

## Pacific Flyway Ecoregion

### Introduction

#### Ecological Setting

The Pacific Flyway Ecoregion extends 400 miles through the state of California, and is largely comprised of three main hydrologic basins, including the Sacramento River Basin, the San Joaquin River Basin, and the Tulare Basin. California's Mediterranean climate, paired with the unique geology of the Coastal and Sierra-Nevada Mountain ranges, and the gentle slopes of the valley floor, has developed a unique checkerboard of historically flooded wetlands, uplands, and dynamic riparian systems. This diverse combination of habitats provides a uniquely valuable resource for both resident and migratory wildlife that depend on it (Figure PFE-1).

The Pacific Flyway Ecoregion is one the most threatened landscapes in the Pacific Southwest Region. Approximately 95% of the wetlands within this ecoregion have been modified for urban development (CA population expected to grow from 39 million to 44 million by 2025), wind and solar development, and conversion to non-compatible agriculture (orchard and vineyard). These direct habitat losses and degradations amplify concerns about species resiliency and mobility throughout the valley in the face of climate change. Restoration and enhancement of priority habitats within this ecoregion are critical to mitigating the effects of climate change by reducing habitat fragmentation, maintaining habitat connectivity, and promoting fish and wildlife migration or movement to adapt to climate-change- induced habitat dynamic.

#### Partners Program Overview

The Partners Program in the Pacific Flyway is implemented by six Project Managers located within the Ecoregion on National Wildlife Refuges (Modoc, Sacramento, Stone Lakes, San Luis and Kern) and the Habitat Restoration Division (Auburn). Of these six Project Managers, four operate exclusively within the Pacific Flyway Ecoregion and two function across other ecoregions as well. Approximately \$450,000 are obligated annually to habitat improvement projects within the ecoregion.

