
» Collapse «

In zijn boek *"Collapse"* beschrijft Jared Diamond hoe beschavingen ten onder zijn gegaan, of integendeel zich hebben aangepast, en voortbestaan, toen ze geconfronteerd werden met radicale veranderingen in hun omgeving : (1) de vernielingen de ze zelf in hun natuurlijke omgeving hebben aangericht, (2) klimaatveranderingen, (3) vijandige buren, en (4) het verlies van handelspartners, in combinatie met (5) hun eigen aanpassingsvermogen of onvermogen.

Jared Diamond schrijft over Montana omdat hij van Montana houdt — hij vindt er rust —, maar ook omdat hij in Montana kan tonen hoe kwetsbaar en afhankelijk een land kan zijn, zelfs al is het dun bevolkt, en maakt het deel uit van een uitzonderlijk sterke politieke en economische macht — *in casu* de *States*. Hij schrijft over de mijnbouw, waarvan de grond- en watervervuiling aan elke controle ontsnapt, over de landbouw, die de vruchtbaarheid van de bodem vernielt, over de recreatieve druk en over de tweede woningen, wier rijke en machtige eigenaars een al te grote invloed hebben op het beleid van de overheid inzake natuurbeheer, zelfs in de uitgestrekte natuurgebieden die onder haar directe bevoegdheid vallen. [Meer dan een derde van Montana — *127.000 km²* — is eigendom van een openbaar bestuur.] Een heel sprekend voorbeeld van dat conflict zijn de bosbranden, die omwille van de maatschappelijke druk niet doeltreffend worden aangepakt.

Jared Diamond is zeer kritisch voor de wijze waarop de aarde en de natuur geplunderd worden, en voor de korte-termijn-keuzen die worden gemaakt. Maar hij is even kritisch voor sommige attitudes inzake milieubescherming en — in andere hoofdstukken — voor de soms beate bewondering van de wijsheid van primitieve volkeren, die vaak dezelfde vergissingen begingen als wij vandaag.

Op de volgende pagina's besteed ik aandacht aan de verzilting, de bodemvervuiling door mijnbouw, de bosbranden, het verdwijnen van de gletsjers en de bestrijding van invasieve waterplanten.

» C o l l a p s e «

"Collapse, how Societies Choose to Fail or Succeed" **(excerpts)**
Jared Diamond (2005)

Montana has the advantage of being a modern First World society whose environmental and population problems are real but still relatively mild compared to those of most of the rest of the First World.

"Every time I return to the Bitterroot, when I enter it on that stretch of road south of Missoula, that first sight of the valley fills me again with that same feeling of tranquility and grandeur, and that same perspective on my relation to the universe. It's easier to preserve that sense in Montana than anywhere else." **[Stan Falkow, quoted by Jared Diamond] That's what the beauty of Montana does to people (...).**

We associate Montana with natural beauty. Indeed, environmentally Montana is perhaps the least damaged of the lower 48 states ; ultimately, that's the main reason why so many people are moving to Ravalli County [in western Montana, Bitterroot Valley].

Montana provides an ideal case study with which to begin this book on past and present environmental problems. (...) It is part of the richest country in the modern world, and it is one of the most pristine and least populated parts of that country, seemingly with fewer problems of environment and population than the rest of the U.S. Certainly, Montana's problems are far less acute than those of crowding, traffic, smog, water quality and quantity, and toxic wastes that beset Americans in Los Angeles, where I live, and in the other urban areas where most Americans live. If, despite that, even Montana has environmental and population problems, it becomes easier to understand how much more serious those problems are elsewhere in the U.S.

Montana's environmental problems today include almost all of the dozen types of problems that have undermined pre-industrial societies in the past, or that now threaten societies elsewhere in the world as well. Particularly conspicuous in Montana are problems of toxic wastes, forests, soils, water (and sometimes air), climate change, biodiversity losses, and introduced pests.

Ik had het in Jared Diamonds boek gelezen — *"Collapse"*, Instorting, Verval — nog voor ik vertrok, en zag het met mijn eigen ogen in Montana. De laaggelegen landbouwgronden zijn vaak spierwit. De witheid die het land in de smeltende gletsjers verliest, vindt het in de verzilte en uitgedroogde waterpartijen, en in laaggelegen land. Ik zag het ook in het landbouwmuseum in Fort Benton : in sommige streken is tussen 1940 en 1970 ongeveer 20% van het landbouwareaal verloren gegaan. En is het ook vandaag nog steeds onbruikbaar. In de Amerikaanse *Great Plains* zijn op die manier miljoenen hectaren verzilt.

