Solar "Grand Minima" Preparedness Plan
i.e. Little Ice Age Preparedness Plan

I. General Discussion

Mankind has been down this road before and we will go down this road again and we will survive. The last time we faced this type of disaster was over 300 years ago, as a result it has almost been erased from our collective memory. A solar "Grand Minima" produces a time of great hardship, a time of significant natural global cooling, a time of great famine and starvation and a time of major epidemics.

The sun exhibits great variability in the strength of each solar cycle. This variability ranges from extremely quiet "Grand Minima" such as the Maunder Minimum (1645-1715 A.D.) to a very active "Grand Maxima" such as the enhanced activity observed during most of the 20th century (1940-2000 A.D.). A solar Grand Minima is defined as a period when the (smoothed) sunspot number is less than 15 during at least two consecutive decades. The sun spends about 17 percent of the time in a Grand Minima state. In the past, these periods caused great hardship to humanity and significant loss of life.

Solar Grand Minima events correspond to periods of dramatic natural global cooling. The Maunder Minimum (about 1645-1715 A.D.) and Spörer Minimum (about 1420 to 1570 A.D.) are two examples of recent "Grand Minima" events and each period has been referred to as a Little Ice Age.

This threat is not a short-term problem but extends over several decades. Of the 27 "Grand Minima's" that have occurred over the past 12,000 years: 30% lasted less than 50 years, 52% lasted between 50 and 100 years, and 18% lasted over 100 years. Of these, the longest was Spörer Minimum which lasted approximately 150 years.

The threat from a quiet sun is describe in the Solar Grand Minima Threat Analysis available at: http://www.breadandbutterscience.com/SGMTA.pdf. This Preparedness Plan is a companion document to this analysis in which the threat is described in substantial detail.

There are several lessons learned from studying very early global cooling events in Europe. These include:

* *The onset of these conditions can be very abrupt and very severe.*
* *A decline in food production due to:*
  - *Dramatic increase in days with overcast skies.*
  - *Decline in the intensity of sunlight.*
  - *Decline by several degrees in global temperature*
  - *Regions of massive rainfall and flooding*
  - *Limited regions experienced droughts*
  - *Shortened growing season*
* *A string of major and minor famines*
* *Malnutrition lead to weakened immune system. Produced influenza epidemics.*
* *Reoccurrence of plagues such as the Black Plague.*
* *Lack of feed for livestock*
* *Parasites (i.e. fusarium nivale), which thrived under snow cover, devastated crops.*
* *Grain storage in cool damp conditions produced fungus (Ergot Blight). Contaminated grains when consumed caused an illness (St. Anthony's Fire) producing convulsions, hallucinations, gangrenous rotting of extremities.*
* *Flooding created swamplands that became mosquito breeding grounds and introduced tropical diseases such as malaria throughout Europe.*

** During hot summers, cold air aloft produced killer hailstorms (massive hailstones that could kill a cow).*

** Higher frequency of powerful storms produced major devastations. (For example during the Spörer Minimum, approximately 400,000 people perished in the A.D. 1570 "All Saints Day storm" in northwestern Europe. And two catastrophic storms hit England and the Netherlands in A.D. 1421 and A.D. 1446, each storm killing 100,000.)*

** Glacier advance swallowed up entire alpine villages.*

** Ruptured glacial ice dams produced deadly floods.*

Table of Contents

II. Individual Preparedness

This plan will focus on three elements for individual preparedness. These elements are food storage, back-up heat source, and adaptation to cold weather environments.

A. Food Storage

It is essential for individuals and families to store food for the times of severe famine. During a Grand Minima, not every year will produce a famine. It may be wise for individuals to store food for the worst years and then restock during the marginal or better years.

Food is a basic human survival need. Humans can live about a week without food, less in cold weather and limited water. In an emergency, stockpiling food, even enough for 5-7 days, saves having to forage, hunt, buy, barter, or trade for it. Or worse! Hunger strips away the resolve of people unaccustomed to its grip. We are accustomed to obtaining food from grocery stores. During a famine these assets will be insufficient and will quickly become exhausted.

There are two primary issues involving food storage: (1) shelf life and (2) cost. Fortunately, modern technology has made great strides in recent years in advancing the science of food storage.

In a proactive approach, individuals and families should prepare for emergencies, even long-term emergencies. Food should be one of the items on the top of everybody's list.

> *Guidance*:
> Individuals and families should store dried wheat, rice, beans and other grains and legumes as a staple food supply to cover their needs for a year. This is relatively inexpensive, long-term shelf life food if properly packaged and stored.
>
> Only after this first objective is accomplished should individuals and families turn their focus to adding variety to their meals by including properly packaged freeze dried food. This is relatively expensive, long-term shelf life food.

Most of the world lives on grass seeds; wheat, oats, rice, millet and other cereals. The United States farmers produces vast quantities of food. In the 2005/2006 trade year, the U.S. farmers produced 63.2 million tons of wheat, 7.8 million tons of rice and 329.3 million tons of coarse grains (corn, barley, sorghum, oats, rye, millet and mixed grains). This production equals approximately 400 million tons. The majority of grain produced in the United States is in the form of corn. Most of this grain is currently used as livestock feed. During a "Grand Minima" grain production in the U.S., Canada, Europe and Russia will be severely constrained due to adverse weather.

The minimum daily requirement for food is 2,100 calories per person. Grain meal provides between 1200-1700 calories per pound. In general, one ton of grain is required to supply the minimal needs of one person for a period of three years.

Individuals and families should store food prior to the onset of a solar "Grand Minima" especially when the handwriting is on the wall that such an event is on the way. ***What amount should be stored?*** I feel a one-year supply is about the right amount. This provides a buffer against the worst famines. Since there will be good crop years mixed in with bad crop years during a "Grand Minima", exhausted stored food supplies should be restocked during the good years.

What form should the food storage take? Shelf life is a major issue. Many forms of food storage have short shelf lives and require a meticulously tracking and food stock rotation program. For that reason, I recommend storage of basic food staples in the form of dried wheat, rice, beans and other grains and legumes. Emergency Essentials at www.BePrepared.com is a good source. Send away for their catalog because I find it difficult to maneuver through their online store website. The grains I recommend are in 6-Gallon Superails. These grains are stored in a metalized bag to keep moisture and odors out. Prior to sealing the grains in the bag, an oxygen absorber is inserted. Oxygen absorber packet chemically binds and remove oxygen from inside the bag. Air normally contains about 78% inert nitrogen and 21% reactive oxygen, leaving about 1% for the other gasses. The packet absorbs the oxygen, leaving about 99% pure nitrogen in a partial vacuum. This will keep the grains fresh for a very, very long time. The bags are inserted in six-gallon Superpails. This protects the metalized bags and also keeps insects, mice

and other vermin out. An example of this type of storage is shown in **Figure 1**. It is important to keep food in these Superpails stored at as cool and steady a temperature as possible (below 75 degrees but not freezing). Food in this form stored in a cool environment will last 20+ years. Thus you can avoid the problem of constant food rotation. The Superpails are stackable and fit easily inside a closet. I found the cost of this food a little higher than the cost at a grocery store. I recommend rice, beans, peas and lentils because of their ease in preparation (simply cooked in boiling water). Wheat, spelt, barley and oats will generally need to be ground to make flour which will then be processed into bread, pasta, cereals, etc. A grain grinder will be required to process this type of grain into flour. I have bought and used this product and give it my thumbs up.

Figure 1. 6-Gallon Superpail, Gamma Lid Removed

I also recommend purchasing a few Gamma Seal Lids. Once you pop the top off a Superpail, you will need to reseal it between daily uses. Gamma lids provide a quick on-off airtight sealing lid.

Figure 2. Freeze Dried Chicken

Secondly I advise individuals to purchase some freeze dried food to add variety and taste to the meal. Refer to **Figure 2**. Nitrogen (nitrogen back-flushed with less than 2% residual oxygen) packed freeze dried food in metal cans have a proven shelf life in excess of 30 years. This is relatively expensive food. Remember to rehydrate freeze dried food immediately prior to use by soaking the food in clean water.

The following are examples of the extensive variety of freeze dried food currently available. Meats include: ground beef, roast beef, white chicken, diced ham, italian meatballs, crumbled sausages, and white turkey. Cheeses include: sharp cheddar, colby, monterey jack and mozzarella. Fruits include: apple, apricot, banana, blackberry, blueberry, mango, orange, peach, pear, pineapple, raspberry, raisin and strawberry. Vegetables include: asparagus, green beans, broccoli, cauliflower, celery, sweet corn, mushrooms, onions, peas, peppers, potatoes, spinach, tomatoes, and zucchini. Freeze dried food can also take the combination form of entrees and meals. A few examples are: chicken teriyaki, beef stroganoff, seafood chowder, macaroni & cheese, blueberry cheesecake.

