



# EPA Releases Final Biological Evaluations for Glyphosate, Atrazine, and Simazine

## For Release: November 12, 2021

After consideration of public comments, EPA has finalized its biological evaluations (BEs) for glyphosate, atrazine, and simazine, three herbicides that are used to control a variety of grasses and broadleaf weeds. EPA has also released a summary document of comments received on the draft BEs and EPA's responses. A BE is a document that contains EPA's analysis of the potential effects of a pesticide on federally threatened or endangered species and their designated critical habitat. It includes any conclusions that the pesticide may affect, and is likely to adversely affect, any of these species or habitats.

EPA evaluated glyphosate, atrazine, and simazine to determine whether they may affect one or more species listed under the Endangered Species Act (ESA) or their designated critical habitats. The BEs find that all of these chemicals may affect, and are likely to adversely affect, certain listed species or their designated critical habitats. These evaluations encompass all registered uses and approved product labels for pesticide products containing these three herbicides.

The "likely to adversely affect" (LAA) determination means that EPA reasonably expects that at least one individual animal or plant, among a variety of listed species, may be exposed to the pesticide at a sufficient level to have an effect, which will be adverse. The LAA threshold for a BE is very sensitive because the likely "take" of even one individual of a species, which includes unintentional harm or death, triggers an LAA

determination. This is the case even if a species is almost recovered to a point where it no longer needs to be listed. As a result, there is a high number of "may affect" and LAA determinations in these BEs. An LAA determination, however, does not necessarily mean that a pesticide is putting a species in jeopardy. Jeopardy determinations will be made by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (collectively "the Services") in the course of formal consultation that evaluates any effects of the pesticides on entire species.

In early 2021, atrazine and simazine registrants requested to voluntarily prohibit use of atrazine and simazine in Hawaii, Alaska, and the U.S. territories and to delete certain uses from their product registrations. Registrants took this action to reduce the potential overlap between where these pesticides can be used and listed species and their critical habitats. Atrazine uses were cancelled for roadsides, Conservation Reserve Program land, conifers, including Christmas tree plantings, timber and forestry, and miscanthus and other perennial bioenergy crops. Simazine uses were cancelled for shelterbelts and forestry (except for Christmas tree plantings). EPA issued a notice of receipt of the use cancellation requests on June 23, 2021, and a final notice [☑ <https://www.regulations.gov/document/epa-hq-opp-2021-0377-0002>](https://www.regulations.gov/document/epa-hq-opp-2021-0377-0002) to terminate certain uses and cancel certain products containing atrazine and simazine on November 1, 2021. In reducing potential overlap, the geographic use prohibitions and voluntary use cancellations effectively reduced the number of LAA determinations in the final BEs for atrazine and simazine.

In January 2021, the only propazine registrant requested to voluntarily cancel its remaining product registrations. On June 8, 2021, EPA issued a final cancellation order [☑ <https://www.regulations.gov/document/epa-hq-opp-2021-0132-0002>](https://www.regulations.gov/document/epa-hq-opp-2021-0132-0002) for propazine, which terminated the last propazine products registered in the United States, therefore EPA did not complete a BE for propazine.

The Services will use the information in EPA's final BEs for these three herbicides to develop their biological opinions (BiOps). The Services may also conduct additional analyses and use additional information that EPA and the applicants provide to support their BiOps. In a BiOp, the Services document their determination of whether a pesticide is likely to jeopardize the continued existence of the species and whether there will be adverse modification to its designated critical habitat. If jeopardy or <sup>^</sup> adverse modification is determined, the Services, with input from EPA and the

registrants, will propose additional protections.

Read the final biological evaluations for glyphosate <<https://epa.gov/endangered-species/final-national-level-listed-species-biological-evaluation-glyphosate>>, atrazine <<https://epa.gov/endangered-species/final-national-level-listed-species-biological-evaluation-atrazine>>, and simazine <<https://epa.gov/endangered-species/final-national-level-listed-species-biological-evaluation-simazine>> ON OUR website. To learn more about these BEs, see the Frequently Asked Questions <[https://epa.gov/system/files/documents/2021-11/glyphosate-atrazine-simazine-final-be-faqs-2\\_2.pdf](https://epa.gov/system/files/documents/2021-11/glyphosate-atrazine-simazine-final-be-faqs-2_2.pdf)>.

