

Compendium of Public Comments on the Proposal to Amend Transition Plan for GMO Crops

Mary Mulry • Longmont

Comment # 46 • 2019-06-03 15:53:01

1. There was far too little time for adequate public input on this proposal. Revised proposal has only been out for a few days. Second public hearing should have been postponed at least two weeks, especially since the first one was scheduled as was admitted without sufficient notice. 2. The transition plan shortened the timetable which is good, but the ban does not need to be extended. The leasees should have been able to transition during after the first announcement in 2016. 3. The plan continues the use of neonics and glyphosate on our public land at great risk to the county now that there are over 13000 lawsuits regarding the use of glyphosate and cancer. The use of neonics has adversely affected the bees and other pollinators as well as insects, in general. 4. There is no need for sugar beets to be grown on public lands. They are very detrimental to the soil and those farmers that have sugar beet shares can lease other land in Boulder, Weld or Larimer counties. We taxpayers should have not to bear the burden of their depressed shares and commodity prices. 4. Corn can be transitioned under the original timetable. 5. If we are going to spend \$1million plus on farmers in the county, it should apply to more than 10 GMO farmers. There should be plan to make the organic farmers more productive and use regenerative (no till or low till) techniques. 6. The beekeepers in the county who have lost colonies should have help as well to replenish and be successful. 7. The Steering Committee should have public representation in addition to a POSAC member. If a POSAC member is chosen, it should be Sue Anderson or someone who does not have a conflict of interest by having a lease with the county. 8. The leases must have a clause in them that requires participation in the program and a clause to release the county from liability due to their continued use of glyphosate and neonics. The farmers should should the burden of liability, not the taxpayers. Farmers who do not participate fully in the program should have their leases released to others who can farm the land to the public's wishes. 9. Mad Ag's plan needs oversight by the Boulder County Staff, BOCC, POSAC and regular updates to the public as to progress, results, successes and challenges. I recommend quarterly reports to the public and a public hearing before the next planting season. 10. Boulder County land is critical to the sustainability of the local food system. We passed a sustainability tax to address issues of health and wellness, climate change, infrastructure, etc. There needs to be specific detailed plans to address this public resource of 25000 acres both now and in the future. The resource is not producing enough income and is not producing local food on at least 1/2 of the acres. 11. A 25000 acre farm would be in the top 1% of farms in the whole country--we are squandering this resource. A future project should look at other ways of managing these acres, including contracting for specific crops, putting crops in grasslands, growing specialty crops that the county already buys for schools, the jail and to give to underserved populations. 12. The Mad Ag workshops should be open to all farmers in the County or given multiple times to benefit as many farmers as possible.

Judy Denberg • Boulder

Comment # 45 • 2019-06-03 15:21:30

Glyphosate is a known carcinogen. The County will be opening itself to lawsuits if Roundup, with its leading ingredient glyphosate is not banned ASAP. If there is an extension on the bans on GMO's and not a complete transition to organic processes, cancer and neuro degenerative diseases will be on the rise. Now, Oregon just banned glyphosate. When our water, food, air and soil are compromised by carcinogens, it will be the legislative body that allowed this to happen who will have to face the consequences. We cannot in good conscience allow Monsanto/Bayer to have control of our lives. If you don't see this you are part of the problem. If you don't do something about it, you are part of the problem. I elected you because I thought that you cared about the health and safety of our community. You represent our community, and I hope that you will protect us from carcinogens and neuro toxins. If not, I hope that you, as our representatives, will be sued and jailed for your inability to put human decency above profit. It is about time that you stand up for our community and not let corporate skills have there way.

Linda Hardesty • Boulder

Comment # 44 • 2019-06-03 14:57:32

Please, please do NOT extend the time for farmers on Boulder County Open Space to cease using GMOs and their associated chemicals. RoundUp is a proven carcinogen, and has been found virtually everywhere. Let's be part of the solution and not the problem.

Ronald Forthofer • Longmont

Comment # 43 • 2019-06-03 14:17:06

I am very disappointed that the current Commissioners are proposing to change the decision that the Commissioners made earlier. This is not a good policy and disrespects the people who previously testified against the use of GMOs. The few farmers who benefit from this proposed change had sufficient time to adjust but, apparently, they chose not to move away from GMO crops. Please show respect for all those who worked very hard to achieve an end to GMOs on county land and continue to follow the previous schedule for the phaseout of GMOs. Sincerely, Ron Forthofer

Lindsay Diamond • Longmont

Comment # 42 • 2019-06-03 14:06:11

As a Boulder County resident, parent and scientist who lives in a small neighborhood surrounded on all sides by open space agricultural land, I fully support this proposal. It is important to me that our open space agricultural land is cared for in a responsible way, and it seems clear that following the proposed research plan is the responsible path forward. Farming is not as simple as non-farmers seem to imply with the rush to move away from GM crops. The potential consequences will be severe if we rush this transition using unproven methods or push farmers into a corner with non-existent solutions. Forcing farmers to stop using GM seeds without a well-established alternative in place is irresponsible. Any real research proposal needs adequate time to experiment with options and gather data. Therefore, I support the plan as it is now with no additional changes. We should respect subject-matter expertise

from the scientists who work in the relevant ecological, agricultural and sustainability fields, and the farmers who are the stewards of these lands. It seems strange that, when it comes to growing food, everyone seems to think that they know what's best. Most people wouldn't presume to tell a pilot how to fly a plane or tell a surgeon how to operate, but everyone wants to tell farmers how they should be growing food. Successful farming requires sophistication and a tremendous amount of knowledge, earned over years and decades - particularly as our climate and growing conditions shift over time. When it comes to how we should be farming the land -- and how we should manage this transition -- we need to listen to the experts. The experts are those that work as professional, full-time farmers. Not non-farming citizens, and not hobbyists. Please give the farmers the opportunity and time to transition with the care, knowledge and data necessary to make responsible decisions.

Terry Mast • Longmont

Comment # 41 • 2019-06-03 12:38:45

I am in favor of phasing out all GMO crops on Boulder County land SOONER rather than later. The damage to our gut microbiome from glyphosate is pervasive in our U.S. food supply. Boulder County (on land owned by taxpayers like myself) must set an example for clean-sourced, organically produced foods that are beneficial to our environment and to human health, not harmful. I am not in favor of extensions on the phase-out of GMOs. Terry S Mast, Master Nutrition Therapist and long-time county resident

Ryan Martens • BOULDER

Comment # 40 • 2019-06-03 12:34:08

see attached

[martens_public_comment_for_6319_commissioners.pdf](#)

Seann Goodman • Lafayette

Comment # 39 • 2019-06-03 10:36:59

No GMO's in Boulder county... well that may be too ideal but at least no GMOs on public lands. Corn is an open polinator which means that it can pollinate other corn crops in fields up to 2 miles away (or more) so if someone on private land is trying to grow GMO free corn, the GMO corn fields two miles away can contaminate the non-GMO corn. The protection of our open space and private gardens are at stake. GMO products only work if you add more chemical fertilizers which we know are also killing bee populations and other vital insects. This is the time to ban GMOs at every level. We take out GMOs we take out the need to fertilize and fulfill our promise for clean water in our watersheds and clean air for all living beings.

Donna Daniell • Longmont

Comment # 38 • 2019-06-03 10:27:09

Dear Honorable Commissioners: I have lived in this community for 38 years and I have been proud of the steps your commission and other elected officials have made to provide the leadership we have needed in this county to stay in the forefront of change and safety and to set the example for other communities to follow. Now is your chance to stand up and continue this leadership to protect our

community and our lands from misuse of pesticides, chemicals and other ways that our farming practices need to stay safe for our environment so that we can make the changes necessary to move through this new normal experience with climate change. Do not extend the ban on these chemicals that are truly destroying our safety and food supply, our bees and insects and our natural world. Please end GMO crops, Round-up and glyphosate use in Boulder County Open Space lands in 2020 and create a just transition for farmers involved. Please institute programs to end their use on all public and private lands in the County in 2020 as well. Create regenerative soil programs that build our soil and sequester carbon throughout the County and promote healthy agricultural and landscape practices without the use of chemical and harmful pesticides. No extension of time for GM crops. Thank you for listening and making this important transition happen now.

Bonnie Sundance • Boulder

Comment # 37 • 2019-06-03 10:07:31

Respected County Commissioners, I am grateful for your hearing citizens on the matter of GMOs and glyphosate on County lands both Open Space and private properties. As a 30-year resident of Boulder County, and long-time activist in opposition to pesticides and GMOs, I believe it is time NOW to cease the use of poor agricultural and landscape practices that have harmed plants, insects, people and soil. The change away from Round-Up, Glyphosate and GMO practices must come NOW throughout the entire County and not just on Open Space lands, without any further extension of time beyond 2020. If we want to create a healthy environment in our County, we must work out transitions which are reasonable and just for all concerned. When someone has been profiting from poor practices, at the Earth's expense, at other's expense then a change is necessary. What that change looks like can be worked out by wise processes towards a win-win solution for all concerned without a time extension. There is a law above human law which the Earth imposes on US ALL, and that is natural LAW. Human law cannot impose itself on Natural Law, it is the other way around. Please help us all to wake up to that fact of life on Earth and to the unwanted consequences of human practices that do not fulfill the protection and care of Earth's environment and all Life and specifically Open Space lands with wisdom. We need laws that protect the life of insects and plants which also benefit humans: both have a right to exist and thrive for themselves. We need laws that assure the lives and work of our pollinators who are essential to growing our food, bees and butterflies, and on. There has been an observable and dramatic decrease in insects in our County the past 5 years. To me this is frightening. Please end GMO crops, Round-up and glyphosate use in Boulder County Open Space lands in 2020 and create a just transition for farmers involved. Please institute programs to end their use on all public and private lands in the County in 2020 as well. Create regenerative soil programs that build our soil and sequester carbon throughout the County and promote healthy agricultural and landscape practices without the use of chemical and harmful pesticides. No extension of time for GM crops.

Rachel Solum • Boulder

Comment # 36 • 2019-06-03 09:53:19

Dear Commissioners, Please take positive action for our planet and our county and do allow use of GMOs and neonicotinoids on Boulder County Open Space. SAVE THE BEES most immediately, and the rest of us.

Lyna Norberg • Boulder

Comment # 35 • 2019-06-03 09:47:47

Greetings, My educated opinion is: NO extension of bans on GMOs and neonicotinoids on Boulder County Open Space, and All farmers on Boulder County Open Space must complete the transition to organic agriculture by 2024. It's the least we can do for our planet! Thanks for your consideration, Lyna Norberg

G Dale Greenawald • Boulder

Comment # 34 • 2019-06-03 09:07:14

Honorable Commissioners: The scientific evidence is overwhelming that Glyphosate exposure is a medical risk. But just as the case decades ago when money from big tobacco obscured the truth, the GMO industry spends lavishly to hide this evidence. As a leading community in environmental protection Boulder citizens deserve that their health and safety be protected by banning GMO's and the subsequent use of chemical on county land. In addition there is also overwhelming evidence that neonicotinoids ravage bees and other necessary insect life. Please it's time to mandate that by 2024 ALL farming on country owned land be organic, There are numerous organic farming research sites around the country that can support these efforts . Thank you, G Dale Greenawald

Scott Brown • Boulder

Comment # 33 • 2019-06-03 07:35:34

Dear Commissioners, I ask you to not extend the bans of GMOs and neonicotinoids on Boulder County Open Space. The people have spoken on this and the majority opinion is clear. It is a vote for ecosystem health and life. Seen from a big picture perspective, the movement toward organic practices represents life, the old system represents death. Please keep that context in mind. Consider the full extent of the harm with both of the options on the table. On the one hand, a demeaning of democracy, ecosystem impacts that we can not begin to know the full extent of, harm to human health and harm to other species. Economic impacts associated with the loss of pollinators, topsoil and topsoil health, contamination of food, air and water, and liability. The psycho-emotional damage of knowing that poison is being used, not only by so many of our neighbors, but also on our public lands. Consider the hopelessness in even this partial list. And on the other hand, a relatively small number of growers who are inconvenienced by the phase-out. By all means consider the full extent of that harm as well. Then weigh it out. Remember the benefits too—the vision of organic, regenerative agriculture. The elimination of poisons in our food, water, soil, and air. Healthy pollinator populations. Life enhancing work on the land and a more localized economy. We should not be surprised that a transition to poison-free practices and lifestyles will create some turbulence when the old systems are so entrenched. But you (and we) are not responsible for filling sugar beet quotas. The Western Sugar Cooperative is not a

constituent of yours. I don't mean this in a disrespectful way, but farmers who have not seen or heeded the writing on the wall in terms of their pesticide use and other practices that undermine ecosystem and human health must take responsibility for their own decisions. Understanding that there's a whole system in place to keep them beholden to the pesticide industry and conventional practices does nothing to alleviate them of their responsibilities. That system is poisonous and immoral and must be replaced if life on earth is to thrive. Sugar itself—added sugar—is a poison. Harmful to our health and of no nutritional value. I ask you to be the leaders you were elected to be. There is a lot of pain associated with this issue and the state of our world more generally. You have a chance today to alleviate some of that pain and be beacons of hope. Stand up for democracy today. Stand by the bans as mandated.
Scott Brown Boulder, CO

Jan DeCourtney • Boulder

Comment # 32 • 2019-06-03 07:11:15

NO GMOs in Boulder. NO Roundup. We want our county poison-free. We want health. We want a natural life and natural lifestyle. Find healthy ways to do this. Don't tamper and poison our food or our open spaces.

richard healy • Boulder

Comment # 31 • 2019-06-02 22:33:29

I am writing to urge Commissioners to reject the proposed amendment to the transition plan and retain the original transition plan that was adopted in 2016 (i.e., phase out GE crops and neonicotinoid pesticides on Boulder County agricultural fields by 2021). I realize that the transition will be difficult for some farmers, but this difficulty must be weighed against damage done to the environment. Neonics have severely impacted many pollinators, including honey bees. They persist in their toxic state for many years in soil and water and thus pose a continued health risk for beneficial insects and humans. The sooner we can reduce the use on neonics, the safer our environment will be. The lack of progress in the last two years on the transition is very disappointing, and it makes one wonder if this is due to resistance by some parties; if so, then might we be facing a similar decision in four years? The time to act is now. Please keep in place the original transition plan.

Molly Greacen • Boulder

Comment # 30 • 2019-06-02 21:18:16

NO extension on the deadline for growing of genetically modified crops and neonicotinoids on Boulder County Open Space. I oppose any extension of deadline for the prohibition of GMOs or neonicotinoids on County Open Space and I am calling on the commissioners to transition all county open space agricultural land to organic agriculture, with a completion date for the transition beginning in 2024. I helped start Bee Safe Boulder 5 years ago. Boulder County took a pledge to become a Pollinator Safe County, to not use neonicotinoids on county open space, on county buildings, lawns, public spaces. When you voted a few years ago to ban GMOs on county open space farm land, we were thrilled. We expect you to keep that promise. The health of everyone and the ecosystem depend upon getting rid of

these pesticides NOW. (That includes glyphosate.) Thank you for doing the difficult things necessary for future life on this planet.

Sharon Simmons • Boulder

Comment # 29 • 2019-06-02 20:55:25

Please ban all GMO's and roundup in our county as soon as you can. I am reading all the articles and understand I comment here by June 3. I live at Vista Village Modular Home park and the managers/owners here use round up and other bad chemicals, unwilling to stop. It bothers my asthma and stinks. I think it could hurt the many children in our park. Stopping its use I think would be the best solution. Thank you for your time. Sharon 720-361-3373

Michael Smith • Boulder

Comment # 28 • 2019-06-02 20:51:28

No, do not revise the transition plan for allowing GMO corn or sugar beets on county land. I would have never voted for Open Space if I knew this is what the land would be used for. Didn't you see the large penalties juries awarded to people who got cancer from Round Up. There are over 13,000 cases lined up on the same issue. <https://www.reuters.com/article/us-bayer-glyphosate-lawsuit/california-jury-hits-bayer-with-2-billion-award-in-roundup-cancer-trial-idUSKCN1SJ29F>

Linda Ohlson Graham • Provincetown

Comment # 27 • 2019-06-02 14:12:28

Please ... NO extension on the deadline for growing of genetically modified crops and neonicotinoids on Boulder County Open Space. **<i>Linda Ohlson Graham</i>** (Boulder resident 93-96 ... 2006-2010 ...) **<i>Linda Ohlson Graham -Global Peace- poetess</i>**
<https://drive.google.com/file/d/0B4WKpAHlmhy1SlowMTRVMzYtdVdqQVhXV2lzNjNrZXINZUN3/view?ts=59e915e6> Sailor Labyrinth builder CO Dept. of Peace Poet Laureate CO District 2 co-ordinator: Mar. 2008-Mar. 2010: Campaign to establish a US Dept. of Peace co-director: The (JMW) Turner Museum Denver, CO 1984-1996 <http://www.lindaohlsongraham.com>
<http://www.earthoceanheavens.com>
http://www.capewomenonline.com/2012_Issues/Spring_2012/Spring_2012Articles/Entrance_poem.html
<http://christiepalmerlowrance.blogspot.com/2013/12/writing-about-provincetown-artist.html>

Anne Knoll • Longmont

Comment # 26 • 2019-06-02 13:18:23

Please continue the moratorium on GMO crops on county open space. The safety of GMO's has not been proven. We don't want to be guinea pigs.

Cynthia Bengtson • Longmont

Comment # 25 • 2019-06-02 08:41:47

I support transitioning away from GMO crops. I don't think the plan should be delayed.

Lisa Flynn • Longmont

Comment # 24 • 2019-06-01 20:05:05

I am against the proposed delayed transition for many reasons. Mainly, the continued poisoning of the land, water and animals (humans included.) From much of the testimony and comments, you're probably quite familiar with the neonics being water soluble with 90% remaining in the soil to then be washed into waterways and contaminate the soils for an period of time. As a beekeeper myself, this is also concerning for the plight of the honey bees. Not to mention the other 500 native bee species and other animals that forage and drink from the unfiltered runoff in irrigation systems. My sister is a lymphoma survivor and is part of a class action suit against Monsanto's Roundup encouraged by her oncologist. This sickens me that we still put profit ahead of health. Roundup as a preharvest spray.....let's just think about that one for a minute. Used on crops right before they're harvested. Then the glyphosate is still right on the food!! Please listen carefully to the testimonies presented on Monday from those people who are not economically attached but have much to lose by pushing back the deadlines. Additionally, there are the farm subsidies from the Federal government that could possibly triple so that should help with the economic set back for transitioning farmers. Thank you.

Martha W D Bushnell • Louisville

Comment # 23 • 2019-06-01 17:15:23

Every effort should be made to keep GMO crops off Boulder lands.

Suzanne Real • Boulder

Comment # 22 • 2019-06-01 12:57:33

I see absolutely no reason for Boulder County to continue allowing GMO crops and the use of pesticides known to be harmful to humans and bees on publicly purchased and funded properties. I want this practice to end immediately. But if you must compromise, then at the very minimum, follow the Citizens Cropland Policy drafted by Richard Andrews. You have deceived the public. You stated that you would discontinued allowing GMO crops before your re-election, and now you are extending the deadline for an unnecessary and unreasonable period. Boulder and Boulder County market themselves as a central power house of innovation in natural food culture. Allowing GMO crops to grow on public lands here is it complete about-face from that moniker and a slap in the face to all of us who live here, pay our taxes, and vote. Banning GMO crops and insecticides should not be looked at through the lens of economic profitability. This is a decision for health, morality, and the good of the planet. Even with that, I am sure that switching to organic farming throughout all of Boulder County's publicly owned lands would actually be more economically sound than what you are allowing now.

Cheryl Furer • Longmont

Comment # 21 • 2019-06-01 09:41:00

Hello, GMOs are still a mystery. There is non-conclusive evidence about long-term human health, environmental and insect, bird, and wildlife effects. We do know that they persist in soil and show up in non-GMO crops for over 5 years after the last gmo was grown in that plot of land. We can see correlation in the rise of gut health disorders in humans since GMOs have entered the food system. We have seen whole colonies of butterflies die after feeding off of gmo plants. Please take a stand to stop this world-wide experiment. The dangers and potential long-term damages far outweigh any short-term benefits. Thank you, Cheryl

Hazel McCoy • Longmont

Comment # 20 • 2019-06-01 09:15:43

Boulder County purports to be a leader in protecting our planet, it's people, and the biodiversity that used to and still could abound on this planet sustaining all life from nature's nutritious soil. Who is man to decide that he knows better than The Whole of All There Is and Ever Has Been. Instead of abiding by federal and state political compromises with the most toxic polluting chemicals the world has ever known, Boulder County must take a stand against those Big Toxic Polluters everywhere. Does Boulder County really want to conspire with Monsanto (now Bayer), Dow Chemical, Syrgenta, and DuPont to poison it's land and all it's people, wildlife, plant, fungi, and micro organisms with genetically modified seed that spreads a toxic super anti-bacteria throughout the soil killing all other life so that some Big Lab Rat can take over all life on the planet, what comes and what goes. Wake Up - Stand Up. Ban all GMO on our tax payer purchased land, or get off the board and let the people speak for themselves. Be Consistent, or Get out of Politics, for we need true statesmen in all our government, not so-called leaders of the people who cow-tow to the hierarchies of Capitalistic Greed just to get some dollars or praise for their next election. Be Real. The Time is almost up for all of us everywhere. They sicken us with their poisons on one, then treat us with their million dollar therapies at the other. Do you really want to be part of such an evil scheme? Be Real Planetary Leaders! BAN ALL GMO use on county owned land.

Erik Johnson • Boulder

Comment # 19 • 2019-06-01 08:13:15

Rethink POS Ag Land and Leases 21st Century goals and uses of ag land... When Boulder County POS ag lands were first purchased, usually to preserve open space and viewsheds and prevent development and sprawl, the lease-back model made sense. We let the farm families who originally owned the land continue to operate on it. The situation has changed – citizen land-owners see a better and higher use of our land than raising commodity crops. Our ag lands should be used for new models of farming with ecological practices, improving soil health and combating climate change, and meanwhile helping to feed Boulder County with nutrient-dense foods. Re-imagine what productive farm land looks like... Farmers and county ag managers and citizens alike need a new vision of what productive farmland looks like. Monolithic fields of bare soil and monocultures from fence-to-fence are an out-of-date idea of farming. Imagine instead patchworks of productive land broken up by windrows, perennial crops,

pollinator habitat, wild areas, greenhouses, row cover, and structures and equipment necessary for diversified farming. Re-wilding and wild-life corridors on marginal land... Some POS ag land should simply be taken out of production. If productivity is sub-optimal then return these acres to short-grass prairie ecosystem and let them/help them recover native species. The crisis of species extinction requires that all land – including POS ag land – should be examined for possible wildlife habitat and corridors to allow movement of species for migration, food-sourcing, and reproduction. Increase riparian and wetland buffer zones. New economic model for county ag land... The POS ag website declares Ag Resources is the only Parks & Open Space Division that is self-funded. This is helpful to the county's annual budgets, but comes at enormous cost to soil-health and community values for our ag land. We need to release Ag Resources from the burden of making a profit on ag leases. Other POS properties – like Rabbit Mountain, Hall Ranch, Caribou Ranch - are not expected to make money – we don't lease them for logging or mineral extraction – they are operated as community assets for recreation, wildlife protection, and ecosystem services. We – the Boulder County taxpayers – should expect some of our tax money to pay for ag land to be operated consistent with our community goals and values. At the same time – income on commodity crop farms seems to be very low. Taking the county's figures on leased land – the county is receiving about \$84/acre of irrigated land. A local organic vegetable grower says his net income – after all expenses – is about \$7700 per acre. Of course not all POS ag land can be operated with an intensive program of labor and high-value crop management and sales. But there could be an economic up-side with development of specialty crops and improved farming techniques. Support farmers... All open space ag lease land should receive public support for cover cropping and compost application if appropriate. If sugar beet shares represent a huge hurdle for certain farmers, then the county should buy out these shares and remove this financial issue. The county should consider supporting farmers with equipment-sharing, crop storage facilities, and a food-processing co-op. We need to provide our local food growers with crop insurance – currently they rely on social media funding to recover from setbacks like hail damage. Replace lease model – contract farming or custom farming... Leasing ag land to farmers and then allowing them to engage in harmful ag practices while taking all the risk is no longer a good option for the farmers or the citizen land-owners. The county should consider a different model for farming POS parcels – contract farming or custom farming. The county would designate crops, own the harvest, and take the risk, while farmers would continue to use their expertise and equipment for growing food/fiber under fixed price contract and crop-share arrangements. Transparency... The county needs to maintain maximum transparency regarding operations of POS ag lands. Ag Resource department budgets should be readily available. Individual ag parcel leases are public documents and should be available. The Cropland Policy requires reporting on soil health and pesticide use, and these reports need to be easily found on the POS website. Allow negotiated delay in GMO transition... Neither the county nor the farmers have provided a good-faith effort to fulfill the 2017 transition mandate. However, in order to provide a little breathing room to implement the above recommendations, the county could at maximum allow: a one-year extension on GMO corn. No extension on GMO sugar beets or neo-nicotinoids. Support the Mad-Ag proposal... In general I support the Mad-Ag proposal for their contracted services for transition of agricultural production on POS ag lands.

[bcpos ag transition plan 1 june 2019.pdf](#)

Linda Schlake • Longmont

Comment # 18 • 2019-05-31 12:41:06

Many members of our family live in Boulder County. Please do not allow the profits of a few farmers hurt the health and safety of so Many of our residents. Already in 2011 the majority of Boulder County residents voted to get GMO's and their associated chemicals off county land. Since then there have been court settlements because of the health consequences of those chemicals. There is already at least one beekeeper who has lost most of his colonies. Now is the time to solve this problem.

bruce feistner • Boulder

Comment # 17 • 2019-05-31 07:46:41

Boulder residents take pride in scientific reasoning when discussing global warming, They condemn those who ignore the science and implement policies destructive to the environment. As Boulder County commissioners consider GMO policy on open space, the Staff Memo discusses the demonstration projects, and proposals to study carbon sequestration and soil health. The justification provided for extending the deadline for implementing the ban appear reasonable with scientific basis. I find it interesting that comments provided don't refer to the Staff Memo. I would think this would be the basis for disagreement and a starting point for discussion. I urge the Boulder County Commissioners to not give in to the mob-mentality pressures being exerted. I realize that standing up to the threats being made by single issue advocates that focus on your re-election, on court cases, and arguments that lack scientific rationale will not be easy. My hope is that you will remain firm in a commitment to good science. If you decide to vote against the recommendation in the Staff Memo please specify why you find the recommendations not convincing.

Richard Andrews • Boulder

Comment # 16 • 2019-05-30 17:19:14

See attached pdf file. This was personally presented today to the three county commissioners in individual conferences at the county courthouse. It outlines optional programs for transitioning all county ag lands to certified organic, beginning in 2020. It provides subcases in which existing lessees might opt out of participating. Also enclosed is a guest editorial to be published on Sunday, June 2 in the Daily Camera and possible the Longmont Times Call newspaper.

[supplemental comments to boulder county commissioners re transtion program 30 may 2019.docx](#)

Mary Smith • Longmont

Comment # 15 • 2019-05-30 10:38:32

Note: This comment was originally submitted online to POSAC on May 28, 2019 4:46 PM Attached is what I presented at the May POSAC meeting regarding your input or lack there-of on the extension of the GMO ban on POS agricultural lands. There is a transition plan on the final page. It is a good plan and should be considered and recommended for adoption by the County Commissioners to include in the proposal being considered by MAD Ag. If the Commissioners are going to recommend the expenditure of \$825,000, then it should be to move forward not hold ground, which is what MAD Ag's proposal is really intended to do.

[smith_posac_meeting_may_23_2019.pdf](#)

Scott Smith • Longmont

Comment # 14 • 2019-05-30 10:36:44

Note: This comment was originally submitted online to POSAC on May 23, 2019 For Sue Anderson: The May 7th meeting was scheduled for the commissioners to vote on the Mad Ag proposal. There was no public process or transparency followed up to that point. The fact that some members of the public found out about the meeting and agenda, who objected at the meeting, only then did the commissioners suggest a deferment of the decision. Fact: Open Space conducted themselves in a manner to avoid public input or consideration. Business as usual for chemical Ag.

M. Adaline Jyurovat • Boulder

Comment # 13 • 2019-05-29 09:49:32

I am opposed to further delays in the transition away from the use of glyphosate and gmos. I voted for the original plan for funding and creating open space in Boulder and Boulder County. I did not vote to approve the use of gmos and the chemicals that come with their use. We have been co-opted just like Colorado State was co-opted by corporate promotion of gmos. BCOS has been co-opted, perhaps as a result of hiring graduates of CSU who put their faith in corporate controlled research. Every president since GHWB has allowed the EPA to be controlled by corporate interests that include the use of glyphosate formulas and gmos. We can't stop the corporate propaganda. It is long past time to recognize it and reject it.

Dick Cole • Boulder

Comment # 12 • 2019-05-29 07:48:06

Dear County Commissioners: Please stop using my tax dollars to support GMO farming on taxpayer-owned Boulder County Open Space properties. While I may not understand why a 'transition' is now needed, GMO farming and GMO chemicals used on taxpayer-owned land should never have been approved in the first place, should be stopped now and no extension granted. Please also remember that ensuring the safety of the citizens of Boulder County is part of the job you were elected by us to do. Thank you, Dick Cole

Shirley Jin • Boulder

Comment # 11 • 2019-05-28 17:20:11

Please do not amend the transition plan for GM crops on Boulder agricultural land. They never should have been allowed in the first place. It was clear that Monsanto info slides were used at that time to persuade decision makers.

Carolyn Bninski • Boulder

Comment # 10 • 2019-05-28 15:14:09

Dear County Commissioners: I am writing on behalf of the Rocky Mountain Peace and Justice Center. We have engaged on the issue of GMOs on County Open Space for over a decade. We are extremely disappointed that you are considering extending the timeline for the ban on GMOs and neonicotinoids. The desire of the people of Boulder County for ending the use of GMOs and pesticides and instead requiring farmers to use organic practices on Open Space has been very clear for over a decade. The RMPJC supports the following seven points for going forward. These points were put together by Rich Andrews. 1. Hold tight on the existing bans and schedules for compliance. 2. Must put specific language in all ag leases that expressly hold all lessees to meeting the non-GMO and neonicotinoid bans and schedules. The bans must also expressly include a ban on the use of glyphosate in any formulation. 3. Must have legitimate citizen oversight on all contracts and verification of compliance. not just insiders and those with conflicts of interest. 4. POSAC must be continually involved and consulted on all leases, contracts and matters of compliance, not just when POS wants to let them be by controlling their agenda. 5. All lessees of BCPOS ag lands must begin transition to certified organic, and achieve certified organic by beginning of crop year 2025. 6. Transitioning to certified organic must be included in signed contracts, or in the leases, with BCPOS to bind them to those conversions and to meeting all USDA-NOP requirements, without exception. 7. Any non-compliance with bans, schedules, and failure by lessees to execute on organic conversions shall be subject to loss of lease, and full return of any incentive payments or cost sharing made by county, with interest charges. We believe that the farmers have been given ample time to make the required changes. We also believe that it is more important that you represent the voice of the people rather than a small group of farmers who haven't made the efforts required by your first duty to the people of Boulder County. Commissioners Jones and Gardner, we have been proud that you have taken the steps you have. We hope you will not backtrack on your achievement. We hope you will also move forward to achieving organic agriculture on our public lands by 2025.

Eileen Monyok • BOULDER

Comment # 9 • 2019-05-27 23:13:19

Dear County Commissioners and GM Transition Plan Personnel, I applaud you for moving forward with your plan to transition our Open Space lands away from GM corn and sugar beets in a way that creates a workable process for local farmers. After reading the book, "Altered Genes, Twisted Truth: How the Venture to Genetically Engineer Our Food Has Subverted Science, Corrupted Government, and Systematically Deceived the Public" by Steven M. Druker, I find it horrifying that genetically engineered crops have made it into our food supply with no safety testing, with squelched warnings by FDA

scientists, and with false assurances from industry. Steven Druker is a public interest attorney who forced the FDA to reveal its files on genetically engineered foods. His book outlines in detail how the genetic engineering process is anything but simple, natural, or proven to be safe. Reading this book has made me work even harder to avoid consuming GM foods. I strongly feel that our county taxpayer-purchased lands should not be supporting crops that benefit large corporations (I won't name the big one here), but could cause potential harm to people. Please stay the course in transitioning our Open Space lands to be free of GM crops in a way that is supportive to our local farmers. Best regards, Eileen Monyok

David Norris • Boulder

Comment # 8 • 2019-05-26 09:13:14

See attached

[boulder_county_commissioners.pdf](#)

Earl Wright • Wellington

Comment # 7 • 2019-05-25 18:59:23

File attached.

[boulder_co_public_comment_52419.pdf](#)

Valerie McLaughlin • Rillton

Comment # 6 • 2019-05-25 06:19:06

My husband and I are in the process of moving to the area in and around Longmont. Here in PA we have been staunch believers and supporters of non GMO farming and almost exclusively buy Organic produce or we buy directly from Mennonite farmers who are registered as organic, non.GMO. So naturally we support wholeheartedly the revision of this plan from its present state to one that supports going with non GMO crops. We hope and pray that it won't stop with just corn and sugar beets! Keep going!! You're headed in the right direction for the future success of farming on a large scale for the conscious consumer. Not to mention how much better it is for the land!

Jane Zander • Niwot

Comment # 5 • 2019-05-23 16:46:25

I think the proposed plan should not take further time and do not support it.

Jim Morris • Boulder

Comment # 4 • 2019-05-22 15:12:52

Carbon Farming Helps Store Carbon and Water and Restores Soil Biodiversity I just read an article about how farming with cover crops, manure, and worms casings restores soil biodiversity and allows the soil microbes to hold more water and more carbon. Here is a link to the article:

<https://www.thenation.com/article/agriculture-carbon-farming-ranching-soil>.

Richard Andrews • Boulder

Comment # 3 • 2019-05-20 17:19:18

Written public testimony provided to County Commissioners at May 7, 2019 public hearing [rich_andrews_testimony_on_ge_transition_5719.pdf](#)

Richard Andrews • Boulder County

Comment # 2 • 2019-05-20 17:15:17

Document attached

[rich_andrews_epadocket_5172019.pdf](#)

Patty Martin • Boulder County

Comment # 1 • 2019-05-20 16:41:07

I'm disappointed to see that last week, the Boulder County Open Space agricultural department requested that the commissioners prolong the transition away from GMO crops tied to glyphosate and neonics for an additional 4 years. I've lived in Boulder County all my life and I cannot believe it when I have to ask my local government to stop poisoning my family. The connections between glyphosate and liver damage and cancer in humans is clear. Boulder County should be a leader in making green choices that don't harm either the environment or the humans who live in it. Please do not extend the use of these horrible chemicals another season.

POSAC Meeting May 23, 2019

Presented by Mary Smith

Subject:

Parks and Open Space Agricultural Lands: Mad Ag Proposal to County Commissioners

Let us begin by reviewing why we are all here at this meeting.

The first step was the creation of the Department of Open Space. The formation of POSAC was instituted so there would be public oversight of the public funds used to procure and support public lands.

1. **0.25% Sales Tax in effect through 2019 (0.125% through 2034)**
 - a. 1993: 0.25% Sales Tax in effect 1994-2009.
[Resolution 93-174](#)
 - b. 1999: Extension of 0.25% Sales Tax in effect through 2019.
[Resolution 99-111](#)
 - c. 2016: Extension of 0.125% Sales Tax (half of 0.25%) through 2034.
[Resolution 2016-77](#)
2. **0.10% Sales Tax in effect through 2029**
 - a. 2000: Extension of existing 0.10% Sales Tax recycling and composting tax for open space through 2009.
[Resolution 2000-113](#)
 - b. 2007: Extension of 0.10% Sales Tax through 2029.
[Resolution 2007-80](#)
3. **0.10% Sales Tax through 2024; 0.05% continues in perpetuity**
 - a. 2004: [Resolution 2004-86](#)
4. **0.15% Sales Tax through 2030**
 - a. 2010: [Resolution 2010-93](#)

Within each resolution document, the last paragraph before the signature lines states:

“IT IS HEREBY DECLARED by the Board of County Commissioners of the County of Boulder, State of Colorado that this resolution is necessary for the immediate preservation of the public health, safety and welfare, and that it shall become effective immediately upon its adoption.”

I would argue that the formation and management of Open Space has never been for the “preservation of the public health, safety and welfare”. Instead, the very practices adopted by POS over these past four decades have resulted in a general decline in the quality and healthfulness of these acres. The continued use of agricultural chemicals including synthetic fertilizers, glyphosate, neonicotinoids, etc. and the ongoing use of 25% of these lands to commodity crop farming practices have results in the degradation and contamination of the soil and water and a reduction in the ability of these lands to financially support the agricultural department within Open Space as the citizens were told they would.

In 2011, members of the public had expressed concern about the potential toxic effects of the chemical inputs being utilized by the conventional farmers as well as the Department of Open Space for managing the agricultural as well as general Open Space lands.

That same year, the Commissioners contracted with a survey company to run a survey of county residents regarding management and use of these acres. 71% of the people surveyed stated that they wanted the agricultural acres used to grow food crops for local sale and consumption and managed utilizing organic, non-chemical, non-GMO agricultural practices.

POSAC recommended that this request be supported in the cropland policy that was being reviewed for adoption at that time and also recommended that the provisions included in the Citizens Cropland Policy be considered and included in the policy.

FAPC had been working diligently for years in developing plans for the creation of programs within the county to produce, process and distribute food grown within the county. They also recommended what POSAC had and also made a formal statement to the County Commissioners.

In spite of it all, the Commissioners decided to continue to allow the use of chemical agriculture and also added in GMO beets to the crops the farmers leasing OS acres could plant.

But in 2016, the then County Commissioners reviewed the policy and decided to institute a ban on GMO crops with 2019 being the last year for GMO corn and 2021 being the last year for GMO sugar beets.

Rich Andrews has given you information about what is motivating the re-engagement of policy review.

In addition, I would like to address not only the issue of these lands NOT being for the “preservation of the public health, safety and welfare” but the fact that the very practices that are being utilized by POS and the farmers who lease these lands are now risking the public health and safety and compromising our financial welfare as well as putting us all in legal jeopardy.

Eight years ago, we presented information to POS as well as the Commissioners as to the dangers of these chemicals and asked for an immediate ban. We also presented an economic proposal that demonstrated the financial benefit of moving our OS ag acres over to “organic” agriculture as the crops from these acres were selling for 3 to 4 times the amount as the same crops grown with chemicals.

All this information was discounted or ignored. Now, after 8 years, the county income from POS ag lands continues to diminish. Had we adopted the policies recommended by POSAC, FAPC and the citizenry all those years ago, we would be in year 4 of organic production (it takes 4 years of non-chemical agricultural practices to get land certified for “organic” production) and the income trajectory would continue to be on the upswing rather than the decline we are witnessing.

We would also have a much cleaner environment with a full 8 years of management without chemicals.

But we didn't and we don't and here we are today, once again, debating this subject which really shouldn't be up for debate.

And it shouldn't be because there is now legal precedent that these practices have negative consequences, to human health, to the environment, and to our financial security because we, as a county, are now vulnerable to law suits because we condone and even participate in the use of these chemicals.

Over these past several months, there have been several court cases that have presented evidence that glyphosate (round-up used with GMO and other crops) causes cancer. And these cases have resulted in verdicts in favor of the victims against Monsanto, the maker of glyphosate. There are an additional 13,000

cases pending in the US courts. We now also have data that demonstrates the toxicity of many of the additional chemicals used by our lessees and POS.

At this juncture, it is imperative that we immediately adopt a moratorium on the use of Glyphosate like Los Angeles County did this March and implement a policy that does indeed preserve the health, safety and welfare of the Boulder County Public.

What I would like to address now is how we can hold fast to the policy as it was passed in 2016 and also include a provision to convert all 25,000 acres of Open Space agricultural land to non-chemical, regenerative practices with the option to certify any and/or all acres to “organic designation by the 2023 cropping year while keeping the farmers who lease these acres financially whole. This proposal is a win-win for everyone and can pay for itself in a few short years because of the increase revenue to both farmers, POS and the County that certified organic crops command.

So this is how it will work:

- Starting with the 2020 cropping season, all POS agricultural leases will contain language that will designate all farming practices used to manage the leased acres as “non-chemical, regenerative and transitional”.
- All acres will be leased at full price with no more reduced rent provided for transitional acres since all acres will be in transition.
- A process will be designed and established to quantify any financial losses that the farmer has incurred during the cropping year by comparing income from the sale of the crop by \$ per acre to what the standard \$ per acre other farmers in Boulder County are getting for the same crop using chemical agriculture.
- The farmers will then be “made whole” by a payment of the determined amount by Boulder County.
- If the farmer decides not to lease the acres, they will be planted in native grasses and flowering plants to allow nature to regenerate the soil, support the pollinators and sequester carbon and water while transitioning over the next three years to “organic” status.
- While there will be a loss of income for POS, this loss can be rectified starting in year 4 of this transition program with the planting, harvesting and sale of “organic” crops.
- During these transition years, the county can work on programs to educate and/or attract farmers to utilize non-chemical, regenerative practices as well as develop programs for local food production, processing and distribution.

It will be necessary for the County Commissioners to adopt this plan and make it mandatory to be followed by the staff at POS as well as Mad Ag to include in their proposal. It is my belief that, when adopted, we will have peace, prosperity and plenty generated by our amazing Open Space resource and can end this season of contention and contamination that has been the result of chemical agriculture imposed on us all during these past several decades.

The end result is freedom from financial risk, chemical exposure, degradation of soil and water, and an overall improvement of our community resources and the promised preservation of public health, safety and welfare for the people of Boulder County.

Boulder County Commissioners
25 May 2019

Re: Relaxation of the ban on GMO crops and neonicotinoid pesticides

Dear Commissioners:

I am writing to request that the Boulder County Commissioners extend the ban on GMO crops and associated pesticides as well as neonicotinoid pesticides indefinitely to croplands, rangelands, open space, road rights of way, parks, public spaces, county buildings & grounds, etc. As an environmental endocrinologist, I have published research on the effects of pesticides, pharmaceuticals, heavy metals, and other man-made chemicals on the health of wildlife for more than 30 years, and I am well aware of the science extending these observations to human health, especially children and the unborn. I have attached a brief summary outlining the dangers of the best studied pesticides, the glyphosate-based herbicides, that are sprayed on many GMO crops to illustrate the dangers to the health and survival of wildlife and humans. Glyphosate is the number one herbicide used in the USA but similar peer-reviewed scientific data are rapidly appearing in the literature on the dangers of other herbicides and insecticides (including the neonicotinoids and their "safe" replacements). It is not the GMO plants themselves that are the problem but the use of associated chemicals that contaminate the soil, the plant products, surface waters, and wildlife, as well as farmers and their families.

I am presently out of the State and will not return in time to attend the public hearing on June 3. Hence, I am writing to you in advance as an informed scientist and an inhabitant of Boulder County to encourage you to read the attached account carefully before making your decision.

Sincerely yours

A handwritten signature in black ink that reads "David O. Norris". The signature is written in a cursive, flowing style.

Dr. David O. Norris, PhD
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Scientific Arguments Against the Use of Herbicides and Herbicide-Resistant Crops

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Abstract

The use of genetically modified organisms (GMOs) with resistance to specific pesticides dominates world agriculture today. The predominant combination used today involves glyphosate-based herbicide (GBH) formulations and glyphosate-resistant crops. These GBHs have deleterious effects on many organisms from soil bacteria to crustaceans to fishes and amphibians to humans. Plantings of genetically modified crops linked to use of GBHs alter soil conditions and is detrimental to subsequent use by non-GBH resistant species and has serious implications for the health of wildlife and humans. GMO crop plants that have been developed for other herbicide formulations raise similar concerns, although they have not been studied as thoroughly as GBHs.

Introduction

The production of genetically modified crop plants resistant to the herbicide glyphosate has resulted in a tremendous increase in the agricultural use of glyphosate-based herbicides (GBHs). In less than 30 years, GBHs have become the most commonly used herbicide in the world today, and they contaminate our air, soil, water, and food (Myers et al., 2016). The

widespread practice of spraying crops with GBHs prior to harvest in order to increase harvesting yields adds significantly to the contamination of corn, wheat, and oat products as well as many fruits such as almonds, grapes, and oranges (e.g., Tempkin, 2018).

The effects of glyphosate [N-(phosphonomethyl)glycine], its major metabolite AMPA (aminomethylphosphonic acid), and GBHs containing toxic emulsifiers such as POEA (polyoxyethylenamine) have been studied extensively by independent scientists over the past two decades. Curiously, the only claims for the safety of these materials are those provided by the manufacturer or by published studies that they support financially whereas almost all of the hundreds of studies by independent scientists report considerable cause for concern (see Myers et al. 2016; Norris, 2018).

Residual effects of GBHs on soils

The problem with GMO crops is that they generally are engineered to be resistant to an herbicide such as glyphosate that in turn is used to kill non-crop species (i.e., weeds). Spraying fields of glyphosate-resistant crops with glyphosate kills most of the weed species but leaves residues of glyphosate and AMPA in the crop plants where it can end up in our food. These residues also contaminate the soil where it can affect soil microbes and invertebrates (Silva et al., 2019). Glyphosate also complexes with copper ions in soil, forming a more toxic form of glyphosate that is harmful to invertebrates (Hansen and Roslev, 2016). Furthermore, the soil residues may later impair growth of non-GMO crops (Soares et al., 2019).

Production of superweeds by GBHs

A secondary action of GBHs, as well as for other herbicides, is the production of “superweeds” that become increasingly resistant to GBHs (Osteen and Fernandez-Cornejo, 2016). The number of superweed species has increased dramatically in the last 20 years (Osteen and Fernandez-Conjehos, 2016; see Figure 1). GBH-resistance is causing farmers to apply higher levels of GBHs in an attempt to keep ahead of the superweeds (Sammons and Gaines, 2014). Consequently, GBH use has intensified since 1992 (Figure 2) and we are seeing increased levels of glyphosate and AMPA in our foods (Myers et al., 2016).

Effects of GBHs on Wildlife

Runoff of rain or irrigation water enters rivers and lakes where these chemicals contact aquatic animals. Non-lethal doses of glyphosate and GBHs affect reproduction, development and growth in fishes (e.g., Lugowska, 2018; Roy et al., 2016; Smith et al., 2019), amphibians (e.g., Baker et al., 2013; Howe et al., 2004; Paganelli et al., 2010), and a number of microbes and invertebrates (e.g., Tsui and Chu 2003). Although animal studies exhibit great differences in sensitivities, sometimes within the same species, the existence of detrimental effects at environmentally relevant concentrations are cause for concern. Studies on laboratory rodents (e.g., Dechartresa et al., 2019; Cassault-Meyer et al., 2014; Manservisi et al., 2019; Milesi et al., 2019; Pham et al., 2019) have documented effects on reproductive systems that have implications for GHB-exposed humans (farmers and especially pregnant women and newborns) as well as those consuming contaminated foods and water.

Peer reviewed scientific studies published in just the first 4 months of 2019 describe toxic effects of low levels of glyphosate, AMPA and PEOA on algae and soil bacteria, as well as

disruption of development and disruption of the endocrine systems of fishes, amphibians, mice and rats. Studies on rodents (Kubsad et al., 2019; Milesi et al., 2019) show that exposure of one generation to glyphosate herbicides produces effects that are transmitted to future generations without additional exposure (called a transgenerational effect). Similar transgenerational effects have been reported for other endocrine-disrupting chemicals in mice (Anway and Skinner, 2006; McLachlan et al., 2006) and humans (Titus-Ernstoff et al., 2007).

Effects of GBHs on Humans

It is important to recognize that developmental processes and the functioning of nervous and endocrine systems of fishes, amphibians, reptiles, birds, and non-human mammals (e.g., laboratory mice, and rats) are the same as for humans (see Norris and Carr, 2013). Therefore, studies on non-mammalian vertebrates are relevant to possible effects in humans.

Additionally, epidemiological data are accumulating to substantiate extrapolations from animal studies to humans.

Adult humans around the world who receive the greatest exposure to and carry the highest body concentrations of GBHs are those who apply them: farmers (Gillizeau et al., 2019; Mills et al., 2017; Perry et al, 2019; Sierra-Diaz et al., 2019; Wongta et al., 2018; Wumbei et al., 2019). A study conducted in Germany reported finding that 99.6% of the 2009 people monitored exhibited glyphosate in their urine and one-third had levels 10-42X the level “allowed” in drinking water (Sagener, 2016); levels were also highest in 10- to 19-year-olds, particular those living on farms. Higher urinary levels of glyphosate in Indiana women,

especially higher in those living in rural areas, is correlated with shorter pregnancies (Parvez et al., 2018).

Glyphosate has deleterious effects on cultured human reproductive cells (umbilical, embryonic placental cells (Benachour and Seralini, 2009). Studies around the world have linked glyphosate pesticides to the induction of cancer in agricultural workers; non-Hodgkins lymphoma (Guyton et al., 2015; Leon et al., 2019) and glyphosate and GBHs have been linked to autism spectrum disorder (von Ehrenstein et al., 2019), liver disease (Mills et al., 2019) and Parkinson's disease (Caballero et al., 2018) as well as birth defects (Benitez Leite et al., 2009; Campana et al., 2010).

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Figure 1. From Osteen CD, Fernandez-Cornejo, J. (2016)

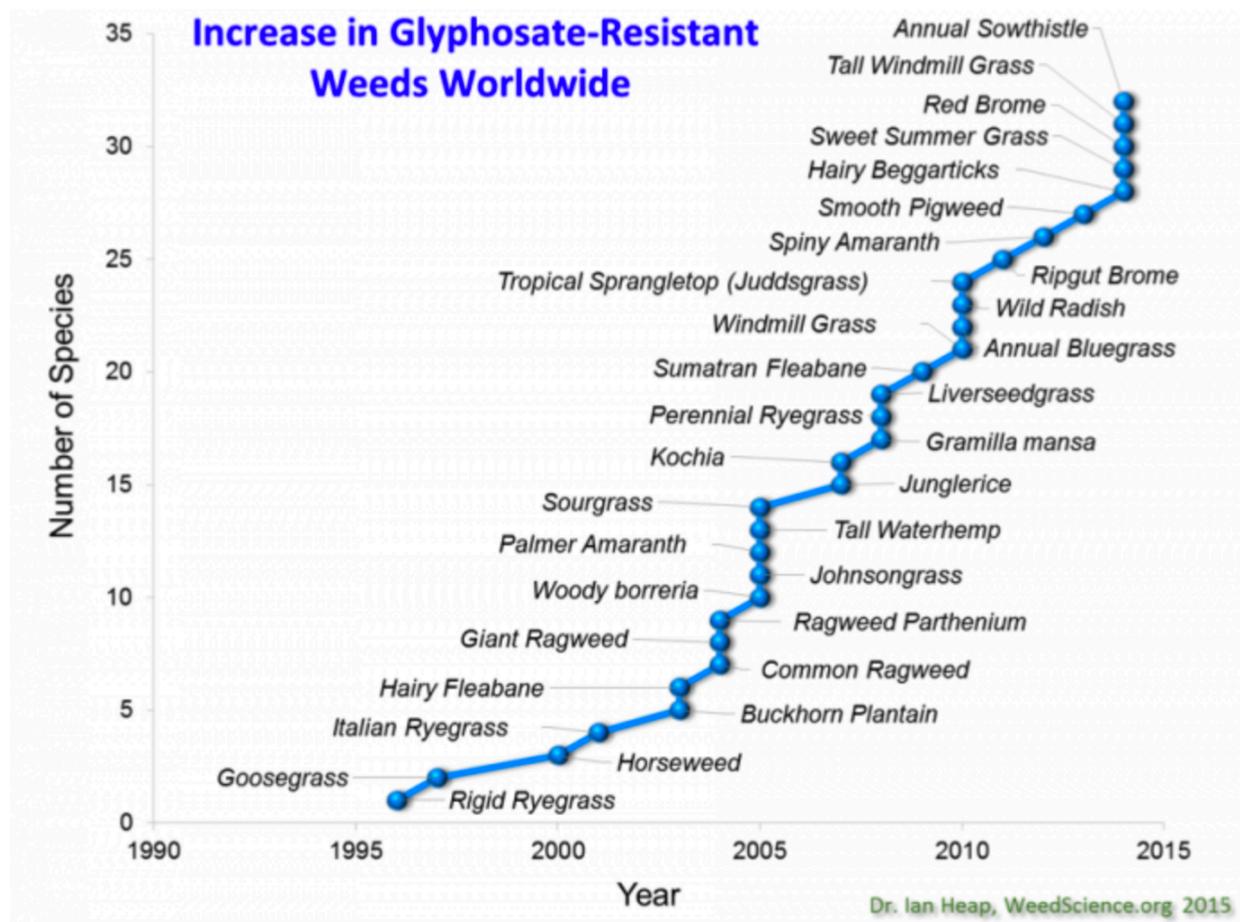
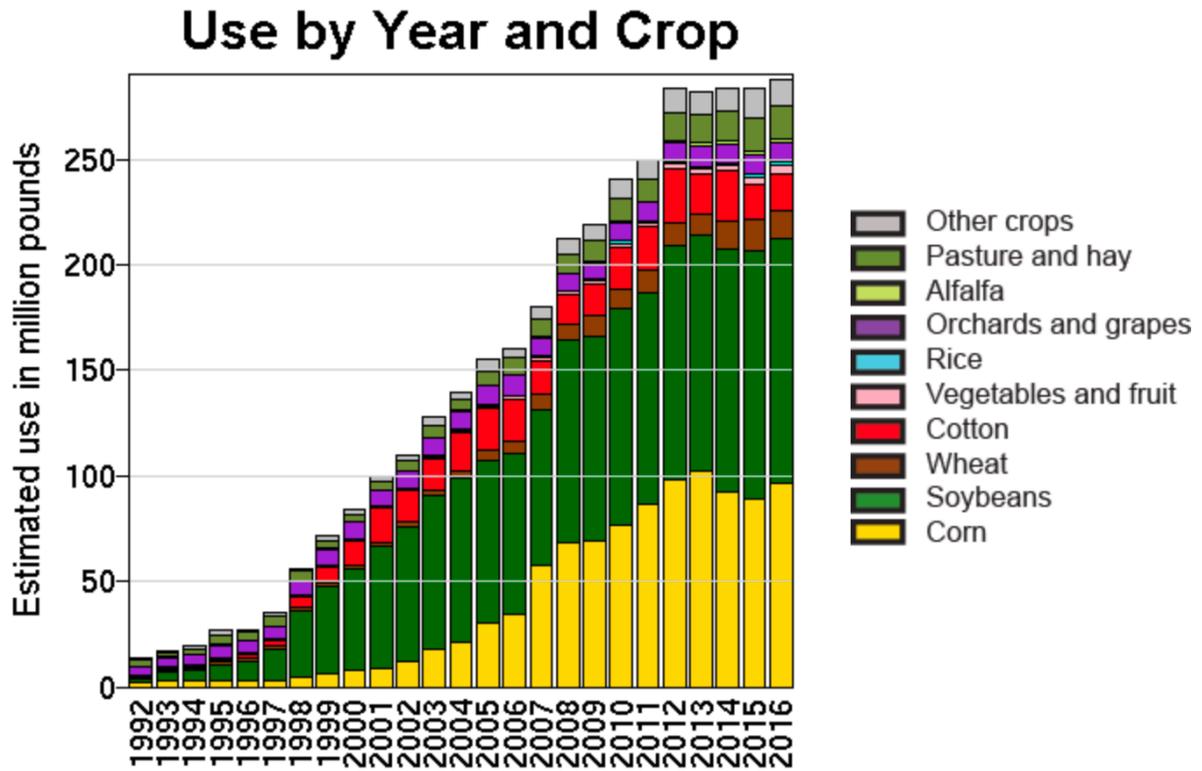


Figure 2. From USGS (1992-2016)



Boulder County, Colorado

Comments on revised transition plan to genetically modified crops.

Prepared by:

Earl Wright
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Wellington, CO. 785-466-1771 ewright@organicgrain.net

The county commissioners will be taking action for the purpose of amending the transition plan to genetically-modified (nonGMO) crops to be grown on Boulder County-owned open space agricultural lands.

The goal of the revised plan is to provide **farm-specific solutions**. I commend the commissioners for taking the steps to eliminate the use of GMO crops and thus discontinue the use of Roundup. I would expect the commissioners have not been lost on Monsanto and now Bayer with their loss in the court over use of Roundup.

I have been involved with Boulder County Parks and Open Space issue of GMO transition since the fall of 2017. I have meet with several members of the Open Space staff concerning issues around the transition. I am currently providing the marketing for corn and Hard Red Spring wheat for two of the certified organic Open Space farmers.

The transition proposal by Philip Taylor of Mad Agriculture is absent of a major concern by producers leasing Open Space land. The proposal is absent a definitive plan for marketing nonGMO crops, a rather large missing issue for farmers to consider nonGMO transition. Farmers may transition and produce nonGMO crops, but they need to market those crops at a premium. To accomplish this marketing objective is not as simple as hauling to the elevator. A decision by commissioners to approve a program from Mad Ag still leaves the farmers with the problem of marketing nonGMO crops at a premium.

Following proposal for commissioners to consider in addition to the Transitional Proposal:

Colorado Organic Feed Company can put into place a marketing plan that would require 100,000 plus bushels of nonGMO and or certified organic corn per year. The marketing plan would require the following:

Feed Mill
Grain Storage
Poultry Processing Plant
Growers of broilers
Broiler market

A poultry processing plant is available in Wellington. Growers and facilities are available in the area that have been producing broilers and can be leased and put back into production.

A grain mill, very close to the Open Space land, is available for purchase and retrofit for producing complete poultry feed. The cost to retrofit the mill for making poultry and livestock feed is less than the cost of the proposed transition plan. This facility also has 60,000 bushels of grain storage.

Our research for a broiler market in the Front Range of Colorado is positive.

Colorado Organic Feed Company would ask for the opportunity to present, in detail, our proposal for Boulder County to participate with a plan that would encourage their land lease holder to see a transition to nonGMO and possible organic as a positive move.

Thank you. Earl Wright

To: Boulder County Commissioners Elise Jones, Deb Gardner and Matt Jones

May 7, 2019, Public Comment by Richard Andrews, Box 19105, Boulder, CO 80308

Subject: **Implementation of Programs of Transitioning to Non-GMO and Pesticide Free Food Production on Boulder County Open Space Lands.**

The Commissioners directed on November 2016 that GMO crops were to be phased out by end of 2019. That time is rapidly approaching but little movement by either the affected farmers or with the support of county Parks and Open Space to meet that deadline. Attempts to support the objective to move to alternative responsible farming methods and crops by conducting county sponsored demonstration farm were thwarted and ultimately abandoned. Despite these failures, the deadlines must still be enforced to move from damaging chemically intensive agriculture on the publicly owned agricultural lands, to toxin free agriculture, producing safe foods and feeds, and conduct agriculture that does not threaten the health of the farmers, the consumers of their produce, continue to contaminate the soil, air, and water, or destroy the ecosystems and essential biodiversity of our planet.

I respectfully request that the Commissioners act on the following:

- **Require a continued and rapid implementation of curtailing GE crops and coated seeds with neonicotinoids and other systemic pesticides, and shall remain effective as currently ordered no later than with the previously decided end of the 2019 crop year.** There is no sound argument that would support any delay. A drawn out transitioning phase in is not acceptable, nor is it needed. There has been plenty notice for farmers to make this conversion, to order non-pesticide coated and non-GE seeds, and to adjust their farming and crop rotational plans.
- **Immediately stop the use of glyphosate and neonicotinoid and associated systemic pesticides on all county lands,** including uses by all county employees and in all county contracts and in all leases of ag and range land and other open space or otherwise county controlled lands. The body of science has continued to expand since 2016 that documents the dangers of these pesticides to human health and the environment.
- **Immediately implement a total ban on use of desiccant uses of glyphosate for all crops, including 2016 harvests.** This use is in total non-conformance with any concept of integrated pest management, and toxic contamination of the foods and feeds harvested with these methods. The literature is rapidly expanding documenting the extent of pesticide residuals contamination of many crops, most notably the non-herbicide tolerant grains (wheat, barley, oats, etc.) that subsequently contaminate breads, pastas, cereals, beers, as well contaminate many other crops (dry beans, squashes, potatoes, and other vegetable crops).
- **Require the Parks and Open Space and county contractors to involve all interested parties in the development of their implementation workplan,** not just the GE farmers. A final implementation transition plan needs to be firmly in place and approved by the County Commissioners immediately, no later than mid to late summer 2019 to ensure the established deadlines for transitioning for crop year 2020 are engaged.

- **Accelerate the transitioning to regenerative organic agriculture for all open space agriculture lands.** There is a concern that eliminating the use of the above noted pesticides on Boulder county lands that farmers and county staff would revert to other potentially toxic chemicals. This must be totally avoided, and implementing a comprehensive simultaneous conversion to certified organic agriculture would assure this would not happen. This is the most effective means to move to producing only known safe and toxic free agricultural products on public ag lands in the county. The transition to organic can be accomplished in three years in accordance with U.S. Department of Agriculture requirements under the National Organic Program (NOP) rules. This should be the timeline for conversion, and if commenced for crop year 2020, could be completed by the end of 2022 and ready for full certification by 2023.
- **A comprehensive revision to an improved integrated pest management (IPM) and pesticide toxicity reduction/elimination programs must be established** concurrently, with commissioner approval by no later than the end of 2019.
- **Support the existing affected farmer lessees of Boulder County open space crop and range land, and develop financial support programs to offset certain incurred losses during the conversion from non-GMO and toxic pesticide free to organic and non-GMO practices.** Some such support is already county policy, such as reduced lease payments and payment of organic certification fees. Other parties are providing some additional suggested approaches to this phase in support to existing farmers, so I do not elaborate on specific methods to accomplish this.
- **Provide more public funding support to independently conducted research, development and demonstration efforts (RD&D) for the advancement of innovative regenerative organic and greenhouse gas limiting, food safety and nutritional density cropping methods.** Do not let such longer term RD&D be an excuse for delaying the transition away from chemically intensive farming....moving rapidly to organic and biologic farming systems. This research and demonstration program should be conducted independently by expert third parties, not POS staff, nor CSU extension, although in cooperation with these entities, and it should definitely not be funded by the ag chem/biotech companies, and should involve public participation in the scoping and design. The voters of the county have approved funding for sustainability programs, and these above noted endeavors can clearly qualify for application of those funds without significantly affecting other BCPOS programs.
- **The Commissioners need to immediately provide these directives in unambiguous terms to direct the BCPOS staff, contractors and lessees. All farm lessee contracts need to be immediately amended to contain all of these transition program requirements.** Formerly vague direction has not worked and transitional progress since 2016 has been decidedly lacking. We can all do much better

Thank you for the opportunity to provide input to improving the health, safety and environmental protection for the lands of Boulder County, hoping serving as a beacon of responsible citizenship to others.

Additional Supporting Comments to Boulder County Commissioners –

Hearing Testimony Regarding Implementation of

Open Space Agriculture Non-GMO Crop Transition Programs

Richard Andrews, May 7, 2019

Executive Summary of Comments:

The transition to non-GMO crops on Boulder County open space ag lands must continue to be accomplished as quickly as possible. Delays in the established schedule of transitioning are deemed unnecessary, despite the county's largely failed efforts to help guide the transition since it was established in 2016, and the affected farmers general lack of significant progress in moving to achieve the deadlines.

As I have testified on numerous occasions it is my personal and scientific based position that the issue is more about the pesticides and industrial chemically intensive methods of farming that need to change, while the GMO question is still an open question. There is no question that the pesticides that are used in GMO and other conventional agriculture are exceedingly dangerous to the health of agricultural workers, to consumers of the tainted agricultural products and are poisoning the general environment, and devastating the essential ecological balance of our world.

The transition program should contain the following major elements:

1. Ban the GMO crops on the current schedule.
2. Simultaneously ban the pesticides that those crops are designed to either produce internally (e.g. Bt) or are designed to be tolerant of (glyphosate based herbicides)
3. Disallow all uses of the neonicotinoid group of insecticides and those related neuro toxicity modes of action, including all seed coating application methods of use.
4. Disallow the use of glyphosate containing herbicides as crop desiccants prior to harvest.
5. Do not allow substitution of other dangerous pesticides that might be proposed by lessees to replace those banned.
6. Make the transition process totally to certified organic agriculture, to be accomplished within the three year time frame (year end 2022) established under USDA National Organic Program.
7. Institute a requirement that all open space ag lessees implement a carbon farm plan to minimize greenhouse gases from ag operations.
8. Develop a program of education required for all open space lessees to assist them in moving to the highest locally suitable crops that can be produced economically, with lowest net GHG emissions, and with highest possible nutritional value to consumers.
9. Institute a program to subsidize and otherwise support the transition of lessees to organic and ultimately to regenerative organic agriculture, and to provide market development assistance for new crops.
10. For those current lessees who elect to opt out of the transition, engage in an enhanced search and development of new qualified farmers.
11. Use the support of qualified independent and non-profit contractor MAD Agriculture to guide the program and assist the transitions by the affected farmers/lessees.

Recap of Draft Proposed Revisions of Boulder County GMO Transition Plan -

A transition program to eliminate the growing of GMO crops on open space ag lands is already in effect, established on November 30, 2016 by the Boulder County Commissioners. The transition mandated the phased in elimination of the growing of genetically engineered corn and sugar beets on the Boulder County open space lands. That existing schedule is as follows:

- Complete cessation of growing GMO corn by the end of 2019.
- Complete cessation of growing GMO sugar beets by the end of 2021.

Very little implementation progress by the farmers growing these GMO crops has occurred since these bans were instituted by County Commissioners (from December 2016 to the present May 2019).

The Boulder County Parks and Open Space Department (BCPOS) likewise has engaged little concrete advancement to facilitate transitioning or achieve the implementation on schedule. Companion plans to implement a county/contractor operated program for demonstration of alternative crops and non-GMO alternative sustainable methods on a county R&D farm have failed in two separate attempts under a proposed program called SARII. Only limited small scale plots have been begun on a few open space lands.

According to an unreleased draft transition proposal, quietly developed with affected lessee farmers since late 2018, a newly revised GMO crop phase out plan has evolved. In this unreleased draft, the two existing GMO cancellation mandates are now under consideration for extensions in the time allowed for implementation as follows:

- Complete cessation of growing GMO corn by the end of 2023 (a four year extension).
- Complete cessation of growing GMO sugar beets according to a schedule that could extend deadlines from four years (2025), to eight years (2029) to as distant as twelve years (2033) or possibly beyond based on a calculated "severity index" factor, variable by individual farmer tenant depending upon their situation and contract obligations with the sugar beet coop.

Another element of the draft proposal includes an extension of phase out of the class of ecologically damaging and human health hazardous neonicotinoid insecticides used on crops on Boulder County Parks and Open Space ag lands. That neonicotinoid ban deadline is proposed to be simultaneous with the GMO corn cessation, at the end of 2023. It is also understood to apply to sugar beets by the end of 2025 (for low severity index farmers) out to as distant as 2033 or beyond. There is no mention of other crops to which neonicotinoids are applied. This extension was proposed without any stated justification in the draft document.

Supporting Comments on the Draft Non-GMO Transition Plan –

The draft revised transition plan is unacceptable as written.

The extension of time to achieve elimination of growing GMO crops on publicly owned Boulder Open Space lands is unwarranted, particularly given that the affected parties, the lessees currently growing GMO crops, have had due notice since 2017 and before, but have shown little effort to develop alternative cropping and agricultural methods.

The draft extension program is totally silent on the continuation of harm to the public health and the environment from associated pesticides. If implemented, the result is many more years of continued toxic contamination and insult to the soils, air and water of the county and beyond, as well as contamination of the foods, feeds and fibers grown on these contaminated lands. This of course translates that Boulder County Open Space will continue to be producing foods from heavy chemical based agriculture that are a danger to public health of all who consume them.

All of the GMO crops involved in Boulder County's bans (corn and sugar beets and previously banned GMO alfalfa) are specifically designed to be used with glyphosate based herbicides. These herbicides are designated as Class 2A Probable Human Carcinogens causative of Non-Hodgkin Lymphoma, by the International Agency for Research in Cancer (IARC), a branch of the World Health Organization (WHO). This international body's determination should be fully followed, at least by Boulder County, even though our US EPA and the CDA ignore the science and warnings.

The manufacturers of glyphosate herbicides are currently deluged with more than 10,000 personal damage lawsuits from individuals who have succumbed to incurable cancer, non-Hodgkin Lymphoma. The first two jury trial cases have just been completed with damage payments to the victims of hundreds of millions of dollars. Even without a glyphosate ban of the two subject GMO crops, the Boulder County Commissioners should immediately ban the use of this deadly chemical throughout the county, for all uses, not just a few selected open space ag land crops.

The other totally unwarranted use of glyphosate containing herbicides is use as a crop desiccant, applying this toxic chemical at the worst possible time in crop production, a few days prior to harvest, simply to facilitate easier timing of harvest and convenience to the farmer. This use is a total violation of county and any concept of Integrated Pest Management (IPM). The result of herbicide desiccation applications is assured pesticide residuals contamination of the crop which is carried directly into the consumer products, and to animal feeds in the case of feed grains. This pre-harvest desiccant practice is prevalent with many crops, including field beans, potatoes, possibly squashes, pumpkins and other vegetables and heavily for many common grains such as wheat, barley, oats, etc. Recent independent sampling and analytical studies have shown the presence of glyphosate in a multitude of products made from these tainted poisoned crops, including particularly beers, wines, breads, pastas, cereal products, honeys, and many more. It is regrettably notable that Boulder County is directly complicit in the providing of glyphosate contaminated dry beans to local food banks from local farmer(s) using this desiccant harvest technique on open space lands. Poisoning of our food insecure and poor county populations is doubly troubling.

The proposed extension of a ban on neonicotinoid insecticides is similarly egregious, and instead of even considering extensions of use for many years if not more than a decade, this entire class of insecticides and near cousin neurotoxin pesticides must be totally and immediately banned on all county agricultural and other county owned lands (roadways, parks, forests, etc.). These chemicals have never been properly investigated by the US EPA, are consequently all illegally registered under US law, but more importantly they are enormously toxic neurotoxins, more than 5000 upwards of 10,000 times more toxic than a long ago banned pesticide, DDT. A dominant use of neonicotinoid insecticides is as a seed coating, applied without any identified threshold damaging pest population present. This is also a direct violation of county IPM policy, i.e. the use of any pesticide in a prophylactic fashion. The human health consequences of exposures to neonicotinoids are coming into sharp focus with increasing public

health studies, surrogate animal toxicity testing, despite decades of claims by the manufacturers that they only affect arthropods/insects. Those claims are being proven false. Neonicotinoids have long half lives in soil environments, and consequently applications can exist for decades, so the sooner these toxin can be banished the better. Even then we and the many other species will suffer from the residuals. Neonicotinoids are very water soluble and can therefore transport readily into ground water and surface water. Recent USGS studies are finding neonics in many if not most streams in agricultural drainages. In Iowa, they were found in the intakes of major city water supplies, and also discovered that the neonics chemically reacted to produce toxic chlorinated disinfection by-product chemicals, forcing utilities to install expensive activated carbon filtration systems for removal.

Broad ecosystem bio-diversity damaging, even massive extinctions of whole families of animals are being observed from neonicotinoid insecticides, including not only the bees and other beneficial pollinators that are so often noted, but many other essential food chain species. The secondary food chain effects also cause massive declines in avian species, aquatic species, reptiles and amphibians, and even mammalian species.

The Commissioners and BCPOS are strongly urged to use this time to make careful revisions to the GMO transition plan and to make the transition into certified organic agriculture simultaneously with the phasing out of GMOs and the above noted particularly dangerous common pesticides. This path will avoid the possible unintended consequence of open space lessee farmers from simply switching to other dangerous chemically intense practices, such as older or even newer pesticides that will replace those specifically called for banning. Switching to organic practices will give much greater assurance that Boulder county will only be producing safe foods and feeds. Even beyond certified organic, the ultimate goal is actually regenerative organic agriculture, which goes beyond organic to rebuild the degraded soils from chemicals, and to even make strides toward reducing the net greenhouse gas emissions associated even with some typical organic farming practices.

The current plan to facilitate the transition is understood to involve the contracting with the non-profit organization MAD Agriculture. This organization is fully qualified to lead and engage this complex effort, both with solid educational aspects and support to the affected farmers/lessees in accessing funding and markets for the non-GMO crops. They can also support very expertly the development of farm plans to minimize the impacts of agriculture on emissions of green house gas emissions and developing carbon sequestration and soil health enhancements. The county is wise to have become involved with MAD Agriculture to support these transitions.

In summary, Boulder County can and must be a leader in only producing the highest nutritionally dense foods while simultaneously restoring the environment from the degradation of decades of high intensity industrial chemical farming.

Closing comments:

As most of you Commissioners already know, when I make statements about the concerns of pesticides and environmental and public health matters, I do the necessary intensive research of the peer reviewed scientific literature to back up my statements. Given the very short notice about this impending public hearing and comment period, I simply did not have the time to compile the full report warranted.

However, I am willing and prepared to conduct such a literature review for the record if it would be desired by the County Commissioners or staff. In lieu of that now, I am attaching a few key more recent literature items to this statement, key items that hit some of the high points and support my above statements.

Please let me know how I can support you as our public servants to make wise and scientifically grounded decisions in the public interest and for the preservation of our sacred world.

Richard D. Andrews,

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Local mobile: 303 918 8297 rich@zeoponix.com

Appendix Materials:

There are hundreds, actually thousands, of scientific references about the negative effects of pesticides on crops, soil health and microbiology, human health, other species health, effects on biodiversity losses, etc. The following citations list which focuses primarily on glyphosate and neonicotinoids is merely a short list that I compiled from papers I have on hand, and which I could quickly retrieve in the short time available prior to this short notice of the hearing.

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EPA Docket EPA-HQ-OPP-2016-0385: Recommended Banning of Glyphosate containing herbicide products:

Submitted by Richard Andrews, President of Boulder Innovative Technologies, Inc.

P.O. Box 19105, Boulder, Colorado 80308 USA

Urgent Action Requested: An immediate ban on the use of glyphosate containing herbicides is recommended based upon overwhelming substantial new medical and environmental evidence of major harms to human health, and ecological negative impacts.

Summary Rationale for Proposed Glyphosate Ban:

The herbicide glyphosate (N-phosphonomethyl glycine) is widely used around the world, including on Boulder County open space crop and rangelands, as well as in many other situations.

Glyphosate is in fact the largest volume herbicide in use today. It rose from less than 10 million pounds in 1992 for USA agriculture to approaching 300 million pounds in the most recent officially reported USDA data. US farmland applications of glyphosate active ingredient since 1974 is over 1.6 billion kilograms (3.5 billion pounds). Two thirds of that total volume of glyphosate applied in the U.S. from 1974 to 2014 has been sprayed in the last ten years, due to the enormous growth over the last two decades in U.S. croplands planted to glyphosate resistant-genetically engineered (HR-GE) crops, including corn, soybeans, sugar beets, cotton, canola, and other crops (47).

Glyphosate has been claimed to be safe by its manufacturers for decades, but a growing body of independent scientific peer reviewed literature has shown otherwise, both with respect to negative environmental and human health effects. Claims that glyphosate has short persistence in the environment, largely based on its binding with clay in soils, have been proven false. The primary metabolic degradation product of glyphosate is AMPA (aminomethyl phosphonic acid) which is also toxic to plants, is persistent and extremely mobile in the environment. Furthermore studies have found that the toxic effects are glyphosate can reoccur in subsequent years due to the carryover in soils and plant residues, reversible release of adsorbed glyphosate from soil particles triggered by phosphorus fertilization, and desorption processes, making it available for plant uptake and negative/toxic effects, even in subsequently planted crops, and in releases to the aqueous environment.

Glyphosate has been claimed to be beneficial as a companion to genetically modified crops that are designed to be resistant to glyphosate toxicity while the pesticide is deadly to weeds. Glyphosate is used with many of the currently approved GE commodity crops in the USA, and in agricultural applications including desiccant uses on non-resistant crops just prior to harvest (67). But recent research increasingly documented in peer reviewed science journals is revealing the numerous negative effects of glyphosate on farming systems:

- plant/crop nutrition (particularly disrupting trace element uptake),
- upsetting soil microbiological diversity and health,
- stimulation of food crop and animal feed pathogens and mycotoxins,
- drag on crop yields over long term use, and
- enhancement of super weed evolution.

Of extreme importance is the growing body of scientific evidence of the toxic effects of glyphosate on humans and other animals. There is very recent research published indicating that glyphosate and its many formulations is a causative agent for:

- birth defects, notably brain and facial/cranial abnormalities including microcephaly
 - developmental disruptions/delays,
 - endocrine disruption disorders
 - reproductive defects,
 - carcinogenicity expressed such as non-Hodgkin lymphoma and leukemia,
 - chronic kidney disease, plus genotoxic DNA effects.
- (23)(24)(25)(27)(28)(29)(30)(31)(32)(33)(34)(35)(36)

The dramatic rise in the incidence of these diseases correlates with high confidence with the enormous growth in the use of glyphosate during the period since the introduction of glyphosate resistant genetically engineered crops (41)(42)(43)(44)(45). Linkages since 2011 have pointed to glyphosate as a causative chemical agent for the dramatic rise in incidence of many human diseases and disorders:

- autism spectrum
- gut microbiome dysfunction and related obesity, diabetes, inflammatory bowel, lipoprotein metabolism disorder, etc.
- chronic kidney disease, acute kidney failure, end stage renal disease
- stroke, hypertension
- Alzheimer's, senile dementia, Parkinson's
- Cancers of thyroid, liver, bladder, pancreas, kidney and myeloid leukaemia

A long list of highly respected worldwide medical professionals and scientists have just issued a consensus statement that glyphosate based herbicides (GBHs) are a major risk and need very serious priority review by such health agencies as Center for Disease Control and Prevention (46). They conclude:

1. *GBHs are the most heavily applied herbicide in the world and usage continues to rise.*
2. *Worldwide, GBHs often contaminate drinking water sources, precipitation and air, especially in agricultural regions.*
3. *The half-life of glyphosate in water and soil is longer than previously recognized.*
4. *Glyphosate and its metabolites are widely present in the global soybean supply.*
5. *Human exposures to GBHs are rising.*

6. *Glyphosate is now authoritatively classified as a probable human carcinogen.*
7. *Regulatory estimates of tolerable daily intakes of glyphosate in the United States and European Union are based on outdated science.*

In March 2015, published in the UK medical journal *The Lancet-Oncology* (39), the International Agency for Research on Cancer (IARC), a branch of the World Health Organization (WHO), issued a finding of glyphosate being a probable human carcinogen (Class 2A carcinogen), and a full IARC Monograph report Number 112 detailing this finding was issued later in the year (40).

A great deal of medical science and toxicology research has been published in peer reviewed journals since this review about glyphosate was first written for the Cropland Policy Advisory Group and the Boulder County Commissioners in 2011. Some of that growing recent literature will be reviewed in subsequent sections of this literature overview document.

Published research from Canada has found glyphosate and AMPA in women, and also found glufosinate and its degradate, closely related herbicides to glyphosate, in both pregnant women and their fetuses (35). Research from France has found that glyphosate is toxic to human placental cells (29)(30)(33). Numerous clinical studies with laboratory test animals have found similar adverse health effects.

Unbelievably glyphosate and its toxic metabolites have never been monitored in foods by USA food safety regulatory agencies (FDA, USDA, EPA) (with one minor exception), but these toxins have nevertheless been sampled and analyzed by numerous other foreign health agencies and independent academic researchers and independent bodies. The U.S. Government Accountability Office (GAO) chastised these U.S. federal agencies in 2014 for this failing among other significant deficiencies in food safety monitoring (66). Other foreign agencies and non-governmental studies and findings indicate glyphosate contamination occurrences in many foods, often above maximum residue limits (MRLs) particularly those foods made from genetically engineered glyphosate resistant (HR GE) crops such as soybeans, and corn. Glyphosate residue are also being found in other crops, notably small grains, where glyphosate is increasingly being used as a harvest *burn-down* desiccant, applied immediately prior to harvest. And these HR GE crops are now dominating both animal feeds and human foods in the USA.

Glyphosate use in agriculture is heavily based upon convenience to the farmer to facilitate reduced trips to fields for weed management, but the near and long term risks simply are not judged to be worth the short term and diminishing benefits of ease of farming, particularly when considering the major concerns about impacts to public health and the environment. All of these negative effects warrant elimination of the use of glyphosate. To do otherwise is incompatible with environmental stewardship and sustainable agricultural practices, and certainly out of a sense that human health and production of the highest quality of safe foods must be the paramount factor, not to mention abrogation of duty to enforce federal law under FIFRA.

Background Literature Review:

Glyphosate Herbicide (aka “Round Up” and other tradenames) –

Since the first edition of this review in 2011, there has been an explosion of scientific literature on the subject of glyphosate. An overview of the interactions and effects of glyphosate with crop physiology, nutrition and diseases of plants, and ramifications to agricultural sustainability is provided in the following literature review. This review also cover aspects of environmental contamination from glyphosate, non-target species effects, human health impacts, food quality contamination, and agricultural economic impacts. A great deal of additional science has evolved on the matters of the enhanced toxicity of actual formulations and mixtures of pesticides on toxic effects.

The following scientific review focuses on the most recent research and primarily includes peer reviewed and published science. It also relies mostly on science from sources that have no apparent or discernable ties to the chemical manufacturers of glyphosate that could potentially bias the results, representations, and interpretations.

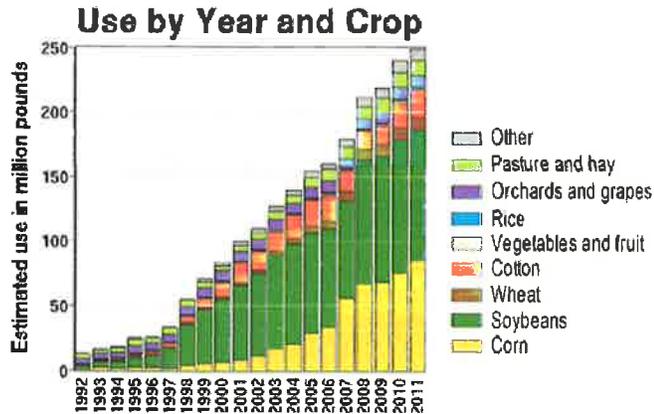
Use Rate Trends of glyphosate herbicides -

The agricultural chemical glyphosate, also known by the tradename *Round Up* in specific formulations and by numerous other tradenames by other manufacturers, is the most widely used herbicide ever (1)(47). It is advertised as generally benign to non-target species and with short environmental half life. But it has recently been shown in scientific evidence, some published by long silent corporate insider research scientists, that its use has undesirable consequences.

Glyphosate agricultural use in the U.S. rose from approximately 3 million pounds per year in 1990 to 250 million pounds in 2014, the most recent published data (47). Non-agricultural uses rose from 2.4 million pounds in 1990 to 12 million pounds in 2014. Nearly 2/3 of total use of glyphosate in the U.S. since 1974 has occurred in just the last 10 years, 90+% in agricultural uses coincident with the domination of GE crops, including glyphosate resistant corn, soybeans, cotton, sugar beets, and others.

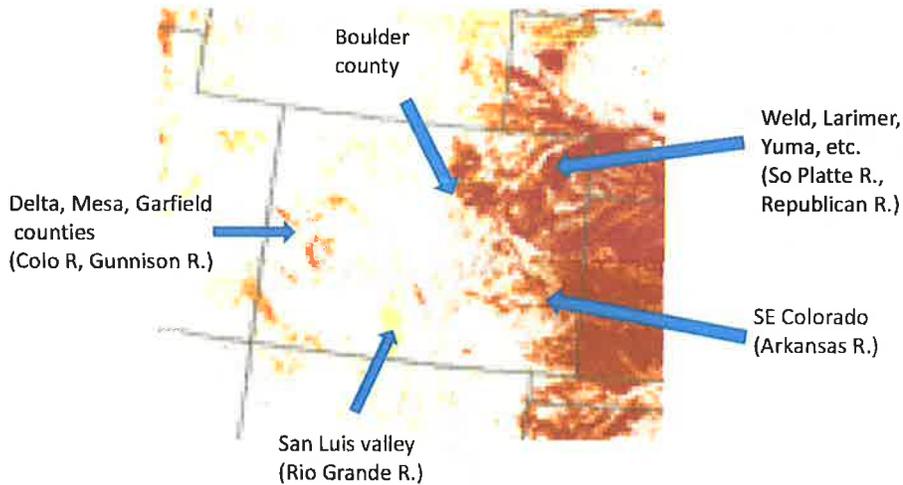
The first deregulated herbicide resistant genetically engineered crops in the U.S. occurred in 1995, with corn, soybeans and cotton. These were engineered to be resistant to glyphosate, and their introduction stimulated the rise in the use of glyphosate dramatically. Subsequent HR-GE crops, canola, further stimulated this rise in demand and use of glyphosate. The following graph of glyphosate use by crop and year illustrates and clearly shows these steps as GE crops are introduced and as the seed companies consolidate their control over the seed available to farmers. Corn and soybeans continue to dominate the induced demand for glyphosate. (Source: USGS mapping and USDA databases)

Glyphosate Herbicide (Round Up) Use



The following maps from U.S. Geological Survey and U.S. Department of Agriculture (NASS data bases) illustrate the dramatic rise in the use of glyphosate since the introduction of genetically engineered crops in the early 1990s. The first map covers Colorado, the other two are for the U.S. in 1992 and 2011, respectively.

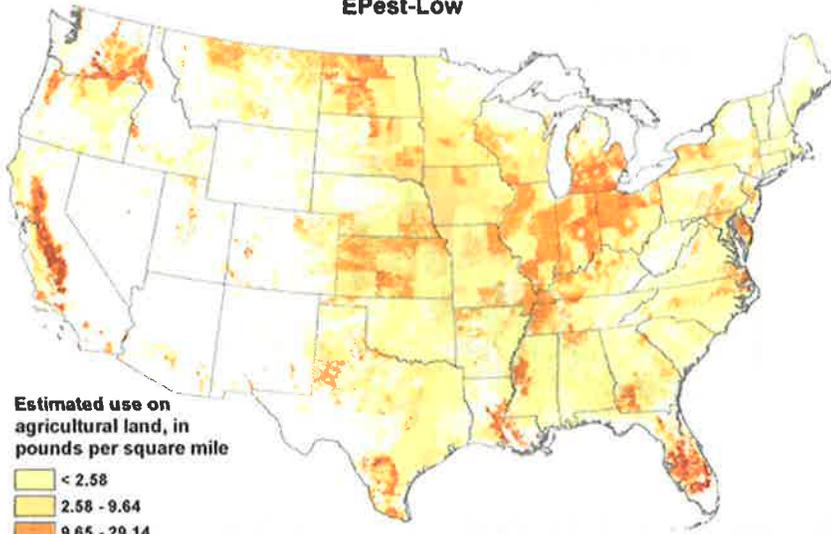
Glyphosate Use Patterns in Colorado 2011



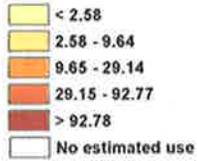
Major crop uses: corn, potatoes, wheat, barley, pasture/hay, sugar beets used with many others (vegetables, fruits, etc.)

Estimated Agricultural Use for Glyphosate , 1992

EPest-Low



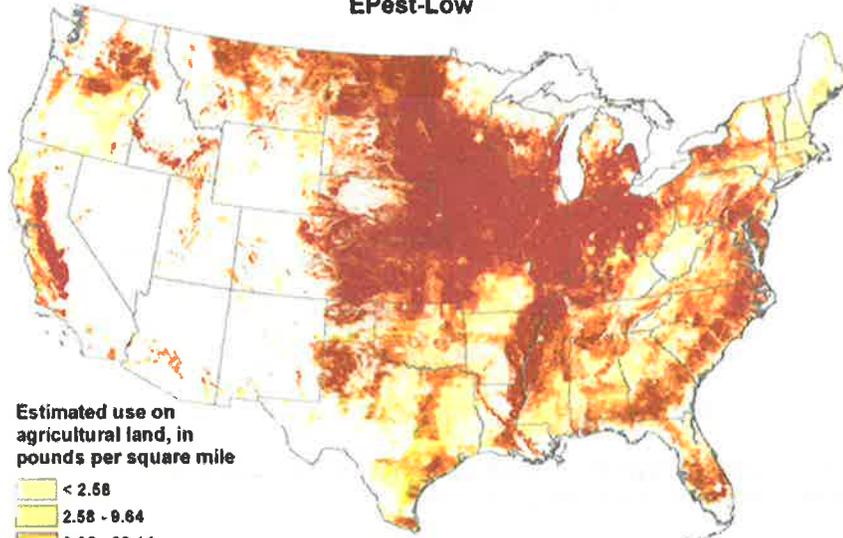
Estimated use on agricultural land, in pounds per square mile



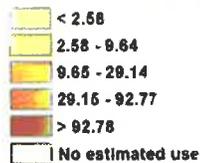
10 million pounds used

Estimated Agricultural Use for Glyphosate , 2011

EPest-Low



Estimated use on agricultural land, in pounds per square mile



~250 million pounds used

Effects of Glyphosate on Crop Nutrition and Crop Health -

In 2009 Yamada, Kremer, Carmargo e Castro and Wood (2) provided an overview assessment of the effects of glyphosate interactions with physiology, nutrition and diseases of plants, and consequent threats to agricultural sustainability in a special edition of European Journal of Agriculture. In a companion paper, a negative consequence to crop health of glyphosate reported by Zobiole et al (3) is a decrease in soybean crop chlorophyll and photosynthetic activity, and related transpiration and stomatal conductance. They also observed significant decrease in macro and micro nutrients in leaf tissue with glyphosate treated plants, lower in the herbicide resistant (HR) plants than non-HR plants. Reduced biomass is observed in both above and below ground plant tissues in all glyphosate treated plants. Similarly, Bott et al (4) observed negative effects on zinc and manganese status in glyphosate treated soybeans. Glyphosate also inhibited root biomass production and elongation and lateral root development.

Zobriole, Kremer et al (16) have reported on the comparison of first generation (RR1) and second generation (RR2) genetically modified soybean cultivars, effects of growth stage and rates of glyphosate application, plus no glyphosate controls with these cultivars. They measure chlorophyll content, nodulation, biomass and nutrient accumulation. Overall conclusions were that RR2 did not improve yield indicating measures compared to RR1. Glyphosate significantly decreased chlorophyll content vs. control and reduction was more pronounced as rate increased and application was delayed during plant growth; observed chlorotic symptoms may relate to decreased photosynthetic rates due to glyphosate damage, potentially exacerbated by immobilization of Mg and Mn being chelated by glyphosate. These observations are consistent with Cakmak et al (18), Zablowtowicz and Reddy (17), and Zobriole et al (3). So the conclusion one draws is that even with genetically modified crops designed to be resistant to glyphosate, its use creates negative consequences to key indicator parameters of plant health and nutrition. In other words glyphosate actually injures the GMO crops it is designed to be used with.

Numerous researchers have in recent years discovered that glyphosate and its metabolites can interact with trace elements such as manganese, magnesium, zinc, iron, and nickel in the soil and inhibit their availability for plant uptake. Some of the elements are key to plant health, notably photosynthetic activity, root development, etc. Bailey et al (37) reported on this in 2002, Bernards et al (38) in 2005, and many others.

As long ago as 1980, USDA researcher Robert Hoagland (68) observed effects of glyphosate and its metabolites on natural plant phenolic compounds such as activity alterations of phenylalanine ammonia-lyase, growth performance, and protein, chlorophyll and anthocyanin levels in soybean seedlings. Negative plant performance effects included inhibition of growth and root elongation. The primary glyphosate metabolite, AMPA, also exhibited inhibitory effects on phenylalanine. Glyphosate also significantly decreased total chlorophyll. Unfortunately this knowledge was used to further promote the herbicide, rather than recognize its dangers to the environment, public health and food safety.

Glyphosate Soil Microbiological Effects -

Glyphosate is a non-selective, broad spectrum herbicide. It kills plants by disruption/inhibition of the EPSPS enzyme (the shikimic pathway) which is plant essential for synthesis of aromatic amino acids. It also stimulates infection of roots of susceptible plants by certain soil micro-organisms, allowed by a decrease in normal plant biochemical defense compounds called phytoalexins. Kremer et al (5) observed that glyphosate treated soybeans, both HR and non-HR cultivars, exuded to soils higher levels of carbohydrates and amino acids, which in turn stimulated soil fungal populations. Kremer and Means (6) also report that glyphosate interactions with rhizosphere microorganisms occurred with maize (corn) crops, stimulating pathogenic *Fusarium*, and altering other soil bacteria colonization. They note that root colonization by the pathogenic *Fusarium* increased significantly after glyphosate applications during the growing seasons, with heavier infestation on HR resistant cultivars of both soybeans and corn, compared to non-HR cultivars and crops not treated with glyphosate. Other observed negative effects were reduced manganese plant translocation and availability, antagonistic bacterial effects, and reduced soy nodulation, and consequent reduced nitrogen fixation. This nodulation nitrogen fixation effect is counterproductive to a key objective to crop rotations with legumes (such as soybean) which can help build the nitrogen content in soils, and consequently reduce the demand for nitrogen fertilizer additions. Similar concerns may also apply to the recently approved HR GE alfalfa, the leading forage and legume crop.

Recently published related research by Johal and Huber (7) has documented an increased incidence of damaging fungal infections in croplands treated with glyphosate. They state, "this relatively simple, broad spectrum, systemic herbicide can have extensive unintended effects on nutrient efficiency and disease severity, thereby threatening its agricultural sustainability." They note that glyphosate can induce weakening of plant defenses and resulted in increased pathogen populations with greater virulence of diseases. The micronutrient connection is due to glyphosate induced immobilization of key nutrients necessary for disease resistance in plants. In a related study by Fernandez et al (8) prior applications of glyphosate (within previous 18 months) have been statistically associated with wheat and barley cereal crop diseases in the following crop caused by *Fusarium* spp., in particular, head blight due to *F. avenaceum* and *F. graminearum*. Counter to the understood benefits of reduced tillage, no or minimum till methods also positively influenced enhanced disease intensity when in combination with prior glyphosate use. A concern with these serious fungal diseases is crop losses and downgrading or disqualification of grain quality due to the presence of mycotoxin compounds exuded by *Fusarium* which are toxic to cattle and people and for uses of barley such as malting. The economic consequences can be severe. It is thought that the soil health effect of glyphosate is disruption of the fungal communities and competitive natural balances, favoring the pathogenic fungi over beneficials. This study indirectly speaks to the longevity of activity of glyphosate and possibly its metabolic decay products in soils, negatively affecting crops in subsequent years.

Another mechanism of unintended harm from glyphosate is killing or functionally degrading beneficial non-target soil organisms, such as the important symbiotic nitrogen fixing bacteria, *Rhizobium japonicum*, in both HR and non HR soybean. Moorman et al (9) investigated the accumulation of

hydrobenzoic acid in glyphosate treated cultures of *Bradyrhizobium japonicum* and found it to be increased by glyphosate cases, a negative indicator. Potential effects of glyphosate may be alteration of the symbiotic interactions between this bacterium and the herbicide.

Similar inhibitory negative effects may occur with nitrogen fixing symbiotic bacteria in glyphosate treated alfalfa and other host symbioses plants of these beneficial bacteria, and potentially non-symbiotic soil algae nitrogen fixers; more research is needed to evaluate these concerns.

While glyphosate is designed specifically to function with GMO crops, it has been found that a glyphosate metabolic and toxic decay product, aminomethylphosphonic acid (AMPA) can negatively affect HR GMO plants. Reddy et al (10) determined that AMPA resulted in injury to HR soybean and reduced chlorophyll content, diminished shoot fresh weight, suggesting this is the damaging chemical agent.

Tesfamariam et al (11) investigated the effect of waiting time between glyphosate applications directly to soils versus foliar weed applications. They measured the phytotoxic effects on the non-target plant, sunflower at various time intervals after glyphosate applications. Detrimental effects were more pronounced in the case of foliar weed applications, indicating greater toxicity when glyphosate (or its metabolic decay products) translocated via weed root tissue residues compared to direct soil application.

Recent research by Bott and others (15) has discovered that glyphosate can be remobilized in the soil by subsequent applications of phosphorus fertilizers. This counters the claims that glyphosate has a short toxic persistence in soils. It has long been known that glyphosate competes with other forms of applied phosphorus for binding sites, notably on soil clay particles. The Bott et al study examined soybean as a test crop, with numerous different soil types, and multiple glyphosate and phosphorus application rates. It revealed that the remobilization of the herbicide glyphosate by P-fertilization does occur and can damage subsequent plantings. On glyphosate treated soils, significant soy plant damage was observed, including shikimate accumulation in root tissue (an indicator of glyphosate toxicity), declines in germination, biomass, and plant nutritional status, etc. Soil type did have an effect on the nature and extent of plant effects, likely related to P fixation potential, CEC, plant available iron, textural properties and soil organic matter.

Reddy and Zablotowicz (69) studied the effects of various formulations of glyphosate on HR-GE soybean yields and observed injury such as reduced nitrogen fixing nodule biomass after late postemergence applications. With additional glyphosate applications the soybean plants recovered, which may be contributing to the need for greater rates and applications of glyphosate to avoid this otherwise negative effect on yield.

Glyphosate and AMPA Environmental Dispersal and Contamination –

Glyphosate and metabolites such as AMPA are increasingly being found in the general environment, including natural waterways, the littoral plant communities, benthic organisms and mucks, and even in

the atmosphere. This is a disturbing but not unexpected finding since glyphosate has been used for more than 3 decades and in the recent two decades it has become the number one herbicide throughout the world. It was once considered and represented as a non-persistent pesticide and relatively benign. That is now clearly challenged by mounting evidence not only about its presence in the general environment but by new research into the toxicity to many organisms other than the target weeds.

Kolpin et al (20) reports on glyphosate and AMPA occurrences in surface water streams, including one Colorado location, the South Platte near Denver. This study focused on sampling of municipal wastewater treatment plant effluents, and upstream-downstream of the receiving streams. Overall, there was a two fold increase in detection of glyphosate and AMPA, comparing upstream from downstream; and AMPA was detected 67.5% compared to glyphosate (17.5%). While this indicates urban uses of this herbicide are significant contributor to dispersal, it also shows that the degradate AMPA is very important to track in environmental evaluations, not just the parent compound glyphosate.

In another study Kolpin et al (19) reported on herbicides and degradates in municipal wells in Iowa. They found a 53% frequency of occurrence of herbicides and associated degradates in these drinking water supplies during a 2001 sampling. In this work, glyphosate and AMPA was not detected.

Very little is known about atmospheric occurrence or transport and depositional fate of glyphosate and AMPA. However, very recent work by the USGS and University of Minnesota has been published by Chang et al (21). They sampled air particulates in Mississippi and Iowa and rain in Indiana during growing seasons. Glyphosate was detected 60 to 100% of the time in both air and rain. Glyphosate concentrations were higher in rain than other high use herbicides. For the Iowa case, they estimate that approximately 0.2% to 0.7% of glyphosate that is applied was measured in air samples and ultimately washed out of the atmosphere in wet deposition at remote locations from the point of crop use. Given the huge amounts applied this is a quite significantly large drift of volatiles that release to the general environment. This can have profound impact on non-target plants, and on organic production, and non-target animals. For example, in Mississippi alone, during 2008 and estimated 2,750 kg of glyphosate was applied to crops with a combination of aircraft and ground rigs. AMPA was detected at approximately 5 to 10% of the concentrations of glyphosate, lower during the major application seasons and increasing with time after last application. Rain is believed to be an efficient removal mechanism for these airborne toxins, since they exist as particulates, removing on average 97% of the atmospheric load by a weekly rainfall of ≥ 30 mm (about 1.1"). The question remains of course about the toxic effects on non-target plants where this deposition ends up. The two mechanisms for suspension of glyphosate and AMPA in air are immediate drift from sprayer application and post application wind erosion of particulate glyphosate and AMPA from the surface of soils.

In a dryer climate such as Boulder county, deposition mechanisms of these glyphosate and AMPA herbicide particulates will be different than the Mississippi valley. Nevertheless application drift and consequent chemical trespass is always a significant concern with any spray applied agricultural

chemical. But subsequent wind erosion and offsite deposition of the soil particles containing such herbicides as glyphosate and its degradate AMPA is also quite important and likely an important local contamination mechanism to neighboring farms and general environment, given the windy character of cropland in Boulder county.

Littoral and periphyton freshwater community ecological effects of glyphosate have been observed. Vera et al (22) studied the effects of glyphosate on macrophyte colonization in outdoor experimental aquatic mesocosms. They simulated glyphosate runoff and aerial drift contamination of constructed shallow pond environments. They observed an algal eutrophication stimulation by Roundup, likely due to excess available phosphorus, which in turn produced a delay in the periphytic colonization of vascular wetland plants. Cyanobacter species were also favored by mesocosms receiving input of glyphosate.

A comprehensive literature survey has not been conducted in this area of glyphosate and AMPA ecological and non-target species effects. The above discussion is considered very incomplete at this time.

Glyphosate has deleterious effects on non-target species, some of which are threatened or endangered. Loss of habitat by excessive use of agricultural herbicides on field margins and conservation areas has been identified as a significant contributing factor to populations declines of many beneficial insects, including pollinators, and species that depend upon insects, such as amphibians and insectivorous birds.

The U.S. Fish and Wildlife Service, as a settlement of a lawsuit, has just agreed to begin assessing the effects of widespread use of herbicides, including glyphosate, on the biodiversity losses and T& E species, and to provide that input to the EPA pesticide risk assessment for pesticide registrations and re-registration actions (61). Glyphosate is currently in the reregistration review process by EPA, a decision delayed numerous times, in part due to such gaps in knowledge about environmental effects such as habitat destruction and T&E species, plus the human health effects.

There have been recent scientific studies that have shown the deleterious effects on honey bees from exposures to glyphosate (59)(60). Sol Balbuena et al (59) found that glyphosate exposures at sublethal levels caused honeybee navigational disturbances in homeward flight abilities due to impaired cognitive capacities, with negative consequences for colony foraging success. Herbert et al (60) found that honeybees exposed to glyphosate demonstrated reduced elemental learning and memory retention as related to reduced olfactory nectar reward sensitivity and associative learning, causing the potential for preferential collection of glyphosate contaminated nectar being foraged and returned to feed the hive. Somewhat similar effects have been observed with honeybees exposed to sublethal amounts of neonicotinoids.

Mecurio et al (70) determined the persistence of glyphosate and AMPA in seawater and found that half-lives ranged from 47 days to 315 days, depending upon water temperature and light conditions. Darkness extended the persistence, and the sorptive characteristics of glyphosate to soils,

and its water solubility all contribute to the widespread contamination by this herbicide in all types of waters. Its longer persistence in dark would also indicate its potential for long times before degradation in ground waters.

Preliminary (unpublished) surface water data from the Colorado Department of Agriculture (analysis by CDA) and Colorado Department of Public Health and Environment (sampling by CDPHE) document occurrences of glyphosate in surface waters in the South Platte River system (64); see table below. Unfortunately sampling by CDA/CDPHE has not been conducted in the Boulder Creek and St Vrain tributaries, only mainstream rivers.

Surface Water Quality Sampling, Colorado Department of Public Health and Environment
 South Platte Sampling Stations, June 2013, Glyphosate Results

SAMPLE NO	WQCD SITE	SITE DESCRIPTION	Active Ingredient	RESULT ug/L
001	5145	SOUTH PLATTE RIVER UPSTREAM OF BIG DRY CR	Glyphosate	0.86
002	5140	SOUTH PLATTE RIVER @ FT. LUPTON	Glyphosate	0.77
003	5138	SOUTH PLATTE RIVER AT WELD CR 18	Glyphosate	0.6
004	5137	SOUTH PLATTE RIVER AT WELD CR 28	Glyphosate	0.61
005	000130	SOUTH PLATTE RIVER NEAR PLATTEVILLE	Glyphosate	0.65

Soil and water sampling of pesticides on and near leased open space croplands, including glyphosate, has reportedly been conducted by Boulder County Parks and Open Space but that data has not been publicly released yet despite public requests for the data (67).

Overall, studies have observed glyphosate to be in all compartments of the terrestrial, aquatic, air, soil environment. It is simply widely dispersed and likely will increase as long as its use in agriculture and urban uses continues. A particular concern that would stimulate even greater occurrences is the anticipated introduction of glyphosate resistant urban lawn and golf course grasses. If that happens, the prospects for human contamination will escalate greatly.

Glyphosate Effects on Non-target Animal Species

Numerous scientific papers have reported on the ecological effects of glyphosate and glyphosate containing herbicides. Following is a review of a sampling of such recent papers.

Amphibians are of concern in ecosystems, and are particularly vulnerable to environmental poisons which they can absorb through their skins, as well as in foods and water ingestion. Yadav et al (83) studied the effects of Roundup on tadpoles of the Indian skittering frog under varying stress conditions. They determined short term (96 hr) and 10 day LC50 values of about 3.4 to 3.8 mg/L, and 1.9 to 2.1 mg/L, respectively, which they considered environmentally relevant concentrations. They also observed development of micronuclei in erythrocytes of the tadpoles, indicating genotoxic effects at 1 to 3 mg/L. Another frog study in Columbia by Meza-Joya (85) studied the toxic, cytotoxic and genotoxic effects of Roundup SL-Cosmoflux 411 F formulation, the product used to defoliate coca crops. Equivalent exposures to aerial application rates of 5.4 ug/cm² and concentrations above 95 ug/mL showed clear cytotoxicity and induced DNA breaks. There are numerous other studies involving amphibians indicating similar concerns with toxicity to glyphosate, Lushchak et al (87), Wagner et al (88), Moore et al (89), Fuentes et al (90), Relyea (91), Howe et al (92).

Piola et al (84) examined earthworms (*Eisenia andrei*) for toxicity with commercial formulation Roundup and another more concentrated glyphosate containing product Mon 8750, thought to be a commercial technical grade without adjuvants. The Roundup was 4.5 times more toxic of the two, which authors ascribed to the presence of "inerts" with Roundup.

Highly of interest is a study by Shehata et al (86) from Germany of the effects of glyphosate on the microbiota of chickens, distinguishing pathogenic and beneficial microbiota. The results were that highly pathogenic bacteria *Salmonella* (*enteritidis*, *Gallinarum*, and *Typhimurium*), and *Clostridium* (*perfringens* and *botulinum*) are all highly resistant to glyphosate. However most of the beneficial bacteria were moderate to highly susceptible to lethal effects of glyphosate. *Campylobacter* spp. was also susceptible to glyphosate. This finding indicates that glyphosate contaminants in feed to chickens could disturb the normal and essential gut bacterial community, and simultaneously increase the risk of harmful bacteria in the human foods from chickens.

Glyphosate Human Health Effects & Evidence from Other Mammalian Species -

Perhaps even more alarming is a growing body of evidence that glyphosate and its metabolic breakdown products are more toxic and longer lasting in the environment than previously reported or claimed by manufacturers, and toxic to non-target species, including humans. Glyphosate has been preliminarily implicated in epidemiological studies as a causative agent of neural defects and cranial-facial birth defects in populations in Chaco Province of Argentina (12). Those studies are considered by many as insufficiently controlled studies or peer reviewed. However they should be considered seriously and should justify additional research. More thorough and controlled medical science from University of Buenos Aires, Argentina, by Paganelli et al (13) investigated health effects of glyphosate

herbicides with embryonic tadpoles and found teratogenic effects, related to impairment of retinoic acid signaling. Retinoic acid biochemistry is associated with the observed human birth defects and cranial-facial malformations noted in the above mentioned Chaco Province epidemiological reports.

Gasnier et al (16) examined the effects of glyphosate and various formulations on human liver HepC2 cells, a well known model for xenobiotic toxicity. They measured cytotoxicity, genotoxicity, anti-estrogenic and anti-androgenic effects, as well as androgen-estrogen conversion and mRNA. All measured parameters were disrupted within 24 hours at sub-agricultural doses with all of the glyphosate formulations. The nature of formulations had significant effect, indicating possible synergistic effects from multiple ingredients. They conclude, "Glyphosate-based herbicides present DNA damages and CMR [*carcinogenic-mutagenic-reprotoxic*] effects on human cells and in vivo." And further, "These herbicides mixtures also present ED [*endocrine disruption*] effects on human cells, at doses far below agricultural dilutions and toxic levels on mitochondrial activities and membrane integrity." They also note that the nature of the glyphosate formulation, that is the various other chemicals used in combination with glyphosate, have a significant effect on observed toxic effects. Also of note is that the effects were observed at levels near the residual authorized levels in transgenic feed stuff. Clearly they raise human and animal health warnings that have not previously been noted.

A major treatise on the birth defects in human and animal from Roundup/glyphosate was recently completed by Michael Antoniou et al (23), just published in June 2011. Antoniou is head of Gene Expression and Therapy Group, Dept of Medical and Molecular Genetics, King's College London School of Medicine UK. The major thrust of this report is the link of glyphosate to birth defects. The report also reviews independent scientific literature linking glyphosate to endocrine disruption, damage to DNA, reproductive and developmental toxicity, neurotoxicity and cancers. That study has since been substantially updated in 2014 by Fagan, Antoniou and Robinson (330 pages)(63), with a broader scope investigating the safety and efficacy of genetically modified crops and foods.

Dallegrave et al (24) published in Reproductive Toxicology research on assessing reproductive effects of glyphosate exposures of pregnant female Wistar rats on the offspring. The results showed, "glyphosate-Roundup did not induce maternal toxicity but induced adverse reproductive effects on male offspring rats: a decrease in sperm number...and daily sperm production during adulthood, an increase in the percentage of abnormal sperms and dose-related decrease in the serum testosterone level at puberty, and signs of individual spermatid degeneration during both periods.....and vaginal canal-opening delay in exposed female offspring."

Romano et al (25) also studied Wistar rats, and found related effects. They state, "results showed that the herbicide [glyphosate] significantly changed the progression of puberty in dose-dependent manner; reduced the testosterone production in seminiferous tubules morphology, decreased significantly the epithelium height." They conclude, "commercial formulation of glyphosate is a potent endocrine disruptor in vivo, causing disturbances in the reproductive development of rats when the exposure was performed during the puberty period."

Manas et al (26)(27) conducted research using Comet assay and cytogenetic tests to investigate genotoxic effects of both glyphosate and AMPA. Glyphosate was found to be genotoxic in the comet assay with Hep-2 cells of mice. With AMPA there was a significant level of DNA damage or genotoxicity in Hep-2 cells; in human lymphocytes there was statistically significant clastogenic effect; and in vivo micronucleus tests showed significant increases in toxicity as well. AMPA was found to be genotoxic in three different tests performed.

Bolognesi and colleagues (28) tested genotoxicity of glyphosate and Roundup formulation with mice, treated intraperitoneally, using a battery of tests; and also using human lymphocyte cells, in vitro. Both pesticide forms. DNA damaging activity was observed as DNA strand breaks, chromosomal alterations, indicating genotoxicity.

Benachour and Seralini (29) evaluated toxicity of four different formulations of glyphosate and adjuvants (POEA) on three different human cell types (placental, umbilical cord vein, embryonic kidney) using low dilutions, well below agricultural levels, to simulate possible low residue levels found foods or feed. All Roundup formulations caused cell death within 24 hours, inhibiting mitochondrial activity, necrosis, and induction of apoptosis. Effects were confirmed by observed DNA fragmentation, and nuclear fragmentation and shrinkage. It was found that AMPA and POEA separately and synergistically damage cell membranes. The mixtures of these formulation ingredients are generally more harmful when combined with glyphosate, confirming the labeled "inerts" are not inert. Benachour et al (30) provide additional research defining the time and dose dependent effects of Roundup on human embryonic and placental cells.

Epidemiological studies conducted in Sweden by Ericksson et al (31) has confirmed an association between known exposure to phenoxyacetic acids and non-Hodgkins lymphoma (NHL), and have further strengthened an association between exposure to glyphosate and NHL. The latency period typical for glyphosate and onset of NHL is often greater than 10 years. Work by Anneclaire De Roos and colleagues (32) examined the cancer incidence among 57, 311 licensed glyphosate exposed pesticide applicators in Iowa and North Carolina. There was a suggested association between exposure and multiple myeloma incidence, but not other cancer subtypes; further analysis for longer term assessment is planned.

The effects of glyphosate on human placental cells, and aromatase, the enzyme responsible for estrogen synthesis was researched by Richard and colleagues (33). Glyphosate and Roundup were found to be toxic to human placental JEG3 cells within 18 hours at concentrations lower with agricultural use. Roundup with adjuvants was more toxic than glyphosate alone. At lower concentrations both forms were disruptive to aromatase activity and mRNA. Endocrine disruption was observed, and is suggested similar effects may be found in other mammals.

Aris and Leblanc (35) tested for blood levels of glyphosate, AMPA, glufosinate and its metabolite MPPA, plus the Cry1Ab protein (a Bt toxin) in the blood of non-pregnant, pregnant and their fetuses, performed in Quebec, Canada. Glyphosate and glufosinate were detected in non-pregnant women.

MPPA and CryAb1 toxin was detected in both non-pregnant and pregnant women as well as their fetuses. This opens questions about the effects and exposures of these pesticides on human embryos, and raises questions about transfer of these toxins across placenta. In an epidemiological study in Ontario of farm populations, an association between preconception exposure to glyphosate and elevated risk of late term abortions was observed (36).

Anadon et al (34) reports in rat brain tissue glyphosate induced 5-hydroxytryptamine (5-HT), serotonin and dopamine depletion, in dose-dependent effects in frontal cortex, midbrain and striatum, with accompanying increases in the metabolites of serotonin and dopamine.

In Sri Lanka a pesticide control study arose during the civil war, wherein glyphosate and other agricultural chemicals were banned in rebel held portions of the country. In studies by Jayasumana et al (72) of the incidence of an epidemic of chronic kidney disease which arose in the government controlled areas of rice production but not in the rebel areas, a hypothesis of cause and effect of field workers exposure to glyphosate was made. This was subsequently investigated and explained by the unique metal chelating properties of glyphosate that concentrated arsenic from hard waters of the area and destroyed the renal tissues of thousands of farmers, resulting in over 400,000 patients with kidney disease and an estimate death toll of 20,000. As a result of this, the government of Sri Lanka banned the use of glyphosate. A similar incidence of chronic kidney disease occurred in El Salvador and that country has also banned glyphosate.

Kurenbach et al (71) tested the effects of commercial formulations of glyphosate (and 2,4-D and dicamba) on microbes, in particular *Escherichia coli* (*E. coli*) and *Salmonella enteric serovar Typhimurium*. A key finding was that glyphosate induced a changed response to antibiotics, up to 6 – fold at concentrations within legal application levels. In particular, glyphosate increased the tolerance of *E. coli* to the antibiotic kanamycin. The importance of this finding is that glyphosate intake and presence in the human body can induce a possible antibiotic medicine resistance to potential pathogens. And moreover, the effects of multiple herbicides can have additive effects on such antibiotic resistance effects. This could drive greater use of antibiotics to overcome the resistance, in both domestic animal rearing operations as well as clinical medical facilities and other uses of antibiotics for disease prevention. For humans, there is a growing crisis of the evolution of human pathogens that are resistant to antibiotics, the U.S. Center for Disease Control and Prevention estimates that more than 2 million people are sickened every year in the U.S. with antibiotic resistant infections, with at least 23,000 dying. To continue to use environmental contaminants such as glyphosate and other pesticides that stimulate such pathogen resistance is indeed unwise.

Research in Thailand, Thongprakaisang et al 2013 (95), demonstrated that glyphosate induces human breast cancer cell growth via estrogen receptors. Glyphosate induced the activation of estrogen response element transcription activity 5 to 13 fold over controls. These results indicated that low and environmentally relevant concentrations of glyphosate possessed estrogenic activity. They also noted that there is an additive estrogenic effect between glyphosate and genistein, a naturally occurring phytoestrogen in soybeans.

A large number of laboratory toxicology studies have been conducted in recent years with glyphosate in its various formulations, many involving rats in long term studies, some with human cells, and have indicated positively that glyphosate is a cancer causing chemical, as well as causing reproductive dysfunctions, neurotoxic effects, and many other diseases.

Mesnage et al (94) conducted a meaningful study with rats for an extended 2 year period administering 0.1 ppb Roundup (50 ng glyphosate equivalent/L) via drinking water. The study observed a marked increase incidence of anatomorphological and blood/urine biochemical changes indicative of liver and kidney structure and functional pathology. The results suggest that chronic exposure to a glyphosate based herbicide at ultra-low environmental dose can result in liver and kidney damage with potential significant health implications for animals and humans.

In another rat study, Romano et al (93), glyphosate was shown to alter aromatase activity and decrease serum testosterone concentrations, with expressions of early onset of puberty and other reproductive related abnormal effects such as hypersecretion of androgens, increased gonadal activity and sperm production.

The papers with laboratory rats and similar test mammals are so numerous in this area that this review paper cannot cover all of them. Refer to a few of the following papers for more detail: Cavalli et al (74), Seralini et al (75), Cattani et al (76), Peixoto (77), Astiz et al (78), Chaufan et al (79), and many others.

Glyphosate has recently been patented as an antibiotic itself. This points to other significant concerns about the effects of contamination of human foods and animal feeds. The linkage of glyphosate to numerous human health diseases and maladies involving the disruptive and toxic effects on otherwise healthy gut microbiome has been increasingly examined.

Beecham and Seneff (80) have postulated a link between autism spectrum disorder and glyphosate in a literature review paper of 2015. They postulate that glyphosate acting in utero on human fetuses disrupts neurodevelopment in a non-dose dependent manner. Their theory focuses on published data involving the interaction of harmful glycine mimetic related to calcium regulatory factors for certain neurons; the N-methyl D-aspartate receptor (NMDA), the glycine receptor (GlyR) and/or the glycine transporter protein 1 (GlyT1). The non-dose dependent aspect is based on more recent toxicology involving time sensitive exposures rather than simply concentration thresholds for effects. Another paper by Beecham and Seneff, just released Jan 2016 (82) reviews further the postulate link between autism and glyphosate formulated herbicides. They discuss the chelating properties of glyphosate and interference with manganese-dependent enzymes, notably the maternal pituitary manganese dependent protein Phosphatase 1, which can affect thyroid stimulating hormone (TSH). Mid pregnancy maternal reduced TSH has been correlated with increased risk of autism in offspring.

Another paper, Seneff, Swanson and Li (81) develops other connections between gut dysbiosis and neurological diseases induced by glyphosate and aluminum on the pineal gland. This is related to glyphosates disruption of cytochrome P450 enzymes. All of these papers three papers rely on studies

done by Swanson (41) that strongly correlate the increasing use of glyphosate with genetically engineered crops and the dramatic rising incidence in autism (and several other diseases and ailments in the U.S.) over the same time period from mid 1990s to the present.

Nancy Swanson and others (41) collected U.S. government databases and time trends on GE crop production, agricultural glyphosate use from USDA, and disease incidence and epidemiological data for numerous diseases from the Center for Disease Control and Prevention (CDC). They performed statistical analyses of 22 diseases in time-series data sets. Highly significant Pearson correlation coefficients were found between the dramatic rise in the use of glyphosate and accelerating incidence of many of the diseases examined. The authors suggest that these correlations warrant serious examination of the potential that glyphosate may be causing serious health effects on the consumers of these crops grown with glyphosate herbicide residuals in the harvested crops and therefore in foods.

The co-authors, Anthony Samsel and Stephanie Seneff, teamed to conduct more in depth analysis of the linkages indicated by the Swanson et al (41) correlations between rising incidence of diseases coincident with the rising of use of glyphosate. They have since authored four peer reviewed papers in various journals:

- I. Glyphosate Suppression of cytochrome P450 enzymes and amino acid biosynthesis by the gut microbiome: pathways to modern diseases, 2013 *Entropy* 15, 1416-1463
- II. Glyphosate, pathways to modern diseases II: Celiac sprue and gluten intolerance, 2013 *Toxicology* 6(4), 159-184.
- III. Glyphosate, pathways to modern diseases III: neurological diseases, and associated pathologies, 2015, *Surgical Neurology International* 6(45)
- IV. Glyphosate, pathways to modern diseases IV: cancer and related pathologies, 2015 *Journal of Biological Physics and Chemistry* 15, 121-159.

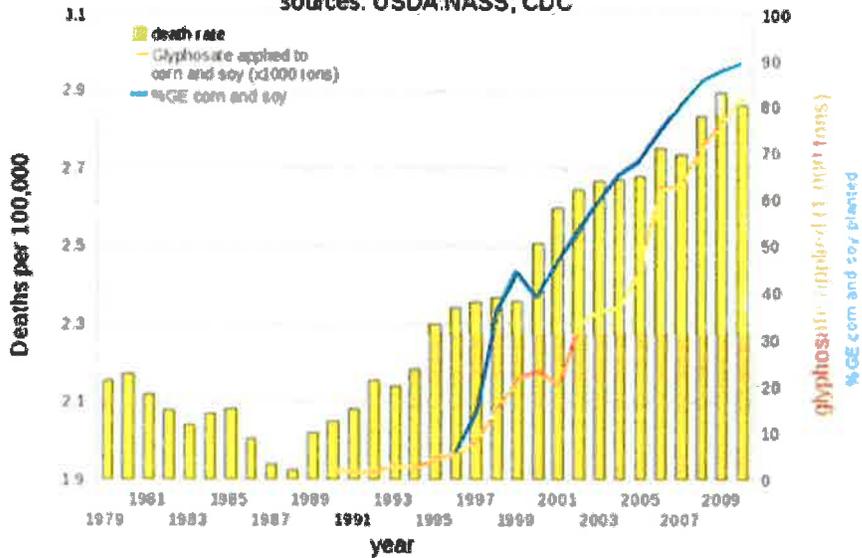
Included below are just four graphs illustrating the correlations reviewed in the Swanson et al (41) and the Samsel and Seneff papers (42)(43)(44)(45). Presented as examples of several diseases are time trends for the dramatic rise in acute myeloid leukaemia, deaths from intestinal infections, diabetes and thyroid cancer. Please take particularly note to the sudden jump from the pre-1990 trend lines in green for diabetes and thyroid cancers, and note that herbicide tolerant (Roundup Ready) GE crops were first introduced in 1995.

While these correlations and literature reviews are indicative of some troubling potential causative effects on the very serious rise in incidence of multiple human diseases since the early 1990s and glyphosate prevalence in the foods and environment, they of course are not absolute proof of causation. However, with all of the other scientific studies that have been reviewed above, there is serious concern with glyphosate and its damaging health effects on many animals including humans.

Deaths due to Acute Myeloid Leukaemia (ICD C92.0 & 205.0)

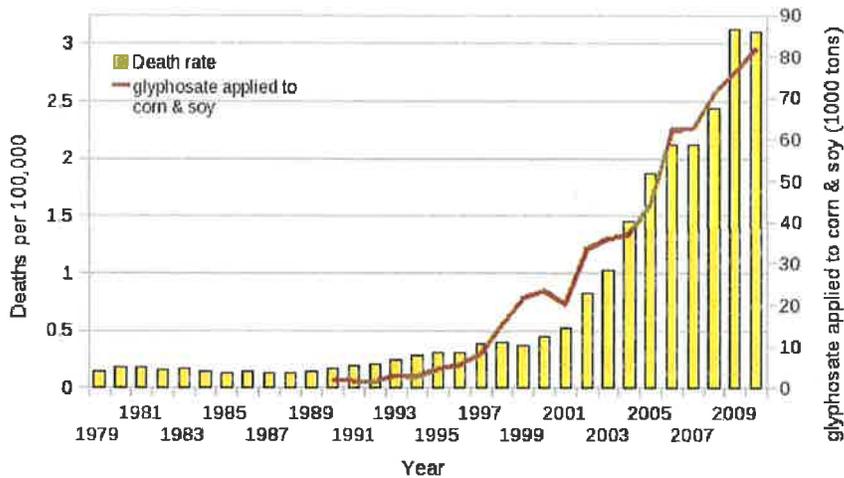
plotted against %GE corn & soy ($R = 0.9466, p \leq 6.625e-06$)
 and glyphosate applied to corn & soy ($R = 0.9293, p \leq 1.143e-07$)

sources: USDA:NASS; CDC



Age Adjusted Deaths due to Intestinal Infection (ICD A04, A09; 008, 009)

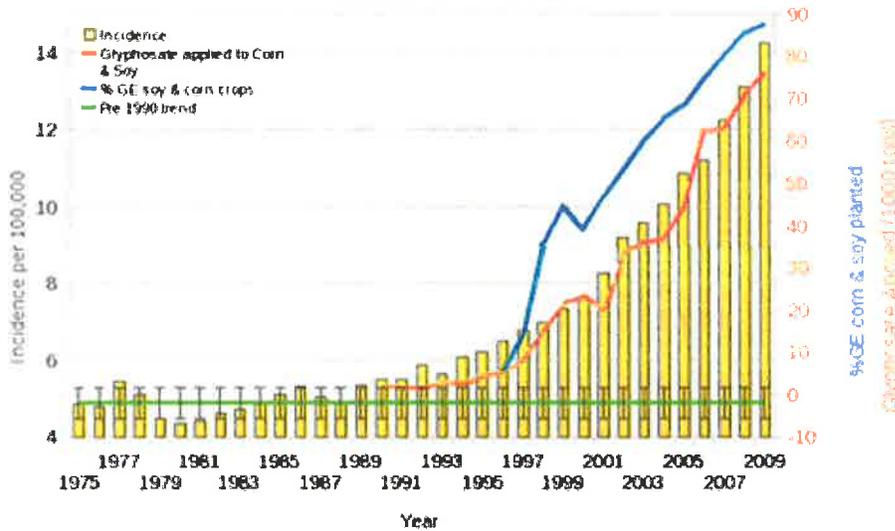
plotted against glyphosate applied to corn & soy ($R = 0.9738, p \leq 7.632e-09$)
 Sources USDA:NASS; CDC



*Plot prepared by Nancy Swanson from available data online

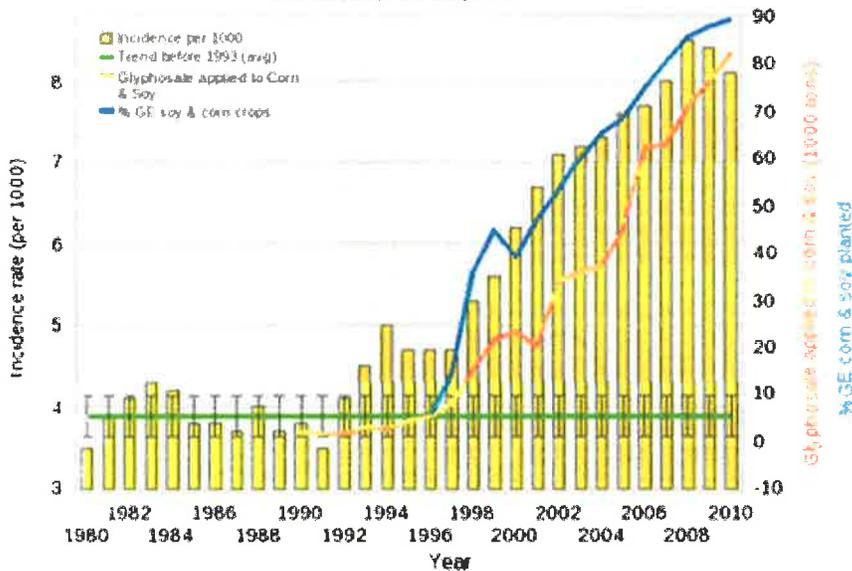
Thyroid Cancer Incidence Rate (age adjusted)

plotted against glyphosate applied to U.S. corn & soy crops ($R = 0.988$, $p \leq 7.612e-09$)
 along with %GE corn & soy crops $R = 0.9377$, $p \leq 2.152e-06$
 sources: USDA NASS, SEER



Annual Incidence of Diabetes (age adjusted)

plotted against %GE corn & soy crops planted ($R = 0.9547$, $p \leq 1.978e-06$)
 along with glyphosate applied to corn & soy in U.S. ($R = 0.935$, $p \leq 8.303e-08$)
 sources: USDA NASS; CDC



Source of above four graphs: Swanson et al 2014, Journal of Organic Systems 9(2)

It has also been very recently postulated that glyphosate may be a causative agent in the epidemic in Latin America of microcephaly birth defects, that health agencies and the press has been otherwise attributing to a mosquito vectored ZIKA virus. These specific birth defects, cranial

malformations and microcephaly, were previously documented several years ago in rural agricultural village areas of Argentina coincident with heavy applications of glyphosate on soybean crops (12) and laboratory animal testing demonstrated similar cranial abnormalities with exposures to glyphosate (13). Further investigation is warranted of this possible pesticide linkage as well as the ZIKA virus hypothesis.

Endocrine disruption and cytotoxicity of glyphosate has been researched by Young, Ho, Glynn and Edwards in Australia (82). They determined that the Roundup formulation was more cytotoxic in experiments with human placental JAr cells, than the technical ingredient glyphosate alone, and cytotoxicity was observed at exposures comparable to Australian drinking water guidelines for glyphosate (0.0059mM). Gasnier et al (73) also determined that glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines.

Glyphosate - Human Exposures from Foods and Beverages –

The first truth that needs to come out is that the U.S. federal government agencies responsible for the safety and monitoring and enforcement of food safety have simply not been doing their jobs with regard to monitoring residual contamination from glyphosate and the metabolite AMPA. There are three U.S. federal agencies with the following roles:

- The U.S. Environmental Protection Agency (EPA) registers the use of pesticides and sets tolerances (maximum allowable amounts of residues in or on foods).
- The Food and Drug Administration (FDA) is charged with enforcing tolerances in imported foods and domestic foods shipped interstate.
- The U.S. Department of Agriculture, Food Safety and Inspection Services (FSIS) monitors and enforces tolerances for meat, poultry and certain egg products.

The FDA conducts a very limited sampling of selected foods such as vegetables, fruits, grains with the Pesticide Monitoring Program (PMP) and the Total Diet Study (TDS), however the FDA has not sampled and analyzed for either of these chemicals in foods.

The USDA-FSIS has also conducted a pesticide residue monitoring program, the Pesticide Data Program (PDP) since 1991, which includes selected raw agricultural products and some processed foods, usually actually performed by states and their labs, such as the Colorado Department of Agriculture (CDA).

The CDA does no known sampling and analysis for glyphosate in foods produced in Colorado, or sold within the state. The Colorado Department of Public Health and Environment defers to the CDA.

So here is the revelation:

None of these U.S. or Colorado agencies have monitored and analyzed for glyphosate or the metabolite aminomethylphosphonic acid (AMPA) in foods despite scores of other pesticides being monitored. This is despite the fact that glyphosate has been in use as an herbicide for more than 45 years, and is the largest herbicide volume use in the USA (and worldwide). One can only conclude

either total government malfeasance and incompetence, or a willful decision compromised by outside influences to not even look for residuals and violations. The infamous Donald Rumsfeld slogan should be invoked: “The absence of evidence is not evidence of absence”. The FDA and USDA and EPA must follow another recent slogan in the military, “Don’t ask and don’t tell”, or a corollary “Don’t look and you will not find”.

As of last week (Feb 17, 2016), the FDA has finally announced that it will for the first time begin sampling for glyphosate in foods. The reasons for this belated decision are not clear, but may have been stimulated by the WHO-IARC declaration in March 2015 that glyphosate is a probable human carcinogen and public or congressional pressure. Also in October of 2014, the U.S. Government Accountability Office issued a scathing report on the failures of these agencies to perform their responsibilities to protect food safety (96). A major part of that report revealed the total failures by both FDA and USDA to monitor for glyphosate, as well as gross statistical inadequacies in sampling methods and numbers of samples across food types. There is no sign yet that the USDA is improving its food safety monitoring program.

The single exception known of any U.S. government agency sampling for glyphosate in foods was conducted by the USDA in a single episode in 2011 which found glyphosate in 90% of 300 soybean samples. That testing revealed glyphosate and AMPA residues of 1.9 to 2.3 ppm (mg/kg of grain), respectively. (98)

Sampling of glyphosate residues in soybeans from Argentina (100) and other countries indicate higher concentrations than reported by the previously discussed single USDA episode of sampling (101).

However, others such as food safety agencies in other countries, independent researchers and private labs have documented the presence of glyphosate in many foods, and in the human body and in domestic livestock. Some of that data is reviewed below.

Myers and thirteen other respected international medical and food safety experts (46) just issued a consensus statement in the professional journal *Environmental Health* (2016), after reviewing world literature and then issuing concerns over the use of glyphosate-based herbicides and risks with exposures. All of these experts and co-authors have no conflicts of interest. They in particular note the fact that glyphosate is widely present in the global soybean supply and that human exposures are rising. They also note that the regulatory determinations of allowable daily intakes (ADI) in both the USA and European Union are based on outdated science, among other findings. One of the authors is the founder of The Endocrine Disruption Exchange, headquartered in Paonia, Colorado, Theo Colborn (recently deceased). This report is a resounding rebuke of the performance of the agencies charged with protecting the public health from glyphosate damages.

In 1993, the National Academy of Sciences published a report, *Pesticides in the Diets of Infants and Children*. This report ultimately resulted in U.S. Congress passing the the 1996 U.S. Food Quality Protection Act (FQPA) which contains a mandate to assure a “reasonable certainty of no harm” for pregnant women, infants and children. However, twenty years later, the failures of the U.S. government

agencies to meet this mandate are many and pervasive. The example of failure to even analyze glyphosate in foods, the most heavily used herbicide in the world is a prime example.

Sampling of foods for glyphosate and AMPA in the European Union is also deficient, but somewhat better than in the U.S. Independent institutions and various countries have conducted limited monitoring and analysis for glyphosate. The UK based Soil Association issued a presentation recently, glyphosate Scientific Briefing: Glyphosate in our Bread (97). The report notes that glyphosate spraying of cereal grain crops has risen by 400% in the last 20 years, involving just over 1 million hectares and approximately 800,000 kg of glyphosate. This compares to about 150,000 kg in 1996. Cereal crops are treated up to 3 times per season. The rise in the use of glyphosate is matched by a rise in the concentration of glyphosate in bread in the UK, and between 17% and 30% of bread samples contained glyphosate in the most recent years (2012-2014) and the average concentration in 2013-14 was 0.2 mg glyphosate per kg of bread. Some of this data was from the UK Food Standard Agency which found glyphosate in 27 of 109 bread samples in 2012 (99).

Other prior testing for glyphosate in the UK has found wholewheat breads to more commonly have glyphosate contamination. In separate testing of wheat bran residues up to 5.7 mg/kg were found in one case (106)(105), and in a German study glyphosate residues in barley were measured at concentrations up to 23 mg/kg (107). As a result of these findings the UK government issued an advisory notice to farmers (102); and leading bakeries in Denmark no longer accept glyphosate treated grains (108)(105).

A just released study from Germany that glyphosate has been found in all of 14 popular German beers at concentrations ranging from 0.46 ug/L up to 29.74 ug/L (ppb). The German Brewer's Association admitted that low residues of the probable human carcinogen glyphosate could not be prevented because "the herbicide is now found virtually everywhere after decades of use in agriculture." (104) Compare these concentrations to the EU standard in drinking water of 0.1 ug/L (ppb). (109)

With Boulder County being the birthplace for craft beer brewing and a haven for scores of craft brewers, their ingredients are also very likely to be suspect to be contaminated with glyphosate...and some barleys are grown right here for these craft brewers as well as the major mainline brewers of Coors and Anheuser-Busch.

Sampling by non-governmental groups in European countries found 44% of city dwellers across 18 countries had urine containing glyphosate (105) and 70% of individuals in the UK had glyphosate in urine. Sampling of women's breast milk in Germany also had glyphosate contamination. (as reported by UK Soil Assoc. (97)) In Canada glyphosate was detected in 55 of blood samples in women, up to 93.6ng/mL (ppb). (110) A study in Iowa of farm and non-farm families detected glyphosate in more than 80% of children's urine. (111)

While much of the above discussion of glyphosate residuals in grains relates to soybean, and soybean is not a crop often grown in Boulder County, the fact is that many grain crops such as Roundup

Ready corn and sugar beets, as well as other grains and crops such as wheat, barley, dry beans, sunflowers, potatoes, etc. can also be contaminated with glyphosate due to the practice of “green burndown” or “desiccation”, spraying of glyphosate on non-resistant crops just prior to harvest to accelerated crop drying for the convenience of the farmer’s harvesting schedule. These desiccant uses are particularly concerning since they are done within one to two weeks of harvest, thereby maximizing the potential for glyphosate residuals to remain in the harvested crops. Very little data is known on this in independent literature, but the practice is promoted by the chemical companies (102) and governments and university Cooperative Extension Service (103), and unfortunately approved by the EPA in glyphosate labels despite the contradiction of spraying the crop...in essence defining it as a pest to allow such a use.

In 2009, the European Union, European Food Safety Authority (EFSA) conducted 186,852 tests on cereal samples for pesticide residues. But in this multi-country effort on five countries tested for glyphosate, 462 samples of which 42 tested positive.

In a news item from Global Research (112), the children’s cereal, Kellogg’s Froot Loops was found to contain 0.12 mg/kg (ppm) of glyphosate.

Moms Across America and Sustainable Pulse conducted glyphosate testing in breast milk, urine and water samples from across America (113). The results of that investigation were that glyphosate was detected in 3 out of 10 samples of breast milk of American women, levels ranging from 76 ug/L to 166 ug/L which are 760 to 1600 times higher than the European drinking water Directive. In the U.S. the allowable drinking water standard for glyphosate is 700 ug/L (7000 times higher than the EU standard). Urine samples were found to be 10 times higher than a similar study in the EU conducted by Friends of the Earth Europe in 2013. Drinking water samples with detectable concentrations for glyphosate ranged from 0.085 to 0.33 ug/L, 70 % with detectable concentrations >0.05 ug/L. Urine samples with detectable concentrations ranged from 8.1 to 18.8 ug/L; 12 of 40 samples had detectable amounts at LOQ 7.5 ug/L.

What is known is that crops on Boulder County Open Space have been sprayed with glyphosate for harvest burndown, including beans, sunflowers, and some grains. (67) Allowing this use is an affront to common sense, and demonstrates no concern for public health and safety.

Rubio , Guo and Kamp (114) surveyed glyphosate residues in honey, corn and soy products. Sixty-nine samples of honey, with a limit of quantification (LOQ) and analytical range were 15 to 800 ppb, 59% of the samples were above the lower LOQ, values ranging from 17 to 163 ppb. Organic honey tested positive for glyphosate for 45% of the samples, ranging between 26 and 93 ppb. Glyphosate was detected in 10 of 28 samples of soy sauces with a concentration range of 88 and 564 ppb; none of the organic soy sauces had detectable glyphosate. Glyphosate was not detected in soy milk, tofu, or corn syrup at the LOQ and range of 75 to 4000 ppb.

Kruger et al (115) examined glyphosate in urine and organs of dairy cows, German and Danish, organic and conventional; and in urine of hares, rabbits; and urine from humans with conventional and

organic diets, and also healthy and chronically diseased individuals. Cows in GMO free area had significantly lower glyphosate concentration in urine compared to conventionally managed and fed cows. Glyphosate was higher in humans with conventional feeding compared to organic; and chronically ill persons had significantly higher glyphosate residues in urine compared to health persons.

What is not known regarding Boulder County open space croplands is how much glyphosate is contained in the crops grown in our county, and particularly on the Boulder county open space croplands. From all indications where limited sampling has been conducted in other parts of the world, one can expect that the grains, sugar beets and other crops are in fact contaminated with this herbicide, possibly accumulating and are being sold into food products and animal feed products. And more concerning is the health effects on these consumers.

Glyphosate Effects on Comparative Nutritional Quality of Crops -

Baranski and a large team of international scientists (62) conducted a massive meta-analysis comparing conventionally non-organic (chemical) grown crops to organic crops which of course are not allowed to use pesticides such as glyphosate. The meta-analysis published in 2014, was based upon 343 peer-reviewed publications across numerous countries and crops, and “indicate statistically significant and meaningful differences in composition between organic and non-organic crops/crop-based foods” in the favor of organic crops. The” concentration of antioxidants such as polyphenols were found to be substantially higher in organic crops.” Such dietary beneficial antioxidants have been linked to a reduced risk of chronic diseases and neurodegenerative diseases and certain cancers. And, “the frequency of occurrences of pesticide residues was found to be four times higher in conventional crops, which also contained significantly higher concentrations of the toxic metal Cd.

As noted previously, the failures of the USDA and FDA to collect data on glyphosate and AMPA in foods is a major failure, and we have a poor to nonexistent data base on what effects glyphosate has on food quality.

One factor that not mentioned yet is the regulatory agencies’ history of raising of Acceptable Daily Intake (ADI) value, or the Chronic Reference Dose (cRfD), as these values are labeled in the EU and the USA, respectively. These values are in turn used to establish tolerance values for glyphosate in individual foods or food groups. The manufacturers of glyphosate have repeatedly requested raising of the allowable tolerances and EPA most recently, partly due to the evolution of glyphosate resistance in weeds making application rates non-efficacious. Currently, the U.S. EPA cRfD is 1.75 mg of glyphosate per kilogram of body weight (mg/kg/day) which was recently raised. The current E.U. ADI value is 0.3 mg/kg/day, established in 2002. The German Federal Institute for Risk Assessment is currently considering raising their ADI value from 0.3 to 0.5 mg/kg/day. A team of independent scientists is seeking a much lower value, down to about 0.1 mg/kg/day. The U.S. EPA are in the midst of a re-registration review for glyphosate, begun in 2009 but still engaged and a decision has been delayed several times, due out sometime in 2016.

One key missing element in determining the safety and risks of glyphosate is hindered by the almost total lack of data about the actual concentrations of glyphosate in grains, fruits, vegetables, meats, dairy products, eggs, etc. and the consequent inability to determine the actual doses experienced by the human population. The failures of USDA and FDA to monitor and analyze for glyphosate has greatly hindered this greatly. EPA has no good data base for establishing glyphosate tolerance values for foods. Catch 22. But countering this data deficiency is the large amount of medical evidence that has been reviewed herein, and much more that exists, that evidence indicating that EPA must choose precaution due to the warnings of great damage from this herbicidal product. And similarly, in the absence of prudent and precautionary regulatory actions by the EPA, Boulder County must choose to ban glyphosate to protect the citizens of the county and all persons that are consuming the foods that are produced in this county.

Glyphosate and Toxicity Enhancing Effects of Adjuvant Chemicals –

The city manager of the City of Boulder, Colorado released in 2011 a memo directing city parks and maintenance staff to cease using Roundup, a commercial version of glyphosate. The ban was triggered by recent research about the elevated health risks and toxicity of glyphosate in combination with an adjuvant surfactant chemical polyethoxylatedtalloamine (POEA)(14). Surfactants are commonly used with active agent pesticides to decrease the surface tension of applied liquids and cause greater contact and penetration of the active poison with plant tissues.

This city of Boulder Roundup ban is in concert with an overall policy trend by the City of Boulder and in draft versions of the (b)(7)(D) latest update to the Boulder Valley Comprehensive Plan to minimize the use of all pesticides except those identified as “minimum risk” under EPA definitions (FIFRA Section 25(b)).

Incredulously, the U.S. EPA does not review the actual formulations of pesticides that are actually used when it reviews the environmental and toxicity effects of a pesticide for registration or re-registration, or for setting allowable tolerances of pesticide residuals on foods. Furthermore, the EPA also does not require the inert ingredients to be listed or quantified on the labels or even publicly divulged, calling that information business confidential or secret. Toxicity studies required of pesticide registrants in their applications are also not required to be conducted with the actual formulations as sold and used, only the technical grade active ingredients (abbreviated as “a.i.”). And most corporation supplied toxicity studies are also declared secret, not available for public or even peer scientific assessment. All of this is an affront to legitimate scientific method, and invalidates the entire EPA review process.

Almost all pesticide products contain these so called inert ingredients in actual formulations to enhance the toxicity of the active ingredient. They may be surfactants to break surface tension and increase absorption into the organism. They may be synergists that biochemically increase the toxicity of the active ingredient by such mechanisms as slowing the active ingredient degradation by biochemical or other processes. Other mechanisms may include blocking or opening active neurological

signal transmitter or enzyme production or activity sites, either directly by the inert ingredient or for attack by the toxic a.i.; or many other such mechanisms.

There are many different “inerts” used with glyphosate and the formulations can vary from high concentrations of glyphosate relative to inerts (e.g. about 40%), to quite low formula ratios, about 1%. And even for the many products involving glyphosate, the types of adjuvants also vary greatly from use formula and tradename and manufacturer, and consequently the actual formula toxicity also varies broadly (50).

Comparative toxicities to non-target organisms, such as various amphibians and aquatic species, by various glyphosate formulations compared to pure glyphosate has been demonstrated in published studies, e.g. Brausch et al (51) and Relyea (52), Howe et al (53) and others. In these, the as applied glyphosate formulations and inerts proved to be more toxic than glyphosate alone, to frogs (53), daphnia magna (an aquatic invertebrate(51), and a range of aquatic community algae and animals (52). This literature review is not complete and abbreviated for this report.

In the case of glyphosate, polyethoxylated tallow amine, also called POEA or POE-15, is an “inert” ingredient in many commercial formulations, including formulations of Monsanto’s widely used RoundUp. This particular chemical, a surfactant, has been proven to dramatically increase the toxicity of RoundUp. Mesnage, Bernay and Seralini (48) published a report on the toxic effects of the POE-glyphosate formulation, glyphosate alone, and POE alone on human hepatic, embryonic, and placental cells. They found that all formulations are more toxic than glyphosate alone, and interestingly POE-15 was the most toxic individual component, at levels of 1 to 3 ppm, inducing cell necrosis. They demonstrated that the government established human acceptable daily intake (ADI) value which are based on glyphosate alone tests is totally inaccurate. They state,

“Since pesticides are always used with adjuvants that could change their toxicity, the necessity to assess their whole formulations as mixtures becomes obvious.”

A later additional report by Mesnage et al in 2014 (49) further amplifies on the above findings. This expansive study included three major herbicides (including glyphosate), three insecticides (including some neonicotinoids) and three fungicides, comparing their active ingredients toxicities to actual formulations with the adjuvants. Three human cells lines were the tested for mitochondrial activities, membrane degradations, and caspases activities. Eight of the nine formulatins were up to one thousand times more toxic than their singular active ingredients. RoundUp formulation was among the most toxic of herbicides and insecticides tested. They note in conclusion regarding glyphosate and glyphosate formulations:

*“It is commonly believed that Roundup is among the safest pesticides. This idea is spread by manufacturers, mostly in the reviews they promote, which are often cited in toxicological evaluations of glyphosate-based herbicides. However, **Roundup was found in this experiment to be 125 times more toxic than glyphosate.**” (bold emphasis added) ...*

“In conclusion, our results challenge the relevance of the ADI (acceptable daily intake), because it is calculated today from the toxicity of the AP (active principle or active ingredient) alone in vivo. An “adjuvant factor” of at least a reduction by 100 can be applied to the calculation of ADI...As an example, the present ADI for glyphosate is 0.3 ppm (parts per million); for glyphosate-based herbicides it would be 3 ppb (parts per billion) or less.”

But unfortunately, the EPA has not yet acknowledged this fundamental scientific flaw in its pesticide risk assessment and toxicity protocols to be obvious. They continue to understate the toxicity of glyphosate and essentially all pesticides by this major flaw by only requiring testing the active ingredient, and not the actual product formulations sold and applied in the field and environment. And the allowable residuals in foods and in exposure models that are built upon these flawed assessments are likewise fundamentally invalid and are not protective of public health.

Toxicity Enhancing Effects of Mixtures of Pesticides –

A similar problem to the failures to properly assess toxicity of such pesticides as glyphosate due to inerts, is the fact that pesticide risks are studied in isolation and EPA and risk assessment and regulatory agencies in other countries do not consider the real world of mixtures of many different pesticides being applied into the environment. These mixtures can have major combination and even synergistic effects, much greater than the single chemical effects, sometimes additive but often greater than simple additive effects. It is a common practice to tank mix pesticides for a single application, or simply apply one after another to the same site at short intervals.

With the increasing weed resistance to glyphosate by “super weeds”, largely brought on by its extreme and increasing use of glyphosate, chemical companies are recommending the use of other herbicides in combination with glyphosate based herbicides, including older chemicals such as 2,4-D. Dow Chemical has recently introduced such a combined product called Enlist Duo (2,4-D and Glyphosate), and with unknown adjuvants...and companion new GE corn and soybeans that is tolerant of both herbicides. This constantly ramping up of more and more pesticides is really a treadmill. Dow Chemical claimed in its EPA registration applications that these two herbicides together were not acting in synergistic fashion, but simultaneously in their patent filing claimed the opposite. EPA reversed its approval of the Enlist Duo due to this falsification of data by Dow Chemical.

Other research on combination pesticide effects has been documented with glyphosate-based herbicides and certain fungicides with other pesticides, and the enhanced effects on honeybees above additive effects of single chemicals (54)(55)(56)(57). Many more such examples can be cited. But the message is clear, the EPA toxicity review processes to determine acceptable pesticide uses, rates, tolerances is seriously scientifically invalid by this compartmentalism or reductionist approach to what they claim to be science.

Crop Production Economics: Costs vs. Benefits -

The effects of conventional agriculture and its high intensity use of chemicals and the external costs is not built into the true costs of business by EPA or chemical manufacturers, such as:

- Effects on climate disruption from fossil fuels used in manufacturing and transport of nitrogen fertilizers to the fields, plus enhanced methane emissions from concentrated animal feeding, nitrous oxide from soils, and other volatile greenhouse gases from the use of soil sterilants and pesticides.
- Extreme costs to public health and health care and loss of human capacity caused by the damages from use of pesticides and associated chemicals
- Costs to the environment from losses of the ecological services of pollinators, and essential support from a balanced biodiverse ecosystem.
- Costs from losses of clean air, clean water, healthy soils
- Costs from losses of cropland productivity due to sterilized soils and eroded soils
- The cost to human welfare from loss of the aesthetic pleasures of being surrounded by birds, frogs, fishes, insects, worms, mammals, and all living things.

These unaccounted for economic losses caused by chemical farming are real. They are truly unsustainable practices in every sense.

Local chemical intensive farmers say that their economic profitability is improved by the use of glyphosate as an effective herbicide. They even argue that glyphosate and the multitude of toxic chemicals they use is essential to their livelihoods. They spray early upon weed emergence and say they can make fewer or no additional cultivation passes per crop cycle. This clearly makes their farming more convenient, and may arguably reduce tractor fuel consumption and labor. However, for truly sustainable farming, this does not account for many external costs such as long term soil health, human health, stimulation of the evolution of glyphosate resistant weeds, and other negative consequences that must also be considered. But these factors are not considered in the farming accounting systems, but are only assessed indirectly and often with great lag times, appearing as long term productivity declines, loss of non-target species, health care bills, etc.

Spraying of glyphosate does cause chemical trespass, even when done with care and observance of atmospheric conditions, sometimes damaging, destroying or threatening the crops and livelihood of downwind and downstream organic farms. These costs are often left for neighbors or subsequent generations to deal with. On balance, the risks of applying glyphosate and adjuvant toxins for the sake of current season profitability or the simplicity gains in farming are insufficient justification for the real costs.

Damages to Organic Farms from Pesticide Drift or other offsite contamination -

As an example, in 2013, a major incidence of glyphosate drift chemical trespass occurred in Boulder County, Colorado. A tractor mounted boom spraying occurred adjacent to a certified organic vegetable farm. The victim was a well known and respected organic vegetable farmer and organic seed producer. This family lost their crops due to major damages to the vegetable crops and inability to harvest and sell them as certified organic produce, and ultimately lost their farm as a result of this pesticide trespass. The case was settled but with too little compensation and too much delay to offset the real damages to this farm. Supporting scientific demonstrations of the impact of the glyphosate drift on organic vegetable crops were conducted by an agricultural expert witness, and supported by another organic farmer. Little support was provided by the CDA investigators in this matter. Some of the details on this egregious case are not available due to out of court settlement agreements. But the case illustrates the problems of use of this dangerous herbicide in off-site contamination and damages.

There is a clear danger of glyphosate entering waters of streams, lakes and irrigation ditches, that can subsequently be applied to downstream farms, resulting in damages to crops.

So the weed control benefits sought by farmers from this broad spectrum herbicide may in fact be counterproductive with negative effects on beneficial soil organisms, to longer term impacts on soil health, increased crop disease prevalence, and even reductions in crop yields or losses by mycotoxins, and with growing human health concerns to those applying it and coming into contact with this poison by its widespread use. A more in depth evaluation of glyphosate and related herbicides such as glufosinate is needed to assist in cropland policy development by BCPOS.

Recap - Summary -

The primary regulatory agency for herbicides such as glyphosate is the U.S. Environmental Protection Agency which must approve the use of such toxic agricultural chemicals that are designed to control or kill weeds. Glyphosate was approved decades ago, in the mid 1970s. However, based upon recent research findings it deserves a serious re-examination and much more unbiased scientific research across numerous disciplines, from soil chemistry and soil microbiology, to crop diseases, to animal feed effects, to food safety and human health effects, and comparative studies between more benign methods of agricultural production and chemical pesticide methods, etc.

Recent investigations into EPA prior knowledge of the harmful human health effects of glyphosate have come to light by independent researchers/investigators under Freedom of Information Act. Thousands of pages of documents from EPA files reveal that knowledge of the carcinogenic and other effects of glyphosate have been known by both the manufacturing corporation and the EPA since at least the early 1980s.

This information is provided in this report as an illustration of the influences of the corporate manufacturers of glyphosate on the EPA, and the resulting EPA malfeasance in protecting the public health and the environment from pesticides. This case is but one example. In addition to malfeasance, the EPA testing protocols and risk review processes are fundamentally scientifically invalid and seriously out of date with current toxicological, ecological, and food safety science. Accompanying this document is a book titled *The Myths of Safe Pesticides*, which it is hoped US EPA staff and administrators will seriously read to understand the gross inadequacies of the regulation of pesticides, including glyphosate.

Until convincing additional research can prove the safety and necessity of glyphosate over the near and long term, its use should be discontinued. Given the mass of medical and ecological evidence already existing, it is unlikely that safety can be proven. The role of US EPA must be to disallow its use until legitimate and independent scientific verification of safety can be assured. Those assurances are currently not indicated by unbiased independent science.

It should also be noted that this literature review is not to be considered comprehensive and the sheer volume of published literature on these subjects is enormous and rapidly growing.

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Comments to Boulder County Commissioners
May 30, 2019

Concerning: County's Proposed Extension of Transition Program for Growing of Genetically Modified Crops Grown and Use of Certain Pesticides on Publicly Owned Parks and Open Space Agricultural Lands

I cannot support the proposed revised "transition" program involving GMO crops and certain pesticides. They revisions are entirely in opposition to positions that I and thousands of citizens of Boulder County have personally worked for over the last many years now, actually now decades long. The extensions are also a breach of trust from county commissioners and staff, who committed to the current policy of selective bans in 2016. But most importantly the proposed extensions will continue the poisoning of the public lands, and endanger the public health, welfare and the environment for many more years into the future.

1. The timeline extensions for implementation of bans on the use of genetically modified crops and associated dangerous pesticides are totally unacceptable. While a draft of the Transition Plan notes that the program is not "kicking the can down the road", that is precisely what is being proposed. The Boulder County GMO farmers have had quite long time already to implement the changes to their farming methods that have been called for by Boulder County....but in fact have dragged their collective feet completely. There is no legitimate reason to cave in to their bad faith actions and failures to already begin transitioning away from GMO crops and the associated dangerous pesticides.

2. As you probably know, a major reason that I have personally opposed the use of GMO crops is that all of the ones involved are genetically engineered to be tolerant of glyphosate (active ingredient in Round Up and other brands) herbicides. I cannot condone the use of glyphosate at all. It is a deadly poison to humans and has progressively wreaked devastation and biodiversity declines to many species of beneficial organisms.

Glyphosate has been declared to be a "probable human carcinogen" (class 2a) since a comprehensive scientific/medical review by the International Agency for Cancer Research (IARC), an arm of the World Health Organization and it is specifically implicated as a causative agent for the incurable cancer, non-Hodgkins Lymphoma. There are currently an estimated 13,000 law suits against Monsanto (now owned by Bayer) for this cancer, with the first three such cases already won for the plaintiffs with major financial penalties (now exceeding multi billions of dollars) against the manufacturer for gross malfeasance, decades of fraud and falsification of toxicity information provided to pesticide regulatory agencies about known damaging health consequences of human exposures to the chemicals in glyphosate containing products.

Glyphosate has many other tragic environmental and public health impacts that threaten our health and the survival of other species. I have numerous times provided to the Commissioners lengthy scientific literature reviews which I compiled from the scientific literature, the last version including about 115 scientific citations for every statement included in my review in support of a total ban of this herbicide for any uses on the public lands of our county. The commissioners have not heeded that warning...and the extensions proposed in the "transition plan" do not even address such a ban of this poison. It is unfortunate that current state law on pesticides only allows lower governmental jurisdictions to impose any restrictions of use of pesticides except on lands owned or controlled by those lower jurisdictions,

but the Commissioners do have the legal authority to invoke total bans on all the county public lands and properties, including ag lands, forest lands, road rights of way, parks, office spaces, etc. With this power, Boulder County must act to protect the environment and the people of our county, setting an example for other jurisdictions and the entire state of Colorado.

3. I came as a shock that this so called transition plan also includes extending the neonicotinoid (aka “neonics”) pesticide ban elements. This is an incredibly dangerous and potent class of insecticides. I cannot condone any extension of the use of these neonicotinoid chemicals. This class of insecticides includes many chemicals, including at least the following: acetamid, imidacloprid, clothianidin, thiamethoxam, and many others called “neonics”, plus more chemicals being developed as patents expire. There are several other insecticides that should be banned also, having similar mechanisms of neuro-toxicity, as well as endocrine disruption, carcinogenicity, teratogenicity, mutagenicity that are also closely similar to the biochemical acetylcholine receptor synapse blocking mechanisms of toxicity to neonics.

To do piecemeal bans on selected pesticides is folly for there are always other toxic chemicals to replace them. Sometimes this is reversion to older toxic pesticides that are still on the market, sometimes it would be new chemicals in the development pipeline, that like their predecessors have never been legitimately tested and proven safe.

The only sure way to deal with the rampant poisoning from agricultural chemicals is to go to strictly organic and environmentally regenerative practices. Boulder County has this authority on all county owned lands, including open space.

Neonics and related insecticidal pesticides are the largest selling class of insecticides in the USA and the world. They are routinely used on many crops, many direct consumption foods which are contaminated with neonic residuals of these cumulative poisons. A most common use is as a seed coating, including use on GMO crops, as a prophylactic method that directly violates any legitimate concept of integrated pest management (IPM). Use of chemical toxins in this manner is applying chemical controls in the absence of any presence of a pest, violating the major proviso of IPM which states that one must always apply the least toxic control methods first, and never apply toxins in the absence of a damaging pest population.

Like glyphosate I have been personally involved for more than 10 years with intensive literature research and nearly daily consultation/collaboration with a large group of scientists and environmental specialists and health/environmental non-profits via a sharing listserve hosted by the Center for Food Safety on these insecticides. A legal settlement with the U.S. Environmental Protection Agency, finally has resulted in the banning of several neonicotinoid products, largely based on the EPA's failure to follow the federal laws by registering such products without completed and proper toxicity tests, and acting in collusion with the corporate product registrants and acceptance of the corporate falsified filings and studies. Even if the EPA had followed its own regulations and the law, the toxicity methodologies required by EPA are scientifically invalid on many fronts, not even actually requiring testing the toxicity of the actual product formulations used and sold. The entire regulatory program is consequently scientifically discredited and grossly flawed, not protective of people's health or the environment.

These neonic insecticides are tremendously potent with acute toxicities from 6000 to 10,000 times than a long ago banned reference poison DDT. These insecticides are not only toxic to insects and related arthropods, but are increasingly being found to be toxic to many other species, including birds, aquatic

species, and more and more mammals (including us), and at exceedingly low concentrations at orders of magnitude below acute levels, are cumulative in the organisms, are exceedingly water soluble and labile therefore readily moving into ground water and surface waters, with quite long environmental half lives, with toxic metabolic breakdown chemicals, and are increasingly being found in public drinking water supplies, being subject to chemical conversion to very toxic disinfection by-product chemicals in public drinking water. Neonicotinoids are found in hundreds of foods as residuals which enter our bodies and can have cumulative toxic effects, notably as neuro toxins.

And of course, the Commissioners are well aware that neonicotinoid insecticides are having devastating effects on honey bees, native bees, and many other essential pollinator insects. There are documented massive losses of these essential insects right in Boulder County, and across the USA and other countries. These pollinator insects are vital to the production of hundreds of food crops, nearly one third of all foods that humans use. These pollinator insects are an essential part of our ecosystems in many other complex ways. The loss of many birds and aquatic species, some as high as 50% population declines and some species nearing extinction over recent decades, not only in the USA but also reaching huge proportions around the world is directly linked to the loss of essential food chain insects caused by excessive use of these insecticides. This is also coupled with the loss of habitat by the massive use of chemical herbicides, including the glyphosate containing products, the largest selling herbicide in the world. This double whammy on our ecosystem is driving many species into extinction. Boulder County needs to take heed of these damages and to take action to ban these deadly chemicals. And it cannot afford to wait and delay the process with further extensions in implementing transitioning to safe methods of agriculture, forestry and land management within its jurisdictions.

Boulder County should simply and completely cease the use of this entire neonicotinoid class of insecticides everywhere that it has jurisdiction to do so. They are simply too dangerous and have broad health and environmental consequences.

4. The impact of these hazardous agrochemicals is very damaging to soil health and is entirely contradictory to restorative agriculture which is fundamentally dependent upon a microbiologically vibrant soil ecology, and not only do these chemicals affect soil ecology, but a broad spectrum of species upon which we and our food crops all depend. Both glyphosate and neonicotinoids (as well as many other pesticides) degrade the ecology of soils, and not only have a significant pre-application embodied greenhouse gas CO₂ equivalent, but degrade the potential for carbon farming/sequestration.

Boulder County states that it intends to reduce the damaging greenhouse gas emissions within its boundaries, and notably on the publically owned open space lands. However, the county is not taking the necessary actions to accomplish that worthy and essential goal by allowing the continued poisoning of those public lands with pesticides that damage the life of soil organisms that are essential in achieving carbon sequestration in soils, and in diminishing the losses from soils of exceedingly harmful potent greenhouse gas emissions like nitrous oxide which are also exacerbated by excessive synthetic nitrogen applications.

The consequences of the continuing barrage of chemical dosing of our farmlands, roadsides, parks and open space with poisons simply must stop.

5. I now understand why the large scale GMO and chemical farmers have accepted this proposed program. Having read the County revised transition proposal, it is clear to me that the very few GMO and chemical based farmers probably believe they can just keep extending doing their irresponsible chemical based agriculture again and again. I feel no assurance that the same delay tactics would not occur again, even after the currently proposed relaxation of implementation of the bans.

6. Regarding supporting the possible sole source contract with Mad Agriculture to guide the implementation of transitioning I do support that non-profit. I can and do support Mad Agriculture as a manager of a Transition Program but only with significant adjustments to the terms of the program to respond to the above very significant issues. Mad Ag must only be a facilitator of a full absolutely support the overall intentions of Mad Ag's programs, to shift damaging agricultural practices to restorative practices, including reducing greenhouse gas impacts from agriculture. But those objectives simply cannot be met by allowing continued poisoning of our lands, air, water, foods, so many species, and our personal health. I feel that Mad Ag must be true to what I think it actually also believes, a path to safe and sane agriculture. This Transition Program is not true to Mad Ag goals and objectives, nor to a sense of urgency to achieve needed improvements to shift from "conventional" agriculture to restorative agriculture and safe toxic free ag products. Furthermore the lands involved with the county proposal are public lands and they belong to the public not the lessees. The lessees must abide by the public demands to stop poisoning our public lands.

I simply cannot speak in favor of this plan revision at the upcoming hearing. But I absolutely must speak the truth as I understand it, based upon my many years of scientific investigations into these issues, and my personal commitment to speak honestly for the protection of our sacred environment and our own species health and safety.

Respectfully offered,

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Rethink POS Ag Land and Leases

21st Century goals and uses of ag land When Boulder County POS ag lands were first purchased, usually to preserve open space and viewsheds and prevent development and sprawl, the lease-back model made sense. We let the farm families who originally owned the land continue to operate on it. The situation has changed – citizen land-owners see a better and higher use of our land than raising commodity crops. Our ag lands should be used for new models of farming with ecological practices, improving soil health and combating climate change, and meanwhile helping to feed Boulder County with nutrient-dense foods.

Re-imagine what productive farm land looks like Farmers and county ag managers and citizens alike need a new vision of what productive farmland looks like. Monolithic fields of bare soil and monocultures from fence-to-fence are an out-of-date idea of farming. Imagine instead patchworks of productive land broken up by windrows, perennial crops, pollinator habitat, wild areas, greenhouses, row cover, and structures and equipment necessary for diversified farming.

Re-wilding and wild-life corridors on marginal land Some POS ag land should simply be taken out of production. If productivity is sub-optimal then return these acres to short-grass prairie ecosystem and let them/help them recover native species. The crisis of species extinction requires that all land – including POS ag land – should be examined for possible wildlife habitat and corridors to allow movement of species for migration, food-sourcing, and reproduction. Increase riparian and wetland buffer zones.

New economic model for county ag land The POS ag website declares *Ag Resources is the only Parks & Open Space Division that is self-funded*. This is helpful to the county's annual budgets, but comes at enormous cost to soil-health and community values for our ag land. We need to release Ag Resources from the burden of making a profit on ag leases. Other POS properties – like Rabbit Mountain, Hall Ranch, Caribou Ranch - are not expected to make money – we don't lease them for logging or mineral extraction – they are operated as community assets for recreation, wildlife protection, and ecosystem services. We – the Boulder County taxpayers – should expect some of our tax money to pay for ag land to be operated consistent with our community goals and values.

At the same time – income on commodity crop farms seems to be very low. Taking the county's figures on leased land – the county is receiving about \$84/acre of irrigated land. A local organic vegetable grower says his net income – after all expenses – is about \$7700 per acre. Of course not all POS ag land can be operated with an intensive program of labor and high-value crop management and sales. But there could be an economic up-side with development of specialty crops and improved farming techniques.

Support farmers All open space ag lease land should receive public support for cover cropping and compost application if appropriate. If sugar beet shares represent a huge hurdle for certain farmers, then the county should buy out these shares and remove this financial issue. The county should consider supporting farmers with equipment-sharing, crop storage facilities, and a food-processing co-op. We need to provide our local food growers with crop insurance – currently they rely on social media funding to recover from setbacks like hail damage.

Replace lease model – contract farming or custom farming Leasing ag land to farmers and then allowing them to engage in harmful ag practices while taking all the risk is no longer a good option for the farmers or the citizen land-owners. The county should consider a different model for farming POS parcels – contract farming or custom farming. The county would designate crops, own the harvest, and take the risk, while farmers would continue to use their expertise and equipment for growing food/fiber under fixed price contract and crop-share arrangements.

Transparency The county needs to maintain maximum transparency regarding operations of POS ag lands. Ag Resource department budgets should be readily available. Individual ag parcel leases are public documents and should be available. The Cropland Policy requires reporting on soil health and pesticide use, and these reports need to be easily found on the POS website.

Allow negotiated delay in GMO transition Neither the county nor the farmers have provided a good-faith effort to fulfill the 2017 transition mandate. However, in order to provide a little breathing room to implement the above recommendations, the county could at maximum allow: a one-year extension on GMO corn. No extension on GMO sugar beets or neo-nicotinoids.

Support the Mad-Ag proposal In general I support the Mad-Ag proposal for their contracted services for transition of agricultural production on POS ag lands.

Addendum – Agro-ecology Model

See also these key points from the International Panel of Experts on Sustainable Food Systems.

Today's food and farming systems have succeeded in supplying large volumes of foods to global markets, but are generating negative outcomes on multiple fronts: widespread degradation of land, water and ecosystems; high GHG emissions; biodiversity losses; persistent hunger and micro-nutrient deficiencies alongside the rapid rise of obesity and diet-related diseases; and livelihood stresses for farmers around the world.

Many of these problems are linked specifically to 'industrial agriculture': the input-intensive crop monocultures and industrial-scale feedlots that now dominate farming landscapes. The uniformity at the heart of these systems, and their reliance on chemical fertilizers, pesticides and preventive use of antibiotics, leads systematically to negative outcomes and vulnerabilities.

Industrial agriculture and the 'industrial food systems' that have developed around it are locked in place by a series of vicious cycles. For example, the way food systems are currently structured allows value to accrue to a limited number of actors, reinforcing their economic and political power, and thus their ability to influence the governance of food systems.

Tweaking practices can improve some of the specific outcomes of industrial agriculture, but will not provide long-term solutions to the multiple problems it generates.

What is required is a fundamentally different model of agriculture based on diversifying farms and farming landscapes, replacing chemical inputs, optimizing biodiversity and stimulating interactions between different species, as part of holistic strategies to build long-term fertility, healthy agro-ecosystems and secure livelihoods, i.e. 'diversified agroecological systems'.

There is growing evidence that these systems keep carbon in the ground, support biodiversity, rebuild soil fertility and sustain yields over time, providing a basis for secure farm livelihoods.

Data shows that these systems can compete with industrial agriculture in terms of total outputs, performing particularly strongly under environmental stress, and delivering production increases in the places where additional food is desperately needed. Diversified agroecological systems can also pave the way for diverse diets and improved health.

Change is already happening. Industrial food systems are being challenged on multiple fronts, from new forms of cooperation and knowledge-creation to the development of new market relationships that bypass conventional retail circuits.

Political incentives must be shifted in order for these alternatives to emerge beyond the margins. A series of modest steps can collectively shift the centre of gravity in food systems.

1 June 2019/EJ

Boulder County Commissioners (for June 3, 2019, GMO Meeting),

Our small Boulder County farm borders open space on three sides and therefore we have a front row seat to the many benefits and opportunities afforded by these open agricultural and natural lands. We support the multi-pronged plan from BCPOS and Mad Agriculture for transitioning off GMO's. We believe this plan is effective, empathetic, and fair while having the potential for starting a snowball of positive impacts across Boulder County. This plan exemplifies what good government does when confronted by a complex situation.

It is clear that the transition off GMO's is a more complex problem than simply mandating a blanket move by a specific date. The adjustments made from your May meeting to June meeting respond well to the public comments and make considerable accommodations to the timing requests as well as neonicotinoid use. We agree that the transition off GMO's needs to be quick and efficient, however; it also needs to be just. Putting farmers, stressed by predatory capitalism, tariffs and climate change, out of business in Boulder County is not the outcome voters had in mind when they banned GMO's on county open space. Healthy, productive land that makes our community more resilient in the face of a changing climate is the picture we had in mind when we cast our vote. A move in any other direction has unintended consequences that threaten our community.

We believe Mad Agriculture has shaped an approach that is empathetic, individualistic and multi-pronged. It is clear that farming in BOCO is already difficult and a transition without empathy and individualistic support could be catastrophic to our local farming community.

We also believe that this transition, done right creates a snowball effect with other conventional farmers on open space and into the private lands of the Boulder County farming community. According to [Project Drawdown, carbon sequestration on farmlands through regenerative and conservation agriculture](#) are among the top 10 solutions to the global climate crisis. This snowball toward healthier soil, carbon sequestration, and better water retention could remove petrochemical inputs while increasing local food quantities and overall profits for farmers. Further, we estimate farmers using public lands have the potential of moving these practices to their private land, that total four times more acreage than their public leases on BOCO open space. For this reason, your investment here has the potential to lead to massive impacts, both socially and environmentally. Good government helps de-risk great opportunities for individuals and businesses.

Of course, the worst case scenario is to "force" the transition in the near term and increase the bankruptcy rate of local farmers, while decreasing trust. This scenario would lead to unfarmed lands that ultimately decreased soil health and increased desertification while also decreasing the economy and lowering overall well being. BCPOS/Mad Agriculture solution mitigates this scenario.

Again, we encourage you to follow the fair, just, and empathic approach put forward by your team and Mad Agriculture. We support healthy soils, local food, thriving farmers, and carbon sequestration on the public and private lands in our watershed. By staying flexible in the timing and use of funds, you will enable the team at Mad Agriculture to learn and improve as they go. Your efforts to keep this contracting approach flexible based on early learning will pay off in both speeds as well as efficiency. These efforts are key to allowing Mad Agriculture to improve the transition approach with every farmer they advance.

Respectfully submitted,
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