CALIFORNIA Water Boards

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State Water Resources Control Board

Implementation Guidance

for the

State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State

April 2020

This Guidance is designed to assist in the implementation of the Procedures. This Guidance is non-regulatory and does not have the force or effect of law. This Guidance does not supersede the Procedures. In the event of any inadvertent conflict, the language in the Procedures shall control.

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Introduction

On April 2, 2019, the State Water Resources Control Board (State Water Board) adopted a State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (Procedures), for inclusion in the forthcoming Water Quality Control Plan for Inland Surface Waters and Enclosed Bays and Estuaries and Ocean Waters of California. The Procedures consist of four major elements: 1) a wetland definition; 2) wetland delineation procedures; 3) a framework for determining if a feature that meets the wetland definition is a water of the state; and 4) procedures for the submittal, review and approval of applications for Water Quality Certifications and Waste Discharge Requirements for dredge or fill activities. In adopting the Procedures, the State Water Board directed staff to develop implementation guidance for potential applicants.

In developing this document to provide such guidance, staff solicited input from stakeholders. The outreach consisted of two publicly noticed stakeholder meetings, receipt of informal comments and questions from the public, and providing drafts of this document for public review. Following finalization of this document, a public training is scheduled to further provide information and guidance to public stakeholders. The State Water Board may continue to revise this guidance as new information regarding the implementation process becomes available.

This document is composed of, and was largely gleaned from, existing materials such as the Staff Report for the Procedures (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/staffrpt_conformed.pdf), the 2019 Response to Comments (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/wrapp/df_rtc_clean.pdf), and the Procedures (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/procedures_conformed.pdf). The goal of this document is to provide applicants some general guidance in preparing their application materials for a dredge or fill project. This document does not cover all possible topics related to implementation of the Procedures; rather, the topics covered reflect the most common requests from stakeholders as identified through a public process. For topics that are not covered in this document, applicants and Water Board staff are encouraged to refer to the Procedures' supporting documentation, for example, the Staff Report, and the 2019 Response to Comments. Applicants that have project specific questions are also encouraged to contact the appropriate Water Board staff at the State or Regional Water Quality Control Boards for more information. Visit the State Water Board's Dredge or Fill Program staff directory to locate the appropriate staff contact information (https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/staffdirectory.pdf).

A note on definitions: as defined in the Procedures, “Order” means waste discharge requirements, waivers of waste discharge requirements, or water quality certification. For the purposes of this document, the terms “permit” and “order” are used interchangeably. In addition, Permitting Authority means the entity or person issuing the order (i.e., the applicable Water Board, Executive Director or Executive Officer, or his or her designee). For the purposes of this document, the terms “Water Boards” and permitting authority is used interchangeably.

Lastly, this document includes links and references to other resources that applicants or staff could find helpful for certain topics as a convenience and for informational purposes only. The links do not constitute an endorsement or an approval by the State Water Board of any of the products, services or opinions of any corporation, organization, or individual. The State Water Board bears no responsibility for the accuracy, legality or content of the external site or documents. As with this Guidance document itself, these resources are not incorporated into the Procedures, are non-regulatory, and in the event of any inadvertent conflict, the language in the Procedures shall control.

I. Wetland Definition, Delineation, and Jurisdictional Framework

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A. Wetland Definition

The Procedures define an area as wetland as follows: *An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation.*

This modified three-parameter definition is similar to the federal definition in that it identifies three wetland characteristics that determine the presence of a wetland: wetland hydrology, hydric soils, and hydrophytic vegetation. Unlike the federal definition, however, the Procedures' wetland definition allows for the presence of hydric substrates as a criteria for wetland identification (not just wetland soils) and wetland hydrology for an area devoid of vegetation (less than 5% cover) to be considered a wetland. However, if any vegetation is present, then the U.S. Army Corps of Engineers' (Corps) delineation procedures would apply to the vegetated component (i.e., hydrophytes must dominate). Examples of waters that would be considered wetlands by the Procedures, but not by the federal wetland definition, are non-vegetated wetlands, or wetlands characterized by exposed bare substrates like mudflats and playas, as long as they met the three-parameters as described in the Procedures. It is important to note that while the Corps may not designate a feature as a wetland, that feature could be considered a special aquatic site or other water of the U.S. by the Corps and potentially subject to Corps' jurisdiction.

When determining the boundary of wetlands (vegetated or not) applicants can rely on Part II of the 1987 Manual that provides information that is sufficient to determine wetland boundaries for compliance with the Procedures. For example, unvegetated areas that are inundated to a depth of more than 6.6 feet would be classified as "deep water aquatic habitats," not wetlands.

The Corps definition refers to "saturated soil conditions," whereas the Procedures' definition refers to saturated substrate leading to "anaerobic conditions in the upper substrate" which is a more inclusive term. However, both of these descriptions define conditions that would lead to dominance of hydrophytes, if the site is vegetated. The Procedures definition refers to "continuous or recurrent saturation of the upper substrate." Continuous saturation describes hydrological conditions that are perennial or tend to persist for at least twelve months. Recurrent saturation describes hydrological conditions that persist for less than twelve months. Hydrological conditions may be periodic and sustained regularly (i.e., tidewater) or episodic and intermittent, (i.e., vernal pools). In order for the recurrent saturation to support the development of anaerobic conditions, the substrate must become, and remain, saturated for a duration of 14 days during an annual cycle. These relationships are discussed and explored in-depth in the 2012 California Wetland and Riparian Area Protection Policy, Technical Advisory Team Technical Memorandum No. 3.[1]

It is important to note that the wetland definition is not a two-parameter definition. Use of the Procedures' definition for identification and delineation requires careful consideration of hydrology, substrate, and vegetation in every case. In other words, the definition would not qualify all areas that are devoid of vegetation as wetlands simply because those areas are devoid of vegetation. The lack of vegetation does not, by itself, establish an area as a wetland. In cases where the hydrology and substrate criteria are present, but vegetation is absent, an analysis must be conducted to determine if that absence is a natural consequence of the hydrologic and substrate conditions under normal circumstances and, if it is not, if the expected vegetation would be predominantly hydrophytic or not.

The statewide wetland definition is intended to provide clear and consistent direction for determining whether an aquatic feature is a wetland. This definition does not affect the meaning of "waters of the state" as it pertains to the Water Boards' jurisdiction pursuant

[1] https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/wrapp/memo3.pdf

to the Porter-Cologne Act, nor does it modify the current authorities of the Water Boards to protect water quality. Rather, a statewide wetland definition provides consistent identification standards for certain types of aquatic features that are sometimes difficult to identify in the field, and for which current policy does not provide adequate guidance.

B. Wetland Delineation

Wetland Delineation means the application of a technical and procedural method to establish if an area is a wetland and, if so, identify the boundary of that wetland area within a specified study site by identifying the presence or absence of wetland indicators at multiple points at the site and by establishing boundaries based on sets of points that share the same status as wetland versus non-wetland. (Procedures section IV.D.)

It is the Water Boards' intent to assist applicants by relying on available wetland delineations where available and appropriate. Per section III of the Procedures, "[t]he permitting authority shall rely on any wetland area delineation from a final aquatic resource report verified by the U.S. Army Corps of Engineers (Corps) for the purposes of determining the extent of wetland waters of the U.S. A delineation of any wetland areas potentially impacted by the project that are not delineated in a final aquatic resource report verified by the Corps shall be performed using the methods described in the three federal documents listed below (collectively referred to as "1987 Manual and Supplements") to determine whether the area meets the state definition of a wetland as defined above. As described in the 1987 Manual and Supplements, an area "lacks vegetation" if it has less than 5 percent areal coverage of plants at the peak of the growing season. The methods shall be modified only to allow for the fact that the lack of vegetation does not preclude the determination of such an area that meets the definition of wetland. Terms as defined in these Procedures shall be used if there is conflict with terms in the 1987 Manual and Supplements."

Applicants must delineate all waters, including wetlands, that are within the Project Evaluation Area and may be subject to Water Board regulation. Wetland waters of the U.S. and waters of the state should be delineated using the same wetland delineation procedures identified in section III of the Procedures, taking into consideration that the methods shall be modified only to allow for the fact that the lack of vegetation does not preclude such an area from meeting the definition of wetland. (Also see other resources listed below.)

The Procedures indicate that the Water Boards will rely on any wetland area delineation from a final aquatic resource report verified by the Corps. If the Corps does not require an aquatic resource delineation report, an applicant must submit a delineation of all waters, but these delineations will be verified by Water Board staff during application review. Similarly, if the Corps does not require a delineation, but similar information is prepared for the California Department of Fish and Wildlife, the applicant can submit that information to the Water Boards, who will determine if it is sufficient for the Water Board's purposes. Applicants are encouraged to contact the appropriate Water Board office for a pre-application consultation to discuss the best strategy to verify jurisdiction for a particular project.

C. Waters of the State

California Code of Regulations, title 23, section 3831(w) states that "[a]ll waters of the United States are also 'waters of the state.'" This regulation has remained in effect despite Supreme Court decisions such as Rapanos and SWANCC, which added limitations to what could be considered a water of the U.S. Therefore, the regulation reflects the Water Boards intent to include a broad interpretation of waters of the United States into the definition of waters of the state. Waters of the state includes features that have been determined by the U.S. EPA or the U.S. Army Corps of Engineers to be "waters of the U.S." in an approved jurisdictional determination; "waters of the U.S." identified in an aquatic resource report certified by the Corps upon which a permitting decision was based; and features that are consistent with any current or historic final judicial interpretation of "waters of the U.S." or any current or historic federal regulation defining "waters of the U.S." Because the interpretation of waters of the U.S. in place at the time section 3831(w) was adopted was broader than any post-Rapanos or post-SWANCC regulatory definitions that incorporated more limitations into the scope of federal jurisdiction, it is consistent with the Water Boards' intent to include both historic and current definitions of waters of the United States into the Water Boards' wetland jurisdictional framework. Further, the people of California have a reasonable expectation that a wetland will continue to be protected when it has been regulated in the past as a water of the U.S. regardless of any subsequent changes in federal regulations. The inclusion of both current and historic definitions of "waters of the U.S." will help ensure some regulatory stability in an area that has otherwise been in flux. Like the other categories of the Water Boards' wetland jurisdictional framework, the status as a water of the U. S. may only be used to establish that a wetland qualifies as a water of the state; it cannot be used to exclude a wetland from qualifying as a water of the state. In other words, wetlands that are categorically excluded from qualifying as a water of the U.S. may nevertheless qualify as waters of the state under another jurisdictional category. For example, an isolated wetland that has historically been outside of the Corps jurisdiction may still be a natural wetland and therefore a water of the state (Procedures section II.1). As another example, an artificial wetland may be specifically identified in a water quality control plan as a wetland or other water of the state (Procedures section II.3.b) and would thus be a water of the state, regardless of federal status. In cases of uncertainty regarding the interpretation of a "current or historic waters of the U.S.," such as when there is no applicable jurisdictional determination for that wetland, it is advisable to first analyze whether the wetland would fit within another jurisdictional category.

D. Wetland Jurisdictional Framework

The Procedures include a jurisdictional framework that applies to aquatic features that meet the technical wetland definition. Types of wetlands that would be considered waters of the state include natural wetlands, wetlands created by a modification of a surface water of the state, and certain artificial wetlands, such as those specifically identified in a water quality control plan as a wetland or other water of the state.

