# Appendix S: Public Comments

# NORTH AMERICAN SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

## APPENDIX S
## Public Comments

December 2021

**Table S-1**

**Responses to Public Comments to Draft Sections 1-5**

| Comment No. | Name | Comment | Response to Comment/Changes to the Draft GSP Section 1-5 |
|---|---|---|---|
| 1 | Rebecca Lillis | We request the following edits be made to section 3.5, Habitat Preserves and Easements: Please update the year of the Placer County Conservation Plan to 2020. Please add the following sentence, beginning on line 3 of Section 3.5, after "...Natomas Basin...Plan 2003).": "The Placer County Conservation Plan was jointly developed by the County of Placer, the City of Lincoln, the Placer County Water Agency and the South Placer Transportation Authority." Please add the following sentences, beginning on line 14 of Section 3.5, after "Other natural marsh areas...Sacramento County.": "In unincorporated western Placer County, some fresh emergent marsh habitats are created by irrigation runoff and many of the wetland habitats are fed by leakage or runoff from irrigation canals or irrigated pastures. Riparian habitat occurs on the American and Bear River corridors and along Raccoon Creek, lower Auburn Ravine, and lower Dry Creek." | Comment noted. Additional clarification added to NASb GSP. |
| 2 | Albert Scheiber | Given the proximity of the wells represented by hydrographs in Appendix G, and specifically to the wells in relation to Streams in the Eastern Area – what is the certainty that these hydrographs are reflecting groundwater conditions as opposed to the levels of underflow associated with these streams? | Comment noted. Section 5.2.3, sentences added in relation of monitoring wells proximity of wells near streams and whether these are representative of perched groundwater or the groundwater table. |
| 3 | Albert Scheiber | Is the Basin simply made up of underflow and underground streams – and not resident groundwater? And if so, what would this circumstance mean with respect to the jurisdiction of the West Placer County Groundwater Sustainability Agency? Wouldn't this mean that jurisdiction rests with the SWRCB for much of the Basin and not the Sustainability Agency? | Comment noted. No change to text. Section 2.1 indicates that each of the five GSAs have been granted exclusive rights to manage groundwater in the Subbasin. Jurisdiction in the Subbasin therefore rests with the GSAs unless the GSP is found to be inadequate, at which time the Subbasin may be placed into probationary status and the SWRCB may begin to temporarily manage the Subbasin. |
| 4 | Albert Scheiber | It appears that many of the larger private agricultural groundwater users have not been included in the analysis, or in the baseline/historic conditions, for the Plan. How can the Plan analyze the groundwater conditions and sustainability without having information relating to the use of groundwater by private agricultural landowners? | Comment noted. All groundwater users, have been included in the GSP analysis based on best available data. Figure 3-13, shows the number of agricultural wells in the Subbasin (DWR, 2019). Section 6.1 - Water Budget Information (which has yet to be released at the time of these comments) documents how groundwater use was estimated (calculated) based on evapotranspiration. |
| 5 | Albert Scheiber | Thus far, the SGMA Plan (GSP) does not contain any information or analysis on groundwater levels in the eastern basin in relation to the planned well expansion and pumping programs by the City of Lincoln. Lincoln plans to increase pumping by adding over 10 new wells west of the City and increasing groundwater pumping during drought periods up to 75% of the City's total water use. | Comment noted. Section 6, Water Budgets and Section 8, Sustainable Management Criteria, had not yet been released at the time of this comment. Section 6.4.3 describes the projected water budget and a description of the projected conditions input. Direct input was received on future projects from local agencies. The City of Lincoln's proposed new wells were included in the model with projected annual pumping. Figure 8-5 shows the projected groundwater elevation declines at representative wells in the Subbasin with information near the City of Lincoln. The difference between 2019 and projected groundwater levels for a 50-year simulation are shown on Figure 8-5 and indicate groundwater levels west of Lincoln area are projected to decline in this area by up to 7 feet. |

**Table S-1**

**Responses to Public Comments to Draft Sections 1-5**

| Comment No. | Name | Comment | Response to Comment/Changes to the Draft GSP Section 1-5 |
|---|---|---|---|
| 6 | Albert Scheiber | In 2011, the City pumped groundwater nearly exclusively for its water use due to a PCWA facility issue and this caused this part of the basin to go into severe decline and overdraft. The City's expanded demand along with a 75% drought pumping program will vastly outpace the water pumped in 2011 that caused the basin to go into decline. It is therefore not entirely true for the GSP to conclude that groundwater levels are stable in the area of the basin near Lincoln. | Comment noted. Section 5.2.3 was modified and further discussion regarding this area was included. For the most part groundwater levels are rising in this area, but a few did not recover completely since the 2012 to 2016 drought as of 2019. The few that did not recover completely have declined by about 2 feet. |
| 7 | Albert Scheiber | The city of Lincoln currently has a lawsuit against the United States Air Force regarding the closed landfill on the East side of Lincoln. What steps is the SGMA Plan taking to insure that if there is contamination coming from that landfill, it will not follow the flow on the graphs to the west and contaminate the entire basin in times of drought and highly increased groundwater pumping? | Comment noted. Clarification sentence added to Section 5.8.3. |
| 8 | Albert Scheiber | The SGMA plan should also specifically address the two new proposed PCWA wells planned for Sunset Area Plan/Placer Ranch Project, which are to be located fairly near the current cone of depression in the southwest part of the Basin. | Comment noted. Section 6.4.3 describes the that local agencies were consulted for future projections of new wells and potential pumping. Figure 3-6 provides the location of planned development areas in the Subbasin that were included in the analyses. |
| 9 | Albert Scheiber | To many non-municipal groundwater users, it appears that this SGMA plan is primarily intended to protect and expand municipal groundwater use at the expense of agriculture and other overlying uses. The basin is not stable and is in decline (or subject to decline) in the eastern area – with little to no surplus water existing during drought periods. Again, this situation is made obvious from the hydrographs. | Comment noted. All beneficial uses and users of groundwater were considered during the development of the GSP as required by SGMA. |
| 10 | Albert Scheiber | I also find it interesting that most of the data on the graphs go back less than ten years. It seems like a plan of this nature and size should contain more data than that. | Comment noted. As stated in Section 5.2.3 there are only a few wells in the Eastern area with long-term historic measurements because this area primarily utilizes surface water. With urbanization of the area and development of groundwater management organizations, over 40 monitoring wells have been constructed since 2003. |

## Re: Comments on the North American Subbasin GSP

To whom it may concern,

I would like to start by saying my comments will be under the "general comment" section because most of what has been presented in the GSP is general information. It is my goal to inform you of items and concerns that I feel are being overlooked and downplayed, but will hopefully be addressed in the future chapters of the draft GSP. My comments are also going under "general comments" because I find the comment form to be ridiculous and more of a headache than any comment process I have ever participated in and I've participated in a fair number.

To date, there has been no meaningful participation sought from "stakeholders". At the PCWA growers meeting on 9/9/2020, we were informed we would have a seat at the table for the GSP. While there has been some halfhearted outreach by West Placer County Groundwater Sustainability Agency, this outreach has thus far appeared to be more about deflecting questions from stakeholders rather than addressing any questions or concerns. For example, the November 12th 2020 zoom meeting allowed for public comments, but wasn't really an "official" comment format. And at the November 17th 2020 SGMA and Agriculture meeting, our comments and questions were either challenged, blown off or labeled as incorrect. Outreach has also only really begun recently now that a Plan has already been developed. It is very unlikely that any input from stakeholders at this stage is meaningful, based on past experience with Placer County and the City of Lincoln. However, the WPGSA will be able to check the box that they held public outreach for "stakeholders".

Given the proximity of the wells represented by hydrographs in Appendix G, and specifically to the wells in relation to Streams in the Eastern Area – what is the certainty that these hydrographs are reflecting groundwater conditions as opposed to the levels of underflow associated with these streams? Is the Basin simply made up of underflow and underground streams – and not resident groundwater? And if so, what would this circumstance mean with respect to the jurisdiction of the West Placer County Groundwater Sustainability Agency? Wouldn't this mean that jurisdiction rests with the SWRCB for much of the Basin and not the Sustainability Agency?

It appears that many of the larger private agricultural groundwater users have not been included in the analysis, or in the baseline/historic conditions, for the Plan. How can the Plan analyze the groundwater conditions and sustainability without having information relating to the use of groundwater by private agricultural landowners?

Thus far, the SGMA Plan (GSP) does not contain any information or analysis on groundwater levels in the eastern basin in relation to the planned well expansion and pumping programs by the City of Lincoln. Lincoln plans to increase pumping by adding over 10 new wells west of the City and increasing groundwater pumping during drought periods up to 75% of the City's total water use. In 2011, the City pumped groundwater nearly exclusively for its water use due to a

PCWA facility issue and this caused this part of the basin to go into severe decline and overdraft. The City's expanded demand along with a 75% drought pumping program will vastly outpace the water pumped in 2011 that caused the basin to go into decline. It is therefore not entirely true for the GSP to conclude that groundwater levels are stable in the area of the basin near Lincoln. Even if "stable," it is highly unlikely that any surplus water exists in this area for the amount of future municipal expansion of use planned by Lincoln – especially given the information in the hydrographs showing decline in groundwater levels during droughts. All of this information is publicly available in the City's Village 5 EIR and Water Supply Assessment.

The city of Lincoln currently has a lawsuit against the United States Air Force regarding the closed landfill on the East side of Lincoln. What steps is the SGMA Plan taking to insure that if there is contamination coming from that landfill, it will not follow the flow on the graphs to the west and contaminate the entire basin in times of drought and highly increased groundwater pumping?

The SGMA plan should also specifically address the two new proposed PCWA wells planned for Sunset Area Plan/Placer Ranch Project, which are to be located fairly near the current cone of depression in the southwest part of the Basin. It is also my understanding that these wells will be turned on and up during times of drought. So at the worst possible time, Lincoln and PCWA will be relying on groundwater, when surface water and surface water recharge will be at a minimum.

To many non-municipal groundwater users, it appears that this SGMA plan is primarily intended to protect and expand municipal groundwater use at the expense of agriculture and other overlying uses. The basin is not stable and is in decline (or subject to decline) in the eastern area – with little to no surplus water existing during drought periods. Again, this situation is made obvious from the hydrographs. It appears to be a program to allow the prescription of existing water rights by municipalities such as is occurring along the Central California Coast. I also find it interesting that most of the data on the graphs go back less than ten years. It seems like a plan of this nature and size should contain more data than that.

In the Eastern Area of the Basin, there appears to be an attempt to "cold store" PCWA's surface water rights to the American River. Some of those rights are by way of permits from the SWRCB. With Lincoln's expansion of its groundwater pumping while at the same time having more water available to it from PCWA that it can presently put to beneficial use, it raises the application of the Cold Storage doctrine. This situation essentially puts PCWA's water rights into cold storage by delaying the application of high value surface water rights to a beneficial use while waiting for Lincoln to develop – while at the same time, Lincoln is developing a program of more groundwater pumping than it can presently use. A program that delays the use of water for future municipal use is prohibited by law. This situation also raises the issue of reasonable use by having a City such as Lincoln expanding groundwater pumping and building additional wells, while having more surface water availability from PCWA than it can presently use beneficially.

I don’t believe that all of the SGMA partners are communicating together as they should. We should all be on the same team, working towards the same goal. But when you have the City of Lincoln and Placer County planning for over 16 wells vs. the City of Roseville currently doing and expanding groundwater recharge, and PCWA not in the least worried about pricing agriculture surface water out of affordability, I’m not sure how you are going to ensure water for everyone.

Many of my comments do not directly relate to the current SGMA plan sections available for public review. It is my hope that by pointing out these issues now, they will be addressed in the future draft sections of the GSP.

This is, in my opinion, a simple problem. Don’t get rid of surface water because if you do, groundwater pumping and lack of groundwater recharge will put the basin in overdraft, period. Learn from the mistakes of Central California.

Thank you

Albert Scheiber

**Table S-2**
**Responses to Public Comments to Public Draft GSP**

| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 1 | Janice Mcalpine | Large ponds using ground water to water ski. My pump had to be lowered due to neighboring business of water ski and jet ski events. Year round pumping ground water to fill massive ponds | Comment noted. Please see Management Action #1 that could potentially address future well spacing and well zoning requirements. |
| 2 | Mark Sigl | I hope the water & power agencies are looking at using the America River as a possible battery (able to store water, power, improve fish & wildlife habit, improve ground water, etc,..). I was looking at the surplus or developing excess solar power availability and using that clean cheap energy to help meet the water & peak power energy needs by creating a massive reverse flow water pumping / storage / energy system. I have some water & power engineering background and have done a couple ground water banking sites. I was looking at a 23 to 25 mile pipeline/canal that could transfer water back up the hill to the Placerville Area (1,000 ft elev) from the Sac Regional WWTP which recycles 25k GPD & Sacramento River. Recycling the water back up the hill to Placerville will allow for additional peak power needs that would pass through the 7 power sites. The additional water flow back into the basin area would also help replenish the ground water tables. Using Hwy 50 as a corridor and doing 150-200 ft lift elevations (5 to 8 stations needed) instead of one massive lift station would be more cost effecting using lower cost equipment, lower water pressures to deal with and could be done with intern storage tanks. A couple pipelines next to each other (lower construction costs since the pipelines would be smaller than using one massive one set up to be able to deliver 1-10k cfs flow. This also allows for easier maintenance & lower O&M costs since down time would be less and various pump combos could be operated for best use of power. This would be more beneficial to everyone (more power & water) while improving several other concerns (using cheap solar power, offsetting peak power, maintaining more water in the American River System while also helps recharge the ground water table, more water for fish & wildlife & recreationally while not wasting or removing water since it is basically being reused and recycled pumping it back up the hill and using the Sac Regional Recycled water which normally would go out to sea. This would like keeping that recycle surplus to keep recycling the water & power system using low cheap abundant solar power to help improve the system and maintain a more consistent level system. Using one technology Solar to help improve the water & peak power needs for the area. | Comment noted. |
| 3 | Amanda Cranford-NOAA - NMFS | The GSA should qualitatively describe what conditions within the subbasin would constitute an undesirable result with regard to streamflow depletion, ensuring that the description accounts for impacts to instream habitat that supports ESA-listed salmonids and green sturgeon. If data that would inform potential streamflow depletion impacts is lacking, NMFS recommends the final GSP follow guidance from California Department of Fish and Wildlife (2019) and develop conservative streamflow depletion thresholds as a cautionary principle until the surface flow/groundwater dynamic in the North American subbasin is better studied and understood. | Comment noted. The NASb GSAs have worked to develop reasonable conservative thresholds to safeguard beneficial uses and users for each sustainability indicator including depletions of interconnected streams. The GSAs will evaluate conditions and thresholds as additional data or information becomes available. Additional information has been provided within the NASb GSP, Appendix Q which estimated location of salmonids. |
| 4 | Amanda Cranford-NOAA - NMFS | SGMA regulations require that a GSP demonstrate "that there is a significant correlation between groundwater levels and the other metric" (DWR 2017), with the "other metric" in question appearing to be "the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results" (CCR 23§354.28(c)(6)). The draft GSP should explain, with supporting evidence, what significant correlation exists between groundwater elevations and streamflow depletion rates or volumes, and how that correlation would allow the GSA to adequately predict and monitor impacts to beneficial uses of surface water. | Comment Noted. Included in the NASb GSP, within Appendix N are hydrographs of surface water levels correlating to groundwater elevations in multiple areas of the NASb demonstrating that groundwater levels can be used as a proxy for stream water depletion. The NASb GSAs have added Table 8-8 to show the seasonal streamflow depletion estimates in terms of the rate and volume. |
| 5 | Amanda Cranford-NOAA - NMFS | The above definition is not appropriate for avoiding significant and unreasonable impacts to surface water beneficial uses because it is completely disconnected from ecological principlesthat govern how those beneficial uses are impacted. Requiring two consecutive years of exceeding the minimum threshold does not account for the fact that organisms live or die depending on the habitat conditions at a moment in time. If streamflow depletion contributes to a creek drying up during a given year, the fish that reside in that creek will perish and an impact to surface water beneficial use will likely have resulted. Requiring two consecutive years of such conditions impacting surface water beneficial uses makes little sense when attempting to avoid impacts to surface water beneficial uses. | Comment noted. The minimum thresholds established in the NASb GSP for the depletion of interconnected surface water sustainable indicator are intended to maintain the maximum acceptable rate of seepage. Furthermore, there was during the development of these minimum thresholds there was no evidence that creeks or streams would dry up under planned groundwater management projections. |

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| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 6 | Amanda Cranford-NOAA - NMFS | The minimum threshold for streamflow depletion was established by averaging the lowest groundwater elevations from fall 2014 and fall 2015. However, using recent groundwater elevations to inform or set streamflow depletion minimum thresholds and measurable objectives is likely inappropriate for avoiding significant impacts to ESA-listed salmonids and sturgeon, and their habitat, including EFH. Basic hydraulic principles dictate that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream or, conversely, seepage from a stream to the underlying aquifer is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. Basing sustainable management criteria upon groundwater elevations that occurred during California's recent historical drought (2011-2016) will likely result in historically high streamflow depletion rates, producing instream conditions that negatively affect ESA-listed Chinook salmon, steelhead, green sturgeon, and their critical habitat | Comment noted. The GSP includes multiple groundwater hydrographs from representative monitoring wells throughout the NASb (see appendix Q). Relatively nominal changes in groundwater levels were observed on these hydrographs during the dry hydrology of 2014 and 2015. The GSAs can rely on both historic and recent data when setting the minimum thresholds in the GSP that are protective for beneficial uses and users of groundwater. |
| 7 | Amanda Cranford-NOAA - NMFS | The GSP asserts that the North American subbasin is "currently under its estimated sustainable yield and in position to support additional groundwater development" (Page 8-12). However, a sustainable yield estimation requires the avoidance of all undesirable results and, as noted throughout this letter, we do not believe significant and unreasonable streamflow depletion will be avoided when using the sustainable management criteria proposed within the draft GSP. Similarly, the assertion that "the sustainability goal is currently being met" within the basin also appears to be unfounded, and directly contradicts DWR's evaluation process that assigned a "high" priority to the subbasin. Per the SGMA regulations, if the GSA wishes to assert that the basin is sustainably managed currently, then they must demonstrate and provide evidence that each sustainability indicator "does not exist and cannot occur" (DWR 2017). Suffice to say, the draft GSP fails to accomplish this. If the GSA wishes to keep this assertion within the draft GSP, they should fully explain, in detail, why the historically high streamflow depletion rates that correspond to their proposed sustainable management criteria will avoid significant and unreasonable impacts to surface water beneficial uses. | Comment noted. The GSA believes that groundwater in the NASb are likely already sustainably being managed based on the understanding of conditions and beneficial uses and users in the basin. |
| 8 | Amanda Cranford-NOAA - NMFS | We suspect that groundwater recharge projects are likely to be an important action implemented as part of the effort to achieve groundwater sustainability in the North American subbasin. NMFS encourages the GSA to consider implementing recharge projects that facilitate floodplain inundation and offer multiple benefits, including downstream flood attenuation, groundwater recharge, and ecosystem restoration. Managed floodplain inundation can recharge floodplain aquifers, which in turn slowly release stored water back to the stream during summer months. These projects also reconnect the stream channel with floodplain habitat, which can benefit juvenile salmon, steelhead, and sturgeon by creating off-channel habitat characterized by slow water velocities, ample cover in the form of submerged vegetation, and high food availability. As an added bonus, these types of multi-benefit projects likely have more diverse grant funding streams that can lower their cost as compared to traditional off-channel recharge projects. | Comment noted. The GSA appreciates stakeholder input identifying potential opportunities. It should be noted that many GSA members are working in other capacities on habitat and conservation and management plans that may address stakeholder interests. |
| 9 | Barbara Evoy - ECOS | Section 6 Water BudgetsLine 211 Table 6-4 Lines 130-210 Provide specifics of the data sets for calculating the current water budgets. However, starting with Table 6-4, Tables list Projected Condition Water Budget with Climate Change.There is no discussion of how Climate Change was analyzed. The document cited in the earlier tables (as the 2015 UWMPs) does not include climate change analysis discussion either. This is a major flaw in the document and needs to corrected in order to provide the reviewer an understanding of the assumptions and the modeling effort. See summary comments above. | Comment noted. The GSAs have added additional information in Appendix P as to how climate change was analyzed. |
| 10 | Barbara Evoy - ECOS | Section 5 Groundwater Conditions Line 94. It would be useful to be clear throughout the document as to timeframe. The statement "some wells have still not fully recovered" (from 2012-2016 pumping) is not clear without knowing whether this is 2018, 2019 or 2020 /2021 data (referencing separate file Appendices makes this clunky). In the context of the current drought crisis, it is important to know whether this conclusion includes the most recent dry years. It is not possible to read the axis of the hydrographs in Figure 5-3. See also line 123, line 131, line 149. Line 489 There is no mention of an effort to address the hexavalent chromium nor a source. Is there a known source for this contaminant or is follow-up investigation warranted? Line 506 The paragraph discusses the process for coordination with others on NDMA but not what levels of NDMA have been detected in Feb. 2004 and beyond. It would be useful to know how significant the problem is and whether or not the coordinated process is having any effect on the levels detected in the last 17 years. Line 652 New information presented recently (Lewis and Burgy 1964 study) to the South American GSP working group suggests root depth analysis for GDEs should use a depth of 80 feet, not the 30 feet used in the GSPD. In addition, The Nature Conservancy (TNC) is about to publish a study indicating root depths for certain oak species are 25 meters. In addition, a recent TNC study identifies the inability of oak woodlands to reproduce when ground water levels are too low. Therefore, a determination of appropriate root depths to maintain GDEs should be included as a potential data gap and for priority Management Action in the final GSP. Line 659 Given the number of monitoring wells with incomplete construction details in Appendix C, is there no need for further investigation as to the screened intervals? | Comment noted. Based on the data and information provided in the NASb GSP (see Appendix B), there does not appear to be the potential for significant levels of negative effects to domestic wells. A domestic/shallow well data collection and communication program has been added as a GSP management actions strengthen communication and the transfer of data and information between the GSA and domestic well owners during GSP implementation. |

