Appendix A
Acronyms List

ESA

APPENDIX A
Acronyms List

AA	Action Area
AAC	Aircraft Approach Category
ARFF	Aircraft Rescue and Firefighting
AB	Assembly Bill
AC	Advisory Circular
ACM	Airport Certification Manual
ADG	Airplane Design Group
ADT	Average Daily Traffic
AEDT	Aviation Environmental Design Tool
AFE	Above Field Elevation
AIP	Airport Improvement Program
ALP	Airport Layout Plan
ALUC	Airport Land Use Commission
ALUCP	Airport Land Use Compatibility Plan
APE	Area of Potential Effects
ARC	Airport Reference Code
APU	Auxiliary Power Unit
ARP	FAA Office of Airports
ASDA	Accelerate-Stop Distance Available
BA	Biological Assessment
BIH	Bishop Airport
BIOS	Biogeographic Information and Observation System
BFE	Base Floor Elevation
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CALTRANS	California Department of Transportation
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CH_4	Methane
CHRIS	California Historical Resources Information System
CLUP	Comprehensive Land Use Plan
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalents
COVID-19	Coronavirus Disease 2019
CRJ	Canadair Regional Jet
CWA	Clean Water Act
dB	Decibel
dBA	A-Weighted Decibel

DEN	Denver International Airport
DNL	Day/Night Average Sound Level
DME	Distance Measuring Equipment
DOT	Department of Transportation
EA	Environmental Assessment
ECOS	Environmental Conservation Online System
EIC	Eastern Information Center
EIS	Environmental Impact Statement
EMFAC2017	Emissions Factor 2017
EO	Executive Order
ESA	Endangered Species Act
ESCOG	Eastern Sierra Council of Governments
ESTA	Eastern Sierra Transit Authority
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMMP	Farmland Mapping and Monitoring Program
FONSI	Finding of No Significant Impact
GA	General Aviation
GBUAPCD	Great Basin Unified Air Pollution Control District
GHG	Greenhouse Gas
GPS	Global Positioning System
GSA	General Study Area
GSE	Ground Support Equipment
GSP	Groundwater Sustainability Plan
GWP	Global Warming Potential
HFC	Hydrofluorocarbons
HMMA	Hazardous Material Management Act
HSWA	Hazardous and Solid Waste Amendments Act of 1984
IPaC	Information, Planning, and Consultation
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt Hours
LADWP	Los Angeles Department of Water and Power
LAX	Los Angeles International Airport
LDA	Landing Distance Available
LOS	Level of Service
LWCF	Land and Water Conservation Fund Act
MIAWG	Mammoth Inyo Airport Working Group
MIRL	Medium Intensity Runway Lights
MLT	Mammoth Lakes Tourism
MMH	Mammoth Yosemite Airport
MMSA	Mammoth Mountain Ski Area
MOA	Military Operations Area
MPH	Miles Per Hour
MS4	Municipal Separate Storm Sewer System
MT	Metric Tons
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFHL	National Flood Hazard Level
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NPL	National Priorities List
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NO_2	Nitrogen Dioxide
N_2O	Nitrous Oxide

NPDES	National Pollutant Discharge Elimination System
NPIAS	National Plan of Integrated Airport System
NPL	National Priorities List
NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
NWI	National Wetland Inventory
OHV	Off Highway Vehicle
OVGA	Owens Valley Groundwater Authority
OVLMP	Owens Valley Land Management Plan
O_3	Ozone
PAPI	Precision Approach Path Indicator
Pb	Lead
PF	Public Service Facilities
PFC	Perfluorocarbons
$PM_{2.5}$	Particulate Matter Less Than or Equal to 2.5 Microns in Diameter
PM_{10}	Particulate Matter Less Than or Equal to 10 Microns in Diameter
PPB	Parts Per Billion
PPM	Parts Per Millions
RCRA	Resources Conservation and Recovery Act
REIL	Runway End Identifier Lights
RNAV	Area Navigation
RNP	Required Navigation Performance
RSA	Runway Safety Area
RTP	Regional Transportation Plan
RVZ	Runway Visibility Zone
RWY	Runway
RWQCB	Regional Water Quality Control Board
SAFE	Safer Affordable Fuel-Efficient
SAN	San Diego International Airport
SARA	Superfund Amendments and Reauthorization Act
SCE	Southern California Edison
SDWA	Safe Drinking Water Act
SF_6	Sulfur Hexafluoride
SFO	San Francisco International Airport
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SSC	Species of Special Concern
SUV	Sport Utility Vehicle
SWFL	Southwester Willow Flycatcher
SWIS	Solid Waste Information System
SWRCB	State Water Resources Control Board
THPO	Tribal Historic Preservation Officer
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
$\mu g/m^3$	Micrograms Per Cubic Meter
USEPA	U.S. Environmental Protection Agency
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

Appendix B
References

APPENDIX B

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Appendix C
List of Preparers and Reviewers

APPENDIX C
List of Preparers and Reviewers

Federal Aviation Administration

Camille Garibaldi. Environmental Protection Specialist, Project Manager. San Francisco Airports District Office. B.A., Business Management. Over 25 years of environmental experience. Responsible for detailed FAA evaluation of the NEPA document and regulatory agency consultations.

Edvige Mbakoup, Environmental Protection Specialist, Los Angeles Airports District Office. M.P.H., Environmental Health Science; B.S., Biology. Ms. Mbakoup is an FAA Environmental Protection Specialist and Project Manager with five years of experience in the federal government. She performed a peer review on the Draft Environmental Assessment.

David B. Kessler, M.A., AICP, Regional Environmental Protection Specialist Office of Airports, Western-Pacific Region, El Segundo, California. M.A., Physical Geography, B.A., Physical Geography (Geology Minor). Mr. Kessler has 39 years of experience. Responsible for detailed FAA evaluation of Environmental Assessments and Environmental Impact Statements as well as coordination of comments from various federal and state agencies in the FAA's Western-Pacific Region. Mr. Kessler ensures consistency of preparation of NEPA documents for airport projects in the Western-Pacific Region.

Mike Millard. Flight Standards Environmental Specialist, AFS-830 General Aviation and Commercial Operations Division. Aviation Safety Inspector. 17 years with the FAA, with five years environmental experience. Responsible for FAA Flight Standards evaluation of NEPA related issues associated with General Aviation and Commercial Aviation operations.

Inyo County Department of Public Works

Ashley Helms. Deputy Public Works Director – Airports. Inyo County Project Manager. B.S., Engineering Science. Four years of experience. Responsible for project management for the airport sponsor.

Environmental Science Associates

Autumn Ward, CM, ENV SP. Principal Associate. Project Director. M.S., Aeronautics; B.S. Aviation Business Administration. Sixteen years of experience. Responsible for project management and QA/QC.

Chris Jones, AICP. Principal Associate. Project Manager. J.D., Law; B.A., Sociology. Seventeen years of experience. Responsible for project management, NEPA documentation including purpose and need, alternatives, socioeconomics, GIS analysis, and QA/QC.

Jeffery Covert, **ENV SP**, Aviation Specialist. M.S., Environmental Science; M.P.A.; B.S., Ecology and Environmental Biology; B.A., Spanish. Five years of experience. Responsible for biological assessment and NEPA documentation including biological resources, hazardous materials, solid waste, and pollution prevention, water resources, and cumulative impacts.

Karl Fairchild. Biologist. M.S., Environmental Studies; B.S., Fish and Wildlife; B.A., Internal Studies. Four years of experience. Responsible for biological assessment.

Patrick Hickman, PLA, AICP, LEED AP. Land Use Planner/Landscape Architect. M.U.R.P.; B.L.A., Landscape Architecture. Twelve years of experience. Responsible for NEPA documentation including land use, natural resources and energy supply, cumulative impacts, and GIS analysis.

Susumu Shirayama. Senior Noise Analyst. B.S. Aerospace Studies. Twenty years of experience. Responsible for the aircraft noise modeling using AEDT.

Chris Sequeira. Senior Managing Associate. M.S. and B.S. Aeronautics and Astronautics, M.S. Technology and Policy. Ten years of experience. Responsible for the analysis of aviation-related air quality and greenhouse gas impacts.

Heidi Koenig, M.A. RPA. Senior Archaeologist. M.A., Cultural Resources Management; B.A., Anthropology. Seventeen years of experience. Responsible for cultural resources.

Victoria Hsu, ENV SP. Managing Associate. M.P.P., M.E., Civil Engineering; B.S., Civil Engineering. Eight years of experience. Responsible for the analysis of transportation-related air quality and greenhouse gas impacts.

Phoebe Weiman. Airport Planner. B.S., Aviation Management with Flight. One year of experience. Contributed to NEPA documentation including visual effects.

Mike Arnold, LEED AP. Sr. Vice President. B.S., Civil Engineering. Twenty-nine years of experience. Responsible for QA/QC.

Steven Alverson. Sr. Vice President. B.S., Aeronautics. Forty years of experience. Responsible for QA/QC.

Heidi Rous, CPP. Director of Air Quality, Climate and Acoustics Services. B.S., Physics. Thirty years of experience. Responsible for QA/QC, air quality.

Appendix D
Aviation Activity Forecasts

ESA

D-1 Bishop Airport Aviation Activity Forecast

County of Inyo

DEPARTMENT OF PUBLIC WORKS

168 N. Edwards Street, Independence, CA 93526

Main 760.878-.0201   Fax 760.878.2001

1/14/2021

Jaime Duran
Lead Planner – Los Angeles ADO

While preparing the air quality and noise analyses for the ongoing Environmental Assessment for the Part 139 Certification project at Bishop Airport, discrepancies were discovered between the Aviation Activity Forecast for the Airport, approved by the FAA on April 28, 2020, and the number of operations calculated by the environmental consultant. Two formula errors were found in the forecast spreadsheet:

1. The original formula for December for years 2026 – 2033 included two flights from LAX for 31 days; the corrected formula includes one flight for 31 days and one flight for 15 days.
2. The formula for February in years 2024, 2028 and 2032 did not take the leap year into account.

The modifications to the number of operations and enplanements are shown on the following page.

Additionally, the forecast assumed a 2-3% cancelation rate for the winter season. The consultant did not take the cancelation rate into account when calculating operations in order to present the maximum potential impact in the noise analysis.

The discrepancy between the number of operations in the two documents are summarized below:

	Approved Forecast	Environmental Assessment
2022	1,196	1,210
2028	1,970	1,942

Please let me know if additional information, or a correction to the forecast, is required.

Thank you,

A. Helms

Ashley Helms
Inyo County Public Works

Table 6: BIH Aircraft Operations Forecast

	Air Carrier*	Commuter / Air Taxi	General Aviation	Military	Total Aircraft Operations
2018	1050	6	23000	3000	27056
2019	1212	6	23000	3000	27218
2020	1212	6	23000	3000	27218
2021	1196	6	23000	3000	27202
2022	1196	6	23000	3000	27202
2023	1226	6	23000	3000	27232
2024	1434	6	23000	3000	27440
2025	1434	6	23000	3000	27440
2026	1525	6	23000	3000	27531
2027	1732	6	23000	3000	27738
2028	1970	6	23000	3000	27976
2029	1970	6	23000	3000	27976
2030	1970	6	23000	3000	27976
2031	1970	6	23000	3000	27976
2032	1970	6	23000	3000	27976
2033	1970	6	23000	3000	27976
	Compound Annual Growth Rate				
2018-2021	4%	-	-	-	0.2%
2023-2028	17%	-	-	-	0.9%
2028-2033	0%	-	-	-	0%

*Air Carrier flights before December 2020 land at MMH

Notes: (1) CAGR for Total Operations at BIH from 2018-2021 is 1.5%
(2) Air Carrier operations assume 3% cancelation rate in winter season

REVISED Table 6: BIH Aircraft Operations Forecast

	Air Carrier*	Commuter/ Air Taxi	General Aviation	Military	Total Aircraft Operations
2018	1050	6	23000	3000	27056
2019	1212	6	23000	3000	27218
2020	1212	6	23000	3000	27218
2021	1196	6	23000	3000	27202
2022	1196	6	23000	3000	27202
2023	1226	6	23000	3000	27232
2024	1441	6	23000	3000	27447
2025	1434	6	23000	3000	27440
2026	1493	6	23000	3000	27499
2027	1701	6	23000	3000	27707
2028	1920	6	23000	3000	27926
2029	1938	6	23000	3000	27944
2030	1938	6	23000	3000	27944
2031	1938	6	23000	3000	27944
2032	1950	6	23000	3000	27956
2033	1938	6	23000	3000	27944
	Compound Annual Growth Rate				
2018-2021	4%	-	-	-	0.2%
2023-2028	16%	-	-	-	0.8%
2028-2033	0%	-	-	-	0%

*Air Carrier flights before December 2020 land at MMH

Notes: (1) CAGR for Total Operations at BIH from 2018-2021 is 1.5%
(2) Air Carrier operations assume 3% cancelation rate in winter season

U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Airports Division
Los Angeles Airports District Office

777 S. Aviation Blvd, Suite 105
El Segundo, CA 90245

April 28, 2020

Mr. Michael Errante, P.E.
Director of Public Works
County of Inyo
168 N. Edwards Street
Independence, CA 93526

Bishop Airport (BIH)
Aviation Activity Forecast Approval

Dear Mr. Errante,

The Federal Aviation Administration (FAA) has reviewed the Aviation Activity Forecast for the Bishop Airport (BIH), Bishop California. The FAA approves this forecast for airport planning purposes.

The forecast was developed using current data and appropriate methodologies. The forecast started with the current Mammoth Yosemite Airport (MMH) service levels as a baseline and adding three daily flights to the winter season over the years 2024 through 2028. The forecast assumes air service will start with Bombardier CRJ 700, a C-II aircraft with 70 seats, which currently provides service to MMH. Over the first five years, the fleet will transition to the Embraer 175, C-III aircraft with 76 seats. Air carrier operations are predicted to increase 4% between the base year and 2021, and 17% between 2023 and 2028.

It is important to note that the approval of this forecast does not guarantee future funding for capital improvements as future projects will need to be justified by current activity levels reached at the time the projects are proposed for implementation and will need to be further analyzed for Airport Improvement Program eligibility purposes.

If you have any questions about this forecast approval, please call me at 424-405-7271.

Sincerely,

Jaime Duran
Lead Airport Planner

County of Inyo
DEPARTMENT OF PUBLIC WORKS
168 N. Edwards Street, Independence, CA 93526
Main 760.878-.0201   Fax 760.878.2001

Jaime Duran, Lead Airport Planner
Los Angeles Airports District Office
Federal Aviation Administration
777 S. Aviation Boulevard, Suite #150
El Segundo, CA 90245

Dear Mr. Duran,

Inyo County is pleased to submit the Aviation Activity Forecast for the Bishop Airport, in Bishop, California. The primary assumption of the 15 year forecast is the transition of commercial service from the Mammoth Yosemite Airport in the fall of 2020. The forecast starts with the current MMH service levels as a baseline, adding 3 daily flights to the winter season over years 2024 – 2029. Additional growth in enplanement numbers are due to gradual increases in flight load factors and a modest increase in aircraft size. Air carrier operations are predicted to increase 4% between the base year and 2021, and 17% between 2023 and 2028. Commuter, military and general aviation operations are expected to remain consistent.

Thank you,

Michael Errante, P.E.
Director of Public Works
Inyo County
760.878.0201

DRAFT AVIATION ACTIVITY FORECAST
BISHOP AIRPORT

Prepared by Inyo County Public Works
Independence, CA
March 2020

Section 1. Introduction and Background

This document presents the forecasted aviation activity for the Bishop Airport (Airport or BIH) and reflects the transition of scheduled commercial air service from Mammoth Yosemite Airport (MMH) to BIH in the fall of 2020. Forecasts are included for enplaned passengers and aircraft operations – including air carrier, commuter, general aviation, military and cargo operations. These forecasts use 2018 as the base year, and analyze three future years – 2023, 2028 and 2033. Due to a degree of uncertainty regarding the initiation of air service at BIH, this forecast is limited to 15 years, and will be re-evaluated after several years of enplanement data is available for the new service.

Section 2. Sources of Historical Data, Forecasting Methods and Assumptions

2.1 Historical Data Sources

The Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) for both BIH and MMH were used as the primary source of historical data for passenger enplanements and aircraft operations. Other references include the 2017 Mammoth Yosemite Airport Aviation Activity Forecast and 2019 Addendum, both prepared by Mead & Hunt; and the 2017 Bishop Airport Passenger Traffic Study, prepared by Leigh Fisher.

2.2 Forecasting Methods

The methods used in the creation of this forecast included an analysis of the historical air service to MMH, the current FAA TAF, the constraints present at MMH and BIH, available lodging, and an assessment of the expansion of service desired by Mammoth Mountain Ski Area (MMSA) and Mammoth Lakes Tourism (MLT).

2.3 Forecasting Assumptions

i. In the fall/winter of 2020, United Airlines will transfer service from MMH to BIH, see airline letter of support in Appendix A.
ii. Mammoth Mountain Ski Resort will continue to draw large amounts of winter tourism to the Eastern Sierra area.
iii. Tourism will continue to be the main driver of the Eastern Sierra economy, with winter tourism to MMSA creating the largest demand for air travel to the area.
iv. Charter service will continue and may expand at MMH.
v. Greater reliability in the air service will gradually increase the flight load factors and will justify additional daily flights.
vi. There will be no large upsets to the price of aviation fuel or air travel behavior.
    a. This assumes a return to normalcy after the Covid-19 pandemic by the fall of 2020.

Section 3. Historical Passenger Enplanements and Aircraft Operations in the Eastern Sierra

This section summarizes the historical operations to the Eastern Sierra region that are pertinent to this forecast – this includes all aviation operations at the Bishop Airport, and commercial airline operations at the Mammoth Yosemite Airport. The source of data for BIH was the FAA 2018 TAF, which is on a Federal Fiscal Year basis. The 2019 Mammoth Yosemite Airport Aviation Activity Forecast Addendum, prepared by Mead & Hunt, was used as the data source for MMH. This report drew from airline records for enplanement data and Hot Creek Aviation (the Fixed Base Operator) for operations data.

3.1 Bishop Airport

Approximately 87% of general aviation operations and 97% of military operations in the Easter Sierra occur at the Bishop Airport. In the last several years Jet Suite X, a scheduled charter service serving the Mammoth Airport, has diverted to BIH numerous times when weather conditions limit access at MMH (these diversions are not represented in the TAF data). There are currently no air carrier operations at BIH.

Table 1 : BIH Historical Aviation Activity - Operations

	Air Carrier	Commuter	Total	General Aviation	Military	Total Aircraft Operations
2009	2	-	2	23000	3000	26000
2010	-	-	-	23000	3000	26000
2011	-	-	-	23000	3000	26000
2012	-	-	-	23000	3000	26000
2013	-	2	2	23000	3000	26000
2014	-	-	-	23000	3000	26000
2015	-	4	4	23000	3000	26000
2016	-	-	-	23000	3000	26000
2017	-	-	-	23000	3000	26000
2018	-	-	-	23000	3000	26000

Source: FAA 2018 TAF data for BIH, accessed February 2020

3.2 Mammoth Yosemite Airport

The current commercial air service to the Eastern Sierra region began in December 2008, when Alaska Airlines started service between the Los Angeles International Airport (LAX) and MMH. This air service was made possible by the public private alliance created between the Mammoth Mountain Ski Area (MMSA), the Town of Mammoth Lakes and Mammoth Lakes Tourism (MLT). This alliance manages the air service and provides financial support in the form of Minimum Revenue Guarantee Contract's, largely through the Tourism Business Improvement District tax managed by MLT.

Yearly enplanements grew quickly in the first few years of service, and have declined each year since the peak in 2013. Due to the location and elevation of MMH, weather issues have led to a 9-18% cancelation rate during the winter seasons. The MMH forecast provides additional analysis of the enplanement trends, including the cessation of service by Alaska Airlines in 2018.

Table 2: MMH Historical Enplanement/Operations Information

	Enplanements	Air Carrier Operations	Air Taxi Operations
2009	5,021	312	1628
2010	19,798	1228	1840
2011	26,196	1394	1824
2012	27,246	1564	1688
2013	30,858	1530	1784
2014	25,892	1404	1514
2015	23,504	1234	1472
2016	22,253	990	1634
2017	21,278	970	2976
2018	22,594	1050	2926

Source: Mammoth Yosemite Airport Aviation Activity Forecast 2019 Addendum, Mead & Hunt

Section 4. Lodging and Demand

The following section is included from the 2017 Bishop Airport Passenger Study, prepared by Leigh Fisher:

In 2016, an estimated 8,000 lodging units were located in Inyo and Mono Counties, including 4,900 fixed structures and 3,100 campground and recreational vehicle sites, as shown in Table 3. Of the fixed structures, hotel, motel, and lodge units accounted for 65% of total, followed by condos with 32%, and chalet, cabin, hostel or other units with 3%.

Table 3: Estimated Lodging Units by Type

Eastern Sierra Region

County/town	Condo	Hotel, motel, and lodge (a)	Chalet, cabin, hostel, or other	Total	Campground and recreational vehicle site	Total	Percent of total
	Lodging units						
	Fixed structures						
Mono county							
Mammoth Lakes	1,558	1,871	148	3,577	842	4,419	55%
Inyo county							
Bishop	--	931	--	931	1,134	2,065	26%
Big Pine	--	104	--	104	276	380	5%
Independence	--	30	--	30	261	291	3%
Lone Pine	--	278	--	278	589	867	11%
Subtotal--Inyo County	--	1,343	--	1,343	2,260	3,603	45%
Total	1,558	3,214	148	4,920	3,102	8,022	100%
Percent of total	19%	40%	2%	61%	39%	100%	
Percent of fixed structures	32%	65%	3%	100%			
	Estimated potential occupants per day						
Mono county							
Mammoth Lakes	7,615	7,912	671	671	3,346	19,544	63%
Inyo county (b)							
Bishop	--	1,862	--	1,862	4,536	6,398	20%
Big Pine	--	208	--	208	1,104	1,312	4%
Independence	--	60	--	60	1,044	1,104	4%
Lone Pine	--	556	--	556	2,356	2,912	9%
Subtotal--Inyo County	--	2,686	--	2,686	9,040	11,726	37%
Total	7,615	10,598	671	18,884	12,386	31,270	100%
Percent of total	24%	34%	2%	60%	40%	100%	
Percent of fixed structures	40%	56%	4%	100%			

Eastern Sierra Region includes Inyo and Mono counties.

(a) Includes bed and breakfasts.
(b) For Inyo county lodging, the number of occupants was estimated based on 2 occupants per hotel, motel, or lodging unit and 4 occupants per unit for all other types of lodging.

Sources: Mono county--Mammoth Lakes Tourism, preliminary estimates for Mammoth Lakes, December 2016.
Inyo county--Adventure Trails of the Eastern Sierra, Final Environmental Impact Statement, June 2014, www.inyocounty.us.

At 100% occupancy, the fixed structures in the Eastern Sierra Region could accommodate 18,884 people per day. During the winter season (December through March), the fixed structure lodging units in Inyo and Mono counties could accommodate 1.4 million people, assuming an average occupancy rate of 60%, to a maximum of 2.3 million, assuming 100% occupancy.

New construction of lodging facilities in the Eastern Sierra include:

- The Tioga Inn Project, located at 22 Vista Point Road near the intersection of SR 120/US 395 and about one-half mile south of Lee Vining, was originally proposed in 1993 to provide a full range of services and facilities for tourists (to Yosemite National Park, the Mono Basin National Scenic Recreation Area, and the Eastern Sierra generally), as well as meeting facilities, jobs and employee housing opportunities for area residents. The current revised proposal includes 80 new workforce bedrooms, an additional 100 seats to the full-service restaurant, and a third story to the hotel to reduce its footprint while retaining the full 120 guest rooms. The current proposal includes substantial additional parking, a park-and-ride facility for Lee Vining residents, and bus parking for Yosemite transit vehicles. The Mono County Community Development Department is planning to prepare a Subsequent Environmental Impact Report (SEIR) and Specific Plan for the Tioga Inn development. (The Sheet, Notice of Public Scoping Meeting and Preparation of Subsequent Environmental Impact Report/Specific Plan for Tioga Inn, October 22, 2016, www.thesheetnews.com.)
- Bishop Paiute Hotel and Business Incubator and Bishop Paiute Casino Project, located in the northern portion of the Bishop Paiute Reservation, includes the modernization and addition of 22,360 square feet to the existing Casino, a 60-room hotel, and a new 75-seat restaurant. Construction of the proposed project is expected to begin in March 2017. (County of Inyo, Planning Department, Environmental Assessments for Bishop Paiute Hotel and Business Incubator and Bishop Paiute Casino Project, October 18, 2016, www.inyoplanning.org)

In 2017, Mammoth Mountain was acquired by the KSL Capital Partners and Aspen/Snowmass, who became Alterra Mountain Company in early 2018. That year, Alterra created the Ikon Pass, a season pass that links 41 ski resorts across the country and world. There are now several hundred thousand Ikon pass holders across the country, which has increased visitorship to MMSA from regions beyond California.

Section 5. Forecasts

5.1 Passenger Enplanements

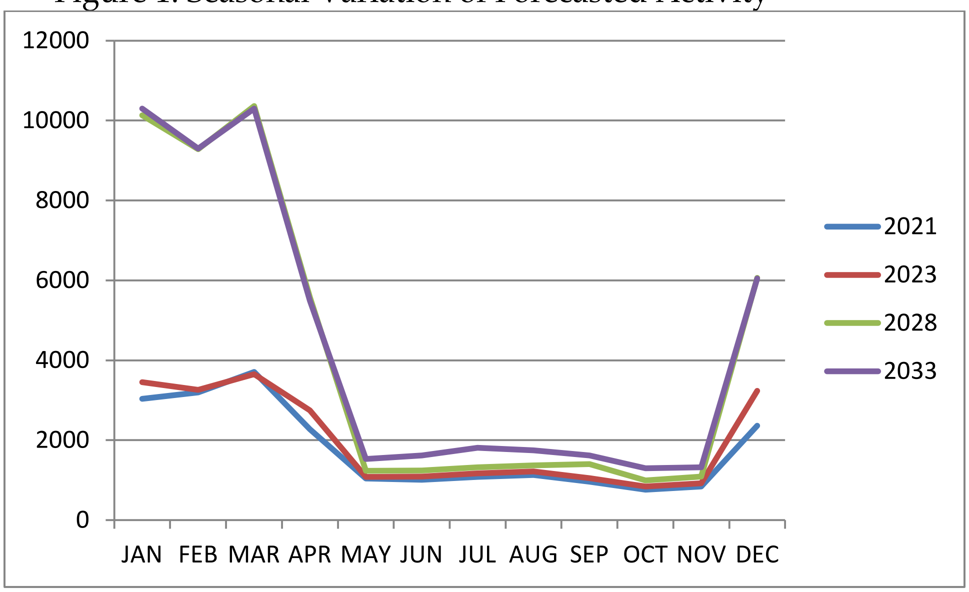
The forecast begins with three years (including the base year) of service at MMH, and is consistent with the MMH forecast. A transition of service to BIH is assumed in year 2021 (December 2020), with the same schedule of flights currently serving MMH.

i. Fleet Mix: This forecast assumes air service by United Express at BIH will start with the Bombardier CRJ 700, a C-II aircraft with 70 seats, which currently provides service to MMH. Over the first five years, the fleet will transition to the Embraer 175, a C-III with 76 seats.

ii. Load Factor: The average load factor of the United flights to the Eastern Sierra may temporarily decrease with the initiation of service at BIH, particularly with the passengers originating in Los Angeles. This load factor is predicted to grow quickly in the first few years of service as passengers see fewer cancelations due to weather, and find that there are reliable transportation options from BIH to various tourist destinations in Inyo and Mono counties. Load factors do fluctuate year to year depending on snow fall, being negatively impacted during drought years.

iii. Seasonal Schedule: The largest demand for commercial flights to the region occurs during the peak ski season, roughly December 15 – April 15. The current service to MMH includes three daily flights during the winter season; decreasing to one daily flight in the spring, summer and fall. This forecast assumes the same seasonal schedule will occur at BIH, with little growth during the spring-fall seasons.

Figure 1: Seasonal Variation of Forecasted Activity



iv. Peak Month Enplanements: In the years 2012-2018, the peak month of service at MMH has alternated between January, February and March, with March as the most consistent. The peak month percentage remaining relatively constant between 18-20%. (Source: Mead & Hunt, Mammoth Yosemite Airport Aviation Activity Forecast – 2019 Addendum). This forecast predicts the peak month percentage to remain consistent with the historical data.

Table 4: Peak Month Enplanement		
	Peak Month (March)	Peak Month % of Annual
2023	3,656	15%
2028	10,366	21%
2033	10,296	20%

v. Anticipated Changes to Service

Year	Change to Service
2024	Second flight to SFO
2025	DEN flight upgrades to E-175
2026	SFO and LAX are upgraded to E-175
2027	New daily flight to SAN in winter season
2028	Second flight to LAX in winter season
2029	LAX summer flights upgrade to an e-175

The changes will occur at the start of the ski season (Dec. 15) of the prior year. Due to the relatively low number of enplanements in this forecast, the addition of a single flight during the winter season leads to a large growth percentage.

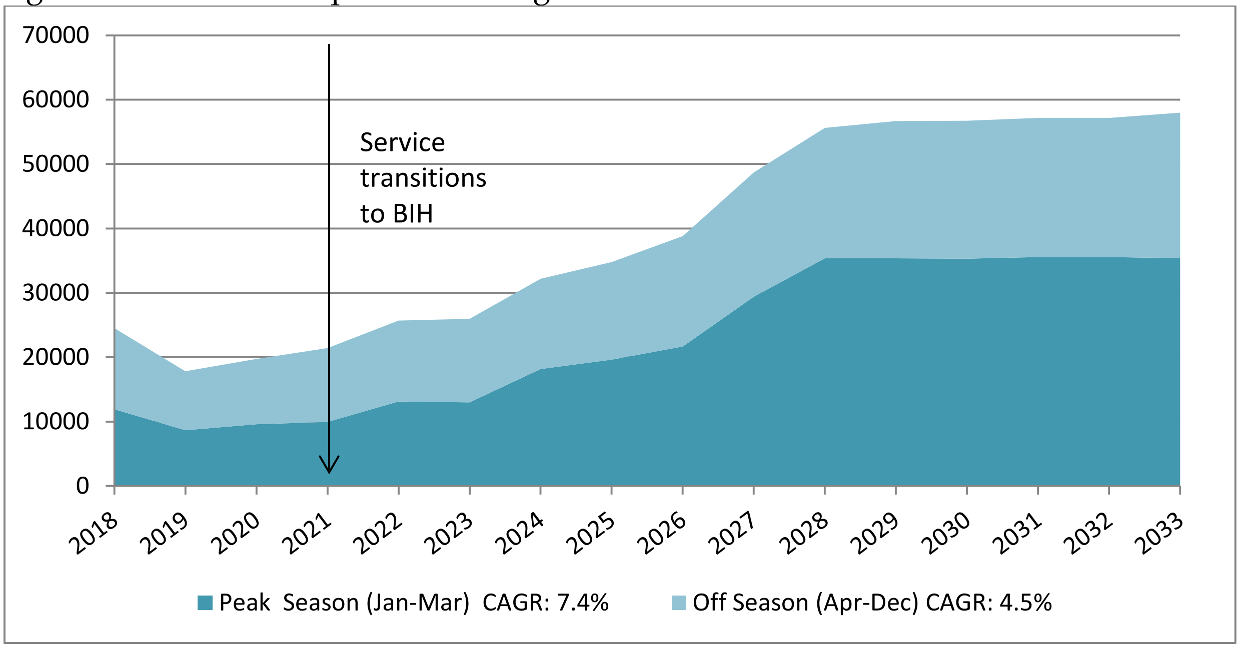
Table 5: BIH Forecast

	Year	Enplanements	Growth	Percent Growth
Base Year	2018	24,523		
Forecast	2019	17,821	-6,702	-27%
	2020	19,734	1,913	11%
	2021	21,416	1,682	9%
	2022	22,878	1,462	7%
	2023	23,742	864	4%
	2024	28,902	5,160	22%
	2025	31,299	2,397	8%
	2026	35,004	3,706	12%
	2027	43,516	8,512	24%
	2028	50,092	6,576	15%
	2029	51,160	1,068	2%
	2030	51,265	106	0%
	2031	51,655	390	1%
	2032	51,921	266	1%
	2033	52,480	558	1%

2018-19 source: FAA MMH TAF

Note: Base year and years 2019-2020 occur at MMH

Figure 2: Forecast of Enplaned Passengers



5.2 Aircraft Operations

General aviation and military operations at BIH are anticipated to remain constant over the forecast years. MMH is assumed to be the primary destination for charter flights, with occasional diversions to BIH during inclement weather. Air carrier operations are forecasted to add three daily flights to the winter season schedule over the initial 8 years of service at Bishop. These additional flights may be limited by the terminal facilities at BIH, and the timing of the planned Central Terminal (depicted on the Bishop Airport ALP, approved 5/20/19).

Table 6: BIH Aircraft Operations Forecast

	Air Carrier(2)	Commuter/ Air Taxi	General Aviation	Military	Total Aircraft Operations
2018*	1050	6	23000	3000	27056
2019*	1212	6	23000	3000	27218
2020*	1212	6	23000	3000	27218
2021	1196	6	23000	3000	27202
2022	1196	6	23000	3000	27202
2023	1226	6	23000	3000	27232
2024	1434	6	23000	3000	27440
2025	1434	6	23000	3000	27440
2026	1525	6	23000	3000	27531
2027	1732	6	23000	3000	27738
2028	1970	6	23000	3000	27976
2029	1970	6	23000	3000	27976
2030	1970	6	23000	3000	27976
2031	1970	6	23000	3000	27976
2032	1970	6	23000	3000	27976
2033	1970	6	23000	3000	27976
	Compound Annual Growth Rate				
2018-2021	4%	-	-	-	0.2% (1)
2023-2028	17%	-	-	-	0.9%
2028-2033	0%	-	-	-	0%

*Air Carrier flights before December 2020 land at MMH

Notes: (1) CAGR for Total Operations at BIH from 2018-2021 is 1.5%

(2) Air Carrier operations assume 3% cancelation rate in winter season

5.3 Comparisons with the 2018 TAF and MMH Forecast

The 2018 TAF for MMH predicts no growth in enplanements or air carrier operations over the forecast period. The TAF maintains enplanements and operations at a level lower than any year in the prior ten years of service; historical data from MMH show enplanement numbers nearly double the predicted enplanements. The decline from the peak in 2013 was due to numerous factors, the largest likely being the high cancelation rate due to weather. The substantial drop in 2019 was due in large part to Alaska Airlines discontinuing service prior to the 18/19 winter season. The cancelation rate at BIH is predicted to be less than 3%; the increased reliability is anticipated to renew interest in flights to the Eastern Sierra.

Table 7: Comparison to 2018 TAF				
	Year	Bishop Forecast	FAA 2018 TAF (a)	Percent Variance
Passenger Enplanements				
Base year	2018	24,523	24,523	0%
Base yr. + 5	2023	23,525	17,821	32%
Base yr. + 10	2028	50,027	17,821	181%
Base yr. + 15	2033	52,480	17,821	194%
Air Carrier Operations				
Base year	2018	1,050	970	8%
Base yr. + 5	2023	1,226	970	26%
Base yr. + 10	2028	1,970	970	103%
Base yr. + 15	2033	1,970	970	103%
Total Operations				
Base year	2018	27,056	26,970	0%
Base yr. + 5	2023	27,232	26,970	1%
Base yr. + 10	2028	27,976	26,970	4%
Base yr. + 15	2033	27,976	26,970	4%

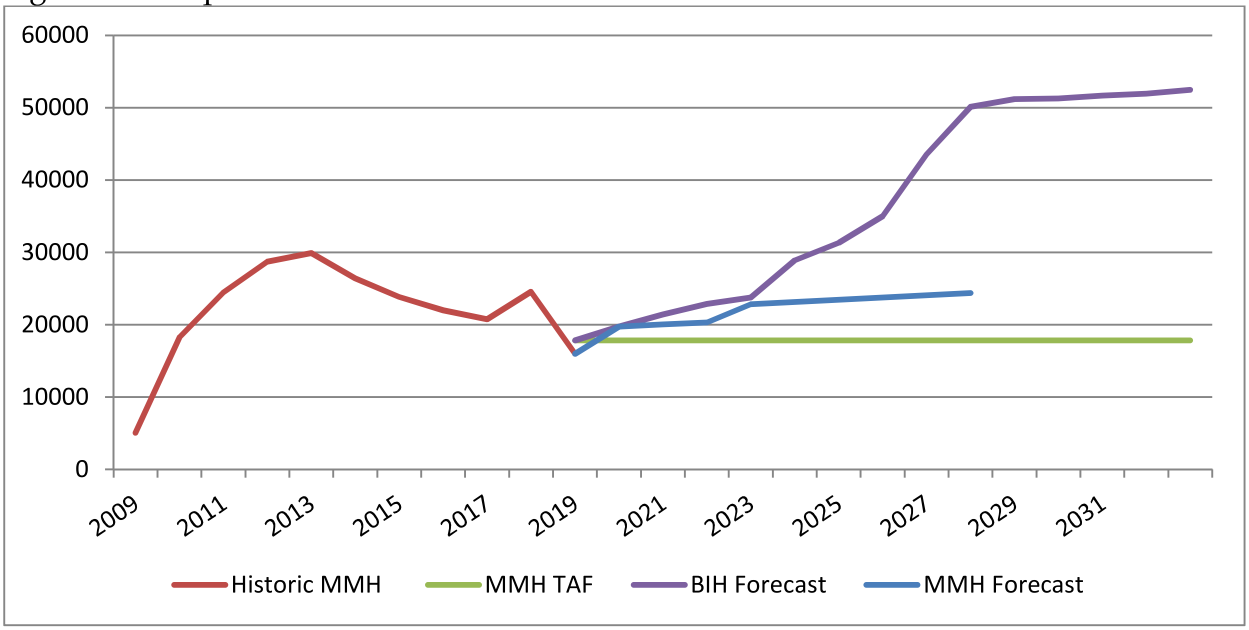
(a) Includes air carrier operations from MMH and GA/Military from BIH

The recent MMH 10 year forecast (Mead & Hunt, 2019) predicts modest growth over the forecast period. Assumptions include a second flight to LAX in the winter season beginning in 2020 and the addition of a winter flight to SAN in 2023; load factors remain relatively low. The BIH forecast introduces additional flights over a longer timeframe, with a total of three additional winter season flights. This forecast also assumes higher load factors due to greater reliability.

Table 8: Comparison to MMH 2019 Forecast				
	Year	Bishop Forecast	FAA 2018 TAF (a)	Percent Variance
Passenger Enplanements				
Base year	2018	24,523	22,594	9%
Base yr. + 5	2023	28,118	22,824	23%
Base yr. + 10	2028	50,523	24,387	107%
Base yr. + 15	2033	52,480	N/A	
Air Carrier Operations				
Base year	2018	1,050	1,050	0%
Base yr. + 5	2023	1,226	1,458	-16%
Base yr. + 10	2028	1,970	1,458	35%
Base yr. + 15	2033	1,970	N/A	
Total Operations				
Base year	2018	28,112	27,050	4%
Base yr. + 5	2023	29,284	27,458	7%
Base yr. + 10	2028	30,492	27,458	11%
Base yr. + 15	2033	30,492		

(a) Includes air carrier operations from MMH and GA/military from BIH

Figure 3: Comparison of historical data and forecasts



Appendix A

Airline Letter of Support

UNITED

Dan Malinowski
Director, Domestic Network Planning
Network Planning

Attn: Mark McClardy
Director FAA Western-Pacific Region
777 S. Aviation Blvd., Suite 150
El Segundo, CA 90245

December 12, 2019

Dear Mr. McClardy:

In May 2018 United airlines shared our support of Mammoth Lakes commercial service to switch from Mammoth Yosemite Airport (MMH) to Bishop Airport (BIH) in late 2020. Once open, United will immediately shift our current LAX service on Canadair CRJ-700 aircraft to BIH. We hope to have commercial service available in time for seasonal service to/from SFO and DEN to begin in the latter half of December 2020.

Regarding ARFF equipment needed, in addition to the CRJ-700 we will consider our full set of regional aircraft (E-175, CRJ-200, ERJ-145, etc.) for BIH service in the future. We anticipate less operational restrictions than MMH today, allowing increased aircraft options.

We look forward to this new chapter of service in the Mammoth Lakes region.

If any follow-up information is required, please contact:

Tom Kremer
Principal, Domestic Network Planning
Thomas.Kremer@United.com

Sincerely,

Dan Malinowski
Director, Domestic Network Planning

CC via Email:

Clint Quilter	Eric Clark
Public Works Director	COO
Inyo County	Mammoth Lakes Resort

D- 2 Terminal Area Forecast for Bishop Airport

APO TERMINAL AREA FORECAST DETAIL REPORT
Forecast Issued January 2020

BIH

	Enplanements			AIRCRAFT OPERATIONS Itinerant Operations					Local Operations					
Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	Total Ops	Total Tracon Ops	Based Aircraft
REGION:AWP **STATE:**CA **LOCID:**BIH **CITY:**BISHOP **AIRPORT:**BISHOP														
1990	0	330	330	0	15,000	16,000	2,500	33,500	6,000	0	6,000	39,500	0	97
1991	0	370	370	0	15,000	16,000	2,500	33,500	6,000	0	6,000	39,500	0	97
1992	72	418	490	0	15,000	16,000	2,500	33,500	6,000	0	6,000	39,500	0	97
1993	0	4	4	0	15,000	16,000	2,500	33,500	6,000	0	6,000	39,500	0	97
1994	0	0	0	0	15,000	16,000	3,000	34,000	6,600	0	6,600	40,600	0	100
1995	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
1996	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
1997	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
1998	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
1999	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
2000	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
2001	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
2002	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
2003	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
2004	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	100
2005	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	84
2006	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	84
2007	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	84
2008	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	64
2009	2	0	2	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	64
2010	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	61
2011	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	54

2012	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	56
2013	0	2	2	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	57
2014	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	48
2015	0	4	4	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	45
2016	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	45
2017	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	37
2018	0	0	0	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2019*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34

APO TERMINAL AREA FORECAST DETAIL REPORT
Forecast Issued January 2020

BIH

	Enplanements			AIRCRAFT OPERATIONS Itinerant Operations					Local Operations					
Fiscal Year	**Air Carrier**	**Commuter**	**Total**	**Air Carrier**	**Air Taxi & Commuter**	**GA**	**Military**	**Total**	**Civil**	**Military**	**Total**	**Total Ops**	**Total Tracon Ops**	**Based Aircraft**
2020*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2021*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2022*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2023*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2024*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2025*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2026*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2027*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2028*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2029*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2030*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2031*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2032*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2033*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2034*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34

2035*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2036*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2037*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2038*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2039*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2040*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2041*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2042*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2043*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2044*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34
2045*	0	3	3	0	0	16,000	3,000	19,000	7,000	0	7,000	26,000	0	34

D-3 Mammoth Yosemite Airport Aviation Activity Forecasts, 2019 Addendum, 2019

U.S. Department
of Transportation
Federal Aviation Administration

Western-Pacific Region
Airports Division

San Francisco Airports District Office
1000 Marina Boulevard, Suite 220
Brisbane, CA 94005-1835

June 19, 2019

Mr. Brian Picken
Airport Manager
Town of Mammoth Lakes
1300 Airport Road
Mammoth Lakes, CA 93546

Dear Mr. Picken,

RE: Mammoth Yosemite Airport Aviation Activity Forecasts, 2019 Addendum

The Federal Aviation Administration (FAA) has completed its evaluation and approves the updated *Mammoth Yosemite Airport Aviation Activity Forecasts Addendum 2019* document for the Mammoth Yosemite Airport (MMH), dated May 15, 2019. This forecast is an update to the forecast approved on April 13, 2017. The San Francisco Airports District Office (SFO ADO) has the following comments about the forecast:

- Concurs with the new design aircraft of a Bombardier CRJ-700, a change from the Bombardier Q400.

- The aviation activity forecast provides adequate justification for near-term and mid-term airport planned development at MMH.

- Concur with the aviation activity forecast methodology. The forecast assumptions presented are considered reasonable. The slight variation reported in the FAA Terminal Area Forecasts (TAF) are acknowledged.

If you have any questions, please contact Katherine Kennedy at 650-827-7611.

Kind Regards,

Laurie Suttmeier
Acting Manager, San Francisco Airports District Office

Mammoth Yosemite Airport

Aviation Activity Forecasts

2019 Addendum

Prepared for the Town of Mammoth Lakes

Mammoth Lakes
CALIFORNIA

Prepared by

Mead & Hunt

May 15, 2019

INTRODUCTION TO ADDENDUM

This update of the forecasts retains the structure of the previous forecasts. Section numbers and headings have been retained. One new section has been added on scheduled charter. Instead of a section number, this section is labeled *New Section 1*. Similarly, a table comparing the design standards for the old and new critical aircraft is titled *New Table A*.

Much of the information in the previous forecasts remains valid. Therefore, this Addendum provides brief notes in each section to identify any changes to that section. All tables in the prior forecasts have been updated and are imbedded in the sections where they were presented previously.

The Town of Mammoth Lakes is aware that Inyo County is actively pursuing Part 139 certification for the Bishop Airport. Regardless of whether Inyo County is successful, the Town remains committed to providing passenger service at its airport through a combination of scheduled airline and scheduled charter flights. These updated forecasts reflect this commitment.

1. INTRODUCTION

The 10-year forecast period now extends to 2028.

2. AIRPORT ROLE

2.1 CURRENT ROLES

The Airport's current roles remain unchanged.

2.2 FUTURE ROLES

The Airport is expected to retain its current roles though the 10-year planning period.

3. HISTORICAL ACTIVITY AT MMH

The general information in the text in this section remains accurate.

Table 1 has been updated through 2018.

3.1 PASSENGER ENPLANEMENTS

Alaska Airlines ended its service to Mammoth in November 2018. All service is now by United Airlines.

Due to the limited amount of lead time, the Air Partners were not able to fully recreate the service previously provided by Alaska Airlines. During the 2018-2019 ski season, United Airlines is providing service from San Francisco (SFO), Los Angles (LAX), and Denver (DEN). DEN and SFO service are once daily during the peak ski season, which is December 18 – March 30 this year, but in the future will typically extend until mid-April (Easter holiday). LAX service is one daily flight year-round. The Air Partners were not able to reestablish the second LAX flight that had served the Airport during the ski season.

As noted in the prior forecast, service from DEN had been tried before; however, that service was once weekly. This limited service was a major constraint for potential visitors and resulted in low load factors. The current service is daily through the ski season. The average load factor for the initial 10 days of service in December 2018 was 43%.

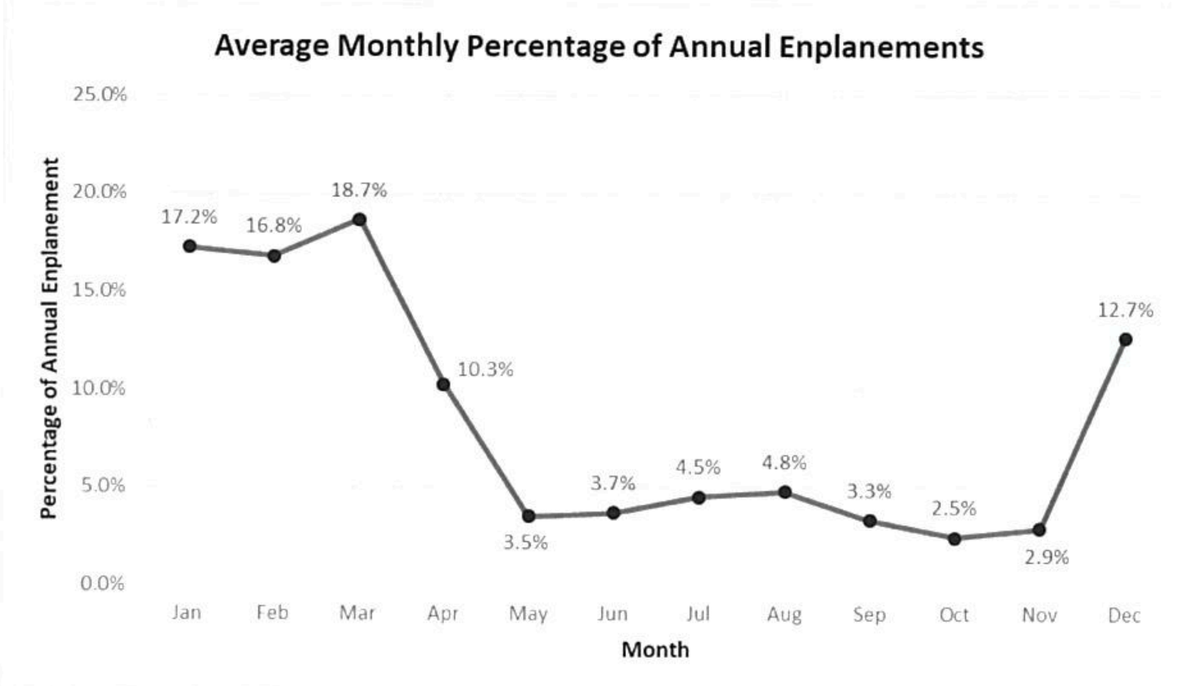
Table 1. Historical Aviation Activity

	Passenger Enplanements[3]			Itinerant Operations					Local Operations			Total Operations	Based Aircraft
Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	General Aviation	Military	Total	Civil	Military	Total		
2009	0	6,157	6,157	312	1,628	3,730	31	5,509	1,896	0	1,896	7,599	4
2010	0	19,798	19,798	1,228	1,840	4,296	62	7,426	200	0	200	7,626	4
2011	0	26,196	26,196	1,394	1,824	4,133	38	7,389	202	0	202	7,591	3
2012	0	27,246	27,246	1,564	1,688	3,568	40	6,860	173	0	173	7,033	3
2013	0	30,858	30,858	1,530	1,784	4,108	56	7,478	199	0	199	7,677	7
2014	0	25,892	25,892	1,404	1,514	3,200	24	6,142	148	0	148	6,290	7
2015	0	23,504	23,504	1,234	1,472	3,325	22	6,053	144	0	144	6,197	7
2016	0	22,253	22,253	990	1,634	4,017	32	6,673	143	0	143	6,816	7
2017	0	21,278	21,278	970	2,976	1,514	312	5,772	1,184	0	1,184	6,956	7
2018	0	22,594	22,594	1,050	2,926	1,308	400	5,684	1,060	0	1,060	6,744	7

Source: Passenger enplanements and air carrier operations: Airport records; 2017 Itinerant and local operations: Hot Creek Aviation; all other operations and based aircraft FAA 2018 Terminal Area Forecast.

Notes:
1. 2009 air carrier operations data not available. Operations estimated by assuming same number of passengers per aircraft as 2010.
2. Airline passenger service started in 2009 and was only for part of the year.
3. Enplanement numbers do not include passengers carried on either scheduled or unscheduled charter flights.

Passenger Enplanements



Source: Data provided by the Airport. December 2018 data not included in average. Alaska Airlines ended service to MMH on 11/30.

NEW SECTION 1: SCHEDULED PASSENGER CHARTERS

Scheduled passenger charter flights were inaugurated at the Airport during the 2017-2018 ski season. Service was provided from Bob Hope Airport (BUR) four days per week. This service continued for the 2018-2019 ski season and service from John Wayne-Orange County Airport (SNA) was added. The average load factor for scheduled charter flights in the 2017-2018 ski season was 54.7%. The first four weeks of the 2018-2019 ski season are seeing average load factors of 65%. The Air Partners have indicated that they intend to evaluate the strength of passenger demand by introducing service from other airports in both southern and northern California, such as McClellan-Palomar Airport and Buchanan Field Airport.

The scheduled charter aircraft utilize the general aviation parking apron west of the commercial apron used by scheduled airlines. Special constraints have been placed upon this apron because the airfield does not provide standard clearances for larger aircraft. It would be useful if the configuration of the general aviation apron was considered during design of the proposed commercial apron serving the new passenger terminal.

One means of resolving constraints on larger charter aircraft would be to design the new commercial apron and terminal to accommodate larger charter aircraft. The new commercial apron will be located further from the runway; this will reduce congestion and increase wingtip clearances for taxiing and parked aircraft. This design would require the charter aircraft and their passengers to be segregated from the scheduled airline aircraft and their passengers. Although uncommon, this arrangement has been used at other airports, including Hector International Airport (Fargo, North Dakota) and Grand Junction Regional Airport (Grand Junction, Colorado).

3.2 BASED AIRCRAFT

The current number of based aircraft (7) remains unchanged.

3.3 AIRCRAFT OPERATIONS

3.3.1 General Aviation Operations

The general pattern of general aviation operations has not changed. Table 1 has been updated with data provided by the Airport's fixed base operator and the Airport Manager.

3.3.2 Military Operations

Military operations include helicopters, C-130 operations, and other turbine aircraft. C-130 operations are conducted at the airport for the purpose of pilots obtaining their high-altitude airport operations certificates. C-130 operations are the most frequent at the airport, with helicopters being the second most frequent to use the airport. Airport staff estimate operations to be about 400 annually.

3.3.3 Airline Operations

United Airlines is currently (January 2019) the only airline providing scheduled passenger service. Operations data for 2018 was taken from Airport records.

3.4 AIR CARGO

Text in prior forecast remains correct: no cargo is shipped through the Airport.

4. NATIONAL AVIATION INDUSTRY TRENDS

4.1 PASSENGER ENPLANEMENTS

The 2018 Aerospace Forecast projects that domestic passenger enplanements for all carriers will grow 1.7 percent annually through 2038. This is the same as projected in the 2016 Aerospace Forecast; however, the short-term, 10-year domestic passenger enplanement is projected to grow at 1.6 percent in the 2018 Aerospace Forecast compared to 1.5 percent projected in the 2016 Aerospace Forecast. The combined domestic and international passenger enplanements for all carriers are projected to grow 1.9 percent in the 2018 Aerospace Forecast, the same growth rate projected in the 2016 Aerospace Forecast.

Table 2.
Comparison of Forecast Passenger Enplanement Growth Rates

	Domestic + International Flights	Domestic Flights		
	2018-2038	2018-2028	2028-2038	2018-2038
Mainline Carriers	2.0%	1.6%	1.8%	1.7%
Regional Carriers	1.6%	1.5%	1.8%	1.6%
All Carriers	1.9%	1.6%	1.8%	1.7%

Source: FAA Aerospace Forecast Fiscal Years 2018-2038

4.2 GENERAL AVIATION AIRCRAFT FLEET

The total number of aircraft has increased from the 2016 to 2018 Aerospace Forecasts except for multi-engine piston aircraft. However, the compound annual growth rate (CAGR) for the total fleet has decreased due to the lower CAGR for all aircraft types except Other. The greatest differences in the 20-year CAGR from 2016 to 2018 Aerospace Forecasts are that of Light Sport (difference of -0.74 percent), Rotorcraft (difference of -0.69 percent), and Experimental (difference of -0.58 percent).

Table 3.
Comparison of Forecast Growth Rates by Aircraft Type

	Total Fleet	Rotorcraft	Fixed Wing					Other
			Turbine	Multi-Engine Piston	Single-Engine Piston	Light Sport	Experimental	
2018*	213,905	11,030	23,585	12,895	130,500	2,705	28,140	5,050
2038	214,090	15,785	35,050	11,845	107,800	5,440	33,105	5,065
CAGR	0.0%	1.8%	2.0%	-0.4%	-1.0%	3.6%	0.8%	0.0%

Source: FAA Aerospace Forecast Fiscal Years 2018-2038 *Estimate from *Aerospace Forecast*
CAGR = Compound Annual Growth Rate

4.3 AIRCRAFT OPERATIONS

The 2018 Aerospace Forecast projects total aircraft operations to increase an average 0.9 percent annually from 2018 to 2038. This is the same growth rate projected in the 2016 Aerospace Forecast. There is a 0.4 percent decrease for Air Carrier operations and a 0.5 percent decrease for Air Taxi/Commuter operations for the 20-year CAGR when comparing the 2018 Aerospace Forecast to the 2016 Aerospace Forecast.

4.4 AIR CARGO VOLUMES

The 2018 Aerospace Forecast projects air cargo revenue ton miles (RTMS) to increase an average 3.8 percent annually from 2018 to 2038. This is 0.2 percent higher than the 3.6 percent 20-year CAGR projected in the 2016 Aerospace Forecast. Overall, both all-cargo and passenger carrier air cargo RTMS 20-year CAGRs have increased in the 2018 Aerospace Forecast compared to the 2016 Aerospace Forecast.

5. FORECASTING METHODOLOGIES

5.1 MARKET SHARE METHODOLOGIES

Description remains correct.

5.2 TIME-SERIES METHODOLOGIES

Description remains correct.

5.3 SOCIOECONOMIC METHODOLOGIES

Description remains correct.

5.4 COMPARISON WITH OTHER AIRPORTS

Description remains correct.

5.5 JUDGEMENTAL FORECASTING

Description remains correct.

6. FORECASTS

6.1 PASSENGER ENPLANEMENTS

6.1.1 Factors Affecting Forecasts

The Airport has now had 10 years of scheduled passenger service. The end of service by Alaska Airlines eliminates the availability of the Required Navigational Performance (RNP) instrument procedures. These procedures were privately developed for Alaska Airlines; they enabled that airline to operate with lower visibility minimums than other airlines or general aviation aircraft. The RNP approaches allowed landings with ceilings as low as 250 feet to both runways. The CRJ-700 aircraft are not equipped to utilize an RNP approach; however, the RNP approaches developed by Alaska Airlines provide a proof of concept in that future air carriers could expect to duplicate.

6.1.2 Methodologies Considered and Rejected

Text remains correct as written.

6.1.3 Selected Forecasting Methodologies

Ten years of enplanement data is now available. Judgmental forecasting includes consideration of the effects of the loss of service by Alaska Airlines and the expansion of service by United Airlines. The effects of introduction of scheduled charter service were considered in enplanement forecasts.

6.1.4 Forecasting Assumptions

Three important changes occurred in 2018 that have resulted in changes to the forecasting assumptions:

- Loss of scheduled service by Alaska Airlines
- Expansion of service by United Airlines, including introduction of daily service from Denver during the ski season
- Scheduled charter service will continue and expand over the next 10 years. For the 2018-2019 ski season, service continues for the second year from Bob Hope Airport (BUR) four days per week. Four weekly flights from John Wayne-Orange County Airport (SNA) were added for the 2018-2019 ski season. Passengers on charter flights are processed through the fixed base operator's facility, not the passenger terminal. Therefore, charter passenger enplanements are not included in the forecast of enplanements.

Because of these changes in the circumstances at the Airport, the pattern of incremental growth will follow three paths:

- Expansion of service from LAX during the ski season.
- Incremental increases in load factors.
- Servicing of the San Diego market solely with scheduled charter flights for four years and then reintroduction of scheduled airline service.

Forecasting assumptions in the prior forecasts are modified as follows:

- **Forecasting Assumption No. 1** – The statements about the existing terminal constraining when flights can be scheduled continues to be correct; however, incremental growth in passenger volumes will be due to both incremental growth in load factors of existing flights, expansion of flights from existing airports, and addition of service from San Diego.
- **Forecasting Assumption No. 2** – This assumption is modified to indicate that there will be a drop in passenger volumes in the first year following loss of service by Alaska Airlines (i.e. 2019). Enplanements will begin growing in 2020 and follow a pattern of slow growth through 2028. The growth will be due to incremental increases in load factors and the addition of scheduled airline service from San Diego in 2023.
- **Forecasting Assumption No. 3** – This assumption states that when the replacement terminal becomes operational, flights are expected to shift to the early evening period due to strong passenger preference. This remains valid.
- **Forecasting Assumption No. 4** – With the elimination of service by Alaska Airlines, this assumption is no longer valid. United Airlines has indicated that it will only provide daily service and will not consider providing flights only four days per week.
- **Forecasting Assumption No. 5** – The general statement that the Air Partners will continue to investigate service from additional airports remains valid. It will use scheduled charter flights to test markets. As anticipated in the prior forecasts, scheduled charter flights from Bob Hope Airport and John Wayne Airport have been introduced for this ski season.
- **Forecasting Assumption No. 6** – This assumption is no longer valid. United Airlines has indicated that it will not provide less than daily service. The strategy of starting with four flights per week and incrementally expanding to daily service cannot be used.
- **Forecasting Assumption No. 7** – This assumption has been modified to state that the only out-of-state service that will occur will be the daily service to Denver during the ski season.
- **Forecasting Assumption No. 8** – The assumption regarding continuation of seasonal service from San Francisco remains valid.

Additional forecasting assumptions have been added:

- **Forecasting Assumption No. 9** – Passenger enplanements for LAX will decrease by one-third in 2019 due to the loss of the second flight during the ski season. This seasonal, second daily flight will be resumed in 2020. The addition of this second flight will result in LAX enplanements returning to 90% of 2018 levels. They will then grow at 1% compounded annual growth rate (CAGR) through the end of the 10-year forecast period.
- **Forecasting Assumption No. 10** – In the first two weeks of service, the DEN flight had an average load factor of 33%. It is expected that this rate will decrease after the peak holiday ski weeks in December and January; therefore, for 2019, an average load factor of 25% has been selected. This is forecast to grow incrementally, reaching 40% in 2028.

- **Forecasting Assumption No. 11 –** The ski season flight from SFO has been served by United since its inception. This is a mature market that will see load factors increase slowly over time. A 1% CAGR has been selected for use in this forecast.
- **Forecasting Assumption No. 12 –** Although SAN had historically been a good ski season market for the Airport, it is not clear that United Airlines will be willing to provide service from this airport in the near term. In this forecast, it is assumed that passengers from the San Diego area will be served by scheduled charter aircraft until 2023. In 2023, scheduled airline service will be reestablished. In the initial year, enplanements will be 60% of the volume in 2018. This is equivalent to a 54% load factor in a 70-passenger CRJ-700. Passenger volumes will then grow by 1% CAGR through the balance of the 10-year forecast period.

6.1.5 Other Forecast Assumptions

Actual Departures – In this forecast it is assumed that the current average of 12% cancellations will continue. It is assumed that the Required Navigation Performance instrument approaches developed by Alaska Airlines will not be reintroduced by United Airlines or another airline serving the Airport in the near future.

Total Seats – It is assumed that all scheduled airline passenger service will be in 70-seat CRJ 700's or similarly sized aircraft throughout the 10-year forecast period.

Load Factor – Although ski season load factors have climbed into the 70% range, year-round average load factors are expected to remain below 50%. This will be lower than in the previous forecast. Several factors will affect the average:

- Load factors for the DEN service are expected to remain lower than for other routes.
- United Airlines will only provide daily service. Alaska Airlines was willing to provide service four times per week. This allowed the Airport to capture the peak demand days. Daily service will result in higher total enplanements but will have a lower average load factors due to the inclusion of low-demand days.
- A portion of the passengers using scheduled charter flights would have used scheduled airline flights.

Summer-Fall Season – This forecast retains the assumption that passenger volumes outside of the ski season will remain static. There are ongoing efforts to develop and market cultural events outside of the ski season; however, the impacts of these efforts are too recent to be used in forecasting trends.

6.1.6 Enplanement Forecasts

The updated enplanement forecasts shifts the base year to fiscal year 2018 and assumes all future service to be flown in 70-passenger CRJ-700 aircraft. Ski-seasons are also assumed to be a consistent 102 days per fiscal year.

The following assumptions were used for each airport when calculating the forecasted enplanements:

- Flights to DEN will have a 25% load factor in 2019.This load factor increases to 40% by 2028.
- There will be one daily flight through the ski season to SFO during the forecast period. Enplanements will grow at 1% CAGR.
- Service to LAX will decrease in 2019 with loss of service by Alaska Airlines. This will reduce, enplanements in 2019 by one-third. The daily year-round service will remain throughout the forecast period. A second daily flight during the ski season will be added in 2020. This will increase LAX enplanements to 90% of the 2019 load factor. Enplanements will grow at 1% CAGR from 2021 to 2028.
- Flights from SAN will not resume until 2023. In this first year of service, passenger volumes will be 60% of 2018 volumes. They will then increase 1% CAGR through the balance of the forecast period.

Table 4.
Passenger Enplanement Forecast

	Year	Enplanements
Base Year	2018	22,594
Forecast Years	2019	15,953
	2020	19,734
	2021	20,020
	2022	20,307
	2023	22,824
	2024	23,138
	2025	23,453
	2026	23,770
	2027	24,067
	2028	24,387

Note: neither scheduled nor unscheduled charter are included in these figures.
Source: Mead & Hunt

6.2 PEAK PASSENGER ACTIVITY

The description of how peak passenger activity is calculated remains correct. The time period has shifted to include 2018 data.

6.2.1 Peak Month Passenger Activity Forecasts

Monthly passenger enplanement data in Table 5 has been updated to extend through 2018. The average percentage of the peak month over the last 5 years (204-2018) is 19.1%. In four of the last eight years, the peak month was March. In three of the last eight years, it was January. The variation is likely due to snow conditions.

In forecasting peak passenger activity, it has been assumed that the peak month will remain at 19.1% of the total. Applying this percentage to the forecasts in Table 4 above yields a peak month enplanement for 2023 of 4,359 and for 2028 of 4,658.

Table 5. Peak Month Enplanements								
Month	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
January	**4,211**	4,336	**5,766**	4,540	4,299	3,928	2,458	**4,144**
February	3,653	4,865	5,657	4,017	3,841	**4,569**	2,738	3,869
March	4,161	**4,897**	5,652	**4,735**	**4,622**	3,659	**4,059**	3,907
April	3,379	3,821	3,025	2,741	1,663	1,341	1,935	2,395
May	1,051	1,061	1,149	1,031	749	629	1,089	810
June	1,165	931	1,117	1,022	975	991	834	920
July	1,189	1,277	1,259	1,330	1,226	1,278	1,223	1,192
August	1,419	1,478	1,378	1,294	1,228	1,306	1,225	1,166
September	1,004	851	1,171	1,002	1,015	718	700	846
October	807	566	579	717	712	538	595	661
November	882	562	799	827	773	810	645	819
December	3,275	2,601	3,306	2,636	2,401	2,486	3,777	1,865
TOTAL	**26,196**	**27,246**	**30,858**	**25,892**	**23,504**	**22,253**	**21,278**	**2,594**
Peak Month % Annual	16.1%	18.0%	18.7%	18.3%	19.7%	20.5%	19.1%	17.8%

6.2.2 Peak Month Average Day Passenger Activity Forecasts

As in the prior forecast, the average day number of passengers on the average day of the peak month will equal 3.2% of the peak month's passengers.

Table 6. Winter-Spring 2018-2019 Peak Day Flight Schedule				
	Time*	**Origin / Destination**	**Aircraft Type**	**Seats**
Arrival	1023	SFO	CRJ 700	70
Departure	1100	SFO	CRJ 700	70
Arrival	1236	DEN	CRJ 700	70
Departure	1312	DEN	CRJ 700	70
Arrival	1556	LAX	CRJ 700	70
Departure	1640	LAX	CRJ 700	70

* Time is expressed as a 24-hour clock. LAX flight times will change between January 7 to February 13, 2019.

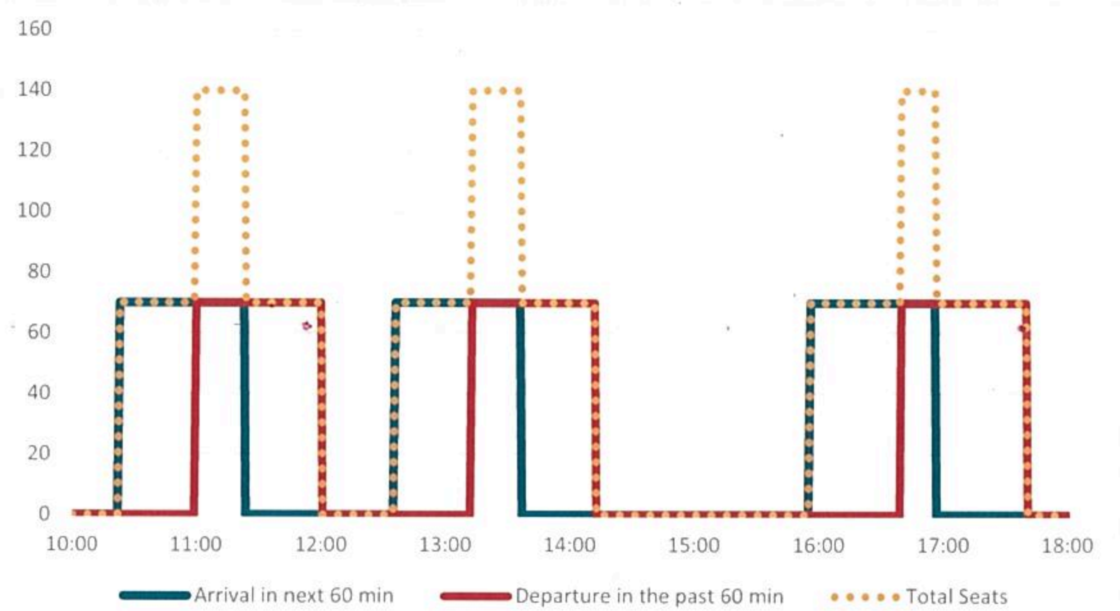
Source: Schedule - Airport

6.2.3 Peak Hour Passenger Forecast

Figure 2 presents the peak hour seats during the 2018-2019 ski season peak. The peak hour consisted of one arrival and one departure in the 70-seat CRJ 700, or 140 seats. The peak hour is between 3:55 p.m. and 4:55 p.m. (1555 to 1655); however, the current pattern of flights is atypical of the historical pattern. The current schedule lacks a second LAX flight and one from SAN. This is due to the inability to replace Alaska Airline's flights with comparable United Airline flights in the limited lead time available following Alaska Airline's announced elimination of service.

A more typical pattern would be two arrivals and two departures. This was the pattern of flights presented in the prior forecasts. With the CRJ 700 providing service, this would total 280 seats during the peak hour. This volume will be used in forecasting peak hour passengers

Figure 2.
2018-2019 Ski Season Peak Hour Seats



Source: DEO data base

Table 7.
Forecast Peak Hour Passengers

Year	Peak Month Enplanements + Deplanements	Average Day Peak Month Enplanements + Deplanements	Peak Hour Passengers		
			Enplanements	Deplanements	Total
2023	8,833	285	86	81	167
2028	9,284	299	105	98	203

Source: Mead & Hunt

6.3 TERMINAL GATE REQUIREMENTS

The prior forecasts stated:

> The winter schedule has been developed over time to reflect passenger preferences, which show mid-to-late afternoon departures from originating cities with arrivals at Mammoth Yosemite occurring about 5:00 p.m. to 6:00 p.m. generally. The airlines have attempted to schedule arrivals away from this late afternoon period with little success, noting that passengers generally prefer a mid-afternoon departure from the major [California] cities.

This general situation has not changed. The current schedule varies from this pattern due to the necessity of the Air Partners negotiating new routes with United Airlines on short notice. If a second seasonal LAX flight is added for 2019-2020 as anticipated, it is expected to be scheduled for the late afternoon-early evening slot preferred by passengers. Within five years (2023) market forces are expected to shape the flight schedule so that it resembles the historical pattern. The expected reintroduction of the SAN flight by 2023 reinforces the likelihood of the historical pattern of peak use being replicated. Discussions with Airport staff suggest that the desired window for arrivals should be more broadly defined as between 4:00 p.m. and 6:00 p.m.

Two gates are the minimum needed to accommodate short-term (five year) demand. By the end of the 10-year forecast period, three gates will be needed to fully accommodate forecast demand. These gates are in addition to hardstand positions provided to accommodate irregular operations. As noted in the prior forecasts:

> At MMH the most common irregular operations are associated with weather delays. During the winter-spring season weather delays occur regularly. This results in three airline aircraft being parked at the Airport about 20 times per winter-spring season (about 18%) with rarer occurrences when four aircraft are parked at the Airport. In 2013, when the Airport had seven flights on five days a week, it proved difficult to schedule flights to reduce peak hour passengers to the terminal's capacity and there were three or more planes on the ground more frequently.

It is anticipated that by the end of the forecast period the Airport will again have at least three aircraft on the ground at the same time. Due to constraints on the ramp, noted earlier, this would result in inadequate clearance between parked aircraft and movement areas. It would increase the potential of conflicts between aircraft moving on the ramp. Without new facilities, it is anticipated that special markings and airport/aircraft specific operating procedures will be required to maintain Part 139 certification at the Airport.

6.4 BASED AIRCRAFT FORECASTING METHODOLOGY

No increase in the number of based aircraft has occurred. Only piston-powered aircraft continue to be based at the Airport.

6.4.1 Methodologies Considered and Rejected

This text remains relevant; no changes are required.

6.4.2 Methodology Selected

Comparisons with area airports remains the appropriate forecasting method. No additional aircraft are forecast to be based at the Airport during the forecast period.

6.5 AIRCRAFT OPERATIONS

6.5.1 Methodologies Considered and Rejected

The four methodologies considered and rejected in the prior forecasts continue to be inappropriate.

6.5.2 Methodology Selected

Judgmental forecasting remains appropriate for commercial and military operations. Socioeconomic analysis continues to be appropriate for general aviation operations.

6.5.3 Scheduled Passenger Airlines

- Operations by scheduled passenger airlines were based upon the number of annual flights for each route serving the Airport.
- Service from LAX was assumed to grow from the current daily service with the addition of a second flight during the ski season. This would increase the number of flights from 365 to 467 annually.
- SFO flights are forecast to remain constant at 102 flights annually.
- Flights from DEN are assumed to remain constant at 102 flights annually.
- When flights from SAN resume in 2023, they are assumed to remain constant at 58 flights annually (four times a week).
- Each flight consists of one arrival and one departure; this counts as two operations. Therefore, airline operations will total 1,458 in 2023 and remain at that level through 2028.

6.5.4 General Aviation Operations

As in the prior forecast, general aviation operations in this update were developed by utilizing the projected population growth rate for Mono County. The January 2018 projection prepared by the California Department of Finance's Demographic Research Unit provides updated population numbers and growth rate. The previous projection estimated a compound annual growth rate of 0.69% between 2015 to 2035; the updated forecast estimates a 0.37% compound annual growth rate for the same period. Therefore, 0.37% has been used to forecast general aviation operations. Applying this growth rate to the 2018 estimated noncommercial operations (minus military operations) yields:

- 5,753 operations in 2029
- 5,897 operations in 2039

Air taxi operations are forecast to continue to account for 52.4% of total general aviation operations. Itinerant general aviation operations are projected to remain at 26.7% of general aviation operations. Local operations are expected to remain at 20.9% of general aviation operations.

6.5.5 Military Operations

Airport staff estimates that military operations are averaging about 400 per year. The average number of operations is expected to remain at this level though the 10-year forecast period.

6.5.6 Operations Forecasts

Table 8.
Operations Forecast

	Itinerant Operations					Local Operations			
Year	Air Carrier	Air Taxi & Commuter	General Aviation	Military	Total	Civil	Military	Total	Total Operations
2018	1,050	2,926	1,308	400	5,684	1,060	0	1,060	6,744
2023	1,458	3,017	1,535	400	6,410	1,200	0	1,200	7,611
2028	1,458	3,093	1,574	400	6,525	1,231	0	1,231	7,755

6.5.7 Peak Hour Operations Forecasts

The methodology presented in the prior forecasts remains valid. The peak hour will be in the late afternoon or early evening during the ski season. Based on historical patterns, March is likely to see the highest number of operations.

As noted in Section 6.2.2, peak hour airline operations are forecast to reach four by 2023 and remain at that level through 2028.

Based upon information from the Airport's fixed base operator, peak hour general aviation operations have remained at five for the last several years. As shown in Section 6.5.4, total general aviation operations are expected to grow 5% over the next 10 years. This growth is judged to be too small to result in an increase in peak hour general aviation operations by itself; however, scheduled charter flights are expected to grow to from two to five daily during the ski season. Currently two scheduled charter operations occur during the desirable 5:00 p.m. to 6:00 p.m. time slot. These are forecast to overlap with the peak hour airline and other general aviation operations in 2023. The growth in scheduled charter operations is forecast to result in an additional peak hour operation by 2028. Therefore, total peak operations will be 11 in 2023 and 12 in 2028.

6.5.8 IFR Operations Forecasts

Based upon the FAA Traffic Flow Management System Counts (TFMSC) Instrument Flight Rule (IFR) operations averaged 52% of total operation for the last four years (2015-2018). Applying this percentage to the previous forecasts of total operations yields:

- 3,958 IFR operations in 2023
- 4.033 IFR operations in 2028

6.5.9 Cargo Forecasts

The update retains the conclusion that no air cargo will be shipped through the Airport.

7. DESIGN AIRCRAFT

The approved Airport Layout Plan for the Airport designates the Bombardier Q400 as the design aircraft. Alaska Airlines is the principal user of this aircraft. With the loss of service an alternate aircraft needs to be selected.

United Airlines is utilizing the Bombardier CRJ-700 to provide service to the Airport. Based upon the current schedule, there will be about 1,138 operations by this aircraft in 2019. This is well over the 500 annual operations threshold to be designated the design aircraft. Therefore, the CRJ-700 will be designated as the new design aircraft for the Airport.

New Table A below compares the FAA's airfield design standards for the Q400 to those of the CRJ-700. It also shows how the Airport's current facilities compare to these standards.

New Table A
Changes in Airfield Design Standards

	Prior Standard B-III*	New Standard C-II	Existing Condition	Notes
Runway Design				
Runway Width	100'	100'	100'	
Shoulder Width	20'	10'	12'	
Blast Pad Width	140'	120'	144'	
Blast Pad Length	200'	150'	200'	
Runway Protection				
Runway Safety Area				
Length beyond departure end	600'	1,000'	1,000'	
Length prior to threshold	600'	600'	600'	
Width	300'	500'	475'	1
Runway Object Free Area				
Length beyond runway end	600'	1,000'	1,000'	
Length prior to threshold	600'	600'	600'	
Width	800'	800'	764	2
Runway Obstacle Free Zone				
Length	200'	200'	200'	
Width	400'	400'	400'	
Precision Obstacle Free Zone				
Length	n/a	n/a	n/a	
Width	n/a	n/a	n/a	
Approach Runway Protection Zone				
Length	1,000	1,700	1,700	3
Inner Width	500'	500'	500'	
Outer Width	700'	1,010'	1,010'	
Departure Runway Protection Zone				
Length	1,000'	1,700	1,700	4
Inner Width	500'	500'	500'	
Outer Width	700'	1,010'	1,010'	
Runway Separation				
Runway centerline to:				
Parallel runway centerline	n/a	n/a	n/a	
Holding position	220'	250'	220'	5
Parallel Taxiway/Taxilane centerline	300'	300'	300'	
Aircraft parking area	400'	400'	400	
	TDG-5	TDG-2		
Taxiway Standards				
Taxiway Width	75'	35'	50'	
Shoulder Width	30'	10'	0'	
Taxiway safety area width	118'	79'	118'	
Taxiway object free area width from centerline	93'	65.5	90.5	6

Mead&Hunt

* For historical reasons the Airport is classified B-III. However, the Q400 aircraft is classified by the FAA as C-III.

Notes

1. Grading needed on south side of runway
2. Fence south of runway and hangars north of runway intrude
3. Portions located off airport
4. Portions located off airport
5. Could be relocated
6. Easterly row of hangars are the critical objects

Source: Mead & Hunt

8. SUMMARY

Table 9.
Summary of Forecasts

	2018	2023	2028
Passenger Enplanements *			
Air Carrier	22,594	22,824	24,387
Commuter	0	0	0
TOTAL	23,289	22,824	24,387
Operations			
Itinerant			
Air Carrier	1,050	1,458	1,458
Commuter/Air taxi	2,926	3,017	3,093
Total Commercial Operations	3,993	4,565	4,551
General Aviation	5,684	5,753	5,897
Military	400	400	400
Local			
General Aviation	1,184	1,200	1,231
Military	0	0	0
TOTAL OPERATIONS	7,062	7,611	7,755
Instrument Operations	3,672	3,958	4,033
Peak Hour Operations	6	11	12
Cargo (enplaned + deplaned pounds)	0	0	0
Based Aircraft			
Single Engine (Non-jet)	4	4	4
Multi Engine (Non-jet)	3	3	3
Jet Engine	0	0	0
Helicopter	0	0	0
Other	0	0	0
TOTAL	**7**	**7**	**7**

*Note: enplanement numbers do not include either scheduled or nonscheduled charter.

D-4 Mammoth Yosemite Airport Aviation Activity Forecasts 2017

Mammoth Yosemite Airport
Aviation Activity Forecasts

Prepared for the Town of Mammoth Lakes

Mammoth Lakes
CALIFORNIA

Prepared by

Mead & Hunt

March 31, 2017

1. INTRODUCTION

Forecasts of aviation demand are used to identify future facility needs. In planning for the future growth of any airport, it is important to understand the context within which potential increases in aviation activity are likely to occur. Aviation forecasting is not an “exact science,” so professional judgment and practical considerations will influence the level of detail and effort required to establish reasonable forecasts and subsequent airport development decisions.

This chapter includes forecasts of the following aviation activities: scheduled passenger enplanements, peak passenger activity, aircraft operations and fleet mix, based aircraft, and air cargo volumes. Because this forecast will be principally used in the assessment of facility requirements for a proposed replacement passenger terminal, it focuses on the next 10 years (i.e., through 2026). The aviation forecasts must be approved by the Federal Aviation Administration (FAA) in order to provide justification for FAA funding participation in eligible airport improvement projects.

Several indicators of aviation activity including regional and local trends for both commercial and general aviation were used to develop an aviation activity forecast for Mammoth Yosemite Airport (MMH or “the Airport”). These trends provide one element that shapes the projections of aviation activity developed for the Airport. However, the unique characteristics of an airport serving a resort destination that is remote from metropolitan areas have a profound effect on forecasting. Particularly important are the revenue guarantees provided to the scheduled passenger airlines.

This chapter is organized into the following sections:

- 1. Introduction
- 2. Airport Role
- 3. Historical Activity at MMH
- 4. National Aviation Industry Trends
- 5. Forecasting Methodologies
- 6. Forecasts
- 7. Design Aircraft
- 8. Summary

2. AIRPORT ROLE

An airport’s role is defined by the mix of aviation uses that exist, or are anticipated to exist, at the facility. Each use is defined by the type of aircraft involved and its mission. Aircraft can be used for multiple missions. A medium-sized turboprop may be used by an airline for scheduled passenger service, an air charter operator for on-demand air taxi service, an air cargo airline for transporting express packages, and the military for transport. It is critical to know both the aircraft type and mission in order to identify the necessary airport support facilities. A key part of the forecasting effort is to identify how the current mix of aircraft types and missions will evolve over the 10-year forecast period. This information will be used to identify needed modifications to the airfield and airport facilities.

2.1 CURRENT ROLES

Mammoth Yosemite Airport is classified by the FAA as a primary, non-hub commercial airport which provides scheduled passenger service to the Mammoth Lakes area and surrounding areas. As of January 2016, the Airport is served by two airlines with non-stop service to three destinations. As of 2016, the aviation activities at the Airport are:

- Passenger Service.
- Recreational Aviation.
- Business Aviation.
- Medical Transport.
- Military Aviation.

The Airport also has limited flight training activity and air cargo has been delivered via scheduled airline aircraft in past years. Information about these uses is presented in the paragraphs that follow.

The Airport is home to one fixed-base operator (FBO) that serves general aviation aircraft. The FBO operates from the general aviation terminal located west of the commercial passenger terminal. The FBO provides:

- Aviation fuels: Jet A and 100LL.
- Aircraft parking and hangar storage.
- Oxygen service and pilot supplies.
- A crew car available for pilots.

The Airport's role can also be defined in operational terms. The mission-related roles defined above can also be grouped into three operational groups:

- Commercial service – scheduled and charter passenger service.
- General aviation – aviation activities other than scheduled service and military.
- Military – transient military aircraft.

2.2 FUTURE ROLES

The Airport is anticipated to maintain existing roles throughout the 10-year planning period. No significant changes to the mix of aircraft types or uses is anticipated.

3. HISTORICAL ACTIVITY AT MMH

This section provides background on historical aviation activity at MMH. The many uncommon aspects of aviation uses at the Airport make familiarity with this background information necessary to understand the approaches used in forecasting. **Table 1** presents historical activity data for the years 2009-2016. Data was taken from several sources to provide the most accurate data for forecasting. Enplanement data was obtained from the Airport from records provided by United and Alaska Airlines. Operations counts were obtained from Hot Creek Aviation, the fixed base operator at the Airport. Based aircraft counts were taken from the FAA's 2016 Terminal Area Forecast, except that the 2016 is an estimate provided by Airport staff.

It should be noted that the FAA defines *air carrier* differently for passenger enplanements and aircraft operations. For enplanements, the FAA divides the passenger airline industry into two categories of airlines: *air carrier* and *commuter* (also called *regional airlines*). The primary difference between the two is the role that the airline plays relative to the other. Regional airlines carry passengers to the hub cities of the air carrier airlines, and may feed passengers onto air carrier service at the hub cities. Regional airlines may operate aircraft painted like air carrier airlines, and may have their tickets sold by the air carrier operator. Air carrier airlines typically fly aircraft with more passenger seats than regional airlines and serve larger markets. However, the difference between air carrier and regional airlines is generally indistinguishable to a passenger with the exception of aircraft size. All of the enplanements at MMH are counted in the *commuter* category.

Airline operations are categorized based on aircraft seating capacity. Aircraft with 60 or more seats are *air carrier*, and aircraft with fewer than 60 seats that are operated by airlines are included in *air taxi/commuter*. All of the airline operations at MMH are counted as *air carrier* operations. The only *air taxi/commuter* operations at the Airport are charter operations that are classified as air taxi. One example of charter activity at MMH is the service recently started by JetSuiteX under contract with the Air Partners group (see page 5 for a discussion of the Air Partners group). JetSuiteX started providing service between Burbank and Mammoth in mid-December 2016. Service was offered four times weekly through the end of 2016 and is scheduled to continue until early April 2017. However, charter activity has always been a significant component of general aviation operations. The Airport's FBO, Hot Creek Aviation, estimates that charter operations account for more than half of all general aviation operations by turbine aircraft.

Table 1. Historical Aviation Activity

	Passenger Enplanements			Itinerant Operations					Local Operations			Total Operations	Based Aircraft
Fiscal Year	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	General Aviation	Military	Total	Civil	Military	Total		
2009	0	5,021	5,021	314	1,570	4,568	106	6,558	214	0	214	6,772	4
2010	0	19,798	19,798	1,228	1,840	4,296	62	7,426	200	0	200	7,626	4
2011	0	26,196	26,196	1,394	1,824	4,133	38	7,389	202	0	202	7,591	3
2012	0	27,246	27,246	1,564	1,688	3,568	40	6,860	173	0	173	7,033	3
2013	0	30,858	30,858	1,530	1,784	4,108	56	7,478	199	0	199	7,677	7
2014	0	25,892	25,892	1,404	1,514	3,200	24	6,142	148	0	148	6,290	7
2015	0	23,504	23,504	1,234	1,472	3,325	22	6,053	144	0	144	6,197	7
2016	0	22,253	22,253	990	1,634	4,017	32	6,673	143	0	143	6,816	7

Source: Passenger enplanements and air carrier operations: Airport records; all other operations: Hot Creek Aviation; based aircraft FAA 2016 Terminal Area Forecast.

Notes:
1. 2009 air carrier operations data not available. Operations estimated by assuming same number of passengers per aircraft as 2010.
2. Airline passenger service started in 2009 and was only for part of the year.

3.1 PASSENGER ENPLANEMENTS

After an 11 year hiatus, scheduled passenger service resumed at MMH in December 2008 with the introduction of service by Alaska Airlines. Service by United Airlines was added in December 2010. Initially service was only provided during winter months. In 2010, year-round service began and continues as of 2017.

Passengers at MMH are predominantly associated with leisure travel which is concentrated during the ski season. Skiing typically starts by mid-November and some years skiing will continue until July. However, the prime ski season lasts from mid-December through mid-April (usually Easter) and accounts for over 70% of annual passengers. For this reason there are distinct winter-spring (i.e. ski season) and summer-fall airline schedules. Winter-spring schedules commonly include service from Los Angeles (LAX), San Diego (SAN), and San Francisco International Airports (SFO). The summer-fall schedule typically includes only flights from LAX. **Figure 1** shows the average monthly distribution of enplanements from 2010 to 2016.

The passenger service offered at MMH is arranged through Minimum Revenue Guarantee Contracts (MRGCs) with airlines. A local partnership (the Air Partners) was established to implement the MRGC program for service to MMH. The Air Partners consist of the Town of Mammoth Lakes, Mammoth Lakes Tourism, and Mammoth Mountain Ski Area (MMSA). An important change occurred in 2014 with the creation of a new revenue guarantee funding mechanism, the Mammoth Lakes Tourism Business Improvement District (MLTBID). MLTBID was formed by public referendum in which local businesses agreed to a special tax on themselves for the purpose of marketing the town as a resort destination with a unique brand. The MLTBID tax raises between $4.7 and $5 million annually. Up to about $2.3 million is available annually, if needed, to support commercial air service by funding MRGCs. About $2.4 million from the MLTBID fund is available for marketing programs to support tourism.

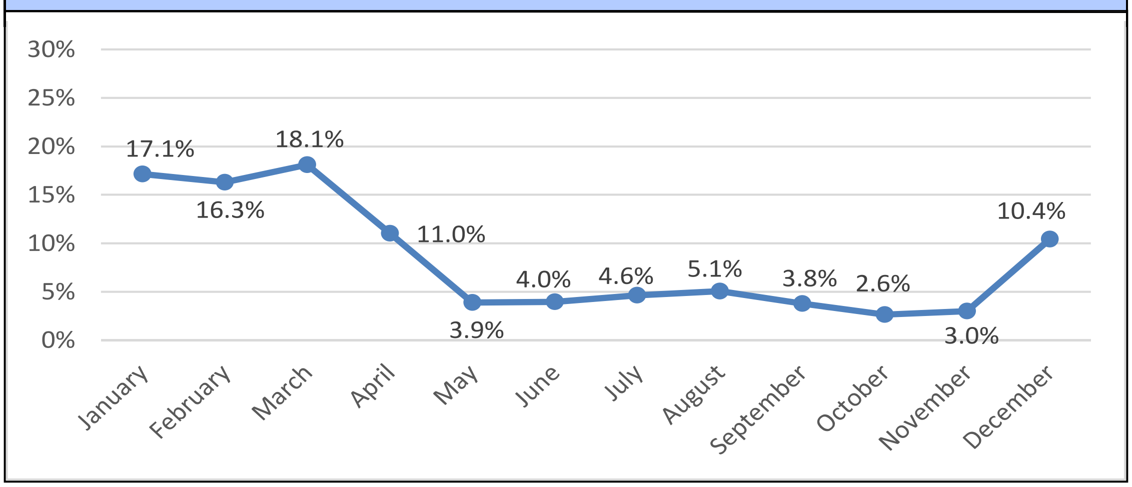
The Air Partners' air service strategy is designed to attract visitors from four markets: southern California, western states, east coast and international. Since the beginning of the program the Air Partners have tried and discontinued flights from five markets. The rationale for initiating and ultimately cancelling service from each destination is summarized below:

- **Reno** – Intent was to pull skiers from the Tahoe-area market. Load factors remained low because the driving distance was too short to make a flight to MMH attractive to many visitors.
- **Denver** – Purpose was to gain access to east coast market by using United Airlines flights from its hub in Denver. The ski clubs on the east coast were specifically targeted. Four drought winters and ski seasons with poor snow resulted in low load factors.
- **San Jose** – Purpose was to attract skiers from the San Francisco Bay Area, particularly the eastern portion. The only available departure time slot was mid-morning with an early afternoon return flight. This proved unattractive to skiers because the mid-morning departure did not allow skiers to begin skiing on the first day and the early afternoon return flight did not permit time for skiing on the last day, while also not allowing for a full work day on either end.

- **Orange County** – This departure location was intended to serve this geographic region within the southern California market. As with the San Jose flights, this service was unsuccessful because of a mid-morning departure and early afternoon return flight.
- **Las Vegas** – Service was started from this location to gain access to the southern Nevada market. Flights were scheduled for a Thursday departure from Las Vegas with a Monday return flight. After the first season it appeared that the choice of days of the week were not appropriate for this market. When it appeared that the aircraft used for this flight was going to be reallocated by the airline, the flight was cancelled by Alaska Airlines.

Over the last three seasons, including the partially completed 2016-2017 ski season, the Air Partners have fine-tuned the schedules for service from Los Angeles, San Diego and San Francisco to increase load factors. This involved reduction or cancellation of service during the shoulder season and reduction in the frequency of service on some routes during the prime winter season. The purpose was to increase load factors to the point where little or no subsidies were required for service from these locations. The load factor is the percentage of filled passenger seats. These schedule modifications were intended to eliminate flights where load factors were in the 20% and 30% ranges. During the 2015-2016 ski season this new strategy reduced flights by 19% while only reducing enplanements by about 6%. This strategy frees-up funds for use in marketing and testing service from new cities.

