14 pages total

Hoekstra - page 1

Public Comment
Storm Water Program Workplan and Implementation
Deadline: 7/24/15 by 12:00 noon

Deadline: 24 July, 2015

Send to: Ms Jeanine Townsend, Clerk to the Board, State Water Resources Control Board, 1001 I Street, 24th floor, Sacramento, CA 95814

RECEIVED
7-24-15
SWRCB Clerk

STORMWATER COMMENTS

Bud Hoekstra, BerryBlest Farm

Bear with me, even humor me, as I move you toward a viewpoint with a brief history of regulation and a smathering of concepts and ideas. I wish I could present the gist of these comments in person, because I suspect that the Board members who make the decisions do not read them fully – merely a substitute reader reads and summarizes the comments in a way that doesn't communicate a larger picture to be communicated.

Let's begin with an annoyingly simple question! How many of you on the Board have sat through high-school English classes in the early years of your lifetime? More to the point, how many of you sat through Ms McHenry's Ninth Grade English classes to learn nouns, verbs, pronouns, adverbs and adjectives – the parts of speech. Bear with me please. If I were to ask you what a pronoun is, you'd tell me right away. "A pronoun takes the place of a noun, a pronoun has an antecedent." That's plain enough to understand, and you'd give me an example at the snap of a finger: The truck has a flat tire; ***it*** had a flat. "it" is the pronoun and "it" refers to truck, the antecedent – that's simple enough to understand!

Now that I have your expert opinion on pronouns, what they are and how they function, would you please tell me what the pronoun "it" refers to in the sentence "it rains." What is its antecedent – it's a simple enough request!

Oh, yeah – the cerebellar wheels are spinning hard, and you are not coming up with an answer. The Water Resources Control Board doesn't comprehend the "***it***" of "it rains." What rains? The rain rains? The sky rains. The cloud rains. The atmosphere drizzles? When we have a leaky sky, "rain" doesn't seem to be the agent of the verbal action "raining" so it must not be the antecedent of it.

Among the Native American Salish languages of Washington, Idaho and Montana, the phrasal construction in Kalispel, I'm told, includes such phrases as "it rivers" and "it islands." Typically a river's water fluctuates in volume and depth by day and by night – the mean average of the waterline against the banks changes minute by minute like weather throughout the day, and whereas we see a river as an object, a thing, a commodity that can be lifted up and carried away, the "it" of the phrasology exists as a cycle in nature like rain – motion without a nominal agency, a verbal action without a doer. What doer does "it" refer to in the phrase "it rivers?" What is the antecedent of "it?" The sentence "It rains" is no less ambiguous from the standpoint of antecedents. We don't know what ***it*** means.

Other North American Indians use the phrase "The sky rains" and would be the correct translation of "it rains." And in the ancient Sanskrit language, the correct phrase is "God rains." Using data and statistics from languages around the world, we have a montage of answers and translations of the English idiom, "It rains." And when water runs down the gussets of the sky, we still won't know all that "***it***" entails.

Crops need water to grow, and since the dawn of tillage, humankind have regulated for water, rather, humankind has tried to exert their power over climate and weather to make their food grow.

Sometimes the regulation takes the form of technology. The Anasazi found a high-elevation plateau whose plain was tilted toward the sun making for an extra- long, high-elevation growing season, and corn grew where corn normally would not grow because of a short growing season due to high elevation. The Hopi of the Southwest applied dry-farming, based on snowmelt. Hopi farmers, as the YouTube clip shows, dug into the earth and if the subsoil was still wet with snowmelt, the farmers plopped in a seed into the hole, covered it and let it grow. If the hole was dry, they passed over it. In a sense, they controlled the water cycle when they planted. Our modern-day cornbelt state of Iowa depends on natural rainfall, but California's central valley needs the artificial boost of irrigation. Irrigation is substitute rain, artificial rain – a manmade twist in the water cycle. On the opposite extreme of the water spectrum – opposite that of

dry-farming – is hydroponics – growing crops in a continuous flow of water – continuous, nonstop irrigation. It works – since Phillips has come out with LED lights in the two crucial spectra, we can now grow crops indoors, in warehouses, with a continuous stream of irrigation and ignore the soil altogether and its benefits to the nutrient content of the food plant and our food.

