CHAPTER 20

Canary in the Arctic

Lisa Kemmerer

In some ways, our plight with regard to bears is like that of early coal miners who descended deeper and deeper into the earth, down longer and longer shafts that penetrated the earth's crusty surface. As miners descended, it became more critical—and more challenging—to maintain life-assuring oxygen. Canaries also require oxygen, but are more sensitive to methane and carbon monoxide than are human beings: Before human lungs are affected by "bad" air, canaries sway on their perches, fall to the cage floor, and perish. Miners exploited the canary's oxygen-sensitivity, toting bright yellow birds into dark mine shafts to serve as early warning signs for noxious gases. They understood that a dead canary was their first and final warning: Get out of the mine shaft before it is too late. Similarly, the world's disappearing bears warn us that we must change our course of action quickly if we are to mitigate the worst effects of past indulgences, and avoid yet more problems in the near future.

Polar Bears and Ice

Polar bears are well adapted to their cold, slippery habitat, and cannot survive without ice. They are more thoroughly covered with fur than any other bear—they even have thick fur on the bottoms of their feet (G. Brown 64, 127). Each hollow, transparent hair absorbs UV light (Amstrup 588). The difference between the temperature of a polar bear's body and the surrounding environment can be as great as 80 C (175 F) (Wood 31). Polar bears are not merely adapted to icy conditions—they require ice to survive. They need ice to hunt, and they quickly overheat in warmer temperatures. The polar bear's range is determined by sea ice (G. Brown 30; "*Ursus*").

Fossils and DNA evidence indicate that polar bears evolved from European brown bears less than 100,000 years ago (Macdonald 580). Most likely, glaciers forced a large group of brown bears onto sea ice during the last ice-age, where they learned to hunt seals and began an independent evolutionary path (Domico 5, 65). Polar bears hunt from the ice, quietly waiting at air holes for prey to surface—sometimes for fourteen hours (Domico 74). Ringed seals are their most important staple, followed by bearded seals. When an unlucky seal comes up for air, a bear swats the pinniped with powerful forepaws, or seizes the head

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with strong jaws, pulling the slippery seal ashore. When a polar bear detects sleeping seals, the bear swims swiftly to the surface, bursts from the water, and dashes across the ice to seize a seal before the whole group disappears underwater. They also hunt on ice by sliding on their underbellies, their hind legs pushing them quietly toward their prey. When close enough—within 100 feet (30 meters)—the bear leaps up and charges the seal (Wood 66).

Ideally, polar bears secure a seal every five or six days (Domico 74). If they are able to catch enough seals, they eat only the blubber, which they digest more easily than protein, leaving the rest for less successful hunters and for those who are unable to pull seals from the water, such as arctic foxes (Amstrup 592). (This is one of the many ways that polar bears are important to larger ecosystems.) When bears are unable to secure food their metabolism drops, just as it does for other bear species when they den. This can happen at any time of year, allowing polar bears to live on fat reserves in the hope that food will soon become available (Domico 75). This ability is unique among bears—indeed, this "ability could make polar bears the most advanced of all mammals when it comes to dealing with food and water deprivation" (Amstrup 598).

Snow and ice are also critical for polar bear reproduction. Generally, polar bears only den if pregnant (Domico 75). Expectant mothers dig cozy dens deep in the snow, sometimes crawling under 3 meters (10 feet) of ice and snow to give birth. Their dens are about 2 meters (6 feet) long and one meter (3 feet) wide and high, with a 3–4.5 meter (10–15 foot) entrance tunnel. Den openings are just large enough (about a foot across—30 cm) for the mother to squeeze through, providing a safe haven for cubs, who sometimes return to the den to rest when they begin to explore the outside world (Wood 47, 35; Domico 76). Dens can be 20 C (36 F) warmer than the outside world, and seldom dip below zero (32 F), giving offspring a better chance of survival (Stonehouse 24; Wood 51; G. Brown 157).

