

Blue Ribbon Committee for the Rehabilitation of Clear Lake

Technical Subcommittee

1:00 pm-3:00 pm
February 20, 2020

Meeting Summary #7

Attendees:

Attendees are listed in Attachment A.

Action Items:

1. CCP will:
 - a. Schedule a regular Subcommittee meeting for the 4th Thursday of the month from 1-3 PM, after confirming the availability of Ms. Ryan and Ms. Kennedy
 - b. Send the March 11th Committee Meeting invitation to the Subcommittee
 - c. Post this Webinar recording to the Committee website
 - d. Follow up with the Subcommittee about convening a small subgroup to develop model selection criteria
 - i. That group may request presentations on: HSPF, LSPC, VELMA, or other models
 - e. Update the draft monitoring plan worksheet and send it to the Subcommittee for feedback, with an accompanying map
 - f. Reschedule a presentation from Dr. Ustin
2. Mr. Domagalski will:
 - a. Send the SPARROW publication links to CCP to be added to the Clear Lake Database
 - b. Work with Dina Saleh to estimate what would be needed to convert SPARROW to an hourly model
 - c. Provide CCP with the cost for the application of SPARROW to Upper Klamath Lake and a cost estimate to adapt SPARROW to Clear Lake
 - d. Provide CCP with a link to SPARROW's related decision support tool in the Chesapeake Bay
3. To follow up on previous Action Items:
 - a. Mr. Zoller will meet with the Fruit Frost Committee to decide whether to install a rain gauge on Cow Mountain
 - b. Dr. Alpers will:
 - i. Compile a list of resources for sediment fingerprinting to discuss within the Subcommittee

- ii. Report back about 3DEP LiDAR Data Release
- c. Ms. Kennedy will send CCP locations of the seasonal tributaries near the City of Clearlake next week

Welcome and Introductions

Sam Magill (Facilitator), Sacramento State Consensus and Collaboration Program (CCP), convened by webinar the seventh meeting of the Technical Subcommittee (Subcommittee) of the Blue Ribbon Committee for the Rehabilitation of Clear Lake (Committee). A full list of participants is included in Attachment A.

The Facilitator outlined the following meeting objectives:

- Confirm the Technical Subcommittee meeting #6 summary
- Set a regular monthly meeting time
- Learn about the Spatially Referenced Regression on Watershed attributes (SPARROW) model from a presentation by Joe Domagalski, US Geological Survey (USGS)
- Continue to develop a comprehensive monitoring plan for the Clear Lake Basin, in accordance with Committee recommendations

Confirm Meeting Minutes from December 5th Technical Subcommittee Meeting

No edits were provided to the Summary from the previous Subcommittee Meeting. The Facilitator reviewed the previous meeting's action items with the group. Unless otherwise indicated below, the action item was completed. Action items from previous meetings, to be completed by the next Subcommittee meeting can be found under this meeting's **Action Item 3**.

1. Mr. Zoller will look into the cost of adding a rain gauge to the Cow Mountain meteorological station

Mr. Zoller will attend a Fruit Frost Advisory Committee meeting in the next month and anticipates this suggestion to be approved and implemented at no cost to the Blue Ribbon Committee.

3. USGS and TERC will meet to discuss model options in depth, as well as a work plan and more specified cost estimate for a bathymetric survey

USGS and TERC met in mid January and agreed that the application of multiple models in the Clear Lake Basin would be advantageous. Modeling is complex and no one model captures all of the information that would be advantageous. This would necessitate a more detailed conversation with the Technical Subcommittee. Other potential models include: Loading Simulation Program in C++ (LSPC), Visualizing Ecosystem Land Management Assessments (VELMA), and Hydrological Simulation Program – Formula Translation (FORTRAN) (HSPF).

