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April 1, 2024

Lolo National Forest

Supervisor's Office

Attn: Amanda Milburn, Lolo Plan Revision

24 Fort Missoula Road

Missoula, MT 59804

RE: SCOPING COMMENTS ON THE PROPOSED ACTION FOR THE LOLO NATIONAL FOREST LAND MANAGEMENT PLAN, RELEASED FOR PUBLIC COMMENT ON JANUARY 31, 2024

Hello,

Native Ecosystems Council, the Alliance for the Wild Rockies, the Council on Wildlife and Fish, Yellowstone to Uintas Connection, and Center for Biological Diversity would like to submit the joint comments for the Proposed Action for the Lolo National Forest Land Management Plan. These comments include one attachment, Attachment A. This attachment includes copies of 42 recent short news reports on ongoing impacts of climate change.

On July 10, 2023, commenters provided initial comments on the Draft Assessment for the forest plan revision process. We raised the following issues and concerns:

1. Failure to manage for wildlife species associated with old growth forests.

2. Failure to manage for wildlife species dependent upon snag forests.
3. Failure to demonstrate clearcutting is optimum management for wildlife.
4. Failure of the agency to limit clearcutting within a given landscape area.
5. Failure of the agency to monitor management impacts on wildlife during the previous planning period.
6. Failure of the agency to complete valid inventories of wildlife in vegetation treatments areas during the previous planning period.
7. Failure of the proposed action to define how the range of natural variation relates to wildlife populations.
8. Failure of agency definitions of "forest health" and "forest resilience" to include management of wildlife habitat and populations.
9. False National Environmental Policy Act (NEPA) claims that forests have grown "too dense" for wildlife.
10. False NEPA claims that logging is necessary to maintain wildlife due to risks of wildfire.
11. Failure of the draft Assessment to include a single habitat standard for big game species, including habitat effectiveness and habitat security.
12. Failure of the draft Assessment to define habitat objectives for big game winter ranges.
13. Failure of the draft Assessment to include the current best science to promote recovery of the grizzly bear by ensuring adequate distribution of "source" habitat.
14. Failure of the draft Assessment to provide a valid conservation strategy for the wolverine.
15. Failure of the draft Assessment to ensure persistence of whitebark pine by avoiding treatments that create severe harm and severe reduction in genetic diversity.
16. Failure of the agency to ensure that Inventoried Roadless Lands will be managed to promote all wildlife species where population losses from vegetation treatments will not occur.
17. Failure of the draft Assessment to address how planned timber management and prescribed burning activities will adversely impact wildlife through climate change.
18. Failure of the agency to include an action alternative that actually manages for wildlife habitat by managing 50% of the forested landscape for wildlife,

including 5,000-acres blocks per 10,000-acre average watershed; not only would this ensure greater persistence of wildlife across the Lolo National Forest, but it would address the complete failure of the agency to monitor wildlife populations and to protect forest raptor nests in vegetation treatment areas, which has surely resulted in massive mortality of these low-density species since the 1986 Forest Plan implementation.

We would like to provide the following comments to support those already provided, without repeating the above 18 issues and concerns. The first is providing specific information on examples of the 200 bird species, as well as other wildlife species, that have no habitat management objectives identified in the Proposed Action.

A. Birds Associated with Old Growth Forests

The proposed Lolo Forest Plan has no requirements to manage any level of old growth for wildlife. Old growth forests can be logged down to the minimum criteria defined by Green et al. (1991). To date, the agency has not demonstrated that this logging will maintain old growth habitat values for the following 22 species associated with old growth. This failure will continue past habitat losses, with only about 10% old growth remaining on this forest, well below the minimum 20-25% recommended for wildlife, including the 22 species listed below. The Revised Forest Plan ensures continued population declines of these species:

Black-backed Woodpecker, Boreal Owl, Brown Creeper, Chestnut-backed Chickadee, Flammulated Owl, Golden-crowned Kinglet, Hairy Woodpecker, Hammond's Flycatcher, Hermit Thrush, Lewis's Woodpecker, Northern Goshawk, Pileated Woodpecker, Pine Grosbeak, Pygmy Nuthatch, Red-breasted Nuthatch, Swainson's Thrush, Three-toed Woodpecker,

Townsend's Warbler, Varied Thrush, Vaux's Swift, White-breasted Nuthatch, and Winter Wren.

B. Birds Associated with Snag Forests

There are at least 32 bird species likely present on the Lolo National Forest that require snag habitat, and in most cases, snag habitat located WITHIN a forest stands. Snag habitat requires hiding cover, thermal cover, and forage resources.

The Proposed Action for the Lolo Forest Plan does not require habitat for these 32 bird species. Instead, the agency is "carrying over" the 1986 Forest Plan strategy whereby snag numbers are used as a "proxy" for wildlife populations. This use of snag numbers to "indicate" populations of 32 bird species associated with snags has never been verified with any science. Use of an invalid "indicator" to define populations and trends of 32 bird species associated with snags is a violation of the NEPA as well as the National Forest Management Act (NFMA). Continued use of this invalid proxy for 32 bird species that use snag habitat will ensure that past declines of these populations on the Lolo National Forest, which are clearly severe, will continue and threaten further declines and local extinctions, some of which have likely already occurred. These bird species associated with snags include the following:

American Kestrel, Barred Owl, Black-backed Woodpecker, Black-capped Chickadee, Boreal Chickadee, Boreal Owl, Brown Creeper, Chestnut-backed Chickadee, Downy Woodpecker, Flammulated Owl, Hairy Woodpecker, House Sparrow, House Wren, House Finch, Lewis's Woodpecker, Mountain Bluebird, Mountain Chickadee, Northern Flicker, Northern Hawk Owl, Pileated Woodpecker, Pygmy Nuthatch, Red-breasted Nuthatch, Red-naped Sapsucker, Northern Saw-whet Owl, Northern Pygmy Owl, Three-toed Woodpecker5, Tree Swallow, Violet-green Swallow, Vaux's Swift, Western Screech Owl, White-breasted Nuthatch, and Williamson's Sapsucker.

There are also many bat species that also depend upon snags for nesting/roosting/ hibernacula activities, including the Big Brown Bat, Little Brown Bat, Long-eared Myotis, Long-legged Myotis, Silver-haired Bat, Townsend's Big-eared Bat, and Yuma Myotis. Also, mammals as the pine marten, fisher, and northern flying squirrel use cavities for denning. A recent Montana Outdoors article estimated that there are 60 wildlife species in Montana that use snags and downed logs.

In order to maintain these 60 species of wildlife, the Lolo National Forest needs to reserve large blocks of mature/older forest habitat from any type of management, so that natural processes, such as bark beetles, and other diseases, as well as fire occur to create the essential snags required for wildlife.

C. Birds that Survive on Conifer Seeds

Large blocks of mature, unlogged forests are required to provide conifer seeds to wildlife. These blocks of highly productive, seed-producing forests need to occur across a large expanse of the landscape, given that local conifer seed production, including by species, is sporadic. There are approximately 31 bird species that may occur on the Lolo National Forest that depend upon conifer seeds as forage. These include the following:

> *Hairy Woodpecker, Clark's Nutcracker, Gray Jay, Stellar's Jay, Black-billed Magpie, Mountain Chickadee, White-breasted Nuthatch, Pygmy Nuthatch, Red Crossbill, Pine Siskin, Scrub Jay, Chipping Sparrow, Song Sparrow, Rufous-sided Towhee, Band-tailed Pigeon, Common Flicker, Lewis's Woodpecker, American Crow, Winter Wren, American Robin, English Sparrow, Brown-headed Cowbird, Evening Grosbeak, Pine Grosbeak, Purple Finch, Red Poll, Goldfinch, Slate-colored Junco, Oregon Junco, and Cassin's Finch.*

The Proposed Action has no conservation strategy for these 31 species of forest birds that feed on conifer seeds. To conserve these species, the agency needs to establish large blocks of forest habitat where optimum seed production is maintained by mature and old growth forests.

D. Mixed Conifer/Aspen Stands

The Proposed Action will continue the past practices of logging out conifers from aspen stands, to the huge detriment to wildlife. These mixed conifer/aspen stands provide some of the highest quality wildlife habitat across the Lolo National Forest, including for a recently declining species, the Williamson's Sapsucker. These mixed conifer/aspen stands are also important habitat for raptors as nesting/foraging habitat, including the Northern Goshawk and Sharp-shinned Hawk, as Flammulated Owl. The aspen trees provide abundant cavities for nesting, while conifers provide year-round hiding cover for wildlife. Also, the conifers provide larger snags for nesting, as opposed to aspen trees. The mix of these tree species within a forest stand should be considered "key ecosystems for wildlife."

E. Burned Forest Habitat

There are at least 14 western forest bird species that benefit from stand replacement fire. These include the following:

> *Black-backed Woodpecker, Cassin's Finch, Clark's Nutcracker, Hairy Woodpecker, House Wren, Lincoln Sparrow, Mountain Bluebird, Olive-sided Flycatcher, Pine Siskin, Ruby-crowned Kinglet, Tree Swallow, Three-toed Woodpecker, Western Wood-pewee, and Williamson's Sapsucker.*

Actually, almost half of 50 bird species monitored in burned forest habitat over an 11 year period benefited from burned forest conditions at some period post-fire,

including in severe, moderate and lightly-burned forests. The diversity of burning levels was an important factor in the response of these birds to fire.