Polar bears depend on ice for their food source, as well as for denning and birthing. Climate change is melting the polar bear's essential, icy habitat: In the last 25 years, northern sea-ice has dropped from 12.5 to 11.5 million km^2, and if these declines continue—and there is every indication that sea-ice will decline more rapidly in the near future—reductions in polar bear habitat are likely to threaten the polar bear's survival (Amstrup 605).

Eating Ice: GHGE[1]

The plight of ice-dependent bears in a rapidly thawing Arctic seems to strike many people as just one more environmental nightmare relentlessly unfolding

1 For more information on environment and animal agriculture, see *Eating Earth*, Kemmerer, 2015.

on our watch—one of many problems that is out of sight, out of mind, and beyond our control. This is not the case—there is something critical that each one of us can do to help preserve and protect polar bears.

Today's accelerated climate change is caused largely by humanity's greenhouse gas emissions (GHGE). More specifically, Arctic warming is caused by human activities that pour carbon dioxide, methane, and nitrous oxide into the earth's atmosphere, creating a greenhouse effect: The sun's warming rays enter the earth's atmosphere, and are held there by thick layers of pollution—by greenhouse gas emissions (GHGE). This retained heat is warming the planet and melting Arctic ice. I learned about GHGE in grade school thirty years ago, but only recently has the relationship between climate change and animal agriculture been brought to light.

Worldwide, animal agriculture contributes more carbon dioxide to the atmosphere (through the use of fossil fuels) than any other single source (Goodland and Anhang 11): Animal agriculture "creates more global warming" than all the world's cars, trucks, trains, boats, and planes combined (Oppenlander 16). Producing animal products pumps *at least* 32,564 million tons of carbon dioxide into the atmosphere every year, creating more than half of the earth's annual greenhouse gas emissions (Goodland and Anhang 11).

Choosing to consume animal products greatly increases our GHGE footprint; beef is likely the greatest offender. The United States and Brazil are the world's leading beef producers—the U.S. consumes about 26 billion pounds (12 billion kg) of beef each year, supporting an industry with a retail value of about $80 billion. The U.S. exports some 3 billion pounds (1.3 billion kg) of beef every year, bringing in more than $5 billion ("Cattle and Beef"). All this even though

- producing just one protein calorie in feedlot bovines requires nearly 80 calories of fossil fuels, while one protein calorie from soybeans requires just 2 calories of fossil fuels (Schwartz 86);
- one serving of beef creates the atmospheric warming potential of 80 pounds (36 kg) of carbon dioxide—as much as an ordinary car driving three hours to travel 155 miles (250 km) (Fanelli);
- industrially produced flesh has an energy input-to-output ratio of 35:1 (Cassuto 4).

Any one of these statistics ought to lead serious environmentalist to replace meat balls and cold cuts with more environmentally friendly options, but with regard to diet and the environment, the most important statistic is this: 70 percent of U.S. grains and 60 percent of EU grains are fed to farmed animals (Oppenlander 12; *Livestock's* 272). Worldwide, farmed animals consume more

than 700 million tons of "cereals" each year ("Top"). Every year in the U.S., cattle alone consume roughly 110 billion pounds (50 billion kg) of grain: Producing one pound (.45 kg) of beef requires an estimated 16 pounds (7.3 kg) of grain (Dawn 280).

Feeding grain to cattle causes much more environmental damage than we would cause if we ate grains directly. Fossil fuels are burned to prepare the land, plant the crops, fertilize the soil, weed and cull crops, and to harvest and transport seeds, fertilizer, equipment, green waste, and grains. Additionally, fossil fuels are burned at every facility that breeds, feeds, and maintains cattle (or other farmed animals), as well as for slaughter, processing, and transportation. Humans create as much as 41 million tons of CO_2 just to produce chemical fertilizers for feedcrops ("Greenhouse").

