Sustainability Roadmap 2018-2019:

Climate Change Adaptation

Progress Report and Plan for Meeting
the Governor's Sustainability Goals
for California State Agencies

California Department of Fish and Wildlife

Edmund G. Brown Jr., Governor

December 2017

California Department of Fish and Wildlife Sustainability Road Map 2018-2019:

Climate Change Adaptation

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Acronyms

AB	Assembly Bill
EHT	Extreme Heat Threshold
EO	Executive Order
GCM	Global Circulation Model
GHG	Greenhouse Gas
RCP	Representative Concentration Pathway
SB	Senate Bill

EXECUTIVE SUMMARY

The California Department of Fish and Wildlife's (CDFW) mission is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

CDFW is responsible for over 1,000,000 acres of fish and wildlife habitat, managed through 722 properties throughout the state. These properties provide habitat for a rich diversity of fish, wildlife, and plant species and comprise habitats from every major ecosystem in the state. In addition to managing wildlife areas and ecological reserves, CDFW operates 24 fish hatcheries to provide sportfish stock for anglers in California. The department is also responsible for other programs, such as private lands conservation programs that assist landowners with the management of wetlands, riparian habitats, native grasslands and wildlife-friendly farmlands.

Due to the variety of programs and services CDFW offers, its portfolio is very diverse. There are approximately 576 structures located on lands owned by CDFW. Some of these buildings include small hunter check stations, residences, and large offices. The wide variety of locations include labs, fish hatcheries, ecological reserves, wildlife areas, field offices and many more. Of the 722 properties, CDFW owns 86 facilities, leases 116 and the rest of the properties are open wildlife areas with no structures or personnel attached.

CDFW has three main types of locations, fish hatcheries, ecological reserves and wildlife areas. Many of the reserves and wildlife areas have large pumps for wildlife that consume large amounts of energy, and the fish hatcheries often operate 24-hours and use large chillers that are necessary for fish health and safety.

CDFW has been working for several years now with the California Natural Resources Agency (CNRA) and various other partners to address climate change impacts on California wildlife and is a main contributor to the Safeguarding California Climate Adaptation Strategy. CDFW is working to incorporate climate science and climate adaptation strategies into its own programs and resource management activities. The department is also addressing climate risks to facilities by adapting its operational practices in ways that will reduce its overall carbon footprint and help to mitigate the sources of climate change.

The department has building locations throughout the state and therefore will face many of the challenges related to climate change including rising temperature, increased precipitation and sea level rise. Given the variety of challenges, the department will need to be prepared to adapt its building management practices accordingly. Where feasible for leased spaces relocation will be an option, however CDFW is somewhat limited with relocation as staff need to be where wildlife lives and thrives.

Other adaptation strategies are being considered and the department is looking at how it can incorporate climate change and lifecycle cost thinking into all forms of planning. A good example of this is the department partnering with a local company to use their analytics program to look at life cycle costs of replacing fleet vehicles with new and zero emission

vehicles. The program takes in consideration initial price, maintenance costs, fuel costs and GHG savings.

To date, the department has employed rain capture systems to use as drinking water for wildlife that will conserve water and address areas that have increased contamination from salt water. To assist with sea level rise, CDFW is using natural infrastructure and building earthen walls higher than normal to account for future rises. Finally, CDFW is beginning to audit facilities at the various locations to identify energy savings opportunities and efficiencies. Sites are also being assessed for onsite renewable energy generation capacity. As roofs and parking lots need to be replaced, the department will consider taking measures such as installing cool roofs and impervious lots when making these repairs. The department is serious about doing all it can to adapt to and mitigate climate change and reduce its carbon footprint as much as possible.

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SUSTAINABILITY GOALS

The Governor has directed California State Agencies to demonstrate sustainable operations and to lead the way by implementing sustainability policies set by the state. Sustainability includes the following general initiatives:

- Greenhouse Gas Emissions Reductions
- Climate Change Adaptation
- Building Energy Efficiency and Conservation
- Indoor Environmental Quality (IEQ)
- Water Efficiency and Conservation
- Monitoring Based Building Commissioning (MBCx)
- Environmentally Preferable Purchasing (EPP)
- Financing for Sustainability
- Zero Emission Vehicle (ZEV) Fleet Purchases
- Electric Vehicle Charging Infrastructure
- Monitoring and Executive Oversight

The Governor has issued numerous executive orders directing sustainable state operations. The order relevant to climate adaptation is:

Executive Order B-30-15

Executive Order (EO) B-30-15 declared climate change to be a threat to the well-being, public health, natural resources, economy, and environment of California. It established a new interim statewide greenhouse gas emission reduction target of 40 percent below 1990 levels by 2030, and reaffirms California's intent to reduce greenhouse gas emissions by 80 percent below 1990 levels by 2050. To support these goals, this order requires numerous state agencies to develop plans and programs to reduce emissions. It also directs state agencies to take climate change into account in their planning and investment decisions and employ life-cycle cost accounting to evaluate and compare infrastructure investments and alternatives. State agencies are directed to prioritize investments that both build climate preparedness and reduce GHG emissions, prioritize natural infrastructure, and protect the state's most vulnerable populations.

