

**EXPERT REPORT  
OF  
LISE VAN SUSTEREN, M.D.**

Kelsey Cascadia Rose Juliana; Xiuhtezcatl Tonatiuh M.,  
through his Guardian Tamara Roske-Martinez; et al.,  
Plaintiffs,

v.

The United States of America; Donald Trump,  
in his official capacity as President of the United States; et al.,  
Defendants.

IN THE UNITED STATES DISTRICT COURT  
DISTRICT OF OREGON

(Case No.: 6:15-cv-01517-TC)

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**TABLE OF ACRONYMS AND ABBREVIATIONS**

AAoP	American Academy of Pediatrics
APA:	American Psychological Association
C:	Celsius
CIA:	Central Intelligence Agency
CO <sub>2</sub> :	carbon dioxide
DSM-5:	Diagnostic and Statistical Manual of Mental Disorders
F:	Fahrenheit
GHG:	greenhouse gas
MENA:	Middle East and North Africa
ppm:	parts per million
PTSD:	Post-Traumatic Stress Disorder

## **INTRODUCTION**

I, Lise Van Susteren, have been retained by Plaintiffs in the above-captioned matter to provide expert testimony on the psychological and mental health impacts of climate change on young people, future generations, and select individual Plaintiffs in this case.

The science and literature show that a vast range of health impacts, including mental health impacts, from climate change are already impacting, and expected to impact in increasingly harmful ways, our most vulnerable population, children. Climate change is already harming children, including these youth Plaintiffs, psychologically, and this suffering increases as climate change worsens and as the federal government continues to exacerbate the dangers of climate change and does not act to stop the climate crisis. This report focuses on the current and expected psychological harms facing children as a result of climate change, and the menacing conditions that threaten future harm, if no meaningful action is taken to address climate change by the federal government. I discuss both acute and chronic climate harms because climate change has short- and long-term impacts on mental health. I discuss how these harms are worse because the federal government, including these defendants, are causing the harm and failing to properly respond to the threats posed by climate change. I also discuss why children, including some of the Plaintiffs in this case, are experiencing disproportionately harmful, and what I expect to be life-long, mental health impacts, as a result of climate change and the government's role in cause it. Finally, in Exhibit D, filed under seal, I provide my professional opinion regarding the mental health impacts individual Plaintiffs in the case are experiencing.

It is my profession opinion that a remedy to ease the psychological suffering of our children and the youth Plaintiffs is clear and available: immediate and effective federal government action to reduce greenhouse gas emissions that are the root cause of the climate crisis and the consequential psychological suffering. We cannot just treat or medicate people who are experiencing mental health impacts as a result of climate change. While that can help, to fully address the problem, we must address the root cause of the psychological injuries: climate change.

## **QUALIFICATIONS AND COMPENSATION**

I am a board certified general and forensics clinical psychiatrist in practice for 25 years. I did my academic and clinical training at the University of Paris, in Togo West Africa, and at St. Elizabeth's Hospital in Washington D.C. I have worked as an Assistant Clinical Professor of Psychiatry at Georgetown University Department of Psychiatry and in public clinics and in private practice. In the course of my work I have provided services to people from all walks of life and across the socioeconomic spectrum. I have worked with the homeless in metropolitan Washington D.C., with displaced persons traumatized by natural disasters, and with Physicians for Human Rights assessing the credibility of torture victims seeking political asylum in the U.S. I have also worked as a behavioral profiler at the Central Intelligence Agency performing psychological assessments of world leaders. As a psychiatrist in private practice I have evaluated and treated individuals, couples and families, helping their health and well-being. I am an expert in evaluating and treating individuals who have experienced trauma.

On national and local television and radio I frequently am asked to comment as an expert on topics concerning human behavior. I have been a guest blogger for the Huffington Post, on topics related to psychology and environmental issues. In 2009, I co-convened the first conference on the psychological effects of climate change, warning that the U.S. mental health system is not prepared. In the last decade I have given hundreds of presentations on climate change and mental health. I have served on the Maryland Task Force on Energy Policy and The Metropolitan Council of Governments, a multi-state council charged with protecting our climate and environmental health. I serve on the Advisory Board of the Center for Health and the Global Environment at Harvard University T.H. Chan School of Public Health. I am a founding member of the Climate Psychiatry Alliance.

I attach as **Exhibit A** my *curriculum vitae*. A list of my relevant publications is contained in my *curriculum vitae*. My report contains citations to sources I have used or considered in forming my opinions, listed in **Exhibit B**. Attached as **Exhibit C** is my professional assessment of the mental health impacts of climate change, and the federal government's conduct in causing climate change, on some of these youth Plaintiffs, which should be filed under seal in this case to protect the privacy of these young people.

I am working pro bono to prepare this expert report in this action because of the magnitude of the harm facing these youth Plaintiffs and the urgent need for the judiciary to understand these consequences of climate change.

My conclusions in this report are based on my training and experience as a general and forensic psychiatrist, my experience as a professional profiler, my knowledge and review of psychology literature and climate science, my research and study of the mental health impacts of climate change, my review of the Plaintiffs' complaint and declarations and my interviews with, and evaluations of, some of the youth Plaintiffs.

### **EXECUTIVE SUMMARY**

The scientific community has officially and repeatedly warned that the health of Americans will suffer from a range of increasingly devastating climate-related impacts during the coming years, including more intense coastal storms and hurricanes, increased coastal community flooding, saltwater intrusion in drinking supplies, disaster-based displacement and relocation, increased winter-time flooding along rivers and streams, more extended summer droughts and water shortages, which in some regions will result in crop failures and shifts, more intense summer heat waves, an increase in catastrophic wildfires, losses in fisheries, the destruction of forests, and the spread of diseases from infestations of insects, and other infectious and other diseases. The science shows that our most vulnerable population, the world's children, are already being harmed both physically and psychologically from climate change, and the suffering increases with each day that sees no meaningful action on climate policy from governments. The focus of this report will be on the current psychological harm to children and the menacing conditions that threaten them with future harm as the climate crisis deepens.

Section I explains that the psychological harms from climate change are both acute and chronic and they accrue directly from impacts such as heat waves, drought conditions, wildfires, air

pollution, violent storms and flooding, new threats of disease, sea level rise, and global food insecurity. Some people experience acute physical climate harms from personally experiencing these impacts that lead to mental health impacts. Others experience the slower and pervasive harms of climate change from the knowledge of what is to come. Both manifestations have been shown to harm mental health. Mental health impacts are also accruing indirectly from a range of cascading climate change impacts, a domino effect of harms attributable to collapsing ecosystems, geopolitical disruptions, national security threats, declining faith in democratic institutions, economic impacts to our nation, and other psycho-social stressors.

Section II describes how the psychological harms from climate change are aggravated by the knowledge that government, despite repeated warnings by scientists, is not only failing to take action to address climate change, but proposing and endorsing policies that make it worse. The deliberate nature of this harm is of a singularly destructive character, known as institutional betrayal, in that government, including these federal defendants, betrays its fundamental role to the people – to keep us safe.

Section III focuses on our children. Children are a special part of our population who are especially sensitive and vulnerable to the mental health impacts of climate change and need special protection for their well-being. Children today and tomorrow will continue to suffer acutely from episodic acute conditions, and they will be stressed chronically from the slow moving disasters. They will suffer anticipatory anxiety from their knowledge of future harm. For some, the focus of their lives will be on running for the safety of higher ground – literally and figuratively.

Many children, including some of the Plaintiffs, are deeply stressed acutely from day to day conditions, anxious about global climate change and are unable to shake their worries, despite reassurances adults around them may offer. They are keenly aware that the window of opportunity to stop the worst impacts of climate change is quickly closing.

In the aftermath of disasters linked to global warming, how children “carry on” will be determined by their background, current mental state, personality, and life experiences. The nature of the event itself also factors into the psychological effect. The intensity of the feeling of powerlessness, the “merciless” character of incidents, the pace, suddenness, degree of damage, loss of life and injury and the extent to which people personalize these incidents will determine the extent of the psychological injury. The cumulative toll of repeated exposure will be especially challenging to surmount.

Through their first amended complaint in this case and their declarations, the Plaintiffs are explicitly and repeatedly telling us of their fears and the traumatizing effects of the federal government’s actions to perpetuate a fossil fuel-based energy system. No one can credibly reassure them that there is no monster under the bed or hiding in the closet. They are surrounded by real, menacing conditions that are thrusting them into existential uncertainty: For the first time in millions of years, CO<sub>2</sub> concentrations are over 400 ppm and the world’s scientists, including many currently or formerly employed by the federal government, declare unequivocally that we and the natural world are in “the danger zone”. Stressed ecosystems critical to survival have the potential to shut down, disappear, and collapse.

Climate change is causing devastating physical injuries, illnesses, and deaths. For the magnitude of its impacts, the potential insinuation into every aspect of our lives, the relentlessness of its nature and debilitating effects, it is the emotional toll of climate change that is even more catastrophic, especially for our children. It has the capacity to destroy them psychologically. A *sole* remedy to ease the psychological suffering of our children can be envisioned: immediate, bold, government action to reduce emissions of the greenhouse gases that are the root cause of the climate crisis.

### **EXPERT OPINION**

#### **I. Climate Change Is Causing Impacts and Events That Harm Children, Not Just Physically, but Psychologically**

Every physical injury, illness and death carries with it an attendant emotional toll. This is no different when the impacts of *climate change* are the cause of injury, illness, or death.

