Pollution: We Wish It Wasn't There, But It Is

An Outline of the Issues We Face In East Jefferson County In the Age of Global Warming

With an Appendix on Alternatives to Toxic Herbicides

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Contents

Introduction

The environmental issues I would like to address in this outline are:

1) Global Warming: a planetary change in climate that will cause untold species extinctions and a widespread decline in resources for humans as well as other organisms

2) Toxic environmental impacts from human actions which have caused and continue to cause disease, destroy organisms, and create ecological imbalances which will take years, possibly generations, to amend. In this review, I will focus on the use of chemical herbicides and pesticides.

3) Treatment of the environment and all nonhuman species as property which is at the mercy of our whim, rather than living beings which deserve the right to be treated with decency and protected from harm, and with which we are living in equilibrium

4) A skewed power structure which allows industry to predominate over public need, and where litigation is the dominant strategy used to win over public representatives

To the reader…

This narrative is merely an outline and a work in progress. It has been abbreviated in order to make it more quickly read and referenced for further discussion and examination. All citations in this outline are valid, and can be referenced. Please contact the author with any questions.

Global Warming

Global climate change has already had observable effects on the environment. Glaciers have shrunk, ice on rivers and lakes is breaking up earlier, plant and animal ranges have shifted and trees are flowering sooner. A study published recently by the Potsdam Institute for Climate Impact Research in Germany showed that "the last time carbon dioxide was detected in the planet's atmosphere at the level it is now was during the Pliocene epoch, which took place 2.6 to 5.3 million years ago, and the sea levels were 20 meters higher." (from https://www.cnn.com/2019/04/04/health/co2-levels-global-warming-climate-intl/index.html)

Effects that scientists had predicted in the past would result from global climate change are now occurring: loss of sea ice, accelerated sea level rise and longer, more intense heat waves. NASA reports "The Northwestern United States will see changes in the timing of streamflow, which will reduce water supplies for competing demands. As sea levels rise, erosion, inundation, risks to infrastructure and increasing ocean acidity will pose major threats. We will see increasing wildfire, insect outbreaks and tree diseases causing widespread tree die-off." (from https://climate.nasa.gov/effects/)

An Increase in Ocean Acidity

The more greenhouse gases we produce, the more acidic the oceans will become. Ocean acidity is rising dangerously fast. Since the beginning of the industrial age (just 250 years ago), it has increased by about 30% worldwide. It is now rising faster than any time in the past 55 million years – much faster than we can expect plants or animals to adapt.

Scientists say that if we continue producing CO2 at our current rate, the ocean's acidity will more than double – some say it will triple – by the end of this century. Seawater this corrosive will cause immense damage to marine life. In an acidic ocean, certain animals will thrive: for example, jellyfish, some seaweed, and the disease-causing Vibrio bacteria.

As acidity increases, animals with shells will grow more slowly and their shells will be weakened. Once the acidity level is high, seawater will dissolve the shells of living animals. Warmer temperatures are also a factor in shell formation. (Ocean Warming, More than Acidification, Reduces Shell Strength in a Commercial Shellfish Species during Food Limitation. from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3904920/)