Er zit zout in de grond van Montana, als natrium-, calcium- of magnesiumsulfaten in de gesteenten, of als resultaat van een oude, mariene afzetting. Duizenden jaren heeft dat zout zich gedeisd gehouden. De weinige regenval (gemiddeld zo'n 30 cm per jaar, dat is minder dan de helft van wat er in Noord-West-Europa valt) werd door de endogene planten snel opgenomen, en nadien verdampt. Door irrigatie, of, vaker nog, door gewijzigde landbouwmethoden, sijpelt dat water vandaag wel verder door, tot in de zoutlagen, die het oplost. Landbouwers kweken tarwe één jaar op twee, en laten de grond een jaar rusten — onbedekt, ze wieden zelfs het "onkruid" —, en ze ploegen diep. Het zout komt in beweging, in een ondergrondse waterlaag, die het verzilt [de diepere bodem uit leisteen, zandsteen of steenkool is waterdicht], en sijpelt op lagere plekken weer naar het oppervlak : *saline seep*. Wat een eeuw geleden de beste gronden waren, want lager en natter, waar gewassen langer groeiden, en grazend vee drinkwater vond, is vandaag nagenoeg dood. Slechts een wijziging van de landbouwtechnieken en gewassen, op de lager en op de hoger gelegen gronden, kan de verzilte bodem weer bebouwbaar maken.

v e r z i l t i n g

Montana's main form of salinization is one that has ruined several million acres of cropland in the northern Great Plains as a whole, including several hundred thousand acres in northern, eastern, and central Montana.

The form is called "saline seep", because salty water building up in the ground in an uphill area percolates through the soil to emerge as a seep in a downhill area up to half a mile or farther distant. Saline seeps frequently become bad for neighborly friendship when the agricultural practices of one farmer uphill cause a saline seep on a downhill neighbor's property.

Here is how a saline seep arises. Eastern Montana has lots of watersoluble salts (especially sodium, calcium, and magnesium sulfates) present as components of the rocks and soils themselves, and also trapped in marine deposits (because much of the region used to be ocean). Below the soilzone is a layer of bedrock (shale, sandstone, or coal) that has low permeability to water. In dry eastern Montana environments covered with native vegetation, almost all rain that falls is promptly taken up by the vegetation's roots and transpired back into the atmosphere, leaving the soil below the root layer dry. However, when a farmer clears the native vegetation to practice crop-and-fallow agriculture, in which an annual crop like wheat is grown during one year and the land is left fallow the next year, there are no plant roots to take up rainwater falling in the fallow year.

That rainwater accumulates in the soil, waterlogs it below the root layer, and dissolves salts that then rise into the root zone as the water table rises. Because of the impermeable underlying bedrock, the salty water doesn't drain deeply into the ground but emerges somewhere downhill nearby as a saline seep.

The result is that crops grow more poorly or not at all, both in the uphill area where the problem arises and in the downhill area where the seep emerges.

Saline seeps became widespread in much of Montana after 1940 as a consequence of changes in agricultural practices — especially the increasing use of tractors and more efficient soil tilling devices, weed-killers to kill weed plant cover during the fallow period, and more land under fallow each year. The problem must be combatted by various intensive types of farm management, such as sowing salt-tolerant plants in the downhill seep areas to start reclaiming them, decreasing the length of fallow time in the uphill area by a crop schedule known as flexible cropping, and planting alfalfa and other perennial water-demanding crops with deep roots to take up excess water from the soil.