**Table S-2**
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| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 11 | Barbara Evoy - ECOS | Section 3.8.2 Line 422-475 Given the number of historic curtailments in 2021, the document should be updated to provide some idea of the security of the water allocations discussed. Simply saying there is a post 1914 water right does not provide an idea of reliability. Many of the current 2021 curtailments are 1880s -1920s water rights or earlier. It is unclear how much of the regional supply is in jeopardy in the now drier water supply climate. As climate change continues to drive watershed systems to less snow and drier early spring/summers, water rights should not be discussed as a given allocation. They are subject to curtailment and are likely to be curtailed earlier and more frequently. To develop a regional budget, clear analysis of the surface water supplies is needed. Lack of surface water (cited as a little more than half of the regional supply (line 812)) will directly impact the groundwater demand. Figure 3-13 The Figure: Density of Domestic Wells Per Square Mile provides a very good attempt at a graphic depiction of the number of domestic wells in Disadvantaged and Severely disadvantaged community areas (although it is difficult to identify the enclosing boundaries along the water courses). This highlights the need to very carefully monitor the effects of GSA activities on these vulnerable areas. The South American Subbasin plans to institute a vulnerable well program to protect primarily shallow domestic users. This need is amplified where there are significant areas of disadvantaged community wells. We recommend that the NASb GSA consider instituting a similar program. Figure 3-16 Groundwater Level Monitoring Network. It appears to be some of the largest gaps in the Northeast corner of the GSA where there are some of the greatest densities of domestic wells and disadvantaged communities (Figure 3-13). Similarly, there does not appear to be good coverage in the southern part of the subbasin in high density domestic well areas. Figure 3-19 See typo in title Section 3 Line 827-834 As noted in the general comments, it is important to include the Water Accounting Framework in the accounting of the GSP gross input/output modeling. If specific allocations are to be considered in future water banking, it will affect the ability of others to withdraw water. Without this allocation within the overall budget, it is not possible to determine whether the management actions will be sufficient to address future groundwater level changes. This is especially important when there is the possibility of out of the basin transfers. Line 897 States that "Most of the land within the Subbasin is currently developed to some use and conversion from agricultural uses to urban uses is not anticipated to increase demand." This does not seem consistent with the fact that the draft stated on ES -1 that that 30 percent of the GSP area is either native vegetation or fallowed farmland. How does non irrigated land conversion to urban uses not increase water use?Line 920 Given modeling that indicates well levels overall are expected to remain near their current levels, it is understandable the conclusion is that there could be little to no impacts to domestic wells. Given that there are a) 2, 563 known domestic wells, b) 6, 471 Other/Abandoned/Unknown wells, and water purveyors in the area that expect to withdraw banked water in certain areas, it would prudent to have a backup approach to ensure domestic and disadvantaged community wells do not run dry. We suggest the North American Subbasin consider this possibility and consider a vulnerable well program such as the South American Subbasin is developing. At a minimum, there should be a commitment to include robust monitoring as part of the Water Bank proposal. The discussion of the Water Accounting Framework includes no discussion of how the program may be operated to ensure no wells will run dry. There are similar concerns with the conclusions on GDEs in the area of potential water banking activities. (Line 926). Line 980-982 The draft GSP points out a very significant gap in the regional well permitting system - None of the well permitting agencies coordinates with county or city land developers. There are no setbacks or special investigation requirements for construction of supply wells near rivers or tributaries. It would be useful for this statement to point to the suggested action section. | Comment noted. As GSP implementation commences, the NASb GSAs plan to continue to work with domestic well owners through the communication and engagement management action activities as identified in Section 8. |
| 12 | Barbara Evoy - ECOS | Executive Summary ES 80-87. This paragraph is awkward and should be edited for clarity. The layperson will have difficulty understanding the intent with the current sentence structure. ES 93 The sentence should specific generally stable over X timeframe reviewed. Same with statement on line 97. Perhaps starting the section with "Groundwater levels were analyzed over the time period of X to", as a way to clearly frame the conclusions of overall declines/recovery. ES 106 GDE depth to groundwater (see summary comments). ES 146 Without an explanation of how the climate change model was run, Table ES-1 has no context when "with Climate Change" is used. See summary comments on Climate Change. Table ES-2 The NASb is proposing a better definition of chronic lowering of groundwater levels, reduction in storage, and depletion of surface water undesirable results, with more clarity, than the South American Subbasin. Kudos. | Comment noted. The NASb GSP executive summary has been updated. |
| 13 | April Doran - Cal F&W | The GSP identifies the locations of interconnected surface waters within the subbasin (Figure 5-31) and presents hydrographs that demonstrate the relationship between groundwater levels and surface water elevations. However, the GSP does not include information related to the quantity and timing of depletions from these interconnected surface waters as required by 23 CCR § 354.16(f). The Department recommends that the GSP include a table quantifying the volume of surface water depletions, by month, for all interconnected surface waters identified within the subbasin. | Comment noted. The rate and volume of seasonal streamflow depletion has been added to the GSP (Table 8-8). |
| 14 | April Doran - Cal F&W | Depth to Water: Further refinement and clarification of GDE identification methods used in the GSP will help to create a more robust analysis. Appendix O states that groundwater contours were developed using groundwater level measurements from Spring 2020 (Section 1.3, page 3), but then also states that GDEs were prioritized using 2019 depth to groundwater contours (Section 1.4, page 3). It is unclear which year of groundwater data was used in the analysis. Additionally, while the Department supports the use of seasonal high spring measurements, 2020 was a dry water year type for the Sacramento Valley. Analysis that relies on depth to water thresholds should incorporate data from a representative hydrologic period that includes a variety of water year types, rather than from a single point in time. The analysis also assumes that groundwater must be less than 30 feet below the ground surface (bgs) to support GDEs based on the maximum rooting depth of Valley Oak (*Q. lobata)* ; however, mature Valley Oak can access groundwater up to 80 feet below the ground surface (Howard 1992, Lewis & Burgy 1964). The use of a 30-foot threshold may incorrectly exclude Valley Oak communities within the subbasin from further consideration as a GDE. The Department recommends that Appendix O be revised to clarify which year of data was used to create the groundwater elevation contours for the GDE analysis and consider how the methodology could be updated to integrate a range of water years for determining potential GDEs. The Department also recommends the GSP narrowly update the methodology for GDE identification for areas within the subbasin that underlie Valley Oak communities to reflect a potential maximum rooting depth of 80 feet bgs. | Comment noted. Groundwater elevations observed during spring 2020 were not significantly different than those observed in spring 2019. Almost no changes in groundwater elevations were observed where groundwater is shallow relative to the ground surface (i.e. areas of the subbasin where groundwater is encountered at a depth of 30 feet or less) and therefore use of spring 2020 measurements was deemed appropriate for establishing sustainable management criteria. The GSP has been updated with use of a minimum threshold of 80 feet below ground surface in where areas of Valley Oak have been identified. This is a change from 30 feet below ground surface as documented in the draft GSP. Information related to these GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs as described in the added management action provided in Section 9. |

**Table S-2**
**Responses to Public Comments to Public Draft GSP**

| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 15 | April Doran - Cal F&W | Perched Groundwater Areas: The GSP discusses locations within the subbasin that have a depth to groundwater of less than 30 feet and may also have areas of perched water, and potential GDEs from these areas were removed. The GSP does not sufficiently characterize the relationship between these perched groundwater areas and the Principal Aquifer, including the impacts of pumping or of seasonally elevated groundwater levels on the groundwater in these perched areas. The Department recommends the GSP include additional information characterizing the relationship between areas of perched groundwater and the Principal Aquifer. The GSP should discuss whether seasonal highs within the Principal Aquifer contribute to the perched areas, and whether pumping within the Principal Aquifer has the potential to deplete these perched areas that may support GDE communities. If the relationship cannot be adequately characterized, the GSP should conservatively include GDEs from these areas, particularly as depth to groundwater for the principal aquifer is within the identified potential root zone for GDEs. | Comment noted. The GSAs have provided additional information within the GSP in Appendix O regarding areas of perched water. However, perched water areas are not in direct hydraulic connect to the NASb principal aquifer and the ability for GSAs to managed perched water is extremely limited and not required by SGMA. |
| 16 | April Doran - Cal F&W | Special Status Species: The GSP methodology includes an evaluation of "non- aquatic critical fauna" that may be present in the subbasin. Interconnected surface waters and their associated aquatic species are also a type of groundwater dependent ecosystem that must be evaluated within the GSP and considered in the development of sustainability criteria and analysis of undesirable results. The critical species analysis included within the GSP should be broadened to include discussion of aquatic species that are supported by interconnected surface waters. | Comment noted. The GSAs have added the list of aquatic species referenced in CDFW's (see Appendix O). Additional analysis has been provided in Table 8-8 that provides seasonal rate and volume of streamflow depletion. |
| 17 | April Doran - Cal F&W | Groundwater Minimum Thresholds: The GSP uses the model-projected groundwater level declines at each representative monitoring site (RMS) to establish minimum thresholds (MTs) by subtracting this projected decline from a baseline set at the average of Fall 2014 and 2015 groundwater elevations (page 8-14, line 318). The GSP fails to contextualize that 2014 and 2015 were two consecutive critically dry water years that occurred during an extended dry period in the Sacramento Valley, wherein groundwater extraction increased to replace more than 70% of lost agricultural water supplies (Lund 2018). Though the GSP asserts that "no negative impacts<br>were reported by beneficial users in the subbasin" (line 320), it is probable that environmental users of groundwater were experiencing adverse impacts due to combined groundwater depletion and reduced surface water availability. These adverse impacts include stressed or dying riparian vegetation, poor instream habitat availability, and increased water temperatures (DFW 2019). It is inappropriate to rely on groundwater levels from 2014 and 2015 as a baseline from which groundwater could continue to decline before reaching the established MTs, as undesirable results will likely be experienced before MTs are reached. The Department recommends the GSP reselect its chosen groundwater level baseline to a more representative hydrologic period for the subbasin, rather than relying on groundwater levels experienced during critically dry years. MTs should be updated accordingly. | Comment noted. Additional information that supports the rationale for use of groundwater elevations from 2014 and 2015 has been added to Section 8. |
| 18 | April Doran - Cal F&W | Depletion of Interconnected Surface Waters: As a result of the projected increases in groundwater use within the subbasin, the GSP projects that groundwater level declines along the interconnected Sacramento River will result in approximately 5,800 acre-feet per year (AFY) of surface water depletions. Though the GSP presents information related to the projected change in groundwater pumping, seepage, diversions, and streamflow in Figure 8-7 (page 8-42), a table summarizing this information by month would clarify potential ISW impacts and facilitate comparisons to baseline conditions (See Comment #1). The GSP asserts that though the Sacramento River will experience depletions, municipal development along the Sacramento River that takes agricultural land out of production will result in a net increase in flows of approximately 17,200 AFY (page 8-41, line 907). Additional information is needed in the GSP to support this claim and ensure that environmental users are protected from undesirable results. The GSP does not provide information related to interconnected surface waters within the subbasin other than the Sacramento River, and it is unclear what effect the SMCs will have on depletions. Furthermore, these anticipated land use changes and concurrent reduced surface water demands are not within the control of GSAs. GSAs should anticipate future scenarios wherein they are accountable for mitigating interconnected surface water depletions attributable to groundwater pumping, instead of leaning on proposed land use change to reduce surface water demand, particularly when surface water rights are not under GSA management. The GSP should include a discussion of projected depletions of all interconnected surface waters in the basin, not only the Sacramento River, based on the established SMCs. The GSP should include additional detail in a table that summarizes the projected depletions, reduced diversions, and streamflow by month to facilitate comparison to depletions under existing conditions. In order to better support its claim that Sacramento River flow would increase over the SGMA implementation period, the GSP must provide additional details related to the underlying assumptions used in this calculation, including the following:<br>1.A characterization of the water rights that the GSP assumes will stop diverting water from the Sacramento River, including a discussion of how the water will be maintained instream to support surface flows.<br>2.The anticipated timeline for the conversion of land from agricultural to municipal use.<br>3.The anticipated timeline for groundwater pumping increases within the subbasin.<br>4.Contingency plans, triggered by specific monitoring metrics, that will initiate projects to avoid surface water depletions should the land use changes fail to offset the increase in groundwater pumping as anticipated. | Comment noted. Additional information supporting the analysis for interconnected surface water has been added to Section 8.9. The anticipated timeline for land use changes and potential increases in pumping does not effect the ability for the NASb to reach sustainability. The established minimum thresholds and description of undesirable results as provided in the NASb GSP is protective of beneficial uses and users of groundwater within the implementation horizon identified in SGMA of 20 years. |
| 19 | April Doran - Cal F&W | Environmental Beneficial Users: The GSP does not sufficiently analyze potential impacts of the selected SMCs on environmental beneficial users of groundwater or interconnected surface waters. While the GSP does include sections that discuss the effects of the minimum thresholds for each sustainability indicator on each beneficial user within the subbasin, for the groundwater level MTs, the GSP states only that the groundwater level MTs "protect most known GDEs" within the subbasin (page 8-20, line 426). It is unclear what the GSP means by "most GDEs," and no further detail is provided about whether any analyses were completed that involve comparing the MTs at each RMS to nearby GDE communities and their rooting depths. Additionally, in its discussion of interconnected surface waters within the subbasin, the GSP does not analyze potential impacts to environmental users of surface waters, including aquatic habitat or species. The Department recommends the GSP include additional analysis related to the impacts of the established SMCs on environmental users, including GDEs and interconnected surface water. The groundwater level MTs at each representative monitoring well identified for GDEs in Figure 7-3 (page 7-14) should be compared to the rooting depths of the identified vegetation in each GDE community (See Comment #2(i)).<br>Monitoring of physical indicators of GDE health (i.e., Normalized Difference Vegetation Index (NDVI)) should be completed in addition to the continued monitoring of groundwater levels. The GSP should also include additional analysis to demonstrate that environmental users of interconnected surface waters would not experience undesirable results under the established MTs. The GSP should explicitly discuss the impacts of projected depletions on surface flows, water temperatures, and aquatic species and habitat. | Comment noted. Information related to GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs Normalized Derived Moisture Index (NDMI) as described in the added management action provided in Section 9. |

**Table S-2**
**Responses to Public Comments to Public Draft GSP**

| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 20 | April Doran - Cal F&W | The planned and supplemental project and management activities included in the GSP focus on increased surface water supplies and delivery, conjunctive use, or water banking and recharge. Though the GSP indicates that the planned projects are expected to be sufficient to achieve basin sustainability, should the projects fail to produce the anticipated groundwater benefit or encounter unexpected delays, it may be necessary to implement additional demand management projects that could likely produce groundwater benefits within a shorter timeframe. The Department recognizes that the GSP discusses existing demand management activities within the subbasin, including temporary conservation measures and urban and agricultural water use efficiency programs (page 9-3, line 38). Additional discussion of potential program expansion or other demand reduction projects that could be implemented within the subbasin would strengthen the GSP's list of supplemental projects. | Comment noted. The NASb GSP includes the appropriate existing and planned projects and management actions to reach or maintain sustainability. |
| 21 | Barbara Evoy - ECOS | Please see ECOS letter for general comments on the GSPD and incorporated them in my public comments by reference.Â  Please also note the relevant concerns of the attached NGO and CDFW letters. | Comment noted. |
| 22 | Barbara Evoy - ECOS | Please attached the ECOS letter to my responses as the general comments apply to my earlier line by line submittal. | Comment noted |
| 23 | ECOS | CLIMATE CHANGE: As one of the most critical elements of long-term water supply planning, the GSPD should clearly describe the climate change study(ies) it based the analysis on, its assumptions, and the arguments for and against the selected approach. The NASb GSPD and the South American Subbasin (SASb) GSPD have little to no discussion in the body of the GSPDs as to how climate change was evaluated. The documents do not have any type of detailed summary of the process, the climatic range considered, how "change" was integrated with historical years reviewed in the past water budget nor how the earlier analysis fits into the current science of climate change. Both state that the work was done as part of the American River Basin Study (ARBS) but 1) provide both inaccurate citations to the study and 2) where it is linked in the NASb GSPD, it is only to a PCWA website that talks generally about it being developed. The climate change model is very generally discussed in 8 lines in Section 6., without offering any true overview of the effort. As it stands now, the GSPD does not set the stage for any of the Water Budget tables that show "climate change".<br>The NASb GSPD includes "with and without climate change" in tables as if reviewers were fully familiar with the model parameters and they were generally agreed upon. While the document displays output, it lacks a clear discussion on the model. The conclusions of the water budget, without an understanding of the climate change analysis, are only speculative to the reviewers. Lack of climate documentation implies either the GSAs do not know how it was done, or the GSAs don't feel the work is of the quality to sustain public scrutiny. We hope neither is the case and encourage the GSAs to include a much clearer discussion of how climate change was handled. | Comment noted. Additional information as provided in Appendix P has being added to the NASb GSP. |
| 24 | Barbara Evoy - ECOS | On September 30, 2021, a 490 page Appendix was released which describes much of the data used in the model and some specifics of the climate change input data. The 490 pages provide a good description of these model inputs for future reference but do not digest the information in a way to provide the reader with an understanding of the overall process and how up to date the model is. | Comment noted. |
| 25 | Barbara Evoy - ECOS | The Delta Stewardship Council's Sacramento-San Joaquin Delta Climate Change Vulnerability Assessment work (Delta Adapts: Water Supply Technical Memorandum May, 2021) summarizes many recent regional climate studies and shows that climate change will substantially raise sea level in the delta. In addition to more frequent and longer curtailment of surface water, additional flows will be necessary from upstream diversions to stave off salinity intrusion. There is no discussion in the GSPD of these new studies, nor what the water supply impacts may be. Presumably, the impacts will not just affect surface water supplies but regional groundwater supplies as well. This report should be part of the GSPD analysis. Rob Swartz indicated both the Delta Stewardship climate change modeling and the anticipated additional surface water releases would be analyzed in relation to the GSPD water budget. | Comment noted. The climate change analysis included in the NASb GSP was inclusive of a scenario of approximately 45 centimeters of sea level rise. In addition, when preparing the water budget and modeling analysis, the GSAs considered the best available and most current information and science. |
| 26 | Barbara Evoy - ECOS | The newly released GSPD Appendix recommends future work to increase the accuracy of the model. These recommendations should be woven into both the management actions, timeline for completion and budget. | Comment noted. |
| 27 | Barbara Evoy - ECOS | GROUNDWATER DEPENDENT ECOSYSTEMS (GDEs): New information presented recently (Lewis and Burgy 1964 study) to the South American GSP working group suggests root depth analysis for GDEs should use a depth of 80 feet, not the 30 feet used in the GSPD. In addition, The Nature Conservancy (TNC) is about to publish a study indicating root depths for certain oak species are 25 meters. A recent TNC study also identifies the inability of oak woodlands to reproduce when ground water levels are too low. Therefore, a determination of appropriate root depths to maintain GDEs should be included as a potential data gap and for priority Management Action in the final GSP. Rob Swartz indicated he had already begun this analysis and that this would be included in the GSPD, if time allowed. | Comment noted. The GSP has been updated with use of a minimum threshold of 80 feet below ground surface in where areas of Valley Oak have been identified. This is a change from 30 feet below ground surface as documented in the draft GSP. Information related to these GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs as described in the added management action provided in Section 9. |

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**Responses to Public Comments to Public Draft GSP**

| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 28 | Barbara Evoy - ECOS | WATER BUDGET: The GSPD provides information from published 2015 Urban Water Management Plans (UWMPs). Earlier this year, water purveyors updated these plans for 2020 submittal. These plans include new forecasted demand data as well as updated actual supply and demand from 2015-2020. These 2020 numbers should be included in the final GSP analysis and discussion. The next GSP update should include information developed for the 2025 UWMP (Rob Swartz indicated this would be done). The Water Budgets should also provide a realistic view of how curtailed surface water rights will affect groundwater withdraws in dry years. Past groundwater demands appear to be extrapolated forward without the regards for climate change effects on surface water supplies | Comment noted. At the time the water budget was being prepared the GSAs used the best available and current information which included 2015 Urban Water Management Plan (UWMP) data. There was not sufficient time to incorporate 2020 UWMP data as most of these UMWP were not adopted by local agencies until the middle of 2021. |
| 29 | Barbara Evoy - ECOS | DEMAND REDUCTION: The GSPD does not include demand reduction as a Project and, therefore, does not reduce groundwater demand resulting from the associated water conservation and efficiency actions and programs that are expected to take place. As conservation programs can be more cost effective than new construction or permitting programs, these demand reducing programs should be described along with the logic for not including them in this GSP. Rob Swartz indicated these were already being done so he did not feel they should be included. We feel the document would be stronger with a clear definition of expected future demand management. | Comment noted. The NASb GSP includes the appropriate existing and planned projects and management actions to reach or maintain sustainability. |
| 30 | Barbara Evoy - ECOS | WATER BANKING: Water Banking is an important aspect of NASb groundwater management, both historically and in the future proposals. Therefore, it is critical to understand how previously banked water fits into the Water Budget described in the GSPD. The basin groundwater is not “all one color” if agencies believe they have not abandoned their banked water but intend to withdraw it under their groundwater rights as developed water. The Water Budget cannot be treated as a common resource and amount if this is the case. The GSPD uses gross input and output numbers to calculate the basin’s sustainability without this critical accounting.<br>If all banked water is abandoned, then the basin’s pumpers can address sustainability with proposed projects. If one or more entity intends to make a significant withdraw of what they consider previously banked water (as discussed in Section 3 lines 827-834), however, the situation changes. The dynamics of the cost/benefit and necessary projects to mitigate groundwater draw down may significantly shift. Section 3 Line 833 cites that SGA has maintained an accounting of groundwater since 2007, but it is not reflected in the document. The document is not clear on what the status of the groundwater rights are nor how they are envisioned to be exercised. | Comment noted. These comments will be considered as the water bank project is further developed. |
| 31 | Barbara Evoy - ECOS | The need for proper accounting is particularly highlighted in a recent PPIC report, Improving California’s Water Market (https://www.ppic.org/publication/improving-californias-water-market/) and the legal discussion in an appendix by Brian Gray (https://www.ppic.org/wp-content/uploads/0921aar-appendix.pdf)<br>If previously “banked” water is not adequately described in the 2020 GSP, it appears the GSP may have to be significantly revised to incorporate this activity, as the conclusions could be substantially different. Significant future revision to account for water banking allocations and management could reduce the amount of time the basin will have to implement projects and reach sustainability by 2040. It would appear that consensus on how the water bank will be operated and what withdraws will be permitted and when, should be a very high priority for the near term. | Comment noted. These comments will be considered as the water bank project is further developed. |
| 32 | Barbara Evoy - ECOS | Rob Swartz indicated that he considers the setting of minimum thresholds in the GSP to provide an operational base for water banking activities. If this is the expectation, then it should be detailed in the GSPD so the purveyors, public, and owners of shallow wells can understand both 1) the impacts to amounts of previously “banked” water, and 2) a minimum threshold that may become an operational constraint and regular groundwater level seen in dry years with water bank withdraws. As this is a different use of the GSPD minimum threshold idea discussed to date, ECOS would like to be engaged in the analysis and public review process of Water Bank impacts using this framework. The discussion of past water banking, accounting, loss, and criteria for withdraw, as well as potential impacts to adjacent subbasins, Interconnected Surface Water and GDEs should include a significant public review component. The outcomes should be clearly discussed in the context of the GSP and reflected in an update to the document. | Comment noted. These comments will be considered as the water bank project is further developed. |
| 33 | Barbara Evoy - ECOS | VULNERABLE SHALLOW WELLS: Given modeling that indicates well levels overall are expected to remain near their current levels, the GSPD conclusion is that there could be little to no impacts to domestic wells. There are, however, a) 2,563 known domestic wells, b) 6,471 “Other/Abandoned/Unknown” wells. Water purveyors in the area are also expected to withdraw banked water for various transfers at specific times. It would be prudent to have a backup approach to ensure domestic and disadvantaged community wells do not run dry. We suggest the NASb consider a vulnerable well program such as the one the SASb is developing. At a minimum, there should be a commitment to seek out additional information on the more than 6,000 unknown or abandoned wells and include robust monitoring as part of the Water Bank proposal. As of October 11, an Appendix B, “Refinement of Domestic Well Densities”, is not posted. | A domestic/shallow well data collection and communication program has been added as a GSP management actions strengthen communication and the transfer of data and information between the GSA and domestic well owners during GSP implementation. In addition, the State and Federal Agency's groundwater substitution transfer program guidance document include a process to evaluate the potential effects of transfer on other beneficial users of uses of groundwater. |

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| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 34 | Barbara Evoy - ECOS | COMMUNICATION AND INVOLVEMENT OF THE PUBLIC: We recommend that the GSAs look carefully at their websites and outreach to fully involve the regional stakeholders in both the monitoring work, the development of Water Bank operating criteria, and the continued GSP evaluation and update process. Websites should have clearly defined standards for announcing public meetings, comment periods, comment procedures and public involvement. We also suggest that the GSAs present monitoring data to the public in a form that allows property owners to track information from sampling events that are of immediate interest to them. We suggest that the GSAs incorporate monitoring well telemetry so timely information is communicated.<br>Residents in the SASb have been interested in making sure their well information is included, and additional domestic wells have been offered for water level and water quality monitoring. NASb residents may wish to provide additional well construction information with further outreach. | Comment noted. The NASb GSAs will continue to make information public as it becomes available during GSP implementation. One example of the GSAs commitment to do so is the addition of a domestic/shallow well data collection and communication program which has been added as a GSP Management Action #4 to strengthen communication and the transfer of data and information between the GSA and domestic well owners during GSP implementation. |
| 35 | Barbara Evoy - ECOS | Rob Swartz and Trevor Joseph indicated they would look at additional commitments to include the public in implementation. We suggest the GSPD consider a public advisory group similar to the one being set up in the Consumnes Basin. This would provide the GSAs feedback as to whether or not they are reaching critical segments of the public and how they might improve outreach. | Comment noted. The GSAs are commented to the outreach and engagement activities and process identified in Section 11. |
| 36 | Barbara Evoy - ECOS | The yet unfinished Water Bank discussion steps should be highlighted in the list of near term actions and any resulting management actions added. Project cost equity may need to be reconsidered if future water banking withdraws significantly change local conditions. Until Water Banking is addressed, the project list should be considered preliminary. | Comment noted. |
| 37 | Barbara Evoy - ECOS | CONCLUSION: The NASb GSPD has a lot of very useful information and will provide an excellent start to regional subbasin management of groundwater with the suggestions provided above. As one of the few community groups that participated in the development of all three subbasin GSPDs, however, we feel improvements not only need to be made in the individual plans, but that consistency is also needed between the plans. There does not appear to a reason for differences in key overarching management approaches, and analytical tools. This subbasin variability will not only hinder economies of scale for analysis, but efficient and effective management of the larger basin. | Comment noted. The NASb GSAs have coordinated with other adjacent subbasins during each respective GSAs development of their GSPs. Similar tools and methodology has been used between subbasins, however each GSP has been developed within the local control and unique characteristics and potential different objectives of each basin in accordance with SGMA. |
| 38 | Barbara Evoy - ECOS | Please add the ECOS Consumnes letter to my public comments, as there are common areas, esp in climate change modeling, that apply to the NASb | Comment noted |
| 39 | Barbara Evoy - ECOS | ECOS is seeing the ongoing, complex effects of climate change on the environment and people in the Cosumnes and Greater Sacramento regions, throughout California as a whole, and globally. Extreme heat waves are now more common in coastal areas, and torrential rains and flooding are becoming far more frequent in the eastern United States and in parts of Europe. While climate change is mentioned in a number of sections in the GSPPD, we are looking for much more robust, comprehensive discussion as it affects each topic. | Comment noted. |
| 40 | Barbara Evoy - ECOS | The document's Executive Summary (ES) does not adequately include the impacts and importance of climate change as a factor affecting CS groundwater sustainability. It is noted as an example of uncertainty in the Sustainable Yield modeling process, and it refers to "wetter" and "drier" years. However, the Executive Summary needs to discuss the pivotal importance of climate change as it could compromise the GSAs' long term best efforts. During the 1999-2018 interval, thirteen out of twenty years were recorded by the California Department of Water Resources in its Water Year Type classification system as Below Normal, Dry, or Critical (Dry) for precipitation. There is no indication that the next twenty to thirty years will have a greater number of wetter years, or years that would be considered "normal". | Comment noted. |
| 41 | Barbara Evoy - ECOS | Climate change needs to be explicitly presented as a key policy concern in every section of the GSP, including the Executive Summary. As is often the case, many readers will stop after reading the Executive Summary. Therefore, the key issues such as climate change, and related priorities for action need to be prominent in the first section of the document. | Comment noted. |