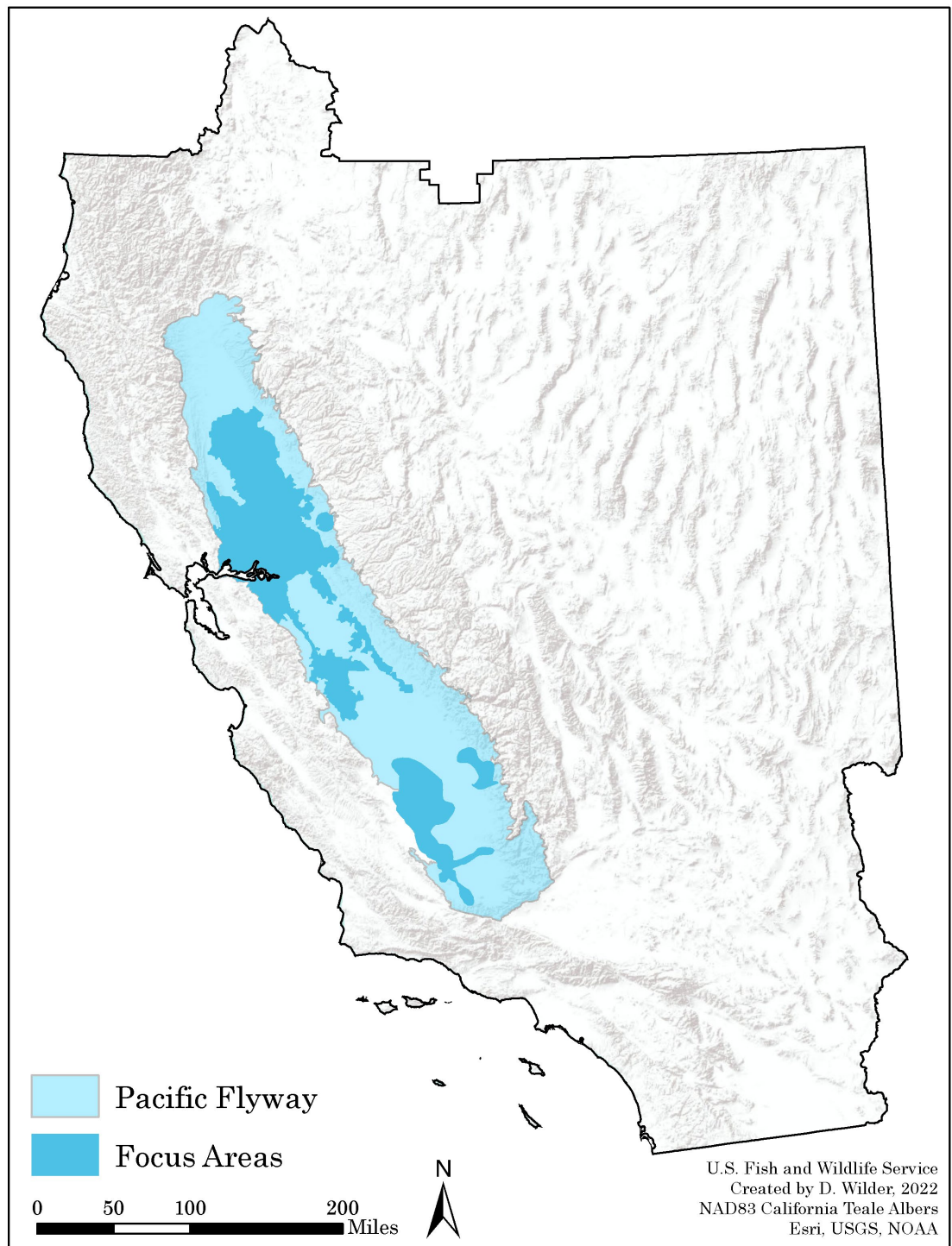
### Conservation Planning

#### Ecoregion Scope and Vision

The scope of the Pacific Flyway Ecoregion is to create strategic plan to guide conservation efforts by identifying priority habitats and delineating corresponding focus areas to set measurable objectives for the Partners for Fish and Wildlife Program from 2022-2026. The scope sets the boundaries of the Partners Program efforts for the life of the plan, and the vision statement anticipates what the Partners Program will strive to achieve within the ecoregion. The Pacific Flyway Ecoregion vision statement is:

*Within the next five years, we will work with private landowners and partners to restore and enhance a mosaic of wetland systems connected by healthy riparian and*

Figure PFE-1. Map of the Pacific Flyway Ecoregion with field station Focus Areas.



*priority upland corridors to meet the habitat needs for migratory waterfowl, shorebirds, and other federal trust species within California's Great Central Valley.*

### **Conservation Targets**

The Pacific Flyway Ecoregion proposed several habitat types as Conservation Targets using the Conservation Standards process. These include the respective species associated with each Target. As with the other Ecoregions, all proposed habitat type Conservation Targets were ranked by the Core Team within the ecoregion with consideration of specific criteria (number of Listed Species, Refuge Purposes, Existing Service Effort, Partner Priority, Supporting Plans, Restoration Opportunity, Social/Economics, and Ability to Improve Status) and given an average score. From this process, four conservation targets were selected as Tier 1. priority and two were considered lower priority targets and identified as Tier 2. This ranking process is detailed in the methods sections of this plan, and results are shown Table PFE-1. As mentioned previously, one key goal for this plan is that 80% of Partners Program efforts during the plan will be directed towards Tier 1. Targets. Tier 2. targets that were considered are still eligible to be considered for projects, but effort will be made to limit effort to 20% while still adhering to existing Partners Program policies.

*Table PFE-1 Results of Conservation Target ranking processes used to establish Tier 1. and Tier 2. Conservation Targets for the Pacific Flyway Ecoregion.*

| Tier 1. Targets              | Habitat Scoring |
|------------------------------|-----------------|
| Managed Seasonal Wetlands    | 0.61            |
| Stream/Riparian              | 0.63            |
| Perm/semi-permanent Wetlands | 0.49            |
| Grasslands                   | 0.51            |
| Tier 2. Targets              |                 |
| Vernal Pools                 | 0.33            |
| Ponds                        | 0.25            |

### **Target Viability Assessment (Current Condition)**

In assessing the current conditions of the conservation targets, Key Ecological Attributes were established for each target (Table PFE-2. viability assess table). Partners Program Project Managers were surveyed to determine the current condition of the targets using best available data and professional judgement, and indicator rankings were selected as the current condition rating for each Conservation Target based on group consensus. The conservation targets Managed Seasonal Wetland, Permanent/Semi-Permanent Wetlands, Stream/Riparian, and Grasslands were all considered to be in fair condition, outside of the acceptable range of variation, and requiring actions.