Figure 1.
Average Monthly Percentage of Annual Enplanements



Source: Airport

Annual enplanements grew from 19,798 in 2010 to 30,858 in 2013 and decreased to 22,253 in 2016 (see **Table 1**). Enplanements declined in between 2013 and 2016. Initially the decline was due to the "right sizing" strategy noted above which eliminated flights with low load factors. Based upon ticket sales, calendar year 2016 would have had higher enplanements than 2015 except for the severe weather in December 2016. The blizzard conditions resulted in flight cancellations that exceeded 50% in some weeks of this peak holiday season.

As a resort destination, visitors come to Mammoth Lakes and the surrounding area for recreation. According to Mammoth Lakes Tourism staff, most travelers are coming in for three- to five-day stays. Flights into Mammoth Lakes during later afternoon hours allow visitors to work half a day, arrive around dinner time and plan on beginning skiing, hiking, biking, fishing and sightseeing the following morning. This also allows them to ski for half a day before their departure (ski lifts close at 4:00 p.m.). The Air Partners have found through experience that flights at other times during the day have not been successful. A late-morning or mid-afternoon flight is often considered a "wasted" day travelling. This flight schedule also allows visitors time during the day to make flight connections from East Coast cities and other locations more conveniently. Early morning flights are not as desirable as late afternoon and early evening flights. An early morning flight would also poorly serve visitors connecting from other cities. The year-round mid-morning flight from LAX exists only because it was the only year-round time slot that Alaska was willing to make available.

The preference for later afternoon or early evening flights is the key factor driving demand for terminal gates at MMH. Currently the terminal has only one gate. During the ski season weather delays occur regularly. This can result in three commercial aircraft being parked at the Airport concurrently approximately 20 times per ski season (about 18%), with rarer occurrences when four aircraft are parked at the Airport concurrently. In 2013, when the Airport had seven flights on five days each week during the ski season, airline scheduling pushed peak hour passengers well past the terminal's capacity. This resulted in three or more planes on the ground more frequently. Some flights had to be scheduled earlier in the day, which reduced their load factor as people chose not to fly due to the inconvenient timing of the flights. By requiring some origination markets to fly during the middle of the day their viability was reduced as enplanements fell and subsidy money was increased. This ultimately led to the cancellation of some of these routes, due to low load factors.

3.2 BASED AIRCRAFT

Based aircraft are defined as those stored at an airport on a long term basis. These aircraft owners buy or lease hangar and parking space from the Airport or a third-party developer. The forecast of based aircraft will be used to determine whether additional hangar spaces are needed. MMH is unusual in that most hangars are used by transient aircraft, that is, aircraft based at another airport. The dominance of hangars used for transient aircraft is due to two factors: aircraft owners who have second homes in the Mammoth Lakes area, and the desire to shield aircraft from the weather (particularly snow) when parked at the Airport. This information will also be used to assess the need for new or expanded supporting facilities or services. The counts of based aircraft from 2009-2016 are shown in **Table 1**.

3.3 AIRCRAFT OPERATIONS

An aircraft operation is either a landing or a take-off. A touch-and-go is a common training activity where the pilot lands and then takes off without leaving the runway. A touch-and-go is counted as two operations.

3.3.1 General Aviation Operations

The Airport does not have an airport traffic control tower, so there is no official count of aircraft operations. However, the Airport's sole FBO is required by contract to keep a record of all landings. The FBO's staff monitors the Airport's Unicom radio frequency and records the aircraft numbers of arriving aircraft. FBO counts include landings that occur during business hours: Saturday-Thursday 8:00 a.m. to 6:00 p.m. and Friday 8:00 a.m. to 8:00 p.m. The counts also include aircraft that arrive at night and are still parked on the transient apron in the morning. Local operations, such as touch and goes, are not included in the count. FBO staff estimate that local operations are about 5% of total piston operations. Based upon a two-month sample of their aircraft logs, the FBO estimates that about 54% of turbine operations are charters (i.e., air taxi). The counts of operations by general aviation aircraft from 2009-2016 are shown in **Table 1.** Aircraft operations include both landings and take-offs. Therefore, the FBO's counts of landings have been doubled.

3.3.2 Military Operations

The FBO's operation counts include military operations. **Table 1** presents the annual counts of operations from 2009-2016. All military operations are transient operations. Most are by helicopters.

3.3.3 Airline Operations

Alaska and United Airlines provide Airport staff with documentation of both their scheduled and actual operations. Records available from the Airport extend back to 2010. The operations estimate for 2009 was calculated from available records of passenger enplanements. It was assumed that the ratio of enplanements to operations was the same as in 2010.

3.4 AIR CARGO

Air cargo activity at MMH does not include any type of scheduled cargo service. According to DOT T100 data, in the first few years following reintroduction of scheduled passenger service small quantities of cargo were carried by the scheduled airlines as belly-haul (i.e., included with passenger baggage). However, in recent years no significant amounts of cargo have been shipped through MMH.

4. NATIONAL AVIATION INDUSTRY TRENDS

Aviation industry trends are based upon data available through April 2016. Separate sections will discuss: passenger enplanements, the general aviation fleet, aircraft operations, and air cargo. Most forecast material is extracted from the FAA's *Aerospace Forecast Fiscal Years 2016-2036* (hereafter *Aerospace Forecast*). The *Aerospace Forecast* presents FAA expectation for the aviation industry at a national level for the next 20 years and is updated annually. This information will provide a context for review of historical activity levels at MMH and development of forecasts. However, as is explained in the individual sections that follow, broad national trends have limited applicability to forecasting for the Airport.

4.1 PASSENGER ENPLANEMENTS

The foremost challenges facing the airline industry are the volatility of fuel prices and global economic uncertainty. Nationally, passenger enplanements have returned to levels achieved prior to the recession that began in 2008. Economic recovery, airline consolidation, and capacity constraints have restored airline profitability. Airlines have increased load factors, the percentage of seats occupied, by reducing flight frequencies. This practice has reduced consumer choice, effectively consolidating a growing number of passengers on to fewer flights. Airlines are also adding aircraft with more seats, which has further necessitated the need to cut frequencies in order to operate the flights profitably.

The *Aerospace Forecast* projects that national passenger enplanements (domestic plus international) will increase an average of 1.9% per year through 2035. Air carrier airlines, called "mainline carriers" in the *Aerospace Forecast*, are expected to grow at 2% a year. This is higher than regional airlines, which are projected to grow at 1.6% a year. This section of the *Aerospace Forecast* is summarized in **Table 2**.

Because commercial carrier capacity is expected to grow at a slightly slower rate than enplanements, most airliners will remain crowded. Domestic commercial carrier capacity (i.e., total number of passenger seats) is expected to grow slowly at an average of 1.8% per year, with mainline carriers growing slower than regional carriers, 1.8% versus 2.0%. Because of subsidies and revenue guarantees, load factors (i.e., percent of seats occupied) for airlines serving ski resorts are commonly lower than for other destinations. Nationally, load factors for domestic mainline airlines are currently around 85% and 80% for domestic regional airlines. It is common to have average load factors on airlines serving ski resorts in the 60% to 70% range and lower on specific routes. It is these low load factors that necessitate having subsidies to make the flights economically viable.

Table 2.
Comparison of Forecast Passenger Enplanement Growth Rates

	Domestic + International Flights 2016-2035	Domestic Flights		
		2016-2025	2026-2035	2016-2035
Mainline Carriers	2.0%	1.5%	1.8%	1.7%
Regional Carriers	1.6%	1.5%	1.8%	1.7%
All Carriers	1.9%	1.5%	1.8%	1.7%

Source: FAA Aerospace Forecast Fiscal Years 2015-2035

Forecasts of national trends in enplanements have limited applicability to the Airport. The airline revenue guarantee program (discussed in Section 1.4) allows scheduled passenger service to be offered that is largely independent of national trends. As long as forecast national economic trends are broadly positive (which they are), it can be assumed that the disposable income necessary for the recreational pursuits (mainly skiing) that are the principal purpose of the Airport's passengers will be available.

4.2 GENERAL AVIATION AIRCRAFT FLEET

The total number of aircraft in a given area or organization is referred to as a *fleet*. The *Aerospace Forecast* indicates that the national general aviation fleet decreased by 3.2% annually from 2010 to 2013. This decline is partially due to aging aircraft requiring expensive repairs to remain airworthy, the aging pilot community struggling to meet medical requirements, the rising cost associated with aircraft ownership, and fewer new pilots overall. Fewer pilots results in reduced demand for new aircraft, particularly those purchased by individuals who would fly for recreation. The *Aerospace Forecast* expects the number of private pilots in the US to decrease at 0.35% per year through 2035.

The *Aerospace Forecast* projects that the number of piston fixed wing aircraft will continue to decline through 2035. Multi-engine piston aircraft are projected to decline by 0.4% per year and single-engine aircraft are forecast to decline at a rate of 0.6% per year. However, within the single-engine group, the light sport aircraft segment is forecast to experience 4.3% annual growth, although this user class makes up less than 2% of the national fleet.

Although the general trend has been one of decline, there are areas of growth for certain segments of the national fleet. Continued concerns about safety, security, and flight delays keep business aviation attractive relative to commercial air travel. For these reasons, the turbine aircraft fleet (jets, turboprops and turbine-powered helicopters) is forecast to grow from 14.3% of the general aviation fleet to 21.5% by 2035. **Table 3** shows that it is the growth of turbine aircraft that supports the projection that the total general aviation fleet will grow at an average annual rate of 0.4% through 2035.

Table 3.
Comparison of Forecast Growth Rates by Aircraft Type

	Total Fleet	Rotorcraft	Fixed Wing					
			Turbine	Multi-Engine Piston	Single-Engine Piston	Light Sport	Experimental	Other
2015*	198,780	10,440	21,305	13,175	122,435	2,355	24,880	4,190
2035	214,260	17,110	33,785	12,135	108,810	5,360	33.040	4,020
CAGR	0.4%	2.5%	2.2%	-0.4%	-0.6%	4.3%	1.4%	-0.2%

Source: FAA Aerospace Forecast Fiscal Years 2015-2035 *Estimate from *Aerospace Forecast*
CAGR = Compound Annual Growth Rate

National trends have limited applicability in forecasting based aircraft at the Airport. With only seven based aircraft, the unique factors shaping decisions by individual aircraft owners will more profoundly affect changes in based aircraft than broad national trends.

4.3 AIRCRAFT OPERATIONS

The number of annual aircraft operations at towered airports in the United States has declined steadily from 2001-2015 (from 66.2 million to 49.6 million). The sharpest drop in all segments of the aviation industry occurred in 2009, the year following the beginning of the recession. From 2013 to 2014, the number of operations by commercial aircraft (air carrier and regional) grew, reflecting improvement in the national economy. Unlike passenger enplanements, which are categorized as air carrier or regional based on the airlines role, operations are categorized based on aircraft seating capacity. Aircraft with more than 60 seats are *air carrier*, and aircraft with 60 seats or fewer are operated by airlines are *air taxi/commuter*. Charter operations, such as the scheduled charter by JetSuiteX introduced in the December 2016, are included in the air taxi category.

General aviation operations grew from 2011 to 2012, before declining again in subsequent years. Segments of the general aviation market, namely aircraft used for business purposes, are operating more frequently while flight training and leisure and hobby flying are contracting. Business general aviation is growing in response to airline consolidation – it is simply less convenient to fly commercially than it used to be. Flight training is growing among students interested in the airline career track, but fewer are learning to fly as a hobby. This has led to the decline in leisure pilots. Reasons for this decline include the increased cost of aircraft ownership, the expense associated with learning to fly, and competing financial needs. Younger generations are saving for a home and repaying student loans, which limits discretionary income.

The *Aerospace Forecast* projects total operations by all segments of the aviation industry to increase at an average rate of 0.9% per year through 2035 at towered airports. Most of the growth is expected to be from increased commercial aircraft activity (up 1.5% annually). The air carrier component is projected to increase an average of 2.7% per year. The increase in air carrier activity is expected to occur due to a combination of air carrier airlines increasing frequencies on select routes, and a switch by regional airlines from 50 seat aircraft to 70-90 seat aircraft, which are counted in the air carrier category by the Terminal Area Forecast (TAF). Air taxi/commuter operations were forecast to fall 4.9% in 2015 and decrease 1% a year through 2035. This reduction in the air taxi/commuter component will be driven by the retirement of passenger jets with fewer than 60 seats. Nationally, at small and non-hub airports such as MMH, total operations are projected to increase at an average annual rate of 0.5% a year. The *Aerospace Forecast* projects that general aviation activity at towered airports will increase an average of 0.4% annually through 2035.

The national trends forecast for aircraft operations have broad applicability to forecasts for the Airport. Although the forecast percentage changes in operations at the national level are not directly used in the Airport's forecasts, several trends support assumptions used in the Airport's forecasts:

- Increase in operations by air carrier aircraft.
- Growth in use of general aviation aircraft for transportation in lieu of using scheduled commercial flights.
- Decline in flight training for individuals interested in flying as a hobby.

4.4 AIR CARGO VOLUMES

The *Aerospace Forecast* concludes that the national volume of air cargo follows trends in the gross domestic product, with secondary influencers of airline fuel costs and the need for just-in-time logistics chains. Air cargo volumes have grown since the post-recession low point in 2009, although there has been some year-to-year variability. Significant structural changes in the air cargo industry have occurred over the last decade and have affected air cargo volumes, including: FAA and TSA air cargo screening requirements, maturation of the domestic express package market, a shift from air to other transportation modes (especially truck), use of all-cargo carriers by the US Postal Service, and the increased use of internet-based mail substitutes. Another key change is the continuing reduction in the amount of air cargo carried on passenger airliners.

The *Aerospace Forecast* projects that air cargo volumes will increase at an average annual rate of 0.5%. The all-cargo carriers' share of the air cargo market are forecast to grow to 90.2% by 2035 as airlines take less and less cargo.

The national trends forecast for air cargo have limited applicability to forecasts for the Airport. Although the forecast percentage changes in air cargo at the national level are not used in the Airport's forecast, the forecasts do reflect the national trend in reduction in cargo carried by airlines.

5. FORECASTING METHODOLOGIES

A variety of forecasting techniques may be used to project aviation activity range from subjective judgment to sophisticated mathematical modeling. These techniques may utilize local or national industry trends in assessing current and future demand. Socioeconomic factors such as local population, retail sales, employment, and per capita income can be analyzed for the relationship they have had, and may have, with activity levels. This section presents a range of methodologies that were considered for use in forecasting aviation activity at MMH. The applicability of these methodologies to each activity forecast (e.g., enplanements, operations) is addressed in the forecast section (Section 6).

5.1 MARKET SHARE METHODOLOGIES

The market share methodology compares local levels of activity with those of a larger market (e.g. state, nation, or world). This methodology implies that the proportion of activity that can be assigned to the local level is a fixed percentage of the larger entity. Most commonly this involves assuming a ratio between activities at an airport with FAA national forecasts.

5.2 TIME-SERIES METHODOLOGIES

Trend lines and regression analyses are widely used methods of forecasting based on historical activity levels at an airport. Trend line analyses can be linearly or nonlinearly extrapolated and are commonly created using the least squares method. Regression analyses can be linear or nonlinear. In time-series methodologies it is common to have only one variable.

Time-series methodologies are only appropriate when the activity being forecast has a sufficiently long history for trends to be established. At least 10 years is normally required although longer periods are desirable. These methodologies are most robust when the underlying factors that establish the activity levels have not fundamentally changed.

5.3 SOCIOECONOMIC METHODOLOGIES

Though trend line extrapolation and regression analyses may provide mathematical and formulaic justification for demand projections, there are many factors beyond historical levels of activity that may identify trends in aviation and its impact on local aviation demand. Socioeconomic and correlation analyses examine the direct relationship between two or more sets of historical data. Socioeconomic data can include: total employment, total earnings, net earnings, total personal income, and gross regional product. Historical and forecasted socioeconomic statistics are commonly obtained from Federal Agencies, such as the Census Bureau, or private firms, such as Woods & Poole Economics.

In these types of analyses the correlation coefficient, denoted as r, is used to measure the strength of the relationship between two variables. An r can range from -1.00 (one variable increases, the other decreases proportionally) to +1.00 (both variables grow or decline proportionally at the same time). A score close to +/-1.00 suggests a stronger correlation, and a score closer to zero suggests that the two variables are not correlated. Typically an r of at least +/-0.70 is needed to conclude that there is a substantial correlation between the two factors. It is important to understand that correlation does not necessarily imply causality. It could be possible that the two factors are jointly being influenced by another factor. Additionally, it is not sufficient that there is a high correlation between the variables. There must be a logical basis to believe that there is relationship between the two variables.

5.4 COMPARISON WITH OTHER AIRPORTS

Using comparisons with other airports can be valuable when there is a lack of historical data or when a major change has occurred. The airports selected should be of the same relative size and possess relevant characteristics. Activity data from the comparison airports can be used as a source of trends. For example, growth rates when a low-cost carrier is first introduced to an airport. Activity data from comparison airports can also be used as benchmarks to assess the reasonableness of forecasts. These comparison airports are often referred to as peer airports.

5.5 JUDGMENTAL FORECASTING

Judgmental forecasting is used when there is a lack of historical data or where circumstances have changed so significantly that historical trends no longer apply. Judgmental forecasts must be formulated based upon a clear understanding of the factors that shape the activity being forecast. Forecasts prepared with this methodology are strongest when growth rates can be related to the experiences of similar airports or regional or national trends.

6. FORECASTS

6.1 PASSENGER ENPLANEMENTS

Forecasts of passenger enplanements are used to anticipate facility needs, such as expansion of the passenger terminal or modification of gates to accommodate different classes of aircraft. A passenger enplanement is defined as the act of one passenger boarding a commercial service aircraft. Passenger enplanements include scheduled and non-scheduled flights of over nine passenger seats, and do not include airline crew.

6.1.1 Factors Affecting Forecasts

Several factors made forecasting enplanements at MMH particularly challenging:

- Limited historical data (eight years) after 11 years without service.
- Variability in the amount of snowfall in Mammoth Lakes and the timing of storm/snowfall events.
- Minimum revenue guarantee contracts support scheduled service with load factors lower than is common on flights without revenue guarantees.
- The strategy of the Air Partners group in managing the revenue guarantee program and its associated marketing campaign continues to evolve. Section 3.1 provides a history of refinements to the strategy. Although refinement of the strategy has succeeded in increasing load factors, it has contributed to the decline in annual enplanements for the last three years.
- Flight cancellations due to weather are a seasonal issue, although the percentage varies year to year. Both low visibility and crosswinds have resulted in cancelled flights at MMH. Recent improvements to

instrument departure procedures (available to all aircraft) and instrument approach procedures (currently only available to Alaska Airlines) are expected to reduce cancellations due to low visibility. Future improvements to instrument procedures may further reduce cancellations. However, weather-related cancellations are expected to remain an issue.

- Passengers have shown a strong preference for flights that arrive in the late afternoon or early evening. Because the passenger terminal has only one gate, the ability to serve multiple flights during the preferred time period is constrained.

6.1.2 Methodologies Considered and Rejected

Three common forecasting methodologies were considered and rejected based upon the specific circumstances of MMH. These methodologies are identified in two common forecasting reference documents: *Forecasting Aviation Activity by Airport (July 2001)* which was prepared for the FAA and *ACRP Report 25, Airport Passenger Terminal Planning and Design, Volume 1: Guidebook*.

- **Historical trend lines and regression analyses** are widely used methods of forecasting based on historical performance. With only six years of year-round enplanement data, the legitimacy of forecasts based upon this brief period is questionable. Additionally, the evolving strategy of the Air Partners added another dimension of volatility to normal year-to-year variation.
- **Socioeconomic and correlation analyses** examine the direct relationship between two or more sets of historical data. Because enplanements are predominantly generated by passengers from outside the Mammoth Lakes Area, the socioeconomic variables would need to come from another geographic area. While the strongest economic link is to Southern California, it appears unlikely that socioeconomic factors in that region drive passenger volumes to MMH. Rather it is more likely that the relative attractiveness of Mammoth Lakes as a tourist destination compared to other destinations is driving demand; thus, this methodology is judged to be inappropriate.
- **Market share analysis** assumes a relationship between activities at an individual airport with activity forecast for a larger geographic area. Most commonly this involves assuming a ratio between activities at an airport with FAA national forecasts. This is judged not to be an appropriate methodology for MMH because enplanements at MMH are tied to its competitive position relative to other ski resorts rather than general national trends in passenger volumes.
- **Comparison with other airports** would be a potentially viable methodology if it were possible to identify airports with sufficiently similar characteristics. Given that aviation activities at MMH are strongly linked to skiing, it is appropriate to consider whether there are airports serving ski resorts that have characteristics similar to Mammoth Mountain Ski Resort. While there are ski resorts with comparable facilities, the nature of the ski market makes it infeasible to draw links between facilities and passenger enplanements. Skiing in the United States is a mature market; the number of skier days is not growing. Growth in the number of skier days at one resort comes at the expense of a competing resort. This competitive situation makes it infeasible to draw comparisons between MMH and other airports.

6.1.3 Selected Forecasting Methodologies

MMH's circumstances make using the common statistical methodologies described above inappropriate. Therefore, judgmental forecasts have been prepared. The judgmental forecasts include consideration of:

- Seven years of enplanement data.
- The history of successful and unsuccessful introduction of service to MMH.
- An emphasis in growing the service to fully serve the Southern California market and passengers using Southern California airports as a connection to reach MMH.
- The availability of $2.4 to $3 million to spend on marketing and revenue guarantees annually.
- The growth in airline ticket sales from 2015 to 2016 that did not result in an increase in enplanements due to weather-related flight cancellations.

6.1.4 Forecasting Assumptions

In these forecasts, the pattern of incremental growth will follow three paths:

- Expansion of service from LAX and SAN during the ski season when sufficient demand exists.
- Addition of service from one additional Southern California airport during the ski season and then gradual expansion of the number of weekly flights.
- Addition of limited service from an out-of-state airport.

The specifics of the forecasting assumptions are presented in the paragraphs that follow.

Forecasting Assumption No. 1

The undersized passenger terminal will continue to constrain passenger volumes until a replacement terminal with additional gates is added. The replacement terminal is assumed to become operational in 2021. Until that time, incremental growth in enplanements will be principally due to increasing load factors of existing flights and expansion of the number of flights per week with the existing daily schedule. There may be one or more new flights added to the schedule outside of the peak hour.

Forecasting Assumption No. 2

The Airport had 19,798 enplanements in 2010 and since that time has had over 22,000 annual enplanements each year, despite variations in snow conditions and reduction in flights due to refinements in the Air Partner's marketing strategy. It is forecast that enplanement volumes will continue to be at least this high through the 10-year forecast period.

Forecasting Assumption No. 3

When the replacement terminal becomes operational some existing flights will be rescheduled to occur during the peak early evening period due to strong passenger preference. The addition of terminal peak capacity will increase the ability to successfully add service from southern California and an out-of-state airport by enabling this service to meet passenger schedule preferences.

Forecasting Assumption No. 4

Beginning in mid-December daily service from LAX and SAN is offered in the late afternoon or early evening. There is also a daily mid-morning flight from LAX. After the three-week Christmas-New Year's holiday season is over, the late afternoon/early evening service is cut back to four days per week. The forecasts assume that the marketing campaign will increase awareness of the Mammoth Lakes region and MMSA and expand demand for passenger service. That will permit the four times weekly service to be incrementally expanded until the afternoon flight would be made daily throughout the ski season.

Forecasting Assumption No. 5

By its very nature, the passenger service program managed by the Air Partners will involve investigating the viability of service from additional airports. These forecasts assume that the Air Service Partners will follow their plan to test air service from various airports in the Southern California market over the next three years. This may include scheduled charters originating at general aviation airports to test some markets. However, ultimately the vast majority of scheduled service will originate at commercial (i.e., Part 139 certified) airports. Candidate airports include Burbank Bob Hope Airport (BUR), John Wayne Airport (SNA), and Santa Barbara Airport (SBA).

Forecasting Assumption No. 6

It is expected that initially, the service from a new Southern California airport would start with daily service during the first three weeks of the ski season and four times weekly service the balance of the ski season. If demand increased, this service would be incrementally increased by one additional day per week. When demand was sufficient service would be offered daily throughout the ski season.

Forecasting Assumption No. 7

Both the Seattle and Phoenix areas are being considered for service. Residents from these two areas currently purchase season passes to MMSA and/or own a second home in the Mammoth Lakes area. For forecasting purposes it is assumed that it will take five years of experimentation to establish service from an out-of-state airport. Due to competition, it is assumed that service will be limited to three flights per week during the ski season.

Forecasting Assumption No. 8

Service to the San Francisco Bay Area will continue indefinitely. These flights have historically had lower load factors than flights from Los Angeles and San Diego. However, about 50% of the passengers on these flights originate from outside of California. These connecting passengers are a market segment that the Air Partners strongly desires to grow. Additionally, without these flights Mammoth Lakes would receive very few visitors from the San Francisco Bay Area during the ski season due to the long drive time.

6.1.5 Other Forecast Assumptions

Actual Departures

The forecasts assume that the current average of 12% cancellations due to weather will be reduced to at least 10% due to new instrument approaches. In 2015, instrument departures were established for both runways that are available both day and night. New Required Navigation Performance (RNP) instrument approaches were also established that lowered ceiling minimums from 1,300 feet for both runways to 250 feet for Runway 27 and 265 feet for Runway 9. The forecasts assume a three-year phase of use of new departure and approach procedures. Currently the RNP approaches are available only to Alaska; however, Alaska is responsible for 77% of flights at MMH. The instrument departure procedures are available to all aircraft. The RNP approaches will allow Alaska to make approaches with the cloud ceiling about 1,000 feet lower than possible today. This will reduce the number of flights cancelled due to low ceilings. The instrument departure procedures will allow departures under instrument weather conditions

Total Seats

It is assumed that the CRJ700 with 70 seats remains in service through 2021 and then is replaced with a regional jet with 76 seats. Similarly it is assumed that the 76-seat Q-400 is eventually replaced by a 76-seat regional jet.

Load Factor

The right-sizing of the schedule has resulted in ski season load factors of over 70%. The load factor is forecast to grow over 10 years to provide year-round load factors over 60%.

Summer-Fall Season

These forecasts assume that passenger volumes outside of the ski season will remain static. There are ongoing efforts to increase visitors (including airline passengers) during this summer-fall season through the development of cultural events. Examples include the Mammoth Lakes Film Festival held annually in May and the Half Marathon held in June. However, the introduction of these cultural events is too recent to form the basis of a forecast for a change in summer-fall passenger volumes.

6.1.6 Enplanement Forecasts

Based upon the preceding assumptions, annual enplanement forecasts were prepared for MMH (see **Table 4**). A compounded average growth rate of 1% has been used in this forecast. This relatively low growth rate reflects the variability associated with weather/snow conditions and uncertainty associated with introduction of service from new locations. These forecasts project that enplanements will reach 23,388 in 5 years (2021) and 24,581 in 10 years (2026).

Table 4. Passenger Enplanement Forecast		
	Year	Enplanements
Base Year	2016	22,253
77Forecast Years	2017	22,476
	2018	22,700
	2019	22,927
	2020	23,157
	2021	23,388
	2022	23,622
	2023	23,858
	2024	24,097
	2025	24,338
	2026	24,581

Source: Mead & Hunt

6.2 PEAK PASSENGER ACTIVITY

Some elements of terminal planning are based upon peak passenger activity. To support these analyses, the peak monthly, daily, and hourly activity levels for passengers for the most recent five calendar years (2011-2015) are first calculated. This data is then used to project these activity levels for the 10-year forecast period.

6.2.1 Peak Month Passenger Activity Forecasts

Monthly passenger enplanement data for the period 2011-2015 is presented in **Table 5**. The peak month has an average of 18.7% of total annual enplanements. In three of the five years, the peak month was March, in two of the five years it was January. The variation is likely due to snow conditions. In forecasting peak passenger activity, it will be assumed that peak month enplanements for this month will remain at 18.7% of the annual total. Applying this percentage to the preferred annual enplanement forecast above yields a peak month enplanement forecast for 2021 of 4,417 and for 2026 of 4,642.

Table 5. Peak Month Enplanements					
Month	**2015**	**2014**	**2013**	**2012**	**2011**
January	4,299	4,540	5,766	4,336	4,211
February	3,841	4,017	5,657	4,865	3,653
March	4,622	4,735	5,652	4,897	4,161
April	1,663	2,741	3,025	3,821	3,379
May	749	1,031	1,149	1,061	1,051
June	975	1,022	1,117	931	1,165
July	1,226	1,330	1,259	1,277	1,189
August	1,228	1,294	1,378	1,478	1,419
September	1,015	1,002	1,171	851	1,004
October	712	717	579	566	807
November	773	827	799	562	882
December	2,401	2,636	3,306	2,601	3,275
TOTAL	23,504	25,892	30,858	27,246	26,196
Peak Month % Annual	**19.7%**	**18.3%**	**18.7%**	**18.0%**	**16.1%**
5-year Average	**18.7%**				

MMH has distinct winter-spring and summer-fall flight schedules with winter-spring being the busier. This prime ski season typically starts on December 15 and runs through Easter. This schedule can vary by a few weeks depending upon snow depths and other factors. **Table 6** shows the schedule for the peak days of the 2015-2016 winter-spring season. Scheduled service from SFO is by United Airlines, while service from LAX and SAN is by Alaska Airlines.

The schedule shows that flights are concentrated in the early evening hours (4:35 p.m. to 6:45 p.m.). Arriving in the evening allows skiers to conduct travel during non-skiing hours to maximize the time available to spend skiing during a vacation. The peak hour is between 5:10 p.m. and 6:11 p.m. (1710 and 1811 in international time). This is graphically shown in **Figure 4**. The peak hour passenger volume was calculated using average enplanement and deplanement load factors for each airline. The average is calculated from flights that occurred from 2010-2015. The peak hour for the most recent (2015-2016) winter-spring season is 163 passengers. This includes passengers associated with an additional arrival that occurs one minute after the calculated peak hour. It should be understood that the Airport has had to negotiate with airlines to ensure that flight schedules will not lead to more than two aircraft on the ground at the same time whenever possible. This constraint has an impact on scheduling which reduces peak hour passengers below that which would otherwise occur. The right-sizing strategy has increased load factors over the last two years (2015-2016). Higher load factors increase the number of peak hour passengers.

6.2.2 Peak Month Average Day Passenger Activity Forecasts

Daily peak activity figures are based on a regularly occurring level of daily activity during the peak, or busiest, month. A review of airline activity schedules for the peak months of March and December indicates that activity is concentrated in the Thursday-Monday block of days. Although some scheduled service changes from daily to four times weekly service during these peak months, the schedule on peak days remains constant. Therefore, the seat total shown in **Table 6** (596) will be used as the peak day seats. The average passengers on the average day in the peak month equals 3.2% of the peak month's passengers.

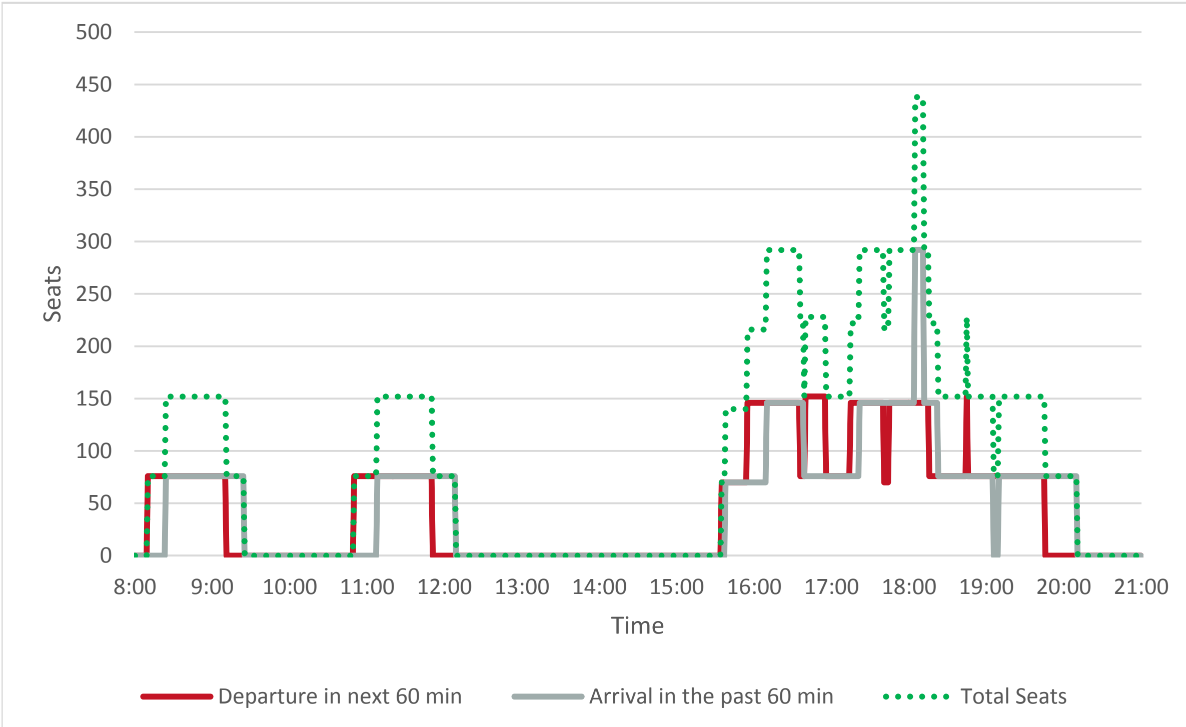
Table 6.
Winter-Spring 2015-2016 Peak Day Flight Schedule

	Time*	Origin / Destination	Aircraft Type	Seats
Arrival	924	LAX	Bombardier Q-400	76
Departure	1050	LAX	Bombardier Q-400	76
Arrival	1638	SFO	Bombardier CRJ700	70
Arrival	1710	LAX	Bombardier Q-400	76
Departure	1715	SFO	Bombardier CRJ700	70
Departure	1745	LAX	Bombardier Q-400	76
Arrival	1811	SAN	Bombardier Q-400	76
Departure	1845	SAN	Bombardier Q-400	76

* Time is expressed as a 24-hour clock

Source: Schedule - Airport

Figure 2.
2015-2016 Ski Season Peak Hour Seats



Source: DEO data base

Peak Hour Passenger Forecast

The number of hourly arriving and departing seats during a typical day in the latter half of the peak month (December) is shown in **Table 5**. Peak hour departing seats currently occur between 5:45 p.m. to 6:45 p.m. (1745 to 1845). Peak hour arriving seats occur between 5:10 p.m. to 6:11 p.m. (1710 to 1811). The peak total arriving and departing seats occurs between 5:10 p.m. to 6:11 p.m. (1710 to 1811).

Peak hour passenger volumes through 2026 were calculated by applying the current peak hour percentages (described above) to the annual passenger volumes previously projected. It is presumed that one additional departure will occur by 2026. These projected peak hour passenger volumes are presented in **Table 7**.

Table 7.
Forecast Peak Hour Passengers

Year	Peak Month Enplanements + Deplanements	Average Day Peak Month Enplanements + Deplanements	Peak Hour Passengers		
			Enplanements	Deplanements	Total
2021	8,833	285	89	81	171
2026	9,284	299	94	131	204

Source: Mead & Hunt

6.3 TERMINAL GATE REQUIREMENTS

An airport's gate requirements are typically examined in terms of the ability of both the airside and terminal building facilities to meet current and projected aviation demand. Commercial airline operations are quantified in peaking characteristics which comprise the "design hour" demand for passengers and aircraft. This approach provides sufficient facility capacity for most days of the year but recognizes that facilities should be neither underbuilt nor overbuilt. Aircraft gate capacity is determined using a design day flight schedule (DDFS), the peak hour of which is the "design hour." For most airports, an average day of the peak month's operations is used to develop a DDFS. The design hour is typically not the absolute peak level activity scheduled throughout a year, nor does it usually represent the total number of people occupying the terminal at a given time. It is a level of activity that is driven by flight schedule and quantified in terms of scheduled aircraft size. For MMH, historical data show the peak hour to be consistent at late afternoon for arrivals and departures during peak winter season travel.

For the peak winter season, Alaska has scheduled a morning arrival and departure at the Airport (see **Table 6**). Alaska and United's next arrivals into the Airport are scheduled between 4:30 p.m. and 5:30 p.m., with corresponding departures between 5:00 p.m. and 6:00 p.m., which constitute the Airport's peak hour for departures. These operations overlap one other with Alaska's Los Angeles flight arriving five minutes before United's San Francisco departure. This requires two gates to accommodate these current operations.

The winter schedule has been developed over time to reflect passenger preferences, which show mid-to-late afternoon departures from originating cities with arrivals at Mammoth Yosemite occurring about 5:00 p.m. to 6:00 p.m. generally. The airlines have attempted to schedule arrivals away from this late afternoon period with little success, noting that passengers generally prefer a mid-afternoon departure from the major cities. This allows them sufficient time to work in the morning, travel to the airport to catch their flight and still arrive at Mammoth Yosemite with time to enjoy the evening and be ready for a full day of recreation the following day. It also allows time for recreation prior to their departure, it should be noted that the ski lifts at MMSA close at 4:00 p.m. It also allows time for weather events in Mammoth Lakes to clear if their flight is delayed.

Given current passenger preferences for travel from destinations within the state, service to a new market will most likely be scheduled into the peak hour. In order to allow for this as well as provide flexibility for operations generally, an additional aircraft gate will be required (for a total of three). MMH currently has one terminal gate and two aircraft parking positions. To accommodate current and future peak hour enplanements forecast in **Table 7**, two gates will not be adequate. Three gates will allow the Airport and carriers to provide a high level of service to their customers. While on a smaller scale at MMH, air carrier service is generally in line with other resort airports in the west, such as Eagle/Vail in Colorado and Friedman Memorial/Sun Valley in Utah.

Three gates would be in addition to hardstand positions provided to accommodate irregular operations. At MMH the most common irregular operations are associated with weather delays. During the winter-spring season weather delays occur regularly. This results in three airline aircraft being parked at the Airport about 20 times per winter-spring season (about 18%) with rarer occurrences when four aircraft are parked at the Airport. In 2013, when the Airport had seven flights on five days a week, it proved difficult to schedule flights to reduce peak hour passengers to the terminal's capacity and had three or more planes on the ground more frequently.

Advisory Circular 5360-9, *Planning and Design of Airport Terminal Building Facilities at Nonhub Locations,* contains the FAA's general guidance on terminal planning. Paragraph 25.a. states:

> *The initial stage of construction of airport terminal facilities should be designed to accommodate, comfortably, the forecast demands 5 years from the proposed date for occupancy.*

The currently adopted Airport Layout Plan includes development of a replacement passenger terminal. It is anticipated that it would take about five years to complete the process leading to occupancy of the replacement terminal (2021). This time would be needed to complete state and federal environmental review, design, and then build the replacement terminal and associated facilities. Therefore, the likely date of occupancy plus five years is approximately nine years from now (2026). As noted in the paragraph above, three gates are needed to accommodate peak hour departures in 2026**.**

6.4 BASED AIRCRAFT FORECASTING METHODOLOGY

All of the aircraft based at the Airport are piston-driven. Nationally this segment of the general aviation fleet is expected to decline in numbers. The *Aerospace Forecasts* states that "the largest segment of the fleet, fixed wing piston aircraft is predicted to shrink over the forecast period at an average annual rate of 0.6 percent." As noted in Section 3, records of based aircraft at MMH are not sufficiently complete to be used to establish a trend. The most that can be said with confidence is that the number of based aircraft appears to have been stable for the last three years.

With only seven based aircraft, the decisions by individual aircraft owners profoundly effects the number of aircraft that will actually be based at the Airport in the future. Decisions by aircraft owners will be based upon economic factors, such as disposable income and changes in aircraft operating costs, as well the mobility value of owning an aircraft to access a somewhat remote location. Small populations are inherently less stable than larger ones and, therefore, likely to have higher variation.

No local factors have been identified that would suggest that growth in the number of based aircraft will occur. Neither Airport nor FBO staff anticipate turboprop or jet aircraft will be based at the Airport. These aircraft have historically been associated with visitors and owners of vacation homes in the Mammoth Lakes area. Neither group is likely to base an aircraft at the Airport.

6.4.1 Methodologies Considered and Rejected

Four of methodologies presented earlier in this document have been rejected as inappropriate for forecasting based aircraft.

- **Historical trend lines and regression analyses** has been rejected due to the lack of reliable historical data.
- **Socioeconomic and correlation analyses** is rejected because no clear link between the number of based aircraft and available socioeconomic data.
- **Market share analysis** is rejected because poor historical data makes it infeasible to evaluate the relationship between the number of based aircraft at MMH and state or national trends.
- **Judgmental forecasting** is rejected because the comparison with other airports provides a less subjective methodology.

6.4.2 Methodology Selected

Comparison with other airports is the methodology that was used to forecast based aircraft at MMH. Three airports were selected: Bishop Airport, Lone Pine/Death Valley Airport and Independence Airport. As with MMH all of these airports are located in valleys east of the Sierra Nevada Mountains along Highway 395. Bishop Airport is located 35 miles from MMH, Independence 66 miles and Lone Pine 83 miles. In 2015 Bishop had 45 based aircraft, Lone Pine had five and Independence had two. The 2016 TAF forecasts anticipates no change in the number of based aircraft at these airports. Therefore, the forecast of based aircraft for MMH is for the number of aircraft to remain at its current level of seven aircraft. Based upon this forecast, no new hangars are needed to accommodate based aircraft.

6.5 AIRCRAFT OPERATIONS

The forecast of operations will be used to determine whether the airfield will need capacity improvements during the next 10 years to accommodate expected demand. Forecasts for total operations are a composite of individual forecasts by operation type. Individual forecasts were prepared for: scheduled passenger airlines, general aviation aircraft, and military aircraft. General aviation operations forecasts include air taxi. The results are then totaled to produce a forecast of annual operations. Operations are also classified as either itinerant, meaning they originate and depart from different airports; and local, meaning that the flight remains near the Airport. Local operations are normally only conducted by general aviation and military aircraft for purposes of flight training.

6.5.1 Methodologies Considered and Rejected

Four of methodologies presented earlier in this document have been rejected as inappropriate for forecasting aircraft operations.

- **Historical trend lines and regression analyses** has been rejected for commercial and general aviation operations due to limited available historical data.
- **Socioeconomic and correlation analyses** is rejected for use in forecasting all operations because no clear link exists between the number of commercial or military operations and socioeconomic factors.
- **Market share analysis** is rejected because, as an airport serving a resort/recreational destination, there is not a strong link between operations at MMH and state or national trends.
- **Comparison with other airports** is rejected for general aviation operations because MMH is an isolated airport that cannot be expected to follow operations trends at other airports. It is rejected for commercial and military operations because there is a stronger link between forecast enplanements and operations than operations at other airports.

6.5.2 Methodology Selected

- **Judgmental forecasting** has been used for commercial and military operations. Previously forecast enplanements have been used to forecast commercial operations using assumptions on aircraft seating capacity and load factors. The low number of military operations have been forecast to remain constant due to a lack of data suggesting and change in past activity levels.
- **Socioeconomic analysis** has been used for general aviation operations. Population growth in the Mammoth Lakes area is believed to be the best available indicator of future general aviation operations.

6.5.3 Scheduled Passenger Airlines

Operations by scheduled passenger airlines was calculated by applying assumed load factors and average seats per departure to the enplanement forecast. The current (2016) load factor is 60.9%. The Air Partners group has indicated that the right-sizing strategy is fully in place and no changes are currently planned to boost load factors. For forecasting purposes it was assumed that this percentage will continue through the 10-year forecast period. Similarly the current (2016) number of average seats per departure, 74.5 seats, is presumed to remain unchanged. This reflects the assumption that the current mix of Q-400 aircraft with 76 seats and the CRJ700 aircraft with 70 seats, will remain unchanged through the forecasting period.

Applying the load factor and average seats per departure to the previously presented enplanement forecast would yield the following forecasts of operations:

- 1,040 air carrier operations in 2021.
- 1,094 air carrier operations in 2026.

6.5.4 General Aviation Operations

With only seven based aircraft and no flight school based at the Airport, the majority of general aviation operations are by transient aircraft. The FBO estimates that about 20% of the transient operations are by aircraft owners who own hangars at the Airport because they also own second homes in the Mammoth Lakes area. Because of this link between second home ownership and transient use, the forecast of general aviation operations has been developed by utilizing the rate of population growth projected for Mono County. Mono County includes the Mammoth Lakes area.

Population forecasts for Mono County were taken from the California Department of Finance, Demographic Research Unit Report P-1, *State and County Population Projections: July 1, 2010-2060*. These projections anticipate that Mono County will grow from 14,525 residents in 2015 to 16,671 residents in 2035. The increase represents a compound annual growth rate of 0.69%. Applying this growth rate to the preceding estimate of 2016 noncommercial operations (minus military operations) yields:

- 6,215 operations in 2021.
- 6,432 operations in 2026.

Air taxi operations are forecast to continue to account for 28.2% of total general aviation operations. Itinerant general aviation operations are assumed to remain 69.3% of general aviation operations. Local operation will remain 2.5% of operations

6.5.5 Military Operations

Military operations have averaged about 35 operations annually over the last 5 years. Therefore, for forecasting purposes, annual military activity has been assumed to remain at 35 operations.

6.5.6 Operations Forecasts

A summary of operations forecasts is presented in **Table 8** below.

Table 8.
Operations Forecast

	Itinerant Operations					Local Operations			
Year	Air Carrier	Air Taxi & Commuter	General Aviation	Military	Total	Civil	Military	Total	Total Operations
2016	990	1,634	4,017	32	6,673	143	0	143	6,816
2021	1,040	1,186	1,753	35	7,137	155	0	155	7,292
2026	1,094	1,314	1,814	35	7,403	161	0	161	7,564

6.5.7 Peak Hour Operations Forecasts

There are no sources that directly provide peak hour operations information for the Airport. However, available data for both scheduled airlines and general aviation activity both indicate that March is the peak month. The attraction is the high quality of snow and good weather for skiing that commonly exists in this month. Airport data on actual airline operations indicate that March has accounted for about 20% of total annual operations in 2013-2015. Counts of noncommercial operations (i.e., all nonairline operations) by the FBO show that March 2013-2015 also accounted for about 20% of annual operations for these aircraft. Where peak day counts are not directly available industry practice is to assume equal division of operations during the peak month. The peak day in March would then equal the monthly total divided by 31. Therefore, the peak day at Mammoth Yosemite Airport would be 20% / 31 = 0.65% of total annual operations. The peak day's percentage of annual operations (0.65%) equated to 44 operations in 2016.

No generic distribution of operations during a peak day is available. Every airport is unique. During the ski season at Mammoth Lakes visitors arriving by air commonly seek to arrive by civil twilight (i.e., sundown). During March this occurs between 6:15 p.m. and 7:45 p.m. During the 2015-2016 ski season three of the four scheduled daily arrivals occur between 4:35 p.m. and 6:45 p.m. General aviation arrivals follow a similar pattern. Based upon FBO landing records, an average peak day in March would see five arrivals by general aviation aircraft during the peak hour. The peak hour is typically 4:30 p.m. to 5:30 p.m. As noted earlier in this report the 2016 peak hour saw three operations by scheduled passenger aircraft. Adding commercial and general aviation peak hour data yields a total peak hour in 2016 of eight operations. In 2016, eight operations would equal 0.12% of total annual operations. Applying this percentage (0.12%) to the 2026 operations forecast yields 9 operations.

6.5.8 IFR Operations Forecasts

Instrument Flight Rule (IFR) operations are recorded in the FAA Traffic Flow Management System Counts (TFMSC). TFMSC operations data for the last four years (2013-2015) ranged from a high of 4,409 in 2013 to a low of 3,699 in 2016. Air carrier operations accounted for about 33% of IFR operations during this four-year period. Total IFR operations accounted for 62% of total operations. Introduction of the RNP instrument approach in the fall of 2016 is expected to increase the total number of air carrier IFR operations by about at least 2%. If air carrier IFR operations increase as projected, the percentage of total IFR operations would increase to 63%. At this rate in 2026 the number of IFR operations will total 4,765.

6.5.9 Cargo Forecasts

Nationally the trend has been a decline in cargo carried as belly-haul in scheduled passenger airline aircraft. The trend at the Airport has followed a declining trend since it started in 2010. Based upon these two trends it is forecast that no air cargo will be handled at the Airport in the future.

7. DESIGN AIRCRAFT

Plans for airport facilities must conform to FAA design standards. Design standards accommodate the physical and operational characteristics of the most demanding 'design aircraft.' The design aircraft must have or reasonably be forecast to conduct 500 annual operations at the Airport. In some cases the design aircraft will actually be a composite of the characteristics of the most demanding aircraft. According to the adopted Airport Layout Plan the current design aircraft for MMH is the Bombardier Q-400 turboprop. The operations counts for the Q-400 for the last four calendar years were:

- 882 operations in 2013
- 1,014 operations in 2014
- 952 operations in 2015
- 796 operations in 2016

The key characteristics of the Q-400 are:

- Aircraft Approach Category: C.

- Airplane Design Group: III.
- Taxiway Design Group: 5.

The Aircraft Approach Category (AAC) relates to aircraft approach speed and is classified by a letter (from A – E). The Airplane Design Group (ADG) component, depicted by a Roman numeral (from I – VI), relates to the aircraft's wingspan and tail height. The Taxiway Design Group (TDG) is based upon the undercarriage (i.e., wheel) spacing of the design aircraft.

The Q-400 is expected to remain the critical aircraft throughout the 10-year forecast period. It should be used as the design aircraft for facility planning.

8. SUMMARY

A summary of the forecasts are shown below in **Table 9**.

Table 9.
Summary of Forecasts

	2016	2021	2026
Passenger Enplanements			
Air Carrier	22,253	23,388	24,581
Commuter	0	0	0
TOTAL	22,253	23,388	24,581
Operations			
Itinerant			
Air Carrier	990	1,040	1,094
Commuter/Air taxi	1,634	1,753	1,814
Total Commercial Operations	2,624	2,793	2,908
General Aviation	4,017	4,309	4,460
Military	32	35	35
Local			
General Aviation	143	155	161
Military	0	0	0
TOTAL OPERATIONS	6,816	7,292	7,564
Instrument Operations	3,699	4,594	4,765
Peak Hour Operations	8	8	9
Cargo (enplaned+deplaned pounds)	0	0	0
Based Aircraft			
Single Engine (Nonjet)	4	4	4
Multi Engine (Nonjet)	3	3	3
Jet Engine	0	0	0
Helicopter	0	0	0
Other	0	0	0
TOTAL	**7**	**7**	**7**

Appendix E
Agency Coordination

ESA

APPENDIX E
Agency Coordination

E-1 Introduction

Under 40 CFR § 1501.4, federal agencies are required to involve environmental agencies, applicants, and the public, to the extent practicable, in the preparation of EAs. The primary components of the agency coordination and consultation and public involvement program for this EA include:

- Publication of the Draft EA Notice of Availability;
- Circulation of the Draft EA and for agency and public review; and
- Preparation of a Final EA that will include responses to comments received on the Draft EA.

Keeping agencies and the public informed and gathering their input is an essential component of any environmental study. The following sections summarize the agency coordination and public involvement program for this EA.

E-2 Agency Coordination

E.2.1 California Office of Historic Preservation – State Historic Preservation Office

To identify Historical, Architectural, Archeological, and Cultural Resources, the FAA established an Area of Potential Effect (APE) for the Proposed Action that includes Runway 12/30 with a 500-foot buffer that incorporates Taxiway A. Records searches of the Native American Heritage Commission and the California Historical Resource Information System occurred per 36 CFR § 800.4 (a)(1)-(3) and (b). The CHRIS records search indicated the presence of three cultural resources within or intersected by the APE. One resource listed on the National Register of Historic Places (NRHP), a tribal archaeological resource, was identified within the APE or airport vicinity. Due to the sensitivity of the site, the precise location will not be disclosed in this document. The other two resources identified within the APE do not meet the requirements for eligibility on the NRHP.

Consultation with the California State Historic Preservation Office (SHPO) occurred verbally on November 5, 2020. The FAA relayed to the SHPO that the request being made by Inyo County in the Proposed Action is administrative in nature. The proposal utilizes existing approach and departure procedures to Runway 12/30, the only runway proposed for commercial operations. The initial air service activity forecast includes approximately one flight a day during the summer season and three flights a day during the winter/ski season. Currently, the airport receives approximately 26,000 General Aviation and

Military operations annually. The response indicated the evaluation approach was reasonable, the Proposed Action would not affect historic properties, and that there was no need for formal consultation. The FAA has determined it will proceed in accordance with 36 CFR § 800.3(a)(1) and issue a finding of "no potential to cause effects."

E.2.2 U.S. Fish and Wildlife Service

The *Commercial Air Service at Bishop Airport Biological Assessment* (BA), dated October 2020, was prepared, which evaluated the presence and potential effect of the Proposed Action on species included on the list of threatened, endangered species, and designated critical habitat identified by United States Fish and Wildlife Service (USFWS) on September 30, 2020. The listed species included the Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*); Lahontan Cutthroat Trout (*Oncorhynchus clarkia henshawi*); Owens Pupfish (*Cyprinodon radiosus*); Owens Tui Chub (*Gila bicolor ssp. Snyderi*); and Fish Slough Milk-vetch (*Astragalus lentiginosus var. piscinensis*) (federally listed species). No critical habitat was identified by USFWS. The FAA considered the BA and has determined that the Proposed Action will have "no effect" on federally-listed species or critical habitat. Accordingly, formal consultation is not warranted.

E.2.3 Los Angeles Department of Water and Power

Consultation with the Los Angeles Department of Water and Power (LADWP) occurred verbally on August 10, 2020 and by email on August 11, 2020 regarding whether the properties around the Airport would qualify as a resource for the purposes of the Department of Transportation Act (DOT Act) Section 4(f). Section 4(f) applies to "parks and recreational areas of national, state, or local significance that are both publicly owned and open to the public." Section 5.2 of the FAA Order 1050.1F Desk Reference indicates that "[a] property must be a significant resource for Section 4(f) to apply."

On October 1, 2020, the LADWP confirmed in writing that the primary purpose of the LADWP-controlled city lands located within the general study area is watershed protection as a function of LADWP's water operations in providing water to the City of Los Angeles. Secondary uses such as livestock grazing and access for public recreation are permitted on those lands at the discretion of LADWP. On October 14, 2020, the FAA indicated that the LADWP letter is sufficient to confirm that the LADWP-controlled city lands in the general study area do not qualify as a DOT Section 4(f) resource. These letters are included as Attachment E-2 to this Appendix.

E-3 Federal Grant Assurances

E.3.1 Bishop Airport Federal Grant Assurances and Compatible Land Use

As a recipient of federal grants issued by the FAA, Inyo County is required to comply with certain assurances to qualify for funding. One grant assurance, Grant Assurance 6, *Consistency with Local Plans* (49 U.S.C 47107), requires that proposed Airport projects be reasonably consistent with the land use plans of the local public agencies responsible for planning and development in the areas surrounding the Airport. In compliance with Grant Assurance 6, on December 1, 2020, Inyo County, as Airport sponsor, submitted a letter to the FAA providing assurance that the Proposed Action is consistent with all applicable local land use plans. The letter is included as Attachment E-3 to this Appendix.

E-1 Correspondence with Los Angeles Department of Water & Power

From: Chris Jones
Sent: Friday, January 22, 2021 4:38 PM
To: Chris Sequeira
Subject: FW: Bishop Airport RE: DOT 4(f) - LADWP

Follow Up Flag: Follow up
Flag Status: Flagged

From: Garibaldi, Camille (FAA) <Camille.Garibaldi@faa.gov>
Sent: Wednesday, October 14, 2020 9:27 AM
To: Ashley Helms <ahelms@inyocounty.us>
Cc: Chris Jones <CJones@esassoc.com>; Autumn Ward <AWard@esassoc.com>; Mbakoup, Edvige B (FAA) <Edvige.B.Mbakoup@faa.gov>
Subject: BIH: Bishop Airport RE: DOT 4(f) - LADWP

Good Morning Ashley,

Thank you again for the letter from LADWP. LADWP confirmed that the primary purpose of the study area is watershed protection with limited secondary uses, livestock grazing and access for public recreation, at its discretion based on its operational needs.

The LADWP letter is sufficient to confirm that the property does not qualify as a Department of Transportation, Section 4(f) resource.

Please let me know if you have any questions or concerns.

Regards,
Camille

____
Camille Garibaldi
Phone: (650) 827-7613

From: Ashley Helms <ahelms@inyocounty.us>
Sent: Thursday, October 08, 2020 12:08 PM
To: Garibaldi, Camille (FAA) <Camille.Garibaldi@faa.gov>
Subject: Section 4(f)

Hi Camille,
We received this letter yesterday from DWP. Chris reviewed it last night and said he thought it should meet our needs for the EA, but I want to make sure you agree.
Thanks,
Ashley

October 1, 2020

Mr. Michael Errante
Public Works Director
County of Inyo
P.O. Drawer Q
Independence, CA 93526

Dear Mr. Errante:

Subject: Business Lease No. 0120 – Bishop Airport – Surrounding Land Uses

The Los Angeles Department of Water and Power (LADWP) is in receipt of the e-mail from Ms. Ashley Helms on September 17, 2020, requesting clarification of the land uses in the vicinity of the Bishop Airport (Airport). It is LADWP's understanding that Inyo County is conducting a National Environmental Policy Act (NEPA) environmental assessment for the Airport to assess impacts related to initiating commercial air service. The general study area for the NEPA assessment covers lands owned by the City of Los Angeles (City) and encompasses the Airport as well as adjacent land outside of the Airport leased premises.

City lands located within the general study area are under the control of LADWP and are owned for the primary purpose of watershed protection as a function of LADWP's water operations in providing a municipal water supply to the City. LADWP permits secondary uses of the property such as livestock grazing and access for public recreation. These secondary uses are allowed at the discretion of LADWP and its operational needs. The City lands within the general study area are undeveloped with the exception of commercial lease areas including the Airport, ranch lessee operating structures, fencing, irrigation ditches and canals, and water measuring and control structures.

If you have any questions regarding this matter, please write to LADWP at 300 Mandich Street, Bishop, California 93514-3449, attention Real Estate, or you may contact Mr. Scott Cimino, Senior Real Estate Officer, at (760) 873-0369, or by e-mail at scott.cimino@ladwp.com.

Sincerely,

Adam Perez
Manager of Aqueduct

SC:vg
c: Ms. Ashley Helms
   Mr. Scott Cimino
   Real Estate

E-2 FAA Correspondence Related to Compatible Land Use Assurance

County of Inyo

DEPARTMENT OF PUBLIC WORKS

168 N. Edwards Street, Independence, CA 93526

Main 760.878-.0201 Fax 760.878.2001

December 1, 2020

Ms. Cathryn Cason, Manager
Los Angeles Airports District Office
Federal Aviation Administration
777 S. Aviation Boulevard, Suite #150
El Segundo, CA 90245

Re: Federal Grant Assurances and Compatible Land Use
Bishop Airport, Inyo County, CA

Ms. Cason,

The Bishop Airport (BIH) is part of the federal National Plan of Integrated Airport Systems (NPIAS), and County of Inyo accepts federal Airport Improvement Program (AIP) grant funds to construct and maintain airport facilities. As a condition of federal funding, the County is obligated to maintain, operate and improve its facilities to comply with the grant assurances and to be as self-sustaining as possible.

Grant Assurance 6, Consistency with Local Plans (49 U.S.C 47107), requires proposed projects to be reasonably consistent with local plans of public agencies responsible for planning development of the area surrounding the airport. As the owner and operator of BIH, the County complies with and provides the necessary Airport Sponsor's compatible land use assurance for existing and proposed land uses in accordance with 49 U.S.C 47107(a)(10). The County provides assurance that appropriate action, including the adoption and enforcement of zoning laws, is undertaken to the extent reasonable to restrict the use of land adjacent to or in the vicinity of BIH to activities and purposes that are compatible with normal airport operations including the takeoff and landing of aircraft.

Please let me know if you have any questions or require additional information about BIH and the County's commitment to comply with federal grant assurances.

Sincerely,

A Helms

Ashley Helms
Deputy Director of Public Works – Airports
County of Inyo

APPENDIX F
Public Involvement

F-1 Introduction

Although scoping, as described in 40 CFR § 1501.7, is optional in the preparation of an Environmental Assessment (EA), it is often considered a useful and worthwhile exercise that allows environmental agencies, applicants, and the public, to the extent practicable, to participate in the preparation of an EA. The primary components of this appendix include transcribed oral testimony and written comments submitted at the two scoping workshops/meetings held for this project, as well as a copy of the public notice issued by Inyo County. The following sections provide a summary of the public scoping undertaken on behalf of this EA.

F-2 Public Scoping

Two public scoping workshops/meetings were held for the Draft EA. The first workshop/meeting was held on January 22, 2020 in Bishop, California, between 6:30 p.m. and 7:30 p.m. The second workshop was held on January 27, 2020 in Mammoth Lakes, California, between 6:00 p.m. and 7:00 p.m.

F-2.1 Bishop Scoping Workshop/Meeting - January 22, 2020

The first public scoping workshop/meeting was held on January 22, 2020 between 6:30 p.m. and 7:30 p.m. This workshop/meeting was held at the Bishop City Hall, City Council Chambers at 377 West Line Street in Bishop, CA. There were a total of 51 attendees: 47 from the general public, three elected officials and one representative from the media. The sign-in sheets for this meeting are provided below. These attendees contributed 10 verbal comments and 12 written comments. A presentation was given at the start of the meeting to provide attendees information on the project and the EA. A copy of the presentation is provided in Section F-4 of this appendix. **Table F-1** provides the transcribed oral comments received during the scoping workshop/meeting. Copies of the written comments received at the public workshop/meeting are provided following Table F-1.

TABLE F-1
PUBLIC SCOPING WORKSHOP ORAL COMMENTS - JANUARY 22, 2020

Commenter	Affiliation	Comment
Mark Vincent	Eastern Sierra Entertainment	"It's time for progressive all-inclusive regional planning to predominate as our beautiful area attracts visitors from all over the globe. I think planes landing both in Mammoth and Bishop is a fantastic growth for this entire region and we should all work to make sure this happens as quickly as possible. However, there are huge problems that need to be solved in a short amount of time. Opposition to the growth in this region will create a huge stymie and will impede getting these airports together."
Bruce Klein		"The environmental impacts of jet exhaustion noise are very well documented. The absorption of exhaust by native vegetation, soil, water and air do threaten eco systems, human health; disrupt reproductive cycles of wildlife, insect, animal, reptile as well as cattle. Additional impacts on alfalfa production can be substantial"
Leanne Wear	Mammoth	"The impact that happens when passengers are flying to Mammoth Airport to ski, or as an example, to attend a wedding and cannot land due to snow is terrible. I think it's an awesome opportunity to land in Bishop because of fewer restrictions due to weather. I think it is a great project and will have a huge impact on our community"
Susanne Rizo	Bishop	"I am confident that the environmental review will include the traffic and congestion. I currently work off of E. line St. The concern is congestion in that area. How are passengers going to get out of the airport and onto Main St? Another concern is the travel of the flight path. Will the flight pattern be over the schools? "
John Harris	Bishop, E. Line	"I am the closest piece of private property near the airport. My wife and I cannot wait to have a functional airport. We have no doubt that traffic will be affected but it is worth it to have the economy grow. To be able to have our children and grandchildren visit easier is worth it. I have a couple questions. I heard talk of Allegiant flying in? Ashley answered "it is a possible future conversation" Will there be flights from Mesa, Chicago, Atlanta and San Diego?" Ashely said "If the service here is successful, there will be a potential to expand services." In regard to the flight dates of Dec 1 8-April 18, which is catered to skiing season. It would be a shame to close in April for fishing season."
Julie Faber	Bishop	"I was contracted by the County in 2013 to a study and public outreach to see who was interested in having an airport in Bishop. There was an overwhelming approval. I do a lot of work with the chamber of commerce. Thank you for your visionary efforts. The carbon footprint going from LA back and forth is a lot less if we have an airport in Bishop."
Damon Cherenzia	Bishop	"I have been a resident for 12 years. I have traveled by car to Reno and Vegas way too many times to visit family. My mother is older and cannot come here because she cannot handle the drive. It has been a strain living here although I love it but I have thought of leaving because it is so hard to travel. My family is dreaming of Bishop getting an airport. Do you have an anticipated weather cancellation rate for bishop vs. Mammoth? "Ashely answered: "There are some very windy days but that is should not be a problem" "Will there be parking fees? Ashely said: "It would be similar to Mammoth". Damon asked: "Will there be an alternative airport entrance behind Vons?" Ashley said "it is not in the current airport plan and there was not a lot of support from business owners" Damon said: Will there be a terminal? Ashely said: "We have plans for a small expansion for our existing terminal, possibly a modular building."
Brent Truax	Sierra Nevada Resorts, Mammoth 19:30	"The Town of Mammoth Lakes supports the Mammoth Airport with financial contributions in addition [to the TBID]. Is Bishop also going to support the airport operations in the same way or how are you going to fund the operations at the airport because the TBID is only going to take care of the flights." Ashley: "The Bishop Airport is operated by Inyo County, so the City of Bishop wouldn't be contributing" Brent "Will Inyo

TABLE F-1
PUBLIC SCOPING WORKSHOP ORAL COMMENTS - JANUARY 22, 2020

Commenter	Affiliation	Comment
		County be contributing?" Ashley: "Yes" Brent: "Is there an agreement already in place?" Ashley: "The airport is an Inyo County facility, so no agreement is required" Brent: "[In regards to CEQA/NEPA] are you going to do an EA then decide on and EIS or have you already decided that an EIS is required?" Chris: "No, we are doing an EA" Brent: "Has the decision been made that an EA is enough or will there be a review of the EA afterwards for an EIS?" Chris: "We'll decide once we're completed with the EA" Brent: "Having been involved with the Mammoth Airport, CEQA documents usually take 18 months, and NEPA, the average in California is 54 months, so how will you get that done in the next 6 months? You have a very compressed schedule, I'm convinced you'll get there, I just don't see a path in the next 6 months to get there" Ashley: "This is maybe unusual compared to most NEPA/CEQA documents because there is no ground disturbing activity. Often those long lead time NEPA documents are because it is a large construction project with significate bio and cultural impacts." Brent: "But sometimes in there you have animal studies that take 18 months, so how do you get that done in 6 months, because I don't think there is a waiver for that to get the NEPA done in that timeframe." Chris: "We'll just have to see."
Jerry Sill	Missouri (may move to Bishop)	"Is this going to be a controlled airport" Ashley stated "This will not be a towered airport" "Will there be instrument approaches?" Ashley answered: "Yes, we do have instrument approaches. On Runway 30 we have an ILS approach" "Is there going to be car rental facility?" Ashley said "Yes, Enterprise. "My concern is fire support. Also, housing is very expensive here, additional housing will need to be considered. People will be moving into the area to work the airport. Are you going to allow military usage? I would like these points a part of the study".

SOURCE: Environmental Science Associates, 2020.

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Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: Bruce Klein

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

Please see attached.

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Additional Comment Space:

Fold Here

Place Stamp Here

Inyo County Public Works
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: Bruce Klein
Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

See attached Comment Form

(Continued)

Commercial Air Service to Bishop

- Is there a completed, FAA approved EIS for Bishop Airport runway improvements?
- What are the proposed takeoff & landing approaches for United?
- What is the proposed frequency of United flights into Bishop?
- What size jets are proposed?
- Declining enplanements at Mammoth/Yosemite over past years doesn't justify increased regional air service.
- Environmental impacts of jet exhaust & noise are well documented: absorption by native vegetation, soil, water & air threaten ecosystems, human health & disrupt reproductive cycles of wildlife (avian, insect, mammal & reptile) as well as cattle. Additional impacts upon quality of economically valuable Owens Valley alfalfa production can also be substantial.
- Living in the unique environment & communities of the Owens Valley requires specific sacrifices for many—a willingness to give up higher incomes in order to achieve & maintain high quality of life. Increased visitation produced by commercial air service essentially driven by the town of Mammoth, benefits relatively few businesses beyond Alterra & corporate hospitality, & inevitably degrades that quality of life.
- Bishop appears on the cusp of becoming an international destination, a result of converging strategies such as proposed commercial air service & a Sierra Nevada Conservancy initiative termed "Sustainable Recreation", which of course cannot exist.
- As Mammoth relentlessly pushes to sell higher priced real estate & generate more skier days, it remains further than ever from providing housing for its workforce, shifting it to Bishop rentals with the result that rental properties become unavailable & unaffordable for Inyo residents in a valley geographically

constrained by over 200,00 acres of Los Angeles ownership. Mammoth skier foundational demographics have always been, & will remain, automobile-based SoCal residents—for one thing, Mammoth requires a car to get around. Despite admirable opportunities provided by Eastern Sierra Transit, United's passengers will require rental vehicles.

Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: GERALD (JERRY) SALL

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

CONTROLLED AIRPORT?
INSTRUMENT APPROACHES?
FIRE SUPPORT?
TSA/BAGGAGE/ATC CONTROL/TICKET PERSONNEL
HOUSING? COSTS?
MILITARY USAGE?
COSTS/REVENUE
CAR RENTAL?
Fuel supply from?

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ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Additional Comment Space:

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Place Stamp Here

Inyo County Public Works
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: Damon Cherenzia
Address: [redacted]

Phone or Email: [redacted] com

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

Excited to not have to travel to Reno/Vegas to visit family. It has been a huge burden in my effort to live in this beautiful area.

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Additional Comment Space:

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Place Stamp Here

Inyo County Public Works
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: Susanne Rizo

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

Flight path not above schools
Traffic patterns on line street effected already
too congested

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

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Inyo County Public Works
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: Brian Matchell

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

1) I worry about Elite outdoors enthusiasts buying second homes, leaving them vacant and changing the culture of our town. With Bishop more accessable, more homes will be bought, prices will go up and our low-income labor force may be priced out.

2) There should be programs implemented to provide low-income Bishop residents with priority avenues for employment at the airport. Many of these residents live in East Bishop, the area that will be most impacted by noise, air pollution, traffic etc. The least we can do is provide struggling households with the opportunity for steady, well paying employment, which we know is scarce in the area.

3. What can residents expect for flight times + their noise? I live in East Bishop. Will I be woken up at night by the sound of airplanes?

Conclusion: I support the airport in Bishop. It will (hopefully) provide more jobs in the area and allow for my parents to visit w/o me driving to Vegas + back. I will bite the bullet on noise.

Please address noise, pollution, traffic, etc. that will undoubtedly impact our low-income residents the most. (Social Justice). Address locals being priced out by coastal elites.

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Additional Comment Space:

Fold Here

Place Stamp Here

Inyo County Public Works
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: Damon Cherenzia

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

Parking fees?
Anticipated weather cancellation rate?
Alternative airport road entrance?
Is there landing strip in other direction? (E/W N/S)?
Is Mammoth subsidizing flights?
Name of Airport? Bishop-Whitney Airport?

(Continued)

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: ROBERT ATLEE

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

- 1982 HISTORY — G.F. → BATTLE CREEK? OR BISHOP?
- PRIVATE COMMERCIAL —
- SAFETY 3 RUNWAYS VISIBILITY/PROXIMITY TO MTN
- 1 MI FROM SLO 20 FLIGHTS/DAY.
- NOISE
- BISHOP 2-3 MI NW APPROACH - LIGHT NEEDED'

(Continued)

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: JULIE FABER
Address: [redacted]
Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary): POSITIVE - SOCIOECONOMIC IMPACT.

In 2013, I was contracted to do public outreach for the Bishop Airport & there was overwhelming support.
My PRIORITY:
Keep finding ways to support Chamber / City / County's integrated efforts to market the Eastern Sierra as a region & the airport location in Bishop is truly what will tie this together. So I am here to say Thank you.

(Continued)

Personally I believe the carbon footprint is bigger if (when) flights are cancelled - fly back to LA or Reno, then have people drive here.

We're talking 3 flights/day in winter & one flight a day in the summer. This feels doable.

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: John Harris

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

There was talk of flights from San Diego, Mesa, AZ, Chicago and Atlanta
Are those still in contemplation?
There was talk of Allegiant. What happened?
3 flights stopping before fishing season
Great for economy
Alternate Route

(Continued)

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name:

Address:

Phone or Email:

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

(Continued)

Dec 15 to 4/15 3 flights day - LAX SFO DEN
1 daily from LA rest of year
United Express

Allegiant
Chicago, Mesa, Atlanta, San Diego

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: MARK VINCENT

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

COMMENT: IT'S TIME FOR PROGRESSIVE, ALL INCLUSIVE REGIONAL PLANNING TO PREDOMINATE AS OUR BEAUTIFUL AREA ATTRACTS VISITORS FROM ALL OVER THE GLOBE.

(Continued)

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Sign-in Sheet

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment and Initial Study
Public Scoping Workshop
January 22, 2020

Representing: (Check One)

Page ____ of ____

GENERAL PUBLIC	MEDIA	ELECTED OFFICIAL	TRIBAL REPRESENTATIVE	NAME	ADDRESS	PHONE	EMAIL
X				Michael States	[redacted]		
X				Christy Jennings	[redacted]		
X				Andrew Clark	[redacted]		
X				Lucas Rooke	[redacted]		
X				MARK VINCENT	[redacted]		
X				Sue Butler	[redacted]		
X Town				Kim Cooke	[redacted]		
X				Karen M. Kong	[redacted]		
X				ANDREW KONG	[redacted]		
X				Deena Davenport Conway	[redacted]		
X				Susanne Rios	[redacted]		
X				Kay Ogden	[redacted]		
X				Rick Kattelmann	[redacted]		
		X		Rick Pucci	[redacted]		
		X		Stephen Muchovej	[redacted]		
				Doug Talmage	[redacted]		

Sign-in Sheet

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment and Initial Study
Public Scoping Workshop
January 22, 2020

Representing:
(Check One)

Page ____ of ____

GENERAL PUBLIC	MEDIA	ELECTED OFFICIAL	TRIBAL REPRESENTATIVE	NAME	ADDRESS	PHONE	EMAIL
X				Wayne Martin	[redacted]		
X				Randy Fenton	[redacted]		
X				Derik Olson	[redacted]		
X				Anne Stark	[redacted]		
/				Matt Kingsley	[redacted]		
X				Jon Russell	[redacted]		
				Marcus Marcuson	[redacted]		
X				Sherri Lisius	[redacted]		
X				Martin Oliver	[redacted]		
X				Warren Boling	[redacted]		
X				LeeAnn Waite	[redacted]		
X				Julia Swanson	[redacted]		
X				Damon Cherenzia	[redacted]		
X				Gigi de Jong	[redacted]		
X				Robert Atche	[redacted]		
X				Bryan Hatchell	[redacted]		

Sign-in Sheet

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment and Initial Study
Public Scoping Workshop
January 22, 2020

Representing:
(Check One)

Page ____ of ____

GENERAL PUBLIC	MEDIA	ELECTED OFFICIAL	TRIBAL REPRESENTATIVE	NAME	ADDRESS	PHONE	EMAIL
X				Wayne Martin	[redacted]		
X				Randy Fendon	[redacted]		
X				Derik Olson	[redacted]		
X				Anne Stark	[redacted]		
/				Matt Kingsly	[redacted]		
X				Jon Russell	[redacted]		
				Marcus Marcuson	[redacted]		
X				Sherri Lisius	[redacted]		
X				Martin Oliver	[redacted]		
X				Warren Boling	[redacted]		
X				LeeAnn Wayne	[redacted]		
X				Julia Swanson	[redacted]		
X				Damon Cherenzia	[redacted]		
X				Gigi de Jong	[redacted]		
X				Robert Atcke	[redacted]		
X				Bryan Hatchell	[redacted]		

Gen Public Heather Johnston [redacted] [redacted]

MATT McCLAIN [redacted]

Media Christina Reed The Sierra Reader [redacted]

F-2.2 Mammoth Lakes Scoping Workshop/Meeting - January 27, 2020

A second public scoping workshop/meeting was held on January 27, 2020 between 6:00 p.m. and 7:00 p.m. This workshop was held at the Town of Mammoth Lakes Offices at 437 Old Mammoth Rd., Suite Z in Mammoth Lakes, CA. There were a total of 24 attendees: 20 from the general public, three elected officials, and one representative from the media. The sign-in sheets for this meeting are provided below. These attendees submitted four verbal comments and two written comments. A presentation was given at the start of the meeting to provide attendees information on the project and the EA. A copy of the presentation is provided in Section F-4 of this appendix. **Table F-2** provides the transcribed oral comments received during the scoping workshop/meeting. Copies of the written comments received at the public workshop/meeting are provided following Table F-2.

TABLE F-2
PUBLIC SCOPING WORKSHOP JANUARY 27, 2020

Commenter	Affiliation	Comment
Doug Talmage	Bishop Resident	"I have a desire for commercial air service to be restored to the Bishop Airport and retained at the Mammoth Airport. My first commercial use was back in 1987 with Alpha Air. Landing in Mammoth and making a shot to Bishop. I have kept my eyes open for workshops like these and try to plug the commercial aircraft service at Bishop Airport. I don't want Mammoth to lose their commercial service. I was discouraged when a friend of mine made comments last meeting in Bishop when he said "Pilots don't like to fly into Mammoth Airport for safety issues." Mr. Talmage went on to say "That was an exaggeration. Mammoth is very safe for pilots." "I wanted to state that publically so that it is on record."
Meg Greenfield	East Coast Resident	"I have been coming here for 2 or 3 months every winter for 6 years. We have flown into Mammoth but this year we didn't even try. This year we flew to Reno and took the bus to Mammoth Lakes. I have mixed feelings about this proposal. I have practical questions that I think relate to environmental impact. How are you going to get from Bishop to Mammoth? Do we have to rent a car? What happens to the rental car service at Mammoth? Will there be a public shuttle that will run between Bishop and Mammoth lakes? What happens to the Taxi cab services? Lastly what if the road is closed after landing? I think these are questions that need to be addressed in this plan." Ashley said "These are issues that will be addressed in the environmental document. There will be a transportation plan that is analyzed." Mrs. Greenfield said "Are there plans that can be described now?" Mike Errante said "There will be several options. There will be rental cars available, ESTA service, and Shuttles." Ashley stated "There will be another public work shop in the summer with a chance for public comment. The documents will be available on line".
Brent Truax	Sierra Nevada	I was at the Bishop meeting, and I was a little disappointed tonight; you went into more detail last time. I thought there were some comments you would have incorporated into here, because to us, as we watch what you're doing there, it's a little unclear sometimes. You're paving some areas, terminal buildings. Some of those conversations would have been valuable to the community here to hear what you're doing. You're proposing that you're going to get the work done by October so the flights can come in. My calculations for timeframes for the FONSI for the FAA, the NEPA/CEQA, and public comment timeframes, and you still have the evaluation between an EA and EIS/EIR. And I want to be clear; we are all searching for a reasonable air regional service solution, lower

TABLE F-2
PUBLIC SCOPING WORKSHOP JANUARY 27, 2020

Commenter	Affiliation	Comment
		cancelation rate, etc. We really want longer air haul flights coming to the area, and not what we are currently doing. San Diego was a good flight before, but no longer, we have the charter; San Francisco, Denver. If we're going to really accomplish what we're looking for, at least as a business owner in this town. We're going to need flights from Houston, Chicago, New York. And I recognize that these are stepping stones, and it takes time. All of us, excuse me, some of us, have been involved in many different things in town that take much longer than we anticipate. Mammoth Airport has undergone many different things. Things are sometimes delayed. I just want to make sure we are being realistic on timeframes of analysis. There are financial considerations, environmental considerations; there are business considerations of transport. It's a short period of time."
Anonymous		Does JetSuite X have access to the [Bishop] Airport during inclement weather? Ashley "Yes, JetSuite X is a Part 135 aircraft; they are currently able to divert to Bishop. So we have maybe 10 diversions a season." "Who uses [the airport] now? Is it private aviation?" We have some commercial operations; FedEx and Ameriflight have operations there, we have an air ambulance based there, and a lot of military activity. As well as a lot of other general aviation, and the charter flights mentioned"

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: Doug Talmage

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

I am advocating commercial air service at BOTH Bishop and Mammoth Lakes

(Continued)

Speaker Card

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 27, 2020

Name: MEG GREENFIELD
Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide a brief summary of your question/comment in the area below. (See back or attach additional sheets if necessary):

1. How will people travel between Bishop + ML? Public Transit?
2. Will rental cars still be available @ ML. Airport - if not where?
3. What happens when road between Bishop + ML is closed?

(Continued)

Sign-in Sheet

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment and Initial Study
Public Scoping Workshop
January 27, 2020

Page ____ of ____

Representing: (Check One)

GENERAL PUBLIC	MEDIA	ELECTED OFFICIAL	TRIBAL REPRESENTATIVE	NAME	ADDRESS	PHONE	EMAIL
				Lucas Moore	[redacted]	[redacted]	[redacted]
		X		Kate Morley	[redacted]	[redacted]	[redacted]
				Sierra Shultz	[redacted]	[redacted]	[redacted]
X				Betsy Truax	[redacted]	[redacted]	[redacted]
X				Stuart Brown	[redacted]	[redacted]	[redacted]
X				Grady Dutton	[redacted]	[redacted]	[redacted]
X				Brad Truax	[redacted]	[redacted]	[redacted]
✓				Mike Britton	[redacted]	[redacted]	[redacted]
✓				C Casey	[redacted]	[redacted]	[redacted]
x				Robert Brence	[redacted]	[redacted]	[redacted]
X				Chris Adams	[redacted]	[redacted]	[redacted]
X				Meg Greenfield	[redacted]		[redacted]
x				David Weinstein	" "		& B
				Rhonda Duggan	[redacted]		[redacted]
X				Heather Johnston	[redacted]		[redacted]

Sign-in Sheet

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment and Initial Study
Public Scoping Workshop
January 27, 2020

Representing:
(Check One)

Page ____ of ____

GENERAL PUBLIC	MEDIA	ELECTED OFFICIAL	TRIBAL REPRESENTATIVE	NAME	ADDRESS	PHONE	EMAIL
X				Doug Talmage	[redacted]		
	X			Zachary Hirt	[redacted]		
✓				Dan Holler	[redacted]		
		X		JOHN WENTWORTH	[redacted]		
		X		Lynda Salcido	[redacted]		
X				Rich Boccia	[redacted]		
Y				Matt Gebo	[redacted]		
X				Rob Patterson	[redacted]		
X				John Urdi	[redacted]		

F-2.3 Comments Received Electronically

The following pages provide a copy of the public notice for the public workshops/meetings conducted for this project.

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Ashley Helms

From: sherri lisius [redacted]
Sent: Saturday, January 25, 2020 8:24 AM
To: Ashley Helms
Subject: airport comments

Hello Ashley,

Thanks for the information at the public meeting!

A few comments...

1) Please consider dark skies when completing your analysis. I live on the far east side of town and a lot of new lights will change the character of the area and not be good for night flying animals. Consider lights that point down and all the typical ways to reduce light pollution.

2) The proposal as it stands doesn't concern me too much. However the discussion of the potential for more flights and more airlines was concerning. If it is reasonably foreseeable that there may be more traffic in the future, please disclose this very clearly in the proposed action or cumulative effects. If you think the dates for 3 day a week flights could change or there could be more flights or airlines, be sure to analyze this so that you are transparent and capture all the effects.

3) Number of flights. For the proposed action and effects analysis, please be clear that it is really 6 take offs and landings a day not just 3.

Thanks and good luck on the analysis!

Ashley Helms

From: Stephen Muchovej [redacted]
Sent: Thursday, January 23, 2020 10:20 AM
To: Ashley Helms
Subject: Environmental Assessment/Initial study comments

Follow Up Flag: Follow up
Flag Status: Completed

Hi Ms. Helms--

Thank you for your presentation yesterday. My comment is with regards to the noise analysis that will take place in the environmental process. It would be useful if we had something to compare the resulting noise contour maps that will be generated from the study to something the public would comprehend. As such, I kindly request that when these maps are produced, that there be an accompanying map that depicts the noise levels around city hall when the noon alarm goes off. This would give the public a way to compare the maps to something familiar to them.

Thanks.

Stephen Muchovej

Ashley Helms

From: Sandy [redacted]
Sent: Sunday, January 26, 2020 3:05 PM
To: Ashley Helms
Subject: AIRPORT COMMENTS INYO REGISTER

TO ASHLEY HELMS:
YES! PLEASE – MOVE AHEAD WITH SERVICE TO BISHOP!!!! October 2020!
When I lived in Monterey, I tried several times, in winter to come to Bishop (visit family) through Mammoth…I got turned back twice from LA because of weather in Mammoth. It was exhausting, and I finally gave up trying.
Now I'm living here and find the drive to Monterey and LA very tiring. I would like to fly both to LA (family) and, occasionally, to Monterey from there.
You will have many more happy visitors, and a safer airport.

Sandra Miles

Ashley Helms

From: Gary Leal [redacted]
Sent: Wednesday, January 29, 2020 10:04 PM
To: Ashley Helms
Subject: Air service

Flying into Bishop May make sense for people who are traveling from a long distance to LAX or SFO and then make the short last jump to Bishop (Presumably followed by bus or some sort of transfer to Mammoth). But for California residents who fly to Mammoth this does not make sense and we will likely not do it. By the time I get to SFO or LAX, wait to board and are then faced with at least 60-90 additional minutes to actually get to Mammoth from Bishop, I might as well drive(especially since I then have my own transportation in town). Maybe it makes sense for the Denver flight but it will kill off a large fraction of current passengers from using air service.
G. Leal
Sent from my iPhone

F-2.4 Comments Received via Post

The following pages provide a copy of the public notice for the public workshops/meetings conducted for this project.

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Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: Concerned Citizen Of Bishop Ca.

Address:

Phone or Email:

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

#1, The big horn sheep in the Silver Canyon/White Mountain range area seem to be thriving, is the extra noise going to drive the heard to the east side of the mountain range.

#2, Wondering how the noise will affect the 20 plus homes an those residents in the Van Loon community,the runway is roughly only 800 yards from the Van Loon Community.

Will this affect the home owners property value by having comerical planes flying over the area?

#3 There has been studys claiming that living near an airport "may be bad for your health" People who live within six miles of an airport have higher levels of asthma and heart problems. This would put the whole City of Bishop at risk since the airport is roughly only 2 miles from Main and Line street.

#4, Line street to the airport is primarily residential with lots of kids playing along the road and fishing the canal area. The extra traffic in the area will potentially put these kids at risk to be involved in a accident.

#5, Where is the county going to come up with the extra funds to maintain this considering they aren't even keeping up with thier current infrastructure.

#6, How does this create revenue for Bishop considering most of the pepole flying are going directly to Mammoth Lakes Ca.?

#7, How will this affect air pollution overall in the Owens Valley?

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

DEPARTMENT OF TRANSPORTATION
DISTRICT 9
500 SOUTH MAIN STREET
BISHOP, CA 93514
PHONE (760) 872-0785
FAX (760) 872-0678
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

February 5, 2020

Ms. Ashley Helms
Inyo County Public Works
P.O. Drawer Q
Independence, CA 93526

File: Iny-395-115.4
Scoping
SCH #: none

Bishop Airport - Commercial Service - Scoping Environmental Assessment/Initial Study

Dear Ms. Helms:

The California Department of Transportation (Caltrans) District 9 appreciates the opportunity to comment during the scoping phase for the proposed commercial air service at Bishop Airport. Please consider the following in project analysis:

- Address additional surface traffic and circulation patterns for transportation modes - passenger vehicles, transit, etc. Assess impacts at the East Line St intersection with US 395 (Main St)/SR 168. Assess if circulation would be optimized with an additional access - such as previously discussed in the Bishop Area Access and Circulation Study (2007), by the Inyo County Local Transportation Commission, and elsewhere. Thus, assess impacts to the Wye Rd area with US 6/US 395.

- Offer appropriate transportation system design features and mitigation to ensure operational efficiency for airport users, through-travelers, pedestrians, and bicyclists.

- Consider including a designated transit stop with passenger amenities and information kiosk. This would further integrate the transportation system and support the California Transportation Plan 2040 (2016).

- Examine the need to provide electric vehicle charging infrastructure, which would also support the California's Zero Emission Vehicle Action Plan (2016).

We look forward to interacting with the County and other entities as this air service proposal proceeds. For any questions, feel free to contact me at (760) 872-0785 or at gayle.rosander@dot.ca.gov.

Sincerely,

Gayle J. Rosander

GAYLE J. ROSANDER
External Project Liaison

c: Mark Reistetter, Caltrans D9

Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: Daniel Goodwin

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

Please Consider the Following:
Future number of Flights/Day ?
Hours of Operation of airport
Noise impacts to Bishop and Surrounding areas + Wilderness
Vehicle traffic in Bishop (# of additional cars + trucks)
Potential Impacts to Siera Wave Clouds (visual Impact)

Inform the public of
the date of noise testing
Approach and departure Routes + elevation Profile
proposed hours of operation

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop

January 22, 2020

Name: Veronica Zielinski

Address: [redacted]

Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

I believe there are several issues which are not being addressed or at least conveyed to the public. Most of which involve the cost of year round commercial air service and transportation costs.

1) Who will be paying the airline the subsidized funds during the 8 months of off season flights? How are these funds going to be raised? MMSA/Altura does not currently pick up these costs with flights to MMH. Is Inyo County and the Town of Bishop going to absorb these costs? Current subsidies paid are for a 70 passenger plane. Those costs will rise if the projected 130 passenger planes are utilized.

2) How will transportation to Mammoth from Bishop be funded? MMSA currently provides transportation during the December-April ski season, BUT ONLY FOR PASSENGERS STAYING AT MOUNTAIN PROPERTIES. If ESTA is contracted to perform these services, what will it cost and who will provide the funding? What about airline passengers that are staying at other hotels, private condos etc.? Will they have to rent a car or take a non-existent TAXI?

I believe the people of Bishop and Inyo County deserve transparency on these issues even if they do not know the questions to ask in open forum. Especially if they are the ones who may ultimately be asked to foot the bill.

3) And why is this "Comment Form" not in a public forum for everyone to view?

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Comment Form

Bishop Airport - Proposed Commercial Air Service
Environmental Assessment / Initial Study
Public Scoping Workshop
January 22, 2020

Name: Katy Belt
Address: [redacted]
Phone or Email: [redacted]

When commenting, please include your full name and address. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask in your comment to withhold from public review your personal identifying information, it cannot be guaranteed that we will be able to do so.

Please provide comments in the area below. (See back or attach additional sheets if necessary):

Dear Inyo Co Public Works

Thankyou for taking public comment on this issue. I attended your recent meeting in Bishop.

I'm strongly opposed to the expansion for these reasons:

- Its impact on wildlife; bighorn sheep etc.
- air pollution (its a basin)
- noise pollution
- the visual interferance within the Wilderness experience that is only available in the Sierras Whites and Inyos. The Owens is an uncommonly untrammeled Valley. And the wilderness quality of it's adjacent Ranges can't be found elsewhere in the Lower 48.
- The airport mostly services Mammoth Ski Resort. I think the expansion is a result of the new ownership; They won't be directly effected by increase air and noise pollution.
- 3 jets/day in winter and 1/day in summer is only the beginning. More air traffic would follow.
- It will increase carbon production.

The comment period ends on February 6, 2020 at 5PM. Comments may be submitted at the Public Workshop or to the following addresses:

MAIL: **Inyo County Public Works**
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Additional Comment Space:

- I struggle to believe Bishop residents "unanimously" support expanding the airport because all I've spoken with are against it. Please make those surveys public if you haven't yet. Thanks.

- Very significantly the plan to complete the project by October 2020 doesn't allow the time needed to do environmental impact studies. The very studies that are needed for sound decisions and planning.

- If the project is aproved I ask that you be ecologically responsible. Please guide the project with respect for the Wilderness.

Thank you for your consideration of my concerns, Katy Belt

(I'm moving to Bishop. So I'm a local too.)

Fold Here

K. Belt

[redacted]

Inyo County Public Works
ATTN: Ashley Helms, Associate Engineer
168 N Edwards, CA
Independence, CA 93526

Place Stamp Here

Dear Inyo County Public Works,

Thank you for taking public comment on this issue. I attended your recent meeting in Bishop.

I am strongly opposed to the expansion of the Bishop airport for the following reason:

-Its impact on wildlife; bighorn sheep in particular.

-air pollution (isn't Bishop in a basin?)

-noise pollution

-the visual interference within the wilderness experience that is only available in the Sierras, the Whites, and Inyos. The Owens Valley is an uncommonly untrammeled valley. And the wilderness quality of it's adjacent ranges can't be found elsewhere.

-The airport mostly services Mammoth Ski resort. I think this expansion is a result of its new ownership; they won't be directly effected by the noise, and air pollution.

- 3 jets/day in winter, and 1/day in summer is only the beginning. More air traffic will follow.

-It will increase carbon production.

-I struggle to believe Bishop residents "unanimously" support expanding the airport because all I've spoken with are against it. Please make those surveys public if you haven't yet. thanks.

-Very significantly the plan to complete the project <u>by October 2020</u> doesn't allow the time to do environmental impact studies. The very studies that are needed for sound decision and planning.

