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County Government Center,
1055 Monterey Street, Room 206
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Submitted online via: https://www.slocounty.ca.gov/Departments/Public-Works/Committees-Programs/Sustainable-Groundwater-Management-Act-(SGMA)/Paso-Robles-Groundwater-Basin/GSP-Development.aspx

Re: Chapters 4-8 and Appendix B of the Paso Robles Subbasin Draft GSP

Dear Angela Ruberto,

The Nature Conservancy (TNC) appreciates the opportunity to comment on Chapters 4-8 and Appendix B of the Paso Robles Subbasin Draft Groundwater Sustainability Plans (GSP) being prepared under the Sustainable Groundwater Management Act (SGMA).

TNC as a Stakeholder Representative for the Environment

TNC is a global, nonprofit organization dedicated to conserving the lands and waters on which all life depends. We seek to achieve our mission through science-based planning and implementation of conservation strategies. For decades, we have dedicated resources to establishing diverse partnerships and developing foundational science products for achieving positive outcomes for people and nature in California. TNC was part of a stakeholder group formed by the Water Foundation in early 2014 to develop recommendations for groundwater reform and actively worked to shape and pass SGMA.

Our reason for engaging is simple: California's freshwater biodiversity is highly imperiled. We have lost more than 90 percent of our native wetland and river habitats, leading to precipitous declines in native plants and the populations of animals that call these places home. These natural resources are intricately connected to California's economy providing direct benefits through industries such as fisheries, timber and hunting, as well as indirect benefits such as clean water supplies. SGMA must be successful for us to achieve a sustainable future, in which people and nature can thrive within the Paso Robles subbasin and California.

We believe that the success of SGMA depends on bringing the best available science to the table, engaging all stakeholders in robust dialog, providing strong incentives for beneficial outcomes and rigorous enforcement by the State of California.

Given our mission, we are particularly concerned about the inclusion of nature, as required, in GSPs. The Nature Conservancy has developed a suite of tools based on best available science to help GSAs, consultants, and stakeholders efficiently incorporate nature into GSPs.

These tools and resources are available online at GroundwaterResourceHub.org. The Nature Conservancy's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Addressing Nature's Water Needs in GSPs

SGMA requires that all beneficial uses and users, including environmental users of groundwater, be considered in the development and implementation of GSPs (Water Code § 10723.2).

The GSP Regulations include specific requirements to identify and consider groundwater dependent ecosystems (23 CCR §354.16(g)) when determining whether groundwater conditions are having potential effects on beneficial uses and users. GSAs must also assess whether sustainable management criteria may cause adverse impacts to beneficial uses, which include environmental uses, such as plants and animals. In addition, monitoring networks should be designed to detect potential adverse impacts to beneficial uses due to groundwater. Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decision, and using data collected through monitoring to revise decisions in the future. Over time, GSPs should improve as data gaps are reduced and uncertainties addressed.

To help ensure that GSPs adequately address nature as required under SGMA, The Nature Conservancy has prepared a checklist (**Attachment A**) for GSAs and their consultants to use. The Nature Conservancy believes the following elements are foundational for 2020 GSP submittals. For detailed guidance on how to address the checklist items, please also see our publication, *GDEs under SGMA: Guidance for Preparing GSPs* (https://groundwaterresourcehub.org/public/uploads/pdfs/GWR_Hub_GDE_Guidance_Doc_2-1-18.pdf).

1. Environmental Representation
SGMA requires that groundwater sustainability agencies (GSAs) consider the interests of all beneficial uses and users of groundwater. To meet this requirement, we recommend actively engaging environmental stakeholders by including environmental representation on the GSA board, technical advisory group, and/or working groups. This could include local staff from state and federal resource agencies, nonprofit organizations and other environmental interests. By engaging these stakeholders, GSAs will benefit from access to additional data and resources, as well as a more robust and inclusive GSP.

2. Basin GDE and ISW Maps
SGMA requires that groundwater dependent ecosystems (GDEs) and interconnected surface waters (ISWs) be identified in the GSP. We recommend using the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) provided online (https://gis.water.ca.gov/app/NCDatasetViewer/) by the Department of Water Resources (DWR) as a starting point for the GDE map. The NC Dataset was developed through a collaboration between DWR, the Department of Fish and Wildlife and TNC.

3. Potential Effects on Environmental Beneficial Users
SGMA requires that potential effects on GDEs and environmental surface water users be described when defining undesirable results. In addition to identifying GDEs in the basin, The Nature Conservancy recommends identifying beneficial users of surface water, which include environmental users. This is a critical step, as it is impossible to define "significant and unreasonable adverse impacts" without knowing *what* is being impacted. For your convenience, we've provided a list of freshwater species within the boundary of the Paso Robles basin in **Attachment C**. Our hope is that this information will help your GSA better

evaluate the impacts of groundwater management on environmental beneficial users of surface water. We recommend that after identifying which freshwater species exist in your basin, especially federal and state listed species, that you contact staff at the Department of Fish and Wildlife (DFW), United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS) to obtain their input on the groundwater and surface water needs of the organisms on the freshwater species list. Because effects to plants and animals are difficult and sometimes impossible to reverse, we recommend erring on the side of caution to preserve sufficient groundwater conditions to sustain GDEs and ISWs.

4. Biological and Hydrological Monitoring

If sufficient hydrological and biological data in and around GDEs is not available in time for the 2020/2022 plan, data gaps should be identified along with actions to reconcile the gaps in the monitoring network.

Our comments related to Chapters 4-8 of the Paso Robles Subbasin Draft GSP are provided in detail in **Attachment B,** and where applicable are in reference to the numbered items in **Attachment A. Attachment D** describes six best practices that GSAs and their consultants can apply when using local groundwater data to confirm a connection to groundwater for DWR's Natural Communities Commonly Associated with Groundwater Dataset (https://gis.water.ca.gov/app/NCDatasetViewer/).

Thank you for fully considering our comments as you develop your GSP.

Best Regards,

Sandi Matsumoto
Associate Director, California Water Program
The Nature Conservancy

Attachment A
Considering Nature under SGMA: A Checklist

The Nature Conservancy is neither dispensing legal advice nor warranting any outcome that could result from the use of this checklist. Following this checklist does not guarantee approval of a GSP or compliance with SGMA, both of which will be determined by DWR and the State Water Resources Control Board. The checklist is available online: https://groundwaterresourcehub.org/public/uploads/pdfs/TNC_GDE_Checklist_for_SGMA_Sept2018.pdf

GSP Plan Element*		GDE Inclusion in GSPs: Identification and Consideration Elements		Item Number
Admin Info	2.1.5 Notice & Communication *23 CCR §354.10*	Description of the types of environmental beneficial uses of groundwater that exist within GDEs and a description of how environmental stakeholders were engaged throughout the development of the GSP.		1.
Basin Setting	2.2.2 Current & Historical Groundwater Conditions *23 CCR §354.16*	Interconnected surface waters:		2.
		Interconnected surface water maps for the basin with gaining and losing reaches defined (included as a figure in GSP & submitted as a shapefile on SGMA portal).		3.
		Estimates of current and historical surface water depletions for interconnected surface waters quantified and described by reach, season, and water year type.		4.
		Basin GDE map included (as figure in text & submitted as a shapefile on SGMA Portal).		5.
		If NC Dataset *was* used:	Basin GDE map denotes which polygons were kept, removed, and added from NC Dataset (Worksheet 1, can be attached in GSP section 6.0).	6.
			The basin's GDE shapefile, which is submitted via the SGMA Portal, includes two new fields in its attribute table denoting: 1) which polygons were kept/removed/added, and 2) the change reason (e.g., why polygons were removed).	7.
			GDEs polygons are consolidated into larger units and named for easier identification throughout GSP.	8.
		If NC Dataset *was not* used:	Description of why NC dataset was not used, and how an alternative dataset and/or mapping approach used is best available information.	9.
		Description of GDEs included:		10.
		Historical and current groundwater conditions described in each GDE unit.		11.
		Ecological condition described in each GDE unit.		12.
		Each GDE unit has been characterized as having high, moderate, or low ecological value.		13.
		Inventory of species, habitats, and protected lands for each GDE unit with ecological importance (Worksheet 2, can be attached in GSP section 6.0).		14.