*Table PFE-2. Assessment of current conditions using Key Ecological Attributes (KEA) of the Conservation Targets for the Pacific Flyway Ecoregion. Indicator rankings are based on the percentage of biologists who scored the ranking categories using their best professional judgement.*

| Conservation Target               | KEA                                                                            | KEA Type          | Indicator                         | Indicator Ranking |      |      |
|-----------------------------------|--------------------------------------------------------------------------------|-------------------|-----------------------------------|-------------------|------|------|
|                                   |                                                                                |                   |                                   | Poor              | Fair | Good |
| Managed Seasonal Wetlands         | Extent of available wetlands during migration (Oct 1-March 1)                  | Landscape Context | Acres of functional habitat       | 20%               | 80%  |      |
| Permanent/Semi-permanent Wetlands | Extent of available wetlands during key Spring/Summer months (April 1 – Aug 1) | Landscape Context | Acres of functioning habitat      |                   | 100% |      |
| Stream/Riparian                   | Extent of functioning habitat                                                  | Landscape Context | Acres/miles of unimpacted habitat | 33%               | 67%  |      |
| Grasslands                        | Extent of functioning habitat                                                  | Landscape Context | Acres of functioning habitat      | 33%               | 67%  |      |

Ideally, the indicator ratings would be quantifiable with data for current and future conditions. However, much of this data is not available at the Ecoregional scale. The lack of quantifiable data to establish current and desired conditions during this planning process represents a data gap, and we set a goal to fill during the span of this plan.

#### **Threats to Conservation Targets**

Program managers initially identified over 18 items as threats to the Conversation Targets during planning sessions. These threats were summarized to 11 human caused threats and linked to their respective habitats and species (Table PFE-3. Direct threat table).

*Table PFE-3. Direct threats for Pacific Flyway Ecoregion Conservation Targets.*

| Habitat                                  | Species                                                                                                                                                                                                   | Direct Threat                                                                                                                                                                                                                            |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Managed Seasonal Wetland</i>          | wintering waterfowl, migratory shorebirds, wading birds                                                                                                                                                   | Land use conversion, lack of funding and staff to purchase easements, water availability, water delivery timing, Agriculture, invasive plant species, disturbance, lack of staff/funding to update infrastructure, water quality         |
| <i>Permanent/Semi-Permanent Wetlands</i> | Giant Garter Snakes, Tricolored Blackbirds, migratory waterfowl, resident breeding and post breeding waterfowl, overwater nesting birds                                                                   | Land use conversion, water availability, water delivery timing, agriculture conversion, invasive species, disturbance, lack of staff/funding to update infrastructure, water quality, mosquito abatement costs, high water pumping costs |
| <i>Stream/Riparian</i>                   | Western yellow-billed cuckoo, valley elderberry longhorn beetle, least Bell's vireo, riparian brush rabbit, Central Valley steelhead, winter-run chinook, spring-run Chinook, native pollinators/monarchs | Land use conversion, invasive plant species, herbicide/pesticide drift, altered hydrologic regime                                                                                                                                        |
| <i>Native Grasslands</i>                 | San Joaquin kit fox, CA tiger salamander, blunt-nosed leopard lizard, Tipton's kangaroo rat, native pollinators/monarchs, CA condors, Alameda whipsnake, giant kangaroo rat, T&E herbaceous plants        | Lack of fire, invasive plant species, land use conversion, herbicide/pesticide drift, lack of appropriate grazing management, altered hydrology                                                                                          |

### ***Strategies, Objectives, and Goals***

Seven restoration strategies were identified during the planning process (Table PFE-4, Appendix G). These strategies will guide the development of projects aimed at remediating the effects of the threats to the Conservation Targets. Table PFE-4 provides an overview of the connection between the Conservation Targets, restoration strategies, and some key treatments to be implemented under a given restoration strategy. Additionally, Table PFE-4 identifies key species associated with the Conservation Target and the five-year performance goals per Conservation Target. Appendix G provides in-depth detail on treatments and the biophysical condition the treatments are designed to remediate.

