvest Mouse: (*Reithrodontomys raviventris*): 9, 10, 13, 14, 15, 16, 31, 33, 39, 43, 50.

Salt Marsh Song Sparrow: (*Melospiza melodia pusillula*): 42, 49.

Salt Marsh Yellowthroat (*Geothlypis trichas striuosa*): 9, 10, 12, 26.

California Least Tern (*Sterna albifrons browni*): 3, 4, 5, 6, 8, 9, 10.

California Clapper Rail (*Rallus longirostris obsoletus*): 9, 10, 28, 30, 48, 52.

Snowy Plover (*Charadrius alexandrinus nivosus*): 8, 9, 10, 23.

BIBLIOGRAPHY OF STUDIES CONCERNING WILDLIFE HABITAT ON LESLIE SALT COMPANY

STUDY 1

Study Site	Baumberg Section; Ponds B6A, 36B, B9, B11, B12, B13, B14, and Baumberg Tract, all ponds. Maps included. Study specific to listed Leslie Salt Co. properties only.
Study Title	"South San Francisco Bay Aerial Salt Pond Survey: A Project Conducted by United States Fish and Wildlife Service and California Department of Fish and Game". Unpublished.
Author(s)	Observers: T. Harvey, P. Kelly, and R. Lowe. Prepared by L. Feeney.
Date of Study	From February 5, 1981 to January 24, 1985.
Where Study Can Be Found	California Department of Fish and Game, 1416 9th Street, Sacramento, CA 95814.
Nature of Study	Aerial survey of bird numbers of Baumberg Tract ponds on 21 days between the above-mentioned dates. Lists names (common name) and numbers of birds seen during survey period. Ten pages.
Notes on Study	Observers comment that due to nature of aerial surveys, counts are lower than actuality.
Conclusions of Study	None.

STUDY 2

Study Site	Baumberg Section: Baumberg Tract, all ponds. Includes Perry Duck Club parcel. Map included. Study specific to listed Leslie Salt Co. properties only.
Study Title	"Diked/Seasonal Wetland Project: Baumberg Tract and Perry Duck Club". Unpublished.
Author(s)	Data prepared by L. Feeney.
Date of Study	From January 21, 1985 to May 2, 1986.

Where Study Can Be Found	California Department of Fish and Game. Address: Post Office Box 47, Yountville, CA 94599.
Nature of Study	Ground survey of designated lands. Data for 10 days on Perry plot. Data for 22 days on Baumberg tract. Lists names (common name) and numbers of birds observed. Also specifies activity of birds observed (e.g. feeding, flushed, bathing, heard only, etc.). Nine pages.
Notes on Study	Strictly a table of names and numbers. No discussion of data.
Conclusions of Study	None.

STUDY 3

Study Site	Alviso Section: Ponds A2E and A2W. Site referred to in the study as the Crittenden Site. Study specific to Leslie Salt Co. properties only.
Study Title	"California Least Tern Observations at Crittendon Site". Unpublished.
Author(s)	Observers: B. Lowman, F. Rice, L. Collins, L. Feeney. Prepared by L. Feeney.
Date of Study	From July 8, 1984 to September 2, 1986.
Where Study Can Be Found	California Department of Fish and Game, 1416 9th Street, Sacramento, CA 95814.
Nature of Study	Draft report. Includes map of area. Data of least tern populations only. Data includes observation dates (five days), number of birds, and respective observers. Map indicates location of least tern populations and their activities at each location (e.g. roosting, foraging, transit flight). Two pages.
Notes on Study	Study is preliminary. Precise location for 1 of 5 observations is not known. Precise dates for 2 observations not known (e.g. "Mid-August 86", "Late-August 86"). Study states that some observers had not been reached prior to the compilation of data.
Conclusions of Study	None.

STUDY 4

Study Site	Baumberg Section. Map of specific study areas not included. Absence of map and description of ponds investigated makes it difficult to effectively locate study site.
Study Title	"Table of California least tern activity: Baumberg Area, 1986". Unpublished.
Author(s)	Observers: B. Acker, L. Collins, L. Feeney. Prepared by L. Feeney.
Date of Study	From May 2, 1986 to September 4, 1986.
Where Study Can Be Found	California Department of Fish and Game, 1416 9th Street, Sacramento, CA 95814.
Nature of Study	Lists numbers of least terns observed on 9 days. Lists numbers of adults and fledglings observed. Brief mention of activities of birds observed. One page.
Notes on Study	Study very brief. Difficult to know exact location of observations. No discussion of data gathered.
Conclusions of Study	None.

STUDY 5

Study Site	Study largely pertains to areas adjacent to Leslie property. Alviso Section: Pond A1 (Charleston Slough). No map included. No references to Leslie Salt Co. given. Personal communication with L. Feeney clarified that study pertains to pond A1.
Study Title	"California Least Tern Observations at Charleston Slough". Unpublished.
Author(s)	Observers: Rare Bird Alert Tape, P. Browning, W. Bousman, J. Campbell, T. Chandik, L. Collins, A. Eisner, L. Feeney, T. Olson, D. Suddjian. Prepared by L. Feeney.
Date of Study	From July 23, 1981 to August 14, 1986.
Where Study Can be Found	California Department of Fish and Game, 1416 9th Street, Sacramento, CA 95814.

Nature of Study	Lists date of observation, number of least terns seen, and name of observer. No discussion of data. One page.
Notes on Study	Raw data put in table. Due to lack of information; it is difficult to locate the area that data is referring to.
Conclusions of Study	None.

STUDY 6

Study Site	Baumberg Section: Ponds B6A, B6B, B8, B9,B10,B11,B12,B13,B14, and Baumberg Tract, all ponds. Maps included.
Study Title	"Table of California Least Tern Observations". Part of a report on California Least Tern use on the Baumberg site. Unpublished.
Author(s)	Observers: San Francisco Bay Bird Observatory, L. Collins, L. Feeney, P. Kelly, S. Foreman. Prepared by L. Feeney.
Date of Study	From August 15, 1983 to August 14, 1985. All observations made during the months of July, August, or September. Majority of observation days logged during August of three years.
Where Study Can Be Found	California Department of Fish and Game, 1416 9th Street, Sacramento, CA 95814.
Nature of Study	Table lists dates of observations, number of least terns sited, and names of observers. Brief discussion of data and explanation of observation methods. Eight maps included in study. Maps document location of individual nests and colonies of California least terns (CLT's) seen on each observation day. Specific comments accompany each map concerning numbers and activities of CLT's sited during each observation day (e.g. "At least 5 CLT simultaneously foraging"). Nine pages.
Notes on Study	Study states that table numbers represent total numbers of birds seen at one time from a single location. Due to nature of topography (e.g. expanse of levees and ponds), numbers give a conservative estimate of actual CLT population. Authors comment on negative datum recorded for 08-14-85, noting that birds had apparently left site by this date. Authors also note that on this date tire tracks were observed on levee as well as footprints in the area where CLT are most often sited, and that such signs of human activity "were not present on previous visits".

Conclusions
of Study None.

STUDY 7

Study Site Alviso Section: Ponds A1, A2W, B1, B2, A3W, A4, A5, A6, A7, A8. Maps included. Study pertains to Leslie Salt Co. property only.

Study Title "Hydrobiology of the Alviso Salt Ponds" *Ecology* 38(3):375-390. 1957.

Author(s) L.H. Carpelan.

Date of Study Period of investigation spans 1951 and 1952. Samples taken on weekly basis during 1951. Samples taken less frequently in 1952.

**Where Study
Can Be Found** San Francisco National Wildlife Refuge, P.O. Box 524, Newark, CA 94561.

Nature of Study Study investigates the salt ponds as suitable habitat for salt-tolerant flora and fauna. Investigates the ecosystem changes resulting from the increasing salinity of the ponds in the process of salt production. Discussion of hydrology of salt ponds. Description of physical and chemical factors (e.g. rainfall, temperature, salinity, hydrogen ion concentration, dissolved oxygen, nitrogen and phosphorus, and micronutrients). Data gathered on physical and chemical factors. Discussion of significance of data included in study. Qualitative description of organisms rather than quantitative data. Brief discussion of avifauna and mammals. Study discusses the following factors regarding salt pond flora and fauna: Seasonal changes in population, growth rate, dry weight of standing crop, kjeldahl nitrogen, and oxygen production. Discusses relationship of salinity to habitat. Qualitative and quantitative presentation of information. Sixteen pages.

Notes on Study Purpose of study is to investigate dynamics of salt pond ecosystem. Detailed study of algal and invertebrate populations in pond system, as well as physical and chemical characteristics of ecosystem. Information on avifauna absent.

**Conclusions
of Study** Conclusions presented in study constitute a recapitulation and further discussion of information previously listed in study.

STUDY 8

Study Site	Includes various sites around South San Francisco Bay. Information in study is characterized in a section-by-section manner. Entries will be made for the following sections that pertain to Leslie Salt Co. property: a. Baumberg section; b. Turk Island section; c. Dumbarton Bridge section; d. Newark section; e. Drawbridge section; f. Milpitas section; g. Alviso section; h. Knapp section; i. Mountain View section; j. Ravenswood Slough section. Maps of each area included. Study uses Leslie Salt Co. pond numbering system.
Study Title	"A Breeding Bird Survey of the South San Francisco Salt Pond Levee System". 1981.
Author(s)	Members of the South Bay Institute for Avian Studies. Report written by Michael Rigney and Theresa Rigney Research Associates.
Date of Study	From May 12, 1981 to August 2, 1981. Surveying was done by vehicle and also on foot (refer to individual sections for percentages).
Where Study Can Be Found	San Francisco National Wildlife Refuge, P.O. Box 524, Newark, CA 95670. Also San Francisco Bay Bird Observatory, P.O. Box 247, Alviso, CA 95002.
Nature of Study	Breeding bird survey of dikes and levees of South San Francisco Bay salt pond system. Description of topography, hydrology and vegetation of each study site, including a discussion of the area's suitability as nesting habitat for bird species. Lists birds observed and provides detailed maps of nest sites for each bird species listed. Comments on human activity and its impact on flora and fauna. Includes detailed wildlife enhancement recommendations for each section. Briefly discusses previous breeding bird surveys of the South San Francisco Bay Area (see Gill, 1973, #37; Moss, 1980, #51). Comments that current study determines total number of bird species and estimates nesting density. Notes that this information not included in the previous studies.

STUDY 8a

Study Site	Baumberg Section. Ponds B6A, B6B, B8, B9, B10, B11, B12, B13, and B14 and Baumberg Tract, all ponds. Includes map of area. This section of the study specific to listed Leslie Salt Co. property only.
Study Title	Section title: The Baumberg Section (pp. 6-14).

Date of Study Two survey dates: June 10, 1981 and June 27, 1981. Eight party hours spent locating and observing nesting birds. 75% of total time spent observing from car; 25% observing on foot.

Notes on Study Discussion of bird data meshed with discussion of topography, etc.

Conclusion of Study Comments on the importance of evaporator ponds as habitat for certain bird species. Comments on pros and cons of area as habitat for bird species (Pros: Broken, unmaintained levees, low or dry evaporator ponds, lack of disturbance or predation. Cons: Lack of feeding ponds). Recommends further study.

STUDY 8b

Study Site Baumberg Section. Ponds B1, B2, B4, B5, B6, B7, B2C, B3C, B4C, B5C, and B6C. Maps included. Study also includes areas not owned by Leslie Salt Company. In study, area referred to as the Turk Island Section.

Study Title Section title: The Turk Island Section (pp. 15-23).

Date of Study Two survey days: June 10, 1981 and June 27, 1981.

Notes on Study Detailed study of area in question.

Conclusions of Study Comments on the suitability of Leslie Salt management practices with regard to providing habitat (e.g. minimizing human disturbance). Comments on favorable habitat provided for American avocet, black-necked stilt, and Caspian tern. Discusses absence of snowy plover, avocets, and stilts. Concluded that absences were due to lateness of study. Recommends earlier censusing in future.

STUDY 8c

Study Site Various sites adjacent to eastern approach of Dumbarton Bridge including Newark Section: Ponds N1, N2, N3 and Coyote Tract non-productive parcel CT4. Mowry Section: Pond M13 and non-productive Hill parcel. Maps included. In study, area is referred to as the Dumbarton Bridge Section.

Study Title Section title: The Dumbarton Bridge Section (pp. 34-41).

Date of Study Five survey days. From May 26, 1981 to June 11, 1981. Total of 12.75 party hours spent conducting survey -- 50% of observations on foot, 50% from car.

**Conclusions
of Study**

Comments on the absence of birds on bittern ponds. Comments on impacts of human disturbance and the inundation of ponds following the completion of bridge approach. Recommends Pond N1 be filled prior to breeding season, to provide nesting habitat for Forster's terns. Mentions alternative plover nest sites if Pond N1 filled. Comments that interval levees of N2 and N3 provide potential nesting sites for American avocets and black-necked stilts. Attributes low number of avocet and stilt nests this year to traffic and construction in vicinity.

STUDY 8d

Study Site

Mowry Section. Ponds M1, M2, M3, and M6. Maps included.

Study Title

Section Title: Newark Section (pp.4247).

Date of Study

Three survey days: May 27, 1981, May 29, 1981, and June 27, 1981. Total of 19.5 party hours spent conducting survey; 100% on foot.

Notes on Study

Maps indicate little nesting activity. Study notes this was due in part to the timing of the survey (before avocet and stilt nesting time). Notes that maintenance dredging and spoiling of levees, in the past year, created a substrate unsuitable for avocet and stilt nesting. Comments that area will remain unsuitable for approximately three to four years. Notes observation of an estimated 10,000 willets, in breeding plumage, on inboard levee. Comments that this is possibly an indication of expansion of willet breeding range.