I would shy away from Meal Ready to Eat (MRE) because they only have a shelf life of approximately 8 years. MREs are also fairly expensive. I would also shy away from storing commercially canned food in metal cans. The general guidelines from the USDA are high acid canned foods (fruits, tomatoes, pickled

products) have a shelf life of 18 to 24 months. Low-acid (meat and vegetables) have a shelf life of 2-5 years. In general, food in metal commercial cans do not last nearly as long as food in canning jars. And the metal cans used today in my opinion are not nearly as durable as those of yesteryear.

"Shelf Life" can be defined in <u>two</u> ways:

Best If Used By Shelf Life *- Length of time food retains most of its original taste and nutrition.*
Life Sustaining Shelf Life *- Length of time food preserves life, without becoming inedible.*

There can be a wide time gap between these two definitions. For example, most foods available in the grocery store that are dated have a "Best If Used By" date that ranges from a few weeks to a few years. On the other hand; scientific studies have determined that when properly stored, powdered milk for example has a "Life Sustaining" shelf life of 20 years. Stored powered milk may not taste as good as fresh powdered milk, but it is still edible and nutritious.

Many individuals out in the country can their own food. So the question comes up, what is the shelf life for food canned in glass canning jars. I have eaten beans from canning jars that we canned 25 years ago. Others have eaten canned pickles and venison over 30 years old without any ill effect. The U.S. Army has found that canned meats, vegetables and jams "were in excellent states of preservation" after 46 years. Some common sense is due here. In many cases, if the food in glass canning jar goes bad, it will pop the lid. This food should be discarded. If mold forms on the food or if the food gives off an offensive strange odor, discard it. If in doubt, recook it at boiling temperatures.

Minerals and carbohydrates do not change much during storage. But proteins can denature and deteriorate in quality. Fats can acquire off odors and off flavors known as rancidity. Vitamins are susceptible to destruction by heat, light, and oxidation. Importantly, even if some components deteriorate, the fat, carbohydrates and proteins still contribute calories. To prevent starvation, the most important component is calories.

For those interested in detailed tracking of nutritional levels for stored food, Emergency Essentials provides a Food Storage Analyzer at http://foodstorageanalyzer.com/. Another source of information on Food Storage can be found in Prudent Food Storage: Questions & Answers by Alan T. Hagan at http://athagan.members.atlantic.net/PFSFAQ/PFSFAQ-1.html#Table%20of%20Contents.

Wonder Mill is an electric grain grinder. The mill can grind around 10 cups of wheat into flour in about a minute. This is enough flour to make a couple loaves of bread. Refer to **Figure 3**.

Figure 3. Wonder Mill

B. Back-Up Heat Source

One of the primary hazards during the depth of a deep winter is the loss of electrical power. This loss will occur in the worst weather conditions such as during blizzards, ice storms and frigid temperatures. If you live in the northern tier of states count on this hazard and be prepared by having a backup heat source in place.

In general, most individual's primary heat source is an electric furnace (100% efficiency rating), gas furnace (~80% efficiency), oil furnace (~78% efficiency) or Liquid Propane (LP) furnace (~78% efficiency). But all of these systems require electricity and when the electrical power goes out, these systems die. In many cases, fireplace inserts require electricity for blower motors to circulate the air around the firebox. Also external wood furnaces or outdoor wood boilers will not work without electrical power. Without heat in our homes and business, the inside temperatures will slowly drop and they will become unlivable.

On 25 January 1978, a paralyzing snowstorm struck Indiana which became known as the Blizzard of 1978. Maximum snow amounts from the storm reached 20 inches over parts of Central and Southern Indiana and up to 40 inches over parts of Northern Indiana. The blizzard produced peak winds of 55 mph. On the 26th, wind chills remained a bone chilling -40° to -50°F (-40° to -46°C) nearly all day. At the start of the blizzard in the Southern Indiana, Warren Strietelmeier observed snowflakes 3 to 4 inches in diameter on his way home from work. A few miles away, Tom Bishop, observed the temperatures dropping to -25°F (-32°C) during the night. Sometime after midnight, the power went out. Tom heated his house with fuel oil. Without electricity, the furnace immediately shut down. When the electricity was restored an hour later, the fuel oil had coagulated into a substance that resembled Jell-O. He was unable to restart the furnace. He woke his wife and children and loaded them into the car and made his way in the storm to his mother's house. But the car's tires were bad, and he blew two along the way. What normally would suffice as an inconvenience, a one-hour loss in electricity, in extreme cold can easily turn into a life and death struggle. Later that year, he purchased a wood stove as his backup heat source.

During the night of 26 January 2009, a deadly ice storm struck Kentucky. The storm broke branches, uprooted trees and split some trees in two. It caused power and communication lines to go down affecting 1.3 million people primarily in Kentucky, Indiana, Ohio, Oklahoma and Missouri. In many regions the electrical power was down for several weeks during freezing temperatures. My son-in-law's parents live in Evansville, Indiana and resorted to burning wood in a fireplace in order to keep some heat in their home. On television they showed a family in Kentucky using an old inefficient pot belly stove to heat their home. They were in the process of tearing down their wooden fence for firewood. After that was gone, they planned on burning their furniture, piece by piece.

A fireplace may look warm and cozy; but, all things considered, it tends to be relatively inefficient for home heating. Believe it or not, fireplace efficiencies typically range from plus 10% to minus 10%. The negative efficiency results from the fire sucking heated air from inside the home to fuel combustion. This air is then vented up the chimney, which pulls cold outside air into the home through the small cracks around windows and doors.

Recommended backup winter heat sources are kerosene heaters (~99.9 fuel efficiency rating), modern airtight radiant wood stoves (75-85% efficient), stocker or hopper fed coal stoves (70-85%), or modern pellet stoves that burns wood pellets, corn or other biomass fuels (~80% efficient). Whatever the heat source, it should not require electrical power to operate and it should be fairly efficient.

For many individuals, a space heater (kerosene heater designed for operations inside a house) will meet this emergency need. Refer to **Figure 4**. Some people will find that kerosene heaters are smelly.

Figure 4. Dyna-Glo 23,000 BTU Portable Kerosene Heater, Model RMC-95C

In areas with abundant firewood, wood stoves can be an effective backup heat source. I have heated my house solely with firewood for the past 30 years. At the time I purchased my first stove; Jøtul produced one of the only high efficiency (> 70%) wood stoves on the market. This is no longer the case. There is a fine selection of high efficiency wood stoves produced today. Refer to **Figure 5**.

Why is high efficiency important? If I decide to buy my firewood instead of cutting & splitting it, my cost is $200 per winter. Because of the size of my house (~300 linear feet of exterior walls), it could easily cost me ten times that amount using a more conventional fuel source. When selecting a wood stove, consider ease of loading firewood, ease of removing ashes and most importantly the efficiency rating.

In a crisis, you do not need to heat the entire home. Reduce the size footprint of your home by closing off areas, rooms that you can live without. Shut doors and stuff towels or rags in cracks under the doors to seal out drafts. Close draperies or cover windows with blankets at night. This can minimize your overall heating requirements.

Figure 5. Jotul Firelight Model #12 Wood Stove

Also one must store sufficient fuel (kerosene, dry seasoned firewood, wood pellets or corn) to last during a prolonged electrical power outage. It might be reasonable to store firewood away from the house to minimize the threat from termites.

When people must use space heaters and fireplaces to stay warm, the risk of household fires increase, as well as the risk of carbon monoxide poisoning. For this reason, it is wise to have a home fire extinguisher and a carbon monoxide detector/alarm handy. Never use a gas oven, gas stove, or unvented appliance to heat your home due to the potential of carbon monoxide poisoning.

C. Adaptation

The winter can be brutal especially along the northern tier of States. This section will focus on adaptation techniques to survive the hard winter months.

1. General

The key approach is PREPARE, PREPARE, PREPARE. You cannot be too prepared. But sometimes, even the best preparations can leave one stranded. And then you must rely on something else.

Other people who also are prepared.

You must have been a helper throughout the spring, summer, and fall. You must have "paid it forward" in more ways than one. You need to know your neighbors, help them as well as strangers, because the guy you help in July, may save your ass in January. You pull together as community at an individual level. Show respect for elders and the knowledge they can share. Show respect for the environment and don't underestimate its stark brutality. And most important of all; show both respect and compassion for others.

One word of advice! Something breaks every year. The trick is to be prepared so when it does break, you have the resources to deal with it.

Mankind have become fairly adaptable to climate change by using clothing, shelters and by creating fire and heat. If Fairbanks, Alaska is used as a gauge to adaptation on the cold side; the following is an example. Most Alaskans do not work outdoors below -20°F (-29°C). Grade schools have recess outdoor down to -20°F. School closes at -50°F (-46°C). No buses run below -50°F. Most work shuts down except for essential personnel when it officially reaches -60°F (-51°C). But generally that is measured by the official airport gauge. (When it was -46°F at the airport, it can be -58°F on an individual's front porch.) Weather is pretty meaningless in Fairbanks unless it gets to -50°F and stays there... but even then, we go out and live our lives. You just dress for it, make sure the car is plugged in, and on the coldest night have enough gasoline to idle all night long. We go to the store in snow storms, in the cold, and in the dark and we go about living our lives.

