



Secretary Karen Ross
California Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814

September 3, 2019

Secretary Wade Crowfoot
California Natural Resources Agency
1416 9th Street
Sacramento, CA 95814

Secretary Jared Blumenfeld
California Environmental Protection Agency
1001 I St
Sacramento, CA 95814

Re: Water Resilience Portfolio Policy Recommendations

Dear Secretaries Ross, Crowfoot, and Blumenfeld:

We write on behalf of the California Climate and Agriculture Network¹ to offer our comments on how agriculture can contribute to meeting the state's goals of water resiliency.

Background: Meeting the Water Resiliency Challenge through Soil Health

Our state's 70,000 farmers and ranchers are on the frontlines of the climate crisis. Mother nature – their #1 business partner – is rapidly changing, repeatedly breaking historic records for heat waves, drought, precipitation, and fire. When we asked farmers to tell us about the climate impacts they worry about most, water is their top concern.²

As the sector that covers 25 percent of the state's landmass, utilizes 80 percent of its developed water, and accounts for 96 percent of the cropland nitrogen inputs, agriculture has a critical role to play in achieving water resilience in California.

On-farm water, soil, and nutrient management's role in water resilience must not be overlooked. Soils are the foundational "natural infrastructure" of our water system. When healthy, soils act like sponges to capture, store, and purify water, while also sequestering carbon and sustaining the plants and animals we depend on for food, fiber, and shelter. Increasing soil water holding

¹ CalCAN is a coalition of the state's leading sustainable and organic agriculture organizations that seeks to advance agricultural solutions to climate change.

²See: <http://calclimateag.org/climate-impacts-on-agriculture-lessons-from-calcan-listening-sessions/>

capacity reduces runoff that carries sediment and other pollutants into streams and rivers, reduces irrigation demand and associated energy use, increases crop and forage yields, increases baseflows and groundwater recharge, reduces flood risk, and increases drought resiliency. Healthy soils, which are rich in soil organic matter (SOM) and life, are also less dependent on synthetic nitrogen and pesticides because they have healthy, functioning ecosystems and slow-releasing, tightly-cycling natural sources of fertility. Healthy soils are fundamental to securing food sovereignty, economic prosperity, and the human right to safe, clean water.

A statewide average increase in soil organic matter of one percent was modeled by Flint et al (2018) for the 4th Climate Assessment. The authors found that a one percent increase in SOM would result in an increase in soil water storage capacity of 1.5 million acre-feet per year, nearly equivalent to Lake Berryessa (the state's 7th largest reservoir) at maximum capacity, while also increasing groundwater recharge by 283,000 acre-feet per year, increasing actual evapotranspiration by 208,000 acre-feet per year (which increases crop and forage productivity), and decreasing runoff by 473,000 acre-feet per year.³ The study authors also estimated the impacts of two percent, three percent, and eight percent increases in SOM, which demonstrated even greater potential hydrologic and resiliency benefits in many regions. However, there are significant regional differences -- based on climates and soil types -- in the ability to increase SOM and achieve related hydrologic benefits. For example, hydrologic benefits are modeled to be greatest in locations with ample precipitation to fill increases in soil water holding capacity. As such, management strategies should be considered on the basis of local conditions.⁴

To address these issues, we are recommending an integrated healthy soils/water approach for the Portfolio.

Farmers and ranchers have made enormous leaps in water stewardship in the past few decades and want to be even better stewards of soils and water. Many farmers in our network have been on the leading edge of innovation – developing, testing, and proving water, soil, and nutrient management practices that conserve water, reduce nitrate leaching, improve yields, and make their operations more resilient to drought.

By scaling up, integrating, streamlining, and leveling the playing field with *existing* policies, farmers and ranchers can rapidly scale up on-farm water resilience solutions.

To that end, we recommend the following integrated policies for the Governor's Water Resilience Portfolio.

1. Provide Irrigated Lands Regulatory Program (ILRP) Relief for Healthy Soils Best Management Practices (BMPs)

The current Irrigated Lands Regulatory Program (ILRP) disproportionately burdens producers who grow diversified crops and use organic and healthy soils practices when the program should

³ Flint, L.E., Flint, A.L., Stern, M.A. (2018). Assessing the Benefits of Soil Organic Matter on Hydrology for Increasing Resilience to a Changing Climate. A Report for California's Fourth Climate Assessment. Available at: https://www.energy.ca.gov/sites/default/files/2019-07/Agriculture_CCCA4-CNRA-2018-006.pdf

⁴ Ibid.

instead seek to incentivize farmers to use these practices. Organic and healthy soils practices significantly increase SOM, thereby increasing soil water holding capacity, and reducing the need for synthetic nitrogen and other chemical inputs, thereby improving water quality and ecosystem health.