8. Dr. Alpers and Ms. DePalma-Dow will discuss, with their respective agencies, the potential for installing temporary rain gauges in the new year

Angela DePalma-Dow, Lake County Water Resources Department (WRD), noted that WRD has right of entry agent, so it is not difficult to have access to install these gauges. Amy Little, State Water Resources Control Board (SWRCB) offered that if rain gauges were to be installed at the drinking water intakes, they could be monitored daily, though SWRCB could not provide the exact locations of these intakes. Geoff Schladow, UC Davis Tahoe Environmental Research Center (TERC), noted that TERC has seven rain gauges around the lake at water level, but the upper watershed needs more rain gauges.

Regular Monthly Meeting Time

All members present agreed they are generally available the fourth Thursday of each month, from 1:00-3:00 PM. CCP will confirm availability with Sarah Ryan, Big Valley Band of Pomo Indians, and Karola Kennedy, Koi Nation of Northern California, who were absent during this meeting, and then send out a standing meeting invitation (**Action Item 1a**).

Review Annual Report Recommendations and Draft Work Plan

The Facilitator announced that the Committee's Annual Report was sent to the legislature and the Governor's office, and is being reviewed by Asm. Aguiar-Curry's staff. Since the previous Committee Meeting, the California Natural Resources Agency (Resources) appointed Eric Sklar, President of the Fish and Game Commission, to Chair the Committee. Mr. Sklar is working with the legislature and with Resources to create a plan to fund the recommendations. He will speak about this process at the March 11th Committee meeting in Sacramento. Because a model can vary in cost between \$1 million and \$10 million, Mr. Sklar is seeking between \$1.75 million and \$11 million for the recommendations. Funding must be in place before the recommendations can be implemented. CCP will send an invitation for the March 11th Committee Meeting to the Subcommittee (**Action Item 1b**).

Presentation: Spatially Referenced Regression on Watershed attributes (SPARROW) model

Joe Domagalski presented on the SPARROW model. The webinar of the Subcommittee meeting, including Mr. Domagalski's presentation titled "Using SPARROW to Model Nutrient Sources and Transport in Rivers and Streams," can be found on the [Committee Website](#). The presentation begins at 0:41:39 in the webinar recording.

SPARROW was developed by the USGS National Water Quality Assessment (NAWQUA) Program to help predict sources and loads of nutrients to streams, account for various constituent inputs into a watershed, predict changes in concentration and load throughout a watershed, and predict ultimate load delivery. SPARROW has successfully modeled nitrogen, phosphorous, and suspended sediment. Version 1 of SPARROW (2002) provides data on average conditions for a watershed, while the dynamic version 2 of SPARROW (2012) can allow for seasonal predictions.

The 2002 Model was calibrated using 100 sites throughout California to calculate annual loads for total nitrogen and total phosphorous. Though in most locations there was enough water chemistry available to examine individual constituents and see which are most important from various point sources, mostly waste water treatment plants. USGS used the National Hydrography Database, version 2, which includes all stream networks in the US, to calibrate the model.

USGS is currently finishing a case study on Upper Klamath Lake (UKL) in Oregon using the second version of SPARROW. This is a hypereutrophic lake with a phosphorous TMDL and the experience there could readily inform how to potentially apply the model to Clear Lake. Similar to Clear Lake, many of the data inputs for the SPARROW model on UKL were readily available from previous monitoring, including data from local Tribes. Mr. Domagalski shared the data inputs and source contributions of total phosphorous. The model on UKL showed that phosphorous in the watershed was primarily geologically derived and so does not offer many management options, so USGS is developing a nitrogen model with SPARROW in the hopes of finding effective management options.

Mr. Domagalski recommended that for using any model on Clear Lake, a basin monitoring program would be necessary to inform it, in order to establish seasonal and annual load at calibration sites. At least two years of monitoring would be required for adequate calibration. Information from SPARROW v.1 may be used for Clear Lake, but it has not been calibrated using local data.

Questions & Responses:

- There are places in the Clear Lake watershed where heavy rains dislodge previously deposited, fine, turbid material in wetlands. The same stream will run clear in the upper watershed but be muddy in the lower areas. Will this model account for that?