One of the issues faced by people in cold weather is temperature embrittlement. Different materials become brittle at different temperatures. Wood splits when you drive a nail into it at -20°F (-29°C). It's generally not a good idea to push it past -15°F (-26°C) though. As a result all construction and woodworking outside comes to a halt at about -15°F. Plastics and rubber get brittle at around -20°F (-29°C). Biting cold temperatures also affect metal, causing them to become brittle and prone to breaking. Tapping on anything at -40°F (-40°C) is not a very good idea. Depending on the previous wear and tear, as well as stress on the material; anything will shatter at those temps. The only good bet is arctic steel which is used for pipelines and petroleum processing but is generally too expensive for most other uses.

2. Homes and Businesses

In general, architectural designs are engineered for the common snow loading parameters for that region where the structure is to be built with a degree of safety margin built in. But during a Little Ice Age, snow loading can increase greatly. This excessive snow loading can cause houses and other buildings to buckle and collapse. Generally this threat is greater for flat or low pitch roof structures. Roofs with less than an 8-12 pitch (8 feet of vertical drop for every 12 feet of horizontal) may require individuals to climb up and shovel snow off their roofs after heavy snowfalls, when roof snow is a couple feet deep.

New construction can adapt to a Grand Minima by increasing the steepness of the roof pitch, by utilizing two story construction and by incorporating greater insulation in the design.

Great snowfalls can bury one story structures. If one travels the back roads of Wisconsin, one can find old two story farmhouses. Some of these houses still possess an interesting feature. It is a door on the second story that opens out to nowhere. In the old days, when the snow was 8 to 10 feet deep this door was the only means out of the house.

Extreme cold weather should drive greater energy efficient into design and construction. When we built our house thirty years ago, we used 2x6 constructions instead of the usual 2x4's in the outside walls. As a result, we were able to pack 6-inch thick fiberglass insulation and achieve an R-19 in the outside walls. We also packed all the interior walls with 4-inch insulation for sound deadening. In the attic areas, we used two layers of 4-inch fiberglass to obtain an R-24. As a result, the house requires very little energy to heat during the cold Indiana winters. (Perhaps the only drawback is the sound deadening. A major storm can blow through and unless you're looking out the window, you can be oblivious to its presence. This quiet effect can be kind of spooky.) [For those unfamiliar with R Value insulation ratings, a primer is available at http://en.wikipedia.org/wiki/R-value_(insulation)]

Skylights can be an interesting challenge for insulating. In our home, we installed a massive skylight in the center module. During the first summer, it was interesting watching small clouds form in the skylight producing miniature rainstorms. But in the winter, the hot air would rise into the skylight and since it was only an R-1, the heat would exit our home like a gaping hole in the roof. We almost froze the first year. In the spring, we purchased 5 large sheets of plexiglass, cut them into shape with an electric skill saw and then mounted them with a one inch air gap between layers on the underside of the skylight. As a result, we achieved an R-6 insulating value and the house has been warm during the winter ever since.

Several means are available to increase the energy efficiencies in existing structures to counter the effects of extremely cold winters.

1. Where possible add extra insulation in attic, crawl space and exterior walls.
2. Plug air leaks. All holes, gaps, and cracks in a home's walls, ceiling and foundation are areas where heat can be quickly lost.
3. Install foam gaskets on electrical switch and electrical outlets on the exterior walls.
4. Windows are a major source of heat loss. This is because glass is a very poor insulator, having an R-value of 1 (for single panes). Replace any cracked or missing panes. Inspect the window molding for cracks and use caulking to seal. Add weather stripping to seal loose drafty windows. Install window insulation film on the outside of the window frame for the winter. Replace single pane windows with double or triple pane, argon gas filled window with a low emittance (low E) rating.
5. Install thermal insulating curtains/drapes or window shades.
6. Inspect the door seals. If a door is loose or warped so one can see daylight around it when it is closed, install weather stripping to tighten it up. If daylight can be seen under the door when it is closed, replace the threshold seal.
7. On fireplaces not in use, make sure the flue damper is closed and tightly sealed.
8. Ensure that furnace ductwork that runs through unconditioned spaces are insulated. Inspect the ductwork and duct tape all cracks and gaps observed.

Figure 6. Electric Water Pipe Freeze Protection Cable

Water pipes that are susceptible to freezing (such as exterior runs) should be wrapped with electric water pipe freeze protection cable and then wrapped with insulation. Refer to **Figure 6**. This should keep the water flowing down to -40°F (-40°C). But if you lose electricity for several hours during extreme cold, this protective will fail.

During periods of extreme cold:

1. leave all water taps slightly open so they drip continuously,
2. keep the indoor temperature warm, and
3. improve the circulation of heated air near water pipes. (for example, open kitchen cabinet doors beneath the kitchen sink.)

If the pipes freeze, do not attempt to thaw the pipes using a propane torch. Instead use an electric hair dryer to slowly warm the pipes.

Generally large electrical blackouts during the winter, may translate into the loss of water, especially if the blackout extends for any duration. Generally the loss of water translates into the loss of the building sanitation system. Without water, toilets will not flush. And in extreme cold temperatures sewer lines can freeze. Therefore it is important to have backup plans for human waste in the event of a prolonged winter blackout.

In my opinion, the most difficult problems to correct in existing structures will be the underground ones involving the foundation, buried water pipes, sewer lines, septic systems and buried fuel oil lines. Generally when a structure is built, it is design for the cold levels normally experienced in that region. But during Little Ice Age conditions the ground will freeze to a greater depths. This can cause the house foundation to shift, buried water pipes and sewer lines to freeze and buried fuel oil lines to clog. Fresh snow is an excellent insulator. Ten inches of fresh fluffy snow containing about 7 percent water is approximately equal to a six-inch-layer of fiberglass insulation with an R-value of R-19. The lack of snow cover, dry soil conditions and very cold air temperatures over an extended period of time can lead to freezing problems for buried piping. One method to reduce this threat is to shovel snow over the underground water and sewer pipe runs or place a snow fence in the area to trap snow. Another method is to place some type of mulch (hay, straw, bags of leaves, etc) at least a foot thick and at least 5 feet wide over the pipe runs during the winter.

In areas subject to extreme cold, have a stockpile of food for the winter, plenty of kerosene of the lamps, fuel for your primary heat source (fuel oil, propane, coal, wood) and fuel for your backup heat source, matches, a multipurpose dry-chemical fire extinguisher, a non-electric can opener, a good tarp, emergency sleeping bags, fresh batteries (for flashlights, radio and clocks), a supply of prescription medicine that family members need and at least 50 rolls of toilet paper in the cupboard by September 15th or so. One should also have water stored in clean containers, or purchased bottle water (5 gallons per person) in case water pipes freeze and rupture.

A good heavy duty canvas tarp can provide a temporarily seal should a home become damaged during winter. For example, if a particularly nasty cold spell is immediately followed by a strong warm chinook that caused the roof snow to melt rapidly, which then causes a large chunk of ice and snow to come loose and slide down the roof, tearing the chimney off and leaving a large gaping hole in the roof. Think this scenario is strange? Not really, it actually happened!

Figure 7. Sleeping Bag - The North Face "DarkStar" rated for -40°F

In cold weather regions, I recommend purchasing sleeping bag rated for the coldest weather your area might potential experience, self inflating sleeping pads and a few down blankets. Sleeping bags are rated for their respective temperature ranges and some are usable down to -40° F or below. Refer to **Figure 7**.

This Petromax lantern runs off of kerosene. Refer to **Figure 8**. It provides 8-12 hours burn time per tank of fuel (1 quart of kerosene). It produces 400 watts of light. Consumers Report rated these lanterns as the safest in the world. Be sure to purchase extra mantles for the lantern. I also recommend permanently storing ten gallons of kerosene.

Historically, the Little Ice Age was known to produce massive summer storms with giant hailstones. (For example, a great storm struck France in 1360 A.D. The hailstones were the size of "goose eggs" and the hailstorm instantly killed 1,000 men and 6,000 horses which were part of King Edward III of England invading army.) As we transition into Little Ice Age conditions, building construction needs to adapt to evolving threats including massive hailstones. Most house construction in the U.S. use asphalt shingles. Large hail can deal a severe blow to this type of roofing. Recent innovation produced a new type of roofing using stone coated steel roofing shingles. These shingles look like asphalt but are really made from steel construction. After my asphalt shingles wore out, I replace them with Decra stone coated steel roofing. In part because I never wanted to replace my shingles again. These shingles will last over 50 years. They have a 120 mile wind warranty and the highest rated Class 4 impact U.L. rating for hail resistance. I do not care to witness hailstones of a size that can kill a cow, but if an extreme hailstorm was to occur I would rather be in my home with its 3/4 inch plywood roof covered with a layer of heavy steel roofing.