For example, data from UC Davis's Long-Term Research on Agricultural Systems study showed that after 13 years, organic plots under standard tillage sequestered 14 times more carbon than conventionally managed plots; under conservation tillage, organic plots sequestered 27 times more carbon than conventional.⁵ Moreover, a six-year study on organic vegetable production in California's Salinas Valley found that despite intensive tillage, annual cover cropping and compost applications increased both soil carbon and microbial populations.⁶

Operations that use diversified crops and organic, healthy soils practices are disproportionately burdened by ILRP for three reasons. The first is that the reporting requirements do not account for the way in which organic sources of nitrogen behave differently than synthetic nitrogen.⁷ The second is that none of the ILRP trainings offered by the agriculture coalitions organized to comply with ILRP are tailored to address nutrient management in systems that use organic sources of nitrogen. Finally, diversified operations can have many dozens of different crops, making it challenging, if not impossible, to accurately report on their nutrient management practices across all of the crops in their production. Combined, these flaws have made ILRP reporting confusing and time-consuming for diversified, organic and healthy soils farmers, as well as deprived them of relevant nutrient management training that non-organic growers receive.

The state should be actively incentivizing these systems by providing regulatory relief in reporting requirements for farmers who adopt healthy soils and organic nutrient management best management practices, including the use of compost, mulch, cover crops⁸, and crop rotations. To do this, the State Water Resources Control Board should provide guidance to the regional water boards on how to incentivize the use of these practices that have a proven track record of reducing nitrate leaching and improving water quality overall.

⁵ De Gryze, S., et. al. 2010. Simulating greenhouse gas budgets of four California cropping systems under conventional and alternative management. *Ecological Applications*, 20(7), 1805-1819.

⁶ Brennan, E. B., & Acosta Martinez, V. (2017). Cover cropping frequency is the main driver of soil microbial changes during six years of organic vegetable production. *Soil Biology and Biochemistry*, 109, 188-204.

⁷ There are several studies in CA cropping systems that show nitrogen sources from healthy soils practices – e.g. cover crops, compost, etc. – behave differently than synthetic nitrogen. Among those studies are the following: Jackson L, Wyland L, Klein J, Smith R, Chaney, Ph.D. W, Koike S. 1993. In lettuce production, winter cover crops can decrease soil nitrate, leaching potential. *Calif Agr* 47(5):12-15. And: Jackson L, Ramirez I, Yokota R, Fennimore S, Koike S, Henderson D, Chaney W, Klonsky K. 2003. Scientists, growers assess trade-offs in use of tillage, cover crops and compost. *Calif Agr* 57(2):48-54. <https://doi.org/10.3733/ca.v057n02p48>.

⁸ Cover crops – which are plants grown primarily to protect and enrich the soil, often between growing seasons (e.g. late fall and winter) and/or planted between vineyard and orchard rows – alone have been shown to reduce nitrate leaching by 70 percent in California vegetable production. Cover crops achieve this by absorbing residual nitrogen and water through their roots in the fall and winter that would have otherwise leached through the soil profile.

2. Fix On-Farm Composting Regulatory Barriers

Applying compost to their fields, orchards, and pastures is among the best ways for farmers to begin building healthy soils. But in order for them to do that, they need affordable, high quality compost, which is difficult to find in many agricultural regions of the state.

One way to meet this demand is to make it easier and more affordable for farms and dairies to make their own compost using their own agricultural byproducts (e.g. orchard waste, manure) on the farm as well as other sources of organic waste (e.g. agricultural processing byproducts, agricultural materials from other farms, some municipal green waste).

However, current air and water quality regulations make it challenging for some producers to pursue on-farm compost production. State Water Board regulations for on-farm composting are being reviewed to make them more relevant to on-farm compost production but this has already taken years and has no clear endpoint, which could severely constrain on-farm production. CalEPA can step in here and help facilitate this process and reach a conclusion that works for farmers and the environment.