Response: One of the USGS modelers is working on this exact issue and calls it “channel storage.” We are trying to incorporate that into the dynamic model, to answer the questions of how much of this material comes down, is stored, and what flow conditions would cause it to be re-suspended into the water column and transported downstream?

- There is a lot of legacy gravel mining material in the lake that releases available phosphorous in anaerobic processes. With sampling would we be able to tell if that is what is happening or if it is coming in from higher in the watershed?

Response: Yes, that is something that could be addressed outside of the model and could be incorporated into the model as we move forward.

- Would the SPARROW be able to communicate/be compatible with the TERC lake model?

Response from Dr. Schladow: The lake model needs stream data inputs, whether real or informed by a model. The models would be compatible, and they do not need to run at the same time.

- How are the fertilizer inputs calculated? I worry about inaccurate information being used and resulting in unnecessarily restrictive regulations.

Response: We previously used fertilizer amounts taken from County-reported fertilizer sales, and proportioned those out to agricultural land based on land use data. More specific local information will help improve the model's accuracy. Ideally the modelers would like to survey local farmers about their fertilizer and irrigation practices, though small-scale surveying has previously resulted in inconsistent responses.

- How well understood is the nutrient transport component through bio-geological processes and how well does the model account for this?

Response: It works reasonably well. When we did SPARROW v1.0 for the whole State, we were able to explain close to 90% of the variation, including biogeological characterization. In smaller watersheds there will be more localized biogeochemical factors and some of the coefficients used to model that will have to be changed as part of the calibration process. That's why in Clear Lake we would calibrate after one year of monitoring and refine after two years. The equations we have used on this are based on a fairly exhaustive research our statisticians did over several years. The equations work well but we may have to refine them for smaller watersheds and some of the Clear Lake basin wetlands that are different or unique.

- How does the calibration work for the Upper Klamath Lake basin?

Response: We believe we have a reasonable return for phosphorous. Sometimes it works better combining distribution of fertilizer and of cattle. We put a lot of time in the phosphorous model, but now we want to look at nitrogen sources, since there aren't a lot of management practices to reduce what turned out to be primarily geologically sourced phosphorous input.

- Has there been discussion in the Technical Subcommittee about a framework for selecting models? What would be the best to inform the lake model?

Response from Dr. Schladow: There is a lot to be said for running more than one model to seek different information. Perhaps we could create a subgroup of the Subcommittee to discuss this. The TERC internal lake model needs to have inputs on a daily basis, while SPARROW works on a monthly timescale.

Response from Dr. Alpers: USGS can look into if the SPARROW dynamic model can be adapted to daily data (**Action Item 2b**). USGS was able to adapt the HSPF model to hourly for a mercury model.

- What was the cost to apply SPARROW in UKL, and what is the likely timeline?

Response: USGS will provide cost estimates (**Action Item 2c**) for the UKL project and how much it might cost for Clear Lake. Any model chosen for Clear Lake will need time to gather hydrological and water quality data. It is worth considering if the current data could be used to start the model and then add new, more consistent data from the basin-wide monitoring network recommended in the Committee's Annual Report.

Response from Ms. DePalma-Dow: Lake County will increase monitoring over the next five years due to new requirements and would like to coordinate planning so monitoring is done efficiently for multiple benefits.

- Where do the outputs of this model connect to management goals and recommendations? These projects should have beneficial impacts to Clear Lake water quality. It seems obvious that management actions would follow data gathering, but many studies have been done in the basin without follow through and management actions. This is what happened with the Total Maximum Daily Load (TMDL) restrictions.

Response: There is an internet-based decision support tool that communicates with SPARROW. It can show hypothetical source reductions by different management actions, and it could communicate with the TERC lake model to show how the lake might respond as a result. USGS can provide a link to this tool for SPARROW on the Chesapeake Bay (**Action Item 2d**).

- Are there interim results that can be shared to show progress to the Committee and the public?

Response: There is the existing model done in the watershed to develop the TMDL. That didn't take advantage of all the data WRD, the local Tribes, and others have been collecting in the last five years. We can try to calibrate that model with data up to 2020. A model with the last five to ten years of data would be an improvement over what's there now.