The jurisdictional framework is intended to exclude small (less than an acre) artificially-created, temporary features, such as tire ruts or other transient depressions caused by human activity from regulation, while still capturing smaller, naturally-occurring features, such as seasonal wetlands and small vernal pools that may be outside of federal jurisdiction. All artificial wetlands that are less than an acre in size and do not satisfy the criteria listed in section II.2, II.3.a, II.3.b, or II.3.c are not waters of the state. Note that this jurisdictional framework applies only to features meeting the technical definition of a wetland.

If an aquatic feature does not meet the definition of a wetland, it may nonetheless be a different type of aquatic feature that may still be regulated as a non-wetland water of the state (e.g., lakes, streams, and ocean waters). The Procedures do not include guidance for jurisdictional determinations for other waters of the state. See also Figure 1: Informational Flowchart for Determining if a Wetland is a Water of the State.

Stakeholders requested additional clarification regarding two specific elements of the jurisdictional framework. This is provided below.

Artificial Wetlands that Resulted from Historic Human Activity

Human activity can cause changes to the surrounding landscape (e.g., grading activities, road construction, direct hydromodification) such that wetlands form where wetlands did not previously exist. Where such artificial wetlands are now a relatively permanent part of the natural landscape, and are not subject to ongoing operation and maintenance, they are waters of the state. By requiring that the wetlands are relatively permanent, the framework excludes wetland that are temporary or transitory. That they are part of the natural landscape also indicates the relative permanence of the wetlands and suggests that the wetland is self-sustaining without ongoing operation and maintenance activities, and provides similar ecosystem services as natural wetlands. By way of example, this category of wetlands includes situations where water flow is permanently redirected as the result of human activity, such as grading in another area, such that new wetlands form in areas that were previously dry. These wetlands may not be natural wetlands because they result from human activity and they were not formed by modifying a water of the state (rather they were an indirect result), but nevertheless they take on the function of natural wetlands such that they should be considered waters of the state. This category would not include artificial wetlands constructed for specific purposes listed in section II.3.d because the artificial wetland would likely require ongoing maintenance such that they would not be deemed "relatively permanent," and/or the artificial wetland is not part of the "natural landscape."

Modification of a Water of the State

Wetlands can be created by modifying stream channels, lakes, and coastal areas, or converting a wetland from one type to another. Modification means that the wetland that is being evaluated was created by modifying an area that was a surface water of the state at the time of such modification. It does not include a wetland that is created in a location where a water of the state had existed historically, but had already been completely eliminated at some time prior to the creation of the wetland. The wetland being evaluated does not become a water of the state due solely to a diversion of water form a different water of the state. By way of example, if a water is converted to dry land, and subsequently wetland features develop on that dry land, those wetlands would not be considered “created by modification of a water of the state.” To determine if a wetland was created by modification of a water of the state, an applicant should research historical site conditions to determine whether any portion of the wetland was created in a pre-existing water of the state. The following sources could be used to make this determination:

- Maps that show a channel flowing through, into or out of the wetland;
- Historical aerial photos that show a waterbody or inundation;
- National Wetland Inventory of California Aquatic Resource Inventory maps that show a wetland or other water of the state;
- Hydric soil maps;
- Evidence of springs, seeps or wetlands upslope of the site;
- Evidence of a channel flowing into the site; or
- Historic land surveys or land grant maps.

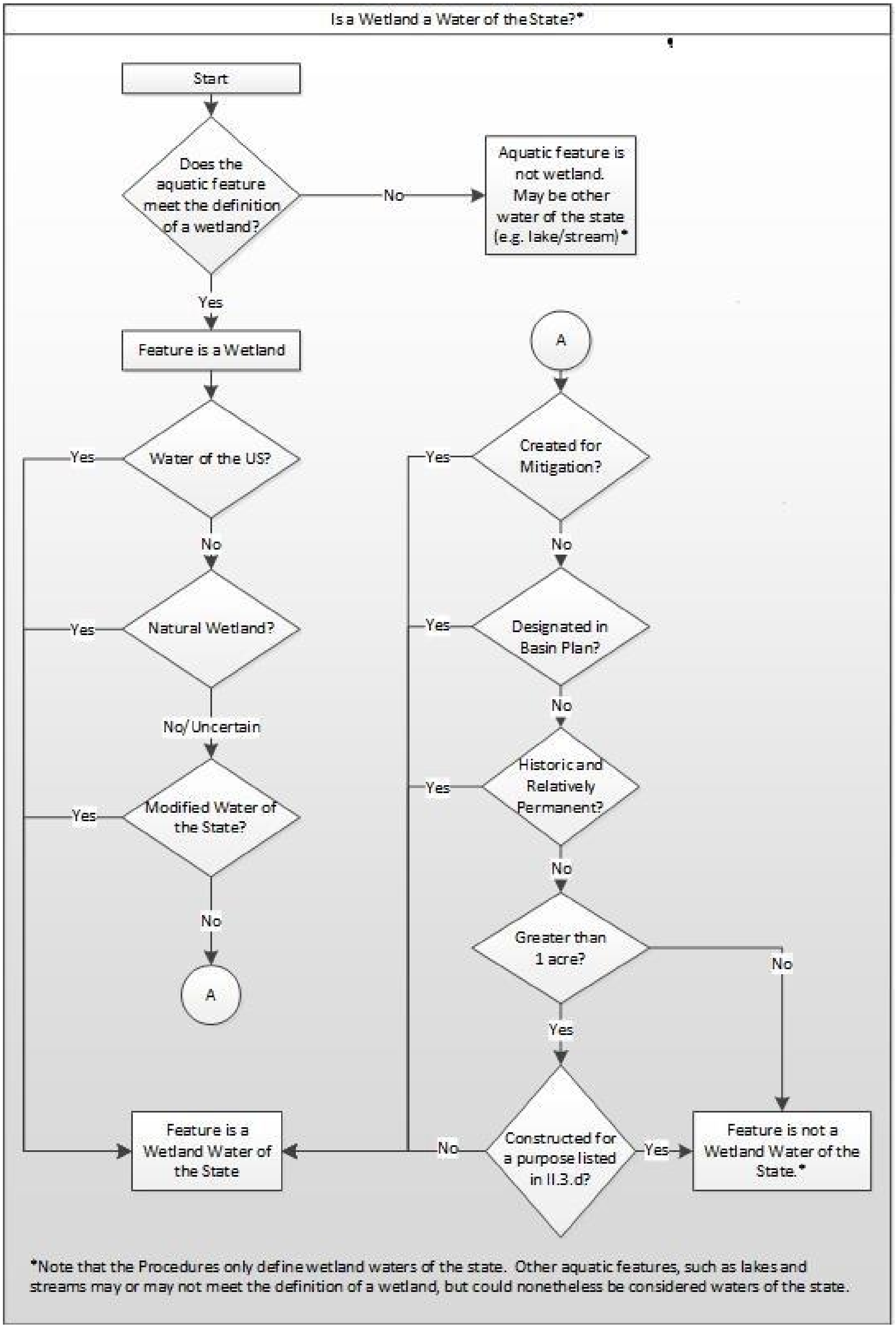

Figure 1: Informational Flowchart for Determining if a Wetland is a Water of the State. (Taken from the Staff Report for the Procedures. April 2, 2019.)

E. Frequently Asked Questions: Wetland Definition, Delineations, and Jurisdictional Framework

1. How will Water Board staff verify an aquatic resource report in cases where the Corps does not verify?

Generally, staff will ensure that the methods described in the Cops' delineation manuals were followed and that the conclusions reached by the delineator were consistent with the evidence presented in the report. Aquatic resource reports may be verified through a desktop analysis to verify and/or compare historical conditions to conditions reflected in the aquatic resource verification report. Staff may need to perform a site visit in order to verify the conditions identified in the report. The Procedures do not mandate a particular process for verifying reports. The appropriate verification method will depend on the nature, location, and complexity of the project.

2. How do I define or delineate non-wetland waters?

The wetland definition and delineation methods set forth in the Procedures apply to wetlands only. The Procedures do not include definitions or identify delineation methods for non-wetland aquatic features. Contact the appropriate regional board to confirm how non-wetland waters should be delineated. Depending on the project, Water Board staff may rely on methods used by the Corps or other state or federal agencies. Some of the frequently used Corps methods and other delineation resources are listed below under Other Resources for Wetland Definition and Delineations.

3. What types of artificial wetlands does the exemption in section II.3(d)(iii) apply to?

The Procedures provide a jurisdictional exemption for artificial wetlands that are currently used and maintained for detention, retention, infiltration, or treatment of stormwater runoff and other pollutants or runoff subject to regulation under a municipal, construction, or industrial stormwater permitting program. This jurisdictional exemption was drafted with National Pollutant Discharge Elimination System (NPDES) permits in mind – individual and general – because currently the MS4 and industrial stormwater programs have Water Board permits that incentivize large stormwater retention basins. Dischargers with Waste Discharge Requirements (WDRs) that may qualify for this exemption should contact their Regional Board to confirm. It should be noted that the stormwater facilities are still subject to the limitations set forth in 2, 3a, and 3b, and wetlands smaller than 1 acre in size (and that do not meet the criteria in 2, 3a, and 3b) are also excluded from jurisdiction.

4. Section II.3.d.iv excludes artificial wetlands that were constructed, and currently used and maintained, for the purposes of "industrial processing or cooling." What is industrial processing?

Artificial wetlands that were created primarily for the purposes of processing and cooling water may be excluded from jurisdiction provided the feature is artificial and does not trigger one of the other criteria (e.g., is also a water of the U.S.). The Procedures do not define "industrial process water;" however, it would be consistent with the Procedures to use standard industrial terms, such as water used to optimize water-based industrial processes, including heating, cooling, processing, cleaning, and rinsing. In addition, artificially created waters that do not meet the wetland definition may be excluded from the Procedures under exclusion IV.D.1.d if they are currently used and maintained for industrial processing, as long as those artificially created features do not meet the criteria in sections II.3.a, II.3.b, II.3.c, and II.3.d.

Other Resources for Wetland Definition and Delineations

- 1987 Wetland Delineation Manual: (http://www.cpe.rutgers.edu/Wetlands/1987-Army-Corps-Wetlands-Delineation-Manual.pdf)
- Arid West Supplement: (https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7627)
- Western Mountains Supplement: (https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7646)
- A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: (https://www.spl.usace.army.mil/Portals/17/docs/regulatory/JD/FinalOHWMManual_2008.pdf)
- Guide to Ordinary High Water Mark Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Region of the United States: (https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7645)
- Wetland Delineation TAT Memo: (https://www.waterboards.ca.gov/water_issues/programs/peer_review/wetl_def_del/docs/tat_memo4_2011.pdf)
- Peer Review of the Wetland Definition and Delineation Method (TAT Memorandum) website: (https://www.waterboards.ca.gov/water_issues/programs/peer_review/wetl_def_del/index.html)

II. Application Completeness Determinations

Application Completeness Topics	Procedures Section	Page(s)
Timeline for determining if an application is complete	Section IV.A	5
List of items required for a complete application	Section IV.A.1	5-7
List of additional items that may be required for a complete application	Section IV.A.2	7-9

A. Pre-application Consultations

Procedures' section IV, and Appendix A section 230.94 (a), encourages applicants to consult with the Water Boards, and any other regulatory agencies, early in the project development process. This is highly recommended for complex or potentially contentious projects. Pre-application meetings or informal consultations will benefit the applicant and Water Board staff by discussing important aspects of the proposed project which could prevent delays during application review. In addition, applicants and Water Board staff could discuss the potential for items required for a complete application on a case-by-case basis thereby potentially eliminating the additional 30-day review period allotted for review of these additional items once they are submitted.