	2.2.3 Water Budget *23 CCR §354.18*	Groundwater inputs and outputs (e.g., evapotranspiration) of native vegetation and managed wetlands are included in the basin's historical and current water budget.		15.
		Potential impacts to groundwater conditions due to land use changes, climate change, and population growth to GDEs and aquatic ecosystems are considered in the projected water budget.		16.
Sustainable Management Criteria	3.1 Sustainability Goal *23 CCR §354.24*	Environmental stakeholders/representatives were consulted.		17.
		Sustainability goal mentions GDEs or species and habitats that are of particular concern or interest.		18.
		Sustainability goal mentions whether the intention is to address pre-SGMA impacts, maintain or improve conditions within GDEs or species and habitats that are of particular concern or interest.		19.
	3.2 Measurable Objectives *23 CCR §354.30*	Description of how GDEs were considered and whether the measurable objectives and interim milestones will help achieve the sustainability goal as it pertains to the environment.		20.
	3.3 Minimum Thresholds *23 CCR §354.28*	Description of how GDEs and environmental uses of surface water were considered when setting minimum thresholds for relevant sustainability indicators:		21.
		Will adverse impacts to GDEs and/or aquatic ecosystems dependent on interconnected surface waters (beneficial user of surface water) be avoided with the selected minimum thresholds?		22.
		Are there any differences between the selected minimum threshold and state, federal, or local standards relevant to the species or habitats residing in GDEs or aquatic ecosystems dependent on interconnected surface waters?		23.
	3.4 Undesirable Results *23 CCR §354.26*	For GDEs, hydrological data are compiled and synthesized for each GDE unit:		24.
		If hydrological data *are available* within/nearby the GDE	Hydrological datasets are plotted and provided for each GDE unit (Worksheet 3, can be attached in GSP Section 6.0).	25.
			Baseline period in the hydrologic data is defined.	26.
			GDE unit is classified as having high, moderate, or low susceptibility to changes in groundwater.	27.
			Cause-and-effect relationships between groundwater changes and GDEs are explored.	28.
		If hydrological data *are not available* within/nearby the GDE	Data gaps/insufficiencies are described.	29.
			Plans to reconcile data gaps in the monitoring network are stated.	30.
		For GDEs, biological data are compiled and synthesized for each GDE unit:		31.
		Biological datasets are plotted and provided for each GDE unit.		32.
		Data gaps/insufficiencies are described.		33.
		Plans to reconcile data gaps in the monitoring network are stated.		34.
		Description of potential effects on GDEs, land uses and property interests:		35.

		Cause-and-effect relationships between GDE and groundwater conditions are described.	36.
		Impacts to GDEs that are considered to be "significant and unreasonable" are described.	37.
		Known hydrological thresholds or triggers (e.g., instream flow criteria, groundwater depths, water quality parameters) for relevant species or ecological communities are reported.	38.
		Land uses include and consider recreational uses (e.g., fishing/hunting, hiking, boating).	39.
		Property interests include and consider privately and publicly protected conservation lands and opens spaces, including wildlife refuges, parks, and natural preserves.	40.
Sustainable Management Criteria	3.5 Monitoring Network *23 CCR §354.34*	Description of whether hydrological data are spatially and temporally sufficient to monitor groundwater conditions for each GDE unit.	41.
		Description of how hydrological data gaps and insufficiencies will be reconciled in the monitoring network.	42.
		Description of how impacts to GDEs and environmental surface water users, as detected by biological responses, will be monitored and which monitoring methods will be used in conjunction with hydrologic data to evaluate cause-and-effect relationships with groundwater conditions.	43.
Projects & Mgmt Actions	4.0. Projects & Mgmt Actions to Achieve Sustainability Goal *23 CCR §354.44*	Description of how GDEs will benefit from relevant project or management actions.	44.
		Description of how projects and management actions will be evaluated to assess whether adverse impacts to the GDE will be mitigated or prevented.	45.

* In reference to DWR's GSP annotated outline guidance document, available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/GD_GSP_Outline_Final_2016-12-23.pdf

Attachment B

TNC Evaluation of Chapters 4 - 8 and Appendix B of the Paso Robles Subbasin GSP Draft

4.1 Subbasin Topography and Boundaries (p.3)

- [Paragraph 2] Please provide additional information on what data was used to determine that "poor quality" groundwater in the Paso Robles Formation would exclude groundwater from being part the subbasin.
- Defining the bottom of subbasin based on geochemical properties is a suitable approach for defining the base of freshwater, however, as noted on page 9 of DWR's Hydrogeologic Conceptual Model BMP (https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_HCM_Final_2016-12-23.pdf) "the definable bottom of the basin should be at least as deep as the deepest groundwater extractions". **Thus, groundwater extraction well depth data should also be included in the determination of the basin bottom.** This will prevent the possibility of extractors with wells deeper than the basin boundary (defined by the base of freshwater) from claiming exemption of SGMA due to their well residing outside the vertical extent of the basin boundary.

4.7.2 Groundwater Discharge Areas Inside the Subbasin (p.31)

- [Paragraph 2] We support the use of the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) to map groundwater dependent ecosystems in the Paso Robles Groundwater Basin (GSP Draft Figure 4-18). Since the NC Dataset is intended as a starting point, The Nature Conservancy has developed a Guidance Document to assist GSAs and their consultants address GDEs in GSPs. Also refer to **Attachment D** for best practices when using the NC dataset.

- The identification of GDEs within GSPs is a required GSP element of the Basin Setting Section under the description of Current & Historical Groundwater Conditions (23 CCR §354.16). Recognizing natural points of discharge (seeps & springs) as GDEs is consistent with the SGMA definition of GDEs[1], however, we recommend **the identification of GDEs (GDE map Figure 4-18) for the Paso Robles basin be moved to Chapter 5: Groundwater Conditions and elaborated upon with a description of current and historical groundwater conditions in the GDE areas**. Chapter 5 is a more appropriate place for the identification of GDEs, since groundwater conditions (e.g., depth to groundwater, interconnected surface water maps, groundwater quality) are necessary local information and data from the GSP in assessing whether polygons in the NC dataset are connected to groundwater in a principal aquifer.
- Decisions to remove, keep, or add polygons from the NC dataset into a basin GDE map should be based on best available science in a manner that promotes transparency and accountability with stakeholders. Any polygons that are removed,

[1] *Groundwater dependent ecosystem refer to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. [23 CCR §351 (m)]*

added, or kept should be inventoried in the submitted shapefile to DWR, and mapped in the plan. **We recommend revising Figure 4-18 to reflect this recommended methodology.**

5.2.1 Change in Groundwater Storage in the Alluvial Aquifer (p. 5-23)

- While it's true that there was no net change in groundwater storage in the Alluvial Aquifer between 1981 and 2011, groundwater storage losses certainly occurred during dry years and recovered in wet years. Potential impacts on groundwater storage loss due to groundwater is still very possible, especially since groundwater pumping data has been estimated from groundwater flow models populated with insufficient vertical groundwater gradient data, shallow monitoring data, and surface flow data. Groundwater storage in the Paso Robles formation has also be on a decline since 1980 due to groundwater pumping (Figure 5-15). Understanding groundwater storage fluctuations in the Alluvial Aquifer depends on how vertical groundwater gradients are impacted by pumping and groundwater storage changes in the Paso Robles Formation **Please address these data gaps in the monitoring network.**