F. Birds of Conservation Concern

The Proposed Action does not include any habitat objectives and standards for identified bird species of conservation concern. The following 13 forest bird species are identified as Montana Species of Concern:

Brown Creeper, Evening Grosbeak, Pileated Woodpecker, Cassin's Finch, Varied Thrush, Lewis's Woodpecker, Clark's Nutcracker, Black-backed Woodpecker, Boreal Chickadee, Flammulated Owl, Great Gray Owl, Northern Goshawk, and Golden Eagle.

The following 10 forest/riparian bird species are identified as Birds of Conservation Concerns by the U.S. Fish and Wildlife Service:

Calliope Hummingbird, Rufous Hummingbird, Broad-tailed Hummingbird, Flammulated Owl, Long-eared Owl, Lewis's Woodpecker, Williamson's Sapsucker, Olive-sided Flycatcher, Evening Grosbeak, and Cassin's Finch.

There are also 11 bat species identified as Montana Species of Concern:

Yuma Myotis, Pallid Bat, Townsend's Big-eared Bat, Spotted Bat, Hoary Bat, Long-legged Myotis, Northern Myotis, Little Brown Myotis, Northern Myotis, Fringed Myotis, Myotis, Eastern Red Bat, and Long-eared Myotis.

It is unclear which of these species may occur on the Lolo National Forest, as there was no information provided on them.

G. Failure of the Lolo Forest Proposed Action to Manage for Western Forest Birds

Of all the birds listed above, there is not a single conservation strategy of habitat plan for any of them, including birds of conservation concern. Actually, given that 64% of western forest birds (67 species) are in decline, this large suite of birds is in desperate need of management to ensure population persistence across the Lolo National Forest landscape. It is clear that there is only one management strategy that will ensure persistence of these species of western forest birds, including in the face of climate change. This is to set aside large blocks of productive forest habitat where no vegetation management activities of any kind are allowed. These areas should be located in each 10,000 acre watershed, and should comprise 50% of the watershed, including 25% old growth and 25% mature/recruitment old growth forests. These management blocks should not be fragmented with any vegetation management actions, including prescribed burning. This strategy will address the following ongoing decimation of wildlife that has occurred during as well as before implementation of the 1986 Forest Plan, due to the following actions.

1. The Lolo National Forest has not monitored any wildlife populations to determine effects of vegetation treatments. This also will not likely occur in the future. This type of monitoring requires a massive amount of labor and analysis, something the Forest Service is not qualified to do. The suggestion that wildlife populations within vegetation treatment areas will be monitored to ensure local viability has never happened, nor will it ever likely to happen based on past agency behavior. In addition, the new monitoring requirements do not actually require any population monitoring of any wildlife species, or measures of impacts of land management activities. In effect, monitoring will never happen, and the only way to

ensure wildlife remain viable within at least portions of the Lolo National Forest is to provide protected wildlife management areas where monitoring is not actually required. We note that the stated monitoring of bird populations is a meaningless program. There may be a few bird species that have high enough numbers of provide population trend data, but this will occur only every 10 years. As well, the limited trend data that will be provided has nothing to do with habitat conditions on the Lolo National Forest. Reasons for any increases or decreases will be unknown. This proposed monitoring program is simply a means of avoiding any accountability for impacts of vegetation treatments on wildlife.

2. The Lolo National Forest also has never protected wildlife in vegetation treatment areas. There have been almost no wildlife surveys ever done for project areas. All of the low density forest raptors that occur in project areas have been most likely extirpated due to loss of nesting sites and loss of nesting habitat. There have also been no requirements to protect nesting sites once nesting is done, even if nesting activity is protected. Once nesting is done, the nest site can be logged and/or burned. The only way to maintain low density forest raptors, as well as to restore their populations, is to provide protected wildlife habitat where no vegetation treatments are allowed.
3. The direct death of forest birds, from songbirds to low-density forest raptors, has likely been massive during the past planning period. Birds have been killed when nesting sites are cut down, or burned in prescribed burning programs. Birds have also been directly killed, or their fitness compromised, with the toxicity of smoke from various burning programs. The only way this direct killing of birds can be fixed is to prevent these types of activities within a reasonable portion of the landscape of the Lolo National Forest. We believe this would be at least 50% of the productive forest base.
4. Without protection of large blocks of wildlife habitat from disturbances from vegetation management activities, there will be very few areas across the Lolo National Forest where productive forest bird populations will occur. There are no habitat protections for old growth forests, which can be logged. There are no protections for forests infested with bark beetles. These are prime areas for large clearcuts. There are no large blocks of

productive forest habitat reserved to ensure high conifer seed crops are available annually at least some where across the landscape. In effect, the Proposed Action assumes that all of the suitable timber lands, as well as many portions of the unsuitable timberlands, will be treated, on approximately 20,000 acres per year. This comes to about 300,000 acre of wildlife habitat destroyed over the planning period, with no actual end in sight of this destruction. Given past losses of wildlife habitat, the Proposed Action is basically an extermination program for most forest wildlife, in violation of the NFMA.

H. Failure of the Proposed Action to Direct Recovery of the Grizzly Bear, Canada Lynx and Wolverine.

A review of open road density impacts on grizzly bears reported that "source habitat" for grizzly bears requires no more than 0.6 km of active motorized routes per square mile. Active motorized route densities of 1.2 km per section have only an 85% survival rate for grizzly bears. An active motorized route density of 1.4 km per section has only a 75% survival rate for grizzly bears. An active motorized route density of 1.6-2.0 km have even lower survival rates. Which as with 1.4 miles per section, are believed to trigger a rapid decline of the grizzly bear population in that landscape. The current best science from multiple bear researchers has reported that one mile per section of active motorized routes is the maximum tolerant level of grizzly bears, with displacement and mortality increasing beyond that level. As such, it can be stated that the current best science for grizzly bears identifies "source habitat" as having no more than a mile per section of active motorized routes.

This current best science is not applied to grizzly bear habitat management on the Lolo National Forest, including within the Northern Continental Divide Ecosystem Recovery Zone, or the Cabinet-Yaak Ecosystem Recovery Zone. Thus these grizzly bear management units are not necessarily "source habitat" for grizzly bears. What is never addressed in the current NEPA documents for this forest plan direction is why source habitat is not required in the Primary Conservation Areas

or Recovery Zones for this threatened species. The failure of the current and proposed forest plan direction to require source habitat within bear management units within recovery zones is a violation of the Endangered Species Act (ESA), including Section 7(a)(1), which requires agency actions to promote recovery.

This failure to promote recovery of the grizzly bear on the Lolo National Forest is also evident in the lack of the requirement for "source habitat" within the Ninemile Demographic Connectivity Area (DCA). Existing active and total road densities in this DCA and other Zone 1 habitat have arbitrarily been established as existing levels, regardless of how these levels impact grizzly bear survival and habitat displacement. These road densities are creating "sink habitat" within areas important to dispersal of grizzly bears to other areas, including the Bitterroot Recovery Zone. The overall health of the grizzly bears in both the Northern Continental Divide Ecosystem and the Cabinet-Yaak Recovery Zone on the Lolo National Forest is being harmed by the proposed forest plan direction, in violation of the ESA.

The agency has also failed to identify another connectivity zone for grizzly bears on this forest, the Cabinet-Bitterroot Connectivity Area. There are no habitat management requirements for grizzly bears in this identified connectivity area, which hinders population viability of both the Bitterrroot and Cabinet-Yaak Recovery Zones, in violation of the ESA.

The Proposed Action needs to address why promoting recovery of the grizzly bear is not a priority for the upcoming planning period, and what is more important as a public benefit. We suggest that our proposed action alternative, protecting at least half of the productive forest lands on this forest just for wildlife habitat, could include designs for provide "source habitat" for grizzly bears within both recovery zones and connectivity areas. This would be consistent with the ESA, and promote long-term recovery and genetic health of grizzly bears in both Montana and Idaho.

The Northern Rockies Lynx Management Direction (hereafter "Lynx Amendment") fails to use the current best science for lynx management, as is required by both the ESA and the NEPA. This Forest Plan direction needs to be amended so that lynx are actually promoted, instead of being exterminated by Forest Plan direction.

Also, the agency needs to develop a valid conservation strategy for the threatened wolverine. This species is highly sensitive to vegetation management activities, and reserves of wolverine habitat protected from vegetation management are required for its conservation. Again, these protected areas for wolverine could be combined with other protected areas for the grizzly bear and other forest wildlife, including birds.