Relevant Legislation

Several pieces of legislation were signed in 2015-16 that codified several elements of the EO. These include the following:

- Assembly Bill (AB) 1482 (Gordon, 2015): Requires that the California Natural Resources Agency (CNRA) update the State's adaptation strategy, Safeguarding California, every three years. Directs state agencies to promote climate adaptation in planning decisions

and ensure that state investments consider climate change impacts, as well as the use of natural systems and natural infrastructure. (Public Resources Code Section 71153)

- Senate Bill (SB) 246 (Wieckowski, 2015): Established the Integrated Climate Adaptation and Resiliency Program within the Governor's Office of Planning and Research to coordinate regional and local efforts with state climate adaptation strategies to adapt to the impacts of climate change. (Public Resources Code Section 71354)
- SB 2800 (Quirk, 2016): Requires State agencies to take the current and future impacts of climate change into planning, designing, building, operating, maintaining, and investing in state infrastructure. CNRA will establish a Climate-Safe Infrastructure Working Group to determine how to integrate climate change impacts into state infrastructure engineering. (Public Resources Code Section 71155)

State Resources and Guidance Documents

California has invested significant resources in understanding the risks of climate change to the State and actions available to respond to and reduce these risks. These include the following:

- **Safeguarding California**: The State's climate adaptation strategy organized by sector. Each sector identifies risks from climate change and actions to reduce those risks.
- **Safeguarding California Implementation Action Plans**: Directed under EO B-30-15, the Implementation Action Plans outline the steps that will be taken in each sector to reduce risks from climate change.
- **Building a Resilient California**: Prepared under direction of EO B-30-15, this document provides a framework for state agencies to integrate climate change into planning and investment, including guidance on data selection and analytical approach.
- **California's Climate Change Assessments**: California has completed three comprehensive assessments of climate change impacts on California. Each assessment has included development of projections of climate impacts on scale that is relevant to state planning (i.e., downscaled climate projections). These data are available through Cal-Adapt, an online data visualization and access tool.
- Adaptation Planning Guide- The guide is designed to provide guidance and support for local governments and regional collaboratives to address the consequences of climate change.
- AB 32 Scoping Plan- AB 32 required the California Air Resources Board (ARB or Board) to develop a Scoping Plan that describes the approach California will take to reduce GHGs to achieve the goal of reducing emissions to 1990 levels by 2020.

CLIMATE CHANGE ADAPTATION

Executive Order (EO) B-30-15 directs State Agencies to integrate climate change into all planning and investment. Planning and investment includes the following:

- Infrastructure and capital outlay projects
- Grants,
- Development of strategic and functional plans,
- Permitting,
- Purchasing and procurement,
- Guidance development,
- Regulatory activity,
- Outreach, and education.

This template will focus on the first three of these activities, and follows the guidance created by the Technical Advisory Group developed under EO B-30-15 to assist State Agencies to complete this task.

Climate Change Risks to Facilities

For all infrastructure, it is important to assess the risk that a changing climate poses to an asset or project (e.g., sea level rise or increasing daily temperatures). It is also important to recognize the impact that an infrastructure project has the surrounding community and the impacts on individual and community resilience (e.g., heat island impacts).

To determine how to consider climate change for a given project or plan or existing infrastructure, this department will consider the following screening questions.

1. What is the lifetime of the facility, planned project or plan?
2. Could it be affected by changing average climate conditions or increases in extreme events over its lifetime?
3. What is the consequence of that disruption?
4. Will that disruption affect vulnerable populations, critical natural systems, critical infrastructure, or other assets?
5. Will that disruption cause irreversible effects or pose an unacceptable risk to public health and safety?

As stated the mission of the department is to protect California's wildlife and other natural resources, and climate change has a huge impact on natural lands. So when considering how the department's assets will be affected by a changing climate, CDFW must not only consider its built infrastructure but also, the wildlife and open lands that the department manages as well.

CDFW working with California Natural Resources Agency (CNRA) has been addressing adaptation and climate change impacts on California wildlife for many years now and is a main contributor to the Safeguarding California Climate Adaptation Strategy. The Department has a unit dedicated to climate change and incorporating climate science and adaptation strategies into all areas of wildlife planning and management. CDFW has made great strides with incorporating climate change planning into Land Management Plans (LMP) and to assist with

this effort, the department created 19 ecoregional reports that summarize climate change projections, vulnerabilities of species and vegetation communities, and adaptation opportunities for each ecoregion. These summaries are an example of how the department is developing resources that inform long-term planning and management to create a more resilient landscape. The Lands Program at the department has also updated its guidance for developing LMPs by adding a new section on how to incorporate climate change-related strategies.