Applicants are encouraged to request a pre-application consultation with the appropriate Regional Water Quality Control Board, or the State Water Board for projects that cross Regional Board boundaries. A request for pre-application consultation should include basic information about the proposed project and specific topics for consultation. Pre-application consultation can be conducted via email, telephone, in-person, or a pre-application site visit. While no regulatory decisions can be made during pre-application consultation, it can help guide and improve applications. Applicants are encouraged to submit any relevant correspondence related to pre-application consultations (e.g., emails, meeting minutes, site visit summaries) with applications for certification to ensure the Water Board has the necessary information to act on an application.

In addition, pre-application consultation will facilitate interagency coordination if those other agencies are invited to participate in that consultation. The Water Boards are committed to interagency coordination to streamline application review and attempt to concurrently reach multiple goals set by various agencies. Applicants are encouraged to keep Water Board staff informed of meetings with other agencies and pre-application site visits so that staff may participate and provide applicants with any information that could assist in preventing application processing delays. For example, applicants should notify the Water Boards if the Corps is reviewing their project during the Corps' regularly scheduled pre-application meetings, which may be attended by Water Board staff.

The following is a list of suggested topics that could be discussed in a pre-application consultation and/or a site visit in order to facilitate substantive and productive pre-application consultation:

- Verification of delineations of wetlands, and other waters of the state;
- Mutual understanding of the proposed project's description and purpose;
- Mutual understanding of potential project impacts and how to avoid them;
- Discussion of potential project alternatives that should be analyzed for practicability and elimination of project alternatives that are not practicable;
- Mutual understanding of temporarily impacted areas and appropriate approaches to restoring them to pre-project conditions; and/or
- Compensatory mitigation proposals – especially for projects that propose permittee responsible compensatory mitigation.

B. Processing Applications

The Procedures do not apply to applications that are submitted prior to the effective date of May 28, 2020, regardless of whether the application is deemed to be a complete application. Prior to the effective date, applications received will be processed according to the application procedures outlined in the California Code of Regulations, title 23, sections 3830-3869 as interpreted by the permitting authority, consistent with their current policies and procedures. Water Board staff may provide email confirmation to applicants upon receipt of an application.

Effective May 28, 2020, the Procedures apply to submittals of all applications. The Procedures do not specifically address cases in which an applicant resubmits an application that was previously denied for procedural reasons. In these cases, the Water Board staff may use the initial application date (prior to May 28, 2020) for the purposes of determining applicability of the Procedures. In other words, Water Board staff could deem the pre-effective submittal date as the operative submittal date. In considering whether to use the initial submittal date or the resubmittal date, the Water Boards are encouraged to use the same three criteria identified in in California Code of Regulations, section 3833, subdivision (b)(4), which are used to determine whether new application fees should be charged.

Specifically, the Water Boards should consider whether the revised application is filed within twelve (12) months of the denial without prejudice; whether the revised application package corrects the procedural problems which caused the denial without prejudice; and whether the project has not changed significantly in scope or potential for adverse impacts (i.e.; no further technical review is necessary). The Procedures' Staff Report notes that if an application was so clearly deficient that it indicated that it was submitted for the purpose of avoiding application of the Procedures, the permitting authority may deny without prejudice that application. It is unlikely that any such application, when resubmitted, would be able to meet the three-criteria listed above.

The Procedures provide a list of items required for a complete application. Section IV.A.1 lists items that are always required for a complete application. Section IV.A.2 lists items that may be required on a conditional or case-by-case basis. Water Board staff will review an application within 30 days of receipt and will provide a completeness determination to the applicant. An application determination will encompass one of the following options:

1. Application complete, and no additional information is needed to make a determination;
2. Application complete, but additional information will be needed to clarify or supplement the application;
3. Application incomplete, and staff will request missing items listed in section IV.A.1 and/or request items required on a case-by-case basis listed in section IV.A.2; or
4. Denial or Denial without Prejudice.

When reviewing applications, Water Board staff will analyze the project description and other information provided in order to determine if any items listed in section IV.A.2 are required. For example, if a project description indicates that an activity would require in-water work or a water diversion, Water Board staff will assess whether the in-water work or water diversion would contribute to water quality impairments. If so, Water Board staff may require that an applicant prepare and submit a water quality monitoring plan in order to monitor compliance with water quality objectives. If items listed in section IV.A.2 are required, Water Board staff have an additional 30 days to review those items once submitted to determine if the application is complete.

The level of detail in an application should be commensurate with the scale and complexity of the proposed activity. It is generally expected that simple, low risk activities will require shorter, less complex or detailed applications and include the minimum requirements discussed below. Applicants must provide sufficient detail that allows staff to evaluate proposed project impacts and make informed regulatory decisions.

If an application for a license or permit to another state (e.g., California Department of Fish and Wildlife) or federal (e.g., Corps) agency includes any of the information required for a complete application, the applicant may submit those materials to the Water Board. Staff will review the materials to determine if they satisfy the corresponding Procedures application requirements. Per the Procedures, applicants shall indicate where these items are located within the application materials. This could also help to expedite staff review of the application materials. When appropriate, applicants and Water Board staff may consult with staff at other state or federal agencies when preparing or reviewing applications to facilitate compatible requirements.

C. Taking Action on a Complete Application

Section IV.B of the Procedures describes how the Water Boards will evaluate the potential impacts on the aquatic environment from the proposed project based on the information submitted in an application. In order to facilitate an accurate and timely application review process, applicants should ensure that items required for a complete application are thorough, accurate, and as organized as possible. As set forth in section IV.B.1, the Water Boards have the discretion to approve a project only if the applicant has demonstrated the following:

- A sequence of actions has been taken to first avoid, then to minimize, and lastly compensate for adverse impacts that cannot be practicably avoided or minimized to waters of the state;
- The potential impacts will not contribute to a net loss of the overall abundance, diversity, and condition of aquatic resources in a watershed (or multiple watersheds when compensatory mitigation is permitted in another watershed as set forth in section IV.B.5(d));
- The discharge of dredged or fill material will not violate water quality standards and will be consistent with all applicable water quality control plans and policies for water quality control; and
- The discharge of dredged or fill material will not cause or contribute to significant degradation of the waters of the state.

D. Supplemental Field Data from the Wet Season to Substantiate Dry Season Delineations

Section IV.A.2.a of the Procedures states that Water Board staff may require, on a case-by-case basis, supplemental field data from the wet season to substantiate dry season delineations.

Generally, wet season delineations are more likely to be necessary in areas where wetland indicators are difficult to resolve. The ideal time to delineate a wetland is during the wet portion of the growing season of a normal climatic period. This is because indicators provided in the Corps' delineation manuals must be relied on to identify wetland boundaries. Collection of supplemental information in certain situations is an accepted practice and is consistent with recommendations presented in the Corps regional supplements for wetland delineation, which recommends that practitioners return to the delineation site, if possible, during the “normal wet portion of the growing season” (Arid West Regional Supplement, pp. 58, 87, 104; Western Mountains, Valleys, and Coast Regional Supplement, pp. 66, 100) to resolve wetland indicators that were unresolved during the dry-season delineation.

Applicants and staff should refer to the 1987 manual and regional supplements for guidance on determining what constitutes the dry season for a specific climatic region (referenced above). The manuals and regional supplements require the consideration of prevailing conditions at the time of delineation. A “normal wet portion of the growing season” would likely have allowed for full expression of the vegetation, soils/substrates, and hydrology of the area being delineated. For example, the arid west is characterized by extended dry seasons in most years and by extreme temporal and spatial variability in rainfall, even in ‘normal’ years. This may result in a false-negative when determining the presence of hydrology. Understanding the normal seasonal and annual variations in rainfall, temperature, and other climatic conditions is essential in interpreting hydrology indicators.

To avoid the risk of unanticipated project delays, applicants should consult with the appropriate Water Board regarding whether supplemental data may be necessary prior to submitting an application.

E. Water Quality Monitoring Plans

Section IV.A.2.c of the Procedures allows the permitting authority to require an applicant to submit a water quality monitoring plan if project activities include in-water work or water diversions and the permitting authority determines that the activities could cause water quality impacts. An applicant may need to demonstrate that the monitoring plan is sufficient to ensure that project activities do not cause or contribute to an exceedance of water quality objectives (turbidity, oil and grease, pH, mercury, dissolved oxygen, etc.), and that exceedance incidents are promptly detected and addressed. A properly prepared monitoring plan will assist applicants in complying with regional water quality control plans and thus avoid delays in application review. Applicants are encouraged to work with the Water Boards in developing draft water quality monitoring plans. A water quality monitoring plan should reference the type of sample, unit of measure, and sampling frequency for each parameter that’s being monitored. Restoration Plans for Temporary Impacts

Section IV.A.2.d of the Procedures requires a draft restoration plan in all cases where temporary impacts are proposed. Temporarily impacted areas are those that can temporarily cause a physical loss and/or degradation of an aquatic resource. Temporarily impacted areas can include areas such as temporary material staging areas, parking lots, or access roads. Generally, temporarily impacted areas are those that can be restored to pre-project conditions within a short period of time (e.g. prior to the end of a growing season, or the occurrence of a sensitive resource period, such as a spawning season). In this context, “restoration plan” is only about temporary impacts, and does not refer to the entirety of a restoration project, such as an Ecological Restoration and Enhancement Projects (EREPs), that seeks to permanently restore water quality in an area.

Water Board staff will identify permanent and temporary impacts to waters of the state when considering items submitted with the application, such as the project and impact description. In order to avoid application processing delays, applicants should identify if their project activities will temporarily impact areas and if so, submit a draft restoration plan with the initial application.

Water Board staff will review the draft restoration plan and will generally require that a final restoration plan is submitted prior to issuing an Order for the proposed project. In limited circumstances, final restoration plans may be submitted prior to initiation of temporary impacts, consistent with section IV.B.4 of the Procedures. The extent and level of detail in a draft restoration plan should be commensurate with the size and the scope of the proposed temporary impacts. If an applicant is unsure about the level of detail that will be sufficient for a restoration plan, they should contact the Water Boards for pre-application consultation.

F. Frequently Asked Questions: Application Completeness Determinations

1. How do I avoid iterative submittals during the application process?

The Procedures include a list of items that are needed in order to make determinations on proposed projects and issue water quality certifications. In addition to engaging the Water Boards early in the application process through pre-application consultation, applicants are encouraged to prepare materials that are likely to be required for a complete application prior to submitting an application. For example, if environmental review has shown that project impacts will result in a net loss of wetlands or other waters of the state, applicants are encouraged to prepare and submit a draft compensatory mitigation plan with the initial application. Note that if items required for a complete application are the same as items submitted for another agency’s regulatory process, those documents, or information within those documents may be submitted. If used, they should be clearly identified.

2. What does a typical water quality monitoring plan consist of?

Generally, water quality monitoring plans consist of components used to assess the activity’s effect(s) on water quality. This may include visual monitoring to detect accidental discharge of construction related pollutants (e.g. oil and grease, turbidity plume, or uncured concrete). Water quality monitoring plans may also include a

F. Mitigation Banks and In-Lieu Fee Programs

Mitigation bank means “a site, or suite of sites, where aquatic resources . . . are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for unavoidable impacts authorized by Orders. In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor. The operation and use of a mitigation bank are governed by a mitigation banking instrument.” Mitigation banking instrument means the legal document for the establishment, operation, and use of a mitigation bank. (Appendix A, Subpart J, section 230.92.)