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|---|---|---|---|
| 42 | Amanda Cranford | Avoiding Undesirable Results: The requirement for minimum thresholds as spelled out in the SGMA regulations is as follows:<br>"The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators." (CCR 23 §354.28(b)(2))<br>According to DWR (2021), "it is up to GSAs to define in their GSPs the specific significant and unreasonable effects that would constitute undesirable results and to define the groundwater conditions that would produce those results in their basins." The GSA should qualitatively describe what conditions within the subbasin would constitute an undesirable result with regard to streamflow depletion, ensuring that the description accounts for impacts to instream habitat that supports ESA-listed salmonids and green sturgeon. If data that would inform potential streamflow depletion impacts is lacking, NMFS recommends the final GSP follow guidance from California Department of Fish and Wildlife (2019) and develop conservative streamflow depletion thresholds as a cautionary principle until the surface flow/groundwater dynamic in the North American subbasin is better studied and understood. | Comment noted. At this time, the NASb GSP includes the appropriate minimum thresholds to avoid undesirable results and maintain sustainability. However, information related to GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs Normalized Derived Moisture Index (NDMI) as described in the added management action provided in Section 9 as an added measure to manage and understand beneficial uses and users of groundwater. |
| 43 | Jeff Litton | How much will the groundwater drop if Nevada Irrigation District(NID) achieves their plan to construct Centennial Dam, divert 221,400 acre feet of water from Bear River above Camp Far West Reservoir, and sell huge amounts of that water to Southern California entities through the California Aqueduct as they have clearly demonstrated to be their plan? They paid to be part of a study showing how they can legally take water from South Sutter Water District and sell it to the highest bidders south of the delta. They paid to be part of a study for the Association of California Water Agencies showing their marketability to Southern California buyers. Releases are made down the Bear River to augment system-wide supply when CVP South-of-Delta agricultural water service contract allocations are below 20 percent.<br>https://www.acwa.com/wp-content/uploads/2017/06/2017-06-05-ACWA-Integrated-Storage-Final-Report.pdf NID literally has no way to pay for the dam without selling that water on the water market. Can SSWD compete against L.A.? NID is not measuring how much extra water there is in the Bear River watershed below the Camp Far West diversions, they are only measuring how much water can be legally stolen from SSWD. NID considers all water going to SSWD as excess water. They are planning to use 1927 water rights under application 5634 to over-allocate the Bear River supply, and create shortage for SSWD users that is their plan.NID would have shortchanged South Sutter Water District 13 out of the previous 18 years studied, or 8 of the previous 10 years studied. Simply look at the amount spilled below Camp Far West Reservoir diversions, and subtract 221,400 AF. 1999, not enough water. 2000, not enough water. 2001, not enough water. 2002, not enough water. 2004, not enough water. 2007, not enough water. 2008, not enough water. 2009, not enough water. 2010, not enough water. 2012, not enough water. 2013, not enough water. 2014, not enough water. 2015, not enough water, and so on. SSWD farmers would be forced to resort to pumping more groundwater, and thereby jeopardize and likely lower the North American Subbasin groundwater level. During the NID Director candidate debates of 2020, former director Scott Miller said NID would continue fighting downstream users in court and win those cases to take their(his) water. A thorough analysis should be conducted to find out the downstream impacts if NID diverts 221,400 acre feet. How many farmers will lose water? How many wells will go dry? I have been to the Colorado River delta, where a great American river dies before reaching the ocean. I've seen what over-allocation looks like. For the sake of our farmers, and our family's well in Wheatland, I hope action is taken to stop Centennial Dam before it's too late.https://yubariver.org/wp-content/uploads/2016/01/a5634X01_noticeSWRCB.pdf | Comment noted. The GSAs are unaware of any discussions related to the Centennial Dam as it relates to groundwater management planning under the SGMA. |
| 44 | Ralph Propper - ECOS | Plan should include a Management Action to form a technical working group (or similar mechanism) comprised of representatives of each of the region's three subbasins. The group should be charged with carrying out the work required to improve the model and to keep the model updated so that it can be used as needed for annual Plan reporting and five-year Plan updates. The work of the group should be open to public review so that diverse scientific viewpoints can be heard. | Comment noted. The NASb GSAs have not identified interbasin coordination as a specific management action as defined under the SGMA. However, GSAs will maintain an open communication and engagement process during GSP implementation including closely coordinating with other subbasins on many aspects of the GSP such as future updates to the groundwater model. |
| 45 | Ralph Propper - ECOS | Plan's Management Action section should identify the specific steps to carry out the model improvements called for in the CoSANA model report. The Plans should provide the funding and other resources needed to accomplish the model updates and improvements in time for the next Plan update in 2025 | Comment noted. The NASb GSAs have included the costs for potential model updated within the GSP implementation budget as described in Section 10. |
| 46 | Ralph Propper - ECOS | Priority should be given to address the specific areas of model deficiency or short comings that are important to subbasin management including the protection of Groundwater Dependent Ecosystems and groundwater surface water interactions. | Comment noted. |
| 47 | Ralph Propper - ECOS | Additional emphasis should be placed on more recent climate conditions and their extrapolation into the future rather than depending on older sets of climate and hydrologic data. Older data sets are not as reflective of the changes in climate currently experienced and projected to occur. This includes increased likelihood of shorter rainy seasons, stronger atmospheric rivers, and warmer temperatures leading to lower peak snowpack. As part of this analysis, consideration should also be given to the changes in absorption that warmer soil will have upon snowpack and rainfall runoff | Comment noted. The NASb GSAs have and will continue to use best available science and data as information becomes available and can be incorporated into the GSP. |
| 48 | Ngodoo Atume - GLF | Provide the population of each identified DAC | Comment noted. The NASb GSP provides the required information under the SGMA. |

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| 49 | Ngodoo Atume - GLF | Include a map showing domestic well locations and average well depth across the subbasin. | Comment noted. The NASb GSP includes density and other relevant domestic well information is provided in Section 3 and Appendix B. |
| 50 | Ngodoo Atume - GLF | On applicable figures in Section 3, make block group map layers more transparent so that the cities and features are visible underneath, to help with understanding the communities and beneficial users that lie within each block group | Comment noted. |
| 51 | Ngodoo Atume - GLF | On the map of stream reaches in the subbasin (Figure 5-31), identify gaining and losing reaches in addition to interconnected and disconnected reaches. Consider any segments with data gaps as potential ISWs and clearly mark them as such on maps provided in the GSP | Comment noted. |
| 52 | Ngodoo Atume - GLF | Provide depth-to-groundwater contour maps using data from additional time periods other than just spring of 2020. Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate when mapping ISWs. We recommend the 10-year pre-SGMA baseline period of 2005 to 2015 | Comment noted. The SGMA requires current groundwater levels for contour maps which is depicted the NASb GSP on Figure 5-2. |
| 53 | Ngodoo Atume - GLF | Reconcile ISW data gaps with specific measures (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP. | Comment noted. The NASb GSAs have not identified any significant interconnected surface water data gaps, however future monitoring network improvements are planned to aid in continued advancement of the basin understanding. |
| 54 | Ngodoo Atume - GLF | Use depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. We recommend that a baseline period (10 years from 2005 to 2015) be established to characterize groundwater conditions over multiple water year types. Refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. | Comment noted. The NASb GSAs analysis supported use of 2020 year water levels as these provided conservative and appropriate estimates for establishment sustainable management criteria in this basin. |
| 55 | Ngodoo Atume - GLF | Refer to Attachment B for more information on TNC's plant rooting depth database. Deeper thresholds are necessary for plants that have reported maximum root depths that exceed the averaged 30-ft threshold, such as valley oak (*Quercus lobata* ). We recommend that the reported max rooting depth for these deeper-rooted plants be used, if these species are present in the subbasin. For example, a depth-to-groundwater threshold of 80 feet should be used instead of the 30-ft threshold, when verifying whether Valley Oak polygons from the NC Dataset are connected to groundwater. | Comment noted. The GSP has been updated with use of a minimum threshold of 80 feet below ground surface in where areas of Valley Oak have been identified. This is a change from 30 feet below ground surface as documented in the draft GSP. Information related to these GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs as described in the added management action provided in Section 9. |
| 56 | Ngodoo Atume - GLF | Quantify and present all water use sector demands in the historical, current, and projected water budgets with individual line items for each water use sector, including managed wetlands. | Comment noted. |
| 57 | Ngodoo Atume - GLF | In the Notice and Communications section, describe active and targeted outreach to engage DACs, domestic well owners, tribes, and environmental stakeholders throughout the GSP development and implementation phases. Refer to Attachment B for specific recommendations on how to actively engage stakeholders during all phases of the GSP process | Comment noted. The NASb GSAs reached out to community water systems in disadvantaged communities (DACs) areas. However many DACs are located within water districts or agencies which are represented by their respective district or agencies boards. Please refer to the Notice and Communication of the GSP (Section 11) for details. For NASb GSA coordination with environmental groups see Section 11.2.4. For NASb GSA coordination with DAC and domestic well owner outreach during development of the GSP see Section 11.2.5. For NASb GSA DAC outreach with domestic well owner during implementation see Section 11.6. |

**Table S-2**
**Responses to Public Comments to Public Draft GSP**

| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 58 | Ngodoo Atume - GLF | Describe efforts to consult and engage with DACs and domestic well owners within the subbasin | See comment response above. |
| 59 | Ngodoo Atume - GLF | Utilize DWR's tribal engagement guidance to comprehensively address all tribes and tribal interests in the subbasin within the GSP | See comment response above. |
| 60 | Ngodoo Atume - GLF | Describe efforts to consult and engage with environmental stakeholders within the subbasin | See comment response above. |
| 61 | Ngodoo Atume - GLF | Chronic Lowering of Groundwater Levels - Describe direct and indirect impacts on DACs, drinking water users, and tribes when describing undesirable results and defining minimum thresholds for chronic lowering of groundwater levels | Comment noted. To evaluate the interests of each beneficial use and users of groundwater including but not limited to domestic, agriculture, municipal and industrial, the unique water level data and information was applied to collectively evaluate the potential negative effects of chronic lowering of groundwater levels as described in 8.4.1.3. |
| 62 | Ngodoo Atume - GLF | Degraded Water Quality - Describe direct and indirect impacts on drinking water users, DACs, and tribes when defining undesirable results for degraded water quality. For specific guidance on how to consider these users, refer to "Guide to Protecting Water Quality Under the Sustainable Groundwater Management Act | Comment noted. To evaluate the interests of each beneficial use and users of groundwater including but not limited to domestic, agriculture, municipal and industrial, the unique water quality data and information was applied to collectively evaluate the potential negative effects of chronic lowering of groundwater levels as described in Section 8.7.1.3. |
| 63 | Ngodoo Atume - GLF | Degraded Water Quality - Evaluate the cumulative or indirect impacts of proposed minimum thresholds for degraded water quality on DACs, drinking water users, and tribes | See comment response above. |
| 64 | Ngodoo Atume - GLF | Degraded Water Quality - Set minimum thresholds and measurable objectives for all water quality constituents within the subbasin that may be impacted or exacerbated by groundwater use and/or management. Ensure they align with drinking water standards | Comment noted. The NASb GSP includes additional water quality detail as documented in Sections 5.8 and 8.7. |
| 65 | Ngodoo Atume - GLF | When defining undesirable results for chronic lowering of groundwater levels, provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the subbasin.[15] Defining undesirable results is the crucial first step before the minimum thresholds can be determined | Comment noted. Information related to GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs as described in the added management action provided in Section 9. |
| 66 | Ngodoo Atume - GLF | When establishing SMC for the subbasin, consider that the SGMA statute [Water Code §10727.4(l)] specifically calls out that GSPs should include "impacts on groundwater dependent ecosystems". | Comment noted. Information related to these GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs as described in the added management action provided in Section 9. |

**Table S-2**
**Responses to Public Comments to Public Draft GSP**

| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 67 | Ngodoo Atume - GLF | When defining undesirable results for depletion of interconnected surface water, include a description of potential impacts on instream habitats within ISWs when minimum thresholds in the subbasin are reached.[17] The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts to environmental beneficial users of interconnected surface waters as these environmental users could be left unprotected by the GSP. These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law. [6, 18] | Comment noted. Based on the GSAs understanding of the water budget and modeling elements of the GSP, instream flows will see only very very minor changes in flow under projected condition (See monthly changes in flow data as described in Section 8.9). For this reason, a reasonable assumption is that groundwater management as described within the GSP will not have a significant and unreasonable impact to beneficial uses and users including environmental that are dependent on interconnected surface water and groundwater. |
| 68 | Ngodoo Atume - GLF | Incorporate climate change into imported water flow inputs for the projected water budget | Comment noted. Local water agencies do no import surface water in the NASb. Changes of surface water inflow into the NASb are contemplated in climate change analysis as described in Section 6 and Appendix P. |
| 69 | Ngodoo Atume - GLF | Incorporate climate change scenarios into projects and management actions | Comment noted. The water budget elements of the NASb GSP as described in Section 6 does incorporate climate change. Projects and management actions as described in the NASb GSP were selected to sustainably manage groundwater through a balanced water budget due to any effects seen from climate change and future land use changes. |
| 70 | Ngodoo Atume - GLF | Provide maps that overlay current and proposed monitoring well locations with the locations of DACs, domestic wells, tribes, GDEs, and ISWs to clearly identify potentially impacted areas. Increase the number of RMWs in the shallow aquifer across the subbasin as needed to adequately monitor all groundwater condition indicators. Prioritize proximity to DACs, domestic wells, tribes, and GDEs when identifying new RMWs | Comment noted. The NASb GSAs specifically considered the interests of all beneficial uses and users of groundwater when specifically identifying each representative monitoring well. in addition, the NASb GSAs followed representative monitoring well density guidelines as provided by DWR. For example, the evaluation of the methodology for identifying representative monitoring wells that aid in safeguarding domestic well groundwater users interests are provided in Section 7.1.4.2. |
| 71 | Ngodoo Atume - GLF | Further describe the biological monitoring that can be used to assess the potential for significant and unreasonable impacts to GDEs or ISWs due to groundwater conditions in the subbasin. | Comment noted. Information related to GDEs is provided in Appendix O and the NASb GSAs are committed to monitoring GDEs Normalized Derived Moisture Index (NDMI) as described in the added management action provided in Section 9 as an added measure to manage and understand beneficial uses and users of groundwater. |

**Table S-2**
**Responses to Public Comments to Public Draft GSP**

| Comment No. | Name | Comment | Response to Comment / Changes to the GSP |
|---|---|---|---|
| 72 | Ngodoo Atume - GLF | For DACs and domestic well owners, include a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. Refer to Attachment B for specific recommendations on how to implement a drinking water well mitigation program | Comment noted. As GSP implementation commences, the NASb GSAs plan to continue to work with domestic well owners through the additional communication and engagement management action activities as identified in Section 8. |
| 73 | Ngodoo Atume - GLF | For DACs and domestic well owners, include a discussion of whether potential impacts to water quality from projects and management actions could occur and how the GSAs plan to mitigate such impacts | Comment noted. Based on the NASb GSAs evaluation of water quality data and information and understanding of the projects and management actions included in the GSP, The GSAs are not anticipating any significant water quality changes during the implementation of the GSP. |
| 74 | Ngodoo Atume - GLF | Recharge ponds, reservoirs, and facilities for managed aquifer recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For further guidance on how to integrate multi-benefit recharge projects into your GSP, refer to the “Multi-Benefit Recharge Project Methodology Guidance Document". | Comment noted. |
| 75 | Ngodoo Atume - GLF | Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results. | Comment noted. Demand management is ongoing effort and consideration for virtually every water agency, city, or municipality serving water in California. Although the GSAs feel the NASb is sustainably being management, the goals and commitment of GSAs to expand conjunctive use is a direct response to address the potential for future undesirable results in the basin. |

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***GAVIN NEWSOM, Governor***
***CHARLTON H. BONHAM, Director***

October 7, 2021

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**Subject: COMMENTS ON THE NORTH AMERICAN SUBBASIN DRAFT GROUNDWATER SUSTAINABILITY PLAN**

Dear Mr. Swartz,

The California Department of Fish and Wildlife's (Department) North Central Region is providing comments on the North American Subbasin Draft Groundwater Sustainability Plan (GSP) prepared by Reclamation District 1001 Groundwater Sustainability Agency (GSA), Sacramento Groundwater Authority GSA, South Sutter Water District GSA, Sutter County GSA, and Placer County GSA pursuant to the Sustainable Groundwater Management Act (SGMA).

As trustee agency for the State's fish and wildlife resources, the Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species (Fish & Game Code §§ 711.7 and 1802). Development and implementation of GSPs under SGMA represents a new era of California groundwater management. The Department has an interest in the sustainable management of groundwater, as many sensitive ecosystems and species depend on groundwater and interconnected surface waters, including ecosystems on Department-owned and -managed lands within SGMA-regulated basins.

SGMA and its implementing regulations afford ecosystems and species specific statutory and regulatory consideration, including the following as pertinent to Groundwater Sustainability Plans:

- GSPs must **consider impacts to groundwater dependent ecosystems** (GDEs) (Water Code § 10727.4(l); see also 23 CCR § 354.16(g));
- GSPs must consider the interests of all beneficial uses and users of groundwater, including environmental users of groundwater (Water Code § 10723.2) and GSPs must **identify and consider potential effects on all beneficial uses and users of groundwater** (23 CCR §§ 354.10(a), 354.26(b)(3), 354.28(b)(4), 354.34(b)(2), and 354.34(f)(3));
- GSPs must **establish sustainable management criteria that avoid undesirable results** within 20 years of the applicable statutory deadline, including **depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water** (23 CCR § 354.22 *et seq*. and Water Code §§ 10721(x)(6) and 10727.2(b)) and describe monitoring networks that can identify adverse impacts to beneficial uses of interconnected surface waters (23 CCR § 354.34(c)(6)(D)); and

- GSPs must **account for groundwater extraction for all water use sectors,** including managed wetlands, managed recharge, and native vegetation (23 CCR §§ 351(al) and 354.18(b)(3)).

Furthermore, the Public Trust Doctrine imposes a related but distinct obligation to consider how groundwater management affects public trust resources, including navigable surface waters and fisheries. Groundwater hydrologically connected to navigable surface waters and surface waters tributary to navigable surface waters are also subject to the Public Trust Doctrine to the extent that groundwater extractions or diversions affect or may affect public trust uses (Environmental Law Foundation v. State Water Resources Control Board (2018), 26 Cal. App. 5th 844). Accordingly, groundwater plans should consider potential impacts to and appropriate protections for navigable interconnected surface waters and their tributaries, and interconnected surface waters that support fisheries, including the level of groundwater contribution to those waters.

In the context of SGMA statutes and regulations, and Public Trust Doctrine considerations, the Department values SGMA groundwater planning that carefully considers and protects groundwater dependent ecosystems (GDEs) and fish and wildlife beneficial uses and users of groundwater and interconnected surface waters.

**COMMENT OVERVIEW**

The Department is writing to support ecosystem preservation in compliance with SGMA and its implementing regulations based on Department expertise and best available information and science.

The Department recognizes and appreciates the effort of the GSAs to characterize all beneficial users of groundwater in the subbasin and include detailed modeling based on robust monitoring data. However, the Department believes the GSP could improve its consideration of environmental users of groundwater and establish more protective management criteria. Accordingly, the Department recommends that the North American Subbasin GSAs address the following comments before submitting the GSP to the Department of Water Resources (DWR).

**COMMENTS AND RECOMMENDATIONS**

The Department's comments are as follows:

1. **Comment #1 Interconnected Surface Waters** (Groundwater Conditions, 5.11 Interconnected Surface Water; starting page 5-52): The GSP fails to include an estimate of the quantity and timing of depletions of interconnected surface water systems as required by 23 CCR § 354.16(f).
    a. *Issue*: The GSP identifies the locations of interconnected surface waters within the subbasin (Figure 5-31) and presents hydrographs that demonstrate the relationship between groundwater levels and surface water elevations. However, the GSP does not include information related to the quantity and timing of depletions from these interconnected surface waters as required by 23 CCR § 354.16(f).

b. *Recommendation*: The Department recommends that the GSP include a table quantifying the volume of surface water depletions, by month, for all interconnected surface waters identified within the subbasin.

2. **Comment #2 Groundwater Dependent Ecosystems** (Appendix O): GDE identification, required by 23 CCR § 354.16(g), is based on methods that risk exclusion of ecosystems that may depend on groundwater.
   a. *Issues*:
      i. Depth to Groundwater: The Department recognizes and appreciates the effort put into identifying GDEs within the subbasin, including the assessment of both vegetation diversity and critical species dependence to inform relative priority. Further refinement and clarification of GDE identification methods used in the GSP will help to create a more robust analysis. Appendix O states that groundwater contours were developed using groundwater level measurements from Spring 2020 (Section 1.3, page 3), but then also states that GDEs were prioritized using 2019 depth to groundwater contours (Section 1.4, page 3). It is unclear which year of groundwater data was used in the analysis. Additionally, while the Department supports the use of seasonal high spring measurements, 2020 was a dry water year type for the Sacramento Valley. Analysis that relies on depth to water thresholds should incorporate data from a representative hydrologic period that includes a variety of water year types, rather than from a single point in time. The analysis also assumes that groundwater must be less than 30 feet below the ground surface (bgs) to support GDEs based on the maximum rooting depth of Valley Oak (*Q. lobata)*; however, mature Valley Oak can access groundwater up to 80 feet below the ground surface (Howard 1992, Lewis & Burgy 1964). The use of a 30-foot threshold may incorrectly exclude Valley Oak communities within the subbasin from further consideration as a GDE.
      ii. Perched Groundwater Areas: The GSP discusses locations within the subbasin that have a depth to groundwater of less than 30 feet and may also have areas of perched water, and potential GDEs from these areas were removed. The GSP does not sufficiently characterize the relationship between these perched groundwater areas and the Principal Aquifer, including the impacts of pumping or of seasonally elevated groundwater levels on the groundwater in these perched areas.
      iii. Special Status Species: The GSP methodology includes an evaluation of "non-aquatic critical fauna" that may be present in the subbasin. Interconnected surface waters and their associated aquatic species are also a type of groundwater dependent ecosystem that must be evaluated within the GSP

and considered in the development of sustainability criteria and analysis of undesirable results.

b. *Recommendations*:

i. Depth to Groundwater: The Department recommends that Appendix O be revised to clarify which year of data was used to create the groundwater elevation contours for the GDE analysis and consider how the methodology could be updated to integrate a range of water years for determining potential GDEs. The Department also recommends the GSP narrowly update the methodology for GDE identification for areas within the subbasin that underlie Valley Oak communities to reflect a potential maximum rooting depth of 80 feet bgs.

ii. Perched Groundwater Areas: The Department recommends the GSP include additional information characterizing the relationship between areas of perched groundwater and the Principal Aquifer. The GSP should discuss whether seasonal highs within the Principal Aquifer contribute to the perched areas, and whether pumping within the Principal Aquifer has the potential to deplete these perched areas that may support GDE communities. If the relationship cannot be adequately characterized, the GSP should conservatively include GDEs from these areas, particularly as depth to groundwater for the principal aquifer is within the identified potential root zone for GDEs.

iii. Special Status Species: The critical species analysis included within the GSP should be broadened to include discussion of aquatic species that are supported by interconnected surface waters.