5.5 Interconnected Surface waters (p. 5-27) - Environmental User Checklist (Attachment A) Items 2-4.

- **Please specify what data were used to determine the elevation of the stream or river bottom.**
- The regulations [23 CCR §351(o)] define interconnected surface waters (ISW) as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted". "At any point" has both a spatial and temporal component. Even short durations of interconnections of groundwater and surface water can be crucial for surface water flow and supporting environmental users of groundwater and surface water. Thus, only considering ISWs as those where *simulated* groundwater elevations were above the stream or river bottom for at least half of the time between 2010 and 2016 does not meet the SGMA definition for the following reasons:
  1) groundwater elevations that are above the stream or river bottom only attempts to map gaining reaches, not losing reaches. ISWs can be either gaining and losing (see Figure 5-16). This is especially problematic in places where losing conditions existed, but the river bottom was used to compare groundwater elevations because stream elevation data was missing; however, in reality, the stream elevation was higher than the river bottom.
  2) looking for interconnections that last more than half of the time does not adequately take into consideration shorter interconnections between groundwater and surface water that occur "at any point" in time. This is especially true since the years between 2010 and 2016 were mostly drought years, which would reduce the number of interconnected surface water areas on Figure 5-17. As seen in section 5.2, significant losses in groundwater storage in both the alluvial and Paso Robles formations occur during drought years, thus potentially causing depletions of surface water (also quantified in Section 5.5.1).
  Due to limited shallow monitoring wells and stream gauges in the basin, **Mapping ISWs would be better estimated by first determining which reaches are**

completely disconnected from groundwater. This approach would involve comparing simulated groundwater elevations with a land surface Digital Elevation Model that could identify which surface waters have groundwater consistently below surface water features, such that an unsaturated zone would separate surface water from groundwater. Groundwater elevations that are always deeper than 50 feet below the land surface can be identified as disconnected surface waters. Please also increase the simulated groundwater elevation time period to include 2017-2019 (which have relatively wetter conditions). Also, please reconcile data gaps (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP to improve ISW mapping in future GSPs.

6. Water Budget (p.25) - Environmental User Checklist (Attachment A) Items 15-16:

- **Please clarify what assumptions and data were used to calculate Riparian Evapotranspiration.**
- Why was evapotranspiration only calculated for riparian vegetation? In Chapter 3.4.2 of the Draft GSP, native vegetation was identified as the largest water use sector in the subbasin by land area. **Please estimate evapotranspiration for all native vegetation in the subbasin for the water budget.**

7.2.1 Groundwater Level Monitoring Network Data Gaps (p.12) - Environmental User Checklist (Attachment A) Items 41-43:

The last row of Table 7-2 states that "Data must be able to characterize conditions and monitor adverse impacts to beneficial uses and users identified within the basin". Aside from GDEs mapped in the basin (Figure 4-18), environmental surface water users have not been identified in the GSP thus far. SGMA requires that potential effects on GDEs and environmental surface water users be described when defining undesirable results. In addition to identifying GDEs in the basin, The Nature Conservancy recommends identifying beneficial users of surface water, which include environmental users. This is a critical step, as it is impossible to define "significant and unreasonable adverse impacts" without knowing *what* is being impacted, nor is possible to monitor ISWs in a way that can "identify adverse impacts on beneficial uses of surface water" [23 CCR §354.34(c)(6)(D)]. For your convenience, we've provided a list of freshwater species within the boundary of the Paso Robles basin in **Attachment C**. Our hope is that this information will help your GSA better evaluate and monitor the impacts of groundwater management on environmental beneficial users of surface water. We recommend that after identifying which freshwater species exist in your basin, especially federal and state listed species, that you contact staff at the Department of Fish and Wildlife (DFW), United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS) to obtain their input on the groundwater and surface water needs of the organisms on the freshwater species list, and how best to monitor them. Because effects to plants and animals are difficult and sometimes impossible to reverse, we recommend erring on the side of caution to preserve sufficient groundwater conditions to sustain GDEs and ISWs. **Please identify appropriate biological indicators that can be used to monitor potential impacts to environmental beneficial users as a current data gap, and make plans to reconcile these in Chapter 10 (Plan Implementation).**

7.6 Interconnected Surface Water Monitoring Network (p.25) - Environmental User Checklist (Attachment A) Items 41-43:

- The first sentence in this section is contradictory to the ISW mapping conducted in Chapter 5 - ISWs do exist in the Paso Robles Subbasin (Figure 5-17).
- Depletions of surface water were also estimated in Section 5.5.1, and the statement that "there is no need for a monitoring network that quantifies surface water depletion from ISW" is false and goes against SGMA requirements. SGMA requires that when monitoring depletions of interconnected surface water that "spatial and temporal exchanges between surface water and groundwater […] are necessary to calculate depletions of surface water caused by groundwater extraction" [23CCR §354.34(c)(6)] and that the monitoring network "shall be designed to ensure adequate coverage of sustainability indicators" [23CCR § 354.34(d)]. Where minimum thresholds for ISWs are to be quantified by "The location, quantity, and timing of depletions of interconnected surface water" [23 CCR §354.28(c)(6)(A)]. **Thus, there is a need for a monitoring network that quantifies surface water depletion from interconnected surface waters.**
- In addition to the need for additional shallow monitoring wells in the Alluvial aquifer to map ISWs, **there is also a need to enhancing monitoring of stream flow and vertical groundwater gradients by installing more stream gauges and clustered/nested wells near streams, rivers or wetlands.** Ideally, co-locating stream gauges with clustered wells that can monitor groundwater levels in both the Alluvial and Paso Robles Formation aquifers would enhance understanding about where ISWs exist in the basin and whether pumping is causing depletions of surface water or impacts on beneficial users of surface water and groundwater.
- **There is a need to integrate biological indicators that can monitor adverse impacts to beneficial uses of surface water and groundwater within ISWs.**

<u>8.3 General Process for Establishing Sustainable Management Criteria - Environmental User Checklist (Attachment A) Items 17-40</u>

- Stakeholder involvement is crucial when establishing sustainable management criteria. The role of the GSA is to represent and balance the needs of *all groundwater* beneficial uses and users in the basin, which has been expressed in the Sustainability goal in Section 8.2. According to p.6, only rural residents, farmers, and local cities were surveyed to gather input on sustainable management criteria. **Please specify what information or efforts have been used/made to protect the interests of environmental users and disadvantaged community members.**
- SGMA requires that sustainable management criteria are consistent with other state, federal or local regulatory standards [23 CCR§354.28(b)(5)]. **Please describe what process was used to identify other regulatory standards that need consideration when establishing minimum thresholds for sustainability criteria.**

<u>8.4 Chronic Lowering of Groundwater Levels Sustainable Management Criteria</u>

- [8.4.1] The definition of 'significant and unreasonable' is a qualitative statement that is used to describe when undesirable results would occur in the basin, such that a minimum threshold can be quantified. Potential effects on all beneficial users of groundwater in the basin need to be taken into consideration. According to the

California Constitution Article X, §2, water resources in California must be "put to beneficial use to the fullest extent of which they are capable". **Please modify the local definition for 'significant and unreasonable' (provided on p. 6), so that it also specifies potential effects on environmental beneficial users of groundwater in the basin, and addresses how water rights amongst beneficial users will be prioritized when establishing thresholds.**

- [8.4.2.1] The use of 2017 groundwater elevations to establish minimum thresholds for the Paso Robles Formation Aquifer is inadequate, since the SGMA benchmark date is January 1, 2015. Also, no scientific rationale was explained for using 2007 groundwater elevation data to establish initial minimum thresholds for the Alluvial Aquifer. SGMA is based on the use of best available science, and selecting minimum thresholds solely on public opinion from a select group of stakeholders (e.g., domestic well users, irrigators, municipalities) in the basin, is not a scientifically-based approach nor does it consider potential effects on environmental beneficial users of groundwater. A better approach is to use 10-year baseline period of groundwater elevation data (2005-2015) to establish how groundwater conditions during that time period affect different water users across the basin**. Please document the consideration of the following when establishing minimum thresholds for chronic lowering of groundwater levels:**
    - Are groundwater elevations between 2005-2015 above the max screen depth for domestic, agriculture, municipal wells?
    - Are the proposed minimum thresholds preserving water rights? [Water Code §10720.5(b)]
    - Are the proposed minimum thresholds consistent with other state, federal or local regulatory standards? [23 CCR§354.28(b)(5)]
    - Are there environmental beneficial groundwater users that need consideration, particularly those that are legally protected under the United States Endangered Species Act or California Endangered Species Act? (See **Attachment C** in the attached letter for a list of freshwater species located in the Paso Robles Subbasin).
    - Is the equity being applied across different beneficial user groups (e.g., domestic, agriculture, municipal, environmental) when establishing minimum thresholds?
- [8.4.2.1] **Please provide a description for how the initial minimum threshold groundwater elevations for the Alluvial Aquifer (Figure 8-3) may impact environmental beneficial users of groundwater (e.g., GDEs) in the basin. When converting groundwater elevations to depth to groundwater contours, please use the USGS digital elevation model (see Attachment D in the letter).**
- [8.4.2.1] **Please make a back-up plan in the Monitoring network chapter on how the GSA will install shallow monitoring wells in the Alluvial Aquifer if confidentially agreements still prevent existing wells from being used as representative monitoring wells for the Chronic Lowering of Groundwater sustainability indicator.**
- [8.4.2.5] Depletions of interconnected surface waters do exist in the Paso Robles Subbasin (Figure 5-17). Depletions of surface water were also estimated in Section 5.5.1, and the statement that "there are no current minimum thresholds or undesirable