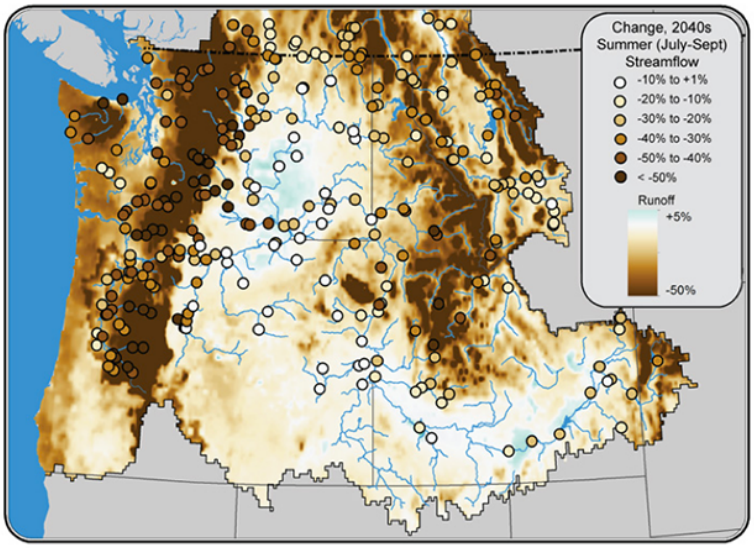
An Increase in Forest Fires

The University of Washington's College of the Environment states, "Rising temperatures, decreased snowpack, and earlier snowmelt are expected to lead to longer fire seasons, dryer fuel, and an increase in the area burned by wildfires in the future. Forest managers therefore need information on how wildfire patterns and forests will change as the climate warms, in order to guide management activities that can sustain the important ecosystem services that forests provide – including timber production, carbon storage, improved water quality, and recreational opportunities."
(from https://nwcasc.uw.edu/science/project/changing-fires-changing-forests-the-effects-of-climate-change-on-wildfire-patterns-and-forests-in-the-pacific-northwest/)

A Shortage of Water from Reduced Snowpack

The snowpack in the Cascade Mountains has decreased about 20 percent since 1950. And in some areas, snow is melting about 30 days earlier than normal, which affects how our water is distributed into the environment. The Climate Reality Project states, “The effects spill throughout the region. With less water running down mountain streams in summers, scientists expect less water will become available to power the region's hydroelectric dams. And because the Northwest generates 40 percent of the nation's hydropower, there could be real economic consequences in the region and beyond.”

Reduced Summer Flows



The image above shows the projected changes in water runoff and streamflow for 2040, as compared to 1915–2006

Rising Sea Levels

Puget Sound has already seen an increase of more than 6 inches in the last century. It’s impossible to know exactly what to expect, but a new report led by Washington Sea Grant and the University of Washington’s Climate Impacts Group provides the clearest picture yet of what to expect in Washington state. The new report provides probabilistic estimates for 171 coastal sites each decade from now until 2150.

Overall, the new report gives a statewide estimate for about 1.5 feet of sea-level rise by 2100 if we manage to limit future greenhouse emissions. The upper bound for 2100, with emissions reductions, is about 7 feet, incorporating the latest science on Antarctic glaciers that increases the amount of possible sea-level rise under certain scenarios.

PROJECTED RELATIVE SEA LEVEL CHANGE FOR 2100
(feet, averaged over a 19-year time period)

Location	Vertical Land Movement Estimate	Greenhouse Gas Scenario	Central Estimate (50%)	Likely Range (83-17%)	Higher magnitude, but lower likelihood possibilities		
					10% probability of exceedance	1% probability of exceedance	0.1% probability of exceedance
Tacoma (47.3N, 122.4W)	-0.5 ± 0.2	Low	2.1	1.5-2.7	3	4.6	7.9
		High	2.5	1.9-3.3	3.6	5.3	8.8
Neah Bay (48.4N, 124.6W)	1.1 ± 0.3	Low	0.5	-0.1 - 1.2	1.5	3.1	6.3
		High	1	0.3 - 1.7	2	3.8	7.4
Taholah (47.4N, 124.3W)	0.3 ± 0.5	Low	1.3	0.6-2.1	2.4	3.9	7.1
		High	1.7	1.0-2.6	2.9	4.6	8.1

This table shows the projections for feet of sea-level rise by 2100, taking into account geologically-driven vertical land motion, at three locations on Washington's coasts: Tacoma, Neah Bay and Taholah on the Quinault River. The white rows are for lower future emissions, and the yellow rows are for higher future emissions. Columns on the right are less likely, but still possible, scenarios, with the percent chance that each one could occur. *Projected Sea Level Rise for Washington State - 2018 Assessment*

Summary

We are already seeing the results of human behavior, namely

- the introduction of more carbon into the atmosphere via industrial emissions
- plastics in the environment in the form of waste
- chemicals basically everywhere, including in our own bodies, from the use of pesticides and herbicides and industrial waste products
- the over-harvesting of plants, animals and natural resources

Considering the future's higher temperatures, lower fresh water supply, sea water acidification, rising sea levels, and forest fires, we can assume that all of our plants, animals, insects and other organisms will be altered in some way, all struggling to adapt to these changes. Many organisms will not be able to survive. Several species have already gone extinct. Sounds pretty grim? Experts are especially looking at vegetation, microorganisms and insects, which are much more vulnerable to these changes, and which provide the basic foundation for all larger organisms, including human beings. Their existence might have felt like a nuisance, but they will be our treasured finds in the years to come.