In a way, all these technologies are stormwater-dependent. Ultimately, crops depend on weather, and weather, despite its seasonal variability, occurs within a larger framework of climate. We've enjoyed a stable climate for 200 years, and due to actions brought about by our own economic activities, that stable climate will change. The wettest month of the year in Iowa – July - has already shifted to June. California already faces the same topsy-turvy beginnings.

Farmers control planting by seeding. We till beds for our seeds, we level land for the trafficability of our machinery, but how do we control the asset of weather? We create our own weather – something akin to artificial rain – by irrigation, but irrigation, if we connect the events of the water cycle, is stormwater – snowpack, soil water and groundwater fall from the sky.

Don't be fooled by this discussion. Human societies have always been at the mercy of the weather, if they do agriculture. The Incas – the Mayans, I forget which of them – believed in the great principle that "God rains" and each year they sacrificed a virgin to their wettest god to win his favor and his drenching of life-giving rain. Their god, a commander and chief of the climate, was male, so the choice for the human immolation was of course female – a form of sexism in religion!

On page 4 of the book THE WEST WITHOUT WATER, the authors talk about Powell's report to the nation, that the West in the United States was so arid that it wasn't suited to the neo-European crops that we farmed. He recommended that the farming arts stay East of the Mississippi River. Climate did not behoove farming, but glorious technology – namely the irrigation ditch – changed that. But make no mistake. If we back-trail the

water, the ditch goes to the stream, the stream to the snowpack, the snowpack to the laden sky, the sky to the ocean's evaporating bounty.

The chestnut was a European staple of the medieval ages, counted among the top ten foodstuffs of Europe, and it is a technology all to itself. Chestnuts grew on chestnut trees even duringa drought. The Italian immigrants to America who brought with them chestnut seeds failed to establish it as a staple foodstuff. Instead, the world's diet shifted with the farming of corn and potatoes. Jefferson, during his presidency, wrote a friend that he had forsworn "Indian corn" because the crop plant "worryed" the soil. Terrible erosion aside, today more than two-thirds of the world's calories come from corn, wheat, rice and potatoes – just four species of food plants among the many thousands available for our use! Go to grocery and buy a can of Green Giant cattails – there's no pontoon tractor and no cattails, which Euell Gibbons called "the supermarket of the swamp." History informs us that the world's great civilizations were characterized and divided on the grasses they grew and ate. Prior to advent of Columbus and others, the Orient grew rice; Europe relied on wheat and rye, native Americans subsisted on corn - all of these are grasses, and stormwater made them grow. The trend in the world's diet was toward a short-order menu of water-hungry crops. I can go to a restaurant in Sweden and order rose-hip soup. We don't use this dryland crop for food here!

Powell's tidings about the un-farm-ability of the West were rebuked by the railroad magnates who claimed, as THE WEST WITHOUT WATER tells, that "`rain follows the plow,' meaning that rainfall would increase as farmers worked the soil and planted crops." That's pretty astonishing palaver, and it didn't work, so that lawmakers had to modify the Homestead Act to make it work. Dry soil doesn't grow crops, so Congress had the answer. In 1873, Congress enacted thew Timber Culture Act that required about a fourth of every 160-acre homestead tract to be sown in trees. Yes, grow trees – for trees would make it rain. Weren't forests wetter than other landscapes? Didn't the farmers who came to the Ohio river valley carve their farms from endless forestland? Simple logic told lawmakers who framed The Timber Culture Act of 1873 how to control the hydrologic cycle

for their benefit. And unlike the Incas, no virgins were needed for sacrifices!