results "for interconnected surface water" is inadequate and goes against SGMA requirements. **Thus, there is a need to establish sustainable management criteria for interconnected surface waters in the basin. (See further comments in letter regarding Interconnected Surface Waters).**

- [8.4.2.7] The description of how the groundwater elevation minimum thresholds affect ecological land uses and users (Section 8.4.2.7 – p.17) is inadequate for the following reasons:
    - The draft GSP has failed to describe current and historical groundwater conditions with GDE areas. Thus, it is impossible to assess how the proposed minimum thresholds relate to historical groundwater conditions in the GDE and whether potential adverse effects could occur to the GDEs as a result of groundwater conditions.
    - Legally protected species located with GDEs have not been identified. Thus, it is impossible to evaluate whether federal, state, or local standards exist for groundwater elevations needed to protect these listed species (see Section 8.4.2.8).
- [8.4.3.1] Under SGMA, Measurable Objectives are to be established to achieve the sustainability goal of the basin within 20 years of Plan implementation [23 CCR § 354.30 (a)]. **Please modify the methodology for setting measurable objectives for groundwater levels (p.18-19) so that it helps attain the sustainability goal defined on p. 4 (Section 8.2):** "sustainably manage the groundwater resources of the Paso Robles Subbasin for <u>long-term community, financial, and environmental benefit of residents and business in the Subbasin</u>. This GSP outlines the approach to achieve a sustainable groundwater resource free of undesirable results within 20 years, while maintaining the unique cultural, community, and business aspects of the Subbasin. In adopting this GSP, it is the express goal of the GSAs to <u>balance the needs of all groundwater users in the Subbasin, within the sustainable limits of the Subbasin's resources</u>."
- [8.4.4.1] **Please elaborate how the 15% exceedance criteria balances the interests of environmental beneficial users in comparison with other groundwater users in the basin.**

<u>8.9 Depletion of Interconnected Surface Water Sustainable Management Criteria</u>

- [8.9.1] According to Chapter 5, interconnected surface waters exist in the Paso Robles Subbasin (Figure 5-17). Depletions of surface water were also estimated in Section 5.5.1. While there is certainly data gaps and a need for additional shallow monitoring wells in the Alluvial aquifer to map ISWs, there is also a need to enhancing monitoring of stream flow and vertical groundwater gradients by installing more stream. SGMA is based on best available science and adaptive management**, thus there should be an attempt to identify some minimum thresholds for ISWs,** which are to be quantified by "The location, quantity, and timing of depletions of interconnected surface water" [23 CCR §354.28(c)(6)(A)].
- [8.9.2] There is a need to evaluate potential effects on beneficial uses of surface and groundwater. **Please refer to Attachment C for a list of freshwater species in Paso Robles Subbasin that may be exist within ISWs. We recommend that after identifying which freshwater species exist in your basin, especially**

federal and state listed species, that you contact staff at the Department of Fish and Wildlife (DFW), United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS) to obtain their input on the groundwater and surface water needs of the organisms on the freshwater species list. Because effects to plants and animals are difficult and sometimes impossible to reverse, we recommend erring on the side of caution to preserve sufficient groundwater conditions to sustain GDEs and ISWs.

<u>Appendix B: Methodology for Identifying Potential Groundwater Dependent Ecosystems - Environmental User Checklist (Attachment A) Items 5-14:</u>

- For clarification, iGDEs are mapped polygons in DWR's NC dataset.
- Please specify what field verification methods (e.g., isotope analysis, enhanced shallow groundwater monitoring) will be used to definitively determine whether potential GDEs are true GDEs.
- It is highly advised that multiple depth to groundwater measurements are used to verify whether an iGDE (or NC dataset polygon) is connected to groundwater, so that fluctuations in the groundwater regime can be adequately represented. The analysis described on p.7 to create Figure B-3 only relies on Spring 2017 depth data, which is also after the Jan 1, 2015 SGMA benchmark date. Also, according to the shallow monitoring well data gaps described in Chapter 5 and 7, there is insufficient data to confidently remove data for NC polygons that are >5km away from a shallow well. See Attachment D of this letter for six best practices when using groundwater data to verify the NC dataset.
- The NC dataset needs to be groundtruthed with aerial photography to screen for changes in land use that many not be reflected in the NC dataset (e.g., recent development, cultivated agricultural land, obvious human-made features).
- Grouping multiple GDE polygons into larger units by location (proximity to each other) and principal aquifer will simplify the process of evaluating potential effects on GDE due to groundwater conditions under GSP Chapter 7: Sustainable Management Criteria.

- Groundwater conditions within GDEs should be briefly described within the portion of the Basin Setting Section where GDEs are being identified.
- Not all GDEs are created equal. Some GDEs may contain legally protected species or ecologically rich communities, whereas other GDEs may be highly degraded with little conservation value. Including a description of the types of species (protected status, native versus non-native), habitat, and environmental beneficial uses (Refer to **Attachment C** for a list of freshwater species found in the Paso Robles Subbasin and refer to Worksheet 2, p.74 of GDE Guidance Document) can be helpful in assigning an ecological value to the GDEs. Identifying an ecological value of each GDE can help prioritize limited resources when considering GDEs as well as prioritizing legally protected species or habitat that may need special consideration when setting sustainable management criteria.
- Decisions to remove, keep, or add polygons from the NC dataset into a basin GDE map should be based on best available science in a manner that promotes transparency and accountability with stakeholders. Any polygons that are removed, added, or kept should be inventoried in the submitted shapefile to DWR, and mapped in the plan. **We**

recommend revising Figure 4-11, Appendix B, and including it in Chapter 5 to reflect this change.

Attachment C

Freshwater Species Located in the Paso Robles Subbasin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result "depletion of interconnected surface waters", Attachment C provides a list of freshwater species located in the Paso Robles Subbasin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the Paso Robles groundwater basin boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015[2]. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife's BIOS[3] as well as on The Nature Conservancy's science website[4].