Read the response to comments document <<https://epa.gov/system/files/documents/2021-11/finalresponse.pdf>>.

---

[Pesticides Home <https://epa.gov/pesticides>](https://epa.gov/pesticides)

---

[A-Z Index <https://epa.gov/pesticides/z-index-pesticide-topics>](https://epa.gov/pesticides/z-index-pesticide-topics)

---

[Antimicrobial Pesticides <https://epa.gov/pesticides/antimicrobial-pesticides>](https://epa.gov/pesticides/antimicrobial-pesticides)

---

[Biopesticides <https://epa.gov/pesticides/biopesticides>](https://epa.gov/pesticides/biopesticides)

---

[International Activities Related to Pesticides <https://epa.gov/pesticides/international-activities-related-pesticides>](https://epa.gov/pesticides/international-activities-related-pesticides)

---

[Contact Us <https://epa.gov/pesticides/forms/contact-us-about-pesticides>](https://epa.gov/pesticides/forms/contact-us-about-pesticides) to ask a question, provide feedback, or report a problem.

LAST UPDATED ON OCTOBER 10, 2023



## Discover

- **Accessibility Statement** <<https://epa.gov/accessibility/epa-accessibility-statement>>

## Connect.

**Data** <<https://epa.gov/data>>

**Inspector General** <<https://www.epaoig.gov/>>

## Ask.

**Contact EPA**  
<<https://epa.gov/home/forms/contact-epa>>



## Why avoid pesticides?

Pesticide is a general term that includes insecticides, herbicides, fungicides, rodenticides or any substance or mixture of substances that can kill, repel, or interfere with a target organism. Long-time city policy aims to reduce and eliminate the use of pesticides. Why?

Pesticides are chemicals that are designed to harm organisms and are intentionally released into the environment for that purpose. In most pesticide applications, the majority of the pesticide never reaches the target pest, but instead travels into the air, water and soil where non-target organisms are exposed. It's commonly assumed that a pesticide will only kill or harm the target pest, but pesticides almost always interfere with the physiology and/or behavior of other living organisms. When non-target organisms share a similar physiological pathway with a pest, the non-target can be directly hurt or killed when exposed to the pesticide - e.g. most insecticides have broad-spectrum action since animals, including humans, share the same type of nerve cells and neurotransmitters with insects. Or sometimes a pesticide can interfere with a physiological pathway that is completely different than the mode of action for the intended pest. Fungicides and herbicides may have one mode of action for a fungus or weed, yet interfere with the physiology in vertebrates through completely different mechanisms than the way the pesticide might kill the pest. The herbicide atrazine is an example of a pesticide designed to kill plants that causes major reproductive impacts at extremely low concentrations to animals and is associated with multiple issues in humans including cancer and urogenital birth defects. The fungicide benomyl is toxic to humans in very low doses. These problems are often discovered after the product has been on the market for many years and it can take decades for these products to be removed from the market. The U.S. allows continued use of pesticides like atrazine and benomyl despite overwhelming evidence of harm, while these

products are banned in other countries.

Pesticides have been shown repeatedly to adversely impact soil, freshwater ecosystems, amphibians, insects, birds, coral reefs, coral fish, marine mammals, etc. The regulatory process is not adequate to appropriately estimate the ecological risk from pesticides or to humans, particularly children. As the EPA phased out the use of problematic pesticide groups like the organophosphates and carbamates, newer pesticide groups like the neonicotinoids and pyrethroids have increased the toxic load of agricultural lands by 50-fold. These newer products that were intended to be safer have contributed to catastrophic insect and wildlife declines.