**Conclusions
of Study**

"Flattening the surface of the levees and filling in the levee chasms created by the drying spoil deposits would greatly improve this section. The levees surrounding pond 1 appear to be the preferred nesting areas for avocets and stilts. Grading or rolling portions of these levees would increase the amount of acceptable substrate and enhance the breeding potential for birds which utilize this type of habitat."

STUDY 8e

Study Site

Various sites in South San Francisco Bay including the following Leslie Salt Co. property: Mowry Section: Ponds M4 and M5. Alviso Section: Pond A21. Maps included.

Study Title

Section Title: Drawbridge Section (pp. 48-53).

Date of Study

Four survey days. From May 21, 1981 to August 2, 1981. Total of 12.5 party hours spent conducting survey — 95% on foot; and 5% by car.

Notes on Study Details recent history of Leslie maintenance activities in study area, i.e. ponds M4 and M5 received dredge spoils along their outer levees in April and May 1981. Notes that this activity eliminated stilt and avocet nesting habitat, probably for several years. Comments that levee maintenance of inner levee between ponds M4 and M5 may preclude nesting of existing Caspian tern colony for an estimated five years. Comments that levees around pond A21 are overgrown with vegetation. These levees subject to feral cat predation. Notes that vegetated levee is unsuitable for avocet and stilt nesting.

Conclusions of Study Recommends control of feral cat population around A21 before 1982 breeding season, to maximize successful nesting of avocets and stilts. Comments that the vegetation along eastern and southern boundaries of A21 might discourage avocet and stilt nesting, but could provide habitat suitable for mallards and gadwalls. Experimental management techniques to restore tern nesting to inner levees of M4 and M5 include: grading and flattening levee surface, then white-washing surface (to simulate historical colony site); use of Caspian tern decoys.

STUDY 8f

Study Site Alviso Area. Ponds: A18, A22, A23, A16, A17, A19, A20. Maps of areas included. In study, area is referred to as the Milpitas Section.

Study Title: The Milpitas Section (pp. 54-65).

Date of Study Thirteen survey days. From May 25, 1981 to September 2, 1981. Total of 56.5 group observation hours— 90% on foot and 10% by auto.

Notes on Study Thorough discussion of area and waterfowl observed. Comments on human disturbance— traffic. Comments on water levels of ponds and effect of water levels of nesting populations. Comments on prevalence of American avocets and black-necked stilts. Discusses disturbance from feral dogs, and cats as well as rat infestation.

Conclusions of Study Discusses factors leading to the high populations of avocets and stilts observed. Comments on the availability of appropriate nesting sites. Also discusses frequency of human and animal disturbance with regard to nesting sites. Recommends stronger, vehicle-proof gate at pond entrances. Recommends effective animal control program. Recommends reduction of motorcycle and foot traffic in area. Recommends continued observation of heron colony to compare with Bair Island heron demographics and to document the northern expansion of little blue herons in California.

STUDY 8g

Study Site	Alviso Section: Ponds A9, A10, A11, A12, A13, A14 and A15. Maps included.
Study Title	Section Title: The Alviso Section (pp. 66-72).
Date of Study	Seven survey days, from May 20, 1981 to July 5, 1981. Total of 17.5 party hours spent conducting survey— 80% on foot and 20% by car.
Notes on Study	Notes change in pond water levels during the course of the survey, and effect on nesting. Comments that a Leslie pumping station, located on levee between A14 and A15, is source of traffic in the area. Effect of traffic on stilt and avocet nesting in area is unknown.
Conclusions of Study	Comments that dredge spoil deposition on levees in study area represents loss of potential nesting area for stilts and avocets. Recommends grading and flattening of the affected areas, to encourage recolonization. Recommends maintaining constant water level in ponds during the peak egg-laying and incubation period. Comments that black-necked stilts tend to nest just above the water line. Recommends control of water level to insure a better success rate for this species.

STUDY 8h

Study Site	Alviso Section. Includes ponds A5, A6, A7, and A8. Study includes areas not owned by Leslie Salt Co. Maps included. Study refers to area as Knapp Section.
Study Title	Section title: The Knapp Section (pp. 73-84).
Date of Study	Five survey days. From May 22, 1981 to June 30, 1981. Total of 24.5 group observation hours— 75% on foot and 25% from auto.
Notes on Study	Discussion of habitat and bird populations observed. Comments on fact that area contained more nesting sites than any other section in the study. Also comments on human disturbance. Observed armed individuals on several occasions and later saw dead American avocets that had been shot. Comments on the close proximity of rat-infested dump and its threat to nearby nesting sites.
Conclusions of Study	Comments on the importance of newly-established California gull colony. Recommends use as starting point for future expansion of nesting sites to other suitable areas in South Bay. Recommends that Leslie Salt be made more aware of the importance of gull colony to insure appropriate management practices. Comments on co-habitation of Forster's tern and California gull populations. Rec-

ommends close surveillance of populations to obtain information concerning species interactions. Also recommends close observation of snowy plover population throughout the nesting season, focusing on the territorial conflicts between plover populations and American avocet and black-necked stilt populations. Recommends further study of nesting success of large populations of American avocet and black-necked stilt located in heavily disturbed sites.

STUDY 8i

Study Site Alviso Section: Ponds B1, B2, A2W, A3W, and A4. Maps included. Study refers to area as Mountain View Section.

Study Title Section title: Mountain View Section. (pp.85-93).

Date of Study Two survey days: June 9, 1981 and June 30, 1981. Total of 11 party hours— 65% of time observing pond B2 and 35% by car.

Notes on Study Comments on dense vegetation on the dikes around ponds A3W and A4. Notes that 65% of survey time was spent observing pond B2. Large concentration of Forster's terns and observed nesting on the small islands of B2. Comments this is one of the largest Forster's tern colonies in northern California. Notes that the islands in B2 are also suitable nesting habitat for stilts and avocets.

Conclusions of Study Comments that, in pond B2, stilts and avocets nested in close association with the Forster's terns. In the southern part of B2, avocets and stilts observed nesting near pintails and gadwalls. Recommends further study of levee characteristics, plant diversity, and plant distribution, and the relationship of these factors to the species cohabiting islands in pond B2.

STUDY 8j

Study Site Redwood City Section: Ponds SF2, R1, R2, R3 and R4. (R1 and R2 were the only ponds actively surveyed). Maps included. Study refers to area as Ravenswood Slough Section.

Study Title Section Title: Ravenswood Slough Section (pp. 94-100).

Date of Study Four survey days. From May 16, 1981 to July 14, 1981. Total of 7 party hours spent conducting survey— 50% on foot and 50% by car.

Notes on Study Comments that salt pond water levels remained fairly constant during the study period. Notes that a PG&E boardwalk runs across pond R2. Observers noted that tracks of cat, dog and skunk visible on islands closest to boardwalk. Comments that the nests on these islands were probably unsuccessful as a result of predation.

Conclusions of Study Recommends placement of a water barrier near the PG&E board walk to discourage predation on nearby islands. Recommends reduction of foot traffic around pond R2 during the incubation period of avocets and stilts. Recommends islands in pond R1, which support Forster's tern colony, not be flooded.

STUDY 9

Study Site Baumberg Section: Ponds B6A, B6B, B8, B9, B10, B11, B12, B13, B14, and Baumberg Tract, all ponds. Map included. Study encompasses adjacent areas not owned by Leslie Salt Co.

Study Title Environmental Impact Report, Environmental Impact Statement: The Shorelands: General Plan Amendment 83-23, Zone Change Application 83-24, Public Notice No. 15283E49. Draft.

Authors Prepared for the City of Hayward and the U.S. Army Corps of Engineers by Cole/Mills Associates in association with Alan Kropp and Associates, Mundie and Associates, Inc. Omni-Means, Inc., Resource Management Associates, Inc., and Western Ecological Services Company, Inc.

Date of Study Document includes several different studies conducted at various times, from 1980 to 1985.

Where Study Can Be Found U.S. Army Corps of Engineers— EIS Coordinator; Corps of Engineers - 211 Main Street, San Francisco, CA 94105, (415) 974-0446; or City of Hayward Coordinator; 22300 Foothill Boulevard, Hayward, CA 94541 (415) 581-2345.

Nature of Study Comprehensive study of all facets of the biological setting of the area and extensive mapping included (e.g. vegetation map, habitat map, water bird nesting activity). Information includes historical setting and uses of area, discussion of vegetation and habitat types, feeding ecology of invertebrate and vertebrate species located in area, data and discussion of water bird populations (species lists and population tables included), nesting locations of various birds, and a discussion of the site as a seasonal wetland for water birds. Also includes a discussion of endangered species found on site (e.g. California brown pelican, salt marsh harvest mouse, California least tern, California clapper rail, etc.), and a discussion of the status of wetlands as it pertains to the proposed Shorelands development. Presents the estimated impacts of development on the ecosystem presently found on the site, and presents alternatives having varying impacts on the ecosystem. Also discusses mitigation plans and options for development. Includes extensive bibliog-

raphy. Biological resources section of report is 97 pages. Other sections of report pertain to geology, soils and seismicity, hydrology, and water quality.

**Conclusions
of Study**

Presents the alternatives for development and the impact that each alternative proposal would have on the ecosystem and its potential. Alternative A is the proposed project with the applicants' proposed mitigation, a plan that would destroy approximately 697 acres of wetland habitat and associated levees. Alternative B is no project. Discussion of other sites included. Mitigation issues and options are presented as well. Study concludes that Baumberg site contains "some of the highest (if not the highest) biological values of all of the sites, and represents a highly sensitive area which would sustain significant adverse impacts requiring extensive offsite mitigation. The Baumberg site contains the largest amount of wetland habitat, the highest potential for direct off-site impacts to endangered species, and represents the area with the greatest potential for marsh restoration" (The Shorelands; p. III-D-65). Recommends further study of alternative sites to obtain more detailed, site specific biological data.

STUDY 10

Study Site	Baumberg Section: Ponds B6A, B6B, B8A, B8, B9, B10, B11, B12, B13, B14, and Baumberg Tract, all ponds. Includes map. Study area pertains to Leslie Salt Co. properties only.
Study Title	"Biological Assessment for the Proposed Shorelands Project-- Hayward, Alameda County, California." Unpublished.
Author(s)	Prepared by Western Ecological Services Company (WESCO) under contract to Cole/Mills Associates (CMA) of Martinez, California.
Date of Study	Study completed in June 1987. Individual studies concerning the endangered and potentially endangered species that are referred to in this study span a period from 1977 to 1986. In order to obtain specific study dates, see each relevant species section.
Where Study Can Be Found	U.S. Army Corps of Engineers, San Francisco District--EIS Coordinator, Corps of Engineers, 211 Main Street, San Francisco, CA 94105. (415) 974-0446.
Nature of Study	Provides information on ecology and occurrence of species found on Leslie Salt Co. properties that are either listed as endangered under the Endangered Species Act, or are designated as candidate species for protection under the Endangered Species Act. The 11 species include: the peregrine falcon, the California least tern, the Califor-

nia clapper rail, the California brown pelican, the salt marsh harvest mouse, the salt marsh yellowthroat, the western snowy plover, the California black rail, the salt marsh wandering shrew, the Point Reyes bird's-beak (plant), and the hairless popcorn flower. The study assesses the potential for impacts to the aforementioned species from the proposed project and discusses the possible effects of mitigation measures proposed by the developer. The study includes a map of the habitat for each species in study area; a discussion of its status (e.g. endangered or "species of special concern", etc.). Also includes a discussion of the species distribution, both locally and throughout the San Francisco Bay Area, its habitat requirements, a description of its general ecology, and a discussion of the impacts that the proposed development would have on it. Ninety- three pages.

Notes on Study

The information provided in study was used in the Draft EIS of the Shorelands Proposal to evaluate the impacts of development in the Baumberg area. The study can be viewed as an appendix to the Shorelands Draft EIS (see entry #9). The document represents a mixture of research by WESCO and reference to studies conducted by other individuals or agencies (e.g. Dr. Howard Cogswell, U.S. Fish and Wildlife Service, etc.).

Conclusions of Study

In the study's "Summary of Impacts", the authors discuss the positive and negative impacts of the proposed Shorelands development. List of advantages includes: purchase and donation to public ownership of 332 acres of existing salt marsh habitat; enhancement of existing salt marsh habitat suitable for the salt marsh harvest mouse, salt marsh wandering shrew, and California black rail; and creation/ enhancement of feeding and nesting sites for snowy plover. List of disadvantages includes: direct loss of seasonal wetlands and endangered species habitats; direct and indirect disturbance of any of aforementioned species using the area in question; increased potential for predation, direct removal of salt marsh vegetation; direct alteration of channel and dike configurations; numerous long-term effects related to newly-introduced human activities, noise, increased access, additional vehicular travel; and the introduction of urban habitats and species; and the permanent removal of 700 acres of the area that could otherwise provide possible location for salt marsh restoration. Comments on the significant growth-inducing effect on other seasonal wetlands in the Bay Area leading to a reduction in the amount of seasonal wetlands. Comments on the adverse impacts of the inevitable presence of associated or support industries that would accompany a project of this magnitude. Comments on the loss of existing duck hunting areas. Comments on the present importance of the area for water birds (esp. California least tern and snowy plover) as large, relatively secure, and undisturbed site for roosting and feeding. Also discusses the impact of increased predation of bird populations by feral cats, rats, skunks.

and raccoons that would result from the proposed development. Comments that although the applicant has proposed certain mitigation measures in the form of moats, fences and other measures to restrict movement of predators from development areas, no restraint systems are completely effective. Comments that an increase in rat and mouse populations will have a significant impact on bird populations, especially snowy plover and California clapper rail populations. Study further states that an increase in predator populations could adversely impact salt harvest mouse populations adjacent to the site. Mitigation proposed by applicant to increase available habitat and enhance existing habitat would be offset by increased competition with house mice and predation by rats and feral cats. Comments on predation as an adverse impact to least tern, clapper rail, black rail, and salt marsh wandering shrew populations.