-If the project does is approved, I ask that you be ecologically responsible stewardship. Please guide the project with respect for the wilderness.

Thank you for you consideration of my concerns, Katy Belt
(I'm moving to Bishop, so I'm a local too.)

my handwriting is not easy to read so I'm including this for clarity. Thanks!

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F-2.5 Public Notice

The following pages provide a copy of the public notice for the public workshops/meetings conducted for this project.

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NOTICE OF SCOPING WORKSHOP/MEETING
ENVIRONMENTAL ASSESSMENT / INITIAL STUDY
FOR THE PROPOSED AIRLINE SERVICE AT THE BISHOP AIRPORT

Project: Proposed Airline Service at the Bishop Airport

Description and Location: Inyo County proposes to initiate commercial airline service at the Bishop Airport (BIH). The Proposed Project includes the amendment of the Operations Specifications for United Airlines (United Express) to allow scheduled commercial air service to BIH, and the issuance of an Airport Operating Certificate (Class I) pursuant to 14 Code of Federal Regulations, Part 139.

Environmental Review: Inyo County is preparing an Environmental Assessment (EA), and an Initial Study (IS) to evaluate and disclose the potential environmental impacts associated with the proposed airline service at the Bishop Airport. The EA will be prepared in accordance with the National Environmental Policy Act, and the IS will be prepared pursuant to the provisions of the California Environmental Quality Act. The Final EA will be submitted to the Federal Aviation Administration (FAA), and the FAA will use the EA when deciding whether to issue a Finding of No Significant Impact or to prepare an Environmental Impact Statement. The Final IS will result in the subsequent preparation of a Negative Declaration, Mitigated Negative Declaration, or an Environmental Impact Report.

Scoping: Inyo County is holding a public Scoping Workshop/Meeting as part of the preparation of the EA and IS for the proposed air service. The meeting will provide an opportunity to provide input on environmental issues related to the proposed action, alternatives to be evaluated, and suggestions on the scope of the environmental documents. There will be an additional opportunity to comment on the proposed project when the Draft EA and IS are circulated for public comment. The scoping period for the proposed project begins January 11, 2020 and ends February 6, 2020.

Workshops:

DATE	LOCATION	TIME
Wednesday January 22, 2020	Bishop City Council Chambers 377 West Line St, Bishop, CA	6:30 to 7:30 PM
Monday January 27, 2020	Town of Mammoth Lakes Offices 437 Old Mammoth Rd, Suite Z Mammoth Lakes, CA	6:00 to 7:00 PM

The meetings are wheelchair accessible. For special requests, contact Ashley Helms (contact information below) at least three working days before the meeting. Efforts will be made to accommodate special needs.

Those who cannot attend the workshop may submit written comments to the address or email address below.

Submit scoping comments, in writing, no later than 5:00 PM, February 6, 2020 to
Ashley Helms, Inyo County Public Works
168 N Edwards, Independence, CA 93526
Phone: 760-878-0200 Email: ahelms@inyocounty.us

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F-2.6 Presentation

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Bishop Airport

Commercial Air Service

Environmental Assessment and Initial Study

Public Scoping Workshop January 22, 2020

6:30 to 7:30 PM

Bishop City Hall, City Council Chambers

Bishop, CA

Welcome

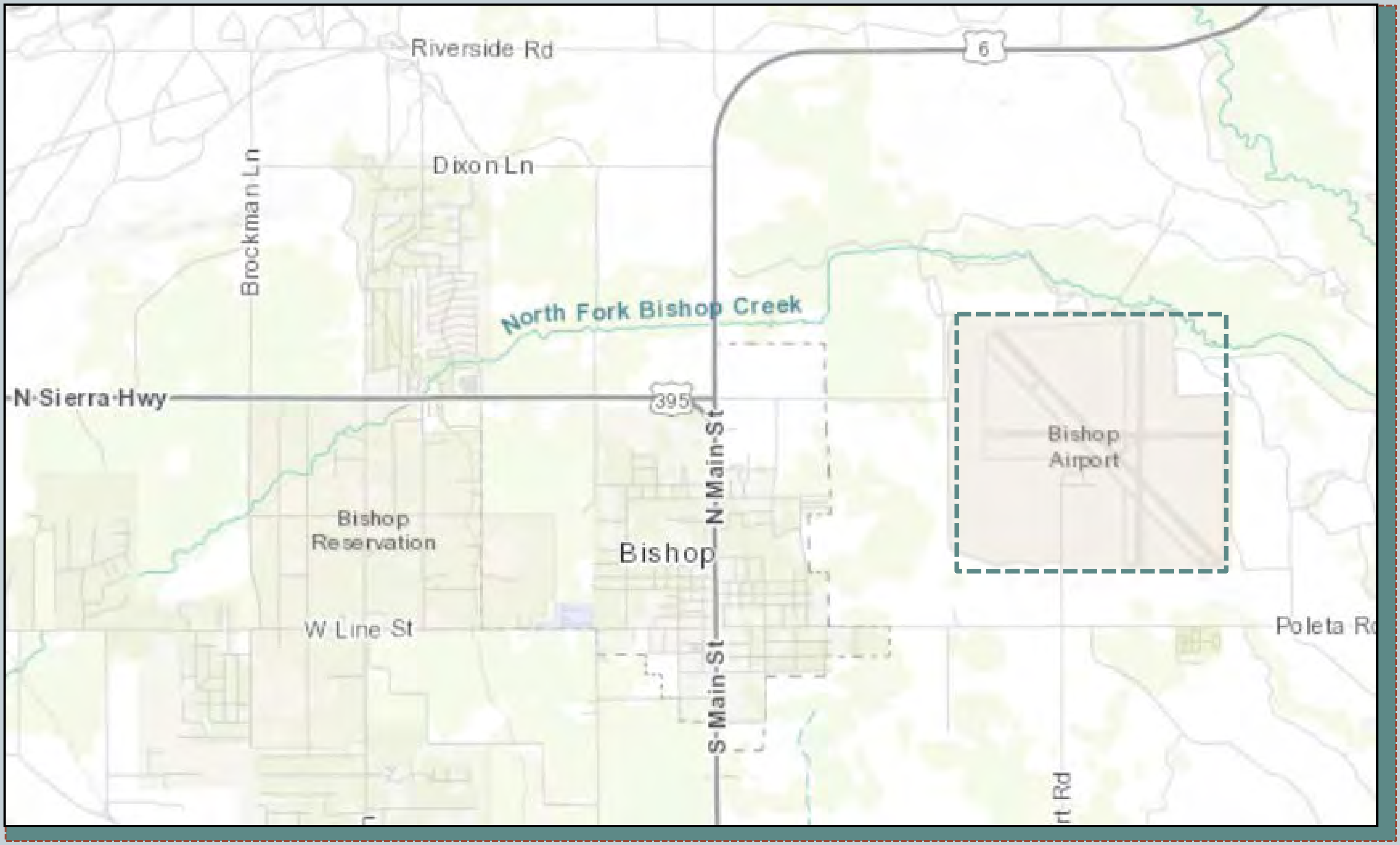
- Sign in at table near entrance
- To provide verbal comment tonight, fill out a speaker card
- To comment in writing use the provided comment sheet
  - Drop off at the end of the meeting
  - Mail or fax later
- Please hold comments and questions until end of presentation

Agenda

- Introduction – County Supervisor Jeff Griffiths
- Project Overview
- Environmental Review Process
- Public Comments and Questions

INTRODUCTION

Airport Location



AIRPORT FACILITIES

- Runway 12-30: 7500’ X 100’, Rehabilitation project in summer 2020
- Taxiway A: Rehabilitation project in spring 2020
- Apron: Reconstructed in 2017

Project Background

PROPOSED COMMERCIAL AIR SERVICE

- United Express
- 3 flights daily during winter season: Dec 15 – Apr 15
  - LAX, SFO, DEN
- 1 flight daily from LAX during summer and shoulder seasons

ENVIRONMENTAL REVIEW PROCESS

Environmental Review Process

- The following federal actions require review under the National Environmental Policy Act (NEPA):
  - Issuance of Airport Operating Certificate and
  - Amendment of United Airlines Operations Specifications
- Environmental Assessment (EA) is being prepared
- Inyo County is concurrently preparing an Initial Study (IS) in compliance with the California Environmental Quality Act (CEQA)
- Environmental analysis informs the planning process
- Analysis to include Proposed Project and the No Project Alternative

Environmental Review Process

Define the Proposed Project

Identify Preliminary Alternatives

Issue Public Notice of Scoping Workshop

Agency and Public Scoping Workshop

Review and Evaluate Scoping Comments

Prepare Draft EA (NEPA) and IS (CEQA)

Circulate Draft Environmental Documents for Public Review

Hold a Public Workshop and/or a Public Hearing for EA

Review and Prepare Responses to Public Comments

County Considers and Approves CEQA Documents

Circulate Final Documents with Response to Comments

FAA Issues Decision Document (e.g., FONSI)

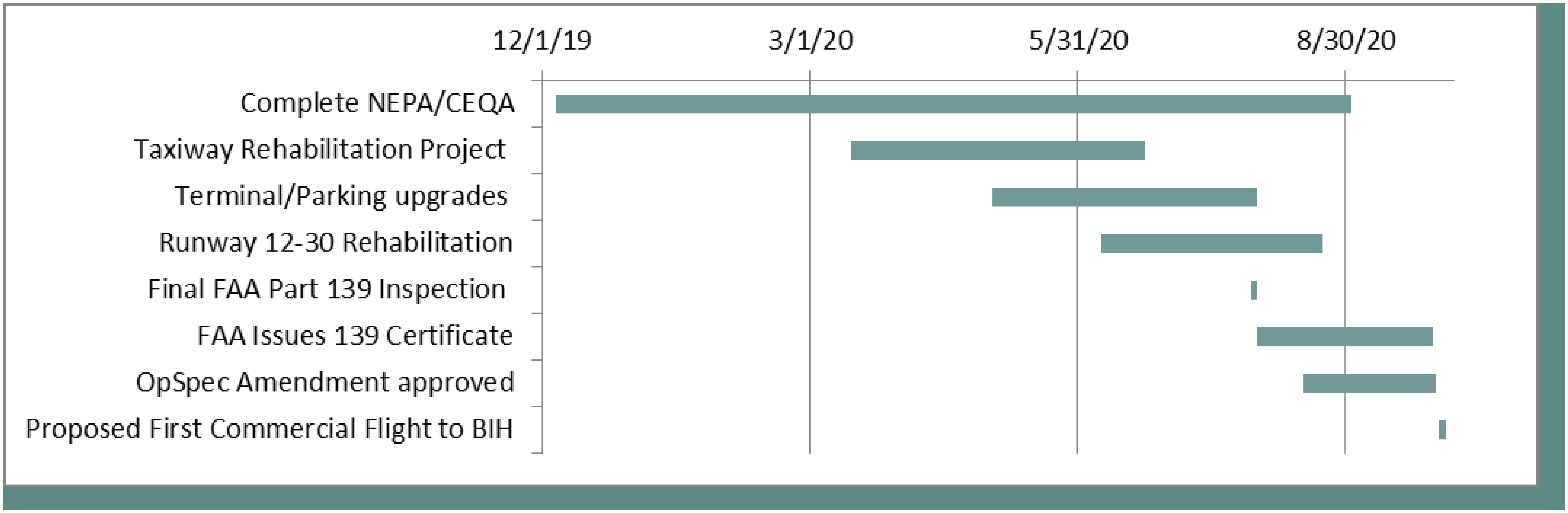
Environmental Review Objectives

- Provide detailed description of the proposed project and existing environment
- Analyze and present potential environmental effects
- Identify ways to reduce environmental effects (if any) through mitigation
- Support agency decision-making process
- Encourage public participation

NEPA / CEQA Environmental Topics

- Air Quality
- Biological Resources
- Climate
- Department of Transportation Act, Section 4(f)
- Hazardous Materials, Solid Waste, and Pollution Prevention
- Historical, Architectural, and Cultural Resources
- Land Use
- Natural Resources and Energy Supply
- Noise and Noise-Compatible Land Use
- Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks
- Visual Effects
- Water Resources
- Cumulative Impacts
- CEQA Specific Topics (e.g., Transportation/Traffic)

Anticipated Schedule



PUBLIC SCOPING COMMENTS

Public Comment Process

- Submit speaker cards to speak
- Wait until your name is called
- Speak clearly and state your name and association
- Verbal comment time is limited to 5 minutes
- Use comment forms for written input

Provide Written Comments

Comments due February 6, 2020

Ashley Helms
Inyo County Public Works
PO Drawer Q
Independence, CA 93526
Phone: (760) 878-0200
Fax: (760) 878-2001
E-mail: ahelms@inyocounty.us

THANK YOU FOR YOUR PARTICIPATION

Provide Written Comments

Comments due February 6, 2020

Ashley Helms
Inyo County Public Works
PO Drawer Q
Independence, CA 93526
Phone: (760) 878-0200
Fax: (760) 878-2001
E-mail: ahelms@inyocounty.us

Appendix G
Air Quality and Climate Technical Analysis

ESA

G-1 Air Quality and Climate Analysis Technical Memorandum

Draft

PROPOSED COMMERCIAL AIRLINE SERVICE AT BISHOP AIRPORT

Air Quality and Climate Analysis

Prepared for
Inyo County Department of Public Works

February 2021

Draft

PROPOSED COMMERCIAL AIRLINE SERVICE AT BISHOP AIRPORT

Air Quality and Climate Analysis

Prepared for
Inyo County Department of Public Works

February 2021

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Air Quality and Climate Analysis

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PROPOSED COMMERCIAL AIRLINE SERVICE AT BISHOP AIRPORT

Air Quality and Climate Analysis

1. Introduction and Overview

This report provides an analysis and overview of the air quality and climate modeling data preparation and resulting aircraft and roadway operational emissions for the 2019 Existing Condition and future years of 2022 and 2028 at Bishop Airport (BIH). This air quality and climate analysis was prepared as a part of the Environmental Assessment (EA) for the proposed commercial airline service. The FAA's Aviation Environmental Design Tool version 3c (AEDT 3c) was used to develop aircraft and ground support equipment (GSE) emissions. The EMFAC2017 web database with application of the SAFE rule for future years of 2022 and 2028 was used to calculate the roadway emissions.

The aircraft and roadway operational emissions were prepared using the existing and forecasted aircraft and vehicle activity for the BIH EA. A detailed discussion of the model inputs used to develop air quality and greenhouse gas (GHG) emissions calculations is included in the following sections.

2. Regulatory Setting

This section provides information pertaining to regulatory conditions in the vicinity of BIH, which includes the Great Basin Valleys - Air Basin. For example, this includes information on attainment/nonattainment designations, and applicable regulatory criteria and/or thresholds that will be applied to the results of the air quality assessment.

2.1 Federal

The United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3) and its precursors such as oxides of nitrogen (NO_x) and volatile organic compounds (VOCs), particulate matter (PM_{10} and $PM_{2.5}$), and sulfur dioxide (SO_2). In complying with the National Environmental Policy Act (NEPA), the FAA must determine if a Federal Action would cause criteria pollutant concentrations to exceed the NAAQS.

FAA will evaluate if the emissions caused by the Proposed Action would result in a significant impact under the FAA's NEPA threshold (discussed in Section 3.2 below). While there are four air quality plans in the Great Basin Unified Air Pollution Control District (GBUAPCD), none of them are applicable to this analysis.

Exhibit 4-1 of FAA Order 1050.1F provides the FAA's significance thresholds for air quality:

> *"The action would cause pollutant concentrations to exceed one or more of the [NAAQS], as established by the [EPA] under the [CAA], for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations."*

2.2 State of California

The Clean Air Act (CAA) allows states to adopt air quality regulations and standards provided they are at least as stringent as the NAAQS. The California Air Resources Board (CARB) was tasked with establishing the California Ambient Air Quality Standards (CAAQS) via the California Clean Air Act of 1988 (CCAA). This motion established CAAQS for pollutants not covered in the NAAQS including sulfates, H_2S, vinyl chloride, and visibility-reducing particles.

Like NAAQS, geographic areas that do not meet the CAAQS are called "nonattainment areas." The CARB is responsible for enforcing regulations to achieve and maintain the NAAQS and CAAQS. The CARB is responsible for reviewing operations and programs in local air districts and requires each air district with jurisdiction over a nonattainment area to develop a strategy for achieving the NAAQS and CAAQS. The local air district, in this case the GBUAPCD, is responsible for the development, implementation, and enforcement of rules and regulations designed to attain the NAAQS and CAAQS in the Great Basin Valleys – Air Basin.

2.2.1 Great Basin Unified Air Pollution Control District

GBUAPCD is the air pollution control agency with jurisdiction over Alpine, Mono, and Inyo County. The Great Basin Valleys - Air Basin (Air Basin) covers the whole GBUAPCD jurisdiction. The purpose of the GBUAPCD is to enforce federal, state, and local air quality regulations and to ensure that the federal and state air quality standards are met.

There are four air quality plans that are currently adopted by the GBUAPCD: Owens Valley PM10 State Implementation Plan (SIP), Mono Basin PM10 SIP, Coso PM_{10} SIP, and the Mammoth Lakes Air Quality Management Plan (AQMP). None of these air quality plans are applicable to the proposed action. While the GBUAPCD has not adopted numerical thresholds, it has adopted daily thresholds for criteria air pollutants from the Mojave Desert Air Quality Management District (MDAQMD) for its regional thresholds of significance.

2.2.2 Greenhouse Gases

The climate change regulatory setting – international, federal, state, and local – is complex and rapidly evolving. The EPA is responsible for implementing federal policies to address GHGs. The federal government administers a wide array of public-private partnerships to reduce the quantity of GHGs generated in the United States. The EPA has published endangerment findings for greenhouse gases indicating that emissions of GHGs from new motor vehicles and certain aircraft contribute to air pollution that endangers the public health and welfare under the CAA, Section 202(a).

There are currently no accepted methods of determining significance for aviation project-related GHGs given the small percentage of emissions contributed. Consistent with FAA Order 1050.1F, a projection of the GHG emissions was estimated. GHGs include carbon dioxide (CO_2), methane (CH_4), NO_2, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Despite this guidance, there are no significance thresholds associated with GHGs. CEQ instructs Federal agencies to disclose a project’s contribution to GHGs in a study area although the need to disclose such emissions for General Conformity purposes does not exist.

The FAA has not established a significance threshold for climate and GHG emissions, nor has the FAA identified specific factors to consider in making a significance determination for GHG emissions. Given the small percentage of emissions that aviation projects contribute, a NEPA analysis is not required to attempt to link specific climate impacts to the Proposed Action or alternative(s).

2.3 Attainment Status

The Airport is located in Inyo County, within the GBUAPCD. The NAAQS and CAAQS attainment/nonattainment statuses for the GBUAPCD are presented in **Table 2-1.**

2.4 Existing Conditions

GBUAPCD monitors air quality at 14 locations throughout Inyo County. The closest air quality monitoring station is located at the White Mountain Research Center on East Line St., about 1.2 miles southeast of the Airport. The White Mountain Research Center monitors concentrations of ozone, CO, SO_2, $PM_{2.5}$ and PM_{10}. There are no monitoring stations that measure concentrations of NO_2 near the Airport. **Table 2-2** summarizes air quality data from the White Mountain Research Station for the most recent three years.

The climate of the GSA and Air Basin is determined by its terrain and geographical location. The Basin is situated in a valley with the Sierra Nevada Mountains to the west and the White-Inyo Mountains to the east. The Sierra Nevada Mountains to the west act as a barrier to precipitation creating a ‘rain shadow’ in the basin. For this reason, the region has an arid climate with an average annual rainfall of about five inches. The temperature typically varies between 22°F to 97°F throughout the year with the hottest months in June through August. The average wind speed ranges from around five miles per hour (mph) in the fall to seven mph in the spring.

TABLE 2-1
CAAQS AND NAAQS IN THE GREAT BASIN VALLEYS - AIR BASIN

Criteria Air Pollutant	NAAQS Attainment Status	CAAQS Attainment Status
Ozone (1-Hour)	Unclassified/Attainment	Nonattainment
Ozone (2015 8-Hour)	Unclassified/Attainment	
CO (1-Hour and 8-Hour)	Unclassified/Attainment	Attainment
NO_2 (1-Hour)	Unclassified/Attainment	Attainment
NO_2 (Annual)	Unclassified/Attainment	
SO_2 (1-Hour)	Unclassified/Attainment	Attainment
SO_2 (24-Hour and Annual)	Unclassified/Attainment	
PM_{10} (24-Hour)	Unclassified/ Nonattainment (Coso Junction, Mono Basin, Mammoth Lake, and Owens Valley portions)[a]	Nonattainment
$PM_{2.5}$ (2012 Annual)	Unclassified/Attainment	Attainment
$PM_{2.5}$ (2006 24-Hour)	Unclassified/Attainment	
Lead	Unclassified/Attainment	Attainment

SOURCE: EPA, 2020. CARB, 2020.
NOTES:
[a] **The project area is not within any of these portions designated as nonattainment by the NAAQS standard**

TABLE 2-2
AIR QUALITY MONITORING DATA SUMMARY (2017-2019)

Pollutant	Monitoring Data by Year		
	2017	**2018**	**2019**
Ozone (O_3)			
Highest 1 Hour Average (ppm)	0.077	0.083	0.069
Days over National Standard	0	0	0
Highest 8 Hour Average (ppm)	0.071	0.075	0.064
Days over National Standard (0.070 ppm)	1	6	0
Sulfur Dioxide (SO_2)			
Highest 1 Hour Average (ppb)	1.1	0.6	0.9
Days over National Standard (75 ppb)	0	0	0
Highest 24 Hour Average (ppb)	0.3	0.4	0.2
Days over National Standard (140 ppb)	0	0	0
Carbon Monoxide (CO)			
Highest 1 Hour Average (ppm)	0.3	1.4	1.6
Days over Federal Standard (35 ppm)	0	0	0
Highest 8 Hour Average (ppm)	0.2	1.3	1.2
Days over National Standard (9.0 ppm)	0	0	0
Particulate Matter ≤ 10 Microns (PM_{10})			
Highest 24 Hour Average (µg/m^3) [a]	215	422	742
Estimated Days over National Standard (150 µg/m^3)	2	2	3
Particulate Matter ≤ 2.5 Microns ($PM_{2.5}$)			
Highest 24 Hour Average (µg/m^3) [a]	21	33.8	98.9
Estimated Days over National Standard (35 µg/m^3)	--	--	--

SOURCES: EPA. Outdoor Air Quality Data; Monitor Values Report. 2020.
NOTES:
ppm = parts per million
ppb = parts per billion
µg/m^3 = micrograms per cubic matter
-- There was insufficient data available to determine the value
[a] exceptional events excluded

2.4.1 Existing Inventory

The sources of air emissions associated with the Airport are typical of a general aviation facility. Emission sources include aircraft during the landing/take-off cycle and airport-related motor vehicles (e.g., passenger vehicles, heavy trucks, shuttles, etc). The Airport does not include any stationary sources such as diesel-powered generators. Emissions from aircraft auxiliary power units (APUs) and GSE were not included because existing aircraft operations are dominated by small general aviation aircraft (piston-engine and turboprops) that do not use GSE or APUs. GSE and APU use are mostly associated with commercial service aircraft. Therefore, the bulk of air pollutants emissions generated from the Airport are produced by aircraft operations and off-airport vehicular travel.

The existing condition (2019) air pollutant emissions inventory for the Airport is presented in **Table 2-3**. The existing conditions air pollutant emissions inventory was developed using the most recent version of FAA's AEDT 3c[1] and the EMFAC2017 web database for motor vehicles.

TABLE 2-3
EXISTING CONDITIONS AIR POLLUTANT EMISSIONS INVENTORY (TONS PER YEAR)

Source	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	109.54	3.58	5.69	0.82	0.10	0.10
Off-Airport Vehicular Travel	1.10	0.15	0.27	<0.01	0.22	0.06
Total	**110.63**	**3.73**	**5.96**	**0.82**	**0.32**	**0.16**

SOURCE: Environmental Science Associates, August 2020.

NOTES:
CO = carbon monoxide
NO_x = oxides of nitrogen
PM_{10} = particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter
SO_X = oxides of sulfur
VOC = volatile organic compound

Similar to the existing calculations conducted for the criteria pollutants, existing GHG emissions were calculated for aircraft operations and off-airport vehicular travel. **Table 2-4** shows GHG emissions at the Airport for 2019. Using AEDT 3c, the amount of CO_2 was calculated for aircraft operations. CH_4 and nitrous oxide (N_2O) for aircraft were calculated using the methods found in the FAA *Aviation Emissions and Air Quality Handbook* (Version 3, Update 1). Emissions of GHGs from mobile sources, such as light-duty vehicles associated with passenger traffic and larger trucks, were calculated using the EMFAC2017 web database.

[1] The AEDT model replaced FAA's legacy modeling tools for emissions (the Emissions and Dispersion Modeling System (EDMS)) and noise (the Integrated Noise Model (INM)).

TABLE 2-4
EXISTING CONDITIONS (2019) GREENHOUSE GAS EMISSIONS
(METRIC TONS PER YEAR)

Source		Carbon Dioxide Equivalent (CO_2e) (metric tons)
Aircraft		2,690.73
Off-Airport Vehicular Travel		238.25
	2019 Total	**2,928.98**

SOURCE: Environmental Science Associates, 2020.

3. Air Quality

3.1 Thresholds of Significance

Exhibit 4-1 of FAA Order 1050.1F provides the FAA's significance threshold for air quality, which states, "The action would cause pollutant concentrations to exceed one or more of the NAAQS, as established by the EPA under the CAA, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations." Since the GSA is not located in an EPA-designated nonattainment or maintenance area for any of the NAAQS, the General Conformity Rule (Section 176(c)(1) of the CAA) de minimis thresholds are not applicable to the Proposed Action.

3.2 Methodology

Operational emissions of criteria air pollutants were estimated for the No Action Alternative and the Proposed Action for two future conditions: 2022 and 2028. The Proposed Action would not result in any construction emissions. Consistent with guidance provided in FAA Order 1050.1F and the FAA's *Aviation Emissions and Air Quality Handbook* (Version 3, Update 1), the following criteria air pollutants were evaluated to produce an emissions inventory for future aircraft operations at BIH: CO, ozone precursors (VOCs and NO_x), oxides of sulfur (SO_x), PM_{10} and $PM_{2.5}$.

The air quality evaluations for the No Action Alternative and the Proposed Action for aircraft and GSE were conducted using the FAA's AEDT 3c. The air quality analysis includes emissions estimates for Airport operations that are anticipated to result from the Proposed Action. For aircraft AEDT inputs, the air quality analysis used the same airframe types, engine types, operational counts, flight tracks, and vertical profiles used for the noise analysis. These inputs are described in the Noise Appendix. The AEDT default mixing height of 3,000 feet above field elevation (AFE) was used. Aircraft startup emissions were also computed for engine types in AEDT that support startup emissions calculations; this calculation excludes aircraft piston, turboprop, and turboshaft engines. For calculation of aircraft taxi emissions, the AEDT default BIH taxi times of 12 minutes 18 seconds for taxi out and 6 minutes 6 seconds for taxi in was used. Helicopter taxi paths were established in order to ensure that taxi emissions were calculated for helicopters as well as fixed-wing aircraft.

For calculation of GSE emissions in the Proposed Action alternatives, the values in **Table 3-1** were used as inputs to AEDT. Equipment types, equipment counts, and usage, were provided by the Applicant. AEDT equipment types were then assumed based on expert knowledge. For each AEDT equipment type, AEDT default horsepower and load factor values were used.

TABLE 3-1
GROUND SUPPORT EQUIPMENT DETAILS USED IN AEDT MODELING

Equipment Type	Total Equipment Count	AEDT Equipment Type (Assumed)	Horsepower	Load Factor	Notes	Usage (Hours per Year)
De-Ice Truck	1	"Gasoline - FMC LMD, Dual engine - Deicer"	270	0.95	Highest-horsepower de-ice truck in AEDT. Default horsepower and load factor. AEDT does not provide a diesel de-ice truck, so the AEDT gasoline truck was selected.	24 hours per year in 2022 40 hours per year in 2028
Air Startup Compressor	1	Diesel - ACE 300/400 - Air Start	850	0.9	Highest-horsepower air startup compressor in AEDT, assumed diesel. Default horsepower and load factor.	13 hours per year
Pre-Conditioned Air Unit	1	Diesel - ACE 802 - Air Conditioner	300	0.75	Highest-horsepower air conditioner in AEDT. Default horsepower and load factor.	1.35 hours per landing = 816.75 hours in 2022 and 1310.85 hours in 2028
Ground Power Unit	1	Diesel - TLD, 400 Hz AC - Ground Power Unit	194	0.75	Highest-horsepower ground power unit in AEDT. Assumed diesel. Default horsepower and load factor.	0.5 hours per landing = 302.5 hours in 2022 and 485.5 hours in 2028

SOURCE: Environmental Science Associates, 2020.

Operational roadway emissions are divided into two types: employee and visitor. Employee trips and vehicle miles traveled (VMT) include Airport workers (e.g. Airport Operations, ESTA, Air Ambulance, TSA employees) coming to and from home and work as well as delivery trucks (e.g. FedEx, UPS) servicing the Airport's operations. Employee trips were assumed to use a mix of gasoline, diesel, and propane powered vehicles. Visitor trips and VMT include passenger vehicles (e.g. taxis, shuttles, cars, light trucks, and SUVs) from travelers passing through the Airport to their final destinations as well as other passenger vehicles from restaurant patrons and hangar lessees. Trip generation for all scenarios was provided by the Applicant and is summarized in **Table 3-2**. VMT was calculated by multiplying the number of trips by the length of the trip for all estimated trips. Where information was not known, it was assumed that an employee's one-way trip length would be 4 miles and a delivery truck's one-way trip length would be 20 miles. Aggregate emission factors for employees and visitors were then computed for each scenario using the EMFAC2017 web database with application of the SAFE rule for light duty gasoline vehicles. Employee emissions were calculated using the following EMFAC2017 vehicle type codes: HHDT, LDA, LDT1, LDT2, LHDT1, LHDT2, MDV, MHDT, OBUS, and UBUS.[2] Visitor emissions include the following EMFAC2017 vehicle type codes: LDA, LDT1, LDT2, and MDV. An aggregate model year was assumed for all vehicle types based on the calendar year of the scenario analyzed.

TABLE 3-2
TRIP GENERATION SUMMARY

Scenario (Year)	Trips/Day	Trips/Year
Employee Trips		
Existing (2019)	182	48,256
No Action (2022)	182	48,256
No Action (2028)	182	48,256
Proposed Action (2022)	198	53,136
Proposed Action (2028)	202	53,624
Visitor Trips		
Existing (2019)	38	11,856
No Action (2022)	38	11,856
No Action (2028)	40	12,480
Proposed Action (2022)	115	41,975
Proposed Action (2028)	196	71,540

SOURCE: Inyo County Public Works, 2020.

3.3 No Action Alternative

Table 3-3 summarizes air quality emissions for the No Action Alternative in 2022 and 2028. The No Action Alternatives do not include emissions from APU or GSE use because operations would consist of small general aviation aircraft that do not use GSE or APUs.

TABLE 3-3
NO ACTION ALTERNATIVE EMISSIONS INVENTORY (TONS PER YEAR) SUMMARY

	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
2022 No Action Alternative						
Aircraft	109.54	3.58	5.69	0.82	0.10	0.10
Off-Airport Vehicular Travel	0.82	0.13	0.20	<0.01	0.22	0.06
Total	**110.36**	**3.71**	**5.89**	**0.82**	**0.32**	**0.16**
2028 No Action Alternative						
Aircraft	109.84	3.59	5.71	0.82	0.10	0.10
Off-Airport Vehicular Travel	0.57	0.10	0.13	<0.01	0.22	0.06

[2] Additional information about the EMFAC2017 vehicle type codes can be found in the EMFAC2017 Handbook for Project-level Analyses, https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-ii-pl-handbook.pdf

	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
Total	**110.41**	**3.69**	**5.84**	**0.82**	**0.32**	**0.16**

SOURCE: Environmental Science Associates, 2020.
NOTE: Numbers may not add, due to rounding.

3.4 Proposed Action Alternative

Table 3-4 summarizes air quality emissions for the Proposed Action in 2022 and 2028. The Proposed Action includes emissions from GSE used to serve commercial aircraft operations at BIH. The Proposed Action does not include emissions from APUs because parked aircraft would utilize diesel-powered pre-conditioned air units and ground power units instead of APUs to power the aircraft cabin. Therefore, the Proposed Action emissions inventory includes aircraft operations, GSE, and off-airport vehicular travel in 2022 and 2028.

TABLE 3-4
PROPOSED ACTION ALTERNATIVE EMISSIONS INVENTORY (TONS PER YEAR) SUMMARY

	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
2022 Proposed Action						
Aircraft	112.23	3.77	8.32	1.13	0.12	0.12
GSE	0.12	0.04	0.10	0.00	0.00	0.00
Off-Airport Vehicular Travel	1.75	0.26	0.29	0.01	0.47	0.13
Total	**114.10**	**4.07**	**8.71**	**1.14**	**0.59**	**0.25**
2028 Proposed Action						
Aircraft	113.59	3.90	9.07	1.25	0.12	0.12
GSE	0.22	0.06	0.15	0.00	0.01	0.01
Off-Airport Vehicular Travel	1.86	0.29	0.23	0.01	0.72	0.19
Total	**115.67**	**4.25**	**9.45**	**1.26**	**0.85**	**0.32**

SOURCE: Environmental Science Associates, 2020.
NOTE: Numbers may not add, due to rounding.

3.5 Mitigation, Avoidance, or Minimization Measures

The Proposed Action does not exceed the applicable significance thresholds for any pollutants. Therefore, no mitigation measures are required.

4. Climate

FAA Order 1050.1F determines the need for and establishes the extent of the GHG assessment required for airport-related actions and projects. The GHG assessment for this EA includes direct and indirect emissions inventories for landside sources (area and mobile) and airside sources (aircraft operations and GSE). GHG emissions inventories were prepared for the Proposed Action and No Action Alternative. Operational emissions were estimated for two future conditions: 2022 and 2028. The analysis of GHG emissions generally follows the same methodology and modeling tools as the air quality criteria pollutant emissions analysis as discussed in Section 3.2. The Proposed Action is unlikely to produce more than a negligible increase in demand to electrical supply.

In terms of analyzing GHG emissions from the Proposed Action, the analysis includes the area within the Airport's geographical boundary which is defined as the geographic boundary of the Airport plus the airspace around the Airport, extending upward to the full extent of AEDT's modeled flight paths, as well as the roads and public transit routes that deliver employees, passengers, and suppliers to and from the Airport. The altitudes used in the analysis include AEDT's modeled flight paths, which are approximately 10,000 feet AFE for aircraft departures, and approximately 6,000 feet AFE for arrivals. The GHG inventory clearly distinguishes the Proposed Action's GHG emissions from other relevant indirect sources affiliated with airport operations.

GHGs include CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6. Increasing concentrations of GHGs in the atmosphere affect global climate. Anthropogenic (i.e., man-made) sources of GHG emissions are primarily associated with the combustion of fossil fuels, including aircraft fuel.

Mass emissions of GHGs are accounted for by converting emissions of specific pollutants to CO_2e emissions by applying the proper global warming potential (GWP) value for each specific pollutant. GWP represents the amount of heat captured by a mass of a specific GHG compared to a similar mass of CO_2. These GWP ratios are provided by the Intergovernmental Panel on Climate Change (IPCC) in its Fifth Assessment Report (AR5).[3] By applying the GWP ratios, project-related CO_2e emissions can be tabulated in metric tons per year. Typically, the GWP ratio corresponding to the warming potential of CO_2 over a 100-year period is used as a baseline.

4.1 Thresholds of Significance

The FAA has not established a significance threshold for climate and GHG emissions, nor has the FAA identified specific factors to consider in making a significance determination for GHG emissions. The CEQ has noted that "it is not currently useful for the NEPA analysis to attempt to link specific climatological changes, or the environmental impacts thereof, to the particular project or emissions, as such direct linkage is difficult to isolate and to understand." [4]

4.2 Methodology

Fossil fuel combustion is the primary source of GHG emissions at the Airport. Consistent with FAA 1050.1F Desk Reference a projection of the GHG emissions was estimated. The GHG evaluations for the No Action Alternative and the Proposed Action 2022 and 2028 were performed primarily using the FAA's AEDT 3c model and the EMFAC2017 web database. GHG emissions for aircraft and on-road vehicles were calculated similar to the methodology described in *Section 3.2 Methodology* for Air Quality. The EMFAC2017 web database was used to determine the emission factors for each scenario.

[3] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, p.87.

[4] Federal Aviation Administration, 1050.1F Desk Reference, https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/ (Accessed August 26, 2020).

4.3 No Action Alternative

The GHG emissions associated with the No Action Alternative include aircraft operations and ground transportation activities. **Table 4-1** presents estimated levels of GHG emissions at BIH in 2022 and 2028 for the No Action Alternative.

TABLE 4-1
NO ACTION ALTERNATIVE
GREENHOUSE GAS EMISSIONS INVENTORY

Operational Year	Emission Source	Estimated GHG Emissions Inventory in CO_{2e} (MT/year) No Action
2022	Aircraft	2,690.73
	Off-Airport Vehicular Travel	217.89
	Total	**2,908.62**
2028	Aircraft	2,698.10
	Off-Airport Vehicular Travel	181.67
	Total	**2,879.77**

SOURCE: ESA Airports, September 2020.

NOTES: CO_{2e} = carbon dioxide equivalent

4.4 Proposed Action Alternative

GHG emissions in the Proposed Action would result from fuel burn associated with aircraft operations, GSE, and motor vehicles. **Table 4-2** presents estimated levels of GHG emissions at BIH in 2022 and 2028 for the Proposed Action Alternative.

TABLE 4-2
PROPOSED ACTION ALTERNATIVE
GREENHOUSE GAS EMISSIONS INVENTORY

Operational Year	Emission Source	Estimated GHG Emissions Inventory in CO_{2e} (MT/year) No Action
2022	Aircraft*	3,985.81
	Off-Airport Vehicular Travel	433.19
	Total	**4,419.00**
2028	Aircraft*	4,571.73
	Off-Airport Vehicular Travel	532.50
	Total	**5,104.23**

SOURCE: ESA Airports, September 2020.

NOTES:
CO_{2e} = carbon dioxide equivalent
* Includes emissions from GSE

As shown in **Table 4-1** and **Table 4-2**, there would be an increase in GHG emissions at BIH in 2022 and 2028 if the Proposed Action were implemented. However, there are no significance thresholds established for aviation GHG emissions, and the FAA has not identified specific factors to consider in making a significance determination for GHG emissions, especially as it may be applied to a particular project. Due to the negligible change the Proposed Action would have on the Airport's existing operational footprint, there would be little, if any, increase in vulnerability to future climate impacts from the implementation of the Proposed Action.

4.5 Mitigation, Avoidance, or Minimization Measures

As the FAA has not established a significance threshold for climate and GHG emissions, the Proposed Action does not exceed a significance threshold for GHG emissions. Therefore, no mitigation measures are required.

G-2 AEDT Results Output

Criteria Pollutant Emissions in Short Tons per Year – 2022 No Action

Emissions Source	Criteria Pollutant Emissions (Tons per year)					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Aircraft	109.54	3.58	5.69	0.82	0.10	0.10
Total Emissions	**109.54**	**3.58**	**5.69**	**0.82**	**0.10**	**0.10**

SOURCE: Environmental Science Associates, 2020.

Criteria Pollutant Emissions in Short Tons per Year – 2028 No Action

Emissions Source	Criteria Pollutant Emissions (Tons per year)					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Aircraft	109.84	3.59	5.71	0.82	0.10	0.10
Total Emissions	**109.84**	**3.59**	**5.71**	**0.82**	**0.10**	**0.10**

SOURCE: Environmental Science Associates, 2020.

Criteria Pollutant Emissions in Short Tons per Year – 2022 With Project

Emissions Source	Criteria Pollutant Emissions (Tons per year)					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Aircraft	112.23	3.77	8.32	1.13	0.12	0.12
GSE	0.12	0.04	0.10	0.00	0.00	0.00
Total Emissions	**112.35**	**3.80**	**8.42**	**1.13**	**0.12**	**0.12**

SOURCE: Environmental Science Associates, 2020.

Criteria Pollutant Emissions in Short Tons per Year – 2028 With Project

Emissions Source	Criteria Pollutant Emissions (Tons per year)					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Aircraft	113.59	3.90	9.07	1.25	0.12	0.12
GSE	0.22	0.06	0.15	0.00	0.01	0.01
Total Emissions	**113.82**	**3.96**	**9.22**	**1.25**	**0.13**	**0.13**

SOURCE: Environmental Science Associates, 2020.

Change in Criteria Pollutant Emissions in Short Tons per Year – 2022

Emissions Source	Criteria Pollutant Emissions (Tons per year)					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Aircraft	2.689	0.183	2.629	0.312	0.014	0.014
GSE	0.121	0.038	0.102	0.001	0.003	0.003
Total Emissions	**2.810**	**0.221**	**2.730**	**0.313**	**0.018**	**0.018**

SOURCE: Environmental Science Associates, 2020.

Change in Criteria Pollutant Emissions in Short Tons per Year – 2028

Emissions Source	Criteria Pollutant Emissions (Tons per year)					
	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Aircraft	3.755	0.303	3.365	0.423	0.021	0.021
GSE	0.224	0.062	0.148	0.001	0.006	0.006
Total Emissions	**3.979**	**0.364**	**3.514**	**0.424**	**0.027**	**0.027**

SOURCE: Environmental Science Associates, 2020.

Greenhouse Gas Emissions in Metric Tons per Year – All 2022 and 2028 Scenarios

Metric Tons per Year	Proposed Project	No Action	Increase
2022	3,985.81	2,690.73	**1,295.08**
2028	4,571.73	2,698.10	**1,873.63**

SOURCE: Environmental Science Associates, 2020.

G-3 Mobile Emissions Summary

				Operational Mobile Emissions													
				Criteria Pollutant Emissions (tons/year)										GHG Emissions (metric tons/year)			
Scenario	**Year**	**Trips/Day**	**Trips/Year**	**ROG**	**NOx**	**CO**	**SOx**	**PM10 Rd Dust**	**PM10**	**PM10 Total**	**PM2_5 Rd Dust**	**PM2_5**	**PM2_5 Total**	**CO2**	**CH4**	**N2O**	**CO2e**
Employee Trips																	
Existing	2019	182	48,256	0.130	0.252	0.913	0.002	0.154	0.029	0.183	0.038	0.013	0.051	200.160	0.010	0.013	204.164
No Action	2022	182	48,256	0.106	0.184	0.686	0.002	0.154	0.028	0.181	0.038	0.012	0.050	183.615	0.007	0.011	187.030
No Action	2028	182	48,256	0.081	0.122	0.476	0.002	0.154	0.027	0.181	0.038	0.011	0.049	152.524	0.004	0.009	155.164
		Winter															
Proposed Action	2022	198	53,136	0.114	0.197	0.735	0.002	0.165	0.030	0.194	0.040	0.013	0.053	196.750	0.008	0.012	200.409
Proposed Action	2028	202	53,624	0.088	0.133	0.518	0.002	0.168	0.029	0.197	0.041	0.012	0.054	166.163	0.005	0.009	169.039
Visitor Trips																	
Existing	2019	38	11,856	0.024	0.019	0.181	0.000	0.031	0.005	0.036	0.008	0.002	0.010	33.623	0.002	0.001	34.082
No Action	2022	38	11,856	0.019	0.013	0.135	0.000	0.031	0.005	0.036	0.008	0.002	0.010	30.506	0.001	0.001	30.861
No Action	2028	40	12,480	0.015	0.007	0.098	0.000	0.033	0.005	0.038	0.008	0.002	0.010	26.248	0.001	0.001	26.505
		Winter															
Proposed Action	2022	115	41,975	0.144	0.096	1.018	0.003	0.236	0.037	0.273	0.058	0.015	0.074	230.102	0.010	0.008	232.781
Proposed Action	2028	196	71,540	0.202	0.094	1.345	0.004	0.453	0.070	0.522	0.111	0.029	0.140	359.920	0.012	0.011	363.456
Combined Employee + Visitor Trips																	
Existing	2019	220	60,112	0.154	0.271	1.094	0.003	0.185	0.034	0.219	0.045	0.015	0.061	233.784	0.012	0.014	238.246
No Action	2022	220	60,112	0.125	0.196	0.821	0.002	0.185	0.032	0.218	0.045	0.014	0.060	214.122	0.009	0.012	217.891
No Action	2028	222	60,736	0.095	0.129	0.574	0.002	0.187	0.032	0.219	0.046	0.014	0.059	178.772	0.005	0.009	181.669
		Winter															
Proposed Action	2022	313	95,111	0.257	0.293	1.753	0.005	0.401	0.066	0.468	0.098	0.028	0.127	426.853	0.018	0.020	433.190
Proposed Action	2028	398	125,164	0.290	0.228	1.864	0.006	0.620	0.099	0.719	0.152	0.041	0.194	526.083	0.016	0.020	532.495

SOURCE: Environmental Science Associates, 2020.

G-4 EMFAC2017 Results Output

Source: EMFAC2017 (v1.0.3) Emissions Inventory
Region Type: Air Basin
Region: Great Basin Valleys
Calendar Year: 2019, 2022, 2028
Season: Annual
Vehicle Classification: EMFAC2007 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	NOx_RUNEX	NOx_IDLEX	NOx_STREX	NOx_TOTEX	PM2.5_RUNEX	PM2.5_IDLEX	PM2.5_STREX	PM2.5_TOTEX	PM2.5_PMTW	PM2.5_PMBW	PM2.5_TOTAL
Great Basin Valleys	2019	HHDT	Aggregate	Aggregate	Gasoline	0.36	21.32	7.22	0.0001659	-	0.0000060	0.0001719	0.0000001	-	0.0000000	0.0000002	0.0000001	0.0000006	0.0000009
Great Basin Valleys	2019	HHDT	Aggregate	Aggregate	Diesel	915.38	139,992.46	11,187.94	0.6367561	0.1140725	0.0199984	0.7708270	0.0110597	0.0003622	-	0.0114219	0.0013845	0.0040704	0.0168768
Great Basin Valleys	2019	LDA	Aggregate	Aggregate	Gasoline	48,381.76	1,932,329.43	226,281.38	0.1645158	-	0.0661522	0.2306680	0.0035706	-	0.0005290	0.0040996	0.0042601	0.0335480	0.0419076
Great Basin Valleys	2019	LDA	Aggregate	Aggregate	Diesel	501.86	20,393.23	2,344.39	0.0048057	-	-	0.0048057	0.0003590	-	-	0.0003590	0.0000450	0.0003541	0.0007580
Great Basin Valleys	2019	LDA	Aggregate	Aggregate	Electricity	497.41	19,849.58	2,509.03	-	-	-	-	-	-	-	-	0.0000438	0.0003446	0.0003884
Great Basin Valleys	2019	LDT1	Aggregate	Aggregate	Gasoline	6,945.04	237,109.15	30,646.72	0.0640301	-	0.0153037	0.0793338	0.0007504	-	0.0001249	0.0008753	0.0005227	0.0041165	0.0055145
Great Basin Valleys	2019	LDT1	Aggregate	Aggregate	Diesel	5.97	98.71	20.73	0.0001725	-	-	0.0001725	0.0000146	-	-	0.0000146	0.0000002	0.0000017	0.0000165
Great Basin Valleys	2019	LDT1	Aggregate	Aggregate	Electricity	4.56	194.97	23.52	-	-	-	-	-	-	-	-	0.0000004	0.0000034	0.0000038
Great Basin Valleys	2019	LDT2	Aggregate	Aggregate	Gasoline	21,431.62	797,643.49	98,323.71	0.1558767	-	0.0527759	0.2086526	0.0015369	-	0.0002385	0.0017754	0.0017585	0.0138482	0.0173821
Great Basin Valleys	2019	LDT2	Aggregate	Aggregate	Diesel	97.07	4,420.89	480.80	0.0002947	-	-	0.0002947	0.0000241	-	-	0.0000241	0.0000097	0.0000768	0.0001106
Great Basin Valleys	2019	LDT2	Aggregate	Aggregate	Electricity	70.10	2,515.50	357.89	-	-	-	-	-	-	-	-	0.0000055	0.0000437	0.0000492
Great Basin Valleys	2019	LHDT1	Aggregate	Aggregate	Gasoline	2,479.90	80,550.45	36,946.85	0.0538295	0.0001119	0.0237031	0.0776445	0.0003177	-	0.0000328	0.0003505	0.0001776	0.0029088	0.0034369
Great Basin Valleys	2019	LHDT1	Aggregate	Aggregate	Diesel	2,476.19	87,952.66	31,147.32	0.3720472	0.0068663	-	0.3789135	0.0036432	0.0000728	-	0.0037160	0.0002909	0.0031761	0.0071830
Great Basin Valleys	2019	LHDT2	Aggregate	Aggregate	Gasoline	258.18	9,260.57	3,846.56	0.0041293	0.0000117	0.0024531	0.0065941	0.0000251	-	0.0000020	0.0000271	0.0000204	0.0003902	0.0004376
Great Basin Valleys	2019	LHDT2	Aggregate	Aggregate	Diesel	749.29	28,217.43	9,425.10	0.0826305	0.0020664	-	0.0846969	0.0009580	0.0000219	-	0.0009800	0.0000933	0.0011888	0.0022621
Great Basin Valleys	2019	MCY	Aggregate	Aggregate	Gasoline	3,278.89	23,969.31	6,557.78	0.0331738	-	0.0020565	0.0352303	0.0000497	-	0.0000272	0.0000769	0.0000264	0.0001332	0.0002365
Great Basin Valleys	2019	MDV	Aggregate	Aggregate	Gasoline	17,175.76	596,961.48	77,580.17	0.1453108	-	0.0501866	0.1954974	0.0012325	-	0.0002316	0.0014641	0.0013161	0.0103641	0.0131443
Great Basin Valleys	2019	MDV	Aggregate	Aggregate	Diesel	307.80	13,263.05	1,488.61	0.0016294	-	-	0.0016294	0.0001065	-	-	0.0001065	0.0000292	0.0002303	0.0003660
Great Basin Valleys	2019	MDV	Aggregate	Aggregate	Electricity	12.09	446.28	62.29	-	-	-	-	-	-	-	-	0.0000010	0.0000077	0.0000087
Great Basin Valleys	2019	MH	Aggregate	Aggregate	Gasoline	571.60	4,616.27	57.18	0.0046483	-	0.0000206	0.0046689	0.0000121	-	0.0000000	0.0000121	0.0000153	0.0002842	0.0003116
Great Basin Valleys	2019	MH	Aggregate	Aggregate	Diesel	169.16	1,616.15	16.92	0.0099454	-	-	0.0099454	0.0002493	-	-	0.0002493	0.0000071	0.0000995	0.0003559
Great Basin Valleys	2019	MHDT	Aggregate	Aggregate	Gasoline	157.60	7,138.40	3,153.34	0.0088289	0.0000149	0.0014803	0.0103241	0.0000148	-	0.0000033	0.0000181	0.0000236	0.0004395	0.0004812
Great Basin Valleys	2019	MHDT	Aggregate	Aggregate	Diesel	299.12	16,838.57	2,563.99	0.0850379	0.0059001	0.0030675	0.0940054	0.0021771	0.0000218	-	0.0021990	0.0000557	0.0010368	0.0032915
Great Basin Valleys	2019	OBUS	Aggregate	Aggregate	Gasoline	46.48	2,296.18	929.95	0.0019492	0.0000033	0.0003615	0.0023140	0.0000021	-	0.0000002	0.0000024	0.0000076	0.0001414	0.0001514
Great Basin Valleys	2019	OBUS	Aggregate	Aggregate	Diesel	44.34	3,517.83	433.62	0.0163494	0.0013229	0.0006794	0.0183517	0.0004054	0.0000068	-	0.0004122	0.0000116	0.0002166	0.0006404
Great Basin Valleys	2019	SBUS	Aggregate	Aggregate	Gasoline	10.60	521.41	42.40	0.0001115	0.0000108	0.0000257	0.0001481	0.0000004	-	0.0000000	0.0000004	0.0000011	0.0001835	0.0001850
Great Basin Valleys	2019	SBUS	Aggregate	Aggregate	Diesel	63.47	2,015.42	732.47	0.0162814	0.0031801	0.0004420	0.0199035	0.0000938	0.0000037	-	0.0000975	0.0000067	0.0007091	0.0008133
Great Basin Valleys	2019	UBUS	Aggregate	Aggregate	Gasoline	30.48	3,068.72	121.92	0.0005359	-	0.0000766	0.0006126	0.0000037	-	0.0000000	0.0000037	0.0000076	0.0001435	0.0001548
Great Basin Valleys	2019	UBUS	Aggregate	Aggregate	Diesel	10.97	888.05	43.89	0.0019524	-	-	0.0019524	0.0000055	-	-	0.0000055	0.0000045	0.0000438	0.0000537
Great Basin Valleys	2019	UBUS	Aggregate	Aggregate	Electricity	0.27	5.98	1.08	-	-	-	-	-	-	-	-	0.0000000	0.0000003	0.0000003
Great Basin Valleys	2019	UBUS	Aggregate	Aggregate	Natural Gas	17.06	1,658.96	68.23	0.0028684	-	-	0.0028684	0.0000080	-	-	0.0000080	0.0000106	0.0000754	0.0000940
Great Basin Valleys	2022	HHDT	Aggregate	Aggregate	Gasoline	0.14	33.70	2.89	0.0000953	-	0.0000002	0.0000955	0.0000000	-	0.0000000	0.0000000	0.0000002	0.0000010	0.0000012
Great Basin Valleys	2022	HHDT	Aggregate	Aggregate	Diesel	967.24	146,141.50	12,025.17	0.4670979	0.1239051	0.0272824	0.6182855	0.0051722	0.0000713	-	0.0052435	0.0014459	0.0042510	0.0109403
Great Basin Valleys	2022	LDA	Aggregate	Aggregate	Gasoline	51,973.74	2,023,564.04	244,166.20	0.1072739	-	0.0571392	0.1644131	0.0032617	-	0.0004961	0.0037578	0.0044612	0.0351319	0.0433509
Great Basin Valleys	2022	LDA	Aggregate	Aggregate	Diesel	586.28	22,986.73	2,745.58	0.0031797	-	-	0.0031797	0.0002616	-	-	0.0002616	0.0000507	0.0003991	0.0007114
Great Basin Valleys	2022	LDA	Aggregate	Aggregate	Electricity	923.70	38,891.52	4,621.90	-	-	-	-	-	-	-	-	0.0000857	0.0006752	0.0007610
Great Basin Valleys	2022	LDT1	Aggregate	Aggregate	Gasoline	7,026.01	236,633.95	31,275.90	0.0410240	-	0.0123462	0.0533702	0.0005791	-	0.0001000	0.0006791	0.0005217	0.0041083	0.0053091
Great Basin Valleys	2022	LDT1	Aggregate	Aggregate	Diesel	4.53	69.67	15.38	0.0001053	-	-	0.0001053	0.0000088	-	-	0.0000088	0.0000002	0.0000012	0.0000101
Great Basin Valleys	2022	LDT1	Aggregate	Aggregate	Electricity	30.94	1,398.19	158.38	-	-	-	-	-	-	-	-	0.0000031	0.0000243	0.0000274
Great Basin Valleys	2022	LDT2	Aggregate	Aggregate	Gasoline	21,916.20	783,811.20	100,428.64	0.1027312	-	0.0424142	0.1451454	0.0013310	-	0.0002148	0.0015458	0.0017280	0.0136081	0.0168819
Great Basin Valleys	2022	LDT2	Aggregate	Aggregate	Diesel	131.69	5,561.89	643.73	0.0002840	-	-	0.0002840	0.0000270	-	-	0.0000270	0.0000123	0.0000966	0.0001359
Great Basin Valleys	2022	LDT2	Aggregate	Aggregate	Electricity	166.21	5,558.90	840.16	-	-	-	-	-	-	-	-	0.0000123	0.0000965	0.0001088
Great Basin Valleys	2022	LHDT1	Aggregate	Aggregate	Gasoline	2,279.42	71,296.25	33,960.03	0.0388472	0.0000994	0.0211014	0.0600481	0.0002413	-	0.0000226	0.0002639	0.0001572	0.0025746	0.0029957
Great Basin Valleys	2022	LHDT1	Aggregate	Aggregate	Diesel	2,323.67	77,126.92	29,228.90	0.2699570	0.0060945	-	0.2760515	0.0028616	0.0000675	-	0.0029290	0.0002551	0.0027852	0.0059693
Great Basin Valleys	2022	LHDT2	Aggregate	Aggregate	Gasoline	247.84	8,573.48	3,692.52	0.0028007	0.0000107	0.0022492	0.0050606	0.0000207	-	0.0000016	0.0000223	0.0000189	0.0003612	0.0004024
Great Basin Valleys	2022	LHDT2	Aggregate	Aggregate	Diesel	743.09	25,959.59	9,347.14	0.0616319	0.0019145	-	0.0635464	0.0008171	0.0000217	-	0.0008388	0.0000858	0.0010937	0.0020183
Great Basin Valleys	2022	MCY	Aggregate	Aggregate	Gasoline	3,373.20	22,972.91	6,746.39	0.0314312	-	0.0021222	0.0335534	0.0000494	-	0.0000249	0.0000743	0.0000253	0.0001276	0.0002272
Great Basin Valleys	2022	MDV	Aggregate	Aggregate	Gasoline	16,703.60	554,072.88	75,193.35	0.0880621	-	0.0384408	0.1265028	0.0009891	-	0.0001884	0.0011775	0.0012215	0.0096195	0.0120185
Great Basin Valleys	2022	MDV	Aggregate	Aggregate	Diesel	371.08	14,649.38	1,772.88	0.0012329	-	-	0.0012329	0.0000937	-	-	0.0000937	0.0000323	0.0002543	0.0003803
Great Basin Valleys	2022	MDV	Aggregate	Aggregate	Electricity	82.35	2,858.74	421.37	-	-	-	-	-	-	-	-	0.0000063	0.0000496	0.0000559
Great Basin Valleys	2022	MH	Aggregate	Aggregate	Gasoline	479.36	3,816.01	47.96	0.0029045	-	0.0000179	0.0029224	0.0000082	-	0.0000000	0.0000082	0.0000126	0.0002350	0.0002558
Great Basin Valleys	2022	MH	Aggregate	Aggregate	Diesel	168.75	1,482.32	16.88	0.0084395	-	-	0.0084395	0.0002034	-	-	0.0002034	0.0000065	0.0000913	0.0003012
Great Basin Valleys	2022	MHDT	Aggregate	Aggregate	Gasoline	156.39	7,786.15	3,129.07	0.0052718	0.0000150	0.0013937	0.0066806	0.0000123	-	0.0000021	0.0000144	0.0000257	0.0004794	0.0005196
Great Basin Valleys	2022	MHDT	Aggregate	Aggregate	Diesel	301.66	17,087.40	2,591.15	0.0510298	0.0046334	0.0045814	0.0602446	0.0006312	0.0000102	-	0.0006414	0.0000565	0.0010522	0.0017501
Great Basin Valleys	2022	OBUS	Aggregate	Aggregate	Gasoline	45.15	2,078.47	903.30	0.0013392	0.0000032	0.0003387	0.0016811	0.0000022	-	0.0000003	0.0000025	0.0000069	0.0001280	0.0001374
Great Basin Valleys	2022	OBUS	Aggregate	Aggregate	Diesel	56.34	4,567.62	533.39	0.0105111	0.0008079	0.0012096	0.0125287	0.0000912	0.0000012	-	0.0000924	0.0000151	0.0002813	0.0003887

Great Basin Valleys	2022	SBUS	Aggregate	Aggregate	Gasoline	13.83	655.61	55.32	0.0001282	0.0000141	0.0000342	0.0001766	0.0000006	-	0.0000000	0.0000006	0.0000014	0.0002307	0.0002327
Great Basin Valleys	2022	SBUS	Aggregate	Aggregate	Diesel	65.45	2,062.95	755.31	0.0153774	0.0030943	0.0005705	0.0190422	0.0000905	0.0000032	-	0.0000938	0.0000068	0.0007259	0.0008265
Great Basin Valleys	2022	UBUS	Aggregate	Aggregate	Gasoline	30.82	3,103.28	123.29	0.0005222	-	0.0000750	0.0005972	0.0000046	-	0.0000000	0.0000047	0.0000077	0.0001451	0.0001575
Great Basin Valleys	2022	UBUS	Aggregate	Aggregate	Diesel	14.32	1,173.43	57.26	0.0006691	-	-	0.0006691	0.0000070	-	-	0.0000070	0.0000055	0.0000607	0.0000732
Great Basin Valleys	2022	UBUS	Aggregate	Aggregate	Electricity	0.27	5.98	1.08	-	-	-	-	-	-	-	-	0.0000000	0.0000003	0.0000003
Great Basin Valleys	2022	UBUS	Aggregate	Aggregate	Natural Gas	14.03	1,401.85	56.11	0.0006375	-	-	0.0006375	0.0000057	-	-	0.0000057	0.0000097	0.0000598	0.0000753
Great Basin Valleys	2028	HHDT	Aggregate	Aggregate	Gasoline	0.40	67.22	8.06	0.0002093	-	0.0000001	0.0002094	0.0000001	-	0.0000000	0.0000001	0.0000004	0.0000020	0.0000024
Great Basin Valleys	2028	HHDT	Aggregate	Aggregate	Diesel	1,015.05	157,846.05	12,910.58	0.3940471	0.1278443	0.0322023	0.5540938	0.0046355	0.0000544	-	0.0046899	0.0015628	0.0045945	0.0108471
Great Basin Valleys	2028	LDA	Aggregate	Aggregate	Gasoline	58,824.17	2,128,047.45	276,338.30	0.0625867	-	0.0463398	0.1089265	0.0025628	-	0.0004321	0.0029950	0.0046915	0.0369459	0.0446324
Great Basin Valleys	2028	LDA	Aggregate	Aggregate	Diesel	703.56	25,810.84	3,318.69	0.0011386	-	-	0.0011386	0.0001000	-	-	0.0001000	0.0000569	0.0004481	0.0006050
Great Basin Valleys	2028	LDA	Aggregate	Aggregate	Electricity	2,277.61	94,629.40	11,221.88	-	-	-	-	-	-	-	-	0.0002086	0.0016429	0.0018515
Great Basin Valleys	2028	LDT1	Aggregate	Aggregate	Gasoline	7,348.61	237,223.67	33,087.93	0.0180598	-	0.0084025	0.0264624	0.0003654	-	0.0000680	0.0004333	0.0005230	0.0041185	0.0050749
Great Basin Valleys	2028	LDT1	Aggregate	Aggregate	Diesel	2.03	38.41	7.51	0.0000279	-	-	0.0000279	0.0000014	-	-	0.0000014	0.0000001	0.0000007	0.0000021
Great Basin Valleys	2028	LDT1	Aggregate	Aggregate	Electricity	122.59	5,281.27	611.37	-	-	-	-	-	-	-	-	0.0000116	0.0000917	0.0001033
Great Basin Valleys	2028	LDT2	Aggregate	Aggregate	Gasoline	23,012.11	761,682.47	105,064.96	0.0506475	-	0.0290997	0.0797471	0.0009976	-	0.0001788	0.0011765	0.0016792	0.0132239	0.0160796
Great Basin Valleys	2028	LDT2	Aggregate	Aggregate	Diesel	187.56	6,904.40	895.32	0.0002639	-	-	0.0002639	0.0000306	-	-	0.0000306	0.0000152	0.0001199	0.0001657
Great Basin Valleys	2028	LDT2	Aggregate	Aggregate	Electricity	494.58	14,425.59	2,447.55	-	-	-	-	-	-	-	-	0.0000318	0.0002504	0.0002823
Great Basin Valleys	2028	LHDT1	Aggregate	Aggregate	Gasoline	1,992.96	59,480.58	29,692.16	0.0204388	0.0000774	0.0161727	0.0366888	0.0001783	-	0.0000171	0.0001954	0.0001311	0.0021479	0.0024745
Great Basin Valleys	2028	LHDT1	Aggregate	Aggregate	Diesel	2,001.87	61,441.56	25,181.06	0.1274131	0.0044046	-	0.1318177	0.0016341	0.0000574	-	0.0016914	0.0002032	0.0022188	0.0041133
Great Basin Valleys	2028	LHDT2	Aggregate	Aggregate	Gasoline	234.20	7,684.36	3,489.16	0.0012849	0.0000088	0.0017830	0.0030766	0.0000167	-	0.0000012	0.0000179	0.0000169	0.0003237	0.0003586
Great Basin Valleys	2028	LHDT2	Aggregate	Aggregate	Diesel	715.54	22,504.54	9,000.65	0.0321731	0.0015243	-	0.0336974	0.0006041	0.0000211	-	0.0006252	0.0000744	0.0009481	0.0016477
Great Basin Valleys	2028	MCY	Aggregate	Aggregate	Gasoline	3,488.95	21,510.04	6,977.90	0.0289559	-	0.0021864	0.0311424	0.0000486	-	0.0000210	0.0000696	0.0000237	0.0001195	0.0002128
Great Basin Valleys	2028	MDV	Aggregate	Aggregate	Gasoline	15,993.06	495,943.32	71,850.69	0.0382694	-	0.0232770	0.0615464	0.0006562	-	0.0001308	0.0007870	0.0010934	0.0086103	0.0104906
Great Basin Valleys	2028	MDV	Aggregate	Aggregate	Diesel	462.35	15,983.92	2,171.47	0.0006131	-	-	0.0006131	0.0000541	-	-	0.0000541	0.0000352	0.0002775	0.0003669
Great Basin Valleys	2028	MDV	Aggregate	Aggregate	Electricity	326.86	9,746.15	1,629.64	-	-	-	-	-	-	-	-	0.0000215	0.0001692	0.0001907
Great Basin Valleys	2028	MH	Aggregate	Aggregate	Gasoline	345.44	2,842.12	34.56	0.0011286	-	0.0000139	0.0011426	0.0000045	-	0.0000000	0.0000045	0.0000094	0.0001750	0.0001889
Great Basin Valleys	2028	MH	Aggregate	Aggregate	Diesel	163.44	1,296.23	16.34	0.0062413	-	-	0.0062413	0.0001346	-	-	0.0001346	0.0000057	0.0000798	0.0002201
Great Basin Valleys	2028	MHDT	Aggregate	Aggregate	Gasoline	175.68	8,994.23	3,515.03	0.0022100	0.0000171	0.0013997	0.0036268	0.0000127	-	0.0000016	0.0000143	0.0000297	0.0005538	0.0005978
Great Basin Valleys	2028	MHDT	Aggregate	Aggregate	Diesel	337.38	17,909.94	2,941.02	0.0368625	0.0034033	0.0065328	0.0467986	0.0002075	0.0000030	-	0.0002105	0.0000592	0.0011028	0.0013725
Great Basin Valleys	2028	OBUS	Aggregate	Aggregate	Gasoline	42.29	1,828.38	846.12	0.0005721	0.0000030	0.0003099	0.0008851	0.0000023	-	0.0000002	0.0000025	0.0000060	0.0001126	0.0001211
Great Basin Valleys	2028	OBUS	Aggregate	Aggregate	Diesel	89.10	6,367.54	821.56	0.0120222	0.0008571	0.0020169	0.0148963	0.0000574	0.0000003	-	0.0000577	0.0000211	0.0003921	0.0004708
Great Basin Valleys	2028	SBUS	Aggregate	Aggregate	Gasoline	20.41	904.10	81.64	0.0001511	0.0000208	0.0000498	0.0002218	0.0000010	-	0.0000000	0.0000011	0.0000020	0.0003181	0.0003212
Great Basin Valleys	2028	SBUS	Aggregate	Aggregate	Diesel	67.07	2,106.09	774.03	0.0119353	0.0026413	0.0008732	0.0154499	0.0000771	0.0000021	-	0.0000792	0.0000070	0.0007410	0.0008272
Great Basin Valleys	2028	UBUS	Aggregate	Aggregate	Gasoline	31.37	3,158.46	125.48	0.0003355	-	0.0000575	0.0003930	0.0000071	-	0.0000001	0.0000072	0.0000078	0.0001477	0.0001627
Great Basin Valleys	2028	UBUS	Aggregate	Aggregate	Diesel	27.73	2,502.60	110.92	0.0016359	-	-	0.0016359	0.0000169	-	-	0.0000169	0.0000151	0.0001153	0.0001473
Great Basin Valleys	2028	UBUS	Aggregate	Aggregate	Natural Gas	1.39	124.77	5.58	0.0000409	-	-	0.0000409	0.0000003	-	-	0.0000003	0.0000004	0.0000077	0.0000084

NOTES:

HHDT = Heavy Duty Diesel Trucks
LDA = Passenger Cars
LDT1 = Light-Duty Trucks (GVWR <6000 lbs. and ETW <= 3750 lbs)
LDT2 = Light-Duty Trucks (GVWR <6000 lbs. and ETW 3751-5750 lbs)
LHDT1 = Light-Heavy-Duty Trucks (GVWR 8501-10000 lbs)
LHDT2 = Light-Heavy-Duty Trucks (GVWR 10001-14000 lbs)
MCY = Motorcycles
MDV = Medium-Duty Trucks (GVWR 6000-8500 lbs)
MH = Motor Homes
MHDT = Medium-Heavy Duty Trucks
OBUS = Other Buses
SBUS = School Buses
UBUS = Urban Buses

SOURCE: EMFAC2017 (v1.0.3) Emissions Inventory

PM10_RUNEX	PM10_IDLEX	PM10_STREX	PM10_TOTEX	PM10_PMTW	PM10_PMBW	PM10_TOTAL	CO2_RUNEX	CO2_IDLEX	CO2_STREX	CO2_TOTEX	CH4_RUNEX	CH4_IDLEX	CH4_STREX	CH4_TOTEX	N2O_RUNEX	N2O_IDLEX	N2O_STREX	N2O_TOTEX	ROG_RUNEX	ROG_IDLEX
0.0000001	-	0.0000001	0.0000002	0.0000005	0.0000015	0.0000021	0.0493899	-	0.0006837	0.0500736	0.0000059	-	0.0000000	0.0000059	0.0000046	-	0.0000001	0.0000047	0.0000440	-
0.0115598	0.0003786	-	0.0119384	0.0055379	0.0094976	0.0269739	223.7058865	21.3510398	-	245.0569263	0.0009219	0.0004333	-	0.0013552	0.0351635	0.0033561	-	0.0385195	0.0198481	0.0093285
0.0038829	-	0.0005753	0.0044582	0.0170402	0.0782786	0.0997769	630.6274557	-	15.2113568	645.8388125	0.0100297	-	0.0201558	0.0301855	0.0148121	-	0.0078111	0.0226232	0.0429487	-
0.0003752	-	-	0.0003752	0.0001798	0.0008261	0.0013812	5.1368370	-	-	5.1368370	0.0000318	-	-	0.0000318	0.0008074	-	-	0.0008074	0.0006843	-
-	-	-	-	0.0001750	0.0008041	0.0009791	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0008159	-	0.0001357	0.0009516	0.0020909	0.0096053	0.0126478	91.8065689	-	2.5127508	94.3193197	0.0032535	-	0.0047090	0.0079625	0.0040567	-	0.0012967	0.0053534	0.0153783	-
0.0000152	-	-	0.0000152	0.0000009	0.0000040	0.0000201	0.0523010	-	-	0.0523010	0.0000009	-	-	0.0000009	0.0000082	-	-	0.0000082	0.0000191	-
-	-	-	-	0.0000017	0.0000079	0.0000096	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0016712	-	0.0002593	0.0019305	0.0070340	0.0323125	0.0412770	339.5200393	-	8.8312923	348.3513316	0.0065428	-	0.0125906	0.0191334	0.0104360	-	0.0047206	0.0151566	0.0293887	-
0.0000252	-	-	0.0000252	0.0000390	0.0001791	0.0002433	1.4973892	-	-	1.4973892	0.0000042	-	-	0.0000042	0.0002354	-	-	0.0002354	0.0000908	-
-	-	-	-	0.0000222	0.0001019	0.0001241	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0003445	-	0.0000354	0.0003799	0.0007103	0.0067872	0.0078775	92.9304017	0.3394181	0.8517776	94.1215974	0.0031647	0.0003259	0.0015397	0.0050303	0.0027679	0.0000078	0.0016750	0.0044508	0.0179699	0.0012795
0.0038079	0.0000761	-	0.0038841	0.0011634	0.0074110	0.0124584	56.6809255	0.3851247	-	57.0660502	0.0009596	0.0000139	-	0.0009736	0.0089095	0.0000605	-	0.0089700	0.0206607	0.0002996
0.0000273	-	0.0000021	0.0000294	0.0000817	0.0009104	0.0010215	12.1289813	0.0406016	0.0957818	12.2653647	0.0001749	0.0000360	0.0001350	0.0003460	0.0002385	0.0000009	0.0001813	0.0004207	0.0008635	0.0001339
0.0010014	0.0000229	-	0.0010243	0.0003733	0.0027739	0.0041714	20.3302306	0.1862876	-	20.5165182	0.0002589	0.0000042	-	0.0002631	0.0031956	0.0000293	-	0.0032249	0.0055733	0.0000907
0.0000529	-	0.0000287	0.0000816	0.0001057	0.0003107	0.0004980	5.9238874	-	0.4897164	6.4136038	0.0099972	-	0.0022582	0.0122554	0.0018604	-	0.0001134	0.0019738	0.0709371	-
0.0013375	-	0.0002510	0.0015885	0.0052643	0.0241829	0.0310357	306.8015502	-	8.5986161	315.4001663	0.0068076	-	0.0122457	0.0190533	0.0092713	-	0.0040636	0.0133349	0.0359110	-
0.0001113	-	-	0.0001113	0.0001170	0.0005373	0.0007655	6.0248364	-	-	6.0248364	0.0000126	-	-	0.0000126	0.0009470	-	-	0.0009470	0.0002704	-
-	-	-	-	0.0000039	0.0000181	0.0000220	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0000131	-	0.0000000	0.0000131	0.0000611	0.0006632	0.0007374	9.5005770	-	0.0018124	9.5023894	0.0001718	-	0.0000024	0.0001741	0.0002341	-	0.0000018	0.0002359	0.0008385	-
0.0002605	-	-	0.0002605	0.0000285	0.0002322	0.0005212	1.9026114	-	-	1.9026114	0.0000118	-	-	0.0000118	0.0002991	-	-	0.0002991	0.0002547	-
0.0000160	-	0.0000036	0.0000196	0.0000944	0.0010256	0.0011397	14.3660440	0.0953097	0.1525433	14.6138970	0.0003195	0.0000408	0.0001671	0.0005274	0.0003736	0.0000010	0.0000928	0.0004674	0.0017183	0.0001727
0.0022756	0.0000228	-	0.0022984	0.0002227	0.0024193	0.0049404	20.5476634	0.5029189	-	21.0505823	0.0002398	0.0000040	-	0.0002437	0.0032298	0.0000791	-	0.0033089	0.0051619	0.0000855
0.0000023	-	0.0000003	0.0000026	0.0000304	0.0003299	0.0003629	4.6809318	0.0198595	0.0290018	4.7297931	0.0000593	0.0000099	0.0000349	0.0001041	0.0000897	0.0000003	0.0000273	0.0001173	0.0002938	0.0000381
0.0004238	0.0000071	-	0.0004308	0.0000465	0.0005054	0.0009828	4.9256900	0.1473503	-	5.0730403	0.0000488	0.0000036	-	0.0000524	0.0007742	0.0000232	-	0.0007974	0.0010513	0.0000767
0.0000004	-	0.0000000	0.0000004	0.0000046	0.0004281	0.0004331	0.5122800	0.0310805	0.0024451	0.5458057	0.0000025	0.0000290	0.0000030	0.0000346	0.0000092	0.0000011	0.0000025	0.0000128	0.0000115	0.0001242
0.0000980	0.0000038	-	0.0001019	0.0000267	0.0016547	0.0017832	2.6136688	0.2674071	-	2.8810760	0.0000114	0.0000010	-	0.0000123	0.0004108	0.0000420	-	0.0004529	0.0002452	0.0000205
0.0000040	-	0.0000000	0.0000040	0.0000303	0.0003349	0.0003692	4.8885450	-	0.0068179	4.8953629	0.0000153	-	0.0000076	0.0000229	0.0000533	-	0.0000078	0.0000611	0.0000466	-
0.0000057	-	-	0.0000057	0.0000179	0.0001021	0.0001257	1.1767028	-	-	1.1767028	0.0000456	-	-	0.0000456	0.0001850	-	-	0.0001850	0.0000269	-
-	-	-	-	0.0000001	0.0000007	0.0000009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0000084	-	-	0.0000084	0.0000423	0.0001760	0.0002267	2.9898747	-	-	2.9898747	0.0093348	-	-	0.0093348	0.0006095	-	-	0.0006095	0.0004222	-
0.0000000	-	0.0000000	0.0000000	0.0000007	0.0000023	0.0000031	0.0685380	-	0.0001580	0.0686960	0.0000020	-	0.0000000	0.0000020	0.0000044	-	0.0000000	0.0000044	0.0000083	-
0.0054061	0.0000745	-	0.0054806	0.0057836	0.0099189	0.0211831	217.9385760	23.9857089	-	241.9242849	0.0003054	0.0004503	-	0.0007557	0.0342569	0.0037702	-	0.0380271	0.0065745	0.0096946
0.0035473	-	0.0005395	0.0040868	0.0178448	0.0819745	0.1039061	609.3636021	-	15.1086484	624.4722505	0.0065219	-	0.0167631	0.0232850	0.0113792	-	0.0074929	0.0188721	0.0261663	-
0.0002734	-	-	0.0002734	0.0002027	0.0009312	0.0014073	5.3660873	-	-	5.3660873	0.0000255	-	-	0.0000255	0.0008435	-	-	0.0008435	0.0005493	-
-	-	-	-	0.0003430	0.0015755	0.0019185	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0006298	-	0.0001087	0.0007385	0.0020868	0.0095860	0.0124113	85.0865653	-	2.3658243	87.4523895	0.0020762	-	0.0036863	0.0057626	0.0028180	-	0.0011659	0.0039839	0.0094962	-
0.0000092	-	-	0.0000092	0.0000006	0.0000028	0.0000126	0.0355853	-	-	0.0355853	0.0000005	-	-	0.0000005	0.0000056	-	-	0.0000056	0.0000117	-
-	-	-	-	0.0000123	0.0000566	0.0000690	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0014475	-	0.0002336	0.0016812	0.0069120	0.0317521	0.0403453	304.2418289	-	8.2576691	312.4994980	0.0044862	-	0.0105266	0.0150128	0.0074780	-	0.0041697	0.0116477	0.0193725	-
0.0000283	-	-	0.0000283	0.0000490	0.0002253	0.0003026	1.7503428	-	-	1.7503428	0.0000051	-	-	0.0000051	0.0002751	-	-	0.0002751	0.0001097	-
-	-	-	-	0.0000490	0.0002252	0.0002742	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0002624	-	0.0000246	0.0002870	0.0006287	0.0060075	0.0069232	80.5703071	0.3084838	0.7493778	81.6281687	0.0021465	0.0002948	0.0011861	0.0036273	0.0020089	0.0000072	0.0015127	0.0035288	0.0114262	0.0011342
0.0029909	0.0000705	-	0.0030615	0.0010202	0.0064988	0.0105804	48.5550183	0.3559569	-	48.9109752	0.0007926	0.0000131	-	0.0008057	0.0076322	0.0000560	-	0.0076881	0.0170649	0.0002811
0.0000225	-	0.0000017	0.0000242	0.0000756	0.0008428	0.0009426	10.9691397	0.0383767	0.0897836	11.0973000	0.0001085	0.0000336	0.0001118	0.0002539	0.0001689	0.0000008	0.0001696	0.0003393	0.0005188	0.0001225
0.0008541	0.0000227	-	0.0008767	0.0003434	0.0025519	0.0037721	18.2291715	0.1816403	-	18.4108117	0.0002276	0.0000042	-	0.0002317	0.0028654	0.0000286	-	0.0028939	0.0048990	0.0000899
0.0000527	-	0.0000263	0.0000790	0.0001013	0.0002978	0.0004781	5.6512507	-	0.4969338	6.1481845	0.0093286	-	0.0022697	0.0115983	0.0017664	-	0.0001170	0.0018834	0.0653076	-
0.0010754	-	0.0002048	0.0012803	0.0048861	0.0224455	0.0286118	262.8231724	-	7.6886333	270.5118058	0.0039783	-	0.0095968	0.0135750	0.0062544	-	0.0034141	0.0096686	0.0178855	-
0.0000979	-	-	0.0000979	0.0001292	0.0005934	0.0008206	6.1881288	-	-	6.1881288	0.0000119	-	-	0.0000119	0.0009727	-	-	0.0009727	0.0002566	-
-	-	-	-	0.0000252	0.0001158	0.0001410	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0000089	-	0.0000000	0.0000089	0.0000505	0.0005483	0.0006076	7.6646092	-	0.0014558	7.6660650	0.0001003	-	0.0000019	0.0001021	0.0001556	-	0.0000017	0.0001573	0.0004629	-
0.0002126	-	-	0.0002126	0.0000261	0.0002130	0.0004517	1.7153414	-	-	1.7153414	0.0000104	-	-	0.0000104	0.0002696	-	-	0.0002696	0.0002242	-
0.0000134	-	0.0000023	0.0000157	0.0001030	0.0011187	0.0012374	15.0559410	0.0923129	0.1401440	15.2883979	0.0001719	0.0000441	0.0001463	0.0003623	0.0002451	0.0000012	0.0000993	0.0003456	0.0008755	0.0001745
0.0006597	0.0000106	-	0.0006704	0.0002260	0.0024550	0.0033515	19.6354819	0.4825195	-	20.1180014	0.0000685	0.0000026	-	0.0000711	0.0030864	0.0000758	-	0.0031623	0.0014756	0.0000558
0.0000024	-	0.0000003	0.0000027	0.0000275	0.0002986	0.0003288	4.1026476	0.0189346	0.0273527	4.1489349	0.0000409	0.0000097	0.0000317	0.0000823	0.0000638	0.0000003	0.0000262	0.0000902	0.0002031	0.0000371
0.0000953	0.0000012	-	0.0000966	0.0000604	0.0006563	0.0008132	5.8548712	0.1463481	-	6.0012193	0.0000101	0.0000023	-	0.0000124	0.0009203	0.0000230	-	0.0009433	0.0002177	0.0000503

0.0000006	-	0.0000000	0.0000007	0.0000058	0.0005383	0.0005447	0.6246241	0.0394235	0.0031041	0.6671517	0.0000026	0.0000378	0.0000038	0.0000442	0.0000111	0.0000014	0.0000033	0.0000158	0.0000118	0.0001622
0.0000946	0.0000034	-	0.0000980	0.0000273	0.0016937	0.0018190	2.6222291	0.2725601	-	2.8947893	0.0000113	0.0000010	-	0.0000123	0.0004122	0.0000428	-	0.0004550	0.0002435	0.0000205
0.0000051	-	0.0000001	0.0000051	0.0000306	0.0003387	0.0003744	4.8309833	-	0.0067244	4.8377076	0.0000146	-	0.0000076	0.0000222	0.0000521	-	0.0000077	0.0000598	0.0000443	-
0.0000073	-	-	0.0000073	0.0000220	0.0001416	0.0001709	1.4471141	-	-	1.4471141	0.0000553	-	-	0.0000553	0.0002275	-	-	0.0002275	0.0000295	-
-	-	-	-	0.0000001	0.0000007	0.0000009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0000060	-	-	0.0000060	0.0000389	0.0001396	0.0001844	2.6451061	-	-	2.6451061	0.0076247	-	-	0.0076247	0.0005392	-	-	0.0005392	0.0001229	-
0.0000001	-	0.0000000	0.0000001	0.0000015	0.0000046	0.0000061	0.1269996	-	0.0003681	0.1273677	0.0000046	-	0.0000000	0.0000046	0.0000093	-	0.0000000	0.0000093	0.0000201	-
0.0048451	0.0000569	-	0.0049019	0.0062510	0.0107205	0.0218734	198.4560247	23.3408472	-	221.7968719	0.0001845	0.0004933	-	0.0006778	0.0311945	0.0036689	-	0.0348634	0.0039724	0.0106206
0.0027873	-	0.0004700	0.0032573	0.0187662	0.0862071	0.1082305	545.3404984	-	14.4762138	559.8167122	0.0034070	-	0.0121033	0.0155103	0.0084732	-	0.0068157	0.0152889	0.0122344	-
0.0001045	-	-	0.0001045	0.0002276	0.0010456	0.0013777	5.1507612	-	-	5.1507612	0.0000144	-	-	0.0000144	0.0008096	-	-	0.0008096	0.0003103	-
-	-	-	-	0.0008345	0.0038334	0.0046679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0003974	-	0.0000739	0.0004713	0.0020920	0.0096099	0.0121732	72.9578543	-	2.1237185	75.0815728	0.0008941	-	0.0022734	0.0031675	0.0015454	-	0.0009618	0.0025072	0.0038644	-
0.0000015	-	-	0.0000015	0.0000003	0.0000016	0.0000034	0.0167048	-	-	0.0167048	0.0000001	-	-	0.0000001	0.0000026	-	-	0.0000026	0.0000026	-
-	-	-	-	0.0000466	0.0002139	0.0002605	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0010850	-	0.0001945	0.0012795	0.0067169	0.0308557	0.0388521	243.9327145	-	7.1869395	251.1196540	0.0023406	-	0.0074132	0.0097538	0.0044483	-	0.0033006	0.0077488	0.0095272	-
0.0000320	-	-	0.0000320	0.0000609	0.0002797	0.0003726	1.8720698	-	-	1.8720698	0.0000062	-	-	0.0000062	0.0002943	-	-	0.0002943	0.0001326	-
-	-	-	-	0.0001272	0.0005844	0.0007116	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0001940	-	0.0000186	0.0002126	0.0005245	0.0050119	0.0057490	62.4799081	0.2574545	0.6291116	63.3664742	0.0010305	0.0002372	0.0008368	0.0021044	0.0010830	0.0000060	0.0012068	0.0022958	0.0052975	0.0008837
0.0017079	0.0000599	-	0.0017679	0.0008127	0.0051771	0.0077577	35.7058238	0.2899579	-	35.9957817	0.0005337	0.0000112	-	0.0005449	0.0056125	0.0000456	-	0.0056580	0.0114895	0.0002422
0.0000182	-	0.0000013	0.0000195	0.0000678	0.0007554	0.0008427	9.0778123	0.0342096	0.0795443	9.1915661	0.0000450	0.0000285	0.0000756	0.0001492	0.0000869	0.0000007	0.0001431	0.0002307	0.0001970	0.0001004
0.0006314	0.0000220	-	0.0006535	0.0002977	0.0022123	0.0031634	14.5848215	0.1649518	-	14.7497733	0.0001770	0.0000040	-	0.0001810	0.0022925	0.0000259	-	0.0023185	0.0038101	0.0000866
0.0000521	-	0.0000223	0.0000744	0.0000948	0.0002788	0.0004481	5.2579285	-	0.4998648	5.7577932	0.0084237	-	0.0022506	0.0106743	0.0016321	-	0.0001209	0.0017530	0.0578888	-
0.0007137	-	0.0001422	0.0008559	0.0043735	0.0200906	0.0253200	195.0545589	-	6.1104962	201.1650551	0.0017899	-	0.0059164	0.0077063	0.0032550	-	0.0024181	0.0056731	0.0075070	-
0.0000566	-	-	0.0000566	0.0001410	0.0006475	0.0008451	5.7533124	-	-	5.7533124	0.0000089	-	-	0.0000089	0.0009043	-	-	0.0009043	0.0001907	-
-	-	-	-	0.0000859	0.0003948	0.0004808	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0000049	-	0.0000000	0.0000049	0.0000376	0.0004083	0.0004508	5.2332451	-	0.0009628	5.2342079	0.0000349	-	0.0000012	0.0000361	0.0000733	-	0.0000015	0.0000747	0.0001438	-
0.0001407	-	-	0.0001407	0.0000229	0.0001862	0.0003498	1.4113529	-	-	1.4113529	0.0000081	-	-	0.0000081	0.0002218	-	-	0.0002218	0.0001738	-
0.0000138	-	0.0000018	0.0000155	0.0001190	0.0012922	0.0014268	15.7744817	0.0963787	0.1387296	16.0095900	0.0000658	0.0000532	0.0001397	0.0002587	0.0001370	0.0000015	0.0001174	0.0002559	0.0003019	0.0001999
0.0002169	0.0000031	-	0.0002200	0.0002369	0.0025732	0.0030301	18.2577909	0.4696010	-	18.7273919	0.0000156	0.0000020	-	0.0000176	0.0028699	0.0000738	-	0.0029437	0.0003362	0.0000421
0.0000025	-	0.0000002	0.0000027	0.0000242	0.0002627	0.0002896	3.2546404	0.0166059	0.0235527	3.2947989	0.0000160	0.0000093	0.0000276	0.0000529	0.0000329	0.0000003	0.0000250	0.0000582	0.0000732	0.0000349
0.0000600	0.0000003	-	0.0000603	0.0000842	0.0009149	0.0010594	7.0731735	0.1740064	-	7.2471799	0.0000037	0.0000026	-	0.0000063	0.0011118	0.0000274	-	0.0011392	0.0000793	0.0000561
0.0000011	-	0.0000000	0.0000012	0.0000080	0.0007423	0.0007514	0.8043218	0.0546223	0.0043134	0.8632574	0.0000029	0.0000553	0.0000055	0.0000637	0.0000139	0.0000021	0.0000048	0.0000208	0.0000127	0.0002394
0.0000806	0.0000022	-	0.0000828	0.0000279	0.0017291	0.0018397	2.5180573	0.2669165	-	2.7849738	0.0000100	0.0000009	-	0.0000109	0.0003958	0.0000420	-	0.0004378	0.0002151	0.0000204
0.0000077	-	0.0000001	0.0000078	0.0000312	0.0003447	0.0003837	4.2342850	-	0.0059698	4.2402548	0.0000118	-	0.0000061	0.0000179	0.0000368	-	0.0000068	0.0000435	0.0000350	-
0.0000176	-	-	0.0000176	0.0000604	0.0002690	0.0003471	3.3129887	-	-	3.3129887	0.0001452	-	-	0.0001452	0.0005208	-	-	0.0005208	0.0000480	-
0.0000003	-	-	0.0000003	0.0000017	0.0000179	0.0000199	0.1849531	-	-	0.1849531	0.0004376	-	-	0.0004376	0.0000377	-	-	0.0000377	0.0000063	-