Scientific Name	Common Name	Legally Protected Status		
		Federal	**State**	**Other**
		BIRD		
Actitis macularius	Spotted Sandpiper			
Aechmophorus clarkii	Clark's Grebe			
Aechmophorus occidentalis	Western Grebe			
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Aix sponsa	Wood Duck			
Anas americana	American Wigeon			
Anas clypeata	Northern Shoveler			
Anas crecca	Green-winged Teal			
Anas cyanoptera	Cinnamon Teal			
Anas platyrhynchos	Mallard			
Anas strepera	Gadwall			
Anser albifrons	Greater White-fronted Goose			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Aythya affinis	Lesser Scaup			
Aythya collaris	Ring-necked Duck			
Aythya valisineria	Canvasback		Special	
Bucephala albeola	Bufflehead			
Bucephala clangula	Common Goldeneye			
Butorides virescens	Green Heron			

[2] Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoSONE, 11(7). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710
[3] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS
[4] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species-database

Calidris mauri	Western Sandpiper			
Chen caerulescens	Snow Goose			
Chen rossii	Ross's Goose			
Chroicocephalus philadelphia	Bonaparte's Gull			
Cistothorus palustris palustris	Marsh Wren			
Egretta thula	Snowy Egret			
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Gallinula chloropus	Common Moorhen			
Geothlypis trichas trichas	Common Yellowthroat			
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus merganser	Common Merganser			
Mergus serrator	Red-breasted Merganser			
Numenius americanus	Long-billed Curlew			
Nycticorax nycticorax	Black-crowned Night-Heron			
Oxyura jamaicensis	Ruddy Duck			
Pandion haliaetus	Osprey		Watch list	
Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			
Podiceps nigricollis	Eared Grebe			
Podilymbus podiceps	Pied-billed Grebe			
Porzana carolina	Sora			
Rallus limicola	Virginia Rail			
Recurvirostra americana	American Avocet			
Riparia riparia	Bank Swallow		Threatened	
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
Tringa melanoleuca	Greater Yellowlegs			
Tringa solitaria	Solitary Sandpiper			
Vireo bellii	Bell's Vireo			
Vireo bellii pusillus	Least Bell's Vireo	Endangered	Endangered	

Xanthocephalus xanthocephalus	Yellow-headed Blackbird		Special Concern	BSSC - Third priority
CRUSTACEAN				
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Cyprididae fam.	Cyprididae fam.			
Hyalella spp.	Hyalella spp.			
Pacifastacus spp.	Pacifastacus spp.			
FISH				
Oncorhynchus mykiss - SCCC	South Central California coast steelhead	Threatened	Special Concern	Vulnerable - Moyle 2013
Catostomus occidentalis mnioltiltus	Monterey sucker			Least Concern - Moyle 2013
Catostomus occidentalis occidentalis	Sacramento sucker			Least Concern - Moyle 2013
Cottus gulosus	Riffle sculpin		Special	Near-Threatened - Moyle 2013
Entosphenus tridentata ssp. 1	Pacific lamprey		Special	Near-Threatened - Moyle 2013
Lavinia exilicauda exilicauda	Sacramento hitch		Special	Near-Threatened - Moyle 2013
Lavinia exilicauda harengeus	Monterey hitch		Special	Vulnerable - Moyle 2013
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013
Orthodon microlepidotus	Sacramento blackfish			Least Concern - Moyle 2013
Ptychocheilus grandis	Sacramento pikeminnow			Least Concern - Moyle 2013
Oncorhynchus mykiss - SCCC	South Central California coast steelhead	Threatened	Special Concern	Vulnerable - Moyle 2013
HERP				

Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC
Ambystoma californiense californiense	California Tiger Salamander	Threatened	Threatened	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Anaxyrus boreas halophilus	California Toad			ARSSC
Anaxyrus californicus	Arroyo Toad	Endangered	Special Concern	ARSSC
Pseudacris cadaverina	California Treefrog			ARSSC
Pseudacris hypochondriaca	Baja California Treefrog			
Pseudacris regilla	Northern Pacific Chorus Frog			
Rana boylii	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Rana draytonii	California Red-legged Frog	Threatened	Special Concern	ARSSC
Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Taricha torosa	Coast Range Newt		Special Concern	ARSSC
Thamnophis hammondii hammondii	Two-striped Gartersnake		Special Concern	ARSSC
Thamnophis sirtalis infernalis	California Red-sided Gartersnake			Not on any status lists
Thamnophis sirtalis sirtalis	Common Gartersnake			
INSECT & OTHER INVERT				
Acentrella spp.	Acentrella spp.			
Agabus spp.	Agabus spp.			
Ambrysus mormon				Not on any status lists
Antocha spp.	Antocha spp.			
Argia emma	Emma's Dancer			
Argia lugens	Sooty Dancer			
Argia spp.	Argia spp.			
Argia vivida	Vivid Dancer			
Baetidae fam.	Baetidae fam.			
Baetis spp.	Baetis spp.			

Berosus punctatissimus				Not on any status lists
Berosus spp.	Berosus spp.			
Callibaetis spp.	Callibaetis spp.			
Centroptilum spp.	Centroptilum spp.			
Chaetarthria bicolor				Not on any status lists
Chaetarthria ochra				Not on any status lists
Cheumatopsyche spp.	Cheumatopsyche spp.			
Chironomidae fam.	Chironomidae fam.			
Chironomus spp.	Chironomus spp.			
Cladotanytarsus spp.	Cladotanytarsus spp.			
Coenagrionidae fam.	Coenagrionidae fam.			
Corisella spp.	Corisella spp.			
Corixidae fam.	Corixidae fam.			
Cricotopus spp.	Cricotopus spp.			
Dicrotendipes spp.	Dicrotendipes spp.			
Dytiscidae fam.	Dytiscidae fam.			
Enallagma civile	Familiar Bluet			
Enallagma cyathigerum				Not on any status lists
Enochrus carinatus				Not on any status lists
Enochrus cristatus				Not on any status lists
Enochrus piceus				Not on any status lists
Enochrus pygmaeus				Not on any status lists
Enochrus spp.	Enochrus spp.			
Ephemerella spp.	Ephemerella spp.			
Ephemerellidae fam.	Ephemerellidae fam.			
Ephydridae fam.	Ephydridae fam.			
Eukiefferiella spp.	Eukiefferiella spp.			
Fallceon quilleri	A Mayfly			
Graptocorixa spp.	Graptocorixa spp.			
Gyrinus spp.	Gyrinus spp.			
Helichus spp.	Helichus spp.			
Helicopsyche spp.	Helicopsyche spp.			
Hetaerina americana	American Rubyspot			
Hydrochus spp.	Hydrochus spp.			
Hydrophilidae fam.	Hydrophilidae fam.			
Hydroporus spp.	Hydroporus spp.			
Hydropsyche spp.	Hydropsyche spp.			
Hydropsychidae fam.	Hydropsychidae fam.			
Hydroptila spp.	Hydroptila spp.			
Hydryphantidae fam.	Hydryphantidae fam.			

Ischnura spp.	Ischnura spp.			
Laccobius ellipticus				Not on any status lists
Laccobius spp.	Laccobius spp.			
Laccophilus maculosus				Not on any status lists
Lepidostoma spp.	Lepidostoma spp.			
Leptoceridae fam.	Leptoceridae fam.			
Libellula saturata	Flame Skimmer			
Limnophyes spp.	Limnophyes spp.			
Liodessus obscurellus				Not on any status lists
Macromia magnifica	Western River Cruiser			
Malenka spp.	Malenka spp.			
Microcylloepus spp.	Microcylloepus spp.			
Microtendipes spp.	Microtendipes spp.			
Nectopsyche spp.	Nectopsyche spp.			
Ochthebius spp.	Ochthebius spp.			
Ophiogomphus bison	Bison Snaketail			
Optioservus spp.	Optioservus spp.			
Oreodytes spp.	Oreodytes spp.			
Paracloeodes minutus	A Small Minnow Mayfly			
Paracymus spp.	Paracymus spp.			
Paratanytarsus spp.	Paratanytarsus spp.			
Peltodytes spp.	Peltodytes spp.			
Phaenopsectra spp.	Phaenopsectra spp.			
Plathemis lydia	Common Whitetail			
Postelichus spp.	Postelichus spp.			
Procladius spp.	Procladius spp.			
Pseudochironomus spp.	Pseudochironomus spp.			
Psychodidae fam.	Psychodidae fam.			
Rheotanytarsus spp.	Rheotanytarsus spp.			
Rhyacophila spp.	Rhyacophila spp.			
Sigara mckinstryi	A Water Boatman			Not on any status lists
Sigara spp.	Sigara spp.			
Simuliidae fam.	Simuliidae fam.			
Simulium spp.	Simulium spp.			
Sperchon spp.	Sperchon spp.			
Sperchontidae fam.	Sperchontidae fam.			
Stictotarsus spp.	Stictotarsus spp.			
Sweltsa spp.	Sweltsa spp.			
Tanytarsus spp.	Tanytarsus spp.			
Tipulidae fam.	Tipulidae fam.			
Tramea lacerata	Black Saddlebags			
Tricorythodes spp.	Tricorythodes spp.			