3. **Comment #3 Sustainable Management Criteria** (Sustainable Management Criteria; 8.4 Chronic Lowering of Groundwater Levels, 8.9 Depletion of Surface Water; starting page 8-9): Sustainable management criteria (SMC) are unlikely to protect against undesirable results for groundwater dependent ecosystems and fish and wildlife beneficial uses and users of groundwater and interconnected surface waters.

a. *Issues*:

i. Groundwater Levels Minimum Thresholds: The GSP projects that development and land use changes within the subbasin will result in increased groundwater use. Additionally, with climate change, some portions of the subbasin are projected to experience a climate-driven decline in groundwater elevations. The GSP uses the model-projected groundwater level declines at each representative monitoring site (RMS) to establish minimum thresholds (MTs) by subtracting this projected decline from a baseline set at the average of Fall 2014 and 2015 groundwater elevations (page 8-14, line 318). The GSP fails to contextualize that 2014 and

2015 were two consecutive critically dry water years that occurred during an extended dry period in the Sacramento Valley, wherein groundwater extraction increased to replace more than 70% of lost agricultural water supplies (Lund 2018). Though the GSP asserts that "no negative impacts were reported by beneficial users in the subbasin" (line 320), it is probable that environmental users of groundwater were experiencing adverse impacts due to combined groundwater depletion and reduced surface water availability. These adverse impacts include stressed or dying riparian vegetation, poor instream habitat availability, and increased water temperatures (DFW 2019). It is inappropriate to rely on groundwater levels from 2014 and 2015 as a baseline from which groundwater could continue to decline before reaching the established MTs, as undesirable results will likely be experienced before MTs are reached.

ii. Depletion of Interconnected Surface Waters: As a result of the projected increases in groundwater use within the subbasin, the GSP projects that groundwater level declines along the interconnected Sacramento River will result in approximately 5,800 acre-feet per year (AFY) of surface water depletions. Though the GSP presents information related to the projected change in groundwater pumping, seepage, diversions, and streamflow in Figure 8-7 (page 8-42), a table summarizing this information by month would clarify potential ISW impacts and facilitate comparisons to baseline conditions (See Comment #1). The GSP asserts that though the Sacramento River will experience depletions, municipal development along the Sacramento River that takes agricultural land out of production will result in a net increase in flows of approximately 17,200 AFY (page 8-41, line 907). Additional information is needed in the GSP to support this claim and ensure that environmental users are protected from undesirable results. The GSP does not provide information related to interconnected surface waters within the subbasin other than the Sacramento River, and it is unclear what effect the SMCs will have on depletions. Furthermore, these anticipated land use changes and concurrent reduced surface water demands are not within the control of GSAs. GSAs should anticipate future scenarios wherein they are accountable for mitigating interconnected surface water depletions attributable to groundwater pumping, instead of leaning on proposed land use change to reduce surface water demand, particularly when surface water rights are not under GSA management.

iii. Environmental Beneficial Users: The GSP does not sufficiently analyze potential impacts of the selected SMCs on environmental beneficial users of groundwater or interconnected surface waters. While the GSP does include sections that discuss the effects of the minimum thresholds for each

sustainability indicator on each beneficial user within the subbasin, for the groundwater level MTs, the GSP states only that the groundwater level MTs "protect most known GDEs" within the subbasin (page 8-20, line 426). It is unclear what the GSP means by "most GDEs," and no further detail is provided about whether any analyses were completed that involve comparing the MTs at each RMS to nearby GDE communities and their rooting depths. Additionally, in its discussion of interconnected surface waters within the subbasin, the GSP does not analyze potential impacts to environmental users of surface waters, including aquatic habitat or species (See Comment 2(iii)).

b. *Recommendations*:

i. Groundwater Levels Minimum Thresholds: The Department recommends the GSP reselect its chosen groundwater level baseline to a more representative hydrologic period for the subbasin, rather than relying on groundwater levels experienced during critically dry years. MTs should be updated accordingly.

ii. Depletion of Interconnected Surface Waters: The GSP should include a discussion of projected depletions of all interconnected surface waters in the basin, not only the Sacramento River, based on the established SMCs. The GSP should include additional detail in a table that summarizes the projected depletions, reduced diversions, and streamflow by month to facilitate comparison to depletions under existing conditions. In order to better support its claim that Sacramento River flow would increase over the SGMA implementation period, the GSP must provide additional details related to the underlying assumptions used in this calculation, including the following:

1. A characterization of the water rights that the GSP assumes will stop diverting water from the Sacramento River, including a discussion of how the water will be maintained instream to support surface flows.
2. The anticipated timeline for the conversion of land from agricultural to municipal use.
3. The anticipated timeline for groundwater pumping increases within the subbasin.
4. Contingency plans, triggered by specific monitoring metrics, that will initiate projects to avoid surface water depletions should the land use changes fail to offset the increase in groundwater pumping as anticipated.

iii. Environmental Beneficial Users: The Department recommends the GSP include additional analysis related to the impacts of the established SMCs on environmental users, including GDEs and interconnected surface water. The groundwater level MTs at each representative monitoring well identified for

GDEs in Figure 7-3 (page 7-14) should be compared to the rooting depths of the identified vegetation in each GDE community (See Comment #2(i)). Monitoring of physical indicators of GDE health (i.e., Normalized Difference Vegetation Index (NDVI)) should be completed in addition to the continued monitoring of groundwater levels. The GSP should also include additional analysis to demonstrate that environmental users of interconnected surface waters would not experience undesirable results under the established MTs. The GSP should explicitly discuss the impacts of projected depletions on surface flows, water temperatures, and aquatic species and habitat.

4. **Comment #4 Projects and Management Actions** (Projects and Management Actions; 9.2 Projects and Management Actions, 9.3 Supplemental Projects; starting page 9-3): Inclusion of additional demand management strategies would strengthen the GSP's list of supplemental projects.
    a. *Issue*: The planned and supplemental project and management activities included in the GSP focus on increased surface water supplies and delivery, conjunctive use, or water banking and recharge. Though the GSP indicates that the planned projects are expected to be sufficient to achieve basin sustainability, should the projects fail to produce the anticipated groundwater benefit or encounter unexpected delays, it may be necessary to implement additional demand management projects that could likely produce groundwater benefits within a shorter timeframe.
    b. *Recommendation*: The Department recognizes that the GSP discusses existing demand management activities within the subbasin, including temporary conservation measures and urban and agricultural water use efficiency programs (page 9-3, line 38). Additional discussion of potential program expansion or other demand reduction projects that could be implemented within the subbasin would strengthen the GSP's list of supplemental projects.

**CONCLUSION**

In conclusion, the draft GSP thoughtfully discusses all beneficial uses of groundwater, provides detailed characterization of groundwater conditions in the subbasin, and incorporates robust modeling of future scenarios; however, the GSP can further refine its management criteria to better avoid potential impacts to GDEs and interconnected surface water. The Department recommends that the North American Subbasin GSAs address the above comments before GSP submission to DWR to best prepare for the following regulatory criteria for plan evaluation:

1. The assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable and/or not supported by the best available information and best available science. [23 CCR § 355.4(b)(1)] (See Comments #1, 2, 3)

2. The interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have not been considered. [23 CCR § 355.4(b)(4)] (See Comments #1, 2, 3)
3. The projects and management actions are not feasible and/or not likely to prevent undesirable results and ensure that the basin is operated within its sustainable yield. [23 CCR § 355.4(b)(5)] (See Comment #4)

The Department appreciates the opportunity to provide comments on the North American Subbasin Draft GSP. Please contact Bridget Gibbons, Environmental Scientist, by email at Bridget.Gibbons@wildlife.ca.gov with any questions.

Sincerely,

DocuSigned by:
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B35A7660DD7848B...

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Enclosures (Literature Cited)

ec:

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UNITED STATES DEPARTMENT OF COMMERCE
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September 29, 2021

John Woodling, Executive Director
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*Electronic transmittal only*

Re: NOAA's National Marine Fisheries Service comments on the developing Groundwater Sustainability Plan for the North American subbasin

Dear Mr. Woodling:

NOAA's National Marine Fisheries Service (NMFS) is the federal agency responsible for managing, conserving, and protecting living marine resources in inland, coastal, and offshore waters of the United States. We derive our mandates from numerous statutes, including the Federal Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The purpose of the ESA is to conserve threatened and endangered species and their ecosystems.

The North American subbasin Groundwater Sustainability Agency (hereafter, "GSA") recently released their draft North American subbasin Groundwater Sustainability Plan (draft GSP) for public comment. The California Department of Water Resources (DWR) has designated the North American subbasin a "high" priority for groundwater management, necessitating the development of a GSP by January 2022, as required under California's Sustainable Groundwater Management Act of 2014 (SGMA). Several waterways that overlie portions of the North American subbasin support federally threatened California Central Valley (CCV) steelhead (*Oncorhynchus mykiss*), threatened Central Valley (CV) spring-run Chinook salmon (*O. tshawytscha*), the threatened Southern Distinct Population Segment (sDPS) of North American green sturgeon (*Acipenser medirostris*), and federally endangered Sacramento River winter-run Chinook salmon (*O. tshawytscha*). In addition, the North American subbasin is designated as Essential Fish Habitat (EFH) for Pacific Coast Chinook salmon, including CV fall-run Chinook salmon (*O. tshawytscha*) and CV late fall-run Chinook salmon (*O. tshawytscha*), which are managed under the MSA. This letter transmits NMFS' comments on the draft GSP.

Surface water and groundwater are hydrologically linked in the North American subbasin, and this linkage is critically important in creating seasonal habitat for Chinook salmon, steelhead, and green sturgeon. Where the groundwater aquifer supplements streamflow, the influx of cold, clean water is critically important for maintaining temperature and flow volume. Pumping water from these aquifer-stream complexes has the potential to affect Chinook salmon, steelhead, and sturgeon habitat by lowering groundwater levels and interrupting the hyporheic flow between

the aquifer and stream. NMFS is concerned that groundwater extraction in the North American subbasin is currently impacting Chinook salmon, steelhead, and green sturgeon instream habitat, and recommends the draft GSP adequately address and minimize these impacts.

**Comments**

Avoiding Undesirable Results: The requirement for minimum thresholds as spelled out in the SGMA regulations is as follows:

> "The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators." (CCR 23 §354.28(b)(2))

According to DWR (2021), "it is up to GSAs to define in their GSPs the specific significant and unreasonable effects that would constitute undesirable results and to define the groundwater conditions that would produce those results in their basins." The GSA should qualitatively describe what conditions within the subbasin would constitute an undesirable result with regard to streamflow depletion, ensuring that the description accounts for impacts to instream habitat that supports ESA-listed salmonids and green sturgeon. If data that would inform potential streamflow depletion impacts is lacking, NMFS recommends the final GSP follow guidance from California Department of Fish and Wildlife (2019) and develop conservative streamflow depletion thresholds as a cautionary principle until the surface flow/groundwater dynamic in the North American subbasin is better studied and understood.

Using Groundwater Elevations as a Proxy for Streamflow Depletion: Groundwater levels are used as a proxy for depletion of surface water because, as the draft GSP states, the "depletion of interconnected surface water is directly related to the gradient between the surface water system at the groundwater interface and the groundwater Subbasin." However, SGMA regulations require that a GSP demonstrate "that there is a significant correlation between groundwater levels and the other metric" (DWR 2017), with the "other metric" in question appearing to be "the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results" (CCR 23 §354.28(c)(6)). The draft GSP should explain, with supporting evidence, what significant correlation exists between groundwater elevations and streamflow depletion rates or volumes, and how that correlation would allow the GSA to adequately predict and monitor impacts to beneficial uses of surface water.

Undesirable result for depletion of surface water: The draft GSP includes the following definition for the streamflow depletion undesirable result:

> *20% or more of the NASb interconnected surface water (ISW) representative monitoring sites (RMSs) have minimum threshold exceedances for 2 consecutive fall measurements (5 out of 23).* (Page 8-42)

The above definition is not appropriate for avoiding significant and unreasonable impacts to surface water beneficial uses because it is completely disconnected from ecological principles

that govern how those beneficial uses are impacted. Requiring two consecutive years of exceeding the minimum threshold does not account for the fact that organisms live or die depending on the habitat conditions at a moment in time. If streamflow depletion contributes to a creek drying up during a given year, the fish that reside in that creek will perish and an impact to surface water beneficial use will likely have resulted. Requiring two consecutive years of such conditions impacting surface water beneficial uses makes little sense when attempting to avoid impacts to surface water beneficial uses.

Basing Sustainable Management Criteria on Historical Drought Conditions: The minimum threshold for streamflow depletion was established by averaging the lowest groundwater elevations from fall 2014 and fall 2015. However, using recent groundwater elevations to inform or set streamflow depletion minimum thresholds and measurable objectives is likely inappropriate for avoiding significant impacts to ESA-listed salmonids and sturgeon, and their habitat, including EFH. Basic hydraulic principles dictate that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream or, conversely, seepage from a stream to the underlying aquifer is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. Basing sustainable management criteria upon groundwater elevations that occurred during California's recent historical drought (2011-2016) will likely result in historically high streamflow depletion rates, producing instream conditions that negatively affect ESA-listed Chinook salmon, steelhead, green sturgeon, and their critical habitat.

Any sustainable management criteria that result must avoid significant and unreasonable impacts to identified beneficial uses of surface water, which for surface waters within the North American subbasin include cold freshwater habitat; migration of aquatic organisms; and spawning, reproduction, and/or early development[1].

Sustainable Yield estimation: The GSP asserts that the North American subbasin is "currently under its estimated sustainable yield and in position to support additional groundwater development" (Page 8-12). However, a sustainable yield estimation requires the avoidance of all undesirable results and, as noted throughout this letter, we do not believe significant and unreasonable streamflow depletion will be avoided when using the sustainable management criteria proposed within the draft GSP. Similarly, the assertion that "the sustainability goal is currently being met" within the basin also appears to be unfounded, and directly contradicts DWR's evaluation process that assigned a "high" priority to the subbasin. Per the SGMA regulations, if the GSA wishes to assert that the basin is sustainably managed currently, then they must demonstrate and provide evidence that each sustainability indicator "does not exist and cannot occur" (DWR 2017). Suffice to say, the draft GSP fails to accomplish this. If the GSA wishes to keep this assertion within the draft GSP, they should fully explain, in detail, why the historically high streamflow depletion rates that correspond to their proposed sustainable management criteria will avoid significant and unreasonable impacts to surface water beneficial uses.

[1] Water Quality Control Plan for the Sacramento River and San Joaquin River Basins. Copy at https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr_201805.pdf

NMFS recommendation for future Projects and Management Actions: We suspect that groundwater recharge projects are likely to be an important action implemented as part of the effort to achieve groundwater sustainability in the North American subbasin. NMFS encourages the GSA to consider implementing recharge projects that facilitate floodplain inundation and offer multiple benefits, including downstream flood attenuation, groundwater recharge, and ecosystem restoration. Managed floodplain inundation can recharge floodplain aquifers, which in turn slowly release stored water back to the stream during summer months. These projects also reconnect the stream channel with floodplain habitat, which can benefit juvenile salmon, steelhead, and sturgeon by creating off-channel habitat characterized by slow water velocities, ample cover in the form of submerged vegetation, and high food availability. As an added bonus, these types of multi-benefit projects likely have more diverse grant funding streams that can lower their cost as compared to traditional off-channel recharge projects. NMFS stands ready to work with any GSA interested in designing and implementing floodplain recharge projects.

Please direct questions regarding this letter to Amanda Cranford, of my staff, at Amanda.Cranford@noaa.gov or (916) 930-3706.

Sincerely,

A. Catherine Marcinkevage

Cathy Marcinkevage
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**References:**

California Department of Fish and Wildlife. 2019. Fish & Wildlife Groundwater Planning Considerations. California Department of Fish and Wildlife, Groundwater Program. June 2019. 28 pp. Available at: https://cawaterlibrary.net/document/fish-wildlife-groundwater-planning-considerations/

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California Department of Water Resources. 2021. Letter from Craig Altare (DWR) to Taylor Blakslee (Cuyama Basin GSA), re. Cuyama Valley - 2020 Groundwater Sustainability Plan. Available at https://sgma.water.ca.gov/portal/gsp/assessments/32

Cc: To the File ARN 151422-WCR2021-SA00121

Electronic copy only:

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October 14, 2021

To: Groundwater Sustainability Agencies in the North American Subbasin
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Jim Peifer, Executive Director, Regional Water Authority, jpeifer@rwah20.org

Subject: Comments on the North American Subbasin (NASb) draft Groundwater Sustainability Plan (GSPD)

ECOS commends the effort of the North American Subbasin Groundwater Sustainability Agencies (GSAs), and their consultants, for involving the public and in preparing the GSPD. The GSPD provides both a technical and lay understanding of the North American Subbasin (NASb) and how groundwater moves within it. The GSPD is an important reference document that brings together a wealth of information in one place. With additional information, projects and management Actions recommended below, the GSPD will present a clear direction for the subbasin's sustainable groundwater management.

Our comments were initially developed in September 2021 and forwarded to The Regional Water Authority (RWA). Two ECOS members, Ted Rauh and Barbara Evoy, participated in a meeting with Rob Swartz and Trevor Joseph, staff of RWA, on October 6, 2021, to discuss them before finalizing the comments. We have noted our understanding of the relevant commitments/direction that the staff provided during our discussion of the issues below.

CLIMATE CHANGE: As one of the most critical elements of long-term water supply planning, the GSPD should clearly describe the climate change study(ies) it based the analysis on, its assumptions, and the arguments for and against the selected approach. The NASb GSPD and the South American Subbasin (SASb) GSPD have little to no discussion in the body of the GSPDs as to how climate change was evaluated. The documents do not have any type of detailed summary of the process, the climatic range considered, how "change" was integrated with historical years reviewed in the past water budget nor how the earlier analysis fits into the current science of climate change. Both state that the work was done as part of the American River Basin Study (ARBS) but 1) provide both inaccurate citations to the study and 2) where it is linked in the NASb GSPD, it is only to a PCWA website that talks generally about it being developed. The climate change model is very generally discussed in 8 lines in Section 6., without offering any true overview of the effort. As it stands now, the GSPD does not set the stage for any of the Water Budget tables that show "climate change".

The NASb GSPD includes "with and without climate change" in tables as if reviewers were fully familiar with the model parameters and they were generally agreed upon. While the document

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displays output, it lacks a clear discussion on the model. The conclusions of the water budget, without an understanding of the climate change analysis, are only speculative to the reviewers. Lack of climate documentation implies either the GSAs do not know how it was done, or the GSAs don't feel the work is of the quality to sustain public scrutiny. We hope neither is the case and encourage the GSAs to include a much clearer discussion of how climate change was handled.

On September 30, 2021, a 490 page Appendix was released which describes much of the data used in the model and some specifics of the climate change input data. The 490 pages provide a good description of these model inputs for future reference but do not digest the information in a way to provide the reader with an understanding of the overall process and how up to date the model is. As the US Bureau of Reclamation has yet to publish the ARBS, Rob Swartz indicated they would work to provide GSPD information that clarifies how the central tendency model was chosen as being conservative, how it aligns (or doesn't) with other more recent regional climate change modeling, and how the ARBS compares to a new model run of much more hot and dry conditions that are thought to reflect serious climate change. He indicated the ARBS work would be updated with new 50-year weather sets in the future, as this will give a more accurate assessment.

The Delta Stewardship Council's Sacramento-San Joaquin Delta Climate Change Vulnerability Assessment work (Delta Adapts: Water Supply Technical Memorandum May, 2021) summarizes many recent regional climate studies and shows that climate change will substantially raise sea level in the delta. In addition to more frequent and longer curtailment of surface water, additional flows will be necessary from upstream diversions to stave off salinity intrusion. There is no discussion in the GSPD of these new studies, nor what the water supply impacts may be. Presumably, the impacts will not just affect surface water supplies but regional groundwater supplies as well. This report should be part of the GSPD analysis. Rob Swartz indicated both the Delta Stewardship climate change modeling and the anticipated additional surface water releases would be analyzed in relation to the GSPD water budget.

The newly released GSPD Appendix recommends future work to increase the accuracy of the model. These recommendations should be woven into both the management actions, timeline for completion and budget.

GROUNDWATER DEPENDENT ECOSYSTEMS (GDEs): New information presented recently (Lewis and Burgy 1964 study) to the South American GSP working group suggests root depth analysis for GDEs should use a depth of 80 feet, not the 30 feet used in the GSPD. In addition, The Nature Conservancy (TNC) is about to publish a study indicating root depths for certain oak species are 25 meters. A recent TNC study also identifies the inability of oak woodlands to reproduce when ground water levels are too low. Therefore, a determination of appropriate root depths to maintain GDEs should be included as a potential data gap and for priority Management Action in the final GSP. Rob Swartz indicated he had already begun this analysis and that this would be included in the GSPD, if time allowed.

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WATER BUDGET: The GSPD provides information from published 2015 Urban Water Management Plans (UWMPs). Earlier this year, water purveyors updated these plans for 2020 submittal. These plans include new forecasted demand data as well as updated actual supply and demand from 2015-2020. These 2020 numbers should be included in the final GSP analysis and discussion. The next GSP update should include information developed for the 2025 UWMP (Rob Swartz indicated this would be done). The Water Budgets should also provide a realistic view of how curtailed surface water rights will affect groundwater withdraws in dry years. Past groundwater demands appear to be extrapolated forward without the regards for climate change effects on surface water supplies (see below).

DEMAND REDUCTION: The GSPD does not include demand reduction as a Project and, therefore, does not reduce groundwater demand resulting from the associated water conservation and efficiency actions and programs that are expected to take place. As conservation programs can be more cost effective than new construction or permitting programs, these demand reducing programs should be described along with the logic for not including them in this GSP. Rob Swartz indicated these were already being done so he did not feel they should be included. We feel the document would be stronger with a clear definition of expected future demand management.

WATER BANKING: Water Banking is an important aspect of NASb groundwater management, both historically and in the future proposals. Therefore, it is critical to understand how previously banked water fits into the Water Budget described in the GSPD. The basin groundwater is not "all one color" if agencies believe they have not abandoned their banked water but intend to withdraw it under their groundwater rights as developed water. The Water Budget cannot be treated as a common resource and amount if this is the case. The GSPD uses gross input and output numbers to calculate the basin's sustainability without this critical accounting.

If all banked water is abandoned, then the basin's pumpers can address sustainability with proposed projects. If one or more entity intends to make a significant withdraw of what they consider previously banked water (as discussed in Section 3 lines 827-834), however, the situation changes. The dynamics of the cost/benefit and necessary projects to mitigate groundwater draw down may significantly shift. Section 3 Line 833 cites that SGA has maintained an accounting of groundwater since 2007, but it is not reflected in the document. The document is not clear on what the status of the groundwater rights are nor how they are envisioned to be exercised.

The need for proper accounting is particularly highlighted in a recent PPIC report, Improving California's Water Market (https://www.ppic.org/publication/improving-californias-water-market/) and the legal discussion in an appendix by Brian Gray (https://www.ppic.org/wp-content/uploads/0921aar-appendix.pdf)

If previously "banked" water is not adequately described in the 2020 GSP, it appears the GSP may have to be significantly revised to incorporate this activity, as the conclusions could be substantially different. Significant future revision to account for water banking allocations and management could reduce the amount of time the basin will have to implement projects and reach

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sustainability by 2040. It would appear that consensus on how the water bank will be operated and what withdraws will be permitted and when, should be a very high priority for the near term.

