Rainfall to Groundwater.net
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Attn. **Paso Robles Subbasin Cooperative Committee**

Subject: **GSP Process Comments: Addendum to comments on Chapters 1-3**

Dear Cooperative Committee Leaders,

I congratulate the Cooperative Committee on its exemplary, timely progress toward the Groundwater Sustainability Plan (GSP). Based on what I've been able to glean about the progress of other GSAs around the state, Paso Robles Subbasin appears to be at the forefront of groundwater sustainability planning.

Given my "outsider's" perspective, I attribute that to the combination of leadership by the County of San Luis Obispo, including its skilled planners, sound consultants and the apparent engagement of GSA stakeholders. Most of all, the elegance and efficiency of the cooperative, collaborative approach seems exemplified by the progress y'all have made. So, again, Congratulations!

Further congratulations are offered for your inviting public, including "outsider" interface such as mine via your Paso Robles Groundwater Communication Portal, through which I've been able to catch up some on your efforts to date.

The following offers more general and overall comments on your GSP in progress as background and support for my comments on the draft GSP chapters.

Longtime Academic/Professional Concern with Paso Robles Subbasin

Labeling myself "outsider" is partly tongue-in-cheek. In truth, while I've not lived in San Luis Obispo County, its expansive rangelands have been "on my radar" for two decades. Throughout that time, I've viewed these lands more in the context of upper Salinas River watershed/ catchment.

Around the turn of the millennium, as part of my doctoral program I initiated and secured funding for the Ventana/ Central Coast Wildlands Project, which offered a Geographic Information System (GIS) analysis of habitat connectivity needs for a suite of focal wildlife species spanning the Central West California Ecoregion.

Veering a bit from related projects in California at that time, I selected steelhead as my own focal species and developed, with technical and even some volunteer assistance, a GIS database of historical steelhead streams and their watersheds, extending from San Francisco Bay southward to San Diego County, since my California Department of Fish and Game source data extended through that greater region.

During the second phase of project funding I relinquished project management to a colleague and the project's final report (Thorne and colleagues 2002) included only overall maps of the distribution of steelhead by population status, along with limited description of the database.

The results of analyses I conducted using the steelhead database during the first phase were relegated to my doctoral dissertation, which was approved by my doctoral committee in July 2008 [Jigour 2008 (2011) abstract attached]. The interval between the GIS analyses and committee approval mostly represents the time I spent conducting and documenting an extensive interdisciplinary literature review supporting the importance of woody plant cover to the detention (infiltration and percolation) functions of watersheds/ catchments.

Among the most striking results of my analyses was the massive expanse of **nonnative annual grasslands** in the watersheds of historical steelhead rivers and streams whose runoff is not controlled by large dams, nowhere better exemplified than in the upper Salinas River watershed/ catchment, a.k.a. region of Paso Robles Subbasin.

Note that this applies to much of the inland Monterey County watersheds/ catchments of Salinas River, as well, but especially with many rangelands "hidden" behind the foothills from the agricultural floodplain, the opportunities there are even farther out of sight and mind to Salinas Valley GSAs.

I must emphasize the ***nonnative*** part of that ecological description, which is absolutely the case, contrary to what the current GSP Chapter 3 suggests. That nonnative description is a clue to the fact that these nonnative annual rangelands represent anthropogenically degraded watersheds/ catchments. Thus, History, and even Prehistory of Land Use is an appropriate topic to at least summarily address in Chapter 3.

The fairly recent history of removal of oaks for use in the local charcoal industry is another clue that should be spatially analyzed, as only local sources may best do. My vision is that students could be supported by GSA scholarships in fleshing out such pertinent information as part of their academic programs.

The charcoal industry history should be compared with other historical land use trends, such as the state sanctioned/ funded mid-20th century efforts to remove oaks and other woody plants in the name of "rangeland improvement" summarized, with citations, in my blog post #6. Ball and Chain & Other Links

In recent decades landscape and restoration ecologists have increasingly recognized the influences on historic and current land cover/vegetation by intentional land management practices of indigenous Californians. While it may be impossible in most cases to document exactly how the landscape would look without the recently recognized indigenous land management skills, some inferences based on that awareness may be useful in establishing vegetative goals and processes to restore watershed/ catchment functions.