Figure 8. Petromax BriteLyt Lantern, Model 500CP

3. Clothing

Cold is a far greater threat to survival than it may appear. It decreases your ability to think and weakens your will to do anything except to get warm. Cold is an insidious enemy; as it numbs the mind and body, it subdues the will to survive.

Cold weather stresses human survival. The death rates from heart attacks (myocardial infarction), stroke and respiratory disease is significantly greater in the winter than the rest of the year.

During starvation, the human body can become hypersensitive to cold. The layers of fat that normally protect the body have shrunk significantly. Individuals that survived the onset of the Little Ice Age recorded the severe pain and agony experienced by the malnourished throughout Europe. They found it difficult to describe in words the evening nightmare, the mass of human beings wailing in the dark cold. This left an indelible mark on survivors.

One way an individual can adapt to extreme cold weather is by their ability to create a warm micro-environment by wearing appropriate clothing.

You must not only have enough clothing to protect you from the cold, you must also know how to maximize the warmth you get from it. For example, always keep your head covered. You can lose 40 to 45 percent of body heat from an unprotected head and even more from the unprotected neck, wrist, and ankles. These areas of the body are good radiators of heat and have very little insulating fat. The brain is very susceptible to cold and can stand the least amount of cooling. Because there is much blood circulation in the head, most of which is on the surface, you can lose heat quickly if you do not cover your head.

There are four basic principles to follow to keep warm.

- ***Keep clothing clean***. *This principle is always important for sanitation and comfort. But in winter, it is also important from the standpoint of warmth. Clothes matted with dirt and grease lose much of their insulation value. Heat can escape more easily from the body through the clothing's crushed or filled up air pockets.*
- ***Avoid overheating***. *When you get too hot, you sweat and your clothing absorbs the moisture. This affects your warmth in two ways: dampness decreases the insulation quality of clothing, and as sweat evaporates, your body cools. Adjust your clothing so that you do not sweat. Do this by partially opening your parka or jacket, by removing an inner layer of clothing, by removing heavy outer mittens, or by throwing back your parka hood or changing to lighter headgear. The head and hands act as efficient heat dissipaters when overheated.*
- ***Wear your clothing loose and in layers***. *Wearing tight clothing and footgear restricts blood circulation and invites cold injury. It also decreases the volume of air trapped between the layers, reducing its insulating value. Several layers of lightweight clothing are better than one equally thick layer of clothing, because the layers have dead airspace between them. The dead airspace provides extra insulation. Also, layers of clothing allow you to take off or add clothing layers to prevent excessive sweating or to increase warmth.*
- ***Keep clothing dry***. *Water conducts heat away from the body 22 times faster than does air. In cold temperatures, your inner layers of clothing can become wet from sweat and your outer layer, if not water repellent, can become wet from snow and frost melted by body heat. Wear water repellent outer clothing, if available. It will shed most of the water collected from melting snow and frost.*

Remember when doing things outdoors you don't want to sweat. It will make you colder. Wet, no matter how you get that way, falling into water, sweating, melting snow getting inside your clothes is VERY BAD.

The most important thing in dressing for extreme cold is LAYERS. Each layer traps air and the air serves as additional insulation. Three elements of the layered approach are:

- *The **foundation layer** next to the skin should be soft, comfortable and able to wick away perspiration quickly so feeling dry. Modern foundation layer garments are generally made of synthetic material. In some cases the material is even treated to prevent the build up of bacteria that causes clothing to smell.*
- *The **insulating layer** is the most variable layer and can be added to as required depending on how cold the conditions are. Several lightweight layers of clothes are better than one thick heavy layer, for*

flexibility as well as for insulating qualities as extra air gets trapped between the layers as well as within them. Traditionally woolen sweaters and natural fiber trousers (pants) were worn. These days, these may still be worn or they may be supplemented or substituted by modern materials such as polypropylene fleece or pile fiber.

- *The **outer or shell layer** is directly exposed to the elements and should be windproof. Waterproof is not necessary for extreme cold weather because rainfall is no longer a threat. Some disadvantages of fully waterproof garments are (1) they tend to be less capable of shedding perspiration readily, and (2) they are less flexible at low temperatures. Insulating materials for this outer layer could be synthetic or natural down.*

Figure 9. Desert Sand 2 Layer Polypropylene Long Underwear

A good clothing setup for extreme cold weather from the skin out:

- *Underwear*
- *Thermal Underwear (both top and bottom) and as high tech as possible. One example is a two layer polypropylene long underwear. http://outersports.com/desert-sand-2-layer-polypropylene-long-underwear-p-2913.html. These are genuine U.S. Military Issue polypropylene thermals, a vital part of the Extended Cold Weather Clothing System (ECWCS). They are thick, but lightweight and "wick" sweat and moisture away from the skin to the outer layers. They dry very fast. Refer to **Figure 9**.*
- *A thin comfortable pair of socks made from synthetic fibers, such as microfiber acrylics, Thermolite®, Hollofil®, or CoolMax®. These fibers provide superior moisture transfer. Refer to **Figure 10**.*
- *One or two pairs of thick warm wool socks.*
- *Thick warm pants.*
- *Two or three insulating layers (shirts, sweatshirts, sweaters, jackets) for the top half of the body made from wool, wool mix, or synthetic material. At least one of the layers should be long at the back to avoid exposure of flesh during exertion.*
- *Hat for when it's cold and with the addition of a balaclava (ski mask) for when it's really cold.*
- *Scarf for insulation and to prevent ingress of blown snow.*
- *Insulated hiking boots or used Army surplus "Mickey Mouse" boots.*
- *Two or three pairs of gloves or mittens according to the conditions and activity. Usually starting with fingerless gloves, then a pair of mittens. Then an insulated*

Figure 10. Stockings
Right--Thermolite Inner Wick Dry Stocking Liners
Left --Outer Outdoor Merino Wool Trail Socks

overglove which will need to be windproof. Refer to ***Figures 11 & 15****.*

- *Outer / shell layer. This garment needs to be windproof and may be waterproof. It could be simply a "shell" (i.e. no additional insulation) or it may have insulation built in. Jackets should always have hoods. Some alternatives include:*
  - *Polar parka, with down or synthetic insulation*
  - *Ventile windproof jacket and over-trousers*
  - *Gore-tex or similar jacket and over-trousers*
  - *Salopette (sort of dungaree-type trousers / pants) with down or synthetic insulation*

Figure 11. Gloves
Left --100% Silk Inner Glove Liners
Right --Fingerless Ragg Gloves

- *Sunglasses to prevent glare from the snow and ice and which can result in snow blindness. Goggles in colder weather or in conditions of blowing snow to prevent snow from getting in the eyes and to cover the top part of the face.*

Wool's thermal properties and ability to wick moisture make it an unbeatable material in insulating garments. But wool has a downside. It can irritate skin causing an itchy feeling. Wool fibers have varying diameters, even when taken from the same sheep. Most wool fibers have a diameter in the range of 15 to 45 microns. If more than 3-4 percent of the fibers are coarser than 28 microns, many people will experience discomfort. Merino sheep produce the finest and softest wool of any sheep. It has a fiber diameter of 15 to 25 microns. As a result Merino wool is the most widely demanded wool type on the market.

Figure 12. The Polar Expedition Parka

If you can afford the two to three hundred dollars, an arctic suit rated to -80°F (-62°C) is always good when the temperatures are below -20°F (-29°C). It's too warm to wear it if the temperature is warmer than that. Refer to **Figure 12**.

Military "Mickey Mouse" boots will keep your feet warm in extreme cold weather. They can be purchased used, reasonably priced at an Army Surplus store. Black Type I Extreme Cold Weather "Bunny" Boots are designed to be worn in wet or dry conditions down to -20°F (-29°C). White Type II Extreme Cold Weather Boots are suitable cold dry weather in snow or ice conditions down to -60°F (-51°C). These boots were first used by the military during the Korean War. Their most distinguishable features are their giant size. Reminded of the iconic cartoon character, soldiers joked they were in Mickey Mouse's shoes. The black boots are 100% rubber,

with thick wool insulation all around, plus an insulating air pocket all sandwiched between the layers of rubber. The white boots are constructed with insulation consisting of three layers of needle punched polyester foam hermetically sealed within an outer and inner layer of rubber. The boot is provided with a pressure release valve to adjust internal air pressure in the boot during high altitude operations. Refer to **Figure 13**.