Toxic Environmental Impacts
Forest and Weed Abatement Practices Which Adversely Affect the PNW

Chemicals: Pesticides and Herbicides

Contamination of Water
One of our main concerns with terrestrial chemical applications is the effect it has on our water supply. This diagram shows the various means of contamination to which our water supply is vulnerable. With global warming on our doorstep and water supplies diminishing, we need to protect our water as much as possible. Chemical herbicides and pesticides are a real concern to the public. They have already infiltrated the water supplies to cities and towns, and will continue to do so if we don't halt the flow into our environment. We cannot downplay their deleterious affect on health to humans, as well as other organisms.

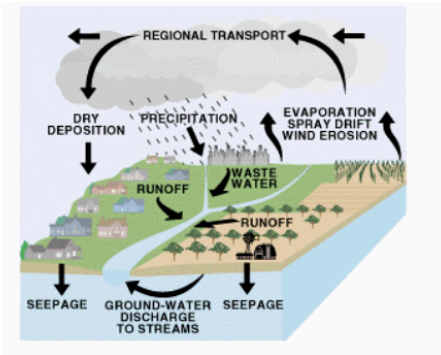


Figure 9. Pesticides applied to the terrestrial environment can be transported to the marine environment. Source: (Majewski and Capel 1995).

Drift Violations

Herbicides and Pesticides are notorious for killing vegetation and organisms beyond their intended target. Drift violations occur with frequency, and a small percentage of these are reported to the

responsible parties. Violations carry minimal fines, however, so the industry is not inclined to change its behavior in lieu of these reported violations. Even in Jefferson County, reports of drift violations are seldom acted upon in any serious manner. Many reported drift violations in our area are those reported by neighboring organic farms, which lost their produce and organic standing, which of course is devastating to their livelihood for years to come. There have also been local reports of human miscarriage and sterility in livestock due to chemical drift violations, which had no repercussions for the timber company responsible for these violations. (Jefferson County, Washington Board of Commissioner Minutes, 1985)

Evolution and Mutation of Species Due to Chemical Infiltration

Glyphosate and other herbicides have become more popular as scientists have created crops that are resistant to the effects of the chemicals. The chemical kills the weeds and other competing vegetation, but the main crop, whether it is a GMO Douglas Fir or strain of wheat, is not. However, nature's own genetic laboratory is creating weeds that are also immune to the herbicides, and we are already seeing organisms that proliferate in the sea of chemicals, or their by-products. In medicine, we have created bacteria that are resistant to the strongest of antibiotic treatment, lethal flesh-eating bacteria which are resistant to any and all treatment despite our pharmaceutical arsenal. I am not exaggerating. We are basically doing the same to our environment. The insects and organisms, which feed upon the by-products of these chemicals are not necessarily our friends. Blue-Green algae is one of those opportunistic bacteria that proliferate from the phosphate by-product of the chemical glyphosate. Our regional lakes have experienced toxic algal blooms since 2006, and it is probable that an exacerbating factor is the regional use of glyphosate and other chemicals on nearby clearcut timberland, roadsides and private gardens.

Chemicals used in agriculture, forests, roadside weed control, private landscaping, paper mills and military sites account for most of the chemical contamination we see in our regional waters, which affects our drinking water, and the Puget Sound and all of its creatures. Several Studies have been performed on deceased Orca Whales and regional salmon, all of which are inundated with high levels of chemicals. Several studies over the years have tried to capture the amount of chemical presence in our sediment that is located at the mouth of waterways and estuaries, in order to gain an understanding of what our pollution contribution may be. Our pollution enters the biosphere in many ways, however.

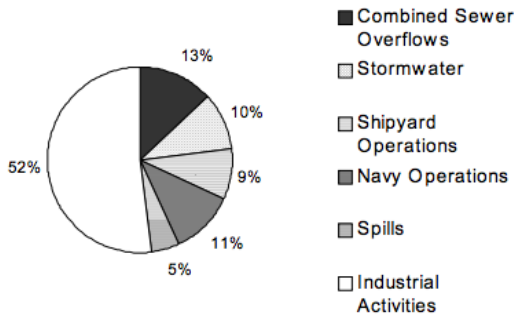


Figure 20. Industrial and urban activities are the major sources of contaminants to sediments in Washington. Source: (Washington State Department of Ecology 2000).