ROG_STREX	ROG_TOTEX	ROG_DIURN	ROG_HOTSOAK	ROG_RUNLOSS	ROG_RESTLOSS	ROG_TOTAL	TOG_RUNEX	TOG_IDLEX	TOG_STREX	TOG_TOTEX	TOG_DIURN	TOG_HOTSOAK	TOG_RUNLOSS	TOG_RESTLOSS	TOG_TOTAL	CO_RUNEX	CO_IDLEX	CO_STREX
0.0000000	0.0000441	0.0000001	0.0000070	0.0000344	0.0000001	0.0000856	0.0000549	-	0.0000000	0.0000549	0.0000001	0.0000070	0.0000344	0.0000001	0.0000964	0.0020335	-	0.0000176
-	0.0291766	-	-	-	-	0.0291766	0.0225956	0.0106198	-	0.0332154	-	-	-	-	0.0332154	0.0767347	0.1076263	-
0.0985239	0.1414726	0.0187087	0.0415380	0.0816370	0.0145451	0.2979014	0.0625097	-	0.1078686	0.1703783	0.0187087	0.0415380	0.0816370	0.0145451	0.3268070	2.0512431	-	0.7280502
-	0.0006843	-	-	-	-	0.0006843	0.0007791	-	-	0.0007791	-	-	-	-	0.0007791	0.0080337	-	-
-	-	0.0000106	0.0000135	-	0.0000046	0.0000287	-	-	-	-	0.0000106	0.0000135	-	0.0000046	0.0000287	-	-	-
0.0263392	0.0417175	0.0078484	0.0143144	0.0576665	0.0055233	0.1270701	0.0222871	-	0.0288363	0.0511234	0.0078484	0.0143144	0.0576665	0.0055233	0.1364760	0.5987685	-	0.1210761
-	0.0000191	-	-	-	-	0.0000191	0.0000218	-	-	0.0000218	-	-	-	-	0.0000218	0.0001449	-	-
-	-	0.0000001	0.0000001	-	0.0000000	0.0000003	-	-	-	-	0.0000001	0.0000001	-	0.0000000	0.0000003	-	-	-
0.0652206	0.0946093	0.0119482	0.0249537	0.0998379	0.0094499	0.2407990	0.0426310	-	0.0714058	0.1140368	0.0119482	0.0249537	0.0998379	0.0094499	0.2602265	1.2690167	-	0.4170092
-	0.0000908	-	-	-	-	0.0000908	0.0001034	-	-	0.0001034	-	-	-	-	0.0001034	0.0007906	-	-
-	-	0.0000015	0.0000019	-	0.0000006	0.0000040	-	-	-	-	0.0000015	0.0000019	-	0.0000006	0.0000040	-	-	-
0.0086678	0.0279171	0.0002907	0.0113532	0.1025355	0.0001306	0.1422271	0.0250825	0.0018604	0.0094785	0.0364214	0.0002907	0.0113532	0.1025355	0.0001306	0.1507314	0.3436819	0.0100833	0.1031206
-	0.0209603	-	-	-	-	0.0209603	0.0235208	0.0003411	-	0.0238619	-	-	-	-	0.0238619	0.0955208	0.0024832	-
0.0007035	0.0017009	0.0000198	0.0007793	0.0072978	0.0000091	0.0098069	0.0012600	0.0001954	0.0007702	0.0022256	0.0000198	0.0007793	0.0072978	0.0000091	0.0103316	0.0166714	0.0010616	0.0094924
-	0.0056640	-	-	-	-	0.0056640	0.0063448	0.0001032	-	0.0064480	-	-	-	-	0.0064480	0.0259142	0.0007514	-
0.0177572	0.0886943	0.0077137	0.0063441	0.0206558	0.0047487	0.1281566	0.0856856	-	0.0193064	0.1049920	0.0077137	0.0063441	0.0206558	0.0047487	0.1444542	0.6635387	-	0.0759538
0.0672432	0.1031543	0.0111276	0.0227720	0.0853078	0.0091310	0.2314927	0.0485201	-	0.0735903	0.1221104	0.0111276	0.0227720	0.0853078	0.0091310	0.2504488	1.2758868	-	0.4426702
-	0.0002704	-	-	-	-	0.0002704	0.0003079	-	-	0.0003079	-	-	-	-	0.0003079	0.0042082	-	-
-	-	0.0000003	0.0000003	-	0.0000001	0.0000007	-	-	-	-	0.0000003	0.0000003	-	0.0000001	0.0000007	-	-	-
0.0000114	0.0008500	0.0001136	0.0000086	0.0002416	0.0000373	0.0012512	0.0012053	-	0.0000125	0.0012178	0.0001136	0.0000086	0.0002416	0.0000373	0.0016190	0.0236133	-	0.0002588
-	0.0002547	-	-	-	-	0.0002547	0.0002899	-	-	0.0002899	-	-	-	-	0.0002899	0.0009457	-	-
0.0010205	0.0029115	0.0000186	0.0007519	0.0052553	0.0000087	0.0089460	0.0024742	0.0002514	0.0011163	0.0038418	0.0000186	0.0007519	0.0052553	0.0000087	0.0098764	0.0396812	0.0026931	0.0225325
-	0.0052475	-	-	-	-	0.0052475	0.0058765	0.0000974	-	0.0059739	-	-	-	-	0.0059739	0.0133151	0.0011120	-
0.0001833	0.0005153	0.0000026	0.0000407	0.0006118	0.0000011	0.0011715	0.0004288	0.0000556	0.0002007	0.0006851	0.0000026	0.0000407	0.0006118	0.0000011	0.0013413	0.0065516	0.0002952	0.0041680
-	0.0011279	-	-	-	-	0.0011279	0.0011968	0.0000873	-	0.0012841	-	-	-	-	0.0012841	0.0030674	0.0006864	-
0.0000165	0.0001522	0.0000003	0.0000025	0.0000274	0.0000001	0.0001826	0.0000168	0.0001813	0.0000181	0.0002161	0.0000003	0.0000025	0.0000274	0.0000001	0.0002465	0.0002215	0.0009602	0.0004764
-	0.0002657	-	-	-	-	0.0002657	0.0002791	0.0000234	-	0.0003025	-	-	-	-	0.0003025	0.0006426	0.0003466	-
0.0000307	0.0000773	0.0000005	0.0000047	0.0000237	0.0000003	0.0001065	0.0000681	-	0.0000336	0.0001017	0.0000005	0.0000047	0.0000237	0.0000003	0.0001308	0.0007006	-	0.0005749
-	0.0000269	-	-	-	-	0.0000269	0.0000752	-	-	0.0000752	-	-	-	-	0.0000752	0.0002063	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	0.0004222	-	-	-	-	0.0004222	0.0098552	-	-	0.0098552	-	-	-	-	0.0098552	0.0582734	-	-
0.0000000	0.0000083	0.0000000	0.0000001	0.0000003	0.0000000	0.0000087	0.0000121	-	0.0000000	0.0000121	0.0000000	0.0000001	0.0000003	0.0000000	0.0000125	0.0008246	-	0.0000316
-	0.0162691	-	-	-	-	0.0162691	0.0074846	0.0110366	-	0.0185212	-	-	-	-	0.0185212	0.0381872	0.1355979	-
0.0774387	0.1036050	0.0152537	0.0354741	0.0728358	0.0123094	0.2394780	0.0381479	-	0.0847849	0.1229328	0.0152537	0.0354741	0.0728358	0.0123094	0.2588058	1.5582819	-	0.7102711
-	0.0005493	-	-	-	-	0.0005493	0.0006253	-	-	0.0006253	-	-	-	-	0.0006253	0.0075062	-	-
-	-	0.0000196	0.0000249	-	0.0000084	0.0000530	-	-	-	-	0.0000196	0.0000249	-	0.0000084	0.0000530	-	-	-
0.0199277	0.0294239	0.0063481	0.0119152	0.0479865	0.0046006	0.1002743	0.0138458	-	0.0218181	0.0356639	0.0063481	0.0119152	0.0479865	0.0046006	0.1065143	0.4038506	-	0.1047796
-	0.0000117	-	-	-	-	0.0000117	0.0000133	-	-	0.0000133	-	-	-	-	0.0000133	0.0000887	-	-
-	-	0.0000007	0.0000009	-	0.0000003	0.0000018	-	-	-	-	0.0000007	0.0000009	-	0.0000003	0.0000018	-	-	-
0.0528760	0.0722485	0.0111694	0.0232212	0.0959183	0.0091781	0.2117356	0.0282517	-	0.0578923	0.0861439	0.0111694	0.0232212	0.0959183	0.0091781	0.2256310	0.9285050	-	0.3807955
-	0.0001097	-	-	-	-	0.0001097	0.0001249	-	-	0.0001249	-	-	-	-	0.0001249	0.0010154	-	-
-	-	0.0000035	0.0000045	-	0.0000015	0.0000095	-	-	-	-	0.0000035	0.0000045	-	0.0000015	0.0000095	-	-	-
0.0063734	0.0189338	0.0002503	0.0100024	0.0975477	0.0001147	0.1268489	0.0166731	0.0016550	0.0069781	0.0253062	0.0002503	0.0100024	0.0975477	0.0001147	0.1332213	0.2166324	0.0093064	0.0897776
-	0.0173460	-	-	-	-	0.0173460	0.0194273	0.0003201	-	0.0197473	-	-	-	-	0.0197473	0.0799793	0.0023302	-
0.0005726	0.0012139	0.0000167	0.0006779	0.0059459	0.0000081	0.0078625	0.0007571	0.0001787	0.0006270	0.0015627	0.0000167	0.0006779	0.0059459	0.0000081	0.0082113	0.0099295	0.0010237	0.0081150
-	0.0049889	-	-	-	-	0.0049889	0.0055772	0.0001024	-	0.0056796	-	-	-	-	0.0056796	0.0232477	0.0007452	-
0.0178209	0.0831285	0.0079966	0.0063997	0.0190186	0.0048677	0.1214111	0.0797899	-	0.0193823	0.0991722	0.0079966	0.0063997	0.0190186	0.0048677	0.1374548	0.5919843	-	0.0788320
0.0509012	0.0687868	0.0100466	0.0208335	0.0803362	0.0085695	0.1885726	0.0259827	-	0.0557280	0.0817106	0.0100466	0.0208335	0.0803362	0.0085695	0.2014965	0.7765215	-	0.3675894
-	0.0002566	-	-	-	-	0.0002566	0.0002922	-	-	0.0002922	-	-	-	-	0.0002922	0.0044259	-	-
-	-	0.0000017	0.0000023	-	0.0000007	0.0000048	-	-	-	-	0.0000017	0.0000023	-	0.0000007	0.0000048	-	-	-
0.0000083	0.0004712	0.0000840	0.0000067	0.0001849	0.0000287	0.0007755	0.0006755	-	0.0000091	0.0006846	0.0000840	0.0000067	0.0001849	0.0000287	0.0009889	0.0122973	-	0.0001955
-	0.0002242	-	-	-	-	0.0002242	0.0002552	-	-	0.0002552	-	-	-	-	0.0002552	0.0008199	-	-
0.0008239	0.0018739	0.0000120	0.0005093	0.0038227	0.0000058	0.0062237	0.0012775	0.0002547	0.0009021	0.0024342	0.0000120	0.0005093	0.0038227	0.0000058	0.0067841	0.0199745	0.0027152	0.0192125
-	0.0015314	-	-	-	-	0.0015314	0.0016799	0.0000635	-	0.0017434	-	-	-	-	0.0017434	0.0049388	0.0011722	-
0.0001654	0.0004055	0.0000027	0.0000423	0.0006594	0.0000011	0.0011111	0.0002964	0.0000541	0.0001811	0.0005315	0.0000027	0.0000423	0.0006594	0.0000011	0.0012371	0.0044863	0.0002869	0.0038139
-	0.0002680	-	-	-	-	0.0002680	0.0002478	0.0000573	-	0.0003051	-	-	-	-	0.0003051	0.0010384	0.0006962	-

0.0000212	0.0001952	0.0000004	0.0000036	0.0000383	0.0000002	0.0002378	0.0000173	0.0002366	0.0000232	0.0002771	0.0000004	0.0000036	0.0000383	0.0000002	0.0003197	0.0002205	0.0012533	0.0006081
-	0.0002641	-	-	-	-	0.0002641	0.0002772	0.0000234	-	0.0003006	-	-	-	-	0.0003006	0.0006565	0.0003953	-
0.0000307	0.0000750	0.0000007	0.0000063	0.0000350	0.0000004	0.0001172	0.0000646	-	0.0000336	0.0000982	0.0000007	0.0000063	0.0000350	0.0000004	0.0001405	0.0007112	-	0.0005721
-	0.0000295	-	-	-	-	0.0000295	0.0000877	-	-	0.0000877	-	-	-	-	0.0000877	0.0001854	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	0.0001229	-	-	-	-	0.0001229	0.0077968	-	-	0.0077968	-	-	-	-	0.0077968	0.0579499	-	-
0.0000000	0.0000201	0.0000000	0.0000002	0.0000013	0.0000000	0.0000216	0.0000293	-	0.0000000	0.0000293	0.0000000	0.0000002	0.0000013	0.0000000	0.0000308	0.0019668	-	0.0000544
-	0.0145930	-	-	-	-	0.0145930	0.0045223	0.0120908	-	0.0166131	-	-	-	-	0.0166131	0.0338620	0.1559210	-
0.0518205	0.0640549	0.0116751	0.0283770	0.0680147	0.0098035	0.1819251	0.0178524	-	0.0567369	0.0745893	0.0116751	0.0283770	0.0680147	0.0098035	0.1924596	1.1373329	-	0.6499462
-	0.0003103	-	-	-	-	0.0003103	0.0003533	-	-	0.0003533	-	-	-	-	0.0003533	0.0063461	-	-
-	-	0.0000483	0.0000605	-	0.0000207	0.0001295	-	-	-	-	0.0000483	0.0000605	-	0.0000207	0.0001295	-	-	-
0.0114203	0.0152848	0.0041321	0.0080411	0.0334546	0.0031846	0.0640972	0.0056390	-	0.0125038	0.0181428	0.0041321	0.0080411	0.0334546	0.0031846	0.0669552	0.2120384	-	0.0855437
-	0.0000026	-	-	-	-	0.0000026	0.0000030	-	-	0.0000030	-	-	-	-	0.0000030	0.0000255	-	-
-	-	0.0000026	0.0000033	-	0.0000011	0.0000070	-	-	-	-	0.0000026	0.0000033	-	0.0000011	0.0000070	-	-	-
0.0354608	0.0449880	0.0099726	0.0198281	0.0881185	0.0086363	0.1715434	0.0139021	-	0.0388251	0.0527272	0.0099726	0.0198281	0.0881185	0.0086363	0.1792826	0.5932589	-	0.3308216
-	0.0001326	-	-	-	-	0.0001326	0.0001509	-	-	0.0001509	-	-	-	-	0.0001509	0.0013360	-	-
-	-	0.0000105	0.0000132	-	0.0000045	0.0000281	-	-	-	-	0.0000105	0.0000132	-	0.0000045	0.0000281	-	-	-
0.0045590	0.0107402	0.0001910	0.0083242	0.0986874	0.0000903	0.1180330	0.0077300	0.0012894	0.0049916	0.0140111	0.0001910	0.0083242	0.0986874	0.0000903	0.1213039	0.1082174	0.0081780	0.0733488
-	0.0117317	-	-	-	-	0.0117317	0.0130801	0.0002757	-	0.0133558	-	-	-	-	0.0133558	0.0547533	0.0020075	-
0.0003732	0.0006706	0.0000118	0.0005002	0.0040761	0.0000064	0.0052651	0.0002874	0.0001465	0.0004087	0.0008426	0.0000118	0.0005002	0.0040761	0.0000064	0.0054370	0.0038565	0.0009728	0.0064759
-	0.0038967	-	-	-	-	0.0038967	0.0043375	0.0000986	-	0.0044361	-	-	-	-	0.0044361	0.0183912	0.0007176	-
0.0175961	0.0754849	0.0081539	0.0061119	0.0144717	0.0047994	0.1090219	0.0718300	-	0.0191501	0.0909801	0.0081539	0.0061119	0.0144717	0.0047994	0.1245171	0.5006046	-	0.0831748
0.0297918	0.0372988	0.0086203	0.0167985	0.0706148	0.0076609	0.1409934	0.0109542	-	0.0326183	0.0435725	0.0086203	0.0167985	0.0706148	0.0076609	0.1472670	0.4135344	-	0.2514917
-	0.0001907	-	-	-	-	0.0001907	0.0002170	-	-	0.0002170	-	-	-	-	0.0002170	0.0042260	-	-
-	-	0.0000069	0.0000088	-	0.0000030	0.0000187	-	-	-	-	0.0000069	0.0000088	-	0.0000030	0.0000187	-	-	-
0.0000051	0.0001489	0.0000426	0.0000036	0.0000899	0.0000160	0.0003010	0.0002098	-	0.0000056	0.0002154	0.0000426	0.0000036	0.0000899	0.0000160	0.0003675	0.0032834	-	0.0001152
-	0.0001738	-	-	-	-	0.0001738	0.0001978	-	-	0.0001978	-	-	-	-	0.0001978	0.0006129	-	-
0.0007223	0.0012240	0.0000075	0.0003726	0.0026032	0.0000041	0.0042114	0.0004405	0.0002917	0.0007908	0.0015230	0.0000075	0.0003726	0.0026032	0.0000041	0.0045103	0.0065188	0.0030967	0.0159445
-	0.0003783	-	-	-	-	0.0003783	0.0003828	0.0000479	-	0.0004307	-	-	-	-	0.0004307	0.0024026	0.0014721	-
0.0001425	0.0002506	0.0000021	0.0000372	0.0006078	0.0000009	0.0008986	0.0001068	0.0000509	0.0001560	0.0003137	0.0000021	0.0000372	0.0006078	0.0000009	0.0009618	0.0015301	0.0002699	0.0031034
-	0.0001354	-	-	-	-	0.0001354	0.0000902	0.0000639	-	0.0001542	-	-	-	-	0.0001542	0.0009167	0.0009454	-
0.0000304	0.0002825	0.0000008	0.0000070	0.0000669	0.0000004	0.0003576	0.0000185	0.0003493	0.0000333	0.0004012	0.0000008	0.0000070	0.0000669	0.0000004	0.0004762	0.0002353	0.0018502	0.0008569
-	0.0002355	-	-	-	-	0.0002355	0.0002448	0.0000232	-	0.0002681	-	-	-	-	0.0002681	0.0006266	0.0005044	-
0.0000244	0.0000594	0.0000005	0.0000042	0.0000211	0.0000003	0.0000855	0.0000511	-	0.0000267	0.0000778	0.0000005	0.0000042	0.0000211	0.0000003	0.0001038	0.0006536	-	0.0005763
-	0.0000480	-	-	-	-	0.0000480	0.0001983	-	-	0.0001983	-	-	-	-	0.0001983	0.0004481	-	-
-	0.0000063	-	-	-	-	0.0000063	0.0004467	-	-	0.0004467	-	-	-	-	0.0004467	0.0030457	-	-

CO_TOTEX	SOx_RUNEX	SOx_IDLEX	SOx_STREX	SOx_TOTEX	Fuel Consumption
0.0020510	0.0000005	-	0.0000000	0.0000005	0.0052854
0.1843609	0.0021135	0.0002017	-	0.0023152	21.8402159
2.7792933	0.0062406	-	0.0001505	0.0063911	68.1703550
0.0080337	0.0000486	-	-	0.0000486	0.4578105
-	-	-	-	-	-
0.7198445	0.0009085	-	0.0000249	0.0009334	9.9557063
0.0001449	0.0000005	-	-	0.0000005	0.0046612
-	-	-	-	-	-
1.6860258	0.0033598	-	0.0000874	0.0034472	36.7695987
0.0007906	0.0000142	-	-	0.0000142	0.1334519
-	-	-	-	-	-
0.4568858	0.0009196	0.0000034	0.0000084	0.0009314	9.9348360
0.0980040	0.0005358	0.0000036	-	0.0005395	5.0858993
0.0272253	0.0001200	0.0000004	0.0000009	0.0001214	1.2946485
0.0266656	0.0001922	0.0000018	-	0.0001940	1.8284943
0.7394926	0.0000586	-	0.0000048	0.0000635	0.6769764
1.7185570	0.0030361	-	0.0000851	0.0031211	33.2914977
0.0042082	0.0000570	-	-	0.0000570	0.5369517
-	-	-	-	-	-
0.0238721	0.0000940	-	0.0000000	0.0000940	1.0030076
0.0009457	0.0000180	-	-	0.0000180	0.1695665
0.0649068	0.0001422	0.0000009	0.0000015	0.0001446	1.5425436
0.0144271	0.0001941	0.0000048	-	0.0001989	1.8760917
0.0110148	0.0000463	0.0000002	0.0000003	0.0000468	0.4992448
0.0037538	0.0000465	0.0000014	-	0.0000479	0.4521247
0.0016582	0.0000051	0.0000003	0.0000000	0.0000054	0.0576115
0.0009892	0.0000247	0.0000025	-	0.0000272	0.2567702
0.0012755	0.0000484	-	0.0000001	0.0000484	0.5167212
0.0002063	0.0000111	-	-	0.0000111	0.1048713
-	-	-	-	-	-
0.0582734	-	-	-	-	0.3455839
0.0008561	0.0000007	-	0.0000000	0.0000007	0.0072511
0.1737851	0.0020590	0.0002266	-	0.0022856	21.5610254
2.2685530	0.0060301	-	0.0001495	0.0061797	65.9150460
0.0075062	0.0000507	-	-	0.0000507	0.4782420
-	-	-	-	-	-
0.5086302	0.0008420	-	0.0000234	0.0008654	9.2308798
0.0000887	0.0000003	-	-	0.0000003	0.0031715
-	-	-	-	-	-
1.3093005	0.0030107	-	0.0000817	0.0030924	32.9853228
0.0010154	0.0000165	-	-	0.0000165	0.1559959
-	-	-	-	-	-
0.3157164	0.0007973	0.0000031	0.0000074	0.0008078	8.6161146
0.0823096	0.0004590	0.0000034	-	0.0004624	4.3590943
0.0190682	0.0001085	0.0000004	0.0000009	0.0001098	1.1713556
0.0239929	0.0001723	0.0000017	-	0.0001740	1.6408273
0.6708163	0.0000559	-	0.0000049	0.0000608	0.6489606
1.1441109	0.0026008	-	0.0000761	0.0026769	28.5533874
0.0044259	0.0000585	-	-	0.0000585	0.5515048
-	-	-	-	-	-
0.0124928	0.0000758	-	0.0000000	0.0000759	0.8091777
0.0008199	0.0000162	-	-	0.0000162	0.1528764
0.0419022	0.0001490	0.0000009	0.0000014	0.0001513	1.6137394
0.0061110	0.0001855	0.0000046	-	0.0001901	1.7929773
0.0085871	0.0000406	0.0000002	0.0000003	0.0000411	0.4379334
0.0017346	0.0000553	0.0000014	-	0.0000567	0.5348468

0.0020818	0.0000062	0.0000004	0.0000000	0.0000066	0.0704200
0.0010518	0.0000248	0.0000026	-	0.0000273	0.2579924
0.0012833	0.0000478	-	0.0000001	0.0000479	0.5106355
0.0001854	0.0000137	-	-	0.0000137	0.1289712
-	-	-	-	-	-
0.0579499	-	-	-	-	0.3057339
0.0020213	0.0000013	-	0.0000000	0.0000013	0.0134441
0.1897831	0.0018749	0.0002205	-	0.0020954	19.7672094
1.7872790	0.0053966	-	0.0001433	0.0055398	59.0904468
0.0063461	0.0000487	-	-	0.0000487	0.4590514
-	-	-	-	-	-
0.2975821	0.0007220	-	0.0000210	0.0007430	7.9251005
0.0000255	0.0000002	-	-	0.0000002	0.0014888
-	-	-	-	-	-
0.9240806	0.0024139	-	0.0000711	0.0024850	26.5064837
0.0013360	0.0000177	-	-	0.0000177	0.1668445
-	-	-	-	-	-
0.1897442	0.0006183	0.0000025	0.0000062	0.0006271	6.6885343
0.0567608	0.0003375	0.0000027	-	0.0003403	3.2080531
0.0113052	0.0000898	0.0000003	0.0000008	0.0000910	0.9701992
0.0191087	0.0001379	0.0000016	-	0.0001394	1.3145445
0.5837794	0.0000520	-	0.0000049	0.0000570	0.6077535
0.6650261	0.0019302	-	0.0000605	0.0019907	21.2336158
0.0042260	0.0000544	-	-	0.0000544	0.5127526
-	-	-	-	-	-
0.0033986	0.0000518	-	0.0000000	0.0000518	0.5524874
0.0006129	0.0000133	-	-	0.0000133	0.1257840
0.0255601	0.0001561	0.0000010	0.0000014	0.0001584	1.6898635
0.0038747	0.0001725	0.0000044	-	0.0001769	1.6690419
0.0049034	0.0000322	0.0000002	0.0000002	0.0000326	0.3477766
0.0018621	0.0000668	0.0000016	-	0.0000685	0.6458906
0.0029424	0.0000080	0.0000005	0.0000000	0.0000085	0.0911196
0.0011310	0.0000238	0.0000025	-	0.0000263	0.2482053
0.0012299	0.0000419	-	0.0000001	0.0000420	0.4475725
0.0004481	0.0000313	-	-	0.0000313	0.2952636
0.0030457	-	-	-	-	0.0213778

Appendix H
Biological Assessment

ESA

PROPOSED COMMERCIAL AIR SERVICE AT BISHOP AIRPORT

Biological Assessment

Prepared for
Inyo County Department of Public Works

October 2020

PROPOSED COMMERCIAL AIR SERVICE AT BISHOP AIRPORT

Biological Assessment

Prepared for
Inyo County Department of Public Works

October 2020

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PROPOSED COMMERCIAL AIR SERVICE AT BISHOP AIRPORT

Biological Assessment

1. Introduction

This Biological Assessment (BA) has been prepared in support of Proposed Commercial Air Service (Proposed Action) at Bishop Airport (BIH). To implement the Proposed Action, the Federal Aviation Administration (FAA) must undertake certain federal actions subject to review under the National Environmental Policy Act (NEPA)(42 U.S.C. § 4321 *et seq*). Accordingly, an Environmental Assessment (EA) is being prepared by Inyo County to evaluate potential environmental impacts associated with the Proposed Action. The FAA is the lead agency for NEPA compliance. As part of this process, this BA was developed to identify and discusses the potential effects on threatened and endangered species protected under the Endangered Species Act of 1973 (ESA)(16 U.S.C. § 1531 *et seq*.) that may result from implementation and operation of the Proposed Action and provides a summary of the effect determination. Other sensitive species of interest, such as state-listed threatened and endangered species, are also addressed in this BA.

1.1 Description of Proposed Action

Bishop Airport is a public-use airport located in Inyo County (County) in the Eastern Sierra region of California. The Airport is owned and operated by Inyo County and is situated on land leased from the Los Angeles Department of Water and Power (LADWP). BIH is designated in the FAA's National Plan of Integrated Airport Systems as a local, general aviation airport. The Airport currently serves general aviation activity and limited military activity, as well as charter and air cargo operations. Commercial air service is not currently offered at BIH. However, the County has identified an unmet demand for commercial air passenger service in the Eastern Sierra region. To serve this unmet demand, the County (Airport Sponsor) is seeking to obtain a Class I Operating Certificate for Bishop Airport under 14 Code of Federal Regulations (CFR) Part 139 to allow for scheduled or unscheduled commercial air service. United Airlines, Inc. and its partner SkyWest Airlines (operating as United Express) seek to amend SkyWest's Operations Specifications to allow the introduction of scheduled commercial air passenger service at the Airport.

The proposed commercial air passenger service would initially commence with one daily arrival and departure between BIH and Los Angeles International Airport (LAX) during the 2021 summer and shoulder seasons (April 15 through December 14) and three daily arrivals and departures between BIH and LAX, Denver International Airport (DEN), and San Francisco International Airport (SFO) during the winter season (December 15 through April 14). An additional flight to/from SFO is anticipated to be added during the 2024 winter season and a daily flight to/from San Diego International Airport (SAN) is anticipated to be added during the 2027 winter season. A second winter season flight to/from LAX is anticipated to be added in 2028. Commercial air passenger service would initially be provided with Bombardier CRJ700 aircraft, an aircraft with 70 seats, which will eventually be replaced by Embraer E175 aircraft, an aircraft with 76 seats. There would be no additional construction or ground disturbance associated with the introduction of commercial air service at BIH.

1.2 Location

Bishop Airport is located in unincorporated Inyo County, approximately 1.5 miles east of the City of Bishop and approximately 45 miles southeast of the town of Mammoth Lakes. The Airport has three runways: Runway 12/30, Runway 17/35, and Runway 8/26. Runway 8/26 is planned for eventual closure, with conversion of the Runway 8 end to a taxiway and the Runway 26 end to helicopter parking. Runway 12/30, the Airport's primary runway, is the only runway proposed to accommodate commercial service. The location of the Airport is shown on **Figure 1**. The Airport and vicinity are depicted on **Figure 2**.

1.3 Need for the Proposed Action

The purpose of the Proposed Action is to initiate commercial air passenger service at Bishop Airport. To facilitate the introduction of commercial air passenger service at BIH, Inyo County, the Airport's sponsor, seeks issuance of a Class I Operating Certificate pursuant to 14 CFR Part 139 from the FAA. United Airlines, Inc. and its partner SkyWest Airlines (operating as United Express) seek to amend SkyWest's Operations Specifications to allow the introduction of scheduled commercial air passenger service at BIH. The need for the Proposed Action is to serve unmet demand for commercial air passenger service in the Eastern Sierra region.

2. Identification of Action Area

An Action Area (AA) was developed to evaluate potential impacts to biological resources that could result from the implementation of the Proposed Action. The AA includes all areas to be directly affected by the Proposed Action as well as indirect impacts that could affect surrounding habitats. Runway 12/30 is the only runway proposed to accommodate for commercial service activity.

The AA includes a 500-foot buffer surrounding Runway 12/30, including the designated Runway Safety Area (RSA) that extends 800-feet beyond Runway 12/30 in both directions, to determine the presence of nesting birds.[1] In addition, the existing RSA unpaved access roads were also included within the AA (please refer to **Figure 3, Action Area)**.

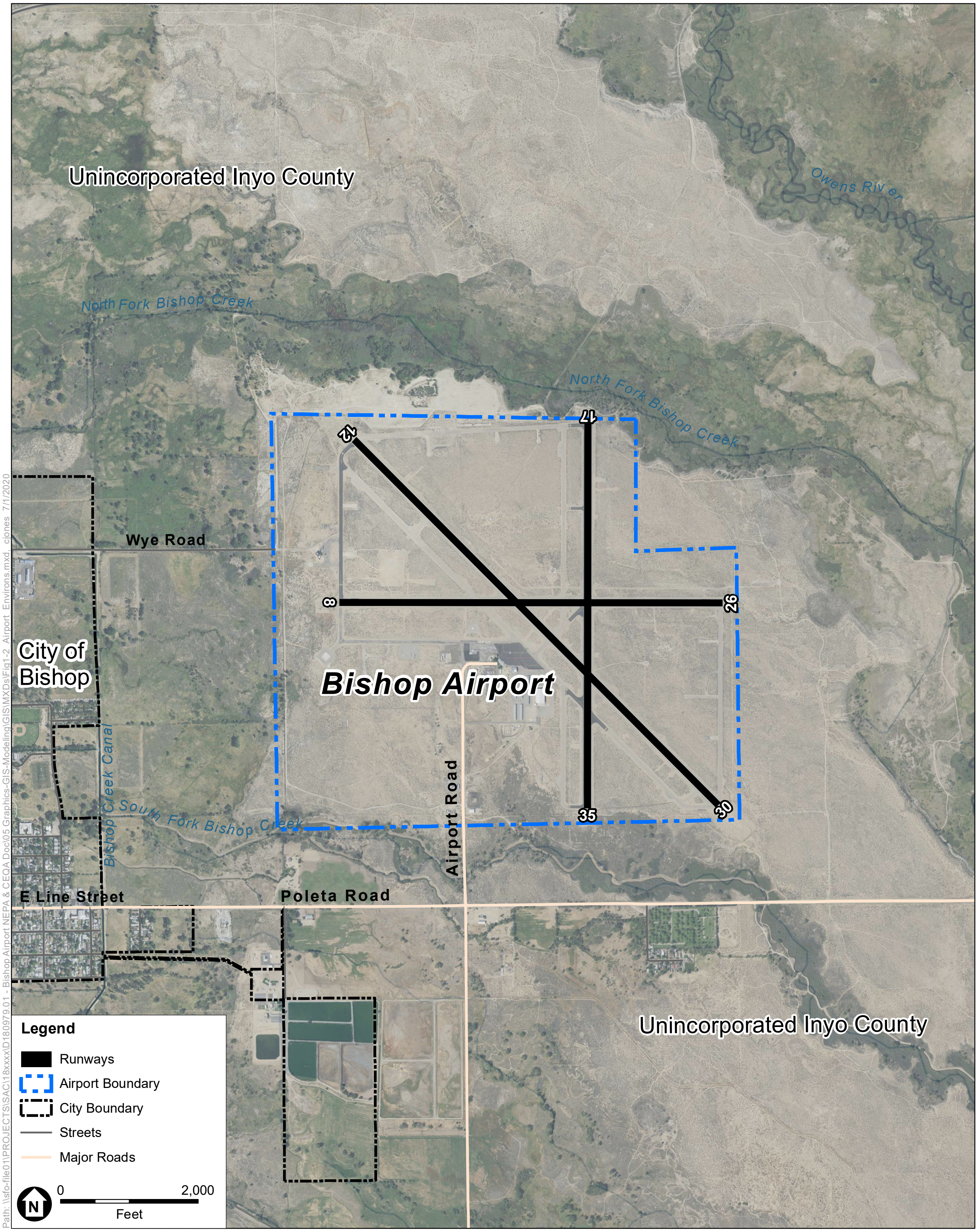
[1] CDFW, Appendix I - CDFW's Conservation Measures for Biological Resources That May Be Affected by Program-level Actions. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=73979 (Accessed: September 21, 2020).

SOURCE: Esri; Inyo County Department of Public Works; ESA, 2020.

Proposed Commercial Air Service at Bishop Airport

Figure 1
Airport Location
Bishop Airport

ESA

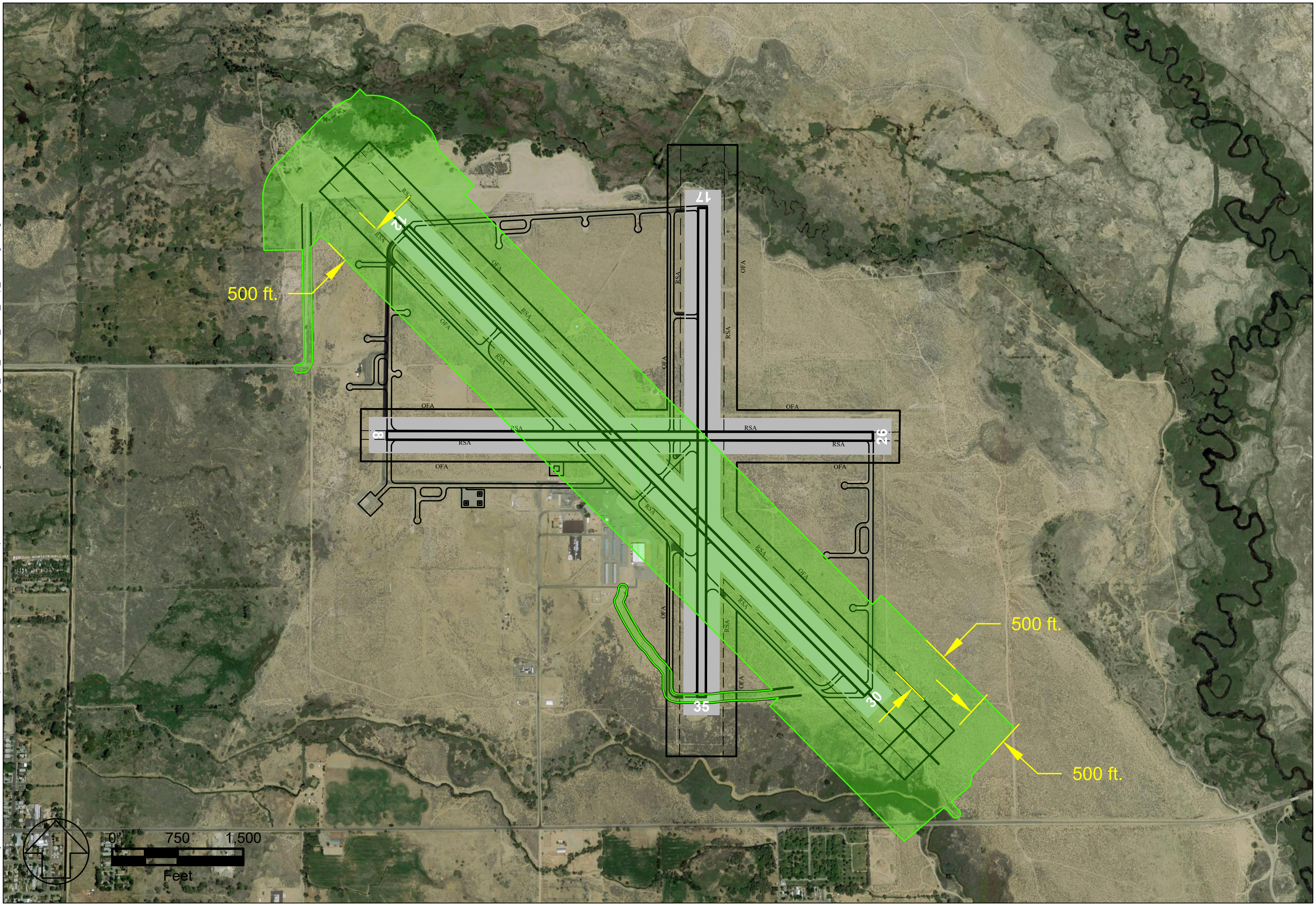


SOURCE: Esri; Inyo County Department of Public Works; ESA, 2020.

Proposed Commercial Air Service at Bishop Airport

Figure 2
Airport Vicinity
Bishop Airport

ESA



Proposed Commercial Air Service at Bishop Airport

Figure 3
Biological Assessment
Action Area

ESA

3. Existing Conditions

The Airport covers approximately 830 acres in Inyo County, California. Data from CDFW Biogeographic Information & Observation System (BIOS) indicates that land within the AA is dominated by low-intensity development, open space, and shrub/scrub habitat. Small portions of emergent herbaceous wetlands, hay/pasture, and woody wetlands occur within the northwest and southeastern ends of the AA. The vegetative communities are described per Sawyer et. al. (2009), U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI), and field-verified by an ESA biologist. A number of field surveys were performed by the field biologist on June 7, 2019 and May 1, 2020. **Appendix A** includes results of the field surveys and a photo log of habitat located within the AA. Additional site surveys were conducted within the AA, however, these “specific-species” surveys are discussed further, in **Section 5.2**.

3.1 Upland Habitat

The area surrounding Runway 12/30 within the AA consist primarily of upland habitat. This includes areas with a mixture of low-intensity development, open space, and shrub/scrub habitat. The open areas surrounding the runway are routinely graded and maintained by the Airport Operations staff for general aviation usage, which requires low-growing vegetation. The area to the northwest of the AA was previously used for gravel mining, but is largely abandoned, except for occasional off-highway vehicle use. The LADWP regularly patrol this area to ensure that there are no illegal dumping activities that could compromise the integrity of local water resources. The shrub/scrub habitat consists primarily of low-growing ruderal grassland and common shrub species. The upland vegetation communities within the AA are described below.

Disturbed/developed

Airport infrastructure (buildings, runways, taxiways, etc.) and actively managed areas are bare or have sparse vegetation. Within the maintained object-free areas adjacent to the runways, low-growing angle-stemmed buckwheat (*Eriogonum maculatum*), cryptantha (*Cryptantha micrantha*), and short-podded mustard (*Hirschfeldia incana*) are present.

Rubber rabbitbrush scrub (*Ericameria nauseosa* Alliance)

Airport property and surrounding areas outside of the actively maintained runway and taxiway object free areas consist of rubber rabbitbrush (*Ericameria nauseosa*) as the primary shrub species, with interspersed greasewood (*Sarcobatus vermiculatus*), and saltbush (*Atriplex* spp.). Herbaceous cover is generally sparse, and includes buckwheat, cryptantha, and short-podded mustard.

3.2 Wetland Habitat

Wetland habitats at the extreme northwestern and southeastern ends of the AA were identified through research using the USFWS NWI database and the field survey conducted in May 2020.[2] The AA contains potential habitat for wetland and stream species along North Fork Bishop Creek and Rawson Canal. North Fork Bishop Creek is described as a perennial stream, located approximately 1,600 feet from the end of Runway 12 (northwest side of the Airport property). Rawson Canal is a perennial stream located on the southeastern end of Runway 30, approximately 500 feet from the Airport property limits. Both streams are located within the Crowley Lake Watershed and empty into the Owens River.

The USFWS NWI identifies the presence of freshwater forested/shrub riparian habitat slightly within and immediately surrounding the AA. Field surveys confirm that these areas consist of perennial herbaceous vegetation, shrubby willow trees (*Salix* sp.), and rose (*Rosa* sp.) bushes at the northern end of Runway 12, close to North Fork Bishop Creek. In addition, small areas of willow trees and rose thicket are located to the south along Rawson Canal. Areas of willow and rose are located no closer than 815 feet to the north of Runway 12. Marginal riparian habitat is also located 830 feet south of Runway 30 along Rawson Canal. The wetland vegetation communities within and in close proximity to the AA are described below.

Sandbar willow thicket (*Salix exigua* Alliance)

Dense thickets of sandbar willow (*Salix exigua*) are present within the northwestern and southeastern ends of the Action Area. Stands are almost uniformly comprised of sandbar willow, with interspersed Wood's rose (*Rosa woodsii*). Due to the high density of sandbar willow, very little herbaceous cover is present. Breaks in this community near North Fork Bishop Creek contain small patches of cattail (*Typha* sp.). Along Rawson Canal, small clusters of common reed (*Phragmites australis*) are also present within this community.

Fremont cottonwood-willow riparian forest (*Populus fremontii*-*Salix gooddingii*- *S. lasiolepis S. laevigata* Alliance)

Patches of Fremont cottonwood (*Populus fremontii*) are scattered along the northwestern edge of the AA, primarily near the transition from upland to riparian areas. Co-occurring species include black willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), and red willow (*Salix laevigata*). Many cottonwood trees are re-sprouting after recent trimming activities by the LADWP. Herbaceous cover associated with this community is highly variable, but includes stands of perennial pepperweed (*Lepidium latifolium*), saltgrass (*Distichlis spicata*), and areas of reeds (*Juncus* sp.).

Willow riparian woodland (*Salix gooddingii*- *S. lasiolepis Salix laevigata* Alliance)

Small areas of willow riparian woodland are present in the northeast portion of the AA, at its closest proximity to North Fork Bishop Creek. Black willow, red willow, and arroyo willow are

[2] U.S. Fish and Wildlife Service, National Wetlands Inventory. https://www.fws.gov/wetlands/data/Mapper.html (Accessed: August 3, 2020).

dominant or co-dominant in this vegetation community. Areas of sandbar willow and Wood's rose occur in the shrub layer, with an herbaceous layer including Indian hemp dogbane (*Apocynum cannabinum*), saltgrass, and reeds.

Saltgrass meadow (*Distichlis spicata* Alliance)

An open saltgrass meadow is located in the AA several hundred feet northwest of the end of Runway 12. Additional component species of this community include common spike rush (*Eleocharis macrostachya*), scratchgrass (*Muhlenbergia asperifolia*), and reeds (*Juncus* sp.). The driest portions of this meadow include small areas of rabbitbrush, while the wettest include cattail and alkali bulrush (*Bolboschoenus maritimus*).[3]

4. Species Considered

Section 7 of the ESA requires federal agencies to determine if their actions may have an adverse impact on federally listed threatened or endangered species or result in destruction or adverse modification of their designated critical habitat. Listed species includes both animal and plant species. The ESA is administered by USFWS and the National Oceanic and Atmospheric Administration (NOAA) Fisheries. USFWS is responsible for terrestrial and freshwater organisms, while NOAA Fisheries is mainly responsible for marine wildlife and anadromous fish, such as salmon. Under the ESA, species are listed as either endangered, threatened candidate species, or species of concern.

This section considers special status species protected under the ESA with potential occurrence within the AA. The USFWS and NOAA Fisheries list several endangered, threatened and candidate species, along with species of concern on the Information, Planning, and Consultation (IPaC) System webpage. Prior to conducting field visits, a literature search was performed in order to evaluate the potential presence of any protected species and/or their critical habitats within or adjacent to the AA. The list of species is based on a request sent to the USFWS and a database search of the following sites:

- CDFW California Natural Diversity Database (CNDDB),
- Cornell Laboratory of Ornithology's eBird database, and the
- USFWS Environmental Conservation Online System (ECOS).

The potential for occurrence of federal and state listed species are included in **Tables 1 and 2**, and is based on literature review and field investigations conducted on June 7, 2019 and May 1, 2020. **Appendix A** includes the results from two separate site surveys conducted by a field biologist. **Appendix B** includes the official USFWS federal list of threatened and endangered species, including designated critical habitat for the AA. **Appendix C** includes the state CDFW list of animal species of special concern.

[3] Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. *A Manual of California Vegetation, Second Edition*. California Native Plant Society, Sacramento, CA.

5. Listed Species and Critical Habitat in the Action Area

5.1 Review of Federally Listed Species Identified by USFWS to Potentially Occur Within Action Area

Based on the list of species provided by USFWS on September 30, 2020, there are a total of five threatened, endangered, or candidate species with potential to occur within the AA. The list of species provided by USFWS include:

- Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*);
- Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*);
- Owens Pupfish (*Cyprinodon radiosus*);
- Owens Tui Chub (*Gila bicolor ssp. Snyderi*); and,
- Fish Slough Milk-vetch (*Astragalus lentiginosus var. piscinensis*).

The USFWS has only designated Critical Habitat for Owens Tui Chub and Fish Slough Milk-vetch, but this Critical Habitat does not exist on or adjacent to the AA. Critical Habitat for the Western Yellow-billed Cuckoo is proposed and under review, but the closest proposed location is over 100 miles south of the AA. All federally listed species included in this BA are depicted in **Table 1**.

5.1.1 Western Yellow-billed Cuckoo

The Western Yellow-billed Cuckoo is primarily a riparian avian species inhabiting dense woodland areas along streams and rivers in the Western United States. They require large, contiguous tracts of riparian habitat for nesting and prefer Cottonwood-willow forests (*Populus spp* and *Salix spp.*) for breeding. Although their migration and wintering behavior is relatively unknown, they have been generally found in scrubby habitat near streams or coastal areas.

Populations of the Yellow-billed Cuckoo have declined precipitously over the past several decades, which has reduced their breeding range and occurrence in the United States. For this reason, the bird species is listed as federally threatened and designated as endangered in the state of California. The CDFW have ranked the species as “critically imperiled” with a very high risk of extirpation in the state due to its restricted range and limited occurrence. Review of CNDDB records for this species indicate that the closest sighting of the Yellow-billed Cuckoo occurred 15 miles south of BIH in 2009. The bird species has also not been detected from site visits conducted at the Airport. Therefore, the Proposed Action will have “*no effect*” on the Western Yellow-billed Cuckoo or its habitat.

TABLE 1
FEDERALLY LISTED SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

Common Name	Scientific Name	USFWS Listing	Potential Occurrence within Action Area	Habitat Preference
Birds				
Western Yellow-Billed Cuckoo	*Coccyzus americanus occidentalis*	T	**Low**	Woodland habitat with dense cover and water nearby, including low scrubby vegetation, dense thickets, and abandoned farmland.
Southwestern Willow Flycatcher [a]	*Empidonax traillii extimus*	E	**Possible**	Dense riparian tree and shrub communities near rivers, swamps, and other wetlands.
Fishes				
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*	T	**Low**	Pristine, cool mountain streams to alkaline waters, high stream temperatures, and low dissolved oxygen.
Owens Pupfish	*Cyprinodon radiosus*	E	**Low**	Spring pools, sloughs, irrigation ditches, swamps, and flooded pastures.
Owens Tui Chub	*Gila bicolor ssp. snyderi*	E	**Low**	Standing waters and low gradient reaches of the Owens River and larger tributaries extending from the River's source.
Flowering Plants				
Fish Slough Milk-vetch	*Astragalus lentiginosus var. piscinensis*	T	**Low**	Alkaline flats paralleling desert wetland ecosystems in Inyo and Mono counties, California.

SOURCES:
U.S. Fish and Wildlife Service, Information, Planning, and Consultation (IPaC) System, April 29, 2020.
Cornell Lab of Ornithology, The Cornell Lab - All About Birds, https://www.birds.cornell.edu/home (Accessed August 4, 2020).

NOTES:
[a] The Southwestern Willow Flycatcher is a federally-listed bird species protected under the ESA. The species was not included in the official USFWS list of endangered or threatened species, but is included in the BA because habitat capable of supporting SWFL was found during site visits within the AA.

Species were evaluated for their potential to occur within the AA and, therefore, their potential to be impacted by the Proposed Action. Potential to occur was based on a combination of biological database research, historical information, and survey efforts in 2019 and 2020. Potential to occur within the AA may also be influenced by occurrences in adjacent similar habitat, and this potential has been noted as appropriate.

Status Codes:
E = Listed as Endangered
T = Listed as Threatened

5.1.2 Lahontan Cutthroat Trout

The Lahontan Cutthroat Trout inhabits a wide range of habitats including cold, high-elevation mountain streams in California to lower-elevation desert lakes with high alkalinity. Their range extends from the Sierra Nevada Mountains northeast into Nevada and Oregon. Although the trout once occupied a vast range, it has since been extirpated from nearly 95% of its native habitat in California. Furthermore, the historic range of the Lahontan Cutthroat Trout includes Lake Tahoe and the Carson, Truckee, and Walker River basins that occur well north of the Airport.[4] The

[4] U.S. Fish and Wildlife Service, Lahontan cutthroat trout. https://www.fws.gov/oregonfwo/articles.cfm?id=149489441#:~:text=Lahontan%20cutthroat%20trout%201%20Historical%20Status%20and%20Current,Reasons%20for%20Decline.%20...%205%20Conservation%20Measures.%20 (Accessed July 31, 2020).

Cutthroat Trout species is not likely to occur in the Crowley Lake watershed—where the Airport is located. Therefore, the Proposed Action will have "*no effect*" on the Lahontan Cutthroat Trout or its habitat.

5.1.3 Owens Pupfish

Habitat for the Owens Pupfish consists of spring pools, sloughs, irrigation ditches, swamps, and flooded pastures in the Owens Valley, including Inyo County. However, this fish is confined to five relatively isolated populations, which includes the Fish Slough Area of Critical Environmental Concern (ACEC). The Fish Slough ACEC is a system of springs and marshes cooperatively managed by state and federal departments to maintain the populations of Owens Pupfish. The Fish Slough ACEC is located approximately six miles north of the City of Bishop and the AA. It spans across the Inyo and Mono County border and consists of rare habitat in the Mojave Desert and Great Basin biomes.[5] The ACEC also provides habitat for rare endemic plants, such as the Fish Slough Milk-vetch. Although Fish Slough ACEC is hydrologically connected to the Owens River, its unique biome and distance make it a relatively unlikely path of migration to the North Fork Bishop Creek or Rawson Canal. Therefore, the Proposed Action will have "*no effect*" on the Owens Pupfish or its habitat.

5.1.4 Owens Tui Chub

Critical Habitat for Owens Tui Chub does not exist on or adjacent to the AA. The distribution of the Owens Tui Chub extends throughout the Owens River and its larger tributaries extending from its source springs to Owens Lake. However, there are three existing natural populations that are present. They are located at the Owens River Gorge, source springs of the Department's Hot Creek Hatchery, and at Cabin Bar Ranch near Owens Dry Lake. The Owens River Gorge is located about seven miles northwest of the AA and represents the closest population of this fish species. Additional populations have been established in cooperation with land owners at the Bureau of Land Management's Mule Spring, Little Hot Creek in Inyo National Forest, and at the University of California White Mountain Research Station owned by the LADWP.[6] Given the distance of North Fork Bishop Creek and Rawson Canal to the Owens River Gorge, combined with its populations' isolation, it is unlikely that the Owens Tui Chub would be found in the AA. Therefore, the Proposed Action will have "*no effect*" on the Owens Tui Chub or its habitat.

5.1.5 Fish Slough Milk-vetch

The Fish Slough Milk-vetch is largely dependent on desert spring-fed wetland ecosystems that consist of highly alkali soils. As previously mentioned, the Fish Slough ACEC includes a unique biome that supports a large diversity of fish and plant species. One of those plants is the Fish Slough Milk-vetch, which is listed by the USFWS as a species of concern that could be present in the AA. After reviewing the California Native Plant Society (CNPS) Calflora, the Fish Slough

[5] California Department of Fish and Wildlife Service, Owens pupfish (Cyprinodon radiosus). https://wildlife.ca.gov/Regions/6/Desert-Fishes/Owens-pupfish (Accessed July 31, 2020).

[6] California Department of Fish and Wildlife, Species Accounts – Fish. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=87529&inline (Accessed July 31, 2020).

Milk-vetch has been positively identified in Inyo County.[7] However, the closest population is approximately five miles from the AA and there are no historical records of its presence on Airport property. Furthermore, it has not been detected from field surveys conducted at the Airport. Therefore, the Proposed Action will have "*no effect*" on the Fish Slough Milk-vetch or its habitat.

5.2 Review of Federally Listed Species Identified During Field Visits to Potentially Occur in the Study Area

The official USFWS federal list of threatened and endangered species does not include the Southwestern Willow Flycatcher (SWFL), which is a federally listed bird species. Site visits identified habitat suitable for the SWFL within and immediately surrounding the AA. Therefore, this BA includes results from species-specific surveys conducted to determine the presence of the SWFL within and immediately surrounding the AA.

5.2.1 Southwestern Willow Flycatcher

The SWFL (*Empidonax traillii extimus*) is a subspecies of Willow Flycatcher found in the Southwestern United States, and the only subspecies of Willow Flycatcher known to breed in the Owens River Valley.[8] Several other subspecies of Willow Flycatcher that breed further north pass through the area during spring and fall migration (*E. t. brewsteri*, *E. t. adastus*). Multiple databases were queried for records of Willow Flycatchers observed in the vicinity of the Proposed Action, with a focus on records between the days of June 15 and July 20 of each year, the "non-migrant period," where individuals observed are presumed to be *E. t. extimus* (Willow Flycatchers are not reliably separated in the field to subspecies by other means). Records of Willow Flycatchers in the Bishop area were found during 2020 on eBird; however, these observations were not during the non-migrant period. The most recent observations during the non-migrant period were in 2013 (eBird) and 2003 (CNDDB), with the closest sightings approximately six miles northwest of BIH along Horton Creek. Observation history from CNDDB and eBird are included in **Appendix E**. A separate search on USFWS ECOS database indicates that there is no SWFL critical habitat within or in close proximity to the AA.

The SWFL occurs in riparian woodlands in Southern California. It prefers riparian areas dominated by willow trees along streams or the margins of a pond or lake, and at wet mountain meadows. Based on the recent field survey, there is potential suitable habitat to support the SWFL at riparian locations along the North Fork Bishop Creek and Rawson Canal by providing opportunities to forage within or near the AA on occasion. However, on-site species-specific surveys, addressed below, did not confirm the presence of SWFL within or near the AA.

[7] California Native Plant Society, Calflora. https://www.calflora.org/entry/observ.html?track=m#srch=t&cols=0,3,61,35,37,13,54,32,41&lpcli=t&taxon=Astragalus+lentiginosus+var.+piscinensis&chk=t&cch=t&inat=r&cc=INY (Accessed July 31, 2020).

[8] Paxton, E.H., 2000, Molecular genetic structuring and demographic history of the Willow Flycatcher: Flagstaff, Arizona, Northern Arizona University, MS thesis, 43 p.

5.2.2 Species-Specific Survey Methodology

Based on the field observations conducted in 2019 and 2020, potential Willow Flycatcher breeding habitat was observed within the AA. Based upon the field observations, species-specific surveys were conducted within potential breeding habitat located within the AA. Surveys were performed in accordance with USFWS's required protocol, found in *A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher* (provided in **Appendix D**).

A USFWS-permitted biologist (TE-92799B-2) conducted the species-specific survey on May 29, June 04, June 16, July 02, and July 10, 2020. Per the protocol requirements:

- One (1) survey was performed during *Survey Period 1* (May 15-May 31),
- Two (2) surveys were performed during *Survey Period 2* (June 01-June 24), and
- Two surveys were performed during *Survey Period 3* (June 25-July 17).

Surveys were not conducted within five days of one another. Surveys were conducted from one hour before sunrise to no later than 10:30 AM. The surveyor broadcast recorded SWFL "fitz-bew" and "britt" call notes (acquired from *xeno-canto.org*, recorded by Bill Haas in 2007), using a cellular phone speaker at maximum volume. The surveyor played calls approximately every 30 meters in suitable habitat. The surveyor listened for approximately 10 seconds, played calls for approximately 30 seconds, and then listened for approximately one minute, before proceeding to the next playback location. All suitable riparian habitats located within the AA were surveyed.

5.2.2.1 Species-Specific Results

No Willow Flycatchers were detected at any point during any of the five species-specific surveys. After playing territorial Willow Flycatcher calls according to USFWS-required methods, and receiving no response, it can be concluded that no Willow Flycatchers are utilizing the AA as breeding or foraging habitat. Therefore, it is not anticipated that the Proposed Action will directly or indirectly impact SWFLs.

5.3 State Listed Species with Potential to Occur within the Action Area

Nine state listed special-status species were identified with the potential to occur in the AA or in its immediate surroundings through field visits on May 1, 2020 and June 7, 2019, and research using the following sites: CDFW CNDDB, Cornell Laboratory of Ornithology's eBird database, and the USFWS ECOS. The state listed special-status species include the following:

- Owens Valley vole (*Microtus californicus vallicola)*;
- Yellow-breasted Chat (*Icteria virens)*;
- Burrowing Owl (*Athene cunicularia*);
- Yellow Warbler (*Setophaga petechia*);
- Northern Harrier (*Circus hudsonius*);
- Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*);
- SWFL (*Empidonax traillii extimus*);
- Owens Pupfish (*Cyprinodon radiosus*); and,

- Owens Tui Chub (*Gila bicolor ssp. Snyderi*).

The state listed species of concern are included in **Table 2**. A full list of the special species of concern listed by the CDFW is included in **Appendix C**. A discussion of state listed species of concern (not already discussed in **Sections 5.1 and 5.2**) are included below.

5.3.1 Owens Valley Vole

The Owens Valley Vole makes its home in groundwater-dependent meadows or near streams and riverbanks where soils are moist. During the previous field reviews, soils located within BIH's property limits were identified as dry, and unlikely to support the Owens Valley Vole, due to a lack of suitable habitat for the species. While CNDDB records for this species indicate its presence near the southeast corner of the Airport, all records are historical, with no present records of its occurrence at BIH.

5.3.2 Yellow-breasted Chat

The Yellow-breasted Chat breeds in areas of dense shrubbery, including abandoned farm fields, clearcuts, powerline corridors, fencerows, forest edges and openings, swamps, and edges of streams and ponds. Its habitat often includes blackberry bushes and other thickets. In arid regions of the West, it can be found in shrubby habitats along rivers. During migration, it usually stays in low, dense vegetation along rivers.

The Yellow-breasted Chat is considered by the CDFW as a Bird Species of Special Concern with a low risk of global extinction but a moderate risk of extirpation in the state due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, and threats to its population. The Yellow-breasted Chat was observed daily within the AA during field surveys conducted in May 2020 and June 2019 by a professional field biologist. The bird species was identified in the northwestern portion of the AA along North Fork Bishop Creek.

5.3.3 Burrowing Owl

The search on Cornell eBird showed burrowing owls observed within five miles of the Airport during 2018. However, there were no burrows observed within the AA during the surveys conducted in May 2020 and June 7, 2019. The unpaved portions of the Airport property are generally suitable for burrowing owls, although areas of rabbitbrush may cause a visible obstruction of their surroundings, creating a less suitable condition for the owls. Additionally, no ground squirrels or burrows were observed in the area, and the most suitable areas for burrowing owls are frequently graded as part of BIH's ongoing operations and maintenance activities.

TABLE 2
STATE LISTED SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

Common Name	Scientific Name	CDFW Listing	Potential Occurrence within Action Area	Habitat Preference
Mammals				
Owens Valley Vole	*Microtus californicus vallicola*	SSC	**Low**	Grassy banks near water sources, upland meadows, and unused agricultural fields.
Birds				
Yellow-breasted Chat	*Icteria virens*	SSC	**Possible**	Dense shrubbery, including abandoned farm fields, forest openings and edges, swamps, and edges of streams and ponds.
Burrowing Owl	*Athene cunicularia*	SSC	**Possible**	Open dry areas with low vegetation, including grasslands, rangelands, agricultural areas, and deserts.
Yellow Warbler	*Setophaga petechia*	SSC	**Possible**	Thickets and other disturbed habitats, particularly along streams and wetlands often among willows.
Northern Harrier	*Circus hudsonius*	SSC	**Possible**	Undisturbed tracts of wetlands and grasslands with low, thick vegetation.
Western Yellow-Billed Cuckoo	*Coccyzus americanuso ccidentalis*	E	**Low**	Woodland habitat with dense cover and water nearby, including low scrubby vegetation, dense thickets, and abandoned farmland.
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	**Possible**	Dense riparian tree and shrub communities near rivers, swamps, and other wetlands.
Fishes				
Owens Pupfish	*Cyprinodon radiosus*	E	**Low**	Spring pools, sloughs, irrigation ditches, swamps, and flooded pastures.
Owens Tui Chub	*Gila bicolor ssp. snyderi*	E	**Low**	Standing waters and low gradient reaches of the Owens River and larger tributaries extending from the River's source.

SOURCES:
California Department of Fish and Wildlife, State and Federally Listed Endangered and threatened Animals of California, July 17,2020.
California Department of Fish and Wildlife, Special Animals List, July 2020.
Inland Deserts Region. California Department of Fish and Wildlife. https://wildlife.ca.gov/Regions/6 (Accessed August 4, 2020).
Cornell Lab of Ornithology, The Cornell Lab - All About Birds, https://www.birds.cornell.edu/home (Accessed August 4, 2020).

NOTE: Species were evaluated for their potential to occur within the AA and, therefore, their potential to be impacted by the Proposed Action. Potential to occur was based on a combination of biological database research, historical information, and survey efforts in 2019 and 2020. Potential to occur within the AA may also be influenced by occurrences in adjacent similar habitat, and this potential has been noted as appropriate.

Status Codes:
E = Listed as Endangered
T = Listed as Threatened
SSC = Species of Special Concern

5.3.4 Yellow Warbler

The Yellow Warbler spends the breeding season in thickets and other disturbed habitats, particularly along streams and wetlands. They are often found among willows, but also live in small birch stands in high alpine environments. In the Mountain West they can occur at high elevations and among aspen groves. The Yellow Warbler is considered a California Bird Species of Special Concern. However, the CDFW designates the species as secure from global extinction and vulnerable/apparently secure from state extirpation. The species was observed daily within the AA during field surveys conducted in May 2020 and June 2019. The bird species was identified in the shrubby wetland habitat in the northwestern portion of the AA along North Fork Bishop Creek.

5.3.5 Northern Harrier

The Northern Harrier prefers undisturbed wetlands and grasslands with low but thick vegetation. Breeding habitat includes freshwaters and saline marshes, meadows, old fields, upland prairies, high-desert shrub-steppe, and riverside woodlands. Populations in the western U.S. tend to be found in dry upland habitats. The Northern Harrier is listed as a California Bird Species of Special Concern; however, the CDFW designates the species as secure from global extinction and vulnerable from state extirpation. The species was observed foraging over the Airport grounds, and may roost near the eastern boundary of the Airport. As this species was only seen during visits early in the field season, and not during subsequent visits, this species is unlikely to nest in the AA.

6. Migratory Bird Treaty Act Bird Species in the Action Area

The Migratory Bird Treaty Act (MBTA) of 1918 makes it illegal for anyone to take any migratory bird, nest, or eggs except under the terms of a valid permit. The migratory bird species in the area include hawks and other raptors, among many others. The birds listed in **Table 3** are considered birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in the AA. This list is included in this BA for information purposes—species specific surveys were not conducted except for the SWFL.

7. Effects of the Proposed Action

As discussed in **Section 1.1**, Inyo County has identified an unmet demand for commercial air passenger service in the Eastern Sierra region. To address this unmet demand, the County has expressed interest in introducing commercial air passenger service to BIH. The effects of introducing commercial aircraft, as proposed by the Action, would not result in ground impacts within the AA since there are no associated excavation, modification or construction activities currently proposed.

The absence of ground impacts indicate that the Proposed Action is unlikely to result in a noticeable effect on biological resources within or immediately surrounding the AA. The Proposed Action would only increase aircraft operations by one arrival and one departure during the breeding and nesting season when birds are most active. Most of the increase in operations will occur in the winter months (up to six per day by 2028), when there are fewer breeding birds and birds are less active. Therefore, it is unlikely that commercial air service will have a noticeable effect due to the proposed schedule and frequency of aircraft operations at BIH. In addition, the Proposed Action does not include the introduction of new arrival or departure procedures to the Airport. Commercial service aircraft will be departing and arriving using existing flight procedures.

TABLE 3
MIGRATORY BIRD TREATY ACT BIRD SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

Common Name	Scientific Name	USFWS Listing	Potential Occurrence within Action Area	Habitat Preference
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	P	Low	Lakes and reservoirs with lots of fish and surrounding forests.
Golden Eagle	*Aquila chrysaetos*	P	Low	Open and semi-open areas with native vegetation, primarily in mountains, canyons, cliffs and bluffs.
Tricolored Blackbird	*Agelaius tricolor*	NL	Low	Wetlands with cattails, bulrushes, and willows.
Olive-sided Flycatcher	*Contopus cooperi*	NL	Low	Boreal forest and in western coniferous forests.
Willow Flycatcher	*Empidonax traillii*	NL	Possible	Areas with willows or other shrubs near standing or running water.
Lewis's Woodpecker	*Melanerpes lewis*	NL	Low	Open ponderosa pine forests and burned forests with a high density of standing dead trees (snags).
Long-billed Curlew	*Numenius americanus*	NL	Low	Sparse, short grasses, including shortgrass and mixed-grass prairies and agricultural fields.
Marbled Godwit	*Limosa fedoa*	NL	Low	Shortgrass prairies near wetlands.
Green-tailed Towhee	*Pipilo chlorurus*	NL	Low	Dense, shrubby habitat, sometimes with scattered trees or cacti.
Pinyon Jay	*Gymnorhinus cyanocephalus*	NL	Low	Pinyon-juniper woodlands, sagebrush, scrub oak, chaparral, and ponderosa pine forests.
Sage Thrasher	*Oreoscoptes montanus*	NL	Possible	Shrubsteppe habitats in open landscapes of the interior West.
Sagebrush Sparrow	*Artemisiospiza nevadensis*	NL	Possible	Shrubsteppe habitats consisting of shrubs up to about 6 feet tall, especially big sagebrush as well as saltbush, rabbitbrush, shadscale, and bitterbrush.
Brewer's Sparrow	*Spizella breweri*	NL	Possible	Exclusively in the sagebrush ecosystem when breeding.
Virginia's Warbler	*Vermivora virginiae*	NL	Low	Open pinyon-juniper and oak woodlands often on steep slopes with shrubby ravines.
Willet	*Tringa semipalmata*	NL	Low	Open beaches, bayshores, marshes, mudflats, and rocky coastal zones.
Lesser Yellowlegs	*Tringa flavipes*	NL	Low	Fresh and brackish wetlands, including mudflats, marshes, lake and pond edges, and wet meadows.

SOURCES: .
U.S. Fish and Wildlife Service, Information, Planning, and Consultation (IPaC) System, April 29, 2020.
Cornell Lab of Ornithology, The Cornell Lab - All About Birds, https://www.birds.cornell.edu/home (Accessed August 4, 2020).

NOTE: Species were evaluated for their potential to occur within the Action Area and their potential to be impacted by the Proposed Action. Potential to occur was based on the presence of habitat within the AA. Potential to occur within the AA may also be influenced by occurrences in adjacent similar habitat, and this potential has been considered.

Status Codes:
E = Listed as Endangered
T = Listed as Threatened
P = Protected under MBTANL = Not Listed

8. Conclusions

The Proposed Action does not include any ground disturbance within or immediately surrounding the AA that may affect habitat or threatened or endangered species and there is no designated critical habitat present. The Proposed Action is expected to produce "*no effect*" on federally listed fish, plant, and avian species within or immediately surrounding the AA. Furthermore, the Proposed Action will have no effect on state species of special concern identified during site surveys, including the Northern Harrier, Yellow Warbler, and Yellow-breasted Chat. **Table 4** summarizes the findings of this BA.

TABLE 4
FEDERAL AND STATE LISTED SPECIES POTENTIAL OCCURRENCE AND EFFECT SUMMARY

Common Name	Scientific Name	Protected Status	Potential Occurrence within Action Area	Recommended Effect Summary
Mammals				
Owens Valley Vole	*Microtus californicus vallicola*	SSC	**Low**	**No Effect.** Action does not include suitable habitat within AA and there are no proposed ground impacts.
Birds				
Western Yellow-Billed Cuckoo	*Coccyzus americanus occidentalis*	FT/SE	**Low**	**No Effect.** Field surveys did not confirm the presence of species or enough suitable habitat.
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	FE/SE	**Possible**	**No Effect.** Field surveys did not confirm the presence of this species on seven total visits between 2019 and 2020 and there are no proposed alterations to habitat that could potentially support the species.
Burrowing Owl	*Athene cunicularia*	SSC	**Possible**	**No Effect.** Field surveys did not confirm the presence of burrows or suitable habitat to support the species.
Yellow-breasted Chat	*Icteria virens*	SSC	**Possible**	**No Effect.** Although field surveys confirm the presence of this species on two separate occasions, there are no proposed alterations to habitat where the species was observed.
Yellow Warbler	*Setophaga petechia*	SSC	**Possible**	**No Effect.** Although field surveys confirm the presence of this species on two separate occasions, there are no proposed alterations to habitat where the species was observed.
Northern Harrier	*Circus hudsonius*	SSC	**Possible**	**No Effect.** Although field surveys observed this species, there are no proposed alterations to habitat where the species was observed.
Fishes				
Lahontan Cutthroat Trout	*Oncorhynchus clarkii henshawi*	FT	**Low**	**No Effect.** Action within USFWS's Consultation Area, but there are no proposed ground or water impacts.
Owens Pupfish	*Cyprinodon radiosus*	FE/SE	**Low**	**No Effect.** Action within USFWS's Consultation Area, but there are no proposed ground or water impacts.
Owens Tui Chub	*Gila bicolor ssp. snyderi*	FE/SE	**Low**	**No Effect.** Action within USFWS's Consultation Area, but there are no proposed ground or water impacts.
Flowering Plants				
Fish Slough Milk-vetch	*Astragalus lentiginosus var. piscinensis*	FT	**Low**	**No Effect.** Action within USFWS's Consultation Area, but there are no proposed ground impacts.

SOURCES: Environmental Science Associates, 2020.

NOTE: Species were evaluated for their potential to occur within the AA and their potential to be impacted by the Proposed Action. Potential to occur was based on a combination of biological database research, and survey efforts in 2019 and 2020. Potential to occur within the AA may also be influenced by occurrences in adjacent similar habitat, and this potential has been noted as appropriate.

Status Codes:
FE = Listed as Federally Endangered
FT = Listed as Federally Threatened
SE = Listed as State Endangered
ST = Listed as State Threatened
SSC = Species of Special Concern

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APPENDIX A

Biological Resource Surveys

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memorandum

date	July 17, 2020
to	Ashley Helms
from	Karl Fairchild, Chris Jones, and Susan Shaw
subject	Results of a Biological Resources Field Survey for Proposed Commercial Air Service at Bishop Airport

This memorandum summarizes the results of a field survey conducted by Environmental Science Associates' (ESA) biologist Karl Fairchild (biologist) at the Bishop Airport (Airport) on May 1, 2020, and which updates a similar field survey conducted June 7, 2019. The survey documented existing vegetation and habitat, and searched for biological resources on the Airport property, located within the Owens River Valley, and within a draft study area (see **Figure 1**), which encompassed areas of potential direct and indirect effects from the Type Certification change project. In addition to surveying for the general presence of biological resources, the survey examined the potential for use by the southwestern willow flycatcher (*Empidonax traillii extimus*, SWFL), including habitat.

Background

Bishop Airport is designated in the Federal Aviation Administration's (FAA) National Plan of Integrated Airport Systems (NPIAS) as a local, general aviation airport. The Airport currently serves general aviation activity and limited military activity, as well as charter and air cargo operations. BIH currently has no scheduled commercial air service. Inyo County, the Airport Sponsor, has expressed interest in obtaining an Airport Operating Certification for Bishop Airport under Title 14 Code of Federal Regulations (CFR) Part 139 to allow for scheduled or unscheduled commercial air service. United Airlines, Inc. and its partner (SkyWest Airlines operating as United Express) are interested in introducing commercial air passenger service to BIH. United Airlines has submitted a request to the FAA to amend its operations specifications to allow the airline to provide scheduled air service to BIH. Commercial aircraft operations are expected to consist of three arrivals and three departures per day during winter months and one arrival and one departure per day during summer months, with commercial service provided by regional jet aircraft (such as the Bombardier CRJ700) or narrow-body mainline jet aircraft (such as the Airbus A319 or the Boeing 737). Runway 12/30, which runs in a southeast/northwest direction, is the only runway proposed for commercial aircraft use.

The scope of this biological resources survey is to provide the County of Inyo with an assessment of the potential for SWFL and other sensitive biological resources to be present within the draft study area for the Part 139 certification. US Fish and Wildlife Service protocol-level surveys for SWFL and other sensitive species were not conducted during this analysis.

Methods

Prior to visiting the Airport, the biologist conducted a search of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB), Cornell Laboratory of Ornithology's eBird database, and the US Fish and Wildlife Service's Environmental Conservation Online System (ECOS) to search for recent occurrences of SWFL, other sensitive species, and habitats to support these species on or in the vicinity of the Airport.

The biologist conducted the biological resources survey on May 1, 2020. The survey consisted of driving the on the Airport property and surrounding publicly accessible areas with County of Inyo representative Ashley Helms, stopping to examine areas of interest as they were encountered. The biologist documented general habitat conditions and if suitable habitat for SWFL or other species existed on site. Suitable habitat for SWFL consists of dense, streamside willow (*Salix* sp.)[1] thickets with multi-layered canopy. Other habitat searched for includes suitable habitat for burrowing owl (*Athene cunicularia*), and Owens Valley vole (*Microtus californicus vallicola*). Suitable habitat for burrowing owl consists of open fields with good visibility, friable soils, and existing burrows from California ground squirrels (*Otospermophilus beecheyi*) or similar species[2]. The Owens Valley vole requires wet meadows and lush grassy areas with friable soils.[3]

Results

Three special-status species were identified with the potential to occur on the Airport property or in its immediate surroundings through the CNDDB search: SWFL, burrowing owl and Owens Valley vole, though all records of the latter were historical (50+ years old). The eBird search showed willow flycatchers (not identified to subspecies) present within 5 miles of the Airport during 2020, and burrowing owls observed within 5 miles of the Airport during 2018. The ECOS search determined that no SWFL critical habitat exists in the Owens River Valley.

The area surrounding the runways and within the draft study area consisted of developed areas, low-growing ruderal grassland, and areas of short rabbitbrush (*Ericameria* sp.). This area is routinely graded and maintained by the Airport Operations staff. This habitat is not suitable for SWFL, and is also not suitable for the Owens Valley vole. However, this area shows some habitat characteristics suitable for burrowing owl; **Appendix 1** depicts habitat conditions observed in the draft study area.

Riparian habitat north and south of the Airport were surveyed for potential SWFL habitat. Areas of willow and rose (*Rosa* sp.) are found to the north of the northern end of Runway 12/30, along North Fork Bishop Creek. In addition, small areas of willow and rose thicket are located to the south along Rawson Canal. Areas of willow and rose are located no closer than 815 feet to the north of Runway 12/30. Marginally suitable habitat is also located 830 feet south of Runway 12/30 along Rawson Canal.

Discussion

Based on the survey results, it is unlikely that commercial aircraft operations at Bishop Airport will affect the SWFL, due to the lack of suitable habitat present on site. While some potential habitat exists in the surrounding area, it is unlikely to be affected by the change in aircraft operations because of the slight increase in aircraft

[1] Sogge, M. K., D. Ahlers, and S. J. Sferra. 2010, A natural history summary and survey protocol for the southwestern willow flycatcher: U.S. Geological Survey Techniques and Methods 2A-10, 38 p.

[2] California Department of Fish and Wildlife. 2012. Staff Report on Burrowing Owl Mitigation. State of California.

[3] Hall E. 1959. The Mammals of North America Volumes 1 & 2. Wiley-Interscience Publication

operations, particularly during nesting season (one aircraft operation per day) and no flight track changes are anticipated.

The unpaved portions of the Airport property are generally suitable for burrowing owls, though areas of rabbitbrush may obstruct visibility of surroundings, creating a less suitable condition. Additionally, no ground squirrels or burrows were observed in the area, and the most suitable areas for burrowing owl are frequently graded as part of ongoing airport operations and maintenance. Nevertheless, it is recommended that burrowing owl surveys be performed in accordance with CDFW protocols prior to any new ground-disturbing activities.

In addition, the Airport grounds are unlikely to support the Owens Valley vole, due to a lack of wetlands or lush grassy areas. While CNDDB records for this species indicate its presence near the southeast corner of the airport, all records are historical.

Memorandum documented by:

Karl Fairchild

Karl Fairchild
Senior Biologist

APPENDIX 1: PHOTO LOG

Photo 1: Photo depicts predominant habitat conditions at the Bishop Airport, photo looking east.

Photo 2: Photo depicts marginally suitable habitat for SWFL, found approximately 1100 feet north of Runway 12/30, photo looking northwest.

Photo 3: Photo depicts marginally suitable habitat for SWFL, found approximately 1000 feet south of Runway 12/30, photo looking west.

Photo 4: Example photo of disturbed/developed habitat within the airport. Photo looking north.

Photo 5: Example photo of rubber rabbitbrush scrub within the airport. Photo looking north.

Photo 6: Overview of north end of Action Area. Abandoned gravel mine is in the foreground; Fremont cottonwood forest is visible in the background. Photo looking northeast.


Photo 7: Example photo of sandbar willow thicket along Rawson Canal. Photo looking west.


Photo 8: Example photo of sandbar willow thicket in northwest corner of the Action Area. Photo looking north.

Photo 9: Example photo of Fremont cottonwood/willow riparian forest in the northwest corner of the Action Area. Photo looking southeast.

Photo 10: Example photo of willow riparian forest in the northwest corner of the Action Area. Photo looking north.

Photo 11: Example photo of saltgrass meadow in the northwest corner of the Action Area. Photo looking west.

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memorandum

date August 15, 2019

to Ashley Helms

from Karl Fairchild, Patrick Tennant, and Autumn Ward

subject Results of a Biological Resources Field Survey for Proposed Commercial Air Service at Bishop Airport

This memorandum summarizes the results of a field survey conducted by Environmental Science Associates' (ESA) biologist Karl Fairchild (biologist) at the Bishop Airport (Airport) on June 7, 2019. The survey documented existing vegetation and habitat, and searched for biological resources on the Airport property, located within the Owens River Valley, and within a draft study area (see Figure 1), which encompassed areas of potential direct and indirect effects from the Proposed Project. In addition to surveying for the general presence of biological resources, the survey examined the potential for the southwestern willow flycatcher (*Empidonax traillii extimus*, SWFL) habitat.

Background

The County of Inyo proposes to accommodate the unmet demand for commercial passenger service at the Airport. The commercial aircraft operations are expected to consist of three arrivals and three departures per day during winter months and one arrival and one departure per day during summer months, with commercial service provided by regional jet aircraft (such as the Bombardier CRJ700) or narrow-body jet aircraft (such as the Airbus A319 or the Boeing 737). Runway 12/30, which runs in a southeast/northwest direction, is the primary runway that would be used for the commercial aircraft operations. Runway 17/35, which runs in a north/south direction, may also be used for commercial aircraft operations, when wind and weather conditions do not permit the use of Runway 12/30 (see Figure 1).

The scope of this biological resources survey is to provide the County of Inyo with an assessment of the potential for SWFL and other sensitive biological resources to be present within the draft study area. US Fish and Wildlife Service protocol-level surveys for SWFL and other sensitive species were not conducted during this analysis.

Methods

Prior to visiting the Airport, the biologist conducted a search of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB), Cornell Laboratory of Ornithology's eBird database, and the US Fish and Wildlife Service's Environmental Conservation Online System (ECOS) to search for recent occurrences of SWFL, other sensitive species, and habitats to support these species on or in the vicinity of the Airport.

The biologist conducted the biological resources survey on June 7, 2019. The survey consisted of driving the on the Airport property and surrounding publicly accessible areas with County of Inyo representative Ashley Helms, stopping to examine areas of interest as they were encountered. The biologist documented general habitat conditions and if suitable habitat for SWFL or other species existed on site. Suitable habitat for SWFL consists of dense, streamside willow (*Salix* sp.)[1] thickets with multi-layered canopy. Other habitat searched for includes suitable habitat for burrowing owl (*Athene cunicularia*), which consists of open fields with good visibility, friable soils, and existing burrows from California ground squirrels (*Otospermophilus beecheyi*) or similar species[2]. The Owens Valley vole (*Microtus californicus vallicola*) requires wet meadows and lush grassy areas with friable soils.[3]

Results

Three special-status species were identified with the potential to occur on the Airport property or in its immediate surroundings through the CNDDB search: SWFL, burrowing owl and Owens Valley vole. The eBird search showed willow flycatchers (not identified to subspecies) present within 5 miles of the Airport during 2019, and burrowing owls observed within 5 miles of the Airport during 2018. The ECOS search determined that no SWFL critical habitat exists in the Owens River Valley.

The area surrounding the runways and within the draft study area consisted of developed areas, low-growing ruderal grassland, and areas of short rabbitbrush (*Ericameria* sp.). This area is routinely graded and maintained by the Airport Operations staff. This habitat is not suitable for SWFL, and is also not suitable for the Owens Valley vole. However, this area shows some habitat characteristics suitable for burrowing owl; the Appendix 1: Photo Log depicts habitat conditions observed in the draft study area.

Riparian habitat north and south of the Airport were surveyed for potential SWFL habitat. Areas of willow and rose (*Rosa* sp.) are found to the north of the northern ends of Runways 12/30 and 17/35, along North Fork Bishop Creek. In addition, small areas of willow and rose thicket are located to the south along Rawson Canal. Areas of willow and rose are located no closer than 815 feet to the north of Runway 12/30 and no closer than 305 feet to the northwest of Runway 17/35. An area with greater potential for use by willow flycatchers is located approximately 730 feet northeast of Runway 17/35. Marginally suitable habitat is located 600 feet south of Runway 17/35 along Rawson Canal, and 830 feet southwest of Runway 12/30.

Discussion

Based on the survey results, it is unlikely that commercial aircraft operations at Bishop Airport will affect the SWFL, due to the lack of suitable habitat present on site. While some potential habitat exists in the surrounding area, it is unlikely to be affected by the change in aircraft operations because of the slight increase in aircraft operations, particularly during nesting season (one aircraft operation per day) and no flight track changes are anticipated.

The unpaved portions of the Airport property are generally suitable for burrowing owls, though areas of rabbitbrush may obstruct visibility of surroundings, creating a less suitable condition. Additionally, no ground squirrels or burrows were observed in the area, and the most suitable areas for burrowing owl are frequently

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[1] Sogge, M. K., D. Ahlers, and S. J. Sferra. 2010, A natural history summary and survey protocol for the southwestern willow flycatcher: U.S. Geological Survey Techniques and Methods 2A-10, 38 p.

[2] California Department of Fish and Wildlife. 2012. Staff Report on Burrowing Owl Mitigation. State of California.

[3] Hall E. 1959. The Mammals of North America Volumes 1 & 2. Wiley-Interscience Publication

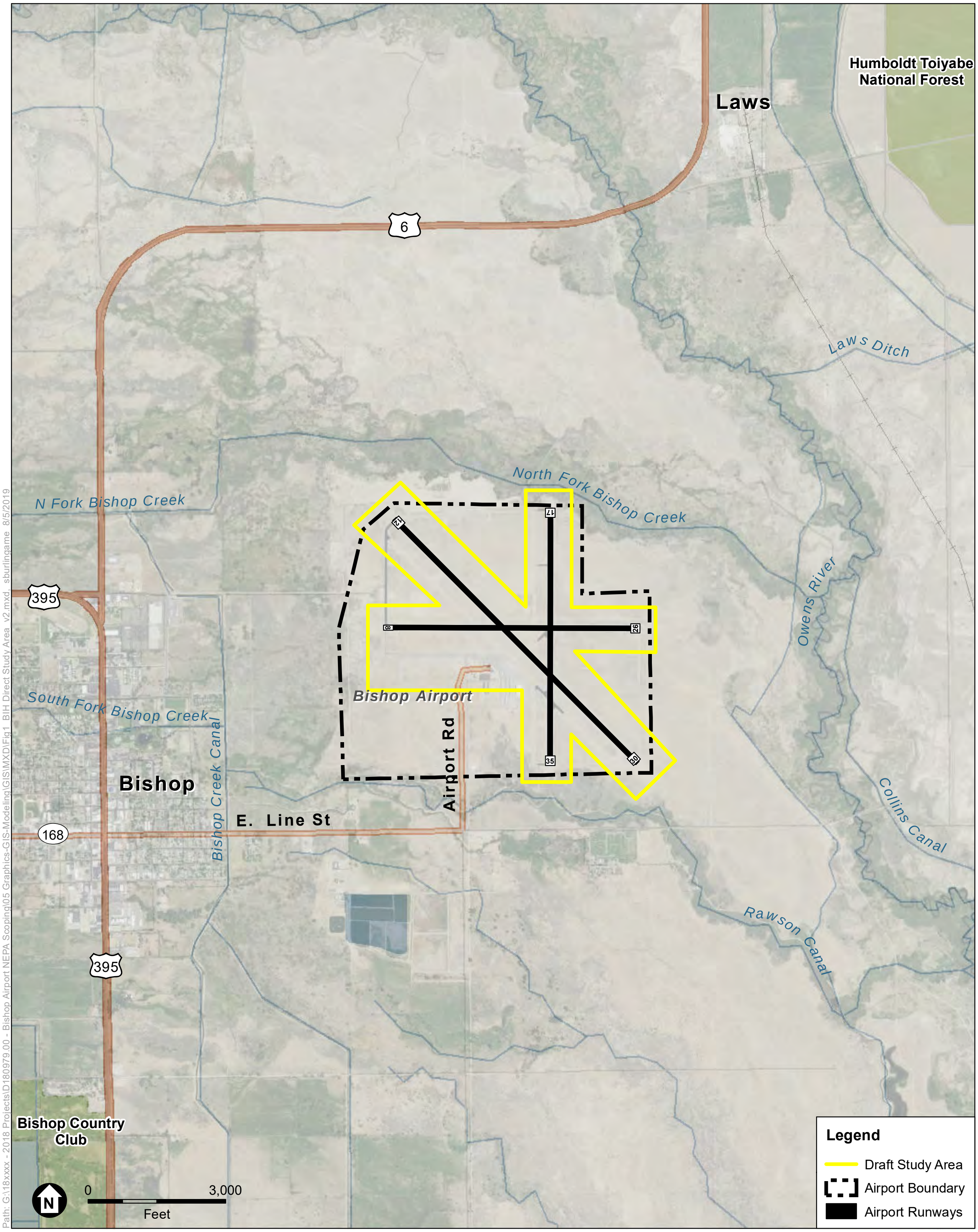
graded as part of ongoing airport operations and maintenance. Nevertheless, it is recommended that burrowing owl surveys be performed in accordance with CDFW protocols prior to any new ground-disturbing activities.

In addition, the Airport grounds are unlikely to support the Owens Valley vole, due to a lack of wetlands or lush grassy areas. While CNDDB records for this species indicate its presence near the southeast corner of the airport, all records are historical.

Memorandum documented by:

Karl Fairchild

Karl Fairchild
Associate Biologist III



SOURCE: Esri; ESA, 2019

BIH NEPA Scoping

Figure 1
Direct Study Area
Bishop Airport

ESA

DRAFT FOR DELIBERATIVE PURPOSES

APPENDIX 1: PHOTO LOG

Photo 1: Photo depicts predominant habitat conditions at the Bishop Airport, photo looking east.

Photo 2: Photo depicts marginally suitable habitat for SWFL, found approximately 320 feet north of Runway 17/35, photo looking north.

Photo 3: Photo depicts moderate-quality habitat for SWFL, found approximately 800 feet northeast of Runway 17/35, photo looking northeast.

APPENDIX B

U.S. Fish and Wildlife Service Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Reno Fish And Wildlife Office
1340 Financial Boulevard, Suite 234
Reno, NV 89502-7147
Phone: (775) 861-6300 Fax: (775) 861-6301
http://www.fws.gov/nevada/

In Reply Refer To: September 30, 2020
Consultation Code: 08ENVD00-2020-SLI-0661
Event Code: 08ENVD00-2020-E-01840
Project Name: Proposed Commercial Airline Service at Bishop Airport

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The attached species list indicates threatened, endangered, proposed, and candidate species and designated or proposed critical habitat that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act of 1973, as amended (ESA, 16 U.S.C. 1531 *et seq*.), for projects that are authorized, funded, or carried out by a Federal agency. Candidate species have no protection under the ESA but are included for consideration because they could be listed prior to the completion of your project. Consideration of these species during project planning may assist species conservation efforts and may prevent the need for future listing actions. For additional information regarding species that may be found in the proposed project area, visit http://www.fws.gov/nevada/es/ipac.html.

The purpose of the ESA is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the ESA and its implementing regulations (50 CFR 402 *et seq*.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Guidelines for preparing a Biological Assessment can be found at: http://www.fws.gov/midwest/endangered/section7/ba_guide.html.

If a Federal action agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species, and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this species list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally listed, proposed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the ESA, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally, as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation, for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the attached list.

The Nevada Fish and Wildlife Office (NFWO) no longer provides species of concern lists. Most of these species for which we have concern are also on the Animal and Plant At-Risk Tracking List for Nevada (At-Risk list) maintained by the State of Nevada's Natural Heritage Program (Heritage). Instead of maintaining our own list, we adopted Heritage's At-Risk list and are partnering with them to provide distribution data and information on the conservation needs for at-risk species to agencies or project proponents. The mission of Heritage is to continually evaluate the conservation priorities of native plants, animals, and their habitats, particularly those most vulnerable to extinction or in serious decline. In addition, in order to avoid future conflicts, we ask that you consider these at-risk species early in your project planning and explore management alternatives that provide for their long-term conservation.

For a list of at-risk species by county, visit Heritage's website (http://heritage.nv.gov). For a specific list of at-risk species that may occur in the project area, you can obtain a data request form from the website (http://heritage.nv.gov/get_data) or by contacting the Administrator of Heritage at 901 South Stewart Street, Suite 5002, Carson City, Nevada 89701-5245, (775) 684-2900. Please indicate on the form that your request is being obtained as part of your coordination with the Service under the ESA. During your project analysis, if you obtain new information or data for any Nevada sensitive species, we request that you provide the information to Heritage at the above address.

Furthermore, certain species of fish and wildlife are classified as protected by the State of Nevada (http://www.leg.state.nv.us/NAC/NAC-503.html). You must first obtain the appropriate license, permit, or written authorization from the Nevada Department of Wildlife (NDOW) to take, or possess any parts of protected fish and wildlife species. Please visit http://www.ndow.org or contact NDOW in northern Nevada (775) 688-1500, in southern Nevada (702) 486-5127, or in eastern Nevada (775) 777-2300.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq*.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the Service's wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

The Service's Pacific Southwest Region developed the *Interim Guidelines for the Development of a Project Specific Avian and Bat Protection Plan for Wind Energy Facilities* (Interim Guidelines). This document provides energy facility developers with a tool for assessing the risk of potential impacts to wildlife resources and delineates how best to design and operate a bird- and bat-friendly wind facility. These Interim Guidelines are available upon request from the NFWO. The intent of a Bird and Bat Conservation Strategy is to conserve wildlife resources while supporting project developers through: (1) establishing project development in an adaptive management framework; (2) identifying proper siting and project design strategies; (3) designing and implementing pre-construction surveys; (4) implementing appropriate conservation measures for each development phase; (5) designing and implementing appropriate post-construction monitoring strategies; (6) using post-construction studies to better understand the dynamics of mortality reduction (*e.g.*, changes in blade cut-in speed, assessments of blade “feathering” success, and studies on the effects of visual and acoustic deterrents) including efforts tied into Before-After/Control-Impact analysis; and (7) conducting a thorough risk assessment and validation leading to adjustments in management and mitigation actions.

The template and recommendations set forth in the Interim Guidelines were based upon the Avian Powerline Interaction Committee's Avian Protection Plan template (http://www.aplic.org/) developed for electric utilities and modified accordingly to address the unique concerns of wind energy facilities. These recommendations are also consistent with the Service's wind energy guidelines. We recommend contacting us as early as possible in the planning process to discuss the need and process for developing a site-specific Bird and Bat Conservation Strategy.

The Service has also developed guidance regarding wind power development in relation to prairie grouse leks (sage-grouse are included in this). This document can be found at: http://www.fws.gov/southwest/es/Oklahoma/documents/te_species/wind%20power/prairie%20grouse%20lek%205%20mile%20public.pdf.

Migratory Birds are a Service Trust Resource. Based on the Service's conservation responsibilities and management authority for migratory birds under the Migratory Bird Treaty Act of 1918, as amended (MBTA; 16 U.S.C. 703 *et seq*.), we recommend that any land clearing or other surface disturbance associated with proposed actions within the project area be timed to avoid potential destruction of bird nests or young, or birds that breed in the area. Such destruction may be in violation of the MBTA. Under the MBTA, nests with eggs or young of migratory birds may not be harmed, nor may migratory birds be killed. Therefore, we recommend land clearing be conducted outside the avian breeding season. If this is not feasible, we recommend a qualified biologist survey the area prior to land clearing. If nests are located, or if other evidence of nesting (*i.e.*, mated pairs, territorial defense, carrying nesting material, transporting food) is observed, a protective buffer (the size depending on the habitat requirements of the species) should be delineated and the entire area avoided to prevent destruction or disturbance to nests until they are no longer active.