Wormaldia spp.	Wormaldia spp.			
MAMMAL				
Castor canadensis	American Beaver			Not on any status lists
MOLLUSK				
Gyraulus spp.	Gyraulus spp.			
Lymnaea spp.	Lymnaea spp.			
Menetus opercularis	Button Sprite			CS
Physa spp.	Physa spp.			
Pisidium spp.	Pisidium spp.			
Planorbidae fam.	Planorbidae fam.			
PLANT				
Alnus rhombifolia	White Alder			
Ammannia coccinea	Scarlet Ammannia			
Anemopsis californica	Yerba Mansa			
Azolla filiculoides	NA			
Baccharis salicina				Not on any status lists
Bolboschoenus maritimus paludosus	NA			Not on any status lists
Callitriche heterophylla bolanderi	Large Water-starwort			
Callitriche marginata	Winged Water-starwort			
Castilleja minor minor	Alkali Indian-paintbrush			
Castilleja minor spiralis	Large-flower Annual Indian-paintbrush			
Cotula coronopifolia	NA			
Crassula aquatica	Water Pygmyweed			
Crypsis vaginiflora	NA			
Cyperus erythrorhizos	Red-root Flatsedge			
Eleocharis macrostachya	Creeping Spikerush			
Eleocharis parishii	Parish's Spikerush			
Epilobium campestre	NA			Not on any status lists
Epilobium cleistogamum	Cleistogamous Spike-primrose			
Eryngium spinosepalum	Spiny Sepaled Coyote-thistle		Special	CRPR - 1B.2
Eryngium vaseyi vaseyi	Vasey's Coyote-thistle			Not on any status lists
Euthamia occidentalis	Western Fragrant Goldenrod			
Helenium puberulum	Rosilla			
Hydrocotyle verticillata verticillata	Whorled Marsh-pennywort			
Juncus dubius	Mariposa Rush			
Juncus effusus effusus	NA			

Juncus luciensis	Santa Lucia Dwarf Rush		Special	CRPR - 1B.2
Juncus macrophyllus	Longleaf Rush			
Juncus xiphioides	Iris-leaf Rush			
Limosella aquatica	Northern Mudwort			
Marsilea vestita vestita	NA			Not on any status lists
Mimulus guttatus	Common Large Monkeyflower			
Mimulus latidens	Broad-tooth Monkeyflower			
Mimulus pilosus				Not on any status lists
Montia fontana fontana	Fountain Miner's-lettuce			
Navarretia prostrata	Prostrate Navarretia		Special	CRPR - 1B.1
Paspalum distichum	Joint Paspalum			
Persicaria lapathifolia				Not on any status lists
Persicaria maculosa	NA			Not on any status lists
Phacelia distans	NA			
Pilularia americana	NA			
Plagiobothrys acanthocarpus	Adobe Popcorn-flower			
Plantago elongata elongata	Slender Plantain			
Platanus racemosa	California Sycamore			
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads			
Ranunculus aquatilis diffusus				Not on any status lists
Rorippa curvisiliqua curvisiliqua	Curve-pod Yellowcress			
Rumex conglomeratus	NA			
Rumex salicifolius salicifolius	Willow Dock			
Salix exigua exigua	Narrowleaf Willow			
Salix laevigata	Polished Willow			
Salix lasiolepis lasiolepis	Arroyo Willow			
Schoenoplectus americanus	Three-square Bulrush			
Schoenoplectus pungens longispicatus	Three-square Bulrush			
Schoenoplectus pungens pungens	NA			
Schoenoplectus saximontanus	Rocky Mountain Bulrush			
Typha domingensis	Southern Cattail			

Typha latifolia	Broadleaf Cattail			
Veronica anagallis-aquatica	NA			
Veronica catenata	NA			Not on any status lists

Attachment D

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IDENTIFYING GDEs UNDER SGMA

Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). The California Department of Water Resources (DWR) has provided the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online (https://gis.water.ca.gov/app/NCDatasetViewer/) to help Groundwater Sustainability Agencies (GSAs) identify GDEs within a groundwater basin. The NC Dataset is a compilation of 48 publicly available State and Federal agency datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California[5].

The NC Dataset indicates the vegetation and wetland features that are good indicators of a GDE. The NC dataset is a starting point, and it is the responsibility of GSAs to utilize best available science and local knowledge on the hydrology, geology, and groundwater levels to verify its presence or absence, as well as whether a connection to groundwater in an aquifer exists (Figure 1)[6]. Detailed guidance on identifying GDEs within a groundwater basin from the NC dataset is available[7]. This document highlights six best practices that GSAs and their consultants can apply when using local groundwater data to confirm a connection to groundwater for the NC Dataset.

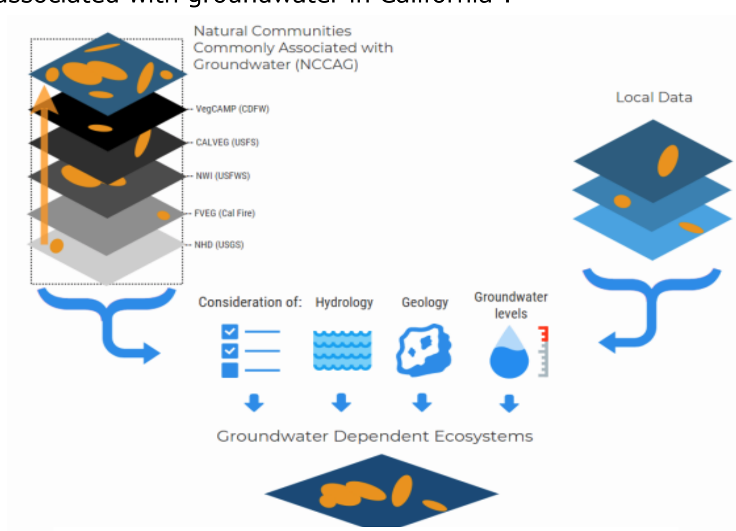

Figure 1. Considerations for GDE identification. Source: DWR[2]

[5] For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf

[6] *California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf*

[7] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/

BEST PRACTICE #1. Connection to an Aquifer

Groundwater basins can be comprised of one continuous aquifer or multiple aquifers stacked on top of each other. Basins with a stacked series of aquifers may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, and groundwater dependent ecosystems (Figure 2). This is because the goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits, and while groundwater pumping may not be currently occurring in a shallower aquifer, it could be in the future. For example, if a shallow perched aquifer is currently not being pumped due to poor water quality resulting from irrigation return flow, producing this water will become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided and a GSA's legal risk be minimized. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