In-lieu fee program means “a program involving the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements. Similar to a mitigation bank, an in-lieu fee program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor. However, the rules governing the operation and use of in-lieu fee programs may be different from the rules governing operation and use of mitigation banks. Projects approved under an in-lieu program may be implemented prior to, concurrent with, or after adverse impacts whereas compensatory mitigation banks are established prior to adverse impacts. The operation and use of an in-lieu fee program are governed by an in-lieu fee program instrument.” In-lieu fee program instrument “means the legal document for the establishment, operation, and use of an in-lieu fee program.” (Appendix A, Subpart J, section 230.92.)

In many cases, the environmentally preferable compensatory mitigation may be provided through mitigation banks or in-lieu fee programs because they usually involve consolidating compensatory mitigation projects where ecologically appropriate, consolidating resources, providing financial planning and scientific expertise (which often is not practical for permittee-responsible compensatory mitigation projects), reducing temporal losses of functions, and reducing uncertainty over project success (section 293.93(a)(1).

Consistent with the Corps 404(b)(1) Guidelines, and stated in section 230.93(b) of the State Supplemental Dredge or Fill Guidelines, the permitting authority shall approve compensatory mitigation types based on what is environmentally preferable with a soft preference to mitigation banks, in-lieu fee programs, and finally, permittee responsible compensatory mitigation. This soft preference requires Water Board staff to take into consideration the best environmental outcome to compensate for the adverse impacts, whether it is through mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. Applicants and staff should also be aware that mitigation banks and in-lieu fee programs are not available everywhere in the state, and in some cases, permittee-responsible mitigation provides the environmentally preferable outcome. For example,

A watershed profile is required to be submitted as part of a draft compensatory mitigation plan. The watershed profile should be developed using either an approved watershed plan or using a watershed approach for a project evaluation area. An applicant may qualify for a potential reduction in the amount of compensatory mitigation required to offset impacts if the watershed profile was developed using information in a watershed plan that has been approved by the Water Boards.

3. **Can multiple applicants use the same watershed profile, on a regional basis?**

Yes. If a watershed profile was developed on a regional basis, complies with the requirements for watershed profiles as defined in the Procedures, and was developed to address multiple projects and/or applicants, it is feasible that a single regional watershed profile could be used by multiple applicants for dredge or fill projects. However, it should be noted that if a watershed profile is developed with regional considerations in mind, it may qualify as a watershed plan that, if approved by the Water Boards, may be used to qualify the project for additional regulatory relief, such as an exemption from the alternatives analysis requirement.

4. **Are applicants required to use CRAM?**

When a project includes unavoidable impacts to waters requiring mitigation, the permitting authority will require an assessment of the overall condition of those waters using an assessment method approved by the Water Boards. While the California Rapid Assessment Method (CRAM) is one such method that may be approved for use by the Water Boards, other assessment methods, such as the California Stream Condition Index, could be approved for use by the Water Boards.

When available, CRAM is likely appropriate for assessing overall condition because it has been peer reviewed and has been used to assess various wetland types common in California. CRAM has been proven to be cost effective and scientifically defensible when used for monitoring ecological conditions and assessing the performance of compensatory mitigation projects and is widely used in California for these purposes. The Water Boards encourage, but do not require, the use of CRAM to assess the overall condition of waters in order to provide statewide consistency in the permitting process.

CRAM should be conducted by a trained practitioner when practicable. Water Board staff should review assessments to ensure that it meets the quality assurance protocols described in the CRAM Technical Bulletin ("Technical Bulletin," https://www.cramwetlands.org/sites/default/files/2019CRAM_TechnicalBulletin.pdf). The California Wetland Monitoring Workgroup's (CWMW) Level 2 Assessments Committee, which serves as the Principal Investigator for ongoing CRAM development and maintenance, reports that most cases of inadequate or inaccurate CRAM reports are tied to untrained practitioners.

C. How to Use this Framework

Procedures section IV.A.2.b.viii states that a climate change assessment may be required as part of a draft compensatory mitigation plan for permittee-responsible compensatory mitigation. If a climate change assessment is not provided with the initial application materials, the Water Boards may, on a case-by-case basis, require an assessment be provided within 30 days of receipt of the items set forth in Procedures section IV.A.1. If applicants are unsure if they should submit a climate change assessment with their application, they are encouraged to contact the appropriate Water Board staff prior to submitting the application.

The framework is aimed at applicants that are well versed in climate change issues, as well as those that are unfamiliar with climate change issues. It may also be useful for Water Board staff when determining if an applicant should be required to prepare a climate change assessment for a proposed mitigation project and in reviewing climate change assessments submitted by applicants. This framework and the accompanying **Optional Climate Change Impact Assessment Worksheet** may be used as an organizational tool and general stepwise method. The framework and worksheet are not required or regulatory, nor are they intended to comprehensively evaluate all possible risk factors or impacts from climate change on a mitigation project. Additionally, other types of assessments related to climate change may be more appropriate to use, depending on the location, aquatic resource type, type of mitigation, and scale of project.

When possible, applicants and Water Board staff should utilize other relevant information provided in application materials in preparing a climate change assessment, such as a watershed profile, watershed plan, and/or long-term management plans, as these application materials will likely already contain some of the information suggested for use in this framework. Refer to the List of Resources and References in section V for links to other existing assessment methodologies.

Lastly, if the mitigation project plan takes into account climate change impacts to ensure long-term viability, a separate climate change assessment may not be necessary. Note, this framework is intended to suggest practical strategies in assessing reasonably foreseeable impacts from climate change on a permittee responsible compensatory mitigation project. It is not intended to question the merits of a mitigation project as a whole. There may also be situations in which the mitigation project is impacted by climate change in such a way that the original intended goals should be modified to reflect anticipated changes. For example, mitigation goals may have included restoration of a coastal wetland influenced by sea level rise; however, due to climate change induced sea level rise over the next 50 to 100 years, the coastal wetland could transition to a different aquatic resource type. In such cases, staff should be open to allowing for mitigation sites to change over time in response to climate change, even to the extent of allowing for type changes in the long-term. Ideally, type changes that occur in response to climate

will be impacted by changes in the timing, duration, and magnitude of storm events, which affect the relative rates of surface runoff and infiltration. Estuarine wetlands will be impacted by changes to watershed hydrology and by sea level rise, and by interactions between the two. This variability of the governing physical processes across aquatic resource types means that each type is vulnerable to climate change through different mechanisms, some of which may be addressed through project location, design, and/or management.

Climate not only helps govern aquatic resource form and structure, it also governs the ways in which these systems are connected throughout a landscape. These connections can include physical connections (e.g., connectivity between a river and floodplain wetlands during floods) as well as ecological connections (e.g., waterfowl movement between physically disconnected vernal pools or seasonal wetlands). These landscape connections are especially important when considering the impacts of climate change on aquatic resources because climate change affects entire landscapes. For example, with the exception of estuarine and coastal wetlands, aquatic resources in the upper portions of watersheds have smaller contributing watersheds than resources lower in a watershed, so upper-watershed aquatic resources may be relatively more vulnerable to climate-driven changes in the volume, timing, and duration of surface water and/or groundwater. However, aquatic resources lower in watersheds are more vulnerable to cumulative change

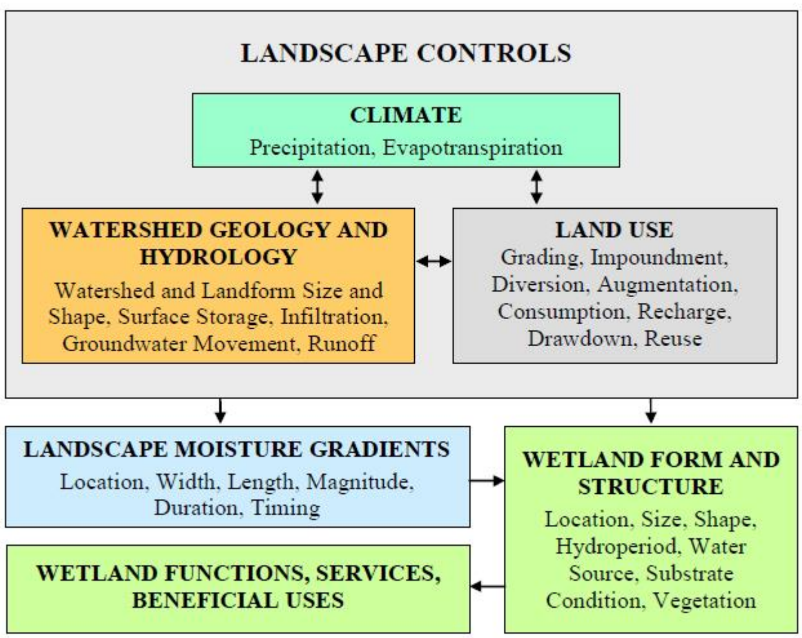

Figure 2. Landscape framework for interpreting wetland functions, services, and beneficial uses in the context of landscape moisture gradients that form within watersheds. 2012 TAT Technical Memo 3.

across broader landscapes. Aquatic resources that provide habitat for rare, special-status, and/or sensitive keystone species may in some cases be less resilient than those without these sensitive species, if the species in question can only persist within a narrow band of environmental conditions that may not be supported in a future climate.

Section II.A proposes a suite of site-scale and landscape-scale factors that applicants and Water Board staff may consider when developing and accessing climate change assessments for permittee-responsible compensatory mitigation plans. Section II.B describes California's unique climate regions and summarizes how climate change is likely to impact aquatic resources, including precipitation, temperature, and sea level rise, within those climate regions.

A. Site-Specific and Landscape-Scale Factors to Consider in a Climate Change Assessment

Table 1 presents a list of site-specific and landscape-scale factors that may be considered when determining an aquatic resource's vulnerability to climate change. The list should be expanded where additional region-specific climate change resources and adaptation guidance are available. The table includes criteria to generally determine whether a given factor is low, medium, or high risk.

It is important to emphasize that this list is meant to provide **general guidance only**. Each of these factors and associated risk levels must be considered within the site and landscape contexts of the beneficial uses the resource is intended to provide, the key functions of the aquatic resources that support those beneficial uses, the physical drivers that support those key functions, and how those drivers are likely to be impacted by climate change (based on the site's location within the climate regions discussed in Section II.B). For example: a large vernal pool in the flats of the relatively drier Central Valley supported by rainfall may be more vulnerable to climate change impacts than a small groundwater-fed wetland along the slopes of the relatively wetter North Coast, the high degree of landscape manipulation in more urbanized areas makes the presence/absence of wetland soils in these areas a less reliable indicator of wetland vulnerability than in rural areas, and so forth. Applicants and Water Board staff should consult with published resources and technical experts in their respective regions if they have questions or uncertainties about any of the factors listed below.

Table 1. Factors and risk levels generally associated with climate change impacts to mitigation projects.

	Factor	Low Risk (score = 1)	Medium Risk (score = 2)	High Risk (score = 3)
1.	Aquatic resource type[3]	Lacustrine, large riverine wetlands	Perennial depressional, playas, wadable perennial streams	Seasonal depressional, vernal pools, episodic streams, slope wetlands, estuarine wetlands
2.	Size[4]	Large size and small edge: area ratio	Medium size and medium edge: area ratio	Small size and large edge: area ratio
3.	Position in watershed[5]	Upper watershed	Mid-watershed	Lower watershed

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[3] Aquatic resources should be classified based on unique physical characteristics including geomorphic setting, water source, and transport mechanisms, and hydrodynamics. It is recommended that aquatic resources be classified using the California Aquatic Resource Inventory (CARI). CARI is a Geographic Information System (GIS) dataset of wetlands, streams, and riparian areas consisting of polygon and line features that are standardized to a common classification system. CARI is continually updated, so applicants and staff should make sure they are working with the most current version when developing a mitigation proposal and climate change assessment.