Not only do pesticides directly harm organisms, but through both direct and indirect effects, entire ecosystems are impacted. As biodiversity continues to decline from multiple stressors, the worlds' academies of science are calling on world leaders to take urgent action to reverse these trends.

## **Pesticide impacts on human health**

Pesticides are associated with multiple human health issues.

Developmental windows during gestation are particularly vulnerable times for pesticide exposure and can lead to birth defects. Pesticide exposure in children is linked to cancer and cognitive disorders like autism and ADHD. Pesticide exposure in adults is associated with reproductive disorders.

We're exposed to pesticides and dozens of other synthetic chemicals in daily settings. Eliminating these chemicals in our homes, schools and workplaces and transitioning our food system to regenerative agriculture will protect our health and help reverse declining biodiversity.

## **Pesticide use on city property**

Turf grass on city properties, including athletic fields, has been managed without pesticides (herbicides, fungicides and insecticides) since 2002. Landscaped areas of parks and medians are also pesticide-free.

Almost all pesticides are banned on city property, including the neonicotinoids and glyphosate (active ingredient of Roundup). Before a pesticide can be considered for use, it must be assessed with a review of the regulatory data and peer-reviewed literature. The results are run through hazard criteria and categorized. Any pesticide use has to be justified. Before city staff can consider applying a pesticide on the city's Approved Pesticide List, they must use the city's Integrated Pest Management decision process and show that non-chemical methods are not feasible and that the undesired organism has exceeded a threshold.

## **Notification of Pesticide Applications**

City staff are required to notify the public of any pesticide application on city property. This dashboard is updated weekly to provide information about the location, product, application method and target pest. Click on the marker on the map to see details about the pesticide applications.

**This dashboard can take some time to load. Please be patient.**

## **Should Indaziflam (Rejuvra™) Be Sprayed on Front Range Parks and Open Space land?**

G. Robert Brakenridge  
Institute of Arctic and Alpine Research  
University of Colorado, Boulder, CO  
robert.brakenridge@colorado.edu

### **The Chemical**

Rejuvra™ is a proprietary formulation of active ingredient (indaziflam, 19%) and the rest undisclosed adjuvants. It was approved in mid-2020 by the Trump Administration EPA for weed control on rangelands <sup>1</sup>.

Another product, Esplanade 200c™, is also 19% indaziflam and has been marketed by the same company since at least 2014. The only difference between Esplanade™ and Rejuvra™ is that the last is labeled for application on pasture or rangeland which will be grazed. Previously, the same formulation, marketed as Esplanade, carried this restriction: “Do not graze or feed forage, hay, or straw from treated areas to livestock”. The relaxing of this restriction for Rejuvra™ is based on EPA judgement concerning the likelihood of indaziflam and daughter chemical residues in food reaching levels above thresholds of concern.

When sprayed onto the land surface, this synthetic petrochemical binds to the topsoil a few inches below the surface. It thereby prevents germination of all shallow-rooted annual species (including, for example, cheatgrass). The chemical degrades under typical environmental conditions to other daughter (by-product) chemicals, but only slowly; it continues to poison all annual seedlings for up to 4 years.

It is a pre-emergent herbicide. It stops seedlings from sprouting and does not kill most already-green vegetation. Perennial plants sending up shoots from roots below the indaziflam barrier are unaffected. Persistence in the soil layer over at least several years is important for the objective: suppressing annual plants and allowing perennials to grow instead.

### **The Target**

The benefit of this relatively newly invented chemical for weed control along the Colorado Front Range is that it inhibits annual plants and may allow more perennial grass to grow. This requires, however, that such plants and deep seeds and roots are already present in treated areas or that reseeding is accomplished. The herbicide treatment can thereby improve rangeland productivity by providing better forage for cattle. After the annual non-native grasses and plants, such as cheatgrass, are controlled, the perennial grasses can, potentially, take their place.