Table PFE-4. Summary tables showing five-year performance goals and key elements associated with the Conservation Targets that were developed and utilized to create Situation Models for the Pacific Flyway Ecoregion.

| Conservation Target<br>(Key Species)                                                                                                                                                                                                  | Restoration<br>Strategy             | Treatments                                                                       | Five-Year<br>Performance Goals |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------|--------------------------------|
| <b>Managed Seasonal Wetlands</b><br>(wintering waterfowl & shorebirds, wading birds)                                                                                                                                                  | Wetland<br>Habitat<br>Restoration   | Wetland restoration, wetland enhancement                                         | 2,670 acres                    |
| <b>Permanent/Semi-Permanent Wetlands</b><br>(giant garter snakes, southwestern pond turtles, tri-colored blackbirds, nesting waterfowl, overwater nesting birds)                                                                      | Wetland<br>Habitat<br>Restoration   | Wetland restoration, wetland enhancement                                         | 195 acres                      |
| <b>Grasslands</b><br>(CA tiger Salamander, San Joaquin kit fox, blunt-nosed leopard lizard, Buena Vista Lake shrew, Tipton's kangaroo rat, monarchs/native pollinators, Alameda whipsnake, giant kangaroo rat, T&E herbaceous plants) | Grassland<br>Habitat<br>Restoration | Upland establishment/restoration, grazing management, Prescribed fire            | 1,775 acres                    |
| <b>Stream/Riparian</b><br>(least Bell's vireo, yellow-billed cuckoo, valley elderberry longhorn beetle, riparian brush rabbit, winter-run chinook, spring-run chinook, Central Valley steelhead, monarchs/native pollinators)         | Riparian<br>Habitat<br>Restoration  | Riparian Restoration, stream channel restoration, modify instream infrastructure | 215 acres                      |

Situation models were developed to graphically present the connection between contributing factors, their direct threats to the target and the restoration strategies. The situation models for each Conservation Target are shown in Figure PFE-2.

### Pacific Flyway Ecoregion Conservation Targets

#### Managed Seasonal Wetland Habitat

The managed seasonal wetlands found in the Pacific Flyway Ecoregion provide critical habitat for millions migrating waterfowl and shorebirds. Moist soil vegetation and aquatic

invertebrates produced by the water management of these wetlands are the vital food source for migratory birds. Additionally, the annual spring drawdown of these wetlands provide important foraging areas for non-migratory wading birds and threatened reptiles such as giant garter snakes. These wetlands also function as filters to improve the water quality and help to recharge the groundwater aquifers. Project Managers restore and enhance wetland habitats by providing a more open water habitat type, creating a diversity of water depths, improving water management capabilities, and increasing hydrologic connectivity.

**Key Species:**

*Migratory Waterfowl*  
*Giant Garter Snakes*

*Migratory Shorebirds*

*Resident Wading Birds*

**Regional Priority:** Refuge Purposes, Listed/At Risk

**National Priority:** Species Conservation, Resilient Ecosystems

***Permanent/Semi-permanent Wetland Habitat***

Permanent/semi-permanent wetlands remain flooded during the summer months. Because of California's Mediterranean climate and lack of summer precipitation, permanent and semi-permanent wetland habitats play a key role in sustaining resident wildlife populations during the dry-hot season. Many of these species are threatened, endangered, and/or are in decline. These wetland habitats are typically much deeper and generally less productive than the managed seasonal wetlands but are often the only water sources found in the summer. Dense emergent vegetation associated with permanent wetlands also serves as thermal cover to migratory bird species in the colder winter months. Water availability and reliable water delivery can be an issue when restoring these wetlands. Due to these factors, Project Managers prioritize restoring these wetlands in strategic locations.