Figure 13. Mickey Mouse White Type II Extreme Cold Weather Boots

Use snowshoes or skies to travel in deep snow. Use metal cleats to travel on ice. Walking on ice can be extremely treacherous. I personally recommend using ice cleats that slip over shoes and boots such as STABILicers for non-slip traction on the slickest ice. Refer to **Figure 14**.

Men during cold winter months should allow their facial hair to grow. It will provide them addition warmth and protection. Historically we come from a heritage of mountain men.

Remember to take into account the wind chill factor when dressing. The cooling effect of moving air is well known and the phrase "wind chill factor" was coined by the American Paul Siple to describe the fact that wind increases the rate of heat loss and has the effect of making it seem as though it's really colder than the thermometer is showing.

Figure 14. Vibram "STABILicers" Metal Cleats

Figure 15. Aris Down Mittens (Deerskin Leather Outer, 100% Nylon Inner, 100% Down Fill)

4. Transportation

a. Automobiles and Trucks

Cold Weather Adaptation

In places like Fairbanks, Alaska, individuals operate automobiles and trucks down to -50°F (-46°C). Below that, people begin to hunker down at home.

Cars are harder to start in cold weather because:

- *Gasoline, like any other liquid, evaporates less when it is cold. Spraying ether into engines in cold weather can help it start because ether evaporates better than gasoline in cold weather.*
- *Oil gets thicker in cold weather. In extreme cold, individuals must use synthetic motor oils because these oils stay liquid in cold temperatures.*
- *Batteries perform poorly in cold weather. The starter motor therefore has less energy to work with when it tries to start the engine, and this causes the engine to crank slowly.*

Figure 16. Fuel Antifreeze

Water condensation forms on the inside of the gasoline tank. In cold temperatures, this condensation can freeze and plug the fuel line. Without fuel the engine dies and cannot be restarted. Two methods are commonly used to prevent this problem. First, keep the fuel tank full. This will minimize the area available for condensation to form. Second, add a gas line antifreeze, such as HEET, to the gasoline tank with every fill-up. For diesel engines, an additive such as PS Diesel Fuel Supplement can be used as an anti-icing additive and the supplement also prevents fuel gelling down to -40°F (-40°C). See **Figure 16**.

In cold temperatures oil can become almost as thick as molasses. Since oil lubricates the engine, thick oil can make the vehicle difficult to start and run. One method of adapting the automobile for these extremes is to switch to a synthetic motor oil, such as a synthetic 0W10 weight. Other synthetic lubricants (such as synthetic gear oil, synthetic transmission fluid, synthetic grease, synthetic brake fluid and synthetic power steering fluid) can be used to improve the vehicles performance in extreme cold temperatures.

Depending on the severity of the cold, several primary methods are used to help the vehicle start. In mild cold weather:

- *Starting fluid (ether) can be sprayed into the carburetor.*
- *The vehicle can be equipped with a remote starter. Individuals start their cars from inside their homes and let them run a half hour before going outdoors.*
- *Leave their vehicles in a heated garage overnight.*

But as the temperatures become severe, other options are employed:

- *The vehicle can be equipped with a simple engine block heater. Generally the heater element is installed in one of the freeze plugs on the engine. A regular power plug is fed through the vehicle's grille. The heater is connected to AC power overnight. Strong engines with good batteries will often start at -15°F to -20°F (-26°C to -29°C), but at -30°F (-34°C), if you're not plugged in, don't expect the vehicle to start. Refer to* ***Figure 17****.*
- *At even colder temperatures, the vehicles can be equipped with a combination heater system that includes an oil pan heater, a battery blanket heater, and a freeze plug heater. These are all wired into a box with a pigtail hanging out the front of the vehicle. In general, individuals with vehicles equipped with engine heaters will plug them in whenever the temperatures fall below +20°F (-7°C). This helps improve startability, reduces emissions, and extends the vehicle's life.*
- *If the car is particularly new, cold natured, or "fragile" in some way several additional options are available such as trickle battery chargers and transmission heaters.*
- *Some vehicles are equipped with automatic systems that start their cars whenever the temperature drops below a certain level and allows the car to idle overnight.*

Figure 17. Engine Block Heater Pigtail

Figure 18. Arctic Blue Cold Weather Cordset

•*At temperatures colder than 0°F (-18°C), many people also leave their vehicle running overnight. Leaving your car idling uses about four or five gallons of gas, but you don't have to worry about the car starting and it also prevents the interior plastic and vinyl from cracking if it gets bumped accidentally before it has a chance to warm up.*

When connecting a vehicle electric heater system pigtail to an AC outlet, it is important to use the correct extension cord. Many extension cords have a limited temperature operating range. In extreme cold these extension cords will get stiff and the wires will break inside the insulation. Arctic blue flexible cold weather extension cords are all-weather cordsets made for outstanding performance in extreme climate conditions at temperatures from -58°F (-50°C) to +221°F (+105°C). Refer to **Figure 18**.

In extremely cold climates, electrical outlets are sometimes found in public or private parking lots, especially in multi-story parking lots. Most places of business have headbolts (plugins) in their parking lots reserved for their employees. These electrical outlets generally are on a timer so that cars get two

hours on and two hours off. It takes a while for a car to cool off. At -20°F (-29°C), a car can go 3 or 4 hours and still restart with no problem. At -40°F (-40°C), some people go out every hour or hour-and-a-half to let their vehicle run for awhile.

Most customer parking lots are not equipped with headbolts. Most people just leave their vehicle run while they're in the store. If they don't have remote electronic locks in their car doors, most individuals will just make a second set of keys, lock the car while it's running and unlock it when they return. The downside to this approach is that the exhaust fumes may not dissipate in this cold weather, due to lack of a breeze and a strong inversion layer, and result in creation of urban ice fog.

Some people have been known to drain the crankshaft oil and remove the batteries temporarily from their car overnight to keep them warm in their home so that they could start their vehicle the next morning.

Battery performance drops off significantly at cold temperature. Automobiles that rely heavily on batteries (such as hybrids, plug in hybrids and electric vehicles) will experience severely degraded performance during extreme cold. Battery blanket heaters may reduce this threat.

It takes 20 to 30 minutes of driving for a car to reach its normal operating temperature. Once the engine reaches this temperature, generally about 200°F (95°C), the thermostat opens and the vehicles cooling systems comes online. By letting the engine warm up as quickly as possible, the thermostat reduces engine wear, deposits and emissions. If the car is turned off before the engine reaches its normal operating temperature fuel delivery is affected, carbon builds up in the engine, wear is increased and performance can suffer. Short trips can dramatically reduce the vehicles life. For this reason a lot of folks will arrive at work and leave their car running for 20 or 30 minutes, just to make sure the engine gets up to normal operating temperature for a while.

Cold weather can damage the vehicles coolant system. Water will freeze at 32°F (0°C). Antifreeze is generally added to the coolant to prevent it from freezing. Unlike most liquids, water expands when it freezes. Since an engine block is not flexible, the expansion can actually crack the cast iron or aluminum block of the engine, destroying it. It is important when you begin driving in freezing weather to watch the temperature gauge. There are two conditions to watch for.

1. If the gauge temperature rises quickly and doesn't stabilize at the normal operating temperature, the engine should be shut down immediately and the radiator checked for freezing. Otherwise the engine can seize. Engine designers anticipated this problem and incorporated a feature into engines that helps avoid expensive damage, called freeze plugs. When the engine was built, the manufacturer bored large holes from the outside of the block into the water jacket. Soft metal plugs are then pressed into these holes to form a tight seal. These are called "freeze plugs" and will be forced out of the block if the water freezes. These freeze plugs act as a way to relieve the pressure.
2. When freeze plugs are forced out, though, an engine will still start normally. However, as soon as the engine warms up, the coolant will melt and leak out of the engine. The danger is that with no coolant in the engine, there will be no boil over and the temperature sensor--which measures water temperature--will provide a false reading at the temperature gauge. The gauge will continue to show low temperatures even though the engine might be white hot. And if the engine begins to glow white hot it can cause the engine to blow a head gasket, warp the head, seize the pistons, crack the engine block and/or damage the cylinder heads. In other words a major, major repair job costing in the thousands of dollars.

The best coolant system advise is to replace the coolant before each winter season and use the proper mix of antifreeze matching the mix ratios to the expected cold extremes. There is a simple ingenious device called an antifreeze tester that can measure the effectiveness of the antifreeze in the radiator. The one I purchased at WalMart for 99 cents (Chaslyn Model 6100) is quick and effective at determining the antifreeze protection level.

At extremely cold temperatures, the vehicle's heater may not work well making it difficult for the driver and passengers to keep warm and to defrost the vehicles windows. Some individuals attach cardboard to the front of the radiator to restrict air flow. This causes the engine compartment to heat up quicker, and improves vehicle heater performance during the winter. Some vehicles (i.e. diesel pickup trucks) have "winter covers" as a option. Generally this option covers the radiator grille and front bumper opening in order to achieve a similar effect.