Consuming dairy products also increases our environmental footprint tremendously. Cows raised for milk require and consume many more calories than do cattle raised for flesh because they must create and birth offspring and produce milk. Some lactating cows consume more than four percent of their body weight, or a whopping 54 pounds (24.5 kg) of grain daily (Grant and Kononoff). Preparing the soil, planting, tending, and harvesting so many tons of grain to feed cattle (and other farmed animals) wastes fossil fuels while greatly increasing GHGE.

In light of the fact that feeding grains to farmed animals wastes more calories than are ultimately produced, no additional grain production is needed as humans transition to a plant based diet. In fact, we can grow considerably less grain, cutting back on fossil fuel use, as well as our use of freshwater, pesticides, chemical fertilizers, and so on. Consuming animal products creates ten times as many fossil fuel emissions *per calorie* as does consuming plant foods directly (Oppenlander 18). We can feed ourselves much more efficiently—and therefore with a much lower environmental footprint—if we replace flesh and dairy with fruits, vegetables, and grains.

After fossil fuels, methane (CH_4) is our second largest—and much more potent—GHGE. Methane remains in the atmosphere for 9–15 years, and in that time traps solar radiation 25 times more effectively than does carbon dioxide (Goodland and Anhang 13). This means that methane holds 72 times more heat than carbon dioxide when calculated across just twenty years (*Livestock's* 82; Oppenlander 6; "Methane"). The decomposition of manure and the digestive process of ruminants (cud-chewing animals such as cattle, sheep, and goats—called enteric fermentation) are responsible for 80 percent of the methane stemming from agriculture. Ruminants exhale about 8.5 million tons of methane annually (*Livestock's* 112). Due to methane's potency, this provides the GHGE equivalent of 18 million tons of carbon dioxide (Cassuto 5; *Livestock's*

96). "Globally, ruminant livestock emit about 80 million metric tons of methane annually, accounting for 28 percent of global methane emissions from human-related activities" ("Entric"). Animal agriculture is the largest human induced (anthropogenic) source of methane, responsible for a whopping 40 percent of global methane (Oppenlander 6; *Livestock's* 82, 95, 112).

Grass-fed beef results in even more methane emissions than standard beef. It takes longer to fatten grass-fed calves for slaughter. Grass is more difficult to digest, so grass-fed cattle emit 50–60 percent more methane than grain-fed cattle (Oppenlander 125). Plants do not emit methane (Oppenlander 18). Dairy products also are linked with enormous amounts of methane. A 10,000-cow dairy farm (larger dairy farms contain more than 15,000 cows) emits 33,092 pounds of methane every day (along with 3,575 pounds of ammonia and 409 pounds of nitrous oxide) (Hawthorne 37; "Changes" 2). The U.K.'s 10 million cows produce 25–30 percent of Britain's methane pollution ("Future").

Nitrous oxide (N_2O) traps solar radiation 300 times more effectively than does carbon dioxide, and stays in the atmosphere "for an average of 120 years" ("Nitrous"). Nitrous oxide is the largest anthropogenic source of GHGE ("NOAA"). Worldwide, agriculture produces a startling 65 percent of human-induced nitrous oxide (Oppenlander 6; *Livestock's* 114). Animal agriculture is responsible for 75 percent of these emissions, resulting in the CO_2 equivalent of 2.2 billion tons of GHGE ("The Role"). Artificial soil fertilization (nitrogen, when added to the soil, emits nitrous oxide), fossil fuel combustion, and manure (oxygen combines with nitrogen as manure decomposes, emitting nitrous oxide) create 96 percent of the earth's nitrous oxide, and animal agriculture is the primary cause of each ("Nitrous"; Gluckman; "What"). All told, U.S. animal agriculture produces almost 1.5 million tons of nitrous oxide every year, providing the GHGE equivalent of more than 41 million tons of carbon dioxide (Cassuto 5).

Animal agriculture is by far the most significant single source of earth-warming GHGE. Our food choices are creating a steady drip in the polar bear's essential, icy habitat.