The mental health impacts of these conditions – actual events, including those seen from a distance, or the threat of them – are both acute and chronic. Acute impacts are often described as high-intensity but time-limited, with a tendency to result in transient mental health symptoms, but not always. Acute traumatic events can also leave scars in our psyches that lead to chronic injury: attendant symptoms awakened or exacerbated by triggers long after the initial traumatic event may have passed. Our brains are hardwired to be alert to the slightest wave of grass that might suggest the predator is back.

Healing from climate events can be impeded by many factors: the frequency and intensity of stressors, the lack of personal and community support in the aftermath, the degree and duration of displacement, the difficulty of rebuilding or restoring, and the belief that the disaster could have been avoided. In some instances people never fully heal.

The psychological toll can become chronic – evolving from acute events or slow moving disasters, or out of the fear of both. Chronic psychological stress may initially be less dramatic than acute conditions, but the damage to mental health is no less serious.

Mental health experts already know that climate change causes, and will continue to cause, mental health impacts by exposing the Plaintiffs, and other children, to more frequent and more intense extreme weather events, and other climate change impacts. The mental health community is seeing a full range of conditions and symptoms from extreme weather events including depression, anxiety, Post-Traumatic Stress Disorder (PTSD), increased drug and alcohol abuse, domestic violence, and child abuse (Neria et al., 2009). The American Psychological Association (APA) found that “PTSD, depression, general anxiety, and suicide all tend to increase after a disaster” (Clayton et al., 2017). The federal defendants correctly acknowledged this reality in a 2016 U.S. Global Change Research Program report: “many people exposed to climate-related or weather-related disasters experience stress and serious mental health consequences. . . . [these consequences] include post-traumatic stress disorder (PTSD), depression, and general anxiety, which often occur at the same time.” The federal defendants rightly predicted that the mental

health impacts of these events should be expected to increase as more and more people experience the trauma and anxiety attendant to these disasters.

The federal defendants have also reported that “many people will experience adverse mental health outcomes and social impacts from the threat of climate change, the perceived direct experience of climate change, and changes to one’s local environment” (Dodgen et al., 2016).

The conclusion by the federal defendants that major psychological injury can be expected from the impacts of climate change has been reached with “high confidence” – the maximum level of certainty on their scale. It was reached because of “strong evidence” and with “high consensus” (Dodgen et al., 2016).

According to the APA, “In general, climate change can be considered an additional source of stress to our everyday concerns, which may be tolerable for someone with many sources of support but can be enough to serve as a tipping point for those who have fewer resources or who are already experiencing other stressors” (Clayton et al., 2017). The APA cites a study showing that climate-related stress can increase substance abuse, anxiety disorders, and depression (Neria & Shultz, 2012). Another study analyzed by the APA found that climate change inspired feeling of loss, helplessness, and frustration (Moser, 2013). Stress drives up the secretion of the hormone cortisol; high levels of cortisol are not damaging when they are short-lived. *Persistently* elevated levels of cortisol, however, can be exceedingly damaging because among other actions they decrease immune function, disturb sleep patterns, disrupt digestion, impair memory, and harm the cardiovascular system (Alderman et al., 2012; Simpson et al., 2011). As the stress of worrying about or surviving climate disasters mounts, physical and emotional consequences will be expected. A society with increased cortisol levels is a society under stress. The cumulative toll of repeated exposure to extreme weather events is especially challenging to surmount.

While not everyone is yet personally experiencing the world’s ongoing extreme weather events from climate change, the pain of empathic identification with seeing other people or places drowned, burned, flooded, or starved brings its own emotional toll, especially for children. Given the pervasive media attention of extreme weather events, the images and personal stories of people killed, injured, dislocated, or otherwise impacted by climate change events are ubiquitous. These images can have significant impacts on people, particularly empathic children.

Contending with the physical impacts of climate change is an ongoing challenge to our ability to cope psychologically. The federal government acknowledges that the physical devastation of climate change can engender the feeling of “loss and disconnection” from “place and identity” – a problem known as solastalgia and described as troubling as chronic stress (Dodgen et al., 2016). When places we have come to know well are irreversibly damaged, we lose the comforting sense of the familiar, the anchoring sense of belonging. Our inner psychic world – a key component of our sense of identity – mirrors the alien state of the damaged physical world – when it is lost, we lose a part of ourselves (Clayton et al., 2017). Native American and indigenous communities, many of whom have maintained deep spiritual and cultural connections across generations for thousands of years, are particularly vulnerable to the loss of an irreversibly damaged homeland.

I agree with the APA and federal government's conclusion; these outcomes and impacts are already occurring and will only get worse.

The emphasis of this report is on the mental health impacts of climate change, but critical to an understanding of the breadth of the crisis is the understanding that the mind and body are connected – it's a two-way street – what harms the mind effects the body, what harms the body effects the mind. In this way the impacts – physical or psychological – have mutual multiplying harmful effects. I will not evaluate the full extent of the physical impacts of climate change here, but will cite them briefly to address how they drive characteristic psychological harms.

#### **A. *Summer Heat Waves and Violence***

As global temperatures rise, there is an increased incidence of extreme heat waves during the summer months (Melillo et al., 2014). In their answer, the federal government admits “that prolonged heat events in recent years have been the most extreme on record and that climate change has contributed to these events . . .” and “that the number of heat-wave days in Los Angeles is projected to double, and the number of heat-wave days in Chicago to quadruple . . .” Fed. Answer ¶¶ 221, 247. In addition to the physical illnesses and deaths caused by heat waves, significant psychological stress is also associated with heat waves. As temperature rises so does aggression (Raj, 2014; Bulbena, 2006; Anderson, 1987). The federal defendants admit that the “impact of extreme heat on mental health is associated with increased incidence of disease and death, aggressive behavior, violence, and suicide and increases in hospital and emergency room admissions for those with mental health or psychiatric conditions” (Dodgen et al., 2016). For each standard deviation of increased temperature and change in rainfall, a 4% increase in conflict between individuals, and a 14% increase in conflict between groups is reported (Hsiang et al., 2013). These findings are valid across all regions and among all ethnic groups. The increased acts of aggression include assaults, murders and suicides, especially violent suicide. As global temperatures continue to rise we can expect an increase in unrest across the country and globally.

The APA describes the impacts of warmer weather on aggression and violence as “extensively studied” (Clayton et al., 2017) and cites lab- and field-based experiments demonstrating a “causal relationship between heat and aggression” that may be due to increased arousal and decreased self-regulation (Anderson, 2001; Simister & Cooper, 2005). More specifically, Ranson (2012) predicts that, from 2010 to 2099, warming will cause an additional 30,000 murders, 200,000 rapes, and 3.2 million burglaries. According to the APA, higher temperatures have also been linked to increased suicide rates (Clayton et al., 2017).

People with pre-existing mental disorders are especially vulnerable to the impacts of heat waves. During hotter periods, they appear to get sicker than expected, show greater dangerousness towards others and require more frequent use of restraints (Bulbena et al., 2006). The federal defendants have acknowledged these mental health impacts of climate change, concluding “there may be a link between extreme heat (climate change related or otherwise) and increasing violence, aggressive motives, and/or aggressive behavior...” (Dodgen et al., 2016). I agree.

### ***B. Drought and Access to Clean Water***

Climate scientists project that drought conditions are worsening across the U.S. as global temperatures rise, particularly in environments such as the western United States. Drought is slower moving than storms and has its own attendant, often chronic, mental health impacts (Stanke, 2013; Fed. Answer ¶¶ 221, 228). Prolonged drought is a major contributing factor to an increase in suicide among affected populations (Hanigan et al., 2012; Carleton, 2017). The unrelenting day after day despair from watching and waiting for water that does not come is particularly damaging to individuals who depend on nature's rains for their livelihood. As stated earlier, prolonged stress is harmful to us psychologically and physically.

As climate change worsens and causes more droughts, particularly in the southwestern U.S., millions of people will continue to see their access to drinking water diminished or threatened – as we are now seeing in Cape Town South Africa where water is predicted to run out in the summer of 2018. Water grips us emotionally in ways other needs do not because we cannot survive beyond a couple of days without water. When a community's supply of clean water dwindles, from drought conditions, diminished snowpack, accelerating and pre-season melting of glaciers, drying up rivers, streams, lakes and aquifers, or from saltwater intrusion or other climate-induced contamination, psychological trauma follows. Fear and violence is already spiking in places where water is scarce globally, and while drought is generally not the sole cause of the conflicts, it increases the likelihood that conflict breaks out (Schleussner et al., 2016). Water scarcity is an issue increasingly facing the southwestern and southeastern U.S. where states are engaged in legal battles over water. In California, the drought conditions between 2013-2016 forced rationing. Neighbors engaged in "drought shaming," fighting, and tattling on each other over their water use, foreshadows what lies ahead (Huffaker, 2015). For those engaged in agricultural practices, diminished access to enough freshwater, especially in warmer drought conditions, places added psychological stress on farmers (Souza, 2014). As friction mounts over scarce resources like water, communities fray.

As the Flint Water Crisis has illustrated, significant psychological harm is associated with water-related disasters. In addition to the direct physical and psychological impacts caused by exposure to the lead tainted water, Flint residents showed signs of "secondary trauma" – the emotionally distressing "ripple effects," including anxiety and depression, from concerns about ill-defined future health effects on their families – particularly their children, limited funds for those wishing to move away, decreased property values, uncertainty about whether the water was now safe. Underpinning this is a growing cynicism that government can't be trusted (Cuthbertson et al., 2016). Where a decline in the availability and quality of freshwater is linked to human caused climate change, an increase in mental impacts such as these should be expected.