[4] When determining if an aquatic resource is large, medium, or small the aquatic resource should be compared to other naturally occurring aquatic resources of the same type within the same area (e.g., regional water board, watershed, or climate region). The size determination should be relative to the average sizes of other naturally occurring aquatic resources.

[5] With respect to an aquatic resource's position in the watershed, generally, the lower in a watershed an aquatic resource is located, the more affected it is by upstream processes and events. For example, the further downstream a project is, the more potential sources of pollution there are upstream, the greater the risk of

	Factor	Low Risk (score = 1)	Medium Risk (score = 2)	High Risk (score = 3)
4.	Soil type and/or appropriate permeability for aquatic resource type	Wetland soils are present, and/or existing permeability is appropriate	Wetland soils are likely present, and/or permeability is likely appropriate	Wetland soils are not present, and/or soils or substrate require significant amending to achieve appropriate permeability
5.	Surrounding land use intensity or encroachment[6]	Low intensity or encroachment	Medium intensity or encroachment	High intensity or encroachment
6.	Hydrological connectivity	Highly connected system through both surface and groundwater or directly abutting an artificial drainage system	Medium hydrological connectivity	Reduced or no hydrological connectivity
7.	Habitat fragmentation	The aquatic resource is located within a project	The aquatic resource is located within a project evaluation area where contiguous	The aquatic resource is located within a project evaluation area made of several small patches, and isolated from each

catastrophic flooding due to upstream runoff, etc. Also, the intensity of land use and the numbers of people increases downstream, such that projects further downstream are subject to more kinds of local stressors. These relationships are amplified by climate change because it will increase the intensity of storms thus increasing runoff from built landscape, flood sizes and the peak runoff.

[6] Climate change impacts should be considered cumulatively in the context of other anthropogenic impacts (e.g., land use and encroachment pressures), which are more immediately and more extensively threatening. Consideration of trends, as well as present and recent pressures on the aquatic resource, will allow a better understanding of where the resource is headed.

	Factor	Low Risk (score = 1)	Medium Risk (score = 2)	High Risk (score = 3)
		evaluation area[7] made of somewhat large, contiguous similar habitats	habitats are present, but a division into smaller patches is occurring	other by a matrix of habitats unlike the original
8.	Mitigating project design	Project minimizes potential future water deficits[8]	Project neither minimizes nor maximizes potential future water deficits	Project maximizes potential future water deficits
9.	Existing mitigating aquatic resource conservation plan	There are one or more existing plans that will likely mitigate for *most* of the climate change impacts	There are one or more existing plans that will likely mitigate for *some* of the climate change impacts	There are no existing plans that will mitigate for the climate change impacts

B. Regionally Based Climate Factors

California is a large state with diverse landscapes, so climate change impacts vary widely depending on location within the state. California's overall climate is Mediterranean with a brief, cool, wet season and a longer, warm, dry season. However, California's eleven climate regions, which were developed by the Western Regional Climate Center (WRCC), differ significantly from one another with regards

[7] A project evaluation area means an area that includes the project impact site, and/or the compensatory mitigation site, and is sufficiently large to evaluate the effects of the project and/or the compensatory mitigation on the abundance, diversity, and condition of aquatic resources in an ecologically meaningful unit of the watershed. The size and location of the ecologically meaningful unit shall be based on a reasonable rationale.

[8] Water deficits occur when water demand exceeds supply. Water deficits are further compounded by the effects of climate change where changes in precipitation, evapotranspiration, loss of wetlands, decreased groundwater connectivity, and consequent changes on land use are all occurring at an increasing rate.

to the timing, volume, and form of precipitation, trends in temperature, and other major climate variables. Scientists from the California Department of Water Resources (DWR) and the WRCC use these regions to track regional differences in how climate change affects trends in precipitation and temperature (Abatzoglou et al. 2009).

How will my aquatic resource be impacted by climate change?

Information that can help applicants and staff assess how an aquatic resource may be impacted by climate change may already be summarized in regional climate change adaptation plans, watershed plans, or other regional planning documents. If a regional planning document exists for the area where the compensatory mitigation project is being proposed, then an applicant should plan the project in accordance with that regional plan. Examples of regional planning documents can be found in section V.A, List of Resources and Documents.

If a regional document does not exist, an applicant may glean information from the summaries of California's eleven climate regions, below. These climate regions are used to track regional differences in climate change trends and the summaries can inform how an aquatic resource may be impacted from climate change. California's climate regions do not directly align with the jurisdictional boundaries of the nine Regional Water Quality Control Boards. Applicants should identify both the appropriate Regional Water Quality Control Board's jurisdiction and the climate region in which their compensatory mitigation project is located (see Figure 2). Regional water boards issue water quality certifications within their region (unless the project overlaps two regional boards, in which case the State Water Board will issue the certification). Use of climate regions is only intended to inform how the physical processes that support the aquatic resource's function may change over time, based on expected climate change impacts within that climate region.

The projections presented in these summaries are drawn from California's *Fourth Climate Change Assessment* (2018)[9] and *California Climate Science and Data for Water Resources Management* (2015).[10] The *Fourth Climate Change Assessment* was written and reviewed by researchers from state agencies, federal agencies, state universities, and the private sector. This report provides the most recent climate change projections with statewide coverage available at this time. *California*

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[9] The statewide assessment, plus regional assessments and technical reports, are available at http://climateassessment.ca.gov/.

[10] https://water.ca.gov/LegacyFiles/climatechange/docs/CA_Climate_Science_and_Data_Final_Release_June_2015.pdf

Climate Science and Data for Water Resources Management was developed by the California Department of Water Resources and relies on WRCC monitoring and projection data. Applicants should use more recent reports as they become available.

For the proposed compensatory mitigation project, a risk score for *precipitation*, *sea level rise*, and *temperature change* should be generated based on the climate region summaries, below. For example, a mitigation project located in a tidal zone in the North Coast climate region would likely have a high-risk score for sea level rise impacts. For ease of use, refer to the **Optional Climate Change Impact Assessment Worksheet** for guidance on how assess risk for these factors.

As a caveat to users, the risk levels below are general in nature and do not reflect site-specific conditions or other local considerations. For example, local considerations could include other non-climate stressors such as land use, water management, population growth, and unsustainable development. Applicants may adjust risk levels based on site-specific conditions, provided there is sufficient justification for the adjustment. Risk scores can generally be applied, as follows:

Precipitation Impact Risk Levels:

Low (score = 1): precipitation unlikely to change at the site in the long term
Medium (score = 2): precipitation likely to change at the site in the long term
High (score = 3): precipitation highly likely to significantly increase (flood risk) or decrease (drought risk) at the site, in both the short and long term

Sea Level Rise Impact Risk Levels:

None (score = 0): site is outside of the effects of sea level rise
Medium (score = 2): site may be directly impacted by sea level change
High (score = 3): site will be directly impacted by sea level change in the short and long term

Temperature Impact Risk Levels:

Low (score = 1): temperature change not likely to impact site
Medium (score = 2): temperature change may impact site in the long term
High (score = 3): temperature change likely to impact site in short and long term

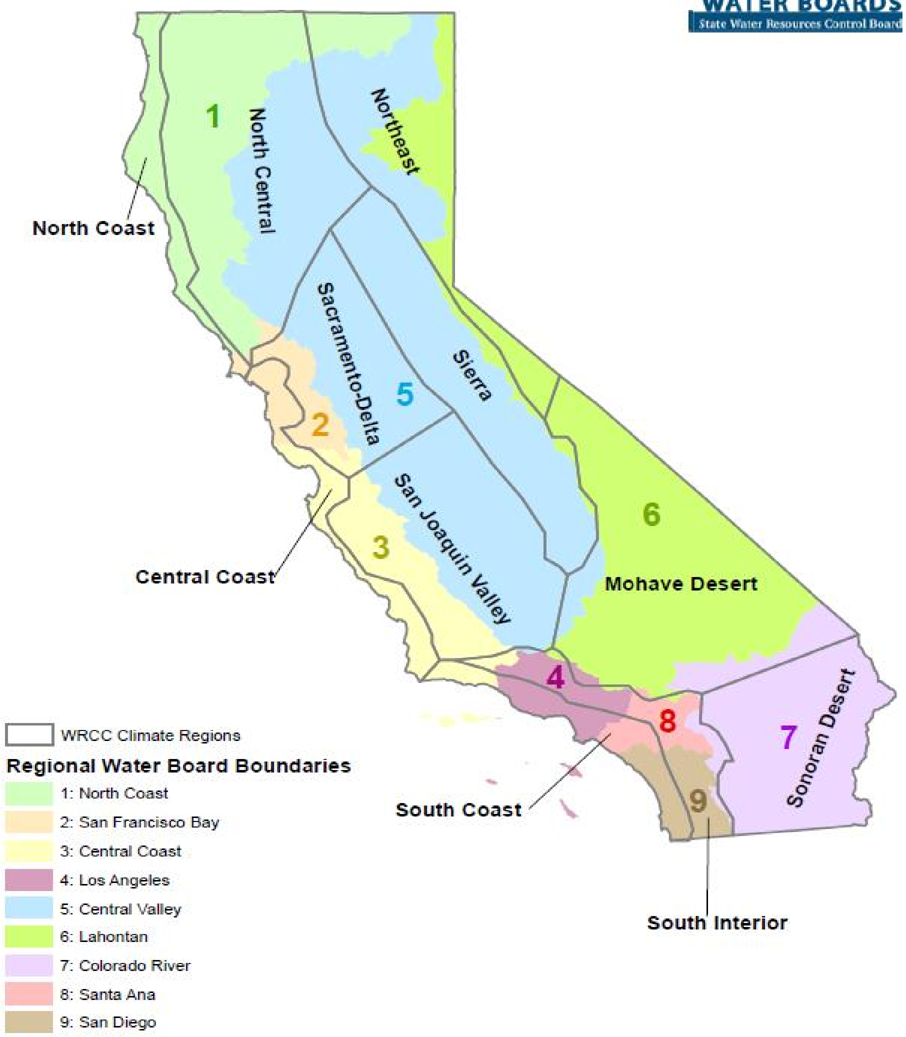

Figure 2: California's Regional Water Board and Climate Change Boundaries

1. North Coast

The North Coast Climate Region (North Coast Region) encompasses portions of the North Coast and San Francisco Bay Regional Water Quality Control Boards. The North Coast Region is a narrow, rugged coastline extending from the Oregon border to just south of Point Reyes National Seashore. Temperatures range from the low-30s in winter to the mid-80s in summer due to the moderating effects of the Pacific Ocean. Most precipitation normally occurs from November to April followed by a prolonged dry season. Annual rainfall averages 55 inches, making the North Coast Region the wettest part of California. Most of the region's annual precipitation is delivered by large storms that track eastwards from the Pacific Ocean, resulting in much wetter conditions along the Coast compared to the adjacent North Central Region. Coastal fog is normally present year-round and plays a vital role in coastal ecosystems. The spatial pattern of fog and low cloud cover on the North Coast is relatively consistent and is affected by the shape of the coastline relative to prevailing winds, elevation, and orientation of terrain features.