Eating Forests: Deforestation

Just as surely as polar bears depend on ice, most bears depend on forests, and the biggest immediate threat to bears around the world is deforestation, which robs bears of their homes, their sustenance, and their protective cover (Craighead 42, 123). Climate change and deforestation are inextricably linked. For Yellowstone grizzlies, fatty whitebark pine seeds are an essential source of sustenance, but winters are no longer cold enough to prevent whitebark pine

beetles from marching northward, consuming Yellowstone's whitebark pines and robbing grizzlies of this rich source of fat (Van Noppen 4). The giant panda's bamboo supply is also feeling the heat, and these distinctive bears will not survive in the absence of the temperature-sensitive bamboo, on which they feed almost exclusively. Andean bears, South America's only bear species, are vulnerable to extinction due to "the expansion of the agricultural frontier" ("*Tremarctos*"). Not only is their habitat destroyed, but when they seek food outside of their vanishing forest home, farmers and ranchers kill bears to protect their property.

A section of rainforest roughly the size of 20 football fields (22 soccer/football fields) is destroyed pretty much every minute of every day. As with GHGE, animal agriculture is the most significant force behind deforestation. For the sake of grazing and feed crops, one fifth of the world's rainforests were destroyed between 1960 and 1990. Between 1985 and 1990, 210 million acres of forest were turned to pasture, "an area nearly the size of Texas and Oklahoma" (Kaufman and Braun 18). In "the Amazon, cattle ranching is now the primary reason for deforestation" (*Livestock's* 272). In just 50 years, 50 percent of Costa Rica's forests disappeared—60 percent were cleared for cattle ("Deforestation in Costa"); only 13 percent of Costa Rica's original rainforests remain, and remaining forests are "highly fragmented and degraded" (Reynolds 11).

South America suffers most acutely from deforestation, with Brazil leading the pack (by a considerable margin). Agriculture is responsible for roughly 98 percent of this deforestation, with cattle ranchers directly responsible for 65–70 percent of Brazil's loss of rainforests ("Causes"). There were about 10 million cattle in Brazil in 1980; there are now upwards of 55 million ("Deforestation: The Leading"). Both the U.S. and the EU are implicated: the U.S. imports some 80 million pounds of Brazilian beef every year: 85 percent of EU beef originates in Brazil. All this ecological devastation yields a mere spot of flesh—55 feet (17 meters) of tropical forests yield just a quarter pound (120 grams) of hamburger. If we continue to consume animal products as we are today, primary forests will be altogether gone by 2050 (Hawthorne 39, Pimm 844).

Those who consume any animal products—turkeys, pigs, chickens, cattle, eggs, cheese, sour cream, butter, mayonnaise, cottage cheese, yogurt, and so on—are implicated in the disappearance of the earth's forests. The primary reason for deforestation is conversion of woodlands to agriculture—for grazing and feed crops. The primary feed crop is now soybeans; 80 percent of the world's soybean crop is fed to farmed animals (Reynolds 13). Land is converted from forests to agriculture in Latin American countries largely to feed farmed animals, "notably soybeans and maize" (*Livestock's* 12). Those who accuse soy-eaters of destroying forests have missed a vital point: 80 percent of the earth's soybeans are raised for chickens, turkeys, pigs, and cattle, implicating those who eat cheese and chicken, not those who eat tofu (Reynolds 13).

Fragmentation and loss of habitat are the most immediate threat to bears around the world (Craighead 42, 123). Omnivorous consumers who buy animal products are chewing habitat—and bears—into oblivion.

Bringing Change

Human beings have brought much harm to other animals and the earth. The canary in the coal mine unwittingly served as a critical warning for miners: When a canary died, miners knew they needed to act quickly to survive. Similarly, the disappearance of bears warns that we must act quickly if we are to save innumerable dwindling species—especially species that are dependent on large expanses of fast-disappearing ice flows and forests.