Cold weather can also affect tires. Cold will reduce the tire pressure and as a result the tires will need to be reinflated at the beginning of each winter season. If your tires are underinflated, they will "take a set". This phenomenon occurs when the bottom of a car's tire flattens due to the weight of the parked vehicle, and then freezes flat due to the cold. In the morning the tires will be flat on one side and the rubber will be very hard. That means you'll be driving on tires that literally are not round for the first few miles. When the vehicle is driven, the occupants will feel like they are driving over corrugated iron at high speed and this is particularly uncomfortable.

The bed of a pickup trucks should be loaded in the winter with around 300 to 600 pounds of weight. The weight should be positioned over the rear axle. The weight provides increased traction in the snow. Firewood, concrete blocks, sandbags or snow is typically used to add this weight. One of the advantages of using sandbags is that you can always bust one open and pout it on the snow or ice for added traction if you get stuck.

During winter, ice can form on the outer windshield. Most plastic ice scrapers will do fine here but when the ice becomes really thick, such as caused by freezing rain, these plastic ice scrapers are almost useless. From my experience, I have found that an ice scrapper with a brass blade works fairly well on glass windshields but care must be exercise to prevent them from damaging the rubber windshield wiper.

Another winter hazard is driving through water or slush. Liquid water splashed onto the brake shoes and brake pads can freeze on the hubs or rotors overnight as the temperatures fall below freezing. If one attempts to drive the next morning in this condition, it can actually pull the brake lining of the metal shoe/ pad. Many individuals will leave the emergency brake off during the winter, instead leaving the car in gear (manual transmission) or in Park (automatic transmission) to preclude this problem.

Typical Problems

Two areas that experience the extremes of cold weather each year are Fairbanks, Alaska and International Falls, Minnesota. The following are some typical problems that drivers from these regions have encountered.

In many cases, salt (sodium chloride) cannot be used to melt ice on streets because its simple too cold. The lower limit of the effective temperature range for salt is 15°F to 20°F (-9°C to -7°C). Another problem is that the ground is also frozen and there is nowhere for the water runoff to go. Therefore, a good supply of gravel is a must. This means most people have chipped and cracked windshields because even a pebble at -30°F (-34°C) will crack a windshield.

Both metal and plastic become very brittle at -40°F (-40°C) and below. Turn your radio knob and it comes off in your hand. One night in this type of cold weather, an individual walked out to their Saab and put their key in the door handle and tried to open it. The door handle came off in their hands. The individual undeterred, walked around to the other side of the vehicle and tried to open the door. Again, that door handle came off as well. Alone and without a cell phone, the only other way into the vehicle was through the trunk and by popping the back seat out. This worked.

In this type of extreme cold, an individual opened the door to their Nissan pickup truck only to have the driver's door come completely off. The metal door welds had broken. Later when it warmed up, the driver called a local welder to come over and repair the vehicle. But the welder couldn't understand the problem. "Your door did what!"

Eventually that driver bought a Mazda pickup truck. It too had a problem in the cold. Below -20°F (-29°C), the driver door wouldn't latch. The individual would drive down the road with the door sticking slightly ajar. After a few miles of rattling, the latch would warm up and the individual was finally able to slam it shut. Of course, that's how you break a door weld!

Some drivers slammed their car door shut a little to hard on these cold mornings only to have the windshield glass shatters. Some will try and adjust their rearview mirror only to have it break free from the windshield. Sometimes a driver will pull on the steering wheel as they enter the vehicle only to have it come off in their hands or shift gears only to have the gear knob break off.

Starting their engines can be very problematic in the extreme cold. Sometimes an individual will exert quite a bit of energy in this task only to find out once they get the engine started and put their car in gear, it won't budge. This is because the rear-end oil is too stiff.

Metal springs in the vehicle seats can get so stiff in cold mornings that there is no spring left. This effect feels like sitting on plywood.

In the cold, speedometer cables can freeze up making a maddening squealing sound. But if the driver continues down the road they soon break and the squealing sound stops.

Some automotive failures after extreme cold weather are like ghost. They can be difficult to troubleshoot and nail down. A pickup truck refused to start. After extensive troubleshoot, the problem was localized to broken ignition coil wiring. The insulation surrounding the wiring looked fine but the wiring inside had broken apart and separated. The end result was $500 in parts and labor.

Blooming Idiot's Award

Learn from other peoples mistakes. This section deals with lessons learned and are not to be repeated.

In the winter, windshield will accumulate a layer of ice. Some individuals grasp for a quick, simple solution and pour boiling hot water on their frozen windshield. The thermal shock causes the windshield to instantly shatter. The cost of replacing a car's windshield begins at $100 and can quickly climb. Another version of this technique occurs when an individual takes their car to a car wash without giving it a chance to warm up. Remember the formula that hot water and ice-cold windshield don't mix.

Figure 19. Burnt Out Shell of a Car

When the car will not turn over because the oil in the crankcase is almost as thick as tar, some individuals, take matters into their own hands and ingeniously build a fire under the car. Some use charcoal; others try propane or even

light wood fire under their crankcases to thin the oil, and when the fire gets really going, their cars join in the fun by catching fire. There isn't much left when a car burns to the ground; as can be seen in **Figure 19**.

Some try a different strategy. They cover their cars' hoods with blankets to hold in the heat and then fire up an electric-heated blowers or propane heaters to warm the engine. But alas the engine compartment gets so hot, it blisters the paint on the hood of the car.

Individuals who aren't use to plugging in their block heaters overnight often forget to unplug them in the morning. They drive away tearing off the wooden posts at the electrical outlets and then drive down the road dragging a 50-foot electric extension cord behind them.

Cars can get so badly flooded from continuing to pump on the accelerator during cold mornings, that the engine may finally explode. Sometimes this blows the dipstick out of its socket and dents the hood of the car. Other times it causes the mufflers to blow off the cars when they finally start.

Driving in Hazardous Weather

Snow Accumulation: A solar "Grand Minima" can produce greater snow accumulation during the winter because of a heavier build-up of layer after layer of snow with minimal melt-off in-between. This can challenge the ability to drive because the roadway may become impassible as the winter progresses. This is a photograph of abnormal snow accumulation that my niece took in Poland of a country road. Refer to **Figure 20**. Generally this threat is greater near large bodies of water such as oceans or large lakes (lake effect snow).

Figure 20. Greater Snow Accumulation

White-Out Conditions: White-out conditions can occur in several different ways: *High Wind, Heavy Snowfall, and Fog*. In *High Wind* it doesn't take a lot of snow to create white-out conditions. It just takes a lot of horizontal wind. The snow generally is light and fluffy with low moisture content. In *Heavy Snow* white-out conditions appear because of the density of the snowfall. This generally happens in blizzards. In *Fog* white snow covered ground combined with the presence of fog can make it impossible to distinguish the landscape from the roadway.

White out conditions reduces visibility to a few feet and kills reaction time. Driving in white-out conditions is extremely dangerous. Even driving at minimal crawling speeds can produce accidents. If you encounter white-out conditions with zero visibility while driving don't stop on the travelled portion of the road. You could become the first link in a chain-reaction collision. Look for an opportunity to pull off the road into a safe parking area and wait for conditions to improve. Don't attempt to pass a vehicle moving slowly or speed up to get away from a vehicle that is following too closely. Increase your following distance. You will need extra distance to brake safely. Stay alert. Remain calm and patient. It is always a good idea to check weather forecasts before you begin traveling. If white-out conditions are forecasts, it is best to delay your trip until conditions improve.

Blizzards: The U.S. Weather Service defines a severe blizzard as having winds exceeding 45 miles per hour (72 km/h), visibility of a quarter mile (0.4 km.) or less, and temperatures of 10°F (-12°C) or lower.

The Great Blizzard of 1888 occurred March 11-14 affecting New Jersey, New York, Massachusetts and Connecticut. This storm was one of the most severe recorded in United States history. The blizzard produced snowfalls of 40-50 inches (102-127 cm) combined with sustained winds of over 45 miles per hour (72 km/h) resulted in snowdrifts exceeding 50 feet (15.2 m). This storm paralyzed railroads and confined people to their homes for up to a week.

The Buffalo Blizzard of 1977 came about in a complex manner. Before the blizzard Lake Erie froze. Then a series of snowstorms dumped several feet of snow on the frozen lake. This snow was loose, not yet developing a hardened crust. When the blizzard hit, the winds in Buffalo averaged 46 mph (74 km/h) with gust up to 69 mph (111 km/hr). These winds stripped snow off Lake Erie and combined it with snow from the snowstorm to produce a devastating effect. Snow drifts reached the tops of power lines and stop lights. Many people became stranded in traffic. Many were rescued but some turned their engines off and froze to death and some kept their engines running and died from carbon monoxide poisoning. This is because the winds quickly drove snow into the cars tailpipes plugging them up and forcing carbon monoxide into the vehicles.