Thus, consideration of **all anthropogenic impacts (including prehistoric)** to the function of existing and prospective restored watersheds/ catchments is entirely germane to the GSP. For an overview, please see my blog post #4. Think Outside the Basin.

While my initial focus was on improving the function of the Salinas River and other Central West Ecoregion watersheds for steelhead – especially augmenting baseflow – it has always been clear that augmenting baseflow necessarily benefits regional groundwater stocks, since baseflow essentially reflects its net status.

Moreover, detention storage offered in watershed/ catchment vadose zones – "the soil profile as a natural reservoir" (Hursh and Fletcher 1942), as well as in the bedrock aquifers that provide longer-term storage but eventually drain to the alluvial aquifers GSAs are directly concerned with, offers the most cost-effective form of short and longer-term storage because: 1.) no hard infrastructure involved, 2.) reduced complexity of permitting ecological restoration projects, and 3.) over time, restored sites will become relatively self-sustaining, so much lest costly to maintain than engineered structures.

2018 Outreach to Paso Robles GSA Points of Contact

While this is my first input on the draft GSP in progress. I have sent email alerts for each of my seven blog posts to date, beginning January 2018, to the specific points of contact for each of the GSAs in the Paso Robles Subbasin. In mid-April I mailed hard copy letters to a couple of you. But to date I don't believe any of your contacts have taken time to explore the Rainfall to Groundwater web site to learn about these opportunities that you won't see proposed/ defined elsewhere.

To date Rainfall to Groundwater is the only proposed approach to groundwater recharge that does not involve diversion of surface waters. Please see Surface

Water Diversions vs Baseflow Augmentation. Furthermore, Paso Robles Subbasin watersheds/ catchments are the prototypical model of expansive opportunities within a single (greater) watershed/ catchment. So I do hope these comments may finally get your attention.

Water Budget Model & Process

These comments pertain to the July 25, 2018 Project Status Update, Water Budget Status. The third page upper exhibit depicting, "Use Model(s) to Develop Water Budgets" indicates that the sole input to "Watershed Model" is "Daily Streamflow".

I assume that "daily streamflow' would be based on one or more stream gages, but draft chapter 3.6.3 and Figure 3-12: Surface Water Gauging and Precipitation Stations suggest few existing gauges relative to the expanses of associated watershed/ catchment area.

Certainly more gauges are welcome, but my critique here is that daily streamflow ***does not*** represent all contributions from the watershed/ catchment. It fails to account for subsurface detention in the vadose zone as well as in bedrock aquifers, and fails to acknowledge drainage, a.k.a. interflow into the alluvial basins of concern from upstream bedrock aquifers and vadose zones. As noted in the second page exhibit, the water budget must include accounting of all inflows. Since we're taking groundwater in the first place, it should be clear that not all groundwater arose from surface flows. So how can "daily streamflow" be the ***sole* input** to "Watershed Model"?

Nevertheless, your team is far from alone. That surface water bias is among the current prevailing paradigms that blinds practitioners, including DWR, to the opportunities for Rainfall to Groundwater. Please see Stream Networks vs Watersheds/ Catchments.

Recommended Links

I'm running out of time and out of steam so I'll just point you to a few more links from my website and hope you'll try surfing a bit from those. California Case offers an overview. Also recommended for orientation are Surface-Groundwater Systems in a Holistic Water Cycle and Plants in an Ecohydrology Context, both of which emphasize the vadose zone – watershed/ catchment interface between surface and groundwater.

I posted an Executive Summary in May but plan to post an updated/ refined version within the next week. I'll be emailing an alert for a new blog post to the GSA points of contact (and anyone new who may sign up for my newsletter) soon.

I do hope my comments have opened your collective minds to new opportunities for the Paso Robles Subbasin GSP.

Sincerely,

Verna Jigour, PhD

Citations

Hursh, C. R. and P. W. Fletcher. 1942. The soil profile as a natural reservoir. Proceedings Soil Science Society of America 7:480-486. http://cwt33.ecology.uga.edu/publications/801.pdf

Jigour, V. M. 2008 (2011). Watershed restoration for baseflow augmentation. Dissertation. Interdisciplinary Studies: Arts & Sciences: Conservation Ecology. Union Institute & University.

Thorne, J., D. Cameron, and V. Jigour. 2002. A guide to wildlands conservation in the central coast region of California. California Wilderness Coalition, Davis, California, USA.