Guidance for minimizing impacts to migratory birds for projects involving communications towers (*e.g.*, cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

If wetlands, springs, or streams are are known to occur in the project area or are present in the vicinity of the project area, we ask that you be aware of potential impacts project activities may have on these habitats. Discharge of fill material into wetlands or waters of the United States is regulated by the U.S. Army Corps of Engineers (ACOE) pursuant to section 404 of the Clean Water Act of 1972, as amended. We recommend you contact the ACOE's Regulatory Section regarding the possible need for a permit. For projects located in northern Nevada (Carson City, Churchill, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Lyon, Mineral, Pershing, Storey, and Washoe Counties) contact the Reno Regulatory Office at 300 Booth Street, Room 3060, Reno, Nevada 89509, (775) 784-5304; in southern Nevada (Clark, Lincoln, Nye, and White Pine Counties) contact the St. George Regulatory Office at 321 North Mall Drive, Suite L-101, St. George, Utah 84790-7314, (435) 986-3979; or in California along the eastern Sierra contact the Sacramento Regulatory Office at 650 Capitol Mall, Suite 5-200, Sacramento, California 95814, (916) 557-5250.

We appreciate your concern for threatened and endangered species. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

The table below outlines lead FWS field offices by county and land ownership/project type. Please refer to this table when you are ready to coordinate (including requests for section 7 consultation) with the field office corresponding to your project, and send any documentation regarding your project to that corresponding office. Therefore, the lead FWS field office may not be the office listed above in the letterhead.

Lead FWS offices by County and Ownership/Program

County	Ownership/Program	Species	Office Lead*

Alameda	Tidal wetlands/marsh adjacent to Bays	Salt marsh species, delta smelt	BDFWO
Alameda	All ownerships but tidal/estuarine	All	SFWO
Alpine	Humboldt Toiyabe National Forest	All	RFWO
Alpine	Lake Tahoe Basin Management Unit	All	RFWO
Alpine	Stanislaus National Forest	All	SFWO
Alpine	El Dorado National Forest	All	SFWO
Colusa	Mendocino National Forest	All	AFWO
Colusa	Other	All	By jurisdiction (see map)
Contra Costa	Legal Delta (Excluding ECCHCP)	All	BDFWO
Contra Costa	Antioch Dunes NWR	All	BDFWO
Contra Costa	Tidal wetlands/marsh adjacent to Bays	Salt marsh species, delta smelt	BDFWO
Contra Costa	All ownerships but tidal/estuarine	All	SFWO
Del Norte	All	All	AFWO
El Dorado	El Dorado National Forest	All	SFWO
El Dorado	LakeTahoe Basin Management Unit		RFWO
Glenn	Mendocino National Forest	All	AFWO
Glenn	Other	All	By jurisdiction (see map)
Humboldt	All except Shasta Trinity National Forest	All	AFWO

Humboldt	Shasta Trinity National Forest	All	YFWO
Lake	Mendocino National Forest	All	AFWO
Lake	Other	All	By jurisdiction (see map)
Lassen	Modoc National Forest	All	KFWO
Lassen	Lassen National Forest	All	SFWO
Lassen	Toiyabe National Forest	All	RFWO
Lassen	BLM Surprise and Eagle Lake Resource Areas	All	RFWO
Lassen	BLM Alturas Resource Area	All	KFWO
Lassen	Lassen Volcanic National Park	All (includes Eagle Lake trout on all ownerships)	SFWO
Lassen	All other ownerships	All	By jurisdiction (see map)
Marin	Tidal wetlands/marsh adjacent to Bays	Salt marsh species, delta smelt	BDFWO
Marin	All ownerships but tidal/estuarine	All	SFWO
Mendocino	Russian River watershed	All	SFWO
Mendocino	All except Russian River watershed	All	AFWO
Modoc	Modoc National Forest	All	KFWO
Modoc	BLM Alturas Resource Area	All	KFWO
Modoc	Klamath Basin National Wildlife Refuge Complex	All	KFWO
Modoc	BLM Surprise and Eagle Lake Resource Areas	All	RFWO

Modoc	All other ownerships	All	By jurisdiction (See map)
Mono	Inyo National Forest	All	RFWO
Mono	Humboldt Toiyabe National Forest	All	RFWO
Napa	All ownerships but tidal/estuarine	All	SFWO
Napa	Tidal wetlands/marsh adjacent to San Pablo Bay	Salt marsh species, delta smelt	BDFWO
Nevada	Humboldt Toiyabe National Forest	All	RFWO
Nevada	All other ownerships	All	By jurisdiction (See map)
Placer	Lake Tahoe Basin Management Unit	All	RFWO
Placer	All other ownerships	All	SFWO
Sacramento	Legal Delta	Delta Smelt	BDFWO
Sacramento	Other	All	By jurisdiction (see map)
San Francisco	Tidal wetlands/marsh adjacent to San Francisco Bay	Salt marsh species, delta smelt	BDFWO
San Francisco	All ownerships but tidal/estuarine	All	SFWO
San Mateo	Tidal wetlands/marsh adjacent to San Francisco Bay	Salt marsh species, delta smelt	BDFWO
San Mateo	All ownerships but tidal/estuarine	All	SFWO
San Joaquin	Legal Delta excluding San Joaquin HCP	All	BDFWO

San Joaquin	Other	All	SFWO
Santa Clara	Tidal wetlands/marsh adjacent to San Francisco Bay	Salt marsh species, delta smelt	BDFWO
Santa Clara	All ownerships but tidal/estuarine	All	SFWO
Shasta	Shasta Trinity National Forest except Hat Creek Ranger District (administered by Lassen National Forest)	All	YFWO
Shasta	Hat Creek Ranger District	All	SFWO
Shasta	Bureau of Reclamation (Central Valley Project)	All	BDFWO
Shasta	Whiskeytown National Recreation Area	All	YFWO
Shasta	BLM Alturas Resource Area	All	KFWO
Shasta	Caltrans	By jurisdiction	SFWO/AFWO
Shasta	Ahjumawi Lava Springs State Park	Shasta crayfish	SFWO
Shasta	All other ownerships	All	By jurisdiction (see map)
Shasta	Natural Resource Damage Assessment, all lands	All	SFWO/BDFWO
Sierra	Humboldt Toiyabe National Forest	All	RFWO
Sierra	All other ownerships	All	SFWO
Siskiyou	Klamath National Forest (except Ukonom District)	All	YFWO
Siskiyou	Six Rivers National Forest and Ukonom District	All	AFWO
Siskiyou	Shasta Trinity National Forest	All	YFWO

Siskiyou	Lassen National Forest	All	SFWO
Siskiyou	Modoc National Forest	All	KFWO
Siskiyou	Lava Beds National Volcanic Monument	All	KFWO
Siskiyou	BLM Alturas Resource Area	All	KFWO
Siskiyou	Klamath Basin National Wildlife Refuge Complex	All	KFWO
Siskiyou	All other ownerships	All	By jurisdiction (see map)
Solano	Suisun Marsh	All	BDFWO
Solano	Tidal wetlands/marsh adjacent to San Pablo Bay	Salt marsh species, delta smelt	BDFWO
Solano	All ownerships but tidal/estuarine	All	SFWO
Solano	Other	All	By jurisdiction (see map)
Sonoma	Tidal wetlands/marsh adjacent to San Pablo Bay	Salt marsh species, delta smelt	BDFWO
Sonoma	All ownerships but tidal/estuarine	All	SFWO
Tehama	Mendocino National Forest	All	AFWO
Tehama	Shasta Trinity National Forest except Hat Creek Ranger District (administered by Lassen National Forest)	All	YFWO
Tehama	All other ownerships	All	By jurisdiction (see map)
Trinity	BLM	All	AFWO
Trinity	Six Rivers National Forest	All	AFWO
Trinity	Shasta Trinity National Forest	All	YFWO

Trinity	Mendocino National Forest	All	AFWO
Trinity	BIA (Tribal Trust Lands)	All	AFWO
Trinity	County Government	All	AFWO
Trinity	All other ownerships	All	By jurisdiction (See map)
Yolo	Yolo Bypass	All	BDFWO
Yolo	Other	All	By jurisdiction (see map)
All	FERC-ESA	All	By jurisdiction (see map)
All	FERC-ESA	Shasta crayfish	SFWO
All	FERC-Relicensing (non-ESA)	All	BDFWO

***Office Leads:**

AFWO=Arcata Fish and Wildlife Office

BDFWO=Bay Delta Fish and Wildlife Office

KFWO=Klamath Falls Fish and Wildlife Office

RFWO=Reno Fish and Wildlife Office

YFWO=Yreka Fish and Wildlife Office

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Reno Fish And Wildlife Office
1340 Financial Boulevard, Suite 234
Reno, NV 89502-7147
(775) 861-6300

Project Summary

Consultation Code: 08ENVD00-2020-SLI-0661

Event Code: 08ENVD00-2020-E-01840

Project Name: Proposed Commercial Airline Service at Bishop Airport

Project Type: Federal Grant / Loan Related

Project Description: This project would see the FAA issue a Class I Airport Operating Certification to Bishop Airport under14 CFR Part 139 (Part 139 Certification). This would allow Bishop Airport to accommodate scheduled or unscheduled commercial air passenger service.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/37.37266033051206N118.36411244726534W

Counties: Inyo, CA

Endangered Species Act Species

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Lahontan Cutthroat Trout *Oncorhynchus clarkii henshawi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3964 Species survey guidelines: https://ecos.fws.gov/ipac/guideline/survey/population/233/office/14320.pdf	Threatened
Owens Pupfish *Cyprinodon radiosus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4982	Endangered
Owens Tui Chub *Gila bicolor ssp. snyderi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7289	Endangered

Flowering Plants

NAME	STATUS
Fish Slough Milk-vetch *Astragalus lentiginosus var. piscinensis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7947	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Brewer's Sparrow *Spizella breweri* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9291	Breeds May 15 to Aug 10

NAME	BREEDING SEASON
Golden Eagle *Aquila chrysaetos* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/1680	Breeds Dec 1 to Aug 31
Green-tailed Towhee *Pipilo chlorurus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9444	Breeds May 1 to Aug 10
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Lewis's Woodpecker *Melanerpes lewis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30
Long-billed Curlew *Numenius americanus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5511	Breeds Apr 1 to Jul 31
Marbled Godwit *Limosa fedoa* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9481	Breeds elsewhere
Olive-sided Flycatcher *Contopus cooperi* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Pinyon Jay *Gymnorhinus cyanocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9420	Breeds Feb 15 to Jul 15
Sage Thrasher *Oreoscoptes montanus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9433	Breeds Apr 15 to Aug 10
Sagebrush Sparrow *Artemisiospiza nevadensis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 15 to Jul 31

NAME	BREEDING SEASON
Tricolored Blackbird *Agelaius tricolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3910	Breeds Mar 15 to Aug 10
Virginia's Warbler *Vermivora virginiae* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9441	Breeds May 1 to Jul 31
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Willow Flycatcher *Empidonax traillii* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/3482	Breeds May 20 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence

in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

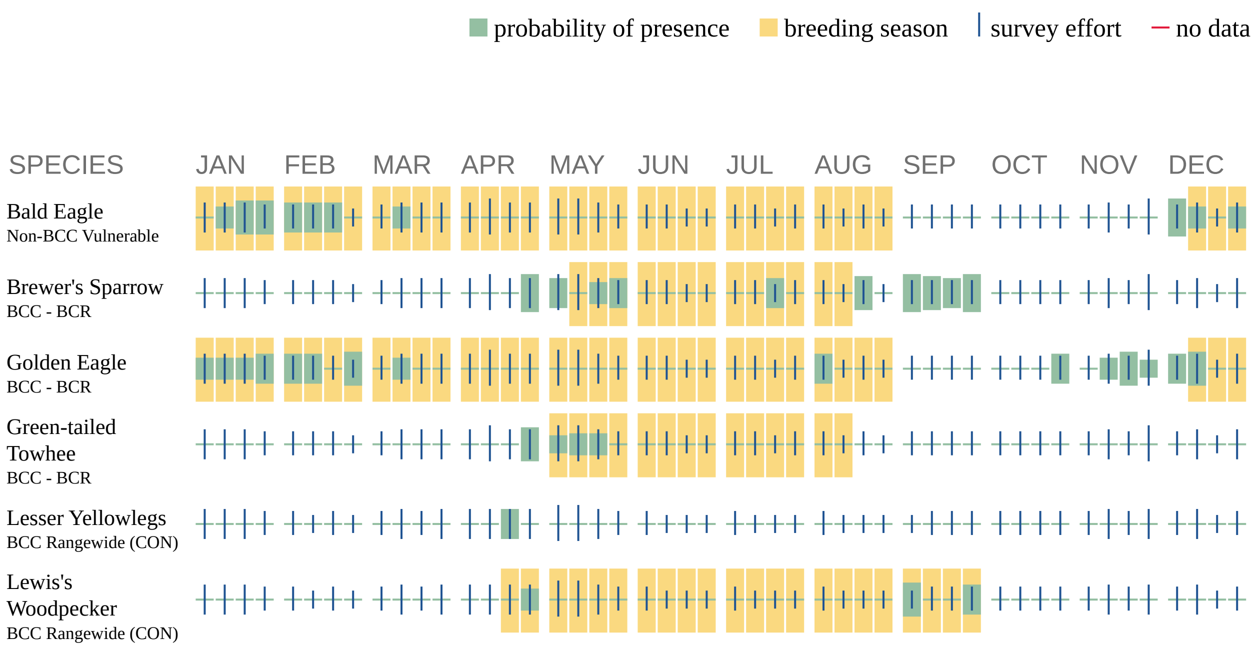
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

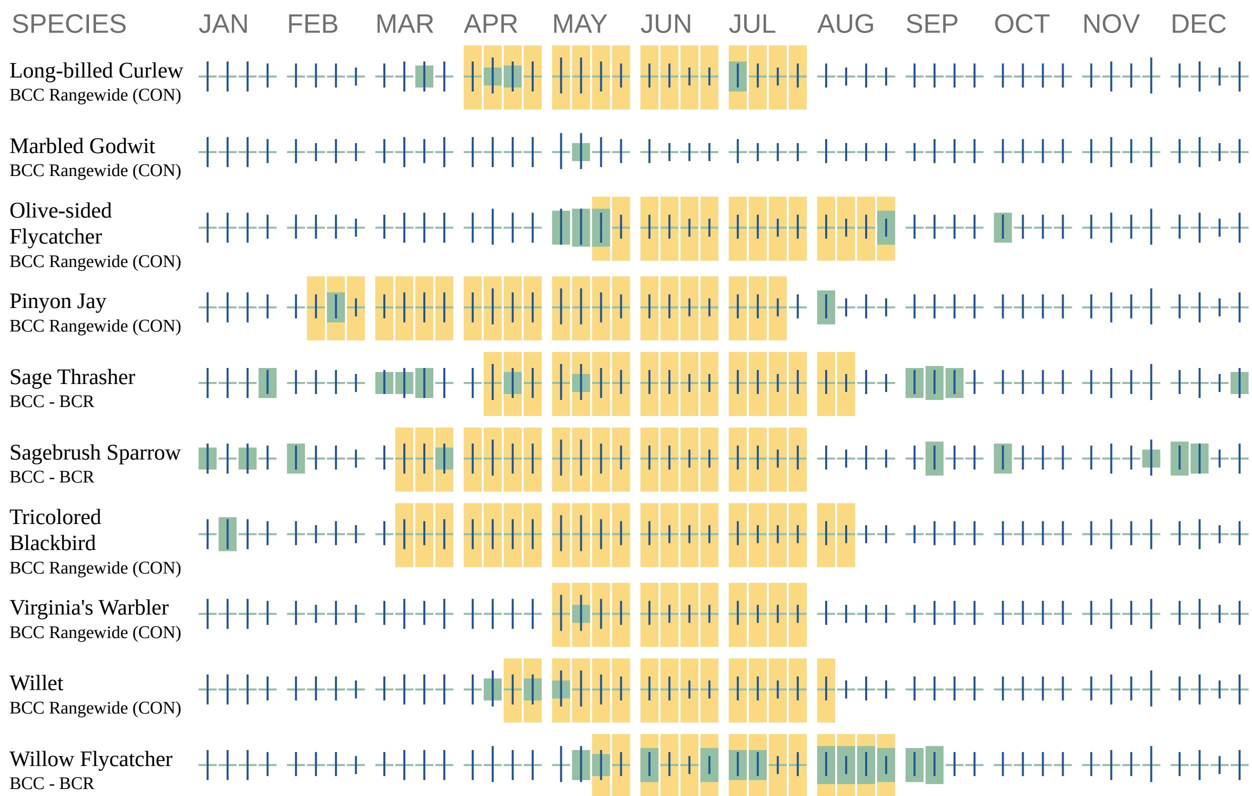
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?
The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In

contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- PEM1C

FRESHWATER FORESTED/SHRUB WETLAND

- PFOC
- PSSC
- PSSF

FRESHWATER POND

- PUBFh

RIVERINE

- R4SBCx

APPENDIX C

California Department of Fish and Wildlife Special Animals List

SPECIAL ANIMALS LIST

July 2020

State of California

Natural Resources Agency

Department of Fish and Wildlife

Biogeographic Data Branch

California Natural Diversity Database (CNDDB)

Recommended Citation:

California Natural Diversity Database (CNDDB). July 2020. Special Animals List. California Department of Fish and Wildlife. Sacramento, CA.

Table of Contents

Special Animals

"Special Animals" is a broad term used to refer to all the animal taxa tracked by the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB), regardless of their legal or protection status. This list is also referred to as the list of "species at risk" or "special status species." The Special Animals List includes species, subspecies, Distinct Population Segments (DPS), or Evolutionarily Significant Units (ESU) where at least one of the following conditions applies:

- Officially listed or proposed for listing under state and/or federal endangered species acts
- Taxa considered by the Department of Fish and Wildlife to be a Species of Special Concern (SSC)
- Taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act Guidelines
- Taxa that are biologically rare, very restricted in distribution, or declining throughout their range, but not currently threatened with extirpation
- Population(s) in California that may be peripheral to the major portion of a taxon's range but are threatened with extirpation in California
- Taxa closely associated with a habitat that is declining in California at a significant rate (e.g., wetlands, riparian, vernal pools, old growth forests, desert aquatic systems, native grasslands, valley shrubland habitats, etc.)
- Taxa designated as a special status, sensitive, or declining species by other state or federal agencies, or a non-governmental organization (NGO), and determined by the CNDDB to be rare, restricted, declining, or threatened across their range in California

The Special Animals List contains taxa that are actively inventoried, tracked, and mapped by the CNDDB, as well as taxa for which mapped data may not yet be incorporated into CNDDB user products. For the latter taxa, information at the county and 7.5-minute USGS quadrangle level can be accessed via the CNDDB QuickView Tool.

Taxa with a “Yes” in the “End Notes?” column have additional information in the End Notes section at the back of the list.

Additional information about the California Natural Diversity Database is available on the CNDDB website.

Information on other CDFW resource management programs is available on the Department’s Conservation and Management of Wildlife and Habitat website.

The CDFW Nongame Wildlife Program provides additional information on wildlife habitat, threats, and survey guidelines.

NatureServe Element Ranking

The California Natural Diversity Database program is a member of the NatureServe Network of natural heritage programs, and uses the same conservation status methodology as other network programs. The ranking system was originally developed by The Nature Conservancy and is now maintained and recently revised by NatureServe. It includes a **Global rank** (G-rank), describing the status for a given taxon over its entire distribution, and a **State rank** (S-rank), describing the status for the taxon over its state distribution. For subspecies and varieties, there is also a “T” rank describing the global rank for the infraspecific taxon. The next page of this document details the criteria used to assign element ranks, from G1 to G5 for the Global rank and from S1 to S5 for the State rank. Procedurally, state programs such as the CNDDB develop the State ranks. The Global ranks are determined collaboratively among the Heritage Programs for the states/provinces containing the species. NatureServe then checks for consistency and logical errors at the national level. Because the units of conservation may include non-taxonomic biological entities such as populations or ecological communities, NatureServe refers to the targets of biological conservation as “elements” rather than taxa.

An element rank is assigned using standard criteria and rank definitions. This standardization makes the ranks comparable between organisms and across political boundaries. NatureServe has developed a “rank calculator” to help increase repeatability and transparency of the ranking process. The three main categories that are taken into consideration when assigning an element rank are rarity, threats, and trends. Within these three categories, various factors are considered, including:

- Range extent, area of occupancy, population size, total number of occurrences, and number of good occurrences (ranked A or B). Environmental specificity can also be used if other information is lacking.
- Overall threat impact as well as intrinsic vulnerability (if threats are unknown).
- Long-term and short-term trends.

Detailed information on this element ranking methodology can be found on the NatureServe Conservation Status Assessment website.

Listed below are definitions for interpreting global and state conservation status ranks. An element's ranking status may be adjusted up or down depending upon the considerations above.

Global Ranking

The global rank (G-rank) is a reflection of the overall status of an element throughout its global range.

- **GX: Presumed Extinct** – Not located despite intensive searches and virtually no likelihood of rediscovery.
- **GH: Possibly Extinct** – Known from only historical occurrences but still some hope of rediscovery. Examples of evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species has been searched for unsuccessfully, but not thoroughly enough to presume that it is extinct throughout its range.
- **G1: Critically Imperiled** – At very high risk of extinction due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
- **G2: Imperiled** – At high risk of extinction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
- **G3: Vulnerable** – At moderate risk of extinction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
- **G4: Apparently Secure** – At fairly low risk of extinction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

- **G5: Secure** – At very low risk of extinction due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
- **GNR: Unranked** – Global rank not yet assessed.

State Ranking

The state rank (S-rank) is assigned in much the same way as the global rank, but state ranks refer to the imperilment status only within California's state boundaries.

- **SX: Presumed Extirpated** – Species is believed to be extirpated from the state Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered
- **SH: Possibly Extirpated** – Known from only historical records but still some hope of rediscovery. There is evidence that the species may no longer be present in the state, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
- **S1: Critically Imperiled** – At very high risk of extirpation in the state due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
- **S2: Imperiled** – At high risk of extirpation in the state due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
- **S3: Vulnerable** – At moderate risk of extirpation in the state due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
- **S4: Apparently Secure** – At a fairly low risk of extirpation in the state due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

- **S5: Secure** – At very low or no risk of extirpation in the state due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
- **SNR: Unranked** – State rank not yet assessed.

Additional Notes on NatureServe Ranks

- Rank Qualifiers
    - Taxa which are subspecies receive a taxon rank (**T-rank**) in addition to the G-rank. Whereas the G-rank reflects the condition of the entire species, the T-rank reflects the global status of just the subspecies. For example, the Point Reyes mountain beaver, *Aplodontia rufa* ssp. *phaea*, is ranked G5T2. The G-rank refers to the whole species, i.e., *Aplodontia rufa*; the T-rank refers only to the global condition of ssp. *phaea*.
    - **C = Captive or Cultivated Only** — taxon at present is presumed or possibly extinct or eliminated in the wild across their entire native range but is extant in cultivation, in captivity, as a naturalized population (or populations) outside their native range, or as a reintroduced population not yet established. The "C" modifier is only used at a global level and not at a state level. Possible ranks are GXC or GHC.
    - **Q = Questionable taxonomy** that may reduce conservation priority — Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The "Q" modifier is only used at the global level, not at the state level.
- Uncertainty about the status of an element is expressed in two major ways:
    - By expressing the ranks as a **range** of values: e.g., S2S3 indicates the rank is somewhere between S2 and S3.
    - By adding a "**?**" to the rank: e.g., S2?; this represents more certainty than S2S3, but less certainty than S2.

- Other considerations used when ranking a species include the pattern of distribution of the element on the landscape, fragmentation of the population, and historical extent as compared to its modern range. It is important to take an overall view when ranking sensitive elements rather than simply counting element occurrences.

Animal Element Occurrences and Mapping

What is an Element Occurrence?

An Element Occurrence (EO) is a location where a given element has been documented to occur. It is a concept developed and applied within the NatureServe natural heritage network. An EO is not a population, but may indicate that a population is present in that area; likewise, a single population may be represented by more than one EO. An EO is based upon the source documents available at the time of mapping. Both the mapped feature and the text portion of EOs are updated as new information becomes available.

Element Occurrence Definitions Vary by Taxa

The EO definition refers to the types of information mapped. For most animal taxa, the CNDDB is interested in information that indicates the presence of a resident population. However, for many migratory birds, the CNDDB only tracks detections of nest sites or behaviors indicating reproduction is occurring at the site. Details about avian detections are available in the Submitting Avian Detections document. For other taxa where CNDDB tracks only a certain part of the range or life history, the area or life stage is indicated on the list under the “Comment” column.

Mapping Conventions

Information in CNDDB is mapped to balance precision and uncertainty, based upon the source materials used to determine the location of the Element Occurrence. Data with precise location information are mapped with 80m-radius circles or specific polygons. Data with vague location information are mapped with non-specific circular features or non-specific polygons. Non-specific features indicate that the species was found somewhere within the mapped area, but the exact location was unknown. Generally, observations/collections within ¼ mile and/or within continuous habitat are combined into a single EO.

Taxonomic Standards

Taxonomic References and Sources of Additional Information

The CNDDB follows current published taxonomy for animals as recognized by the scientific organizations listed below. The CNDDB reviews publications that propose new taxonomy and nomenclature for CNDDB-tracked species, and evaluates whether these proposals are recognized by the larger scientific community. The CNDDB makes every effort to use the best available science in the taxonomy used, but different experts may recognize different names for some time after a taxonomic change is proposed. In these cases, the CNDDB will generally use the preexisting nomenclature until a change is formally recognized beyond the initial publication. In addition, the CNDDB recognizes some taxa identified by experts on the California fauna where these taxa may not be recognized by national biological societies. Generally, the taxonomy used by NatureServe is followed, with additional evaluation of taxonomy from the following sources:

- Reptiles and amphibians:
    - The Center for North American Herpetology
    - The Society for the Study of Amphibians and Reptiles
- Fishes:
    - Moyle, P. B. 2002. Inland fishes of California. University of California Press.
    - Nelson, J.S., E.J. Crossman, H. Espinosa-Perez, L.T. Findley, C.R. Gilbert, R.N. Lea, and J. D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society, Special Publication 29, Bethesda, Maryland. 386 pp.
    - Jelks, H.L., S.J. Walsh, N.M. Burkhead, S. Contreras-Balderas, E. Díaz-Pardo, D.A. Hendrickson, J. Lyons, N.E. Mandrak, F. McCormick, J.S. Nelson, S.P. Platania, B.A. Porter, C.B. Renaud, J.J. Schmitter-Soto, E.B. Taylor, and M.L. Warren, Jr. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. Fisheries 33(8):372-407.

- Birds:
    - The checklist of the American Ornithologists' Union
- Mammals:
    - The American Society of Mammalogists
    - Bradley, R.D., L.K. Ammerman, R.J. Baker, L.C. Bradley, J.A. Cook, R.C. Dowler, C. Jones, D.J. Schimdly, F.B. Stangl Jr., R.A. Van Den Bussche, and B. Wursig. 2014. Revised checklist of North American mammals north of Mexico, 2014. Museum of Texas Tech University Occasional Papers 327:1-28. Available at: https://www.depts.ttu.edu/nsrl/publications/downloads/OP327.pdf.

Listing and Special Status Information

CALIFORNIA ENDANGERED SPECIES ACT (CESA) LISTING CODES: The listing status of each species is current as of the date of this list. The most current changes in listing status will be found in the "Endangered and Threatened Animals List," which the CNDDB updates and issues quarterly. Additional information can be found on the California Fish and Game Commission CESA web page.

- SE State listed as endangered
- ST State listed as threatened
- SCE State candidate for listing as endangered
- SCT State candidate for listing as threatened
- SCD State candidate for delisting

FEDERAL ENDANGERED SPECIES ACT (ESA) LISTING CODES: The listing status is current as of the date of this list. The most current changes in listing status will be found in the "Endangered and Threatened Animals List," which the CNDDB updates and issues quarterly. Federal listing actions are published in the Federal Register.

- FE Federally listed as endangered
- FT Federally listed as threatened
- FPE Federally proposed for listing as endangered
- FPT Federally proposed for listing as threatened
- FPD Federally proposed for delisting
- FC Federal candidate species (former Category 1 candidates)

Section 4(c)(2)(A) of the Act requires the U.S. Fish and Wildlife Service and the National Marine Fisheries Service to conduct a review of listed species at least once every five years. Five year reviews are available from the Sacramento Fish and Wildlife Office or from the National Marine Fisheries Service.

OTHER STATUS CODES: The status of species on the Special Animals List according to other conservation organizations is provided below. Taxa on these lists are reviewed for inclusion in the CNDDB Special Animals List, but are not automatically included. For example, taxa that are regionally rare within a portion of California may not be included, because they may be of lesser conservation concern across their full range in California.

- American Fisheries Society (AFS):
    - Designations for freshwater and diadromous species were taken from the paper:
        - Jelks, H.L., S.J. Walsh, N.M. Burkhead, S. Contreras-Balderas, E. Díaz-Pardo, D.A. Hendrickson, J. Lyons, N.E. Mandrak, F. McCormick, J.S. Nelson, S.P. Platania, B.A. Porter, C.B. Renaud, J.J. Schmitter-Soto, E.B. Taylor, and M.L. Warren, Jr. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. Fisheries 33(8):372-407. Available at: https://www.fs.fed.us/rm/pubs_other/rmrs_2008_jelks_h001.pdf
    - Designations for marine and estuarine species were taken from the paper:
        - Musick, J.A. et al. 2000. “Marine, Estuarine, and Diadromous Fish Stocks at Risk of Extinction in North America (Exclusive of Pacific Salmonids). Fisheries 25(11):6-30. Available at: https://doi.org/10.1577/1548-8446(2000)025%3C0006:MEADFS%3E2.0.CO;2
- **Bureau of Land Management (BLM) Sensitive:** Bureau of Land Management Manual §6840 states that “BLM sensitive species are: (1) species listed or proposed for listing under the Endangered Species Act (ESA), and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species.” Downloadable copies of the California-BLM Special Status Animals and Sensitive Species Lists are available.
- **California Department of Forestry and Fire Protection (CDF) Sensitive:** California Department of Forestry and Fire Protection classifies “sensitive species” as those species that warrant special protection during timber

operations. The list of “sensitive species” is given in §895.1 (Definitions) of the California Forest Practice Rules.

- **CDFW Species of Special Concern (SSC):** It is the goal and responsibility of the Department of Fish and Wildlife to maintain viable populations of all native species. To this end, the Department has designated certain vertebrate species as “Species of Special Concern” because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of designating SSCs is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long-term viability. Not all SSCs have declined equally; some species may be just starting to decline, while others may have already reached the point where they meet the criteria for listing as a threatened or endangered under state and/or federal endangered species acts.
- **CDFW Fully Protected:** The classification of Fully Protected was the State's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, amphibians and reptiles, birds, and mammals. Most of the species on these lists have subsequently been listed under the California and/or federal endangered species acts; the exceptions are white-tailed kite, golden eagle, trumpeter swan, northern elephant seal, and ring-tailed cat. The white-tailed kite and the golden eagle are tracked in the CNDDB; the trumpeter swan, northern elephant seal, and ring-tailed cat are not. The Fish and Game Code sections dealing with Fully Protected species state that these species "...may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected" species, although take may be authorized for necessary scientific research. This language arguably makes the "Fully Protected" designation the strongest and most restrictive regarding the "take" of these species. In 2003, code sections dealing with Fully Protected species were amended to allow the Department to authorize take resulting from recovery activities for state-listed species. More information on Fully Protected species and the take provisions can be found in the Fish and

Game Code: birds at §3511, mammals at §4700, reptiles and amphibians at §5050, and fish at §5515). Additional information on Fully Protected fish can be found in the California Code of Regulations, Title 14, Division 1, Subdivision 1, Chapter 2, Article 4, §5.93. The category of Protected Amphibians and Reptiles in Title 14 has been repealed.

- **International Union for Conservation of Nature (IUCN) Red List of Threatened Species:** The IUCN assesses, on a global scale, the conservation status of species, subspecies, varieties, and even selected subpopulations in order to highlight taxa threatened with extinction, and therefore promote their conservation. Detailed information is available from the IUCN Red List Online.
- **Marine Mammal Commission (MMC) Marine Mammal Species of Special Concern:** Section 202 of the Marine Mammal Protection Act (MMPA) directs the MMC, in consultation with its Committee of Scientific Advisors, to make recommendations to the Department of Commerce, the Department of the Interior, and other federal agencies on research and management actions needed to conserve species of marine mammals. To meet this charge, the Commission devotes special attention to particular species and populations that are vulnerable to various types of human-related activities, impacts, and contaminants. Such species may include marine mammals listed as endangered or threatened under the federal ESA or as depleted under the MMPA. In addition, the Commission often directs special attention to other species or populations of marine mammals not so listed whenever special conservation challenges arise that may affect them. More information on the MMPA and the list of species is available from the MMC Marine Mammal Species and Populations of Concern website.
- **North American Bird Conservation Initiative (NABCI):** The North American Bird Conservation Initiative is a coalition of government agencies and private organizations that works to ensure the long-term health of North America's native bird populations. They publish an annual State of the Birds report which includes a watch list of bird species in need of conservation help. Species on the list are assigned to either the Red Watch List for species with extremely high

vulnerability, or Yellow Watch List for species that may be range restricted or may be more widespread but with declines and high threats.

- **National Marine Fisheries Service (NMFS) Species of Concern:** The Office of Protected Resources (OPR) is a headquarters program office of the National Marine Fisheries Service (also referred to as NOAA Fisheries), under the U.S. Department of Commerce, with responsibility for protecting marine mammals and endangered marine life. OPR works to conserve, protect, and recover species under the federal ESA and the MMPA. Established by NMFS effective April 15, 2004, NMFS Species of Concern are those species about which NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA. "Species of Concern" status does not carry any procedural or substantive protections under the ESA, but is meant to draw proactive attention and conservation action to these species.
- **U.S. Fish and Wildlife Service (USFWS) Birds of Conservation Concern:** The goal of the Birds of Conservation Concern 2008 report is to accurately identify the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent highest conservation priorities and draw attention to species in need of conservation action.
- **United States Forest Service (USFS) Sensitive:** The USDA Forest Service defines sensitive species as plant and animal species identified by a regional forester that are not listed or proposed for listing under the federal Endangered Species Act for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Regional Foresters shall identify sensitive species occurring within the region. More information on California species can be found on the Pacific Southwest Region (Region 5) Plants and Animals site, including links to download the Regional Forester's Sensitive Animal Species List.

- **Western Bat Working Group (WBWG):** The WBWG is composed of agencies, organizations, and individuals interested in bat research, management, and conservation from 13 western states and provinces. The goals of the group are to (1) facilitate communication among interested parties and reduce risks of species decline or extinction; (2) provide a mechanism by which current information on bat ecology, distribution, and research techniques can be readily accessed; and (3) develop a forum to discuss conservation strategies, provide technical assistance, and encourage education programs. Species are ranked as High, Medium, or Low Priority in each of 10 regions in western North America. Because California includes multiple regions where a species may have different WBWG Priority ranks, the CNNDB includes categories for Medium-High and Low-Medium Priority. The CNDDB tracks bat species that are at least Low-Medium Priority in California.

Table of Special Status Code Abbreviations

Organization	Abbreviation
American Fisheries Society - Endangered	AFS_EN
American Fisheries Society - Threatened	AFS_TH
American Fisheries Society - Vulnerable	AFS_VU
Bureau of Land Management - Sensitive	BLM_S
Calif Dept of Forestry & Fire Protection - Sensitive	CDF_S
Calif Dept of Fish & Wildlife - Fully Protected	CDFW_FP
Calif Dept of Fish & Wildlife - Species of Special Concern	CDFW_SSC
Calif Dept of Fish & Wildlife - Watch List	CDFW_WL
IUCN - Critically Endangered	IUCN_CR
IUCN - Endangered	IUCN_EN
IUCN - Near Threatened	IUCN_NT
IUCN - Vulnerable	IUCN_VU
IUCN - Least Concern	IUCN_LC
IUCN - Data Deficient	IUCN_DD
IUCN - Conservation Dependent	IUCN_CD
Marine Mammal Commission - Species of Special Concern	MMC_SSC
National Marine Fisheries Service - Species of Concern	NMFS_SC
North American Bird Conservation Initiative - Red Watch List	NABCI_RWL
North American Bird Conservation Initiative - Yellow Watch List	NABCI_YWL
U.S. Forest Service - Sensitive	USFS_S
U.S. Fish & Wildlife Service Birds of Conservation Concern	USFWS_BCC

Special Animals List

(914 taxa)

Last updated July 22, 2020

The remainder of this document contains the CNDDB's Special Animals List, current as of the date on the title page of this document. For additional information on how CNDDB determines what species to track please see the CNDDB webpage.

Invertebrates

PELECYPODA (clams and mussels)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Anodonta californiensis	California floater		G3Q	S2?	None	None	USFS:S	Yes	
Anodonta oregonensis	Oregon floater		G5Q	S2?	None	None		Yes	
Gonidea angulata	western ridged mussel		G3	S1S2	None	None		Yes	
Margaritifera falcata	western pearlshell		G4G5	S1S2	None	None		Yes	
Pisidium ultramontanum	montane peaclam		G1	S1	None	None	IUCN:VU USFS:S	Yes	

GASTROPODA (snails, slugs, and abalones)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Algamorda newcombiana	Newcomb's littorine snail		G5	S1S2	None	None		No	
Ammonitella yatesii	tight coin (=Yates' snail)		G1	S1	None	None	IUCN:VU	Yes	
Ancotrema voyanum	hooded lancetooth		G1G2	S1S2	None	None		Yes	
Assiminea infima	Badwater snail		G1	S1	None	None	IUCN:VU	Yes	
Binneya notabilis	Santa Barbara shelled slug		G1	S1	None	None	IUCN:DD	Yes	
Colligyrus convexus	canary duskysnail		G1G2	S1S2	None	None		Yes	
Eremarionta immaculata	white desertsnail		G1	S1	None	None	IUCN:VU	Yes	
Eremarionta millepalmarum	Thousand Palms desertsnail		G1	S1	None	None	IUCN:VU	No	
Eremarionta morongoana	Morongo (=Colorado) desertsnail		G1G3	S1	None	None	IUCN:NT	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Eremarionta rowelli bakerensis	Baker's desertsnail		G3G4T1	S1	None	None	IUCN:DD	Yes	
Eremarionta rowelli mccoiana	California Mccoy snail		G3G4T1	S1	None	None	IUCN:DD	Yes	
Fluminicola seminalis	nugget pebblesnail		G2	S1S2	None	None	USFS:S	Yes	
Fontelicella sp.	Deep Springs fontelicella		G1	S1	None	None		Yes	
Glyptostoma gabrielense	San Gabriel chestnut		G2	S2	None	None		Yes	
Haliotis corrugata	pink abalone		G3?	S2?	None	None	NMFS:SC	No	
Haliotis cracherodii	black abalone		G3	S1S2	Endangered	None	IUCN:CR	Yes	
Haliotis fulgens	green abalone		G3G4	S2	None	None	NMFS:SC	No	
Haliotis kamtschatkana	pinto abalone		G3G4	S2	None	None	IUCN:EN NMFS:SC	No	
Haliotis sorenseni	white abalone		G1	S1	Endangered	None		No	
Haplotrema catalinense	Santa Catalina lancetooth		G1	S1	None	None		Yes	
Haplotrema duranti	ribbed lancetooth		G1G2	S1S2	None	None		Yes	
Helisoma newberryi	Great Basin rams-horn		G1	S1S2	None	None	USFS:S	Yes	
Helminthoglypta allynsmithi	Merced Canyon shoulderband		G1	S1	None	None	IUCN:VU	Yes	
Helminthoglypta arrosa monticola	mountain shoulderband		G2G3T1	S1	None	None		Yes	
Helminthoglypta arrosa pomoensis	Pomo bronze shoulderband		G2G3T1	S1	None	None	IUCN:DD	Yes	
Helminthoglypta ayresiana sanctaecrucis	Ayer's snail		G1G2T1T2	S1S2	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Helminthoglypta callistoderma	Kern shoulderband		G1	S1	None	None	IUCN:EN	Yes	
Helminthoglypta coelata	mesa shoulderband		G1	S1	None	None	IUCN:VU	Yes	
Helminthoglypta concolor	whitefir shoulderband		G1G2	S1S2	None	None		Yes	
Helminthoglypta fontiphila	Soledad shoulderband		G1	S1	None	None		No	
Helminthoglypta greggi	Mohave shoulderband		G1	S1	None	None		Yes	
Helminthoglypta hertleini	Oregon shoulderband		G3Q	S1S2	None	None		Yes	
Helminthoglypta milleri	peak shoulderband		G1	S1	None	None		Yes	
Helminthoglypta mohaveana	Victorville shoulderband		G1	S1	None	None	IUCN:NT	Yes	
Helminthoglypta nickliniana awania	Peninsula coast range shoulderband		G3T1	S1	None	None	IUCN:DD	Yes	
Helminthoglypta nickliniana bridgesi	Bridges' coast range shoulderband		G3T1	S1S2	None	None	IUCN:DD	Yes	
Helminthoglypta sequoicola consors	redwood shoulderband		G2T1	S1	None	None	IUCN:DD	Yes	
Helminthoglypta stiversiana williamsi	Williams' bronze shoulderband		G2G3T1	S1	None	None	IUCN:DD	Yes	
Helminthoglypta talmadgei	Trinity shoulderband		G2	S2	None	None		Yes	
Helminthoglypta taylori	westfork shoulderband		G1	S1	None	None		Yes	
Helminthoglypta traskii pacoimensis	Pacoima shoulderband		G1G2T1	S1	None	None		No	
Helminthoglypta traskii traskii	Trask shoulderband		G1G2T1	S1	None	None		Yes	
Helminthoglypta uvasana	Grapevine shoulderband		G1	S1	None	None		No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Helminthoglypta vasquezi	Vasquez shoulderband		G1	S1	None	None		Yes	
Helminthoglypta walkeriana	Morro shoulderband (=banded dune) snail		G1	S1S2	Endangered	None	IUCN:CR	Yes	
Herpeteros angelus	Soledad desertsnail		G1	S1	None	None		No	
Hesperarion plumbeus	leaden slug		G1	S1	None	None		Yes	
Ipnobius robustus	robust tryonia		G1G2	S1	None	None		Yes	
Juga acutifilosa	topaz juga		G2	S2	None	None	USFS:S	Yes	
Juga chacei	Chace juga		G1	S1	None	None	USFS:S	Yes	
Juga occata	scalloped juga		G1	S1	None	None	USFS:S	Yes	
Juga orickensis	redwood juga		G2	S1S2	None	None		Yes	
Lanx alta	highcap lanx		G2G3	S1S2	None	None		Yes	
Lanx klamathensis	scale lanx		G1	S1	None	None		No	
Lanx patelloides	kneecap lanx		G2?	S2	None	None	USFS:S	Yes	
Megomphix californicus	Natural Bridge megomphix		G1G2	S1S2	None	None		Yes	
Micrarionta facta	Santa Barbara islandsnail		G1G2	S1S2	None	None	IUCN:VU	Yes	
Micrarionta feralis	San Nicolas islandsnail		G1	S1	None	None	IUCN:CR	Yes	
Micrarionta gabbi	San Clemente islandsnail		G1	S1	None	None	IUCN:VU	Yes	
Micrarionta opuntia	pricklypear islandsnail		G1	S1	None	None	IUCN:VU	Yes	
Monadenia callipeplus	downy sideband		G1?	S1S2	None	None		Yes	
Monadenia chaceana	Siskiyou shoulderband		G2G3	S2	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Monadenia churchi	Klamath sideband		G2G3	S2	None	None		Yes	
Monadenia circumcarinata	keeled sideband		G1	S1	None	None	BLM:S IUCN:VU	Yes	
Monadenia cristulata	crested sideband		G1?	S1S2	None	None		Yes	
Monadenia fidelis leonina	A terrestrial snail		G4G5T1T2	S1S2	None	None		Yes	
Monadenia fidelis pronotis	rocky coast Pacific sideband		G4G5T1	S1	None	None		Yes	
Monadenia infumata ochromphalus	yellow-based sideband		G2T1	S1	None	None		Yes	
Monadenia infumata setosa	Trinity bristle snail		G2T2	S2	None	Threatened	IUCN:VU	Yes	
Monadenia marmarotis	marble sideband		G1	S1	None	None		No	
Monadenia mormonum buttoni	Button's Sierra sideband		G2T1	S1S2	None	None		Yes	
Monadenia mormonum hirsuta	hirsute Sierra sideband		G2T1	S1	None	None	BLM:S	Yes	
Monadenia troglodytes troglodytes	Shasta sideband		G1G2T1T2	S1S2	None	None	IUCN:DD USFS:S	Yes	
Monadenia troglodytes wintu	Wintu sideband		G1G2T1T2	S1S2	None	None	IUCN:DD USFS:S	Yes	
Monadenia tuolumneana	Tuolumne sideband		G1	S1	None	None	BLM:S	Yes	
Monadenia yosemitensis	Yosemite Mariposa sideband		G1	S1S2	None	None		Yes	
Noyo intersessa	Ten Mile shoulderband		G2	S2	None	None		Yes	
Pomatiopsis binneyi	robust walker		G1	S1	None	None		Yes	
Pomatiopsis californica	Pacific walker		G1	S1	None	None		No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Pomatiopsis chacei	marsh walker		G1	S1	None	None		No	
Pristiloma shepardae	Shepard's snail		G1	S1	None	None		Yes	
Pristinicola hemphilli	pristine pyrg		G3	S1	None	None	USFS:S	Yes	
Prophysaon coeruleum	blue-gray taildropper slug		G3G4	S1S2	None	None		No	Yes
Punctum hannai	Trinity Spot		G1G2	S1S2	None	None		Yes	
Pyrgulopsis aardahli	Benton Valley (=Aahrdahl's) springsnail		G1	S1	None	None		Yes	
Pyrgulopsis archimedis	Archimedes pyrg		G1G2	S1S2	None	None		Yes	
Pyrgulopsis cinerana	Ash Valley pyrg		G1G2	S1S2	None	None		Yes	
Pyrgulopsis diablensis	Diablo Range pyrg		G1	S1	None	None	IUCN:VU	Yes	
Pyrgulopsis eremica	Smoke Creek pyrg		G2	S2	None	None		Yes	
Pyrgulopsis falciglans	Likely pyrg		G1	S1	None	None		Yes	
Pyrgulopsis gibba	Surprise Valley pyrg		G3	S1S2	None	None		Yes	
Pyrgulopsis greggi	Kern River pyrg		G1	S1	None	None	IUCN:VU	Yes	
Pyrgulopsis lasseni	Willow Creek pyrg		G1G2	S1S2	None	None	USFS:S	Yes	
Pyrgulopsis longae	Long Valley pyrg		G1	S1	None	None		Yes	
Pyrgulopsis owensensis	Owens Valley springsnail		G1G2	S1S2	None	None	USFS:S	Yes	
Pyrgulopsis perturbata	Fish Slough springsnail		G1	S1	None	None		Yes	
Pyrgulopsis rupinicola	Sucker Springs pyrg		G1	S1	None	None		Yes	
Pyrgulopsis taylori	San Luis Obispo pyrg		G1	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Pyrgulopsis ventricosa	Clear Lake pyrg		G1	S1	None	None	IUCN:CR	Yes	
Pyrgulopsis wongi	Wong's springsnail		G2	S2	None	None	IUCN:LC USFS:S	Yes	
Radiocentrum avalonense	Catalina mountainsnail		G1	S1	None	None	IUCN:CR	Yes	
Rothelix warnerfontis	Warner Springs shoulderband		G1	S1	None	None	USFS:S	Yes	
Sterkia clementina	San Clemente Island blunt-top snail		G1	S1S2	None	None	IUCN:NT	Yes	
Trilobopsis roperi	Shasta chaparral		G2	S1	None	None	USFS:S	Yes	
Trilobopsis tehamana	Tehama chaparral		G2	S1	None	None	USFS:S	Yes	
Tryonia imitator	mimic tryonia (=California brackishwater snail)		G2	S2	None	None	IUCN:DD	Yes	
Tryonia margae	Grapevine Springs elongate tryonia		G1	S1	None	None		Yes	
Tryonia rowlandsi	Grapevine Springs squat tryonia		G1	S1	None	None		Yes	
Vespericola karokorum	Karok hesperian		G2	S2	None	None	IUCN:DD	Yes	
Vespericola marinensis	Marin hesperian		G2	S2	None	None		Yes	
Vespericola pressleyi	Big Bar hesperian		G1	S1	None	None	USFS:S	Yes	
Vespericola scotti	Benson Gulch hesperian		G1	S1	None	None		Yes	
Vespericola shasta	Shasta hesperian		G1	S1	None	None	USFS:S	Yes	
Vespericola sierranus	Siskiyou hesperian		G3	S1S2	None	None		Yes	
Xerarionta intercisa	horseshoe snail		G1	S1	None	None	IUCN:VU	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Xerarionta redimita	wreathed cactussnail		G1G2	S1	None	None	IUCN:VU	Yes	
Xerarionta tryoni	Bicolor cactussnail		G1	S1	None	None	IUCN:VU	No	

ARACHNIDA (spiders and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aphrastochthonius grubbsi	Grubbs' Cave pseudoscorpion		G1G2	S1S2	None	None		Yes	
Aphrastochthonius similis	Carlow's Cave pseudoscorpion		G1G2	S1S2	None	None		No	
Archeolarca aalbui	Aalbu's Cave pseudoscorpion		G1G2	S1S2	None	None		No	
Banksula californica	Alabaster Cave harvestman		GH	SH	None	None		Yes	
Banksula galilei	Galile's cave harvestman		G1	S1	None	None		Yes	
Banksula grubbsi	Grubbs' cave harvestman		G1	S1	None	None		Yes	
Banksula incredula	incredible harvestman		G1	S1	None	None		Yes	
Banksula martinorum	Martins' cave harvestman		G1	S1	None	None		Yes	
Banksula melones	Melones Cave harvestman		G1	S1	None	None	IUCN:VU	Yes	
Banksula rudolphi	Rudolph's cave harvestman		G1	S1	None	None		Yes	
Banksula tuolumne	Tuolumne cave harvestman		G1	S1	None	None		Yes	
Banksula tutankhamen	King Tut Cave harvestman		G1	S1	None	None		Yes	
Calicina arida	San Benito harvestman		G1	S1	None	None		Yes	
Calicina breva	Stanislaus harvestman		G1	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Calicina cloughensis	Clough Cave harvestman		G1	S1	None	None		Yes	
Calicina conifera	Crane Flat harvestman		G1	S1	None	None		Yes	
Calicina diminua	Marin blind harvestman		G1	S1	None	None		Yes	
Calicina dimorphica	Watts Valley harvestman		G1	S1	None	None		Yes	
Calicina macula	marbled harvestman		G1	S1	None	None		Yes	
Calicina mesaensis	Table Mountain harvestman		G1	S1	None	None		Yes	
Calicina minor	Edgewood blind harvestman		G1	S1	None	None		Yes	
Calicina piedra	Piedra harvestman		G1	S1	None	None		Yes	
Calileptoneta briggsi	Briggs' leptonetid spider		G1	S1	None	None		Yes	
Calileptoneta oasa	Andreas Canyon leptonetid spider		G1	S1	None	None		Yes	
Calileptoneta ubicki	Ubick's leptonetid spider		G1	S1	None	None		Yes	
Calileptoneta wapiti	Mendocino leptonetid spider		G1	S1	None	None		Yes	
Fissilicreagris imperialis	Empire Cave pseudoscorpion		G1	S1	None	None	IUCN:VU	Yes	
Hubbardia idria	Idria short-tailed whipscorpion		G1	S1	None	None		Yes	
Hubbardia secoensis	Arroyo Seco short-tailed whipscorpion		G1	S1	None	None		Yes	
Hubbardia shoshonensis	Shoshone Cave whip-scorpion		G1	S1	None	None	BLM:S	Yes	Yes
Larca laceyi	Lacey's Cave pseudoscorpion		G1G2	S1	None	None		Yes	
Meta dolloff	Dolloff Cave spider		G1	S1	None	None	IUCN:VU	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Microcina edgewoodensis	Edgewood Park micro-blind harvestman		G1	S1	None	None		Yes	
Microcina homi	Hom's micro-blind harvestman		G1	S1	None	None		Yes	
Microcina jungi	Jung's micro-blind harvestman		G1	S1	None	None		Yes	
Microcina leei	Lee's micro-blind harvestman		G1	S1	None	None		Yes	
Microcina lumi	Lum's micro-blind harvestman		G1	S1	None	None		Yes	
Microcina tiburona	Tiburon micro-blind harvestman		G1	S1	None	None		Yes	
Neochthonius imperialis	Empire Cave pseudoscorpion		G1	S1	None	None		Yes	
Pseudogarypus orpheus	Music Hall Cave pseudoscorpion		G1G2	S1	None	None		Yes	
Socalchemmis gertschi	Gertsch's socalchemmis spider		G1	S1	None	None		Yes	
Socalchemmis icenoglei	Icenogle's socalchemmis spider		G1	S1	None	None		Yes	
Socalchemmis monterey	Monterey socalchemmis spider		G1	S1	None	None		Yes	
Talanites moodyae	Moody's gnaphosid spider		G1G2	S1S2	None	None		Yes	
Talanites ubicki	Ubick's gnaphosid spider		G1	S1	None	None		Yes	
Telema sp.	Santa Cruz telemid spider		G1G2	S1S2	None	None		No	
Texella deserticola	Whitewater Canyon harvestman		G1	S1	None	None		No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Texella kokoweef	Kokoweef Crystal Cave harvestman		G1	S1	None	None		Yes	
Texella shoshone	Shoshone Cave harvestman		G1	S1	None	None		Yes	

CRUSTACEA, Order Anostraca (fairy shrimp)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Artemia monica	Mono Lake brine shrimp		G3	S3	None	None	IUCN:CD	Yes	
Branchinecta campestris	pocket pouch fairy shrimp		G2	S1	None	None		Yes	
Branchinecta conservatio	Conservancy fairy shrimp		G2	S2	Endangered	None	IUCN:EN	Yes	
Branchinecta longiantenna	longhorn fairy shrimp		G1	S1S2	Endangered	None	IUCN:EN	Yes	
Branchinecta lynchi	vernal pool fairy shrimp		G3	S3	Threatened	None	IUCN:VU	Yes	
Branchinecta mesovallensis	midvalley fairy shrimp		G2	S2S3	None	None		Yes	
Branchinecta sandiegonensis	San Diego fairy shrimp		G2	S2	Endangered	None	IUCN:EN	Yes	
Linderiella occidentalis	California linderiella		G2G3	S2S3	None	None	IUCN:NT	Yes	
Linderiella santarosae	Santa Rosa Plateau fairy shrimp		G1G2	S1	None	None		Yes	
Streptocephalus woottoni	Riverside fairy shrimp		G1G2	S1S2	Endangered	None	IUCN:EN	Yes	

CRUSTACEA, Order Notostraca (tadpole shrimp)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Lepidurus packardi	vernal pool tadpole shrimp		G4	S3S4	Endangered	None	IUCN:EN	Yes	

CRUSTACEA, Order Anomopoda (water fleas)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Dumontia oregonensis	hairy water flea		G1G3	S1	None	None		Yes	

CRUSTACEA, Order Isopoda (isopods)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Bowmanasellus sequoiae	Sequoia cave isopod		G1	S1	None	None		Yes	
Caecidotea tomalensis	Tomales isopod		G2	S2S3	None	None		Yes	
Calasellus californicus	An isopod		G2	S2	None	None		Yes	
Calasellus longus	An isopod		G1	S1	None	None		Yes	

CRUSTACEA, Order Amphipoda (amphipods)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Hyalella muerta	Texas Spring amphipod		G1	S1	None	None		Yes	Yes
Hyalella sandra	Death Valley amphipod		G1	S1	None	None		Yes	Yes
Stygobromus cherylae	Barr's amphipod		G1	S1	None	None		Yes	
Stygobromus cowani	Cowan's amphipod		G1	S1	None	None		Yes	
Stygobromus gallawayae	Gallaway's amphipod		G1	S1	None	None		Yes	
Stygobromus gradyi	Grady's Cave amphipod		G1	S1	None	None	IUCN:VU	Yes	
Stygobromus grahami	Graham's Cave amphipod		G2	S2	None	None		Yes	
Stygobromus harai	Hara's Cave amphipod		G1G2	S1S2	None	None	IUCN:VU	Yes	
Stygobromus hyporheicus	Hypoheic amphipod		G1	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Stygobromus imperialis	Empire Cave amphipod		G1	S1	None	None		Yes	
Stygobromus lacicolus	Lake Tahoe amphipod		G1	S1	None	None		Yes	
Stygobromus mackenziei	Mackenzie's Cave amphipod		G1	S1	None	None	IUCN:VU	Yes	
Stygobromus myersae	Myer's amphipod		G1G2	S1S2	None	None		Yes	
Stygobromus mysticus	Secret Cave amphipod		G1	S1	None	None		Yes	
Stygobromus rudolphi	Rudolph's amphipod		G1	S1	None	None		Yes	
Stygobromus sheldoni	Sheldon's amphipod		G1	S1	None	None		Yes	
Stygobromus sierrensis	Sierra amphipod		G1	S1	None	None		Yes	
Stygobromus tahoensis	Lake Tahoe stygobromid		G1	S1	None	None		Yes	
Stygobromus trinus	Trinity County amphipod		G1	S1	None	None		Yes	
Stygobromus wengerorum	Wengerors' Cave amphipod		G1	S1	None	None	IUCN:VU	Yes	

CRUSTACEA, Order Decapoda (crayfish and shrimp)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Pacifastacus fortis	Shasta crayfish		G1	S1	Endangered	Endangered	IUCN:CR	Yes	
Pacifastacus leniusculus klamathensis	Klamath crayfish		G5T5	S3	None	None		No	
Syncaris pacifica	California freshwater shrimp		G2	S2	Endangered	Endangered	IUCN:EN	Yes	

INSECTA, Order Odonata (dragonflies and damselflies)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ischnura gemina	San Francisco forktail damselfly		G2	S2	None	None	IUCN:VU	Yes	

INSECTA, Order Plecoptera (stoneflies)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Capnia lacustra	Lake Tahoe benthic stonefly		G1	S1	None	None		Yes	
Cosumnoperla hypocrena	Cosumnes stripetail		G2	S2	None	None		Yes	

INSECTA, Order Orthoptera (grasshoppers, katydids, and crickets)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aglaothorax longipennis	Santa Monica shieldback katydid		G1G2	S1S2	None	None	IUCN:CR	Yes	
Ammopelmatus kelsoensis	Kelso jerusalem cricket		G1G2	S1S2	None	None	IUCN:VU	Yes	
Ammopelmatus muwu	Point Conception jerusalem cricket		G1	S1	None	None	IUCN:VU	Yes	
Idiostatus kathleenae	Pinnacles shieldback katydid		G1G2	S1S2	None	None		Yes	
Idiostatus middlekauffi	Middlekauff's shieldback katydid		G1G2	S1	None	None	IUCN:CR	Yes	
Macrobaenetes algodonensis	Algodones sand treader cricket		G1G2	S1S2	None	None		No	
Macrobaenetes kelsoensis	Kelso giant sand treader cricket		G2	S2	None	None	IUCN:VU	Yes	
Macrobaenetes valgum	Coachella giant sand treader cricket		G1G2	S1S2	None	None	IUCN:VU	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Pristoceuthophilus sp.	Samwell Cave cricket		G1G3	S1S3	None	None	IUCN:VU	No	
Psychomastax deserticola	desert monkey grasshopper		G1G2	S1S2	None	None	IUCN:VU	Yes	
Stenopelmatus cahuilaensis	Coachella Valley jerusalem cricket		G1G2	S1S2	None	None	IUCN:VU	Yes	
Tetrix sierrana	Sierra pygmy grasshopper		G1G2	S1S2	None	None	IUCN:VU	Yes	
Trimerotropis infantilis	Zayante band-winged grasshopper		G1	S1	Endangered	None	IUCN:EN	Yes	
Trimerotropis occidentiloides	Santa Monica grasshopper		G1G2	S1S2	None	None	IUCN:EN	Yes	
Trimerotropis occulens	Lompoc grasshopper		G1G2	S1S2	None	None	IUCN:EN	Yes	

INSECTA, Order Heteroptera (true bugs)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ambrysus funebris	Nevares Spring naucorid bug		G1	S1	Candidate	None		Yes	
Belostoma saratogae	Saratoga Springs belostoman bug		G1	S1	None	None		Yes	
Oravelia pege	Dry Creek cliff strider bug		G1	S1	None	None		Yes	
Pelocoris shoshone	Amargosa naucorid bug		G1G3	S1S2	None	None		Yes	
Saldula usingeri	Wilbur Springs shorebug		G1	S1	None	None		Yes	

INSECTA, Order Neuroptera (lacewings)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Oliarces clara	cheeseweed owlfly (cheeseweed moth lacewing)		G1G3	S2	None	None		Yes	

INSECTA, Order Coleoptera (beetles)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aegialia concinna	Ciervo aegilian scarab beetle		G1	S1	None	None	BLM:S IUCN:VU	Yes	
Agabus rumppi	Death Valley agabus diving beetle		G1G3	S1	None	None		Yes	
Agrilus harenus	Harenus jewel beetle		G1G2	S1S2	None	None		Yes	
Anomala carlsoni	Carlson's dune beetle		G1	S1	None	None		Yes	
Anomala hardyorum	Hardy's dune beetle		G1	S1	None	None		Yes	
Anthicus antiochensis	Antioch Dunes anthicid beetle		G1	S1	None	None		Yes	
Anthicus sacramento	Sacramento anthicid beetle		G1	S1	None	None	IUCN:EN	Yes	
Atractelmis wawona	Wawona riffle beetle		G3	S1S2	None	None		Yes	
Chaetarthria leechi	Leech's chaetarthrian water scavenger beetle		G1?	S1?	None	None		Yes	
Cicindela gabbii	western tidal-flat tiger beetle		G2G4	S1	None	None		Yes	
Cicindela hirticollis abrupta	Sacramento Valley tiger beetle		G5TH	SH	None	None		Yes	
Cicindela hirticollis gravida	sandy beach tiger beetle		G5T2	S2	None	None		Yes	
Cicindela latesignata latesignata	western beach tiger beetle		G2G4T1T2	S1	None	None		Yes	
Cicindela ohlone	Ohlone tiger beetle		G1	S1	Endangered	None		Yes	
Cicindela senilis frosti	senile tiger beetle		G2G3T1T3	S1	None	None		Yes	
Cicindela tranquebarica ssp.	San Joaquin tiger beetle		G5T1	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cicindela tranquebarica viridissima	greenest tiger beetle		G5T1	S1	None	None		Yes	
Coelus globosus	globose dune beetle		G1G2	S1S2	None	None	IUCN:VU	Yes	
Coelus gracilis	San Joaquin dune beetle		G1	S1	None	None	BLM:S IUCN:VU	Yes	
Coenonycha clementina	San Clemente Island coenonycha beetle		G1G2	S1S2	None	None		Yes	
Cyclocephala wandae	Wandae dune beetle		G1G2	S1S2	None	None		Yes	
Deltaspis ivae	marsh-elder long-horned beetle		G1	S1	None	None		Yes	
Desmocerus californicus dimorphus	valley elderberry longhorn beetle		G3T2	S2	Threatened	None		Yes	
Dinacoma caseyi	Casey's June beetle		G1	S1	Endangered	None		Yes	
Dubiraphia brunnescens	brownish dubiraphian riffle beetle		G1	S1	None	None		Yes	
Dubiraphia giulianii	Giuliani's dubiraphian riffle beetle		G1G3	S1S3	None	None		Yes	
Elaphrus viridis	Delta green ground beetle		G1	S1	Threatened	None	IUCN:CR	Yes	
Glaresis arenata	Kelso Dunes scarab glaresis beetle		G2	S2	None	None		Yes	
Hydrochara rickseckeri	Ricksecker's water scavenger beetle		G2?	S2?	None	None		Yes	
Hydroporus leechi	Leech's skyline diving beetle		G1?	S1?	None	None		Yes	
Hydroporus simplex	simple hydroporus diving beetle		G1?	S1?	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Hygrotus curvipes	curved-foot hygrotus diving beetle		G1	S1	None	None		Yes	
Hygrotus fontinalis	travertine band-thigh diving beetle		G1	S1	None	None		Yes	
Juniperella mirabilis	juniper metallic wood-boring beetle		G1	S1	None	None		Yes	
Lepismadora algodones	Algodones sand jewel beetle		G1	S1	None	None		Yes	
Lichnanthe albipilosa	white sand bear scarab beetle		G1	S1	None	None		Yes	
Lichnanthe ursina	bumblebee scarab beetle		G2	S2	None	None		Yes	
Lytta hoppingi	Hopping's blister beetle		G1G2	S1S2	None	None		Yes	
Lytta insperata	Mojave Desert blister beetle		G1G2	S1S2	None	None		No	
Lytta moesta	moestan blister beetle		G2	S2	None	None		Yes	
Lytta molesta	molestan blister beetle		G2	S2	None	None		Yes	
Lytta morrisoni	Morrison's blister beetle		G1G2	S1S2	None	None		Yes	
Microcylloepus formicoideus	Furnace Creek riffle beetle		G1	S1	None	None		Yes	
Miloderes nelsoni	Nelson's miloderes weevil		G2	S2	None	None		Yes	
Nebria darlingtoni	South Forks ground beetle		G1	S1	None	None		Yes	
Nebria gebleri siskiyouensis	Siskiyou ground beetle		G4G5T4	S1S2	None	None		Yes	
Nebria sahlbergii triad	Trinity Alps ground beetle		G1T1	S1	None	None		Yes	
Ochthebius crassalus	wing shoulder minute moss beetle		G1G3	S1S3	None	None		No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ochthebius recticulus	Wilbur Springs minute moss beetle		G1	S1	None	None		Yes	
Onychobaris langei	Lange's El Segundo Dune weevil		G1	S1	None	None		Yes	
Optioservus canus	Pinnacles optioservus riffle beetle		G2	S1	None	None		Yes	
Paleoxenus dohrni	Dohrn's elegant eucnemid beetle		G3?	S3?	None	None		No	
Polyphylla anteronivea	Saline Valley snow-front June beetle		G1	S1	None	None		Yes	
Polyphylla barbata	Mount Hermon (=barbate) June beetle		G1	S1	Endangered	None		Yes	
Polyphylla erratica	Death Valley June beetle		G1G2	S1S2	None	None		Yes	
Polyphylla nubila	Atascadero June beetle		G1	S1	None	None		Yes	
Prasinalia imperialis	Algodones white wax jewel beetle		G1G2	S1S2	None	None		No	
Pseudocotalpa andrewsi	Andrew's dune scarab beetle		G1	S1	None	None		Yes	
Scaphinotus behrensi	Behrens' snail-eating beetle		G2G4	S2S4	None	None		No	
Trachykele hartmani	serpentine cypress wood-boring beetle		G1	S1	None	None		Yes	
Trichinorhipis knulli	Knull's metallic wood-boring beetle		G1	S1	None	None		No	
Trigonoscuta brunnotesselata	brown tassel trigonoscuta weevil		G1G2	S1S2	None	None		Yes	
Trigonoscuta dorothea dorothea	Dorothy's El Segundo Dune weevil		G1T1	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Trigonoscuta rothi algodones	Algodones dune weevil		G1G2	S1S2	None	None		No	
Trigonoscuta rothi imperialis	Imperial dune weevil		G1G2	S1S2	None	None		No	
Trigonoscuta rothi punctata	Punctate dune weevil		G1G2	S1S2	None	None		No	
Trigonoscuta rothi rothi	Roth's dune weevil		G1G2	S1S2	None	None		No	
Trigonoscuta sp.	Doyen's trigonoscuta dune weevil		G1Q	S1	None	None		Yes	Yes
Trigonoscuta stantoni	Santa Cruz Island shore weevil		G1	S1	None	None		Yes	
Vandykea tuberculata	serpentine cypress long-horned beetle		G1	S1	None	None		Yes	

INSECTA, Order Mecoptera (scorpionflies)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Orobittacus obscurus	gold rush hanging scorpionfly		G1	S1	None	None		Yes	

INSECTA, Order Diptera (flies)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ablautus schlingeri	Oso Flaco robber fly		G1	S1	None	None		Yes	
Apiocera warneri	Glamis sand fly		G1G2	S1S2	None	None		Yes	
Brennania belkini	Belkin's dune tabanid fly		G1G2	S1S2	None	None	IUCN:VU	Yes	
Efferia antiochi	Antioch efferian robberfly		G1G2	S1S2	None	None		Yes	
Efferia macroxipha	Glamis robberfly		G1G2	S1S2	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Metapogon hurdi	Hurd's metapogon robberfly		G1G2	S1S2	None	None		Yes	
Paracoenia calida	Wilbur Springs shore fly		G1	S1	None	None		Yes	
Rhaphiomidas terminatus abdominalis	Delhi Sands flower-loving fly		G1T1	S1	Endangered	None		Yes	
Rhaphiomidas terminatus terminatus	El Segundo flower-loving fly		G1T1	S1	None	None		Yes	
Rhaphiomidas trochilus	Valley mydas fly		G1	S1	None	None		No	

INSECTA, Order Lepidoptera (butterflies and moths)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Adela oplerella	Opler's longhorn moth		G2	S2	None	None		Yes	
Apodemia mormo langei	Lange's metalmark butterfly		G5T1	S1	Endangered	None		Yes	
Areniscythris brachypteris	Oso Flaco flightless moth		G1	S1	None	None		Yes	
Callophrys comstocki	desert green hairstreak		G3G4	S1S2	None	None		No	
Callophrys mossii bayensis	San Bruno elfin butterfly		G4T1	S1	Endangered	None		Yes	
Callophrys mossii hidakupa	San Gabriel Mountains elfin butterfly		G4T1T2	S1S2	None	None	USFS:S	Yes	
Callophrys mossii marinensis	Marin elfin butterfly		G4T1	S1	None	None		Yes	
Callophrys thornei	Thorne's hairstreak		G1	S1	None	None	BLM:S	Yes	Yes
Carolella busckana	Busck's gallmoth		G1G3	SH	None	None		Yes	
Carterocephalus palaemon magnus	Sonoma arctic skipper		G5T5	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cercyonis pegala carsonensis	Carson Valley wood nymph		G5T1T2	S1S2	None	None		No	
Chlosyne leanira elegans	Oso Flaco patch butterfly		G4G5T1T2	S1S2	None	None		Yes	
Coenonympha tullia yontockett	Yontocket satyr		G5T1T2	S1	None	None		Yes	
Danaus plexippus pop. 1	monarch - California overwintering population		G4T2T3	S2S3	None	None	USFS:S	Yes	
Euchloe hyantis andrewsi	Andrew's marble butterfly		G3G4T1	S1	None	None		Yes	
Eucosma hennei	Henne's eucosman moth		G1	S1	None	None		Yes	
Euphilotes battoides allyni	El Segundo blue butterfly		G5T1	S1	Endangered	None		Yes	
Euphilotes battoides comstocki	Comstock's blue butterfly		G5T2	S2	None	None		Yes	
Euphilotes baueri	Bauer's dotted-blue		G2G4	S1S2	None	None	USFS:S	No	
Euphilotes enoptes smithi	Smith's blue butterfly		G5T1T2	S1S2	Endangered	None		Yes	
Euphilotes mojave	Mojave dotted-blue		G2G3	S1S2	None	None		No	
Euphydryas editha bayensis	Bay checkerspot butterfly		G5T1	S1	Threatened	None		Yes	
Euphydryas editha monoensis	Mono checkerspot butterfly		G5T2T3	S1S2	None	None	USFS:S	Yes	
Euphydryas editha quino	quino checkerspot butterfly		G5T1T2	S1S2	Endangered	None		Yes	
Euphyes vestris harbisoni	dun skipper		G5T1T2	S1S2	None	None		No	
Euproserpinus euterpe	Kern primrose sphinx moth		G1G2	S1	Threatened	None		Yes	Yes
Glaucopsyche lygdamus palosverdesensis	Palos Verdes blue butterfly		G5T1	S1	Endangered	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Hesperia miriamae longaevicola	White Mountains skipper		G2G3T1	S1	None	None		Yes	
Hesperopsis gracielae	MacNeill's sootywing		G2G3	S1S2	None	None		No	
Lycaena hermes	Hermes copper butterfly		G1	S1	Candidate	None	IUCN:VU USFS:S	Yes	
Lycaena rubidus incana	White Mountains copper		G5T2T3	S1	None	None		No	
Panoquina errans	wandering (=saltmarsh) skipper		G4G5	S2	None	None	IUCN:NT	Yes	
Philotiella speciosa bohartorum	Boharts' blue butterfly		G3G4T1	S1	None	None		Yes	
Plebejus icarioides albihalos	White Mountains icarioides blue butterfly		G5T2T3	S2?	None	None		Yes	
Plebejus icarioides missionensis	Mission blue butterfly		G5T1	S1	Endangered	None		Yes	
Plebejus icarioides moroensis	Morro Bay blue butterfly		G5T2	S2	None	None		Yes	
Plebejus icarioides parapheres	Point Reyes blue butterfly		G5T1T2	S1S2	None	None		Yes	
Plebejus idas lotis	lotis blue butterfly		G5TH	SH	Endangered	None		Yes	
Plebejus saepiolus albomontanus	White Mountains saepiolus blue butterfly		G5T2	S1S2	None	None		Yes	
Plebejus saepiolus aureolus	San Gabriel Mountains blue butterfly		G5T1	S1	None	None	USFS:S	Yes	
Plebulina emigdionis	San Emigdio blue butterfly		G1G2	S1S2	None	None	USFS:S	Yes	
Polites mardon	mardon skipper		G2G3	S1	None	None	USFS:S	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Polites sabuleti albamontana	White Mountains sandhill skipper		G5T2	S2	None	None		No	
Pseudocopaeodes eunus eunus	alkali skipper		G3G4T2	S2	None	None		No	
Pseudocopaeodes eunus obscurus	Carson wandering skipper		G3G4T1	S1	Endangered	None		Yes	
Pyrgus ruralis lagunae	Laguna Mountains skipper		G5T1	S1	Endangered	None		Yes	
Speyeria adiaste adiaste	unsilvered fritillary		G1G2T1	S1	None	None		Yes	
Speyeria callippe callippe	callippe silverspot butterfly		G5T1	S1	Endangered	None		Yes	
Speyeria egleis tehachapina	Tehachapi Mountain silverspot butterfly		G5T2	S2	None	None	USFS:S	Yes	
Speyeria nokomis carsonensis	Carson Valley silverspot		G3T1T2	S1	None	None		Yes	
Speyeria zerene behrensii	Behren's silverspot butterfly		G5T1	S1	Endangered	None		Yes	
Speyeria zerene hippolyta	Oregon silverspot butterfly		G5T1	S1	Threatened	None		Yes	
Speyeria zerene myrtleae	Myrtle's silverspot butterfly		G5T1	S1	Endangered	None		Yes	Yes
Speyeria zerene sonomensis	Sonoma zerene fritillary		G5T1	S1	None	None		Yes	

INSECTA, Order Trichoptera (caddisflies)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cryptochia denningi	Denning's cryptic caddisfly		G1G2	S1S2	None	None		Yes	
Cryptochia excella	Kings Canyon cryptochian caddisfly		G1G2	S1S2	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cryptochia shasta	confusion caddisfly		G1G2	S1S2	None	None		Yes	
Desmona bethula	amphibious caddisfly		G2G3	S2S3	None	None		Yes	
Diplectrona californica	California diplectronan caddisfly		G1G2	S1S2	None	None		Yes	
Ecclisomyia bilera	Kings Creek ecclysomyian caddisfly		G1G2	S1S2	None	None		Yes	
Farula praelonga	long-tailed caddisfly		G1G2	S1S2	None	None		Yes	
Goeracea oregona	Sagehen Creek goeracean caddisfly		G3	S1S2	None	None		Yes	
Lepidostoma ermanae	Cold Spring caddisfly		G1G2	S1S2	None	None		Yes	
Limnephilus atercus	Fort Dick limnephilus caddisfly		G3G4	S1	None	None		Yes	
Neothremma genella	golden-horned caddisfly		G1G2	S1S2	None	None		Yes	
Neothremma siskiyou	Siskiyou caddisfly		G1G2	S1S2	None	None		No	
Parapsyche extensa	King's Creek parapsyche caddisfly		GH	SH	None	None		Yes	
Rhyacophila lineata	Castle Crags rhyacophilan caddisfly		G1G3	S1S2	None	None		Yes	
Rhyacophila mosana	bilobed rhyacophilan caddisfly		G1G2Q	S1S2	None	None		Yes	
Rhyacophila spinata	spiny rhyacophilan caddisfly		G1G2	S1S2	None	None		Yes	

INSECTA, Order Hymenoptera (ants, bees, and wasps)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Andrena blennospermatis	Blennosperma vernal pool andrenid bee		G2	S2	None	None		Yes	
Andrena macswaini	An andrenid bee		G2	S2	None	None		Yes	
Andrena subapasta	An andrenid bee		G1G2	S1S2	None	None		Yes	
Argochrysis lassenae	Lassen cuckoo wasp		G1	S1	None	None		Yes	
Ashmeadiella chumashae	Channel Islands leaf-cutter bee		G2?	S2?	None	None		Yes	
Bombus caliginosus	obscure bumble bee		G4?	S1S2	None	None	IUCN:VU	Yes	
Bombus crotchii	Crotch bumble bee		G3G4	S1S2	None	Candidate Endangered		Yes	
Bombus franklini	Franklin's bumble bee		G1	S1	None	Candidate Endangered	IUCN:CR	Yes	
Bombus morrisoni	Morrison bumble bee		G4G5	S1S2	None	None	IUCN:VU	Yes	
Bombus occidentalis	western bumble bee		G2G3	S1	None	Candidate Endangered	USFS:S	Yes	
Bombus suckleyi	Suckley's cuckoo bumble bee		GU	S1	None	Candidate Endangered		Yes	
Ceratochrysis bradleyi	Bradley's cuckoo wasp		G1	S1	None	None		Yes	
Ceratochrysis gracilis	Piute Mountains cuckoo wasp		G1	S1	None	None		Yes	
Ceratochrysis longimala	Desert cuckoo wasp		G1	S1	None	None		Yes	
Ceratochrysis menkei	Menke's cuckoo wasp		G1	S1	None	None		Yes	
Chrysis tularensis	Tulare cuckoo wasp		G1G2	S1S2	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cleptes humboldti	Humboldt cuckoo wasp		G1G2	S1S2	None	None		Yes	
Dufourea stagei	Stage's dufourine bee		G1G2	S1	None	None		Yes	
Eucerceris ruficeps	redheaded sphecid wasp		G1G3	S1S2	None	None		Yes	
Euparagia unidentata	Algodones euparagia		G1G2	S1S2	None	None		Yes	
Habropoda pallida	white faced bee		G1G2	S1S2	None	None		No	
Halictus harmonius	haromonius halictid bee		G1	S1	None	None		Yes	
Hedychridium argenteum	Riverside cuckoo wasp		G1G2	S1S2	None	None		Yes	
Hedychridium milleri	Borax Lake cuckoo wasp		G1	S1	None	None		Yes	
Lasioglossum channelense	Channel Island sweat bee		G1	S1	None	None		Yes	
Melitta californica	California mellitid bee		G4?	S2?	None	None		Yes	
Microbembex elegans	Algodones elegant sand wasp		G1G2	S1S2	None	None		Yes	
Minymischa ventura	Ventura cuckoo wasp		GU	SU	None	None		Yes	
Myrmosula pacifica	Antioch multilid wasp		GH	SH	None	None		Yes	
Neolarra alba	white cuckoo bee		GH	SH	None	None		No	
Paranomada californica	California cuckoo bee		G1	S1	None	None		Yes	
Parnopes borregoensis	Borrego parnopes cuckoo wasp		G1G2	S1S2	None	None		Yes	
Perdita algodones	Algodones perdita		G1G2	S1S2	None	None		Yes	
Perdita frontalis	Imperial Perdita		G1G2	S1S2	None	None		No	
Perdita scitula antiochensis	Antioch andrenid bee		G1T1	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Perdita stephanomeriae	a miner bee		GNR	S1S2	None	None		No	
Philanthus nasalis	Antioch specid wasp		G1	S1	None	None		Yes	
Protodufourea wasbaueri	Wasbauer's protodufourea bee		G1	S1	None	None		Yes	
Protodufourea zavortinki	Zavortink's protodufourea bee		G1	S1	None	None		Yes	
Rhopalolemma robertsi	Roberts' rhopalolemma bee		G1	S1	None	None		Yes	
Sedomaya glamisensis	Glamis night tiphiid		G1G2	S1S2	None	None		No	
Sphaeropthalma ecarinata	Glamis night mutillid		G1G2	S1S2	None	None		No	
Sphecodogastra antiochensis	Antioch Dunes halcitid bee		G1	S1	None	None		Yes	
Stictiella villegasi	Algodones sand wasp		G1G2	S1S2	None	None		No	
Trachusa gummifera	San Francisco Bay Area leaf-cutter bee		G1	S1	None	None		Yes	

Fishes

PETROMYZONTIDAE (lampreys)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Entosphenus folletti	northern California brook lamprey		G1G2Q	S1S2	None	None	CDFW:SSC	Yes	
Entosphenus lethophagus	Pit-Klamath brook lamprey		G3G4	S3	None	None	AFS:VU CDFW:SSC	Yes	
Entosphenus similis	Klamath River lamprey		G3G4Q	S3	None	None	AFS:TH CDFW:SSC USFS:S	Yes	
Entosphenus tridentatus	Pacific lamprey		G4	S4	None	None	AFS:VU BLM:S CDFW:SSC USFS:S	Yes	
Entosphenus tridentatus ssp. 1	Goose Lake lamprey		G4T1	S1	None	None	AFS:VU CDFW:SSC USFS:S	Yes	
Lampetra ayresii	western river lamprey		G4	S3	None	None	AFS:VU CDFW:SSC	No	
Lampetra hubbsi	Kern brook lamprey		G1G2	S1S2	None	None	AFS:TH CDFW:SSC IUCN:NT USFS:S	Yes	
Lampetra richardsoni	western brook lamprey		G4G5	S3S4	None	None	CDFW:SSC USFS:S	Yes	

ACIPENSERIDAE (sturgeon)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Acipenser medirostris	green sturgeon	southern DPS	G3	S1S2	Threatened	None	AFS:VU CDFW:SSC IUCN:NT NMFS:SC	Yes	Yes
Acipenser transmontanus	white sturgeon		G4	S2	None	None	AFS:EN CDFW:SSC IUCN:LC	No	

SALMONIDAE (trout and salmon)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Oncorhynchus clarkii clarkii	coast cutthroat trout		G4T4	S3	None	None	AFS:VU CDFW:SSC USFS:S	Yes	
Oncorhynchus clarkii henshawi	Lahontan cutthroat trout		G4T3	S2	Threatened	None	AFS:TH	Yes	
Oncorhynchus clarkii seleniris	Paiute cutthroat trout		G4T1T2	S1S2	Threatened	None	AFS:EN	Yes	
Oncorhynchus gorbuscha	pink salmon		G5	S1	None	None		Yes	
Oncorhynchus keta	chum salmon		G5	S1	None	None		No	
Oncorhynchus kisutch pop. 2	coho salmon - southern Oregon / northern California ESU		G4T2Q	S2?	Threatened	Threatened	AFS:TH	Yes	Yes
Oncorhynchus kisutch pop. 4	coho salmon - central California coast ESU		G4	S2?	Endangered	Endangered	AFS:EN	Yes	Yes
Oncorhynchus mykiss aguabonita	California golden trout		G5T1	S1	None	None	AFS:TH CDFW:SSC USFS:S	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Oncorhynchus mykiss aquilarum	Eagle Lake rainbow trout		G5T1Q	S1	None	None	AFS:TH CDFW:SSC USFS:S	Yes	
Oncorhynchus mykiss gilberti	Kern River rainbow trout		G5T1Q	S1	None	None	AFS:TH CDFW:SSC USFS:S	Yes	
Oncorhynchus mykiss irideus pop. 1	steelhead - Klamath Mountains Province DPS		G5T3Q	S2	None	None	CDFW:SSC USFS:S	No	Yes
Oncorhynchus mykiss irideus pop. 10	steelhead - southern California DPS		G5T1Q	S1	Endangered	None	AFS:EN	Yes	Yes
Oncorhynchus mykiss irideus pop. 11	steelhead - Central Valley DPS		G5T2Q	S2	Threatened	None	AFS:TH	Yes	Yes
Oncorhynchus mykiss irideus pop. 16	steelhead - northern California DPS		G5T2T3Q	S2S3	Threatened	None	AFS:TH	Yes	Yes
Oncorhynchus mykiss irideus pop. 36	summer-run steelhead trout		G5T4Q	S2	None	Candidate Endangered	CDFW:SSC	Yes	Yes
Oncorhynchus mykiss irideus pop. 8	steelhead - central California coast DPS		G5T2T3Q	S2S3	Threatened	None	AFS:TH	Yes	Yes
Oncorhynchus mykiss irideus pop. 9	steelhead - south-central California coast DPS		G5T2Q	S2	Threatened	None	AFS:TH	Yes	Yes
Oncorhynchus mykiss ssp. 1	Goose Lake redband trout		G5T2Q	S2	None	None	AFS:VU CDFW:SSC USFS:S	Yes	
Oncorhynchus mykiss ssp. 2	McCloud River redband trout		G5T1	S1S2	None	None	AFS:VU CDFW:SSC USFS:S	Yes	
Oncorhynchus mykiss ssp. 3	Warner Valley redband trout		G5T2Q	S1?	None	None	AFS:VU USFS:S	No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Oncorhynchus mykiss whitei	Little Kern golden trout		G5T2	S2	Threatened	None	AFS:EN	Yes	
Oncorhynchus tshawytscha pop. 13	chinook salmon - Central Valley fall / late fall-run ESU		G5	S2	None	None	AFS:VU CDFW:SSC NMFS:SC USFS:S	No	Yes
Oncorhynchus tshawytscha pop. 14	chinook salmon - southern Oregon/northern California coastal		G5T3Q	SNR	None	None	CDFW:SSC	No	
Oncorhynchus tshawytscha pop. 17	chinook salmon - California coastal ESU		G5	S1	Threatened	None	AFS:TH	Yes	Yes
Oncorhynchus tshawytscha pop. 30	chinook salmon - upper Klamath and Trinity Rivers ESU		G5	S1S2	Candidate	Candidate Endangered	CDFW:SSC USFS:S	Yes	
Oncorhynchus tshawytscha pop. 6	chinook salmon - Central Valley spring-run ESU		G5	S1	Threatened	Threatened	AFS:TH	Yes	Yes
Oncorhynchus tshawytscha pop. 7	chinook salmon - Sacramento River winter-run ESU		G5	S1	Endangered	Endangered	AFS:EN	Yes	
Prosopium williamsoni	mountain whitefish		G5	S3	None	None	CDFW:SSC	Yes	
Salvelinus confluentus	bull trout		G4	SX	Threatened	Endangered	IUCN:VU	Yes	

OSMERIDAE (smelt)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Hypomesus transpacificus	Delta smelt		G1	S1	Threatened	Endangered	AFS:TH IUCN:EN	Yes	
Spirinchus thaleichthys	longfin smelt		G5	S1	Candidate	Threatened		Yes	Yes
Thaleichthys pacificus	eulachon	southern DPS	G5	S3	Threatened	None		Yes	

CYPRINIDAE (minnows and carp)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Gila coerulea	blue chub		G3G4	S2S3	None	None	CDFW:SSC	Yes	
Gila elegans	bonytail		G1	SH	Endangered	Endangered	AFS:EN IUCN:EN	Yes	
Gila orcuttii	arroyo chub		G2	S2	None	None	AFS:VU CDFW:SSC USFS:S	Yes	
Lavinia exilicauda chi	Clear Lake hitch		G4T1	S1	None	Threatened	AFS:VU USFS:S	Yes	
Lavinia exilicauda exilicauda	Sacramento hitch		G4T2T4	S2S4	None	None	CDFW:SSC	No	
Lavinia exilicauda harengus	Pajaro/Salinas hitch		G4T2T4	S2S4	None	None	CDFW:SSC	Yes	
Lavinia symmetricus mitrulus	Pit roach		G4T2	S2	None	None	AFS:VU CDFW:SSC	Yes	
Lavinia symmetricus navarroensis	Navarro roach		G4T1T2	S2S3	None	None	CDFW:SSC	Yes	
Lavinia symmetricus parvipinnis	Gualala roach		G4T1T2	S2S3	None	None	CDFW:SSC	Yes	
Lavinia symmetricus ssp. 1	San Joaquin roach		G4T3Q	S3	None	None	CDFW:SSC	Yes	Yes
Lavinia symmetricus ssp. 2	Tomales roach		G4T2T3	S2	None	None	CDFW:SSC	Yes	
Lavinia symmetricus ssp. 3	Red Hills roach		G4T1	S1	None	None	AFS:VU BLM:S CDFW:SSC	Yes	
Lavinia symmetricus ssp. 4	Clear Lake - Russian River roach		G4T2T3	S2S3	None	None	CDFW:SSC	No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Lavinia symmetricus subditus	Monterey roach		G4T2T3	S2S3	None	None	CDFW:SSC	Yes	
Mylopharodon conocephalus	hardhead		G3	S3	None	None	CDFW:SSC USFS:S	Yes	
Pogonichthys macrolepidotus	Sacramento splittail		GNR	S3	None	None	AFS:VU CDFW:SSC IUCN:EN	Yes	
Ptychocheilus lucius	Colorado pikeminnow		G1	SX	Endangered	Endangered	CDFW:FP IUCN:VU	Yes	
Rhinichthys osculus ssp. 1	Amargosa Canyon speckled dace		G5T1Q	S1	None	None	AFS:TH BLM:S CDFW:SSC	Yes	Yes
Rhinichthys osculus ssp. 2	Owens speckled dace		G5T1T2Q	S1S2	None	None	AFS:TH BLM:S CDFW:SSC	Yes	Yes
Rhinichthys osculus ssp. 3	Santa Ana speckled dace		G5T1	S1	None	None	AFS:TH CDFW:SSC USFS:S	Yes	
Rhinichthys osculus ssp. 5	Long Valley speckled dace		G5T1	S1	None	None	AFS:EN CDFW:SSC	Yes	
Siphateles bicolor mohavensis	Mohave tui chub		G4T1	S1	Endangered	Endangered	AFS:EN CDFW:FP	Yes	
Siphateles bicolor pectinifer	Lahontan Lake tui chub		G4T3	S1S2	None	None	CDFW:SSC	Yes	
Siphateles bicolor snyderi	Owens tui chub		G4T1	S1	Endangered	Endangered	AFS:EN	Yes	
Siphateles bicolor ssp. 1	Eagle Lake tui chub		G4T1T2	S1S2	None	None	CDFW:SSC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Siphateles bicolor ssp. 2	High Rock Spring tui chub		G4TX	SX	None	None		Yes	
Siphateles bicolor ssp. 3	Pit River tui chub		G4T1T3	S1S3	None	None		No	
Siphateles bicolor thalassinus	Goose Lake tui chub		G4T2T3	S2	None	None	AFS:TH CDFW:SSC	Yes	
Siphateles bicolor vaccaceps	Cow Head tui chub		G4T1	S1	None	None	AFS:EN BLM:S CDFW:SSC	Yes	

CATOSTOMIDAE (suckers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Catostomus fumeiventris	Owens sucker		G3G4	S3	None	None	CDFW:SSC	Yes	
Catostomus latipinnis	flannelmouth sucker		G3G4	S1	None	None		Yes	
Catostomus microps	Modoc sucker		G2	S2	Delisted	Endangered	AFS:EN CDFW:FP IUCN:EN	Yes	
Catostomus occidentalis lacusanserinus	Goose Lake sucker		G5T2Q	S1	None	None	AFS:VU CDFW:SSC USFS:S	Yes	
Catostomus platyrhynchus	mountain sucker		G5	S3	None	None	CDFW:SSC	Yes	
Catostomus rimiculus ssp. 1	Jenny Creek sucker		G5T2Q	S1	None	None	AFS:VU	No	
Catostomus santaanae	Santa Ana sucker		G1	S1	Threatened	None	AFS:TH IUCN:VU	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Catostomus snyderi	Klamath largescale sucker		G3	S3	None	None	AFS:TH CDFW:SSC IUCN:NT	Yes	
Chasmistes brevirostris	shortnose sucker		G1	S1	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	Yes	
Deltistes luxatus	Lost River sucker		G1	S1	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	Yes	
Xyrauchen texanus	razorback sucker		G1	S1S2	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	Yes	

CYPRINODONTIDAE (killifishes)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cyprinodon macularius	desert pupfish		G1	S1	Endangered	Endangered	AFS:EN IUCN:VU	Yes	
Cyprinodon nevadensis amargosae	Amargosa pupfish		G2T1T2	S1S2	None	None	AFS:VU BLM:S CDFW:SSC IUCN:VU	Yes	
Cyprinodon nevadensis nevadensis	Saratoga Springs pupfish		G2T1	S1	None	None	AFS:TH CDFW:SSC IUCN:VU	Yes	
Cyprinodon nevadensis shoshone	Shoshone pupfish		G2T1	S1	None	None	AFS:EN CDFW:SSC IUCN:VU	Yes	
Cyprinodon radiosus	Owens pupfish		G1	S1	Endangered	Endangered	AFS:EN CDFW:FP IUCN:EN	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cyprinodon salinus milleri	Cottonball Marsh pupfish		G1T1Q	S1	None	Threatened	AFS:TH IUCN:EN	Yes	
Cyprinodon salinus salinus	Salt Creek pupfish		G1T1	S1	None	None	AFS:VU CDFW:SSC IUCN:EN	Yes	