When a blizzard strikes, many cities and states will ban all nonessential traffic. Obeying these travel bans saves lives. It means that someone else will not have to risk their lives in order to rescue yours. Strong winds and heavy snowfalls can make travel impossible even with four wheel drive vehicles. If one becomes stranded in a remote location during a blizzard, one may need to wait inside their cars for days in freezing weather. In the winter, it is a good practice to have a winter emergency kit available in the trunk. Suggested items for this kit might include: warm blankets or sleeping bags, flashlights, emergency road flares, box of wooden matches, tow rope, jumper cable, tri-fold shovel, empty water bottles, food, sanitation kit, a couple strips of carpet and a couple large plastic trash bags. Also it is critically important to dress appropriately for the weather conditions outside and to have a fully charged cell phone available. Many people jump from a warm house into a warm car not dressed appropriately, thereby inviting disaster. It is almost like they have a welcome mat out for Death. A tri-fold shovel is a shovel that folds up compactly. A sanitation kit is a means of collecting human waste. It may be as simple as an empty 5-gallon plastic bucket with an inner trash bag liner, along with several rolls of toilet paper. If one becomes trapped in snow, strips of carpet can be placed under and behind the tires to provide traction to back out. Empty water bottles can be filled with snow to produce drinking water. The kit should have five days supply of food per occupant. Generally, this is food that does not need to be cooked to be eaten and will not be harmed by freezing temperatures. These are foods like cookies, crackers, tuna fish, breads or MREs (Meals-Ready-to-Eat) food packets. A GPS system might aid in identifying exact location which could be forwarded to authorities for rescue operations. Remember there are many dead zones for cell phones especially out in the country. If the weather calms down, you might be able to seek higher ground to increase cell phone reception.

Black Ice: Black ice is ice frozen without many air bubbles trapped inside, making it highly transparent. Because of this transparency, the ice visually appears like the black pavement beneath. Black ice is very deceptive and dangerous. Bridges and overpasses can be especially dangerous. Black ice forms first on bridges and overpasses because air can circulate both above and below the surface of the elevated roadway, causing the pavement temperature to drop more rapidly. The ground retains heat better than air.

At low temperatures below 0°F (-18°C), black ice can form on roadways when the moisture from automobile exhaust condenses on the road surface. Road salt is ineffectiveness at melting ice at these cold temperatures and can compounds the problem.

Black ice is one of the worst hazards you can come upon when driving. Because black ice is so tricky to detect, a driver may not realize there is an icy road surface until his car begins to slide. Worse yet, if you hit your brakes, it can cause you to slide even more or even overturn. Recommendations to counter this

threat are to reduce speeds significantly before crossing bridges or overpasses that appears wet. Observe the cars in front. Have any lost traction and are sliding? Give yourself plenty of space between you and the cars in front of you. If you find yourself on black ice, it may be better to reduce speed by taking your foot off the accelerator rather then pressing down hard on the brakes. Tap the brake pedal lightly.

Ice Storms and Freezing Rain: If given the choice, it is always best to never attempt to drive on ice. On the way home while I was driving my wife's brand new Jeep home, I encountered heavy freezing rain. The cars in front of me slowed down to a crawl and some were sliding this way and that. I gently stepped on the brake and sure enough, I could feel the car begin to slide. This is all sure signs that the road was being coated with ice and it was getting worst by the minute. Since it was my wife's car and I know that I would be in a world of hurt if anything happened to it, I gave some pause and reflected on the situation. I was at least 10 miles from home. I knew that four-wheel drive vehicles offered no advantage over other vehicles when driving on ice. I took the following course of action:

1. I steered away from all traffic by taking a back country road even though it was a longer route - it is harder to run into another vehicle when there is no one else on the roadway,
2. I avoided valleys and hills - without traction how can one control a vehicle going down a hill or have sufficient friction to drive up a hill, and
3. I slowed my speed down to creepy crawl.

The country road was gravel which was a little easier to travel on then a paved road for this hazard. An hour later I made it home in one piece but it was a miracle.

Freezing rain occurs when the water droplets are cooled below freezing 32°F (0°C). When these supercooled droplets hit the ground, tree branches, power lines, telephone wires they can instantly freeze into ice. The thin layers of ice can build up, and the weight of the ice can break branches, split trees, and knock down power lines. Therefore the ice storm not only produces a hazardous sheet of ice on the roadways but many obstacles (downed branches, trees and power lines) and can knock out electricity (taking out stoplights and throw roadway into total utter darkness).

Tire chains work on ice covered roadways but should not be used at speeds greater than 35-40 mph. The best ones have hardened short U shaped bars welded to the chains that go across the tread of the tire. The chains wear quickly on bare pavement. Also the chains on bare pavement will heat up and can even melt into the tires.

Studded tires (winter tires spiked with metal studs) will provide a more tenacious grip on ice, black ice and snow covered roadways. Studded tires generally have 80-100 studs per tire. But there are a few disadvantages to studded tires.

1. They require longer stopping distances on wet or dry asphalt than standard tires.
2. Studded tires will damage the asphalt roadway due to abrasion.
3. If a stud pops out while driving, the projectile is like a bullet and can damage windshields.
4. Studded tires are generally noisier.

Many states limit the use of studded tires. Lighter weighted studs (less than 1.1 grams) reduce pavement wear substantially and are heavily used in Scandinavian countries. There have been new innovations in studless tire technology in recent years. I suspect the U.S. will transition into greater use of studded tires or studless winter tires (such as the Bridgestone Blizzak DM-V1 for automobiles or the W965 for trucks) for winter driving as the nation moves into Little Ice Age conditions.

Hail Storms: This hazard has a greater association with spring and summer than winter. It is associated with extreme storms such as those that produce tornadoes. From my experience, hail appears in small tight slow moving bands. When traveling in a hailstorm it is very claustrophobic. Most vehicles are made from metal. As the hailstones hit the car they sound like rocks hitting the shell of the vehicle. The constant bombardment of these hailstones is very frightening. You have a sense of helplessness. The few times I have been caught in a hailstorm, I have taken the following actions. In one case, I found shelter for the car beneath an underpass. In another case, I tried to drive through the hail band knowing it would be only a short distance to the other side. I first checked the cars traction by seeing how it would react to

tapping on the brakes. Traction appeared good. So I felt good to go. But a problem arose. A car, three or four cars in front of mine, decided to take a different approach and slowed down to a 2 mile per hour crawl. My car was pelted for 15 long minutes while we crept slowly down the road. Finally the car turned off to the shoulder. I drove through the hail band in about a minute and then it was good sailing ahead. These may not be the recommended actions for this hazard but they worked fine for me. The sound of hailstones hitting the car may have more bark than bite. In other words, cars are fairly resilient to hailstones and only the larger hailstones can damage a vehicle.

One day at work a hailstorm hit. This hailstorm was unusual because of the size of the hailstones. Some were 2 inches in diameter or larger. They looked like squashed doughnuts in shape. Taking my life in my hands, I went out into the hailstorm and gathered up a few samples. Then I quickly took them inside and photographed them before they melted. **Figure 21** is one of the photographs. These hailstones were of a size that could damage automobiles. In this case they destroyed the side mirrors, windshield and produced many dents on the hood/ trunk and tops of vehicles. Individuals at work started calling their insurance companies to report the damage. The response they got from their agents were lackluster. I had sent the hailstone photographs to individuals within my department by email. But they forwarded it to others who forwarded to others who forwarded to their insurance agents. Within an hour almost all the insurance companies decided the damage was significant enough to bring agents on the base to assess damage and settle claims. The damage was localized. Some areas experienced extensive damage but other areas only a half mile away experience significantly smaller hailstones and no damage.

Figure 21. 2-Inch Diameter Hailstones

Ice Fog:

Ice fog is a type of fog where the droplets have frozen into extremely tiny crystals of ice that float in midair. Generally this condition occurs in clear, calm weather at temperatures below -22°F (-30°C). Ice fog is totally opaque. Ice fog is sometimes referred to by the Shoshone word “pogonip” for cloud. Indian folklore refers to it as "white death" because the pogonip fog is so thick you can't even see your hand. When you walk through thick ice fog, a visible tunnel appears behind you. You can easily become lost in seconds. And in early settler days, if it lingers you'll likely die of starvation or exposure. Breathing pogonip can damage your lungs thus the term white death.