There is currently no valid science developed for management of whitebark pine forests. What is clear is that treatment of whitebark pine areas is resulting is a massive loss of genetic diversity of this imperiled species by destruction of expansive numbers of seedlings and saplings, as well as smaller mature trees. In addition, management of whitebark pine stands is likely increasing their risk of mortality from pine beetles. In addition, whitebark pine are highly sensitive to fire. Finally, treatments to remove competing conifers is unlikely necessary, as succession of these other conifers in whitebark pine areas could take hundreds and hundreds of years. Until there is a valid protection strategy for whitebark pine stands, experts state that these stands should just be left along.

I. Protection of Inventoried Roadless Lands

The Forest Service has increasingly been treated IRAs with both slashing, burning and even logging. To date, the impact of these treatments on wildlife, including western forest birds, grizzly bear, wolverine and lynx are dismissed without any actual analysis. The reduction in carrying capacity for all of these wildlife species is a direct action of treatments in IRAs, and needs to be addressed. The Forest Plan

needs to define the standard excuses for treating IRAs, which are to protect wildlife from uncharacteristic fire, and to restore ecosystems. We have never seen any actual analysis as to why wildlife needs to be protected from fire, or why eliminating wildlife habitat qualifies as "ecosystem restoration." We are requesting that the agency provide an in-depth analysis, along with the supporting science, to demonstrate that protecting wildlife from fire is needed in IRAs, and why removing vegetation results in increased wildlife populations.

Also, we would like the agency to provide an analysis of how treatments in IRAs affects suitability of wildlife as per temperatures. In recent years, average daily temperatures have increased across Montana, and further increases will result from treatments in IRAs. We would like to know what the expected levels of temperature increases will be in IRAs, and why these increases benefit wildlife, not just forest birds, but the wolverine as well.

Since the agency almost never completes any reliable surveys for wildlife, including songbirds, please provide an analysis of the estimated number of birds that will be killed with burning and/or logging in IRAs. What is the expected habitat benefit that will result in increased productivity of birds post-burning, to compensate for the birds killed by direct slashing/logging activities, and by direct mortality from smoke toxicity, and reduced survival potential as well from smoke toxicity?

J. Climate Change

We have included one attachment to these comments, Attachment A. This attachment includes 42 news clips and short reports on the ongoing impacts of climate change across the world, as well as in Montana, where temperatures continue to increase. All of the proposed management of forest resources in the Proposed Action require logging and burning of forests, including 20,000 acres estimated per year. What is never provided in regards to this objective is why this

will address climate change. The agency needs to provide the public with an analysis as to the amount of photosynthetic carbon uptake that will be reduced annually with this 20,000 acre of vegetation treatments, along with the increase in carbon emissions that will result of burning/logging forest habitat. Also, the public needs to understand why these increases in emissions in carbon and reductions in carbon uptake by vegetation are needed to address climate change. How specifically are these benefits to climate change being measured? If there are no benefits, why is the Forest Service not required to address climate change? Why doesn't the agency has a public responsibility to address climate change as it is impacted by agency management activities?

Regards,

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Attachment A for the Comments being Submitted by NEC, AWR, CWF, Y2U, and CBC on the Proposed Action for the Lolo Land Management Plan 2024.

Attachment A includes 42 brief news report/articles on the ongoing impacts of climate change across the globe.

Climate costs: The home insurance squeeze

In some places, home protection against climate change can cost as much as a home, said **Felipe Marques** and **Devon Pendleton** in ***Bloomberg***. Across the country, the price of homeowners' insurance "is reshaping who can live where, and at what cost." In Florida, the average rate has tripled in just five years to roughly $6,000 today. But premiums can rise to stratospheric heights. One megamansion in Florida that was insured for $60 million "carried a premium of about $600,000 last year." This year, the premium has risen to $750,000—for just $10 million of coverage, with wind damage excluded. In some exclusive enclaves, increases of 800 percent have become the norm. But the squeeze has hit homeowners of every income level. Overall, in Florida, nearly 15 percent of homes are uninsured.

Fort Myers Beach, Fla., after Hurricane Ian in 2022

Some buyers are already getting cold feet at the prospect of rising insurance rates, said **Jean Eaglesham** in ***The Wall Street Journal***. One Southern California realtor said she recently had a client who was scared off from purchasing a $13.5 million property because "the home-insurance premiums quoted were $100,000 to $300,000 a year." Nationally, only 9 percent of home builders say home sales are being affected by insurance costs. But in Florida and parts of California, the number has jumped to about a third, further dampening a housing market that's already sluggish from high mortgage rates.

Good insurance will get harder to come by, said **Jacob Bogage** in ***The Washington Post***. At least five major property insurers told regulators in a survey "that extreme weather patterns have led them to stop writing coverages in some regions," change their policies, and raise premiums. Their fears are far from unwarranted. U.S. insurers "disbursed a record $295.8 billion in natural-disaster claims over the past three years." In California, many homebuyers already can't find any kind of coverage at all, said **Sam Dean** in the ***Los Angeles Times***. Companies "representing more than half of California's $12 billion home insurance market have stopped or limited new policies." Consumer advocates have argued against requests for premiums increases of 28.1 to 35.6 percent. But insurers have responded by "effectively closing for business."

Beth Pratt works for the National Wildlife Federation and has lived in her home right by Yosemite National Park for close to 25 years, said **Juliette Kayyem** in ***The Atlantic***. Trying to "coexist with fire," she added a 2,500-gallon water tank and replaced her wood decks with metal. To her insurance company, though, Pratt's "resolve appears to be irrelevant," and she recently lost her coverage. For insurers, the "risk calculation" no longer works, and homes like Pratt's are just too dangerously situated. Painful as it is, we should be listening to what they're telling us.

Review of reviews: Books

Book of the week

The Heat Will Kill You First: Life and Death on a Scorched Planet

by Jeff Goodell (Little, Brown, $29)

"More than any other effect of climate change, heat destroys life with an excruciating immediacy," said **Peter Holley** in ***Texas Monthly***. In his best-selling new book, climate journalist Jeff Goodell delivers "a bracing examination of climate change in its most essential form," showing how the planet's rising temperature is unleashing spells of deadly extreme heat and reminding us how vulnerable we are to temperatures like those that have gripped much of the southernmost U.S. in the past week.

"Goodell is at his most effective when he describes how heat affects the human body," said **Shannon Osaka** in ***The Washington Post***. He recounts in detail how a California couple and their 1-year-old all died on a trail in 2021 when a morning hike ended less than 2 miles from safety during a sunbaked climb back to their truck through 100-degree heat. Like the

A traffic warden braves last week's heat wave.

15,000 people who perished in Paris during a 2003 heat wave or the 600 killed in British Columbia in 2021 by a fluke weeklong temperature spike, the California family were victims of the body's surprising vulnerability to internal temperatures above 98.6 degrees. When those internal temperatures hit 102 or 103, a victim can pass out, as the body's attempt to cool off sends blood to the skin, abandoning internal organs, including the brain. Above 107 degrees, "things start to break down at a cellular level." Cell membranes melt away, unleashing systemic hemorrhaging and fatal heatstroke.

Predictably, the old, sick, and poor are more vulnerable to extreme heat, said **Jennifer Szalai** in ***The New York Times***. But "people who have faith that their resources will spare them are kidding themselves." Heat imperils food supplies because of the hazards it poses to plant and animal life. It also causes forest fires and rising sea levels, and contributes to many deadly storms. And when regions like British Columbia can be hit with triple-digit temperatures, few places on the planet are invulnerable to heat waves and failures of the electric grid that can result in widespread death. *The Heat Will Kill You First* covers all those threats as it surveys much of the planet, and "Goodell's stripped-down style suits his subject. This is a propulsive book, one to be raced through." As it strings together troubling scenes and links the crisis to the burning of fossil fuels, it packs in enough data to terrify "even the most casual reader," said **Bethanne Patrick** in the ***Los Angeles Times***. It reads like "a wake-up call with no snooze button."

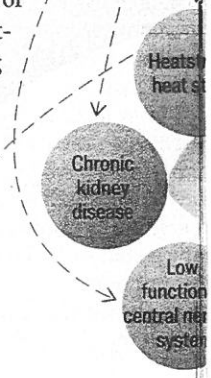
Cascading Climate Impacts

The far-reaching consequences of a warming world

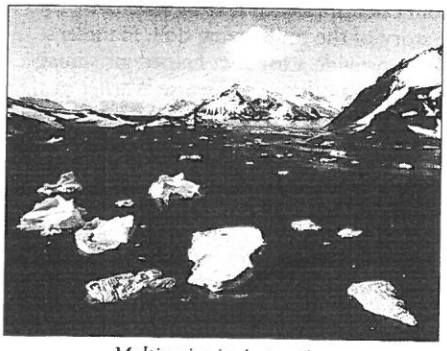
TEXT BY LORI YOUMSHAJEKIAN
GRAPHIC BY FEDERICA FRAGAPANE

WHEN PEOPLE IMAGINE the aftermath of a natural disaster, skin infections and gastrointestinal illnesses aren't usually the problems that come to mind. But these conditions are embedded in a cascade of extensive and often unexpected consequences of wildfires, hurricanes, and other calamities related to climate change. A report entitled *Atlas of Disaster* connects the dots between the initial effects of climate hazards and the longer-term outcomes. Most of the U.S. is already feeling the impact—90 percent of American counties experienced a climate-related disaster in the decade from 2011 to 2021, and some have seen many. The damage is even worse in numerous other parts of the world.

"Climate change is here, and our communities are suffering," says report co-author Amy Chester, managing director of Rebuild by Design, a nonprofit founded after the devastation of Hurricane Sandy in 2012. She hopes this research will shift the national discussion away from what to do if climate disasters occur and toward what we can do now that they are happening.



Inspired by "Cascading Impacts of Climate Events" graphic by Geethanjali MR, in *Atlas of Disaster*, from Rebuild by Design; Rebuild by Design sources: *Preparing for Regional Health Impacts of Climate Change in the United States*, Centers for Disease Control and Prevention Climate and Health Program, July 2020; *Human Health and the Climate Crisis*, by Gail L. Carlson, Jones & Bartlett Learning, January 2022; "Health Effects of Coastal Storms and Flooding in Urban Areas: A Review and Vulnerability Assessment," by Kathryn Lane et al., in *Journal of Environmental and Public Health*, Vol. 2013, http://dx.doi.org/10.1155/2013/913064



Getty (3)

Melting ice in Antarctica

Points of no return for the climate

The planet is on the verge of breaching not one but five catastrophic climate tipping points, scientists have warned. Those include the loss of ice sheets in Greenland; glacier loss in the West Antarctic; the thawing of permafrost; the destruction of coral reefs; and the collapse of a crucial oceanic current in the North Atlantic. The Global Tipping Point report, the work of an international team of 200 researchers, also found that three other thresholds, including the destruction of mangroves and boreal forests, could be reached in the 2030s if temperatures rise more than 1.5 degrees Celsius above preindustrial averages. These processes reach tipping points because they are systems that don't gradually deteriorate as the planet warms, reports *New Scientist*. Instead, they can suddenly flip from one state to another, causing catastrophic damage that can never be undone. The changes "pose threats of a magnitude never faced by humanity," says lead author Tim Lenton, from the University of Exeter. "They can trigger devastating domino effects, including the loss of whole ecosystems and capacity to grow staple crops, with societal impacts including mass displacement, political instability, and financial collapse." Staving off at least some of the changes is still possible, the researchers say, by drastically cutting greenhouse gas emissions.

The Week 12/22/23

3/21/23

UN climate report delivers stark warning

On'thin ice'

ASSOCIATED PRESS

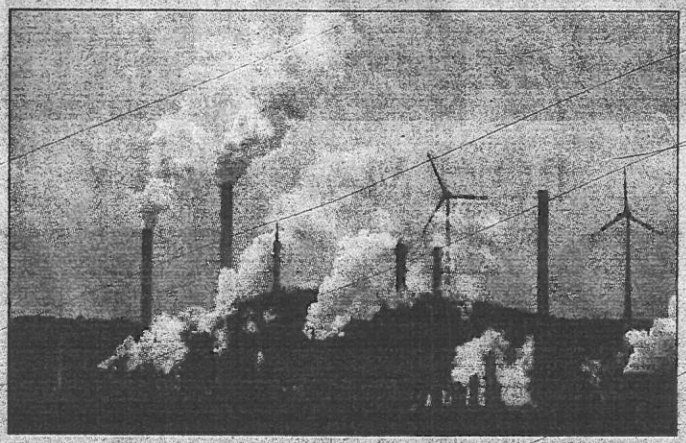
BERLIN — Humanity still has a chance, close to the last, to prevent the worst of climate change's future harms, a top United Nations panel of scientists said Monday.

But doing so requires quickly slashing nearly two-thirds of carbon pollution by 2035, the Intergovernmental Panel on Climate Change said. The United Nations chief said it more bluntly, calling for an end to new fossil fuel exploration and for rich countries to quit coal, oil and gas by 2040.

"Humanity is on thin ice — and that ice is melting fast," United Nations Secretary-General Antonio Guterres said. "Our world needs climate action on all fronts — everything, everywhere, all at once."

Stepping up his pleas for action on fossil fuels, Guterres called for rich countries to accelerate their target for achieving net zero emissions to as early as 2040, and developing nations to aim for 2050 — about a decade earlier than most current targets. He also called for them to stop using coal by 2030 and 2040, respectively, and ensure carbon-free electricity generation in the developed world by 2035, meaning no gas-fired power plants either.

That date is key because nations soon have to come up with goals for pollution reduction by 2035, according to the Paris climate agreement. After contentious debate, the U.N. science report approved Sunday concluded that to stay under the warming limit set in Paris the world needs to cut 60% of its greenhouse gas emissions by 2035, compared with 2019, adding a new target not previously mentioned in six previous reports issued since 2018.



ASSOCIATED PRESS PHOTOS

ABOVE: The industrial backdrop of a BP refinery and a Uniper coal-fired power plant is seen in Gelsenkirchen, Germany, on March 6. **BELOW:** Pakistani women wade through floodwaters as they take refuge in Pakistan on Sept. 2.

"The choices and actions implemented in this decade will have impacts for thousands of years," the report, said calling climate change "a threat to human well-being and planetary health."

"We are not on the right track but it's not too late," said report co-author and water scientist Aditi Mukherji. "Our intention is really a message of hope, and not that of doomsday."

With the world only a few tenths of a degree away from the globally accepted goal of limiting warming to 1.5 degrees Celsius (2.7 degrees Fahrenheit) since pre-industrial times, scientists stressed a sense of urgency. The goal was adopted as part of the 2015 Paris climate agreement and the world has already warmed 1.1 degrees Celsius (2 degrees Fahrenheit).

This is likely the last warning the Nobel Peace Prize-winning collection of scientists will be able to make about the 1.5 mark because their next set of reports may well come after Earth has either breached the mark or is locked into exceeding it soon, several scientists, including report authors, told The Associated Press.

After 1.5 degrees "the risks are starting to pile on," said report co-author Francis X. Johnson, a climate, land and policy scientist at the Stockholm Environment Institute. The report mentions "tipping points" around that temperature of species extinction, including coral reefs, irreversible melting of ice sheets and sea level rise on the order of several meters (several yards).

"1.5 is a critical critical limit, particularly for small islands and mountain (communities) which depend on glaciers," said Mukherji, who's also the climate change impact platform director at the research institute CGIAR.

"The window is closing if emissions are not reduced as quickly as possible," Johnson said in an interview. "Scientists are rather alarmed."

Many scientists, including at least three co-authors, said hitting 1.5 degrees is inevitable.

"We are pretty much locked into 1.5," said report co-author Malte Meinshausen, a climate scientist at the University of Melbourne in Australia. "There's very little way we will be able to avoid crossing 1.5 C sometime in the 2030s" but the big issue is whether the temperature keeps rising from there or stabilizes.

Guterres insisted "the 1.5-degree limit is achievable." Science panel chief Hoesung Lee said so far the world is far off course.

If current consumption and production patterns continue, Lee said, "the global average 1.5 degrees temperature increase will be seen sometime in the [illegible] decade."

Scientists emphasize that the world or humanity won't end suddenly if Earth passes the 1.5 degree mark. Mukherji said "it's not as if it's a cliff that we all fall off." But an earlier IPCC report detailed how the harms -- including even nastier extreme weather — are much worse beyond 1.5 degrees of warming.

"It is certainly prudent to be planning for a future that's warmer than 1.5 degrees," said IPCC report review editor Steven Rose, an economist at the Electric Power Research Institute in the United States.

If the world continues to use all the fossil fuel-powered infrastructure either existing now or proposed Earth will warm at least 2 degrees Celsius since pre-industrial times, the report said.

The Week 4/17/23

Mexico: Can a destroyed Acapulco be resurrected?

Acapulco is living its darkest hours, said **Jovany Hurtado García** in ***El Universal***. In late October, Hurricane Otis ripped through it as a category 5 monster, uprooting palms, flooding streets, and unleashing boulders that "rolled from the hills and crushed houses." At least 100 people are presumed dead, and nearly every building in the city was damaged. Acapulco's crescent beach, once a playground for Hollywood icons like Elizabeth Taylor and Frank Sinatra, "looks like a war zone," the windows of its high-rise hotels "blown out" and boats strewn across the sand. Stranded without phone service, internet, or electricity for days after the storm, Acapulco's 1 million residents were reduced to scavenging in the ruins for food and water. With gusts over 200 miles an hour, Otis wasn't just the worst storm to hit Mexico, said **David Razú** in ***Milenio***. It was one of the strongest ever recorded in the world. Damages could top $15 billion—and that doesn't include the losses from tourism over the next year. Yet while President Andrés Manuel López Obrador claims Mexico has "unlimited resources" to offer the city, his recovery plan offers a paltry $3.4 billion. It won't be anywhere near enough.

Rebuilding this resort city will cost billions.

Rebuilding will be a long and complicated endeavor, said **Raymundo Riva Palacio** in ***El Financiero***. The surge in drug violence in surrounding Guerrero state had Acapulco already "severely ailing" before the storm hit. Since 2006, cartels have been battling for control of the state, unleashing bloodshed and terror. In a single week this past August, a prominent Acapulco businessman was murdered, a woman's body was found in a trash bag by the highway, and narcos set a taxi aflame with the driver inside. The violence has "scared off tourists," especially the foreign tourists the city's economy depends on, and many hotel chains pulled out years ago.

Those losses exacerbated the grinding poverty of an underclass long hidden behind Acapulco's glamorous facade, said **Viri Ríos** in ***El País***. That's why Mexican authorities shouldn't focus on just refurbishing the damaged hotels. "This is a golden opportunity to create a new Acapulco that works for everyone." That means relocating to higher ground residents of the flood-prone, low-lying neighborhoods that Otis decimated. It means paving the dirt roads that had turned to muddy streams. Above all, it means changing the tourism industry so that it no longer "privatizes the beach" for the exclusive use of foreign tourists at the expense of locals. Realizing a new concept for the city will take longer and cost more, but it's "the rescue Acapulco deserves."

Such a renaissance could light the way to "the salvation of Mexico," said **Carlos López Medrano** in ***La Orquesta***. Acapulco was all of Mexico in microcosm, with its "years of abandonment, its acceptance of a state of disorder," its gradual normalization of the presence of gangsters and corruption. But it used to be sexy and fun, a place where people believed "that paradise was not out of reach." If we can restore Acapulco's glamor, that could provide "the necessary impetus to heal the rest of the country."

Climate: Will COP28 change anything?

World leaders last week struck a climate deal that's "both historic and 30 years too late," said **Karl Mathiesen** in ***Politico***. At the 28th Conference of the Parties (COP28), an annual climate summit organized by the U.N., some 200 nations committed for the first time to "transitioning away from fossil fuels." But tougher language calling for the complete "phaseout" of planet-warming oil, natural gas, and coal was stripped from the deal to appease the United Arab Emirates, the summit's host nation, and other petrostates. How shortsighted, said ***Nature*** in an editorial. Earth's temperature is now 1.3 degrees Celsius above pre–industrial revolution levels, and we're "all but certain" to blow past the 2015 Paris climate agreement's goal of limiting warming to 1.5 degrees. We'd need to eliminate carbon emissions in "little more than a decade" to have even a 50 percent chance of hitting that target and heading off the most devastating and "potentially irreversible" effects of climate change. COP28 doesn't come close.

"Give credit where it's due," said **Mark Gongloff** in ***Bloomberg***: COP28 achieved more than its predecessors. Reaching a workable agreement among oil producers, big-time polluters, and small island nations "on the front lines of global heating" usually proves impossible. COP28 seemed destined to be another failure: It was held in a notorious petrostate and led by Sultan Al Jaber, an Emirati oil exec who recently declared that a fossil fuel phaseout would put humankind "back into caves." But he and U.S. climate envoy John Kerry worked feverishly "to turn what could have been an 'F' on a global climate deal into a respectable 'C.'" Participants agreed to decouple from fossil fuels, triple renewable-energy capacity, and establish a "loss and damage" fund for climate-vulnerable countries.

"At the end of the day, or record-hot year, what matters is not what language countries agree to but what they actually do," said **Elizabeth Kolbert** in ***The New Yorker***. The U.S. pushed for phaseout language in negotiations but shows little evidence of transitioning away from fossil fuels. It is now the world's largest oil and natural gas producer, and the Biden administration continues to steadily approve new hydrocarbon projects. With the planet already experiencing "dangerous" climate change—brutal heat waves, extreme rainfall, melting ice sheets—perhaps leaders will get serious at the next COP summit. It's "scheduled to take place in another petrostate, Azerbaijan."

The Week 12/29/23

CLIMATE CHANGE

Zeroing In

Supercomputer network could predict climate change effects down to the neighborhood

SCIENTISTS HAVE USED computer models to predict global warming's implications for more than five decades. As climate change intensifies, these increasingly precise models require more and more computing power. For a decade the best simulations have been able to predict climate change effects down to a 25-square-kilometer area. Now a new modeling project could tighten the resolution to one kilometer, helping policymakers and city planners spot the neighborhoods—or even individual buildings—most vulnerable to extreme weather events.

"Climate [science] has always had a computing problem," says Bjorn Stevens, director of Germany's Max Planck Institute for Meteorology. Recent technological advances such as shrinking transistors, however, have made computers far more capable, Stevens says. He and a group of climatologists and scientists from other disciplines are developing a network of global supercomputing centers called Earth Visualization Engines, or EVE, which they hope to complete within the decade. These centers would work together by running climate models, interpreted by machine-learning algorithms, on supercomputers to predict climatic shifts and severe weather events locally.

A residental area in Pakistan flooded after heavy monsoon rains in 2022.

The Week 9/1/23

Watching the flames approach

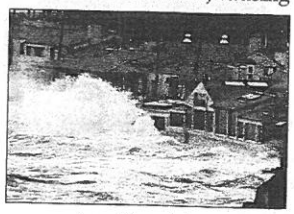
Kelowna, British Columbia
Fires threaten cities: Canadian troops were called in to fight a wildfire in British Columbia this week after the province declared a state of emergency. At least 35,000 people in the resort city of Kelowna had to be evacuated as wildfire flames raced through the suburbs, consuming houses along the way. "This event is going to leave a long-lasting scar," said West Kelowna fire chief Jason Brolund. Dry, windy conditions and baking heat have made this Canada's worst fire season, with 650 fires currently deemed out of control. In the remote Northwest Territories, firefighters are battling a blaze near the only city, Yellowknife, whose entire population of 20,000 has been evacuated.

■ Last year was the world's warmest on record and likely the hottest in the last 100,000 years, according to the European Union's climate-change agency. Averaged across 2023, temperatures were 2.66 degrees F higher than they were in the 1850-1900 pre-industrial period.
The New York Times

The Week 1/19/24

The Week 2/2/24

San Diego
Historic flood: More than 4 inches of rain fell on San Diego this week within a matter of hours, causing severe flooding that filled homes with mud and swept cars downstream on roads turned to rivers. Hundreds of people were rescued from their homes after the city's fourth-wettest day in nearly 175 years. Some residents said that flood warnings were perilously delayed, but no deaths were reported. "Entire lives changed in just a few minutes," San Diego Mayor Todd Gloria said. Many of the hardest-hit neighborhoods are also the city's poorest. Families fled chest- or even neck-deep floodwaters, and many people and their pets were seen crying for help from rooftops. Residents returned to fi d thick sludge covering what remained of their belongings. "All my memories are gone," said Luis Reyes, 18, who managed to climb out of a bedroom window in his family's apartment with his two Chihuahuas.



A sudden deluge

Scientific American 11/23

GRAPHIC SCIENCE

Text by Andrea Thompson | Graphic by Amanda Montañez

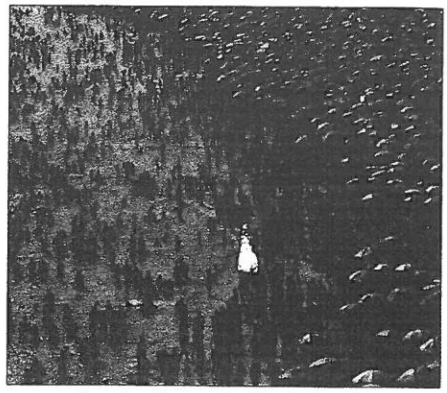
A Fair Share of Carbon

Some countries are using too much of the world's CO_2 budget

To have a 50-50 chance of keeping global temperatures from rising by more than 1.5 degrees Celsius relative to preindustrial times, Earth's nations need to limit carbon dioxide emissions to about 500 gigatons between 2020 and 2030. With the world currently putting out roughly 40 gigatons of CO_2 per year and emissions continuing to rise, we will easily exceed that budget and keep emitting past 2030.

But countries have not contributed to emissions equitably. A new analysis of the national carbon budgets of a select group of countries shows that the collective European Union and nations such as the U.S. and Russia have produced far more than their fair share, whereas countries that have industrialized more recently, such as India, have not come close to theirs. Developing countries cannot emit their allotment of carbon without worldwide temperature goals being overshot. Therefore, developed nations need to cut their emissions much more aggressively and provide financial and technological support for renewable energy in the developing world, experts say.

Highest Emitte



Beating the heat in Rio de Janeiro

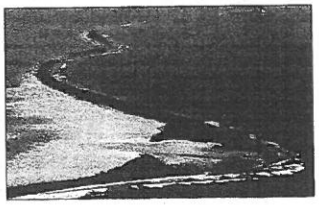
Global warming's scary milestone

Nov. 17 was an unwelcome landmark in the fight against climate change, reports *Time*: It was the first day in human history when the average global temperature hit 2 degrees Celsius warmer than preindustrial levels. The following day, that watershed moment was repeated. This doesn't mean we've officially breached the 2015 Paris Agreement, which committed the world to limiting temperature rise to well below 2 degrees (and ideally to 1.5 degrees). That goal is based on long-term temperature averages over several years. But it's not a good sign, particularly as this is not the only record to fall in recent months. Every month since June has set a new high temperature. The past eight years have been the eight hottest on record, and 2023 is on track to break the 2016 record for hottest year ever. At this rate, the latest U.N. report says, Earth is speeding toward 2.5 to 2.9 degrees Celsius of warming by the end of the century. "It's really an indication that we are already seeing a change, an acceleration," said report lead author Anne Olhoff, of Danish climate think tank Concito. "Based on what science tells us, this is just like a whisper. What will be in the future will be more like a roar."

THE WEEK December 8, 2023

Canberra, Australia

Climate refugees welcomed: Australia has agreed to resettle residents of the Pacific island nation of Tuvalu, which is threatened by rising sea levels. Two of the nine islands are already gone, and the main island could disappear by 2100. In a deal struck last week, Australia will give visas to 280 Tuvaluans each year, about 2.5 percent of the country's 11,000 people. At that rate it would take 40 years for everyone to move, but Tuvaluan Prime Minister Kausea Natano said he wants to avoid mass upheaval. It's the first time Australia has recognized climate change as grounds for asylum—but Canberra also has less altruistic motives, notably countering China's influence in the region. The deal bars Tuvalu from clinching any security pact without Australian approval.



The main island: Shrinking

THE WEEK November 24, 2023

■ This October was the hottest on record globally, about 3.1 degrees Fahrenheit above the pre-industrial average for the month. It was the fifth straight month to shatter temperature records. "We can say with near certainty," said Samantha Burgess, deputy director of Europe's climate agency, "that 2023 will be the warmest year on record."
The New York Times

Rio de Janeiro

Oppressive heat kills Swift fan: A fan died of apparent heatstroke on opening night of the Brazil leg of Taylor Swift's "Eras" tour last week. Ana Clara Benevides Machado, 23, collapsed after waiting eight hours in 108-degree temperatures—with a heat index of 140—to enter the packed, 60,000-seat stadium in Rio de Janeiro. Medics revived Benevides briefly, but she died shortly afterward at a hospital. "I feel this loss deeply," Swift said on social media, "and my broken heart goes out to her family and friends." The concert the following night was postponed because of continued heat. Performances resumed the next day after temperatures dropped to the 80s, but some ticket holders, many of whom had traveled to Rio from hundreds of miles away, could not make the rescheduled date. Rio Mayor Eduardo Paes ordered the stadium to add more water stations to the venue, as no outside bottles are allowed in.

The Week 12/1/23

The Week 8/11/23

Talking points

Global boiling: An ominous warning

The era of global warming is over, said **Madison Pauly** in *Mother Jones*. We're now in the age of "global boiling." That's the term United Nations Secretary-General António Guterres used last week after scientists reported that July was likely the world's hottest month on record, at least 0.4 degrees Fahrenheit above July 2019, the previous warmest. The signs of global boiling are everywhere: wildfires raging in Canada and around the Mediterranean, water temperatures hitting 101 degrees off Florida. This human-caused climate chaos, Guterres warned, is "just the beginning." Perhaps the future will look like Phoenix, said **Jack Healy** in *The New York Times*. The city has endured a "month in hell"—31 days exceeding 110 degrees. Residents have been hospitalized with burns after falling "on pavement that can heat up to 180 degrees" and the city has deployed "trailer-size coolers to store bodies." Phoenix has reported 25 heat-related deaths this year; another 249 are under investigation.

Treating a heat stroke patient in Phoenix.

Extreme heat "threatens virtually every aspect of human health," said **Dr. Leana Wen** in *The Washington Post*. Heat stroke, which occurs when ambient temperatures are so high that the body can't cool down, can cause organ failure within minutes. Research shows that high temperatures can also "exacerbate underlying medical conditions by straining the heart, lungs, and kidneys"; impair sleep; and "worsen depression, anxiety, and suicide rates." Then there's the economic toll, said **Coral Davenport** in *The New York Times*. In Southern California, Amazon drivers and warehouse workers have gone on strike in part to protest working conditions that can top 100 degrees; in Michigan, "construction crews are working shortened days because of heat." One study found that loss of labor due to heat exposure cost the economy $100 billion in 2020. That figure is predicted to hit $500 billion annually by 2050.

The basic rhythms of human behavior are being reordered as the mercury rises, said **Scott Simon** in *NPR.com*. In Italy, the health ministry has "cautioned people not to walk outside, and to avoid wine and coffee." In normally mild Washington, a growing number of residents are seeking air-conditioned shelter. Summer should be blissful: "School is out. Vacations are planned. We can go coatless, feel carefree." But it's becoming a "season to fear," with festivals, outdoor concerts, and sporting events canceled "because of unsafe heat, and wildfire smoke in the skies." Soon, people may spend July and August longing for January.

Moapa Valley, Nev.
Scorched to death: Two hikers died of suspected heat exhaustion last week at Nevada's Valley of Fire State Park, the latest in a rash of heat-related deaths during a historically sweltering summer. Officials said Jessica Rhodes, 34, and Diana Matienzo Rivera, 29, had been walking a 4.6-mile trail and ran out of water as temperatures hit 118 degrees. Days earlier at Death Valley National Park, Calif.—about 180 miles west—a 71-year-old hiker died of apparent heat-related causes as temperatures hovered around 120 degrees. At least five people are thought to have died from heat-related causes in national parks since June 1, a higher toll than is typically recorded in an entire year. In the Phoenix area, dozens of people have been hospitalized for burns after falling on sizzling sidewalks. "It only takes a few seconds for you to get a third-degree burn," emergency room doctor Frank LoVecchio said.

Valley of Fire: Hit 118 degrees

The Week 8/4/23

The Week 8/11/23

The bottom line

■ In 1980, losses from three U.S. natural disasters—a drought, a flood, and a hurricane—topped $1 billion each (in 2023 dollars). Last year, there were 18 events across the country that caused $1 billion or more in damage, including Hurricane Ian, which was responsible for $114 billion in damage.
Bloomberg

The Week 8/18/23

■ Phoenix, which recently had a record-breaking 31 consecutive days of temperatures at or above 110 degrees Fahrenheit, is the country's fastest-growing metropolitan area.
The Atlantic

The Week 8/4/23

■ From June 22 to July 22 nearly 5,000 records for heat and rainfall were broken or tied in the U.S. More than 10,000 records were set globally.
Associated Press

The Week

16 NEWS

8/18/23

Noted

■ During July, the hottest month on record, global temperatures for the first time blew past a key temperature threshold, rising between 2.7 and 2.9 degrees Fahrenheit (1.5 degrees Celsius) above preindustrial levels. "It's just shocking just how big an excursion this is from anything we've seen before," said climate scientist Zeke Hausfather.
The Washington Post

URUGUAY

Can farmers survive the hot new normal?

Juan Martín Posadas
El País

Even winter has brought South America no relief from global warming, said Juan Martín Posadas. For months, Uruguay has been suffering under a drought like a "biblical punishment." By May, the Paso Severino reservoir, which serves Montevideo's 2 million people, was parched and cracked, "looking like a scene from the Apocalypse," and the water utility was forced to draw from the brackish River Plate. The foul-tasting water in the taps ran brown, and officials warned pregnant women not to drink it. Now, in what should be our coldest month—August down here is like February in the U.S.—temperatures in northwestern Uruguay hover above 80 degrees, thanks to an extreme heat dome baking South America. In neighboring Argentina they've surpassed 90, while one Chilean town high in the Andes topped 100. These extremes have hit farmers the hardest. Many "lost everything" this harvest season as more than $1 billion worth of crops dried to dust. If this is the new normal, city dwellers will be fine: We're already building desalinization plants to make river water potable. But in the countryside, "every aspect of life will be disrupted." Farmers will need new livestock breeds, new feeds, nev crop varietals. We're in for a "colossal upheaval."

Getty

The Week 10/27/23

Trying to cool off in a Lahore canal

Will Pakistan become unlivable?

Heat waves can already have fatal consequences for vulnerable people, but as temperatures rise, some world cities will become so hot by the middle of the century that even the young and healthy could start dying of heatstroke or kidney failure. That's the conclusion of a new study that estimated how many days a year heat and humidity will be so intense that the human body can no longer cool itself. Only brief stretches of such extreme conditions are expected in the U.S.: about one day a year in Chicago, for example. But Lahore, Pakistan, is likely to pass that threshold for nine to 15 days a year, even under the most conservative warming scenario. Under the worst scenario, those conditions would last for months. "It's when you see these accumulations of weeks or months of this at a time that things become too hot for humans," lead author Daniel Vecellio, from George Mason University, tells *The Washington Post*. The Red Sea port of Al Hudayah, Yemen, will be even worse off, with deadly heat for a month or two under the best scenario and nearly all year long under the worst. Cities in India, Vietnam, Saudi Arabia, and Iran are also at risk.

The week 8/11/23

Beijing

Deadly flooding: At least 21 people were killed in Beijing this week when Typhoon Doksuri dumped months' worth of rain in just four days, causing landslides and floods that swept away homes and cars. A million people were evacuated from the megacity's western outskirts and neighboring Hebei province, which saw a record 29 inches of rainfall and the worst of the flooding. Military crews were sent to rescue hundreds of people who were trapped in apartment buildings as water filled the lower floors—reaching as high as 13 feet. At the height of the storm, hundreds of train passengers were stranded on waterlogged tracks for 30 hours. "Supplies cannot come in. People are hungry," one traveler told state television.

Acres under u ter

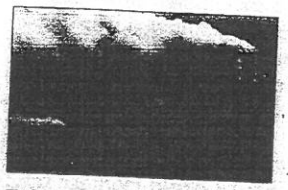
The Week 10/20/23

Noted

■ Global temperatures hit a record high for the third month in a row in September, shattering the previous heat record for that month by 0.9 degrees Fahrenheit—the largest monthly jump ever observed. September's relative heat was "absolutely gobsmackingly bananas," said climate scientist Zeke Hausfather.
The Guardian

USA Today

The Week March 17, 2023



■ Carbon dioxide emissions reached a record high of 36.8 gigatons last year. The rebound of air travel and driving from a pandemic lull and a growth in oal-fueled power plants helped drive a 1 percent increase over 2021, but a boom in renewable energy and electric vehicles largely offset the greater use of fossil fuels.
CNBC.com

pg 16

The Week 7/28/23

Book of the week

The Heat Will Kill You First: Life and Death on a Scorched Planet

by Jeff Goodell (Little, Brown, $29)

"More than any other effect of climate change, heat destroys life with an excruciating immediacy," said **Peter Holley** in *Texas Monthly*. In his best-selling new book, climate journalist Jeff Goodell delivers "a bracing examination of climate change in its most essential form," showing how the planet's rising temperature is unleashing spells of deadly extreme heat and reminding us how vulnerable we are to temperatures like those that have gripped much of the southernmost U.S. in the past week.

"Goodell is at his most effective when he describes how heat affects the human body," said **Shannon Osaka** in *The Washington Post*. He recounts in detail how a California couple and their 1-year-old all died on a trail in 2021 when a morning hike ended less than 2 miles from safety during a sunbaked climb back to their truck through 100-degree heat. Like the 15,000 people who perished in Paris during a 2003 heat wave or the 600 killed in British Columbia in 2021 by a fluke weeklong temperature spike, the California family were victims of the body's surprising vulnerability to internal temperatures above 98.6 degrees. When those internal temperatures hit 102 or 103, a victim can pass out, as the body's attempt to cool off sends blood to the skin, abandoning internal organs, including the brain. Above 107 degrees, "things start to break down at a cellular level." Cell membranes melt away, unleashing systemic hemorrhaging and fatal heatstroke.

A traffic warden braves last week's heat wave.

Predictably, the old, sick, and poor are more vulnerable to extreme heat, said **Jennifer Szalai** in *The New York Times*. But "people who have faith that their resources will spare them are kidding themselves." Heat imperils food supplies because of the hazards it poses to plant and animal life. It also causes forest fires and rising sea levels, and contributes to many deadly storms. And when regions like British Columbia can be hit with triple-digit temperatures, few places on the plar t are invulnerable to heat waves and failures of the electric grid that can result in widespread death. *The Heat Will Kill You First* covers all those threats as it surveys much of the planet, and "Goodell's stripped-down style suits his subject. This is a propulsive book, one to be raced through." As it strings together troubling scenes and links the crisis to the burning of fossil fuels, it packs in enough data to terrify "even the most casual reader," said **Bethanne Patrick** in the *Los Angeles Times*. It reads like "a wake-up call with no snooze button."

Europe: The demise of the summer beach holiday

Raging wildfires put a terrifying end to my family's Greek vacation last week, said **James Palmer** in ***The Times*** (U.K.). We were on the island of Corfu when my 11-year-old son first saw the smoke—"a narrow plume of white and gray billowing up from the forests." We knew that out-of-control fires were consuming the arid island of Rhodes but had felt relatively safe on cooler, verdant Corfu. Within hours, though, "the smoke had become a line of orange flame gilding the horizon," and our family was among the nearly 2,500 people forced to flee. Another 20,000 people, half of them British vacationers, were evacuated from Rhodes—the largest emergency rescue in Greek history. So much for a relaxing holiday. "As I write this, planes and helicopters buzz overhead toward the smoking hills, dumping seawater into the forests."

Fleeing the flames in Rhodes

It's not just Greece: Extreme heat and fires are likely to destroy summer vacation as we know it all across southern Europe, said **Judith A. Sägesser** in the ***Stuttgarter Zeitung*** (Germany). Last week, German Health Minister Karl Lauterbach concluded as much from his "overheated vacation in Italy," where July temperatures were well over 100 degrees. "If things continue like this, these holiday destinations will have no future," Lauterbach said. "Climate change is destroying southern Europe." Nobody wants to hear that, of course—not the pale German hordes who flock southward each summer and certainly not the Mediterranean countries whose economies depend on them. But Lauterbach "hit the nail on the head." The news all summer has been full of stories of tourists being airlifted off Italian beaches or rushed by ambulance to Greek hospitals. That's nobody's idea of a restful vacation.

With Spain, Italy, and Greece becoming unbearably hot, where else can Europeans go? asked ***Savon Sanomat*** (Finland) in an editorial. Try Finland. Sure, our summer "is notoriously short and sometimes rainy," but at least we have few wildfires. Rather than heading south each summer, Europeans should look to the north. In fact, that's already happening, said **Greta Ilekyte** in ***Lietuvos rytas*** (Lithuania). The European Travel Commission says that the number of people traveling to the Mediterranean this summer has dropped 10 percent over last year, while visits to central and northern Europe are up. Maybe Lithuania, where temperatures barely scrape the mid-70s in July and August, will start to look like "an increasingly attractive destination."

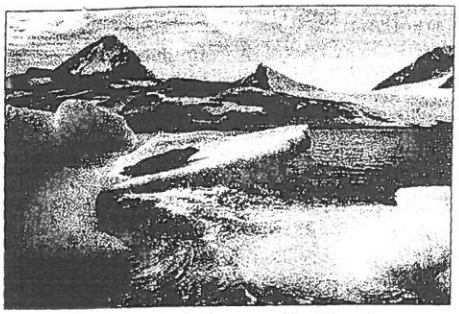
A better solution is to forgo this yearly migration altogether, said **Igor Danis** in ***Pravda*** (Slovakia). "Mass travel has become a pointless fad," something we do not for fun but for Instagram. And all those airplane trips generate ever more of the carbon emissions that are heating the climate. Every European country has its share of charming getaway spots—why not vacation at home, rather than battling for space on overcrowded beaches that "resemble swarming anthills"? The fires that torched the Greek islands this summer should be "a warning to all of humanity. It's time to hit the brakes, people!"

The Week 8/11/23

Is the Gulf Stream about to stop flowing?

A critical system of ocean currents that transfers heat around the planet could collapse as soon as 2025. Effectively an aquatic conveyor belt, the Atlantic Meridional Overturning Circulation—which includes the Gulf Stream—transports warm water from the tropics to the North Atlantic, and sends back colder water along the ocean floor. But the compounding effects of climate change—including an influx of cold water from melting Arctic ice and the loss of Amazon rainforest trees that put water into the atmosphere—have upset the system's balance and could alter the current flow. Until now, scientists believed such a catastrophe was a long way off, reports *The New York Times*. But a new University of Copenhagen study, based on sea surface temperatures dating back to 1870, suggests that the system is already critically unstable and could stall out anytime between now and the 2090s. That could have massive consequences, sending North American and European temperatures plunging, further heating the tropics, and disrupting the monsoon rains that billions of people depend on for food in Asia, Africa, and South America. Not all scientists agree that the data indicate such a dire timeline. But "it is very plausible that we've fallen off a cliff already and don't know it," says marine scientist Hali Kilbourne, who wasn't involved in the study. "By the time any of this is settled science, it's way too late to act."

A photo illustration of the Gulf Stream



The western shelves are disappearing.

Antarctic melt can't be stopped

Halting global carbon emissions right now wouldn't be enough to stop the ice shelves of West Antarctica from collapsing, the BBC reports. The ice shelves, glacier tongues that jut out over the sea, act as stoppers that prevent the land ice from melting into the water. As the planet warms, though, those shelves have been melting from below increasingly quickly. A new study finds that even if the world limits global warming to 1.5 degrees Celsius—a target most scientists think is already unachievable—the melting will continue. "It appears that we may have lost control of the West Antarctic ice shelf melting over the 21st century," says study co-author Kaitlin Naughten, from the British Antarctic Survey. "That very likely means some amount of sea level rise that we cannot avoid." Naughten and her colleagues used computer simulations to work out roughly how much ocean temperatures have changed already, and how much melting that has caused, then used those numbers to estimate the potential impact of several global-warming scenarios. They found that regardless of emissions, the water beneath the ice shelf will warm over the next few decades three times faster than in the past. That means sea levels will likely rise more, maybe much more, than the 1 to 3 feet predicted by 2100.

Getty (2); Alamy

The Week 11/10/23

CLIMATE

State climatologist predicts even warmer days ahead

Dr. Kelsey Jencso, state climatologist with the Montana Climate Office, believes that by 2069, some areas of Montana can expect up to five more weeks of above-90-degree days each year.

During a Zoom conference on climate change this past November, Jencso explained his prediction by pointing out that, over the past 65 years, the state's temperature has increased 0.42 degree per decade while the national average is 0.26 per decade. That's an increase of 2.7 degrees in the past 65 years, which is also above the national average.

The greater rate of change is due to Montana's higher altitude, making it more sensitive to temperature fluctuations, Jencso told the conference, organized by the Montana League of Women Voters. He also said:

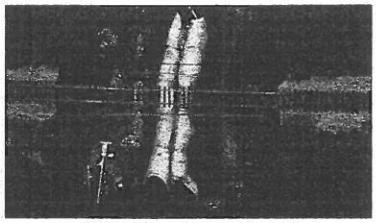
- Total precipitation from spring rains has increased by 1.3–2 inches per year in eastern Montana and declined by 0.9 inch in western Montana.
- By mid-century, computer models predict a 5-degree temperature increase in eastern and north-central Montana and a 4-degree increase in central and western Montana.
- Also by mid-century, eastern Montana is expected to have 39 more days above 90 degrees each year and western Montana will see 10 to 15 additional days of 90-degree plus temperatures. ■

Montana Outdoors 3/4 2023

The Week 8/4/23

8 NEWS

The world a



Rail culvert washed out in Halifax

Halifax, Nova Scotia

Biblical flooding: Nearly 10 inches of rain fell in less than 24 hours in Bedford, Nova Scotia, just outside the capital, Halifax, this week, engorging rivers, submerging roads, and killing at least four people, including two children, who were washed away in their vehicles. Halifax Mayor Mike Savage said the rain reached "biblical proportions." Six bridges were totally destroyed and another 19 damaged, while hundreds of people had to be evacuated. North of Halifax, a railway culvert was washed away, forcing the CN Rail track to the city to close. "This is the only rail line we have going through here," one resident told CTV news, "and it's a total necessity." The last time the region got so much rain so quickly was in 1971, during Hurricane Beth, yet this rainfall was simply a summer storm.

The Week 11/24/23

■ The U.S. now experiences an extreme weather event in which damages and costs top $1 billion every three weeks. That compares with every four months in the 1980s, when adjusted for inflation. Weather events now cost the U.S. nearly $150 billion

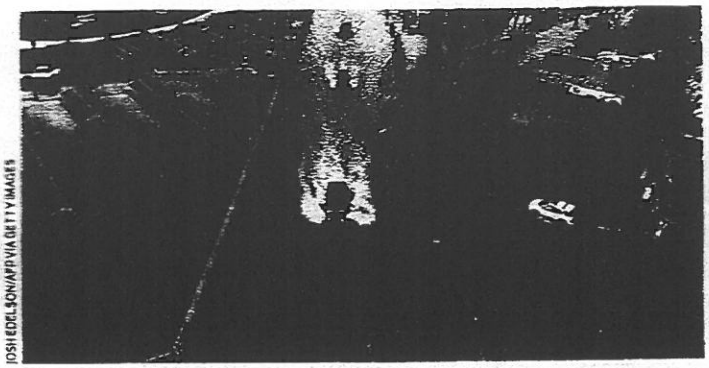
BRAZIL

The Amazon is parched and dying

Editorial
Correio Braziliense

"What is happening in the Amazon is frightening and unimaginable," said *Correio Braziliense* in an editorial. As Brazil's hottest, driest winter on record gives way to a scorching springtime, rivers that should nourish the world's largest rainforest have become little more than muddy streams, so shallow that boats run aground. Local Indigenous villages, which rely on rivers for transport, are stranded without food and medicine, and their people must walk miles to find drinking water. In the Amazonian city of Manaus, "the air is unbreathable" because of a blanket of thick smoke from fires that were illegally lit to clear forestlands for farming and mining. Nobody can go out—the city has had to cancel school and university classes and even postpone the marathon. Climate change is to blame, of course, but "the effects of global warming have been worsened" by the federal government's failure to crack down on miners and ranchers. "Without sustainable development alternatives based on the economic potential of the forest and its people," Amazonas state Gov. Wilson Lima said last week, "we will not be able to protect either the forest, threatened by chain saws, or the people, threatened by poverty and extreme weather events."

Sea level rise is already leading to longer commutes



JOSH EDELSON/AFP VIA GETTY IMAGES

A flooded roadway in Planada, California, in January 2023

FLOODING due to sea level rise has added an average of 23 minutes to the time people in the coastal US spend commuting over the course of a year. By 2060, even a modest amount of additional sea level rise could increase that delay 10-fold, amounting to billions of hours of wasted time.

"It's here. It's now. It's a delay that is already occurring," says Mathew Hauer at Florida State University. He and his colleagues have looked at census data representing 74 million actual commuting routes in more than 200 counties on or near the US coasts. They used a traffic model to calculate normal commute times. They then calculated how tidal flooding changed these times, using tidal gauge readings taken between 2002 and 2017 to model levels of inundation and an algorithm to account for commuters rerouting to drive around flooded areas.

After screening out extreme events related to storm surges, they found that flooding-related delays increased from an average of around 12 minutes per person per year in 2002 to an average of 23 minutes per person per year in 2017. In some areas, the increase in delay length was more marked. Residents of coastal counties in Florida saw a 360 per cent increase in the length of delays since 2002, for instance, while coastal residents in South Carolina saw a 225 per cent increase (*Environmental Research*, doi.org/kxv4).

"It turns out it's pretty widespread. We just haven't had a good way of quantifying it or how common it is," says Hauer

Future sea level rise driven by climate change will lead to more delays, according to the new model. The researchers found that if the world is on course for a rise of 0.3 metres by 2100, considered to be a low-end scenario, there would be 183 minutes of delay per year to the average commute time in these counties in 2060. A high sea level rise scenario of 2.5 metres by 2100 would lead to 643 minutes of delay in 2060.

While most commuters wouldn't notice what might amount to a few seconds when spread across daily commutes, the time adds up, says Jennifer Jacobs at the University of New Hampshire. She and her colleagues have found that traffic delays caused by such flooding in the US have already cost billions of dollars in lost time. The cost is expected to rise to hundreds of billions this century if steps aren't taken to prevent flooding by, for example, raising roads or building sea walls, she says. ■ James Dinneen

New Scientist, 2/24

New hurricane category

Climate change is making hurricanes so strong that scientists want to expand the scale used to measure them to include a "Category 6" storm. The Saffir-Simpson hurricane scale goes up one category for each extra 15 to 25 or so miles per hour of wind speed, maxing out at Category 5 for storms with sustained wind speeds of 157 mph or more. But researchers found that if an extra tier were added for winds hitting 192 mph, five storms over the past decade would have made the cut, including Typhoon Haiyan, which hit the Philippines in 2013, and Hurricane Patricia, the strongest yet recorded, which hammered Mexico in 2015 with wind speeds of 215 mph. Those speeds are "hard to even imagine," says co-author Michael Wehner, from the Lawrence Berkeley National Laboratory. "Being caught in that sort of hurricane would be bad. Very bad." Climate change makes hurricanes so intense because the warmer the ocean, the more the storm can pull in water vapor and heat, resulting in stronger winds. This wouldn't be the first weather-categorization system to be revamped to accommodate global warming, reports *The Guardian* (U.K.). Australia's meteorology bureau had to add new colors to its weather maps during the heat wave of 2013: purple for temperatures above 122 degrees Fahrenheit and pink for over 125.

The Week 2/23/24

The Week 3/8/24

■ There has been almost no ice in the Great Lakes this winter, a result of climate change and the El Niño weather pattern raising temperatures far above average in the region. Total ice coverage reached 2.7 percent in mid-February, far below the typical late-winter peak of 53 percent.
The Wall Street Journal

The Week 3/22/24

Hottest oceans ever

Ocean temperatures soared to their highest level in recorded history in February, reports *The New York Times*. Figures released by the EU showed that the oceans hit an average daily high of 21.09 degrees Celsius, while the average for the month was 21.06 degrees, both higher than the previous records set in August last year. When land and sea surface temperatures were combined, it was the hottest February ever recorded—the ninth month in a row to break its monthly record—at 1.77 degrees higher than preindustrial levels. Warmer waters can have catastrophic effects on marine wildlife, starving fish of oxygen and increasing the risk of harmful algal blooms. One factor driving the higher ocean temperature was the El Niño weather system, which is expected to weaken later this year and potentially be replaced by a cooler La Niña. But given that most years' highest temperatures come in August, it's still possible that further records will be broken before then. "The temperature's just going off the charts," says Matthew England, a professor at Australia's University of New South Wales who studies ocean currents. "It's like an omen of the future."

The Week 3/22/24

■ The lower 48 states just had their warmest winter on record, with the average winter temperature hitting 5.4 degrees Fahrenheit above average. Globally, last month was the warmest February on record, and the ninth straight month to set a temperature record.
Axios