CDFW is now also beginning to incorporate climate change adaptation planning into its existing facilities located on these lands. Using the information outlined in this roadmap, CDFW can better plan where to locate long-term leased facilities as well as new construction when the need arises. The questions above have been used to evaluate existing facilities, and are a checklist going forward for new buildings. Once this is data is analyzed, it will be shared with area managers as with the ecoregional reports, so that the area managers can make more informed decisions about their locations.

Since CDFW has other ways of addressing climate change within wildlife and habitat management, the majority of this document will focus on the facilities located at these sites. For more information on what CDFW is doing to manage wildlife in these changing conditions, please either see the Safeguarding California document or visit the CDFW Climate Change Program's website.

Understanding Climate Risk to Existing Facilities

Data in the following sections is from Cal-Adapt. Cal-Adapt provides a view of how climate change might affect California and contains tools, data, and resources to conduct research, develop adaptation plans and build applications.

Risk from Increasing Temperatures

Under a changing climate, temperatures are expected to increase – both at the high and low end. As a result, facilities will experience higher maximum temperatures and increased minimum temperatures.

Table 1a: Top 5 Facilities Most Affected by Changing Temperature – Ranked by Highest Average Minimum by End of Century

Facility Name	Annual Mean Max Temp. (1961 – 1990) (°F)	Annual Mean Max Temp. (2031 – 2060) (°F)	Annual Mean Max Temp. (2070 - 2099) (°F)	Annual Mean Minimum Temp. (1961 – 1990) (°F)	Annual Mean Minimum Temp. (2031 – 2060) (°F)	Annual Mean Minimum Temp. (2070-2099) (°F)
IMPERIAL WA	88.74	93.80	97.59	57.8	63.01	67.51

BERMUDA DUNES FIELD OFFICE (LEASED)	88.40	93.24	96.89	57.38	62.35	66.57
BLYTHE FIELD OFFICE (LEASED)	87.73	93.11	96.95	56.00	61.81	66.50
MEKO BOAT BERTH (LEASED)	75.50	79.90	83.50	56.10	60.20	64.00
CAMP CADY WA	81.38	86.95	90.80	52.75	57.42	61.88

Table 1b: Top 5 Facilities Most Affected by Changing Temperature - Ranked by Highest Average Minimum Percent Change

Facility Name	Annual Mean Max Temp. Percent Change (1961-1990) to (2030-2060)	Annual Mean Max Temp. Percent Change (1961-1990) to (2070-2099)	Annual Mean Minimum Temp. Percent Change (1961 – 1990) to (2030-2060)	Annual Mean Minimum Temp. Percent Change (1961 – 1990) to (2070-2099)
BUTTE VALLEY WA	9%	18%	22%	41%
SLINKARD/LITTLE ANTELOPE WA	10%	18%	21%	39%
HUNTINGTON LAKE PATROL CABIN	11%	19%	22%	38%
HALLELUJAH JUNCTION WA	10%	17%	20%	35%
ALTURAS DISTRICT OFFICE (LEASED)	9%	16%	18%	35%

In addition to changing average temperatures, climate change will increase the number of extreme heat events across the state. Extreme events are likely to be experienced sooner than changes in average temperatures. Using data from CalAdapt, the following table identifies the facilities that will be most impacted by the increase in the number of extreme heat days.

Table 2: Five Facilities that Will Experience the Largest Increase in Days of Extreme Heat Events

Facility Name	Extreme heat threshold (EHT) (°F)	Average number of days above EHT (1961-1990)	Average number of days above EHT (2031-2060)	Increase in number of days above EHT by mid-century	Avg. # days above EHT (2070-2099)	Increase in Avg. # days above EHT by end of century
HOT CREEK FH	81.40	4	33	29	66	62
BALDWIN LAKE ER	86.80	4	39	35	66	62
KERN RIVER FH	98.00	4	37	33	65	61
CANEBREAKER ER	99.50	4	36	32	64	60
HUNTINGTON LAKE PATROL CABIN	82.00	3	30	27	63	60

When considering rising temperatures the department looked at all of the facilities both leased and owned. Table 1A lists the department's top five facilities that will have the highest annual mean maximum temperature in the timeframe of 2031 – 2060. While this is important, it was decided to also look at the top five ranked by highest average minimum percentage change (Table 1B). This data is significant because these areas are going to experience higher degree in change of warm temperature so a focus on adaptation at these facilities is needed. Table 2 lists the five facilities with the largest increase in extreme heat events. All of the sites jump from days to over 30 by mid-century.

Most of the locations manage wildlife and hotter days means more water needed to provide for the wildlife and wetlands, as more water is pumped, more energy is used. Higher heat also causes problems for wildlife needing shade, etc., and thus the department may need to build new structures or employ additional machines/technology to assist. Staff located in these remote areas will need to find ways to stay cool and more use of air conditioning units will be needed. This may mean purchasing new units or larger units depending on the site. Further, there could be impacts on human health for staff working outdoors on extreme heat days which could result in illness or loss productivity.