In the North Coast Region, climate change is expected to influence temperatures, precipitation patterns, fog dynamics, and sea-level rise. Summer season temperatures are projected to increase 3-5°F by mid-century and 6-9°F by end-century. Winter season temperatures are expected to increase by a greater magnitude: 5-7°F by mid-century, and 8-11°F by end of century. Increased winter temperatures will result in less precipitation falling as snow, reducing total snowpack to a small fraction of its historical average. Model predictions of annual precipitation fall within the range of historical variation but trend towards slightly higher (2-16%) precipitation across the region by the end of century. However, projections indicate an increase in the intensity of individual storms. The projected rise in the frequency of wet and dry year extremes has been termed "precipitation whiplash" and describes a new climate regime consisting of frequent, dramatic swings between wet and dry years. Precipitation pattern impacts may include changes in soil moisture, extended fire seasons, drought, and flooding. Changes in temperature and precipitation patterns are predicted to reduce summertime coastal fog; however, quantitative projections are difficult to calculate since fog is affected by several complex ocean-atmospheric processes. Land subsidence along the Pacific Northwest coast in combination with the thermal expansion of the ocean drives sea-level rise. Some locations exhibit a rise of 0.09 inches per year, 34 percent greater than the global average rate of 0.06 inches per year. For example, recent estimates of sea-level rise indicate that Humboldt Bay has the highest sea-level rise rate (0.20 in/yr) in California.

2. North Central

The North Central Climate Region (North Central Region) encompasses the inland portion of the North Coast and the north western portion of the Central Valley

Regional Water Quality Control Boards. It is positioned between the rugged coastline of the North Coast Climate Region and Northeastern Climate Region. High inter-annual variability is typical for the North Central Region since it encompasses such a large portion of California. Its central position leads to drier conditions and more variable temperatures, which often fall below 30°F in the winter and exceed 100°F in the summer. Rainfall varies in this region and is dependent upon proximity to the coastline and mountain ranges. Most of the region's precipitation drains into the Sacramento River and ultimately the San Francisco Bay, and much of that via large reservoirs. Some of the area drains to large coastal rivers such as the Klamath-Trinity river system.

In the North Central Region, direct impacts from climate change include rising temperatures, changes to precipitation patterns, and drought. Summer temperatures are projected to increase 3-5°F by mid-century and 6-9°F by end of century. Winter temperatures are expected to increase by a greater magnitude: 5-7°F by mid-century, and 8-11°F by end of century. Temperature increase in conjunction with longer dry periods will extend the fire season, especially for higher elevations with decreasing snowpack. Loss of snowpack storage resulting from increased temperatures is also projected to impact runoff and streamflow patterns, placing additional stress on water systems. Overall, annual precipitation is predicted to fall within the range of historical variation; however, models indicate that the intensity of individual storms will increase and will be compressed into shorter periods of time. This would result in a later onset of rain in the fall and earlier spring drying.

3. Northeast

The Northeast Climate Region (Northeast Region) encompasses segments of the Central Valley, North Coast, and Lahontan Regional Water Quality Control Boards. The Northeast Region is positioned on the eastern side of the northern Sierra Nevada and southern Cascade ranges between the Sacramento River Valley and the edge of The Great Basin. The topography of the surrounding mountain ranges produces a continental desert climate regime of dry, mild summers and cold, dry winters. The Northeast Region receives 15-18 inches of orographic precipitation annually but varies considerably year to year. At elevations of 4,000 feet or higher, precipitation will fall as snow and accumulate to form snowpack. Due to the Region's position, there is limited surface water drainage to the ocean. Most precipitation will either evaporate, transpirate, infiltrate as groundwater, or flow into lakes (mostly saline).

Observed climate changes effects in the Northeast Region are affecting heat and precipitation extremes, with long-term warming trends, declining snowpack, and changes in streamflow timing. Manifestation of these climatic changes will depend on many factors, including elevation within the mountain range, with quicker warming trends and precipitation changes at highest elevations. Annual precipitation overall is projected to vary by no more than ±10-15% of current totals in the Northeast Region; however, precipitation extremes (both as deluge and drought) are expected to increase in frequency remarkably as a result of climate change. The observed average temperature change over the past century for the Northeast Region is an increase of 1-2°F. By the end of the century, temperatures are projected to warm by 6-10°F on average, which is enough to increase the divide between rain and snow during a storm by 1500-3000 feet. The rise in snowline translates to more rain for the Northeast Region and a decrease in overall snowpack. At the conclusion of spring, snowpack is projected to be largely gone and water that has flowed out of the range in the cool season will no longer be available. This would lead to a dramatic decline in summer runoff, streamflows, soil moisture, and groundwater recharge. In addition, an increase in temperatures combined with prolonged dry periods is projected to increase the frequency and total area burned by wildfires.

4. Sierra

The Sierra Climate Region (Sierra Region) encompasses the Central Valley and Lahontan Regional Water Quality Control Boards and is characterized by its mountainous landscape and its role as “California’s reservoir.” The relatively high elevations of the mountains in the Sierra Region lend to a cool, wet climate with some of the largest year-to-year climatic fluctuations in the United States. Due to topographic differences, the southern Sierra receives more snow than the northern Sierra. The snowpack that accumulates at higher elevations comprise a seasonally varying natural reservoir that holds water equal to—on average in spring—about two-thirds of the average overall volume of water stored in the state’s man-made reservoirs. At the onset of spring, the stored water is slowly released into streams and recharges groundwater supplies. This process is known as the “spring pulse.” The annual rise in water levels inundate wetlands and act as a secondary water reservoir. The wetlands absorb runoff, reducing spring flooding downstream. The spongy soils store the water for later use while supporting plant and animal communities.

Similar to the Northeast Region, climate changes are already impacting the Sierra Region. The observed temperature change over the past century for the Sierra Region is an increase of 1-2°F. Minimum temperatures in this region have increased about three times faster than maximum temperatures. The rise in spring season minimum temperatures and decrease in the number of days with temperatures below freezing have impacted snowpack and rate of snowmelt. Snow cover is a factor affecting temperature in this region: the disappearance of snow cover exposes surfaces that absorb solar energy, resulting in further warming (a phenomenon known as “snow albedo feedback”) (Walton et al., 2017). By the end of century, temperatures are projected to warm by 6 to 10°F on average, which is enough to raise the divide between rain and snow during a storm by about 1500 to 3000 feet.

The southern Sierras are partially buffered against rising temperatures by their higher elevation but are still expected to have declines in total snowpack of about 40% while the northern Sierras are expected to have almost no annual snowpack by the end-of-century. This would lead to a dramatic decline in summer runoff, streamflows, soil moisture, and groundwater recharge. Projections of future precipitation totals range from about -5% to +10% depending on location within the Sierra Region. However, precipitation from large storms - e.g., maximum-annual 3-day precipitation totals and atmospheric rivers - is projected to increase by 5-30% compared to historical norms. Increased interannual variability is projected to increase remarkedly both as deluge and drought. An increase in temperatures combined with prolonged dry periods is projected to increase the frequency and total area burned by wildfires.

5. Sacramento-Delta

The Sacramento-Delta Climatological Region (Sacramento-Delta Region) encompasses the Central Valley, San Francisco Bay, and Central Coast Regional Water Quality Control Boards. It is enclosed by the Sierra Nevada mountains to the east, and the Coastal mountains to the west. The Sacramento-Delta Region has mild, wet winters and hot, dry summers with average annual rainfall of 15-25 inches (Huber-Lee et al.). The Delta of the Sacramento and San Joaquin Rivers is upstream of the largest estuary on the U.S. West Coast, the San Francisco Estuary (Cloern et al. 2011). Both rivers are sourced from Sierra runoff and reservoir outflow which then flow onto the valley floodplains (Knowles and Cayan 2002). Once the water has been delivered to the valley, it flows over a 3,000-square-kilometer landscape comprised of islands and shallow waterways before flowing into the San Francisco Estuary.

Climate change has direct, measurable impacts to the Sacramento-Delta Region, such as rising temperatures and shifting precipitation patterns. The observed average temperature increase over the past century is 1.5-2.5°F. By mid-century, the annual mean temperature is projected to increase by 4°F, and the daily maximum temperature will increase 10°F by end of century. Rising temperatures will continue to result in more frequent and intense heat waves throughout the Sacramento-Delta Region. For example, midtown Sacramento is projected to experience a spike in extreme heat days (temperatures more than 103.9°F) from about 4 days/year to 40 days/year by the end of the century. Despite little projected change in annual precipitation, extreme weather events, from drought to deluge, are expected to increase approximately 25%. Extended dry periods increase the likelihood for wildfires in the spring, summer, and fall. Wetter localized winters in addition to increased winter runoff from the northern Sierras will challenge water storage and flood control systems, leading to a greater flood risk. End-of-century sea level rise in the San Francisco Bay area is likely to be 2.5 to 4 feet, which will lead to the intrusion of salty ocean waters into the freshwaters of the Sacramento-Delta Region.

6. San Joaquin Valley

The San Joaquin Valley Climate Region (San Joaquin Valley Region) encompasses the Central Valley and Central Coast Regional Water Quality Control Board. The San Joaquin Valley Region is characterized by hot, dry summers and foggy, rainy winters. However, it receives significantly less annual rainfall than the Sacramento Valley with an average of 5-15 inches per year. Extending southward from the Sacramento-Delta, the San Joaquin Valley Region is bounded by the Sierra Nevada to the east, Tehachapi Mountains to the south, and the Coast Ranges to the west. Like the Sacramento-Delta Region, the San Joaquin Valley Region receives most of its' surface water supply from Sierra runoff and reservoir outflow (Knowles and Cayan 2002). The San Joaquin River and its tributaries drain the northern half of the San Joaquin Valley Region and flow towards the Delta; the southern half of the San Joaquin Valley Region drains to the closed Tulare Basin.

Potential impacts from climate change in the San Joaquin Valley Region include rising temperatures, more frequent extreme weather events, more severe and frequent wildfires. The observed average temperature change over the past century is an increase of 1-2°F. By the mid-21st century, the annual mean temperature is projected to increase by 4°F. Despite little projected change in annual precipitation, extreme weather events of drought to deluge are expected to increase by the end of the century. Extended dry periods, in combination with increased temperatures, the likelihood for wildfires in the spring, summer, and fall. Such conditions would also increase the demand on groundwater resources since Sierra snowpack is a major water resource for the San Joaquin Valley Region. Wetter localized winters in addition to increased winter runoff from the southern Sierras will challenge water storage and flood control systems, leading to a greater flood risk.

7. Central Coast

The Central Coast Climate Region (Central Coast Region) encompasses parts of the San Francisco Bay and Central Coast Regional Water Quality Control Boards. It stretches from Point Reyes National Seashore to Point Conception. The Central Coast Region is tempered by the ocean climate and coastal fog, so the temperatures are generally cooler and less variable than inland regions of the state. Fog droplets transported from the marine environment add water to coastal systems and provide up to a third of the water received by coastal ecosystems. The landscape pattern of coastal fog and low clouds is remarkably stable. Low elevation sites and valleys in the Central Coast Region that are open to northwest summer winds, such as Salinas Valley and Monterey Peninsula, average 15 hours/day of summertime fog and low cloud cover. Areas protected from the wind, such as Santa

Cruz, get the least fog. Low cloud cover reflects solar radiation, which is an important cooling process and reduces plant evapotranspiration and water demand. Annual average precipitation varies depending on location but generally decreases from 37 inches in the north to 16 inches in the south.

Over the past century, the mean temperature has increased by 1.5-2°F. Due to climate change, by the end of this century, annual average minimum temperatures are projected to rise by 7-8°F across the Central Coast Region. Average precipitation is expected to increase by a relatively small amount but on a daily time scale, the wettest day of the year is expected to increase up to 35% for some locations relative to historical standards by the late-century. The Central Coast Region is projected to be subject to increasingly variable and extreme precipitation and dry weather periods, driven by El Nino conditions and atmospheric rivers. The future of coastal fog in the Central Coast Region is uncertain due to the complexities of its formation and feedbacks between ocean, air and land systems. However, historical trends have shown a decrease in over land fog due to land surface change. The Central Coast Region has historically experienced 0.33 – 0.55 inches/year of sea level rise, depending on location and vertical land motion. Coupled with the accelerating rate of sea level rise over the coming decades, coastal erosion and cliff retreat rates can also be expected to increase significantly.