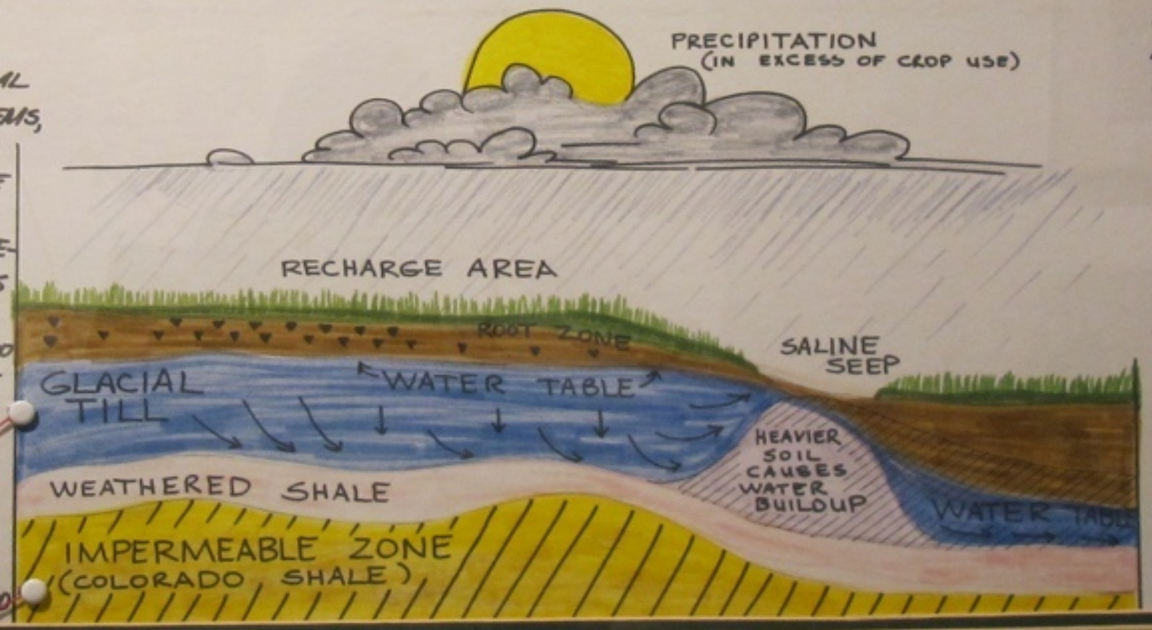
Jared Diamond — *"Collapse"* (2005, excerpt)

1 acre = 0,4 ha | bedrock = grondgesteente | crops = gewassen | fallow = braak(land) | seep = sijpelen | soil = bodem | tilling = ploegen | weed = onkruid | wheat = tarwe

Saline Seep - a soil and ground water problem caused by the DRYLAND CROP FALLOW FARMING SYSTEM.....

SALINE SEEPS ARE LOW VOLUME SPRINGS CAUSED BY THE ARTIFICIAL BUILDUP OF LOCAL SALINE GROUND WATER SYSTEMS, RESULTING FROM A CHANGE IN LAND USE FROM NATIVE RANGE TO THE CROP FALLOW FARMING PATTERN. APPROXIMATELY 300,000 ACRES OF MONTANA'S CROPLAND HAS BECOME SALINE AFFECTED, WITH OVER 3,000,000 ACRES IN THE NORTHERN GREAT PLAINS. SALINIZATION IS A MAJOR PROBLEM AFFECTING GROUND WATER RESOURCES ACROSS THE REGION.

IN THE EARLY 1970'S, MONTANA RESEARCHERS DEVELOPED



A RECLAMATION STRATEGY USING DEEP ROOTED PERENNIALS AND INTENSIVE CROPPING SYSTEMS IN UPSLOPE RECHARGE AREAS. THIS LIMITS GROUND WATER RECHARGE, AND LOWERS THE WATER TABLE.

IF THE WATER LEVEL IS LOWERED TO 6 FEET IN THE SEEP AREA, PRECIPITATION WILL LEACH SALT BELOW THE ROOT ZONE. ALTHOUGH SOILS CAN BE RECLAIMED IN A REASONABLE TIME, DAMAGE TO GROUND WATER MAY BE PERMANENT. THEREFORE, PREVENTION OF SEEPS IS AS IMPORTANT AS RECLAMATION.

De bodemvervuiling ten gevolge van de mijnbouw is minder zichtbaar. Maar daarom niet minder aanwezig. Je kan wel, in het oude mijnstadje Butte (nu nog 34.000 inwoners), naar de Berkeley Pit gaan kijken — ik heb het niet gedaan —, een enorm gat in de grond, met een diameter van anderhalve kilometer, en een halve kilometer diep. De inwoners van Butte vrezen de dampen van het water, dat na het sluiten van de mijn de vrijgekomen ruimte heeft gevuld, en dat zeer zwaar vervuild is. Behalve koper, dat in een zo hoge dichtheid aanwezig is (187ppm Cu), dat er ernstig aan gedacht werd het te ontginnen, bevat het water ook veel arsenicum, cadmium, zink en zwavelzuur. Het heeft een zuurtegraad van 2,5 pH, wat te vergelijken valt met citroenzuur. In 1995 stierf een groep van 342 ganzen nadat ze op het water waren neergestreken.

Wat je ook kan zien — of in feite niet zien — zijn de zuiverings- en natuurherstelprojecten op de Clark Fork River en de Silver Bow Creek, die een eeuw lang het zwaar vervuilde water van de mijnen hebben afgevoerd. *"Niet zien"*, omdat de verwezenlijkingen er net in bestaan dat de rivier er opnieuw natuurlijk uitziet, en in zekere mate ook is — omdat ze haar loop opnieuw zoekt, nadat dammen zijn weggebroken en vervuild slib weggevoerd werd naar een veiliger plaats.