In addition, there are two fish hatcheries on the list. These are 24-hour facilities that exist to grow and protect life. Higher heat days puts more strain on the grid which can produce black or brown outs thus causing power loss at these facilities. Back up energy generation will be necessary and with the possibility of being used more frequently. This causes more strain on the machines and higher costs. Likewise, at the hatcheries new machines may be required to

pump extra water and or chill the water. Fish need certain temperature to stay healthy and added heat days and minimums would require increased use of chillers and pumps. This causes increases in energy and also, the possibility of purchasing equipment that was not necessary in the past.

CDFW is aware of these possibilities and is taking actions to help mitigate the effects of extreme climate change conditions. One of these action is the department is assessing all sites for the possibility of onsite renewable energy generation and energy storage. Onsite renewable energy generation (most likely solar photovoltaic panels) reduces the energy load and costs, as well in some areas provides shade to the sites and fish needing shelter for the extreme temperatures. Another action that the department is taking is to conduct energy audits and where feasible, energy efficiency upgrades at all sites. The department will also routinely audit and upgrade into the long-term future as necessary to address extra energy required. Also, routine maintenance and replacement of old less efficient units will assist as well. Finally, adaptation measures can be incorporated into planning of facilities and landscapes at the facilities to address these issues into the future. For example, planting more trees where possible and not paving or paving with impervious lots will also mitigate some of these effects at the site. Ensuring that the buildings are efficient, insulated and have proper shading will assist as well.

For those sites that are leased, and it is possible to move staff, then the department will relocate offices to other areas. Unfortunately, when it comes to most sites within the department, relocating is not an option as the staff need to be where wildlife lives and thrives.

Risks from Changes in Precipitation

The impacts of climate change on the amount of precipitation that California will receive in the future are slightly less certain that the impacts on temperature. However, it is expected that California will maintain its Mediterranean climate pattern (dry summers and wet winters), but more precipitation will fall as rain than as snow. Larger rains may result in flooding, but will also result in shifts in runoff timing (earlier) and runoff volumes (higher). It will also result in decreased snowpack. Using data from CalAdapt, CDFW identified facilities most at risk from changes in precipitation.

Table 3: Facilities that Will be Most Impacted by Projected Changes in Precipitation

Facility Name	Annual Mean Maximum Precipitation (1961 – 1990) Inches	Annual Mean Precipitation (2031 – 2060) Inches	Percent Change by mid-century	Annual Mean Precipitation (2070 – 2099) Inches	Percent change by end of century
MT. WHITNEY FACILITY	5.46	6.65	22%	7.83	43%
BLACK ROCK SPRINGS FH	4.60	5.65	23%	6.47	41%
SLINKARD/LITTLE ANTELOPE WA	19.54	23.84	22%	26.82	37%
KNOXVILLE WA	24.86	30.92	24%	33.65	35%

DEER CREEK FA	17.53	22.10	26%	23.71	35%

Table 3 lists the department's facilities that will be most impacted by projected changes in precipitation, because they are projected to experience the highest increase in percent change of precipitation. These facilities include wildlife areas, fish hatcheries, and fishing access locations.

Facilities that are located in remote places or have assets contained outside would be most impacted by the changing precipitation patterns. When a facility is in a remote area, the trail may become too dangerous to take or working out in the field may pose too dangerous for scientists. Generally in the wildlife areas more precipitation is not a bad thing, it means less pumping and often is good for the wildlife. However, if precipitation increases too much and snowpack melts too fast there flooding occurs. Flooding can destroy or damage structures and equipment as well as cause inaccessibility to areas.

Further, flooding in areas near the ocean and bays creates the potential for increase saltwater contamination to fresh water supplies. In many areas, humans and wildlife depend on this fresh water for drinking. If drinking water is contaminated other sources will need to be brought in or piped in, which causes increased GHG emissions from transport, increased infrastructure needs and increased costs. If wildlife do not have access to proper water, they could die or leave the area.

The Mount Whitney Hatchery is an example of how severe precipitation has seriously impacted a facility. In 2008, heavy rains broke down four buildings, killed all the rainbow trout and ruined the habitat ponds. To this day, restoration has not been resumed due to the location of this facility. Thankfully with tools provided by the CNRA and the information located in these roadmaps, CDFW is able to make better informed decisions about where to locate their facilities.

There are many actions the department is taking to mitigate the effects of precipitation increases. One such action is creating rain capture systems. For example, one of the wildlife areas where salt contamination is a current threat, has created an extensive roof rain capture system that feeds into a large capture pond that is used for watering the facilities and drinking water for the wildlife. When completed/full the pond will hold two years' worth of water. Other locations are using or investigating rain capture systems as well. Another action the department can take is to locate facilities on higher ground to protect them from flooding, especially where expensive equipment is stored in lower areas. Finally, those sites that are leases, if they are able to be relocated will be, but unfortunately due to wildlife needs, most sites are unable to be relocated.