8. Mojave Desert

The Mojave Desert Climate Region (Mojave Desert Region) encompasses segments of the Lahontan, Central Valley, and Colorado River Basin Regional Water Quality Control Boards. It is characterized by large seasonal and diurnal fluctuations in temperatures, experiencing over 130°F during the summer in the lowest parts of the Death Valley, and below 0°F at the highest elevations during winter months. The Mojave Desert Region is a cool high desert compared to the Sonoran Desert Region directly to the south. Rainfall is highly variable from year to year, but average rainfall rates are approximately 5 inches a year. Precipitation in the Mojave Desert Region occurs during two seasons. In the winter, large scale global circulations occasionally bring extratropical cyclones from the northern and eastern Pacific region. These storms are responsible for most of the annual rainfall with February typically being the wettest month. Winter precipitation increases with elevation and decreases going north to south, and west to east. In the summer, global circulations reverse, allowing the North American Monsoon to periodically drift westward into this portion of the state. The monsoonal rains account for about 15% of precipitation in the Mojave Desert Region. The Mojave Desert Region contains several large groundwater basins; however, the Colorado River is the main source of freshwater since it receives such little annual precipitation.

The observed temperature change over the past century has been an increase of 1.5-2.5°F. By the end of the next century, higher elevations are projected to experience only 2 days a year with temperatures below freezing. Victorville, for example, experienced an average of 44 days a year below freezing from 1981-2000. In contrast, daily maximum temperatures are projected to increase by 8-14°F on top of the already extreme heat the Mojave Desert Region experiences .Extremely hot days, defined as temperatures >95°F, are projected to increase in frequency from the historical average of 90 per year up to 141 by the end of the century. Higher temperatures as a result of climate change enable the atmosphere to carry more water, increasing evaporative demand on already scarce water supplies and a decrease in soil moisture. Dry soils are poor absorbers of precipitation and cause increased runoff. Climate change is also anticipated to increase the variability of precipitation patterns in the Mojave Desert Region, with reductions in minimum annual precipitation up to 50% and increases of maximum annual precipitation of 40-65% by the end of the 21st century. Sudden unprecedented precipitation in combination with drier soils have the potential to overwhelm infrastructure and cause more frequent flash flooding events. Extreme drought weather events increase the risk of wildfire given the close relationship between precipitation variability and growth of invasive grasses, which act as the major fuel for wildfire in the Mojave Desert Region.

9. Sonoran Desert

The Sonoran Desert Climate Region (Sonoran Desert Region) is entirely within the boundary of the Colorado River Regional Water Quality Control Board Summer air temperatures routinely exceed 104°F, and often reach 118°F. The Sonoran Desert Region is a hot low desert compared to the Mojave Desert Region to the north. The Region is characterized by its' extreme temperatures and moderate rainfall, averaging 3-20 inches depending on elevation. Precipitation in the Sonoran Desert Region occurs during two seasons. In the winter, large scale global circulations occasionally bring extratropical cyclones from the northern and eastern Pacific region. These storms are responsible for most of the annual rainfall with February typically being the wettest month. Winter precipitation increases with elevation and decreases going north to south, and west to east. In the summer, global circulations reverse, allowing the North American Monsoon to periodically drift westward into this portion of the state. The monsoonal rains account for about 30% of precipitation in the Sonoran Desert Region.

Over the past century, mean temperature has increased by 1-2°F and minimum temperature has increased nearly 3°F. Daily maximum temperatures are projected to increase by 8-14°F and extremely hot days, defined as temperatures >95°F, are projected to increase in frequency from the historical average of 135 per year up to 179 by the end of the century.

Current models reveal an increase in inter-annual precipitation variability, with reductions in minimum annual precipitation of up to 50% and increases in maximum annual precipitation of 40-65% by the end of the century. Sudden influxes of unprecedented precipitation in combination with drier soils have the potential to overwhelm infrastructure and cause more frequent flash flooding events. Extreme drought weather events would increase the risk of wildfire given the close relationship between precipitation variability and growth of invasive grasses, which act as the major fuel for wildfire in the region.

10. South Interior

The South Interior Climate Region (South Interior Region) encompasses the inland portions of the Central Coast, Los Angeles, Santa Ana and San Diego Regional Water Quality Control Boards and the south western edge of the Lahontan and Colorado River Basin Regional Water Quality Control Boards. It is located directly inland of the South Coast, spanning from the Los Padres National Forest to the Cleveland National Forest at the Mexico-United States border. Due to its inland position, the South Interior Region experiences greater temperature ranges and seasonal precipitation amounts compared to the adjacent South Coast Region. During summer, daily maximum temperatures in the South Interior Region average 10-20°F warmer than the South Coast Region. In some parts, average summer maximum temperatures exceed 100 °F. At night, the dry conditions in the desert promote nighttime cooling. In winter, average coastal and desert temperatures are more similar than in summer. However, there are notable differences in the amount of day-to-day variability. The coldest winter temperatures are observed in the highest elevations, where average nighttime winter temperatures are below freezing. Most of the heaviest precipitation events occur during winter, although the region experiences scattered, localized high rainfall events from tropical storms or convective rainfall patterns during late summer and early fall. Annual total precipitation ranges between a low of 5 inches to a high of over 35 inches, depending on elevation. Similar to other California regions, the high year-to-year variability of precipitation in the South Interior Region is heavily affected by extreme precipitation events, which accounts for 80% of the year-to-year variability.

The observed temperature change over the past century for the South Interior Region has been an increase of 1-2°F. By the end of the century, climate change is expected to raise yearly average temperatures by about 7-10°F. The average hottest day is projected to increase to 110-125°F, which is 5-10°F hotter than the historical average. Although the region is projected to experience more intense precipitation events, droughts are also projected to become more frequent and intense. The increase in drought is a result of fewer wet days as the subtropical zone expands leading to more dry years. An increase in the duration, frequency, and severity droughts in the future is expected. Higher temperatures will exacerbate future droughts leading to larger water deficits across the landscape. The projected changes in the precipitation regime, with increasing drought and drier autumns, will increase wildfire risk during the dangerous fire weather conditions that Santa Ana winds create especially during the peak season in December and January.

11. South Coast

The South Coast Climate Region (South Coast Region) encompasses the coastal portions of the Central Coast, Los Angeles, Santa Ana and San Diego Regional Water Quality Control Boards. The strip of coastline stretches from Santa Barbara county down to the Mexico-United States border. Precipitation and temperature depend on several factors, such as distance from the coast, elevation, and local topographic features. Most of the South Coast Region’s surface water comes from Sierra Nevada and Colorado Rockies runoff in conjunction with reservoir outflow. Average temperatures in the South Coast Region range from 59-89°F in summer to 32-58°F during winter.

The observed temperature change over the past century for the South Coast Region has been an increase of 2-3°F, which is the largest increase of any region. However, the South Coast Region is projected to experience relatively lower amounts of warming compared to inland regions as the ocean provides a buffering effect. By the end of the century, average maximum temperatures are projected to increase 5-8°F. The number of extremely hot days is also projected to increase, with the hottest day of the year up to 10°F warmer compared to historical trends. Fifty percent of the region’s annual precipitation comes from a handful of storms, delivering less than 12 inches of rain a year. Average precipitation is highly variable year to year; however, climate change is predicted to result in increased periods of extreme drought and more extreme rainfall events. The frequency and intensity of wildfires is predicted to increase as the South Coast’s climate becomes more variable with extended periods of droughts and increasing temperatures. By the middle of the twentieth century, sea level is projected to rise approximately 1-2 feet along the southern coast of California. Coupled with intensified storms, future sea level rise is predicted to cause coastal flooding and coastal erosion

C. Assessing Overall Impact Risk Level

Applicants and staff should generate a score using the factors described in Table 1 and the climate regions (and others, if highlighted in region-specific climate change and adaptation guidance and/or local considerations), The score generated from this information will inform the overall risk of climate change impacts on a proposed compensatory mitigation project.

1. High-scoring projects will likely always require a climate change assessment, and low-scoring projects may need one depending on landscape context and the beneficial uses/ecological functions/etc. in question if a climate change assessment has not already been submitted.

Note: Steps 1 and 2 of the **Optional Climate Change Impact Assessment Worksheet** could also be used as an initial screening tool for applicants or Water Board staff to determine if a climate change assessment should be required for a mitigation project.

2. If a climate change assessment has been submitted with an application, whether it adequately addresses climate change impacts by proposing appropriate location, design, and/or management strategies to avoid and/or minimize the long-term impacts of climate change on the mitigation project. Additional information about impact avoidance and minimization factors is provided in section III.

   If inadequate information about either the project or its landscape context has been provided by the applicant such that staff cannot confidently assess the factors listed above, staff should request supplemental information from the applicant.

Generally, if the score is low (recommended score of less than twenty (20)), additional avoidance and minimization measures for the project may not be needed. If the score is high (recommended score of more than twenty (20)), applicants should identify how avoidance and minimization measures related to the climate change risk factors are incorporated in the compensatory mitigation plan. Suggestions on how to incorporate such strategies are described in section III. Note that there may be other factors or considerations in addition to the ones described in sections II.A and II.B that may increase or decrease the risk of climate change affecting the compensatory mitigation project. For example, other factors may include local considerations, such as land use, water management, population growth, and unsustainable development. Applicants are encouraged to consult with the appropriate Water Board to discuss if there are any local or regional factors that should be included in the risk assessment.

II. Using a Climate Change Assessment to Inform Compensatory Mitigation Project Planning

Once the reasonably foreseeable impacts from climate change have been identified for a compensatory mitigation project, and it has been determined that a climate change assessment is necessary, the next step is to identify how avoidance and minimization measures may be incorporated to mitigate for those impacts. For example, the compensatory mitigation project may be modified with regard to the location, design (including shape and size), and/or management (short or long term) to lessen the risk of failure, or the long-term success standards could be modified to incorporate expected climate impacts. Essentially, by ensuring that a project is planned in a way that promotes achievement of performance standards, a project is more likely to succeed and be resilient to impacts from climate change in the future. In addition, planning projects with climate change in mind may be advantageous to applicants as this may alleviate the need for, and cost associated with, some adaptive management measures. Management strategies listed below are not meant to be prescriptive in the sense that one management strategy could apply to multiple aquatic resource types.

A. Management Strategies for Coastal Wetlands

The following is a list of general strategies that may be incorporated into a compensatory mitigation plan to mitigate for reasonably foreseeable impacts from climate change to coastal wetlands. Applicants should prioritize strategies that alleviate the highest risk factors for their project. For example, if the proposed compensatory mitigation project is at risk due to a high degree of ecological isolation, applicants can minimize that impact by removing barriers to reconnect wetlands. This strategy will facilitate species movement, natural sediment transport, and hydrological flows between wetland fragments and from river channels into wetlands. See section V.A for a list of resources and references that may assist in informing measures to offset impacts from climate change to coastal wetlands.