Bodemvervuiling blijft echter vaak een onzichtbare dreiging. Montana telt zo'n 20.000 verlaten mijnen, vaak zonder verantwoordelijke eigenaar. De zuren en de zware metalen die ze lozen bedreigen de kwaliteit van het grond- en oppervlaktewater.

bodemvervuiling door mijnbouw

Clark Fork River, nabij Bearmouth (hoogte 1160 meter), met op de achtergrond de federale Highway Interstate 90 (Boston-Seattle)
[Dit is westelijk Montana, ten westen van de continentale waterscheidingslijn — *the Continental Divide* — waar neerslag wel overvloedig is.]

In 1882 the mining companies that later became the Anaconda Copper Mining Company began operations at Butte near the headwaters of the Clark Fork of the Columbia River. By 1900, Butte accounted for half of the U.S.'s copper output. Until 1955 most mining at Butte involved underground tunnels, but in 1955 Anaconda began excavating an open-pit mine called the Berkeley Pit, now an enormous hole over a mile in diameter and 1,800 feet deep. Huge quantities of acidic mine tailings with toxic metals ended up in the Clark Fork River. But Anaconda's fortunes then declined because of cheaper foreign competition, expropriation of its mines in Chile, and growing environmental concerns in the U.S. In 1976 Anaconda was bought by the big oil company ARCO (more recently bought in turn by the bigger oil company BP), which closed the smelter in 1980 and the mine itself in 1983, thereby eliminating thousands of jobs and three-quarters of the economic base for the Butte area.

The Clark Fork River, including the Berkeley Pit, is now the largest and most expensive Superfund cleanup site in the U.S. In ARCO's view, it is unfair to hold ARCO responsible for damage done by the mine's previous owner, before the Superfund law even existed. In the view of the federal and state governments, ARCO acquired Anaconda's assets, including Anaconda's liabilities. At least, ARCO and BP are not declaring bankruptcy. As one environmentalist friend told me, *"They are trying to get away with paying as little as possible, but there are worse companies to deal with than ARCO."* The acidic water seeping into the Berkeley Pit will be pumped out and treated forever. ARCO has already paid several hundred million dollars to the state of Montana for restoration of the Clark Fork, and its total eventual liability is estimated at one billion dollars, but that estimate is uncertain because the cleanup treatment consumes much power : who knows what power will cost 40 years from now ?

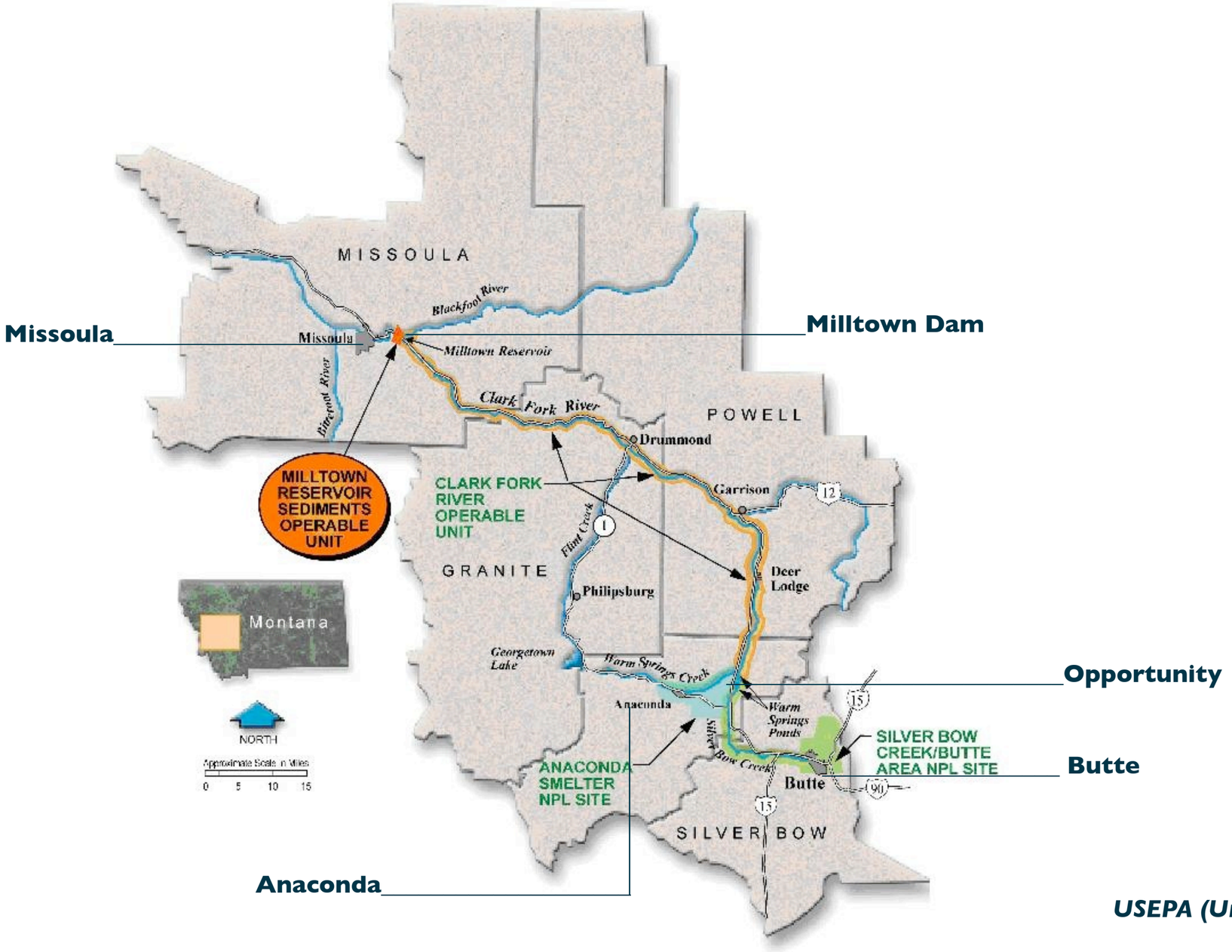
Jared Diamond — *"Collapse"* (2005, excerpt)