Risks from Sea Level Rise

Increasing global temperatures are contributing to rising sea levels. Rising sea levels will result in inundation of coastal areas and increased flooding due to storm surges. The California

Ocean Protection Council (OPC) has issued guidance for State agencies on what level of sea level rise to consider. The Guidance document provides the following estimates of sea level rise for the California Coast, which are based on a study by the National Academy of Sciences:

Time Period	North of Cape Mendocino	South of Cape Mendocino
2000 - 2030	-4 to 23 cm (-0.13 to 0.75 ft)	4 to 30 cm (0.13 to 0.98 ft)
2000 – 2050	-3 to 48 cm (-0.1 to 1.57 ft)	12 to 61 cm (0.39 to 2.0 ft)
2000 – 2100	10 to 143 cm (0.3 to 4.69 ft)	42 to 167 cm (1.38 to 5.48 ft)

An accompanying OPC resolution recommends that departments base analyses on estimates of sea level rise in the upper two-thirds of the range. Another resource for sea level rise is the Rising Seas in California update.

Several tools are available to visualize rising sea levels. Cal-Adapt provides information for the San Francisco Bay and Sacramento-San Joaquin Delta. CoSMoS, a model developed by the National Oceanic and Atmospheric Administration, provides data for larger portions of the California coast. Table 4, lists facilities at risk from rising sea levels in three distinct zones in California at four possible sea level rise scenarios. Using these scenarios, CDFW is able to better plan its facilities and wildlife projects.

Table 4: Facilities at Risk from Rising Sea Levels

Facility Name	Affecting Seas	Sea Level Rise 0.0 m	Sea Level Rise 0.5 m	Sea Level Rise 1.0 m	Sea Level Rise 1.41 m
PETALUMA MARSH WA	San Francisco Bay	1.80	2.24	3.02	3.53
	CA Coast	N/A	1.84	2.62	3.00
EDEN LANDING ER	San Francisco Bay	0.04	0.64	1.67	2.34
	CA Coast	0.36	1.25	1.99	2.41
NAPA-SONOMA MARSHES WA	San Francisco Bay	1.36	1.71	2.21	2.76
	CA Coast	1.19	1.41	1.93	2.51

DELTA OPERATIONS BASE	**Delta**	**N/A**	**0.15**	**0.57**	**0.93**
GRIZZLY ISLAND WA	**San Francisco Bay**	**N/A**	**0.87**	**1.85**	**2.44**
	CA Coast	**0.95**	**1.57**	**2.07**	**2.49**
BOLSA CHICA ER	**CA Coast**	**N/A**	**0.59**	**1.29**	**1.86**
SOUTH SPLIT WA	**CA Coast**	**N/A**	**N/A**	**N/A**	**0.11**
Eureka License Office (Leased)	**CA Coast**	**0.28**	**0.84**	**1.39**	**1.83**
LED Warehouse 2 (Leased)	**CA Coast**	**2.41**	**1.91**	**2.91**	**3.61**

Similarly to the flooding that occurs from increased precipitation, sea level rise has the potential to cause flooding that would require relocation of sites or the use of other adaptation actions. Unfortunately, it is not possible to relocate all projects and locations that fall in these areas as this is where wildlife live. However, there are measures that can be taken to minimize the effects. Such as locating buildings and other sensitive equipment on higher ground, and buildup of natural and manmade infrastructure to accommodate the projected rise. As mentioned before, climate change adaptation has been incorporated into wildlife planning for some time in this department, and an example of this is a project that required to repair an earthen wall for a wetland restoration. When it was rebuilt the project took considerations of how the sea level would rise in that area and built the wall higher than was previously projected to accommodate the rise. CDFW is beginning to incorporate this planning on the facilities side as has already been done with wildlife projects.

Natural Infrastructure to Protect Existing Facilities

EO B-30-15 directs State agencies to prioritize the use of natural and green infrastructure solutions. Natural infrastructure is the "preservation or restoration of ecological systems or the utilization of engineered systems that use ecological processes to increase resiliency to climate

change, manage other environmental hazards, or both. This may include, but need not be limited to, flood plain and wetlands restoration or preservation, combining levees with restored natural systems to reduce flood risk, and urban tree planting to mitigate high heat days" (Public Resource Code Section 71154(c)(3)).

Given the mission of CDFW much of the work done within the department is habitat and wetlands restoration and management. In addition, the department manages many other wildlife areas and ecological reserves. Much of the actions undertaken to fulfill the department's mission is the essence of using natural and green infrastructure processes.