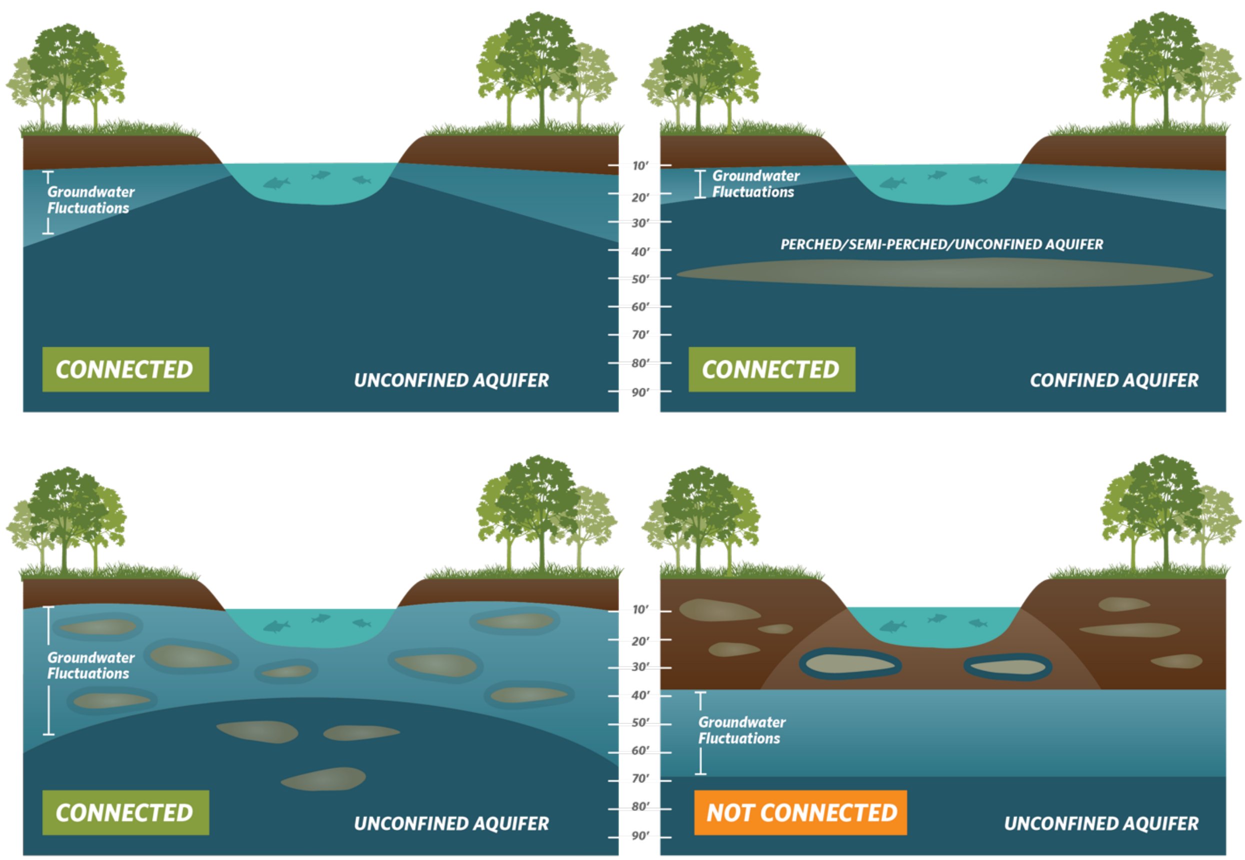

Figure 2. Confirming whether an ecosystem is connected to groundwater in a principal aquifer. Top: (Left) Depth to Groundwater in the aquifer under the ecosystem is an unconfined aquifer with depth to groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(Right)** Depth to Groundwater in the *shallow* aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the *shallow* aquifer. **Bottom: (Left)** Depth to groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystems connection to groundwater. (Right) Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is *due to* direct recharge from precipitation and indirect recharge under surface water feature.

BEST PRACTICE #2. Characterize Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth to groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability (i.e., wet, average, dry, and drought years) that is characteristic of California's climate. DWR's Best Management Practices document on water budgets[8] recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline[9] could be determined based on data between 2005 and 2015.

GDEs existing on the earth's surface depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach[10] for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in the GDE guidance document[2], one of the key factors to consider when mapping GDEs is to contour depth to groundwater in the aquifer that is in direct contact with the ecosystem.

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however, if these groundwater conditions are prolonged adverse impacts to GDEs can result. While depth to groundwater levels within 30 feet[2] are generally accepted as being a proxy for confirming that polygons in the NC dataset are connected to groundwater, it is highly advised that fluctuations in the groundwater regime are taken into consideration and to characterize the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer[11]. However, if insufficient data are available to describe groundwater conditions within polygons from the NC dataset, it is highly advised that they be included in the GSP until data gaps are reconciled in the monitoring network (See Best Practice #6).

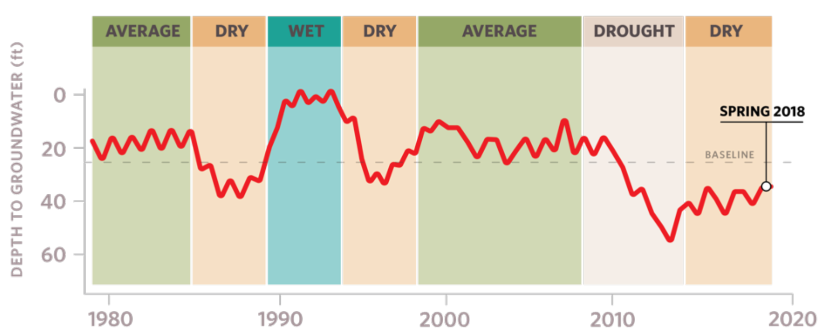

Figure 3. Example seasonality and interannual variability in depth to groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

[8] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[9] *Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]*

[10] Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs - link in footnote above).

[11] *SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer*

BEST PRACTICE #3. Ecosystems Can Rely on Both Surface and Groundwater

GDEs can rely on groundwater for all or some of its requirements, using multiple water sources simultaneously and at different temporal or spatial scales. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around NC polygons does not preclude the possibility that a connection to groundwater exists. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth to groundwater data should be used to identify whether NC polygons are connected to groundwater and should be considered GDEs.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and would not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

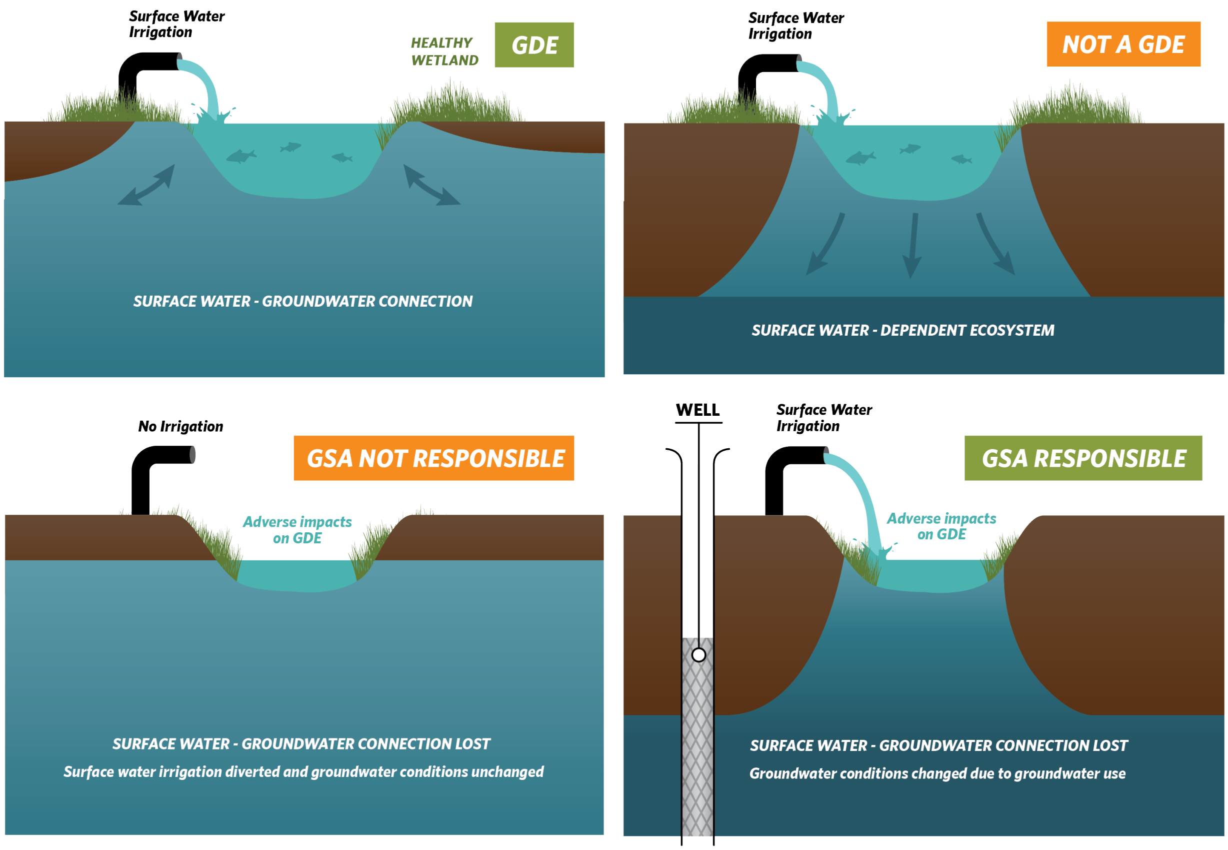

Figure 4. Ecosystems can depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, such that a connection to groundwater exists for the ecosystem. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **Bottom: (Left)** An ecosystem that was once dependent on an interconnected surface water and groundwater connection, but then loses this connection due to surface water diversions would not be the GSA's responsibility. **(Right)** Groundwater dependent ecosystems in places where a surface water – groundwater connection existed, but then loose that connection due to groundwater pumping would be the GSA's responsibility.