STUDY 11

Study Site	Study refers to various study sites around San Francisco Bay including the following Leslie Salt Co. lands: Baumberg Section: Ponds B2C, B3C, B4, B4C, B5, B5C, B6A, B6B, B6C, B7, B7C, B8, B8A, B9, B10, B11, B12, B13, B14, and Baumberg Tract, all ponds. Referred to in study as Baumberg Tract. Also Newark Section: Ponds NA1, NA2, NA3, N1, N2, N3, N4, N5, N6, N7, N8, N9. Referred to in the study as the Coyote Tract Ponds. Mowry Section: Ponds M1, M2, M3, M4, M5, M7, M8, M9, M10, M11. Referred to in study as Newark Tract North. Alviso Section: Ponds A2W, B1, A2E, B2, A3W, A5, A6, A7, A8, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23. Referred to in study as Newark Tract East and Newark Tract South. Also Redwood City Section. Ponds R1, R2, R3, R4, R5, R5B, R7A, R7B, R7C, R8, R9, R11, and R12. Referred to as A in study. Study also includes property not owned by Leslie Salt Co. Maps included.
Study Title	"The Breeding Status of the Snowy Plover in California". Section III of text: The California Interior; South San Francisco Bay, Alameda, Santa Clara, and San Mateo Counties. 1979.
Author(s)	G.W. Page and L.E. Stenzel, editors.
Date of Study	From April 26, 1978 to July 13, 1978.
Where Study Can Be Found	San Francisco National Wildlife Refuge, P.O. Box 254, Newark, CA 94560.
Nature of Study	Study of South San Francisco Bay is part of snowy plover study spanning the state of California. Study outlines distribution of snowy plovers, describes the habitat, and nesting sites observed.

Comments on the historical and present occurrence of the species in the area. Maps of areas investigated and table of data collected are included. Ten pages (III-20 to III-30).

Notes on Study	Presentation and description of qualitative information along with quantitative information.
Conclusions of Study	Comments that South San Francisco Bay is one of the most important breeding areas in the state. Found that vast majority of birds were found on the east side of the bay. Comments on the two most attractive habitat types levees around salt evaporators that are full of water and levees and flats in evaporators with exposed flats. Comments on the attraction of species to dry versus wet habitats. Comments on the decline of species in certain areas through comparison to earlier studies (Gill; 1972). Comments on presence of vegetation with regard to nesting sites. Comments on disturbance. Lists possible predators observed. Comments on lack of human disturbance due to prohibition of public access to Leslie Salt Co. properties.

STUDY 12

Study Site	Various sites around San Pablo and San Francisco Bays including the following Leslie Salt Co. properties: Ponds SP1, SP2 (Leslie intake), SP3, SP4 (Little Island), SP5 (Edgerly Island), SP7 (Russ Island), SP8 (Knight Island). Alviso Section: Ponds A8, A15, A16, A17, A18, A19, A20, A21. Also Mowry Section: Pond M4. Detailed maps of study areas included. Study area includes land not owned by the Leslie Salt Company.
Study Title	"Breeding Season Survey of Salt Marsh Yellowthroats (<i>Geothlypis trichas striuosa</i>) in the San Francisco Bay Region": San Francisco Bay Bird Observatory.
Author(s)	K. Hobson, P. Perrine, E.B. Roberts, M.L. Foster, P. Woodin. Prepared for the U.S. Fish and Wildlife Services.
Date of Study	From March 1985 to July 1985.
Where Study Can Be Found	San Francisco National Wildlife Refuge, P.O. Box 254, Newark, CA 94560.
Nature of Study	Study determines the current breeding populations of the subspecies within its historic breeding range. Presents the distribution of breeding pairs of salt marsh yellowthroats within the 9 counties of San Francisco Bay Region. Describes subspecies in question. Provides life history. Includes discussion of study methods. Comments on the birds' habitat requirements. Presents and discusses the loca-

tion and number of nesting sites. Provides detailed maps of each study area and nesting sites in that area. Describes habitat of areas around nesting sites. Includes lengthy discussion of survey findings as compared to previous studies to indicate population trends that may be occurring. Comments on the increasing populations of the subspecies. Notes that the higher populations of this study as compared to the low breeding populations observed by Foster in 1977 may be due to the drought that occurred during 1975-1977 and caused a decrease in suitable habitat. Also comments on the presence of clapper rails and black rails observed in study areas. Ninety-three pages.

Notes on Study

Species habitat is characterized as brackish marsh, salt marsh, riparian woodland/swamp, freshwater marsh, and upland/grassland. Nesting in salt ponds is not observed. Nesting sites are primarily found along borders of Leslie property where marsh habitat is more prevalent.

Conclusions of Study

Found that populations were larger in most locations than those found by Foster (1977) (See entry # 26). Comments on pressures of development in subspecies nesting habitat. Discusses the adverse effects of development and maintenance of flood control channels or relocation of effluent discharge sites on nesting habitat. Recommends that subspecies habitat owned by state or federal agencies should be managed by those respective agencies in accordance with salt marsh yellowthroat breeding requirements. Recommends the maintenance of marsh during drought years, planting and maintaining upland vegetation along edges of marshes, and providing or maintaining strip-like marshes along streams and sloughs to provide corridors for seasonal movements and dispersal. Recommends that breeding sites located on privately-owned lands should be protected from development or degradation. Such areas should be enhanced by allowing vegetation to grow during the yellowthroat's breeding season and by establishing a border of upland vegetation along the edges of breeding areas. Recommends the planting of upland vegetation next to salt and brackish marshes in San Pablo and San Francisco Bays. Emphasizes the importance of upland habitat for subspecies breeding purposes. Comments on the adverse impacts which the discing of upland areas has on the subspecies. Comments on the conversion of Napa Marsh to salt evaporation ponds. States that present salt producing activities do not appear to have a negative effect on current populations of salt marsh yellowthroats but warns that future industrial or residential development is a possibility that would threaten subspecies habitat. Comments on the presence of 11 pairs of yellowthroats along Leslie Salt Company's inlet channel (On Island No. 1) and the adverse effects that would occur through restoration of old levees along salt ponds and other impounded lands. Such restoration involves the removal of vegetation beside the levee along with dredging of the underlying

STUDY 14

Study Site	San Pablo Bay properties: Ponds SP1 (non- productive parcel) and SP2. Maps included. Study includes areas not owned by Leslie Salt Co.
Study Title	"Trapping Survey of Salt Marsh Harvest Mice (<i>Reithrontomys raiiventris</i>) in the Marshes of the San Francisco Bay Region During 1982". San Francisco Bay National Wildlife Refuge-United States Fish and Wildlife Service.
Author	M. Newcomer.
Date of Study	From June 1982 to October 1982.
Where Study Can Be Found	San Francisco National Wildlife Refuge, P.O. Box 524, Newark, CA 94560.
Nature of Study	Lists and discusses the results of trapping survey of salt marsh harvest mouse. Compares results with results of trapping studies conducted in the past (e.g. Gilroy and Shellhammer, 1980, see entry #31). Describes materials and methods. Presents and discusses results both in tabular and written form. Discusses vegetation with respect to species habitat. Discusses the effect of tidal action on species populations and on trapping success. Twenty-five pages.
Notes on Study	Presentation of quantitative information. Discussion of data with respect to environmental factors.
Conclusions of Study	From trapping results, author concludes that species population is relatively high as compared to other years.

STUDY 15

Study Site	San Pablo Bay properties: SP-1 Island No. 1. Maps included. Study areas include land not owned by Leslie.
Study Title	"Salt-marsh harvest mouse survey": The Resources Agency, Department of Fish and Game, State of California. Wildlife Management Branch. Unpublished.
Author(s)	D.B. Schaub.
Date of Study	Summer of 1971.

Where Study Can Be Found	San Francisco National Wildlife Refuge, P.O. Box 524, Newark, CA 94560.
Nature of Study	Trapping study of areas throughout the Bay. All mice were marked and released. Discussion of two subspecies located in Bay Area. States that subspecies <i>Reithrodontomys raviventris halicoetes</i> is more prevalent in northern and eastern regions of the Bay while <i>R.r. raviventris</i> is more prevalent in the central and south regions of the bay. Description of habitat (esp. vegetation). Comments on historic decline of species populations. Comments on the correlation between extremely high tidal ranges and low mouse populations. Correlation is due to inundation of suitable mouse habitat. Tides push mice onto levees which, if cleared or partially cleared, exposes mice to predators. Notes that Leslie Salt Co. property located on the northern shore of San Pablo Bay, East of Sonoma Creek, was recorded as having the second largest population in the Bay Area study. Fifty-four pages.
Notes on Study	Author comments on the practical limitations of the study (e.g. population variation due to tidal fluctuation and the non-homogeneous nature of the habitat).
Conclusions of Study	Found highest populations in San Pablo Bay regions, while critically low numbers were recorded in the South Bay regions due to higher tidal ranges and more prevalent habitat destruction. Recommends further study of the movement of populations (esp. movements in regard to monthly and daily high tides) and extensive analysis of the marshlands of the Bay. Recommends the establishment of refuge areas for remaining populations. Marshland should be allowed to assume its natural, gently sloping condition with a minimal amount of diking and upper marsh fill. If levees are necessary, they should be covered at their upper edge with thick vegetation to reduce predation during high tides. Recommends future surveys using standard procedures and locations to maintain continuity of information.

STUDY 16

Study Site	Baumberg Section: Pond B12. Maps included. Study includes lands not owned by Leslie Salt Co.
Study Title	"Studies of the salt marsh harvest mouse (<i>Reithrodontomys raviventris</i>) in marginal and other sites in the south San Francisco Bay, 1983-1985". California Department of Fish and Game: The Resources Agency. Unpublished.

Author(s)	H. Shellhammer, V. Jennings, V. Johnson, S. Muench, M. Newcomer.
Date of Study	1983-1985.
Where Study Can Be Found	San Francisco National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Trapping survey of salt marsh harvest mouse in tidal and diked marshes on east side of S.F. Bay. Detailed discussion of habitat and mouse populations surveyed. Notes the development pressure on surveyed lands. Describes methods. Includes table of data and results and maps of areas surveyed. Provides brief summary of trapping surveys conducted from 1977 to 1985. Comments on the presence of mice in various areas (e.g. tidal areas, diked areas, etc.). Sixty pages.
Notes on Study	Comments on the habitat variability within each of the two designated trapping areas (i.e. "tidal" and "non-tidal").
Conclusions of Study	Small numbers of salt marsh harvest mice were found in many of the diked areas, especially in 1985. Several of the tidal areas produced few animals. Found population numbers to be average to below average in 1985 and low in 1984 and 1983. Notes inverse correlation between amount of rainfall and mouse populations present during the following summer. Suggests that diked areas along east side of Bay are extremely important to the recovery and survival of the southern subspecies of the mouse population. Comments on the effect of human impacts (e.g. subsidence, vegetative change, diking, and back-filling) on wetlands and wetland community. Notes that habitat is small and diminishing. Comments on status of habitat and mouse populations in diked areas. Characterizes habitat as having marginal cover dominated by inappropriate species. Notes severe environmental impacts which diked areas undergo, i.e. discing, drying, flood control flooding, and uncontrolled flooding. Notes that diked areas comprise largest remaining habitat for southern subspecies of mouse. Notes that the mouse appears to be both K and r-selected. Comments that dikes can act as refugia for mice since such areas are not subject to destructive factors affecting tidal marshes. Lists dangers to diked habitat, i.e. land development, purposeful modifications to create less mesic and less halic areas, intensive discing, and prolonged drying. Notes that survival of mice in diked areas is due to the large size of such marshes. Situation gives mice ability to move from one area to another as portions of the marsh are disced or flooded. Expresses concern over development plans, land prices, and mitigation actions that are resulting in a smaller area of appropriate habitat. Notes that small high quality marshes may not be as valuable as large, marginal marshes with respect to the viability of the mouse population. Rec-

ommends the acquisition, protection and management of diked areas hundreds of acres in size in the South San Francisco Bay Region. (Authors note idealism of aforementioned recommendation). Recommends further research to obtain knowledge concerning appropriate management techniques. Continue study of "flat" marshes, tidal marshes. Attempt to develop such marshes if necessary to protect sub-species. Further recommends the development of trapping criteria to enhance data collection on mouse populations.

STUDY 17

Study Site	South San Francisco Bay salt ponds, Alviso section. Specific sites not given. No maps included.
Study Title	"Salt Pond Study". San Francisco Bay Bird Observatory Newsletter.
Author(s)	D. Lonzarich.
Date of Study	September 1986.
Where Study Can Be Found	San Francisco Bay Bird Observatory, P. O. Box 247, Alviso, CA 95002. Leslie Salt Company, P.O. Box 364, 7220 Central Avenue, Newark, California 94560.
Nature of Study	Discussion of biology of salt pond ecosystem (e.g. salinity, invertebrates, fish, and avifauna populations). Qualitative rather than quantitative discussion of area. No specific data presented. Comments on the diversity of organisms found in salt ponds. Three pages.
Notes on Study	Document is a brief discussion of a more detailed study conducted by the author.
Conclusions of Study	Comments on the unique biological community inhabiting salt ponds. Notes the replacement of salt marsh communities by salt ponds and the benefit of such a change for some species. Concludes that salt ponds provide a "...different type of very productive and important habitat which benefit many estuarine fishes, invertebrates and birds".