Understanding the Potential Impacts of Facilities on Communities

Vulnerable Populations

Certain populations are more susceptible to the effects of changing climate conditions, and will have less capacity to recover from changing average conditions and more frequent and severe extreme events. A number of factors contribute to vulnerability, often in overlapping and synergistic ways. These include a number of social and economic factors, and be determined by existing environmental, cultural, and institutional arrangements. Vulnerable populations include, but are not limited to, people living in poverty; people with underlying health conditions; incarcerated populations; linguistically or socially isolated individuals; communities with less access to healthcare or educational resources; or communities that have suffered historic exclusion or neglect.

CDFW interacts with vulnerable communities in many different ways. The department provides green spaces and natural areas for nearby communities. While many of the locations are remote and may not be accessed by public transit, there are still some that are located nearby urban areas. The sites provide recreation and potential food through fishing and hunting. Finally, CDFW locations provide access to education about wildlife and natural lands as well as threats to them such as climate change. The department can increase educational materials and events held at these sites to include more on climate change adaptation and mitigation, especially as the department adds solar and LED lighting upgrades to its facilities. CDFW has a good opportunity to increase education on climate change in addition to the wildlife and the natural lands themselves.

Disadvantaged Communities

California is required to invest resources in disadvantaged communities (DACs). DACs are identified using CalEnviroScreen, a tool that ranks census tracts based on a combination of social, economic, and environmental factors. While it does not capture all aspects of climate vulnerability, it is one tool that is available, and does include several relevant characteristics. In many cases, disadvantaged communities are more likely to suffer damage under changing climate conditions, including extreme events. The department's facilities located in these communities can contribute or alleviate the vulnerability of these communities.

Table 5, lists CDFW locations that are part of a DAC. Disadvantaged communities have CalEnviroScreen scores between 75 – 100.

Table 5: Facilities Located in Disadvantaged Communities

Facility Name	CalEnviroScreen Score
NORTH GRASSLANDS WA	91-95%
LOS BANOS WA	91-95%
MENDOTA WA	86-90%
MERCED RIVER FH	81-85%
IMPERIAL WA	81-85%
EDEN LANDING ER	76-80%
CAMP CADY WA	76-80%
SAN JACINTO WA	76-80%
WEST SACRAMENTO WAREHOUSE (LEASED)	91-100%
STOCKTON LICENSE OFFICE (LEASED)	91-95%
R2 – FIELD OFFICE 2 (LICENSE)	91-95%
DTD (LEASED)	86-90%
HQ'S SACRAMENTO OFFICES (LEASED)	81-90%
R4 – CENTRAL REGION OPERATIONS (LEASED)	81-85%

Eleven percent of CDFW's owned facilities are located in disadvantaged communities. Twenty-five percent of CDFW's leased facilities are located in disadvantage communities. CDFW interacts with the communities in many ways, providing recreation, access to natural lands and wildlife and education. In addition, through hunting and fishing, the department provides communities access to food. The department also supports the communities by assisting with mitigation of urban heat islands through the addition of greenspaces and natural infrastructure. The department also provides the communities with education on the natural environment, climate change and actions that individuals can take to help mitigate the problem. In the event of an emergency, CDFW will assist however possible, however, it is likely in the event of flooding and such, these locations will be the first to flood. CDFW is also seeking other ways to address these communities, and one way is to put in electric vehicle chargers at many of the locations in these areas to assist with the increased adoption of zero emissions vehicles.

Urban Heat Islands

Urban heat islands are areas with localized spikes in temperature, which impact human health, increase pollution, and increase energy demand. Urban heat islands occur during the hot

summer months in areas with higher percentages of impervious surface and less vegetation. This is likely in areas with large parking lots, dense development, and lower tree density and shading. Urban heat islands can be mitigated (i.e., reduced) through tree planting and other greening measures, cool roofs (e.g., lighter roofing materials that reflect light), cooler pavements, and other measures.

Data in table 6 is from the State's Urban Health Island interactive maps, and lists all CDFW facilities that are located in an Urban Heat Island. The larger the Urban Heat Island Index (UHII), the larger the heat island.

Table 6: Facilities Located in Urban Heat Islands

Facility Name	Urban Heat Island Index
REGION 3 HEADQUARTERS	9,855.58
NIMBUS DAM FH	8,827.73
DELTA OPERATIONS BASE	3,391.21
SAN JOAQUIN FH	3,330.00
MOJAVE RIVER FH	2,082.50
AQUATIC BIOASSESSMENT LABORATORY	1,767.12
FILLMORE FH	1,627.07
MARINE WILDLIFE VETERINARY CARE & RESEARCH CENTER	526.40

Thirty-three percent of CDFW owned facilities are located in urban heat islands. Thirty-eight percent of CDFW leased facilities are located in urban heat islands. Of these locations, about half are wildlife areas and ecological reserves. These locations are generally wide open undeveloped spaces with a small building footprint, and therefore, contribute very little to the urban heat island. The other half these locations are office buildings, most of which are leased. For these leased buildings there is little the department has control over, but when the lease agreements are up for renewal, CDFW can request the landlords modify buildings to increase energy efficiency. It is also possible to request some of these improvements in new lease agreements. Of the owned office buildings, CDFW will look for opportunities to incorporate impervious surfaces, cool roofs, etc. CDFW's owned locations are very small and have much less of a contribution to the urban heat islands. Nonetheless, the department wants to do its part and will do whatever possible to incorporate these strategies.