- How does this compare with the other models mentioned?

Response: Charlie Alpers is willing to present on HSPF with Michelle Stern, USGS (**Action Item 1.d.i**). That is a daily model with different strengths from SPARROW.

Alternatively, the model used for the TMDL was very limited in what data it utilized. It indicated subwatersheds and expected reductions. There was an expectation that some activities could have been done on the land to affect input, but those were never funded or supported.

- Are there cost and efficiency benefits to running multiple models?

Response: It's hard to predict how much it would affect the cost, but there are some efficiencies in sharing data inputs. It's cheaper to run them all together under the same conditions than separately from scratch. Running multiple models with similar results does increase confidence by providing error propagation.

Continued Development of Monitoring Plan

The Facilitator shared a draft worksheet of three tables to further define what the Subcommittee would like represented in a comprehensive basin-wide monitoring plan. The first table focused on proposed monitoring locations and included: latitude and longitude, public or private property, and key monitoring parameters. The second table expanded on monitoring parameters: identifying constituents to monitor for, whether it requires field or lab analysis, and what entity is best suited to monitor the particular constituents. The third table identified timing for monitoring sites: how frequently monitoring should be done, what time of year, and under what conditions.

The Facilitator asked the Subcommittee whether they found this exercise to be helpful in developing the monitoring plan, and if they had comments or questions. Their responses were:

- This is useful, and WRD created something similar with partner agencies after the Mendocino Complex Fire. WRD can add the data from that monitoring plan to this document.

- Clarify if the monitoring locations are stream, lake, or meteorological
- Include existing monitoring sites on the list, and information about how long and how frequently the existing sites have been monitored
- Indicate which sites are proposed to only be monitored to gather data for the model, but might be too costly to run longer-term
- In the constituents list, distinguish between the different types of phosphorous and nitrogen

The Facilitator will update the draft monitoring plan worksheet based on the Subcommittee's feedback and send it to the Subcommittee with an accompanying map (**Action Item 1e**) and a reminder to the Subcommittee members to return the completed tables in two weeks.

General comments arose regarding monitoring locations and constituents during the discussion about the worksheet, these included:

- The Technical Subcommittee should discuss if they would like to monitor for mercury in more locations than the Oaks Arm. That could provide valuable information but is expensive.
- USGS is doing source analysis on mercury for the US Environmental Protection Agency (USEPA) and would like to add a mercury component to the TERC lake model.
 - For mercury, or any constituents monitored, the Subcommittee must identify and communicate clearly if the intention is to recommend a management action, or simply to have more information. The intention may affect the way the monitoring plan is structured and implemented.
- When the dam is closed, stormwater from Cache Creek flows back into the lake, so Cache Creek should not be excluded from basin monitoring.
- Total organic carbon should be monitored to inform water purveyors. It would be helpful for this to be part of the TERC lake model.

Adjourn

The Facilitator thanked the Subcommittee for their participation. Subcommittee members thanked Mr. Domagalski for his presentation. If Ms. Kennedy and Ms. Ryan confirm their availability for the fourth Thursday of every month, the next Subcommittee meeting will be from 1:00 PM to 3:00 PM on March 26th. CCP will reach out to Dr. Ustin to reschedule a presentation on remote telemetry options available (**Action Item 1f**).

ATTACHMENT A: Roster of Participants

Participants		
First	Last	Organization
Charlie	Alpers	United States Geological Survey
Angela	DePalma-Dow	Lake County Water Resources Department
Joe	Domagalski	United States Geological Survey
Amy	Little	State Water Resources Control Board
Conner	McVeigh	United States Geological Survey
Dina	Saleh	United States Geological Survey
Geoffrey	Schladow	University of California Davis, Tahoe Environmental Research Center
Jim	Steele	Lake County resident
Lisa	Wilson	Central Valley Regional Water Quality Control Board
Broc	Zoller	Lake County Farm Bureau
Sam	Magill	California State University, Sacramento
Sophie	Carrillo-Mandel	California State University, Sacramento