### ***C. Wildfires***

Increasing temperatures from climate change dry out land and vegetation, causing bigger, more frequent, and intense wildfires (Melillo et al., 2014). Homes and communities are increasingly threatened by more intense wildfires. Persistent psychological stress is common, from the threat of loss; the trauma of evacuation; to the catastrophic realities: the loss of one's home, possessions, and perhaps pets – a lifetime of memories in ashes. Affecting both adults and

children victims and caretakers, the emotional toll can rise to the level of clinical disorders: mental health professionals are already seeing an alarming increase in depressive disorders, generalized anxiety disorders, PTSD, drug and alcohol abuse and a rising incidence of domestic violence (Finlay et al., 2012). In modern American society, the unavoidable exposure to triggers such as the smell of smoke, the sight of ash, hearing sirens, and others can reignite crippling fear reactions. Adding to the stress, the comforting “face” of one’s community may have been lost or rendered unrecognizable, and the network of supportive members scattered due to the fire and evacuations. Often the areas burned are prone to additional fires, or mudslides after intense rains, making the question of rebuilding or returning home an additional stress.

Smoky air choked with pollutants sickens people nearby and at distances of hundreds of miles. An increase in smoky conditions and reduced air quality in the western U.S. during the fire season exacerbates existing respiratory conditions and illness and can trigger new respiratory problems. Children with asthma are more likely to have an asthma attack with smoky conditions. In August and September 2017, Oregon and Washington States experienced consecutive days of “hazardous” air quality – levels at which health officials recommend all individuals refrain from exerting themselves outside. Many more days ranged from “very unhealthy,” to “unhealthy for sensitive groups,” – such as children and seniors – with recommendations that outdoor activities be restricted. These hazardous air quality conditions also coincided with record-breaking heat, including temperatures up to 107 degrees F. During the blistering 2003 wildfire in California, conditions linked to poor air quality led to a jump in hospital admissions among 5 to 19 year olds of 56% (Adhoot, 2015).

Psychological harms that can result from exposure to wildfires and smoke can include trauma from evacuation or the loss of homes, communities, and animals; depression; PTSD; anxiety, increased anger, and depression. Children are especially vulnerable (Finlay et al., 2012). Wildfires can also lead people to suffer grief and distress related to the loss of a forest, or other places with which they had a connection, as a result of the fire. Solastalgia, a term coined by Australian philosopher Glenn Albrecht in 2003, describes the gripping sense of existential loss when treasured places are irreparably damaged or destroyed as a result of human carelessness or willful disregard for them (Albrecht, 2005). Solastalgia manifests itself “in the erosion of the sense of belonging (identity) to a particular place and a feeling of distress (psychological desolation) about its transformation. It can cause profound distress, mental anguish, and result in intense visceral pain. Indigenous people are especially likely to experience solastalgia when their cultural traditions and Native lands are adversely impacted, or destroyed (Albrecht, 2005).

#### ***D. Polluted Air***

When fossil fuels are burned for energy the process causes air pollution by releasing particulate matter into the air. Smog, primarily composed of particulate matter, forms more quickly at higher temperatures. Low-lying ozone pollution, a component of smog, also increases with increasing temperatures. U.S. studies have attributed 200,000 early deaths each year to air pollution (even at levels below national standards), with the leading causes being pollution from the transportation and power sectors (Caiazzo, 2013; Di et al., 2017).

Children, especially, are affected by poor air quality. Asthma is the most pervasive chronic disease in children, affecting 9 million children under 18 (12.5%) (Johnson et al., 2016). Approximately 1.8 million emergency room visits are made each year for children due to asthma; children miss about 14 million school days each year due to asthma (Johnson et al., 2016). Between 2001 and 2010, the rate of children's visits to the emergency department for asthma increased by 13.3% (Nath & Hsai, 2015). Asthma attacks are emotionally damaging, for everyone, but especially for children, who may experience life-long trauma (Glazebrook et al., 2006). An increase in the incidence and intensity of asthma as a result of climate change can be expected to exacerbate the existing psychological harm.

The American Academy of Pediatrics has confirmed the link between climate change, hotter than average weather and impacts on children's health (Clayton et al., 2017). Ground-level ozone is predicted to increase as temperatures increase, which will exacerbate pre-existing asthmatic conditions, lead to increased hospital visits, and increase children's risk of developing asthma. Ozone has a corrosive effect on tissue in the lungs and bronchial tubes – causing inflammation, predisposing children to infections. Children are the most prone to exposure to ozone both because they spend more time outdoors and because they have higher respiration rates (Ahdoot, 2015).

Anyone suffering from asthma, and parents of children with asthma, know how frightening this condition can be, and how panic quickly overtakes someone who cannot get enough air. Millions of children in America's cities will suffer even higher rates of asthma and other respiratory illnesses as a result of polluted air from burning fossil fuels. Feeling anxiety at the experience or even the prospect of medical procedures or trips to the hospital, causes anxiety. The medical literature is replete with reports of the traumatizing and sometimes life-long impacts of early life exposure to illness and scary, painful treatments.

Additionally, warmer temperatures, due to climate change, are lengthening the frost-free period and the growing season, causing a longer and more intense pollen season. Since 1995, the pollen season has been lengthened by between 13 and 27 days. Increased pollen counts and the lengthened pollen season are worsening allergies and asthma attacks in children. Allergies currently affect close to one tenth of U.S. children, and places them at greater risk for suffering asthma attacks as a result (Ahdoot, 2015).

Psychological impacts *alone* are also linked to polluted air. Children exposed to small particles of chemicals in the air are more likely to have symptoms of anxiety or depression and show impaired intellectual functioning (Weir, 2012). Even the comparatively low levels of pollution measured in Sweden, which is primarily due to vehicle exhaust, are associated with increased risk of mental illness in children (Oudin et al., 2016). Polluted air is exceedingly toxic to brain tissue, causing inflammation. Toxic ultra-fine particulate matter, scientists have recently learned, can enter the blood stream directly through the lungs – potentially triggering inflammation throughout the body and into the brain directly through the nose when we breathe (Baldauf et al., 2016; Obederdöster et al., 2009).

Polluted air also impairs the mental functioning of children – and may cause dementia in adults (Calderón-Garcidueñas et al., 2015; Frank-Cannon et al., 2009). Inflamed brain tissue is linked to

brain diseases. It should come as no surprise then, that exposure to polluted air is associated with an increase in neurodegenerative disorders such as Alzheimer's, Parkinson's Disease, and Amyotrophic Lateral Sclerosis (Underwood, 2017; Dacks, 2017; Seelen et al., 2017).

Polluted air is also linked to neuropsychiatric disorders, including obsessive compulsive disorder, and classic psychiatric disorders such as bipolar disorder and schizophrenia (Souhel et al., 2013; Attademo et al., 2017; Fonken et al., 2011; Campbell et al., 2004). Emergency Room visits for anxiety, including panic attacks, and threat to commit suicide are significantly higher on days with poor air quality (Szyszkowicz et al., 2010).

### ***E. Violent Storms and Flooding***

Climate change is increasing the moisture content in the atmosphere, which in turn has increased the severity and the frequency of storms and floods (Melillo et al., 2014; Fed. Answer ¶¶ 220, 221). As with other climate change extreme events, violent storms and floods can unleash catastrophic physical and emotional harm – triggering the psychological disorders and conditions cited earlier, including but not limited to, anxiety, depression, and PTSD. Of all the extreme weather events, flooding affects the greatest number of people. The flooding of one's home brings a particular type of anguish – unceremoniously getting “kicked out” of your place of comfort by nature – your refuge from the outside world – underscores the fear and in some cases the “belief” – that no place is safe. Furthermore, recovery from personal sorrows and injuries takes place more quickly in a setting that is comforting and familiar.

The far-reaching psychological impacts of violent storms saw their prototype in Hurricane Katrina (2005). Grief, anxiety, violence, outbursts of outrage, and blame at a government slow to respond were among the acute emotional injuries of many Katrina victims. One poll showed that 70% of polled evacuees (680 people were polled) disapproved of the way the president responded and 60% said it made them feel that the “government doesn't care” about them (Morin & Rein, 2005). The storm-scattered residents of New Orleans from one end of the country to the other – shattering a culture, breaking up families. Years later New Orleans was still working to recover, with many of its residents continuing to experience post-storm linked anxiety, depression and PTSD (Moore & Varela, 2009). One study found that there was an *increase* in serious medical illness, PTSD, and suicidal ideation-plans at the time of the second interview, one year after the storm, compared to the first interview 5-8 months after the hurricane. These are findings contrary to other disaster studies when such mental disorders generally *decrease* over time (Kessler et al., 2008).

Research confirms the association between chronic stress resulting from extreme weather events, like Hurricane Katrina, and heart health (Peters et al., 2014). Residents of New Orleans suffered heart attacks at a rate three times higher than the rate reported before the storm. Some residents are unlikely to regain the psychological wellbeing they had pre-Katrina and will experience ongoing “pre-traumatic anxiety” – that is, the fear that another Katrina is just around the corner. Many residents also wrestle with the prediction that over the course of the next century, New Orleans will become uninhabitable from the twin climate change scourge of rising seas and storm surges.