But those are not the only regulations farmers are facing for on-farm compost production. Unfortunately, regional air quality management districts (AQMDs) in non-attainment districts, including most of the central valley, create potential obstacles to farmers making their own compost. For example, these AQMDs' interpretation of on-farm compost piles as a “new source” of pollution has created a cost-prohibitive permitting barrier for most farmers. In reality, on-farm composting is an environmentally-friendlier alternative to the current (i.e. baseline) practices of burning orchard waste, flushing dairy manure into lagoons, directly applying manure and green waste to the land, or landfilling organic waste.

We strongly urge these agencies to reconsider and review these issues to allow farmers to compost orchard and manure waste, thereby increasing the availability of much-needed compost in agricultural regions in a manner that avoids other downstream air and water quality problems.

3. Scale-up and Integrate Climate Smart Agriculture Programs

The state has developed the country's leading programs to promote climate smart agriculture. Three of those programs are specifically focused on the soil/water/compost connections. They are: Healthy Soils, the State Water Efficiency and Enhancement Program (SWEET) and the Alternative Manure Management Program (AMMP). Through technical assistance, financial incentives, and demonstration projects, CDFA provides resources to farmers and ranchers to adopt a suite of practices that improve SOM, carbon sinks and water resiliency. What is needed now is for these programs to expand their impact, reach more producers and integrate their efforts.

For example, SWEET funds irrigation management upgrades to save water and energy associated with on-farm water use. This enormously successful program has funded over 700 projects throughout the state, boosting on-farm water use efficiency and cutting greenhouse gas

emissions associated with water pumping. The 606 projects funded through the first six rounds of the program are estimated to have the potential to:

- Improve water use efficiency by 85,000 acre-feet per year, roughly equivalent to 42,000 Olympic-size swimming pools.⁹
- Reduce GHG emissions by 303,310 MTCO_{2e} over 10 years, equivalent to removing 65,000 cars from the road for one year.¹⁰

Improving water use efficiency is also an important strategy to reducing nitrate leaching into groundwater, because non-uniform distribution and overirrigation are what leach nitrates and other water-soluble chemicals beneath the root zone. A 2013 UC Riverside study found “that irrigation management is at least equal in importance to, and possibly of greater importance than, fertilizer application in affecting the leaching of nitrate.”¹¹ Pressurized and micro irrigation systems like those funded by SWEEP allow greater control over distribution uniformity and the amount of water applied, as compared to gravity flow irrigation systems, thus improving water quality in addition to offering water savings.¹²

The state could further incentivize on-farm water conservation by jointly promoting the Healthy Soils Program (for healthy soils’ water quantity and quality benefits) and SWEEP. Moreover, CDFA must consider how SWEEP can better meet the needs of groundwater recharge (by incentivizing conjunctive use irrigation systems and on-farm ponds); training for farmers on effective maintenance, monitoring, and scheduling of their new irrigation systems; and limited resource and socially disadvantaged farmers and ranchers who are most vulnerable to drought and face the most barriers in accessing SWEEP grants. CalCAN documented these opportunities – based on interviews with over a dozen SWEEP experts – in our 2018 SWEEP Policy Brief.¹³

A current two-year bill, AB 1086 (Bauer-Kahan), would address many of these issues. The bill will integrate groundwater recharge objectives into SWEEP to align with SGMA efforts as well as incorporate relevant training in SWEEP for irrigation managers and prioritize small and mid-scale farms and socially disadvantaged farmers. AB 1086 also creates an advisory committee of SWEEP project grant reviewers, technical assistance providers and other specialists in the field to develop recommendations for “SWEEP 2.0”. But the administration does not have to wait for legislation to move forward on this.

The first step for SWEEP is to fund the program. SWEEP funding was eliminated in the FY 2019-20 budget. The program has just \$10 million in Proposition 68 funds remaining. Once those funds are spent, the program will be out of funding. This is the state’s only program that aims to improve on-farm water management. Its funding must be restored and expanded as part of the FY 2020-21 Greenhouse Gas Reduction Fund budget to meet the growing demands of on-

⁹ Based on CDFA data from Rounds 1-6. More information available on CalCAN’s 2019 SWEEP Fact Sheet, available at: <http://calclimateag.org/wp-content/uploads/2019/02/CSA-fact-sheets-combined.pdf>

¹⁰ Calculated with CDFA data and US EPA’s Greenhouse Gas Equivalencies Calculator

¹¹ Letey J, Vaughan P. 2013. Soil type, crop and irrigation technique affect nitrogen leaching to groundwater. Calif Agr 67(4):231-241.