Of course The Timber Culture Act didn't work, and farmers farmed with little understanding of how the ecology around them functioned. At the time of the thirteen colonies before the Revolutionary War, the "bread" belt of America, where wheat, oats and rye grew, was Vermont. Wheat fields teamed on the green Mountain farm estates, and erosion marred the fields with ever-deepening gullies. Vermont was 80% under plow, according to Little, in his book GREEN FIELDS FOREVER, which has been reversed - Vermont is now 80% "under" forest. The soil base of that bread basket washed away, and the erosion uprooted its farmers. John Deere and family gathered up their belongings, left Vermont and moved to Illinois where the family bread-winner set up a machinery shop and made horse-drawn equipment for the iconic John Deere company. His neighbors packed and left too, and they took their mountain wheat seed with them – a seed best-fitted for wet mountain climes – and they took the mountain land races of wheat seed to the dry-cycle flatland of the panhandles of Texas and Oklahoma – where they drained the playas that gave them water in wet years. The wrong landrace of seed and the periodic droughts conspired to produce farm failures, boom-and-bust economies and eventually the catastrophic Dust Bowl. From Thomas Jefferson's "worryed" soils, to the Timber Culture Act of 1873, to the blankets of dust in Ndew York and Philadelphia, we learned nothing of the water cycle – the ecological service that Aldo Leopold named "the round river."

When the dust blew East and settled on sills of Philadelphia's and Baltimore's windows, Congress took note of the dust. The dust was the wheat crop in entropy! The message of the Soil Conservation Service was no longer the old refrain, plow more land or plant more trees. The strides made by the SCS had to do with keeping soil in its place – WITH or WITHOUT water! Windbreaks worked, sorghum was seeded for dry periods -.a few farmers even contour-plowed their fields. Erosion lessened, but did not disappear. Droughts still afflicted the nation, like Governor Perry's state of Texas in the late 2000''s.

Texas Governor Rick Perry told his drought-stricken Texans to pray. A state "prayer day" was called to enlist the help of God to procure the missing rain. God didn't answer his prayers as fast as Perry wanted, and Perry might have done better with a virgin sacrifice of some kind.

California solved its water riddle with irrigation technology. The state built dams and reservoirs on the West side of the Sierra-Nevada range, a network of flumes to distribute water and a road system that takes stormwater that would ordinarily infiltrate the ground and fills the reservoirs with it. The state is awash in drainages – in road ditches and reservoirs. Roads are seldom more than artificial streams that flush stormwater to the ocean – a hydrological short circuit. Reservoirs are industry-sized evaporation vats that methylate mercury while they store water. The future prognosis for California is that the water cycle will shift from the West side of the Sierra-Nevada range to the East side where we haven't built dams and reservoirs yet. Virgin sacrifices may be coming! Pumping technology has been refined and bettered – we have deeper wells and bigger pumps, and we pump the stored commodity of groundwater from the ground in order to grow rice in the desert. The pyramids of ancient Egypt don't hold a candle to our Central Valley's technology, the world's greatest wonder of irrigation!

We can express our incredible awe at the technological wonder of irrigation and massive food production of the Valley, but our awe has to tempered by the hidden flaws of its design. The truth is that agriculture is more if-fy than the technological magnificence that we see. Big yields are not the course of nature, farming is not sustainable. If we undo a stable climate, California's water system fails – we know the risk. What we do about it is the answer. We could stop eating or start up virgin sacrifices – I don't know which is the better of the two! Water is a resource, and if the resource base dries up, we wither with the weather. How do we make farming resilient to drought?

I can't think of a better way of expressing the awe and the misgivings than with the proverbial example of the glass of water. Fill a glass half-way, and do we describe the glass as "half-full" or "half-empty." This

theme has been repeated in so many words throughout the years. During the Reagan years as President, the lead economist of the Reagan era was Julian Simon who spoke to the Commonwealth Club of San Francisco with these words, "My thesis is that just about every important measure of human welfare shows improvement over the decades and centuries, in the United States as well as in the rest of the world, in the most important material aspects of our lives. And there is no persuasive reason to believe that these trends will not continue indefinitely." By the time he delivered half his speech, his speaker's water was half-full. Almost simultaneously, Lester Brown of the World Watch Institute delivered a half-empty message to the organization of World Futurists, "At the global level, almost all the indicators are negative … every major indicator shows deterioration in natural systems." This is our dilemma: when wealth goes up, the resource base on which that wealth depends goes down. There's an inverse relationship between boom and bust.

We enshrine "market forces" in this country, and we elevate their status to that of a worshipped icon, - not unlike a virgin sacrifice - but the year I was born, Aldo Leopold humorlessly wrote, "To build a better motor we tap the uppermost powers of the human brain, to build a better countryside we throw dice." Market forces are dice.

