



# ruined SUMMER SUMMER

HOW CLIMATE CHANGE  
SCORCHED THE NATION  
IN 2012



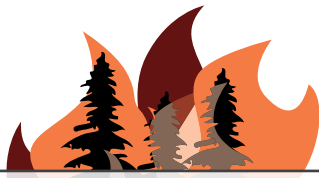
I.

# INTRO- DUCTION

# Is climate change ruining our summers?

It is certainly altering them in dramatic ways, and rarely for the better. The summer of 2012 has been full of extreme weather events connected to climate change. Heat records have been broken across the country, drought conditions forced the United States Department of Agriculture (USDA) to make the largest disaster declaration in U.S. history, and wildfires have raged throughout the West. New research by world-renowned climate scientist James Hansen confirms that the increasingly common extreme weather events across the country, like record heat waves and drought, are linked to climate change.<sup>1</sup>

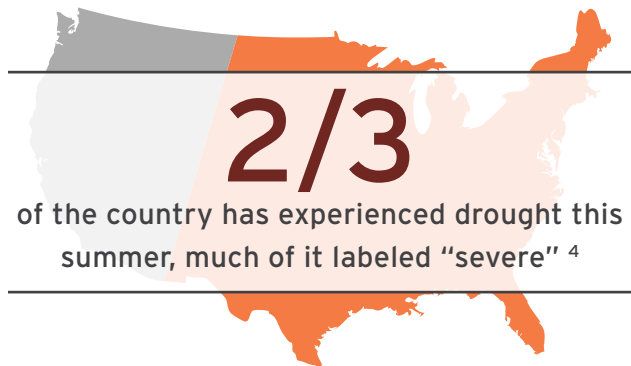
This report examines those climate change impacts whose harm is acutely felt in the summer. Heat waves; warming rivers, lakes, and streams; floods; drought; wildfires; and insect and pest infestations are problems we are dealing with this summer and what we are likely to face in future summers.



As of August 23rd,

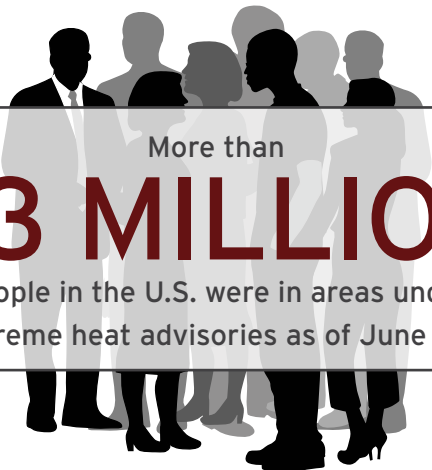
**7 MILLION**

acres of wildlife habitat and communities have burned in wildfires<sup>2</sup>



**2/3**

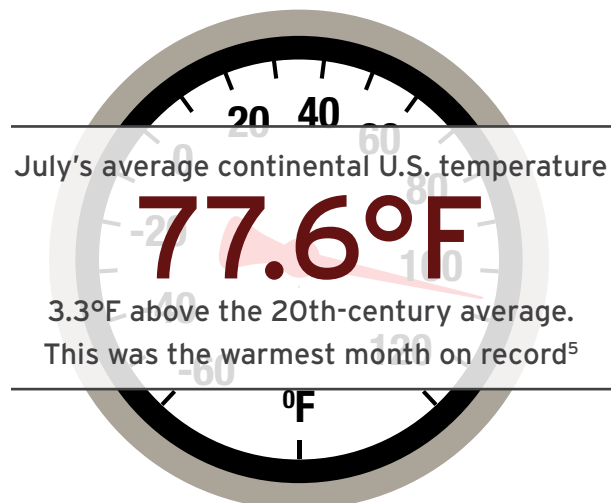
of the country has experienced drought this summer, much of it labeled "severe"<sup>4</sup>



More than

**113 MILLION**

people in the U.S. were in areas under extreme heat advisories as of June 29<sup>3</sup>



July's average continental U.S. temperature

**77.6°F**

3.3°F above the 20th-century average. This was the warmest month on record<sup>5</sup>

Unfortunately, hot summers like this will occur much more frequently in years ahead. Climate change means far more than hotter weather: as the atmosphere heats up, climate systems are altered in ways that impact forests, lakes, prairies, rivers, wetlands, and other habitats, as well as the communities and wildlife that depend on them. Average water temperatures in streams, rivers, lakes, and oceans are increasing, precipitation patterns are changing, and extreme weather emergencies such as droughts and floods are becoming both more frequent and severe.<sup>6</sup>

To understand how 2012 represents what we can expect in the future, we must understand how climate change is connected to the weather we are experiencing. A recent scientific study published in the Bulletin of the American Meteorological Society, "Explaining Extreme Events of 2011 From a Climate Perspective", found that some of the weather extremes around the world have become far more likely because of climate change. For example, climate change made the severe heat wave Texas experienced in 2011 twenty times more likely to occur than it would have been in the 1960s.<sup>7</sup> Climate change made this heat wave hotter and last longer. Penn State geosciences professor Richard Alley puts it this way: "Humans have made some extreme weather events more likely, and they are happening. Just as a back-street gambler might beat someone in an honest game but has a better chance with loaded dice, nature might have caused this summer's weather but we gave it a boost."<sup>8</sup>

**By taking action now to reduce the amount of carbon pollution from the nation's largest sources, and providing support for wildlife-friendly wind, solar, geothermal and biomass energy, we can reduce the impact of a changing climate and power a new clean energy economy for all Americans.**

**If we don't enact the solutions we have on hand to reduce carbon pollution, wildlife, people, and our summers will suffer.**



Photo: Flickr/Elvert Barnes

# HEAT

It is not surprising that a warmer atmosphere is leading to more severe heat waves.<sup>9</sup> According to scientists from the National Oceanic Atmospheric Administration (NOAA), 2010 is tied with 2005 as the warmest year of the global surface temperature record. In the contiguous United States, 2010 was the 14th consecutive year with an annual temperature above the long-term average. Nine of the warmest 10 years on record have occurred since 2000, according to the NASA Goddard Institute for Space Studies.<sup>10</sup> If current conditions continue, 2012 will be even hotter. In the United States, July 2012 was the single hottest month recorded since measurements began in the 1890s. As syndicated newspaper columnist Eugene Robinson recently noted, **“Welcome to the rest of our lives.”**<sup>11</sup>

Heat waves as severe as those we have seen this summer are not just unpleasant; they are dangerous to human health. Hot and sunny days with little or no wind provide ideal conditions for the build-up of dangerous levels of ground-level ozone pollution.<sup>12</sup> According to National Wildlife Federation (NWF) climate scientist Dr. Amanda Staudt, “Global warming is bringing more frequent and severe heat waves, and the result will be serious for vulnerable populations. That means air pollution in urban areas could get worse, bringing increased risk of heart attacks, strokes and asthma attacks. Children,

the elderly, poor, and people of color are especially vulnerable to these effects.”<sup>13</sup> Not only are high daytime temperatures dangerous, high nighttime temperatures combined with high humidity put people at risk for heat-related illness and death because their bodies cannot recover from the heat they experienced during the day.<sup>14</sup>

High summer temperatures harm agriculture as well. Summer is the growing season for most crops, from corn to soybeans to blueberries and cherries. Extreme weather and climate conditions can thwart crop yields, especially if they occur during critical growth or reproductive phases of plant growth. Livestock are also sensitive to high temperatures, which can make it harder for them to gain weight, produce milk, and reproduce.<sup>15</sup>

A summertime delight is a bowl of fresh cherries, but an unusual spring heat wave ruined many of Michigan’s fruit crops this year. Many fruit trees blossomed nearly three weeks earlier than normal.<sup>16</sup> Then, a sudden end to Michigan’s warm March followed by overnight freezes in April devastated many of the state’s largest fruit farms. The USDA’s Michigan field office described the impact as the “worst weather damage to fruit in the state in the past half-century.” Cherries bore the brunt of the heat. Michigan produced 70.9 percent of the nation’s tart cherries in 2010. The state is expected to harvest a mere 2 million pounds of tarts this year, down from 135 million pounds in 2010 and 266 million pounds in 2009, according to the Michigan Frozen Food Packers Association. Michigan’s apples, peaches, and juice grapes were also harmed by the abrupt temperature changes this spring.<sup>17</sup> The devastation to growers, harvesters, wholesalers, and retailers cannot be underestimated or ignored.



## **Bob Sutherland,** owner of Cherry Republic in Michigan, has experienced this crop devastation firsthand. The heat of 2012 has impacted him, his cherry business and the community.

"I have never seen a summer like this before," said Southerland. "We were really counting on having a good season to fill back up, as 2012 follows up two previous years that had harvests also below average, and now we have nothing left in storage or in the freezer."

As a business, Southerland explains that they have been unique in trying to be really light about the severity of the crop devastation to the customers and to the community; they've been getting cherries from Poland and flying the Polish flag in the shop. Cherry Republic has also come to a temporary, year-long "truce" with cranberries and are mixing them with cherries to keep prices down.

"We are already thinking about back-up plans, but it is hard; We're just a cherry company—we do cherries. We can't just move crops," said Southerland. "But we have to be prepared for this to happen again."

With August being the rush of their summer business, Sutherland and his fellow farmers are just barely reacting to what has happened this year, but looking forward, he knows that it is going to be a challenge:

"I think climate change has moved this problem [crop devastation] from a once-a-century to a once-a-decade occurrence, and I don't know where it will end up—or if it will start happening more often," said Southerland. "I don't know how to get it into people's heads that they need to change their habits and their carbon footprint."

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**We're just a cherry company—we do cherries. We can't just move crops.**

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# WARMING WATER

Photo: Ram Vasudev

Thousands of fish across the United States have already died this summer:

- 1,000 fish, including commercially valuable bass, shad and catfish were found dead in Heron Pond in Ohio.<sup>19</sup>
- Nearly 58,000 fish, including 37,000 sturgeon worth nearly \$10 million, died along 42 miles of the Des Moines River.<sup>20</sup>
- 6,000 gizzard shad and 600 perch died in a Delaware lake.<sup>21</sup>
- Fish kills attributable to “hot” water were reported in Michigan, Minnesota, Pennsylvania, Wisconsin, Indiana, and Illinois.<sup>22</sup>

The stench of rotten fish was common across rural and urban areas alike this summer as fish died by the thousands. Extreme heat caused warmer water temperatures, resulting in fatal consequences for wildlife. When streams get too warm, oxygen levels and fish growth rates decline, and fish can become more susceptible to toxins, parasites, and disease. If water temperatures stay too warm for too long, a river may become an unsuitable habitat for fish. In general, locales have found that when the average daily air temperature in the warmest summer months is greater than 69.8° F the “thermal limit” has been breached for most adult salmon, steelhead, and trout species.<sup>18</sup>



Photo: Lori Skelton

Northern pike, a cool-water species, are among numerous fish species threatened because they are unable to adjust to higher water temperatures sustained for more than a few days. Other species impacted by higher water temperatures include walleye, yellow perch, and bluegills.<sup>23</sup>

According to NWF biologist Doug Inkley, “Fish are up a creek without a paddle when the water gets too warm. They are important to the overall health of stream ecosystems, which are suffering in the extreme heat.”

Warmer water temperatures have a direct impact on fish that simply can't tolerate the heat, but rising temperatures also have indirect impacts on fish. Warming water both holds less oxygen and facilitates the rapid growth of harmful algae. Higher temperatures combined with oxygen depletion can be a quiet killer. Ed Perry, a Pennsylvania angler, remembers experiencing this "quiet killer" in 2005:

"We've had repeat fish kills in Pennsylvania since 2005; that summer, I was out fishing on the Susquehanna River with my two sons, and we saw hundreds and hundreds of small mouth bass floating past us; we didn't know at the time, but we were seeing the beginning of an annual fish kill."

And the quiet killer continues in 2012.

When Minnesota experienced heavy rains earlier this summer, voluminous runoff from fertilized areas put high nutrient loads in some Minnesota lakes. A high nutrient load combined with hot weather can accelerate the growth of algae. Because algae produces oxygen during the day and uses it at night, too much algae can lead to oxygen depletion in certain parts of a lake (dead zones). This creates very stressful conditions for fish which can lead to fish kills.<sup>24</sup> The warm water alone won't do it, but it can cause massive fish kills when combined with oxygen depletion. Keith Blomstrom, president of the Minnesota Conservation Federation, is concerned about what this combination may mean for Minnesota:

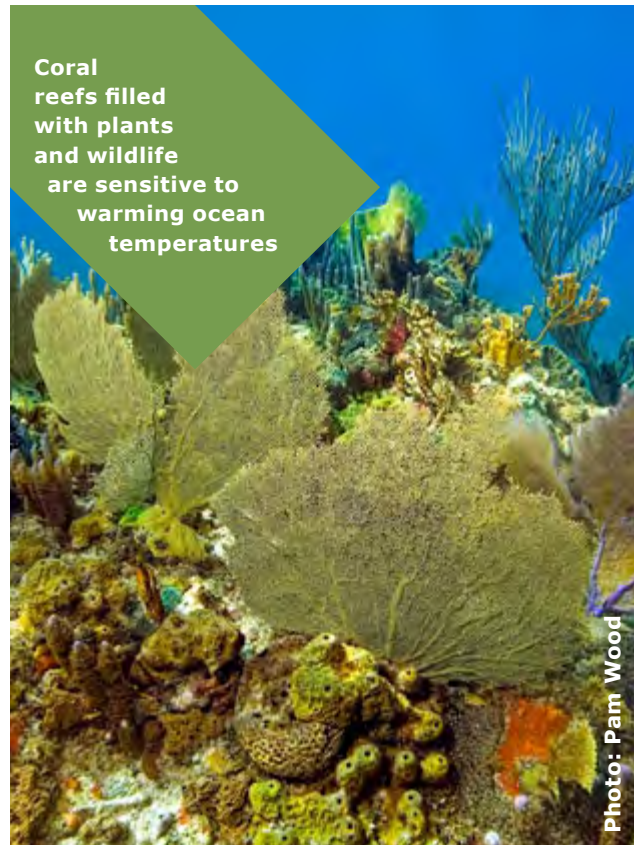


**"You can't drink the water, you can't fish on the lakes, and no fishing affects the local bait shop— and the fish kills make the town smell like rotten fish—it's all a trickle-down effect that isn't getting better,"** said Blomstrom. **"In fact, from what I have seen it is getting worse—we're at the tipping point this summer."**



Fish kill in June 2012 near Beloit, Wisconsin

Photo: Flickr/Earl R Shumaker



Coral reefs filled with plants and wildlife are sensitive to warming ocean temperatures

Photo: Pam Wood

*Snorkeling allows humans to see a diverse, beautiful underwater world of coral reefs teeming with plants and wildlife, but unfortunately, rising water temperatures are threatening this fragile ecosystem. Because of their delicate chemistry, makeup and structure, coral reefs are extremely vulnerable to changes in water temperature and ocean acidification, both of which are connected to climate change.<sup>25</sup>*

*The colorful corals snorkelers seek out are turning white as changes in water temperature stress the polyps, causing them to lose algae that give coral their vibrant color. The increased water temperature of a degree or two, as we have seen in recent decades, is enough to affect these fragile organisms.<sup>26</sup> Ocean acidification, caused by the absorption of carbon dioxide also accelerates the breakdown of corals.<sup>27</sup>*



# FLOODING

Photo: Flickr/Lars Plougmann


In June 2012, Tropical Storm Debby made landfall in Florida and impacted hundreds of thousands of people, causing a mandatory evacuation in Pasco County near Tampa Bay, between the Anclote and Pithlachascotee rivers. The Anclote River rose from nine feet to more than 27 feet, well above flood stage. This year broke the record for the most named storms so early in the Atlantic season.<sup>32</sup> And in August, the 2012 forecast for the number of hurricanes was increased.<sup>33</sup>

**Carbon pollution has also exacerbated flooding across the country.** Global warming brings more heavy rain events because as the air becomes warmer, it can hold more moisture. In the continental United States, the amount of rainfall occurring in the most intense precipitation events has been increasing at a rate of 20 percent per 100 years.<sup>28</sup> In the Midwest and Northeast, big storms that historically would only be seen once every 20 years are projected to happen as often as every 4 to 6 years by the end of the 21st century.<sup>29</sup>

Many floodplains and wetlands that absorb floodwaters have been replaced by cities, towns, agriculture, and transportation infrastructure. These investments are at greater risk as they face more extreme rainfall events without natural protections. Indeed, recent rain events have had significant economic consequences. The Midwest floods in May and June 2008 caused damages of more than \$15 billion, just 15 years after the same area was hit by severe flooding. In January 2009, the Pacific Northwest experienced floods that caused \$125 million in damage, forced 30,000 people to evacuate, and shut-down major roads and rail services.<sup>30</sup> In 2011, unusually heavy rainfall again caused flooding along the Mississippi, with damages totaling \$3 billion.<sup>31</sup>

**"I find it extraordinary that so many political leaders won't actually talk about the relationship between climate change, fossil fuels, our continuing irrational exuberance about burning fossil fuels, in light of these storm patterns that we've been experiencing,"**

-Vermont Governor Peter Shumlin, after devastating flooding following Hurricane Irene in 2011.<sup>34</sup>



**Flooding  
near  
Duluth, MN**

Photo: Janice Tarvestad

V.

# DROUGHT

During the summer of 2012, the United States has been afflicted with one of the worst droughts in its history and the most severe drought in 50 years. The drought is drying up wetlands, turning Western forests and sagebrush habitats to tinder, and shriveling crops on farmlands.

In July 2012, the USDA declared a federal disaster area in more than 1,000 counties, almost one-third of all the counties in the United States, the largest disaster declaration ever made by the USDA.<sup>35</sup> In August another 218 were added to the list, bringing the total to more than half the nation's counties.<sup>36</sup> **This declaration covered almost every state in the southern half of the continental U.S., from South Carolina to California. At the end of July, about 62 percent of the country was facing "moderate to extreme drought."**<sup>37</sup> But even Americans outside the drought-stricken range will feel the effects, especially in their pocketbooks. As our corn withers, the resulting scarcity is expected to increase pork, beef, egg, and dairy prices by up to 5 percent in the months ahead.<sup>38</sup>

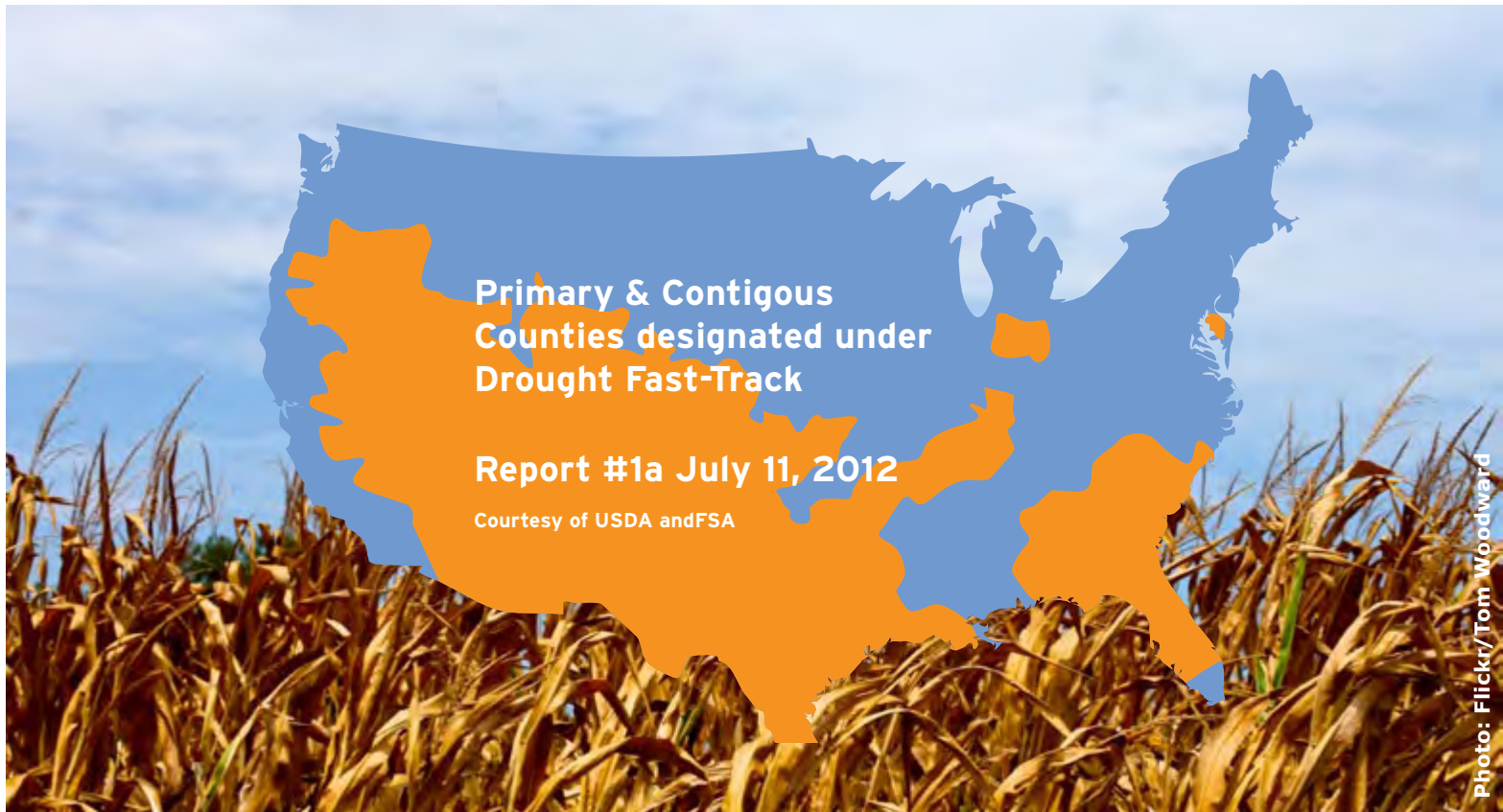
Increases in average temperatures cause increases in evaporation, which is not a major concern when normal rainfall exists and ground water sources are abundant.

However, when available water from rainfall, rivers, lakes, groundwater, and other sources falls below normal levels, this higher rate of evaporation leads to serious water deficits. As the climate warms, many areas are expected to experience more frequent and severe droughts. In addition, climate projections indicate that some places, including the Southwestern United States, may transition to an even more arid climate on a permanent basis over the next century. **This problem is not limited to the U.S. The fraction of land area considered dry has increased over the past few decades from 15 percent to 25 percent of the globe.**<sup>39</sup> **Climate change is modifying the global circulation patterns of the atmosphere, resulting in a poleward expansion of dry belts.**<sup>40</sup> This expansion is likely causing areas just adjacent to deserts, such as much of the Southwest, to become drier. Snow pack has also been shrinking as more precipitation falls as rain instead of snow.<sup>41</sup> At the same time, snow pack is melting earlier in the year.<sup>42</sup> Both of these trends can cause major water shortages in late summer and fall.

Photo: Flickr/Bobby Johnston



A farmer's dried up catfish pond in Arkansas



In 2007, the Southeastern U.S. had crop losses due to drought estimated at more than \$1.3 billion for corn, wheat, soybeans, cotton, and hay.<sup>43</sup> As bad as 2007 was, the summer of 2012 is turning out to be even worse. According to University of Missouri Agronomist William Wiebold, "Triple-digit heat with prolonged drought gives corn farmers very little chance of success. Corn plants stop growing at about 95° F and need about 86° F optimal temperature for pollination. Nighttime temps need to be less than 70° F for the plant to fill corn kernels after pollination, when pollen from corn tassels falls on the silks of each ear of corn. We've had days and days of bright sun, low humidity, high winds. That all adds up to rapid evaporation of water. I don't see any way around this from being a tragedy for our farmers."<sup>44</sup>

While the drought has had a serious negative economic effect in the U.S., it also has grave implications for U.S. diplomacy.<sup>45</sup> The U.S. Agency for International Development's Food for Peace program has fed billions of people by sending 106 million metric tons of food to the hungry around the world. The program depends on the productivity of American farmers and a strong agricultural system. On average, American food aid provides 60 percent of the world's food aid, feeding millions of desperately hungry people every year. This year's drought and the

ensuing agricultural disaster will likely limit the U.S.'s ability to assist during global disasters, especially food crises.<sup>46</sup>

Another result of severe drought is the numerous water use restrictions placed on citizens. This summer, cities in Texas, Nebraska, North Dakota and Massachusetts have limited how much water residents and businesses are allowed to use. According to Greg Kail with the American Water Works Association, "It's likely that hundreds of utilities across the country are using water restrictions, and pretty soon more will be mandatory."<sup>47</sup>

VI.

# WILDFIRES

Photo: Flickr/USDAgov

pronghorn antelope, red-tailed hawks, trout and countless other species that call the Gila, Lincoln, Arapaho and Roosevelt National forests home are not always prepared to deal with the size and frequency of these fires.<sup>50</sup> Following the largest wildfire in New Mexico's history, biologists were forced to capture and relocate the remaining wild populations of the endangered Gila trout to fish hatcheries.<sup>51</sup>

The devastating wildfires that have ripped through the U.S. in recent years paint a vivid picture of how climate change can take something that once was a part of a natural cycle (fire), make it more powerful, and cause more severe and longer-term damage to people, the landscape and wildlife. According to University of Montana ecosystems professor and wild fire expert, Steven Running, "The 100-degree heat, drought, early snow pack melt and beetles waking from hibernation early to strip trees all combined to set the stage for the current unusual spread of wildfires in the West."<sup>48</sup>

Now in the United States, fire seasons are longer because spring snowmelt ends earlier, summer heat builds up more quickly, and higher temperatures last well into the fall. Western forests typically become combustible within a month of when snowmelt finishes and snowpack is melting earlier and earlier.<sup>49</sup>

For wildlife, more severe and more frequent forest fires mean greater destruction of habitat that may rejuvenate very slowly or never. Places like New Mexico and Colorado are seeing some of their worst wildfires in history. The elk, black bears, mountain lions, mule deer,

Wildfires are not just happening in the Rocky Mountain states and farther west; Oklahoma has been hit by wildfires this summer, and on August 5, crews were fighting 18 different wildfires across the state, which have already burned more than 68,000 acres.<sup>52</sup>

Many tranquil locations saw wildfires this summer



Photo: Gwendolyn Beasley

According to climate scientists, there are many ways climate change increases the risk of forest fires, all of which are relevant to the wildfires we have seen in recent years. These factors are longer fire seasons, drier conditions, more available fuel for forest fires, and increased frequency of lightning.<sup>53</sup>

- **Longer fire seasons:** Western forests typically become combustible within a month of the snowpack melting, which is happening one to four weeks earlier than it did 50 years ago. This year, an unusually warm and dry winter resulted in one of the smallest snow packs in Colorado history. As of June 1, the snow pack was only 2 percent of its normal extent.
- **Drier conditions:** Climate change is expected to bring more frequent and more intense droughts to the Southwest, perhaps shifting the area to a more arid climate. As of the end of May 2012, Colorado, New Mexico, Arizona, and Texas all had areas in the grip of severe and extreme drought.
- **More fuel for forest fires:** Widespread beetle infestations have left broad swaths of dead and highly combustible trees in their wake. Higher temperatures enhance winter survival of mountain pine beetles and allow for a more rapid lifecycle. Ecologists in Colorado recently confirmed that beetle populations are able to complete two generations during longer, warmer summers, leading to a possible 60-fold increase in the number of beetles.
- **Increased frequency of lightning** is expected as thunderstorms become more severe. In the western United States lightning strikes could increase by 12 to 30 percent by mid-century and therefore ignite more fires. Both the High Park fire in Colorado and the Whitewater-Baldy Complex Fire in New Mexico were ignited by lightning.

The increased frequency of severe wildfires is a harsh new reality for the firefighters and local governments tasked with responding. They have been struggling to keep up with these longer fire seasons, which in some places are now year round. They are also finding it harder to control fires, in part because nighttime conditions are hotter and drier, meaning that fires can stay active around the clock. Just as human beings benefit from cooling off at night, so too do forests gain a measure of protection from lower nighttime temperatures.

The summer of 2012 was so hot and dry that many state and local governments in Arkansas, Illinois, Indiana, Kansas, Missouri, Utah, and Wisconsin were forced to cancel their July 4th fireworks displays. The parched landscape combined with a stray ember posed too great a fire risk. Additionally, firefighters, especially in the West, were too busy fighting existing wildfires to supervise the celebrations.<sup>54</sup> The specifics of climate change's impact on future summers will vary, but the overall trend is impossible to ignore, and it is headed in only one direction—more extreme summer weather filled with heat waves, droughts, wildfires, and other problems requiring expensive responses.

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The cost of wildfire suppression, about \$3 billion a year, has tripled in the United States since the late 1990's. The majority of these expenses are borne by the U.S. Forest Service, which now spends around half of its annual budget fighting fires.

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Photo: Flickr/  
The National Guard



## **Fire Chief Bob Czerwinski of Pittsfield, Massachusetts and retired smokejumper Joe Gutkoski of Bozeman, Montana, are each experiencing and witnessing these wildfires of 2012; Czerwinski in the northeast and Gutkoski in the west**

The wildfires in the Northeast have been more severe than previously because the conditions [for wildfires] are perfect.

"The woods are brown, people's lawns are brown, and the lightning storms in the late afternoon are striking in the middle of the woods where the conditions are just right for fire to catch," said Czerwinski. "And when it does rain, it doesn't help. It is either absorbed too quickly or because it is so dry, it runs off."

And then, these wildfires become dangerous for the first responders. Retired smokejumper Gutkoski has seen the impact of this year's wildfires out west on regional smokejumpers and is worried.

"We have August and September to get through, with no prospect of rain alleviating our drought; the fall rain usually puts out our fire season, but I'm afraid the rain has passed us this year," said Gutkoski. "You hope that it rains, but as a former smokejumper, fighting fires is our job, but occasionally, we get a season like this year: it's been a very tiresome and busy season, and a lot of hard work without much rest."

Czerwinski agrees.