¹² Ibid.

¹³ Available at: <http://calclimateag.org/wp-content/uploads/2018/09/SWEEP-Policy-Brief-CalCAN-9-11-18.pdf>

farm water use efficiency work. Then the state must get underway in developing SWEEP 2.0 to meet the complex water needs of California farmers.

Another example of program integration is to bring together the AMMP and Healthy Soils programs to better connect those making compost (dairy producers, who often have a surplus of nitrogen from their manure) and those in need of it (cropland and rangeland producers). Two-thirds of AMMP recipients are dairy producers who are using their grants to upgrade their dairies and turn their manure into compost. They are not only reducing potent methane emissions, but creating a product – compost, which is in short supply in some agricultural regions of the state. The program has been hugely popular, and like SWEEP, is oversubscribed with more farmers seeking grants than funding allocated for the program.

We need better information on how dairy producers under the program are using their compost and how they are developing a market for their new product. What barriers exist to converting dairy manure, which is responsible for 33 percent of all nitrogen inputs in the San Joaquin Valley¹⁴, into compost and moving it to crop or rangeland producers? The state can assist with better understanding these issues by partnering with the industry to survey producers and examine possible linkages between AMMP and Healthy Soils recipients.

Lastly, we are not coming close to meeting the farmer demands for technical assistance, financial incentives and demonstration projects for climate smart agriculture. We must scale up investments to the tune of \$130 million annually for all three programs if we are to come close to meet the need for these programs.

4. Invest in Compost Infrastructure

Compost is a core tool in farmers' healthy soils toolkit, but to scale up healthy soils adoption, meet our organic waste reduction goals, and enhance the potential for growth in resilient agriculture by closing the nutrient loop, we must invest in composting infrastructure to make quality, affordable compost the norm throughout the state.

Meeting SB 1383 landfill methane reduction goals and mandates for 75 percent diversion of organic waste (by 2025) will mean up to 8 million new tons of compost could be produced, but only if infrastructure is in place to process the materials. CalRecycle has estimated organic materials management infrastructure will cost up to \$3 billion, requiring at least \$100 million annual investment from the state to meet these highly-aggressive goals in the next six years.

5. Invest in Boots on the Ground - Reach all farmers and ranchers by 2030

We cannot meet the state's needs for improved water resiliency and climate preparedness without the technical experts on the ground informing and working with the state's farmers and ranchers. When the Dust Bowl hit and displaced tens of thousands of farmers and threatened our food security, the government responded some 75 years ago to invest in technical experts to

¹⁴ Harter et al (2012). Addressing Nitrate in California's Drinking Water. Report for the State Water Resources Control Board.

work with farmers to keep our top soil and conserve our natural resources. These public interest technical experts on the ground include the Resources Conservation Districts, the University of California Cooperative Extension, including its new 10-member Climate Smart Team, and a diversity of nonprofit organizations.

However, since the 1990s we have seen a steady decline in technical assistance resources for farmers but an ever increasingly complex farm environment to work within. For example, as of 2011, the number of on-farm Cooperative Extension advisors and specialists had been reduced by more than 40 percent from the early 1990s.¹⁵ Climate change is our new emergency that requires strategic investment in technical assistance to expand our impact and reach all of the state's farmers and ranchers by 2030 on issues of soil health, water resiliency and climate smart farming. This can come in the form of outreach, education, project development, grant application assistance and/or project implementation.

6. Develop Soils/Water Tool for Sustainable Groundwater Management Act (SGMA) Implementation

CalCAN supported the passage of the package of bills that created the Sustainable Groundwater Management Act (SGMA) because many of the farmers we work with have experienced the negative impacts of groundwater overdraft, spurred in part by larger, often absentee landowners, digging deeper and bigger wells at the height of our most recent drought.

As SGMA implementation is underway we are missing a key strategy in many of the early Groundwater Management Plans, which is using smart soil management practices that increase water conservation and improve groundwater management. The lack of focus on soil management is due in large part to the lack of a tool available to Groundwater Sustainability Agencies on how to calculate the benefits of incorporating outcomes like improved SOM and related practices into their plans.