one billion dollars = een miljard dollar | assets and liabilities = activa en passiva | mine tailings = mijnafval | open-pit mining = dagbouw, mijnbouw door ontgraving | smelter = smelterij | Superfund = een federaal programma voor het opruimen van vervuilde sites (CERCLA-wet van 1980)

Silver Bow Creek Remediation and Restoration
een informatiebord langs de snelweg

"This sign was dedicated in fall 2010 to the purpose and goals of Silver Bow Creek environmental cleanup.

- **Remedial cleanup covers 22 stream miles of Silver Bow Creek, extending from Butte to the Warm Springs Ponds.**
- **This work is funded from a settlement with Atlantic Richfield Corporation (ARCO) completed under federal Superfund Law.**
- **The Silver Bow Creek remediation and restoration project cost is over $ 120 million.**
- **More than 80 people a year have been employed during the decade plus remediation and restoration work.**
- **Trout have been returned to portions of the creek and deer, elk and other wildlife are regularly seen on site. A mink and trumpeter swan were also seen in the remediated wetlands, indicating the ecosystem is returning.**
- **The remediation and restoration of Silver Bow Creek, perhaps the largest project of this type in the United States, has won local, national and international awards for environmental excellence.**
- **Silver Bow Creek remediation and restoration has been conducted by the Montana Department of Environmental Quality, in partnership with the Natural Resource Damage Program of the Montana Department of Justice and the Greenway Service District, and in consultation with the U.S. Environmental Protection Agency.**
- **Century old contamination was caused by flood events that discharged tailings and other mine wastes containing elevated concentrations of metals to Silver Bow Creek. These toxic discharges polluted the stream and floodplain, eliminating aquatic life."**



The Clark Fork River Operable Unit
& The Silver Bow Creek
USEPA (United States Environmental Protection Agency)

The second case involves Milltown Dam, built in 1907 across the Clark Fork River downstream of Butte to generate power for a nearby sawmill. Since then, 6,600,000 cubic yards of sediments contaminated with arsenic, cadmium, copper, lead, and zinc have been washed down from Butte's mines and accumulated in the reservoir behind the dam. A resulting "minor" problem is that the dam prevents fish from migrating along the Clark Fork and Blackfoot Rivers (the latter is the trout stream made famous by Norman Maclean's novella and Robert Redford's film *A River Runs Through It*). The major problem, discovered in 1981 when local people noticed a bad taste in drinking water from their wells, is that a huge plume of groundwater with dangerous arsenic levels 42 times higher than federal water standards is spreading from the reservoir. The dam is decrepit, in need of repair, poorly anchored, located in an earthquake zone, was nearly broken by an ice jam in 1996, and is expected to break sooner or later. No one would think of constructing such a flimsy dam today. If the dam did break and release its toxic sediments, the water supply of Missoula, southwestern Montana's largest city located just seven miles downstream of the dam, would become undrinkable, and the lower Clark Fork River would be ruined for fishing.