Front Range, Colorado parks and open space lands include large parcels that are managed for plant and animal conservation. The goal in such properties is to maintain “natural” vegetation and wildlife, reduce negative effects from past land use such as overgrazing and soil erosion, and also, where possible, reduce risk to surrounding areas from wildfire.

In regard to the last, cheatgrass is well-known for its “fire ecology” in the arid sage brush-dominated areas of Utah, Nevada, and other states. After cheat invasion, previously nearly bare-ground desert soils host dense, monocultural stands of cheat. This is prone to fires after it dies in mid-summer. After wildfires occur, leaving bare soil, the cheat then re-invades. Cheat provides some benefit, however, to local herds of antelope, bighorn sheep and other herbivores: important forage in the spring. It was planted by ranchers in the mid-20<sup>th</sup> century in some of these arid lands to provide more cattle forage. However, there is increased risk to local human settlements from wildfire: the cheatgrass provides fuel for such where there was very little before.

Cheat is non-native and considered a noxious weed in most western states, but efforts to eradicate it where it is present have been largely unsuccessful. Climate change may be favoring its further spread, as may also be the case for human-related disturbance in urban fringes. Unlike in arid sagebrush ecosystems, cheatgrass is not invasive in healthy Front Range grasslands and shrublands. It mainly colonizes bare ground. Where dense monocultural patches of it occur, this is commonly due to prior disturbance that has suppressed vegetation and provided bare soil areas for cheatgrass germination. Compared to native grasslands and shrublands, cheatgrass provides a lower fuel loading. Dry grass of any species, however, poses a fire hazard risk when growing adjacent to homes or farm storage structures. In such hazardous locations along the Front Range, replacing cheat with perennial grass does not reduce this risk because the latter is also seasonally dry and brown.

The barbed seeds (awns) of cheatgrass can harm cattle or horses that feed on it. Around urban areas also, pets can suffer from the seeds being embedded in noses, mouths, paws, and ears. Like many native plants, cheat is prickly, and perennial grasses are more desirable in settled areas.

### **The Product Label**

The question now to be addressed is: should the cheatgrass growing in Front Range open space natural landscapes be controlled by Rejuvra™ applications?

The EPA-approved product label <sup>1</sup> includes relevant information. On it, the maker warns about the persistence in the environment, the chemical’s ability to be transported off-site, and the bare-ground issue. It states that a reseeded program is needed when treating cheatgrass. From the product label:



- “This product is classified as having a high potential for reaching surface water via runoff for several months or more after application.”
- “DO NOT apply when powdery dry soil or light or sandy soils are known to be prevalent in the area to be treated. Treatment of powdery dry soil and light sandy soils, when there is little likelihood of rainfall soon after treatment, may result in off target movement and possible damage to susceptible crops and desirable vegetation.
- Injury to crops or desirable vegetation may result if treated soil is washed, blown, or moved onto land used to produce crops or land containing desirable vegetation.
- Applications should be made only when there is little or no risk of spray drift or movement of applied product into sensitive areas. Sensitive areas are defined as bodies of water (ponds, lakes, rivers, and streams), habitats of endangered species and non-labeled agricultural crop areas.
- Removal of dense stands of annual grasses or other weeds in degraded areas with few perennial species remaining may result in large areas of bare ground devoid of vegetation. Before making applications in such areas, a multi-year restoration management plan should be in place.

The *Boulder County Weed Management Plan* is now in review. Clearly, it should be responsive to these and other warnings on the product label. There are dense stands of cheatgrass in some areas. They have been and are the target of Rejuvra™ spraying campaigns, including from the air. Application of the chemical in any areas that will not be reseeded or otherwise managed to prevent cheatgrass return violate the EPA product label: which sets a minimum standard for legal use. Where applications have occurred without such a multi-year restoration management plan, they are in violation of the product label, and potentially against federal law.