**Key Species:**

*Giant Garter Snakes*

*Tricolored Blackbirds*

*Western Pond Turtles*

*Locally Nesting Waterfowl*

*Overwater Nesting Birds*

*California Red-legged Frogs*

**Regional Priority:** Listed/At Risk, Refuge Purposes

**National Priority:** Species Conservation, Resilient Ecosystems

***Stream/Riparian Habitat***

Instream/Riverine habitat is one of the most important resources biologically, socially, and economically in the Ecoregion. This habitat type supports several species of anadromous and resident fish that are of cultural and economic significance and provides critical ecosystem services. Project Managers restoring and enhancing these habitats are focused on reestablishing geomorphic process, providing in-stream habitat complexity, off-channel habitat, and improving water quality.

#### Key Species:

*Chinook Salmon*  
*Least Bell's Vireo*

*Locally Nesting Waterfowl*

*Central Valley Steelhead*  
*Overwater Nesting Birds*

*Yellow-billed Cuckoo*  
*California Red-legged Frogs*

Regional Priority: Listed/At Risk, Interjurisdictional fish

National Priority: Species Conservation, Habitat Connectivity, Resilient Ecosystems

#### **Grasslands Habitat**

Native grassland habitats contain some of the greatest diversity of federally threatened and endangered species in the Region. Nearly 90 percent (197) of California's rare and endangered species inhabit the State's grassland ecosystems (California Native Grasslands Association, <http://www.cnga.org>). Degradation of these habitats occurs through changes in plant composition and structure from encroachment by conifers, fire suppression, urban development, and the conversion of land to agriculture. Project Managers commonly use prescribed burns, mowing, controlled grazing, and hand removal to control the overload of annual grass thatch and/or the spread of non-native invasive plant species.