- Remove barriers that prevent wetlands from expanding or migrating.
- Protect, manage, and acquire adjacent land, including within the wetland-upland transition zone.
- Grade areas adjacent to wetlands to increase opportunity for migration.
- Relocate or modify adjacent infrastructure or development.
- Remove barriers to reconnect channels to wetlands.
- Allow tidal inlets to open and close naturally.
- Modify or remove structures to restore inundation regime.
- Remove barriers to release sediment held higher in the watershed.
- Manage flows in river channels to increase their capacity to move sediment from the watershed.
- Augment sediment processes to raise and maintain marsh elevation.

B. Management Strategies for Non-Coastal Wetlands

The following is a list of general strategies that may be incorporated into a compensatory mitigation plan to mitigate for reasonably foreseeable impacts from climate change to non-coastal wetlands. Applicants should prioritize strategies that alleviate the highest risk factors for their project. For example, if the proposed compensatory mitigation project is at high risk because the project maximizes its water consumption and evapotranspiration due to projected increase in temperatures, applicants can minimize that impact by incorporating shaded buffers into the project design increased shade may moderate water temperatures, reducing water consumption and evapotranspiration. See section V.B for a list of resources and references that may assist in informing measures to offset impacts from climate change to non-coastal wetlands.

- Include buffers in project design to reduce potential for erosion and pollution, to keep water temperature low, and to allow migration of plant and animals. For example, including buffer areas will reduce the potential for erosion by slowing the flow of surface waters to the aquatic resource during precipitation events.
- Support local biodiversity and ecosystems, provide vegetation corridors for enabling species range shift and improve habitat connectivity.
- Enlarge existing wetlands and create new ones, increasing the habitat connectivity by adding new habitat patches. For species that are sensitive to landscape barriers, increase the permeability by increasing the density of natural and semi-natural elements in anthropogenic landscapes (e.g., agricultural landscapes).
- Promote habitat diversity by maintaining macro- and microtopographic features, such as swales, oxbows, or potholes.
- Reintroduce rare and threatened species (such as seeding or planting mature native species) to restore self-sustaining and genetically diverse populations, with multiple patches in multiple locations.
- Prevent, and where possible, reverse local wetland drainage schemes, especially where wetlands have been historically drained or local catchment runoff has been artificially diverted around and away from natural wetlands.
- Manage other degrading factors such as stock access, grazing and cropping activities, invasive species etc.

C. Management Strategies for Streams

The overall management strategy for streams and watersheds is: 1) to protect and restore streams to render them resilient now; and 2) to make near-term resilience an explicit planning objective. Streams and ecosystems that are resilient now or in the near-term will more likely to be resilient in the future under increasing climate change threats. Such systems will have higher capacity to absorb disturbance and to reorganize in ways that retain the same functions, structures, and feedbacks, and will therefore have a higher chance to evolve into self-sustaining systems.

Applicants should prioritize strategies that restore and increase diversity and connectivity in streams and watersheds. Hydrologic and ecologic connectivity enhances capacity for self-organization and recovery at multiple scales both through space and time. Diversity and spatial/temporal variability of habitats confer resilience by maintaining functions and species diversity. Applicants should also prioritize strategies that alleviate the highest risk factors for their project. For example, if the proposed compensatory mitigation project is at risk due to a low degree of hydrologic connectivity, applicants can minimize that impact by incorporating riparian buffers, floodplain restoration, or groundwater recharge sites. See section V.B for a list of resources and references that may assist in informing measures to offset impacts from climate change to streams.

The following is a list of general strategies that may be incorporated into a compensatory mitigation plan to mitigate for reasonably foreseeable impacts from climate change to streams.

- Match the scale of mitigation and restoration to the scale of physical and biological functions at the site or watershed.
- Avoid and reverse encroachment on floodplains and riparian areas in streams. One of the most effective strategies is to include buffer zones along streams to provide space for functions to take place and to allow for a dynamic, ecologically healthy stream.
- Expand protected and natural areas. Avoid or minimize encroachment on wildlands.
- Avoid or minimize impacts to native vegetation.
- Explicitly consider management of sediment regime and not just the flow regime. Mitigation plan designs should consider changes in sediment production, transport, and delivery, in addition to changes in runoff and temperature.
- Increase shade via riparian restoration to mitigate against increases in water temperatures in areas where temperature increases are expected to be significant.
- In urban areas, recognize green infrastructure and Low Impact Development principles as the core management strategy to reduce stormwater runoff, provide additional green space, reduce impervious cover, and recharge water in the local groundwater system.

III. List of Resources and References

A. Regional Climate Change Adaptation Plans, Watershed Plans, or Other Regional Planning Documents

DWR and WRCC maintain the *California Climate Tracker*[11], which allows for the easy tabular or graphical presentation of historic and current climate data (currently temperature and precipitation) for all of California's climate regions.

DWR uses information from the California Climate Tracker to develop its *State Hydroclimate Reports*, released annually by the Office of the State Climatologist.[12]

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[11] https://wrcc.dri.edu/Climate/Tracker/CA/

[12] https://water.ca.gov/Programs/Flood-Management/Flood-Data/Climatology-and-Meteorology

These reports describe observed climate status and trends for each water year (WY), and support advance planning work on adapting to and mitigating for climate change impacts.

California's Fourth Climate Assessment developed a series of reports[13] that summarize relevant climate impacts for the state's different regions (political, not climate regions), including potential changes in temperature and precipitation.

Stakeholders in the San Francisco Bay Region (including the SF Bay Water Board) collaboratively developed an update to the *Baylands Goals Project* that focuses on how sea level rise driven by climate change will impact the Bay's tidal wetlands, and proposes a suite of strategies to improve the long-term, landscape-scale resilience of these systems.

The San Francisco Estuary Institute and the San Francisco Bay Area Planning and Urban Research Association's *"San Francisco Bay Shoreline Adaptation Atlas: Working with Nature to Plan for Sea Level Rise Using Operational Landscape Units."*[14]

The Southern California Wetlands Recovery Project (WRP) collaboratively developed "*Wetlands on the Edge: The Future of Southern California Wetlands, Regional Strategy 2018"*[15] which outlines key restoration priorities and approaches for coastal regions located in Southern California which include Santa Barbara, Ventura, Santa Monica, San Pedro, and San Diego.

B. Management Strategies for Coastal Wetlands

The Southern California Wetlands Recovery Project (WRP) collaboratively developed "*Wetlands on the Edge: The Future of Southern California Wetlands, Regional Strategy 2018"*[16] which outlines key restoration priorities and approaches for coastal regions located in Southern California which include Santa Barbara, Ventura, Santa Monica, San Pedro, and San Diego.

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[13] http://climateassessment.ca.gov/regions/

[14] https://www.sfei.org/documents/adaptationatlas

[15] https://scwrp.org/wp-content/uploads/2018/10/WRP-Regional-Strategy-2018-100518_lowRes.pdf

[16] https://scwrp.org/wp-content/uploads/2018/10/WRP-Regional-Strategy-2018-100518_lowRes.pdf

The Association of State Wetland Managers (ASWMs) in the "*Recommendations for a National Wetlands and Climate Change Initiative*"[17] provide specific adaptation measures for coastal/estuarine and freshwater wetlands.

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C. Management Strategies for Non-Coastal wetlands

The Association of State Wetland Managers (ASWMs) in the "*Recommendations for a National Wetlands and Climate Change Initiative*"[18] provide specific adaptation measures for coastal/estuarine and freshwater wetlands.

The Department of Sustainability and Environment, Victorian Government, provide the "Indicative Assessment of Climate Change Vulnerability for Wetlands in Victoria"[19] which includes a number of management options for wetlands that may be applicable to aquatic resources in California.

New York State's Department of Environmental Conservation developed Technical Guidance for Creating Wetlands as Part of Unconsolidated Surface Mining

[17] https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/united-states/national/us---other-national-reports/ASWM.-2009.-US-National-Wetlands--CC-Initiative.pdf

[18] https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/united-states/national/us---other-national-reports/ASWM.-2009.-US-National-Wetlands--CC-Initiative.pdf

[19] https://www.water.vic.gov.au/__data/assets/pdf_file/0024/66336/Wetland-vulnerability-to-climate-change-Victoria.pdf

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[20] http://www.dec.ny.gov/docs/materials_minerals_pdf/wetland.pdf

D. Management Strategies for Streams

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Optional Climate Change Impact Assessment Worksheet

The purpose of this worksheet is to provide an optional resource to applicants that are required to assess reasonably foreseeable impacts from climate change to a compensatory mitigation project. This worksheet is intended to serve as an organizational tool and general stepwise method for applicants to use when assessing the ability of the aquatic resource to maintain the beneficial uses the aquatic resource is intended to provide, the key functions of the aquatic resources that support those beneficial uses, the physical drivers that support those key functions, and how those drivers are likely to be impacted by climate change. Use of this worksheet is not required for this purpose, nor is it intended to comprehensively evaluate all possible risk factors or impacts from climate change on a mitigation project. In addition, other types of assessments related to climate change impacts may be more appropriate, depending on the aquatic resource type and scale of project. Applicants should work with staff at the Water Boards to determine if a different type of climate change assessment method is more appropriate for the proposed mitigation project.

Note: Steps 1 and 2 of this worksheet could also be used as an initial screening tool for applicants or Water Board staff to assess if a climate change assessment may be required for a mitigation project.

Step 1. Identify Reasonably Foreseeable Impacts

Fill out the table below to assess the overall risk of reasonably foreseeable climate change impacts to your mitigation project. For the Description of Risk or Impact Level column, refer to Table 1 in Section II.A to fill in the appropriate risk description and score. The Risk Score for levels of impacts for Precipitation, Sea Level, and Temperature are generally identified by each climate region in Section II.B. For example, a compensatory mitigation project located in the tidal zone in the North Coast climate region would likely have a high-risk score (3) for sea level impacts. Note that the climate region descriptions of precipitation, sea level rise, and temperature changes are **general**. Applicants should, wherever available, use local and site-specific planning documents, resources, and best available science in determining what level of risk their mitigation project may be at from climate change impacts.

Factor	Description of Risk or Impact Level	Score
1. Aquatic resource type	*[Example: Lacustrine, large riverine wetlands]*	*[1]*
2. Size		
3. Position in watershed		
4. Soil type/permeability		
5. Land use intensity or encroachment		
6. Degree of hydrological connectivity		
7. Degree of habitat fragmentation		
8. Mitigating project design		
9. Existing mitigating aquatic resource conservation plan		
10. Precipitation Impact	See climate regions in section II.B above.	

11. Sea Level Impact	See climate regions in section II.B above.	
12. Temperature Impact	See climate regions in section II.B above.	
13. Regional Factors	If applicable; consult with your Regional Board.	

What is the risk your mitigation project may be impacted by climate change?

Total Score:

Step 2. Assess Overall Impact Risk Level

Evaluate your overall risk of climate change impacts based on your Total Score:

a. If your Total Score equals less than 20, then your project is generally considered to be at a low risk.
b. If your Total Score equals more than 20, then your project is generally considered to be at a high risk. Go on to Step 3.

Note: there may be other factors or considerations in addition to the ones listed above that may increase or decrease the risk of climate change affecting your project. Consultation with the appropriate Regional Board is encouraged to discuss if there are any local or regional factors that should be included in the risk assessment.

Step 3. Identify Avoidance and Minimization Measures

If your overall score equals more than 20 in Step 2, identify measures to avoid and/or minimize those impacts or factors that individually scored as high or medium risk for your mitigation project. For guidance on what types of measures can be taken, refer to sections III and V.

A. Identify project design measures that will avoid and/or minimize impacts from climate change:

B. Identify monitoring and/or performance measures that will avoid and/or minimize impacts from climate change:

C. Identify management measures that will avoid and/or minimize impacts from climate change:
