

Green Tips For Congregational Use:

Use these Green Tips in Sunday bulletins, monthly newsletters, post on a congregational Facebook page or use in other congregational communications to bring awareness about our congregational and individual responsibility for care of creation and actions that can be taken. New Green Tips are posted weekly on the NE Synod EcoFaith Network Facebook page at: <https://www.facebook.com/nemnecofaithnetwork/> More Green Tips will be posted in several months. These tips are not time sensitive; the dates correspond to dates published at the local church.

Green Tips Assembled by Laura Raedeke, Lutheran Church of the Cross, Nisswa

A report released in May, 2019 by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) finds that **human-caused climate change is a direct driver of an impending loss of 1 million species in just a few decades.** Nearly 150 authors from 50 nations worked for three years to compile the report, which states that the **effects of overfishing, widespread pesticide use and urban expansion** point to a decline in the **biodiversity** that is the foundation of our **economies, livelihoods, food security, health and quality of life worldwide.** The world's population has **doubled since 1950, while urban areas worldwide have doubled since 1992,** resulting in the altering of **75 percent of the land environment** and well more than **half the marine environment.** URGE YOUR POLICY-MAKERS to address the biodiversity crisis that threatens our well-being.

The first settlers in Minnesota found **20 million acres of prairie and 32 million acres of pine forests.** Today, despite efforts from those earliest days to practice conservation, **less than 1 percent of prairies remain and forests have shrunk to about 18 million acres of mostly hardwoods, with threats to water quality everywhere.** Water-rich Minnesota has **92,000 miles of rivers and lakes** that provide transport, sustenance and recreation and **supports 1,000 species of fish.** While fishing is nearly unrivaled as an outdoor activity, with about **1.4 million licensed anglers in Minnesota,** state climate experts warn of threatening trends - **rising air temperatures and more extreme storms and rainfall** - that will affect the **ecosystems of wildlife, forests and water.** SUPPORT policies that protect these natural gifts and work to correct the "**nature deficit disorder**" so prevalent among children in a modern life of tech gadgetry and overscheduling.

Seven years in the making, *Audubon's 2014 Birds and Climate Change Report* warns us that **half our North American bird species** are slipping toward extinction, with hundreds of species, such as the **Bald Eagle, Brown Pelican, Burrowing Owl, Common Loon, and Baltimore Oriole** in danger of disappearing forever. Since the physiology, behavior, and genetics of every species is **finely tuned to a set of environmental conditions,** it is important to keep the following in mind: **1) Identify and protect priority areas for future conservation** that will allow birds to adapt to climate change; **2) Urge lawmakers, agencies and citizens** to shape practices and policies that limit greenhouse gas emissions; **3) Engage private landowners and public land managers** to put millions of acres of farms, ranches, and forests to **work for birds;** **4) Encourage millions of us to connect with nature** and protect it through our **nationwide centers, sanctuaries, and educational programs.**

Tullibee fish are a high energy source of food for predator fish like **walleye, pike and muskies**, making tullibee a key part of the **aquatic food chain and the surrounding wildlife that depends on them**. The MN DNR and U of M scientists have identified **600 tullibee lakes of which 176** are most likely to protect the **cold-water tullibee fish** that flourish **only in the deepest, clearest and least developed lakes**. Since tullibee **die at temperatures of 75 degrees**, rising temperatures are making lakes too warm for them, with **big lake homes, lawns, streets, and parking lots** warming the water and **sending oxygen-depleting pollutants like phosphorus and nitrogen into the water**. Eventually warming lakes become murky, attracting species like carp, and unable to support our **cold-water fisheries, a major economic, recreational, and cultural engine for the state**. **PROTECT LAKES by preserving watersheds in forests and wetlands, urging lakeshore landowners to conserve their properties and draft management plans** to strengthen the resiliency of their land in the face of climate change.

After four years of effort, and in a rare example of **broad bipartisan deal-making**, the U.S. House of Representatives this spring **passed the Natural Resources Management Act**, the lands conservation bill that the **Senate also overwhelmingly passed**. The bill, which **protects 3-million-plus acres of land, classifies hundreds of miles of US rivers as wild, scenic, or recreational, and creates three new national monuments**, also does the following: **1) The Land and Water Conservation Fund**, established in 1964 but allowed to expire every few years since 2014, has been **permanently reauthorized**, using fees from offshore drilling to pay for **preserving and protecting outdoor spaces in all 50 states; 2) locks in the Every Kid Outdoors program for the next seven years, providing over 2 million fourth graders and their families with free national park passes; 3) creates the Yellowstone Gateway Mineral Withdrawal, which will prevent areas in Montana adjacent to Yellowstone National Park from being mined**. This builds buffer zones that keep ecosystems intact outside National Parks. **THANK your lawmakers for caring about our beautiful Public Lands.**

Birds help to keep ecosystems in balance by **pollinating plants, dispersing seeds, scavenging carcasses, and recycling nutrients back into the earth**. **WHEN BIRDS THRIVE, ECOSYSTEMS THRIVE**, indicating to us how well we are taking care of our planet. But with *Audubon's 2014 Birds and Climate Change Report* warning us that **half of our North American birds are in danger of extinction**, **HERE IS WHAT YOU CAN DO TO HELP: 1) Create safe places for birds to rest and nest** in your yard, school grounds, church grounds, parks, vacant lots and common areas by **using fewer pesticides, letting dead trees stand, installing birdbaths, and converting lawns and gardens to native plants; 2) share with your peer group the scientific findings on dangers to wildlife; 3) Check out renewable energy opportunities for individuals and communities, and urge your elected leaders to research options for energy efficiency, renewable portfolio standards, and other proactive measures for reducing emissions; 4) encourage your local leaders to protect wildlife in the face of climate change, take field trips with a community group to nature centers or sanctuaries, and reach more people by writing a letter to your newspaper sharing why birds matter to you.**

In addition to **cleaning watercraft and trailers** of aquatic plants, **removing drain plugs** and keeping them out during transport, and **disposing of unwanted bait** in the trash, here are **THREE MORE TIPS**

to keep out invasive species: **1) Spray** with high-pressure water; **2) Rinse with very hot water** (120 degrees for at least two minutes or 140 degrees for at least 10 seconds); **3) Dry** for at least five days. And for **weekend BBQs**, follow these tips: **1) Ditch the disposables** - bring your own **water bottle** and your own **set of silverware**; **2)** If you are hosting, **use your regular dishes**, and ask a friend to bring theirs if you need more. Make sure to **set out bins for recycling and compost right next to the trash**; **3) Gas grills are better than charcoal**, but if you use charcoal, opt for **briquettes made from invasive species or from sustainably managed forests**. **Lighter fluid** contains harmful chemicals, so use **chimney charcoal starter instead**; **4)** Sunscreens and bug sprays may contain **harmful chemicals**, so check the **Environmental Working Group** for their great guides to the **best sunscreens and bug sprays** (ewg.org).

Going **Zero Waste** can be overwhelming, but here are **THREE THINGS** you can do to begin moving in that direction: **1) Carry a refillable water bottle or cup** - you will save money, be more hydrated and it will make a real impact; **2) Recycle plastic film** - expand your recycling habits by **hanging a bag to collect** plastic film such as shopping bags and overwrap on things like paper towels, etc. Most **grocery stores have bins for accepting these items**, which must be clean and dry to be recycled; **3) Compost food waste** - food waste **releases methane gas as it decomposes**, and even a head of lettuce can take **decades to decompose** from lack of oxygen in traditional garbage facilities. If you can't compost at home, check to see if your community **offers curbside composting, or drop-off sites and free composting bags for you to collect waste in**. Store the bags in your freezer to eliminate smells, and when full take them to the compost drop. **Check with your county to learn more about options in your area**, and if none exist, **BE AN ADVOCATE for instigating action in your community**.

While we hear much about **oceans warming** and **sea levels rising**, **OCEAN ACIDIFICATION** is happening at such a rapid pace that **shifts in acidity** can be measured just a year after the emission of **atmospheric carbon dioxide**. According to the highly regarded nonpartisan *Union of Concerned Scientists*, dissolved carbon dioxide prevents marine organisms such as shellfish and corals from forming shells, **putting the global food chain at risk**. Surface waters are now nearly **30 percent more acidic than they were in 1850**, with ocean acidification happening at a **faster rate than at any point in the last 66 million years**. UCS calculates the increase of carbon dioxide in the atmosphere can be traced back to the **extraction, production and sale of oil, gas and coal, as well as cement production** (see the peer-reviewed journal *Climatic Change*). **Warming and acidification** pose an existential threat to the **millions of people worldwide** who depend on healthy oceans for their survival. **YOU CAN** learn more by visiting www.ucsusa.org/ocean-acidification.

According to the University of Minnesota, more than **300 different species of bees** are native to our state, while worldwide the number is **more than 20,000**. Yet these important pollinators are seeing massive population declines in recent years due to **habitat loss, pesticide use, parasites and disease**, all of which also affect other pollinators such as **wasps, flies, ants, butterflies, moths, beetles, some birds and even bats**. Since more than **one-third of the world's crop species (including fruits and leafy greens)** depend on bee pollination, our survival will depend on making sure pollinators survive. **YOU CAN PLAY A PART IN THEIR REVIVAL** by planting and maintaining a **lawn or garden** that is hospitable to them. **BEE LAWNS**, the U of M researchers find, can support bees without drastic changes in care routines or aesthetics. By allowing dandelions to flourish for early spring feeding, and adding **Dutch white clover, self-heal and creeping thyme**, your lawn will attract many kinds of pollinators. **For more information on how to help bees, and which flowers are better at providing pollen and nectar**, go to the U of M's website, www.beelab.umn.edu/bees.

Minnesota health officials, using new scientific data, are issuing alarms about chemicals in our water that are part of a family of compounds known as **per- and polyfluoroalkyl substances, or PFAS**. Known as "forever" chemicals, these compounds were manufactured beginning in the 1950s for a variety of industrial and consumer products, including **nonstick cookware, stain and water repellents for clothing and furniture, food wrappers and firefighting foam**. About 20 years ago, studies found **PFAS** were showing up around the globe in **water, soil, wildlife and even in humans**. More study is being done, but research has **linked prolonged exposure to PFAS to health problems including some cancers, thyroid disease, immune system disorders and infertility**. While the US Environmental Protection Agency (EPA) has established non-binding advisory levels of the chemicals, **URGE YOUR POLICY MAKERS to adopt the precautionary principle ("better safe than sorry") by supporting Minnesota's more stringent advisory levels, and by personally purchasing products guaranteed not to contain PFAS.**

Unprecedented expansion of **fossil fuel exploration** in our nation's **public lands and waters** is putting America's most vulnerable and wildest places at risk. As **climate change** continues to significantly impact our shared public lands, opening them to **seismic exploration drilling and mining with destructive heavy equipment will undermine and destroy environmental protections**. Places already being threatened include the **Arctic National Wildlife Refuge, Bears Ears and Grand Staircase-Escalante national monuments in Utah, and Minnesota's Boundary Waters Canoe Area Wilderness**. With more than 1,000 lakes and rivers spanning 1.1 million acres, Minnesota's BWCA is the **most visited wilderness area in America**. Proposed sulfide-ore mining in the nearby **Superior National Forest** would introduce pollution into this pristine wilderness, putting the **clean water, wildlife and land in serious jeopardy, as well as our health and our future**. **OUR PUBLIC LANDS BELONG TO ALL AMERICANS**, so support groups such as the **Wilderness Society (wilderness.org)** and learn all you can about how to protect our shared public lands.

Canada, following the example of the European Union, voted recently to **ban 10 single-use plastics that most often end up in the ocean, including plastic cutlery, plates and cotton-swap sticks**. More than **8 million tons of plastic** are dumped into the world's oceans every year, currently totaling **50 million tons of plastic** that is being ingested by at least **331 species of animals**. According to the *Proceedings of the National Academy of Sciences*, by 2050 **99 percent of all seabird species will have consumed plastic, leading to suffering from obstructions, stomach ruptures and starvation**. While the US ranks 20th worldwide for producing plastic marine debris, the US has long been the **world's biggest exporter of plastic waste to the poorer countries lacking waste management that generate nearly 60 percent of plastic pollution**. US industry interests also benefit from **selling plastics and products packed in non-recyclable plastic to developing countries**, according to the Center for Oceanic Awareness, Research and Education. **URGE OUR LEADERS to be a part of a shared global commitment to significantly reduce or phase out single-use plastic, and pledge to do so yourself.**

Alarm over climate change is driving the setting of **aggressive new clean energy goals** by states across the country, with **Minnesota being among the leaders** in doing so. While coal still provides **40% of Minnesota's electricity**, utilities such as Xcel plan to **close coal plants by the mid-**

2020s. Both Xcel Energy and legislation pending in the state legislature are **setting a goal of 100% carbon-free electricity, making for a totally clean grid by 2050.** With **wind turbines now providing one-fifth of Minnesota's electricity generation, and solar providing 1%,** the trend for all these technologies is to get less expensive over time, even as **new battery technologies** will need to be developed to make them more stable sources of power. While another **22% of Minnesota's electricity is generated by nuclear energy,** large new nuclear plants, even though carbon-free, are **no longer being considered,** due to enormous expense and huge cost overruns in recent constructions elsewhere. Xcel is open to the idea of extending current nuclear licenses for 20 years (if it is cost effective and safe), an option researched by Harvard's Center for the Environment. Still, this is controversial, and will continue to produce radioactive waste. FOR MORE INFORMATION, check out the analysis done at **Union of Concerned Scientists** (ucsusa.org) and the **Great Plains Institute,** a nonprofit energy research group in Minneapolis.

Green Tips Assembled by Steve Spirgerelli, First Lutheran Church, Aitkin

AUGUST 17-18: SOME DISTURBING CLIMATE FACTS--2019

-- Carbon dioxide levels in the atmosphere (415 ppm) are the highest they have been in 3 million years; the last time they were this high sea levels were 50 feet higher than today and the Arctic was covered with forests.

--Global greenhouse gas emissions increased in 2017 by 1.6% and in 2018 by 2.7%, despite the Paris Climate Agreement

-- Globally, 18 of the hottest years on record have occurred since 2000.

-- Greenland's ice sheet and the Earth's glaciers are melting 5 times faster than they were in 1960; and Antarctic ice loss is 3 times faster than it was 10 years ago.

-- Global sea levels have risen 8 inches and sea water temperatures have risen 0.5 F since 1970. Clearly, global warming is accelerating and mankind has not yet found the courage to seriously combat this threat to God's creation.

AUGUST 3-4: LIFESTYLE CHANGES TO COMBAT GLOBAL WARMING

According to Bill Nye, ("The Science Guy"), these are the most effective actions that we can take to help slow global warming.

1. Vote to elect candidates who show an understanding and belief of a) the science behind global warming and b) the urgency to reduce greenhouse gas emissions. Show your support for legislation that would reduce greenhouse levels.
2. Be a critical thinker by seeking second opinions, questioning inherent biases, and recognizing political motivations for climate denials.
3. Reduce your own carbon footprint, even though it may cause you some lifestyle changes, such as: using less energy by driving less; adopting renewable sources of energy (if available); buying hybrid or electric vehicles; adding insulation to your home; and changing your diet to emphasize locally produced foods, and less meat.

JULY 20-21: "THERE IS NO AWAY"

Although the number of coal-fired power plants in the U.S. is declining rapidly, the remaining 265 coal plants and those recently shut down continue to present huge risks to humans and the environment.

Over 100 million tons of highly toxic coal ash are produced each year by these coal plants, and the ash is mixed with water to produce a sludge which is stored in earthen ponds or landfills. Coal ash contains many contaminants, including mercury, arsenic, heavy metals and natural radioisotopes which can leach from unlined ponds/landfills into groundwater. Even worse, if the retention ponds fail, as occurred in Tennessee in 2008, widespread contamination of surface and groundwater is certain. Unfortunately, government regulations generally do not require cleanup of these storage pond/landfills, even when a coal plant shuts down.

JULY 6-7: MICROPLASTICS IN AIR, WATER AND FOOD

A recent study published in a prestigious scientific journal estimates that humans ingest at least 70,000 - 120,000 micro-plastic and nano-plastic particles each year--the equivalent of eating a plastic credit card every week. Bottled water is the major source of human ingestion of these tiny plastic particles, followed by foods and air. Most micro-plastic particles occur as fragments of larger pieces of plastic, while some of the smaller nano-plastics actually were parts of original products such as cosmetics. The effects of these micro/nano-plastics on humans and other organisms are poorly understood, but there is concern about the high concentrations in aquatic organisms and the possibility that plastic particles in air or water absorb contaminants and transfer them to humans and other critters.

JUNE 8-9 SOME GOOD GREEN NEWS!

Corporations from various economic sectors, including oil and gas, are now publicly vocalizing the need to limit greenhouse gas emissions, and three separate coalitions of corporations are launching efforts to lobby Congress to place a tax on carbon. One such coalition, including Shell, BP, ExxonMobil, ConocoPhillips and others, is proposing a plan called "Americans for Carbon Dividends" which would return the taxes collected from carbon emitters to consumers. The motivation for corporations to initiate this lobbying effort is not to save the planet; they are responding to competitive pricing and rapid growth of renewables, legal issues, pressure from investors and increasing public concern about global warming. However, this corporate plan to tax carbon emissions and return a dividend to consumers has appeal to both conservative and liberal politicians, and could be a first step toward regulation of greenhouse gases in the U.S.

JUNE 22-23 A NEW ECO-REFORMATION

"For Christians, care of the Earth is not an environmental cause. Rather, it is central to our holy calling to treasure the Earth and to care for it as our common home, fully integrating creation care into our love of God and neighbor. We believe that the Reformation did not end, but is ongoing, and that we are called to embrace an Eco-Reformation which will expand our understanding of ourselves as creatures within creation as a whole. Often, we have seen ourselves as living on Earth rather than being embedded in it. We have assumed that the Earth belongs to us, instead of recognizing that we belong to the Earth. Changing our viewpoint in this way would lead to an Eco-Reformation and would place Christians at the forefront of creation care." (Quotes and paraphrases from ELCA.org)

May 11-12: ELECTRIC VEHICLES IN MN

The motivation for producing electric vehicles (EVs) is to reduce or eliminate greenhouse gases from the transportation industry. Excluding standard hybrid vehicles that do not use external charging,

there are over 5000 plug-in EVs registered in MN. These vehicles produce 1/3 of the greenhouse gases of gasoline powered cars, assuming the electricity used to charge them is produced from fossil fuels. If the electricity is produced from renewables (wind, solar), EVs produce no greenhouse gases. This industry is expanding rapidly in MN, partially due to new public EV charging stations being built with settlement funds from Volkswagen. State and federal tax credits, electric utility incentives, and a wide selection of available EV models are contributing to this growth.

May 25-26 PLASTICS AND RECYCLING

Since they were first produced in the 1950s, a total of 9 billion tons of plastics have been produced globally. Of that total, 6.9 billion tons are still with us, as garbage and litter. Each year, about 500 million tons are produced globally, and about 40% of that production is not recyclable. Actually, less than 20% of all plastics is recycled globally, and less than 10% is recycled in the U.S. This situation is rapidly becoming more critical, as China now has stopped importing recyclables from other countries, and the recycling market has become dysfunctional, with many municipalities canceling their recycling programs. Clearly, the problems with plastics are intensifying.

April 27-28: EARTH DAY—2019

The theme of this 49th Earth Day (April 22) is “PROTECT OUR SPECIES”. In previous Green Tips we noted the decline of insect species globally, the decrease in average size of all animals on earth, and the pressure from proponents of development to gut the Endangered Species Act. Recent estimates of species extinction rates indicate that current losses of plant and animal species are 100-1000s of times the natural rate, achieving “mass extinction” levels today. Total land and marine mammal species are down 40%; 60% of primate species are threatened; 40% of bird species are in decline; most big cat species are in decline; and plant species extinction rates are thousands of times higher today (eg tropical deforestation).

From March 2019

THE ANTHROPOCENE—A NEW GEOLOGIC AGE?

The science of geology records time on earth as ages or eras, periods of time when climate remains relatively stable until natural forces cause significant climate change. Rapid changes in climate have occurred due to infrequent asteroid impacts and volcanism, but normally climate changes occur due to the glaciation cycle over thousands /millions of years. The period since the last global glaciation (12,000 years) is called the Holocene. Past climate changes are defined by changes in the animal and plant fossil record in the sediments of lakes and oceans, i.e., the science of climate change relies on changes in biota and their fossil record to define a timeline because species composition and distribution are the most indicative of climate conditions. Now, some scientists are proposing that we are entering a new geologic era—the Anthropocene (human era) when the impacts of human activities, esp. global warming, will be detectable as major changes in species.

MARCH 2-3: ANTARCTICA- 2018

Antarctica, the southern most continent on earth, is also the driest and coldest place with annual precipitation of only 0-8” and temperatures as cold as -130F. This ice-covered continent gains ice only through a limited amount of snowfall, and loses ice as it flows down to the ocean. If the rate of

ice flow to the ocean increases and snowfall remains constant, sea level will rise due to the additional ice melt. And that is exactly what is happening now; the rate of ice flow to the ocean in the Antarctic has increased six fold since 1989, due to warming of the atmosphere by the additional carbon dioxide and methane from burning fossil fuels.

Ponder this: the current amount of ice in Antarctica, if completely melted, would raise global sea level by 180'.

MARCH 16-17. MN RENEWABLE ENERGY UPDATE

Since 2007, renewable sources of electrical energy (wind, solar, hydro, biomass) have tripled in MN, from 8% to 25% of total electric production in 2017, due mostly to MN mandates for wind and solar. Currently, wind accounts for 18% of total electric production, solar 1.2%, and hydro/biomass for 5%. Natural gas's share of the electrical pie also increased over this period, from 7 to 12%, due to it's falling prices and lower emissions than coal. Coal dropped from 60% to 40% as it was replaced by renewables and natural gas. This trend will accelerate as MN utilities pursue plans to increase the use of renewable sources, e.g., MN Power plans to achieve 45% renewables by 2025.

Sent from my iPad

February 2-3: OUR TAMARACK FORESTS ARE IN TROUBLE

Temperature is the most influential environmental variable for cold-blooded organisms, and our warming climate is now favoring a pest that kills our tamaracks. The Eastern Larch Beetle is native to MN and, for eons, has been held in check by colder winters; previous outbreaks were localized and short lived. But warmer winter temperatures allow the beetle to survive and reproduce at a faster rate. The current outbreak is 18years old now, with over 440,000 acres of tamarack forests in MN infested by the larch beetle. Similar infestations of tamarack are occurring in Canada, Alaska, and NE U.S, and global warming is the major culprit.

February: 16-17: SECULAR QUOTES ABOUT HUMANS AND CREATION

"If you can't be in awe of Mother Nature, there is something wrong with you". Alex Trebek

"We do not inherit the Earth from our ancestors, we borrow it from our children". Native American Proverb

" Look deep into nature, and there you will understand everything better". Albert Einstein.

"Anything else you're interested in is not going to happen if you can't breathe the air or drink the water. Don't sit this one out--Do something!" Carl Sagan

"The economy is a wholly owned subsidiary of the environment, not the reverse". Herman Daly

January 5-6 , 2019 THE "ENVIRONMENTAL PRESIDENT"

President George H.W. Bush passed away recently and we have heard much about his character and accomplishments, but there has been little mention of his achievements to protect God's earth. In 1990 President Bush sided with the environmental movement and signed the Clean Air Act

amendments which restricted the release of sulfur and nitrogen oxides from fossil fuels. These regulations not only improved air quality and reduced human health effects of air pollution, but they significantly decreased acid rain and its impacts on aquatic species in lakes and rivers. Although President Bush and his political allies rejected early warnings about climate change, his Clean Air Act regulations effectively reduced the total amount of coal burning, and forced the replacement of eastern coal with cleaner burning western coal.