"Years like this, it becomes extremely dangerous for the 90 men who work with me. Just because wildfires don't involve a human life, like an apartment building in the city, doesn't mean we don't take it seriously," said Czerwinski.

As the wildfire season continues on, both Czerwinski and Gutkoski hope for snow in the winter and that "we won't have another year like this one." Because Gutkoski knows that Montana is in for a troubling future if steps aren't taken to prevent global warming from progressing.

"I believe in global warming and that the earth is getting warmer; we're in for a heck of a future," said Gutkoski. "If it continues to be drier and drier each year like scientists are predicting, then Montana will just be a desert one day."



**Colorado's  
High Park  
fire in 2012  
was caused by  
lightning**

Photo: Flickr/  
The National Guard

# INSECTS AND PESTS

A warming climate promotes insect infestations. As temperatures rise, the habitat for fire ants expands northward, mosquitoes increase their disease transmission potential, and grasshoppers arrive earlier and in greater numbers.<sup>55</sup> Deer ticks, which carry Lyme disease, have been found for the first time on Isle Royale in Lake Superior. The island used to be too cold for deer ticks, but with temperatures rising consistently, that is no longer the case.<sup>56</sup> Warmer conditions have helped winter tick populations surge in Minnesota, contributing to a significant decline in the moose population.<sup>57</sup>

Perhaps the most ominous example of how climate change and pests are interacting is the saga of the bark beetle, one of the U.S.'s scariest, most harmful pests unleashed by climate change. Cold snaps during winter normally kill most of their over-wintering larvae. The warmer winters facilitate beetles reaching unprecedented population levels killing more than a billion trees across millions of acres.<sup>58</sup> Recently, bark beetles have killed more trees than have been destroyed by fire.<sup>59</sup> Forests have been ravaged by these pests, leaving landscapes the color of burnt red and destroying valuable forest products.<sup>60</sup>

The bark beetle is an example of a destructive cycle not uncommon among climate impacts. When forests are devastated by beetle infestations, they then have less

ability to remove carbon dioxide from the air and reduce the carbon pollution that causes climate change. Conversely, the opposite happens: huge quantities of carbon dioxide are released by beetle-induced death and decay, making forests a carbon source instead of a carbon sink.<sup>61</sup> Furthermore, once green and productive forests decimated by beetles are left extremely vulnerable to forest fires, which displace and kill wildlife and put homes and businesses at great risk.

**Recently, bark beetles have killed more trees than have been destroyed by fire.**

Another unpopular summer pest is the mosquito, whose potential for disease transmission during summer is a serious concern. Warming winters associated with climate change leading up to summer further increase the spread of disease<sup>62</sup>. The Center for Disease Control reminded the public to not forget bug spray this summer as the mosquito-borne West Nile Virus has intensified across the country. Forty-three states have already reported West Nile infections in birds, people or mosquitoes this year, resulting in 26 human deaths.<sup>63</sup> Dallas, Texas, suffering from the deadliest outbreaks this summer, has even resorted to aerial spraying of pesticides to kill the mosquitoes transmitting the disease.<sup>64</sup>

VIII.

# CON- CLUSION

**The adverse impacts of climate change are happening right now. Climate change is not only ruining our summer, it is an indication of longer-term consequences. Heat waves, warming water, floods, droughts, wildfires, and insect and pest infestations are the new reality of an ever-warming world.**

**These problems also have consequences that go well beyond the initial damage to the natural world. We need to act now to reduce carbon pollution if we want to preserve our wildlife, farmlands, economies, waterways, oceans, natural heritage, and the character of our special places.**

- Support Environmental Protection Agency and Congressional action to limit industrial carbon pollution from power plants, the nation's largest source of the air pollution that causes climate change, and other big sources;
- Provide support to quickly expand wildlife-friendly wind, solar, geothermal, and biomass energy to power a new clean energy economy for all Americans; and
- Hold fossil fuel industries accountable for the full costs of their pollution, including carbon pollution that is threatening our communities and wildlife.



**Learn  
more &  
act!**

[www.nwf.org/cleanair](http://www.nwf.org/cleanair)

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Photo: Daniel DAuria

# protect the **MOOSE**

As the wildfires caused by global warming blazed across the West this summer, a 700-pound male moose swam across the Horsetooth Reservoir that separates the mountains from Fort Collins, Colorado, as he fled wildfires – only to meet highly populated areas and warmer temperatures in the lower elevation city. The moose was one of many animals spotted far from their usual cool habitat in the Colorado mountains, searching for shade, food, and water.<sup>65</sup>

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