The dice of market forces has taken us great leaps forward economically and in so doing, it has upped the ante on precarious collapse. I want to share some ideas with the Water Board on how we might cope better now than in the past.

First though, I want to explore with you in general what market forces have done – from the half-empty viewpoint. Many people praise and extol the wonders of the technological world – we hallucinate mastery over the water cycle with irrigation! I want to look at the darker underside of the glorious technologies of our times, examine the fading ecological services and then suggest some rectifications for the losses. If you take the ecosystem out of agriculture, you must replace the lost ecosystem services. That is perhaps more fundamental to our economic system than economic principles.

Aside from virgin sacrifice, we have two ways of looking at water management – one is through the eyes of resource management. Water is a resource, stormwater is a commodity, and it is up to us to manage our economic commodities. Teddy Roosevelt, the great Conservationist, once said, "I do not recognize the right of this generation to rob future generations by wasteful use." California's constitution outlaws the wasteful use of water. All this implies a careful resource management, but resource management is economic in its discipline, and the human ecology needs an ecological approach.

The other viewpoint, the one in contrast to resource management, is that we tap into the water cycle – "the round river" as Aldo Leopold said of it. Human ecology relies on the structure and function of the hydrological cycle, and preserving the cycle's structure and function is a management priority. Sustainability means perpetuating the water cycle for its benefits – for people, profits, planet!

We have three approaches to the problem – the problem being a dearth of water, thus a dearth of food. We can throw dice and let market forces do their thing – as we have been doing to some extent for the past 200-300 years. Or, we manage water as an economic resource, and we can go at it by maintaining or improving our resource base. Or, number three, we can tune up the natural ecological systems to make sure that the water cycle is structured and functions appropriately in the state so that we get the dividens, rain or shine! Perhaps we need to consider all of these avenues as the ultimate solution.

The EPA's regulatory regime of adaptive management is catch-all approach to environmental issues. One textbook for regulators is the EPA's book NATIONAL MANAGEMENT MEASURES FOR THE CONTROL OF NONPOINT POLLUTION FROM AGRICULTURE. In short, the textbook espouses the framework of management measure [environmental goal] + suite of BMP's [best practices] = environmental protection [sustainability]. The notion of adaptation is adjunct with science. Farmers monitor and test the efficiencies of their BMP's to see that the BMP's they chose really do work, and if the BMP's aren't up to snuff, the

farmers can add and subtract BMP's to find a more effective suite of them. BMP's range from microdrip irrigation to winter cover crops, from mulches to an agrichemical handling facility, all designed to achieve water quantity or quality. In California, the Basin plans provide the management measures for the farmers, and the Water Code allows the land-owner to choose the BMP's. That's a simple sketch of the theoretical picture

Best Management Practices maintain or improve the resource base [resource management] or they preserve the structure and the function of the ecosystem and its ecological services [ecology is a component of our notion of sustainability, along with economy and equity]. I won't go into these components, but "willing seller, willing buyer" – the fundamental principle of our economy – is an equitable concept. These theoretical notions take some doing to comprehend.

I've taken the Board this far in their understanding of the larger picture, but probably not beyond their ken of understanding. Everyone understands what I said. Nonetheless, I want to deploy in a few concrete examples of how all this theory and philosophy works – forget what's on paper, let's look at what's on the ground.

Bear with me. Let's look at roads – let's look at how roads alter the structure and function of the local ecology and alter its water cycle.

For most of us, a road is how we get from point A to point B efficiently. Highway engineers and trail experts tell us that roads and trails concentrate environmental damage caused by our getting around.

Let's jog through history briefly and see how roads and paths have evolved into what they are today – gigantic drainage devices.

The first roads trace back to two-track lanes, made by ox cart wheels. In Europe a weed species labeled "Plantago" grew in the compacted ruts of roads. Plantago means "sole of the foot" in Latin, and Pliny referred to the plant as the "cart-track weed." The invasive plant has migrated to every corner of globe where roads are, and when it appeared in North America, Native Americans sometimes called the invasive species "whiteman's foot"

because it followed in the shadow of roads, shadowing whitemen's presence in the New World. Today plantains are ubiquitous as roads.