Polar bears are threatened by climate change and Andean bears are threatened by deforestation. Both problems stem most prominently from human consumption patterns in comparatively wealthy nations—from animal agriculture. If we want to protect endangered species, we must change what we eat and inform others regarding climate change, habitat, endangered wildlife, and dietary choice. We must also encourage senators and representatives to:

- create/support policies that require industries and consumers to pay the full cost of production (including environmental costs) for all goods consumed;
- alter policies that create or maintain subsidies to artificially lower the cost of meat, milk, eggs, or feedstock grains;
- create/support policies that ban the importation of animal agriculture products from nations experiencing high levels of deforestation;
- ratify the Kyoto Protocol, which will commit the U.S. to follow international guidelines reducing GHGE;
- create policies that require the U.S. Government to provide nutritional information (especially in grade school texts) informed solely by international scientific research (excluding influence from powerful lobbies such as the meat and dairy industries).

Humans have taken over the planet, leaving little room for other animals. We have captured, caged, and shot bears; we have stolen their lands and forests, their gall bladders, paws, and fur coats. Bears around the world face exploitation, extermination, extirpation, and/or extinction. We are not at our leisure to waste time blaming and lamenting—we must pinpoint key threats, figure out what can be done on behalf of the world's bears, and do it.

Forests will not grow back overnight; previous GHGE will linger for many years to come, but we are not helpless. The fate of bears from the Arctic ice to

tropical rainforests is not yet sealed. We have the power to bring change. Apathy, rather than climate change and deforestation, is our most dangerous enemy. Like miners watching a canary sway on her perch, we must heed the clear (and unnerving) warning signs: We can and must change our ways—starting with our diet.

References

Amstrup, Steven C. "Polar Bear: *Ursus maritimus*." *Wild Mammals of North America: Biology, Management, and Conservation,* 2nd edition. Ed. George A Feldhamer, Bruce C. Thompson, and Joseph A. Chapman. Baltimore: Johns Hopkins U.P., 2003. 587–610.

Brown, Gary. *Great Bear Almanac.* CT: Lyons Press, 1993.

Cassuto, David N. "The CAFO Hothouse: Climate Change, Industrial Agriculture, and the Law." Ann Arbor: Animals and Society Institute, 2010.

"Changes in the Size and Location of U.S. Dairy Farms." *Profits, Costs, and the Changing Structure of Dairy Farming / ERR-47.* Economic Research Service/USDA. 2–4. Accessed Feb. 20, 2012. <http://www.ers.usda.gov/publications/err47/err47b.pdf>.

Comerford, John W., George L. Greaser, H. Louis Moore, and Jayson K. Harper. "Agricultural Alternatives: Feeding Beef Cattle." Pennsylvania State University. 2001. Accessed 26 Dec. 2011. <http://agalternatives.aers.psu.edu/Publications/feeding_beef_cattle.pdf>.

Craighead, Lance. *Bears of the World.* Stillwater MN: Voyageur, 2000.

Dawn, Karen. *Thanking the Monkey.* NY: William Morrow, 2008.

Domico, Terry. *Bears of the World.* NY: Facts on File, 1988.

"Entric Fermentation Mitigation." *Center for Climate and Energy Solutions: Working Together for the Environment and for the Economy.* Accessed April 13, 2013. <http://www.c2es.org/technology/factsheet/EntericFermentation>.

Fanelli, Daniele. "Meat is Murder on the Environment." *New Scientist.* July 18, 2007.

"Future Technology." *Future Electro Tech.* Blogspot.com. 23 Oct. 2008. Accessed 28 Dec. 2011. <http://futureelectrotech.blogspot.com/>.

Gluckman, Matt. "EPA Regional CAFO Waste Issues." *Epa.gov.* Accessed 27 Dec. 2011. <http://www.epa.gov/ncer/publications/workshop/pdf/gluckman_region582007.pdf>.

Goodland, Robert and Jeff Anhang. *Livestock and Climate Change.* Worldwatch.org Nov./Dec. 2009. Accessed 27 December 2011. <http://www.worldwatch.org/files/pdf/Livestock%20and%20Climate%20Change.pdf3>.