GASTEROSTEIDAE (sticklebacks)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Gasterosteus aculeatus microcephalus	resident threespine stickleback	South of Pt. Conception only	G5T2T3	S2S3	None	None		No	Yes
Gasterosteus aculeatus santaannae	Santa Ana (=Shay Creek) threespine stickleback		G5T1Q	S1	None	None	AFS:EN	No	Yes
Gasterosteus aculeatus williamsoni	unarmored threespine stickleback		G5T1	S1	Endangered	Endangered	AFS:EN CDFW:FP	Yes	Yes

CENTRARCHIDAE (sunfishes)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Archoplites interruptus	Sacramento perch	Within native range only	G2G3	S1	None	None	AFS:TH CDFW:SSC	Yes	

EMBIOTOCIDAE (surfperches)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Hysterocarpus traskii lagunae	Clear Lake tule perch		G5T2T3	S2S3	None	None	CDFW:SSC	Yes	
Hysterocarpus traskii pomo	Russian River tule perch		G5T4	S4	None	None	AFS:VU CDFW:SSC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Hysterocarpus traskii traskii	Sacramento-San Joaquin tule perch		G5T2T3	S2S3	None	None		No	

GOBIIDAE (gobies)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Eucyclogobius newberryi	tidewater goby		G3	S3	Endangered	None	AFS:EN CDFW:SSC IUCN:VU	Yes	

COTTIDAE (sculpins)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cottus asper ssp.	Clear Lake prickly sculpin		G5T1	SNR	None	None	CDFW:SSC	No	
Cottus asperrimus	rough sculpin		G2	S2	None	Threatened	AFS:VU BLM:S CDFW:FP IUCN:VU	Yes	
Cottus gulosus	riffle sculpin		G5	S3S4	None	None	CDFW:SSC	No	
Cottus klamathensis klamathensis	Upper Klamath marbled sculpin		G4T1T2	S1S2	None	None	CDFW:SSC	Yes	
Cottus klamathensis macrops	bigeye marbled sculpin		G4T3	S2S3	None	None	AFS:VU CDFW:SSC	Yes	
Cottus klamathensis polyporus	Lower Klamath marbled sculpin		G4T2T4	S2S4	None	None	CDFW:SSC	Yes	
Cottus perplexus	reticulate sculpin		G4	S2S3	None	None		No	

Amphibians

AMBYSTOMATIDAE (mole salamanders)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ambystoma californiense	California tiger salamander		G2G3	S2S3	Threatened	Threatened	CDFW:WL IUCN:VU	Yes	Yes
Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander		G5T1T2	S1S2	Endangered	Endangered	CDFW:FP	Yes	
Ambystoma macrodactylum sigillatum	southern long-toed salamander		G5T4	S3	None	None	CDFW:SSC	Yes	

DICAMPTODONTIDAE (giant salamanders)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Dicamptodon ensatus	California giant salamander		G3	S2S3	None	None	CDFW:SSC IUCN:NT	Yes	

RHYACOTRITONIDAE (Olympic salamanders)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Rhyacotriton variegatus	southern torrent salamander		G3G4	S2S3	None	None	CDFW:SSC IUCN:LC USFS:S	Yes	

SALAMANDRIDAE (newts)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Taricha rivularis	red-bellied newt		G4	S2	None	None	CDFW:SSC IUCN:LC	Yes	
Taricha torosa	Coast Range newt	Monterey Co. & south only	G4	S4	None	None	CDFW:SSC	Yes	

PLETHODONTIDAE (lungless salamanders)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aneides niger	Santa Cruz black salamander		G3	S3	None	None	CDFW:SSC	Yes	Yes
Batrachoseps altasierrae	Greenhorn Mountains slender salamander		G4	S3S4	None	None		Yes	
Batrachoseps bramei	Fairview slender salamander		G3	S3	None	None	USFS:S	Yes	
Batrachoseps campi	Inyo Mountains slender salamander		G3	S3	None	None	BLM:S CDFW:SSC IUCN:EN USFS:S	Yes	
Batrachoseps diabolicus	Hell Hollow slender salamander		G2	S3	None	None	IUCN:DD	No	
Batrachoseps gabrieli	San Gabriel slender salamander		G2G3	S2S3	None	None	IUCN:DD USFS:S	Yes	
Batrachoseps incognitus	San Simeon slender salamander		G2G3	S2	None	None	IUCN:DD USFS:S	No	
Batrachoseps kawia	Sequoia slender salamander		G1G2	S2	None	None	IUCN:DD	No	
Batrachoseps luciae	Santa Lucia slender salamander		G2G3	S3	None	None	IUCN:LC	No	
Batrachoseps major aridus	desert slender salamander		G4T1	S1	Endangered	Endangered		Yes	
Batrachoseps minor	lesser slender salamander		G1	S1	None	None	CDFW:SSC IUCN:DD USFS:S	Yes	
Batrachoseps pacificus	Channel Islands slender salamander		G4	S3S4	None	None	IUCN:LC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Batrachoseps regius	Kings River slender salamander		G2	S2S3	None	None	IUCN:VU USFS:S	Yes	
Batrachoseps relictus	relictual slender salamander		G1	S1	None	None	CDFW:SSC IUCN:DD USFS:S	Yes	Yes
Batrachoseps robustus	Kern Plateau salamander		G3	S3	None	None	IUCN:NT	Yes	
Batrachoseps simatus	Kern Canyon slender salamander		G2G3	S2S3	None	Threatened	IUCN:VU USFS:S	Yes	
Batrachoseps stebbinsi	Tehachapi slender salamander		G2	S2S3	None	Threatened	BLM:S IUCN:VU	Yes	
Ensatina eschscholtzii croceater	yellow-blotched salamander		G5T3	S3	None	None	BLM:S CDFW:WL USFS:S	Yes	
Ensatina eschscholtzii klauberi	large-blotched salamander		G5T2?	S3	None	None	CDFW:WL USFS:S	Yes	
Hydromantes brunus	limestone salamander		G2G3	S2S3	None	Threatened	BLM:S CDFW:FP IUCN:VU USFS:S	Yes	
Hydromantes platycephalus	Mount Lyell salamander		G4	S4	None	None	CDFW:WL IUCN:LC	Yes	
Hydromantes shastae	Shasta salamander		G1G2	S3	None	Threatened	BLM:S IUCN:VU USFS:S	Yes	
Plethodon asupak	Scott Bar salamander		G1G2	S1S2	None	Threatened	IUCN:VU	Yes	Yes
Plethodon elongatus	Del Norte salamander		G4	S3	None	None	CDFW:WL IUCN:NT	Yes	
Plethodon stormi	Siskiyou Mountains salamander		G3?	S1S2	None	Threatened	IUCN:EN USFS:S	Yes	

ASCAPHIDAE (tailed frogs)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ascaphus truei	Pacific tailed frog		G4	S3S4	None	None	CDFW:SSC IUCN:LC	Yes	

SCAPHIOPODIDAE (spadefoot toads)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Scaphiopus couchii	Couch's spadefoot		G5	S2	None	None	BLM:S CDFW:SSC IUCN:LC	Yes	
Spea hammondii	western spadefoot		G3	S3	None	None	BLM:S CDFW:SSC IUCN:NT	Yes	

BUFONIDAE (true toads)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Anaxyrus californicus	arroyo toad		G2G3	S2S3	Endangered	None	CDFW:SSC IUCN:EN	Yes	Yes
Anaxyrus canorus	Yosemite toad		G2G3	S2S3	Threatened	None	CDFW:SSC IUCN:EN USFS:S	Yes	Yes
Anaxyrus exsul	black toad		G1	S1	None	Threatened	BLM:S CDFW:FP IUCN:VU USFS:S	Yes	Yes
Incilius alvarius	Sonoran Desert toad		G5	SH	None	None	CDFW:SSC IUCN:LC	Yes	Yes

RANIDAE (true frogs)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Lithobates pipiens	northern leopard frog	Native populations only	G5	S2	None	None	CDFW:SSC IUCN:LC	Yes	Yes
Lithobates yavapaiensis	lowland leopard frog		G4	SX	None	None	BLM:S CDFW:SSC IUCN:LC	Yes	Yes
Rana aurora	northern red-legged frog		G4	S3	None	None	CDFW:SSC IUCN:LC USFS:S	Yes	Yes
Rana boylii	foothill yellow-legged frog		G3	S3	None	Endangered	BLM:S CDFW:SSC IUCN:NT USFS:S	Yes	Yes
Rana cascadae	Cascades frog		G3G4	S3	None	Candidate Endangered	CDFW:SSC IUCN:NT USFS:S	Yes	
Rana draytonii	California red-legged frog		G2G3	S2S3	Threatened	None	CDFW:SSC IUCN:VU	Yes	Yes
Rana muscosa	southern mountain yellow-legged frog		G1	S1	Endangered	Endangered	CDFW:WL IUCN:EN USFS:S	Yes	Yes
Rana pretiosa	Oregon spotted frog		G2	SH	Threatened	None	BLM:S CDFW:SSC IUCN:VU	Yes	
Rana sierrae	Sierra Nevada yellow-legged frog		G1	S1	Endangered	Threatened	CDFW:WL IUCN:EN USFS:S	Yes	Yes

Reptiles

CHELONIIDAE (sea turtles)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Chelonia mydas	green turtle		G3	S1	Threatened	None	IUCN:EN	Yes	

KINOSTERNIDAE (musk and mud turtles)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Kinosternon sonoriense	Sonoran mud turtle		G4	SH	None	None	CDFW:SSC IUCN:VU	Yes	

EMYDIDAE (box and water turtles)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Emys marmorata	western pond turtle		G3G4	S3	None	None	BLM:S CDFW:SSC IUCN:VU USFS:S	Yes	Yes

TESTUDINIDAE (land tortoises)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Gopherus agassizii	desert tortoise		G3	S2S3	Threatened	Threatened	IUCN:VU	Yes	

GEKKONIDAE (geckos)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Coleonyx switaki	barefoot gecko		G4	S1	None	Threatened	BLM:S IUCN:LC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Coleonyx variegatus abbotti	San Diego banded gecko		G5T3T4	S1S2	None	None	CDFW:SSC	Yes	

CROTAPHYTIDAE (collared and leopard lizards)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Gambelia copeii	Cope's leopard lizard		G5	S1S2	None	None	CDFW:SSC IUCN:LC	Yes	
Gambelia sila	blunt-nosed leopard lizard		G1	S1	Endangered	Endangered	CDFW:FP IUCN:EN	Yes	

PHRYNOSOMATIDAE (spiny lizards)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Phrynosoma blainvillii	coast horned lizard		G3G4	S3S4	None	None	BLM:S CDFW:SSC IUCN:LC	Yes	
Phrynosoma mcallii	flat-tailed horned lizard		G3	S2	None	None	BLM:S CDFW:SSC IUCN:NT	Yes	
Sceloporus graciosus graciosus	northern sagebrush lizard		G5T5	S3	None	None	BLM:S	Yes	
Uma inornata	Coachella Valley fringe-toed lizard		G1Q	S1	Threatened	Endangered	IUCN:EN	Yes	
Uma notata	Colorado Desert fringe-toed lizard		G3	S2	None	None	BLM:S CDFW:SSC IUCN:NT	Yes	
Uma scoparia	Mojave fringe-toed lizard		G3G4	S3S4	None	None	BLM:S CDFW:SSC IUCN:LC	Yes	

XANTUSIIDAE (night lizards)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Xantusia gracilis	sandstone night lizard		G1	S1	None	None	CDFW:SSC IUCN:VU	Yes	
Xantusia riversiana	island night lizard		G3	S3	Delisted	None	IUCN:LC	Yes	
Xantusia vigilis sierrae	Sierra night lizard		G5T1	S1	None	None	CDFW:SSC USFS:S	Yes	Yes

SCINCIDAE (skinks)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Plestiodon skiltonianus interparietalis	Coronado skink		G5T5	S2S3	None	None	BLM:S CDFW:WL	Yes	

TEIIDAE (whiptails and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aspidoscelis hyperythra	orange-throated whiptail		G5	S2S3	None	None	CDFW:WL IUCN:LC USFS:S	Yes	
Aspidoscelis tigris stejnegeri	coastal whiptail		G5T5	S3	None	None	CDFW:SSC	Yes	

ANGUIDAE (alligator lizards)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Elgaria panamintina	Panamint alligator lizard		G3	S3	None	None	BLM:S CDFW:SSC IUCN:VU USFS:S	Yes	

ANNIELLIDAE (legless lizards)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Anniella alexanderae	Temblor legless lizard		G1	S1	None	None	CDFW:SSC	Yes	Yes
Anniella campi	Southern Sierra legless lizard		G1G2	S1S2	None	None	CDFW:SSC USFS:S	Yes	Yes
Anniella grinnelli	Bakersfield legless lizard		G2G3	S2S3	None	None	CDFW:SSC	Yes	Yes
Anniella pulchra	Northern California legless lizard		G3	S3	None	None	CDFW:SSC USFS:S	Yes	Yes
Anniella spp.	California legless lizard		G3G4	S3S4	None	None	CDFW:SSC	Yes	Yes
Anniella stebbinsi	Southern California legless lizard		G3	S3	None	None	CDFW:SSC USFS:S	Yes	Yes

HELODERMATIDAE (venomous lizards)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Heloderma suspectum cinctum	banded Gila monster		G4T4	S1	None	None	BLM:S CDFW:SSC IUCN:NT	Yes	Yes

BOIDAE (boas)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Charina umbratica	southern rubber boa		G2G3	S2S3	None	Threatened	USFS:S	Yes	

COLUBRIDAE (egg-laying snakes)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Arizona elegans occidentalis	California glossy snake		G5T2	S2	None	None	CDFW:SSC	Yes	
Diadophis punctatus modestus	San Bernardino ringneck snake		G5T2T3	S2?	None	None	USFS:S	Yes	
Diadophis punctatus regalis	regal ringneck snake		GNR	S2S3	None	None	CDFW:SSC	Yes	
Diadophis punctatus similis	San Diego ringneck snake		G5T2T3	S2?	None	None	USFS:S	Yes	
Masticophis flagellum ruddocki	San Joaquin coachwhip		G5T2T3	S2?	None	None	CDFW:SSC	Yes	
Masticophis fuliginosus	Baja California coachwhip		G5	S1S2	None	None	CDFW:SSC	Yes	
Masticophis lateralis euryxanthus	Alameda whipsnake		G4T2	S2	Threatened	Threatened		Yes	
Pituophis catenifer pumilus	Santa Cruz Island gophersnake		G5T1T2	S1?	None	None	CDFW:WL	No	
Salvadora hexalepis virgultea	coast patch-nosed snake		G5T4	S2S3	None	None	CDFW:SSC	Yes	

NATRICIDAE (live-bearing snakes)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Thamnophis gigas	giant gartersnake		G2	S2	Threatened	Threatened	IUCN:VU	Yes	
Thamnophis hammondii	two-striped gartersnake		G4	S3S4	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Thamnophis hammondii pop. 1	Santa Catalina gartersnake		G4T1?	S1	None	None		No	
Thamnophis sirtalis pop. 1	south coast gartersnake	Coastal plain from Ventura Co. to San Diego Co., from sea level to about 850 m.	G5T1T2	S1S2	None	None	CDFW:SSC	Yes	Yes
Thamnophis sirtalis tetrataenia	San Francisco gartersnake		G5T2Q	S2	Endangered	Endangered	CDFW:FP	Yes	

VIPERIIDAE (vipers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Crotalus ruber	red-diamond rattlesnake		G4	S3	None	None	CDFW:SSC USFS:S	Yes	

Birds

ANATIDAE (ducks, geese, and swans)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Anser albifrons elgasi	tule greater white-fronted goose	Wintering	G5T2	S2S3	None	None	CDFW:SSC	No	
Aythya americana	redhead	Nesting	G5	S3S4	None	None	CDFW:SSC IUCN:LC	No	
Aythya valisineria	canvasback	Nesting	G5	S2	None	None	IUCN:LC	No	
Branta bernicla	brant	Wintering & staging	G5	S2?	None	None	CDFW:SSC IUCN:LC	No	
Branta hutchinsii leucopareia	cackling (=Aleutian Canada) goose	Wintering	G5T3	S3	Delisted	None	CDFW:WL	Yes	
Bucephala islandica	Barrow's goldeneye	Nesting	G5	S1	None	None	CDFW:SSC IUCN:LC	No	
Dendrocygna bicolor	fulvous whistling-duck	Nesting	G5	S1	None	None	CDFW:SSC IUCN:LC	Yes	
Histrionicus histrionicus	harlequin duck	Nesting	G4	S1	None	None	CDFW:SSC IUCN:LC	Yes	

PHASIANIDAE (grouse and ptarmigan)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Bonasa umbellus	ruffed grouse		G5	S3S4	None	None	CDFW:WL IUCN:LC	Yes	
Centrocercus urophasianus	greater sage-grouse	Nesting & leks	G3G4	S2S3	None	None	BLM:S CDFW:SSC IUCN:NT USFS:S	Yes	Yes

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Dendragapus fuliginosus howardi	Mount Pinos sooty grouse		G5T2T3	S2S3	None	None	CDFW:SSC	Yes	Yes
Tympanuchus phasianellus columbianus	Columbian sharp-tailed grouse		G4T3	SX	None	None	CDFW:SSC	No	

ODONTOPHORIDAE (partridge and quail)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Callipepla californica catalinensis	Catalina California quail		G5T2	S2	None	None	CDFW:SSC	No	

GAVIIDAE (loons)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Gavia immer	common loon	Nesting	G5	S1	None	None	CDFW:SSC IUCN:LC	No	

DIOMEDEIDAE (albatrosses)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Phoebastria albatrus	short-tailed albatross		G1	S1	Endangered	None	CDFW:SSC IUCN:VU NABCI:RWL	No	

HYDROBATIDAE (storm petrels)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Oceanodroma furcata	fork-tailed storm-petrel	Nesting colony	G5	S1	None	None	BLM:S CDFW:SSC IUCN:LC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Oceanodroma homochroa	ashy storm-petrel	Nesting colony	G2	S2	None	None	BLM:S CDFW:SSC IUCN:EN NABCI:RWL USFWS:BCC	Yes	
Oceanodroma melania	black storm-petrel	Nesting colony	G3G4	S1	None	None	CDFW:SSC IUCN:LC NABCI:YWL	Yes	

PELECANIIDAE (pelicans)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Pelecanus erythrorhynchos	American white pelican	Nesting colony	G4	S1S2	None	None	CDFW:SSC IUCN:LC	Yes	
Pelecanus occidentalis californicus	California brown pelican	Nesting colony & communal roosts	G4T3T4	S3	Delisted	Delisted	BLM:S CDFW:FP USFS:S	Yes	

PHALACROCORACIDAE (cormorants)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Phalacrocorax auritus	double-crested cormorant	Nesting colony	G5	S4	None	None	CDFW:WL IUCN:LC	Yes	

ARDEIDAE (herons, egrets, and bitterns)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ardea alba	great egret	Nesting colony	G5	S4	None	None	CDF:S IUCN:LC	Yes	
Ardea herodias	great blue heron	Nesting colony	G5	S4	None	None	CDF:S IUCN:LC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Botaurus lentiginosus	American bittern		G4	S3S4	None	None	IUCN:LC	No	
Egretta thula	snowy egret	Nesting colony	G5	S4	None	None	IUCN:LC	Yes	
Ixobrychus exilis	least bittern	Nesting	G4G5	S2	None	None	CDFW:SSC IUCN:LC USFWS:BCC	Yes	
Nycticorax nycticorax	black-crowned night heron	Nesting colony	G5	S4	None	None	IUCN:LC	Yes	

THRESKIORNITHIDAE (ibises and spoonbills)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Plegadis chihi	white-faced ibis	Nesting colony	G5	S3S4	None	None	CDFW:WL IUCN:LC	Yes	

CICONIIDAE (storks)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Mycteria americana	wood stork		G4	S2?	None	None	CDFW:SSC IUCN:LC	No	

CATHARTIDAE (New World vultures)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Gymnogyps californianus	California condor		G1	S1	Endangered	Endangered	CDF:S CDFW:FP IUCN:CR NABCI:RWL	Yes	

PANDIONIDAE (ospreys)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Pandion haliaetus	osprey	Nesting	G5	S4	None	None	CDF:S CDFW:WL IUCN:LC	Yes	

ACCIPITRIDAE (hawks, kites, harriers, and eagles)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Accipiter cooperii	Cooper's hawk	Nesting	G5	S4	None	None	CDFW:WL IUCN:LC	Yes	
Accipiter gentilis	northern goshawk	Nesting	G5	S3	None	None	BLM:S CDF:S CDFW:SSC IUCN:LC USFS:S	Yes	
Accipiter striatus	sharp-shinned hawk	Nesting	G5	S4	None	None	CDFW:WL IUCN:LC	Yes	
Aquila chrysaetos	golden eagle	Nesting & wintering	G5	S3	None	None	BLM:S CDF:S CDFW:FP CDFW:WL IUCN:LC USFWS:BCC	Yes	
Buteo regalis	ferruginous hawk	Wintering	G4	S3S4	None	None	CDFW:WL IUCN:LC USFWS:BCC	Yes	
Buteo swainsoni	Swainson's hawk	Nesting	G5	S3	None	Threatened	BLM:S IUCN:LC USFWS:BCC	Yes	
Circus hudsonius	northern harrier	Nesting	G5	S3	None	None	CDFW:SSC IUCN:LC	Yes	Yes

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Elanus leucurus	white-tailed kite	Nesting	G5	S3S4	None	None	BLM:S CDFW:FP IUCN:LC	Yes	
Haliaeetus leucocephalus	bald eagle	Nesting & wintering	G5	S3	Delisted	Endangered	BLM:S CDF:S CDFW:FP IUCN:LC USFS:S USFWS:BCC	Yes	
Parabuteo unicinctus	Harris' hawk	Nesting	G5	S1	None	None	CDFW:WL IUCN:LC	No	

FALCONIDAE (falcons)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Falco columbarius	merlin	Wintering	G5	S3S4	None	None	CDFW:WL IUCN:LC	Yes	
Falco mexicanus	prairie falcon	Nesting	G5	S4	None	None	CDFW:WL IUCN:LC USFWS:BCC	Yes	
Falco peregrinus anatum	American peregrine falcon	Nesting	G4T4	S3S4	Delisted	Delisted	CDF:S CDFW:FP USFWS:BCC	Yes	

RALLIDAE (rails, coots, and gallinules)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Coturnicops noveboracensis	yellow rail		G4	S1S2	None	None	CDFW:SSC IUCN:LC NABCI:RWL USFS:S USFWS:BCC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Laterallus jamaicensis coturniculus	California black rail		G3G4T1	S1	None	Threatened	BLM:S CDFW:FP IUCN:NT NABCI:RWL USFWS:BCC	Yes	Yes
Rallus obsoletus levipes	light-footed Ridgway's rail		G5T1T2	S1	Endangered	Endangered	CDFW:FP NABCI:RWL	Yes	Yes
Rallus obsoletus obsoletus	California Ridgway's rail		G5T1	S1	Endangered	Endangered	CDFW:FP NABCI:RWL	Yes	Yes
Rallus obsoletus yumanensis	Yuma Ridgway's rail		G5T3	S1S2	Endangered	Threatened	CDFW:FP NABCI:RWL	Yes	Yes

GRUIDAE (cranes)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Antigone canadensis canadensis	lesser sandhill crane	Wintering	G5T4	S3S4	None	None	CDFW:SSC	No	
Antigone canadensis tabida	greater sandhill crane	Nesting & wintering	G5T4	S2	None	Threatened	BLM:S CDFW:FP USFS:S	Yes	

CHARADRIIDAE (plovers and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Charadrius alexandrinus nivosus	western snowy plover	Nesting	G3T3	S2S3	Threatened	None	CDFW:SSC NABCI:RWL USFWS:BCC	Yes	Yes

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Charadrius montanus	mountain plover	Wintering	G3	S2S3	None	None	BLM:S CDFW:SSC IUCN:NT NABCI:RWL USFWS:BCC	Yes	Yes

SCOLOPACIDAE (sandpipers and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Numenius americanus	long-billed curlew	Nesting	G5	S2	None	None	CDFW:WL IUCN:LC NABCI:YWL USFWS:BCC	No	

LARIDAE (gulls and terns)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Chlidonias niger	black tern	Nesting colony	G4	S2	None	None	CDFW:SSC IUCN:LC	Yes	
Gelochelidon nilotica	gull-billed tern	Nesting colony	G5	S1	None	None	CDFW:SSC IUCN:LC NABCI:YWL USFWS:BCC	Yes	Yes
Hydroprogne caspia	Caspian tern	Nesting colony	G5	S4	None	None	IUCN:LC USFWS:BCC	Yes	Yes
Larus californicus	California gull	Nesting colony	G5	S4	None	None	CDFW:WL IUCN:LC	Yes	
Leucophaeus atricilla	laughing gull	Nesting colony	G5	S1	None	None	CDFW:WL IUCN:LC	No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Rynchops niger	black skimmer	Nesting colony	G5	S2	None	None	CDFW:SSC IUCN:LC NABCI:YWL USFWS:BCC	Yes	
Sternula antillarum browni	California least tern	Nesting colony	G4T2T3Q	S2	Endangered	Endangered	CDFW:FP NABCI:RWL	Yes	Yes
Thalasseus elegans	elegant tern	Nesting colony	G2	S2	None	None	CDFW:WL IUCN:NT	No	Yes

ALCIDAE (auklets, puffins, and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Brachyramphus marmoratus	marbled murrelet	Nesting	G3G4	S1	Threatened	Endangered	CDF:S IUCN:EN NABCI:RWL	Yes	
Cerorhinca monocerata	rhinoceros auklet	Nesting colony	G5	S3	None	None	CDFW:WL IUCN:LC	Yes	
Fratercula cirrhata	tufted puffin	Nesting colony	G5	S1S2	None	None	CDFW:SSC IUCN:LC	Yes	
Ptychoramphus aleuticus	Cassin's auklet	Nesting colony	G4	S2S4	None	None	CDFW:SSC IUCN:LC USFWS:BCC	No	
Synthliboramphus scrippsi	Scripps's murrelet	Nesting colony	G3	S2	Candidate	Threatened	BLM:S IUCN:VU NABCI:RWL USFWS:BCC	Yes	Yes

CUCULIDAE (cuckoos and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Coccyzus americanus occidentalis	western yellow-billed cuckoo	Nesting	G5T2T3	S1	Threatened	Endangered	BLM:S NABCI:RWL USFS:S USFWS:BCC	Yes	

STRIGIDAE (owls)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Asio flammeus	short-eared owl	Nesting	G5	S3	None	None	CDFW:SSC IUCN:LC	Yes	
Asio otus	long-eared owl	Nesting	G5	S3?	None	None	CDFW:SSC IUCN:LC	Yes	
Athene cunicularia	burrowing owl	Burrow sites & some wintering sites	G4	S3	None	None	BLM:S CDFW:SSC IUCN:LC USFWS:BCC	Yes	Yes
Micrathene whitneyi	elf owl	Nesting	G5	S1	None	Endangered	BLM:S IUCN:LC USFWS:BCC	Yes	
Psiloscops flammeolus	flammulated owl	Nesting	G4	S2S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	Yes	
Strix nebulosa	great gray owl	Nesting	G5	S1	None	Endangered	CDF:S IUCN:LC USFS:S	Yes	
Strix occidentalis caurina	northern spotted owl		G3T3	S2S3	Threatened	Threatened	CDF:S IUCN:NT NABCI:YWL	No	Yes

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Strix occidentalis occidentalis	California spotted owl		G3G4T2T3	S3	None	None	BLM:S CDFW:SSC IUCN:NT USFS:S USFWS:BCC	No	Yes

APODIDAE (swifts)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Chaetura vauxi	Vaux's swift	Nesting	G5	S2S3	None	None	CDFW:SSC IUCN:LC	No	
Cypseloides niger	black swift	Nesting	G4	S2	None	None	CDFW:SSC IUCN:LC NABCI:YWL USFWS:BCC	Yes	

TROCHILIDAE (hummingbirds)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Calypte costae	Costa's hummingbird	Nesting	G5	S4	None	None	IUCN:LC USFWS:BCC	No	
Selasphorus rufus	rufous hummingbird	Nesting	G5	S1S2	None	None	IUCN:LC NABCI:YWL USFWS:BCC	No	

PICIDAE (woodpeckers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Colaptes chrysoides	gilded flicker		G5	S1	None	Endangered	BLM:S IUCN:LC NABCI:YWL USFWS:BCC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Melanerpes lewis	Lewis' woodpecker	Nesting	G4	S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	Yes	
Melanerpes uropygialis	Gila woodpecker		G5	S1	None	Endangered	BLM:S IUCN:LC USFWS:BCC	Yes	
Picoides arcticus	black-backed woodpecker	Nesting	G5	S2	None	None		Yes	
Sphyrapicus ruber	red-breasted sapsucker	Nesting	G5	S4	None	None		Yes	

TYRANNIDAE (tyrant flycatchers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Contopus cooperi	olive-sided flycatcher	Nesting	G4	S4	None	None	CDFW:SSC IUCN:NT NABCI:YWL USFWS:BCC	Yes	
Empidonax traillii	willow flycatcher	Nesting	G5	S1S2	None	Endangered	IUCN:LC USFS:S USFWS:BCC	Yes	Yes
Empidonax traillii brewsteri	little willow flycatcher	Nesting	G5T3T4	S1S2	None	Endangered	USFWS:BCC	Yes	Yes
Empidonax traillii extimus	southwestern willow flycatcher	Nesting	G5T2	S1	Endangered	Endangered	NABCI:RWL	Yes	Yes
Myiarchus tyrannulus	brown-crested flycatcher	Nesting	G5	S3	None	None	CDFW:WL IUCN:LC	Yes	
Pyrocephalus rubinus	vermilion flycatcher	Nesting	G5	S2S3	None	None	CDFW:SSC IUCN:LC	Yes	

LANIIDAE (shrikes)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Lanius ludovicianus	loggerhead shrike	Nesting	G4	S4	None	None	CDFW:SSC IUCN:LC USFWS:BCC	Yes	
Lanius ludovicianus anthonyi	Island loggerhead shrike		G4T1	S1	None	None	CDFW:SSC NABCI:RWL	No	
Lanius ludovicianus mearnsi	San Clemente loggerhead shrike		G4T1Q	S1	Endangered	None	CDFW:SSC NABCI:RWL	Yes	Yes

VIREONIDAE (vireos)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Vireo bellii arizonae	Arizona Bell's vireo	Nesting	G5T4	S1S2	None	Endangered	BLM:S IUCN:NT USFWS:BCC	Yes	Yes
Vireo bellii pusillus	least Bell's vireo	Nesting	G5T2	S2	Endangered	Endangered	IUCN:NT NABCI:YWL	Yes	Yes
Vireo huttoni unitti	Catalina Hutton's vireo		G5T2?	S2?	None	None	CDFW:SSC	No	
Vireo vicinior	gray vireo	Nesting	G4	S2	None	None	BLM:S CDFW:SSC IUCN:LC NABCI:YWL USFS:S USFWS:BCC	Yes	

CORVIDAE (jays, crows, and magpies)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aphelocoma californica cana	Eagle Mountain scrub-jay		G5T3Q	S3Q	None	None	CDFW:WL	No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aphelocoma insularis	Island scrub-jay		G1	S1	None	None	IUCN:NT NABCI:RWL USFWS:BCC	No	
Pica nuttalli	yellow-billed magpie	Nesting & communal roosts	G3G4	S3S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	No	

ALAUDIDAE (larks)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Eremophila alpestris actia	California horned lark		G5T4Q	S4	None	None	CDFW:WL IUCN:LC	Yes	

HIRUNDINIDAE (swallows)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Progne subis	purple martin	Nesting	G5	S3	None	None	CDFW:SSC IUCN:LC	Yes	
Riparia riparia	bank swallow	Nesting	G5	S2	None	Threatened	BLM:S IUCN:LC	Yes	

PARIDAE (titmice and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Baeolophus inornatus	oak titmouse	Nesting	G4	S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	Yes	
Poecile atricapillus	black-capped chickadee		G5	S3	None	None	CDFW:WL IUCN:LC	No	

TROGLODYTIDAE (wrens)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Campylorhynchus brunneicapillus sandiegensis	coastal cactus wren	San Diego & Orange Counties only	G5T3Q	S3	None	None	CDFW:SSC USFS:S USFWS:BCC	Yes	Yes
Cistothorus palustris clarkae	Clark's marsh wren		G5T2T3	S2S3	None	None	CDFW:SSC	No	
Thryomanes bewickii leucophrys	San Clemente Bewick's wren		G5TX	SX	None	None	CDFW:SSC	No	

POLIOPTILIDAE (gnatcatchers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Polioptila californica californica	coastal California gnatcatcher		G4G5T2Q	S2	Threatened	None	CDFW:SSC NABCI:YWL	Yes	Yes
Polioptila melanura	black-tailed gnatcatcher		G5	S3S4	None	None	CDFW:WL IUCN:LC	Yes	

MIMIDAE (mockingbirds and thrashers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Toxostoma bendirei	Bendire's thrasher		G4G5	S3	None	None	BLM:S CDFW:SSC IUCN:VU NABCI:RWL USFWS:BCC	Yes	
Toxostoma crissale	Crissal thrasher		G5	S3	None	None	BLM:S CDFW:SSC IUCN:LC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Toxostoma lecontei	Le Conte's thrasher		G4	S3	None	None	BLM:S CDFW:SSC IUCN:LC NABCI:RWL USFWS:BCC	Yes	Yes

PASSERELLIDAE (sparrows)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aimophila ruficeps canescens	southern California rufous-crowned sparrow		G5T3	S3	None	None	CDFW:WL	Yes	
Aimophila ruficeps obscura	Santa Cruz Island rufous-crowned sparrow		G5T2T3	S2S3	None	None	CDFW:SSC	No	
Ammodramus savannarum	grasshopper sparrow	Nesting	G5	S3	None	None	CDFW:SSC IUCN:LC	Yes	
Artemisiospiza belli belli	Bell's sage sparrow		G5T2T3	S3	None	None	CDFW:WL USFWS:BCC	Yes	Yes
Artemisiospiza belli clementeae	San Clemente sage sparrow		G5T1Q	S1	Threatened	None	CDFW:SSC NABCI:YWL USFWS:BCC	Yes	Yes
Junco hyemalis caniceps	gray-headed junco	Nesting	G5T5	S1	None	None	CDFW:WL	Yes	
Melospiza melodia	song sparrow ("Modesto" population)		G5	S3?	None	None	CDFW:SSC	Yes	
Melospiza melodia graminea	Channel Island song sparrow		G5T1	S1	None	None	CDFW:SSC USFWS:BCC	Yes	Yes
Melospiza melodia maxillaris	Suisun song sparrow		G5T3	S3	None	None	CDFW:SSC USFWS:BCC	Yes	
Melospiza melodia pusillula	Alameda song sparrow		G5T2?	S2S3	None	None	CDFW:SSC USFWS:BCC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Melospiza melodia samuelis	San Pablo song sparrow		G5T2	S2	None	None	CDFW:SSC USFWS:BCC	Yes	
Melozone aberti	Abert's towhee		G3G4	S3	None	None	IUCN:LC	No	
Melozone crissalis eremophilus	Inyo California towhee		G4G5T2	S2	Threatened	Endangered	NABCI:RWL	Yes	Yes
Passerculus sandwichensis alaudinus	Bryant's savannah sparrow		G5T2T3	S2S3	None	None	CDFW:SSC	No	
Passerculus sandwichensis beldingi	Belding's savannah sparrow		G5T3	S3	None	Endangered		Yes	
Passerculus sandwichensis rostratus	large-billed savannah sparrow	Wintering	G5T2T3Q	S2	None	None	CDFW:SSC	No	
Pipilo maculatus clementae	San Clemente spotted towhee		G5T1	S1S2	None	None	CDFW:SSC USFWS:BCC	No	
Pooecetes gramineus affinis	Oregon vesper sparrow	Wintering	G5T3?	S3?	None	None	CDFW:SSC NABCI:RWL USFWS:BCC	No	
Spizella breweri	Brewer's sparrow	Nesting	G5	S4	None	None	IUCN:LC USFWS:BCC	Yes	

ICTERIIDAE (yellow-breasted chats)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Icteria virens	yellow-breasted chat	Nesting	G5	S3	None	None	CDFW:SSC IUCN:LC	Yes	

ICTERIDAE (blackbirds)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Agelaius phoeniceus aciculatus	Kern red-winged blackbird		G5T1T2	S1S2	None	None	CDFW:SSC	No	
Agelaius tricolor	tricolored blackbird	Nesting colony	G2G3	S1S2	None	Threatened	BLM:S CDFW:SSC IUCN:EN NABCI:RWL USFWS:BCC	Yes	
Xanthocephalus xanthocephalus	yellow-headed blackbird	Nesting	G5	S3	None	None	CDFW:SSC IUCN:LC	Yes	

PARULIDAE (wood-warblers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Geothlypis trichas sinuosa	saltmarsh common yellowthroat		G5T3	S3	None	None	CDFW:SSC USFWS:BCC	Yes	Yes
Oreothlypis luciae	Lucy's warbler	Nesting	G5	S2S3	None	None	BLM:S CDFW:SSC IUCN:LC USFWS:BCC	Yes	
Oreothlypis virginiae	Virginia's warbler	Nesting	G5	S2	None	None	CDFW:WL IUCN:LC NABCI:YWL USFWS:BCC	Yes	
Setophaga petechia	yellow warbler	Nesting	G5	S3S4	None	None	CDFW:SSC USFWS:BCC	Yes	Yes
Setophaga petechia sonorana	Sonoran yellow warbler	Nesting	G5T2T3	S2	None	None	CDFW:SSC USFWS:BCC	Yes	Yes

CARDINALIDAE (cardinals)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Cardinalis cardinalis	northern cardinal		G5	S1	None	None	CDFW:WL IUCN:LC	Yes	
Piranga flava	hepatic tanager	Nesting	G5	S1	None	None	CDFW:WL IUCN:LC	Yes	
Piranga rubra	summer tanager	Nesting	G5	S1	None	None	CDFW:SSC IUCN:LC	Yes	

FRINGILLIDAE (finches and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Spinus lawrencei	Lawrence's goldfinch	Nesting	G3G4	S3S4	None	None	IUCN:LC NABCI:YWL USFWS:BCC	Yes	

Mammals

TALPIDAE (moles)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Scapanus latimanus insularis	Angel Island mole		G5THQ	SH	None	None		Yes	
Scapanus latimanus parvus	Alameda Island mole		G5THQ	SH	None	None	CDFW:SSC	Yes	

SORICIDAE (shrews)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Sorex lyelli	Mount Lyell shrew		G3G4	S3S4	None	None	CDFW:SSC IUCN:LC	Yes	
Sorex ornatus relictus	Buena Vista Lake ornate shrew		G5T1	S1	Endangered	None	CDFW:SSC	Yes	
Sorex ornatus salarius	Monterey shrew		G5T1T2	S1S2	None	None	CDFW:SSC	Yes	
Sorex ornatus salicornicus	southern California saltmarsh shrew		G5T1?	S1	None	None	CDFW:SSC	Yes	
Sorex ornatus sinuosus	Suisun shrew		G5T1T2Q	S1S2	None	None	CDFW:SSC	Yes	
Sorex ornatus willetti	Santa Catalina shrew		G5T1	S1	None	None	CDFW:SSC	Yes	
Sorex vagrans halicoetes	salt-marsh wandering shrew		G5T1	S1	None	None	CDFW:SSC	Yes	
Sorex vagrans paludivagus	Monterey vagrant shrew		G5T1	S1	None	None		No	

PHYLLOSTOMIDAE (leaf-nosed bats)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Choeronycteris mexicana	Mexican long-tongued bat		G4	S1	None	None	CDFW:SSC IUCN:NT WBWG:H	Yes	
Leptonycteris yerbabuenae	lesser long-nosed bat		G4	S1	Delisted	None	CDFW:SSC IUCN:VU WBWG:H	Yes	Yes
Macrotus californicus	California leaf-nosed bat		G4	S3	None	None	BLM:S CDFW:SSC IUCN:LC WBWG:H	Yes	

VESPERTILIONIDAE (evening bats)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Antrozous pallidus	pallid bat		G5	S3	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S WBWG:H	Yes	
Corynorhinus townsendii	Townsend's big-eared bat		G3G4	S2	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S WBWG:H	Yes	
Euderma maculatum	spotted bat		G4	S3	None	None	BLM:S CDFW:SSC IUCN:LC WBWG:H	Yes	
Lasionycteris noctivagans	silver-haired bat		G5	S3S4	None	None	IUCN:LC WBWG:M	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Lasiurus blossevillii	western red bat		G5	S3	None	None	CDFW:SSC IUCN:LC WBWG:H	Yes	
Lasiurus cinereus	hoary bat		G5	S4	None	None	IUCN:LC WBWG:M	Yes	
Lasiurus xanthinus	western yellow bat		G5	S3	None	None	CDFW:SSC IUCN:LC WBWG:H	Yes	
Myotis ciliolabrum	western small-footed myotis		G5	S3	None	None	BLM:S IUCN:LC WBWG:M	Yes	
Myotis evotis	long-eared myotis		G5	S3	None	None	BLM:S IUCN:LC WBWG:M	Yes	
Myotis lucifugus	little brown bat	San Bernardino Mountains population	G3	S2S3	None	None	IUCN:LC WBWG:M	No	
Myotis occultus	Arizona Myotis		G4	S1	None	None	CDFW:SSC IUCN:LC WBWG:M	Yes	
Myotis thysanodes	fringed myotis		G4	S3	None	None	BLM:S IUCN:LC USFS:S WBWG:H	Yes	
Myotis velifer	cave myotis		G5	S1	None	None	BLM:S CDFW:SSC IUCN:LC WBWG:M	Yes	
Myotis volans	long-legged myotis		G5	S3	None	None	IUCN:LC WBWG:H	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Myotis yumanensis	Yuma myotis		G5	S4	None	None	BLM:S IUCN:LC WBWG:LM	Yes	

MOLOSSIDAE (free-tailed bats)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Eumops perotis californicus	western mastiff bat		G5T4	S3S4	None	None	BLM:S CDFW:SSC WBWG:H	Yes	
Nyctinomops femorosaccus	pocketed free-tailed bat		G4	S3	None	None	CDFW:SSC IUCN:LC WBWG:M	Yes	
Nyctinomops macrotis	big free-tailed bat		G5	S3	None	None	CDFW:SSC IUCN:LC WBWG:MH	Yes	

OCHOTONIDAE (pikas)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ochotona princeps schisticeps	gray-headed pika		G5T2T4	S2S4	None	None	IUCN:NT	Yes	

LEPORIDAE (rabbits and hares)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Brachylagus idahoensis	pygmy rabbit		G4	S3	None	None	BLM:S CDFW:SSC IUCN:LC USFS:S	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Lepus americanus klamathensis	Oregon snowshoe hare		G5T3T4Q	S2	None	None	CDFW:SSC	Yes	
Lepus americanus tahoensis	Sierra Nevada snowshoe hare		G5T3T4Q	S2	None	None	CDFW:SSC	Yes	
Lepus californicus bennettii	San Diego black-tailed jackrabbit		G5T3T4	S3S4	None	None	CDFW:SSC	Yes	
Lepus townsendii townsendii	western white-tailed jackrabbit		G5T5	S3?	None	None	CDFW:SSC	Yes	
Sylvilagus bachmani riparius	riparian brush rabbit		G5T1	S1	Endangered	Endangered		Yes	

ERETHIZONTIDAE (New World porcupines)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Erethizon dorsatum	North American porcupine		G5	S3	None	None	IUCN:LC	Yes	

APLODONTIDAE (mountain beavers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Aplodontia rufa californica	Sierra Nevada mountain beaver		G5T3T4	S2S3	None	None	CDFW:SSC IUCN:LC	Yes	Yes
Aplodontia rufa humboldtiana	Humboldt mountain beaver		G5TNR	SNR	None	None		Yes	
Aplodontia rufa nigra	Point Arena mountain beaver		G5T1	S1	Endangered	None	CDFW:SSC IUCN:LC	Yes	Yes
Aplodontia rufa phaea	Point Reyes mountain beaver		G5T2	S2	None	None	CDFW:SSC IUCN:LC	Yes	Yes

SCIURIDAE (squirrels and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ammospermophilus nelsoni	Nelson's antelope squirrel		G2	S2S3	None	Threatened	BLM:S IUCN:EN	Yes	
Callospermophilus lateralis bernardinus	San Bernardino golden-mantled ground squirrel		G5T1	S1	None	None		No	
Glaucomys oregonensis californicus	San Bernardino flying squirrel		G5T1T2	S1S2	None	None	CDFW:SSC USFS:S	Yes	
Neotamias alpinus	Alpine chipmunk		G3	S3	None	None	IUCN:LC	No	
Neotamias panamintinus acrus	Kingston Mountain chipmunk		G4T1T2	S1S2	None	None		Yes	
Neotamias speciosus callipeplus	Mount Pinos chipmunk		G4T1T2	S2	None	None	USFS:S	Yes	
Neotamias speciosus speciosus	lodgepole chipmunk		G4T2T3	S2S3	None	None		Yes	
Urocitellus mollis	Piute ground squirrel		G5	S3	None	None	IUCN:LC	No	
Xerospermophilus mohavensis	Mohave ground squirrel		G2G3	S2S3	None	Threatened	BLM:S IUCN:VU	Yes	
Xerospermophilus tereticaudus chlorus	Palm Springs round-tailed ground squirrel		G5T2Q	S2	None	None	BLM:S CDFW:SSC	Yes	

GEOMYIDAE (pocket gophers)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Thomomys bottae operarius	Owens Lake pocket gopher		G5T1?	S1?	None	None		No	

HETEROMYIDAE (kangaroo rats, pocket mice, and kangaroo mice)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Chaetodipus californicus femoralis	Dulzura pocket mouse		G5T3	S3	None	None	CDFW:SSC	Yes	
Chaetodipus fallax fallax	northwestern San Diego pocket mouse		G5T3T4	S3S4	None	None	CDFW:SSC	Yes	Yes
Chaetodipus fallax pallidus	pallid San Diego pocket mouse		G5T34	S3S4	None	None	CDFW:SSC	Yes	Yes
Dipodomys californicus eximius	Marysville California kangaroo rat		G4T1	S1	None	None	CDFW:SSC	Yes	
Dipodomys heermanni arenae	Lompoc kangaroo rat		G3G4T1T2	S1S2	None	None		No	
Dipodomys heermanni berkeleyensis	Berkeley kangaroo rat		G3G4T1	S1	None	None		Yes	
Dipodomys heermanni dixoni	Merced kangaroo rat		G3G4T2T3	S2S3	None	None		Yes	
Dipodomys heermanni goldmani	Salinas kangaroo rat		G3G4T2T3	S2S3	None	None		No	
Dipodomys heermanni heermanni	Heermann's kangaroo rat		G3G4T2	S2	None	None		No	
Dipodomys heermanni morroensis	Morro Bay kangaroo rat		G3G4TH	SH	Endangered	Endangered	CDFW:FP	Yes	
Dipodomys ingens	giant kangaroo rat		G1G2	S1S2	Endangered	Endangered	IUCN:EN	Yes	
Dipodomys merriami collinus	Earthquake Merriam's kangaroo rat		G5T2?	S1S2	None	None		Yes	
Dipodomys merriami parvus	San Bernardino kangaroo rat		G5T1	S1	Endangered	Candidate Endangered	CDFW:SSC	Yes	
Dipodomys merriami trinidadensis	Valle de la Trinidad kangaroo rat		G5T2T3Q	S2	None	None		No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Dipodomys nitratoides brevinasus	short-nosed kangaroo rat		G3T1T2	S1S2	None	None	BLM:S CDFW:SSC IUCN:VU	Yes	
Dipodomys nitratoides exilis	Fresno kangaroo rat		G3TH	SH	Endangered	Endangered	IUCN:VU	Yes	
Dipodomys nitratoides nitratoides	Tipton kangaroo rat		G3T1T2	S1S2	Endangered	Endangered	IUCN:VU	Yes	
Dipodomys panamintinus argusensis	Argus Mountains kangaroo rat		G5T1T3	S1S3	None	None		Yes	
Dipodomys panamintinus panamintinus	Panamint kangaroo rat		G5T3	S3	None	None		Yes	
Dipodomys simulans	Dulzura kangaroo rat		G4	S3	None	None	IUCN:LC	No	
Dipodomys stephensi	Stephens' kangaroo rat		G2	S2	Endangered	Threatened	IUCN:EN	Yes	
Dipodomys venustus elephantinus	big-eared kangaroo rat		G4T2	S2	None	None	CDFW:SSC	Yes	
Dipodomys venustus sanctiluciae	Santa Lucia Mountain kangaroo rat		G4TNR	SNR	None	None		No	
Dipodomys venustus venustus	Santa Cruz kangaroo rat		G4T1	S1	None	None		Yes	
Perognathus alticola alticola	white-eared pocket mouse		G1G2TH	SH	None	None	BLM:S CDFW:SSC IUCN:EN USFS:S	Yes	Yes
Perognathus alticola inexpectatus	Tehachapi pocket mouse		G1G2T1T2	S1S2	None	None	CDFW:SSC IUCN:EN USFS:S	Yes	Yes
Perognathus inornatus	San Joaquin pocket mouse		G2G3	S2S3	None	None	BLM:S IUCN:LC	Yes	Yes

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Perognathus inornatus psammophilus	Salinas pocket mouse		G4T2?	S1	None	None	CDFW:SSC	Yes	
Perognathus longimembris bangsi	Palm Springs pocket mouse		G5T2	S2	None	None	BLM:S CDFW:SSC	Yes	
Perognathus longimembris brevinasus	Los Angeles pocket mouse		G5T1T2	S1S2	None	None	CDFW:SSC	Yes	
Perognathus longimembris internationalis	Jacumba pocket mouse		G5T2T3	S2	None	None	CDFW:SSC	Yes	
Perognathus longimembris pacificus	Pacific pocket mouse		G5T1	S1	Endangered	None	CDFW:SSC	Yes	
Perognathus longimembris salinensis	Saline Valley pocket mouse		G5T1	S1	None	None		No	
Perognathus longimembris tularensis	Tulare pocket mouse		G5T1	S1	None	None		No	
Perognathus mollipilosus xanthonotus	yellow-eared pocket mouse		G5T2T3	S1S2	None	None	BLM:S	Yes	

MURIDAE (mice, rats, and voles)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Arborimus albipes	white-footed vole		G3G4	S2	None	None	CDFW:SSC IUCN:LC	Yes	
Arborimus pomo	Sonoma tree vole		G3	S3	None	None	CDFW:SSC IUCN:NT	Yes	
Microtus californicus halophilus	Monterey vole		G5T1	S1	None	None		No	
Microtus californicus mohavensis	Mohave river vole		G5T1	S1	None	None	CDFW:SSC	Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Microtus californicus sanpabloensis	San Pablo vole		G5T1T2	S1S2	None	None	CDFW:SSC	Yes	
Microtus californicus scirpensis	Amargosa vole		G5T1	S1	Endangered	Endangered		Yes	
Microtus californicus stephensi	south coast marsh vole		G5T1T2	S1S2	None	None	CDFW:SSC	Yes	
Microtus californicus vallicola	Owens Valley vole		G5T3	S3	None	None	BLM:S CDFW:SSC	Yes	
Neotoma albigula venusta	Colorado Valley woodrat		G5T3T4	S1S2	None	None		Yes	
Neotoma fuscipes annectens	San Francisco dusky-footed woodrat		G5T2T3	S2S3	None	None	CDFW:SSC	Yes	
Neotoma fuscipes riparia	riparian (=San Joaquin Valley) woodrat		G5T1Q	S1	Endangered	None	CDFW:SSC	Yes	Yes
Neotoma lepida intermedia	San Diego desert woodrat		G5T3T4	S3S4	None	None	CDFW:SSC	Yes	
Neotoma macrotis luciana	Monterey dusky-footed woodrat		G5T3	S3	None	None	BLM:S CDFW:SSC IUCN:DD	Yes	
Onychomys torridus ramona	southern grasshopper mouse		G5T3	S3	None	None	CDFW:SSC	Yes	
Onychomys torridus tularensis	Tulare grasshopper mouse		G5T1T2	S1S2	None	None	BLM:S CDFW:SSC	Yes	
Peromyscus maniculatus anacapae	Anacapa Island deer mouse		G5T1T2	S1S2	None	None	CDFW:SSC	Yes	
Peromyscus maniculatus clementis	San Clemente deer mouse		G5T1T2	S1S2	None	None	CDFW:SSC	No	
Reithrodontomys megalotis distichlis	Salinas harvest mouse		G5T1	S1	None	None		Yes	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Reithrodontomys megalotis santacruzae	Santa Cruz harvest mouse		G5T1Q	S1	None	None		Yes	Yes
Reithrodontomys raviventris	salt-marsh harvest mouse		G1G2	S1S2	Endangered	Endangered	CDFW:FP IUCN:EN	Yes	
Sigmodon arizonae plenus	Colorado River cotton rat		G5T2T3	S1S2	None	None	CDFW:SSC	Yes	
Sigmodon hispidus eremicus	Yuma hispid cotton rat		G5T2T3	S2	None	None	CDFW:SSC	Yes	

DIPODIDAE (jumping mice)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Zapus trinotatus orarius	Point Reyes jumping mouse		G5T1T3Q	S1S3	None	None	CDFW:SSC	Yes	

CANIDAE (foxes, wolves, and coyotes)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Canis lupus	gray wolf		G4	S1	Endangered	Endangered	IUCN:LC	Yes	
Urocyon littoralis	island fox	Mapped by subspecies	G1	S1	None	Threatened	IUCN:CR	No	Yes
Urocyon littoralis catalinae	Santa Catalina Island fox		G1T1	S1	Threatened	Threatened	IUCN:CR	Yes	Yes
Urocyon littoralis clementae	San Clemente Island fox		G1T1	S1	None	Threatened	IUCN:CR	Yes	Yes
Urocyon littoralis dickeyi	San Nicolas Island fox		G1T1	S1	None	Threatened	IUCN:CR	Yes	Yes
Urocyon littoralis littoralis	San Miguel Island fox		G1T1	S1	Delisted	Threatened	IUCN:CR	Yes	Yes

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Urocyon littoralis santacruzae	Santa Cruz Island fox		G1T1	S1	Delisted	Threatened	IUCN:CR	Yes	Yes
Urocyon littoralis santarosae	Santa Rosa Island fox		G1T1	S1	Delisted	Threatened	IUCN:CR	Yes	Yes
Vulpes macrotis mutica	San Joaquin kit fox		G4T2	S2	Endangered	Threatened		Yes	
Vulpes vulpes necator	Sierra Nevada red fox		G5T1T2	S1	Candidate	Threatened	USFS:S	Yes	
Vulpes vulpes patwin	Sacramento Valley red fox		G5T2	S2	None	None		No	

MUSTELIDAE (weasels and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Enhydra lutris nereis	southern sea otter		G4T2	S2	Threatened	None	CDFW:FP IUCN:EN MMC:SSC	Yes	Yes
Gulo gulo	California wolverine		G4	S1	Proposed Threatened	Threatened	CDFW:FP IUCN:NT USFS:S	Yes	
Lontra canadensis sonora	southwestern river otter		G5T1	S1	None	None	CDFW:SSC	Yes	Yes
Martes caurina	Pacific marten		G5	S3	None	None	IUCN:LC USFS:S	Yes	
Martes caurina humboldtensis	Humboldt marten		G5T1	S1	None	Endangered	CDFW:SSC USFS:S	Yes	
Martes caurina sierrae	Sierra marten		G5T3	S3	None	None	USFS:S	Yes	
Mustela frenata inyoensis	Inyo long-tailed weasel		G5T2Q	S2	None	None		No	
Mustela frenata xanthogenys	San Joaquin long-tailed weasel		G5T2T3	S2S3	None	None		No	

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Pekania pennanti	fisher - West Coast DPS		G5T2T3Q	S2S3	Endangered	Threatened	BLM:S CDFW:SSC USFS:S	Yes	Yes
Taxidea taxus	American badger		G5	S3	None	None	CDFW:SSC IUCN:LC	Yes	

MEPHITIDAE (skunks)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Spilogale gracilis amphiala	Channel Islands spotted skunk		G5T3	S3	None	None	CDFW:SSC	Yes	

FELIDAE (cats and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Lynx rufus pallescens	pallid bobcat		G5T3?	S3?	None	None		No	
Puma concolor browni	Yuma mountain lion		G5T1T2Q	S1	None	None	CDFW:SSC	Yes	

OTARIIDAE (sea lions and fur seals)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Arctocephalus townsendi	Guadalupe fur-seal		G1	S1	Threatened	Threatened	CDFW:FP IUCN:NT	Yes	
Callorhinus ursinus	northern fur-seal		G3	S1	None	None	IUCN:VU	Yes	
Eumetopias jubatus	Steller (=northern) sea-lion		G3	S2	Delisted	None	IUCN:EN MMC:SSC	Yes	

BOVIDAE (sheep and relatives)

Scientific Name	Common Name	Comments	Global Rank	State Rank	ESA	CESA	Other Status	Records in CNDDB?	End Notes?
Ovis canadensis nelsoni	desert bighorn sheep		G4T4	S3	None	None	BLM:S CDFW:FP USFS:S	Yes	Yes
Ovis canadensis nelsoni pop. 2	Peninsular bighorn sheep DPS		G4T3Q	S1	Endangered	Threatened	CDFW:FP	Yes	Yes
Ovis canadensis sierrae	Sierra Nevada bighorn sheep		G4T2	S2	Endangered	Endangered	CDFW:FP	Yes	

End Notes

Invertebrates

GASTROPODA (snails, slugs, and abalones)

Prophysaon coeruleum

Blue-gray taildropper slug

1) May be a species complex.

ARACHNIDA (spiders and relatives)

Hubbardia shoshonensis

Shoshone Cave whip-scorpion

1) BLM Sensitive list uses the scientific name Trithyreus shoshonensis.

CRUSTACEA, Order Amphipoda (amphipods)

Hyalella muerta

Texas Spring amphipod

1) First North American hypogean hyalellid.

Hyalella sandra

Death Valley amphipod

1) Population in Texas Springs is an accidental introduction. Population in Nevares Springs may be a new species.

INSECTA, Order Coleoptera (beetles)

Trigonoscuta sp.

Doyen's trigonoscuta dune weevil

1) Sometimes referred to as Trigonoscuta doyeni, which is an unpublished manuscript name.

INSECTA, Order Lepidoptera (butterflies and moths)

Callophrys thornei

Thorne's hairstreak

1) Formerly Mitoura thornei.

Euproserpinus euterpe

Kern primrose sphinx moth

1) Until its rediscovery in Kern County in 1974, this moth had been thought to be extinct. A second population was later found in San Luis Obispo County (Xerces Society 2005).

Speyeria zerene myrtleae

Myrtle's silverspot butterfly

1) The USFWS and others have not yet determined if the taxonomic expansion by Emmel and Emmel (1998) into S. z. myrtleae and S. z. puntareyes is warranted. The Speyereia zerene along the coast of Marin and Sonoma Counties are federally endangered under the subspecies concept in the 1992 listing.

Fishes

ACIPENSERIDAE (sturgeon)

Acipenser medirostris

green sturgeon

1) Federal listing includes all spawning populations south of the Eel River.
2) The NMFS Species of Concern designation refers to the northern DPS which includes spawning populations north of the Eel River (inclusive).

SALMONIDAE (trout and salmon)

Oncorhynchus kisutch pop. 2

coho salmon - southern Oregon / northern California ESU

1) Federal listing refers to populations between Cape Blanco, Oregon and Punta Gorda, Humboldt County, California.
2) State listing refers to populations between the Oregon border and Punta Gorda, Humboldt County, California.

Oncorhynchus kisutch pop. 4

coho salmon - central California coast ESU

1) Federal listing is limited to naturally spawning populations in streams between Punta Gorda, Humboldt County and the San Lorenzo River, Santa Cruz County.
2) State listing is limited to populations south of Punta Gorda, Humboldt County.

Oncorhynchus mykiss irideus pop. 1

steelhead - Klamath Mountains Province DPS

1) This ESU includes all naturally spawned populations residing in streams between the Elk River in Oregon and the Klamath River in California, inclusive.
2) CDFW SSC designation refers only to the California portion of the ESU and refers only to the summer-run.

Oncorhynchus mykiss irideus pop. 10

steelhead - southern California DPS

1) The federal designation refers to fish in the coastal basins from the Santa Maria River (inclusive), south to the U.S. - Mexico Border.

Oncorhynchus mykiss irideus pop. 11

steelhead - Central Valley DPS

1) Federal listing includes all runs in the Sacramento and San Joaquin rivers and their tributaries.

Oncorhynchus mykiss irideus pop. 16

steelhead - northern California DPS

1) The federal designation refers to naturally spawned populations residing below impassable barriers in coastal basins from Redwood Creek in Humboldt County to, and including, the Gualala River in Mendocino County
2) CDFW SSC designation refers only to the summer-run.

Oncorhynchus mykiss irideus pop. 36

summer-run steelhead trout

1) Summer-run steelhead are part of both the Klamath Mountains Province DPS and the Northern California DPS.
2) CESA candidacy is for northern California summer-run steelhead

Oncorhynchus mykiss irideus pop. 8

steelhead - central California coast DPS

1) Federal listing includes all runs in coastal basins from the Russian River in Sonoma County, south to Soquel Creek in Santa Cruz County, inclusive. It includes the San Francisco and San Pablo Bay basins, but excludes the Sacramento-San Joaquin River basins.

Oncorhynchus mykiss irideus pop. 9

steelhead - south-central California coast DPS

1) Federal listing includes all runs in coastal basins from the Pajaro River south to, but not including, the Santa Maria River.
2) CDFW SSC designation refers to southern steelhead trout.

Oncorhynchus tshawytscha pop. 13

chinook salmon - Central Valley fall / late fall-run ESU

1) The Central Valley fall/late fall-run ESU refers to populations spawning in the Sacramento and San Joaquin rivers and their tributaries.
2) CDFW SSC designation refers only to the fall-run.

Oncorhynchus tshawytscha pop. 17

chinook salmon - California coastal ESU

1) Originally proposed as part of a larger Southern Oregon and California Coastal ESU. This new ESU was revised to include only naturally spawned coastal spring- and fall-run chinook salmon between Redwood Creek in Humboldt County and the Russian River in Sonoma County.

Oncorhynchus tshawytscha pop. 6

chinook salmon - Central Valley spring-run ESU

1) Federal listing refers to the Central Valley spring-run ESU. It includes populations spawning in the Sacramento River and its tributaries.

OSMERIDAE (smelt)

Spirinchus thaleichthys

longfin smelt

1) Federal candidate status is for the San Francisco Bay-Delta DPS of the longfin smelt.

CYPRINIDAE (minnows and carp)

Lavinia symmetricus ssp. 1

San Joaquin roach

1) Current taxonomy considers this taxon to be a population of Lavinia symmetricus symmetricus, the Sacramento-San Joaquin roach.

Rhinichthys osculus ssp. 1

Amargosa Canyon speckled dace

1) Current taxonomy considers this taxon to be a distinct population of Rhinichthys osculus nevadensis.

Rhinichthys osculus ssp. 2

Owens speckled dace

1) Current taxonomy includes the Benton Valley speckled dace (formerly ssp 4) with the Owens speckled dace.

GASTEROSTEIDAE (sticklebacks)

Gasterosteus aculeatus microcephalus

resident threespine stickleback

1) USFS Sensitive designation refers to the full species.

Gasterosteus aculeatus santaannae

Santa Ana (=Shay Creek) threespine stickleback

1) USFS Sensitive designation refers to the full species.

Gasterosteus aculeatus williamsoni

unarmored threespine stickleback

1) USFS Sensitive designation refer to the full species.

Amphibians

AMBYSTOMATIDAE (mole salamanders)

Ambystoma californiense

California tiger salamander

1) Central Valley DPS federally listed as threatened. Santa Barbara County DPS and Sonoma County DPS are federally listed as endangered.

PLETHODONTIDAE (lungless salamanders)

Aneides niger

Santa Cruz black salamander

1) CDFW SSC status uses former subspecies concept of Aneides flavipunctatus niger.

Batrachoseps relictus

relictual slender salamander

1) Taxonomy follows Jockusch et al. 2012. Morphological and molecular diversification of slender salamanders (Caudata: Plethodontidae: Batrachoseps) in the southern Sierra Nevada of California with descriptions of two new species. Zootaxa 3190:1-30, which synonymized Batrachoseps sp. 1, Breckenridge Mountain slender salamander, with B. relictus.

Plethodon asupak

Scott Bar salamander

1) Since this newly described species was formerly considered to be a subpopulation of Plethodon stormi (Mead et al. 2005), and since Plethodon stormi is listed as threatened under CESA, Plethodon asupak retains the designation as a threatened species under CESA (Calif. Regulatory Notice Register, No. 21-Z, p.916, 25 May 2007).

BUFONIDAE (true toads)

Anaxyrus californicus

arroyo toad

1) At the time of listing, arroyo toad was known as Bufo microscaphus californicus, a subspecies of southwestern toad. In 2001, it was determined to be its own species, Bufo californicus. Since then, many species in the genus Bufo were changed to the genus Anaxyrus, and now arroyo toad is known as Anaxyrus californicus (Frost et al. 2006).

Anaxyrus canorus

Yosemite toad

1) Formerly Bufo canorus; Frost et al. (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Anaxyrus (Tschudi 1845).

Anaxyrus exsul

black toad

1) Formerly Bufo canorus; Frost et al. (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Anaxyrus (Tschudi 1845).

Incilius alvarius

Sonoran Desert toad

1) Formerly Bufo alvarius. Between 2006-2009, the scientific name has been changed to Cranopsis alvaria, Ollotis alvaria, Incilius alvarius, back to Ollotis alvarius, and then back to Incilius alvarius. The common name has changed from Colorado River toad to Sonoran Desert toad.

RANIDAE (true frogs)

Lithobates pipiens

northern leopard frog

1) Formerly Rana pipiens; Frost et al. (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Lithobates (Fitzinger 1843).

Lithobates yavapaiensis

lowland leopard frog

1) Formerly Rana yavapaiensis; Frost et al. (2006. The Amphibian Tree of Life. Bulletin of the American Museum of Natural History 297: 1-370) placed this species in the genus Lithobates (Fitzinger 1843).

Rana aurora

northern red-legged frog

1) An mtDNA study (Shaffer et al. 2004) concluded that Rana aurora aurora and Rana aurora draytonii should be recognized as separate species with a narrow zone of overlap.

Rana boylii

foothill yellow-legged frog

1) CESA listing status varies by clade as follows: Southwest/South Coast, West/Central Coast, and East/Southern Sierra clades are endangered; northeast/Northern Sierra and Feather River clades are threatened; listing of the Northwest/North Coast clade is not warranted.

Rana draytonii

California red-legged frog

1) An mtDNA study (Shaffer et al. 2004) concluded that Rana aurora aurora and Rana aurora draytonii should be recognized as separate species with a narrow zone of overlap, and that the range of draytonii extends about 100 km further north in coastal California than previously thought.

Rana muscosa

southern mountain yellow-legged frog

1) Original federal endangered listing, effective 20020702, was for the southern DPS (populations in the San Gabriel, San Jacinto, and San Bernardino Mountains).
2) Federal endangered listing of the northern DPS (populations occurring north of the Tehachapi Mountains in the Sierra Nevada) became effective 20140630.
3) Rana muscosa has been split into Rana sierrae, the Sierra Nevada yellow-legged frog, found in the northern and central Sierra Nevada, and Rana muscosa, the southern mountain yellow-legged frog, found in the southern Sierra Nevada and southern California.

Rana sierrae

Sierra Nevada yellow-legged frog

1) Formerly Rana muscosa. Rana muscosa was split into Rana sierrae, the Sierra Nevada yellow-legged frog, found in the northern and central Sierra Nevada, and Rana muscosa, the southern mountain yellow-legged frog, found in the southern Sierra Nevada and southern California.

Reptiles

EMYDIDAE (box and water turtles)

Emys marmorata

western pond turtle

1) CNDDB tracks western pond turtle at the full species level, based on the determination that the previous subspecies split was not warranted (Spinks, P.Q. and Shaffer, H.B. 2005. Range-wide molecular analysis of the western pond turtle (Emys marmorata): cryptic variation, isolation by distance, and their conservation implications. Molecular Ecology 14(7):2047-2064).
2) Genus was updated to Emys based on findings in: Spinks, P.Q. and Shaffer, H.B. 2009. Conflicting mitochondrial and nuclear phylogenies for the widely disjunct Emys (Testudines: Emydidae) species complex, and what they tell us about biogeography and hybridization. Systematic Biology. 58(1):1-20.

XANTUSIIDAE (night lizards)

Xantusia vigilis sierrae

Sierra night lizard

1) Formerly Xantusia sierrae; scientific name changed to reflect currently accepted subspecies concept.

ANNIELLIDAE (legless lizards)

Anniella alexanderae

Temblor legless lizard

1) Legless lizards (Anniella spp.) in California were traditionally considered one species, but are now considered five species (Pappenfuss and Parham, 2013). The prior (Jennings and Hayes, 1994) and current (Thompson et al. 2016) Species of Special Concern (SSC) projects evaluated the traditional single species taxon and determined all legless lizards in California to be an SSC. Therefore, the SSC status is carried over to the new taxon concepts until further SSC evaluation.

Anniella campi

Southern Sierra legless lizard

1) Legless lizards (Anniella spp.) in California were traditionally considered one species, but are now considered five species (Pappenfuss and Parham, 2013). The prior (Jennings and Hayes, 1994) and current (Thompson et al. 2016) Species of Special Concern (SSC) projects evaluated the traditional single species taxon and determined all legless lizards in California to be an SSC. Therefore, the SSC status is carried over to the new taxon concepts until further SSC evaluation.

Anniella grinnelli

Bakersfield legless lizard

1) Legless lizards (Anniella spp.) in California were traditionally considered one species, but are now considered five species (Pappenfuss and Parham, 2013). The prior (Jennings and Hayes, 1994) and current (Thompson et al. 2016) Species of Special Concern (SSC) projects evaluated the traditional single species taxon and determined all legless lizards in California to be an SSC. Therefore, the SSC status is carried over to the new taxon concepts until further SSC evaluation.

Anniella pulchra

Northern California legless lizard

1) Legless lizards (Anniella spp.) in California were traditionally considered one species, but are now considered five species (Pappenfuss and Parham, 2013). The prior (Jennings and Hayes, 1994) and current (Thompson et al. 2016) Species of Special Concern (SSC) projects evaluated the traditional single species taxon and determined all legless lizards in California to be an SSC. Therefore, the SSC status is carried over to the new taxon concepts until further SSC evaluation.

Anniella spp.

California legless lizard

1) This element represents California records of Anniella not yet assigned to new species within the Anniella pulchra complex. Legless lizards (Anniella spp.) in California were traditionally considered one species, but are now considered five species (Pappenfuss and Parham, 2013). CNDDB has assigned new species concepts to most, but not all, previously known and extant legless lizard occurrences. Where an occurrence of a legless lizard is not known to the species level, the general concept California legless lizard (Anniella spp.) will be applied until further evidence is available. All legless lizards in California are a Species of Special Concern (Thomson et al., 2016).

Anniella stebbinsi

Southern California legless lizard

1) Legless lizards (Anniella spp.) in California were traditionally considered one species, but are now considered five species (Pappenfuss and Parham, 2013). The prior (Jennings and Hayes, 1994) and current (Thompson et al. 2016) Species of Special Concern (SSC) projects evaluated the traditional single species taxon and determined all legless lizards in California to be an SSC. Therefore, the SSC status is carried over to the new taxon concepts until further SSC evaluation.

HELODERMATIDAE (venomous lizards)

Heloderma suspectum cinctum

banded Gila monster

1) BLM Sensitive designation refers to the full species.

NATRICIDAE (live-bearing snakes)

Thamnophis sirtalis pop. 1

south coast gartersnake

1) CDFW Species of Special Concern treats this population as a distinct taxon, though it is more commonly treated as a subpopulation of Thamnophis sirtalis infernalis, the California red-sided gartersnake.

Birds

PHASIANIDAE (grouse and ptarmigan)

Centrocercus urophasianus

greater sage-grouse

1) 20151002 finding was that federal listing of the ful species was not warranted, Proposed rule to federally list the Bi-State DPS (Mono Basin of CA and NV; Mono, Alpine, and Inyo counties in California) as threatened was withdrawn 20200331.

Dendragapus fuliginosus howardi

Mount Pinos sooty grouse

1) Formerly merged with D. obscurus as blue grouse, but separated on the basis of genetic evidence and differences in voice, behavior, and plumage.
2) The North American Bird Conservation Initiative Watch List designation refers to the full species.

ACCIPITRIDAE (hawks, kites, harriers, and eagles)

Circus hudsonius

northern harrier

1) Formerly considered conspecific with Circus cyaneus, but treated as separate on the basis of differences in morphology, plumage, and breeding habitat.

RALLIDAE (rails, coots, and gallinules)

Laterallus jamaicensis coturniculus

California black rail

1) The North American Bird Conservation Initiative Watch List designation refers to the full species.
2) The IUCN designation of Near Threatened refers to the full species.

Rallus obsoletus levipes

light-footed Ridgway's rail

1) The North American Bird Conservation Initiative Watch List designation refers to the full species.

Rallus obsoletus obsoletus

California Ridgway's rail

1) The North American Bird Conservation Initiative Watch List designation refers to the full species.

Rallus obsoletus yumanensis

Yuma Ridgway's rail

1) The North American Bird Conservation Initiative Watch List designation refers to the full species.

CHARADRIIDAE (plovers and relatives)

Charadrius alexandrinus nivosus

western snowy plover

1) Federal listing applies only to the Pacific coastal population.
2) CDFW SSC designation refers to both the coastal and interior populations.

Charadrius montanus

mountain plover

1) Proposed rule to federally list the mountain plover as threatened was withdrawn 20110512.

LARIDAE (gulls and terns)

Gelochelidon nilotica

gull-billed tern

1) Taxonomy recently changed from Sterna nilotica.

Hydroprogne caspia

Caspian tern

1) Taxonomy recently changed from Sterna caspia.

Sternula antillarum browni

California least tern

1) Taxonomy recently changed from Sterna antillarum browni.

2) North American Bird Conservation Initiative Watch List designation refers to the full species.

Thalasseus elegans

elegant tern

1) Taxonomy recently changed from Sterna elegans.

ALCIDAE (auklets, puffins, and relatives)

Synthliboramphus scrippsi

Scripps's murrelet

1) Formerly included in Xantus's murrelet as Synthliboramphus hypoleucus scrippsi. Now considered a full species.

STRIGIDAE (owls)

Athene cunicularia

burrowing owl

1) A burrow site = an observation of one or more owls at a burrow or evidence of recent occupation such as whitewash and feathers. Winter observations at a burrow are mapped. Winter observations with or without a burrow in San Francisco, Ventura, Sonoma, Marin, Napa, and Santa Cruz Counties are mapped.

Strix occidentalis caurina

northern spotted owl

1) There are no spotted owl EOs in the CNDDB. All spotted owl location information is maintained in a separate database (https://wildlife.ca.gov/Data/CNDDB/Spotted-Owl-Info). CNDDB subscribers can access these datasets from the same bookmark as the CNDDB layer in BIOS (https://www.wildlife.ca.gov/Data/BIOS).
2) North American Bird Conservation Initiative Watch List designation refers to the full species.

Strix occidentalis occidentalis

California spotted owl

1) There are no spotted owl EOs in the CNDDB. All spotted owl location information is maintained in a separate database (https://wildlife.ca.gov/Data/CNDDB/Spotted-Owl-Info). CNDDB subscribers can access these datasets from the same bookmark as the CNDDB layer in BIOS (https://www.wildlife.ca.gov/Data/BIOS).
2) The North American Bird Conservation Initiative Watch List designation refers to the full species.

TYRANNIDAE (tyrant flycatchers)

Empidonax traillii

willow flycatcher

1) State listing of the full species includes all subspecies.

Empidonax traillii brewsteri

little willow flycatcher

1) State listing of the full species includes all subspecies.
2) North American Bird Conservation Initiative Watch List designation refers to the full species.

Empidonax traillii extimus

southwestern willow flycatcher

1) State listing of the full species includes all subspecies.
2) North American Bird Conservation Initiative Watch List designation refers to the full species.

LANIIDAE (shrikes)

Lanius ludovicianus mearnsi

San Clemente loggerhead shrike

1) Subspecific identity of shrikes currently on San Clemente is uncertain. Mundy et al. (1997a, b) provided evidence L. l. mearnsi is genetically distinct from L. l. gambeli and L. l. anthonyi, whereas Patten and Campbell (2000) concluded, based on morphology, that the birds now on San Clemente are intergrades between L. l. mearnsi and L. l. anthonyi.

VIREONIDAE (vireos)

Vireo bellii arizonae

Arizona Bell's vireo

1) North American Bird Conservation Initiative Watch List designation refers to the full species.
2) The IUCN designation of Near Threatened refers to the full species.

Vireo bellii pusillus

least Bell's vireo

1) North American Bird Conservation Initiative Watch List designation refers to the full species.
2) The IUCN designation of Near Threatened refers to the full species.

TROGLODYTIDAE (wrens)

Campylorhynchus brunneicapillus sandiegensis

coastal cactus wren

1) CDFW Bird Species of Special Concern report uses the common name San Diego cactus wren.

POLIOPTILIDAE (gnatcatchers)

Polioptila californica californica

coastal California gnatcatcher

1) CDFW Bird Species of Special Concern report uses the common name Alta California gnatcatcher.
2) North American Bird Conservation Initiative Watch List designation refers to the full species.

MIMIDAE (mockingbirds and thrashers)

Toxostoma lecontei

Le Conte's thrasher

1) CDFW SSC designation refers only to the San Joaquin population.
2) The BLM Sensitive designation refers to the San Joaquin Le Conte's thrasher, Toxostoma lecontei macmillanorum, although the subspecies concept is not universally recognized.

PASSERELLIDAE (sparrows)

Artemisiospiza belli belli

Bell's sage sparrow

1) North American Bird Conservation Initiative Watch List designation refers to the full species.

Artemisiospiza belli clementeae

San Clemente sage sparrow

1) Subspecific validity uncertain. Recognized by AOU (1957), but not by Patten and Unitt (2002).
2) North American Bird Conservation Initiative Watch List designation refers to the full species.

Melospiza melodia graminea

Channel Island song sparrow

1) Subspecific validity is uncertain. This subspecies when referred to as Santa Barbara song sparrow is extinct. However, the subspecies was merged by Patten (2001) with the San Miguel (M. m. micronyx), and San Clemente (M. m. clementae) song sparrows as the Channel Island song sparrow with the subspecific name M. m. graminea.

Melozone crissalis eremophilus

Inyo California towhee

1) Previously in the genus Pipilo.

PARULIDAE (wood-warblers)

Geothlypis trichas sinuosa

saltmarsh common yellowthroat

1) CDFW Bird Species of Special Concern report uses the common name San Francisco common yellowthroat

Setophaga petechia

yellow warbler

1) This element includes the subspecies S. p. morcormi and S. p. brewsteri, which are tracked under the full species, S. petechia, due to difficulty distinguishing them. S. p. sonorana, which nests in California only along the Colorado River, is tracked separately.

Setophaga petechia sonorana

Sonoran yellow warbler

1) Nests in California only along the Colorado River. Observations of yellow warblers from other regions are tracked as the full species, S. petechia.

Mammals

PHYLLOSTOMIDAE (leaf-nosed bats)

Leptonycteris yerbabuenae

lesser long-nosed bat

1) Federal listing uses the scientific name Leptonycteris curasoae yerbabuenae.

APLODONTIDAE (mountain beavers)

Aplodontia rufa californica

Sierra Nevada mountain beaver

1) The IUCN Least Concern designation refers to the full species.

Aplodontia rufa nigra

Point Arena mountain beaver

1) The IUCN Least Concern designation refers to the full species.

Aplodontia rufa phaea

Point Reyes mountain beaver

1) The IUCN Least Concern designation refers to the full species.

HETEROMYIDAE (kangaroo rats, pocket mice, and kangaroo mice)

Chaetodipus fallax fallax

northwestern San Diego pocket mouse

1) CDFW SSC designation refers to the full species.

Chaetodipus fallax pallidus

pallid San Diego pocket mouse

1) CDFW SSC designation refers to the full species.

Perognathus alticola alticola

white-eared pocket mouse

1) CDFW SSC, BLM Sensitive, and IUCN Endangered designations refer to the full species.

Perognathus alticola inexpectatus

Tehachapi pocket mouse

1) CDFW SSC and IUCN Endangered designations refer to the full species.

Perognathus inornatus

San Joaquin pocket mouse

1) This element includes the subspecies P. i. inornatus and P. i. neglectus, which are tracked under the full species, P. inornatus, due to difficulty distinguishing them. P. i. inornatus generally occurs on the eastern side of the San Joaquin Valley, while P. i. neglectus generally occurs on the western side. P. i. psammophilus, which occurs only in the Salinas Valley, is tracked separately.

MURIDAE (mice, rats, and voles)

Neotoma fuscipes riparia

riparian (=San Joaquin Valley) woodrat

1) This species is currently undergoing taxonomic revision

Reithrodontomys megalotis santacruzae

Santa Cruz harvest mouse

1) Synonymous with Reithrodontomys megalotus longicaudus, Santa Cruz Island population.

CANIDAE (foxes, wolves, and coyotes)

Urocyon littoralis

island fox

1) State listing is at the full species level and includes all subspecies on all islands. Federal listing does not include San Nicolas or San Clemente island subspecies.

Urocyon littoralis catalinae

Santa Catalina Island fox

1) The IUCN Critically Endangered designation refers to the full species.

Urocyon littoralis clementae

San Clemente Island fox

1) The IUCN Critically Endangered designation refers to the full species.

Urocyon littoralis dickeyi

San Nicolas Island fox

1) The IUCN Critically Endangered designation refers to the full species.

Urocyon littoralis littoralis

San Miguel Island fox

1) The IUCN Critically Endangered designation refers to the full species.

Urocyon littoralis santacruzae

Santa Cruz Island fox

1) The IUCN Critically Endangered designation refers to the full species.

Urocyon littoralis santarosae

Santa Rosa Island fox

1) The IUCN Critically Endangered designation refers to the full species.

MUSTELIDAE (weasels and relatives)

Enhydra lutris nereis

southern sea otter

1) The IUCN Endangered designation refers to the full species.

Lontra canadensis sonora

southwestern river otter

1) CDFW SSC status refers only to the subspecies L. canadensis sonora, which is known in California only from the Colorado River.

Pekania pennanti

fisher - West Coast DPS

1) Formerly considered a subspecies, Pacific fisher (Martes pennanti pacifica); this subspecies concept is no longer considered valid.
2) In 2004, the West Coast DPS of fisher became a candidate for federal listing, and underwent numerous evaluations, proposed rules, and revisions in subsequent years. In 2020, the West Coast DPS was further divided into the Southern Sierra Nevada DPS and the Northern California/Southern Oregon DPS (which also includes Northern Sierra Nevada and Southern Oregon Cascades subpopulations which arose from reintroductions). Federal endangered status applies only to the Southern Sierra Nevada DPS.
3) CESA threatened status applies only to the Southern Sierra Nevada ESU, defined as south of the Merced River.

BOVIDAE (sheep and relatives)

Ovis canadensis nelsoni

desert bighorn sheep

1) Desert bighorn sheep (O. c. nelsoni) in the Peninsular Ranges are tracked as a metapopulation of the subspecies, Peninsular bighorn sheep DPS (O. c. nelsoni pop. 2)
2) Fully Protected with the exception of legal hunting conducted in compliance with California Code of Regulations 14 CCR 362.

Ovis canadensis nelsoni pop. 2

Peninsular bighorn sheep DPS

1) The subspecies peninsular bighorn sheep (O. c. cremnobates) has been synonymized with O. c. nelsoni (Wehausen & Ramey 1993). Peninsular bighorn sheep are now considered to be a metapopulation and are recognized as a federal Distinct Population Segment (DPS).

APPENDIX D

Southwest Willow Flycatcher Survey Methodology

Prepared in cooperation with the Bureau of Reclamation and the U.S. Fish and Wildlife Service

A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher

Chapter 10 of
Section A, Biological Science
Book 2, Collection of Environmental Data

Techniques and Methods 2A-10

U.S. Department of the Interior
U.S. Geological Survey

Cover: Southwestern Willow Flycatcher. Photograph taken by Susan Sferra, U.S. Fish and Wildlife Service.

A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher

By Mark K. Sogge, U.S. Geological Survey; Darrell Ahlers, Bureau of Reclamation; and Susan J. Sferra, U.S. Fish and Wildlife Service

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U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2010

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Figures

Conversion Factors

Multiply	By	To obtain
centimeter (cm)	0.3937	inch (in.)
gram (g)	0.03527	ounce, avoirdupois (oz)
hectare (ha)	2.471	acre
kilometer (km)	0.6214	mile (mi)
meter (m)	3.281	foot (ft)
millimeter (mm)	0.03937	inch (in.)

Abbreviations and Acronyms

GPS	Global Positioning System
NDVI	Normalized Difference Vegetation Index
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher

By Mark K. Sogge, U.S. Geological Survey; Darrell Ahlers, Bureau of Reclamation; and
Susan J. Sferra, U.S. Fish and Wildlife Service

Background

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) has been the subject of substantial research, monitoring, and management activity since it was listed as an endangered species in 1995. When proposed for listing in 1993, relatively little was known about the flycatcher's natural history, and there were only 30 known breeding sites supporting an estimated 111 territories rangewide (Sogge and others, 2003a). Since that time, thousands of presence/absences surveys have been conducted throughout the historical range of the flycatcher, and many studies of its natural history and ecology have been completed. As a result, the ecology of the flycatcher is much better understood than it was just over a decade ago. In addition, we have learned that the current status of the flycatcher is better than originally thought: as of 2007, the population was estimated at approximately 1,300 territories distributed among approximately 280 breeding sites (Durst and others, 2008a).

Concern about the Southwestern Willow Flycatcher on a rangewide scale was brought to focus by Unitt (1987), who described declines in flycatcher abundance and distribution throughout the Southwest. *E. t. extimus* populations declined during the 20th century, primarily because of habitat loss and modification from activities, such as dam construction and operation, groundwater pumping, water diversions, and flood control. In 1991, the U.S. Fish and Wildlife Service (USFWS) designated the Southwestern Willow Flycatcher as a candidate category 1 species (U.S. Fish and Wildlife Service, 1991). In July 1993, the USFWS proposed to list *E. t. extimus* as an endangered species and to designate critical habitat under the Act (U.S. Fish and Wildlife Service, 1993). A final rule listing *E. t. extimus* as endangered was published in February 1995 (U.S. Fish and Wildlife Service, 1995); critical habitat was designated in 1997 (U.S. Fish and Wildlife Service, 1997). The USFWS Service released a Recovery Plan for the Southwestern Willow Flycatcher in 2002 (U.S. Fish and Wildlife Service, 2002), and re-designated critical habitat in 2005 (U.S. Fish and Wildlife Service, 2005).

In addition to its federal status, the Southwestern Willow Flycatcher is listed as an endangered species or species of concern in Arizona (Arizona Game and Fish Department, 2006), New Mexico (New Mexico Department of Game and Fish, 1996), California (California Department of Fish and Game, 1991), and Utah (Utah Division of Wildlife Resources, 1997).

Sound management and conservation of an endangered species like the Southwestern Willow Flycatcher requires current, detailed information on its abundance and distribution. This requires, among other things, identifying where flycatchers are and are not breeding, and annual monitoring of as many breeding areas as possible. Such efforts require effective, standardized survey protocols and consistent reporting, at both local and regional levels. However, the Willow Flycatcher is a difficult species to identify and survey for. Moreover, inconsistent or ineffective surveys are of limited value, can produce misleading information (including "false positives" and "false negatives"), hinder regional and rangewide analyses, and waste limited resources.

We developed this document to provide a standardized survey protocol and a source of basic ecological and status information on the flycatcher. The first section summarizes the current state of knowledge regarding Southwestern Willow Flycatcher natural history, based on a wide array of published and unpublished literature. Emphasis is given to information relevant to flycatcher conservation and management, and to conducting and interpreting surveys. The second section details a standard survey protocol that provides for consistent data collection, reporting, and interpretation. This protocol document builds on and supersedes previous versions, the most recent of which was Sogge and others (1997a). In this update, we incorporate over a decade of new science and survey results, and refine the survey methodology to clarify key points. Further, we update the standard survey data sheets and provide guidelines on how to fill in the requested information. Amidst these revisions, the basic approach of the survey protocol has remained unchanged—multiple surveys at each survey area within the same breeding season, the use of the call-playback technique using flycatcher vocalizations to increase the probability of detection, and verification of species identity through its diagnostic song.

Section 1. Natural History

Breeding Range and Taxonomy

The Willow Flycatcher is a widespread species that breeds across much of the conterminous United States (Sedgwick, 2000). Four subspecies commonly are recognized in North America, with each occupying a distinct breeding range (fig. 1): *E. t. adastus*, ranging across the northern Rocky Mountains and Great Basin; *E. t. brewsteri*, found west of the Sierra Nevada and Cascade Mountains along the Pacific Slope; *E. t. extimus*, the Southwestern Willow Flycatcher, which breeds across the Southwest; and *E. t. traillii*, ranging east of the northern Rocky Mountains. Although the overall subspecies' ranges are distinct, Sedgwick (2001) and Paxton (2008) noted interbreeding/gradation zones in the boundary area between *E. t. extimus* and *E. t. adastus*.

The breeding range of the Southwestern Willow Flycatcher includes southern California, Arizona, New Mexico, southwestern Colorado, and extreme southern portions of Nevada and Utah: specific range boundaries are delineated in the subspecies' recovery plan (U.S. Fish and Wildlife Service, 2002). Unitt (1987) included western Texas in the subspecies' range, but recent breeding records from western Texas are lacking. Records of probable breeding Southwestern Willow Flycatchers in Mexico are few and restricted to extreme northern Baja California and Sonora (Unitt, 1987; Wilbur, 1987). Although recent data are lacking, the USFWS does include parts of northern Mexico in its description of *E. t. extimus* breeding range (U.S. Fish and Wildlife Service, 2002).

Although they appear very similar to most observers, experienced taxonomist or those using specialized equipment (for example, an electronic colorimeter) can differentiate among the subspecies by subtle differences in color and morphology (for example, Unitt, 1987; Paxton, 2008). Despite the subtle level of differences, the taxonomic status of *E. t. extimus* has been critically reviewed and confirmed multiple times based on morphological, genetic, and song data (Hubbard, 1987; Unitt, 1987; Browning, 1993; Paxton, 2000; Sedgwick, 2001).

The Southwestern Willow Flycatcher was described by Phillips (1948) from a specimen collected along the San Pedro River in southeastern Arizona. The Southwestern Willow Flycatcher generally is paler than other Willow Flycatcher subspecies, although this difference is indistinguishable without considerable experience and training, and study skins as comparative reference material. The southwestern subspecies differs in morphology (primarily wing formula) but not overall size. The plumage and color differences between the Willow Flycatcher subspecies are so subtle that they should not be used to characterize birds observed in the field (Unitt, 1987; Hubbard, 1999; U.S. Fish and Wildlife Service, 2002).