The Romans engineered roads that were sustainable – perhaps permanency is a better term – many Roman roads still are in use today. Laying down a rock base, Roman engineers covered the roadway with pebbles and softer stone, often canting the surface so that water ran off.

A Scottish engineer of the 19th century named McAdam duplicated the Roman way and made his roads convex to shed water. His roads were dubbed macadams by his British fans. Late in his career he tarred the surface, and his roads were dubbed tarmacadams – or tarmacs for short. Our word tarmac is a corruption of the British slang for road-building and the beginnings of the asphalt industry.

The twentieth century saw a breed of roadways, designed solely for drainage. New technological innovations came about – curbs, gutters, storm drains, culverts and the proverbial "ditch." The ditch is America's one great tool! Every road was designed to be an artificial watercourse. If we took every mile of pavement in the U.S. and laid the miles of pavements side by side, our roads would cover the state of Mississippi without a crack. If we translate this into the terms of hydrogeology, the land has lost the equivalent of water infiltration and groundwater recharge. Groundwater falls from the sky, and nature evolved ground covers that cause stormwater to sink in. Even plaintain – the Plantago species that we talked about, is designed by evolution for its compacted microenvironment of the wheel rut. The spatulate leaves sluice moisture to the stem so that the plant's taproot stores water and grows. The taproot burrows into the hard-packed soil where wheels once rode. Hard-packing, a form of hardscape, must be drained, and the ecological service of recharge is lost.

The point there is that our network of roads and highways were engineered for drainage, not recharge. 40% of Americans, according to EPA, drink groundwater from wells – groundwater that falls from the sky. The bottom line here is that we drink stormwater, and we designed our society to waste stormwater. Stormwater renews our well supply – only if

rainfall penetrates the ground. Pavements are impenetrable – impenetrable "hardscapes" – that convert recharge into runoff. We do not compensate for the loss of recharge by making roadside infiltration zones nor do we devise bioswaies to catch road runoff. We add dicthes and storm drains that flush the water into streams and rivers that carry tap water to the ocean and away from our irrigation pumps. How does the logic of this boondoggle compute for our future?

Our highway system was designed for two products: cars and runoff. We neglected to plan for recharge – and recharge is what we use for drinking and irrigation. In our simple ignorance of the round river, we've chipped away the land's natural capacity for recharge and we hydromodify roadscpaes to speed drainage, as if food and water don't matter in the long haul.

Our vicious tampering has disrupted the natural cycles on the land. We lay down hardscapes – tarmacadams – but we reconstitute their engineering so that the hardscapes drain into artificial watercourses, and not into infiltration zones that take in water. We have an up escalator called a pump, we have no down escalator called recharge. We spray herbicides along roads, effectively reducing the land's ability to infiltrate. The road bed acts as a subsurface dam that traps subsurface flows and locks them up so that rivers do not receive their late-season flows. Aren't market forces the masked robbers of future generations!

We enshrine snowpack for late-season water. But this year, the rain has stopped and the snowmelt volume is nil. Snowmelt is gone, for the most part, and the water we see flowing in our rivers and streams is latent soil water – water percolating through the uppercrusts of soil and bypassing the network of damming roads. We dam those flows with roads, and we strip away plants that hold back storm rain and break up soil crusts so that water penetrates and percolates. We don't even measure the P & P to see if our road construction retains a natural pattern of runoff retention.

Our farm machinery is heavy – designed by the market forces of cheap fuel. In Europe where the price of gas is double ours, we see walk-behind

tractors. Earth Tool's website in Kentucky displays the European line of equipment for walk-behind BCS's – balers, sickle bars, even ridgers, - everything for the walk-behind tractor. Walk-behinds are lightweight tractors, less likely to cause a plow pan than are our monsters of the clod sea. We over-power our farms, and the growing trend is toward huger tractors that suck more fuel and require more trafficability in the fields. Cheap fuel shaped the size of the American farm and tractor, and has inadvertently shaped our water use.

Heavy equipment shaped the plow pan – every farm suffers a degree of plow pan from overweight machinery and its hardscaping effects. This means that a farm behaves less like a unit of a recharge system and more like a unit of a drainage system. Iowa is an agricultural state, and about 80% of Iowa's cropland is tiled for drainage. Because drainage aerates the upper profile of the soil, aerobic activity goes on all year long, turning soil organic matter into greenhouse gases.