ARCO acquired the liability for the toxic sediments behind the dam when it bought Anaconda Copper Mining Company, whose activities created the sediments. The near-disaster in the ice jam of 1996, and fish deaths downstream resulting from releases of water with toxic copper levels from the dam then and again in 1998, triggered recognition that something had to be done about the dam. Federal and state scientists recommended removing it and its accumulated toxic sediments, at a cost to ARCO of about $100,000,000. For a long time, ARCO denied that the toxic sediments caused the fish deaths, denied its liability for the arsenic in Milltown groundwater or for cancer in the Milltown area, funded a "grass-roots" movement in the nearby town of Bonner to oppose removing the dam, and proposed instead just strengthening it, at the much lower cost of $20,000,000. But Missoula politicians, businesspeople, and the public, who initially considered the proposal to remove the dam crazy, switched to being strongly in favor of it.
In 2003 the federal Environmental Protection Agency adopted the proposal, making it almost certain that the dam will be removed.

Jared Diamond — *"Collapse"* (2005, excerpt)

1 cubic yard = 0,76 m3 (1 yard = 0,91 m)
In juni 2006 startten de werken. De vervuilde sedimenten werden per trein vervoerd naar een gecontroleerde site nabij het stadje Opportunity — *what's in name* — zo'n honderd mijl stroomopwaarts de Clark Fork River, nabij de mijnen van Anaconda en Butte.
Daar was men er niet gelukkig mee. *"Opportunity, Montana : Big Copper, Bad Water, and the Burial of an American Landscape"* — Brad Tyer (2013)

On December 16, 2011, I was one of a couple hundred history-conscious Missoulians who walked out onto a snow-covered bluff above the old Milltown Dam abutment to see something you almost never get to see: a river tangibly restored. Below us, the Clark Fork began to spill down its reconstructed streambed, joining the also-undammed Blackfoot River in free flow for the first time since the dam was built in 1908. We took pictures, though the visuals weren't dramatic. A wall of water crashing down the valley would have looked much cooler.

At first, as earthmovers upstream breached the embankment that kept the river in its temporary bypass, the restoring confluence was just a trickle you could step across—not that anyone was allowed down there to do that. By the end of the day, it had washed out its mouth and was flowing full bore in its new custom-made bed. Now it's a river. Parks are planned, and the banks have been planted, but the confluence won't be open to through-going canoeists for another couple of years.

Renaturation of the Clark Fork at Milltown
Milltown Superfund Redevelopment Working Group

***"Opportunity, Montana : Big Copper, Bad Water, and the Burial of an American Landscape"* — Brad Tyer (2013)**

Clark Fork Valley, nabij Bearmouth

Het is riskant hier een parallel te trekken tussen de afgebrande bossen die ik heb gezien (in Montana, Alberta...) en wat Jared Diamond over bosbranden schrijft.

Feit is dat hij wijst op inconsequenties in het beleid, die stoelen op een foute perceptie van het bosbestand. De bossen van de westelijke *States* zijn niet natuurlijk, omwille van meer dan honderd jaar bosbouw en begrazing door schapen, maar ook omwille van de wijze waarop op bosbranden werd en wordt gereageerd. Het zou wijzer zijn de bossen vaker te laten branden — dan is het alleen het laaghout dat brandt, en blijven de grote bomen door hun stevige schorsen beschermd — en/of de bossen uit te dunnen. Maar de perceptie van de landschappen en van de natuur staat een dergelijke aanpak in de weg.

b o s b r a n d e n

Forest fires have recently increased in intensity and extent in some forest types in Montana and throughout the western U.S., with the summers of 1988, 1996, 2000, 2002, and 2003 being especially severe fire years.

(...)

This recent increase in fires has resulted partly from climate change (the recent trend towards hot dry summers) and partly from human activities, for complicated reasons that foresters came increasingly to understand about 30 years ago but whose relative importance is still debated. One factor is the direct effects of logging, which often turns a forest into something approximating a huge pile of kindling. (...) Another factor is that the U.S. Forest Service in the first decade of the 1900s adopted a policy of fire suppression (attempting to put out forest fires) for the obvious reasons that it didn't want valuable timber to go up in smoke, nor people's homes and lives to be threatened. The Forest Service's announced goal became, *"Put out every forest fire by 10:00 A.M. on the morning after the day when it is first reported."* Firefighters became much more successful at achieving that goal after World War II, thanks to the availability of firefighting planes, an expanded road system for sending in fire trucks, and improved firefighting technology. For a few decades after World War II, the annual acreage burnt decreased by 80%.