California has some the best soil scientists and water experts in the world. We can develop such a tool but resources are needed to support its development. We urge the state to work with our soil and water experts in the state to develop such a tool to measure the groundwater recharge benefits of smart soil management so that GSAs may incorporate soil management practices into their plans.

Thank you for considering our comments and working to advance California's embrace of water resiliency. Agriculture can and must play a positive role in our water future.

Sincerely,



Jeanne Merrill, Policy Director



Brian Shobe, Associate Policy Director

¹⁵ Ready... Or Not? An Assessment of California Agriculture's Readiness for Climate Change (2011). Available at: <http://calclimateag.org/wp-content/uploads/2011/03/Ready-Or-Not-Exec-Summary.pdf>



Secretary Karen Ross
California Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814

February 7, 2020

Secretary Wade Crowfoot
California Natural Resources Agency
1416 9th Street
Sacramento, CA 95814

Secretary Jared Blumenfeld
California Environmental Protection Agency
1001 I St
Sacramento, CA 95814

Nancy Vogel, Director of the Governor's Water Portfolio Program
State Capitol, Room 1173
Sacramento, CA 95814

Re: Water Resilience Portfolio Comments

Dear Secretaries Ross, Crowfoot, and Blumenfeld and Director Vogel:

We write on behalf of the California Climate and Agriculture Network¹ to offer our comments on the draft Water Resilience Portfolio. The portfolio offers an important opportunity to chart a path forward for the state to address a future California with rising temperatures, greater weather extremes and volatile water resources. This work will be particularly important for the long-term viability of our food and farming systems and the communities they support.

We support a number of the recommendations in the draft and offer our comments on how to strengthen it further.

Thank you again for considering our comments and working to advance California's water resiliency. We look forward to discussing this further with you.

Sincerely,

Jeanne Merrill, Policy Director

Brian Shobe, Associate Policy Director

¹ CalCAN is a coalition of the state's leading sustainable and organic agriculture organizations that seeks to advance agricultural solutions to climate change.

We support the following 2020 Water Resilience Portfolio recommendations:

- 1. Recognition of soil health and working lands as integral to water supply and quality.** As the sector that covers 25 percent of the state’s landmass, utilizes 80 percent of its developed water, and accounts for 96 percent of the cropland nitrogen inputs, agriculture – especially its soils -- has a critical role to play in achieving water resilience in California. We especially appreciate the line on page 14 that reads: “In many circumstances, forests, soils, wetlands, floodplains, and other natural assets can help California water systems adapt to climate change in more beneficial and durable ways than human engineering.”
- 2. Recommendation 2.3 to fund SWEEP and prioritize socially disadvantaged farmers and ranchers (SDFRs).** As the state’s only on-farm water conservation program, SWEEP can and should play a critical role in helping farmers adapt to and achieve the goals of the Sustainable Groundwater Management Act (SGMA). With limited state resources, we agree those funds should be prioritized for farmers who are least likely to have the resources to upgrade systems on their own, which includes both SDFRs *and* small and mid-scale farmers (e.g. farms of 500 acres or less). To further align SWEEP with SGMA, we recommend incorporating groundwater sustainability as an explicit objective of the program and incentivizing conjunctive use systems and joint projects with irrigation districts.
- 3. Recommendation 8.6 to increase irrigation and nutrient management training and technical assistance.** We are glad to see this Portfolio follows the advice of the state’s top irrigation experts and supports increasing irrigation and nutrient management training and technical assistance for growers. Such training is critical because poor distribution uniformity, irrigation scheduling, and maintenance are responsible for most water, energy, and nitrogen inefficiency in agriculture, even in high-tech and drip irrigation systems. SWEEP recipients would greatly benefit from this training to ensure they can maximize the benefits of their state-funded irrigation systems. Thus, we encourage CDFG to coordinate such training and technical assistance between the FREP and SWEEP programs.
- 4. Recommendation 16.1 and 16.2 to fund the Healthy Soils Program and other incentives for on-farm conservation.** To achieve carbon neutrality within the agricultural sector by 2030 (an important milestone to carbon neutrality statewide in 2045), the state needs to catalyze scaled-up adoption of healthy soils practices on approximately 900,000 new acres per year through 2030. This is achievable but requires scaled up investments now, including General Fund and Climate Resilience Bond investments in addition to GGRF.
- 5. Recommendation 16.3 to support comprehensive technical assistance through Resource Conservation Districts (RCDs) and UC Cooperative Extension (UCCE).** Funding for the RCDs and UCCE has never recovered from massive cuts in the 1990s and early 2000s, severely limiting farmers’ and ranchers’ access to science-based technical assistance at a time when the natural resource management issues they face are more complex than ever before. Thus, we strongly support ongoing and increased investments for UCANR, including their Climate Smart Agriculture Team, and the RCDs.

We recommend the following additions to the Portfolio:

- 1. The Irrigated Lands Regulatory Program has unintended consequences and perverse incentives for healthy soils practices and negative impacts on small, organic, diversified, and disadvantaged farmers.** Importantly, the Portfolio does not make mention of the Irrigated Land Regulatory Program (ILRP), which is the state's primary program to address water pollution associated with farm management. This oversight must be rectified in the final Portfolio. As we noted in our earlier comment letter, current ILRP implementation may actually be worsening water quality and accelerating the loss of diversified family farms by: 1) disincentivizing diversified cropping systems and organic and healthy soils practices; and 2) disproportionately burdening small, diversified, organic, and disadvantaged farmers, who pose the least risk to water quality.

We ask that the Portfolio address these issues by including the following recommendation: *The SWRCB will provide guidance to regional water boards on incentivizing healthy soils practices and providing regulatory relief for small, diversified, organic, and socially-disadvantaged farmers and ranchers who use healthy soils practices.*

- 2. Recommendation 8.7 to enhance manure management programs to protect water quality.** We support this recommendation but are seeking greater detail and actionable items to support this effort. Two-thirds of the dairy and livestock awardees under the innovative Alternative Manure Management Program (AMMP), administered by CDFA, are turning wet manure, which produces methane emissions and can harm waterways, into beneficial compost. This is a successful program that should be scaled up to reach a greater portion of the state's dairy and livestock operators.

To build upon this existing effort, we ask that the Portfolio include the following recommendation: *CDFA will look for synergies across the Alternative Manure Management and Healthy Soils programs to support increased dairy manure composting and linkages between AMMP projects and healthy soils projects in need of compost, all while scaling up the use of alternative manure management practices to reach the majority of dairy producers by 2030.*

- 3. The role of farmland conservation in groundwater recharge and mitigating flood risk.** The portfolio acknowledges the multi-benefit value of working lands for water resilience, but omits the troubling reality that the state is losing an average of 50,000 acres of agricultural land every year, 40,000 of which is lost to urban conversion.

We suggest the Portfolio include the following recommendation on farmland conservation: *Through a diversity of smart growth strategies, the state will seek to protect our finite agricultural lands from sprawl development, improve access to agricultural land for future generations of farmers and ranchers, and scale up adoption of healthy soils and water smart practices on our farms and ranches.*

- 3. On-farm composting regulatory barriers and the shortage of composting infrastructure.** As we described in our earlier comment letter, compost builds soil organic matter – and thus soil water holding capacity -- faster than any other soil health practice. The problem is: 1) clean, affordable compost is cost-prohibitive in many farming regions; 2) current air and water quality regulations make it cheaper and easier to burn organic waste, send it to the landfill, flush it into noxious lagoons, or directly apply it to land than it is to produce compost; and 3) CalRecycle estimates organic materials management infrastructure will cost up to \$3 billion, requiring at least \$100 million annual investment from the state to meet these goals in the next six years.

We suggest the Portfolio include the following: *1) CalEPA will provide guidance to CalRecycle, SWRCB, and regional Air Quality Management Districts (AQMDs) on how to streamline and reduce the cost of regulatory compliance for on-farm composting of orchard, manure, and clean, green municipal waste. 2) Increase funding for CalRecycle's compost infrastructure programs.*

- 4. The lack of tools for GSAs to model the groundwater recharge benefits of improved soil organic matter, cover crops, and other soil management practices.** The Portfolio addresses the need for new modeling tools to assist GSAs and other water agencies in a number of sections, but does not address the need for a tool to help GSAs better understand the impacts of changes in soil organic matter and soil management practices. Such a tool is critical to supporting GSAs in including on-farm healthy soils management as a viable and important strategy to meet their sustainable groundwater management goals.

We suggest the following Portfolio recommendation: *DWR will collaborate with soil and water experts to develop a tool to model the groundwater recharge benefits of increased soil organic matter and specific soil management practices so that GSAs may incorporate soil management practices into their plans.*