Super Storm Sandy (2012), its ferocious winds, 13-foot storm surge, and monstrous reservoir of water is another example of an extreme weather event linked to climate change. In its wake were anguished families who lost loved ones and suffered injuries themselves. Homes and businesses were lost or damaged, and communities struggled without electricity and other services as they tried to get back on their feet. One study found that victims of Hurricane Sandy experienced a 14.5% rate of PTSD (Boscarino et al., 2014).

The Louisiana Flood of August 2016 reignited the emotional trauma of Katrina survivors, and brought in new victims experiencing physical and psychological impacts. Individuals already suffering from “storm trauma” are more prone to future trauma because each successive experience deepens their psychological vulnerability. In an era of multiple repeating disasters occurring within a short time frame, victims do not have a chance to recover before the next disaster hits.

The more extreme events individuals experience, the higher the likelihood of PTSD (Edwards & Wiseman, 2011; Hobfoll, 2007). The more severe the disaster, the higher the suicide risk is (Norris et al., Part II, 2002).

The cumulative toll of storms and worries about storms has become destabilizing: the summer of 2017 brought trauma *again* to New Orleans with “rain bombs” of 8-10 inches in a matter of hours. At the time residents described feeling traumatized at the very sight of storm clouds.

Further complicating the picture: residents of New Orleans are already raw and “primed” from the oft-cited government incompetence responsible for so much suffering in the Katrina era. Now they, and others faced with repeated or ongoing disasters, must contend with the realization that no lessons have been learned. At least the healing process is helped along if we can look back, identify where we went wrong and take action so we can legitimately say we are doing all that we can to prevent further injury. But on the contrary – even as the dangers continue to unspool at an ever higher rate, the federal defendants continue to actively promote the extraction and use of fossil fuels and denies that climate change is happening at all. Federal defendant actions that are not only not helping, but actually making things even worse, exacerbating the mental health impacts and creating mounting cynicism towards our government and institutions.

Elsewhere individuals who live where tornadoes and tornado warnings are common are paralyzed by fear of extreme weather events. Their fear is so extreme it can be considered a phobia. In one study assessing people’s reactions to thunderstorms and tornadoes, even an extreme weather forecast a week in advance could leave some participants “prisoners in their own homes” (Westefeld, 1996). As climate change increases the frequency and intensity of extreme weather events, such as thunderstorms and tornadoes, we will see more people suffering from this kind of psychological injury.

The widespread presence of mold in homes and other buildings is common in the aftermath of floods; the physical symptoms associated with exposure to mold are well documented (Potera, 2007). A link has been found between exposure to mold and psychiatric disorders, especially depression, and reduced cognitive functioning (Shenassa, 2007; Gordon, 2004). Other impacts

include anxiety, irritability, fatigue, among others (Hope, 2013). Toxic mold-induced mental illness and cognitive decline are rarely correctly diagnosed or treated.

Furthermore, seeing one's belongings a soggy ruin – more often than not turning black and moldy as they undergo the slow but inexorable process of rotting, brings unconscious associations to dying and death. The sense of powerlessness over “nature unleashed” weighs heavily and can make emotional recovery more difficult. In this vein, Plaintiff Jayden reported in her declaration that, “I have been scared that everything would flood again and that we would not have the carpets or blankets to soak up the water the next time. . . . My family and I feel very vulnerable” (Declaration of Jayden F. at ¶ 20). Jayden's testimony is consistent with the literature on mental health impacts after flooding.

In the aftermath of the physical devastation from storms, floods, and fires, we struggle to clean up, provide basic and emergency services, replant and rebuild. And funding for mental health – rarely a top priority in a budget – will, if the past is prologue, be among the first to be cut when resources grow tighter. Funding for mental health services is considered discretionary. So resources will be least available – at a time when they are needed more than ever. Adding to the burden of existing psychological trauma: when people are forced to evacuate their homes after disasters – from fires, floods, wildfires, storms, etc. – they are often separated from family, social networks, schools, and other relationships and the community ties that provide emotional – and even physical – support. Low levels of, or the absence of social support is one of the strongest predictors of posttraumatic stress (Brewin et al., 2000; Ozer et al., 2003).

#### ***F. New Disease Threats***

As ecosystems are altered by climate change old diseases are expanding their reach and new diseases are emerging. While all of us are vulnerable to disease, it is especially children who suffer. An estimated 88% of the burden of disease from climate change is borne by children under the age of 5. Children who are poor suffer disproportionately (Ahdoot & Pacheco, 2015).

Warnings that new diseases and old diseases with expanded reach are emerging in the U.S. are heard with increasing frequency. They are deeply unnerving, precipitating a pervasive if not always fully conscious sense of vulnerability that adds to existing stress. Many of these diseases agitate ominously in the background, but bursting into headlines recently was the mosquito-born Zika virus. Millions worried about being exposed to the virus – with widespread repercussions: local economies took a hit as fears drove tourists away from affected and potentially affected areas; pregnancies were put off; travels plans altered; and decisions about family life and individual personal choices were driven by fears of infection. Dozens of people in the U.S. were infected. In Brazil, thousands of families suffered the anguish of babies born deformed or with the threat of disabilities that might emerge down the road. Some fathers of affected babies abandoned their children – and their moms. Zika is far from the only virus threatening our health that is associated with climate change. Lyme disease is taking a grievous physical and mental toll: families and infected individuals struggle with the anguish of treatments that are often ineffective, especially when the diagnosis – sometimes difficult to make – comes after years of raging infection and unexplained symptoms. They wrestle with the reality of long-term damage to the entire body – including severe chronic depression, anxiety, and impaired intellectual

functioning. Other climate linked viruses, parasites and bacteria storm on and off stage depending on local weather conditions, or are waiting in the wings for their chance, or continue their inexorable expansion: Dengue Fever, familiarly known as “Bone-break Fever” because it is so painful, and sometimes fatal, Chikungunya, Hanta Virus, West Nile, Chagas, and of course Malaria.

Future research will chart the rising statistics of the mental health toll from both the emotional impacts that accompany all illnesses, and the fear that expanding old and new disease threats are already having on the Plaintiffs and will have on other children. As they envision falling prey to the increasingly provocative conditions that burning fossil fuels is unleashing, certainly they are justified in hoping their vulnerability is taken seriously and that action commensurate with what they stand to lose is taken.

### **G.     *Sea Level Rise***

With some *acute* climate events, victims can arm themselves with actions they can take to build resilience should they live through a similar event. Sea level rise is different. Although governments can work to adopt measures to mitigate harm in the short term, some amount of future sea level rise will continue inundating low lying cities, countries, and islands no matter what we do because some impacts are “locked in” due to heat in the oceans and glacial melt.

Experts project that without immediate dramatic action to curb rising carbon emissions, at the current melt rate sea level rise of several meters is possible in as few as 50 years (Hansen et al., 2016). Sea level rise is already displacing people and millions more will follow. In America alone, tens of millions of Americans live on the coastline and depend upon stable coastlines for their livelihoods, well-being, and survival; worldwide hundreds of millions of people live within 30 feet of sea level (McGranahan et al., 2007). The psychological harm due to the displacement of millions of people, and the associated physical harms and conflicts, will be incalculable.

Current and future climate refugees, who have been displaced from their homes, will search for safety and security, but chaos and violence often follow them, and can spread to others along the way. The example of Hurricane Katrina – with the mass relocation that occurred – will be the tip of the iceberg in the face of sea levels that permanently dislocate millions of people.

The grave psychological plight of climate refugees is increasingly the focus of the mental health profession. While resilience may be created when the hope of returning home, restoring, and rebuilding, is a reasonable response to nurture in the face of some cataclysmic events – the displacement from sea level rise is permanent, the healing effect of hope extinguished in the face of unflinching physics. Layered on top of the crushing financial loss of being forced to walk away from homes (which for most people is their biggest investment) with little or no value, is the stress of trying to adapt to new places, customs, and communities. A welcoming reception is not likely – given that additional, unexpected demands for resources and services are suddenly foisted on the new community. The newcomers may well be scapegoated. For example, Katrina refugees were initially accused of precipitating a crime wave in Houston, where many were taken in, before a closer analysis showed this was a misreading of statistics (Hamilton, 2010). Psychological stressors that rise to the level of disorders and fraying social conditions reflecting

these “shot-gun” relationships are now sowing seeds of discord in many parts of the world and are leading to geopolitical instability.

Families are already stressed by frequent flooding in storm prone, low lying regions. The waters damage infrastructure – disrupting attendance at school, access to work, hampering socializing and recreational activities. More problematic acutely – emergency services and access to medical care can be delayed. Mental health services, often *critically* relied upon by unstable individuals in the best of times, are less likely to be available in times of disaster when they are needed more than ever. Difficulties obtaining food, medicine and other staples must be factored in as victims, cut off from supplies, or competing for limited resources, struggle to take care of themselves. Fears of permanent displacement to unfamiliar places will gnaw at victims – provoking additional stress – financial, social, personal.

Believing we can take action, and are empowered to protect ourselves, is a critical factor in maintaining our mental health. But no such empowering action exists to stop locked in sea level rise. Without immediate, dramatic action by the federal defendants to reduce greenhouse gas emissions and minimize sea level rise, our levels of anxiety will continue their own inexorable and accelerating rise – along with the fear that the world is falling apart. For some it will be a reality.

#### ***H. Global Food Security and Malnutrition in the Face of Climate Change***

Climate change leads to food insecurity in the long term by reducing the amount, types, and nutritional value of the food we can produce (Ziska et al., 2016). Food insecurity destabilizes governments, damages our health and harms our communities. Every one degree centigrade rise in temperature above 30°C (86°F) brings at least a 10% decline in corn and soybean yields (Lobell & Asner, 2003). As supply falls, food prices rise. Crops exposed to high concentrations of CO<sub>2</sub> carry lower concentration of critical nutrients such as iron, magnesium, manganese copper, zinc, and protein (Ziska et al., 2016). Deficits of these nutrients are associated with an array of illnesses – including cognitive and psychological disorders (Ziska et al., 2016; Swardfager et al., 2013). Infants and children are most vulnerable because more nutrient enriched food is required for those critical periods of surging physical and mental growth and development (Ziska et al., 2016).

#### ***I. Indirect and Vicarious Climate Change Impacts***

In addition to the acute and chronic mental health impacts associated with specific climate change impacts described above, there are chronic mental health impacts associated with the awareness and knowledge of current and predicted impacts of climate change, even when a person was not directly affected by a particular climate impact (Doherty & Clayton, 2011). This can result in more gradual, though by no means less significant, psychological impacts. Those who are most knowledgeable and fully understand the reality of the threats posed by climate change, and haven’t chosen to turn a blind eye to the reality as a psychological defense mechanism, are most likely to experience the biggest impact on their social, emotional, and spiritual well-being (Fritze et al., 2008).

The impacts of indirect and vicarious climate change are a stew of emotional ills – anxiety, depression, despair, along with feeling of anger and powerlessness, and a growing rise in apathy and numbness to crises (Doherty & Clayton, 2011; Fritz et al., 2008; Clayton et al., 2017). Becoming injured to suffering is a maladaptive response that suggests trying to survive may drown out a uniquely human emotion, needed now more than ever, active compassion. Some people feel guilty and frustrated when their best efforts to stop climate change are not successful (Clayton et al., 2017). A growing body of literature on the issue is evidence that many are suffering debilitating knowledge that humans, entrusted with the highest capacity for empathy, and well within their power to control the contributing factors, are instead at the core of the problem. Deep-seated fears lead to existential questions about the survival – not only of other species in this age of mass extinction, but, indeed, questions about the survival of humans. If we do survive, many are asking, what will the world look like?

Day in and day out worrying about the unprecedented scale of the risk posed by climate change, and the future for oneself, children, and future generations, takes a heavy toll on an individuals' well-being wearing them down, sending some to the "breaking point." Children are especially vulnerable.

In a 2007 survey of Australian children, researchers Tucci, Mitchell, and Goddard found that "a quarter of children are so troubled about the state of the world that they honestly believe it will come to an end before they get older" (Tucci et al., 2007). Reports describe children crying, worrying about what is happening to animals, having problems sleeping, and wondering why their parents cannot do more. In the first known case of what is being called "climate change delusion," a depressed 17-year-old Australian boy was hospitalized for refusing to drink water for fear it would cause the death of millions of people caught in his drought-ridden country (Wolf & Salo, 2009).

The fatalistic feelings related to a loss of long-term safety and security go underappreciated because traditional scientific and economic frameworks don't recognize or measure such subjective feeling, no matter how widespread they are (Doherty & Clayton, 2011).

As social scientist William Bruce Cameron has observed, "Not everything that counts can be counted ..." Just as our society does not have a framework to measure happiness – we have no system to measure "gross national unhappiness." In my expert opinion, if climate change continues unabated, children will grow up in an atmosphere that is not consistent, for some, with their survival, let alone with the psychological health needed to address the mounting challenge before them.

## **II. The Mental Health Impacts of Climate Change are Exacerbated because they are Caused by the Federal Government's Role in Creating and Failing to Respond to Climate Change.**

In the aftermath of a disaster, people look for the *cause* of the traumatic event as they try to cope and recover. How they process the event is determined in part by how they answer the questions – *why* did it happen, *who* or *what* is responsible, and could the disaster have been prevented? Was it a "pure" accident – due to a mistake, carelessness – or *worse*, the result of *deliberate*

*disregard for consequences?* The answers to these questions lay the groundwork for the degree of difficulty we face in trying to put the event behind us.

After a *natural* disaster, an identifiable low point is seen, followed by the feeling that “the worst is over,” and the recovery process can begin. Disasters experienced as “natural” generally are easier to “reconcile” because they are experienced as “fate” – beyond our control. But when disasters are no longer experienced solely as natural, as “acts of god or nature,” but instead, are experienced as having arisen or been made worse because of the behavior of humans – it is much tougher for people to recover and the psychological harms are more grave. Injuries that occur as the result of an intentional act – or acts that could have been avoided – are much harder to put behind us and therefore are more psychologically damaging than injuries that occur accidentally (Folkman et al., 1986).

Human “generated” injuries, known as “technological disasters,” “generally cause more severe mental health problems than natural disasters when they are of roughly the same magnitude.” (Weisaeth, 1994).

When a trusted and powerful institution that people depend on (e.g., schools, church, or government) is implicated in causing harm, the trauma is exacerbated. This “Institutional Betrayal” occurs “when an institution causes harm to an individual who trusts or depends upon that institution” (Smith and Freyd, 2014). It can occur when the institution affirmatively causes the harm, or when the institution fails to take protective, preventative, or responsive actions. It includes institutional actions covering up or destroying damaging information related to the harm it perpetrated (Smith et al., 2014). Institutional betrayal can lead to a higher degree of psychological harm. It is uniquely harmful because it involves a betrayal of trust in a relationship in which the individual depends on the institution. Those who have less power and status in society, such as minorities and youth, are especially vulnerable to institutional betrayal. Emerging research has identified “judicial betrayal,” – occurring when victims feel that the judicial system has let them down by failing to address the harms that are being perpetrated on them (Smith et al., 2014).

An example of a technological disaster and institutional betrayal is the water crisis in Flint, Michigan. Public officials were repeatedly warned that Flint’s water showed dangerously high levels of lead, but they downplayed the risk, misleading the public about the severity of the threats and harm. The disaster continued unabated despite the concerns voiced by federal agencies, health care providers, academics, scientists, and despite the pleas of families with children who were already showing signs of contamination or were at risk. A state of emergency was declared, but by then, the harm had already been set in motion and people were suffering the consequences. Five officials involved have been charged with manslaughter. The emotional toll on families from the Flint water crisis has been grievous. In addition to the damage to the health consequences from lead poisoning, residents have a plethora of additional woes: debilitating outrage at a catalogue of irresponsible decisions and outright deception, and the disastrous conclusion that government, upon which they depend for security and safety, cannot be trusted. Anxiety, stress, depression, and substance abuse have increased in Flint residents (Cuthbertson, 2016).

Climate change is an example of both a technological disaster and institutional betrayal. That humans are the primary drivers of the current impacts of climate change is not scientifically disputed. The federal defendants' 2017 Fourth National Climate Assessment, found it "extremely likely" that human activities, primarily from burning fossil fuels, are the dominant driver of climate change (Wuebbles et al., 2017). For decades the federal defendants have extensively studied and proposed feasible options to reduce GHG emissions and minimize the threat of climate change. Two examples are referred to in Plaintiffs' First Amended Complaint: the 1990 Environmental Protection Agency plan, "Policy Options for Stabilizing Global Climate," and the 1991 Congressional Office of Technology Assessment plan, "Changing By Degrees: Steps to Reduce Greenhouse Gases" (¶¶ 3, 6).

As people struggle to get beyond the impacts of a climate related disaster, they will try to process the event by looking to government and people in positions of authority to answer the critical questions. Why did this happen? Who is responsible? Could it have been avoided? If they believe reasonable action to assure their safety and health is being taken by government – recovery from a disaster is less arduous; if, on the contrary, they believe government affirmatively caused or substantially contributed to the disaster, the psychological toll can be expected to rise steeply and greatly impede recovery.

In my expert opinion, the psychological impacts of your barn burning down because it was struck by lightning are far different from your barn burning down because your neighbor lit a fire close by – or worse set it on fire deliberately. Indeed the legal system also recognizes this distinction – the greater degree of intentionality with which a harmful act is judged to have been committed, the greater the cost to make the person "whole," and, for a criminal act, the harsher the punishment.

In the context of climate change, it is becoming well known that "natural disasters" are occurring more frequently and with greater intensity because of human-caused climate change. Years of clear, repeated warnings show that the harm from climate change is no accident – that it could have been prevented by the federal defendants, at least in part. The Plaintiffs know this. As it becomes increasingly apparent that deliberate indifference, willful ignorance, callousness, and politics have been put ahead of human safety and health, the resulting anger greatly encumbers the grieving process, making any recovery that much more difficult.

The general populace can be expected to realize with mounting outrage, much like the residents of Flint, the degree to which they have been deceived and betrayed by the government that is meant to protect them – persistently downplaying the risks of climate change, failing to respond to federal agencies, academics, climate scientists and the pleas of young people, all presenting evidence of already measureable and devastating physical and psychological impacts. Buffeted by the consequences of terrible decisions made in the past – now carrying irreversibly worsening conditions – the dark inevitability will breed bitter feelings of loss and anger – to feelings of confusion and despair.

That the federal defendants continue to use the legal system – with statutes, regulations, executive orders, and other legal measures – to perpetuate the use of the fossil fuels responsible for causing climate change – despite knowing now for more than 50 years of the grave threats

posed by climate change, is significant. The federal defendants' sanctioning of climate change as lawful in federal law and policy makes the psychological injuries suffered by individuals, including the Plaintiffs, particularly harmful and insidious.

As we look down the road to contemplate future recovery efforts, our progeny will know government officials knew for decades that harm was coming to them. Knowing that we did not value them enough to bother protecting them from harm, which is how they will interpret actions today, will foment not only anguish but a dangerous feeling of cynicism and distrust, breeding deep and enduring hostility towards democratic institutions, and towards each other as survival becomes an issue. It may not be realistic to imagine a well-functioning civil society under these circumstances.

In my expert opinion, absent immediate government action on climate change, that in addition to the physical and economic harms that will befall our nation, the mental health conditions of a growing number of people, including especially children, will decline and threaten the fabric of society.

The persistent, intentional, and reckless disregard for the health and well-being of citizens erodes the social contract. As federal defendants remove critical science-based documents and studies from their websites, cancelling projects aimed at better understanding how to manage the growing climate crisis, eliminating the words "climate change" and "global warming," while exponentially increasing the peril by opening up vast areas of the U.S. coastline to oil and gas drilling, faith in institutions and the democratic process will continue a dangerous downward slide.

Corrupt political process fills people with outrage and apathy. A declining faith in institutions erodes our democratic form of government, which depends on an involved citizenry. Democracy is not a default form of government. When the lights went out on Athens, it was 2000 years before we saw democracy again (Ringen, 2013). As the effects of climate change heat up – the world will look to leaders on climate change for help. If the U.S. is no longer the role model for the world, who will be? Will their form of government be emulated and adopted because it fights climate change more effectively? Under what form of government will our children live? As a former CIA psychological profiler, I fear for our democratic way of life.

### **III. Youth Are Especially Vulnerable to the Mental Health Impacts of Climate Change.**

Children under 18 years of age make up nearly a quarter of the U.S. population, and are distinct from the older population (U.S. Census Bureau, 2016). Children are not simply small adults and because their bodies and brains are still growing and developing, they are particularly vulnerable to environmental stressors. Early childhood is critical for brain development and stress from even minor disturbances during childhood can impact brain development in critical ways (Clayton et al., 2017). The consensus of neuroscientists is that brain development persists in humans until the mid-twenties, especially within the prefrontal cortex. The prefrontal cortex is the part of the brain that "decides" how to act after receiving information from other parts of the brain.

Commanding the "executive" functioning of the brain – it governs how we express ourselves, consider moral values and questions, how we regulate ourselves emotionally. The prefrontal

cortex is where we make complex decisions and judgments, where we strategize and problem solve using our reason and in consideration of the data coming in from other parts of the brain. Adverse conditions from external stressors – sensory, emotional, social – can **permanently** affect the development of the prefrontal cortex, adversely affecting the manner in which we present ourselves to the outside world – and in turn how the world responds to us (Kolb et al., 2012). Exposure to climate trauma during this period of development has the potential to create damaging life-long consequences.

The American Academy of Pediatrics issued this policy statement, which is accompanied by a technical report: “The social foundations of children’s mental and physical health are threatened by the specter of far-reaching effects of unchecked climate change, including community and global instability, mass migrations, and increased conflict. Given this knowledge, failure to take prompt, substantive action would be an act of injustice to all children. A paradigm shift in production and consumption of energy is both a necessity and an opportunity for major innovation, job creation, and significant, immediate associated health benefits” (AAoP, 2015).

The American Academy of Pediatrics has found mental health impacts in children from acute climate events: “Extreme weather events place children at risk for injury, loss of or separation from caregivers, exposure to infectious diseases, and a uniquely high risk of mental health consequences, including posttraumatic stress disorder, depression, and adjustment disorder. Disasters can cause irrevocable harm to children through devastation of their homes, schools, and neighborhoods, all of which contribute to their physiologic and cognitive development” (AAoP, 2015). Children are especially affected by the psychosocial stressors of dislocation. Following a disaster, minor deviance and delinquency among adolescents increases. Young children often have trouble sleeping, may become hyperactive, or manifest their anxiety through increased “clinginess” (Norris et al., Part I, 2002).

The National Commission on Children and Disasters presented a report to the President and Congress in 2010 on the academic challenges, behavioral problems and mental health impacts of children displaced by extreme events, noting that children have been more of an afterthought than a priority in disaster planning and response, and recommending that the President establish a national strategy for specially addressing the needs of children, including in the area of mental health (National Commission on Children and Disasters, 2010).

Numerous studies have documented the impact specifically on children from natural disasters. One study looking at the mental health impacts after Hurricane Charley found that posttraumatic stress and PTSD in children was at high levels nearly two years after the disaster, leading the authors to conclude that the mental health impacts persist for a long time and that children were generally not recovering from the effects of the storm (La Greca et al., 2010). Another study, looking at the impact of Hurricane Andrew on children, found that while the number of children experiencing very severe to severe PTSD did decline over time, a significant number, still reported very severe to severe PTSD 10 months after the disaster (La Greca et al., 1996). A significant number of children experience persistent mental health symptoms from natural disasters and that number will grow as climate change leads to an increase in extreme weather.

In my expert opinion, children, including these youth Plaintiffs, suffer substantial emotional trauma from the chronic, or longer-term, effects of climate change beyond the context of an immediate disaster. Children, including these Plaintiffs, are already harmed, both directly and indirectly, by knowing that continuing to burn fossil fuels is causing global temperatures to rise – bringing about sea level rise, ocean acidification, coral bleaching, increased air pollution, new diseases, the loss of biodiversity, the 6th mass extinction of wildlife species, the declining availability of freshwater, threats to national security and military installations, and geopolitical crises. Children know that for many in their generation, survival is on the line.

Many children are more attuned and sensitive to the changes in the natural world than their parents – in part because they spend more time outside, exploring, learning, and playing. They are deeply and personally traumatized seeing beaches they play on disappear, having places they hike, camp, and recreate destroyed by wildfires; witnessing verdant areas around their homes dry up or be inundated with flood waters; seeing coral reefs where they swim and snorkel bleach and die; or being unable swim in water because it is contaminated with heat-induced toxic algal blooms.

The wanton, reckless disregard for the future most grievously affects our children. For the reasons described above, their emotional state will be increasingly precarious. Many will engage in coping mechanisms that are intended to relieve their anxiety, but can make things worse. When children are exposed to multiple traumatic events, the harms tend to be worse. A “strong relationship” is seen between the number of adverse childhood experiences and health risk factors (both mental and physical) associated with a premature death (Felitti et al., 1998). As the number of exposure to traumatic events increased so did the health risks. As climate change gets worse, and traumatic climate events become more frequent, the health risks will be magnified for children. They will spend their lives, literally and figuratively, running for higher ground.

Many children wonder how they can do “more” to protect their environment and address the climate crisis. They also struggle with the knowledge that they should never have been put in this situation to begin with because our government, the “adults in the room,” have been aware of the threat of climate change for decades. They will likely be pinned to feelings of failure when rescue efforts fall short or their eagerness is not embraced by others, including their government leaders. Some also have feelings of frustration towards adults who praise them for their actions instead of taking more actions themselves. But their deepest and most gripping emotions are directed at the federal government for the abject injustice of being abandoned to a ferociously uncertain future.

Chronic climate mental health impacts and fear about the future especially ravage sensitive and highly empathic children. It has the power to unravel them. Without trust in our government institutions and in the people expected to serve the public, the fabric of society breaks down. Mental health professionals know this from working within the family model of mental health: when dysfunctional parents do not take care of their children, in the chaotic home environment that results, families fall apart. Similar chaos and mental health impacts can result at the societal level, in ways that resemble the family model, when the heads of our society are behaving in dysfunctional and dangerous ways toward society and children.

Children of grossly irresponsible parents, like the classic case of children of alcoholics, are said to “grow up quickly.” They often must take care of themselves, sometimes their parents, and their younger siblings. Adults may mistakenly praise them because they seem to function well on the outside, but on the inside it is often a very different story. They frequently feel abandoned, angry, overwhelmed, misunderstood, and alienated from the culture of the kids around them. Filled with worry, they may have a hard time relaxing and even feeling comfortable being happy. They are deprived of a normal childhood. As adults, they may have difficulty with close emotional relationships, distrust authority and wrestle with a cynical view of the world that keeps them from community engagement. I do not see how, without rapid intervention, many of our children now desperately seeking to awaken the world to the perils of climate change before us, in the absence of responsible action from adults, will escape many of these same struggles.

While all the apocalyptic warnings about the future are unspeakably traumatizing, for many, and especially children, knowing that human actions are hurting animals can be the emotional breaking point. Children identify with animals. The association pins them to their own fears – if animals are suffering, they feel lost too. Their touch, their magnificence, their endearing behaviors – bring profound and enduring emotional comfort to children. Mental health experts increasingly recognize the cornucopia of beneficial effects to human physical and emotional well-being from human connections to animals. Many species of wildlife are today in a gut-wrenching decline from climate change impacts: Scientists project one in six species faces extinction, with between 100-200 species a day going extinct around the world (Urban, 2015). Scientists have determined that we are in an era of the sixth great mass extinction – the last one was more than 60 million years ago. They are warning that it carries the potential for ecological collapse.

As we venture into the psyches of future generations, the blast of rage, the fury at our dangerous actions, the despair that the climb is so steep, the awareness that so little, comparatively speaking, would have been necessary to save their world in time, will have them thinking we were utterly depraved, demented, to have stood by, knowing full well what would happen. The youth Plaintiffs in this case already speak powerfully and resentfully of feeling abandoned and neglected by their government when it comes to climate change, consistent with what I would expect when faced with institutional betrayal.

As the news grows, and every day the fossil fuel infrastructure expands under the Trump administration, increasing numbers of children may become unhinged. The violence the climate crisis is doing to their future is known. Their anxieties are legitimate. Who will treat them? Mental health professionals have no special powers to wave away harm inflicted by adults taken to be in full possession of their senses.

There is another special mental health impact on young people that is distinct from the older population. Young people are now wrestling with a deeply unnatural conflict – whether or not to have children. Two issues weigh heavily on them: the child’s safety, given future climate harm scenarios, and, knowing that raising another life will lead to greater CO<sub>2</sub> emissions, the cost to the planet of bringing another person into the world in a society still dependent on fossil fuels. Some young women report feeling a spike of optimism around child-bearing and creating a family when hearing a piece of good news about the environment – and seeing it dip upon

hearing another round of bad news. Conceivable Future, a recently formed organization, describes the climate crisis as a reproductive crisis (<http://conceivablefuture.org>).

While all youth are especially vulnerable to the emotional toll of climate change, a particular burden is borne by the youth activists. In Roman mythology Cassandra was given the power of prophecy – but her fate was to foretell of future harm and not be believed – and to suffer seeing the consequences when protective action was not taken. Youth climate activists, including Plaintiffs, these modern day “Climate Cassandras” – are visualizing the fateful future, warning the federal government of the dangers, but seeing these warnings discounted, disregarded. Many of these “Climate Cassandras” live daily with the images of climate disasters they can’t get out of their minds. They struggle with “pre-traumatic stress disorder,” a version of the classic PTSD that impedes their ability to experience joy, to think of anything but the doom that lies ahead.

In failing to take action on climate change – denying even that it is a threat or a scientifically credible phenomenon – the current Trump administration adds to the existing anguish and frustration – while adding even more pressure to the sense they have of personally being responsible for getting the federal government to do the right thing. And as they dig ever deeper in the effort to try to be more convincing, valiantly working to save beloved animals and the natural world, with ignominious government resistance relentlessly testing them to the core – some struggle with feelings of failure.

Enhancing our ability to adapt to challenges builds resilience – an ability that we will call upon all throughout life. While youth can be resilient, when their adaptive processes are jeopardized, they are additionally vulnerable. Some of the greatest threats to those adaptive processes include disruption in the caregiver relationships and supportive environments, impaired brain development and cognition, difficulty regulating emotions, and decreased engagement with the environment (Masten, 2001). The burning of fossil fuels and the impacts of climate change can bring about all of these threats, severely undermining the natural resilience that youth may otherwise have.

With respect to supporting environments, while parents are often the most valuable support agents, peers and teachers are also very important (Vernberg et al., 1996). When storms and other extreme weather events result in children having to move or change schools, it often disrupts friendship networks, which adversely affecting that social support network (La Greca et al., 2010). Studies of the impacts of Hurricane Andrew on children concluded that supportive relationships in school, both from teachers and classmates, are important for children’s psychological well-being in the aftermath of a disaster (Vernberg et al., 1996). Disasters can also lead to illness or death; stress from the event and its aftermath can strain the relationship of parents. In all these scenarios, the social-familial support network is severely tested – sometimes eroded or even lost – exacerbating the mental health challenges for youth.

Research now shows that exposure to traumatic events can alter our DNA by awaking *additional* genes (beyond those needed under normal conditions) that “code” for stress. Studies have shown that psychological harm from early life stresses experienced by refugees and survivors of war trauma, childhood sexual abuse, or other traumatic events, can awaken these additional genes. Through “transgenerational epigenetic inheritance” the *expression* of activated stress genes can

subsequently be passed on to our children, even in absence of the original trauma (Babenko et al., 2015; Gapp et al., 2014; Jablonka, 2009).

High levels of stress over time have multiple damaging effects on our bodies. Among the potential harms: altering hormone levels affecting reproductive success, impairing cognitive functioning, inducing maladaptive behaviors, and in children, altering brain development. In addition to the stress of external trauma from climate change, transgenerational epigenetic inheritance is an internal source of climate stress (Gapp et al., 2014; Kellerman, 2013; & Reul, 2014).

The trauma that children are now experiencing, and will experience in the future, due to acute and chronic climate change impacts is positioned to be genetically passed down to future generations, making climate change truly an intergenerational crisis, and underscoring the need for immediate action by the federal government in order to avoid multi-generational mental health harms that are literally part of children, and their children's, DNA.

### **CONCLUSION**

Approximately seventy-four million children under age 18 live in America. As the consequences of yesterday's and today's fossil fuel-based energy choices "come home to roost," they will be at the center of the storm as warming accelerates and Earth's natural systems produce more violent, inhospitable conditions resulting in cumulative and repetitive harm to human life and civilization.

In my expert opinion, these youth Plaintiffs, and many other children, are already experiencing acute and chronic mental health impacts as a result of climate change and its impacts. These mental health impacts are exacerbated because climate change is a direct result of actions taken by the federal defendants, who are supposed to be protecting the Plaintiffs and future generations. Some of the Plaintiffs are in a state of despair, others are angry and have feelings of hopelessness. They are extremely worried about their futures and the world that they will grow up in. Without immediate action by the federal defendants to address climate change, it is my expert opinion that these Plaintiffs will continue to suffer acute and chronic mental health impacts and that their suffering will worsen. These conclusions are consistent with what I have seen in my practice and the literature.

The mental health impacts of climate change have the power to destroy us psychologically, both as individuals and as a nation. Climate change results in acute and chronic mental health challenges, particularly for children. The mental health impacts of climate change can be reduced, and future harms avoided, through immediate action by the federal defendants to reduce greenhouse gas emissions consistent with the relief sought in this case. If the federal defendants fail to do so, an underlying sense of betrayal will intensify the mental health consequences of youth, particularly these individual Plaintiffs, from the current unstable climate system. Climate change is a clear assault on youth and future generations.

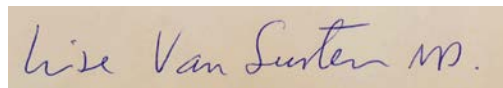
Given that portions of the world and our country will this century be uninhabitable, with other places unrecognizable to those living today, with all the attendant geopolitical consequences and

humanitarian crises, the extinction of animals and nature turned upside down, and that the damage to our children of having ruthlessly, chillingly abandoned them to this fate with full knowledge of the consequences, renders this expert opinion a straightforward one to make. I have seen children suffer physically and emotionally at the hands of adults; I know abuse when I see it. I see it. The federal defendant-supported and -perpetuated climate crisis is an intolerable assault on our children and is justifiably equivalent to child abuse. For its scale and permanency, it is unmatched in the annals of history. It is causing and will continue to cause profound psychological damage to children, and to these Plaintiffs.

Though the survival and well-being of humanity is on the line, it is an especially excruciating injustice that those who have benefitted from climate stability should be unmoved or silent at the harm that will be unleashed upon those who are just beginning their lives. We have the opportunity of many lifetimes – alone of all generations, to stand in the path of climate calamity. All of the accomplishments and dreams of humanity, the breathtaking beauty and life-giving bounty of the natural world now lies in the hands of a few courageous and well-placed individuals who have the capacity to turn the course of history towards survival.

Our country, the world, our children, and Our Posterity need help. These brave Plaintiffs are confronting the perpetrators of the harm they are facing and they are calling upon the judicial system to bring the perpetrators to justice. It is my professional opinion that their mental health depends upon the outcome of their constitutional plea for help.

Signed this 13th day of April, 2018 in Washington, DC.




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Lise Van Susteren, M.D.

**EXHIBIT A: CURRICULUM VITAE**

Lise C. Van Susteren, M.D.  
 1906 Connecticut Ave. NW Suite 300  
 Washington, D.C. 20009  
 (301) 787-1780  
[lvs350@me.com](mailto:lvs350@me.com)

## **EDUCATION**

Residency in Psychiatry - St. Elizabeth's Hospital Washington, D.C.	1982 - 1986
Internship - Hospital St. Anne Paris, France	1980 - 1981
Internship - American Hospital at Neuilly Paris, France	1980 - 1981
Internship - Hospital Tokoin Lome, Togo (West Africa)	1981 - 1982
Doctorate in Medicine - University of Paris Paris, France	1973 -1982
University of Wisconsin Madison, Wisconsin	1969 - 1973
University of Paris – Sorbonne Paris, France	1970 -1971

## **PROFESSIONAL QUALIFICATIONS**

Licensed to practice Medicine Washington, D.C.	1983 - present
Board Certified in Forensic Psychiatry	1999 - present
Board Certified in General Psychiatry	1989 - present

## **WORK EXPERIENCE**

Private Practice: General and Forensic Psychiatry	1987 - present
Candidate for the US Senate, Maryland	2005 - 2006
Consultant to the Central Intelligence Agency Medical Behavioral Unit: Profiler of world leaders.	(confidential)
Staff Psychiatrist Alexandria Mental Health Center, Alexandria, VA 1991	1985 -

Springfield Mental Health Center, Springfield, VA 1989	1984 -
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### **TEACHING EXPERIENCE**

Associate Clinical Professor of Psychiatry Georgetown University School of Medicine, Washington D.C.	1998 - 2005
Georgetown University Medical School Seminar on Psychiatry and the Law	1998 - 2000

### **COMMUNITY ACTIONS:**

March for Science, The National Mall (with Earth Day Network)	April 2017
Lead organizer "Rally for the Pope on Climate," The National Mall	September 2015