Rob Swartz indicated that he considers the setting of minimum thresholds in the GSP to provide an operational base for water banking activities. If this is the expectation, then it should be detailed in the GSPD so the purveyors, public, and owners of shallow wells can understand both 1) the impacts to amounts of previously "banked" water, and 2) a minimum threshold that may become an operational constraint and regular groundwater level seen in dry years with water bank withdraws. As this is a different use of the GSPD minimum threshold idea discussed to date, ECOS would like to be engaged in the analysis and public review process of Water Bank impacts using this framework. The discussion of past water banking, accounting, loss, and criteria for withdraw, as well as potential impacts to adjacent subbasins, Interconnected Surface Water and GDEs should include a significant public review component. The outcomes should be clearly discussed in the context of the GSP and reflected in an update to the document.

VULNERABLE SHALLOW WELLS: Given modeling that indicates well levels overall are expected to remain near their current levels, the GSPD conclusion is that there could be little to no impacts to domestic wells. There are, however, a) 2,563 known domestic wells, b) 6,471 "Other/Abandoned/Unknown" wells. Water purveyors in the area are also expected to withdraw banked water for various transfers at specific times. It would be prudent to have a backup approach to ensure domestic and disadvantaged community wells do not run dry. We suggest the NASb consider a vulnerable well program such as the one the SASb is developing. At a minimum, there should be a commitment to seek out additional information on the more than 6,000 unknown or abandoned wells and include robust monitoring as part of the Water Bank proposal. As of October 11, an Appendix B, "Refinement of Domestic Well Densities", is not posted.

COMMUNICATION AND INVOLVEMENT OF THE PUBLIC: We recommend that the GSAs look carefully at their websites and outreach to fully involve the regional stakeholders in both the monitoring work, the development of Water Bank operating criteria, and the continued GSP evaluation and update process. Websites should have clearly defined standards for announcing public meetings, comment periods, comment procedures and public involvement. We also suggest that the GSAs present monitoring data to the public in a form that allows property owners to track information from sampling events that are of immediate interest to them. We suggest that the GSAs incorporate monitoring well telemetry so timely information is communicated.

Residents in the SASb have been interested in making sure their well information is included, and additional domestic wells have been offered for water level and water quality monitoring. NASb residents may wish to provide additional well construction information with further outreach.

Rob Swartz and Trevor Joseph indicated they would look at additional commitments to include the public in implementation. We suggest the GSPD consider a public advisory group similar to the one being set up in the Consumnes Basin. This would provide the GSAs feedback as to whether or not they are reaching critical segments of the public and how they might improve outreach.

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KUDOS: There are two significant areas where the NASb GSPD provides superior information or clarity than the SASb GSPD. First, the NASb definitions of Undesirable Results for Chronic lowering of groundwater, reduction of storage and depletion of surface water, are a clearer and more conservative approach than that used in the SASb. We recommend that rather than two separate standards, the SASb consider adopting the NASb's.

Second, The NASb's Projects and Management Actions appear to be well thought out and the specificity of the budget, as it stands now, with in-kind resources needed, provides a good initial map of the first part of implementation. Recommendations made in several GSPD sections and appendices (such as the COSANA model needs) should be added to the management action lists, however.

The yet unfinished Water Bank discussion steps should be highlighted in the list of near term actions and any resulting management actions added. Project cost equity may need to be reconsidered if future water banking withdraws significantly change local conditions. Until Water Banking is addressed, the project list should be considered preliminary.

CONCLUSION: The NASb GSPD has a lot of very useful information and will provide an excellent start to regional subbasin management of groundwater with the suggestions provided above. As one of the few community groups that participated in the development of all three subbasin GSPDs, however, we feel improvements not only need to be made in the individual plans, but that consistency is also needed between the plans. There does not appear to a reason for differences in key overarching management approaches, and analytical tools. This subbasin variability will not only hinder economies of scale for analysis, but efficient and effective management of the larger basin.

ECOS strongly supported the use of common analytical tools to develop a basinwide understanding of the surface and groundwater flow elements. ECOS also strongly supported joint evaluation of GDEs and felt this was important to the regional outcome. Collaboration and consistency are also needed, however, in the setting of management objectives, shallow and disadvantaged well programs, water bank evaluation and potential adjacent subbasin impacts, additional GDE evaluation using new studies, baseline demand reduction measures, water demand data timeframes, public involvement and very importantly, climate change modeling. The NASB website promises a new Appendix R, Interbasin Coordination in the final GSP. ECOS requests that all three subbasins consider not just touch points between the subbasins, but a commitment to bring consistency in substantive approaches to the next round of GSPs.

The Environmental Council of Sacramento (ECOS) is a 501c3 nonprofit, with the mission to achieve regional and community sustainability and a healthy environment for existing and future residents. Member organizations of ECOS include: 350 Sacramento, Breathe California Sacramento Region, Environmental Democrats of Sacramento, Friends of Stone Lakes NWR, International Dark-Sky Association, Physicians for Social Responsibility Sacramento Chapter,

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Sacramento Audubon Society, Sacramento Citizens' Climate Lobby, Sacramento Electric Vehicle Association, Sacramento Housing Alliance, Sacramento Natural Foods Coop, Sacramento Valley Chapter of the California Native Plant Society, Sacramento Vegetarian Society, Save Our Sandhill Cranes, Save the American River Association and Sierra Club Sacramento Group. Habitat 2020 is a coalition that works to protect the lands, waters, wildlife and native plants in the Sacramento region. Member organizations of Habitat 2020 include: the ECOS member groups italicized above, as well as the Friends of Swainson's Hawk, Sacramento Area Creeks Council and Sacramento Heron and Egret Rescue. Habitat 2020 also serves as ECOS' Habitat and Conservation committee.

We thank you for the opportunity to provide comments. If you have any questions regarding this letter, please feel free to contact us.

Sincerely,

Ralph Propper
President, ECOS

Sean Wirth
Co-Chair, Habitat 2020

Robert Burness
Co-Chair, Habitat 2020

cc: Jessica Law, Executive Director, Water Forum, jlaw@waterforum.org
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October 26, 2021

To: GSAs associated with the development of GSPs for the North and South American subbasins and the Cosumnes Subbasin

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Subject: Comments on CoSANA model report to be included as part of the Groundwater Sustainability Plan

Board Chairs,

ECOS/Habitat 2020 submit the following CoSANA comments for your consideration. These comments deal with the Recommendation Section, page 6-1 through 6-3 of the CoSANA model report proposed for inclusion in your Groundwater Sustainability Plans (Plans). Given the length of the report and the short time for review, we have not conducted a technical assessment of the model, but have instead limited our review to the Recommendations Section of the document. We focus our comments on what further work is needed to keep the CoSANA model updated for use in annual Plan reporting, five-year Plan updates, and to improve the model's shortcomings.

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First, we believe that each Plan should include a Management Action to form a technical working group (or similar mechanism) comprised of representatives of each of the region's three subbasins. The group should be charged with carrying out the work required to improve the model and to keep the model updated so that it can be used as needed for annual Plan reporting and five-year Plan updates. The work of the group should be open to public review so that diverse scientific viewpoints can be heard.

Second, we believe that each Plan's Management Action section should identify the specific steps to carry out the model improvements called for in the CoSANA model report. The Plans should provide the funding and other resources needed to accomplish the model updates and improvements in time for the next Plan update in 2025.

Third, we believe priority should be given to address the specific areas of model deficiency or short comings that are important to subbasin management including the protection of Groundwater Dependent Ecosystems and groundwater surface water interactions.

Fourth, we believe that more focus should be placed on integration of climate change predictive modeling and the CoSANA model so that improved climate change modeling scenarios can be run in subsequent years.

Finally, we believe that additional emphasis should be placed on more recent climate conditions and their extrapolation into the future rather than depending on older sets of climate and hydrologic data. Older data sets are not as reflective of the changes in climate currently experienced and projected to occur. This includes increased likelihood of shorter rainy seasons, stronger atmospheric rivers, and warmer temperatures leading to lower peak snowpack. As part of this analysis, consideration should also be given to the changes in absorption that warmer soil will have upon snowpack and rainfall runoff.

We appreciate and commend you for all of the work and resources that have gone into the development of the CoSANA model and the fact that all three subbasin GSAs have participated in its development and use. We strongly urge this type of regional coordination and hope that it will extend to other GSP areas.

*  *  *  *  *

The Environmental Council of Sacramento (ECOS) is a 501c3 nonprofit, with the mission to achieve regional and community sustainability and a healthy environment for existing and future residents. Member organizations of ECOS include: 350 Sacramento, Breathe California Sacramento Region, Environmental Democrats of Sacramento, *Friends of Stone Lakes NWR*, *International Dark-Sky Association*, Physicians for Social Responsibility Sacramento Chapter, *Sacramento Audubon Society*, Sacramento Citizens' Climate Lobby, Sacramento Electric Vehicle Association, Sacramento Housing Alliance, Sacramento Natural Foods Coop, *Sacramento Valley*

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*Chapter of the California Native Plant Society*, Sacramento Vegetarian Society, *Save Our Sandhill Cranes, Save the American River Association* and *Sierra Club Sacramento Group.*

Habitat 2020 is a coalition that works to protect the lands, waters, wildlife and native plants in the Sacramento region. Member organizations of Habitat 2020 include: the ECOS member groups italicized above, as well as the Friends of Swainson's Hawk, Sacramento Area Creeks Council and Sacramento Heron and Egret Rescue. Habitat 2020 also serves as ECOS' Habitat and Conservation committee.

Signatures

Ralph Propper

Ralph Propper
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Co-Chair, Habitat 2020

Robert Burness
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October 29, 2021

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Citrus Heights, CA 95610

*Submitted via web: https://portal.nasbgroundwater.org/comment/new*

**Re: Public Comment Letter for North American Subbasin Draft GSP**

Dear Rob Swartz,

On behalf of the above-listed organizations, we appreciate the opportunity to comment on the Draft Groundwater Sustainability Plan (GSP) for the North American Subbasin being prepared under the Sustainable Groundwater Management Act (SGMA). Our organizations are deeply engaged in and committed to the successful implementation of SGMA because we understand that groundwater is critical for the resilience of California's water portfolio, particularly in light of changing climate. Under the requirements of SGMA, Groundwater Sustainability Agencies (GSAs) must consider the interests of all beneficial uses and users of groundwater, such as domestic well owners, environmental users, surface water users, federal government, California Native American tribes and disadvantaged communities (Water Code 10723.2).

As stakeholder representatives for beneficial users of groundwater, our GSP review focuses on how well disadvantaged communities, drinking water users, tribes, climate change, and the environment were addressed in the GSP. While we appreciate that some basins have consulted us directly via focus groups, workshops, and working groups, we are providing public comment letters to all GSAs as a means to engage in the development of 2022 GSPs across the state. Recognizing that GSPs are complicated and resource intensive to develop, the intention of this letter is to provide constructive stakeholder feedback that can improve the GSP prior to submission to the State.

Based on our review, we have significant concerns regarding the treatment of key beneficial users in the Draft GSP and consider the GSP to be **insufficient** under SGMA. We highlight the following findings:

1. Beneficial uses and users **are not sufficiently** considered in GSP development.
    a. Human Right to Water considerations **are not sufficiently** incorporated.
    b. Public trust resources **are not sufficiently** considered.
    c. Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users **are not sufficiently** analyzed.
2. Climate change **is not sufficiently** considered.
3. Data gaps **are not sufficiently** identified and the GSP **does not have a plan** to eliminate them.

4. Projects and Management Actions **do not sufficiently consider** potential impacts or benefits to beneficial uses and users.

Our specific comments related to the deficiencies of the North American Subbasin Draft GSP along with recommendations on how to reconcile them, are provided in detail in **Attachment A.**

Please refer to the enclosed list of attachments for additional technical recommendations:

| | |
|---|---|
| **Attachment A** | GSP Specific Comments |
| **Attachment B** | SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users |
| **Attachment C** | Freshwater species located in the basin |
| **Attachment D** | The Nature Conservancy's "Identifying GDEs under SGMA: Best Practices for using the NC Dataset" |
| **Attachment E** | Maps of representative monitoring sites in relation to key beneficial users |

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

Best Regards,

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# Attachment A

**Specific Comments on the North American Subbasin Draft Groundwater Sustainability Plan**

## 1. Consideration of Beneficial Uses and Users in GSP development

Consideration of beneficial uses and users in GSP development is contingent upon adequate identification and engagement of the appropriate stakeholders. The (A) identification, (B) engagement, and (C) consideration of disadvantaged communities, drinking water users, tribes,[1] groundwater dependent ecosystems, streams, wetlands, and freshwater species are essential for ensuring the GSP integrates existing state policies on the Human Right to Water and the Public Trust Doctrine.

### A. Identification of Key Beneficial Uses and Users

**Disadvantaged Communities, Drinking Water Users, and Tribes**

The identification of Disadvantaged Communities (DACs), drinking water users, and tribes is **incomplete**. The GSP provides information on DACs, including identification by name and location on a map (Figure 3-8). Figure 3-3 highlights specific water systems as they relate to DACs, and water sources for DACs are identified as local water agencies and domestic wells. Tribal lands have been identified and mapped (Figure 3-2) within the subbasin.

However, we note the following deficiencies with the identification of these key beneficial users:

- The GSP fails to describe the population of each DAC.
- While the GSP provides a map of domestic well density on Figure 3-13, it fails to provide depth of these wells (such as minimum well depth, average well depth, or depth range) within the subbasin.

These missing elements are required for the GSAs to fully understand the specific interests and water demands of these beneficial users, and to support the consideration of beneficial users in the development of sustainable management criteria and selection of projects and management actions.

| RECOMMENDATIONS |
| --- |
| • Provide the population of each identified DAC.<br>• Include a map showing domestic well locations and average well depth across the subbasin. |

[1] Our letter provides a review of the identification and consideration of federally recognized tribes (Data source: SGMA Data viewer) within the GSP from non-tribal members and NGOs. Based on the likely incomplete information available to our organizations for this review, we recommend that the GSA utilize the California Department of Water Resources' "Engagement with Tribal Governments" Guidance Document (https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents) to comprehensively address these important beneficial users in their GSP.

- On applicable figures in Section 3, make block group map layers more transparent so that the cities and features are visible underneath, to help with understanding the communities and beneficial users that lie within each block group.

**Interconnected Surface Waters**

The identification of Interconnected Surface Waters (ISWs) is **insufficient**, due to lack of supporting information provided for the ISW analysis. To assess ISWs, the GSP presents depth-to-water contours from Spring 2020. The GSP states (p. 5-52): *"For purposes of this GSP the rivers and creeks were assumed to be interconnected when the depth to water is less than 30 feet bgs and are subject to future refinements."* However, using seasonal groundwater elevation data over multiple water year types is an essential component of identifying ISWs. Using depth-to-groundwater contours from one point in time, especially after the 2015 SGMA benchmark date, is not sufficient evidence to state that reaches are not connected to groundwater. In California's Mediterranean climate, groundwater interconnections with surface water can vary seasonally and interannually, and that natural variability needs to be taken into account when identifying ISWs.

The GSP discounts surface water supported by perched groundwater as potential ISW. The GSP states (5-53): *"Studies along the upper reaches of Racoon Creek, generally east of Highway 65, show the area is underlain by the Ione Formation and, due to its low permeability, would tend to perch water. Therefore, the surface water is not connected to the principal aquifer."* However, shallow aquifers that have the potential to support well development, support ecosystems, or provide baseflow to streams are principal aquifers, even if the majority of the subbasin's pumping is occurring in deeper principal aquifers.[2] If areas of perched groundwater are discounted as ISWs, the GSP should provide more supporting evidence of 1) vertical groundwater gradients between the perched system and deeper principal aquifers, and 2) whether perched groundwater is providing significant or economic quantities of water to streams, wells (e.g., domestic wells), and ecosystems (e.g., GDEs).

**RECOMMENDATIONS**

- On the map of stream reaches in the subbasin (Figure 5-31), identify gaining and losing reaches in addition to interconnected and disconnected reaches. Consider any segments with data gaps as potential ISWs and clearly mark them as such on maps provided in the GSP.
- Provide depth-to-groundwater contour maps using data from additional time periods other than just spring of 2020. Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate when mapping ISWs. We recommend the 10-year pre-SGMA baseline period of 2005 to 2015.
- Reconcile ISW data gaps with specific measures (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.

[2] "'Principal aquifers' refer to 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)]

**Groundwater Dependent Ecosystems**

The identification of Groundwater Dependent Ecosystems (GDEs) is **incomplete**, due to use of inadequate temporal data to characterize groundwater conditions under GDEs. Appendix O (Identification of Likely Groundwater Dependent Ecosystems) presents groundwater contours from Spring 2020. The appendix states that this date was used because it has the most complete set of measurements. However, as stated above under the ISW section of this letter, use of depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) is essential to characterize groundwater conditions and the natural variability in conditions across the subbasin, and therefore should be used to determine the range of depth to groundwater around GDEs.

The GSP identified and mapped GDEs using the Natural Communities Commonly Associated with Groundwater dataset (NC dataset). Appendix O presents a complete inventory of flora and fauna, and identifies critical species in the subbasin. Appendix O states (p. 2): *"Quercus lobata (Valley Oak) was considered to have the deepest rooting depth of all species evaluated (24 feet). Therefore, with allowing for some capillary action of the soils, if depth to groundwater of less than 30 feet below ground surface groundwater was assumed to potentially being capable of supporting dependent ecosystems."* We recommend instead that a 80-foot depth-to-groundwater threshold be used when inferring whether Valley Oak polygons in the NC dataset are likely reliant on groundwater. This recommendation is based on a recent correction in TNC's rooting depth database, after finding a typo in the max rooting depth units for Valley Oak.[3] This resulted in a specific change in the max rooting depth of Valley Oak from 24 feet to 24 meters (80 feet). For all other phreatophytes, we continue to recommend that a 30-foot depth-to-groundwater threshold be used when inferring whether all other NC dataset polygons are likely reliant on groundwater.

The NC dataset is a starting point for mapping GDEs in the subbasin, and contains information on vegetation, wetlands, and hydrologic features that are commonly known to be reliant on groundwater. For practicality purposes, the conservative use of depth-to-groundwater thresholds can cost-effectively screen which NC dataset polygons are most likely reliant on groundwater (see Attachment D for more details). Because phreatophytes are foundation species within many GDEs, the depth-to-groundwater threshold is based on a phreatophyte's ability to access the water table and capillary fringe. For the majority of phreatophytes, 10 meters is considered indicative of a phreatophyte's ability to access the water table and capillary fringe due to the maximum rooting depth of most phreatophytes globally.[4,5] However, for potentially deeper rooted plants, such as Valley Oak, a deeper depth-to-groundwater threshold is required to ensure that this endemic and iconic California species is not inaccurately removed from the GSP's GDE map; until other local studies (e.g., isotopic source water analyses, rooting depth studies) prove otherwise.

**RECOMMENDATIONS**

- Use depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. We recommend that a baseline period (10 years from 2005 to 2015) be established to characterize groundwater conditions over multiple water year types. Refer to Attachment D of this letter for best practices for using local groundwater data

[3] TNC. 2021. Plant Rooting Depth Database. Available at: https://groundwaterresourcehub.org/sgma-tools/gde-rooting-depths-database-for-gdes/

[4] Canadell, J. et al. 1996. Maximum rooting depth of vegetation types at the global scale. *Oecologia*, 108:583-595.

[5] Doody, T. et al. 2017. Continental mapping of groundwater dependent ecosystems: A methodological framework to integrate diverse data and expert opinion. *Journal of Hydrology: Regional Studies.* 10:61-81.

to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer.

- Refer to Attachment B for more information on TNC's plant rooting depth database. Deeper thresholds are necessary for plants that have reported maximum root depths that exceed the averaged 30-ft threshold, such as valley oak (*Quercus lobata*). We recommend that the reported max rooting depth for these deeper-rooted plants be used, if these species are present in the subbasin. For example, a depth-to-groundwater threshold of 80 feet should be used instead of the 30-ft threshold, when verifying whether Valley Oak polygons from the NC Dataset are connected to groundwater.

**Native Vegetation and Managed Wetlands**

Native vegetation and managed wetlands are water use sectors that are required to be included in the water budget.[6,7] The integration of these ecosystems into the water budget is **insufficient**. The water budget did explicitly include the current, historical, and projected demands of native vegetation, but did not explicitly include the current, historical, and projected demands of managed wetlands. Table 3-1 states there are over 1,700 acres of managed wetlands in the subbasin, which are mapped on Figure 3-9. The omission of explicit water demands for managed wetlands is problematic because key environmental uses of groundwater are not being accounted for as water supply decisions are made using this budget, nor will they likely be considered in project and management actions.

**RECOMMENDATION**

- Quantify and present all water use sector demands in the historical, current, and projected water budgets with individual line items for each water use sector, including managed wetlands.

## B. Engaging Stakeholders

**Stakeholder Engagement during GSP Development**

Stakeholder engagement during GSP development is **insufficient**. SGMA's requirement for public notice and engagement of stakeholders is not fully met by the description in the Notice and Communications Section of the GSP (Section 11).[8]

We note the following deficiencies with the overall stakeholder engagement process:

[6] "'Water use sector' refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation." [23 CCR §351(al)]

[7] "The water budget shall quantify the following, either through direct measurements or estimates based on data: (3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow." [23 CCR §354.18]

[8] "A communication section of the Plan shall include a requirement that the GSP identify how it encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin." [23 CCR §354.10(d)(3)]

- The opportunities for public involvement and engagement for DACs, domestic well owners, tribes, and environmental stakeholders during the GSP development and implementation processes are described in very general terms. They include attendance at meetings, notices, direct mailers, social media, and discussions with environmental organizations for developing sustainable management criteria. Details about the nature of the engagement process for beneficial users are not provided in the Notice and Communications section (i.e. planning for public listening sessions, actions to improve accessibility and increase participation among a diversity of beneficial users).

- The GSP does not include a plan for continual opportunities for engagement through the *implementation* phase of the GSP for DACs, domestic well owners, tribes, and environmental stakeholders.

**RECOMMENDATIONS**

- In the Notice and Communications section, describe active and targeted outreach to engage DACs, domestic well owners, tribes, and environmental stakeholders throughout the GSP development and implementation phases. Refer to Attachment B for specific recommendations on how to actively engage stakeholders during all phases of the GSP process.

- Describe efforts to consult and engage with DACs and domestic well owners within the subbasin.

- Utilize DWR's tribal engagement guidance to comprehensively address all tribes and tribal interests in the subbasin within the GSP.[9]

- Describe efforts to consult and engage with environmental stakeholders within the subbasin.

## C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users

The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is **insufficient**. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results and establishing minimum thresholds.[10,11,12]

[9] Engagement with Tribal Governments Guidance Document. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Doc-for-SGM-Engagement-with-Tribal-Govt_ay_19.pdf

[10] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results." [23 CCR §354.26(b)(3)]

[11] "The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[12] "The description of minimum thresholds shall include [...] how state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the agency shall explain the nature of and the basis for the difference." [23 CCR §354.28(b)(5)]

**Disadvantaged Communities and Drinking Water Users**

For chronic lowering of groundwater levels, the GSP presents an analysis of the impact of minimum thresholds on domestic wells. Minimum thresholds were established to maintain groundwater elevations above the shallowest perforated intervals of nearby wells. The GSP states (p. 8-19): *"As documented in Appendix B, domestic well construction was analyzed to identify the top of screen intervals for existing domestic wells. By maintaining water levels above the top screen, domestic users are protected. At each RMS location, the top screen interval for domestic wells is shown in reference to the applicable MT (see Appendix Q – SMC Hydrographs). MTs could result in slightly higher energy costs associated with greater pumping lifts in limited areas. No wells are expected to go dry."*

The GSP does not however, sufficiently describe or analyze direct or indirect impacts on DACs, drinking water users or tribes when defining undesirable results, nor does it describe how the existing minimum threshold groundwater levels are consistent with avoiding undesirable results to DACs and tribes in the subbasin.

For degraded water quality, the GSP establishes SMC for total dissolved solids (TDS) and nitrate. Minimum thresholds are set to state secondary maximum contaminant level (MCL) and the state primary MCL, respectively. SMC have not been established for other constituents of concern (COCs), however. The GSP states (8-26): *"As described in Section 5 – Groundwater Conditions, there are some areas of elevated total dissolved solids (TDS), arsenic (As), hexavalent chromium (CrVI), iron (Fe), and manganese (Mn). With no trends in As, CrVI, Fe, and Mn observed to date, the NASb is not setting SMCs for these constituents at this time."* The GSP continues (p. 8-27): *"It is also worth noting that in the Sacramento County portion of the NASb, there are well-documented larger areas of contamination and localized quality issues as described in Section 5 – Groundwater Conditions. As also described in that section, the NASb has maintained active coordination with regulators and responsible parties to address effective remediation of these contaminants. For that reason, there are no SMC for the contaminants in groundwater."* SMC should be established for all COCs in the subbasin that may be impacted and/or exacerbated by groundwater use or management, in addition to coordinating with water quality regulatory programs. Naturally occurring COCs can be exacerbated as a result of groundwater use or groundwater management within the subbasin.