STUDY 18

Study Site	Mowry Section: Pond M9. No map included. Written description of site.
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Study Title	"Phytoplankton of Commercial Salt Evaporation Ponds in Newark, California". Unpublished paper, 1970.
Author(s)	A. Jenkins
Date of Study	Spring 1970.
Where Study Can Be Found	Leslie Salt Company; P.O. Box 364, 7220 Central Ave., Newark, California 94560.
Nature of Study	Determination of the types and distribution of phytoplankton living in the saline environment of Leslie salt ponds. Discussion of physical and environmental factors which govern the distribution of the algal forms encountered in the habitat (e.g. rainfall, air and water temperature, dissolved oxygen content, salinity, and pH). Reference made to Carpelan study (See entry #7). Correlates physical and chemical factors to the presence of various phytoplankton. Eight pages.
Notes on Study	Paper for a college class.
Conclusion of Study	Comments on the increase in selectivity or harshness progressing through the pond system. Colors imparted to water by different algal forms become useful biological indicators in determining phytoplankton populations.

STUDY 19

Study Site	Baumberg Section: Ponds B1, B2, and B4. Alviso Section: Ponds A1 and A2W. Study discusses only land owned by Leslie Salt Co. No maps included. Written description of study areas.
Study Title	"Water Quality and Nuisance Algal Monitoring In Leslie Salt Ponds: Field Program 1986". Unpublished.
Author(s)	Prepared by Wetlands Research Associates, Inc.
Date of Study	From May 1985 to July 1986.
Where Study Can Be Found	Leslie Salt Company; P.O. Box 364, 7220 Central Ave., Newark, California 94560.
Nature of Study	Describes results of field sampling to determine causes of nuisance algal blooms in Leslie Salt ponds. Includes tables and graphs of findings. Quantitative information includes dissolved oxygen, hydrogen sulfide, phosphorous, total keldjahl nitrogen, total dissolved keldjahl nitrogen, ammonia, nitrate and nitrite. Discussion of causes of increase in algal growth. Eighteen pages.

Notes On Study	Detailed study of specific area and subject for a specific purpose— i.e. to investigate complaints of strong odor emanating from Leslie properties.
Conclusions of Study	No detectable levels of hydrogen sulfide were measured in study area. Levels of dissolved oxygen remained at 100% saturation. Ben- thic macroalgal growth was observed in Baumberg Section ponds B1, B2, and B4. The following recommendations were made to alle- viate the problem of macroalgal growth: maintain water turbidity so that water penetration does not reach the bottom of the pond; manage the ponds so that temperature and salinity do not exceed le- thal limits for the natural algal populations, introduce fish grazers on the macroalgae such as grass carp or brine shrimp (study notes that care must be taken in introducing exotic species, as they may cause more harm than good to the workings of the natural system). Suggests further investigation on mechanisms to maintain turbidi- ty in ponds.

STUDY 20

Study Site	Alviso Section: A9, A10, A11, A12, A13, A14, A15.
Study Title	"Life History and patterns of distribution in salt pond fishes: a community level study".
Author(s)	D. Lonzarich
Date of Study	April 1985 to October 1986.
Where Study Can Be Found	San Jose State University, Master's Thesis will be submitted winter 1987.
Nature of Study	The primary purpose of the study is to describe the structure and dy- namics of various fish communities found in a series of 6 low sa- linity salt evaporation ponds in South San Francisco Bay. Obser- vations and comparisons are made of life history traits, including determinations on age-class structure, food habits and spawning habits. Concurrent investigations on a variety of physical, chemi- cal and biological characteristics in the different ponds are made to determine the environmental influences on observed fish distribu- tion and life history patterns. Study categorizes ponds as hyposa- line or low salinity, and hypersaline or high salinity ponds on the basis of differences that existed in community structure and stabili- ty. Discusses fish species diversity with respect to salinity, includ- ing contrasting salinity tolerances in juvenile and adult staghorn sculpin, the prolonged spawning seasons and early spawning age of

topsmelt; spawning by three-spined stickleback in a marine environment (previously thought to only spawn in freshwater); and the distribution of long-jawed mudsucker with respect to salinity. Seasonal variations in diversity are correlated with a variety of factors including pH, dissolved oxygen, temperature and salinity. Effects of Leslie salt pond management on pond biota discussed. Study also discusses adaptation as a factor concerning fish species found in salt ponds.

Notes on Study

Work in progress. A bird census was also conducted in conjunction with the study, but is not included in the thesis.

Conclusions

Author states that: "Fish species present in salt ponds can be grouped into three broad categories. These are those species which do not respond well to the seasonal abiotic and biotic variability in the pond environments and eventually die; those which can cope with seasonal environmental change, but are unable to successfully spawn under these conditions (i.e. juveniles marine and estuarine fish), and those which complete their entire life history in the ponds (i.e. topsmelt, mudsucker, killifish and stickleback). In fact, the ponds can be ideal habitats for fish with short life histories and high reproductive outputs. Topsmelt, killifish, staghorn sculpin and stickleback fall into this category; with the only exception appearing to be long-jawed mudsuckers which can live up to 3 years in the ponds. Somewhat surprisingly, the low salinity ponds can also become extremely stressful to all aquatic life when the requirements of the Leslie Salt Company conflict with those of the aquatic community. Fish species diversity in the ponds is not as high as that found in the surrounding bay waters primarily because Leslie Salt closes off the intake pond from tidal flow in the winter and spring months restricting fish that use the bay during these times from also entering the ponds. "Low salinity, hyposaline, salt ponds are very dynamic and stochastically structured communities. They can range from extremely productive, diverse and complex communities to unproductive and very simple. They can be best described as unstable and unpredictable environments which rarely, if ever, approach a community structure which could be considered climax. In contrast to low salinity ponds, hypersaline ponds are relatively stable, and resilient communities. This can be attributed to the adaptability of the various species that inhabit these ponds, and the relatively stable water quality conditions. Finally, although salinity severely reduces the species diversity in the Alviso ponds, it does necessarily follow that salinity leads to lower productivity. In fact the annual productivity of the hypersaline ponds may match or even exceed that of low salinity ponds."

STUDY 21

Study Site	Bay-wide bird survey. Includes lands owned by Leslie Salt Co. as well as refuge lands under salt production. Pertains to both south bay and San Pablo Bay holdings. Study also includes lands not owned or operated by Leslie Salt Co. Study not site specific. General map of bay areas surveyed included.
Study Title	"Bimonthly Bird Counts at Selected Observation Points Around San Francisco Bay, February 1964 to January 1966". <i>California Fish and Game Quarterly</i> 56 (4): 224-239. 1970.
Author(s)	F.H. Bollman, P.K. Thelin, R.T. Forester.
Date of Study	From February 1964 to January 1966.
Where Study Can Be Found	California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814.
Nature of Study	Two-year study to identify and count birds using the San Francisco Bay estuary. Study divides habitat into five categories - open water, tidal flats, marsh, saltpond, and other. Data includes: tables of habitat acreage for each census area, distribution of birds by habitat and by census period, numbers of birds by species group and census period, total number of birds counted for all land areas, average number of birds counted per sighting for all land areas, number of bird sightings and average number of birds sighted, average bird count per sighting at each census land area and their yearly ranking. Includes discussion of data with regard to birdlife/habitat trends. Sixteen pages.
Notes on Study	Found that salt ponds and tidal flats had the highest average bird densities. May be due to the fact that bird counting in these areas was much easier and more accurate. The inverse is true for heavily vegetated marsh habitat where wildlife is secretive and observation more difficult. Study emphasizes the importance of both habitats. Ground count more reliable than aerial count.
Conclusions of Study	States the importance of the San Francisco Bay as a resting and feeding area for waterfowl in the Pacific Flyway. Magnitude of the recorded bird population gives an overall estimate to the importance of the Bay for bird support. Notes that the relationships between one site and another site or between the different types of habitat within a specific study area are imprecisely understood. The role played by each site in the bio-system supporting birdlife would entail comprehensive investigations. Survey yields valuable information on the bird populations and the relative numbers, the

importance of the Bay sites to migrating waterfowl, and an approximate ranking of habitat quality in the Bay Area. Each habitat provides the conditions necessary for birdlife and cannot be assessed independently of the other habitats.

STUDY 22

Study Site	Newark Section: Coyote Tract non-productive parcels CT1, CT2, CT4. Study also includes areas not owned by Leslie Salt Co. CT4 referred to in study as Hickory Street Animal Shelter pond.
Study Title	Bird Counts— Abandoned Salt Ponds and Seasonal Wetlands (near SFBNWR Headquarters).
Author(s)	Observers: R. Pagan, R. Lee, E. Wells, R. Lowe and T. Harvey.
Date of Study	Two survey periods: From February 23, 1982 to June 18, 1983 (45 survey days), and data for ten additional survey days for 1982.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge: P. O. Box 524, Newark, CA 94560.
Nature of Study	Lists species (common names) and numbers of birds observed. Data organized by study site. Detailed maps of study areas included. Data for parcel CT1 collected on one day only. No discussion of data.
Notes on Study	Raw data in tabular form.
Conclusions of Study	None.

STUDY 23

Study Site	Baumberg Section: Ponds B1, B2, B4, B5, B6, B6A, B6B, B6C, B7, B8, B8A, B9, B10, B11, B12, B13 and B14. Also includes Alviso Section Ponds A6, A9, A10, A11, A12, A13, A14, A15, B1, B2, A2E and A3W. Alviso Section referred to as Moffett and Newark sections in study.
Study Title	Brown/White Pelican Counts.
Author(s)	Observers: D. Kimbrell, T. Harvey and R. Lowe.
Date of Study	From July 2, 1982 to November 1, 1982.

Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Lists numbers of brown and white pelicans observed. Notes age of birds, and also specifies activities of birds observed (e.g. feeding, swimming, diving, roosting). Includes graphs tabulating results of census counts, percentage of pelicans feeding, success rate of diving and surface feeding techniques. Detailed maps of study area included. Seventeen pages.
Notes on Study	Raw data in tabular form, and graphs summarizing data. No written discussion of data.
Conclusions of Study	None.

STUDY 24

Study Site	Salt ponds in various locations around South San Francisco Bay, including: Redwood City Section: Ponds R1 and R2. Mowry Section: Ponds M1, M2, M3, M4, M5 and M6. Alviso Section: Pond A19. Study specific to San Francisco Bay National Wildlife Refuge salt ponds only.
Study Title	Hunt Area Bird Census-- SFBNWR Hunt Ponds.
Author(s)	Observers: T. Harvey and D. Kimbrell.
Date of Study	From July 28, 1982 to December 9, 1982.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Lists species and numbers of birds observed. Also includes some notes on activities of birds (e.g feeding, roosting, preening). Study area censused on a weekly basis. Twenty-eight pages.
Notes on Study	Raw data in tabular form (field notes).
Conclusions of Study	None.

STUDY 25

Study Site	Various sites around San Francisco Bay, including the following Leslie Salt Co. property: Baumberg Section: All ponds and Baumberg Tract, all ponds. Also, Redwood City Section: Ponds R1, R2, R4, and SF2. Alviso Section: Ponds A9, A10, A11, A12, A13, A14, A15, A16. Mowry Section: Pond M4. Newark Section: Ponds N1, N2, N3, N4, N6, and N9. Map not included.
Study Title	"Records of Birds Using Salt Evaporator/ Crystallizer Habitats (sL in HAB field) in 1986 from H.L. Cogswell's Field Notes". Unpublished.
Author(s)	Observer: H. L. Cogswell.
Date of Study	From January, 1986 to December, 1986.
Where Study Can Be Found	Dr. Howard Cogswell, 1548 East Ave., Hayward, Ca. 94541.
Nature of Study	Computer printout of field notes in tabular form. Field observations are recorded for each species of bird. Entries are made by species and arranged in phylogenetic order. Lists bird species, date, time of day, locality, county, number and activity of birds. Also included are the number of survey party hours, and the biotic district (based on map of geographic subdivisions of California in Waterbirds of California, Cogswell, 1977). Eight pages.
Notes on Study	Data presented in table is in encoded form consistent with other published and unpublished work of Dr. Cogswell. Data presented are part of work in progress. Study uses dBASE III PLUS program.
Conclusions	None given.

STUDY 26

Study Site	Various sites around the San Francisco Bay including the following Leslie Salt Co. properties: San Pablo Bay property; Southern portion of Edgerley Island (SP-5). Baumberg Section: Pond B6A. Study also pertains to areas adjacent to Leslie property on Coyote Creek. Maps included.
Study Title	"Status of the Salt Marsh Yellowthroat (<i>Geothlypis trichas sinuosa</i>) in the San Francisco Bay Area, California 1975-1976".

Author(s)	M. Foster.
Date of Study	From June through August, 1975, and March through August, 1976.
Where Study Can Be Found	San Francisco National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Study determines the present breeding population of the salt marsh yellowthroat in the San Francisco Bay Area as of the study dates, establishes remaining potential breeding habitat, and places survey results in the context of the historical breeding range of the subspecies. Points out the loss of suitable habitat due to human activity (i.e. diking/ draining of wetlands, water pollution) and discusses drought of 1975-76 and its impact on the salt marsh yellowthroat population. Describes winter and breeding habitat requirements of subspecies. Includes discussion of study methods. Includes maps and descriptions of study sites where birds were observed.
Notes on Study	Describes three types of habitat where salt marsh yellowthroats were observed to be breeding: Woody swamp, brackish marsh, and freshwater marsh. Emphasizes importance of artificially maintained habitat, where water levels do not fluctuate (i.e. sewage outfalls, Alameda Flood Control District), especially during a drought year such as 1975-76. Comments on drop in number of salt marsh yellowthroats from 1975 to 1976. Notes possible correlation between availability of winter habitat (salt marsh) and the presence of the subspecies in nearby or adjacent breeding habitat. This study is predecessor to 1985 study by K. Hobson (see entry #12), and Foster, 1977 (see bibliography).
Conclusions of Study	Found that population size and distribution has decreased when compared to earlier studies of the subspecies. Concludes that subspecies populations in South San Francisco Bay are approaching critically low levels. Relates lower number of birds observed in 1976 to the drought of that year. Comments that two effects of the drought year were: changes in the plant composition of breeding areas, and a smaller insect food supply.