That happy situation began to change in the 1980s, due to the increasing frequency of large forest fires that were essentially impossible to extinguish unless rain and low winds combined to help. People began to realize that the U.S. federal government's fire suppression policy was contributing to those big fires, and that natural fires caused by lightning had previously played an important role in maintaining forest structure. That natural role of fire varies with altitude, tree species, and forest type.

Foresters now identify the biggest problem in managing western forests as what to do with those increased fuel loads that built up during the previous half-century of effective fire suppression. In the wetter eastern U.S., dead trees rot away more quickly than in the drier West, where more dead trees persist like giant matchsticks. In an ideal world, the Forest Service would manage and restore the forests, thin them out, and remove the dense understory by cutting or by controlled small fires. But that would cost over a thousand dollars per acre for the one hundred million acres of western U.S. forests, or a total of about $100 billion. No politician or voter wants to spend that kind of money.

(...)

➤

logging = houthakken, bosbouw | kindling = aanmaakhout | fuel = brandstof

➤

Montanans themselves hold diverse and often self-contradictory views about forest management and forest fires. On the one hand, the public fears and instinctively dislikes the "let it burn" response that the Forest Service is forced to take towards huge fires that would be dangerous or impossible to try to extinguish. When the 1988 fires in much of Yellowstone National Park were allowed to burn, the public was especially loud in its protests, not understanding that in fact there was nothing that could be done except to pray for rain or snow. On the other hand, the public also dislikes proposals for forest thinning programs that could make the forests less flammable, because people prefer beautiful views of dense forests, they object to "unnatural" interference with nature, they want to leave the forest in a "natural" condition, and they certainly don't want to pay for thinning by increased taxes. They (like most foresters until recently) fail to understand that western forests are already in a highly unnatural condition, as the result of a century of fire suppression, logging, and sheep grazing.

Jared Diamond — *"Collapse"* (2005, excerpt)

"Though fire is a recurring force of nature and a necessary part of forest ecology, if similar dry condition continue to occur these large scale events will increase."
(Glacier National Park)

Diamond wijst op de rechtstreekse en onrechtstreekse gevolgen van de opwarming van de aarde voor de landbouw en voor de watervoorziening waar ze afhankelijk van is. Enerzijds kan de klimaatverandering een vermindering van de neerslag teweeg brengen — alles hangt af van de regio die je bekijkt : er zijn winnaars en verliezers, en het nu al droge Oost-Montana hoort allicht bij de verliezers. Anderzijds wordt de verdeling van de neerslag over het jaar flink verstoord. Gletsjers smelten en sneeuw blijft minder liggen. Dat is winterse neerslag die de lente- en zomerse gewassen niet meer ten goede komt. Daar komt bij dat het beheer van de watervoorraden danig ontregeld is : er werden meer water-rechten toegekend dan er water is. Ook de waterkwaliteit laat te wensen over, door overbemesting (*"every farmer growing hay adds at least 200 pounds of fertilizer to each acre of land, but it is unknown how much of that fertilizer ends up in the river"*), huiselijk afvalwater, en bodemverontreiniging door de mijnbouw.

Van de 150 gletsjers die in de negentiende eeuw in *Glacier National Park* werden geteld, zijn er vandaag nog 35 over.
In 2030 blijft er wellicht geen een.

klimaatverandering

Een interactieve maquette in het bezoekerscentrum van Glacier National Park toont hoe er steeds minder gletsjers zijn.

The ultimate reason for decreasing amounts of water is climate change : Montana is becoming warmer and drier. While global warming will produce winners as well as losers in different places around the world, Montana will be among the big losers because its rainfall was already marginally adequate for agriculture. Drought has now forced abandonment of large areas of farmland in eastern Montana, as well as in adjacent areas of Alberta and Saskatchewan. Visible effects of global warming in my summering areas in western Montana are that snow in the mountains is becoming confined to higher altitudes and often now no longer remains throughout the summer on the mountains surrounding the Big Hole Basin, as it did when I first visited in 1953.

The most visible effect of global warming in Montana, and perhaps anywhere in the world, is in Glacier National Park. While glaciers all over the world are in retreat — on Mt. Kilimanjaro, in the Andes and Alps, on the mountains of New Guinea, and around Mt. Everest — the phenomenon has been especially well studied in Montana because its glaciers are so accessible to climatologists and tourists. When the area of Glacier National Park was first visited by naturalists in the late 1800s, it contained over 150 glaciers ; now, there are only about 35 left, mostly at just a small fraction of their first-reported size. At present rates of melting, Glacier National Park will have no glaciers at all by the year 2030. Such declines in the mountain snowpack are bad for irrigation systems, whose summer water comes from melting of the snow that remains up in the mountains. It's also bad for well systems tapping the Bitterroot River's aquifer, whose volume has decreased because of recent drought.