**RECOMMENDATIONS**

**Chronic Lowering of Groundwater Levels**

- Describe direct and indirect impacts on DACs, drinking water users, and tribes when describing undesirable results and defining minimum thresholds for chronic lowering of groundwater levels.

**Degraded Water Quality**

- Describe direct and indirect impacts on drinking water users, DACs, and tribes when defining undesirable results for degraded water quality. For specific guidance on how to consider these users, refer to "Guide to Protecting Water Quality Under the Sustainable Groundwater Management Act."[13]

- Evaluate the cumulative or indirect impacts of proposed minimum thresholds for degraded water quality on DACs, drinking water users, and tribes.

[13] Guide to Protecting Water Quality under the Sustainable Groundwater Management Act https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1559328858/Guide_to_Protecting_Drinking_Water_Quality_Under_the_Sustainable_Groundwater_Management_Act.pdf?1559328858.

- Set minimum thresholds and measurable objectives for all water quality constituents within the subbasin that may be impacted or exacerbated by groundwater use and/or management. Ensure they align with drinking water standards.[14]

**Groundwater Dependent Ecosystems and Interconnected Surface Waters**

For chronic lowering of groundwater levels, the GSP states (p. 8-14): *"Following the calculations of the MTs, the resulting values were then compared to beneficial users to evaluate whether they would experience significant impacts at those future groundwater elevations. Hydrographs for each RMS showing actual groundwater elevations in comparison to baseline and model projected MTs are in Appendix Q – SMC Hydrographs."* Some of the hydrographs in Appendix Q show the 30 foot depth-to-water threshold used in the GDE identification. However, within the SMC section of the GSP, there is no further discussion or explanation of the impacts to GDEs, including discussion of the location of RMS wells in relation to GDEs or the impacts to GDEs when groundwater levels fall below the 30 foot threshold (or 80 feet within the context of Valley Oak).

For the depletion of interconnected surface water sustainability indicator, groundwater levels are used as a proxy. The GSP states (p. 8-42): *"Depletion of surface water is considered significant and unreasonable when the following occurs: 20% or more of the NASb interconnected surface water (ISW) representative monitoring sites (RMSs) have minimum threshold exceedances for 2 consecutive fall measurements (5 out of 23)."* The GSP continues (p. 8-43): *"The MTs for depletion of surface water are the same as for chronic lowering of groundwater, with the exception that only a subset of the RMS locations is considered interconnected with the surface water system."* However, no analysis or discussion is presented to describe how the SMC will affect GDEs, or the impact of these minimum thresholds on GDEs in the subbasin. Furthermore, the GSP makes no attempt to evaluate the impacts of the proposed minimum threshold on environmental beneficial users of surface water. The GSP does not explain how the chosen minimum thresholds and measurable objectives avoid significant and unreasonable effects on surface water beneficial users in the subbasin (see Attachment C for a list of environmental users in the subbasin), such as increased mortality and inability to perform key life processes (e.g., reproduction, migration).

**RECOMMENDATIONS**

- When defining undesirable results for chronic lowering of groundwater levels, provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the

[14] "Degraded Water Quality [...] collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues." [23 CCR §354.34(c)(4)]

subbasin.[15] Defining undesirable results is the crucial first step before the minimum thresholds can be determined.[16]

- When establishing SMC for the subbasin, consider that the SGMA statute [Water Code §10727.4(l)] specifically calls out that GSPs should include "impacts on groundwater dependent ecosystems".

- When defining undesirable results for depletion of interconnected surface water, include a description of potential impacts on instream habitats within ISWs when minimum thresholds in the subbasin are reached.[17] The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts to environmental beneficial users of interconnected surface waters as these environmental users could be left unprotected by the GSP. These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law.[6,18]

## 2. Climate Change

The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures.[19] The effects of climate change will intensify the impacts of water stress on GDEs, making available shallow groundwater resources especially critical to their survival. Condon *et al.* (2020) shows that GDEs are more likely to succumb to water stress and rely more on groundwater during times of drought.[20] When shallow groundwater is unavailable, riparian forests can die off and key life processes (e.g., migration and spawning) for aquatic organisms, such as steelhead, can be impeded.

The integration of climate change into the projected water budget is **insufficient**. The GSP does incorporate climate change into the projected water budget using data from the American River Basin Study. However, the plan does not consider multiple climate scenarios (e.g., the 2070 extremely wet and extremely dry climate scenarios) in the projected water budget. The GSP should clearly and transparently incorporate extremely wet and dry scenarios into projected water budgets or select more appropriate extreme scenarios for the subbasin. The GSP assesses the effects of possible extreme conditions for a Hot-Dry (HD) scenario. Given the location of the subbasin between the American and Sacramento rivers,

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[15] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results". [23 CCR §354.26(b)(3)]

[16] The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[17] "The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results." [23 CCR §354.28(c)(6)]

[18] Rohde MM, Seapy B, Rogers R, Castañeda X, editors. 2019. Critical Species LookBook: A compendium of California's threatened and endangered species for sustainable groundwater management. The Nature Conservancy, San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/Critical_Species_LookBook_91819.pdf

[19] "Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow." [23 CCR §354.18(e)]

[20] Condon et al. 2020. Evapotranspiration depletes groundwater under warming over the contiguous United States. Nature Communications. Available at: https://www.nature.com/articles/s41467-020-14688-0

a cool and wet scenario may also help identify potential vulnerabilities and/or opportunity areas for recharge projects. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant and their inclusion can help identify important vulnerabilities in the subbasin's approach to groundwater management.

The GSP incorporates climate change into key inputs (e.g., precipitation and evapotranspiration) of the projected water budget. However, imported water was not quantified as part of surface water flow inputs for future water budgets. If the water budgets are incomplete, including the omission of projected climate change effects on imported water flow inputs, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems, DACs, tribes, and domestic well owners.

**RECOMMENDATIONS**

- Incorporate climate change into imported water flow inputs for the projected water budget.
- Incorporate climate change scenarios into projects and management actions.

## 3. Data Gaps

The consideration of beneficial users when establishing monitoring networks is **insufficient**, due to a lack of specific plans to increase the Representative Monitoring Wells (RMWs) in the monitoring network that represent water quality conditions and shallow groundwater elevations around DACs, domestic wells, tribes, GDEs, and ISWs in the subbasin.

Figure 7-8 (Representative Monitoring Wells for Chronic Lowering of Groundwater) and Figure 7-10 (Shallow Aquifer Water Quality Representative Monitoring Wells) show that no monitoring wells are located across portions of the subbasin near DACs, domestic wells, and tribes (see maps provided in Attachment E). Beneficial users of groundwater may remain unprotected by the GSP without adequate monitoring and identification of data gaps in the shallow aquifer. The Plan therefore fails to meet SGMA's requirements for the monitoring network.[21]

The GSP provides some discussion of data gaps for GDEs and ISWs in Sections 7.4.6 (Chronic Lowering of Groundwater Levels Data Gaps), however, it does not provide specific plans, such as locations or a timeline, to fill the data gaps.

**RECOMMENDATIONS**

- Provide maps that overlay current and proposed monitoring well locations with the locations of DACs, domestic wells, tribes, GDEs, and ISWs to clearly identify potentially impacted areas. Increase the number of RMWs in the shallow aquifer across the subbasin as needed to adequately monitor all groundwater condition indicators. Prioritize proximity to DACs, domestic wells, tribes, and GDEs when identifying new RMWs.

[21] "The monitoring network objectives shall be implemented to accomplish the following: [...] (2) Monitor impacts to the beneficial uses or users of groundwater." [23 CCR §354.34(b)(2)]

- Further describe the biological monitoring that can be used to assess the potential for significant and unreasonable impacts to GDEs or ISWs due to groundwater conditions in the subbasin.

## 4. Addressing Beneficial Users in Projects and Management Actions

The consideration of beneficial users when developing projects and management actions is **insufficient**, due to the failure to completely identify benefits or impacts of identified projects and management actions, including water quality impacts, to key beneficial users of groundwater such as GDEs, aquatic habitats, surface water users, DACs, drinking water users, and tribes. While the expansion of the Sacramento Regional Water Bank is described as a recharge project within the subbasin, the plan fails to specify any benefits the project will have to the environment or DACs. Therefore, potential project and management actions as currently proposed may overlook the protection of these beneficial users. Groundwater sustainability under SGMA is defined not just by sustainable yield, but by the avoidance of undesirable results for *all* beneficial users.

**RECOMMENDATIONS**

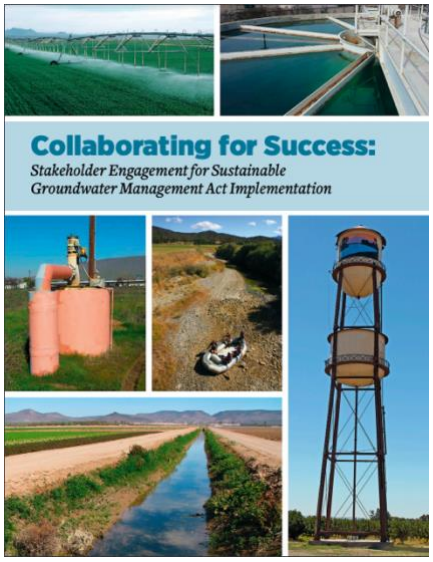
- For DACs and domestic well owners, include a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. Refer to Attachment B for specific recommendations on how to implement a drinking water well mitigation program.
- For DACs and domestic well owners, include a discussion of whether potential impacts to water quality from projects and management actions could occur and how the GSAs plan to mitigate such impacts.
- Recharge ponds, reservoirs, and facilities for managed aquifer recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For further guidance on how to integrate multi-benefit recharge projects into your GSP, refer to the "Multi-Benefit Recharge Project Methodology Guidance Document."[22]
- Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.

[22] The Nature Conservancy. 2021. Multi-Benefit Recharge Project Methodology for Inclusion in Groundwater Sustainability Plans. Sacramento. Available at: https://groundwaterresourcehub.org/sgma-tools/multi-benefit-recharge-project-methodology-guidance/

# Attachment B

## SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users

## Stakeholder Engagement and Outreach



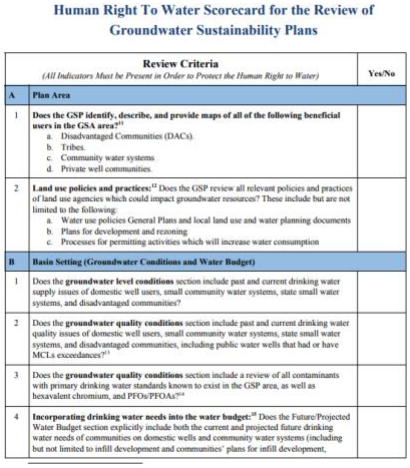

Clean Water Action, Community Water Center and Union of Concerned Scientists developed a guidance document called Collaborating for success: Stakeholder engagement for Sustainable Groundwater Management Act Implementation. It provides details on how to conduct targeted and broad outreach and engagement during Groundwater Sustainability Plan (GSP) development and implementation. Conducting a targeted outreach involves:

- Developing a robust Stakeholder Communication and Engagement plan that includes outreach at frequented locations (schools, farmers markets, religious settings, events) across the plan area to increase the involvement and participation of disadvantaged communities, drinking water users and the environmental stakeholders.

- Providing translation services during meetings and technical assistance to enable easy participation for non-English speaking stakeholders.

- GSP should adequately describe the process for requesting input from beneficial users and provide details on how input is incorporated into the GSP.

## The Human Right to Water



**Human Right To Water Scorecard for the Review of Groundwater Sustainability Plans**

| | Review Criteria *(All Indicators Must be Present in Order to Protect the Human Right to Water)* | Yes/No |
|---|---|---|
| **A** | **Plan Area** | |
| 1 | **Does the GSP identify, describe, and provide maps of all of the following beneficial users in the GSA area?**[43]<br>a. Disadvantaged Communities (DACs).<br>b. Tribes.<br>c. Community water systems.<br>d. Private well communities. | |
| 2 | **Land use policies and practices:**[44] Does the GSP review all relevant policies and practices of land use agencies which could impact groundwater resources? These include but are not limited to the following:<br>a. Water use policies General Plans and local land use and water planning documents<br>b. Plans for development and rezoning<br>c. Processes for permitting activities which will increase water consumption | |
| **B** | **Basin Setting (Groundwater Conditions and Water Budget)** | |
| 1 | Does the **groundwater level conditions** section include past and current drinking water supply issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities? | |
| 2 | Does the **groundwater quality conditions** section include past and current drinking water quality issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities, including public water wells that had or have MCLs exceedances?[45] | |
| 3 | Does the **groundwater quality conditions** section include a review of all contaminants with primary drinking water standards known to exist in the GSP area, as well as hexavalent chromium, and PFOs/PFOAs?[46] | |
| 4 | **Incorporating drinking water needs into the water budget:**[48] Does the Future/Projected Water Budget section explicitly include both the current and projected future drinking water needs of communities on domestic wells and community water systems (including but not limited to infill development and communities' plans for infill development, | |

The Human Right to Water Scorecard was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid Groundwater Sustainability Agencies (GSAs) in prioritizing drinking water needs in SGMA. The scorecard identifies elements that must exist in GSPs to adequately protect the Human Right to Drinking water.

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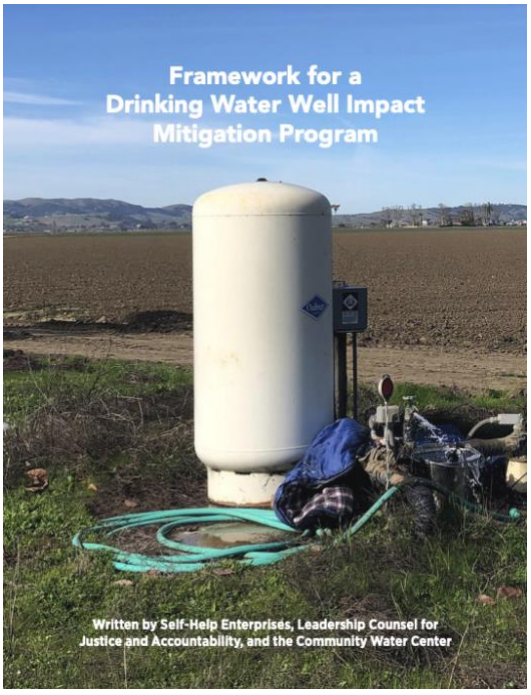
## Drinking Water Well Impact Mitigation Framework




The Drinking Water Well Impact Mitigation Framework was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid GSAs in the development and implementation of their GSPs. The framework provides a clear roadmap for how a GSA can best structure its data gathering, monitoring network and management actions to proactively monitor and protect drinking water wells and mitigate impacts should they occur.

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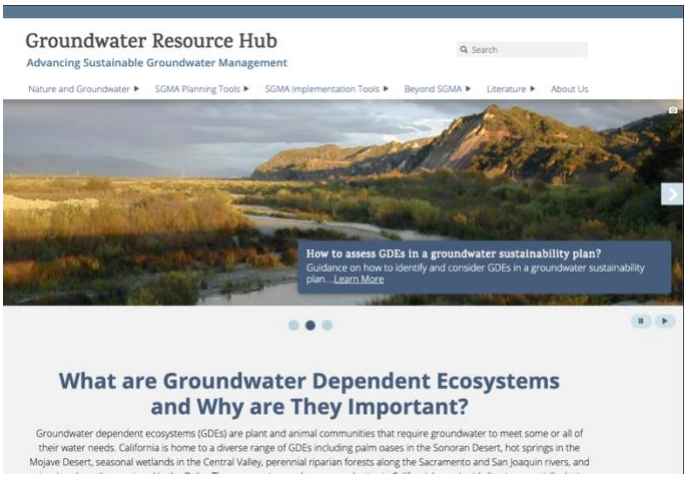
## Groundwater Resource Hub




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.

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## Rooting Depth Database

The Plant Rooting Depth Database provides information that can help assess whether groundwater-dependent vegetation are accessing groundwater. Actual rooting depths will depend on the plant species and site-specific conditions, such as soil type and

availability of other water sources. Site-specific knowledge of depth to groundwater combined with rooting depths will help provide an understanding of the potential groundwater levels are needed to sustain GDEs.

## How to use the database

The maximum rooting depth information in the Plant Rooting Depth Database is useful when verifying whether vegetation in the Natural Communities Commonly Associated with Groundwater (NC Dataset) are connected to groundwater. A 30 ft depth-to-groundwater threshold, which is based on averaged global rooting depth data for phreatophytes[1], is relevant for most plants identified in the NC Dataset since most plants have a max rooting depth of less than 30 feet. However, it is important to note that deeper thresholds are necessary for other plants that have reported maximum root depths that exceed the averaged 30 feet threshold, such as valley oak (*Quercus lobata*), Euphrates poplar (*Populus euphratica*), salt cedar (*Tamarix spp.*), and shadescale (*Atriplex confertifolia*). The Nature Conservancy advises that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to groundwater threshold of 80 feet should be used instead of the 30 ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to re-emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.

The Plant Rooting Depth Database is an Excel workbook composed of four worksheets:

1. California phreatophyte rooting depth data (included in the NC Dataset)
2. Global phreatophyte rooting depth data
3. Metadata
4. References

## How the database was compiled

The Plant Rooting Depth Database is a compilation of rooting depth information for the groundwater-dependent plant species identified in the NC Dataset. Rooting depth data were compiled from published scientific literature and expert opinion through a crowdsourcing campaign. As more information becomes available, the database of rooting depths will be updated. Please Contact Us if you have additional rooting depth data for California phreatophytes.

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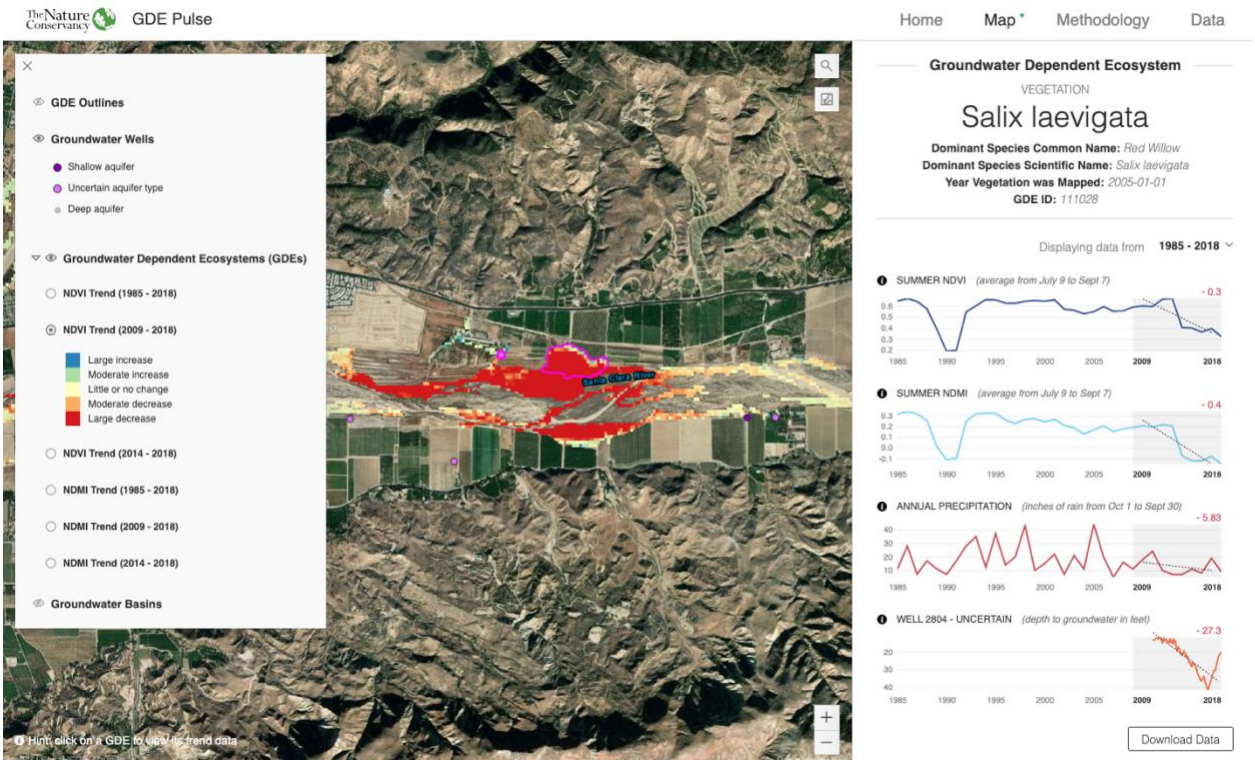
[1] Canadell, J., Jackson, R.B., Ehleringer, J.B. et al. 1996. Maximum rooting depth of vegetation types at the global scale. Oecologia 108, 583–595. https://doi.org/10.1007/BF00329030

# GDE Pulse




GDE Pulse is a free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data. Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset. The following datasets are available for downloading:

**Normalized Difference Vegetation Index (NDVI)** is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

**Normalized Difference Moisture Index (NDMI)** is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

**Annual Precipitation** is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

**Depth to Groundwater** measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

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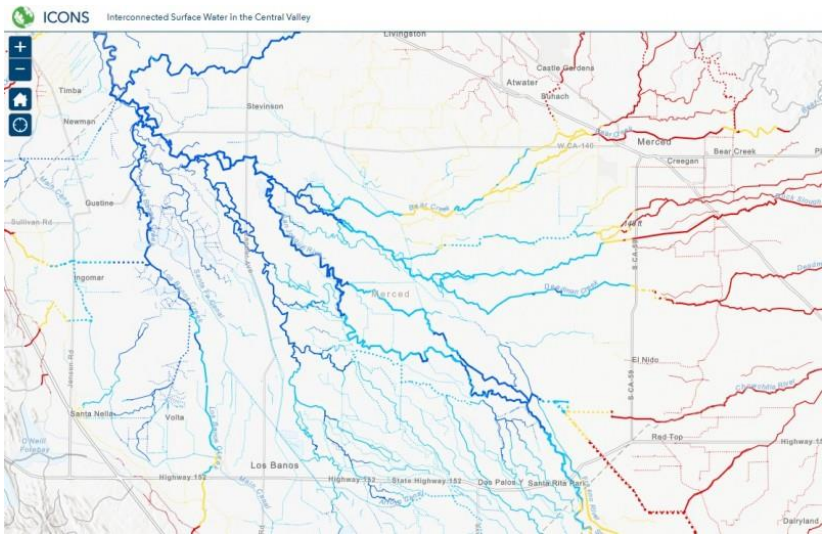
# ICONOS Mapper

## Interconnected Surface Water in the Central Valley




ICONS maps the likely presence of interconnected surface water (ISW) in the Central Valley using depth to groundwater data. Using data from 2011-2018, the ISW dataset represents the likely connection between surface water and groundwater for rivers and streams in California's Central Valley. It includes information on the mean, maximum, and minimum depth to groundwater for each stream segment over the years with available data, as well as the likely presence of ISW based on the minimum depth to groundwater. The Nature Conservancy developed this database, with guidance and input from expert academics, consultants, and state agencies.

We developed this dataset using groundwater elevation data available online from the California Department of Water Resources (DWR). DWR only provides this data for the Central Valley. For GSAs outside of the valley, who have groundwater well measurements, we recommend following our methods to determine likely ISW in your region. The Nature Conservancy's ISW dataset should be used as a first step in reviewing ISW and should be supplemented with local or more recent groundwater depth data.