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin require that groundwater conditions are characterized to confirm whether polygons in the NC dataset are connected to an underlying aquifer. Once an aquifer has been identified, representative groundwater wells are necessary to characterize groundwater conditions (Figure 5). It is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of the NC Dataset polygons, and more likely to reflect the local conditions relevant to the ecosystem. NC dataset polygons that are farther than 5 km from a well should not be excluded because of interpolated groundwater depth conditions, as there is insufficient information to make that determination. Instead, they should be retained as potential GDEs until there is sufficient data to determine whether or not the NC Dataset polygon is connected to groundwater and is a GDE.

- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.

- Avoid relying on wells that have insufficient well information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer.

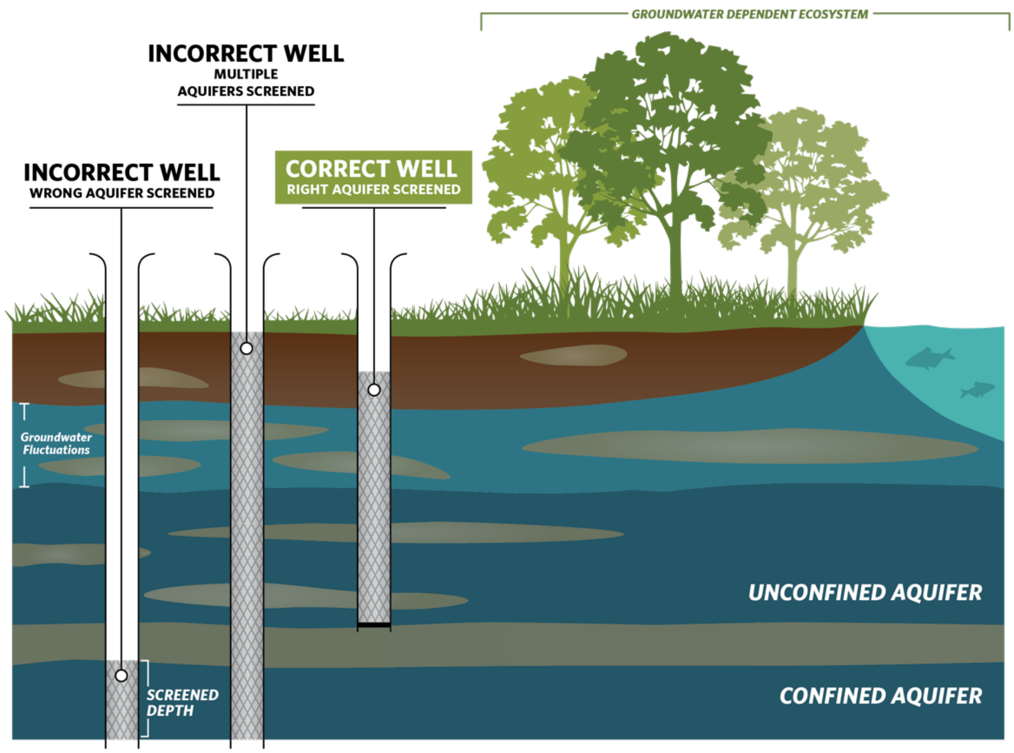

Figure 5. Selecting representative wells to characterize groundwater conditions in the aquifers directly connected with GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

A common, but error prone practice, to contour depth to groundwater over a large area is to interpolate depth to groundwater measurements at monitoring wells. This practice causes errors when the land surface contains features like streams and wetlands depressions because it assumes the land surface is constant across the landscape and depth to groundwater is constant below these low-lying areas (Figure 6). A more accurate approach is to interpolate **groundwater elevations** at monitoring wells to get an estimate of groundwater elevation across the landscape. This layer can then be subtracted from the land surface elevation from a Digital Elevation Model (DEM)[12] to estimate depth to groundwater contours across the landscape (Figure 7). This will provide a much more accurate contours of depth to groundwater along streams and other land surface depressions where GDEs are commonly found.

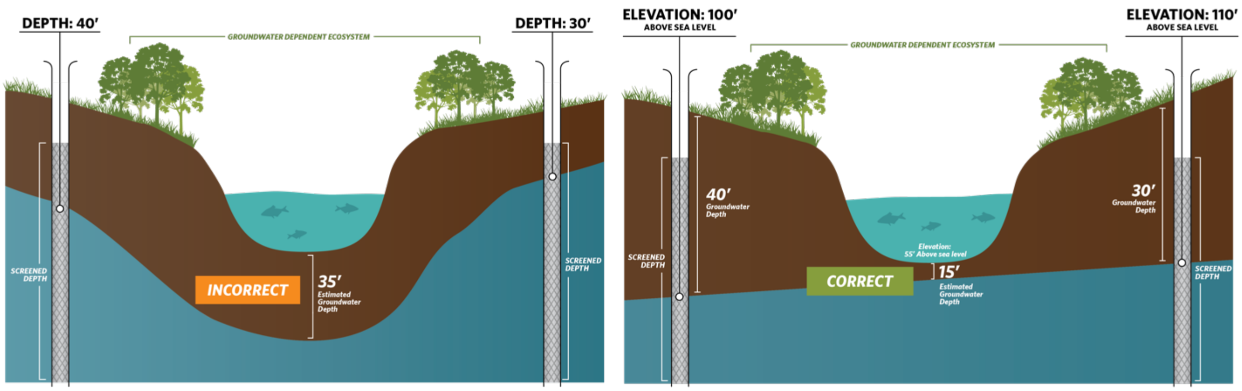

Figure 6. Contouring depth to groundwater around surface water features and GDEs. (Left) Groundwater level interpolation using depth to groundwater data from monitoring wells. **(Right)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

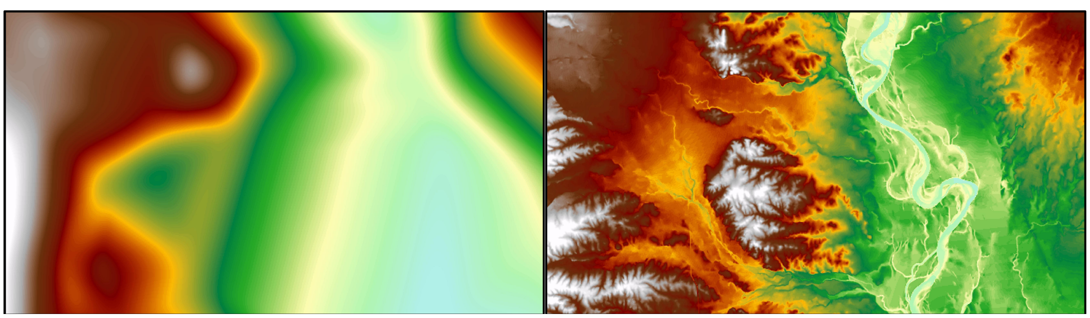

Figure 7. Depth to Groundwater Contours in Northern California. (Left) Contours were interpolated using depth to groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth to groundwater contours. The image on the right shows a more accurate depth to groundwater estimate because it takes the local topography and elevation changes into account.

[12] *Digital Elevation Model data is available at: https://catalog.data.gov/dataset/usgs-national-elevation-dataset-ned-1-meter-downloadable-data-collection-from-the-national-map-*

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, **The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network.** Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. *23 CCR §341(g)(1)*

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. *23 CCR §351(m)*

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. *23 CCR §351(o)*

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. *23 CCR §351(aa)*

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.