Jared Diamond — *"Collapse"* (2005, excerpt)

Deze affiche zag ik in 2013 in Vermont, maar ook in Montana gelden dergelijke eisen : *Reinig grondig je boot, of je wordt gestraft.*
De boete, voor het vervoer van *Aquatic Invasive Species,* kan er zelfs oplopen tot 5000 $.

Er zijn controlestations langs de weg, waarop alle boten — en dat zijn er veel — worden gecontroleerd.

invasieve waterplanten

Een mobiele controlepost voor boten in Hardin, langs de *Interstate Highway 90*.

Jared Diamond besteedt meerdere pagina's aan "invasive pests", *maar invasieve waterplanten komen in zijn hoofdstuk over Montana niet aan bod. Achtereenvolgens spreekt hij over geïntroduceerde vissoorten, parasieten op vis, op runderen en op wild, en tenslotte invasieve planten.*

While CWD *[chronic wasting disease of deer and elk]* is potentially Montana's most frightening problem caused by an introduced pest *[because it might cause an incurably fatal human illness]*, introduced weeds are already Montana's most expensive such problem. About 30 noxious weed species, mostly of Eurasian origin, have become established in Montana after arriving accidentally in hay or as wind-blown seeds, or in one case being introduced intentionally as an attractive ornamental plant whose dangers weren't anticipated. They cause damage in several ways : they are inedible or poorly edible to livestock and wild animals, but they crowd out edible plant species, so they reduce the amount of livestock fodder by up to 90% ; some of them are toxic to animals ; and they may triple rates of erosion because their roots hold the soil less well than do roots of native grasses.

deer = hert | elk = eland | noxious = schadelijk | weed = onkruid | hay = hooi | edible = eetbaar | livestock = veestapel | fodder = voeder | soil = bodem | Leafy Spurge = Heksenmelk | mowing = maaien

Economically, the two most important of these weeds are Spotted Knapweed *[Centaurea Maculosa]* and Leafy Spurge *[Euphorbia Esula]*, both now widespread throughout Montana.
(...)
Estimates of the direct economic damage that these and other weeds cause in Montana are over $100,000,000 per year. Their presence also reduces real estate values and farm productivity. Above all, they are a huge pain in the neck for farmers, because they cannot be controlled by any single measure alone but require complex integrated management systems.
They force farmers to change many practices simultaneously : pulling out weeds, applying herbicides, changing fertilizer use, releasing insect and fungus enemies of weeds, lighting controlled fires, changing mowing schedules, and altering crop rotations and annual grazing practices. All that because of a few small plants whose dangers were mostly unappreciated at the time, and some of whose seeds arrived unnoticed !

Jared Diamond — *"Collapse"* (2005, excerpt)

Als de bodem minder goed is, blijft er nog de ondergrond : 29 miljoen vaten olie (of 4,6 miljoen m3) in 2013.

Thus, seemingly pristine Montana actually suffers from serious environmental problems involving toxic wastes, forests, soils, water, climate change, biodiversity losses, and introduced pests. All of these problems translate into economic problems. They provide much of the explanation for why Montana's economy has been declining in recent decades to the point where what was formerly one of our richest states is now one of the poorest.

Whether or how these problems become resolved will depend on the attitudes and values that Montanans hold. But Montana's population is becoming increasingly heterogeneous and cannot agree on a vision for their state's environment and future. Many of my friends commented on the growing polarization of opinion. For instance, banker Emil Erhardt explained to me, *"There is too much raucous debate here. The prosperity of the 1950s meant that all of us were poor then, or we felt poor. There were no extremes of wealth ; at least, wealth wasn't visible. Now, we have a two-tiered society with lower-income families struggling to survive at the bottom, and the wealthier newcomers at the top able to acquire enough property that they can isolate themselves. In essence, we are zoning by money, not by land use !"*

The polarization that my friends mention is along many axes : rich versus poor, old-timers versus newcomers, those clinging to a traditional lifestyle versus others welcoming change, pro-growth versus anti-growth voices, those for and against governmental planning, and those with and without school-age children. Fueling these disagreements are Montana's paradoxes that I mentioned near the beginning of this chapter : a state with poor residents but attracting rich newcomers, even while the state's own children are deserting Montana upon graduating high school.

Jared Diamond — *"Collapse"* (2005, excerpt)