# Attachment C

## Freshwater Species Located in the North American 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 North American 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 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[1]. 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[2] as well as on The Nature Conservancy's science website[3].

| Scientific Name | Common Name | Legal Protected Status | | |
|---|---|---|---|---|
| | | Federal | State | Other |
| **BIRDS** | | | | |
| Agelaius tricolor | Tricolored Blackbird | Bird of Conservation Concern | Special Concern | BSSC - First priority |
| Ardea alba | Great Egret | | | |
| Ardea herodias | Great Blue Heron | | | |
| Egretta thula | Snowy Egret | | | |
| Nycticorax nycticorax | Black-crowned Night-Heron | | | |
| Phalacrocorax auritus | Double-crested Cormorant | | | |
| Riparia riparia | Bank Swallow | | Threatened | |
| Actitis macularius | Spotted Sandpiper | | | |
| Aechmophorus clarkii | Clark's Grebe | | | |
| Aechmophorus occidentalis | Western Grebe | | | |
| Aix sponsa | Wood Duck | | | |
| Anas acuta | Northern Pintail | | | |
| Anas americana | American Wigeon | | | |
| Anas clypeata | Northern Shoveler | | | |
| Anas crecca | Green-winged Teal | | | |
| Anas cyanoptera | Cinnamon Teal | | | |
| Anas discors | Blue-winged Teal | | | |
| Anas platyrhynchos | Mallard | | | |
| Anas strepera | Gadwall | | | |
| Anser albifrons | Greater White-fronted Goose | | | |
| Aythya affinis | Lesser Scaup | | | |

[1] 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

[2] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS

[3] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species-database

| | | | | |
|---|---|---|---|---|
| Aythya americana | Redhead | | Special Concern | BSSC - Third priority |
| Aythya collaris | Ring-necked Duck | | | |
| Aythya marila | Greater Scaup | | | |
| Aythya valisineria | Canvasback | | Special | |
| Botaurus lentiginosus | American Bittern | | | |
| Bucephala albeola | Bufflehead | | | |
| Bucephala clangula | Common Goldeneye | | | |
| Butorides virescens | Green Heron | | | |
| Calidris alpina | Dunlin | | | |
| Calidris mauri | Western Sandpiper | | | |
| Calidris minutilla | Least Sandpiper | | | |
| Chen caerulescens | Snow Goose | | | |
| Chen rossii | Ross's Goose | | | |
| Chlidonias niger | Black Tern | | Special Concern | BSSC - Second priority |
| Chroicocephalus philadelphia | Bonaparte's Gull | | | |
| Cistothorus palustris palustris | Marsh Wren | | | |
| Cygnus buccinator | Trumpeter Swan | | | |
| Cygnus columbianus | Tundra Swan | | | |
| Empidonax traillii | Willow Flycatcher | Bird of Conservation Concern | Endangered | |
| Fulica americana | American Coot | | | |
| Gallinago delicata | Wilson's Snipe | | | |
| Gallinula chloropus | Common Moorhen | | | |
| Grus canadensis | Sandhill Crane | | | |
| Haliaeetus leucocephalus | Bald Eagle | Bird of Conservation Concern | Endangered | |
| Himantopus mexicanus | Black-necked Stilt | | | |
| Icteria virens | Yellow-breasted Chat | | Special Concern | BSSC - Third priority |
| Limnodromus scolopaceus | Long-billed Dowitcher | | | |
| Lophodytes cucullatus | Hooded Merganser | | | |
| Megaceryle alcyon | Belted Kingfisher | | | |
| Mergus merganser | Common Merganser | | | |
| Mergus serrator | Red-breasted Merganser | | | |
| Numenius americanus | Long-billed Curlew | | | |
| Numenius phaeopus | Whimbrel | | | |
| Oxyura jamaicensis | Ruddy Duck | | | |
| Pelecanus erythrorhynchos | American White Pelican | | Special Concern | BSSC - First priority |
| Phalaropus tricolor | Wilson's Phalarope | | | |
| Piranga rubra | Summer Tanager | | Special Concern | BSSC - First priority |
| Plegadis chihi | White-faced Ibis | | Watch list | |

| | | | | |
|---|---|---|---|---|
| Pluvialis squatarola | Black-bellied Plover | | | |
| Podiceps nigricollis | Eared Grebe | | | |
| Podilymbus podiceps | Pied-billed Grebe | | | |
| Porzana carolina | Sora | | | |
| Rallus limicola | Virginia Rail | | | |
| Recurvirostra americana | American Avocet | | | |
| Setophaga petechia | Yellow Warbler | | | BSSC - Second priority |
| Tachycineta bicolor | Tree Swallow | | | |
| Tringa melanoleuca | Greater Yellowlegs | | | |
| Tringa semipalmata | Willet | | | |
| Tringa solitaria | Solitary Sandpiper | | | |
| Xanthocephalus xanthocephalus | Yellow-headed Blackbird | | Special Concern | BSSC - Third priority |
| **CRUSTACEANS** | | | | |
| Branchinecta lynchi | Vernal Pool Fairy Shrimp | Threatened | Special | IUCN - Vulnerable |
| Lepidurus packardi | Vernal Pool Tadpole Shrimp | Endangered | Special | IUCN - Endangered |
| Linderiella occidentalis | California Fairy Shrimp | | Special | IUCN - Near Threatened |
| Branchinecta conservatio | Conservancy Fairy Shrimp | Endangered | Special | IUCN - Endangered |
| Cambaridae fam. | Cambaridae fam. | | | |
| Crangonyx spp. | Crangonyx spp. | | | |
| Cyprididae fam. | Cyprididae fam. | | | |
| Gammaridae fam. | Gammaridae fam. | | | |
| Gammarus spp. | Gammarus spp. | | | |
| Hyalella spp. | Hyalella spp. | | | |
| **FISH** | | | | |
| Acipenser medirostris ssp. 1 | Southern green sturgeon | Threatened | Special Concern | Endangered - Moyle 2013 |
| Oncorhynchus mykiss irideus | Coastal rainbow trout | | | Least Concern - Moyle 2013 |
| Pogonichthys macrolepidotus | Sacramento splittail | | Special Concern | Vulnerable - Moyle 2013 |
| Spirinchus thaleichthys | Longfin smelt | Candidate | Threatened | Vulnerable - Moyle 2013 |
| Oncorhynchus mykiss - CV | Central Valley steelhead | Threatened | Special | Vulnerable - Moyle 2013 |
| Oncorhynchus tshawytscha - CV spring | Central Valley spring Chinook salmon | Threatened | Threatened | Vulnerable - Moyle 2013 |
| Oncorhynchus tshawytscha - CV winter | Central Valley winter Chinook salmon | Endangered | Endangered | Vulnerable - Moyle 2013 |
| **HERPS** | | | | |
| Actinemys marmorata marmorata | Western Pond Turtle | | Special Concern | ARSSC |
| Ambystoma californiense californiense | California Tiger Salamander | Threatened | Threatened | ARSSC |
| Anaxyrus boreas boreas | Boreal Toad | | | |
| 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 |
| Thamnophis gigas | Giant Gartersnake | Threatened | Threatened | |
| Thamnophis sirtalis sirtalis | Common Gartersnake | | | |
| Pseudacris regilla | Northern Pacific Chorus Frog | | | |
| Thamnophis elegans elegans | Mountain Gartersnake | | | Not on any status lists |
| Thamnophis sirtalis fitchi | Valley Gartersnake | | | Not on any status lists |
| **INSECTS & OTHER INVERTS** | | | | |
| Ablabesmyia annulata | | | | Not on any status lists |
| Ablabesmyia spp. | Ablabesmyia spp. | | | |
| Acentrella spp. | Acentrella spp. | | | |
| Aeshna spp. | Aeshna spp. | | | |
| Aeshnidae fam. | Aeshnidae fam. | | | |
| Agabus lutosus | | | | Not on any status lists |
| Agabus spp. | Agabus spp. | | | |
| Alotanypus spp. | Alotanypus spp. | | | |
| Ambrysus spp. | Ambrysus spp. | | | |
| Anax junius | Common Green Darner | | | |
| Anax spp. | Anax spp. | | | |
| Anopheles spp. | Anopheles spp. | | | |
| Apedilum spp. | Apedilum spp. | | | |
| Argia agrioides | California Dancer | | | |
| Argia emma | Emma's Dancer | | | |
| Argia spp. | Argia spp. | | | |
| Argia vivida | Vivid Dancer | | | |
| Baetidae fam. | Baetidae fam. | | | |
| Baetis spp. | Baetis spp. | | | |
| Baetis tricaudatus | A Mayfly | | | |
| Belostoma spp. | Belostoma spp. | | | |
| Brechmorhoga mendax | Pale-faced Clubskimmer | | | |
| Brillia spp. | Brillia spp. | | | |
| Caenis amica | A Mayfly | | | |
| Caenis latipennis | A Mayfly | | | |
| Caenis spp. | Caenis spp. | | | |
| Callibaetis spp. | Callibaetis spp. | | | |
| Camelobaetidius kickapoo | | | | Not on any status lists |
| Camelobaetidius spp. | Camelobaetidius spp. | | | |
| Centroptilum album | A Mayfly | | | |
| Centroptilum spp. | Centroptilum spp. | | | |

| | | | | |
|---|---|---|---|---|
| Ceraclea spp. | Ceraclea spp. | | | |
| Cheumatopsyche spp. | Cheumatopsyche spp. | | | |
| Chimarra spp. | Chimarra spp. | | | |
| Chironomidae fam. | Chironomidae fam. | | | |
| Chironomus spp. | Chironomus spp. | | | |
| Cladopelma spp. | Cladopelma spp. | | | |
| Cladotanytarsus marki | | | | Not on any status lists |
| Cladotanytarsus spp. | Cladotanytarsus spp. | | | |
| Clinotanypus spp. | Clinotanypus spp. | | | |
| Coenagrionidae fam. | Coenagrionidae fam. | | | |
| Corisella decolor | | | | Not on any status lists |
| Corixidae fam. | Corixidae fam. | | | |
| Cricotopus annulator | | | | Not on any status lists |
| Cricotopus spp. | Cricotopus spp. | | | |
| Cryptochironomus spp. | Cryptochironomus spp. | | | |
| Cryptotendipes spp. | Cryptotendipes spp. | | | |
| Culex spp. | Culex spp. | | | |
| Culicidae fam. | Culicidae fam. | | | |
| Culiseta spp. | Culiseta spp. | | | |
| Dicrotendipes adnilus | | | | Not on any status lists |
| Dicrotendipes spp. | Dicrotendipes spp. | | | |
| Dubiraphia brunnescens | Brownish Dubiraphian Riffle Beetle | | Special | |
| Dubiraphia spp. | Dubiraphia spp. | | | |
| Dytiscidae fam. | Dytiscidae fam. | | | |
| Dytiscus marginicollis | | | | Not on any status lists |
| Enallagma boreale | Boreal Bluet | | | |
| Enallagma carunculatum | Tule Bluet | | | |
| Enallagma civile | Familiar Bluet | | | |
| Enallagma cyathigerum | | | | Not on any status lists |
| Enallagma praevarum | Arroyo Bluet | | | |
| Enallagma spp. | Enallagma spp. | | | |
| Endochironomus spp. | Endochironomus spp. | | | |
| Ephydridae fam. | Ephydridae fam. | | | |
| Epitheca canis | Beaverpond Baskettail | | | |
| Erythemis collocata | Western Pondhawk | | | |
| Eukiefferiella spp. | Eukiefferiella spp. | | | |
| Euryhapsis spp. | Euryhapsis spp. | | | |
| Fallceon quilleri | A Mayfly | | | |
| Fallceon spp. | Fallceon spp. | | | |
| Gerridae fam. | Gerridae fam. | | | |
| Glyptotendipes spp. | Glyptotendipes spp. | | | |
| Gomphidae fam. | Gomphidae fam. | | | |

| | | | | |
|---|---|---|---|---|
| Gomphus kurilis | Pacific Clubtail | | | |
| Gomphus spp. | Gomphus spp. | | | |
| Helochares normatus | | | | Not on any status lists |
| Helophorus spp. | Helophorus spp. | | | |
| Hetaerina americana | American Rubyspot | | | |
| Hydraena spp. | Hydraena spp. | | | |
| Hydrophilidae fam. | Hydrophilidae fam. | | | |
| Hydrophilus triangularis | | | | Not on any status lists |
| Hydropsyche alternans | | | | Not on any status lists |
| Hydropsyche californica | A Caddisfly | | | |
| Hydropsyche spp. | Hydropsyche spp. | | | |
| Hydropsychidae fam. | Hydropsychidae fam. | | | |
| Hydroptila ajax | A Caddisfly | | | |
| Hydroptila spp. | Hydroptila spp. | | | |
| Hydroptilidae fam. | Hydroptilidae fam. | | | |
| Ironodes spp. | Ironodes spp. | | | |
| Ischnura cervula | Pacific Forktail | | | |
| Ischnura perparva | Western Forktail | | | |
| Ischnura spp. | Ischnura spp. | | | |
| Labrundinia spp. | Labrundinia spp. | | | |
| Laccobius spp. | Laccobius spp. | | | |
| Laccophilus spp. | Laccophilus spp. | | | |
| Larsia spp. | Larsia spp. | | | |
| Lepidostoma spp. | Lepidostoma spp. | | | |
| Leptoceridae fam. | Leptoceridae fam. | | | |
| Lestes congener | Spotted Spreadwing | | | |
| Libellula forensis | Eight-spotted Skimmer | | | |
| Libellula luctuosa | Widow Skimmer | | | |
| Libellula pulchella | Twelve-spotted Skimmer | | | |
| Libellula saturata | Flame Skimmer | | | |
| Libellula spp. | Libellula spp. | | | |
| Libellulidae fam. | Libellulidae fam. | | | |
| Limnophyes spp. | Limnophyes spp. | | | |
| Liodessus obscurellus | | | | Not on any status lists |
| Liodessus spp. | Liodessus spp. | | | |
| Mesovelia spp. | Mesovelia spp. | | | |
| Micrasema spp. | Micrasema spp. | | | |
| Microchironomus nigrovittatus | | | | Not on any status lists |
| Microchironomus spp. | Microchironomus spp. | | | |
| Micropsectra spp. | Micropsectra spp. | | | |
| Microtendipes spp. | Microtendipes spp. | | | |
| Microvelia spp. | Microvelia spp. | | | |

| | | | | |
|---|---|---|---|---|
| Mideopsis pumila | | | | Not on any status lists |
| Mideopsis spp. | Mideopsis spp. | | | |
| Mystacides alafimbriatus | A Caddisfly | | | |
| Mystacides spp. | Mystacides spp. | | | |
| Nanocladius spp. | Nanocladius spp. | | | |
| Nectopsyche dorsalis | A Caddisfly | | | |
| Nectopsyche gracilis | A Caddisfly | | | |
| Nectopsyche spp. | Nectopsyche spp. | | | |
| Ochthebius spp. | Ochthebius spp. | | | |
| Ophiogomphus arizonicus | | | | Not on any status lists |
| Ophiogomphus occidentis | Sinuous Snaketail | | | |
| Ophiogomphus spp. | Ophiogomphus spp. | | | |
| Ordobrevia nubifera | | | | Not on any status lists |
| Orthocladius spp. | Orthocladius spp. | | | |
| Oxyethira spp. | Oxyethira spp. | | | |
| Pachydiplax longipennis | Blue Dasher | | | |
| Pantala hymenaea | Spot-winged Glider | | | |
| Parachaetocladius spp. | Parachaetocladius spp. | | | |
| Parachironomus spp. | Parachironomus spp. | | | |
| Paracloeodes minutus | A Small Minnow Mayfly | | | |
| Parakiefferiella spp. | Parakiefferiella spp. | | | |
| Parametriocnemus spp. | Parametriocnemus spp. | | | |
| Paraphaenocladius spp. | Paraphaenocladius spp. | | | |
| Paratanytarsus spp. | Paratanytarsus spp. | | | |
| Paratendipes spp. | Paratendipes spp. | | | |
| Peltodytes spp. | Peltodytes spp. | | | |
| Pentaneura inconspicua | | | | Not on any status lists |
| Pentaneura spp. | Pentaneura spp. | | | |
| Perlodidae fam. | Perlodidae fam. | | | |
| Petrophila confusalis | | | | Not on any status lists |
| Petrophila spp. | Petrophila spp. | | | |
| Phaenopsectra spp. | Phaenopsectra spp. | | | |
| Plathemis lydia | Common Whitetail | | | |
| Polypedilum albicorne | | | | Not on any status lists |
| Polypedilum spp. | Polypedilum spp. | | | |
| Procladius spp. | Procladius spp. | | | |
| Progomphus borealis | Gray Sanddragon | | | |
| Protoptila spp. | Protoptila spp. | | | |
| Psectrocladius spp. | Psectrocladius spp. | | | |
| Psectrotanypus spp. | Psectrotanypus spp. | | | |
| Pseudochironomus spp. | Pseudochironomus spp. | | | |
| Pseudosmittia spp. | Pseudosmittia spp. | | | |

| | | | | |
|---|---|---|---|---|
| Psychodidae fam. | Psychodidae fam. | | | |
| Rhagovelia spp. | Rhagovelia spp. | | | |
| Rheotanytarsus hamatus | | | | Not on any status lists |
| Rheotanytarsus spp. | Rheotanytarsus spp. | | | |
| Rhionaeschna californica | California Darner | | | |
| Rhionaeschna multicolor | Blue-eyed Darner | | | |
| Robackia demeijeri | | | | Not on any status lists |
| Simuliidae fam. | Simuliidae fam. | | | |
| Simulium spp. | Simulium spp. | | | |
| Sperchon spp. | Sperchon spp. | | | |
| Sperchon stellata | | | | Not on any status lists |
| Stenochironomus spp. | Stenochironomus spp. | | | |
| Stylurus olivaceus | Olive Clubtail | | | |
| Sympetrum corruptum | Variegated Meadowhawk | | | |
| Tanypus spp. | Tanypus spp. | | | |
| Tanytarsus angulatus | | | | Not on any status lists |
| Tanytarsus spp. | Tanytarsus spp. | | | |
| Tipulidae fam. | Tipulidae fam. | | | |
| Tramea lacerata | Black Saddlebags | | | |
| Tramea spp. | Tramea spp. | | | |
| Trichocorixa calva | | | | Not on any status lists |
| Trichocorixa spp. | Trichocorixa spp. | | | |
| Tricorythodes explicatus | A Mayfly | | | |
| Tricorythodes spp. | Tricorythodes spp. | | | |
| Tropisternus spp. | Tropisternus spp. | | | |
| Unionicolidae fam. | Unionicolidae fam. | | | |
| Uvarus subtilis | | | | Not on any status lists |
| Wormaldia spp. | Wormaldia spp. | | | |
| Xenochironomus spp. | Xenochironomus spp. | | | |
| Zavrelimyia spp. | Zavrelimyia spp. | | | |
| Zoniagrion exclamationis | Exclamation Damsel | | | |
| **MAMMALS** | | | | |
| Castor canadensis | American Beaver | | | Not on any status lists |
| Lontra canadensis canadensis | North American River Otter | | | Not on any status lists |
| Neovison vison | American Mink | | | Not on any status lists |
| Ondatra zibethicus | Common Muskrat | | | Not on any status lists |
| **MOLLUSKS** | | | | |
| Ferrissia spp. | Ferrissia spp. | | | |
| Galba spp. | Galba spp. | | | |

| | | | | |
|---|---|---|---|---|
| Gonidea angulata | Western Ridged Mussel | | Special | |
| Gyraulus circumstriatus | Disc Gyro | | | CS |
| Gyraulus crista | Star Gyro | | | CS |
| Gyraulus spp. | Gyraulus spp. | | | |
| Helisoma spp. | Helisoma spp. | | | |
| Hydrobiidae fam. | Hydrobiidae fam. | | | |
| Lymnaea spp. | Lymnaea spp. | | | |
| Lymnaeidae fam. | Lymnaeidae fam. | | | |
| Margaritifera falcata | Western Pearlshell | | Special | |
| Menetus opercularis | Button Sprite | | | CS |
| Menetus spp. | Menetus spp. | | | |
| Physa acuta | Pewter Physa | | | Not on any status lists |
| Physa spp. | Physa spp. | | | |
| Pisidium spp. | Pisidium spp. | | | |
| Planorbidae fam. | Planorbidae fam. | | | |
| Sphaeriidae fam. | Sphaeriidae fam. | | | |
| Sphaerium spp. | Sphaerium spp. | | | |
| Anodonta californiensis | California Floater | | Special | |
| **PLANTS** | | | | |
| Chloropyron molle hispidum | | | Special | CRPR - 1B.1 |
| Downingia pusilla | Dwarf Downingia | | Special | CRPR - 2B.2 |
| Gratiola heterosepala | Boggs Lake Hedge-hyssop | | Endangered | CRPR - 1B.2 |
| Legenere limosa | False Venus'-looking-glass | | Special | CRPR - 1B.1 |
| Orcuttia viscida | Sacramento Orcutt Grass | Endangered | Endangered | CRPR - 1B.1 |
| Sagittaria sanfordii | Sanford's Arrowhead | | Special | CRPR - 1B.2 |
| Alnus rhombifolia | White Alder | | | |
| Alopecurus pratensis | NA | | | |
| Alopecurus saccatus | Pacific Foxtail | | | |
| Ammannia coccinea | Scarlet Ammannia | | | |
| Ammannia robusta | Grand Redstem | | | |
| Arundo donax | NA | | | |
| Baccharis salicina | | | | Not on any status lists |
| Brodiaea nana | | | | Not on any status lists |
| Callitriche heterophylla bolanderi | Large Water-starwort | | | |
| Callitriche marginata | Winged Water-starwort | | | |
| Cephalanthus occidentalis | Common Buttonbush | | | |
| Cotula coronopifolia | NA | | | |
| Crassula aquatica | Water Pygmyweed | | | |
| Crassula solieri | NA | | | Not on any status lists |
| Downingia bicornuta | NA | | | |

| | | | | |
|---|---|---|---|---|
| Downingia cuspidata | Toothed Calicoflower | | | |
| Downingia ornatissima | NA | | | |
| Elatine brachysperma | Shortseed Waterwort | | | |
| Eleocharis acicularis acicularis | Least Spikerush | | | |
| Eleocharis macrostachya | Creeping Spikerush | | | |
| Eleocharis montevidensis | Sand Spikerush | | | |
| Elodea canadensis | Broad Waterweed | | | |
| Epilobium campestre | NA | | | Not on any status lists |
| Epilobium cleistogamum | Cleistogamous Spike-primrose | | | |
| Eryngium castrense | Great Valley Eryngo | | | |
| Eryngium vaseyi vallicola | | | | Not on any status lists |
| Eryngium vaseyi vaseyi | Vasey's Coyote-thistle | | | Not on any status lists |
| Euthamia occidentalis | Western Fragrant Goldenrod | | | |
| Gratiola ebracteata | Bractless Hedge-hyssop | | | |
| Helenium puberulum | Rosilla | | | |
| Isoetes howellii | NA | | | |
| Isoetes orcuttii | NA | | | |
| Juncus acuminatus | Sharp-fruit Rush | | | |
| Juncus diffusissimus | NA | | | |
| Juncus effusus pacificus | | | | |
| Juncus uncialis | Inch-high Rush | | | |
| Lasthenia fremontii | Fremont's Goldfields | | | |
| Leersia oryzoides | Rice Cutgrass | | | |
| Lemna minor | Lesser Duckweed | | | |
| Lemna valdiviana | Pale Duckweed | | | |
| Limnanthes alba alba | White Meadowfoam | | | |
| Limnanthes floccosa californica | Shippee Meadowfoam | Endangered | Endangered | CRPR - 1B.1 |
| Ludwigia hexapetala | NA | | | Not on any status lists |
| Ludwigia palustris | Marsh Seedbox | | | |
| Ludwigia peploides montevidensis | NA | | | Not on any status lists |
| Ludwigia peploides peploides | NA | | | Not on any status lists |
| Lycopus americanus | American Bugleweed | | | |
| Mimulus cardinalis | Scarlet Monkeyflower | | | |
| Mimulus guttatus | Common Large Monkeyflower | | | |
| Mimulus tricolor | Tricolor Monkeyflower | | | |
| Myosotis laxa | Small Forget-me-not | | | |
| Myosotis scorpioides | NA | | | |
| Myosurus apetalus | Bristly Mousetail | | | |
| Myriophyllum aquaticum | NA | | | |

| | | | | |
|---|---|---|---|---|
| Navarretia intertexta | Needleleaf Navarretia | | | |
| Navarretia leucocephala leucocephala | White-flower Navarretia | | | |
| Navarretia myersii myersii | Pincushion Navarretia | | Special | CRPR - 1B.1 |
| Panicum dichotomiflorum | NA | | | |
| Persicaria hydropiper | NA | | | Not on any status lists |
| Persicaria lapathifolia | | | | Not on any status lists |
| Persicaria maculosa | NA | | | Not on any status lists |
| Persicaria punctata | NA | | | Not on any status lists |
| Phyla nodiflora | Common Frog-fruit | | | |
| Pilularia americana | NA | | | |
| Plagiobothrys distantiflorus | California Popcorn-flower | | | |
| Plagiobothrys greenei | Greene's Popcorn-flower | | | |
| Plagiobothrys undulatus | NA | | | Not on any status lists |
| Plantago elongata elongata | Slender Plantain | | | |
| Platanus racemosa | California Sycamore | | | |
| Pogogyne zizyphoroides | | | | Not on any status lists |
| Psilocarphus brevissimus brevissimus | Dwarf Woolly-heads | | | |
| Psilocarphus oregonus | Oregon Woolly-heads | | | |
| Psilocarphus tenellus | NA | | | |
| Ranunculus bonariensis | NA | | | |
| Rorippa curvisiliqua curvisiliqua | Curve-pod Yellowcress | | | |
| Rumex conglomeratus | NA | | | |
| Sagittaria latifolia latifolia | Broadleaf Arrowhead | | | |
| Salix breweri | Brewer's Willow | | | |
| Salix exigua exigua | Narrowleaf Willow | | | |
| Salix gooddingii | Goodding's Willow | | | |
| Salix laevigata | Polished Willow | | | |
| Salix lasiandra lasiandra | | | | Not on any status lists |
| Salix lasiolepis lasiolepis | Arroyo Willow | | | |
| Salix melanopsis | Dusky Willow | | | |
| Schoenoplectus acutus occidentalis | Hardstem Bulrush | | | |
| Schoenoplectus californicus | California Bulrush | | | |
| Sidalcea calycosa calycosa | Annual Checker-mallow | | | |
| Stachys stricta | Sonoma Hedge-nettle | | | |

| | | | | |
|---|---|---|---|---|
| Triglochin scilloides | NA | | | Not on any status lists |
| Typha domingensis | Southern Cattail | | | |
| Typha latifolia | Broadleaf Cattail | | | |
| Veronica anagallis-aquatica | NA | | | |

# Attachment D

The Nature Conservancy

July 2019

## 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). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online[1] to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)[2]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.