In this regard, cheatgrass does provide some ecosystem services. Where it grows on sloping land, it reduces runoff and erosion. In areas managed for nature, it may be more desirable than no vegetation cover. The long term goal is expansion of perennial native grasses into these treated areas. But simply spraying the Rejuvra™ cannot accomplish this. Instead, as noted, reseeding and a restoration plan to prevent the chemically-induced bareground from becoming overgrown with cheatgrass is necessary. However, the cost for this over large areas of thousands of acres may be too high to be practical.

### **Other Ecosystem and Public Health Effects**

The native flora consists of both deep- and shallow-rooted species; all of the latter will be controlled. This includes threatened and endangered Colorado species if they are present

in the treated acreage. In lands managed for conservation of natural ecosystems, the potential loss of such species must be of major concern.

Some examples of undesirable effects:

1. From a Boulder County-sponsored study<sup>2</sup>: "For (short-lived) native species, in burned areas, richness was 75% lower in sprayed areas than unsprayed areas, and this difference was highly significant" (page 11). The study also documents significant losses in species richness for native long-lived forbs in sprayed *unburned* areas. Native long-lived grasses as well exhibited decreased richness in sprayed parcels. The spraying mainly favored perennial non-native grasses (see their Table 4)<sup>2</sup>. The chemical applications in this case actually favored non-native species
2. Such results agree generally with those of other field studies from other western U.S. locations which show pervasive and undesirable plant ecological effects<sup>3,4, 5</sup>. Meanwhile, inventories of native plants on Boulder County open space lands document the many native species that will be controlled if they are within the area treated by Rejuvra™<sup>6</sup>.
3. Potential negative effects on local aquatic ecosystems and soil microbiota are expected and have been observed in some studies. It is especially concerning that indaziflam is being stored in the tissue of aquatic organisms such as mussels. In some cases, however, it is the surfactant or other non-active ingredients that are the cause of negative effects<sup>7-10</sup>.
4. Indaziflam itself is newly determined to be a potent amoebicide<sup>11</sup> and is thus expected to poison this component of soil microbiota<sup>12</sup>.
5. There may also be undesirable indirect ecological effects from the point of view of wildlife conservation. The decimation of all annual plant species in the areas to be treated could have major effects on local native insect and bird species<sup>13,14</sup>. Cheatgrass has for many decades been resident in the Front Range foothills ecosystem. It provides a food source for deer, elk, and big horn sheep at a potentially critical time in early spring<sup>15,16</sup>. If we are to expend major effort in attempting local eradication of cheat, evaluation of the expected benefits versus the expected losses is clearly in order.
6. Finally, the product was considered not likely to be carcinogenic to humans according to the EPA standards when it was approved. However, a new study demonstrates that in fact it is genotoxic to standard Hep2 (human) cells<sup>17</sup>. Because of how recently indaziflam was approved for use, and its persistence in the environment and ability to be transported after rainstorms into drainages, this potential new hazard is important. It is likely that the tolerance thresholds for indaziflam residues in food could in the future be set much lower if further studies

confirm such findings, and in this case also the approval for rangeland use would require reconsideration.

### **Rejuvra™ in Boulder County's Version 2 Weed Management Plan**

Many of these concerns have been previously raised with the agency (Boulder County Parks and Open Space) charged with preparing a revision to Boulder County's Weed Management Plan. A helicopter spraying campaign against cheatgrass using Rejuvra™ has now been modified to aerial drone applications. However, in the version 2 Plan, this spraying campaign has so far been otherwise left as is. It would treat an additional 3000 acres of open space land for cheatgrass in the name of "biodiversity", without acknowledgement of any negative effects on the ecosystem or public health. It also is not accompanied by a restoration program designed to address the bare ground issue. Here below is text quoted from this Draft Plan:

*"Since 2019, BCPOS has successfully conducted treatments on about 4,300 acres of cheatgrass infestation within High Biodiversity Areas. And now, populations of cheatgrass within those treatment areas have been largely eradicated. Without competition from that cheatgrass, native plant communities in the treatment areas have rebounded from native seed source still present in the soil.*

*These past treatments have consisted of broadcast herbicide application to infested areas accompanied by ongoing monitoring. Going forward, drone application is planned for foothills areas where access is challenging due to steep and/or rocky terrain. These properties are identified with an asterisk (\*) in the list below and identified on Implementation Map B-4b, Drone Application for Biodiversity Preservation. The drone application areas are about 3,000 acres in total."*

This text asserts that 4300 acres of cheatgrass have been "largely eradicated" where sprayed, and that native plant communities are rebounding. These already-treated areas are not, however, mapped, nor is any evidence presented for the resurgence of native plants on them.

Also, the 7300 total acres likely does include local drainages and wetlands, and rare and endangered plants. There is no detailed surveying of such, and no establishment of the critical buffers needed for drainages and local wetlands; at least not published in any of the associated planning documents. Given the acute toxicity of this chemical to aquatic invertebrates, fish, and (very likely though untested) amphibians and reptiles, this is an glaring omission in a Plan purporting to be about protecting biodiversity.

To emphasize this point, it is also the case that in the version 2 Plan there is no evaluation of any negative effects of this past and proposed chemical treatment whatsoever. This is surprising: even in the cheat control studies in which indaziflam is one of the chemicals used, and which include conclusions that it is a useful tool in rangeland restoration, there

is included abundant information on negative effects on non-target species<sup>18</sup>. The science is there to consider such effects and incorporate into decision-making, but the Weed Management Plan is silent on them.

To summarize:

- There is no long-term restoration plan for the treated acres described,
- There is no monitoring program described for evaluating where and which native plants are returning, and
- No monitoring is described for Rejuvra™ and daughter chemical levels in the soils and runoff and the soil and aquatic biota.

### **Recommendations**

Rejuvra™ should not be sprayed on Front Range parks and open space land before demonstration that the expected ecological benefits will outweigh the expected negative effects. This is necessary work that should proceed any large scale spraying campaign of this chemical. Per the product label, it should also not be sprayed without specific long term management plans directed at re-establishing the vegetation cover.

After several years of chemical use on these properties already, there are still no data concerning whether (or not) any of the chemical has found its way into local wetlands or surface water after storm events. No assays have been performed. After completion of the planned work, a total of 7300 acres of land will have been aerially sprayed with this chemical formulation absent any assessment of the benefits and the drawbacks. This should be unacceptable given that the goals of such work are ecological in character.

Badly needed are metrics to assess progress towards specific ecological goals. Thoughtful study and analysis of fundamental questions could be accomplished, to address questions such as: 1) Where is the target species (cheatgrass) actually providing a net ecosystem service and need not be controlled at all. Where is its growth instead indeed posing an actual ecological threat? 2) What are the long term plant succession prospects in “pure” cheatgrass stands in typical Front Range grasslands and shrublands? Are they now fixed in cheatgrass cover, or will other shrubs and grasses eventually be established without any control interventions? Finally, 3) Are climate change and urban fringe-related NOx pollution now promoting rapid cheatgrass spread? Land management for ecological restoration purposes requires efforts to answer such urgent but difficult questions.

### **Two Sample Recommendations From Other Agencies**

Even state extension services that accept chemical weed control as a central tool for cheatgrass control provide clear guidance about the steps that need to be taken to accomplish the management objective. For this (cheatgrass) weed target, spraying campaigns alone do not work.

Below is one such guidance from the Montana State University extension service. It highlights several matters detailed above: the persistence of this herbicide in the environment, the accompanying need for post-spraying monitoring, and the requirement for long term management plans including reseedling.

*“If planting desired species into areas treated with Rejuvra™; avoid planting for at least 8 months and then conduct a field bioassay to determine residual herbicide effects on desirable species. The active ingredient persists, which is ideal for annual grass control, but needs to be taken into consideration if revegetation is necessary as part of an integrated weed management plan”*

<https://www.montana.edu/extension/judithbasin/crops-and-livestock/news-and-alerts/rejuvra-epa-approval-rangeland.html>”

Also see a review jointly conducted by the Massachusetts Department of Environmental Protection Office of Research and Standards and the Massachusetts Department of Agricultural Resources regarding indaziflam applications in rights-of-way. It describes the critical importance of determining areas where aquatic species as well as amphibians and reptiles may be in residence and thus directly affected by applications of this chemical. Again, these are concerns that are entirely absent from the version 2 Boulder County Weed Management Plan but which certainly should be included. From that governmental agency review:

*“However, impacts to amphibians and reptiles are based on surrogate toxicity information for fish and birds respectively, and as such have additional uncertainty. Therefore, additional precautions should be taken as warranted to identify potentially significant amphibian and reptilian habitat prior to application. Sensitive non-target plant species have been identified as organisms of concern. Given that herbicides are designed to control plants, this is not surprising. This information, coupled with the fact that indaziflam is moderately mobile and some of its metabolites are highly mobile strongly indicates that application of indaziflam should be targeted as much as possible to avoid impacts on non-target plants. Measures that minimize drift should be used in applying this product. In addition, as with any application, a preliminary field survey should be conducted prior to application to identify any plants on the endangered species list and/or any other plant species that are important to that ecosystem.”*

<https://www.mass.gov/doc/indaziflam-2022/download#:~:text=Based%20upon%20the%20available%20database,Rights%2Dof%2DWay%20Regulations.>

- 1 Anonymous. (Bayer Environmental Science Research Triangle Park, NC, 2020).
- 2 Alba, C. & DePrenger-Levin, M. Incorporation of indaziflam (Rejuvra®) into Boulder  
County Parks and Open Space Weed Management: A Post-Fire Assessment. *Denver  
Botanical Gardens Project Report* (2021).
- 3 Hoffman, T. S. *Belowground Biodiversity Following Herbicide Application Post  
Wildfire*. (University of Wyoming, 2023).
- 4 Meyer-Morey, J., Lavin, M., Mangold, J., Zabinski, C. & Rew, L. J. Indaziflam controls  
nonnative Alyssum spp. but negatively affects native forbs in sagebrush steppe.  
*Invasive Plant Science Management* **14**, 253-261 (2021).
- 5 Meyer-Morey, J., Lavin, M., Mangold, J., Zabinski, C. & Rew, L. J. Indaziflam controls  
nonnative Alyssum spp. but negatively affects native forbs in sagebrush steppe.  
*Invasive Plant Science and Management* **14**, 253-261 (2021).
- 6 Warsh, S., de Silva, I. & Manzitto-Tripp, E. A. S. M. A floristic inventory of two Boulder  
County open space parcels: Heil Valley Ranch and Hall Ranch, Colorado. *Madrone*  
**69**, 263-285 (2022).
- 7 Defarge, N., de Vendôme, J. S. & Séralini, G. E. Toxicity of formulants and heavy  
metals in glyphosate-based herbicides and other pesticides. *Toxicology Reports* **5**,  
156-163 (2018).
- 8 Mikó, Z. & Hettyey, A. Toxicity of POEA-containing glyphosate-based herbicides to  
amphibians is mainly due to the surfactant, not to the active ingredient.  
*Ecotoxicology* **32**, 150-159 (2023).
- 9 Ruuskanen, S. *et al.* Ecosystem consequences of herbicides: the role of  
microbiome. *Trends in ecology & evolution* **38**, 35-43 (2023).
- 10 Tissot, A. G., Granek, E. F., Thompson, A. W. & others, a. The silence of the clams:  
Forestry registered pesticides as multiple stressors on soft-shell clams. *Science of  
The Total Environment* **819** (2022).
- 11 Siddiqui, R., Mungroo, M. R., Anuar, T. S. & others, a. Antiamoebic Properties of  
Laboratory and Clinically Used Drugs against *Naegleria fowleri* and *Balamuthia  
mandrillaris*. *Antibiotics* **11** (2022).
- 12 Wang, Z., Huang, W., Liu, Z. & others, a. The neonicotinoid insecticide imidacloprid  
has unexpected effects on the growth and development of soil amoebae. *Science of  
the Total Environment* **869** (2023).
- 13 Buddhadev, M., Rana, S. & Ghosh, T. S. Role of herbicides in the decline of butterfly  
population and diversity. *Journal of Experimental Zoology* **349**, 346–356. (2023).
- 14 Mallick, B., Rana, S. & Ghosh, T. S. Role of herbicides in the decline of butterfly  
population and diversity. *Journal of Experimental Zoology Part A: Ecological and  
Integrative Physiology* **339**, 346-356 (2023).
- 15 Goodson, N. J., Stevens, D. R. & Bailey, J. A. Winter-Spring Foraging Ecology and  
Nutrition of Bighorn Sheep on Montane Ranges. *The Journal of Wildlife Management*  
**55** (1991).
- 16 Schwartz, C. C. Pronghorn diets relative to forage availability in northeastern  
Colorado. *Journal of Wildlife Management* **40**, 469-478 (1976).

- 17 Adıgüze, S. K. The possible cytotoxicity and genotoxicity assessment of indaziflam on HepG2 cells. *Human and Experimental Toxicology* **42**, 1-8 (2023).
- 18 Clark, S. L., Sebastian, D. J., Nissen, S. J. & Sebastian, J. R. Evaluating winter annual grass control and native species establishment following applications of indaziflam on rangeland. *Invasive Plant Science Management* **13**, 199-209 (2020).

Thank you Commissioners for supporting the health of People and Planet time and time again, often leaders think of only short-term progress but you, women, really are compassionate, especially with the moratorium that's been in place this last year.

Here's a blast from the past, "More doctors smoke Camels than any other cigarette," "For a better start in life start coke-a-cola earlier (in your baby's bottle)," "DDT is good for meeee", "Let this magic mineral, Asbestos, protect the buildings on your farm"...these are just a few of the big, bold lies from Big Industry over this past century, that took decades for the real science to debunk. Pesticides are being debunked as we speak, we will look back on this self-imposed ecological disaster and either mourn or laugh, today's leaders will choose.

Commissioners you want a "credible land management plan" but you're asking "experts" who are at a "Earth is the center of the Universe" stage when Dr. Tim Seasteadt and Dr. Robert Brackenridge are Galileo types and The Pesticide Pushers are perpetuating a money-making dogma.

This revised Weed Mgmt. Plan is literally like a lung cancer patient saying, "he'll smoke half as much by 2030; but this year he's going to switch from 1 pack a day to 3 packs a day."

This is understandable, though, considering our current global climate. BCPOS isn't the only one sleepwalking, most of the global industries are telling their oncologists they'll quit smoking in 2050. We are looking to you, commissioners to lead us out of, what scientists are calling, the beginning of the 6<sup>th</sup> mass extinction.

WE, The People have reached our limit with environmental toxins. According to Beyond Pesticides 100 percent of US streams contain pesticide residues. THIS proposed drone spraying is a violation of our human rights to not be poisoned, just like the Nov. 1<sup>st</sup>, 2022 helicopter spraying.

The worst part is STILL, to me, the lack of transparency; and that Lyons was treated differently than wealthier neighborhoods outside of Boulder. I know an oncologist, personally. He couldn't believe that we weren't asked. He said he lives near The Boulder Reservoir and was called and asked if spraying from a helicopter was ok for Weed Mgmt. He said absolutely not since he deals with cancers that are caused by pesticides. To make matters worse, Rejuvra is 80% UNKNOWN so Lyons was sprayed with a "mystery" concoction of polymers, emulsifiers, solvents, etc....without our consent.

Two of my neighbors experienced unusual medical conditions after the aerial spray in Lyons. One was a baby with a full body rash, I'm sure you remember. Another is the father of my kids best friend who was outside in his yard on Nov. 1<sup>st</sup> watching a helicopter spraying across the street from his house without warning. He afforded the expensive test to find out that his sudden colon cancer IS in fact from environmental toxins, not genetic.