Migration and Winter Range, Habitat, and Ecology

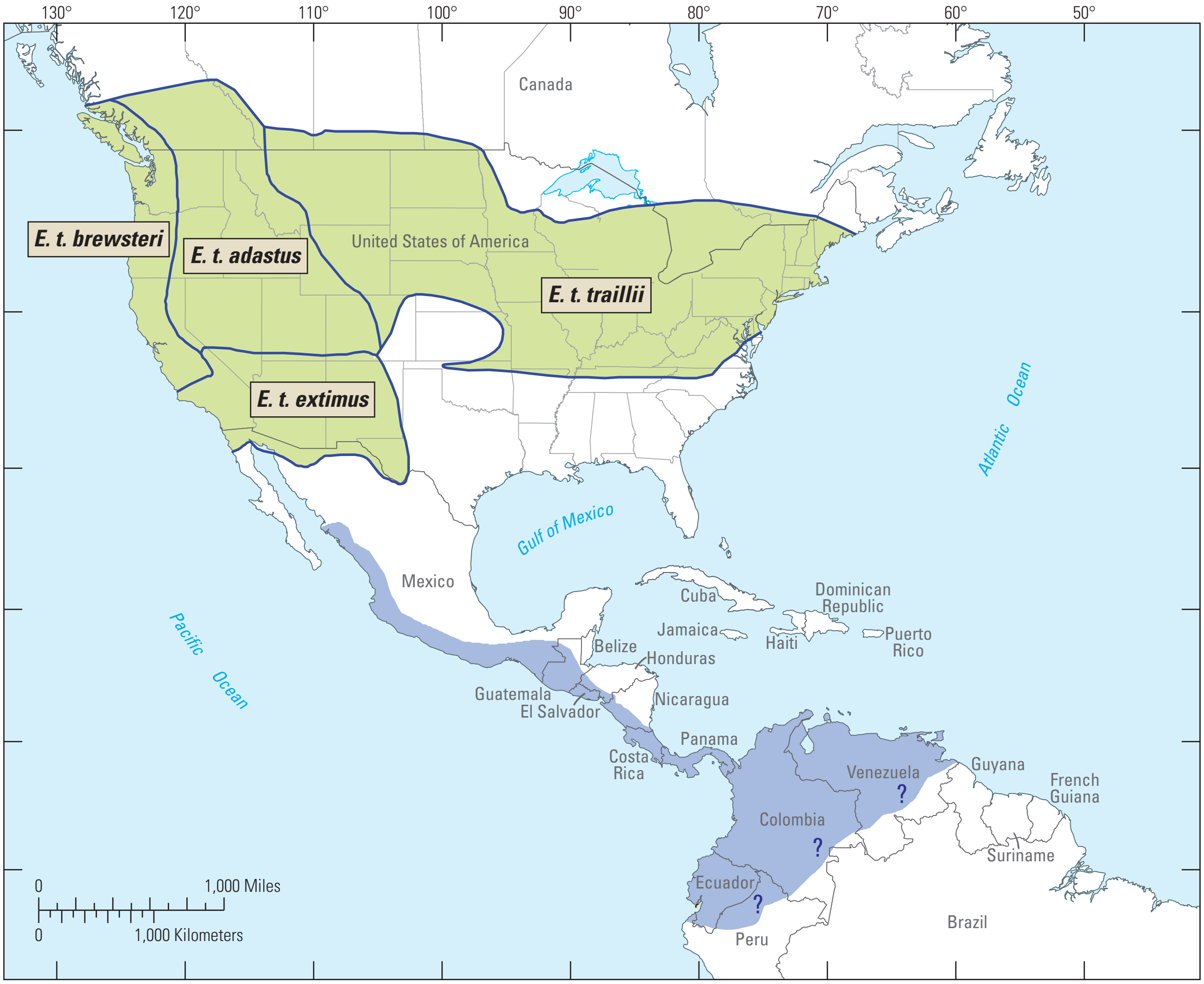
All Willow Flycatcher subspecies breed in North America but winter in the subtropical and tropical regions of southern Mexico, Central America, and northern South America (Sedgwick, 2000; Koronkiewicz, 2002; fig. 1). Most wintering birds are found in the Pacific slope lowlands in Mexico and Central America, and Caribbean slope lowlands in Mexico and Guatemala.

Because all Willow Flycatcher subspecies look very similar, determining specific wintering sites for the southwestern race has been challenging. However, recent genetic analysis of wintering birds (Paxton, 2008) suggests that the four subspecies occupy finite areas of the wintering grounds, but with overlapping ranges. The Southwestern Willow Flycatcher appears to be largely restricted to the center of the winter range (in the vicinity of Costa Rica), although Paxton (2008) suggests more research is needed to address this question.

On the wintering grounds, flycatchers primarily are found in habitats that have four main components: (1) standing or slow moving water and/or saturated soils, (2) patches or stringers of trees, (3) woody shrubs, and (4) open areas (Koronkiewicz and Whitfield, 1999; Koronkiewicz and Sogge, 2000; Lynn and others, 2003; Nishida and Whitfield, 2007; Schuetz and others, 2007). Based on surveys to date, the presence of water or saturated soils is almost universal, although tree heights and configurations, the presence of woody shrubs, and the amount of open space surrounding winter territories can vary considerably (Schuetz and others, 2007).

Male and female flycatchers hold separate, individual non-breeding territories, and defend those territories throughout the winter by using song, calls, and aggression displays. Fidelity to wintering territories and sites is high, as is survivorship over the wintering period (Koronkiewicz and others, 2006b; Sogge and others, 2007).

Willow Flycatchers travel approximately 1,500–8,000 km each way between wintering and breeding areas. During migration, flycatchers use a wider array of forest and shrub habitats than they do for breeding, although riparian vegetation may still be a preferred migration habitat type (Finch and others, 2000). Migration requires high energy expenditures, exposure to predators, and successful foraging in unfamiliar areas. Therefore, migration is the period of highest mortality within the annual cycle of the flycatcher (Paxton and others, 2007). Willow Flycatchers of all subspecies sing during northward migration, perhaps to establish temporary territories for short-term defense of food resources.



Basemap modified from U.S. Geological Survey and other agency digital data, various scales. Projection Mercator, World Geodetic System1984 datum.

EXPLANATION

Approximate range distribution of the Willow Flycatcher (*Empidonax traillii*)—Adapted from Unitt (1987), Browning (1993), and Paxton (2008)

Breeding range, including boundaries of the Willow Flycatcher subspecies

? Wintering range—Question marks reflect uncertainty of the location of the eastern boundary of the winter range

Figure 1. Approximate ranges of the Willow Flycatcher (*Empidonax traillii*) during breeding and non-breeding seasons.

Southwestern Willow Flycatchers typically arrive on breeding grounds between early May and early June (Ellis and others, 2008; Moore and Ahlers, 2009). Because arrival dates vary annually and geographically, northbound migrant Willow Flycatchers of multiple subspecies pass through areas where Southwestern Willow Flycatchers have already begun nesting. Similarly, southbound migrants in late July and August may occur where Southwestern Willow Flycatchers are still breeding (Unitt, 1987). This can make it challenging for an observer to differentiate local breeders from migrants. Other than timing, we still know relatively little about Southwestern Willow Flycatcher migratory behavior, pathways, or habitat use.

Breeding Habitat

Breeding Southwestern Willow Flycatchers are riparian obligates, typically nesting in relatively dense riparian vegetation where surface water is present or soil moisture is high enough to maintain the appropriate vegetation characteristics (Sogge and Marshall, 2000; U.S. Fish and Wildlife Service, 2002; Ahlers and Moore, 2009). However, hydrological conditions in the Southwest can be highly variable within a season and between years, so water availability at a site may range from flooded to dry over the course of a breeding season or from year to year.

The Southwestern Willow Flycatcher breeds in dense riparian habitats across a wide elevational range, from near sea level in California to more than 2,600 m in Arizona and southwestern Colorado (Durst and others, 2008a). Vegetation characteristics of Southwestern Willow Flycatcher breeding habitat generally include dense tree or shrub cover that is ≥ 3 m tall (with or without a higher overstory layer), dense twig structure, and high levels of live green foliage (Allison and others, 2003); many patches with tall canopy vegetation also include dense midstory vegetation in the 2–5 m range. Beyond these generalities, the flycatcher shows adaptability in habitat selection, as demonstrated by variability in dominant plant species (both native and exotic), size and shape of breeding patch, and canopy height and structure (U.S. Fish and Wildlife Service, 2002).

Southwestern Willow Flycatcher breeding habitat can be quantified and characterized in a number of ways, depending on the level of detail needed and habitat traits of interest. For many sites, detailed floristic composition, plant structure, patch size, and even characteristics such as Normalized Difference Vegetation Index (NDVI) have been described in agency reports and scientific journal articles (Allison and others, 2003; Hatten and Paradzick, 2003; Koronkiewicz and others, 2006a; Hatten and Sogge, 2007; Moore, 2007; Schuetz and Whitfield, 2007; Ellis and others, 2008). For purposes of this survey protocol, we take a relatively simple approach and broadly describe and classify breeding sites based on plant species composition and habitat structure. Clearly, these are not the only important components, but they are conspicuous to human perception and easily observed and recorded. Thus, they have proven useful in conceptualizing, selecting and evaluating suitable survey habitat, and in predicting where breeding flycatchers are likely to be found.

Breeding habitat types commonly used by Southwestern Willow Flycatchers are described below. The general categories are based on the composition of the tree/shrub vegetation at the site—native broadleaf, exotic, and mixed native/exotic. In the field, breeding habitats occur along a continuum of plant species composition (from nearly monotypic to mixed species) and vegetation structure (from simple, single stratum patches to complex, multiple strata patches). The images in figures 2–7 illustrate some of the variation in flycatcher breeding habitat, and other examples can be found in numerous publications and agency reports, and on the USGS photo gallery web site (http://sbsc.wr.usgs.gov/SBSCgallery/). The intent of the descriptions and photographs is to provide a general guide for identifying suitable habitat in which to conduct surveys.

Native broadleaf.—Southwestern Willow Flycatchers breed across a great elevational range, and the characteristics of their native broadleaf breeding sites varies between high elevation sites and those at low and mid-elevation sites.

High elevation sites (fig. 2) range from nearly monotypic dense stands of willow to mixed stands of native broadleaf trees and shrubs, 2–7 m in height with no distinct overstory layer; often associated with sedges, rushes, nettles, and other herbaceous wetland plants; usually very dense structure in lower 2 m; live foliage density is high from the ground to the canopy. Vegetation surrounding the patch can range from open meadow, to agricultural lands, to pines or upland shrub.

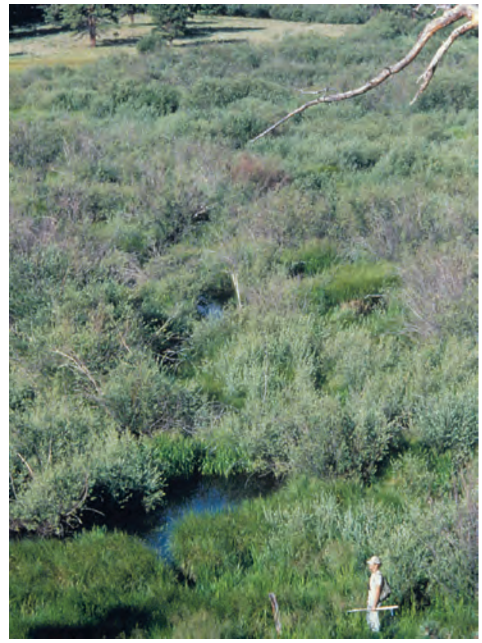
At low and mid-elevations (fig. 3), flycatcher breeding sites can be composed of single species (often Goodding's willow (*Salix gooddingii*), *S. exigua*, or other willow species) or mixtures of native broadleaf trees and shrubs including (but not limited to) cottonwood, willows, boxelder (*Acer negundo*), ash (*Fraxinus* spp.), alder (*Alnus* spp.), and buttonbush (*Cephalanthus* spp.), height from 3 to 15 m; characterized by trees of different size classes; often a distinct overstory of cottonwood, willow or other broadleaf tree, with recognizable subcanopy layers and a dense understory of mixed species; exotic/introduced species may be a rare component, particularly in the understory.

Monotypic exotic.—(fig. 4) Breeding sites also can include nearly monotypic, dense stands of exotics such as saltcedar (*Tamarix* spp.) or Russian olive (*Elaeagnus angustifolia*), 4–10 m in height forming a nearly continuous, closed canopy (with no distinct overstory layer); lower 2 m commonly very difficult to penetrate due to dense branches, however, live foliage density may be relatively low 1–2 m above ground, but increases higher in the canopy; canopy density uniformly high.

Aerial view of Little Colorado River near Greer, Arizona. Photograph by USGS, 1995.

Parkview Fish Hatchery, New Mexico. Photograph by USGS, 2000.

Tierra Azul, New Mexico. Photograph by USGS, 2005.



Little Colorado River near Greer, Arizona. Photograph courtesy of Arizona Game and Fish Department, 1996.

Rio Grande State Wildlife Area, Colorado. Photograph by USGS, 2002.

McIntyre Springs, Colorado. Photograph by USGS, 2002.

Figure 2. Examples of Southwestern Willow Flycatcher breeding habitat in native broadleaf vegetation at high-elevation sites.

Hassayampa River, Arizona. Photograph by USGS, 2003.

Santa Ynez River, California, Photograph by USGS, 1996.

San Luis Rey River, California. Photograph by USGS, 2005.

Kern River, California. Photograph by USGS, 1995.

Bosque del Apache, Rio Grande, New Mexico. Photograph courtesy of Bureau of Reclamation, 2008.

Kern River, California. Photograph by USGS, 1995.

Figure 3. Examples of Southwestern Willow Flycatcher breeding habitat in native broadleaf vegetation at low and mid-elevation sites.

Aerial view of Topock Marsh, Colorado River, Arizona. Photograph by USGS, 1996.

Salt River, Arizona. Photograph courtesy of Bureau of Reclamation, 1996.

Topock Marsh, Colorado River, Arizona. Photograph by USGS, 1996.

Orrilla Verde, Rio Grande, New Mexico. Photograph by USGS, 2006.

Rio Grande, New Mexico. Photograph by USGS, 2005.

Aerial view of Salt River, Arizona. Photograph by USGS, 1996.

Figure 4. Examples of Southwestern Willow Flycatcher breeding habitat in exotic vegetation.

Mixed native/exotic—(fig. 5) These sites include dense mixtures of native broadleaf trees and shrubs (such as those listed above) mixed with exotic/introduced species, such as saltcedar or Russian olive; exotics are often primarily in the understory, but may be a component of overstory; the native and exotic components may be dispersed throughout the habitat or concentrated as a distinct patch within a larger matrix of habitat; overall, a particular site may be dominated primarily by natives or exotics, or be a more-or-less equal mixture.

Regardless of the plant species composition or height, occupied sites almost always have dense vegetation in the patch interior (fig. 6). These dense patches are often interspersed with small openings, open water, or shorter/sparser vegetation, creating a mosaic that is not uniformly dense.

Gila River, Arizona. Photograph by USGS, 2002.

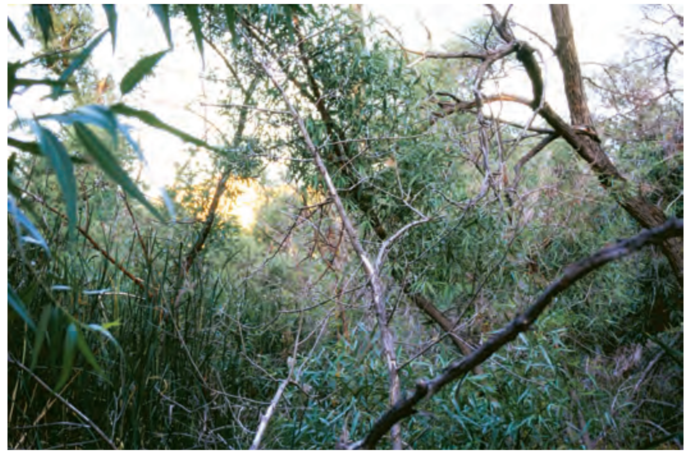
Roosevelt Lake, Arizona. Photograph by USGS, 1999.

Verde River River, Arizona. Photograph by USGS, 2002.

Virgin River, Utah. Photograph by USGS, 1997.

Figure 5. Examples of Southwestern Willow Flycatcher breeding habitat in mixed native/exotic vegetation.

Gila River, Arizona. Photograph by USGS, 2002.



Kern River, California. Photograph by USGS, 1999.

Rio Grande, New Mexico. Photograph by USGS, 2007.

Salt River, Arizona. Photograph by USGS, 1999.

Rio Grande, New Mexico. Photograph by USGS, 2007.

Rio Grande, New Mexico. Photograph by USGS, 2005.

Figure 6. Examples of dense vegetation structure within breeding habitats of Southwestern Willow Flycatcher.

Riparian patches used by breeding flycatchers vary in size and shape, ranging from a relatively contiguous stand of uniform vegetation to an irregularly shaped mosaic of dense vegetation with open areas. Southwestern Willow Flycatchers have nested in patches as small as 0.8 ha (for example, in the Grand Canyon) and as large as several hundred hectares (for example, at Roosevelt Lake, Ariz., or Elephant Butte Reservoir, New Mex.). They have only rarely been found nesting in isolated, narrow, linear riparian habitats that are less than 10 m wide, although they will use such linear habitats during migration.

Flycatcher territories and nests typically are adjacent to open water, cienegas, marshy seeps, or saturated soil, and within riparian areas rooted in standing water. However, in the Southwest, hydrological conditions at a site can vary remarkably within a season, between years, and among nearby sites (fig. 7). Surface water or saturated soil may only be present early in the breeding season (that is, May and part of June), especially in dry years. Similarly, vegetation at a patch may be immersed in standing water during a wet year, but be hundreds of meters from surface water in dry years (Ahlers and Moore, 2009). This is particularly true of reservoir sites, such as the Kern River at Lake Isabella, Calif., Tonto Creek and Salt River at Roosevelt Lake, and the Rio Grande near Elephant Butte Reservoir. Natural or human-caused river channel modifications and altered subsurface flows (for example, from agricultural runoff), can lead to a total absence of water or visibly saturated soil at a site for several years.

Other potentially important aspects of Southwestern Willow Flycatcher habitat include distribution and isolation of vegetation patches, hydrology, food base (arthropods), parasites, predators, environmental factors (for example temperature, humidity), and interspecific competition (U.S. Fish and Wildlife Service, 2002). Population dynamics

Rio Grande at San Marcial, New Mexico, with dry substrate. Photograph by USGS, 2007.

Rio Grande at San Marcial, New Mexico, with flowing water beneath the territories. Photograph by USGS, 2007.

Tonto Creek inflow to Roosevelt Lake, Arizona, during a dry year. Photograph by USGS, 2004.

Tonto Creek inflow to Roosevelt Lake, Arizona, during high-water year. Photograph by USGS, 2005.

Figure 7. Examples of the variable hydrologic conditions at breeding habitats of Southwestern Willow Flycatcher.

factors, such as demography (for example, survivorship rates, fecundity), distribution of breeding groups across the landscape, flycatcher dispersal patterns, migration routes, the tendency for adults and surviving young to return to their previous year breeding site, and conspecific sociality also influence where flycatchers are found and what habitats they use (U.S. Fish and Wildlife Service, 2002).

It is critically important to recognize that the ultimate measure of habitat suitability is not simply whether or not a site is occupied. Habitat suitability occurs along a gradient from high to poor to unsuitable; the best habitats are those in which flycatcher reproductive success and survivorship result in a stable or growing population. Some occupied habitats may be acting as population sources, while others may be functioning as population sinks (Pulliam, 1988). Therefore, it can take extensive research to determine the quality of any given habitat patch. Furthermore, productivity and survival rates can vary widely among years (Paxton and others, 2007; Ellis and others, 2008; Ahlers and Moore, 2009), so conclusions based on short-term datasets or data extrapolated from one area to another may be erroneous. It also is important to note that not all unoccupied habitat is unsuitable; some sites with suitable habitat may be geographically isolated or newly established, such that they are not yet colonized by breeding flycatchers. There also may simply not be enough flycatchers in a given area to fill all available habitat in particular locations (U.S. Fish and Wildlife Service, 2002). A better understanding of which habitats or sites are sinks or sources can be especially helpful in site conservation and restoration planning.

As described earlier, migrant Willow Flycatchers may occur in riparian habitats that are structurally unsuitable for breeding (for example, too sparse, smaller patch size, etc.), and in non-riparian habitats. Such migration stopover areas, even though not used for breeding, may be critically important resources affecting local and regional flycatcher productivity and survival (U.S. Fish and Wildlife Service, 2002, 2005).

Breeding Chronology and Biology

Unless otherwise noted, the information that follows and upon which the generalized breeding season chronology (fig. 8) is based comes from Unitt (1987), Whitfield (1990), Maynard (1995), Sogge and others (2003b), Paxton and others (2007), Schuetz and Whitfield (2007), and Ellis and others (2008). Extreme or record dates for any stage of the breeding cycle may vary by 1–2 weeks from the dates presented, depending on the geographic area, extreme weather events, yearly variation and other factors. Higher elevation areas, in particular, have delayed chronology (Ahlers and White, 2000).

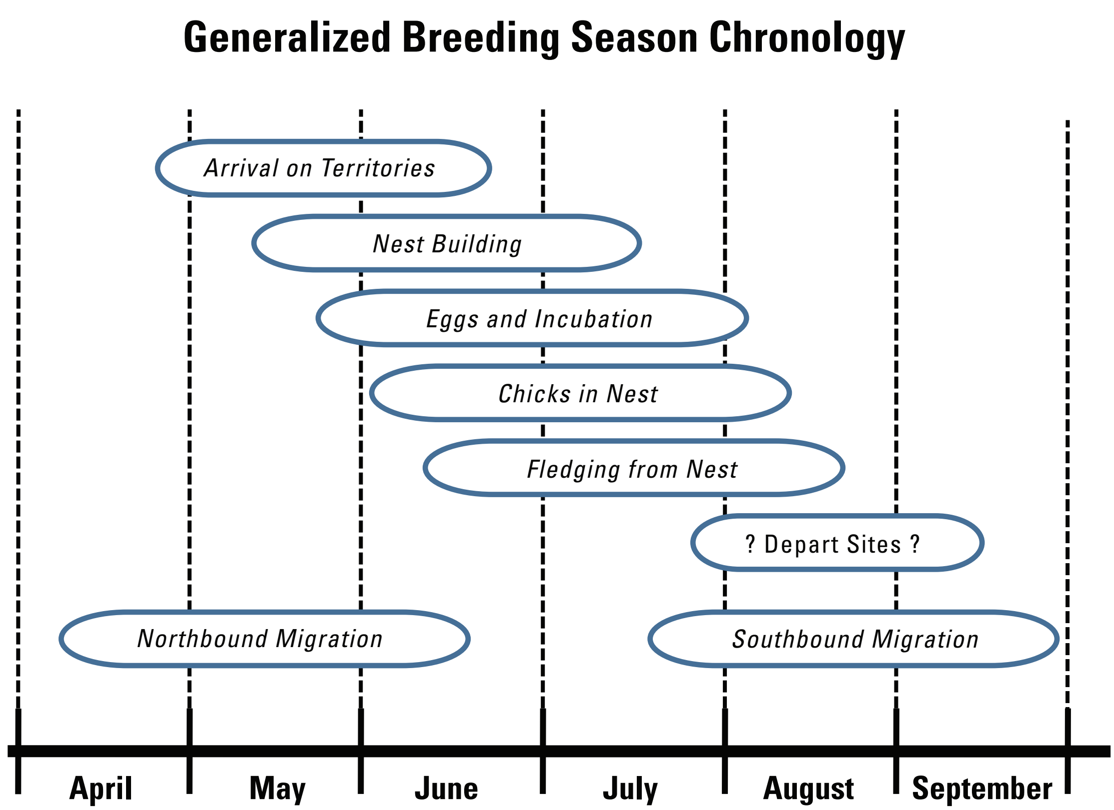


Figure 8. Generalized migration and breeding chronology for the Willow Flycatcher in the Southwest. Extreme or record dates may occur slightly earlier or later than indicated.

Both sexes can breed beginning in their second year. Male Southwestern Willow Flycatchers generally arrive at breeding areas first; older males typically arrive before younger ones. Although females usually arrive a few weeks after males, some older females are present at sites before late-arriving males. Adult flycatchers will sometimes wander extensively through large riparian sites before and after breeding, possibly as a way to evaluate potential breeding habitat (Cardinal and others, 2006).

Males establish and defend their territories through singing and aggressive interactions. Females settle on established territories, and may choose a territory more for its habitat characteristics than for the traits of its territorial male. Territory size tends to be larger when a male first arrives, then gets smaller after a female pairs with the male (Cardinal and others, 2006). Similarly, male song rate is very high early in the season, then declines after pairing (Yard and Brown, 2003). Not all males are successful in attracting mates in a given year, and as a result unpaired territorial males occur at many breeding sites. Unpaired males are usually a small percentage of any local population, but can comprise as much as 15–25 percent of the territories in some populations (Munzer and others, 2005; Ahlers and Moore, 2009).

Although the Willow Flycatcher as a species is considered predominantly monogamous during the breeding season (Sedgwick, 2000), some Southwestern Willow Flycatcher populations have a relatively high degree of polygyny whereby one male can have more than one breeding female in its territory. Polygynous males generally have two females in their territory, but up to four have been recorded (Davidson and Allison, 2003; Pearson and others, 2006). Polygyny rates can vary between sites, and among years at a given site. At some sites, polygynous males have much higher productivity than monogamous males (Paxton and others, 2007).

Nest building within the territory usually begins within a week or two after pair formation. Egg laying begins as early as mid-May, but more often starts in late May to mid-June. Chicks can be present in nests from late May through early August. Young typically fledge from nests from mid-June through mid-August; later fledglings are often products of re-nesting attempts. Breeding adults generally depart from their territories in early to mid-August, but may stay later if they fledged young late in the season. Males that fail to attract or retain mates, and males or pairs that are subject to significant disturbance, such as repeated nest parasitism or predation may leave territories by early July. Fledglings probably leave the breeding areas a week or two after adults, but few details are known.

Southwestern Willow Flycatcher territory size varies widely, probably due to differences in population density, habitat quality (including vegetation density and food availability), and nesting stage. Studies have reported estimated territory sizes ranging from 0.06 to 2.3 ha (Sogge and others, 1995; Whitfield and Enos, 1996; Bureau of Reclamation, 2009). At Roosevelt Lake, Ariz., measurements of home ranges, which include the defended territory and sometimes adjacent use areas, averaged 0.4 ha for actively breeding males; home range can be much larger for pre- and post-breeding males (Paxton and others, 2007). During incubation and nestling phases territory size, or at least the activity centers of pairs, can be very small. Flycatchers may increase their activity area after young are fledged, and use non-riparian habitats adjacent to the breeding area (Cardinal and others, 2006). This variability among sites, individual territories, and over time illustrates the challenge of defining a minimum habitat patch size for breeding flycatchers, or estimating the number of territories based simply on the size of a given breeding site.

At some breeding sites, non-territorial adult "floaters" will be present among the territorial population. Floaters are quieter and less aggressive than territorial adults, and therefore are harder to detect and frequently overlooked. Most floaters are young males, and float for only a single year. At Roosevelt Lake, floaters typically accounted for 3–8 percent of the known adult population, although the rate was much higher in drought years when habitat quality was lower (Paxton and others, 2007). The presence of floaters in a population may indicate that there is not enough high quality habitat to support all potentially territorial individuals present in a given breeding season.

Nests and Eggs

Historically, 75–80 percent of reported Southwestern Willow Flycatcher nests were placed in willows (Phillips, 1948; Phillips and others, 1964; Hubbard, 1987; Unitt, 1987). Southwestern Willow Flycatchers still commonly place their nests in native plants, but will often build nests in exotics, such as saltcedar and Russian olive (Sogge and Marshall, 2000; Stoleson and Finch, 2003; Durst and others, 2008a). In Arizona, most nests are in saltcedar or willows (Paradzick and Woodward, 2003; McLeod and others, 2007). In a unique situation in San Diego County, Calif., the flycatcher nests in coast live oak (*Quercus agrifolia*) along the San Luis Rey River (Haas, 2003), where oak became the dominant plant species adjacent to the river following willow removal in the 1950s. In another unusual situation, flycatchers in the Cliff-Gila Valley in New Mex. nest in tall boxelder (Stoleson and Finch, 2003). Southwestern Willow Flycatcher nests also have been found in buttonbush, black twinberry (*Lonicera involucrata*), Fremont cottonwood (*Populus fremontii*), alder (*Alnus* spp.), blackberry (*Rubus ursinus*), baccharis (*Baccharis* spp.), and stinging nettle (*Urtica* spp.). Overall, flycatcher nest site selection appears to be driven more by plant structure than by species composition.

Southwestern Willow Flycatchers build open cup nests approximately 8 cm high and 8 cm wide (outside dimensions), exclusive of any dangling material at the bottom. Females build the nest with little or no assistance from the males. Nests typically are placed in the fork of a branch with the nest cup supported by several small-diameter vertical stems. Nest height is highly variable and depends on the available plant structure within the territory; nests have been found from 0.6 m to approximately 20 m above ground. In any given habitat type or nest substrate, nests can be placed wherever suitable twig structure and vegetative cover are present.

Egg laying generally begins from mid-May through mid-June, depending on the geographic area and elevation. Willow Flycatcher eggs are buffy or light tan, approximately 18 mm long and 14 mm wide, with brown markings in a wreath at the blunt end. Clutch size is usually three or four eggs for first nests. Only the female develops a brood patch and incubates the eggs. Incubation lasts 12–13 days from the date the last egg is laid, and all eggs typically hatch within 24–48 hours of each other.

Flycatcher chicks are altricial and weigh only about 1–2 g at hatching, but grow rapidly and are ready to leave the nest at 12–15 days of age (Sedgwick, 2000; Paxton and Owen, 2002). The female provides most or all initial care of the young, although the role of the male increases with the age and size of nestlings. After Willow Flycatchers fledge at 12–15 days of age, they stay close to the nest and each other for 3–5 days, and adults continue feeding the fledged young for approximately 2 weeks. Recently fledged birds may repeatedly return to and leave the nest during this period (Spencer and others, 1996). Both male and female adults feed the fledged young, which give frequent, loud "*peep*" calls.

Southwestern Willow Flycatchers readily re-nest following an unsuccessful nesting attempt, although rarely more than once (Ellis and others, 2008). They also will sometimes nest again (double brood) following a successful nesting attempt, although this is more uncommon than re-nesting and varies between sites and years. From 2002 to 2008 at Elephant Butte Reservoir, approximately 13 percent of the pairs produced two successful nests per year (Ahlers and Moore, 2009). The productivity gains from pairs having successful second nests are important drivers of positive population growth (Paxton and others, 2007; Moore and Ahlers, 2009).

Replacement nests are built in the same territory, either in the same plant or at a distance of as much as 20 m from the previous nest. Reuse of old nests is uncommon, but does occur (Yard and Brown, 1999; Darrell Ahlers, Bureau of Reclamation, unpub. data, 2009). Replacement nest building and egg laying can occur (uncommonly) as late as the end of July or early August. Pairs may attempt a third nest if the second fails. However, clutch size, and therefore potential productivity, decreases with each nest attempt (Whitfield and Strong, 1995; Ellis and others, 2008).

Food and Foraging

The breeding season diet of Southwestern Willow Flycatchers is relatively well documented (DeLay and others, 2002; Drost and others, 2003; Durst, 2004; Wiesenborn and Heydon, 2007; Durst and others, 2008b). Breeding flycatchers are exclusively insectivorous, and consume a wide range of prey taxa ranging in size from small leafhoppers (Homoptera) to large dragonflies (Odonata). Major prey taxa include bugs (Hemiptera), bees and wasps (Hymenoptera), flies (Diptera), and leafhoppers; however, diet can vary widely between years and among different habitat types. There is no known differences in diet by sex, but there are differences between adult and nestling diet in the proportions of some arthropod groups. Differences in the composition of arthropods in flycatcher diet have been documented between native and exotic habitats, and between years within particular breeding sites; however, flycatchers appear able to tolerate substantial variation in relative prey abundance, except in extreme situations such as severe droughts (Durst and others, 2008b).

Willow Flycatchers of all subspecies forage primarily by sallying from a perch to perform aerial hawking and gleaning (Sedgwick, 2000; Durst, 2004). Males and females forage with similar maneuvers, although males may forage higher in the tree canopy than females. Foraging frequently takes place at external edges or internal openings within a habitat patch, or at the top of the upper canopy.

Site Fidelity and Survivorship

Based on studies of banded birds, most adult Southwestern Willow Flycatchers that survive from one year to the next will return to the same river drainage, often in proximity to the same breeding site (U.S. Fish and Wildlife Service, 2002; McLeod and others, 2007; Paxton and others, 2007). However, it is common for individual flycatchers to return to different sites within a breeding area, and even to move between breeding areas, from one year to the next. Some of this movement may be related to breeding success and habitat quality. At Roosevelt Lake, those birds that moved to different sites within a breeding area had on average higher productivity in the year following the move than in the year before the move (Paxton and others, 2007). At Roosevelt Lake and on the San Pedro and Gila Rivers, movement out of breeding patches also increased with the relative age of a patch, which may indicate a preference for younger riparian vegetation structure.

In addition to movements within a breeding site, long-distance movements within and between drainages have been observed (Paxton and others, 2007), at distances up to approximately 450 km. Dispersal of first-year flycatchers is more extensive than adult birds, as typical for most bird species.

Survivorship within the breeding season can be very high, averaging 97 percent at Roosevelt Lake (Paxton and others, 2007). Between-year survivorship of adults can be highly variable, but appears to be similar to that of most small passerine birds studied, with estimates generally ranging from approximately 55 to 65 percent (Stoleson and others, 2000; McLeod and others, 2007; Paxton and others, 2007; Schuetz and Whitfield, 2007). Males and females have similar survivorship rates.

Estimated survivorship of young birds (from hatching to the next breeding season) is highly variable, depending in part on how the estimates are generated (Stoleson and others, 2000). Generally reported as between 15 and 40 percent, juvenile survivorship typically is lower than adult survivorship (Whitfield and Strong, 1995; Stoleson and others, 2000; McLeod and others, 2007). Early fledging young have higher survivorship than those that leave the nest later in the season (Whitfield and Strong, 1995; Paxton and others, 2007). Most flycatchers survive for only 1–2 adult years, and mean life expectancy in Arizona was estimated to be 1.9 years following fledging. However, some individuals live much longer. The maximum reported ages of banded Southwestern Willow Flycatchers are 9–11 years (Sedgwick, 2000; Paxton and others, 2007).

Overall, the Southwestern Willow Flycatcher population appears to persist as one or more widely dispersed metapopulations (Busch and others, 2000; U.S. Fish and Wildlife Service, 2002), with movement of individuals, and thus genetic exchange, occurring across the landscape. However, the amount of movement and interchange is lower among sites that are farther apart or more isolated. Some sites serve as population sources while others may be sinks; some sites will be ephemeral over periods of years or decades. Flycatcher movement and dispersal among sites is important for initial site colonization and subsequent recolonization.

There are few general predictors for the persistence of breeding sites. Relatively large populations, such as the Kern River Preserve, San Pedro River, Elephant Butte Reservoir, and the Gila River have persisted for 10 or more years. However, such large sites can be subject to major changes in population numbers, and even potential extirpation, due to changes in local hydrology, site inundation, drought, etc. (Moore, 2005; Paxton and others, 2007). Although some small populations may be ephemeral and last only a few years (Durst and others, 2008a), others have remained occupied for much longer periods (Kus and others, 2003). Breeding populations also may reappear at unoccupied sites following 1–5 year absences. Suitable flycatcher habitat also can develop—and poor quality habitat can improve—relatively quickly in some sites, under favorable hydrological conditions. For example, at Roosevelt Lake and the San Pedro River (AZ), the age of riparian vegetation when first colonized was as young as 3 years (Paxton and others, 2007). In the same study, flycatchers moved back into older habitat patches when nearby younger, occupied habitat was inundated or scoured away.

Overall, the vegetation and flycatcher occupancy of a habitat patch or river drainage are often dynamic; few if any sites remain static over time. The amount of suitable flycatcher habitat can substantially increase or decrease in just a few years, at local and regional scales. Flycatchers can respond quickly to habitat changes, colonizing new sites if available and abandoning others. Therefore, one cannot assume that local, regional, or rangewide flycatcher population numbers will remain stable over time.

Threats to the Flycatcher and Habitat

The greatest historical factor in the decline of the Southwestern Willow Flycatcher is the extensive loss, fragmentation, and modification of riparian breeding habitat (U.S. Fish and Wildlife Service, 2002). Large-scale losses of southwestern wetlands have occurred, particularly the cottonwood-willow riparian habitats historically used by the Southwestern Willow Flycatcher (Unitt, 1987; General Accounting Office, 1988; Dahl, 1990; State of Arizona, 1990). Changes in the riparian plant community have frequently reduced, degraded, and eliminated nesting habitat for the flycatcher, curtailing its distribution and abundance.

Habitat losses and changes have occurred and continue to occur because of urban, recreational, and agricultural development, water diversion and impoundment, channelization, livestock grazing, and replacement of native habitats by introduced plant species (Marshall and Stoleson, 2000; U.S. Fish and Wildlife Service, 2002). Hydrological changes, natural or man-made, can greatly reduce the quality and extent of flycatcher habitat. Although riparian areas are often not considered as fire-prone, several Southwestern Willow Flycatcher breeding sites were destroyed by fire over the past decade (U.S. Fish and Wildlife Service, 2002), and others are at risk to similar catastrophic loss. Fire danger in these riparian systems may be exacerbated by increases in exotic vegetation, such as saltcedar, diversions or reductions of surface water, increased recreational activity, and drawdown of local water tables.

Although the degradation of many river systems and associated riparian habitat is a key cause of their absence, Southwestern Willow Flycatchers do not require free-running rivers or “pristine” riparian habitats. Most of the largest

Southwestern Willow Flycatcher populations in the last decade were found in reservoir drawdown zones, such as at Roosevelt Lake and Elephant Butte Reservoir. Many breeding populations are found on regulated rivers (Graf and others, 2002). In addition, the vegetation at many smaller flycatcher breeding sites is supported by artificial water sources such as irrigation canals, sewage outflow, or agricultural drainages (U.S. Fish and Wildlife Service, 2002). Although rising water levels could be detrimental to breeding flycatchers within a reservoir drawdown zone, reservoir fluctuations can simulate river dynamics with cycles of destruction and establishment of riparian vegetation, depositing rich sediments and flushing salt accumulations in the soil (Paxton and others, 2007). Therefore, managed and manipulated rivers and reservoirs have the potential to play a positive role by providing flycatcher breeding habitat. However, because rivers and reservoirs are not managed solely to create and maintain flycatcher habitat, the persistence of riparian vegetation in these systems—and any flycatchers breeding therein—is not assured.

Although the historic degradation and loss of native riparian negatively affected the Southwestern Willow Flycatcher, this species does not show an inherent preference for native vegetation. Instead, breeding habitat selection is based primarily on vegetation structure, density, size, and other stand characteristics, and presence of water or saturated soils (U.S. Fish and Wildlife Service, 2002). In fact, approximately 25 percent of known territories are found in habitat composed of 50 percent or greater exotic vegetative component—primarily saltcedar (Durst and others, 2008a). Saltcedar also can be an important habitat component in sites dominated by native vegetation (U.S. Fish and Wildlife Service, 2002, 2005). Despite suggestions that flycatchers breeding in saltcedar are suffering negative consequences and that removal of saltcedar is therefore a benefit (DeLoach and others, 2000; Dudley and DeLoach, 2004), there is increasing and substantial evidence that this is not the case. For example, Paxton and others (2007) found that flycatchers did not suffer any detectable negative consequences from breeding in saltcedar. This is consistent with the findings of Owen and others (2005) and Sogge and others (2006). Therefore, the rapid or large-scale loss of saltcedar in occupied flycatcher habitats, without rapid replacement of suitable native vegetation, could result in reduction or degradation of flycatcher habitat (U.S. Fish and Wildlife Service, 2002; Sogge and others, 2008).

In evaluating Southwestern Willow Flycatcher use of either native or exotic habitat, it is important to recognize that throughout the Southwest, there are many saltcedar-dominated and native-dominated habitats in which flycatchers do not breed (U.S. Fish and Wildlife Service, 2002; Sogge and others, 2006). Therefore, the use of any riparian patch—native or exotic—as breeding habitat will be site specific and will depend on the spatial, structural, and ecological characteristics of that particular patch and the potential for flycatchers to colonize and maintain populations within it.

Drought can have substantial negative effects on breeding flycatchers and their breeding habitat by reducing riparian vegetation vigor and density, and reducing prey availability (Durst, 2004; Paxton and others, 2007; Bureau of Reclamation, 2009). For example, the extreme drought of 2002 caused near complete reproductive failure of the large flycatcher population at Roosevelt Lake; among approximately 150 breeding territories, only two nests successfully fledged young in that year (Ellis and others, 2008). If future climate change produces more frequent or more sustained droughts, as predicted by many climate change models (for example, Seager and others, 2007), southwestern riparian habitats could be reduced in extent or quality. This scenario would present a challenge to the long-term sustainability of Southwestern Willow Flycatcher populations.

Brood parasitism by the Brown-headed Cowbird (*Molothrus ater*) was initially considered another significant threat to the Southwestern Willow Flycatcher (Whitfield, 1990; Harris, 1991; U.S. Fish and Wildlife Service, 1993, 1995; Whitfield and Strong, 1995; Sferra and others, 1997). Cowbirds lay their eggs in the nest of other species (the "hosts"), which raise the young cowbirds—often at the expense of reduced survivorship of their own young. Southwestern Willow Flycatchers seldom fledge any flycatcher young from nests that are parasitized by cowbirds (Whitfield and Sogge, 1999). Although parasitism negatively impacts some Southwestern Willow Flycatcher populations, especially at small and isolated breeding sites, it is highly variable and no longer considered among the primary rangewide threats to flycatcher conservation (U.S. Fish and Wildlife Service, 2002). Cowbird abundance, and therefore parasitism, tends to be a function of habitat type and quality, and the availability of suitable hosts, not specific to the flycatcher. Therefore, large-scale cowbirds control may not always be warranted unless certain impact thresholds are met (U.S. Fish and Wildlife Service, 2002; Rothstein and others, 2003; Siegle and Ahlers, 2004).

Section 2. Survey Protocol

The fundamental principles of the methodology described in this version have remained the same since the original Tibbitts and others (1994) and subsequent Sogge and others (1997a) protocols: the use of vocalization play-back, repeated site visits, and confirmation of flycatcher identity via the species-characteristic song. This newest protocol incorporates guidelines of the 2000 USFWS addendum, and includes changes based on our improved understanding of Willow Flycatcher biology and the significance of potential threats, and the availability of new survey technologies.

Several factors work together to make Southwestern Willow Flycatcher surveys challenging. Difficulties include the flycatcher's physical similarities with other species and subspecies; accessing the dense habitat they occupy; time constraints based on their breeding period; and vocalization patterns. Given these challenges, no methodology can assure 100-percent detection rates. However, the survey protocol described herein has proven to be an effective tool for locating flycatchers, and flycatchers generally are detectable when the protocol is carefully followed. Since 1995, hundreds of sites have been surveyed and thousands of flycatchers detected using the two previous versions of the survey protocol.

The Willow Flycatcher is 1 of 10 regularly occurring *Empidonax* flycatchers found in North America, all of which look very much alike. Like all *Empidonax*, Willow Flycatchers are nondescript in appearance, making them difficult to see in dense breeding habitat. Although the Willow Flycatcher has a characteristic *fitz-bew* song that distinguishes it from other birds (including other *Empidonax*), Willow Flycatchers are not equally vocal at all times of the day or during all parts of the breeding season. Because Southwestern Willow Flycatchers are rare and require relatively dense riparian habitat, they may occur only in a small area within a larger riparian system, thus decreasing detectability during general bird surveys. Migrating Willow Flycatchers (of all subspecies) often sing during their migration through the Southwest, and could therefore be confused with local breeders. In addition, Southwestern Willow Flycatchers are in breeding areas for only 3–4 months of the year. Surveys conducted too early or late in the year would fail to find flycatchers even at sites where they breed.

These life history characteristics and demographic factors influence how Southwestern Willow Flycatcher surveys should be conducted and form the basis upon which this protocol was developed. This protocol is based on the use of repeated call-playback surveys during pre-determined periods of the breeding season, to confirm presence or to derive a high degree of confidence regarding their absence at a site. Such species-specific survey techniques are necessary to collect reliable presence/absence information for rare species (Bibby and others, 1992).

The primary objective of this protocol is to provide a standardized survey technique to detect Southwestern Willow Flycatchers, determine breeding status, and facilitate consistent and standardized data reporting. The survey technique will, at a minimum, help determine presence or absence of the species in the surveyed habitat for that breeding season. Ultimately, the quality of the survey that is conducted will depend on the preparation, training, and in-the-field diligence of the individual surveyor.

This protocol is designed for use by persons who are non-specialists with *Empidonax* flycatchers or who are not expert birders. However, surveyors must have sufficient knowledge, training, and experience with bird identification and surveys to distinguish the Willow Flycatcher from other non-*Empidonax* species, and be able to recognize the Willow Flycatcher's primary song. A surveyor's dedication and attitude, willingness to work early hours in dense, rugged and wet habitats, and their ability to remain alert and aware of important cues also are important. Surveys conducted improperly or by unqualified, inexperienced, or complacent personnel may lead to inaccurate results and unwarranted conclusions.

Surveys conducted by qualified personnel in a consistent and standardized manner will enable continued monitoring of general population trends at and between sites, and between years. Annual or periodic surveys in cooperation with State and Federal agencies should aid resource managers in gathering basic information on flycatcher status and distribution at various spatial scales. Identifying occupied and unoccupied sites will assist resource managers in assessing potential impacts of proposed projects, avoiding impacts to occupied habitat, identifying suitable habitat characteristics, developing effective restoration management plans, and assessing species recovery.

The earlier versions of this protocol (Tibbitts and others, 1994; Sogge and others, 1997a) were used extensively and successfully for many years. Hundreds of flycatcher surveys conducted throughout the Southwest since 1994 revealed much about the usefulness and application of this survey technique. Three important lessons were: (1) the call-playback technique works and detects flycatchers that would have otherwise been overlooked; (2) multiple surveys at each site are important; and (3) with appropriate effort, general biologists without extensive experience with *Empidonax* can find and verify Willow Flycatcher breeding sites.

This revised protocol is still based on call-playback techniques and detection of singing individuals. However, it includes changes in the timing and number of surveys to increase the probability of detecting flycatchers and to help determine if they are breeders or migrants. It also incorporates the basic premise of the USFWS 2000 addendum to the 1997 protocol by requiring a <u>minimum</u> of five surveys in all "project-related" sites. A detailed description of surveys and timing is discussed in section, "Timing and Number of Visits." Changes in the survey data sheets make them easier to use and submit, and allow reporting all site visits within a single year on one form. The new survey forms also are formatted such that the data on the respective forms can be easily incorporated into the flycatcher range-wide database.

This protocol is intended to determine if a habitat patch contains territorial Southwestern Willow Flycatchers, and is not designed establish the exact distribution and abundance of flycatchers at a site. Determining precise flycatcher numbers and locations requires many more visits and additional time observing the behavior of individual birds. This survey protocol also does not address issues and techniques associated with nest monitoring or other flycatcher research activities. Those efforts are beyond the scope usually needed for most survey purposes, and require advanced levels of experience and skills to gather useful data and avoid potential negative effects to the flycatcher. If nest monitoring is a required component of your study, refer to Rourke and others (1999) for appropriate nest monitoring techniques (available for download at http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/reports.asp).

Biologists who are not expert birders or specialists with regard to *Empidonax* flycatchers can effectively use this protocol. However, users should attend a U.S. Fish and Wildlife Service-approved Southwestern Willow Flycatcher survey training workshop, and have knowledge and experience with bird identification, surveys, and ecology sufficient to effectively apply this protocol.

Permits

Federal endangered species recovery permits are required for surveys in all USFWS regions where the Southwestern Willow Flycatcher breeds (application forms can be downloaded at http://www.fws.gov/forms/3-200-55.pdf). State permits also may be required before you can survey within any of the States throughout the Southwestern Willow Flycatcher's range: be certain to check with the appropriate State wildlife agency in your area. It usually takes several months to receive permits, so apply early to avoid delays in starting your surveys. You also must obtain permission from government agencies and private landowners prior to conducting any surveys on their lands.

Pre-Survey Preparation

The degree of effort invested in pre-survey preparation will have a direct effect on the quality and efficiency of the surveys conducted. Pre-survey preparation is often overlooked, but can prove to be one of the more important aspects in achieving high-quality survey results.

Surveyors should study calls, songs, drawings, photographs, and videos of Willow Flycatchers. Several web sites describe life history requirements, and provide photographs and vocalizations. It is especially critical for surveyors to be familiar with Willow Flycatcher vocalizations before going in the field. Although the *fitz-bew* song is the basis of verifying detections using this protocol, Willow Flycatchers use many other vocalizations that are valuable in locating birds and breeding sites. We strongly encourage that all surveyors learn as many vocalizations as possible and refer to the on-line "Willow Flycatcher Vocalizations; a Guide for Surveyors" (available at http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/wiflvocl.asp). Several commercial bird song recordings include Willow Flycatcher vocalizations, but these recordings typically have only a few vocalizations and the dialects may differ from those heard in the Southwest.

If possible, visit known Willow Flycatcher breeding sites to become familiar with flycatcher appearance, behavior, vocalizations, and habitat. Such visits are usually part of the standardized flycatcher survey workshops. All visits should be coordinated with USFWS, State wildlife agencies, and the property manager/owner, and must avoid disturbance to territorial flycatchers. While visiting these sites, carefully observe the habitat characteristics to develop a mental image of the key features of suitable habitat.

Surveyors must be able to identify, by sight and vocalizations, other species likely to be found in survey areas that may be confused with Southwestern Willow Flycatchers. These include Bell's Vireo (*Vireo bellii*), Western Wood-pewee (*Contopus sordidulus*), young or female Vermillion Flycatchers (*Pyrocephalus rubinus*), and other *Empidonax* flycatchers. At a distance, partial song or call notes of Bell's Vireo, Ash-throated Flycatchers (*Myiarchus cinerascens*) and some swallows can sound considerably like a *fitz-bew*. Surveyors also should be able to identify Brown-headed Cowbirds by sight and vocalizations. It is worthwhile to make one or more pre-survey trips to the survey sites or other similar areas to become familiar with the local bird fauna. You might consider obtaining a species list relative to your area and become familiar with those species by site and sound.

Prior to conducting any presence/absence surveys in your respective State or USFWS Region, contact the respective flycatcher coordinators to discuss the proposed survey sites and determine if the sites have been surveyed in prior years. If possible, obtain copies of previous survey forms and maintain consistency with naming conventions and site boundaries. Study the forms to determine if flycatchers have been previously detected in the site, record locations of any previous detections, and read the comments provided by prior surveyors. While surveying, be sure to pay special attention to any patches where flycatchers have previously been detected.

Familiarity with the survey site prior to the first surveys is the best way to be prepared for the conditions you will experience. Determine the best access routes to your sites and always have a back-up plan available in the event of unforeseen conditions (for example, locked gates, weather, etc.). Know the local property boundaries and where the potential hazards may be, including deep water, barbed wire fencing, and difficult terrain. Be prepared to work hard and remain focused and diligent in a wide range of physically demanding conditions. At many sites, these include heat, cold, wading through flowing or stagnant water, muddy or swampy conditions, crawling through dense thickets (often on hands and knees), and exposure to snakes, skunks, and biting insects.

It is imperative that all surveyors exercise the adage “safety first.” Be aware of safety hazards and how to avoid them, and do not allow the need to conduct surveys to supersede common sense and safety. Inform your coworkers where you will be surveying and when you anticipate returning. Always take plenty of water and know how to effectively use your equipment, especially compass, Global Positioning System (GPS), and maps.

Equipment

The following equipment is necessary to conduct the surveys:

1. **USGS topographic maps of the area**: A marked copy is required to be attached to survey data sheets submitted at the end of the season. Be sure to always delineate the survey area and clearly mark any flycatcher detections. If the survey area differed between visits; delineate each survey individually.
2. **Standardized survey form**: Always bring more copies than you think you need.
3. **Lightweight audio player**: Be sure the player has adequate volume to carry well; use portable speakers if necessary. Several digital devices, such as CD players and MP3 players, are currently available and can be connected to external amplified speakers for broadcasting the flycatcher vocalizations. However, not all are equally functional or effective in field conditions; durability, reliability, and ease of use are particularly important. Talk to experienced surveyors for recommendations on particular models and useful features.
4. **Extra player and batteries**: In the field, dirt, water, dust, and heat often cause equipment failure, and having backup equipment helps avoid aborting a survey due to equipment loss or failure.
5. **Clipboard and permanent (waterproof) ink pen**: We recommend recording survey results directly on the survey data form, to assure that you collect and record all required data and any field notes of interest.
6. **Aerial photographs**: Aerial photographs can significantly improve your surveys by allowing you to accurately target your efforts, thus saving time and energy in the field. Previously, aerial images were often expensive and difficult to obtain. However, it is now easy to get free or low-cost images from sources, such as Google© Earth. Even moderate resolution images generally are better than none. For higher resolution aerial photographs, check with local planning offices and/or State/Federal land-management agencies for availability. Take color photocopies, not the original aerial photographs, with you in the field. Aerial photographs also are very useful when submitting your survey results but cannot be substituted in lieu of the required topographic map.
7. **Binoculars and bird field guide**: Although this protocol relies primarily on song detections to verify flycatcher presence, good quality binoculars are still a crucial field tool to help distinguish between possible Southwestern Willow Flycatchers and other species. Use a pair with 7–10 power magnification that can provide crisp images in poor lighting conditions. A good field guide also is essential for the same reason.
8. **GPS unit**: A GPS unit is needed for determining survey coordinates and verifying the location of survey plots on topographic maps. All flycatcher detections should be stored as waypoints and coordinates recorded on the survey form. A wide variety of fairly inexpensive GPS units are currently available. Most commercially available units will provide accuracy within 10 m, which is sufficient for navigating and marking locations.
9. **Compass**: Surveyors should carry a compass to help them while navigating larger habitat patches. This is an important safety back-up device, because GPS units can fail or lose power. Most GPS units have a feature to provide an accurate bearing to stored waypoints (for example, previous flycatcher detections, your parked vehicle, etc.); however, many units do not accurately display the direction in which the surveyor is traveling slowly through dense vegetation. A compass set to the proper bearing provides a more reliable method to navigate the survey site and relocate previously marked locations.

The following equipment also is recommended:

10. **Camera:** These are very helpful for habitat photographs, especially at sites where flycatchers are found. Small digital cameras are easily portable and relatively inexpensive.
11. **Survey flagging:** Used for marking survey sites or areas where flycatcher are detected. Check with the local land owner or management agency before flagging sites. Use flagging conservatively so as to not attract people or predators.
12. **Field vest:** A multi-pocket field vest can be very useful for carrying field equipment and personal items. We recommend muted earth-tone colors.

13. **Cell phone and/or portable radio**: In addition to providing an increased level of safety, cell phones or portable radios may be used by surveyors to assist each other in identifying territories and pairs in dense habitats, or where birds are difficult to hear.

In addition to the necessary equipment mentioned above, personal items, such as food, extra water or electrolyte drink, sunscreen, insect repellent, mosquito net, first-aid kit, whistle, and a light jacket, also should be considered. Being prepared for unforeseen difficulties, and remaining as comfortable as conditions allow while surveying are important factors to conducting thorough and effective surveys.

All survey results (both negative and positive) should be recorded directly on data forms when possible. These data forms have been designed to prompt surveyors to record key information that is crucial to interpretation of survey results and characterization of study sites. Even if no flycatchers are detected or habitat appears unsuitable, this is valuable information and should be recorded. Knowing where flycatchers are not breeding can be as important as knowing where they are; therefore, negative data are important. Standardized data forms are provided in appendix 1, or can be downloaded online. Always check for updated forms prior to each year's surveys.

Willow Flycatcher surveys are targeted at this species and require a great deal of focused effort. Surveyors must be constantly alert and concentrate on detecting a variety of flycatcher cues and responses. Therefore, field work, such as generalized bird surveys (for example, point counts or walking transects) or other distracting tasks, should not be conducted in conjunction with Willow Flycatcher surveys. Avoid bringing pets or additional people who are not needed for the survey. Dress in muted earth-tone colors, and avoid wearing bright clothing.

Willow Flycatcher Identification

The Southwestern Willow Flycatcher is a small bird, approximately 15 cm long and weighing about 11–12 g. Sexes look alike and cannot be distinguished by plumage. The upper parts are brownish-olive; a white throat contrasts with the pale olive breast, and the belly is pale yellow. Two white wing bars are visible (juveniles have buffy wing bars) and the eye ring is faint or absent. The upper mandible is dark and the lower mandible light. The tail is not strongly forked. When perched, the Willow Flycatcher often flicks its tail upward. As a group, the *Empidonax* flycatchers are very difficult to distinguish from one another by appearance. The Willow Flycatcher also looks very similar to several other passerine species you may encounter in the field.

Given that Willow Flycatchers look similar to other *Empidonax* flycatchers that may be present at survey sites, the most certain way to verify Willow Flycatchers in the field is by their vocalization. For the purpose of this protocol, identification of Willow Flycatchers cannot be made by sight alone; vocalizations are a critical identification criterion, and specifically the primary song *fitz-bew*. Willow Flycatchers have a variety of vocalizations (see Stein, 1963; Sedgwick, 2000), but two are most commonly heard during surveys or in response to call-playback:

1. ***Fitz-bew***. This is the Willow Flycatcher's characteristic primary song. Note that *fitz-bews* are not unique to the southwestern subspecies; all Willow Flycatchers sing this characteristics song. Male Willow Flycatchers may sing almost continuously for hours, with song rates as high as one song every few seconds. Song volume, pitch, and frequency may change as the season progresses. During prolonged singing bouts, *fitz-bews* are often separated by short *britt* notes. *Fitz-bews* are most often given by a male, but studies have shown female Willow Flycatchers also sing, sometimes quite loudly and persistently (although generally less than males). Flycatchers often sing from the top of vegetation, but also will vocalize while perched or moving about in dense vegetation.

2. ***Whitt***. This is a call often used by nesting pairs on their territory, and commonly is heard even during periods when the flycatchers are not singing (*fitz-bewing*). The *whitt* call appears to be a contact call between sexes, as well as an alarm call, particularly when responding to disturbance near the nest. *Whitt* calls can be extremely useful for locating Willow Flycatchers later in the season when *fitz-bewing* may be infrequent, but are easily overlooked by inexperienced surveyors. When flycatcher pairs have active nests and particularly once young have hatched, *whitts* may be the most noticeable vocalization. However, many species of birds *whitt*, and a *whitt* is not a diagnostic characteristic for Willow Flycatchers. For example, the "*whitt*" of the Black-headed Grosbeak (*Pheucticus melanocephalus*) and Yellow-breasted Chat (*Icteria virens*) are often confused with that of the flycatcher.

The *fitz-bew* and *whitt* calls are the primary vocalizations used to locate Willow Flycatchers. However, other less common Willow Flycatcher vocalizations can be very useful in alerting surveyors to the presence of flycatchers. These include twittering vocalizations typically given during interactions between flycatchers and sometimes between flycatchers and other birds, bill snapping, *britt*'s, and *wheeo*'s. Because these sounds can be valuable in locating territories (Shook and others, 2003), they should be studied prior to going in the field. Willow Flycatcher vocalization recordings are available from Federal and State agency contacts and online at http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/. Standardized recordings of Southwestern Willow Flycatchers also are available online at http://www.naturesongs.com/tyrrcert.html#tyrr. Specifically, only *fitz-bews* and *britts* should be used for conducting surveys, to provide more robust comparative results among sites and years.

Willow Flycatcher song rates are highest early in the breeding season (late May–early June), and typically decline after eggs hatch. However, in areas with many territorial flycatchers or where an unpaired flycatcher is still trying to attract a mate, or where re-nesting occurs, singing rates may remain high well into July. Isolated pairs can be much quieter and harder to detect than pairs with adjacent territorial flycatchers. At some sites, pre-dawn singing (0330–0500 hours) appears to continue strongly at least through mid-July (Sogge and others, 1995). Singing rates may increase again later in the season, possibly coinciding with re-nesting attempts (Yard and Brown, 2003). The social dynamics of adjacent territories can strongly influence vocalization rates. A single "*fitz-bew*" from one flycatcher may elicit multiple responses from adjacent territories. When these interactions occur, it is a good opportunity to distinguish among territories and provides the surveyor with an estimate of territory numbers in the immediate area.

There are some periods during which Willow Flycatchers do not sing and even the use of call-playback sometimes fails to elicit any response. This can be particularly true late in the breeding season. Early and repeated surveys are the best way to maximize the odds of detecting a singing flycatcher and determining its breeding status.

Timing and Number of Visits

No survey protocol can guarantee that a Southwestern Willow Flycatcher, if present, will be detected on any single visit. However, performing repeated surveys during the early to mid-nesting season increases the likelihood of detecting flycatchers and aids in determining their breeding status. A single survey, or surveys conducted too early or late in the breeding cycle, do not provide definitive data and are of limited value.

For purposes of this survey protocol, we have divided the Southwestern Willow Flycatcher breeding season into three basic survey periods, and specified a minimum number of survey visits for each period (fig. 9). Although the Sogge and others (1997a) protocol recommended a minimum of one survey in each period, we now recommend a differing number of visits for general surveys versus project-related studies.

General surveys are conducted for the sole purpose of determining whether Willow Flycatchers are present or absent from a respective site, when there is no foreseeable direct or indirect impact to their habitat from a known potential project or change in site management. In such cases, a minimum of one survey visit is required in each of the three survey periods.

Project-related surveys are conducted to determine the presence or absence of Willow Flycatchers within a site when there is a potential or foreseeable impact to their habitat due to a potential project or change in site management. Additional surveys are required for project-related studies in order to derive a greater degree of confidence regarding the presence or absence of Willow Flycatchers.

All successive surveys must be at least 5 days apart; surveys conducted more closely are not considered to be separate surveys. Although a minimum of three or five surveys are required for general and project-related purposes, respectively, if the habitat patches are large, contiguous and extremely dense, additional surveys are strongly encouraged to ensure full coverage of the site.

If you are uncertain whether three general surveys or five project-related surveys are required for your respective study, contact your USFWS flycatcher coordinator. As noted earlier, this survey protocol will help determine if territorial flycatchers are present and their approximate locations; if your project requires fine-scale estimates of flycatcher numbers or distribution at a site, you may need to conduct more intensive efforts that include additional surveys, nest searches, and nest monitoring.

Survey Period 1: May 15–31.—For both general and project-related surveys: a minimum of one survey is required. The timing of this survey is intended to coincide with the period of high singing rates in newly arrived males, which tends to begin in early to mid-May. This is one of the most reliable times to detect flycatchers that have established their territories, so there is substantial value to conducting period 1 surveys even though not all territorial males may yet have arrived. Migrant Willow Flycatchers of multiple subspecies will likely be present and singing during this period. Because both migrant and resident Willow Flycatchers are present during this period, and relatively more abundant then in subsequent surveys, it is an excellent opportunity to hone your survey and detection skills and gain confidence in your abilities. Detections of flycatchers during period 1 also provide insight on areas to pay particular attention to during the next survey period.

Survey Period 2: June 1–24.—For general surveys: a minimum of one survey is required. For project-related surveys, a minimum of two surveys are required. Note that this differs from the minimum of one survey that was recommended in this period under the previous protocol (Sogge and others, 1997a). During this period, the earliest arriving males may already be paired and singing less, but later arriving males should still be singing strongly. Period 2 surveys can provide insight about the status of any flycatchers detected during survey period 1. For example, if a flycatcher is detected during survey period 1 but not survey period 2, the first detection may have been a migrant. Conversely, detecting a flycatcher at the same site during periods 1 and 2 increases the likelihood that the bird is not a migrant, although it does not necessarily confirm it. Survey period 2 also is the earliest time during which you are likely to find nesting activity by resident birds at most sites. Special care should be taken during this period to watch for activity that will verify whether the flycatchers that are present are attempting to breed. A little extra time and diligence should be spent at all locations where flycatchers were detected during survey period 1.

Survey Visit Timing, Numbers, and Detection Interpretation

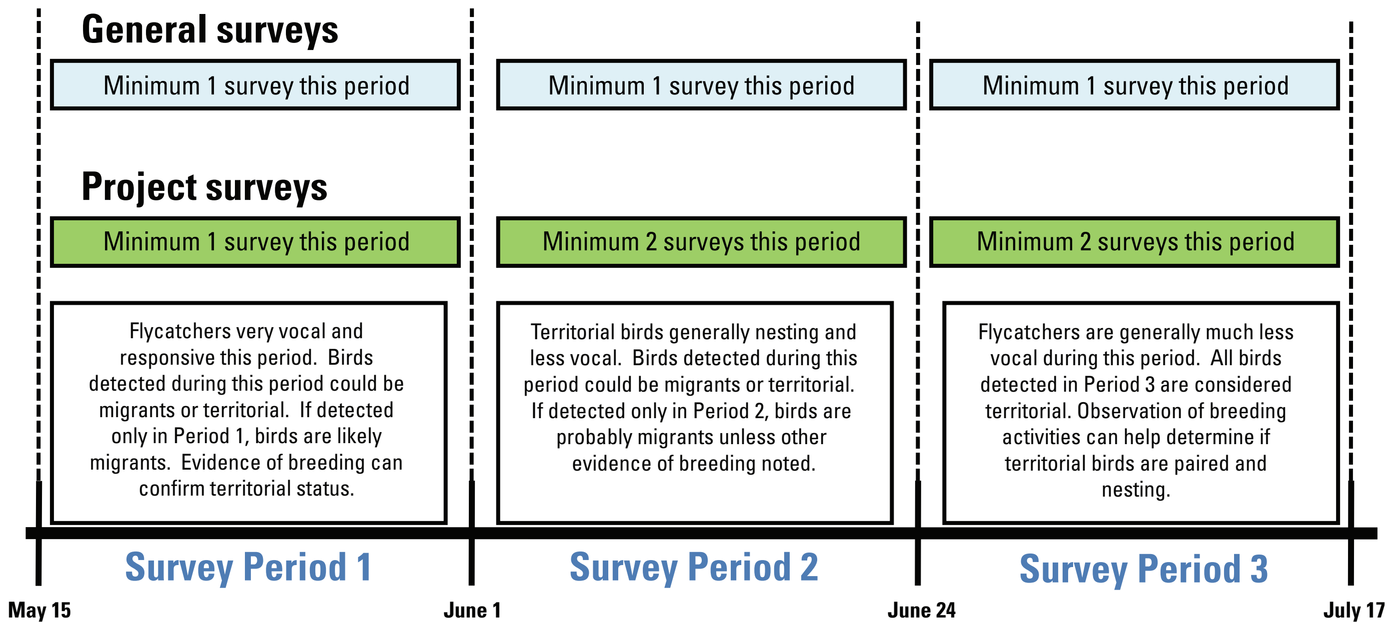


Figure 9. Recommended numbers and timing of visits during each survey period for general surveys and project surveys. General surveys are those conducted when there is no foreseeable direct or indirect impact to their habitat from a known potential project or change in site management. Project-related surveys are conducted when there is a potential or foreseeable impact to their habitat due to a potential project or change in site management.

Survey Period 3: June 25–July 17.—For general surveys, a minimum of one survey is required. For project-related surveys, a minimum of two surveys are required. Virtually all Southwestern Willow Flycatchers should have arrived on their territories by this time. Flycatcher singing rates probably have lessened, and most paired flycatchers will have initiated or even completed their first round of nesting activity. Migrant Willow Flycatchers should no longer be passing through the Southwest; therefore, any flycatchers that you detect are likely to be either territorial or nonbreeding floaters. Surveyors should determine if flycatchers detected during surveys in periods 1 or 2 are still present, and watch closely for nesting activity. Flycatchers that have completed a first nesting attempt may resume vigorous singing during this period. Extra time and diligence should be spent at all locations where flycatchers were detected during survey periods 1 or 2.

At high elevation sites (above 2,000 m), Southwestern Willow Flycatcher arrival and initiation of breeding activities may occur in early June, and possibly later in some years due to weather or migration patterns. Therefore, flycatcher breeding chronology may be delayed by 1 or 2 weeks at such sites, and surveys should be conducted in the latter part of each period.

It may not require multiple surveys to verify Southwestern Willow Flycatcher presence or breeding status. If, for example, Willow Flycatchers are observed carrying nest material during survey periods 1 or 2, this is conclusive verification they are breeders as opposed to migrants, regardless of what is found during period 3. However, it requires a minimum of three surveys for general studies and five surveys for project-related studies to determine with relative confidence that Southwestern Willow Flycatchers probably are not breeding at a site in that year, based on lack of detections.

We strongly encourage additional follow-up surveys to sites where territorial Southwestern Willow Flycatchers are verified or suspected. Extra surveys provide greater confidence about presence or absence of flycatchers at a site, as well as help in estimating the number of breeding territories or pairs, and determining breeding status and the outcome of breeding efforts. Pre-survey visits the evening before the survey or post-survey follow-up later in the morning can help confirm breeding status when surveyors are not under time constraints. However, avoid returning to a site so often as to damage the habitat, establish or enlarge trails, or cause undue disturbance to the flycatchers.

Survey Methods

The survey methods described below fulfill the primary objectives of documenting the presence or absence of Willow Flycatchers, and determining their status as territorial versus migrant. This protocol primarily is a call-playback technique, a proven method for eliciting response from nearby Willow Flycatchers (Seutin, 1987; Craig and others, 1992), both territorial and migrants. The premise of the call-playback technique is to simulate a territorial intrusion by another Willow Flycatcher, which generally will elicit a defensive response by the territorial bird, increasing its detectability. At each site, surveyors should broadcast a series of recorded Willow Flycatcher *fitz-bews* and *britts*, and look and listen for responses. In addition to maximizing the likelihood of detecting nearby flycatchers, this method also allows for positive identification by comparing the responding bird's vocalizations to the known Willow Flycatcher recording.

Documenting Presence / Absence—Begin surveys as soon as there is enough light to safely walk (about 1 hour before sunrise) and end by about 0900–1030 hours, depending on the temperature, wind, rain, background noise, and other environmental factors. Use your best professional judgment whether to conduct surveys that day based on local field conditions. If the detectability of flycatchers is being reduced by environmental factors, surveys planned for that day should be postponed until conditions improve. If observers are camped in or near potential Willow Flycatcher habitat, afternoons and evenings can be spent doing site reconnaissance and planning a survey strategy for the following morning. If camped immediately adjacent to survey sites, surveyors can awaken early and listen for flycatchers singing during the predawn period (0330–0500 hours), when territorial males often sing loudly.

Conduct surveys from within rather than from the perimeter of the sites, while limiting the breaking of vegetation or damaging the habitat. If surveys cannot be conducted from within the habitat, walk along the perimeter and enter the patch at intervals to broadcast the vocalizations and listen for responses. Flycatchers often respond most strongly if the recording is played from within the habitat and territory, rather than from the periphery. In addition, it can be surprisingly difficult to hear singing Willow Flycatchers that are even a short distance away amidst the noise generated by other singing and calling birds, roads, noisy streams, and other extraneous sounds. Therefore, it is preferable to survey from within the habitat, but always move carefully to avoid disturbing habitat or nests. Surveying from the periphery should not be conducted only for the sake of convenience, but is allowable for narrow linear reaches or when absolutely necessary due to safety considerations.

Because flycatchers may be clustered within only a portion of a habitat patch, it is critical to survey all suitable habitat within the patch. Small linear sites may be thoroughly covered by a single transect through the patch. For larger sites, choose a systematic survey path that assures complete patch coverage throughout the length and breadth of the site. This may require multiple straight transects, serpentine, zig-zag, or criss-cross routes. Aerial photographs and previous survey forms are valuable tools to help plan and conduct surveys, and to assure complete coverage. Always move carefully through the habitat to avoid disturbing vegetation or nests.

Initially approach each site and stand quietly for 1–2 minutes or longer, listening for spontaneously singing flycatchers. A period of quiet listening is important because it helps acclimate surveyors to background noises that can be quite loud due to roads, aircraft, machinery, waterways, and other sounds. It also allows surveyors to recognize and shift attention away from the songs and calls of other bird species, letting them focus on listening for flycatchers. Although it happens rarely, some singing Willow Flycatchers will actually stop vocalizing and approach quietly in response to a broadcast song, perhaps in an effort to locate what they perceive as an intruding male. Therefore, playing a recording before listening for singing individuals has at least some potential of reducing detectability.

If you do not hear singing flycatchers during the initial listening period, broadcast the Willow Flycatcher song recording for 10–15 seconds; then listen for approximately 1 minute for a response. Repeat this procedure (including a 10-second quiet pre-broadcast listening period) every 20–30 m throughout each survey site, more often if background noise is loud. The recording should be played at about the volume of natural bird calls, and not so loud as to cause distortion of the broadcast. We recommend that the playback recording include a series of *fitz-bews* interspersed with several *britts*.

Response to the broadcast call could take several forms. Early in the breeding season (approximately May–mid-June), a responding Willow Flycatcher will usually move toward the observer and *fitz-bew* or *whitt* from within or at the top of vegetation. Territorial Willow Flycatchers almost always vocalize strongly when a recording is played in their territory early in the season. If there are several flycatchers present in an area, some or all may start singing after hearing the recording or the first responding individual. Flycatchers can often hear the recording from far away but will not usually move outside of their territory, so listen for distant responses. Also, stay alert and listen for flycatchers vocalizing behind you that may not have responded when you were first in their territory. Another common flycatcher response is alarm calls (*whitts*) or interaction twitters from within nearby vegetation, particularly once nesting has begun. Willow Flycatchers will often sing after a period of *whitting* in response to a recording, so surveyors hearing *whitts* should remain in the area and quietly listen for *fitz-bews* for several minutes. Because some flycatchers may initially respond by approaching quietly, particularly during periods 2 and 3, it is critical to watch carefully for responding birds.

If you detect flycatchers that appear particularly agitated, it is possible that you are in close proximity to their nest. Agitated flycatchers may swoop down at the surveyor, snap their beaks, and otherwise appear distressed. Exercise extreme caution so as to not accidently disturb the nest, and move slowly away from the immediate area.

For the purpose of this protocol, detection of a *fitz-bew* song is essential to identify a bird as a Willow Flycatcher. Similar appearing species (including other *Empidonax* flycatchers) occur as migrants, and even breeders, at potential Willow Flycatcher sites. A few of these other species may even approach a broadcast Willow Flycatcher song and respond with vocalizations. In order to standardize interpretation of survey results and assure a high degree of confidence in surveys conducted by biologists of varying experience and skill, positive identification must be based on detection of the Willow Flycatcher's most unique characteristic—its song. It is important to remember that the *whitt* call is not unique to Willow Flycatchers, and therefore cannot serve as the basis of a positive identification. However, *whitts* are extremely useful for locating flycatchers and identifying areas needing follow-up visits. Loud, strong *whitting* may indicate a nearby nest, dictating that surveyors exercise extra caution moving through the area.

Whenever a verified or suspected Willow Flycatcher is detected, be careful not to overplay the song recording. Excessive playing could divert the bird from normal breeding activities or attract the attention of predators and brood parasites. Wildlife management agencies may consider overplaying the recording as "harassment" of the flycatcher, and this is not needed to verify species identification. Although flycatchers usually sing repeatedly once prompted, even a single *fitz-bew* is sufficient for verification. If you have played a recording several times and a bird has approached but has not *fitz-bewed*, do not continue playing the recording. If a potential Willow Flycatcher responds, approaches or *whitts* but does not sing, it is best to carefully back away and wait quietly. If it is a Willow Flycatcher, it probably will sing within a short time (5–10 minutes). Another option is to return to the same site early the following morning to listen for or attempt to elicit singing again. If you are still uncertain, record the location with your GPS, record comments on the survey form, and follow-up on the detection during subsequent surveys. If possible, request the assistance of an experienced surveyor to determine positive identification.

If more habitat remains to be surveyed, continue onward once a flycatcher is detected and verified. In doing so, move 30–40 m past the current detection before again playing the recording, and try to avoid double-counting flycatchers that have already responded. Willow Flycatchers, particularly unpaired males, may follow the broadcast song for 50 m or more.

Looking For and Recording Color Bands.—Several research projects have involved the capture and banding of Willow Flycatchers at breeding sites across the Southwest. In such projects, flycatchers are banded with one or more small colored leg bands, including a federal numbered band. As a result, surveyors may find color-banded individuals at their survey sites, and identification and reporting of the band combination can provide important data on flycatcher movements, survivorship, and site fidelity.

To look for bands, move to get a good view of the flycatcher's legs. This may be difficult in dense vegetation, but flycatchers commonly perch on more exposed branches at the edges of their territory or habitat patch. If bands are seen, carefully note the band colors. If there is more than one band on a leg, differentiate the top (farthest up the leg) from the bottom (closest to the foot), and those on the bird's left leg versus the right leg. If you are unsure of the color, do not guess. Instead, record the color as unknown. Incorrect color-band data are worse than incomplete data, so only record colors of which you are certain. The fact that a banded bird was seen, even without being certain of its color combination, is very important information. Record the color-band information on the survey form, and report the sighting to the appropriate State or Federal contact as soon as you return from the survey that day.

Determining the Number of Territories and Pairs.— Accurately determining the number of breeding territories and pairs can be more difficult than determining simple presence or absence. Flycatcher habitat is usually so dense that visual detections are difficult, and seeing more than one bird at a time is often impossible. Flycatchers sing from multiple song perches within their territories, and may be mistaken for more than one flycatcher. A flycatcher responding to or following a surveyor playing a recording may move considerable distances in a patch and thus be counted more than once. Territorial male flycatchers often sing strongly, but so do many migrants and some females, particularly in response to call-playback (Seutin, 1987; Unitt, 1987; Sogge and others, 1997b). Rangewide, many territorial male flycatchers are unmated, particularly those in small breeding groups. For these reasons, each singing flycatcher may not represent a territory or a mated pair. Following the established survey protocol and carefully observing flycatcher behavior can help determine if you have detected migrants, territorial birds, breeders, unmated birds, or pairs.

Given sufficient time, effort and observation, it is usually possible to approximate the number of territories and pairs. First, listen carefully for simultaneously singing flycatchers. Note the general location of each bird—especially concurrently singing individuals—on aerial photographs, map, or a site sketch. Spend some time watching each flycatcher to determine approximate boundaries of its territory, and how it interacts with other flycatchers. If one or more singing birds stay primarily in mutually exclusive areas, they can be considered as separate territories. To determine if a flycatcher is paired, watch for interactions within a territory. Refer to the section, "Determining Breeding Status" for signs of pairing and breeding activity. Do not report a territorial male as a pair unless you observe one or more of the signs listed below. In some cases, it may be possible only to estimate the number of singing individuals. In other cases, it may take multiple site visits to differentiate territories or pairs.

Determining Breeding Status.—One way to determine if the flycatchers found at a particular site are migrants or territorial is to find out if they are still present during the "non-migrant" period, which generally is from about June 15 to July 20 (Unitt, 1987). A Willow Flycatcher found during this time probably is a territorial bird, although there is a small chance it could be a non-territorial floater (Paxton and others, 2007). If the management question is simply whether the site is a potential breeding area, documenting the presence of a territorial flycatcher during the non-migrant period may meet all survey objectives, and the site may not need to be resurveyed during the remainder of that breeding season.

However, in some cases, surveyors will be interested in knowing not only if territorial Southwestern Willow Flycatchers are present at a site, but also whether breeding or nesting efforts are taking place. Some males maintain territories well into July yet never succeed in attracting a mate, so unpaired males are not uncommon (McLeod and others, 2007; Ellis and others, 2008; Ahlers and Moore, 2009). Thus, an assumption that each singing male represents a breeding pair may not be well founded, especially in small populations. If it is important to determine whether a pair is present and breeding in that territory, move a short distance away from where the bird was sighted, find a good vantage point, and sit or lie quietly to watch for evidence of breeding. Signs of breeding activity include:

a. observation of another unchallenged Willow Flycatcher in the immediate vicinity (indicates possible pair);
b. *whitt* calls between nearby flycatchers (indicates possible pair);
c. interaction twitter calls between nearby flycatchers (indicates possible pair);
d. countersinging or physical aggression against another flycatcher or bird species (suggests territorial defense);
e. physical aggression against cowbirds (suggests nest defense);
f. observation of Willow Flycatchers copulating (verifies attempted breeding);
g. flycatcher carrying nest material (verifies nesting attempt, but not nest outcome);
h. flycatcher carrying food or fecal sac (verifies nest with young, but not nest outcome);
i. locating an active nest (verifies nesting). Recall that general survey permits do not authorize nest searching or monitoring, and see section, "Special Considerations";
j. observation of adult flycatchers feeding fledged young (verifies successful nesting).

You may be able to detect flycatcher nesting activity, especially once the chicks are being fed. Adults feed chicks at rates of as many as 30 times per hour, and the repeated trips to the nest tree or bush are often quite evident. Be sure to note on the flycatcher survey form any breeding activity that is observed, including detailed descriptions of the number of birds, and specific activities observed. Also note the location of breeding activities on an aerial photograph, map, or sketch of the area.

The number of flycatchers found at a site also can provide a clue as to whether they are migrants or territorial birds. Early season detections of single, isolated Willow Flycatchers often turn out to be migrants. However, discovery of a number of Willow Flycatchers at one site usually leads to verification that at least some of them remain as local breeders. This underscores the importance of completing a thorough survey of each site to be confident of the approximate number of flycatchers present.

In some cases, regardless of the time and diligence of your efforts, it will be difficult to determine the actual breeding status of a territorial male. In these instances, use your best professional judgment, or request the assistance of an experienced surveyor or an agency flycatcher coordinator to interpret your observations regarding breeding status.

Reporting Results.—There is little value in conducting formal surveys if the data are not recorded and submitted. Fill in all appropriate information on the Willow Flycatcher survey form while still in the field, and mark the location of detections on a copy of the USGS topographic map. Make a habit of reviewing the form before you leave any site—trying to remember specific information and recording it later can lead to missing and inaccurate data. Note the location of the sighting on an aerial photograph or sketch of the site. Attaching photographs of the habitat also is useful. Whenever a Willow Flycatcher territory or nest site is confirmed, notify the USFWS or appropriate State wildlife agency as soon as you return from the field. The immediate reporting of flycatcher detections or nests may differ among USFWS regions and States—discuss these reporting procedures with your respective State and USFWS flycatcher coordinators.

Complete a survey form (appendix 1) for each site surveyed, whether or not flycatchers are detected. "Negative data" (that is, a lack of detections) are important to document the absence of Willow Flycatchers and help determine what areas have already been surveyed. Make and retain a copy of each survey form, and submit the original or a legible copy. Electronic copies of the survey forms also are acceptable and are available online (http://sbsc.wr.usgs.gov/cprs/research/projects/swwf/). All survey forms must be submitted to the USFWS and the appropriate State wildlife agency by the specified deadline identified in your permits. Timely submission of survey data is a permit requirement, and will ensure the information is included in annual statewide and regional reports.

Special Considerations

To avoid adverse impacts to Willow Flycatchers, follow these guidelines when performing all surveys:

1. Obtain all necessary Federal, State, and agency permits and permissions prior to conducting any surveys. Failure to do so leaves you liable for violation of the Endangered Species Act, various State laws, and prosecution for trespass.
2. Do not play the recording more than necessary or needlessly elicit vocal responses once Willow Flycatchers have been located and verified. This may distract territorial birds from caring for eggs or young, or defending their territory. If flycatchers are vocalizing upon arrival at the site, and your objective is to determine their presence or absence at a particular site—there is no need to play the recording. Excessive playing of the recording also may attract the attention of predators or brood parasites. Stop playing the survey recording as soon as you have confirmed the presence of a Willow Flycatcher, and do not play the recording again until you have moved 30–40 m to the next survey location.
3. Proceed cautiously while moving through Willow Flycatcher habitat. Continuously check the area around you to avoid disturbance to nests of Willow Flycatchers and other species. Do not break understory vegetation, even dead branches, to create a path through the surveyed habitat.
4. Do not approach known or suspected nests. Nest searches and monitoring require specific State and Federal permits, have their own specialized methodologies (Rourke and others, 1999), and are not intended to be a part of this survey protocol.
5. If you find yourself close to a known or suspected nest, move away slowly to avoid startling the birds or force-fledging the young. Avoid physical contact with the nest or nest tree, to prevent physical disturbance and leaving a scent. Do not leave the nest area by the same route that you approached. This leaves a "dead end" trail that could guide a potential predator to the nest/nest tree. If nest monitoring is a component of the study, but you are not specifically permitted to monitor the nest, store a waypoint with your GPS, affix flagging to a nearby tree at least 10 m away, and record the compass bearing to the nest on the flagging. Report your findings to an agency flycatcher coordinator or a biologist who is permitted to monitor nests.
6. If you use flagging to mark an area where flycatchers are found, use it conservatively and make certain the flagging is not near an active nest. Check with the property owner or land-management agency before flagging to be sure that similar flagging is not being used for other purposes in the area. Unless conducting specific and authorized/permitted nest monitoring, flagging should be placed no closer than 10 m to any nest. Keep flagging inconspicuous from general public view to avoid attracting people or animals to an occupied site, and remove it at the end of the breeding season.
7. Watch for and note the presence of potential nest predators, particularly birds, such as Common Ravens (*Corvus corax*), American Crows (*Corvus brachyrhynchos*), jays, and magpies. If such predators are in the immediate vicinity, wait for them to leave before playing the recording.
8. Although cowbird parasitism is no longer considered among the primary threats to flycatcher conservation it remains useful to note high concentrations of cowbirds in the comment section of the survey form. While conducting surveys, avoid broadcasting the flycatcher vocalizations if cowbirds are nearby, especially if you believe you may be close to an active flycatcher territory. The intent of not broadcasting flycatcher vocalizations is to reduce the potential for attracting cowbirds to a flycatcher territory or making flycatcher nests more detectable to cowbirds.
9. Non-indigenous plants and animals can pose a significant threat to flycatcher habitat and may be unintentionally spread by field personnel, including those conducting flycatcher surveys. Simple avoidance and sanitation measures can help prevent the spread of these organisms to other environments. To avoid being a carrier of non-indigenous plants or animals from one field site to another visually inspect and clean your clothing, gear, and vehicles before moving to a different field site. A detailed description on how to prevent and control the spread of these species is available by visiting the Hazard Analysis and Critical Control Point Planning for Natural Resource Management web site (http://www.haccp-nrm.org). One species of particular interest is the tamarisk leaf-beetle (*Diorhabda* spp.). If you observe defoliation of saltcedar while conducting flycatcher surveys and believe that *Diorhabda* beetles may be responsible, notify your USFWS coordinator immediately. Other non-native species of concern in survey locations are the quagga mussel (*Dreissena rostriformis bugensis*), cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens*), giant salvinia (*Salvinia molesta*), water milfoil (*Myriophyllum spicatum*), parrot's feather (*M. aquaticum*), and amphibian chytrid fungus (*Batrachochytrium dendrobatidis*).

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Appendix 1. Willow Flycatcher Survey and Detection Form

Always check the U.S. Fish and Wildlife Service Arizona Ecological Services Field Office web site (http://www.fws.gov/southwest/es/arizona/) for the most up-to-date version.

Willow Flycatcher (WIFL) Survey and Detection Form (revised April 2010)

Site Name____ State______ County __________________________
USGS Quad Name ____ Elevation _______________________ (meters)
Creek, River, Wetland, or Lake Name____

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? Yes___ No____

Survey Coordinates: Start: E__________________ N______________________ UTM Datum_______(See instructions)
Stop: E__________________ N______________________ UTM Zone ________

If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.

***** Fill in additional site information on back of this page *****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding; potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator	GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary.			
Survey # 1 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 2 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 3 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 4 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Survey # 5 Observer(s)	Date Start Stop Total hrs ___						# Birds	Sex	UTM E	UTM N
Overall Site Summary Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals. Total Survey Hrs________		Total Adult Residents	Total Pairs	Total Territories	Total Nests	Were any Willow Flycatchers color-banded? Yes___ No ___ If yes, report color combination(s) in the comments section on back of form and report to USFWS.				

Reporting Individual ______________________________________ Date Report Completed________ ____________________
US Fish and Wildlife Service Permit #_______________________State Wildlife Agency Permit #______________________

Submit form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.

Fill in the following information completely. Submit form by September 1st. Retain a copy for your records.

Reporting Individual ____Phone # _______________________
Affiliation ____ E-mail ________________________
Site Name____Date Report Completed __________

Did you verify that this site name is consistent with that used in previous years? Yes ____ No _____ Not Applicable ___
If site name is different, what name(s) was used in the past?____
If site was surveyed last year, did you survey the same general area this year? Yes ____ No ____ If no, summarize below.
Did you survey the same general area during each visit to this site this year? Yes ____ No ____ If no, summarize below.

Management Authority for Survey Area : Federal____ Municipal/County ____ State ____ Tribal ____ Private ____
Name of Management Entity or Owner (e.g., Tonto National Forest) ____

Length of area surveyed: ___________ (meters)

Vegetation Characteristics: Mark the category that best describes the predominant tree/shrub foliar layer at this site (check one):

_____ Native broadleaf plants (entirely or almost entirely, > 90% native, includes high-elevation willow)

_____ Mixed native and exotic plants (mostly native, 50 - 90% native)

_____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

_____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific name.
____

Average height of canopy (Do not include a range): ______________________________ (meters)

Attach copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections.
Attach sketch or aerial photo showing site location, patch shape, survey route, location of any WIFLs or WIFL nests detected.
Attach photos of the interior of the patch, exterior of the patch, and overall site; describe any unique habitat features.

Comments (attach additional sheets if necessary)
____
____
____
____
____
____

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM N	UTM E	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Attach additional sheets if necessary

Appendix 2. Willow Flycatcher Survey Continuation Sheet / Territory Summary Table

Always check the U.S. Fish and Wildlife Service Arizona Ecological Services Field Office web site (http://www.fws.gov/southwest/es/arizona/) for the most up-to-date version.

Willow Flycatcher Survey Continuation Sheet

(For reporting additional detections and territories; append to Survey and Detection form)

Reporting Individual ______________________________ Phone # ______________
Affiliation ______________________________ E-mail ______________
Site Name ______________________________ Date Report Completed ______________

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Comments______________________________

Appendix 3. Instructions for Completing the Willow Flycatcher Survey and Detection Form and the Survey Continuation Sheet

These instructions are provided as guidance for completing the standard survey form. It is particularly important to provide the correct type and format of information for each field. Complete and submit your survey forms to both the appropriate State Willow Flycatcher coordinator and the U.S. Fish and Wildlife Service (USFWS) by September 1 of the survey year. You also may complete forms digitally (Microsoft© Word or Excel) and submit them via email with attached or embedded topographic maps and photographs.

Page 1 of Survey Form

Site Name. Standardized site names are provided by the flycatcher survey coordinators for each State and should be consistent with the naming of other sites that might be in the area. If the site is new, work with your State or USFWS flycatcher coordinator to determine suitable site names before the beginning of the survey season. If the site was previously surveyed, use the site name from previous years (which can be obtained from the State or USFWS flycatcher coordinator). If you are uncertain if the site was previously surveyed, contact your State or USFWS flycatcher coordinator.

USGS Quad Name. Provide the full quad name, as shown on the appropriate standard 7.5-minute topographic maps.

Creek, River, Wetland, or Lake Name. Give the name of the riparian feature, such as the lake or watercourse, where the survey is being conducted.

Survey Coordinates. Provide the start and end points of the survey, which will indicate the linear, straight-line extent of survey area, based on Universal Transverse Mercator coordinates (UTMs). California surveyors only: provide latitude/longitude geographic coordinates instead of UTMs in the UTM fields and identify them as such. If the start and end points of the survey changed significantly among visits, enter separate coordinates for each survey in the comments section on the back of the survey sheet. Note that we do not need the coordinates for the detailed path taken by the surveyor(s).

Datum. Indicate the datum in which the coordinates are expressed: NAD27, WGS84, or NAD83. The datum can be found in the settings of most GPS units. Note that Arizona prefers NAD27 and New Mexico prefers NAD83.

Zone. Provide the appropriate UTM zone for the site, which is displayed along with the coordinates by most GPS units. Zones for California are 10, 11, or 12. The zone for Arizona is 12. Zones for New Mexico are 12 or 13.

Survey #. Survey 1 – 5. See the protocol for an explanation of the number of required visits for each survey period. **Note:** A survey is defined as a complete protocol-based survey that occurs over no more than 1 day. If a site is so large as to require more than a single day to survey, consider splitting the site into multiple subsites and use separate survey forms for each. Casual site visits, pre-season or supplemental visits, or follow-up visits to check on the status of a territory should not be listed in this column, but should be documented in the Comments section on page 2 or in the survey continuation sheet.

Date. Indicate the date that the survey was conducted, using the format mm/dd/yyyy.

Start and **Stop.** Start and stop time of the survey, given in 24-hour format (e.g., 1600 hours rather than 4:00 p.m.).

Total hours. The duration of time (in hours) spent surveying the site, rounded to the nearest tenth (0.1) hour. For single-observer surveys, or when multiple observers stay together throughout the survey, total the number of hours from survey start to end. If two or more observers surveyed sections of the site concurrently and independently, sum the number of hours each observer spent surveying the site.

Number of Adult WIFLs. The total number of individual adult Willow Flycatchers detected during this particular survey. Do not count nestlings or recently fledged birds.

Number of Pairs. The number of breeding pairs. Do not assume that any bird is paired; designation of birds as paired should be based only on direct evidence of breeding behaviors described in the protocol. If there is strong evidence that the detected bird is unpaired, enter "0". If it is unknown whether a territorial bird is paired, enter "–". Note that the estimated number of pairs can change over the course of a season.

Number of Territories. Provide your best estimate of the number of territories, defined as a discrete area defended by a resident single bird or pair. This is usually evidenced by the presence of a singing male, and possibly one or more mates. Note that the estimated number of territories may change over the course of a season.

Nest(s) Found? Yes or No. If yes, indicate the number of nests. Renests are included in this total.