January 19-20, 2019 PARIS CLIMATE AGREEMENT--2018

A recent report by the international "Global Climate Project" provides estimates of carbon dioxide (CO₂) emissions by the major contributing countries who, with the exception of the U.S., continue to subscribe to the Paris Climate Agreement. Despite encouraging stabilization of global emissions from 2014-2016, levels in 2017 increased by 1.6% and levels in 2018 increased 2.7% and reached a record high at 37 billion tons. Nations that are responsible for the majority of this pollution increased their emissions significantly compared to 2017; India had the greatest increase at 6.4%, followed by China at 4.7%, and the U.S. at 2.5%. However, the European Union countries managed to decrease their emissions by 1%. At a recent meeting of Paris Climate Agreement nations, there was universal alarm that nations are not meeting their goals to reduce greenhouse gases, and the U.N. Secretary General commented that "We are in deep trouble with climate change."

Sent from my iPad

DECEMBER 8-9, 2018 "WE'RE STILL IN"

"We're Still In" is a coalition of public and private U.S. entities that have pledged to pursue the goals of the Paris Climate Agreement, "in the absence of leadership from Washington". Since June 2017, 10 states, 280 cities and counties, 211 city mayors, 13 state governors, 9 Tribes, 346 colleges and universities, and over 2000 companies have signed on to this agreement, representing over 154 million Americans. MN is "Still In" as evidenced by our Clean (Renewable) Energy goals and standards which require 25% renewable electrical energy by 2025 and 1.5% solar energy by 2020. We have already hit the 25% renewables target through development of wind, solar, biomass and hydroelectric power.

DECEMBER 22-23, 2018 : ENDANGERED SPECIES ACT UNDER ATTACK

Pro-business members of the U.S. Congress recently sponsored bills that would weaken the Endangered Species Act (ESA) by placing more emphasis on the economic benefits of developments, rather than on impacts to endangered/threatened species. The ESA was signed into law in 1973 by President Nixon with almost unanimous support by Congress. Since then, it has been one of the most effective conservation laws in U.S. history, because it has protected the habitat of endangered/threatened species when proposed developments (oil/gas, mining, etc.) would have impacted these species. Despite the effectiveness of the ESA, natural habitat for unprotected species has declined by 22% over the last 40 years. Habitat loss is the major reason for the decline of God's creatures, followed by pollution and invasive species.

HISTORIC QUOTES ABOUT HUMANS AND GOD'S CREATION

"When the well is dry we will know the value of water." Benjamin Franklin

"In wilderness is the preservation of the world." Henry David Thoreau

"A nation that destroys its soils destroys itself." Franklin D. Roosevelt

"We abuse land because we regard it as a commodity belonging to us." John Muir

"The supreme reality of our time is the vulnerability of our planet." John F. Kennedy

WHAT'S WRONG WITH THE EARTH'S BUGS?

Recent scientific studies have found very disturbing declines in the numbers of many invertebrate species in different habitats and areas of the earth. In Germany, flying insect numbers have decreased by 76% over the past few decades, and an international study found that invertebrates around the globe have decreased by 45%. A recent study in Puerto Rico found a huge reduction in the numbers of insects and arthropods (spiders, etc) in the tropical forests over the last 40 years. In some cases, these decreased invertebrate numbers have already caused "bottom-up" effects on predators that eat these invertebrates, and the potential for human impacts are huge (e.g. reduced pollination). The causes of these declines are not yet well defined, but climate change and chemical pollution are the prime suspects.

MAY 20-21, 2018

RECORD WARMTH IN THE U.S.

From 1985 -2016, the eastern 2/3 of the U.S. experienced above normal average temperatures and some freakish weather. The last 1, 2, 3, 4 and 5 year periods rank as the warmest in the 122 years of record keeping (NOAA, 2017). Some examples of the freaky weather include: 1) Denver hit 80 degrees as late as it ever has in 2016, and as early as ever in 2017; 2) Spirit Lake (Aitkin Co.) recorded its earliest ice-out on March 24, 2012 and its latest recorded ice-out on May 11, 2013. In December 2015, 29 states experienced their warmest December on record. Record high temperatures have outnumbered record low temperatures in the U.S. for the last 28 months in a row, and the number of record highs have exceeded the record lows by as much as 20-40 times.

JUNE 3-4, 2018

WHAT'S THE TRUTH ABOUT COAL?

Recently, the Trump Administration has proposed that the U.S. reverse course and increase the use of coal to produce electricity, nominally to "bring back jobs" in the coal industry. But history tells us that the loss of jobs started in the 1920s when coal industry jobs peaked at 750,000 miners and an estimated total number of 1 million coal-related workers. By 1990, the number of miners had dropped to 100,000, while today that number is about 80,000 miners (170,000 total). The major decrease in coal jobs occurred long before we had any concerns about the environmental impacts of burning coal, and the cause of those earlier decreases in jobs was the advent of new mining technologies which reduced the workforce needs of mining. Coal is a relic of the early industrial revolution, when it provided a cheap, readily available source of energy. Today, solar, wind, and natural gas are readily available, cost-competitive, growing fast, and much less polluting than coal. Currently, the energy-related jobs mix in the U.S. is: OIL-500,000; NATURAL GAS-400,000; SOLAR-375,000; COAL-170,000; WIND-100,000; NUCLEAR-75,000.