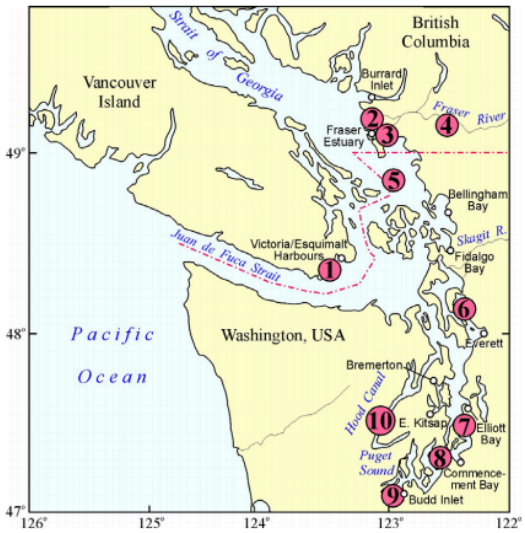
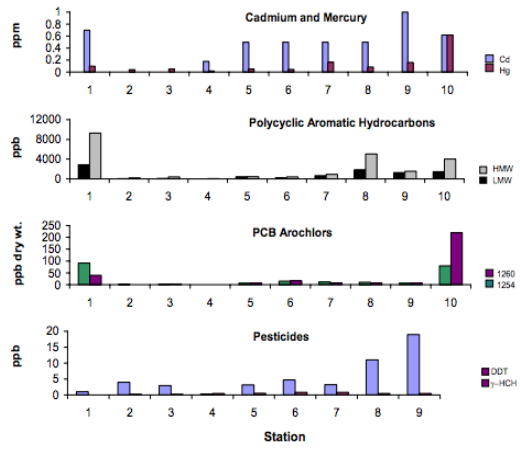


Figure 18. Contaminated sediments are concentrated in areas near large B.C. and Washington urban centers. Numbers (1-10) represent sampling stations; concentrations of metals, PAHs, PCBs, and DDT that correspond to station numbers are presented in Figure 19.



HMW-high molecular weight polycyclic aromatic hydrocarbons; LMW-low molecular weight polycyclic aromatic hydrocarbons; γ−HCH-gamma hexachlorocylcohexane

Figure. 19. Concentrations of metals, PAHs, PCBs, and DDT are concentrated in harbours and near large urban centres in B.C. and Washington. Concentrations of metals, PCBs and DDT are particularly high in Puget Sound (station 6-10). Station **1**: Victoria/Esquimalt Harbours (Foy et al. 1995); stations **2**, **3**, and **4**: Fraser River (Brewer et al. 1998); station **5**: Strait of Georgia; stations **6** to **10**: Puget Sound (Department of Ecology, 1995).

A couple examples of the effects of human chemical waste on Orca whales and salmon:
- Polychlorinated biphenyl (PCB) levels in Orca whales is large enough to cause immune deficiency and reproductive disruption, resulting in a decrease of the population to the extent that it creates a danger of extinction
- Salmon populations have decreased from approximately 900,000 in 1984 to approximately 430,000 in 2016. Pesticides and herbicides used by the shellfish industry and general effluent flowing into Puget Sound waters from the coastal human population are injuring fish (including salmon) and their food sources. A decrease in the fish population creates a decrease in the seal and orca population. This, paired with over-harvesting by humans, will create a deficiency in the fish population.

An important thing to keep in mind as we look at these studies of Orca and salmon, is that these creatures are exhibiting the symptoms of all of the organisms in our environment. These chemicals are in every living being now, and in every source of food and water. Even if we stopped using chemicals now, the detoxification process will be long and slow. But it is certain that we should stop or significantly limit our use as soon as possible.