Understanding Climate Risk to Planned Facilities

The department currently has no plans for new construction. As projects come up, the department will incorporate these tools into the planning of the projects to ensure that climate change is considered.

Table 7: Climate Risks to New Facilities

Facility Name	Annual Mean Maximum Temperature (1961 – 1990)	Annual Mean Maximum Temperature (2031 – 2060)	Annual Mean Minimum Temperature (1961 – 1990)	Annual Mean Minimum Temperature (2031 – 2060)	Annual Mean Maximum Precipitation (1961 – 1990)	Annual Mean Precipitation (2031 – 2060)
N/A						

Table 8: Extreme Heat Events and New Facilities

Facility Name	Extreme heat threshold (EHT)	Average number of days above EHT (1961-1990)	Average number of days above EHT (2031-2060)	Increase in number of days above EHT
N/A				

Table 9: New Facilities and Disadvantaged Communities and Urban Heat Islands

Facility Name	Located in a Disadvantaged Community (yes/no)	Located in an urban heat island (yes/no)
N/A		

Full Life Cycle Cost Accounting

EO B-30-15 directs State agencies to employ full lifecycle cost accounting in all infrastructure investment. Lifecycle cost accounting includes:

- Considering initial investment costs, as well as lifetime operation and maintenance costs under changing climate conditions, including changing average conditions and increases in extreme events.
- Applying non-market evaluation methods such as travel cost, avoided costs or contingent valuation to capture hard to quantify benefits and costs

CDFW is beginning to incorporate lifecycle cost accounting into its facility and fleet planning. The department is evaluating different tools and technologies to assist with this effort. Two examples of tools the department is researching and testing is the Envision sustainable infrastructure planning tool and the CarbonBlu fleet planning tool. Since it is in the early stages of using these tools, no formal process has been set up as of yet. However, CDFW understands the importance of lifecycle cost accounting and will incorporate it into all planning where feasible

Integrating Climate Change into Department Planning and Funding Programs

EO B-30-15 extends beyond infrastructure to broader planning efforts. The tables below, indicate how CDFW has incorporated climate change adaptation actions into planning processes.

Table 10: Integration of Climate Change into Department Planning

Plan	Have you integrated climate?	If no, when will it be integrated?	If yes, how has it been integrated?
State Adaptation Plan	Yes	N/A	As part of the state plan, CDFW is required to document department adaptation actions.
State Wildlife Plan	Yes	N/A	Climate change was addressed in the selection of conservation targets and in the development of associated conservation strategies.
Land Management Plans (LMP)	Yes	N/A	Several LMPs have already included climate change to some degree. As LMPs are updated, or as new ones are created, climate change is being addressed. The ecoregional summaries will assist with this effort.

Table 11: Engagement and Planning Processes

Plan	Does this plan consider impacts on vulnerable populations?	Does this plan include coordination with local and regional agencies?	Does this plan prioritize natural and green infrastructure?
Natural Community Conservation Planning	Yes	Yes	Yes
Regional Conservation Investment Strategies Program	Yes	Yes	Yes
Adaptation Roadmap	Yes	Not at this time	Yes

Funding is a priority for the department and all types of grants and funding programs will be considered to assist with climate change adaptation and mitigation both in the management of wildlife as well as facility planning.