JUNE 18, 2018:

WHAT ABOUT NUCLEAR ENERGY??

We seldom hear much about nuclear energy these days, except when a serious accident occurs, such as Chernobyl. Nuclear energy currently provides 20% of the electricity produced in the U.S. and about 11% of the world's electricity. The U.S. has 99 nuclear reactors and the global total is over 400

reactors. About 500 more new reactors are planned worldwide, mainly in China and India. Considering the large numbers and long operational safety of the U.S.-designed reactors, nuclear power is considered a safe and environmentally friendly alternative to fossil fuels. Under normal operating conditions, nuclear reactors are non-polluting, and they release no radiation or CO₂. The issue of radioactive waste storage is a problem in the U.S. because we have not identified a safe storage site, while other nations have solved this problem. In the future, a climate friendly mix of energy sources will include solar, wind, hydroelectric and nuclear.

JULY 2, 2018 CLIMATE CHANGES IN THE ARCTIC AND ANTARCTIC

Will Steger, the world famous Minnesotan and Arctic explorer recently reported that, in 2016, the extent and thickness of sea ice in the Arctic was the lowest in 38 years of satellite records. The reduction in area of ice was the equivalent of the size of California and Texas combined. In 2016, temperatures in the Arctic were 4.5 degrees warmer than the average temperature over the last 30 years. Both the Arctic and Antarctic are experiencing unusual thawing and accelerated growth of plants. Mosses in the Antarctic grew 3 times faster than average, and the amount of moss increased 4 fold. In areas surrounding the poles where soils normally remain frozen (permafrost), melting of the soils is releasing CO₂ and methane, exacerbating the greenhouse effect.

JULY 16, 2018: WHAT WAS THAT BIRD I JUST SAW?

Have you seen any unusual animals lately? Cardinals and red-headed woodpeckers are frequenting my feeder for the first time this year. In fact, land-based species of animals and plants are moving to areas that are warming by an average of 17 kilometers/decade, while marine species are moving at 72 km/decade. In the north Atlantic, populations of mackerel have moved so far north that the catch in Iceland has increased 100 fold, while the catches at lower latitudes have decreased. These changes in species distributions are caused by global warming, i.e. the rise in temperatures of air, soil and water. Aside from the economic disruptions that occur, the increase in temperatures are also causing diseases and pests from warmer areas to move to new areas where there are no natural controls for these species, e.g. tropical diseases are spreading north into the U.S. where people have no natural immunity.

JULY 29-30: HAVE YOU TESTED YOUR DRINKING WATER?

If you use a groundwater source for your drinking water, you should have the water tested for contaminants, especially if your well is in a shallow, unconfined aquifer. Such wells are susceptible to contamination from activities on the land surface, such as agriculture or industry. Shallow wells may be contaminated with bacteria, nitrates, pesticides or other water soluble contaminants. Testing services for some of these contaminants are available from Aitkin County or private water testing labs. Deep wells (confined by an overlying clay or rock layer) are less susceptible to contamination from above, but these wells can be contaminated by natural chemicals in the deep aquifer, such as arsenic or radon. Radon can be tested with kits available from many stores, while arsenic requires specific analysis by a testing lab. Both of these contaminants have been found in deep wells in this region.

AUGUST 12-13, 2018; DOES THE MISSISSIPPI RIVER MEET WATER QUALITY STANDARDS?

Water quality monitoring and assessment studies in MN are now focused on the health of watersheds (the drainage area for a waterbody). A river or lake's health is expressed in terms of its

quality to support: 1) river life, i.e. ecological health; 2) recreation; and 3) fish consumption. Aitkin falls in the Brainerd watershed of the Miss. River (Brainerd to St. Cloud). Within this watershed, the water quality standards are generally met, except for consumption of fish due to high mercury levels in large fish. From St. Cloud downstream to the Twin Cities, river health deteriorates and fails all three criteria, primarily due to the amount of agriculture, industry and development in this region. The quality of the river continues to degrade as it flows south to the Gulf of Mexico, where its contaminants cause huge "dead zones" every year.

SEPTEMBER 9-10, 2018: WHAT ARE MICROPLASTICS?

We all are familiar with the vast amount of plastic trash visibly polluting our environment; but we cannot see the most serious pollution from microplastics. Microplastics are small (less than 5 mm) pieces of plastic that are released from everyday man-made products, and these particles are now common pollutants in waters across the earth. Microbeads are very small plastic beads that are added to many products such as cosmetics and toothpaste. Microfibers are larger plastic fibers that are released from clothing (e.g. fleece) and other man-made fabrics when they are washed. Billions of microfibers are released each year from sewage treatment facilities throughout the U.S. because sewage treatment removes only a fraction of these particles. These petroleum-based plastic particles are not biodegradable; they absorb contaminants like PCBs and pesticides; and they are found in many aquatic species. In Lake Michigan, plastic microfibers are so numerous that they appear in most fish stomachs.

WILL MINNESOTA NEED THE OIL FROM ENBRIDGE LINE 3?