Some other statistics on extinctions, from 2006:
Amphibians are the hardest hit. 32% of all amphibian species are threatened, representing 1,896 species. As many as 165 ampmphibian species may already be extinct.
12% of bird species are threatened.
23% of all mammal species
21% or all reptile species
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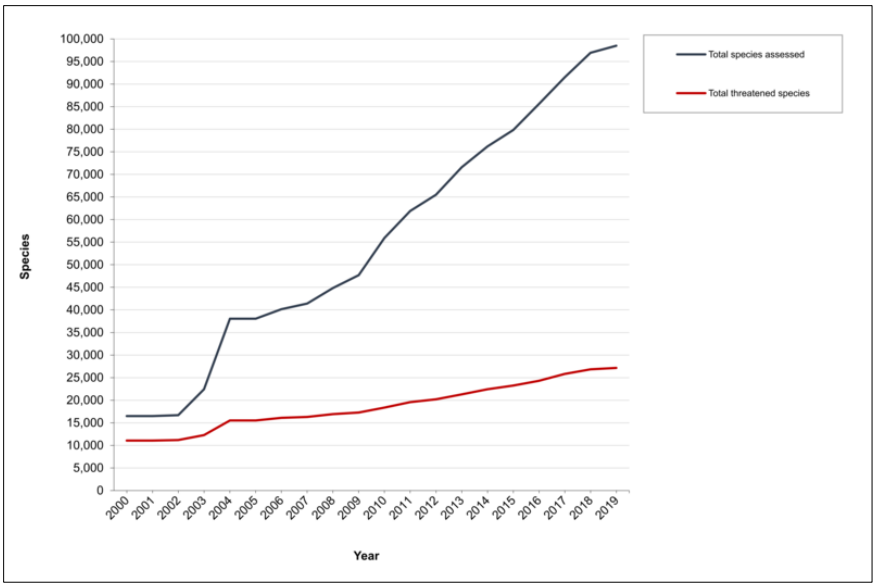

https://www.iucnredlist.org/resources/summary-statistics

Plastics

Our continual use of plastics here in the PNW, and in any area of the world, is indisputably the wrong thing to do. Plastic waste is accumulating, and we have no way of eliminating it. Plastic is poisonous to the environment and is dangerous for any creature that ingests it or becomes trapped by it. If you doubt his information, please take the time to read: Dangerous Plastics Are a Threat to Us and Future, by Meena Miriam Yust at https://www.commondreams.org/views/2019/04/04/dangerous-plastics-are-threat-us-and-future-generations

As the effects of global warming create shortages of clean water and put other strains on society and the environment, it will become increasingly necessary to manage our waste, especially plastic. That said, it is beyond the scope of this paper to research this issue at this time. All I can say is: Don't use plastic!

Summary:

- Pesticides and herbicides eliminate the good and the bad, and allow other species to proliferate
- Decreases in key animal populations, such as Orca whales, are indicators of an ENTIRE ecosystem deficiency, not just those key species
- Target species of herbicides evolve and become immune to those chemicals faster than we can design new products
- Areas of chemical infiltration are deleterious and widespread, affect every species, and invade every ecosystem
- Herbicides and pesticides are not required to undergo thorough testing
- Mistakes are commonplace with herbicide and pesticide chemical application, and the industry can easily withstand the costs of violations
- The EPA and lawmakers, from local representatives to the POTUS, are bribed and threatened with litigation into supporting them, thus placing the public at a severe disadvantage

Our Treatment of the Environment and All Nonhuman Species as Property, Profit, and Whim

In 2013, Gus Speth, a US advisor on climate change, helped found the Natural Resources Defense Council and was dean of the Yale School of Forestry and Environmental Studies said:

> "I used to think that top environmental problems were biodiversity loss, ecosystem collapse and climate change. I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a cultural and spiritual transformation. And we scientists don't know how to do that."

Most days, I witness some example of how humans believe they are superior to other humans or to other creatures. I'm not sure where we get those beliefs. I expect they have evolved alongside the diverse cultural environments that have surrounded us in the last few thousand years. Rene Descartes, a philosopher from the late 1600's, wrote: "animals are mere machines but man stands alone". Charles Darwin was one of the first to speak out against this idea. In *The Descent of Man* (1871), he wrote "There is no fundamental difference between man and the higher mammals in their mental faculties" and that all the differences are "of degree, not of kind". Many of his ideas were ignored later, as both religion and industry moved to the forefront of human society. The idea that one should act respectfully toward the environment and its creatures certainly went against the need to feel entitled, to be the chosen race or creed, and to make a profit. These human traits probably have existed as long as humans have existed. I suppose that same sense of entitlement fueled colonialism and war. It's only since the industrial age and our widespread use of chemicals that this sense of entitlement affects our environment in such a dangerous way as it does today.