STUDY 27

Study Site	Redwood City Section: Ponds R1, R2, R3, and R4.
Title of Study	"The Relationship Between the Fluctuations of Bird Populations and the Salinities of Ponds in South San Francisco Bay." July, 1980.
Author(s)	R. Hirano

Date of Study	From June 24, 1978 to June 1, 1979.
Where Study Can Be Found	Department of Biological Sciences, California Polytechnic State University, San Luis Obispo, CA 93407.
Nature of Study	Study investigates the correlation between bird usage and the salinity of salt ponds. Bi-monthly census of four salt ponds (in sequential order of salt evaporation process). Lists bird numbers, species and uses (e.g. resting, surface-feeding, wading, nesting) of ponds, and pond salinities. Includes graphs depicting relationship of numbers of birds, types (waterfowl, phalaropes, gulls and terns, shore-birds) to salinity of water (in parts/00), for each observation day. Effects of weather and hunting required elimination of one of the ponds from the study. Discussion of results of census of bird types. Discusses factors contributing to density of birds. Includes data on average number of birds per acre. Detailed map of study area included. Thirty-eight pages.
Notes on Study	Study was Senior Project at Cal Poly. (undergraduate).
Conclusions of Study	Study concludes that number of birds per acre increases with salinity of ponds. Concludes diversity of bird species decreases with salinity. Notes that other variables, such as pond depth, are associated with bird use of pond. Mentions correlation of availability of brine shrimp with pond use. Concludes that salt ponds, as well as marshes and tidal flats, are important for preservation of wildlife in San Francisco Bay.

STUDY 28

Study Site	Approximately 12,350 acres of the San Francisco Bay Area tidal marshes were studied, including the following Leslie Salt properties: Baumberg Section: Mt. Eden Creek. San Pablo Bay Properties: SP5 (Fly Bay, Edgerley Island, Coon Island), SP6 (Napa Plant site) and SP9 (Fagan Slough) and China Slough. Census sites also include areas adjacent to Leslie properties: Redwood Creek, Westpoint Slough, Mud Slough, Newark Slough, Mowry Slough, Ideal Marsh, Coyote Creek, Aviso Slough, Guadalupe Slough, and the salt marsh along Plummer Creek. In Solano and Napa Counties: Dutchman Slough, South Slough, Mud Slough, Napa Slough and Devil's Slough.
Study Title	"Status and Distribution of the California Clapper Rail (<i>Rallus longirostris obsoletus</i>). <i>California Fish and Game</i> 65(1): 36-49. 1979.
Author(s)	R. Gill

Date of Study	From February 1971 to December 1975. (Augmented by more recent data).
Where Study Can Be Found	California Department of Fish and Game: 1416 9th Street, Sacramento, Ca. 95814.
Nature of Study	Census of California clapper rail population and distribution in the San Francisco Bay Area. Study alteration of California's estuarine marshes. Outlines subsequent declaration of California clapper rail as endangered species, and necessity of procuring current data for protection efforts. Describes principal flora and invertebrate fauna of habitat. Discusses historic and current distribution of rail population by county. Includes rough maps of historic distribution of tidal marsh (1850), and current (1971-75) rail breeding distribution. Tabulates percentage of available tidal marsh used as range. Also tabulates average yearly populations. Habitat utilization, limiting factors and potential range expansion also discussed. Brief discussion and graph of breeding and non-breeding season densities also included. Fifteen pages.
Notes on Study	Data for current distribution, abundance and habitat requirements were obtained from other surveys (Gould, 1973. See entry #48, published and unpublished sight records) and 120 censuses taken during breeding (March 1 - August 31) and non-breeding (September 1 - February 28) seasons from 1971 through 1975. Author notes that no comprehensive reports on California clapper rail distribution have been done since 1944.
Conclusions of Study	Author suggests that fluctuations in <i>Spartina</i> biomass and productivity caused by climatic changes may be an important factor in clapper rail population fluctuations and preferred nesting habitats.

STUDY 29

Study Site	Redwood City Section: Ponds unknown.
Study Title	Biotic Report for Leslie Salt Wash Pond (Phase I), Redwood City, California. (Unpublished consulting report).
Author(s)	Ecumene Associates, Inc.
Date of Study	July 31, 1981.

Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Study assesses biological setting of proposed development site. Report presents brief descriptions of physical and chemical characteristics of salt ponds (e.g. salinity, temperature). Describes vegetation in study area. Also describes populations and feeding ecology of invertebrate and vertebrate species in study area. Summarizes distinct biological areas found on site (e.g. salt ponds, levee, mud shores, dry salt bed), and their importance to wildlife. Assessment of the estimated impacts of proposed development on the ecology of the site. Discusses possible impacts of two alternatives, leaving site unchanged and restoring site to original salt marsh condition. Presents mitigation plans for development complex. Report also includes a checklist of birds that utilize the ponds, a diagram of "food chain relationships of the salt pond habitats", and photos of the biological areas on the site.
Notes on Study	None.
Conclusions of Study	Study finds no positive environmental impacts of proposed harbor business center development. Presents mitigation plans/alternatives to facilitate continued utilization of the area by shorebirds.

STUDY 30

Study Site	Various sites around San Francisco Bay, including the following Leslie Salt Co. properties: Alviso Section: Pond A3W. Study also pertains to areas bordering Leslie property, including sites on Flood Slough, Charleston Slough, Newark Slough, Dumbarton Point and Ideal Marsh. Majority of study area not on Leslie property. Maps of sites included.
Title of Study	"California Clapper Rail Survey, 1978-1979". California Department of Fish and Game, Job V-1.8. 1980.
Author(s)	T.E. Harvey.
Date of Study	From December 1978 through July 1979.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Study of Santa Clara and San Mateo County sites are part of an eight-county census study of clapper rail population, spanning the San Francisco, Monterey, and Morro Bay areas. Purpose of study is

to examine distribution of California clapper rail at the periphery of its range. The author also examines the general status of the rail population in San Francisco Bay in relation to possible extension of range, as predicted in earlier studies. The study focuses on sites where development is anticipated. Comments on vegetation, habitat requirements of subspecies, and phase of breeding cycle, in relation to survey results. Provides table of data including census results, census method, and marsh vegetation. Also includes rough maps locating census sites, and whether clapper rails were found. Compares survey results with previous studies. Discusses factors contributing to fluctuations in clapper rail population. Also discusses importance of *Spartina* marshes for clapper rail populations, and mentions detrimental affects on *Spartina* of increased salinity, inadequate drainage, and lack of protection from wave action. Includes summary of census results by county and current factors affecting population fluctuation, including development, traffic, discharge of sewage plant outfall and research methodology.

Notes on Study	Census sites focused on areas where population status was unknown, or already significantly populated. Surveys done on foot, by boat, and sometimes with use of hunting dog.
Conclusions of Study	Recommends further surveys to determine population trends, especially in South San Francisco Bay. Suggests more studies regarding clapper rail reproductive success in various types of marshes. Encourages projects to preserve and restore tidal marshlands. Recommends retaining California clapper rail as endangered species on state and federal lists.

STUDY 31

Study Site	Various sites around South San Francisco Bay including the following Leslie Salt Co. properties: Baumberg Section: Pond B8A (referred to in study as North Alameda). Newark Section: Pond NA1 (referred to in study as Coyote Hills area). Study includes sites adjacent to Leslie salt pond levees and also includes areas not owned by Leslie Salt Co.
Study Title	"Trapping Survey of Salt Marsh Harvest Mice. (<i>Reithrodontomys raviventris raviventris</i>) in the Marshes of South San Francisco Bay During the Summer of 1980". Unpublished report, San Jose State University, Department of Biological Sciences.
Author(s)	A. Gilroy and H. Shellhammer.
Date of Study	July 11, 1980 to September 6, 1980. (Newark Section: Pond NA1 – 100 trap nights, and Baumberg Section: Pond B8A– 400 trap nights).

Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Lists and discusses the results of trapping survey of salt marsh harvest mouse in South San Francisco Bay. Compares results with results of previous studies (Shellhammer, 1976-77; Cummings, 1974-75, see entry #33). Includes vegetation analysis for each study site (average height of vegetation, percent cover of each species), as well as description of habitat. Presents and discusses results in both tabular and written form. Discusses quality of habitat (vegetation species composition, salinity, degree of flooding), in relation to trapping results. Notes low numbers of salt marsh harvest mice throughout study area and discusses possible factors contributing to those numbers (i.e. destruction of habitat, or alteration by diking/drainage).
Notes on Study	Study done concurrently with salt marsh harvest mouse surveys of San Pablo Bay and Suisun Bay (Simons and Shellhammer, 1981). Notes that trapping success of current study much lower than the results of the San Pablo Bay survey, and higher than the survey of Suisun Marsh.
Conclusions of Study	Concludes that low trapping success levels due in part to destruction or reduction of habitat, and comments that, "some survey sites may support population size below minimum size necessary for positive trapping results". Recommends further trapping surveys of areas where salt marsh harvest mice not captured in current study.

STUDY 32

Study Site	Newark Section: Coyote Tract non-productive parcels CT1, CT2, CT3, and CT4. Study also pertains to lands not owned by Leslie Salt, including San Francisco Bay National Wildlife Refuge lands adjacent to Leslie property. Maps included.
Study Title	"Bird Use of Coyote Tract - Newark, 1984- 1985. Report to Leslie Salt Co." . Unpublished.
Author(s)	H. Cogswell.
Date of Study	From mid-October, 1984 to end of October, 1985.
Where Study Can Be Found	Dr. Howard Cogswell. 1548 East Avenue, Hayward, CA 94541. (415) 581-2201.
Nature of Study	Detailed census of bird use of study area. Study plots grouped by major habitat types. Data and discussion of data included. Data ac-

cessible in tabulated form by: study plots, habitat types, species, season, range, and current status in San Francisco Bay. Study includes very detailed information on bird activities. Compares bird use of parcels CT2 and CT3 with other plots in study. Also includes detailed comparison of results of census with those of previous studies (e.g. by habitat type, breeding cycle). Notes occurrence of bird species of special concern in study area. Includes summary of information presented in text.

Notes on Study	Comprehensive and detailed study of bird use of Coyote Tract. Written discussion of data pertains to Leslie parcels CT2 and CT3 only. Raw data included for all study sites. Studies of soils and flora of site conducted concurrently with Dr. Cogswell's. Computerized organization of data using dBASE III PLUS program.
Conclusions of Study	None. Author states that the burrowing owl's use of study area "merits primary attention with respect to change in land use."

STUDY 33

Study Site	Study pertains to numerous sites around the San Francisco Bay Area, including the following Leslie Salt Co. properties: San Pablo Bay Section: non-productive areas of Ponds SP1 and SP2 (referred to in study as Sonoma Creek, east bank, and Leslie Salt intake, west bank, respectively). Alviso Section: Ponds A17, A20 (referred to in study as Triangle Marsh and Drawbridge sites). Mowry Section: Ponds M2 and M3 (referred to in study as Marsh west of Pond M2 and Coyote Creek, North bank). Baumberg Section: Ponds B1C, B2C, B3C, B4C, B5C (Turk Island), and areas not in salt production west of Ponds B8A, B9, B10. Study also pertains to sites adjacent to Leslie Salt Co. property, including: Ravenswood Slough, Alviso Slough, Mowry Slough, Newark Slough, Ideal Marsh, Coyote Hills Slough, and Alameda Creek.
Study Title	"Survey of Salt Marsh Harvest Mice Around San Francisco and San Pablo Bays. 1974-1975". Unpublished report.
Author(s)	E. Cummings.
Date of Study	From June 1974 to August 1975.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Trapping survey of 41 marshes or diked former marshes around San Francisco Bay, to determine current status of <i>R. raviventris raviventris</i> in its historic range. Data in written and tabular form.

Lists and maps previously documented locations of *R. ravyentris*, and most recent capture dates. Also lists and maps the results of trapping done for each marsh in study. Describes methods. Compares results with results of trapping studies conducted in the past (e.g. Wondolleck, et. al, 1972; Fislser, 1965, 1971). Discusses factors affecting population distribution. Provides description of vegetation at trap sites with respect to frequency of capture. Includes table of plant species occurring near trap sites. Discusses height of vegetation in relation to population distribution. Discusses capture success in relation to time of year, consecutive trapping nights, and trapping methods. Estimates of total populations not calculated. Thirty-seven pages.

Notes on Study Comprehensive study that makes detailed comparisons to previous surveys and is frequently cited in later studies.

Conclusions of Study Study states that, in general, fewer salt marsh harvest mice caught in South Bay than North Bay. *R. ravyentris ravyentris* was found at only 9 of 29 marshes within its historic range in South San Francisco Bay. Subspecies *R. r. halicoetes* was found at 8 of the 12 marshes within its historic range in the North Bay. Previous studies also reported mice at 4 marshes where no mice were found in this study. Author discusses historic changes in San Francisco Bay ecosystem with respect to available habitat and species distribution (e.g. fragmentation of marshes, marsh subsidence due to depletion of underground aquifers for city water, encroaching industrialization, extreme high tides). Comments on population differences in the South Bay due to lack of wide, continuous marshlands in which mice can disperse during extreme high tides. Notes that height and density of vegetation may be important factor for mice in escaping inundation during extreme high tides. Study makes recommendations for monitoring, stabilizing, and restoring salt marsh harvest mice populations in the San Francisco Bay Area. Recommends that levees in need of restoration, which are connecting currently isolated marshes, be moved toward adjacent ponds. New levees could be built, and old levees returned to salt marsh vegetation. Study suggests levees could be continuously moved inboard to widen the fringe marsh connecting isolated marshes, thereby providing more available habitat.

