December 17, 2021
To: California Air Resources Board
From: Muriel Strand, P.E.
Re: 2022 Scoping Plan Update – Natural and Working Lands Workshop

Briefly mentioned during the workshop was the attendance of staff from the various other state agencies participating in the scoping plan. Ideally, those staff are also reviewing some if not all of the hundreds of comments already submitted about the scoping plan workshops. If (CARB) staff have not yet written down all the ways the different agencies need to be networked in on information digestion, I would start right now. And then also prepare a schematic for the general public, with appropriate points for public comment noted.

Scenarios 1-4 all seem generally well-grounded in sensible possible policies, and I expect they will offer valuable information for decision-makers with respect to the baseline of BAU. I strongly recommend that the **reports of model results include ranges of likely outcomes**, upper and lower envelopes as well as averages. **Sensitivity analyses** would also be a great help for decision-makers.

To the extent that financial costs are variables in the models, costs should be accounted in embedded kwhr and GHG emissions as well as dollars. Although monetary numbers may appear as scientific as physics and chemistry, money and ecological reality are not always rationally connected.

Economics
Although numbers are central to currencies and finance, few economists seem to understand that physicists and chemists are using math in a rather different way. Economists seem to think that a mathematical demonstration of some economic concept *is* a proof; however the laws of physics and chemistry are proved in the lab and only described with math.

Currencies are human artifacts, and thus financial processes are subject to human delusion and corruption in ways that physics and chemistry are not. Particularly in our present situation, **financial systems are largely tied to fossil fuels, which offer energy that is hundreds of times cheaper than human power** at US prices. We are all, except perhaps the homeless, accustomed to having this cheap power at our disposal; the result is that it has warped people's intuition about what's really economical and what's not.

Thus, decisions made on the basis of the real world, of the physical sciences, will always be more accurate than those made only on the basis of finances. The Mechanism Pathways are downstream of the models and model predictions, in the realm of finance and politics. **The transition from the selected Actions to those Mechanism Pathways will be crucial, and all too vulnerable to gaming the system.** Decision-makers will benefit greatly from cost information about potential mechanisms that is denominated in embedded kwhr and GHG emissions, not just dollars.

And consumers at the retail level would benefit at least as much by having such parallel price information for common expenses such as food and shelter. Theoretically, prices are determined collectively by people's values and market information, reflected in their choices when trading their income for goods and services.

Providing consumers with that kind of granular cost information, based directly on physics and chemistry, makes it easier for them to bring externalities into the market where they can be accountable. Pairing that kind of cost information with a personal carbon 'quota' would facilitate our societal carbon 'diet plan.' We know approximately the global per capita carbon 'quota' that one planetary resident might actually be entitled to. We can calculate quotas for GHG/person per month that are consistent with:

1.5C increased average global temperature
2C increased average global temperature
450 ppm CO2
350 ppm CO2

Basically, the more real market information consumers have, the more they can, in effect, model the scenarios directly, though on a rather different schedule than when modelers process the proposed scenarios next year. And over the medium to long term, such consumer awareness would doubtless improve the selections of Mechanisms to accomplish the Actions.

Scenario Modeling Results

Models being what they are, the most recent information and research about ecological carbon sequestration may not be included. Given the timing, it seems unlikely that substantial changes in models' logic or structure can be made before running the scenarios. **When the model results are reported, I urge staff to include in those reports the most recent information that could not be included in the modeling**, so decision-makers have the best possible perspectives, including traditional ecological knowledge. Selection of the best management strategies will depend on having the best possible and most complete information. I share below some of what I have gleaned from paying attention to the world of agriculture, organic and otherwise.

Flora & Fauna

The summaries of the logic and structure of the agriculture, grasslands, and forest-plus-shrub models do not mention animals. Given that **animals play an essential role in regenerative agriculture and healthy wildlands**, this aspect should be carefully examined and included, whether directly in the models or in the newer information that should also inform predictions and decisions. The predictions of models are only as good as the input data and the accuracy of the internal logic.

Agriculture

It was indicated during the workshop that organic agriculture is a variable parameter in the model. **The reality of organic farming entails many complexities unknown to most urban shoppers and possibly not fully represented in the model.** It's unfortunate we do not use the term 'biological agriculture,' as do the French; organic chemistry and

biology are radically different. Many of the substances used in conventional 'inorganic' agriculture, such as NPK ionic fertilizers and poisons such as glyphosate, weaken and/or destroy the biology responsible for carbon sequestration. And plowing is about as healthy for the soil microbiome as sweeping homeless camps is for those campers.

So step #1 would be to stop shooting ourselves in the foot and immediately convert all natural and working lands to organic/biological permaculture management. My comments on the initial scoping plan workshops in June include Charles Eisenstein's excellent list of steps for restoring ecological health: https://www.arb.ca.gov/lists/com-attach/19-sp22-kickoff-ws-AmFUMwZ1AjNWDwIw.pdf

Organic Agriculture

The current organic regulatory situation is a disaster. Julie Guthman describes in detail how the organic label has become a ceiling rather than a floor. **Organic farm certification, with the farmer paying to be certified, is as conflicted** as were the Wall Street ratings like Moody's in 2007. The predictable gaming of the system is described in several references below. More recently, a USDA panel, stacked with political appointees rather than organic farmers, approved hydroponics as an organic method. This method obviously sequesters no meaningful carbon.

'Industrial organic' agriculture is also problematic. The true and basic philosophy of organic agriculture does not include monoculture crops grown in huge fields. Such a degradation of biology **cannot be expected to sequester nearly as much carbon as restorative agriculture** and polycultures which can produce far more photosynthesis and food value than any monoculture; one can infer that polycultures will sequester more carbon per unit area.

The videos from the Understanding Ag youtube channel offer lots of great and accessible information about truly regenerative agriculture. Presentations by a wide variety of experienced practitioners offer the attentive listener an excellent foundation with a modest time commitment. Some of them discuss restorative agriculture and ranching in brittle dryland environments similar to those found in California.

As well, many other youtube videos offer a very wide variety of information on permaculture, ecological restoration, and traditional ecological knowledge. Basically, **reviving biological organisms of all sizes will increase carbon cycling and sequestration opportunities.** The soil microbiota is the base of the biological pyramid, supporting all terrestrial plants which in turn support insects, birds, various amphibians, reptiles, and mammals, including a few too many homo sapiens. Embedded within the planetary cycles of water, energy, carbon, and so forth, are cycles that are continental, regional, local—and fractal.

Biochar

Despite the blandishments of the Green Revolution, there have always been advocates and practitioners of various traditional methods of farming, as well as more alternative

ideas such as biodynamics. The relatively recent discovery of terra preta, that is, biochar, has added another great tool for regeneration and carbon sequestration.

Biochar's potential beneficial synergies are substantial. Made from 'waste' biomass by pyrolysis processes, it yields primarily black carbon double-bonded microscopic lattice, and some 'syngas,' a usable fuel that's mostly CO and CH4. Bladders can be used to hold and transport humanscale quantities from small biochar projects, while large projects can support more standard engineered piping systems. The microscopic lattice offers stable sequestration for decades to centuries, as well as high-surface-area condos for healthy soil microbiota. Reportedly, soil amended with properly prepared biochar supports vigorous plant growth and even more ongoing carbon sequestration. A truly virtuous cycle.

Recently I attended a symposium jointly organized by the US Biochar Initiative and the International Biochar Initiative. I heard about progress in research beyond the impressive results described in detail by Albert Bates and Kathleen Draper. I learned that **carbon credit markets are very interested in buying credits from biochar sequestration, and that prompt attention is in order for the research and verification procedures required for credits that are reliable.** And I learned that syngas may contain (green?) H2 as well s CO and CH4. I conclude there is huge potential here that is unlikely to be included in models' logic.

Wildlands

Forests and grasslands and their inhabitants all play a key role in the cycles of carbon, water, energy, and biology that are powered by direct solar energy. Thus**, their ecological health can be expected to increase carbon sequestration.** Many of the insights and methods of regenerative agriculture can strengthen wildlands.

Almost everyone is all too aware of the challenges—the hazardous and healthy role—of forest fire in Mediterranean climates like California. Traditional ecological knowledge can be expected to offer crucial information on managing these situations, despite the major differences between California's ecology now and a few hundred years ago. Chad Hanson's recent book lays out in detail his controversial research results indicating that much of what 'everybody knows' is incorrect. Close attention to the very specific details of data acquisition and interpretation are required to properly understand and appreciate his argument. By his account, market participants who are primarily interested in profit have produced research results designed to maximize profits rather than forest health, by gaming the statistics in ways that are typically buried deep in the weeds.

Residences in WUI areas that are vulnerable to fire are often scattered single-family homes rather than clustered defensible villages. I believe the US homestead tradition has led to this development pattern here, in contrast to peasant and indigenous settlement patterns. **Perhaps rural infill would reduce risk by inducing clustering**, by attracting some city dwellers to join existing homesteads and/or relocating some risk-averse rural residents. **Repopulating rural areas** would relocate people in groups who could tend the

forests and farms nearby, shrinking supply chains. Traditional ecological knowledge can surely guide us in integrating villages with wildlands.

Beaver, a keystone species, were at one time widespread throughout North America. Nature's engineers, they construct ponds that retain water at high altitudes, and could replace some of the Sierra snowpack. They also tend to increase the interface between land and water, increasing infiltration. Unfortunately, current California regulations prohibit beneficial relocation within the state.

Settlement

Urban and suburban areas suffer from vast wastelands of pavement, mostly laid down to support the weight of motor vehicles. Cut off from sun and water, the soil microbiome under pavement is effectively dead and cannot sequester any carbon. **Pavement removal is thus another path to increased carbon sequestration.**

Support for urban agriculture is limited to gardeners and grassroots advocates; some local governments seem asleep at the wheel. Yet there is huge potential for retraining many mow-and-blowers and laid-off truckers in permaculture practices for raising substantial amounts of food in settled areas and thereby also shrinking supply chains. And of course, **the pesticides and chemical fertilizers that annihilate the soil microbiota in agricultural areas are also lethal in urban areas, suppressing that carbon sequestration pathway.**

Currently, suburban agricultural-residential zoning allows 5-acre parcels without actually prescribing crop production as should be required. And as noted above, small village and 'transition towns' offer opportunities for shrinking supply chains.

Wetlands have agricultural potential; in general, it's better to restore and nurture existing wetlands rather than building new ones. The prospect of the one-tunnel project that's planned to take water from the Delta seems to contradict the goal of optimum carbon sequestration. It appears that increased interaction between water and soil tends to increase photosynthesis and thus carbon sequestration. However, decomposition of plant material in underwater, anaerobic conditions does produce net methane in magnitudes which appear to depend on the plant species. The effect of beaver on the methane emissions from wetlands seems like an important factor.

References

Toxic Legacy: How the Weedkiller Glyphosate Is Destroying Our Health and the Environment, by Stephanie Seneff
https://www.chelseagreen.com/product/toxic-legacy/

Poison Spring: The Secret History of Pollution and the EPA, by EG Vallianatos w/ McKay Jenkins
https://www.bloomsbury.com/us/poison-spring-9781608199259/

Agrarian Dreams: The Paradox of Organic Farming in California, by Julie Guthman
https://www.ucpress.edu/book/9780520277465/agrarian-dreams

The Great Organic-Food Fraud by Ian Parker. New Yorker, Nov 8 2021
https://www.newyorker.com/magazine/2021/11/15/the-great-organic-food-fraud

More fraud:
https://theintercept.com/2021/07/02/epa-chemical-safety-corruption-whistleblowers/
https://www.theguardian.com/commentisfree/2019/may/07/epa-monsanto-round-up-trial
https://islandpress.org/books/whitewash
https://theintercept.com/2021/06/30/epa-pesticides-exposure-opp/

Growing Food in a Hotter, Drier Land – Lessons from Desert Farmers on Adapting to Climate Uncertainty, by Gary Nabhan
https://www.chelseagreen.com/product/growing-food-in-a-hotter-drier-land/

Holistic Management: A Commonsense Revolution To Restore Our Environment, by Allan Savory & Jody Butterfield
https://savory.shop/products/holistic-management-a-commonsense-revolution-to-restore-our-environment

Burn: Using Fire To Save the Earth, by Albert Bates and Kathleen Draper
https://www.chelseagreen.com/product/burn/

The Business of Biochar Online Symposium
https://biochar-international.org/the-business-of-biochar-online-symposium/

Understanding Ag
https://www.youtube.com/channel/UCQk96t4pMertgPRHe6D73qA

Toxic Legacy, Dr Stephanie Seneff 6 10 21
https://www.youtube.com/watch?v=pqJrkLy5VdQ

Epigenetics with Gabe Brown & Dr. Allen Williams 11-19-21
https://www.youtube.com/watch?v=p0zxtal2cQ0

Building Resiliency with Gabe Brown & Shane New 9-23-21
The Relationship Between Water, Carbon & Biology
https://www.youtube.com/watch?v=r5012KFGQoc&t=1034s

Building Resiliency: Ranch Resiliency with Alejandro Carrillo 10-28-21
https://www.youtube.com/watch?v=_mO1I5ys56E

The Farm Bill IS Climate Legislation

https://www.researchgate.net/publication/350327927_The_Farm_Bill_IS_Climate_Change_Legislation

Smokescreen: Debunking Wildfire Myths To Save Our Forests and Our Climate, by Chad T. Hanson
https://www.kentuckypress.com/9780813181073/smokescreen/

Hanson interview with Oregon Sierra Club
https://www.youtube.com/watch?v=xeVLy3gfUhw

Forest Ecology in the West – Hanson interview
https://www.youtube.com/watch?v=KRb_V5UKD_Q

The Beaver Management Forum
https://www.facebook.com/groups/339105817425

In Beaver World, by Enos Abijah Mills
https://archive.org/details/inbeaverworld00milluoft

Once They Were Hats: In Search of the Mighty Beaver, by Frances Backhouse
https://ecwpress.com/products/once-they-were-hats

Eager: The Surprising, Secret Life of Beavers and Why They Matter, by Ben Goldfarb
https://www.chelseagreen.com/product/eager-paperback/