"We plumbed our society wrong," I heard the director of the UC-Davis student farm say. It's a worthy quote, but nobody listens.

Field accesses and highway roads are not designed for recharge but for drainage. UCCE/UCANR suggests crowning a gravel road with a 2-4% slope to spread water into infiltration zones. Surface-spreading BMP's are better than the channelization BMP's that we prodigally use. The California Water Plan calls for "surface-spreading" technologies, not channelization BMP's like culverts and ditches. The USDA-NRCS tells me "outsloping is `in', inboard designs are 'out'." But no one honestly cares if tomorrow's children in California eat or drink.

We design roofs with gutters – gutters are channelization BMP's – gutters flush the rainfall into rills and gullies, and into streams, ultimately running the delivery of groundwater from the skies to the oceans. Rain washes off my roof into a bed of gravel where it soaks in. I designed it for zero runoff. The gravel is also a fuelbreak for wildland fires and it conserves the ration of groundwater that we get each year. A rain barrel or cistern does as much. But we divert the flow of rain from our roofs into gutters, pipe it into

downspouts and send it ocean-ward through a network of storm sewers and natural streams. Soon we must must fetch our drinking water from the ocean.

What we need to do is to restore the structure and function of the ecology that feeds groundwater tank. We need to house-scape the land, and not landscape the house, hydromodifying the land's recharge features. Roads must be redesigned and rebuilt to perform as a part of the groundwater ecogeology, not as artificial streams that shunt away future tap water through a network of alleys that function as drainage.

Soil is our largest reservoir, including groundwater aquifers. Compactions must cease; we must revegetate to break up hard crusts and accelerate infiltration. Free markets are probably not important as free flows. Nature works – nature is sustainable. The more we tamper, the more we menace our survival. Everything in our built environment, including farms, shrieks of drainage – we must in everything we do preserve the structure and function of the water cycle. No dice roll ever!

In the late 19th century an American biologist with a British name, Sheffield, defined "ecology" as a community of plants and animals. The science grew by leaps and bounds, and by the 1940's, a British ecologist Sir Arthur Tansley redefined it as energy flow through a system of plants and animals – Aldous Huxley said of it – "how plants and animals make a living." The science of ecology underwent a rebirth with ecologists like Eugene Odum who saw the master plan of structure and function. Human ecology has to be a part of the master plan of hydrogeology, it cannot erode the structure and function of the planetary system that sustains us - under whose "glass" we live, from whose "glass" we drink.

Washington state researchers last year sampled the runoff from a busy four-lane highway and tested it for toxicity – read about it in the NEW YORK TIMES. The brew of runoff killed ceriodaphnia, the base of the food chain for fish and wildlife. The runoff was toxic. We design our roads and highways to channel the toxic brew into streams and rivers, not into the earth that filters it clean.

The Washington researchers also took a sample of the toxic brew from highways and poured it through a column of dirt – soil! The water that dripped out was drinkable again, clean – soil had filtered it. We design roads for unfiltered runoff. Salmon die, the price of a meal goes up. When we remove the ecosystem from the landscape, we have to replace the lost ecosystem service – clean, abundant, natural water, the earth's most precious mineral!

That said, that is precisely the task that the Board faces – we must outlaw the dice and begin to work with the ecology of the land. We must restore the land's capacity for recharge of our groundwater. We must elevate the soil organic matter content and preserve the subsurface flows of water to our streams and rivers. The huge irony we face is that the so-called Biosphere II, built in Arizona, didn't work. We could not build a self-sustaining ecosystem, one that was manmade. Now we face the behemoth job of reinventing Biosphere I – which is failing us because of our own foibles.

In 1948, a candidate for president – one who lost the election – said to the entire world over the airways of the BBC – "We are passengers on a tiny spaceship, dependent on its vulnerable supplies of air and soil, preserved from annihilation by the work, the care – and I will say, the love – we give our fragile craft." This means a water plan in every county's general plan.

Thank you for bearing with me and for letting me share my comments,

Bud Hoekstra

Bud Hoekstra, CCA

BerryBlest Farm [POB 234, Glencoe, CA 95232]