Table 12: Climate Change in Funding Programs

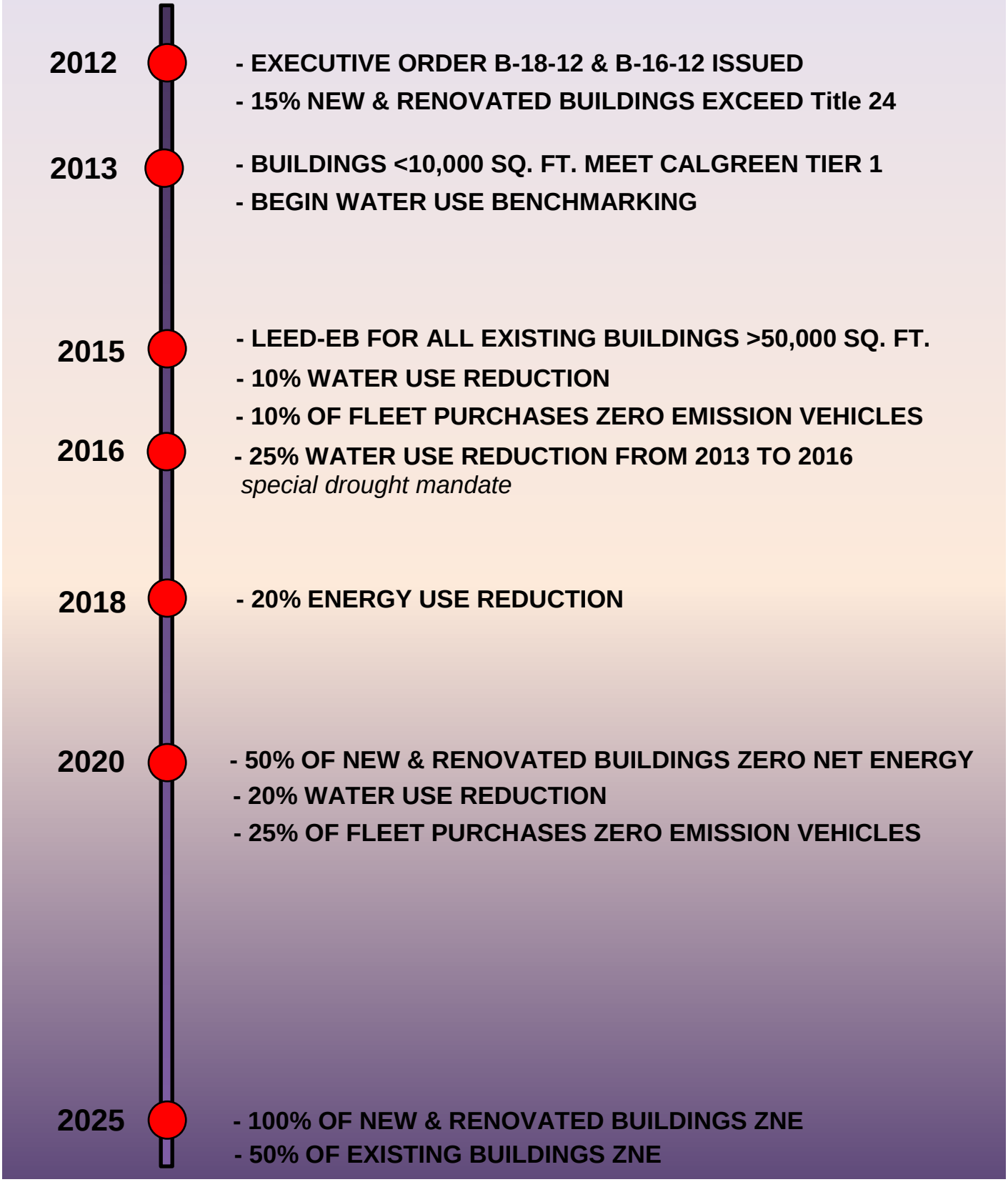
	Have you integrated climate change into program guidelines?	If no, when will it be integrated?	Does this plan consider impacts on vulnerable populations?	Does this program include coordination with local and regional agencies?
Fisheries Restoration Grant Program	Yes	N/A	N/A	Yes

Proposition 1 Restoration Grant Program	Yes	N/A	N/A	Yes
Wetland Restoration for GHG Reduction Grant Program	Yes	N/A	N/A	Yes
State Wildlife Grant Program	Yes	N/A	N/A	Yes
Land Acquisition Evaluation practices	Yes	N/A	N/A	Yes
Utility Programs	N/A	N/A	Yes	No

Measuring and Tracking Progress

Even though CDFW has been incorporating climate change thinking into land management plans and other projects for wildlife there is more to be done. Tracking resilience and adaptation can be tricky given that the results are happening over long periods of time, however measuring how species are thriving in the wildlife areas in general is a way to track progress. Depending on the type of wildlife and location, there are different targets, goals and plans to ensure that species are thriving. The department is still in the early stages of implementing life cycle cost into planning and implementing adaptation measures for facilities. On the facilities side, the department intends to continue using the current tracking systems Energy Star Portfolio Manager for energy and water usage and The Climate Registry Information System for GHG emissions to assess progress. The department will incorporate new technology as it becomes available and is cost effective.

SUSTAINABILITY MILESTONES & TIMELINE



DEPARTMENT STAKEHOLDERS

Understanding Climate Risk at Existing Facilities	
Individual / Manager	Title
Diane Brown-Tapia Gabe Tiffany	Sustainability Manager Deputy Director

Understanding Climate Risk at Planned Facilities	
Individual / Manager	Title
Diane Brown-Tapia Gabe Tiffany	Sustainability Manager Deputy Director

Integrating Climate Change into Department Planning and Funding Programs	
Individual / Manager	Title
Diane Brown-Tapia Gabe Tiffany	Sustainability Manager Deputy Director

Measuring and Tracking Progress	
Individual / Manager	Title
Diane Brown-Tapia Gabe Tiffany	Sustainability Manager Deputy Director