As Gus Speth points out, our choice to not support our ecosystem may be rooted in our deeper spiritual beliefs. When we as humans fail to make a decision that is in our logical best interest, I assume that there is some deeper emotional or spiritual motivation at play. George Bush called our need for oil "an addiction". A very apt term to describe our behavior. Hopefully we don't have to hit bottom before we decide to manage this addiction.

Appendix A
Alternatives to Chemical Herbicides

Excerpts from recent publications on weed control without using harmful chemical herbicides

‘‘Dover, New Hampshire has just become the first city in the Northeast to purchase a steam weeding unit to manage vegetation along 30 miles of roadside. This is a cost-effective and safe method that uses water to "cook" the weeds and can even reduce the amount of weeds that grow over time by exhausting the seed bank.” http://www.nontoxiccommunities.com/news

“Rather than simply substituting allowable weed control products for banned ones, municipalities have successfully adopted alternative practices that are less reliant on chemical weed control. In places where the more toxic herbicides are not permitted, the surveyed cities have adopted two primary approaches to keep weed populations down: (1) preventing the spread of weeds through cultural practices that strengthen the growth of desired plants, and (2) suppressing weeds when they do appear, primarily through mechanical means. Typically, even the pest control products that are allowed under cosmetic pesticide bans are used infrequently, and only as a last resort. These strategies are implemented through practices such as:

- maintaining healthy turf through aeration, overseeding and fertilization
- mowing and targeted use of line trimmers
- using permitted pest control products sparingly for limited purposes.

Weed Control Is Possible Without Toxic Pesticides, Municipal Weed Control: Lessons from Ground Zero
October 2018, Canadian Association of Physicians for the Environment (CAPE)
Author: Randall McQuaker, MES, Pesticides Director, CAPE
Peer Review: Kim Perrotta, MHSc, Executive Director, CAPE

“In the wake of provincial and municipal cosmetic pesticide bans, municipalities in this survey adopted three primary strategies to maintain acceptable levels of weed control in parks, sports fields and other green spaces:

1. Implementing cultural practices to build healthy soil and nourish desired plants to prevent weeds from getting established in the first place;
2. Suppressing the growth and spread of weeds once they appear, primarily by mechanical means; and
3. Establishing different weed control priorities and levels of service for various categories of green space.

In addition to building healthy soil, cities have increased mowing in parks, on sports fields and in high-visibility green spaces, particularly in central core areas. This is a common practice for the control of dandelions in the spring. Some other areas, such as roadsides, cemeteries and outlying spaces, are mowed less frequently. Guelph mows parks and boulevards on a 10-day business cycle. Rural roadsides are mowed twice a year…

Some cities have adopted naturalization programs to re-introduce native species that will flourish and displace weeds. These ecological restoration programs aim to establish natural succession in selected areas. Once established, naturalized areas require little (or no) weed control or other forms of active maintenance, saving costs and eliminating any need for chemical intervention

Some municipalities do not use pesticides of any kind on green spaces such as sports fields. Managers report that alternative methods work successfully and it is not necessary to use even the least toxic pesticides that are allowed by the bans. For particular purposes, allowable substances are sparingly used. A common conclusion is that intensive use of permitted products would be too expensive, given the scale of municipal green spaces. This is especially so in the case of Toronto, for example, which maintains over 8,000 hectares of green space. In light of these limitations, the use of allowable products is generally targeted to specific areas. In some cities, specialized pieces of equipment (such as weed steamers) are occasionally used for non-chemical weed control. For example:

• The lower-risk substances most commonly mentioned by the survey respondents were iron chelate, horticultural vinegar, and corn gluten.
• Toronto uses horticultural soaps in beds and gardens, and acetic acid in beds and gardens and on hard surface areas.
• Richmond did not find corn gluten to be as effective as expected.
• Guelph and London use horticultural vinegar on vegetation growing out of “hardscape” (i.e. in sidewalk cracks and spaces between paving blocks).
• St. Catharines has also used a preparation based on acetic acid.
• Richmond uses hot water/steam equipment to eliminate weeds on main road sidewalks and, as needed, on aggregate walkways. St. Catharines plans to test out similar equipment.
• Cape Breton Regional Municipality has found that allowable substances such as chelated iron work satisfactorily for the purposes for which they are used.’