#### Key Species:

*San Joaquin Kit Fox*

*Alameda Whipsnake*

*Blunt-nosed Leopard Lizard*

*Native Pollinators*

*California Tiger Salamander*

*Tipton's Kangaroo Rat*

*CA Condor*

*Listed Herbaceous Plants*

*Giant Kangaroo Rat*

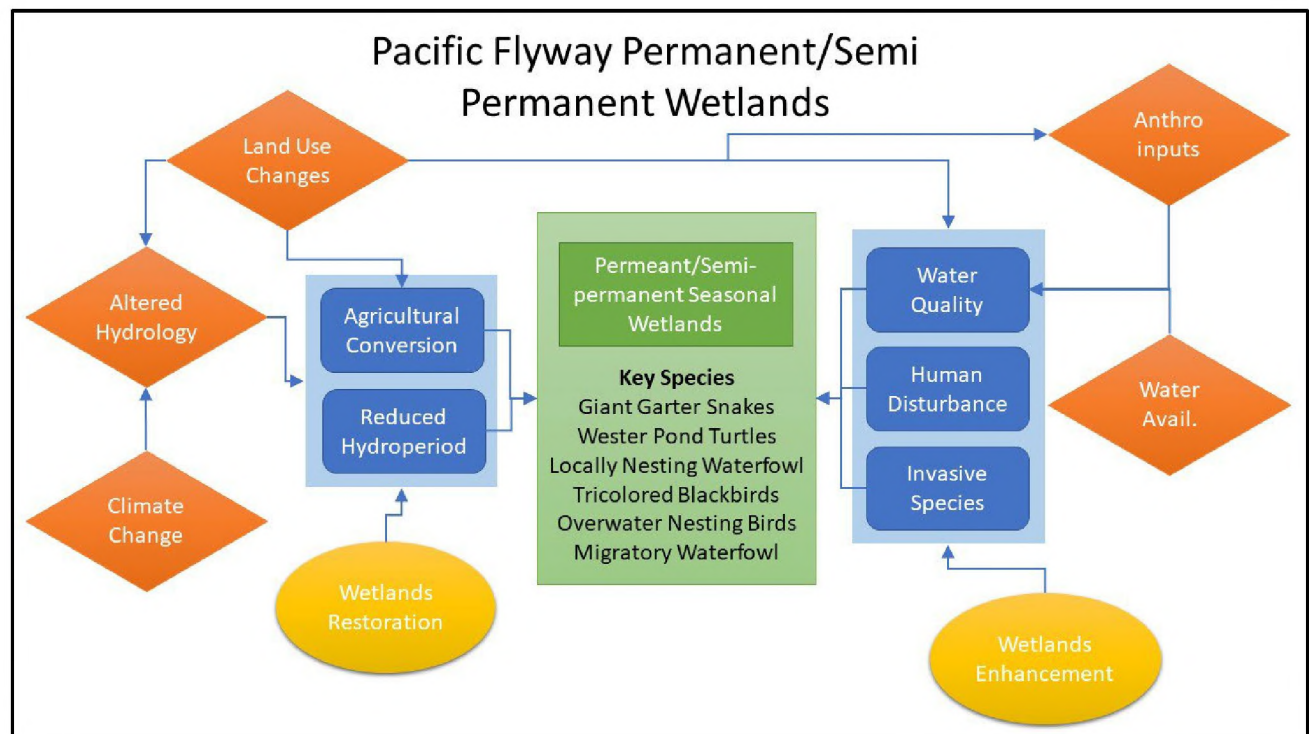
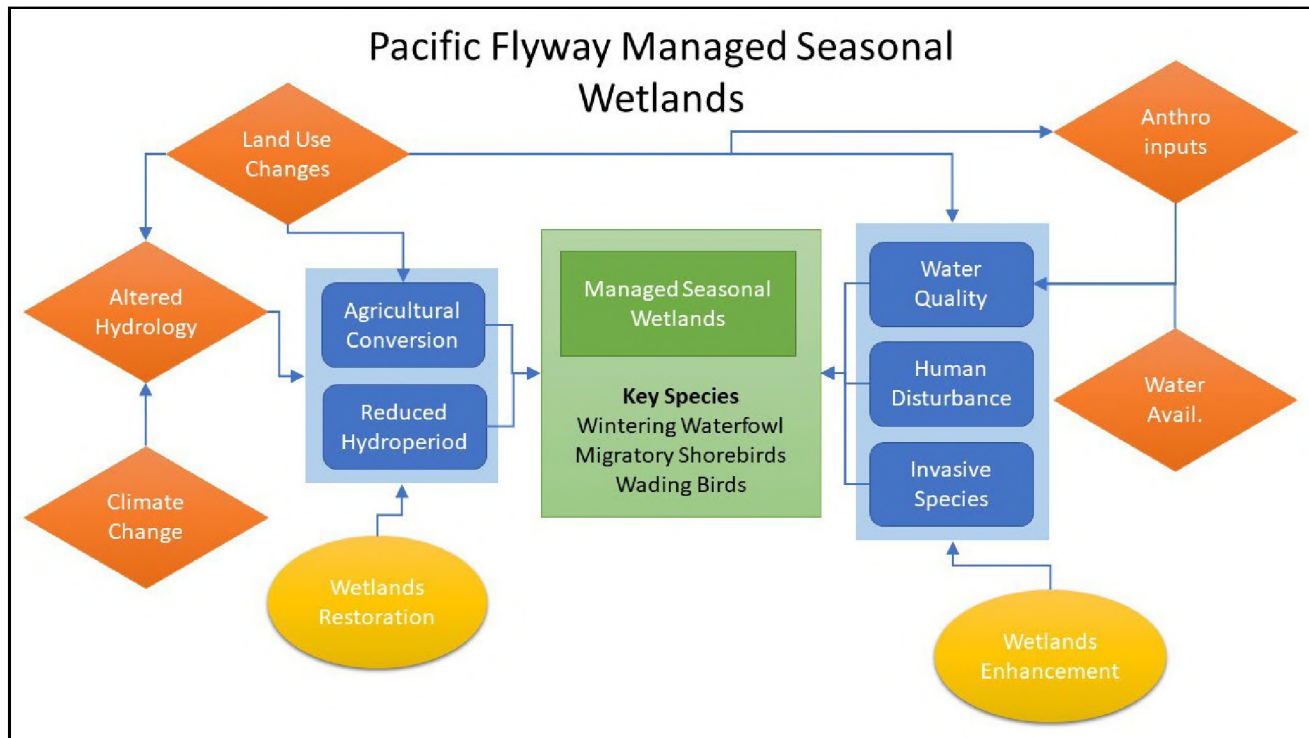
*Buena Vista Lake Shrew*