STUDY 34

Study Site Study covers 142 sites, defined by the author as seasonal wetlands, in 7 counties around San Francisco and San Pablo Bays, and includes the following non-productive Leslie Salt Co. parcels: Baumberg Section: Perry Duck Club (A16), and Baumberg Tract, all ponds (A18). Newark Section: Coyote Tract non-productive parcels CT1

(A11, A23), CT2 (A23, A24), CT4 (A26). Mowry Section: Plummer Creek (A10).

Study Title	"Diked Baylands Wildlife Study". U.S. Fish and Wildlife Service, Div. of Ecological Services.
Author(s)	Project Coordinator: Ruth Pratt.
Date of Study	On-going study, begun October, 1982, to continue through 1989. Data pertaining to study sites on Leslie non-productive parcels was obtained between 12/23/83 and 10/11/86.
Where Study Can Be Found	U.S. Fish and Wildlife Service, Division of Ecological Services, 2800 Cottage Way, Room E-1803, Sacramento, CA 95825.
Nature of Study	Aerial and ground surveys of wildlife uses of diked former tidelands. Raw data in tabular form. Lists bird species and numbers. Also lists activities of birds (e.g. nesting, passing, foraging, resting) in percentages. Data includes total numbers of birds, and waterbirds for each survey day. Also includes the percentage of ponding on each site. Notes vegetation and other animals observed. Study sites were chosen bayward of the historic marsh margin of 1851 (Nichols, 1971 see bibliography), diked off from the Bay and not subject to tidal action. The authors state that "The purpose of the study is to gather baseline information on the use of these areas [seasonal wetlands] by fish and wildlife resources." Volunteer observers contribute a total of 250 group observation hours each month to ground observations. Study sites are surveyed twice monthly from November to April, and once a month from May to October. Aerial surveys are conducted during the wet winter months. Number of survey days per site, and duration of survey period varies for each site. Detailed maps included. Authors comment on having limited access to Leslie land. 154 pages.
Notes on Study	Computer printout of preliminary data from work in progress. No discussion of data.
Conclusions of Study	None.

STUDY 35

Study Site	Mowry Section: Ponds M1, M2, M3, M4, M5, and M6.
Study Title	"A Preliminary Study of the Relationship of Saltponds and Wildlife— South San Francisco Bay." <i>Calif. Fish and Game</i> . 56(4):240-252. 1970.

Author(s)	W. Anderson.
Date of Study	From September 1967 to September 1969. Surveys of birds conducted twice per month.
Where Study Can Be Found	California Department of Fish and Game, Wildlife Management Branch. 1416 9th Street, Sacramento, Ca. 95814.
Nature of Study	Study investigates five salt evaporation ponds, of increasing salinity, as wildlife habitat. Also investigates possible causes of variation in use of ponds by wildlife. Surveys number and species of birds in each pond. Provides information on salinity levels, depth, tidal cycles and water temperature of ponds. Presents results of sampling for organisms contained in the water and benthos of the ponds. Also provides brief outline of salt evaporation process in ponds. Study presents results of bird counts in written and tabular form. Organizes birds into twelve groups (e.g. grebes, doublecrested cormorants, white pelicans, herons, geese, dabbling ducks, etc.), and comments on relationship of salinity to food supply, population and distribution of birds. Discusses and tabulates food habits of birds surveyed. Map of study site included. Eleven pages.
Notes on Study	Important early study on topic, often referred to in future studies.
Conclusions of Study	Study recorded 55 bird species in ponds. Study states that "dabbling ducks, coots and fish-eating birds exhibited a marked preference for Pond M1, which had the lowest average salinity. Diving ducks, grebes, phalaropes and Bonaparte's gulls disclosed a high degree of salinity tolerance and predilection for food items existing in ponds of high salinity. Shorebirds used ponds that were shallow enough for walking irrespective of salinity." Makes recommendations for improving methods of future studies of this kind.

STUDY 36

Study Site	Baumberg Section: Ponds B11, B12, B13, and B6A. Also Baumberg Tract. all ponds (and Perry Duck Club). Maps included. Leslie Salt Co. numbering system not used.
Study Title	"Water Bird Survey and General Biotic Overview Baumberg Tract, Hayward, Ca. November 15, 1982 - June 6, 1983." Unpublished report prepared for Shorelands Corp.
Author(s)	S. McGinnis.

Date of Study	From November 15, 1982 to June 6, 1983.
Where Study Can Be Found	Western Ecological Services Co. (WESCO), 14 Galli Dr. Suite A; Novato, CA 94947.
Nature of Study	Baseline environmental assessment of Baumberg Tract. Describes vegetation, plant communities, hydrology, marine invertebrates, and avifauna of study area. Brief discussion of other vertebrates included. Data presented in both written and tabular form. Presents results of weekly salinity monitoring in tabular form over time. Discusses population and feeding ecology of marine invertebrates on site (brine shrimp, water boatmen, brine flies), their relationship to salinity, and as a food source for water birds. Lists and discusses results of weekly water bird survey. Includes table of duck and shorebird numbers present in study area over time. Notes correlation between pond water depth and abundance of shore/wading birds and ducks. Also notes correlation between rise in brine shrimp population during the course of study and an increase in the number of ducks observed (they utilize brine shrimp as food source). Eighteen pages.
Notes on Study	Unpublished report for the Shorelands Corporation. Information from study included in WESCO, 1987 (see entry #10) and Shorelands Draft EIS/EIR, 1987 (see entry #9).
Conclusions of Study	Concludes that there are no rare or endangered plants on study site, and no rare or endangered animal species feeding, resting, breeding, or residing on site, during period of study. Concludes no functional salt marsh community on site. Comments that bufflehead ducks present on site in large numbers, due to large invertebrate food supply and adequate water for feeding. Comments that human disturbance, in the form of hunters, adversely affects birds using study area.

STUDY 37

Study Site	Various sites around South San Francisco Bay, including the following Leslie Salt Co. properties: Newark Section: All ponds. Mowry Section: All ponds. Alviso Section: All ponds. Redwood City Section: All ponds. Also includes adjacent creeks, sloughs and marshes, and other property not owned by Leslie Salt Co. Maps included.
Study Title	"South San Francisco Bay Breeding Bird Survey, 1971." Cal. Dept. of Fish and Game - Wildlife Management Branch Administrative Report No. 72-6 (June, 1972).
Author	R. Gill, Jr.

Where Study Can Be Found	California Department of Fish and Game, 1416 9th Street, Sacramento, CA.
Nature of Study	Study determines numbers and species of birds nesting in South San Francisco Bay. Discusses the historical occurrence of species, based on previous comprehensive studies (Sibley, 1952; Grinnell & Miller, 1944, and Grinnell & Wythe, 1927). Author comments that ..."Baseline information is urgently needed for future assessment of habitat alterations." Study delineates 7 habitat types, and their acreage within the study area, 2 of which pertain to Leslie Salt Co. property: Salt ponds and dikes and levees. Determines wildlife habitat value of each habitat type. Study organized by bird species. Data presented in both written and tabular form. Data includes: nesting dates, location, nest type, and clutch size for each species. Maps of nesting areas included for most species. Sixty-eight pages.
Notes on Study	Comprehensive and detailed survey, predecessor of Rigney and Rigney, 1981 (see entry #8) and the on-going Colonial Breeding Bird Survey (San Francisco Bay Bird Observatory, see entry #47). Places each bird species in the context of its historical range.
Conclusions of Study	Study concludes that the wildlife value of salt ponds varies in relation to salinity. Waterfowl, pelicans and terns are found in ponds with lower salinities, and shorebirds and grebes prefer the higher salinity ponds. Concludes that the salt pond levees are very important nesting habitat for certain species: Forster's terns, Caspian terns, avocets, black-necked stilts, snowy plovers, killdeer and some species of waterfowl. Notes that birds tend to nest on levees where vehicular traffic is absent. Recommends enhancement of nesting habitat for California least tern, Forster's tern and Caspian tern within study area. Recommends further South San Francisco Bay breeding bird-surveys, at 3-5 year intervals, to follow changes in bird species composition and distribution. Recommends censusing clapper rail population, in South San Francisco Bay, annually or semi-annually. Recommends that salt production in South San Francisco Bay continue, to provide feeding and nesting habitat for birds. Recommends continuation of bird banding for Caspian and Forster's terns, great blue herons, black-crowned night herons and snowy egrets, in order to collect additional data on dispersal, movements, and wintering areas.

STUDY 38

Study Site	Study pertains to various areas throughout San Francisco Bay, including the following Leslie properties: Baumberg Section: All ponds and Baumberg Tract, all ponds. Newark Section: All ponds. Mowry Section: All ponds. Alviso Section: All ponds. Redwood City
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Section: All ponds. Also includes San Pablo Bay properties: Ponds SP1, SP2.

Study Title	"Review of the Bi-monthly Bird Counts of San Francisco Bay. February 1964-December 1965." California Department of Fish and Game, Wildlife Management Branch Administrative Report No. 72-8 (August, 1972).
Author	R. Gill Jr., Avian Biology Laboratory, California State University, San Jose, California.
Date of Study	From February, 1964 to December, 1965.
Where Study Can Be Found	California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814.
Nature of Study	Author reviews data collected by California Department of Fish and Game (Bollman, Thelin, and Forester, 1970, see entry #21), during a two year census of bird life throughout San Francisco Bay: 139 observation points in 13 census areas observed on a bi-monthly basis. Study lists number of birds and comments on population indices, seasonal distribution and movement trends for 28 species of the water-associated birds observed in census. Comments include observations on distribution, presence of breeding colonies, endangered status, timing of migration, habitat preference, etc. Tabulates population totals by species and census area for each year. Provides graphs of seasonal distribution and abundance of each species. Study includes written summary of results of census. Rough map of census area included. Nineteen pages.
Notes on Study	Author states that this is the "...first major study assessing the importance of San Francisco Bay for bird life".
Conclusions of Study	None.

STUDY 39

Study Site	Study pertains to numerous sites around the San Francisco Bay including the following Leslie properties: Baumberg Section: Baumberg Tract: Mt. Eden Creek, and Perry Duck Club. Newark Section: Unidentifiable areas referred to in study as "Leslie Salt". Mowry Section: Unidentifiable areas unnamed in study. Alviso Section: Unidentifiable areas unnamed in study. Study also includes sites on the following areas adjacent to Leslie property: Coyote Hills Slough, Newark Slough. The map included within the portion of the study reviewed was too imprecise to determine site locations on
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specific Leslie Salt Co. ponds. More detailed maps of study sites are available.

Study Title	"Growing Pains in the San Francisco Bay Area".
Author(s)	D. Sloan and T. Fletcher, Editors.
Date of Study	June 1987.
Where Study Can Be Found	Senior Seminar, Environmental Sciences Group Major, University of California, Berkeley, Berkeley, Ca 94720. Detailed maps of each site are on file with the Environmental Sciences program, UC Berkeley, California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814.
Nature of Study	Recent study quantitatively examines 52 sites for known and potential habitat of salt marsh harvest mouse (SMHM) and estimates habitat losses in non-tidal diked marshes in South San Francisco Bay. Compares availability of habitat with habitat loss to estimate relative status of SMHM protection and its opportunities for survival. Study provides information on SMHM behavior, habitat requirements, factors affecting survival (especially habitat destruction) and biological and historical influences contributing to adaptation and evolution of SMHM. Tabulates and discusses known potential and lost habitat of SMHM. Research includes published and unpublished studies and personal communications. (Sorenson, 1986; Harvey and Stanley Associates, 1985-1986; Union City General Plan Amendment, 1986; Jennings and WESCO; Kelly, 1978). Rough map of studies included. Eight pages.
Notes on Study	Only chapter 2 of this study, which pertains specifically to SMHM, was reviewed. Provides overview of factors pertaining to SMHM biology and status in layman's terms.
Conclusions of Study	Study concludes that habitat availability is crucial to SMHM survival. Makes several recommendations to preserve or increase habitat. Study also concludes, "In areas of potential mouse habitat, it would make more sense to assume the mouse's presence, as opposed to the current system where its absence is assumed and must be proven otherwise".

STUDY 40

Study Site	Study pertains to two sites. One site in San Diego County is not on Leslie property. The other site is at Alviso Section: Ponds A1, A2, A3, A4, and A5.
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Study Title	"Effects of Salinity on Algae Distribution". <i>Ecology</i> Vol. 45 (1): 70-71. 1964.
Author(s)	L. H. Carpelan.
Date of Study	1964.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560; and UC Berkeley Biology Library, Life Sciences Building, Room 3503, Berkeley, CA 94720.
Nature of Study	Study investigates two sites and compares effect of salinity on distribution and abundance of flora (primarily algae) and fauna. Author mentions previous studies (Gunter, 1961 and Allee et al 1949) which form positions on salinity as limiting factor in populations. Surveys species, population abundance and seasonal distribution of flora, invertebrates (primarily brine shrimp) and fish within the salinity gradients of study sites. Provides and discusses data on tolerance of algae to salt concentration levels in salt ponds. Includes graph of salt toleration levels. Discusses adaptability of individuals and species to salinity, and factors limiting adaptability (e.g. precipitation of minerals and change in ionic proportions in ocean water). Discusses other possible factors affecting population abundance and distribution, such as changes in concentrations of dissolved ammonia, phosphate and oxygen, and availability of food sources. Includes discussion of effects of salinity on evolutionary selection of species surviving in ponds.
Notes on Study	None.
Conclusions of Study	Author concludes, "The examples given show that salinity can be a limiting factor to some organisms in some situations while to other organisms either in the same or in other situations, salinity may be an inoperative phenomenon. The specific organism and the particular environmental conditions must be specified when discussing the effect of salinity on distribution." Concludes that it is impossible to generalize about the effect of salinity on distribution as previous studies had attempted. Also states that salinity can affect the distribution and the abundance of an organism differently, and that the two should be distinguished. Study comments that there is a difference between "estuarine conditions where a gradient allows choice of optimal salinities and non-estuarine conditions where the organisms present have no choice", and that the difference should be recognized in determining distribution and abundance of organisms.

STUDY 41

Study Site	Newark Section: Ponds N4, N6 and N9. Maps included.
Study Title	"Environmental Assessment of Dumbarton Bridge Replacement Project on Fish and Wildlife Resources, South San Francisco Bay, California." June 1972. Interagency Agreement No. S-1276; Dept. of Public Works and California Dept. of Fish and Game.
Author(s)	H.T. Harvey and R. Gill.
Date of Study	From December 1971 to March 1972.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Outlines proposed replacement of Dumbarton Bridge and bridge approach. Inventories salt pond and grassy field habitats traversed by bridge approaches. Describes physical characteristics of salt pond ecosystem, and includes tabulated data on salinity, dissolved oxygen, pH, and temperature. Describes flora and fauna of salt ponds in study area, including protozoa, invertebrates, fish, and birds. Discusses effects of salinity on species abundance, and the interdependence of salt pond organisms. Lists birds observed, numbers, and status of each species (e.g. migrating, breeding, year-round resident). Outlines proposed displacement of southern portions of ponds N4, N6, and N9 by filling, and the probable impacts on wildlife and salt production in the affected areas. Comments on the historical loss of salt marsh in South San Francisco Bay and discusses the merits of reclaiming an area, equal to the proposed fill, as salt marsh.
Notes on Study	Study includes avifauna research data from several previous studies of San Francisco Bay (e.g. Bollman, 1970, see entry #21; Anderson, 1968 and 1970, see entry #35).
Conclusions of Study	Concludes that salt ponds have a high wildlife value to migrating birds. Also comments that grassland habitat has "minimal ecological worth". Recommends mitigation in the form of salt marsh restoration. Also recommends reconstruction of outboard levee channel, similar to that displaced by project. Recommends shoreline bridge construction be on pilings to allow free tidal action.

STUDY 42

Study Site	Study pertains to various sites throughout the San Francisco Bay area including the following Leslie Salt Co. properties: San Pablo Bay: Non-productive pond SP2 and SP7. Census sites also include the following sloughs and marsh areas adjacent to Leslie property: Ideal Marsh, Mowry Slough, Plummer Creek, Coyote Creek, Mud Slough, Sonoma Creek, Ravenswood Slough and Ravenswood Point. Maps included.
Study Title	"The Status of the Salt Marsh Song Sparrows of the San Francisco Bay System, 1974-1975." Unpublished.
Author	B. Walton.
Date of Study	February 1974 to September 1975.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560, and San Jose State University, Avian Biology Laboratory, San Jose, CA.
Nature of Study	Study censuses three races of song sparrow (<i>Melospiza melodia pusillula</i> , <i>M. m. samuelis</i> , and <i>M. m. maxillaris</i>) in 136 acres to determine population density within its historic range throughout San Francisco Bay. Study examines salt marsh song sparrow (SMSS) distribution, abundance, habitat preference, population density, and size of territory at time of study. Discusses factors affecting race differentiation. Describes races. Reviews previous studies and censuses on song sparrows. Describes study area (e.g. topography, geology, hydrology, climate, salinity, tides and man-made alterations). Characterizes habitat types as freshwater, brackish, and salt marshes. Discusses birds' historic range and effect of habitat alteration on song sparrow populations. Presents information on habitat requirements. Provides diagrammatic representations of habitats and habitat vegetation, and marsh utilization and territory size in San Francisco Bay marshes. Includes discussion of study methods. Study selects 25 permanent census areas to enable standardization of comparisons of future studies. Compares sizes of song sparrow territory in various locations around the country. Compares density of territories in different habitat types; comparisons presented in tabular form. Also tabulates total numbers of each race by habitat type. Discusses factors affecting marshland stability including sedimentation, pollution, subsidence, dredging, landfilling and diking. Also discusses requirements for maintaining song sparrow populations in regard to management of remaining marshland. Includes map of historic distribution of SMSS habitat. Appendices include maps of major public and private

landowners in San Francisco Bay Area and maps of the 25 recommended permanent census areas. Two pages.

Notes on Study Study mentions that Mewaldt and Shellhammer (1973) proposed endangered species status for the three endemic races of song sparrow in the San Francisco Bay marshes. Above authors note that the SMSS have undergone similar habitat loss as that of the salt marsh harvest mouse and the California clapper rail. Study was preceded by Gill (1972) census of breeding population density of Alameda song sparrow (*M. m. pusillula*). Walton, 1975 (see bibliography) is a continuation of the research contained in the above study.

Conclusions of Study Study states that "Factors affecting race differentiation may be increasing, but long term habitat stability, required for differentiation, has been reduced." Author concludes that "Habitat alteration...has reduced habitat [of historic range] to isolated marshes and to intervals of vegetation along stream and sloughs ... Geographical distribution and abundance has decreased, especially in the range of the Alameda song sparrow...The other two races occupy large areas of remaining marsh and are maintaining their existing population levels...song sparrows adapt readily to changing environments and can maintain themselves in small demes of 100- 200 individuals if provided with adequate food, cover and water". Study states that density of territories are similar to historic densities. Territory sizes in San Francisco Bay Area among the smallest for any song sparrow populations. Study concludes that populations appear stable in remaining unaltered marshes, and threatened in non-protected marshes which are frequently disturbed.

STUDY 43

Study Site San Pablo Bay Properties: Pond SP5 (Fly Bay). Map of study site included. Study specific to Leslie property.

Study Title "Memorandum to Files re Salt Marsh Harvest Mouse Trapping - Napa Marsh." California Department of Fish and Game (endangered species).

Author(s) J. L. Michaels - Fish and Wildlife Assistant, Region I.

Date of Study January 29 and 30, 1976.

Where Study Can Be Found San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.

Nature of Study Lists results of live-trapping of salt marsh harvest mice in Napa marsh. Describes vegetation present and topography along each of

3 study transects, and total number of mice captured at each site.
Two pages.

Notes on Study None.

Conclusions
of Study None.

STUDY 44

Study Site Newark section: ponds NA1, NA2, NA3, NA4, N3, N4, N5, N6, N7, N8, N9, N10.

Study Title "The Distribution Patterns and Ecology of Waterbirds Using the Coyote Hills Salt Ponds". 1982.

Author(s) C. Swarth, C. Akagi, and P. Metropulos.

Date of Study From November 1979 to April 1980, and from October 1980 to September 1981.

Where Study Can Be Found San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.

Nature of Study Study documents seasonal abundance, distribution, and activities of waterbirds on 14 salt ponds west of Coyote Hills, within the San Francisco Bay National Wildlife Refuge, study also "...relates the differences in distribution abundance of birds among ponds with the salinity, prey biomass and other characteristics of the ponds". Reviews previous studies of waterbirds and ecology of South San Francisco Bay ponds. Provides brief history of salt pond construction, and an overview of the topography, vegetation, and man-made structures in study area. Study also provides general description of pond flow and salinity levels involved in salt evaporation process. Discusses invertebrate species in salt ponds (e.g. brine shrimp, brine flies, waterboatman bugs and salt-tolerant estuarine fish). Discussion of census methods. The study consisted of 55 waterbird censuses; 20 censuses were conducted between October 10, 1980, and September 29, 1981. The bird censuses were taken at 7-14 day intervals. Invertebrate populations were also sampled twice a month to assess the food resources available to the birds. Study discusses water movement and pond depth, water temperature, pH and salinity, invertebrate biomass and factors influencing invertebrate distribution; information also presented in tabular form. Results of survey discussed. Authors state that 70 bird species were observed using the study area ponds "...almost every species of waterbird found in the south Bay". Includes discussion and tables of density of wa-

terbirds in different habitat types in study area and correlates densities to tide cycles and salinity. Discusses and tabulates seasonal occurrence patterns of species, feeding techniques (e.g. pecking, scooping, plunging) for 49 species, and factors affecting the distribution patterns of non-breeding waterbirds. Study presents a summary of the seasonal abundance, distribution and behavior of waterbirds in the study area by species, and the status of these species throughout the South San Francisco Bay salt pond environment. Study makes preliminary suggestions for managing salt ponds to improve habitat for wildlife. Appendices include a list of characteristic and numbered codes used in computer analysis of invertebrate biomass, the seasonal fluctuation in pH and salinity for the 14 ponds, a list of the landbirds associated with the study area and notes on their occurrence, and definitions of the waterbird abundance categories and the seasons used for the population status descriptions in the studies account of each species. Map of study area included. Seventy-four pages.

Notes on Study	None.
Conclusions of Study	No conclusions. However, study makes recommendations to facilitate better understanding of distribution of birds, their food sources, and the birds' use of salt ponds. Authors also recommend continued restriction of public access to pond dikes, especially during nesting season.

STUDY 45

Study Site	San Pablo Bay properties: Pond SP2 (nonproductive portion). Rough map included.
Study Title	"Ecological and Physiological Factors Influencing the Ecotone Between <i>Spartina foliosa</i> Trin. and <i>Salicornia virginica</i> L. in Salt Marshes of Northern San Francisco Bay". Doctoral dissertation, University of California, Berkeley.
Author(s)	B. E. Mahall.
Date of Study	February 1972 - August 1973.
Where Study Can Be Found	U.C. Berkeley, Biology Library, and San Francisco Bay National Wildlife Refuge, P. O. Box 524, Newark, CA 94560.
Nature of Study	Study investigates the ecotone between two species of salt marsh plants, <i>Spartina foliosa</i> and <i>Salicornia virginica</i> . Study focuses on ecological and physiological factors influencing zonation of these species, both in the field study plots, and by laboratory and green-

house experimentation. Detailed review of existing literature pertaining to zonation of salt marsh vegetation. Discusses possible causes of zonation, e.g. soil composition, tidal water, soil aeration, soil salinity, nutrients, and reproductive mechanisms. Data gathered in the field for each of the two species includes: above and below ground biomass, soil salinity and soil oxygen diffusion rates. Laboratory experiments conducted include: exposing root mediums to varying salinities and exposure of plants to tides of different heights. 315 pages.

- Notes on Study Although one of two transect sites chosen by author is on Leslie Salt Co. property, a majority of the research was conducted in the laboratory and greenhouse, simulating natural and stressful conditions.
- Conclusions of Study Discusses results of field sampling along transects, with focus on ecotone between *Spartina foliosa* and *Salicornia virginica*. Presents results of data collected on above and below ground biomass, net productivity/m², soil salinity (winter and summer) and soil oxygen diffusion rates. Discusses results of laboratory experiments, including: growth response of shoots to root medium of various salinities, and exposure of plants to tides of varying heights, but same frequency.

STUDY 46

- Study Site The study pertains to the Napa Marsh on San Pablo Bay including the Leslie Salt Co. San Pablo Bay properties: All ponds. (SP1, SP2, SP3, SP4, SP5, SP6, SP7, SP8, SP9).
- Study Title "The Natural Resources of Napa Marsh". California Department of Fish and Game. Coastal Wetlands Series #19, 1977.
- Author(s) Madrone Associates, Environmental Consultants. Assisted by James Michaels, Wildlife Biologist, Department of Fish and Game. Under contract to Department of Fish and Game.
- Date of Study August, 1977.
- Where Study Can Be Found California Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814. Also found at UC Berkeley, Main Library, Government Documents Department, Berkeley, CA 94720.
- Nature of Study Comprehensive study documenting biological/ecological, aesthetic, recreational and productive (agriculture and salt) resources of the Napa Marsh. Includes detailed analysis of threats to marsh environment from human demands, and recommendations for solu-

tions to specific problems. Describes environment of entire Napa marsh area including its physical features, geology and soils, climate, drainage and hydrology, groundwater hydrology, water quality and characteristics, and historical setting and use. Discussion of reclamation and development of marsh includes brief acquisition history of property owned by Leslie Salt Co. Provides descriptions of habitat types in Napa marsh; descriptions include geomorphology of habitat, species and feeding ecology of flora and fauna, and effect of environmental influences on distribution and abundance of species within each habitat type. Habitat value to fauna (especially avifauna) and endangered species also discussed. Provides information on fish and wildlife (e.g. reptiles and amphibians, birds, mammals, invertebrates, insects) found throughout study area, and discusses wildlife use, preference and seasonal relationship to habitat. Includes graph of monthly populations of shorebirds and ducks for 1975-1976. Discusses ecological relationships (life cycles) of flora and fauna within Napa Marsh and significance of entire marsh within the larger Bay Area ecological system. Provides brief descriptions and maps of biologically significant areas including Leslie non-productive property on Coon Island. Study presents information on utilization of natural resources, current ownership, and land use. Discusses impact of these uses. Provides detailed discussion of responsibilities of jurisdiction over land use in Napa Marsh including regulatory and advisory powers of local counties (Sonoma, Napa, Solano), cities (Napa and Vallejo), BCDC, Army Corps of Engineers, S.F. Bay Region Water Quality Control Board, California Department of Fish and Game and U.S. Fish and Wildlife Service. Discusses problems and threats to wildlife habitat, primarily resulting from present or potential conflicts with human uses of the marsh. Summary of text included. Appendices contain tables of the common and scientific names and locations of flora; the species, populations, and life history notes of fish; and the species and rate of occurrence of mammals, reptiles and amphibians. Appendices also include data on distribution and abundance of birds, as well as lists of invertebrates found in study area. Maps of Napa Marsh habitat types, San Pablo Bay National Wildlife Refuge, Napa Marsh State Wildlife Area, Napa Marsh watershed and entire study area included. Photos of study area also included. Ninety-seven pages.

Notes on Study

Comprehensive study. Best available source for overview of biota, ecology, and problems pertaining to habitat value of Napa Marsh and Leslie Salt Co. North Bay properties. Written for general public as well as professionals. One of 20 reports in California Department of Fish and Game Coastal Wetland series.

Conclusions of Study

Study states that approximately 75% of original marshlands of San Pablo Bay have been converted to agricultural uses through diking and draining. Also states that there are approximately

46,700 acres presently existing in Napa Marsh area. Leslie Salt Co. is "...the largest single land owner of record, laying claim to 10,906 acres, roughly 23.5% of the entire marsh." Study notes that "a potential problem lies in the eventual disposition of these lands, should salt production eventually become economically unfeasible." Study concludes that "...the greatest threat to the present status of Napa Marsh is the continuing pressure for development" and that "...the only sure guarantee of adequate protection of Napa Marsh and its natural resources is the acquisition of sensitive wetland areas and habitat of particular ecologic value." The study recommends that:

- "1. No further intensification of land use occur within the historic boundary of Napa Marsh.
2. Local zoning ordinances be brought into conformity with existing open space and conservation plans of local jurisdictions.
3. Key parcels of marsh, highly vulnerable to encroachment or of special ecological or biological significance, be acquired and placed in public ownership.
4. Upon termination of their present use, lands in Napa Marsh that are under salt production and in military use be restored to, and/or used for, wildlife habitat."

STUDY 47

Study Site	Various sites around San Francisco Bay including all properties owned by Leslie Salt Co. Maps included.
Study Title	Colonial Breeding Bird Survey of South San Francisco Bay.
Author(s)	San Francisco Bay Bird Observatory (SFBBO).
Date of Study	From 1982 to the present.
Where Study Can Be Found	San Francisco Bay Bird Observatory. P. O. Box 247, Alviso, CA 95002.
Nature of Study	Raw data in tabular form using standardized format developed by the National Audubon Society and Cornell Laboratory of Ornithology (Cornell University.) Information is used by the National Colonial Bird Register, a computerized data base for the collection and dissemination of information about colonial birds, as well as by the SFBBO, and SFBNWR, and the Portland Regional Office of U. S. Fish and Wildlife Service. SFBBO has been collecting data on colo-

nial nesting birds in South San Francisco Bay for five years using the national Colonial Bird Register forms. Information includes total populations, total active nests, nesting stages, disturbance factors, habitats, and census techniques. Varying number of site visits per breeding season. Detailed maps of census sites included.

Notes on Study Work in progress. Preceded by Rigney & Rigney, 1981 (see entry #8) and Gill, 1972 (see entry #37.)

Conclusions of Study None.

STUDY 48

Study Site Various sites around San Francisco Bay including the following Leslie Salt Properties: San Pablo Bay Properties: Ponds SP2, SP3, and SP7. Study also pertains to areas bordering Leslie Salt Property, including sites on Napa Slough and Sonoma Creek.

Title of Study "Clapper Rail Survey". California Department of Fish and Game, Special Wildlife Investigation. Job Progress Report. Project No. W-54-R-5. Job No. II-10.

Author(s) G. Gould, Jr.

Date of Study From July 1, 1972 to June 30, 1973.

Where Study Can Be Found San Francisco Bay National Wildlife Refuge, P.O. Box 524, Newark, CA 94560. California Department of Fish and Game, 1416 9th Street, Sacramento, CA 95814.

Nature of Study Census of California clapper rail (*Rallus longirostris obsoletus*) population in 19 marshes in the San Francisco Bay area and 3 marshes along the central California coast. Purposes of the survey are to define the range of the endangered rail and to develop methods for locating and censusing rails. Rail survey methods developed by Fish and Game personnel. Censusing done on foot, by boat and sometimes with use of hunting dog. Mentions dominant vegetation of preferred habitat type. Includes table which identifies vegetation and other habitat requirements present in sites in survey area. Briefly discusses results of survey and factors affecting rail populations (e.g. availability of suitable vegetation, effect of housing development and pollution on habitat) by site. Presents study results in tabular form. Study provides instructions for conducting clapper rail surveys. Includes maps of locations of study areas. Eleven pages.

Notes On Study This study is preceded by the South San Francisco Bay breeding bird survey, 1971 (Gill, 1972, see entry #37) which established the distribution of the clapper rail within the South San Francisco Bay area. Succeeding studies of clapper rail activity include Gill, 1979 (see entry #28), Harvey, 1980 (see entry #30), and Harvey, 1987 (see entry #52).

Conclusions of Study None.

STUDY 49

Study Site See entry #42. Site-specific map not included in study but available in Dept. of Fish and Game, Non-game Wildlife Investigations files.

Study Title "Salt Marsh Song Sparrow Study". California Dept. of Fish and Game, Special Wildlife Investigations. Job Final Report. Project No. W-54-R-6. Job No.II-5.12.

Author(s) R. Jurek

Date of Study From February 4, 1974 to October 4, 1974.

Where Study Can Be Found San Francisco Bay National Wildlife Refuge, P. O. Box 526, Newark, CA 94560, and California Dept. of Fish and Game, 1416 9th Street, Sacramento, CA 95814.

Nature of Study Survey and inventory of the three endemic races of salt marsh song sparrow (SMSS) restricted in distribution to marshlands of the San Francisco Bay region. This survey is continued through September 1975 by Brian Walton, "The Status of the Salt Marsh Song Sparrows of the San Francisco Bay System, 1974-1975". (See entry #42). This study offers information not contained in entry #42, including written descriptions specifying location of the ranges of the three races of SMSS. It also specifies the location of altered habitat areas in relation to SMSS range. The study discusses the effects of habitat alterations on the the population of SMSS at specific locations. Provides table of "Breeding Population Densities Recorded in 1974 compared with Densities Recorded in 1950 by Johnston (1956) and in 1971 by Gill (1972)". Includes maps of approximate distribution of SMSS in 1900 and 1974. Ten pages.

Notes On Study Results of research conducted in this study are contained in the Dept. of Fish and Game, Non-game Wildlife Investigations Files. This information includes locations and descriptions of survey sample areas, population data, observation of other wildlife species (especially endangered species), and preliminary recommendations for habitat improvement protection.

**Conclusions
of Study** **None.**

STUDY 50

Study Site **Baumberg Section: Mt. Eden Creek and Perry Duck Club. Newark Section, Coyote Tract non-productive Parcels CT1, CT2, and CT3. Maps included.**

Study Title **Correspondence from U. S. Fish and Wildlife Service, Sacramento Endangered Species Office, to Paul Shepherd, Vice-President and Land Manager of Leslie Salt Company property.**

Author(s) **G. Kobetich.**

Date of Study **April 21, 1986.**

**Where Study
Can Be Found** **San Francisco Bay National Wildlife Refuge and U. S. Fish and Wildlife Service, Sacramento Endangered Species Office, 2800 Cottage Way, Room E-1823, Sacramento, CA 95825.**

Nature of Study **Letter advising Leslie Salt Company of records indicating the presence of the salt marsh harvest mouse on or adjacent to company property. Describes location of sites where mice were live-trapped, number of mice trapped, and characteristic vegetation at trap site. Includes maps of trap site locations and salt marsh harvest mouse habitat on Leslie Salt Company property as referred to in text of letter. Five pages.**

Notes on Study **None.**

**Conclusions
of Study** **None.**

STUDY 51

Study Site **Various sites around South San Francisco Bay, including the following Leslie Salt Company salt ponds: Newark Section: ponds NA1, NA2, NA3, NA4, N1, N2, N4, N5, N6, N7, N8, N9. Mowry Section: ponds M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13. Alviso Section: ponds A11, A19, A20, A21, A22, A23. Redwood City Section: ponds R1, R2, SF2. Detailed maps included.**

Study Title	"Dike-nesting Bird Survey, San Francisco Bay National Wildlife Refuge, Summer, 1980". Unpublished report USFWS-SFBNWR, 1980.
Author(s)	J. G. Moss
Date of Study	From June 19, 1980 to June 28, 1980.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 526, Newark, CA 94560.
Nature of Study	Breeding birds survey of the dikes and levees of the South San Francisco Bay salt pond system, within the boundaries of the San Francisco Bay National Wildlife Refuge. The study pertains to the following seven species of dike-nesting birds: American avocets, black-necked stilts, snowy plovers, killdeer, Caspian terns, Forster's terns and California least terns. "...the refuge dikes were either walked or driven in search of signs of breeding birds, which included mobbing adult birds, nests, eggs, or young. This information was plotted on maps and recorded on data sheets. Information gathered included kind of nest (species), number of eggs, chicks or juveniles, number of mobbing adults, orientation of nest, height of nest above water, nesting materials, location of dike, and surface-type and width of dike". Detailed maps of study areas and survey routes included. Data presented in both written and tabular form. Compares results with those of previous studies (see above). Estimates number of breeding birds and location of "sensitive breeding areas" within San Francisco Bay National Wildlife Refuge boundaries. (25 pages, plus maps).
Notes on Study	Study preceded by Gill, 1972 (see entry #37)
Conclusions of Study	Recommends that future surveys be conducted earlier in the nesting season (one month earlier). Recommends survey of dike-nesting birds two to three times per breeding season, on a yearly basis.

STUDY 52

Study Site	Study pertains to marshes throughout San Francisco Bay including Leslie properties adjacent to sloughs and marshes. Study is not site-specific. Maps of specific study sites not included.
Study Title	"The California Clapper Rail: Biology, Present Status and Future Trends". (1987 AOU Presentation). Unpublished.
Author(s)	T. E. Harvey

Date of Study	1987.
Where Study Can Be Found	San Francisco Bay National Wildlife Refuge, P. O. Box 526, Newark, CA 94560.
Nature of Study	<p>Summary of biology and status of the California clapper rail (CCR) and of threats to CCR existence in the future. Describes historic range and threats to early CCR populations (e.g. hunting and loss of habitat), which resulted in declaration of endangered species status. Mentions vegetation and common characteristics of optimal habitat. Discusses and maps movement of rails between marshes in the South San Francisco Bay. Discusses population densities during breeding and non-breeding seasons. Provides estimates of total rail population in San Francisco Bay in 1979, and since 1981, in written and tabular form. Discusses disparity in estimates. Study presents and discusses numerous threats to CCR population including effects of predation by Norway rats and red foxes, loss of high marsh and transition zone habitat (especially during extreme winter high tides), pollutants, potential continued loss of habitat due to development, and inundation due to a rise in sea level as a result of the "greenhouse effect". Author states that "heavy predation and shortage of high cover are the most critical threats facing the CCR", and that "tidal restoration of large tracts of former bay lands as proposed in the (rail) Recovery Plan, offers the best hope for offsetting the combined threats posed by introduced predators, shortage of high marsh/transitional habitat and contaminants". Study provides hectares of historic and existing marshes in San Francisco Bay, hatching success for 26 nests in the South San Francisco Bay, and CCR egg residue analysis for traces of heavy metals and selenium. Study includes map of the current distribution of the CCR in the San Francisco Bay area. Fifteen pages.</p>
Notes on Study	<p>Study is the text of a presentation given to the American Ornithological Union (AOU). Compares CCR population estimates to estimates reported by Gill from 1971- 1975. Study is most recent work available pertaining to status of CCR populations.</p>
Conclusions of Study	<p>Author concludes that "studies to date reveal a sub-species of clapper rail in San Francisco Bay whose present status is much more precarious than previously thought and whose future is overshadowed by serious threats on several fronts".</p>

STUDY 53

Study Site	Baumberg Section. No map included. Specific description includes Baumberg Tract, the salt evaporators on Mt. Eden Creek, and "the two gun-club ponds or grassy area south of old Baumberg Village".
Study Title	"The Kite Call: Baumberg Tract Field Trip".
Author(s)	H. Cogswell.
Date of Study	February 22, 1986.
Where Study Can Be Found	California Dept. of Fish and Game, P. O. Box 47, Yountville, CA 94599.
Nature of Study	List of bird species and mammal species observed (common names). Species counts divided into three distinct study areas (discussed above). Fifty-two different species of birds observed; two mammal species observed. Brief discussion of study area. Author comments on status of wildlife and development of Leslie lands. One page.
Notes on Study	Document written in form of field notebook entry. Brief discussion concerning the necessity of Leslie's dike maintenance program.
Conclusions of Study	None.

STUDY 54

Study Site	Newark Section: Coyote Tract, non-productive parcels CT1, CT2, AND CT3.
Study Title	Environmental Assessment of Newark-Coyote Tract. (Unpublished report prepared for Leslie Salt Co., 1982)
Author(s)	S. McGinnis.
Date of Study	1981.
Nature of Study	Environmental assessment of study area, in the context of proposed development on site. Brief history of salt production in study area, including date of abandonment of salt production by Leslie (early 1960's). Notes current uses of study area. Describes topography, hydrology and vegetation of study area. Lists birds, mammals, reptiles, amphibians, fish and marine invertebrates observed on study site. Brief discussion of seasonal usage of site by fauna. Notes that

no endangered species observed during period of study. Presents the estimated positive and negative impacts of development on the ecosystem presently found on site. Also discusses the possible impacts of two alternative scenarios; 1) If site retains its present use, and 2) if site is restored to its original fresh-water marsh and upland state. Lists mitigation alternatives for each parcel. Includes appendix outlining detailed recommendations for drainage of study area stormwater run-off into San Francisco Bay National Wildlife Refuge ponds.

Notes On Study	Preliminary report for proposed development plan.
Conclusions of Study	None.

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