Grant, Rick and Paul J. Kononoff. University of Nebraska-Lincoln. "Feeding to Maximize Milk Protein and Fat Yields." Feb. 2007. Accessed 28 Dec. 2011. <http://elkhorn.unl.edu/epublic/live/g1358/build/#target2>.

Hawthorne, Mark. "Planet in Peril." *VegNews.* March-April 2012. 34–41.

Kaufman, Stephen R.and Nathan Braun. *Good News for All Creation: Vegetarianism as Christian Stewardship.* Cleveland: Vegetarian Advocates Press, 2004.

Kemmerer, *Lisa. Eating Earth: Dietary Choice and Planetary Health.* Oxford: Oxford U. Press, 2014.

Livestock's Long Shadow: Environmental Issues and Options. Food and Agriculture Organization of the United Nations. Rome: Food and Agriculture Organization, 2006.

Macdonald, David W., ed. *The Encyclopedia of Mammals.* Oxford U. Press, 2009. 574–588.

"Methane vs. CO_2 Global Warming Potential." *Global Warning Forecasts.* N.d. Accessed 28 Dec. 2011. <http://www.global-warming-forecasts.com/methane-carbon-dioxide.php>.

"Nitrous Oxide Emissions: Greenhouse Gas Emissions." *EPA United States Environmental Protection Agency: Climate Change.* Accessed Jan. 31, 2013. <http://epa.gov/climatechange/ghgemissions/gases/n2o.html>.

"NOAA Study Shows Nitrous Oxide Now Top Ozone-Depleting Emission." *NOAA National Oceanic and Atmospheric Administration United States Department of Commerce.* Aug. 27, 2009. Accessed Jan. 31, 2013. <http://www.noaanews.noaa.gov/stories2009/20090827_ozone.html>.

Oppenlander, Richard A. *Comfortably Unaware: Global Depletion and Food Responsibility ... What You Choose to Eat is Killing our Planet.* Minneapolis: Langdon Street, 2011.

Pimm, Stuart L. and Peter Raven. "Extinction by Numbers." *Nature* 403 (24 Feb. 2000): 843–845.

"Rainforest Facts." Raintree.com. 20 Mar. 2010. Accessed 28 Dec. 2011. <http://www.rain-tree.com/facts.htm>.

Reynolds, Laura and Danielle Nierenberg. *Worldwatdch Report 188: Innovations in Sustainable Agriculture: Supporting Climate-Friendly Food Production.* Washington, DC: Worldwatch Institute, 2012.

"The Role of Livestock in Climate Change." *Food and Agriculture Organization of the United Nations: Livestock, Environment, and Development.* Accessed May 27, 2013. <http://www.fao.org/agriculture/lead/themeso/climate/en/>.

Schwartz, Richard H. *Judaism and Vegetarianism.* New York: Lantern, 2001.

Stonehouse, Bernard. *A Visual Introduction to Bears.* NY: Checkmark, 1998.

"Top 5 of Anything: Farming & Agriculture Statistics." The Top 5 Most Common Types of Livestock Feed Used Worldwide. Accessed Nov. 15, 2012. <http://top5ofanything.com/index.php?h=2aadbfa5>.

"*Tremarctos ornatus* Andean Bear." IUCN Red List of Threatened Species. Accessed Aug. 22, 2013. <http://liveassets.iucn.getunik.net/downloads/andean_bear.pdf>.

"*Ursus maritimus.*" *The IUCN Red List of Endangered Species.* Accessed Aug. 15, 2013. <http://www.iucnredlist.org/details/22823/0>.

Van Noppen, Trip. "A Bad Climate for Grizzlies." *EarthJustice* (Summer 2012): 4.

"What are the Main Sources of Nitrous Oxide (N_2O) Emissions?" *What's your impact on climate change? Use our calculator and learn how to help!.* Accessed 28 Dec. 2011. <http://www.whatsyourimpact.eu.org/n2o-sources.php>.

Wood, Daniel. *Bears.* Vancouver, Canada: Whitecap, 2005.