*Monarch Butterfly*

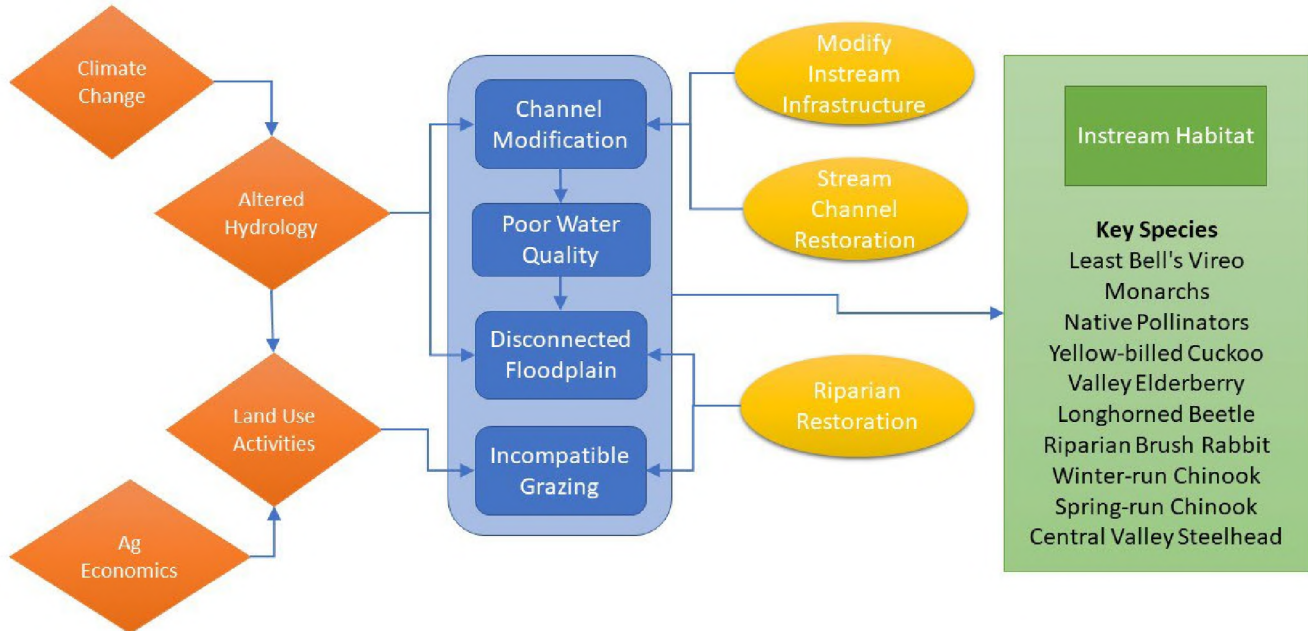
Regional Priority: Listed/At Risk Species

National Priority: Species Conservation, Resilient Ecosystems

Figure PFE-2. Situational models for the Pacific Flyway Ecoregion showing Tier 1. Targets and key species (green) depicting the interactions among Contributing Factors (orange), their respective influence on the Threats (blue), and the Restoration Strategies to be implemented by the Partners Program to reduce the effects of the Threats on Targets.



## Pacific Flyway Stream/Riparian



## Pacific Flyway Grasslands