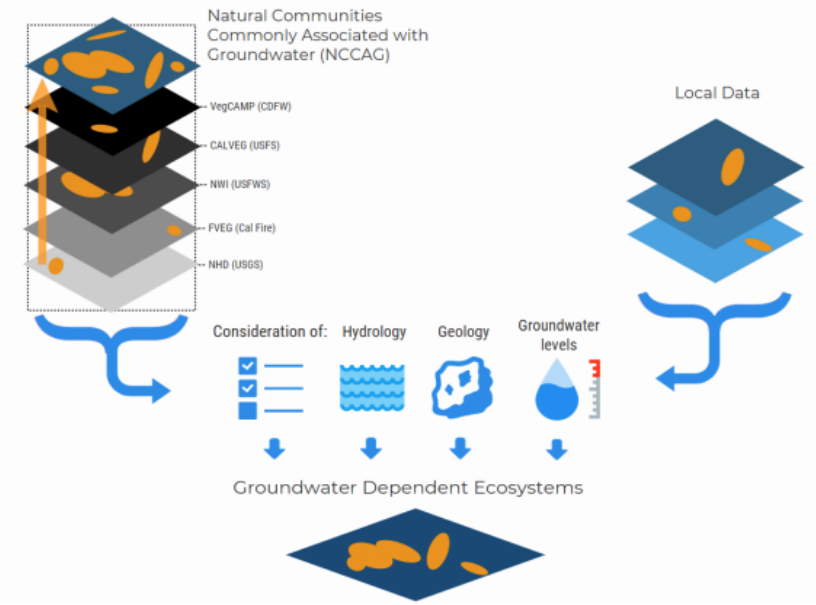



**Figure 1. Considerations for GDE identification.**
Source: DWR[2]

[1] NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/
[2] 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

The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California[3]. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset[4] on the Groundwater Resource Hub[5], a website dedicated to GDEs.

## BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) 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, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may 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. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

[3] 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
[4] "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/
[5] The Groundwater Resource Hub: www.GroundwaterResourceHub.org

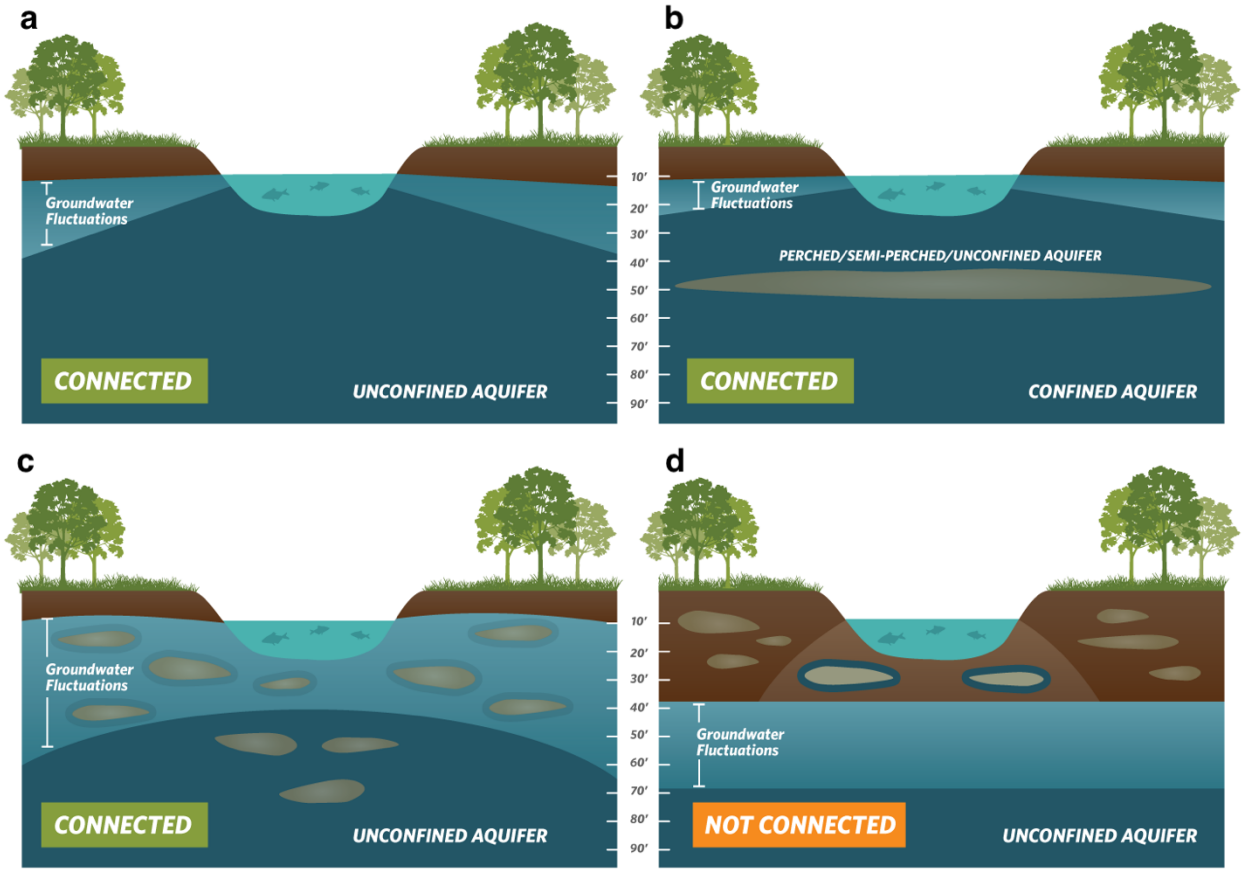



**Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a)** Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. **Bottom: (c)** Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. **(d)** 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 the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

## BEST PRACTICE #2. Characterize Seasonal and Interannual 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 typical of California's climate. DWR's Best Management Practices document on water budgets[6] 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[7] could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs 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[8] 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 TNC's GDE guidance document[4], one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

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[4] of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand 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[9]. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network (see Best Practice #6).

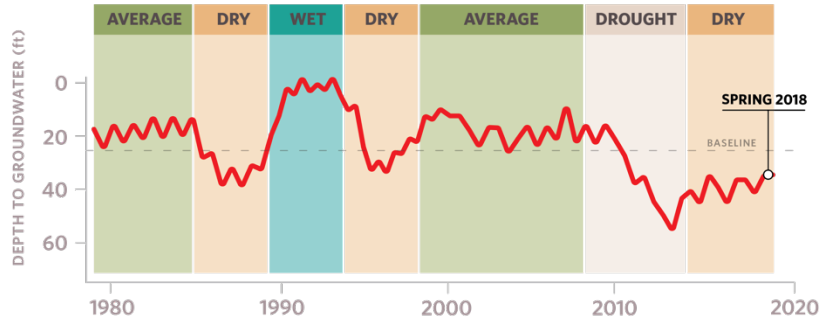



**Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time.** Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future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

[6] 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

[7] 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)]

[8] 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[4]).

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

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

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. 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 a GDE does not preclude the possibility that it is supported by groundwater, too. 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 supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals[10], which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

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 may 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).

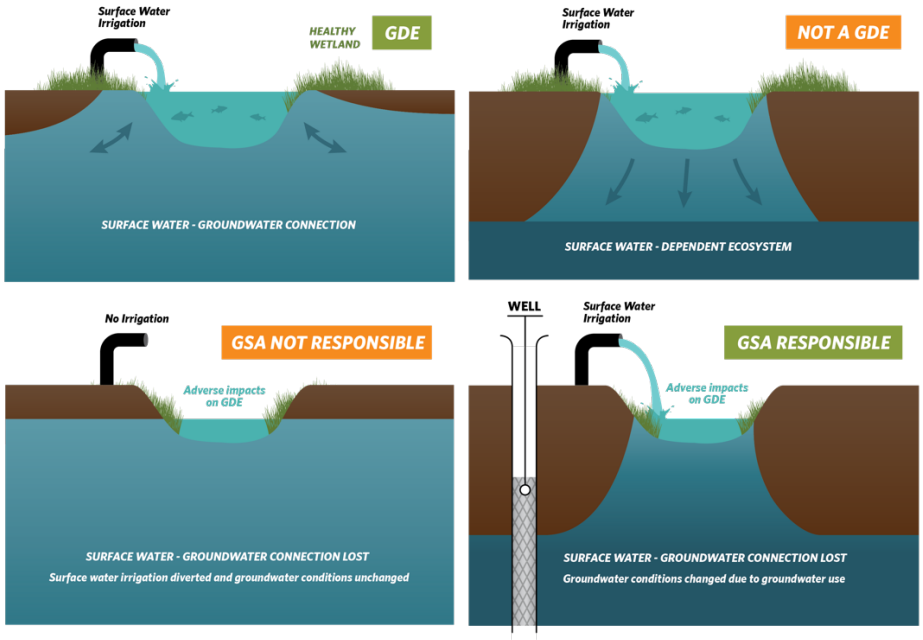



**Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left)** Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **Bottom: (Left)** An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. **(Right)** Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

[10] For a list of environmental beneficial users of surface water by basin, visit: https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/

## BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, 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 each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.

- 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 information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

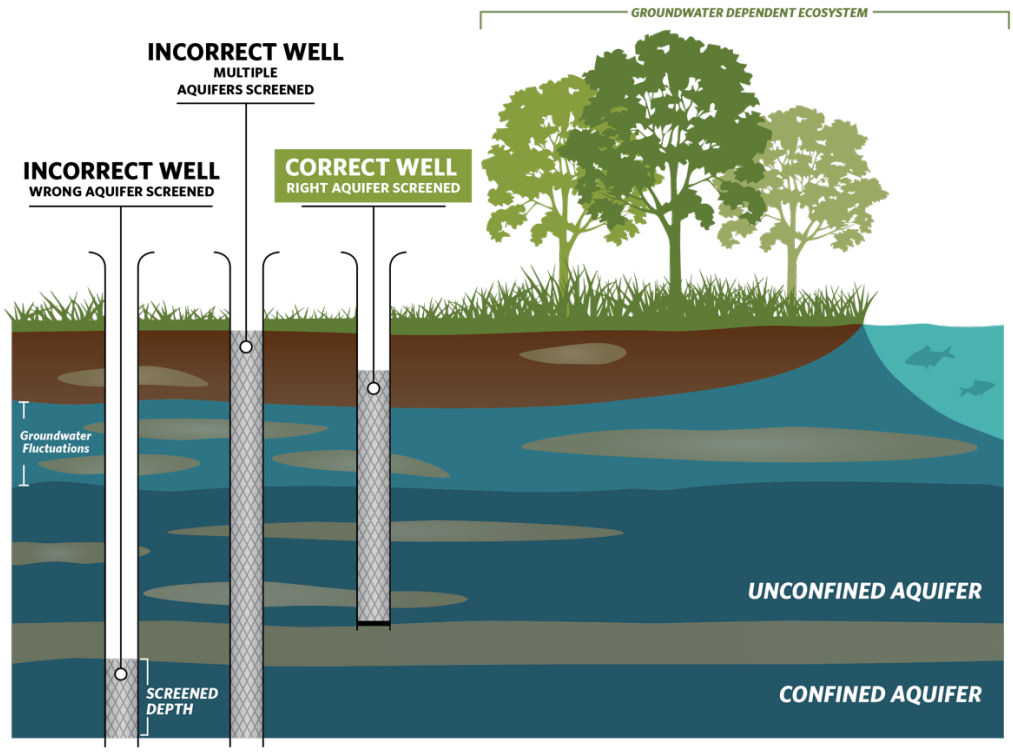



**Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.**

## BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate **groundwater elevations** at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[11] to estimate depth-to-groundwater contours across the landscape (Figure b; 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.

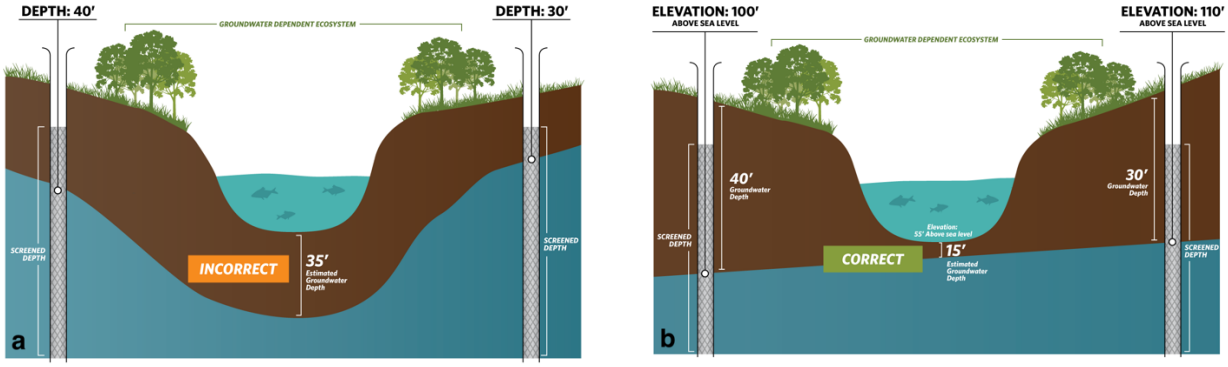



**Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a)** Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

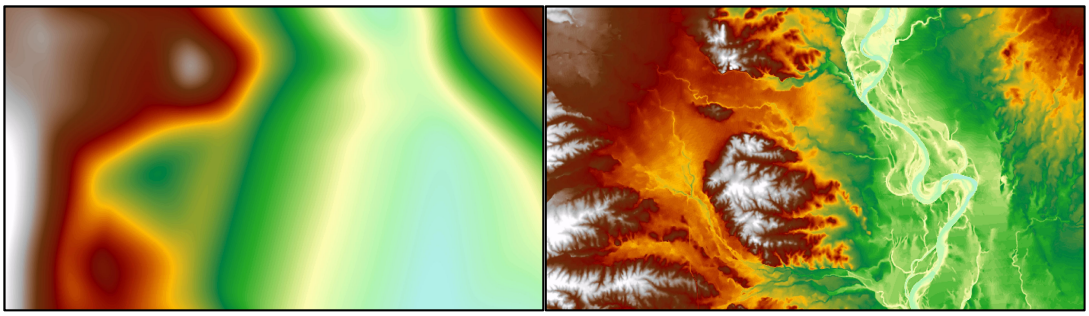


**Figure 7. Depth-to-groundwater contours in Northern California. (Left)** Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface 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.

[11] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

### 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 programs 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.

# Attachment E

## Maps of representative monitoring sites in relation to key beneficial users

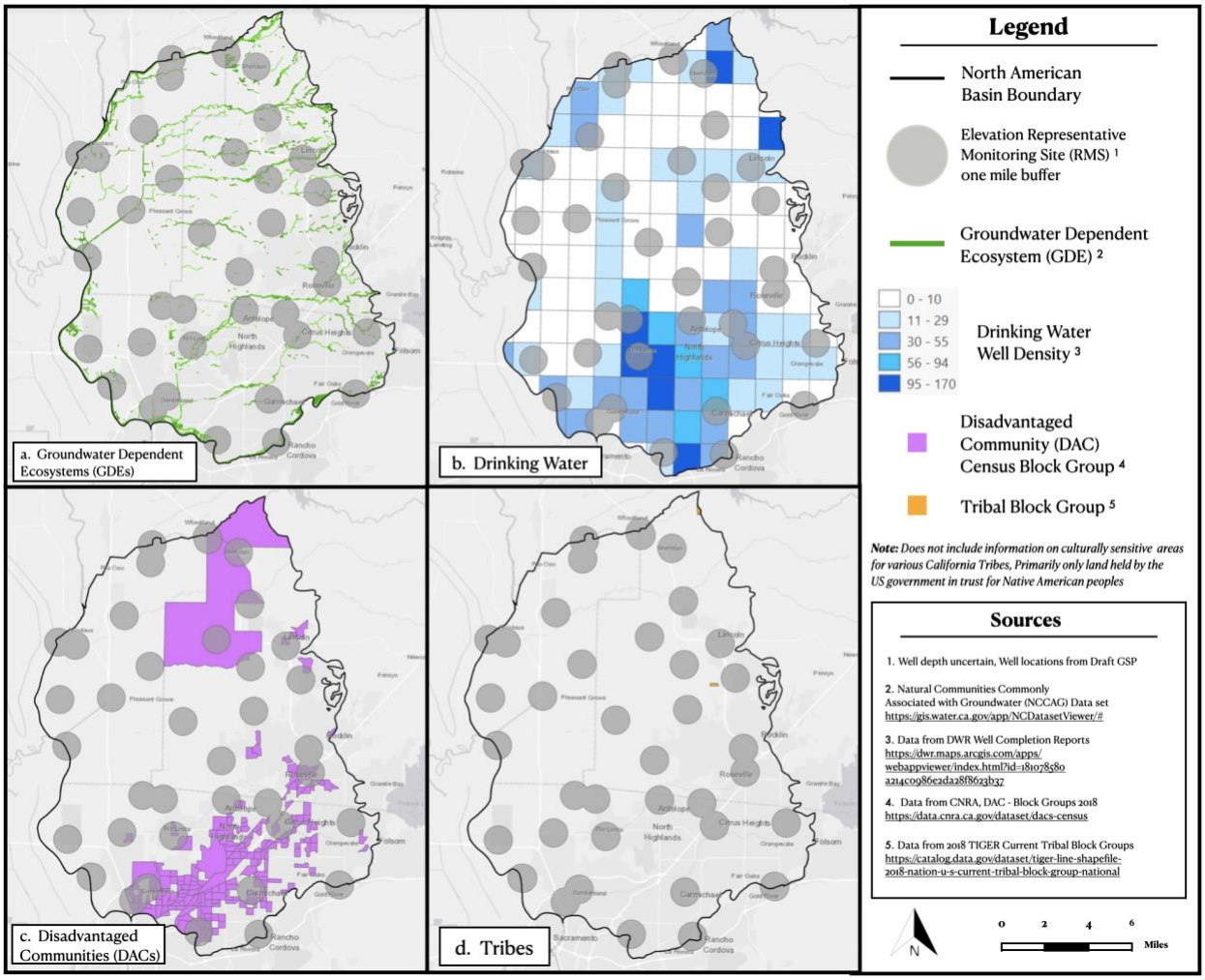



**Figure 1.** Groundwater elevation representative monitoring sites in relation to key beneficial users: a) Groundwater Dependent Ecosystems (GDEs), b) Drinking Water users, c) Disadvantaged Communities (DACs), and d) Tribes.

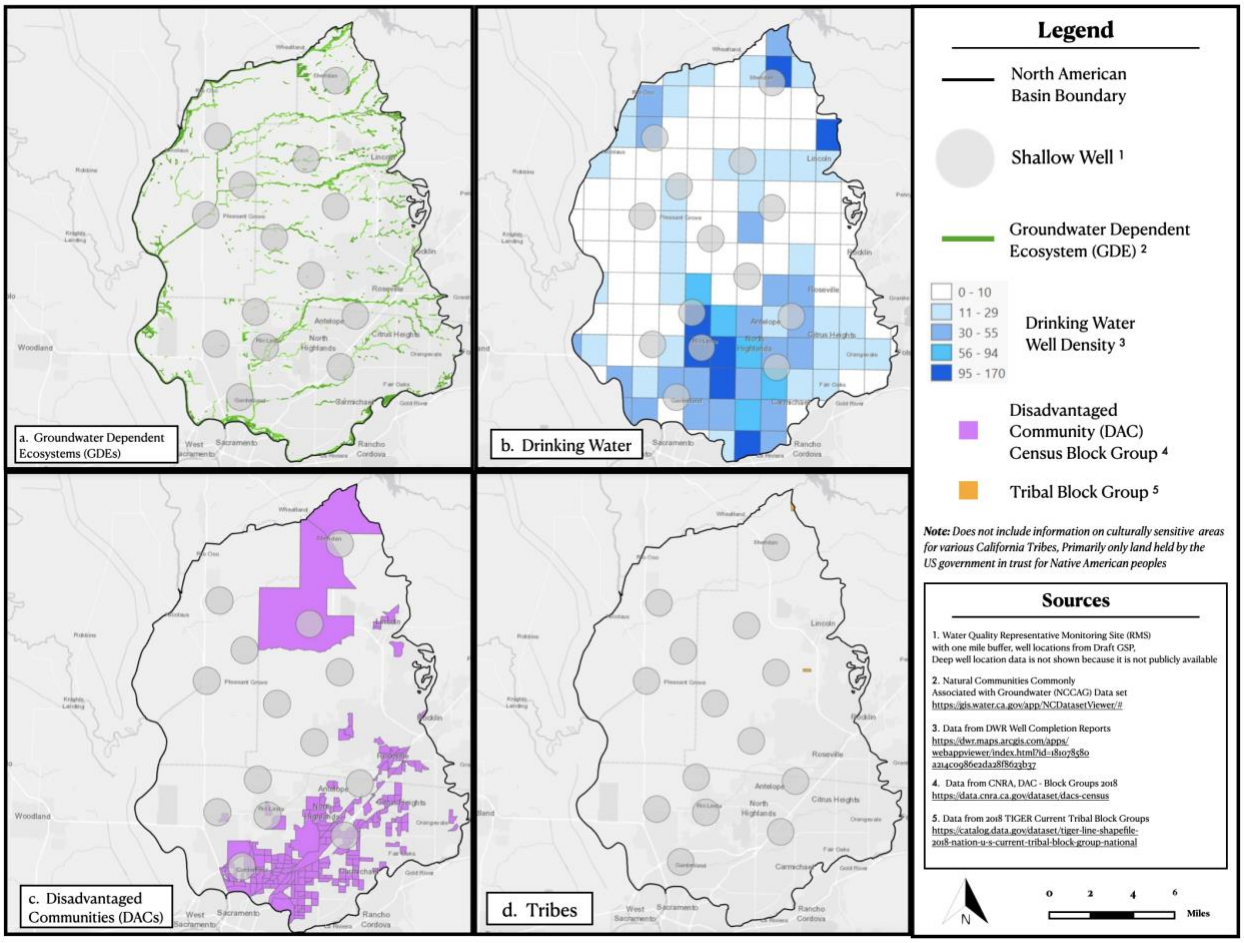



**Figure 2.** Groundwater quality representative monitoring sites in relation to key beneficial users: a) Groundwater Dependent Ecosystems (GDEs), b) Drinking Water users, c) Disadvantaged Communities (DACs), and d) Tribes.