### **PRO-BONO FORENSIC CONSULTATIONS:**

Michael Foster "Valve Turner", (necessity defense) Physicians for Human Rights (evaluations and testimony for torture victims seeking U.S. asylum)	October 2017 2010 - present
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### **PROFESSIONAL MEMBERSHIPS AND ACTIVITIES**

American Psychiatric Association Medical Society of the District of Columbia Metropolitan Washington Psychiatric Society	
Member Psychiatry Section Medical Society of the District of Columbia	1995 - 2003
Vice Chair Committee on Public Health Medical Society of the District of Columbia 2002	
Member - Committee on Grassroots Medical Society of the District of Columbia	1998 – 1999
Member - Judicial Committee Medical Society of the District of Columbia	1996 - 1999
Editor: Newsline Extra Medical Society of the District of Columbia	1996-1997

Chairperson Communications Committee Medical Society of the District of Columbia	1995 - 1997
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Chairperson Mini-internship Medical Society of the District of Columbia	April, October 1996
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## **PUBLICATIONS**

### **Professional Press**

“The Psychological Impacts of Climate Change – A Call to Action” The British Journal of Psychiatry	in press
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“Hold Your Breath: Air Pollution and your Mental Health” Clinical Psychiatry News	March 20 2017
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“Climate Change: A Call to Action for Psychiatry”	January 24, 2017
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“Assessing Dangerous Climate Change”: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature; PLOS (James Hansen, Pushker Kharecha, Makiko Sato, Valerie Masson-Delmotte, Frank Ackerman, David J. Beerling, Paul J. Hearty, Ove Hoegh-Guldberg, Shi-Ling Hsu)	December 3, 2013
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“Insanity Defense, Cont’d; American Academy of Psychiatry and the Law	December 2002
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“The Creative Physician and Parent”; Psychiatric Times	August 2001
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“Psychiatric Abandonment”; Psychiatric Times	June 2001
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“Premenstrual Syndrome as a Legal Defense”; Trauma; Vol. 5, p. 31	1995
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Chronic Fatigue Syndrome; Trauma; Vol. 39, No. 1	1997
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Sexual Harassment; Trauma; Vol. 34, No. 4	1993
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AIDS and Confidentiality - A New Dilemma; Trauma; Vol. 32, No. 1	1991
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### **Lay Press:**

“Delivering on Labor Day”, Huffington Post	November 2013
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“The Psychological Effects of Global Warming on the US 2012 and why the US Mental Health System is not Adequately Prepared”	February
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National Wildlife Federation,  
with funding from the Robert Wood Johnson Foundation

"Crisis in the Situation Room", Huffington Post	May 2011
"National Insecurity and the Dress Code", Huffington Post	August 2010
"Psychic Pains and Spilled Oil", Huffington Post	June 2010
"Moms United", Huffington Post	May 2010
"Our Moral Obligation": Mental Health Professionals Tackle Climate Change Huffington Post	April 2009
 "Alcohol and Families" Washington Post Health Section	 April 1999
"Seasonal Affective Disorder" Capitol Hill Rag	1996
"Prevention of Choking in Children" Capitol Hill Rag, Sea Services Weekly	1995
 "Multiple Personality Disorder in an HIV Positive Patient" Washington Post Outlook Section	 February 26, 1989

### **ORGANIZATIONS**

CO-Founder: Climate Psychiatry Alliance

Co-Founder: Interfaith Moral Action on Climate (IMAC)

Board member:

- Earth Day Network	2015 - present
- The Climate Mobilization	
- Center for Health and the Global Environment, Harvard T. H. Chan School of Public Health	2013 - present 2012 - present
- Metropolitan Washington Council of Governments	2012 -2014
- Chesapeake Climate Action Network	2006 – present
- United Planet Faith and Science Initiative	2011 - present
- Vice President's Al Gore's "The Climate Project"	2007 – 2008
- National Wildlife Federation	2006 - 2013

### **SPEAKING ENGAGEMENTS**

Since 2006 I have given more than 200 presentations around the world on issues related to climate change. These include presentations on the health effects and psychological aspects of climate change, the impacts of climate change locally and globally, and solutions. Specifics provided upon request.

National Geographic/Lindblad Expedition to Antarctica Featured Speaker: #1 Climate Change - the Physical and Emotional Toll #2 The Charms, Tricks and Secrets of Nature - Turning Awe into Action on Climate	November - December 2017
“Duty to Warn and Protect on Climate”, American Public Health Association	November 2017
“Acton on Climate”; Health of People, Health of Planet Workshop; Pontifical Academy of Sciences, The Vatican: Rome, Italy	November 2017
“Duty to Warn and Protect in the Era of Climate Dangers” American Psychiatric Association New Orleans, LA	October 2017
“Climate Change – Your health and Your Role” Ohio Wesleyan University Delaware, Ohio	September 27, 2017
“Mental Health and Climate”; Citizens Climate Lobby; Washington D.C.	June 2017
“Resilience in the Face of Climate Change”; American Public Health Association Washington D.C.	June 2017
“Human Health in a Changing Climate Symposium”, Harvard Global Health Institute, Cambridge, MA	April 27, 2017
“Climate and Health Meeting”: With former Vice President Al Gore (Climate Reality) The Harvard Global Health Institute Atlanta, Georgia	February 2017
“Climate and your Health”, The Emerging Markets Symposium Oxford, England	January 2017
“Your Health and Climate Change”; California Department of Health	October 2016
“Climate and Health”; American Psychiatric Association, Washington D.C.	October 2016
“Climate in Court” with Dr. James Hansen and Jeffrey Sacks, University of Oregon School of Law Eugene, Oregon	September 2016
“Disaster Psychiatry: Current Needs in Managing Climate Change” American Psychiatric Association San Diego, CA	May 22, 2017

Interviewing and Testifying for Torture Victims Seeking Political Asylum: Physicians for Human Rights, Washington D.C.	2010 - present
Health Effects of Global Warming: (Moderator) The Climate Project, Nashville, TN	May 2009
"What We Can Do to Save our Planet" 2009 United States Department of the Treasury Washington D.C.	April
"What We Can Do to Save our Planet" United States Secret Service Washington D.C.	April 2009
Co-Chair: "Psychological and Mental Health Impacts of Climate Change" National Conference, Washington, DC Funding: The Robert Wood Johnson Foundation; National Wildlife Federation	March 2009
American Academy of Forensic Sciences, Dallas, TX The Insanity Defense, Andrea Yates, and the problem with Park Dietz	February 2004
National Multi Housing Council Annual Meeting, Phoenix, AZ "Psychiatric Issues for Everyday Use"	January 2001
McKenna and Cuneo, Washington DC "Conflict Resolution"	October 1998
National Multi Housing Council Annual Meeting, Laguna Niguel, CA "What is the Purpose of Life?"	January 1997
Grand Rounds, Alexandria Hospital, Alexandria, VA "Multiple Personality Disorder in an HIV Positive Patient"	February 1989

### **TELEVISION and RADIO PRESENTATIONS**

I have appeared on national (CNN, GMA, NBC) and local television more than 100 times to address current events, public health concerns and psychological matters; with recent commentary on global terrorism and violence, and various topics in psychiatry: the mental state of hostages, serial killers, arsonists, psychological profiles" of national figures, and the insanity defense in court.

Additional information available upon request.

Weekly Radio Segment on Health: The Paul Berry Radio Show	2005 - 2006
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**MISCELLANEOUS**

Years of Living Dangerously with Jack Black December 2016  
National Geographic Television Series

Consultant - World Bank International Leadership November 1999  
Wye, MD

Founder and member of The Friends of St. Elizabeth's 1984 - 1997  
(a non-profit organization dedicated to the humane treatment of the  
mentally ill and the preservation of the historic status of St. Elizabeth's  
Hospital in Washington, DC)

Co-Chair - Ben W. Murch Elementary School Auction 1998

Consultant - Center for International Leadership July  
1997

Lake Geneva, Wisconsin

Consultant to John Turturro in the movie "Fearless" 1992

## **EXHIBIT B: REFERENCES**

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Declaration of Jaime B. in Support of Plaintiffs' Opposition to Defendants' Motion to Dismiss. (2016). In *Juliana et al. v. United States et al.*, Case No. 6:15-cv-01517-TC, Document No. 41-4.

Declaration of Jayden F. in Support of Plaintiffs' Opposition to Defendants' Motion to Dismiss. (2016). In *Juliana et al. v. United States et al.*, Case No. 6:15-cv-01517-TC, Document No. 78.

Declaration of Journey Z. in Support of Plaintiffs' Opposition to Defendants' Motion to Dismiss. (2016). In Juliana et al. v. United States et al., Case No. 6:15-cv-01517-TC, Document No. 41-5.

Declaration of Levi D. in Support of Plaintiffs' Opposition to Defendants' Motion to Dismiss. (2016). In Juliana et al. v. United States et al., Case No. 6:15-cv-01517-TC, Document No. 41-7.

Declaration of Levi D. in Support of Answer of Real Parties In Interest to Petition for Writ of Mandamus. (2017). In United States of America et al. v. United States District Court for the District of Oregon and Juliana et al., Case No. 17-71692, Dkt Entry 14-5.

Declaration of Victoria B. in Support of Plaintiffs' Opposition to Defendants' Motion to Dismiss. (2016). In Juliana et al. v. United States et al., Case No. 6:15-cv-01517-TC, Document No. 41-9.

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