In our last Green Tip we mentioned that the MN Dept. Commerce recommended that the Enbridge Line 3 Replacement pipeline was not needed. Their conclusion was based on an independent study indicating that MN would not need more oil in the future. A major reason for this conclusion is that many studies are projecting a rapid increase in the number of hybrid and electric vehicles (EVs), while fossil-fueled (FF) vehicles are expected to decline. Currently, EVs comprise about 1% of all vehicles globally; EV numbers are projected to increase slowly until 2020, then rapidly to 20-30% of all vehicles by 2030. Forbes has projected that EVs will be 65% of the U.S. total by 2050. China has set a goal of 20% EVs by 2025 and India's goal is 100% EVs by 2032. Of course, many factors will determine the growth rate of EVs, including: political biases; public acceptance of EVs; the availability of charging stations; and cost and range comparisons with FF vehicles. But expectations are clearly in favor of EV growth and less oil demand in the future.

IS ROUNDUP A SAFE HERBICIDE?

Roundup (Glyphosate) was introduced by Monsanto in 1974, as an herbicide (weed killer) that is "as safe as table salt". For about 20 years Roundup was used as a total vegetation killer and it was not used in agriculture because crops were killed by it. But in 1996 Monsanto introduced genetically modified (GMO) crops that are resistant to Roundup. Now many different crops have been genetically engineered to resist Roundup, such as corn, soybeans, and cotton, and Roundup is the most widely used herbicide in U.S. agriculture. Recent testing by non-government labs has found residues of Roundup in many U.S. foods, including honey, oatmeal, eggs, flour, beer and infant formula. The International Agency for Research on Cancer and the State of California recently classified Roundup as a "probable carcinogen" (causes cancer). Currently, the U.S.EPA has no restrictions on Roundup, but there are numerous lawsuits in progress against the EPA and Monsanto, claiming cancer and other health effects from exposure to Roundup.

GROWTH IN RENEWABLE ENERGY

Many studies have shown that investments in renewable energy currently are more cost effective and yield more jobs than investments in fossil fuels. Wind and solar energy now account for almost 15% of the total electricity generated in the U.S. Since 2007, the use of coal to generate electricity has decreased 40%, being replaced by natural gas, wind and solar. These trends have been driven mostly by economics as the costs of solar and natural gas have declined. In MN clean energy is the fastest growing sector of our economy, providing 57,000 jobs. Despite the efforts of the current administration in Washington to reverse these trends and increase the use of coal, many states, like MN, are moving away from fossil fuels. Mn has a legislated goal of 25% renewable energy by 2025, and there are proposals to increase this goal to 50% by 2030.

June 9-10, 2018

EARTH'S ANIMALS ARE GETTING SMALLER

100,000 years ago, during the last ice-age, many large mammals roamed the earth, both predators (e.g. sabertooth tiger) and prey (e.g. mastodon). At that time, beavers weighed around 200 pounds. But most of these very large species disappeared as humans migrated into the habitats of these creatures, and learned how to hunt them. The average weight of all mammals in Eurasia dropped by 50% as humans became the dominant predator, and the average weight of all mammals in N. America dropped from 216 to 17 pounds as the larger species were hunted to extinction. The same phenomenon is occurring today in the oceans, as whales and larger fish species are decreasing in number. On land, large mammals (e.g. elephants, rhinos) reptiles, amphibians and birds are also decreasing in number, thereby reducing the average weight of all remaining species.

June 23-24

IS COAL A VIABLE FUEL FOR AMERICA?

Despite the recent lip service paid to our coal industry by the White House, the facts clearly paint a different story. Since 2010, 268 coal-fired power plants have shut down in the U.S., and all have been replaced by other forms of energy including, solar, wind and natural gas. The major reason for coal's continuing demise is economic; the costs of construction, operation and remediation of coal power now are higher than solar, wind, or natural gas. Electric utilities are closing coal power plants at a record pace, while solar and wind applications are growing very fast. This trend is a very positive step toward reducing greenhouse gases and all the other pollutants released from coal burning.

GLOBAL WARMING UPDATE--2018

Since global temperature records have been kept, 2016 was the hottest year, 2017 was the 2nd (or 3rd) hottest year, and 18 of the hottest years have occurred in the last 20 years. And now, 2018 is shaping up to be another record breaker. Extreme high temperatures are occurring in both hot and cool areas. Japan experienced its hottest ever temperature of 106 F during a heat wave that killed 65 people and hospitalized thousands. In Montreal a record high temperature of 98 F killed 70 people. Extreme heat throughout the U.S. thus far has resulted in 35 weather stations recording record highs overnight. These high temperatures are the direct result of unusual movements of the jet stream, which have caused weather systems to stall and persist in a given area. Consider that such extreme temperatures and weather patterns are occurring while the global average temperature has increased only 1 degree Celsius, or about 1.8 F. Without substantial reductions in global fossil fuel use, the projections are that the global average temperature will increase at least 3-4 degrees Celsius.