https://cape.ca/wp-content/uploads/2018/10/Municipal-Weed-Control-Report-October-11-2018-.pdf

Alternatives to Glyphosate
https://www.birc.org/FinalDecemberQuarterly2018

http://www.nontoxiccommunities.com/landscapes.html

References

https://science2017.globalchange.gov/

the American farmer and poet Wendell Berry. “The face of the country is everywhere marked by the agony of our enterprise of self-destruction.”

The British countryside is being killed by herbicides and insecticides – can anything save it?
“Seven years on, the statistics for the British countryside are heartbreaking.
Over a quarter of all British birds are under threat, eight species are almost extinct. Three-quarters of all flying insects have disappeared since 1945, including a staggering 60 different moths. Orchid ranges have shrunk by half; two species are gone.”
https://www.theguardian.com/uk-news/2018/may/31/herbicides-insecticides-save-british-countryside-meaows (sic)

Strange Bedfellows: Why Science and Policy Don’t Mesh and What Can Be Done About It
by Jefferey A. McNeely
http://life.bio.sunysb.edu/~spgp/Fall%202003/10_10_03/McNeely.pdf

Carbon War Room, Washington DC, USA
http://unsdsn.org/about-us/people/jose-maria-figueres/

A Pathway to Sustainable American Cities: A Guide to Implementing the SDGs
MARCH 1, 2019
http://unsdsn.org/resources/publications/a-pathway-to-sustainable-american-cities/

http://www.kristinsworld.com/2006_07_01_archive.html (a great conservationist’s blog)

SOUTHERN RESIDENT KILLER WHALES AT RICK: TOXIC CHEMICALS IN THE BRITISH COLUMBIA AND WASHINGTON ENVIRONMENT
by S.C.H. Grant and P.S. Ross
Fisheries and Oceans Canada Institute of Ocean Sciences, 2002

http://blogs.discovermagazine.com/d-brief/2018/09/28/killer-whales-at-risk-of-collapse-from-toxic-chemicals/#.XKou6JNKj8M

Why Does Gov. Inslee permit spraying of carcinogenic pesticides on Salish Sea eelgrass beds?

By David Camp • On Apr 03, 2019
• In Bellingham
https://nwcitizen.com/entry/why-does-gov-inslee-permit-spraying-of-carcinogenic-pesticides-on-salish-sea-eelgrass-beds

With Declining Orcas and Salmon, Why Do We Allow the Shellfish Industry to Poison Our Coastal Waters With Herbicides and Pesticides? by Cliff Mass, March 17, 2019
https://cliffmass.blogspot.com/2019/03/with-declining-orcas-and-salmon-why-do.html

Against Extinction: The Story of Conservation
By William (Bill) Adams

Charles Darwin
https://en.wikipedia.org/wiki/Charles_Darwin

North Olympic Group Newsletter
https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/north-olympic-group/MAR%20-%20APR%202018%20NOG%20Newsletter%201.pdf

Premier calls for new strategies for Interior forest companies
https://www.peninsulanewsreview.com/business/museum-hospital-expansion-to-use-mass-timber-john-horgan-says/

New Climate Books Stress We Are Already Far Down The Road To A Different Earth
https://www.npr.org/2019/03/25/706499110/new-climate-books-stress-we-are-already-far-down-the-road-to-a-different-earth?sc=tw&fbclid=IwAR2HldY765v3fudiGRF6L_01zcrVprxDR6Lf2BOtL2K4sfl4pckIJFtYeHE

Wild Olympic.org
http://www.wildolympics.org/forests-and-rivers/

RE-INVENTING THE UNITED STATES FOREST SERVICE: EVOLUTION FROM CUSTODIAL MANAGEMENT, TO PRODUCTION FORESTRY, TO ECOSYSTEM MANAGEMENT
http://www.fao.org/3/ai412e/AI412E06.htm