Comments about this survey. Describe bird behavior, evidence of pairs or breeding, evidence of nest building, evidence of nestlings/fledglings, nesting, vocalizations (e.g., interaction twitter calls, *whitts, britts, wheeos, fitz-bews*/countersinging), potential threats (e.g., livestock, cowbirds, saltcedar leaf beetles [*Diorhabda* spp.] etc.). If *Diorhabda* beetles are observed, contact your USFWS and State flycatcher coordinator immediately. Please be aware that permits are needed for nest monitoring.

GPS Coordinates for WIFL Detections. Provide the number of birds (e.g., unpaired, paired, or groups of birds) and corresponding UTMs. If known, provide the sex of individuals.

Overall Site Summary. For each of these columns, provide your best estimate of the overall total for the season. Do not simply total the numbers in each column. In some cases where consistent numbers were detected on each survey, the overall summary is easy to determine. In cases where numbers varied substantially among the different surveys, use professional judgment and logic to estimate the most likely number of adults, pairs, and territories that were consistently present. Be careful not to double count individuals. Record only territorial adult Southwestern Willow Flycatchers, do not include migrants, nestlings, or fledglings in the overall summary. In complex cases, consult with your State or USFWS flycatcher coordinator.

Total Survey Hours. The sum of all hours spent surveying the site.

Were any WIFLs color-banded? Circle or highlight "Yes" or "No". If yes, report the sighting and color combination (if known) in the comments section on back of form, and contact your USFWS coordinator within 48 hours after returning from the survey. Note that identifying colors of bands is difficult and might require follow-up visits by experienced surveyors.

Reporting Individual. Indicate the full first and last name of the reporting individual.

Date Report Completed. Provide the date the form was completed in mm/dd/yyyy format.

U.S. Fish and Wildlife Service Permit #. List the full number of the required federal permit under which the survey was completed.

State Wildlife Agency Permit #. If a State permit is required by the State in which the survey was completed, provide the full number of the State permit. State permits are required for Arizona and California. State permits are recommended for New Mexico.

Page 2 of Survey Form

Affiliation. Provide the full name of the agency or other affiliation (which is usually the employer) of the reporting individual.

Phone Number. Self-explanatory; include the area code.

E-mail. Self-explanatory.

Was this site surveyed in a previous year? Indicate "Yes", "No", or "Unknown."

Did you verify that this site name is consistent with that used in previous years? Indicate "Yes" or "No". This can be determined by checking survey forms from previous years or consulting with agency flycatcher coordinators.

If site name is different, what name(s) was used in the past? Enter the full site name that was used in previous years.

If site was surveyed last year, did you survey the same general area this year? Indicate "Yes" or "No". If no, indicate the reason and how the survey varied in the Comments section.

Did you survey the same general area during each visit to this site this year? If no, indicate the reason in the Comments section and delineate the differing route of each survey on the topographical map.

Management Authority for Survey Area. Mark the appropriate management authority.

Name of Management Entity or Owner (e.g., Tonto National Forest). Provide the name of the organization or person(s) responsible for management of the survey site.

Length of area surveyed. Estimate the linear straight-line distance of the length of the area surveyed, in kilometers. This is not an estimate of the total distance walked throughout the survey site. Do not provide a range of distances.

Vegetation Characteristics: Mark only one of the categories that best describes the predominant tree/shrub foliar layer at the site.

Native broadleaf habitat is composed of entirely or almost entirely (i.e., > 90%) native broadleaf plants.

Mostly native habitat is composed of 50–90% native plants with some (i.e., 10–50%) non-native plants.

Mostly exotic habitat is composed of 50–90% non-native plants with some (i.e., 10–50%) native plants.

Exotic/introduced habitat is composed entirely or almost entirely (i.e., > 90%) of non-native plants.

Identify the 2–3 predominant tree/shrub species in order of dominance. Identify by scientific name.

Average height of canopy. Provide the best estimate of the average height of the top of the canopy throughout the patch. Although canopy height can vary, give only a single (not a range) overall height estimate.

Attach the following: (1) copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections; (2) sketch or aerial photo showing site location, patch shape, survey route, location of any detected WIFLs or their nests; (3) photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments. Include the flycatcher territory number and GPS location. You also may include a compact disc of photographs.

Comments. Include any information that supports estimates of total territory numbers and breeding status. You may provide additional information on bird behavior, banded birds, evidence of pairs or breeding, nesting, potential threats (e.g., livestock, cowbirds, saltcedar leaf beetles [*Diorhabda* spp.] etc.), and changes in survey length and route throughout the season. Attach additional pages or use the continuation sheet if needed.

Table. If Willow Flycatchers are detected, complete the table at the bottom of the form. Identify flycatchers by territory number and include the dates detected, UTMs, whether or not pairs were detected, and whether or not nests were located. Also describe the observation. For example, the surveyor might have observed and heard a bird *fitz-bew* from an exposed perch, heard and observed two birds interacting and eliciting a twitter call, heard a bird *fitz-bew* while observing another carrying nesting material, heard birds from territory 1 and 2 countersinging, etc. This information provides supporting information for territory and breeding status. Use the continuation sheet if needed.

Appendix 4. Example of a Completed Willow Flycatcher Survey and Detection Form (with map)

Willow Flycatcher (WIFL) Survey and Detection Form (revised April, 2010)

Site Name: **DL-08** State: **New Mexico** County: **Socorro**

USGS Quad Name: **Paraje Well** Elevation: **1,356** (meters)

Creek, River, or Lake Name: **Rio Grande**

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? Yes **X** ***No*** ______

Survey Coordinates: Start: E **306,009** N **3,715,506** UTM Datum: **NAD 83** (See instructions)

Stop: E **304,339** N **3,711,922** UTM Zone: **13**

If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.

*****Fill in additional site information on back of this page*****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey Time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding;-potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator.	GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary.			
							# Birds	Sex	UTM E	UTM N
Survey # 1 Observer(s): D. Savage	Date: 5/24/2009 Start: 5:45 Stop: 10:15 Total hrs: 4.5	5	0	5	N	Suitable breeding habitat dispersed throughout site. WIFLs were very vocal, and covering large areas. No obvious signs of pairing were observed. Approximately 10 head of cattle were found within this site.	1	M	305,276	3,714,926
							1	M	305,131	3,714,628
							1	M	305,191	3,714,778
							1	M	305,394	3,715,009
							1	M	305,084	3,714,732
							# Birds	Sex	UTM E	UTM N
Survey # 2 Observer(s): S. Kennedy	Date: 6/10/2009 Start: 6:00 Stop: 10:15 Total hrs: 4.3	11	4	7	Y (3)	Portions of site are flooded, 1-2 ft deep. Two males found during 1st survey appear unpaired. Three pairs confirmed based on nesting, and another pair suspected based on vocal interactions and nonaggressive behavior with another flycatcher. Two additional territories (1 pair and 1 unpaired male) found during this survey.	1	M	305,276	3,714,926
							1	M	305,131	3,714,628
							2	M/F	305,191	714,778
							2	M/F	305,394	3,715,009
							2	M/F	305,084	3,714,732
							2	M/F	305,001	3,714,640
							1	M	305,010	3,714,524
							# Birds	Sex	UTM E	UTM N
Survey # 3 Observer(s): S. Kennedy	Date: 6/21/2009 Start: 5:30 Stop: 10:00 Total hrs: 4.5	12	5	7	Y (4)	Portions of site still flooded. All territories found in Survey 2 are still active. The two males found during Surveys #1 and #2, still believed to be unpaired. All other territories are believed to be paired. Several cows observed in vicinity of active territories.	1	M	305,276	3,714,926
							1	M	305,131	3,714,628
							2	M/F	305,191	3,714,778
							2	M/F	305,394	3,715,009
							2	M/F	305,084	3,714,732
							2	M/F	305,001	3,714,640
							2	M/F	305,010	3,714,524
							# Birds	Sex	UTM E	UTM N
Survey # 4 Observer(s): D. Moore	Date: 7/1/2009 Start: 6:00 Stop: 10:00 Total hrs: 4.0	12	5	7	Y (4)	Site is no longer flooded, but saturated soils persist throughout most of site. No change in territory numbers or status. All SWFL pairs very quiet - only a few whits and fitz-bews. Light rain over night, vegetation was saturated early in the morning. Lots of mosquitos!	1	M	305,276	3,714,926
							1	M	305,131	3,714,628
							2	M/F	305,191	3,714,778
							2	M/F	305,394	3,715,009
							2	M/F	305,084	3,714,732
							2	M/F	305,001	3,714,640
							2	M/F	305,010	3,714,524
							# Birds	Sex	UTM E	UTM N
Survey # 5 Observer(s): D. Moore	Date: 7/10/2009 Start: 5:30 Stop: 10:00 Total hrs: 4.5	11	5	6	Y (4)	Site beginning to dry out, some portions still muddy. One of the unpaired males could not be detected. It was hard to hear SWFLs due to breezy conditions early in the morning.	1	M	305,131	3,714,628
							2	M/F	305,191	3,714,778
							2	M/F	305,394	3,715,009
							2	M/F	305,084	3,714,732
							2	M/F	305,001	3,714,640
							2	M/F	305,010	3,714,524

Overall Site Summary	Total Adult Residents	Total Pairs	Total Territories	Total Nests	
Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals. Total survey hrs: 21.8	12	5	7	4	Were any WIFLs color-banded? Yes ______ No **X** If yes, report color combination(s) in the comments section on back of form and report to USFWS.

Reporting Individual: **Darrell Ahlers** Date Report Completed: **8/20/2009**

US Fish & Wildlife Service Permit #: **TE819475-2** State Wildlife Agency Permit #: **N/A**

<u>Submit</u> form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.

Fill in the following information completely. <u>Submit</u> form by September 1st. Retain a copy for your records.

Reporting Individual **Darrell Ahlers** Phone # **(303) 445-2233**
Affiliation **Bureau of Reclamation** E-mail dahlers@usbr.gov
Site Name **DL-08** Date report Completed **8/20/2009**
Was this site surveyed in a previous year? Yes__x__ No____ Unknown____
Did you verify that this site name is consistent with that used in previous yrs? Yes **x** No ____ Not Applicable ____
If name is different, what name(s) was used in the past? **Not applicable**
If site was surveyed last year, did you survey the same general area this year? Yes **x** No ____ If no, summarize below.
Did you survey the same general area during each visit to this site this year? Yes **x** No ____ If no, summarize below.

Management Authority for Survey Area: Federal **X** Municipal/County ____ State ____ Tribal ____ Private ____
Name of Management Entity or Owner (e.g., Tonto National Forest) **Bureau of Reclamation**

Length of area surveyed: **2.5** (km)

Vegetation Characteristics: Check (only one) category that best describes the predominant tree/shrub foliar layer at this site:

____ Native broadleaf plants (entirely or almost entirely, > 90% native)

X Mixed native and exotic plants (mostly native, 50 - 90% native)

____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific name.
Salix Gooddingii, Populus spp., Tamarix spp.

Average height of canopy (Do not include a range): **6** (meters)

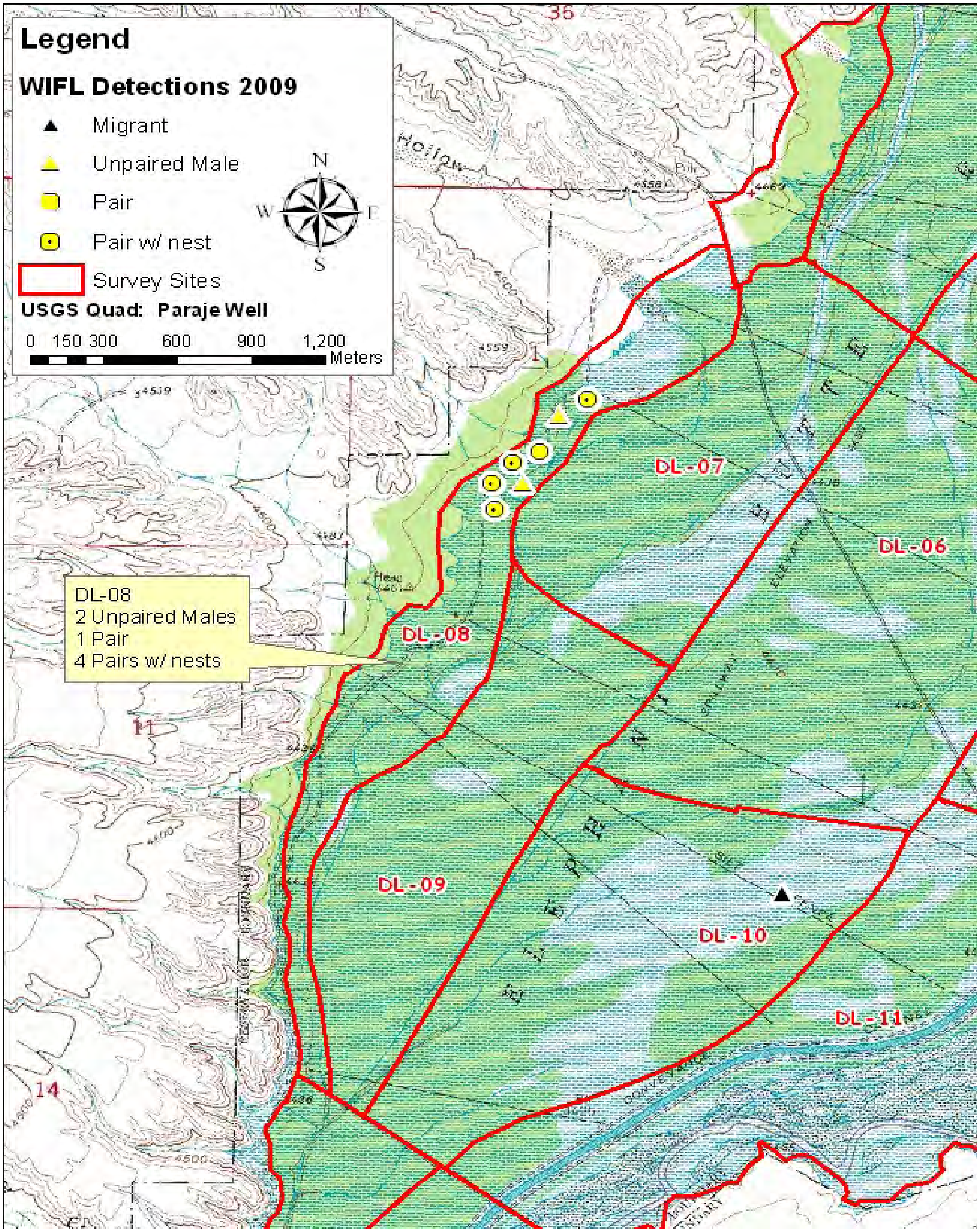
Attach the following: 1) copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections;
2) sketch or aerial photo showing site location, patch shape, survey route, location of any detected WIFLs or their nests;
3) photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments.

<u>Comments (such as start and end coordinates of survey area if changed among surveys, supplemental visits to sites, unique habitat features. Attach additional sheets if necessary.</u>
<u>Great habitat with saturated or flooded soils throughout most of the site on 1st survey. Site began to dry by the end of the breeding season. SWFL territories are dominated by Gooddings willow, however Tamarix spp. tends to be increasing in density compared to previous years. Site is supported by flows from the Low Flow Conveyance Channel.</u>

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)
1 (Unpaired male)	5/24, 6/10,6/21,7/1	305,276	3,714,926	N	N	extended presence at site from 5/24 through 7/1, no evidence of pairing
2 (Unpaired male)	5/24, 6/10,6/21,7/1, 7/10	305,131	3,714,628	N	N	extended presence at site from 5/24 through 7/10, no evidence of pairing
3 (Pair)	5/24, 6/10,6/21,7/1, 7/10	305,191	3,714,778	Y	Y	Pair confirmed based on vocalizations and observation of unchallenged WIFL
4 (Pair w/nest)	5/24, 6/10,6/21,7/1, 7/10	305,394	3,715,009	Y	Y	Confirmed breeding status with nest
5 (Pair w/nest)	5/24, 6/10,6/21,7/1, 7/10	305,084	3,714,732	Y	Y	Confirmed breeding status with nest
6 (Pair w/nest)	6/10,6/21,7/1, 7/10	305,001	3,714,640	Y	Y	Confirmed breeding status with nest
7 (Pair w/nest)	6/10,6/21,7/1, 7/10	305,010	3,714,524	Y	N	Confirmed breeding status with nest

Attach additional sheets if necessary


Legend
WIFL Detections 2009
Migrant
Unpaired Male
Pair
Pair w/ nest
Survey Sites
USGS Quad: Paraje Well
0 150 300 600 900 1,200
Meters
N
S
W
E
DL-08
2 Unpaired Males
1 Pair
4 Pairs w/ nests
DL - 06
DL - 07
DL - 08
DL - 09
DL - 10
DL - 11
36
11
14

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For more information concerning the research in this report, contact
Mark Sogge
U.S. Geological Survey
2255 Gemini Drive,
Flagstaff, AZ 86001

Sogge and others—**A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher**—Techniques and Methods 2A-10

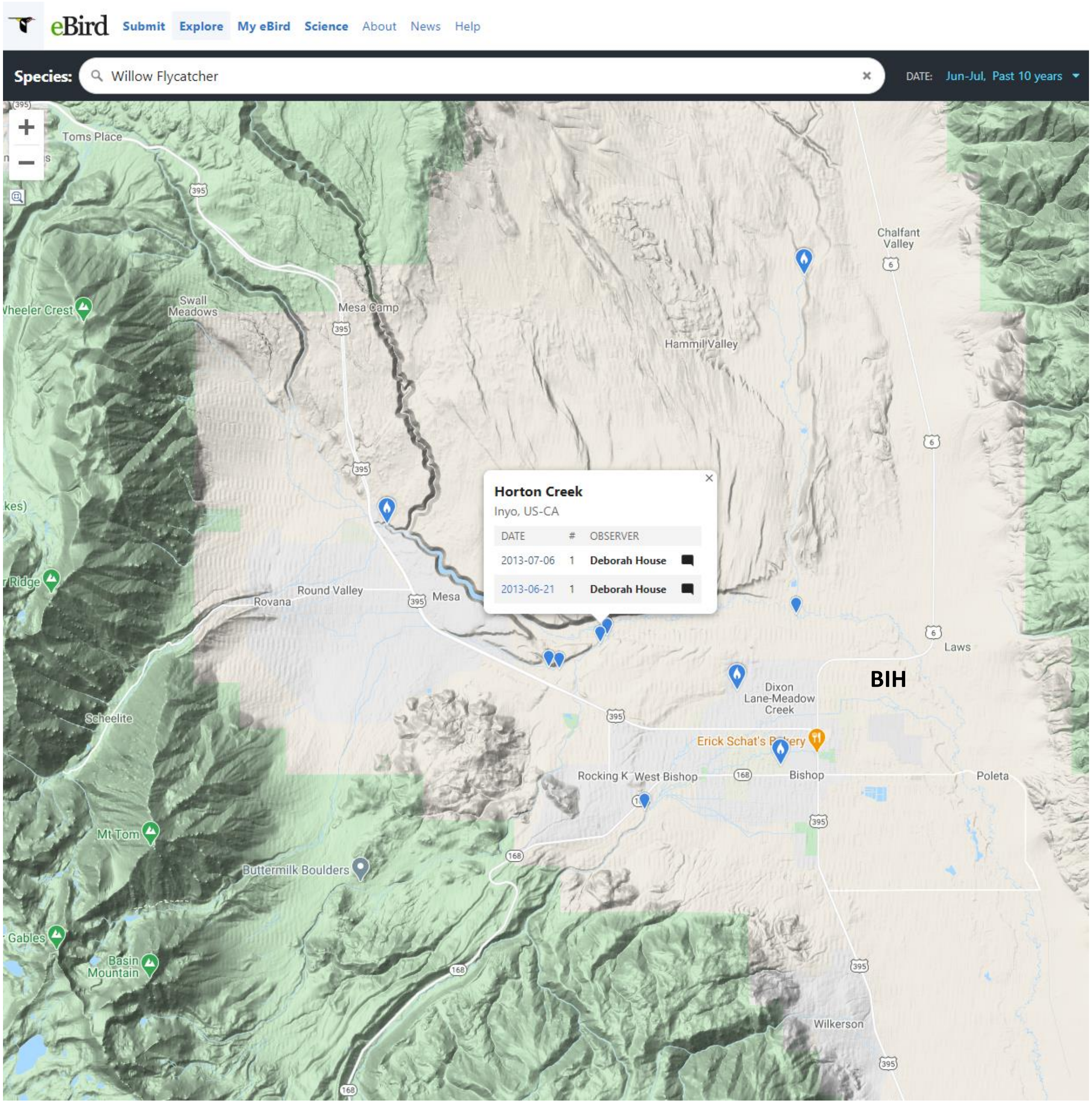
APPENDIX E

Southwest Willow Flycatcher Observation History

Appendix E-1

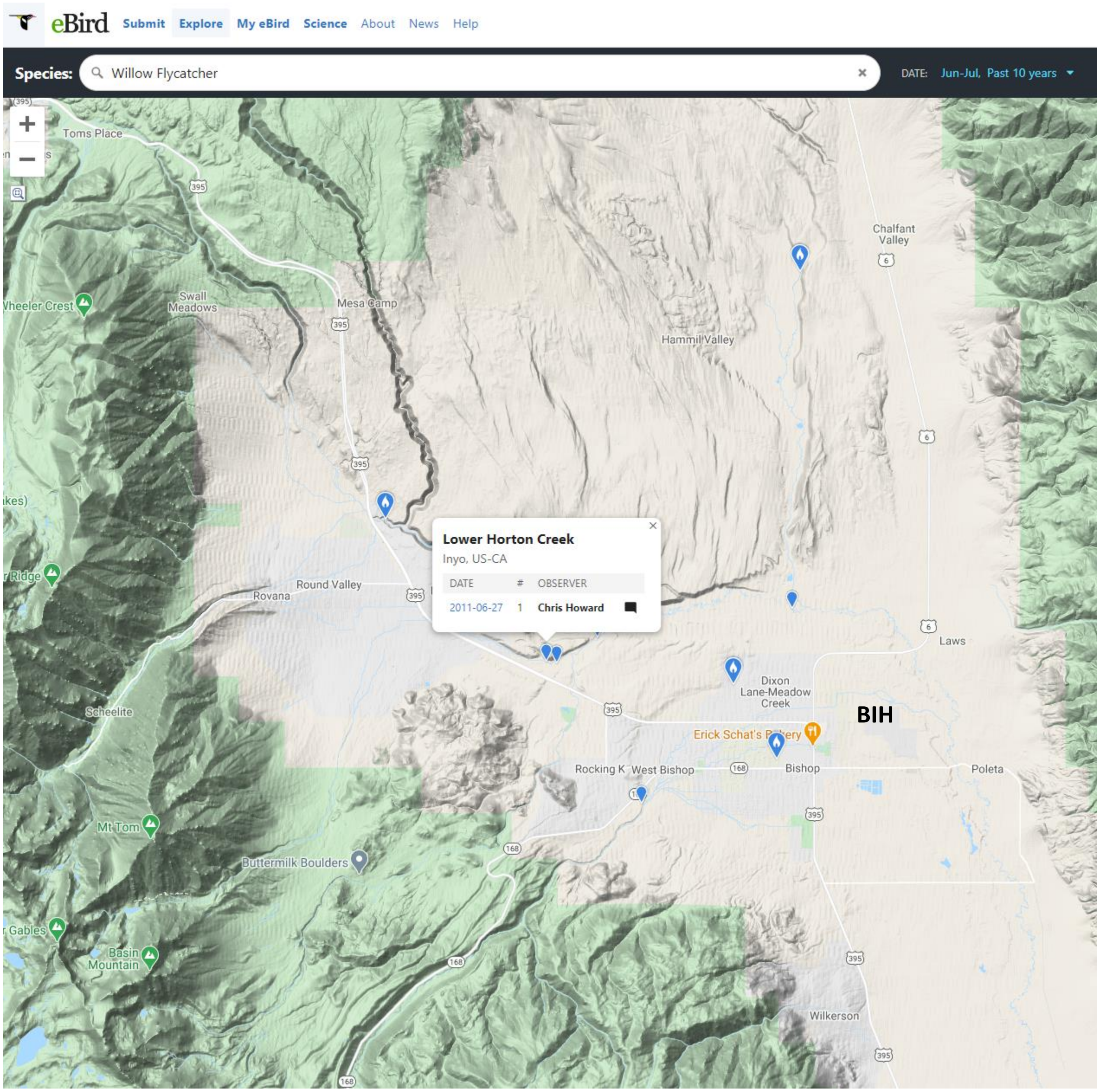
Cornell Laboratory of Ornithology's eBird Database Search Results

Cornell Laboratory of Ornithology's eBird Database Search Results



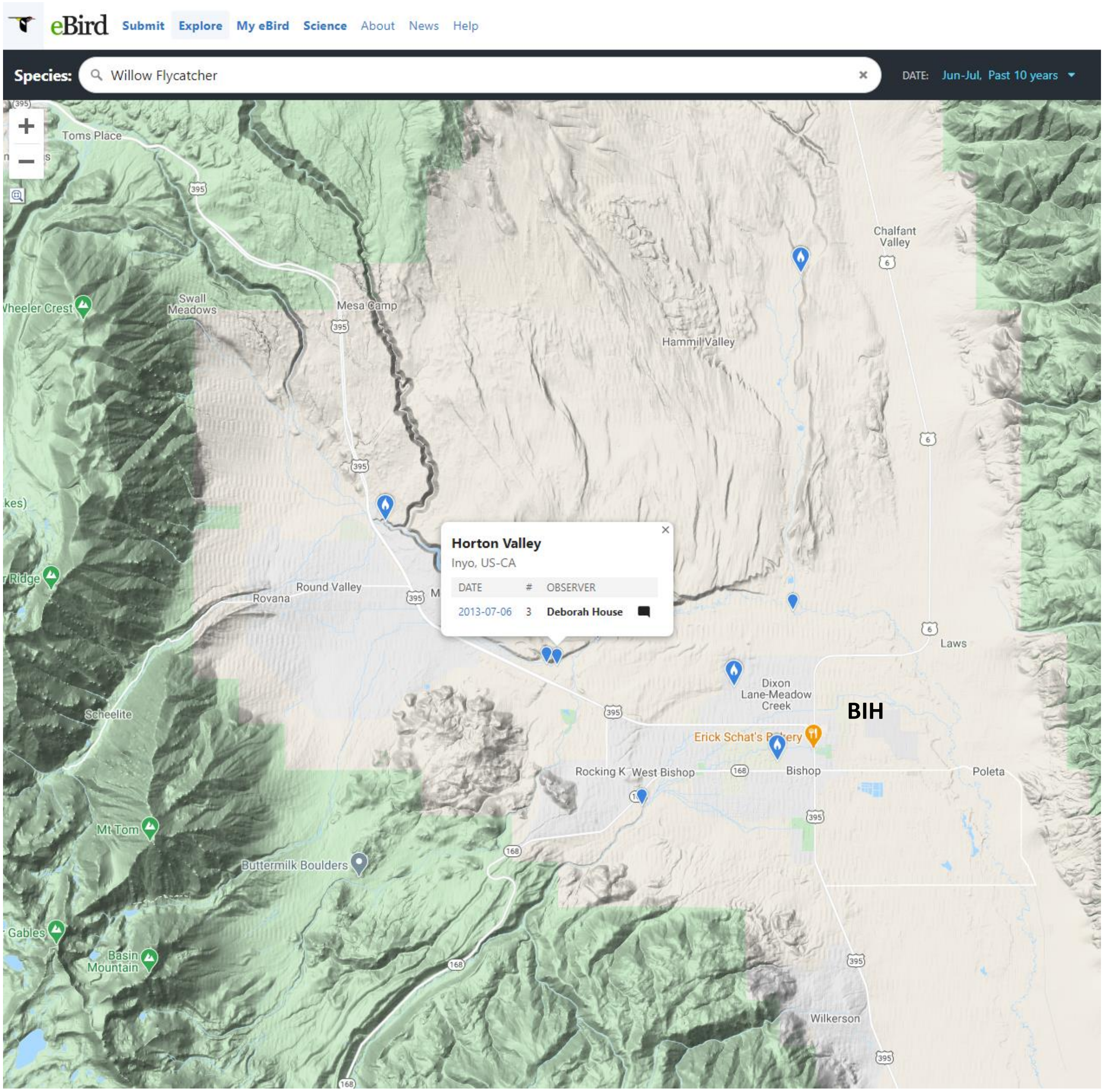
SOURCE:
Cornell Laboratory of Ornithology, eBird database, https://ebird.org/, (Accessed: October 5, 2020)

NOTES:
This figure depicts the closest sightings of Willow Flycatchers in the last ten years between the days of June 15 and July 20 (i.e., the "non-migrant period"), where individuals observed are presumed to be *E. t. extimus.* The sightings shown above are depicted near Horton Creek, approximately 6 miles northwest of the Airport. Other sightings identified in the figure were not recorded during the "non-migrant period."



SOURCE:
Cornell Laboratory of Ornithology, eBird database, https://ebird.org/, (Accessed: October 5, 2020)

NOTES:
This figure depicts the closest sightings of Willow Flycatchers in the last ten years between the days of June 15 and July 20 (i.e., the "non-migrant period"), where individuals observed are presumed to be *E. t. extimus.* The sightings shown above are depicted near Horton Creek, approximately 6 miles northwest of the Airport. Other sightings identified in the figure were not recorded during the "non-migrant period."



SOURCE:
Cornell Laboratory of Ornithology, eBird database, https://ebird.org/, (Accessed: October 5, 2020)

NOTES:
This figure depicts the closest sightings of Willow Flycatchers in the last ten years between the days of June 15 and July 20 (i.e., the "non-migrant period"), where individuals observed are presumed to be *E. t. extimus.* The sightings shown above are depicted near Horton Creek, approximately 6 miles northwest of the Airport. Other sightings identified in the figure were not recorded during the "non-migrant period."

Appendix E-2

California Department of Fish and Wildlife California Natural Diversity Database

California Department of Fish and Wildlife California Natural Diversity Database Search Results

SciName	ComName	TaxonGroup	ElmCode	FedList	CalList	GRank	SRank
Empidonax traillii extimus	southwestern willow flycatcher	Birds	ABPAE33043	Endangered	Endangered	G5T2	S1
Empidonax traillii extimus	southwestern willow flycatcher	Birds	ABPAE33043	Endangered	Endangered	G5T2	S1

OthrStatus	OccNumber	EOndx	Mapndx	ElmDate	SiteDate	Sensitive
NABCI_RWL-Red Watch List	52	66321	66239	20030625	20030625	N
NABCI_RWL-Red Watch List	66	79300	1749	19170713	20050714	N

OccRank	Presence	Accuracy	AccuracyOrder	Trend	OccType	County
A-Excellent	Presumed Extant	Specific bounded area	20	Unknown	Natural/Native occurrence	Inyo
U-Unknown	Presumed Extant	Circular feature with a 1600 meter radius (1 mile)	90	Unknown	Natural/Native occurrence	Inyo

OwnerMgt	LastUpdate	KeyQuad	UTMZone	UTME	UTMN
LADWP	3/1/2010 0:00	Fish Slough (3711844)	11	367423	4139701
UNKNOWN	3/23/2010 0:00	Laws (3711843)	11	380083	4139783

Quad	Elevation	Latitude	Longitude	UTM	PLSS
Fish Slough (3711844) | Rovana (3711845)	4370	37.39461	-118.49775	Zone-11 N4139701 E367423	T06S, R32E, Sec. 30, SE (M)
Laws (3711843)	4100	37.39707	-118.35478	Zone-11 N4139783 E380083	T06S, R33E, Sec. 28 (M)

Location	LocDetails	Ecological	ThreatList	Threat	General
HORTON CRK FROM PLEASANT VALLEY DAM RD W ABOUT 0.2 MI, & E OF PLEASANT VLY DAM RD ABOUT 0.25 MI S OF JCT WITH THE CRK.	MAPPED TO PROVIDED COORDINATES. 2000 GENETIC STUDY BY PAXTON INDICATES THAT WILLOW FLYCATCHERS IN THE OWENS VALLEY AREA SHOULD BE CLASSIFIED AS SUBSPECIES EXTIMUS.	NATIVE RIPARIAN FOREST DOM BY SALIX GOODINGII & SALIX EXIGUA WITH A WELL-DEVELOPED UNDERSTORY. WATER IS PRESENT YEAR-ROUND AT THIS SITE. MAINTAINED AS OPEN SPACE FOR WATERSHED PROTECTION; LIVESTOCK GRAZING & RECREATION ALLOWED.	Improper burning regime	POTENTIAL THREAT OF HUMAN-CAUSED WILDFIRE.	NW: 1 PAIR ON 8 JUL 2001, 1 PAIR ON 30 JUN 2002, & A SINGLE BIRD ON 25 JUN 2003. NE: SINGLE BIRD ON 8 JUL 2001, SINGLE BIRD ON 17 MAY & 30 JUN 2002, & A PAIR ON 25 JUN 2003. S: 2 BIRDS ON 11 MAY 2002, WITH ONLY 1 SUBSEQUENTLY ON 30 JUN.
VICINITY OF LAWS AND THE OWENS RIVER, OWENS VALLEY.	MVZ LOCATIONS DESCRIBED AS "LAWS" & "FARRINGTON RANCH, LAWS." 1986 SURVEY OF OWENS RIVER INCLUDED T6S R33E SEC 28. 2005 LOCATION JUST SOUTH OF HWY 6 ABOUT 0.1 MI WEST OF JUNCTION WITH SILVER CANYON RD (COORDS PROVIDED).	RIPARIAN HABITAT BORDERING THE OWENS RIVER. DOMINATED BY SANDBAR WILLOW, ARROYO WILLOW & WOOD ROSE. SUITABLE HABITAT FOR SMALL # OF BREEDING BIRDS. SOME FORMERLY GOOD HABITAT BURNED - UNSUITABLE. RAILROAD DEVELOPMENT PROPOSED IN 2005.		DEVELOPMENT AND FIRE.	MVZ SPECIMENS COLLECTED ON 5 JUL 1917 (#27968 - ALSO IN BLM80S), 10 JUL 1917 (#27969 - ALSO IN BLM80S) & 13 JUL 1917 (#27970). NONE DETECTED IN 1986. WIFL MIGRANT DETECTED MAY 2005. SUBSPECIES EXTIMUS OCCURS IN OWENS VALLEY (PAXTON 2000).

SOURCE:
California Department of Fish and Wildlife, California Natural Diversity Database (CNDDB) search results through August 2020, August 12, 2020.

NOTES:
Results are sorted for the Southwestern Willow Flycatcher (*Empidonax traillii extimus*; SWFL), which includes two sightings in Inyo County, California. The closest SWFL sighting to the Airport was recorded in 2003 near Horton Creek.

APPENDIX I

Cultural Resources Technical Analysis

Due to the sensitive nature of the resources evaluated in the cultural resources technical analysis, this appendix has been redacted.

Appendix J
Noise Technical Report

ESA

Draft

PROPOSED COMMERCIAL AIRLINE SERVICE AT BISHOP AIRPORT

Noise Technical Report

Prepared for

County of Inyo Department of Public Works

February 2021

ESA

Draft

PROPOSED COMMERCIAL AIRLINE SERVICE AT BISHOP AIRPORT

Noise Technical Report

Prepared for

February 2021

County of Inyo Department of Public Works

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PROPOSED COMMERCIAL AIRLINE SERVICE AT BISHOP AIRPORT

Noise Technical Report

1. Introduction

Inyo County has identified an unmet demand for commercial air passenger service in the Eastern Sierra region. To meet this demand, the County has expressed interest in obtaining a Class I Airport Operating Certification for Bishop Airport (BIH or Airport) under Title 14 Code of Federal Regulations (CFR) Part 139 (Part 139 Certification). By obtaining Part 139 Certification, BIH will be able to accommodate scheduled or unscheduled commercial air passenger service. United Airlines, Inc. and its partner SkyWest Airlines, operating as United Express (henceforth referred to as SkyWest Airlines) are interested in introducing commercial air passenger service to BIH. SkyWest Airlines has submitted a request to the FAA to amend its Operations Specifications, pursuant to 14 CFR Part 121, to allow the airline to provide scheduled commercial air passenger service to BIH.

The following sections discuss the methodology employed in the modeling process and the modeling results.

2. Methodology

2.1 Introduction

The information described in this section was compiled and incorporated into the FAA's Aviation Environmental Design Tool version 3c (AEDT 3c). AEDT 3c was used to develop CNEL 65 dB, 70 dB, and 75 dB contours for this analysis. The contours and CNEL values were developed and disclosed in accordance with FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*, and the 1050.1F Desk Reference.

Five modeling scenarios were evaluated:

- 2019 Existing Conditions
- 2022 No Action Alternative
- 2022 Proposed Action Alternative
- 2028 No Action Alternative
- 2028 Proposed Action Alternative

The CNEL contours were prepared using existing operational data as well as the FAA approved forecast for BIH. A detailed discussion of the model inputs used to develop these contours is included in the following sections.

2.2 Forecast

The aircraft operations for each scenario described in Section 2.1, were derived from an Aviation Activity Forecast prepared for the County of Inyo in March 2020. The FAA's Terminal Area Forecast (TAF) is an official forecast of aviation operations for airports included in the National Plan of Integrated Airport Systems (NPIAS). The TAF indicated constant aircraft activities at BIH without the introduction of commercial airline service. The number of annual operations would be 26,000 operations, consisting of 7,000 local general aviation operations, 16,000 itinerant general aviation operations, and 3,000 military operations. The Aviation Activity Forecast presented forecast data incorporating the transition of commercial airline operations from Mammoth Yosemite Airport (MMH) to BIH.[1] The forecast and the United Airlines Letter of Support associated with the transition can be found in Appendix A of the Draft 2020 Aviation Activity Forecast provided in **Appendix D-1**. The forecast prepared for BIH varies from the TAF, indicating 1,000 more operations in 2028 than is forecast in the TAF. The total operations for 2022 and 2028 used for the analysis were derived from a schedule of operations provided by the County of Inyo, and a summary of these operations is provided in **Table 1**.

TABLE 1
AIRCRAFT OPERATION SUMMARY

Study Year	Scenario	Itinerant				Local		Total
		Air Carrier	Air Taxi[1]	General Aviation[2]	Military[2]	General Aviation[2]	Military[2]	
2019	Existing Conditions	0	6	16,000	3,000	7,000	0	26,006
2022	No Action	0	6	16,000	3,000	7,000	0	26,006
	Proposed Action[3]	1,210	6	16,000	3,000	7,000	0	27,216
2028	No Action	0	6	16,000	3,000	7,000	0	26,006
	Proposed Action[3]	1,942	6	16,000	3,000	7,000	0	27,948

NOTES:
1 BIH Aviation Activity Forecast document indicated there would be approximately 6 operations diverted from MMH due to the weather. These are charter aircraft operations.
2 FAA TAF
3 In June 2020, the County of Inyo provided the 2022 and 2028 proposed aircraft operations with aircraft types, schedule, and destination. These operations varied slightly from those in the BIH Aviation Activity Forecast.

SOURCE: BIH Aviation Activity Forecast, 2019; FAA TAF, 2020; County of Inyo, 2020.

The 26,000 operations included in the TAF remain constant in the estimated activity for BIH. Therefore, the number of aircraft operations under 2019 Existing Conditions and the 2022 No Action Alternative and 2028 No Action Alternative scenarios would remain unchanged. Proposed

1 *Draft Aviation Activity Forecast Bishop Airport*, Inyo County Department of Public Works, March 2020.

Action operations in 2022 and 2028 would include scheduled air carrier operations. **Table 2** presents the proposed operations by season and aircraft type.

TABLE 2
PROPOSED ACTION AIRCRAFT OPERATIONS

Season[1]	Aircraft Type[2]	Destination[2]	Distance (NM)[3]	Annual Operations[4]
2022				
Winter	C-II	SFO	192	240
Winter	Bombardier CRJ-700	DEN	660	240
Winter	Bombardier CRJ-700	LAX	206	240
Summer and Shoulder	Bombardier CRJ-700	LAX	206	490
		Grand Total of 2022 Proposed Operations		1,210
2028				
Winter	C-III[6]	SFO	192	484
Winter	Embraer 175-LR	DEN	660	242
Winter	Embraer 175-LR	LAX	206	484
Winter	Embraer 175-LR	SAN	284	242
Summer and Shoulder	Bombardier CRJ-700	LAX	206	490
		Grand Total of 2028 Proposed Operations		1,942

NOTES:
1 Winter season is between December 17 and April 15, a total of 120 days. The summer and shoulder seasons represent the remainder of the year, a total of 245 days.
2 BIH provided ESA with the estimated aircraft operations, aircraft types, schedule, and destinations proposed by the airlines.
3 Distances between BIH and destination airports were derived from Great Circle Mapper.
4 2028 is a leap year. The winter season is 121 days and the summer and shoulder season period is 245 days.
5 For example the Bombardier CRJ-700.
6 Aircraft Reference Code for Embraer 175-LR is C-III.

SOURCE: County of Inyo, 2020.

2.3 Aircraft Fleet Mix

Various aircraft have different noise characteristics dependent upon factors such as size, engine type, and airframe design. Therefore, it is necessary to account for the different aircraft types, or fleet mix, operating in the environment when modeling noise exposure. BIH management provided fleet mix and approximate frequency of cargo, air ambulance, civilian helicopter operations, and military operations. In addition, representative based aircraft types were included in the 2020 Existing Conditions fleet mix. BIH management identified Osprey (V-22) as an aircraft that operates at the airport. The V-22 is not included in the AEDT and a substitution aircraft type must be approved by the FAA for use in the model. **Attachment J-1** includes the approval letter from the FAA for the substitution of the V-22 with the Sikorsky CH-53 Sea Stallion. The AEDT fleet mix and other operational information used for this analysis is presented in **Attachment J-2**.

2.4 Stage Lengths

An aircraft's stage length (or trip length) refers to the distance an aircraft flies from its origin airport (BIH) to its intended destination. Stage length is important in noise modeling since the longer the distance an aircraft will fly to its destination, the greater the fuel load required and overall weight and, as a result, the lower its departure profile. Once the specific fleet mix was completed, departure destination information was analyzed to determine departure stage lengths. Stage lengths used in the AEDT include the following stages:

Stage Length 1:	0 to 500 miles
Stage Length 2:	500 to 1,000 miles
Stage Length 3:	1,001 to 1,500 miles
Stage Length 4:	1,501 to 2,500 miles
Stage Length 5:	2,501 to 3,500 miles
Stage Length 6:	3,501 to 4,500 miles
Stage Length 7:	4,501 to 5,500 miles
Stage Length 8:	5,501 to 6,500 miles
Stage Length 9:	6,500+ miles

For 2019 Existing Conditions as well as the future No Action Alternative scenarios, all aircraft were assigned to Stage Length 1. For the Proposed Action, scheduled operations to Denver would be Stage Length 2.

2.5 Time of Day

Another important component in developing the CNEL contours is determining the day-evening-night use percentages for each AEDT aircraft. This data is important because the CNEL metric is a 24-hour, time-weighted energy average. The time-weighting refers to the fact that noise events occurring during certain noise sensitive time periods receive an additional weighting. For the CNEL metric, noise events occurring between the hours of 7:00:00 p.m. and 9:59:59 p.m. receive a 4.77-dB weighting. Noise events occurring between the hours of 10:00:00 p.m. and 6:59:59 a.m. receive a 10-dB weighting. These weightings attempt to account for the higher sensitivity to noise in the evening and nighttime that would accompany the expected decrease in background noise levels compared with background noise levels during the day. Because noise is measured on a logarithmic scale, a 4.77-dB weighting means each evening event is weighted as equivalent to 3 daytime events and a 10-dB weighting means each nighttime noise event is weighted as equivalent to 10 daytime events.

The aircraft operation data provided for this analysis used day-evening-night percentages as presented in **Table 3**.

TABLE 3
TIME OF DAY PERCENTAGES

Aircraft/Operation Categories	Day	Evening	Night
Civilian Helicopters	90%	10%	0%
General Aviation Fixed Wing Aircraft and Military Helicopters	90%	7%	3%

NOTES:

Aircraft operations by cargo carriers and military fixed wing occur 100% during the daytime.
Civilian general aviation and helicopter and military helicopter operations occur during all time periods.
All future air carrier operations will all occur during daytime periods,

SOURCE: County of Inyo, 2020.

2.6 Runway Use

Runway use percentages are another important component in developing CNEL contours. Some airports have a preferential runway use system that balances noise concerns with the safest and most efficient use of the airport. If a certain runway is used predominantly for departures while another runway is used for arrivals, the noise contours will differ to reflect the type of activity. BIH management provided estimated runway use information. **Table 4** shows the runway use percentages, by aircraft operations, used for all noise analysis scenarios.

TABLE 4
RUNWAY USE

	Runway						
	12	30	17	35	8	26	Total
Departure							
Day	18%	40%	10%	30%	1%	1%	100%
Evening	25%	55%	5%	15%	0%	0%	100%
Night	30%	70%	0%	0%	0%	0%	100%
Arrival							
Day	40%	18%	30%	10%	1%	1%	100%
Evening	55%	25%	15%	5%	0%	0%	100%
Night	70%	30%	0%	0%	0%	0%	100%
Touch-and-Go							
Day Only	18%	40%	10%	30%	1%	1%	100%

NOTES:

Proposed commercial operations by CRJ-700 and EMB-175, as well as operations by C-130 would only occur on Runway 12/30.

SOURCE: County of Inyo, 2020; Environmental Science Associates, 2020.

BIH management provided ESA with the locations of three helicopter landing pads at the airport, as indicated on the Airport Layout Plan. It is assumed that all three helicopter landing pads will be used equally.

2.7 Flight Track and Flight Track Use Percentages

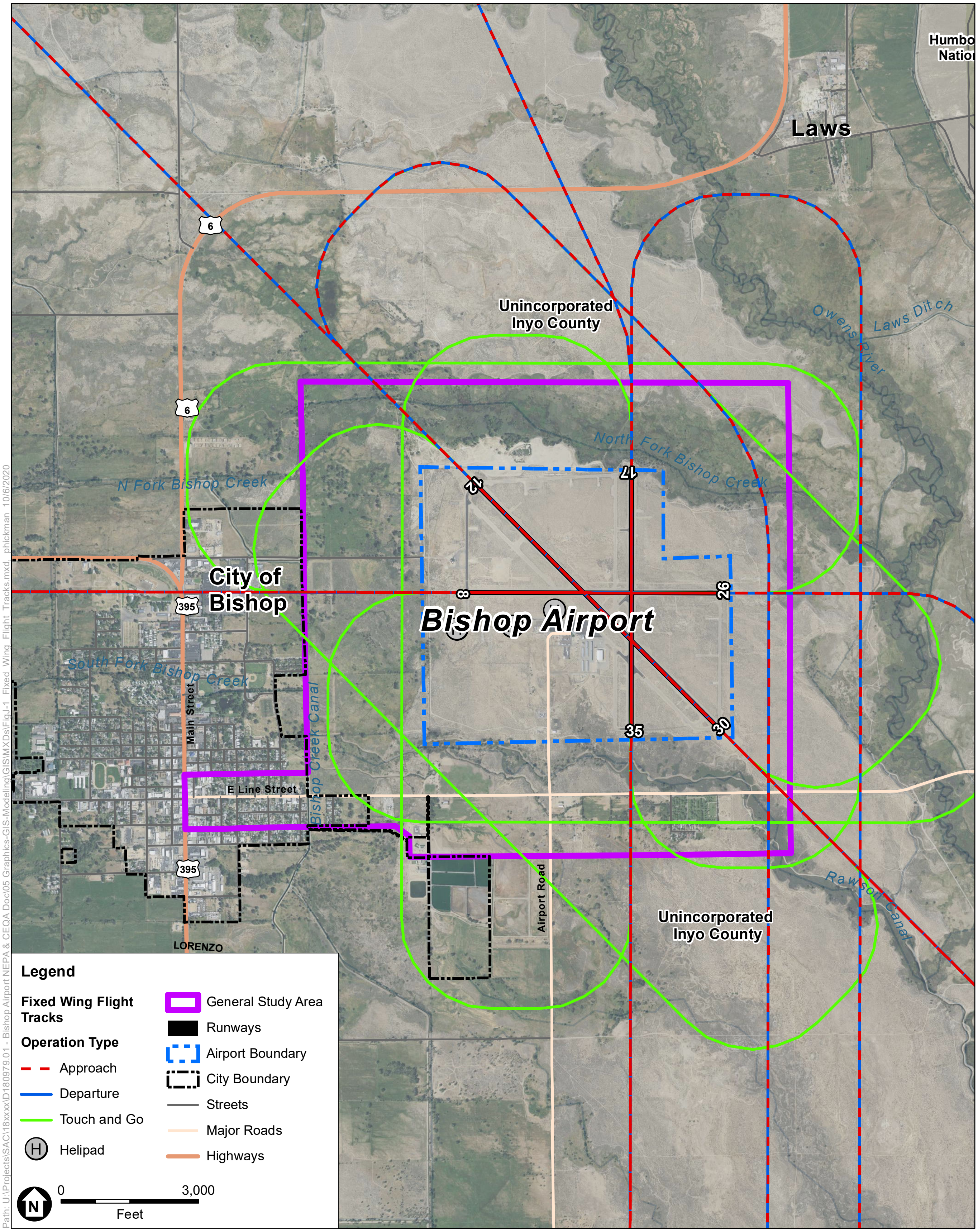
To determine noise levels on the ground, it is not only important to know how many operations are occurring and on what runways, but also to know where the aircraft are flying beyond the runways as they ingress and egress the airport. Flight track and flight track use percentages are a key element in the development of the CNEL contours. Flight tracks were developed based on a review of published flight procedures,[2] as well as the consideration of terrain in the vicinity of BIH. BIH has four published instrument procedures; three are Area Navigation (RNAV) instrument approach procedures, and one is a Localizer-type Directional Aid (LDA) approach.[3] No changes in aircraft arrival or departure flight procedures in the terminal or enroute environments are expected for the Proposed Action Alternative; therefore, the same flight tracks were modeled for both the No Action and Proposed Action Alternatives.

For fixed-wing aircraft operations, including Instrument Flight Rules and Visual Flight Rules operations, it was assumed that aircraft would arrive and depart BIH along U.S. Highway 395, one to the northwest and one to the south. Unless destinations were known, the flight track use percentages were 50 percent to the northwest and 50 percent to the south.

For helicopters, it was assumed that helicopters would arrive and depart BIH along U.S. Highway 395 as well as U.S. Highway 6 to the north. All helicopters were assigned equally to three directions.

The flight track use percentages used in the modeling effort also remained unchanged throughout the proposed analysis years. **Attachment J-2** includes flight track use percentages used by BIH operations. The modeled flight tracks are depicted in **Figures 1** and **2**.

[3] A complete set of approach and departure procedure plates at BIH can be found at http://www.airnav.com/airport/KBIH

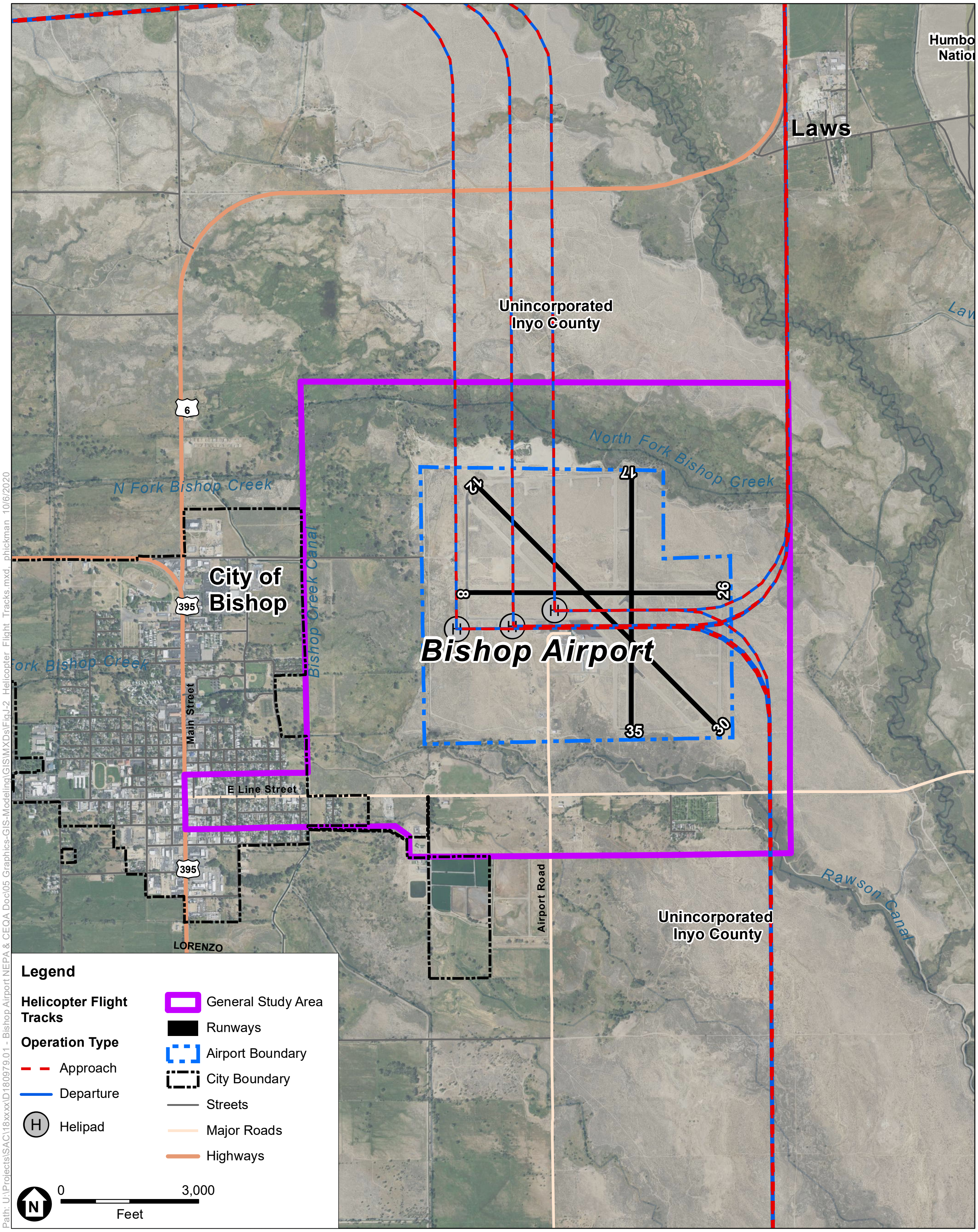


SOURCE: Esri; Inyo County Department of Public Works; ESA, 2020.

Proposed Commercial Airline Service at Bishop Airport

Figure 1
Modeled Fixed Wing Flight Tracks
Bishop Airport

ESA



SOURCE: Esri; Inyo County Department of Public Works; ESA, 2020.

Proposed Commercial Airline Service at Bishop Airport

Figure 2
Modeled Helicopter Flight Tracks
Bishop Airport

ESA

3. Noise Modeling Results

3.1 CNEL Contours

The information described above was compiled and incorporated into the AEDT. The AEDT calculates aircraft noise exposure using a defined network of grid points at ground level around an airport. It computes the noise generated by each aircraft operation, by aircraft type, and engine thrust level along each flight track. The noise exposure levels for each aircraft are then summed at each grid point. The cumulative noise exposure levels at all grid points are then used to develop noise exposure contours for selected values (e.g., CNEL 65, 70 and 75 dB). Using the results of the grid point analysis, noise contours of equal noise exposure can then be plotted.

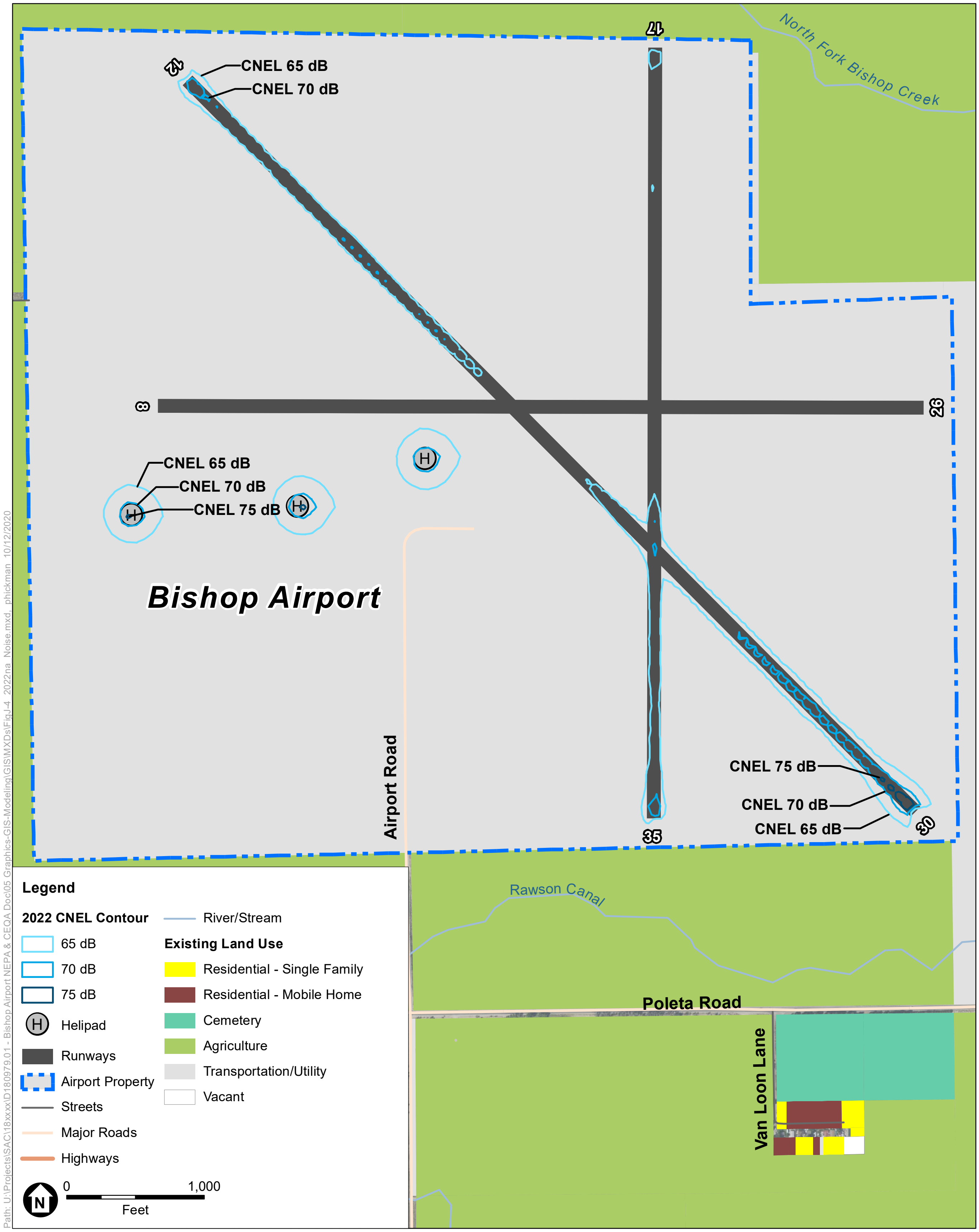
The CNEL 65, 70, and 75 dB contours for 2019 Existing Conditions, the 2022 and 2028 No Action Alternatives, and the 2022 and 2028 Proposed Action Alternatives are shown in **Figures 3, 4, 5, 6,** and **7**, respectively. These contours represent the 24-hour aircraft noise exposure to areas surrounding BIH on an average annual day. Note that the CNEL 65 dB contour did not extend beyond the airport property line in any of the scenarios modeled. **Table 5** presents the acreages within the CNEL contours for each scenario. Because the CNEL 65 dB contour did not extend beyond the airport property in any modeled scenario, and there are no changes to existing flight procedures, it is expected that noise impacts to wildlife and wilderness areas would be negligible.

SOURCE: Esri; Inyo County Department of Public Works; County of Inyo Assessor, July 2020 (existing land use); ESA, 2020.

Proposed Commercial Airline Service at Bishop Airport

Figure 3
2019 CNEL Contours and Generalized Existing Land Uses
Bishop Airport

ESA



SOURCE: Esri; Inyo County Department of Public Works; County of Inyo Assessor, July 2020 (existing land use); ESA, 2020.

Proposed Commercial Airline Service at Bishop Airport

Figure 4
2022 No Action CNEL Contours and Generalized Existing Land Uses
Bishop Airport

ESA

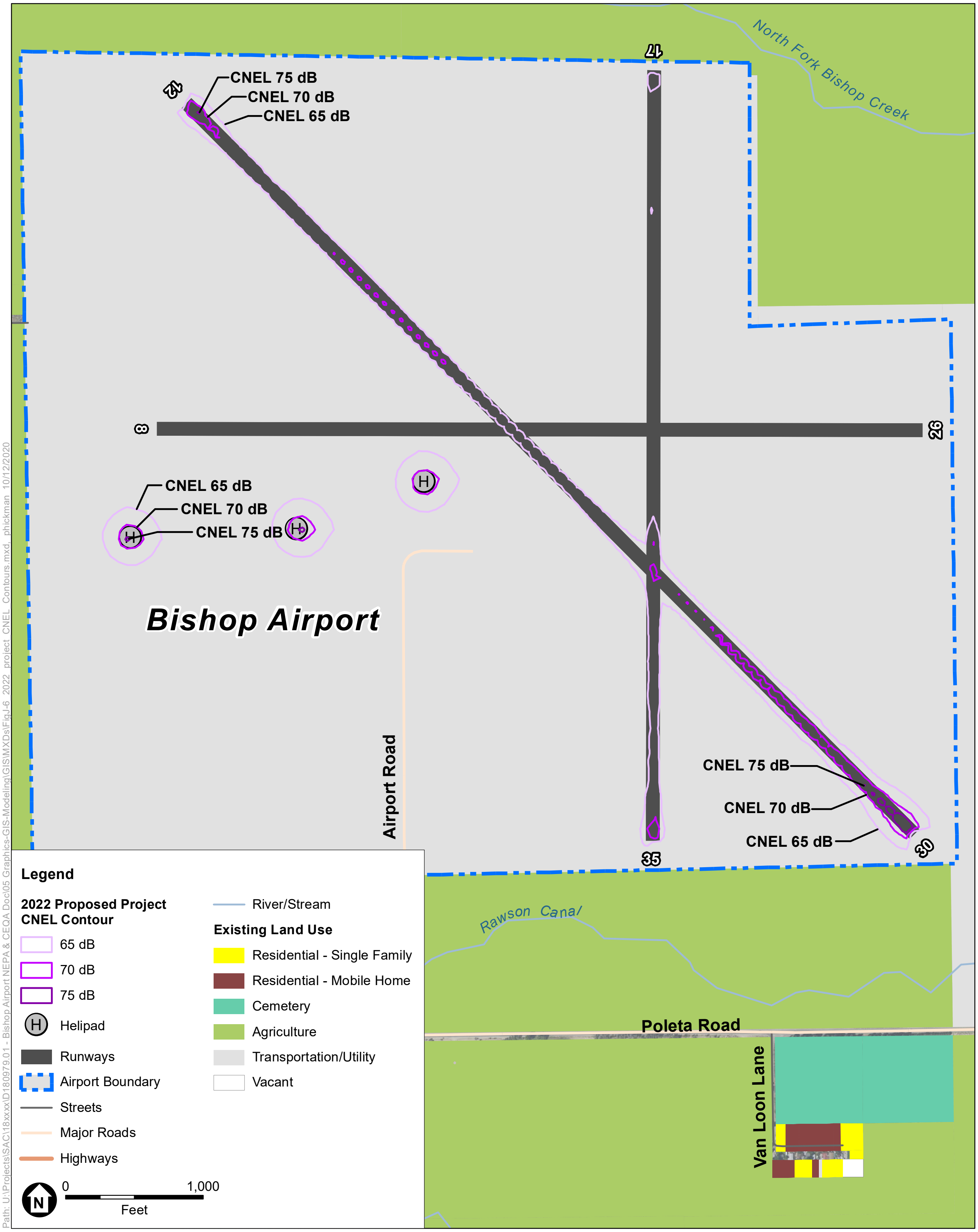
Path: U:\Projects\SAC\18xxxx\D180979.01 - Bishop Airport NEPA & CEQA Doc\05 Graphics-GIS-Modeling\GIS\MXDs\FigJ-5_2028na_Noise.mxd, phickman 10/12/2020

SOURCE: Esri; Inyo County Department of Public Works; County of Inyo Assessor, July 2020 (existing land use); ESA, 2020.

Proposed Commercial Airline Service at Bishop Airport

Figure 5
2028 No Action CNEL Contours and Generalized Existing Land Uses
Bishop Airport

ESA



SOURCE: AEDT 3c, August 2020; Esri; Inyo County Department of Public Works; County of Inyo Assessor, July 2020 (existing land use); ESA, 2020.

Proposed Commercial Airline Service at Bishop Airport

Figure 6
2022 Proposed Action CNEL Contours and Generalized Existing Land Uses
Bishop Airport

SOURCE: AEDT 3c, August 2020; Esri; Inyo County Department of Public Works; County of Inyo Assessor, July 2020 (existing land use); ESA, 2020.

Proposed Commercial Airline Service at Bishop Airport

Figure 7
2028 Proposed Action CNEL Contours and Generalized Existing Land Uses
Bishop Airport

TABLE 5
CNEL NOISE CONTOUR AREAS (ACRES)

Noise Contour	Existing Conditions 2019	Proposed Action 2022	Proposed Action 2028	No Action 2022	No Action 2028
CNEL 65 or greater	34.2	39.3	50.9	34.2	34.2
CNEL 70 or greater	4.5	5.8	11.3	4.5	4.5
CNEL 75 or greater	0.3	0.4	1.1	0.3	0.3

SOURCE: Environmental Science Associates, 2020.

Attachment J-1
FAA Letter of Approval Regarding V-22 Osprey Substitution

U.S Department
of Transportation
Federal Aviation Administration

Western-Pacific Region
Office of Airports
Los Angeles Airports District Office

777 S. Aviation Blvd., Suite 150
El Segundo, CA 90245

September 28, 2020

Ashley Helms
Associate Engineer
Inyo County Public Works
168 N. Edwards Street
PO Drawer Q
Independence, CA 93526-0121

Dear Ms. Helms

Bishop Airport
Proposed Part 139 Certification and Operations Specification Amendment
Environmental Assessment – Aircraft Substitution Request

The Federal Aviation Administration (FAA) evaluated the Aviation Environmental Design Tool (AEDT) 3c aircraft substitution request received on August 5, 2020 for the Bishop Airport (BIH) Proposed 139 Certification and Operations Specification Amendment Environmental Assessment. The request was submitted by ESA Airports on behalf of Inyo County (County). The request indicates that approximately 14 days per year the aviation activity at BIH includes use by Osprey (V-22) tiltrotor military aircraft. The V-22 is not an aircraft included within the AEDT 3c model, therefore, approval of a substitution aircraft is necessary for air quality and noise modeling purposes. The ESA Airports request recommended use of Boeing CH-47D Chinook (CH47D ANP type) to model the V-22. On September 9, 2020, the County estimated that the V-22 operates in helicopter mode 90 percent of the time and 10 percent of the time as a fixed wing aircraft at BIH.

The FAA completed its evaluation of this request and recommends that Equipment ID 15 (Sikorsky CH-53 Sea Stallion mapped to the S65 ANP aircraft type) [S65 ANP] be used rather than the CH47D ANP type. The S65 ANP type would generally produce a larger noise signature than the proposed CH47D ANP type and is therefore a more conservative selection given the unique characteristics of the V-22. This substitution is also approved with the understanding that the V-22 will be operating at BIH predominantly in a vertical lift mode. Accordingly, the FAA does not approve the use of CH47D ANP type to model the V-22 operations at BIH.

Please understand that the approval to use the S65 ANP for the V-22 operations is limited to this particular Environmental Assessment at BIH, and for use with AEDT 3c only. Further non-standard AEDT inputs for additional assessments or proposals require separate FAA evaluation and approval.

If you have any questions or concerns, I am available at (650) 827-7613 or by email at Camille.Garibaldi@faa.gov.

Sincerely,

Camille Garibaldi

Digitally signed by Camille Garibaldi
Date: 2020.09.28 13:06:08 -07'00'

Camille Garibaldi
Environmental Protection Specialist

Attachment J-2
Aircraft Operational Information

ATTACHMENT J-2
Aircraft Operational Information

The following tables present operational information relevant to the modeling of the CNEL contours for the Proposed Commercial Airline Service at Bishop Airport Draft Environmental Assessment.

TABLE B1 – 2019, 2022, AND 2028 BASELINE ANNUAL AVERAGE DAY AIRCRAFT OPERATIONS

			Arrival			Departure			Touch-and-Go			
Airframe	**Engine**	**Engine Mod Code**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**	**Total**
Cessna 172 Skyhawk	IO360	NONE	13.3927	1.0417	0.4464	13.3927	1.0417	0.4464	13.9808	1.0874	0.4660	45.2959
Cessna 208 Caravan	PT6A14	NONE	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.0000
Cessna 552 T-47A	1PW037	JT15D-5	0.0767	0.0000	0.0000	0.0767	0.0000	0.0000	0.0000	0.0000	0.0000	0.1534
Embraer ERJ135-LR	6AL017	NONE	0.0082	0.0000	0.0000	0.0082	0.0000	0.0000	0.0000	0.0000	0.0000	0.0164
Lockheed C-130 Hercules	250B17	NONE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.4795	0.0000	0.0000	1.4795
Pilatus PC-12	PT67B	NONE	2.0000	0.0000	0.0000	2.0000	0.0000	0.0000	0.0000	0.0000	0.0000	4.0000
Raytheon Beech 99	PT6A60	NONE	2.0000	0.0000	0.0000	2.0000	0.0000	0.0000	0.0000	0.0000	0.0000	4.0000
Raytheon Beech Baron 58	TIO540	NONE	1.4881	0.1157	0.0496	1.4881	0.1157	0.0496	1.5534	0.1208	0.0518	5.0329
Aerospatiale SA-350D Astar (AS-350)	TPE3	NONE	1.0899	0.1211	0.0000	1.0899	0.1211	0.0000	0.0000	0.0000	0.0000	2.4219
Bell 206 JetRanger	250B17	NONE	0.4401	0.0342	0.0147	0.4401	0.0342	0.0147	0.0000	0.0000	0.0000	0.9781
Bell UH-1 Iroquois	T400	NONE	0.4401	0.0342	0.0147	0.4401	0.0342	0.0147	0.0000	0.0000	0.0000	0.9781
Boeing CH-46 Sea Knight	T588F	NONE	0.0247	0.0019	0.0008	0.0247	0.0019	0.0008	0.0000	0.0000	0.0000	0.0548
Kaman SH-2 Seasprite	T588F	NONE	0.0592	0.0066	0.0000	0.0592	0.0066	0.0000	0.0000	0.0000	0.0000	0.1315
Sikorsky CH-53 Sea Stallion	T646B	NONE	0.4377	0.0340	0.0146	0.4377	0.0340	0.0146	0.0000	0.0000	0.0000	0.9726
Sikorsky CH-53 Sea Stallion	T64415	NONE	1.1836	0.0921	0.0395	1.1836	0.0921	0.0395	0.0000	0.0000	0.0000	2.6301
Sikorsky S-64-F	T64100	NONE	0.0592	0.0066	0.0000	0.0592	0.0066	0.0000	0.0000	0.0000	0.0000	0.1315
Sikorsky UH-60 Black Hawk	T70070	NONE	0.4377	0.0340	0.0146	0.4377	0.0340	0.0146	0.0000	0.0000	0.0000	0.9726
Grand Total			**24.1378**	**1.5222**	**0.5948**	**24.1378**	**1.5222**	**0.5948**	**17.0137**	**1.2082**	**0.5178**	**71.2493**

NOTES:
Baseline operations remain unchanged for 2019, 2022, and 2028.

SOURCE: County of Inyo, 2020; Environmental Science Associates, 2020.

TABLE B2 – 2022 AND 2028 PROPOSED PROJECT ANNUAL AVERAGE DAY AIRCRAFT OPERATIONS

			Arrival			Departure			Touch-and-Go			
Airframe	**Engine**	**Engine Mod Code**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**	**Total**
2022												
Bombardier CRJ-700	5GE083	NONE	1.6575	0.0000	0.0000	1.6575	0.0000	0.0000	0.0000	0.0000	0.0000	3.3151
Grand Total			**1.6575**	**0.0000**	**0.0000**	**1.6575**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**3.3151**
2028												
Bombardier CRJ-700	5GE083	NONE	0.6712	0.0000	0.0000	0.6712	0.0000	0.0000	0.0000	0.0000	0.0000	1.3425
Embraer ERJ175-LR	8GE108	NONE	1.9890	0.0000	0.0000	1.9890	0.0000	0.0000	0.0000	0.0000	0.0000	3.9781
Grand Total			**2.6603**	**0.0000**	**0.0000**	**2.6603**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**5.3205**

SOURCE: County of Inyo, 2020; Environmental Science Associates, 2020.

TABLE B3 - RUNWAY USE

Arrival				Departure				Touch-and-Go			
Runway	Day	Evening	Night	Runway	Day	Evening	Night	Runway	Day	Evening	Night
12	40%	55%	70%	**12**	18%	25%	30%	**12**	50%	0%	0%
30	18%	25%	30%	**30**	40%	55%	70%	**30**	50%	0%	0%
17	30%	15%	0%	**17**	10%	5%	0%	**17**	0%	0%	0%
35	10%	5%	0%	**35**	30%	15%	0%	**35**	0%	0%	0%
08	1%	0%	0%	**08**	1%	0%	0%	**08**	0%	0%	0%
26	1%	0%	0%	**26**	1%	0%	0%	**26**	0%	0%	0%
Total	100%	100%	100%	**Total**	100%	100%	100%	**Total**	100%	100%	100%

Helipad	Day	Evening	Night	Runway	Day	Evening	Night	Runway	Day	Evening	Night
H01	33.34%	33.34%	33.34%	**H01**	33.34%	33.34%	33.34%				
H02	33.33%	33.33%	33.33%	**H02**	33.33%	33.33%	33.33%				
H03	33.33%	33.33%	33.33%	**H03**	33.33%	33.33%	33.33%				

NOTES:
Runway utilization remains unchanged with or without the proposed project.
Air carrier, air taxi, and military aircraft operate exclusively on Runway 12/30 and share the same runway use percentages for day, evening, and night.
Touch-and-Go runway use represents C-130. General Aviation aircraft touch-and-go operations use departure day runway use.

SOURCE: County of Inyo, 2020; Environmental Science Associates, 2020.

TABLE B4 - FLIGHT TRACK USE

Arrival			Departure			Touch-and-Go		
Runway	**Track**	**Track Use %**	**Runway**	**Track**	**Track Use %**	**Runway**	**Track**	**Track Use %**
12	12A01	50%	**12**	12D01	50%	**12**	12T01	100%
	12A02	50%		12D02	50%	**30**	30T01	100%
30	30A01	50%	**30**	30D01	50%	**17**	17T01	100%
	30A02	50%		30D02	50%	**35**	35T01	100%
17	17A01	50%	**17**	17D01	50%	**08**	08T01	100%
	17A02	50%		17D02	50%	**26**	26T01	100%
35	35A01	50%	**35**	35D01	50%			
	35A02	50%		35D02	50%			
08	08A01	50%	**08**	08D01	50%			
	08A02	50%		08D02	50%			
26	26A01	50%	**26**	26D01	50%			
	26A02	50%		26D02	50%			
Helipad	**Track**	**Track Use %**	**Helipad**	**Track**	**Track Use %**			
H01	H01A01	33.34%	**H01**	H01D01	33.34%			
	H01A02	33.33%		H01D02	33.33%			
	H01A03	33.33%		H01D03	33.33%			
H02	H02A01	33.34%	**H02**	H02D01	33.34%			
	H02A02	33.33%		H02D02	33.33%			
	H02A03	33.33%		H02D03	33.33%			
H03	H03A01	33.34%	**H03**	H03D01	33.34%			
	H03A02	33.33%		H03D02	33.33%			
	H03A03	33.33%		H03D03	33.33%			

NOTES:
Flight track utilizations are the same for the No Action and Proposed Action Alternatives.
Aircraft operations with known destinations were assigned to specific direction to the north or to the south.

SOURCE: County of Inyo, 2020; Environmental Science Associates, 2020.

Attachment J-3 Bishop Airport Approach Charts

APP CRS	Rwy ldg	7498
301°	TDZE	4111
	Apt Elev	4124

RNAV (RNP) RWY 30
BISHOP (BIH)

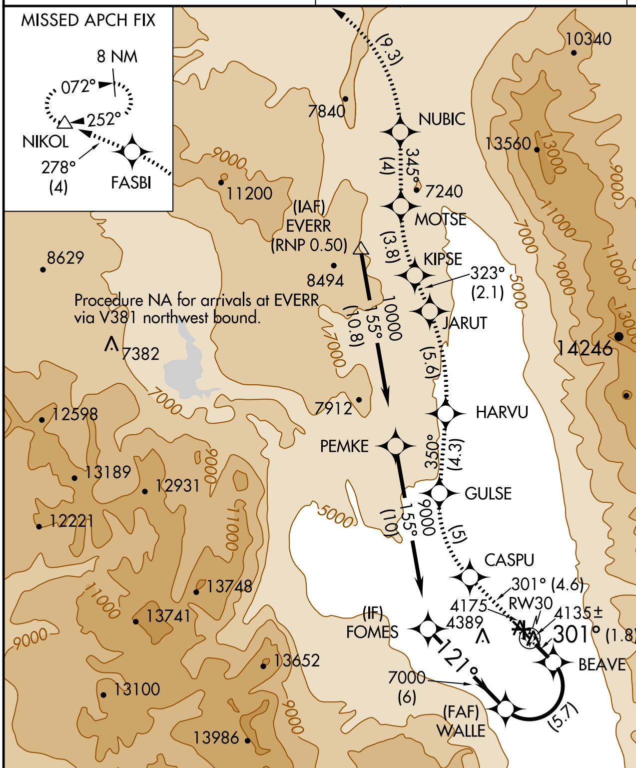
RNP AR APCH, RF required.

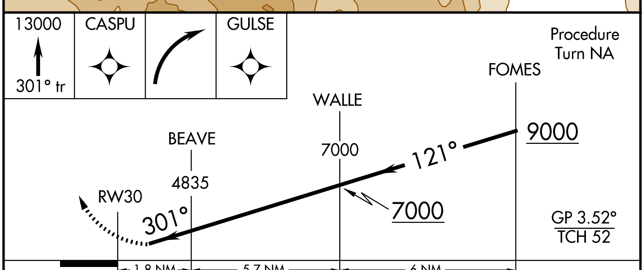
T

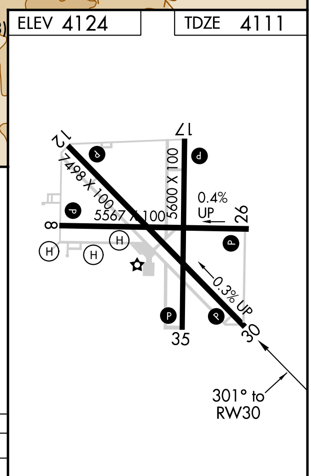
A NA For uncompensated Baro-VNAV systems, procedure NA below -12°C or above 54°C.

MISSED APPROACH: Climb to 13000 via 301° track to CASPU, right turn to GULSE, 350° track to HARVU, left turn to JARUT, 323° track to KIPSE, right turn to MOTSE, 345° track to NUBIC, left turn to FASBI, 278° track to NIKOL and hold.

ASOS	OAKLAND CENTER	UNICOM
119.025	125.75 284.65	123.0 (CTAF) L







CATEGORY	A	B	C	D
RNP 0.30 DA	4476-1 365 (400-1)			NA

AUTHORIZATION REQUIRED

MIRL Rwys 8-26, 12-30, and 17-35 L
REIL Rwys 12, 17, 30 and 35

SW-2, 28 JAN 2021 to 25 FEB 2021

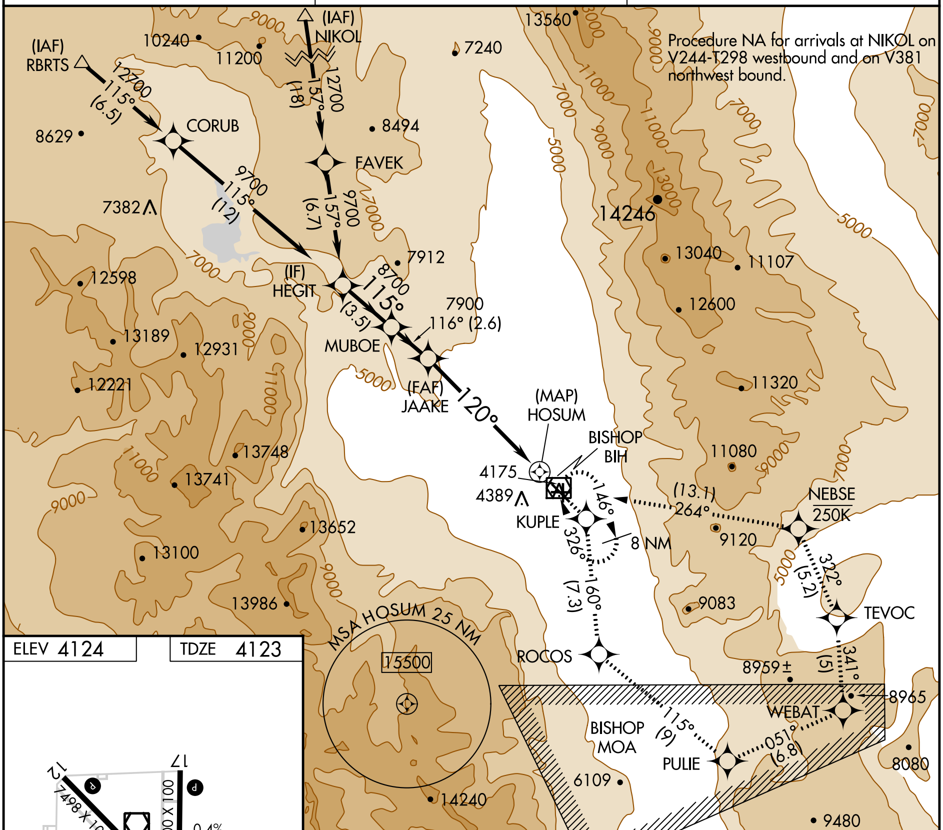
RNAV (GPS) Y RWY 12
BISHOP (BIH)

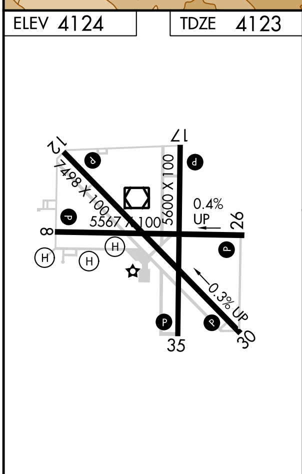
APP CRS	Rwy ldg	7498
120°	TDZE	4123
	Apt Elev	4124

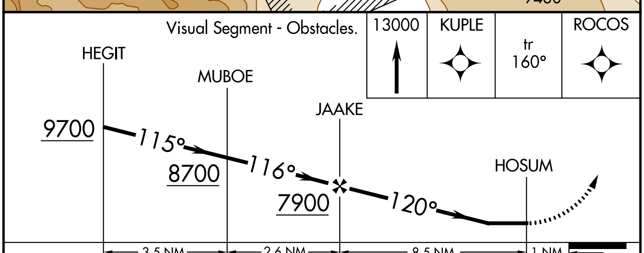
RNP APCH.

MISSED APPROACH: (Do not exceed 250 KIAS until NEBSE) Climb to 13000 direct KUPLE and on track 160° to ROCOS and on track 115° to PULIE and on track 051° to WEBAT and on track 341° to TEVOC and on track 322° to NEBSE and on track 264° to BIH VOR/DME and hold.

ASOS	OAKLAND CENTER	UNICOM
119.025	125.75 284.65	123.0 (CTAF) L







CATEGORY	A	B	C	D
LNAV MDA	6600-1¼ 2477 (2500-1¼)	6600-1½ 2477 (2500-1½)	6600-3 2477 (2500-3)	NA

MIRL Rwys 8-26, 12-30, and 17-35 L
REIL Rwys 12, 17, 30 and 35

SW-2, 28 JAN 2021 to 25 FEB 2021

SW-2, 28 JAN 2021 to 25 FEB 2021

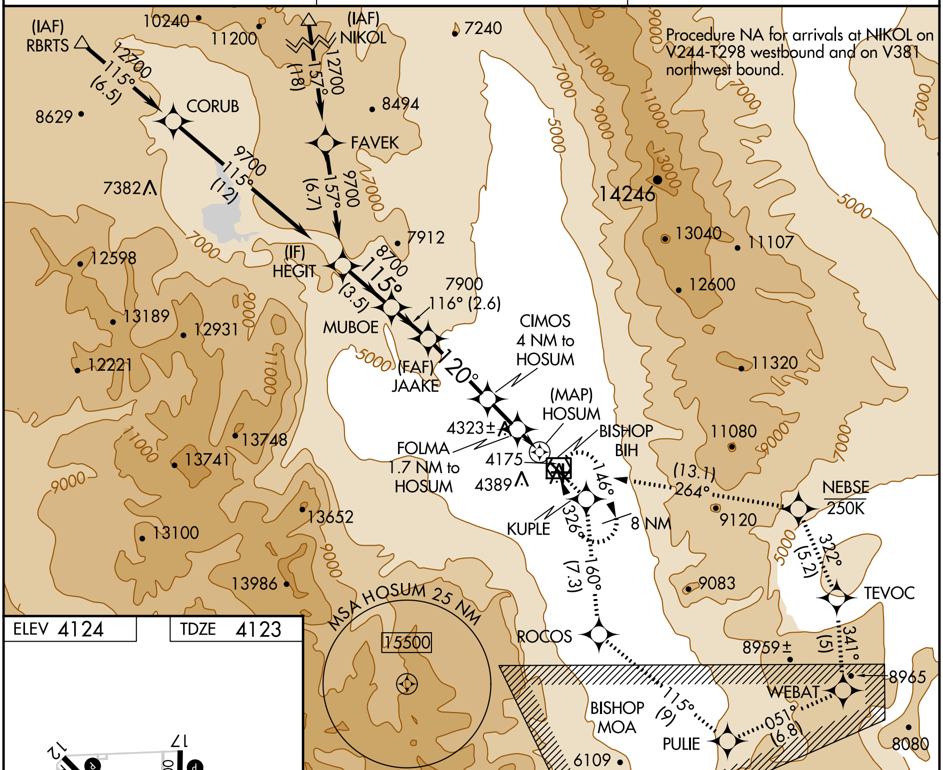
RNAV (GPS) Z RWY 12
BISHOP (BIH)

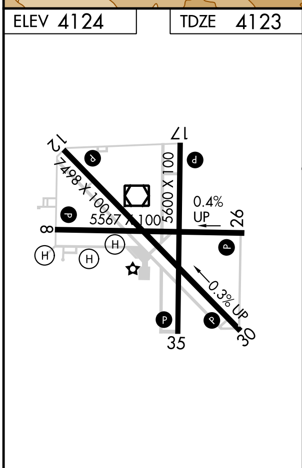
APP CRS	Rwy ldg	7498
120°	TDZE	4123
	Apt Elev	4124

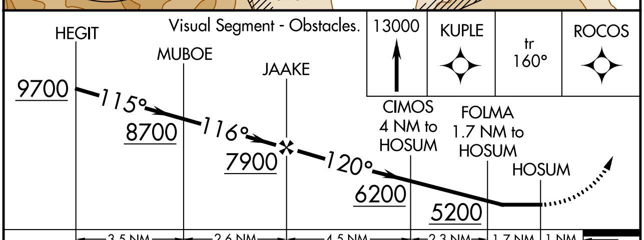
T A DME/DME RNP-0.3 NA
Missed approach requires minimum climb of 325 feet per NM to 11000; if unable, see RNAV (GPS) Y RWY 12.

MISSED APPROACH: (Do not exceed 250 KIAS until NEBSE) Climb to 13000 direct KUPLE and on track 160° to ROCOS and on track 115° to PULIE and on track 051° to WEBAT and on track 341° to TEVOC and on track 322° to NEBSE and on track 264° to BIH VOR/DME and hold.

ASOS	OAKLAND CENTER	UNICOM
119.025	**125.75 284.65**	**123.0** (CTAF) L







CATEGORY	A	B	C	D
LNAV MDA	4580-1¼ 457 (500-1¼)			NA
CIRCLING	6420-1¼ 2296 (2300-1¼)	6420-1½ 2296 (2300-1½)	6420-3 2296 (2300-3)	NA

MIRL Rwys 8-26, 12-30, and 17-35 L
REIL Rwys 12, 17, 30 and 35

SW-2, 28 JAN 2021 to 25 FEB 2021

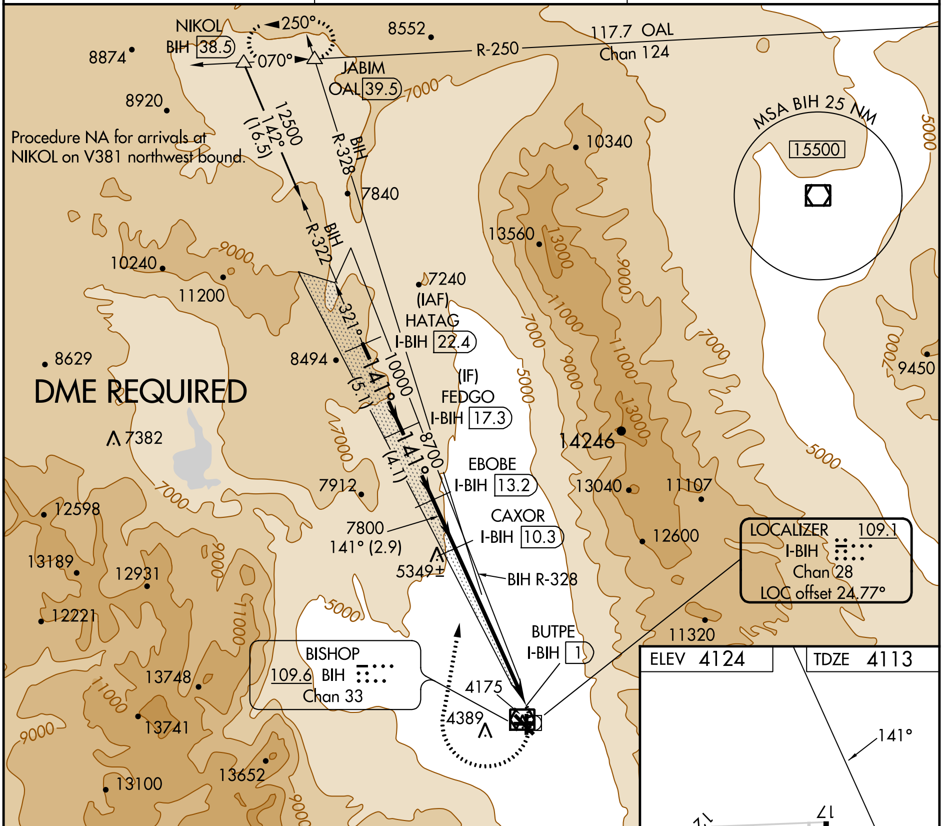
LDA RWY 17
BISHOP (BIH)

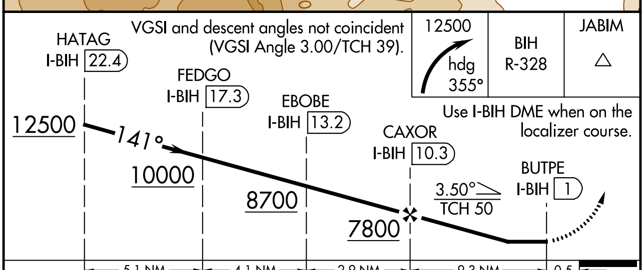
LOC/DME I-BIH 109.1 Chan 28	APP CRS 141°	Rwy ldg 5600 TDZE 4113 Apt Elev 4124

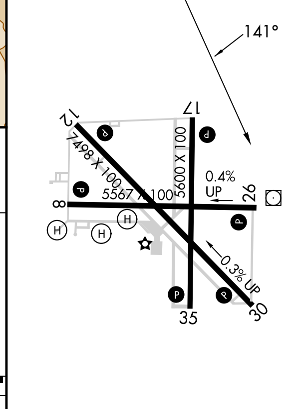
DME required.

MISSED APPROACH: Climbing right turn to 12500 on heading 355° and on BIH VOR/DME R-328 to JABIM INT/OAL 39.5 DME and hold.

ASOS	OAKLAND CENTER	UNICOM
119.025	125.75 284.65	123.0 (CTAF)







CATEGORY	A	B	C	D
S-17	6340-1¼ 2227 (2300-1¼)	6340-1½ 2227 (2300-1½)	6340-3 2227 (2300-3)	

MIRL Rwys 8-26, 12-30, and 17-35
REIL Rwys 12, 17, 30 and 35

SW-2, 28 JAN 2021 to 25 FEB 2021