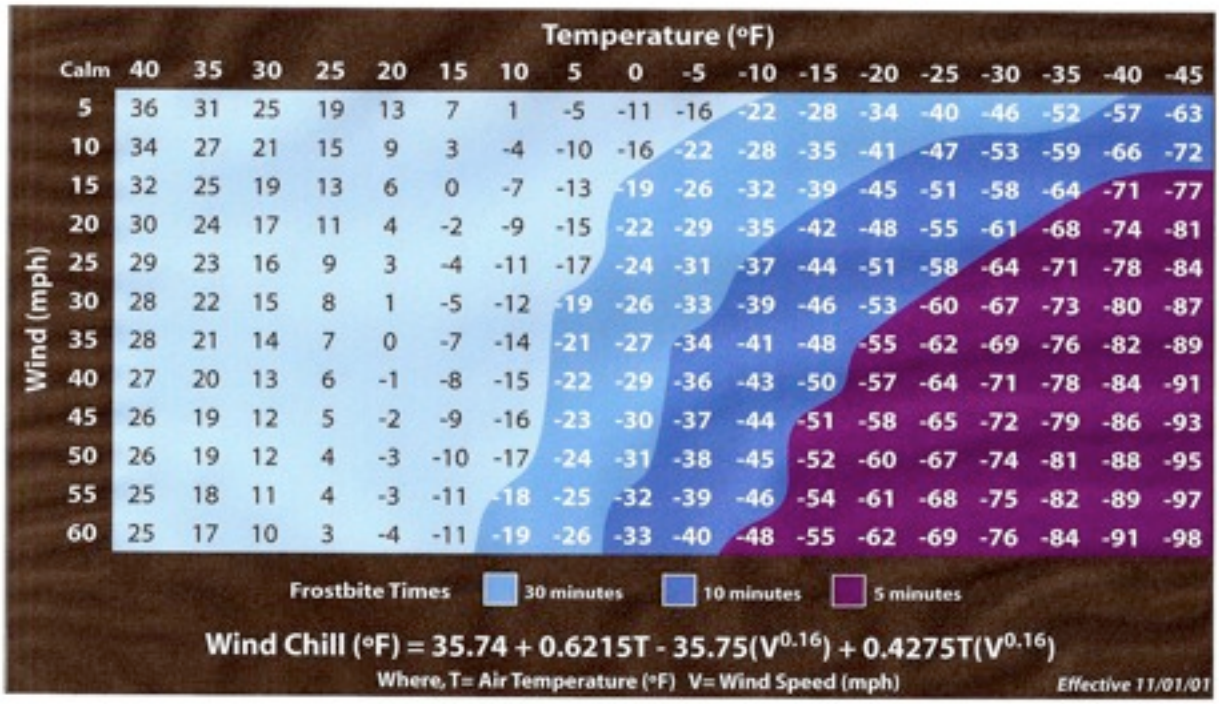
A variant of ice fog is referred to as urban ice fog. It occurs in urban areas when warm water vapor from urban pollutants (*automobile exhaust*, *power plants and incinerators exhaust*, and *people and animals breathing)* instantly freezes. It smells like a combination of oil fumes and body odor. Urban ice fog can become extremely dense and will persist day and night until the temperature rises.

b. Snow Machines

Only an Outsider (someone from Outside Alaska) would call a snow machine a snowmobile. Snow machines are the premier method of moving around. Some people have more miles on their snow

machines that they do on their cars! Snow machines can haul heavy loads and can be used to travel between remote areas during the winter. They are not constrained by the roadways. Rivers become highways. Trails firm up and many are only useable in the winter. There are snow machines set up for work and some set up to do nothing but to go forward very fast. It just depends on what you want to do with it that determines how you set it up. Think racing trucks and work trucks. Same basic structure, whole different set up. In winter, snow machines are extremely useful.

Windchill should be factored in when using a snow machine. Thirty years ago, my brother drove a snow machine on the trail for an hour. The temperature was -40°F (-40°C) and his average speed was 17 miles/hour (27 kilometers/hour). The windchill was -72°F (-58°C). At the time, he swore that he would never do that again. Years later as his memory aged, he said "I would like to point out, though, that at no time was I close to 'freezing to death'. I was never even uncomfortable. I planned the trip well and had enough arctic gear with me to camp if necessary." The front visor on the snowmobile provides some protection against the wind. Helmets and goggles are also important.



During the Buffalo Blizzard of 1977, in the hardest hit areas, snowmobiles were the only viable method of transportation.

c. Hovercraft

Cold weather can paralyze transportation. Blizzards and heavy snow can shut down highways stranding cars, buses and trucks dead in their tracks. Winter storms can shut down airports. Trains, the iron horse, are fairly immune to the weather, but even then record snowfalls can halt train service and strand passengers and cargo. Another transportation option is the hovercraft.

A hovercraft is a vehicle that travels over land, water and ice on a cushion of pressurized air. Air is forced under the hull of the craft and is contained by a tube or "skirt" of flexible material. Because the friction against the bottom of the craft has been greatly reduced “surface effect”, less energy is required to propel it. The air cushion also gives a smoother ride over rough surfaces.

A large hovercraft has the ability to move cargo (up to 500 tons) up frozen rivers to resupply cut-off communities stranded by extreme winter conditions. Frozen rivers and lakes become major transportation arteries. Unlike boats and ships, hovercraft do not require traditional docks.

5. Cold Weather Medical Hazards

This section is a primer to acquaint individuals on some of the health dangers associated with extreme cold weather. These hazards are not new. But during a “Grand Minima” the land area affected by extreme cold will greatly increase and more people will be exposed to these hazards.

Exposure to cold temperatures, whether indoors or outside, can cause serious or life-threatening health problems. Infants and the elderly are particularly at risk, but anyone can be affected.

An individuals ability to feel temperature change decreases with age, and older people are more susceptible to problems cause by cold temperature. Older adults often make less body heat because of a slower metabolism and less physical activity. Individuals over 65 years of age should have easy-to-read indoor thermometer and check the temperature in their homes often during severely cold weather.

Infants less than one year old should never sleep in a cold room because infants lose body heat more easily than adults; and unlike adults, infants cannot make enough body heat by shivering. It is important to provide warm clothing for infants and try to maintain a warm indoor temperature. If the temperature cannot be maintained, make temporary arrangements to stay elsewhere. In an emergency, you can keep an infant warm using your own body heat. Wrap them inside your clothing against your bare skin. If you must sleep, take precautions to prevent rolling on top the baby.

A reduction in body temperature results in impaired body function. This can be observed in cold weather when an individual tries try to tie a shoe-lace or fasten an awkward button with fingers that are clumsy with cold. The nerve cells that transmit impulses work more slowly as do the muscles controlling your fingers. 54°F (12°C) is the critical air temperature for good manual dexterity and 46°F (8°C) for touch sensitivity.

Your body has a control system that lets it react to temperature extremes to maintain a temperature balance. There are three main factors that affect this temperature balance—heat production, heat loss, and evaporation. The difference between the body's core temperature and the environment's temperature governs the heat production rate. Your body can get rid of heat better than it can produce it. Sweating helps to control the heat balance. Maximum sweating will get rid of heat about as fast as maximum exertion produces it.

Shivering causes the body to produce heat. It also causes fatigue that, in turn, leads to a drop in body temperature. Air movement around your body affects heat loss. It has been noted that a naked man exposed to still air at or about 32°F (0°C) can maintain a heat balance if he shivers as hard as he can. But unfortunately he cannot shiver forever.

It has also been noted that a man at rest wearing the maximum arctic clothing in a cold environment can keep his internal heat balance during temperatures well below freezing. However, to withstand really cold conditions for any length of time, he will have to become active or shiver.

When winter winds howl, you hear warnings about the wind chill factor. Wind chill shows how cold the wind makes exposed flesh feel and is a good indication of how much danger you face of frostbite or hypothermia. The lower the wind chill, the more you should bundle up.

a. Hypothermia

Hypothermia is the lowering of the body temperature at a rate faster than the body can produce heat. Causes of hypothermia may be exposure to cold due to inadequate clothing or the sudden wetting of the body (i.e. falling into a lake). The warning signs for hypothermia in adults are uncontrolled shivering, exhaustion, drowsiness, fumbling hands, stumbling, confusion, memory loss, and slow or slurred speech. Sometimes a person does not realize what is happening to them and will not ask for help and may die. The warning signs in infants are bright red, cold skin and very low energy.

If someone is exposed to cold and inadequately protected, their body will first try to generate more heat through shivering to maintain a normal temperature. If the body can't stay warm by these means, it will start trying to decrease heat loss by decreasing blood flow to the extremities to minimize cooling. Finally, if the loss of heat carries on despite these measures, the body will slow its metabolism to minimize its need for fresh blood flow and oxygen supply.

When you are healthy, your inner core temperature (torso temperature) remains almost constant at 98.6°F (37°C). Since your limbs and head have less protective body tissue than your torso, their temperatures vary and may not reach core temperature. Clinically hypothermia occurs when the human body core temperature falls below 95°F (35°C) - that's not much of a drop. The initial symptom is shivering, numb hands and other extremities and reduced manual dexterity. Complex skills become more difficult. The victim may also feel tired and may argue and become uncooperative. The beginnings of hypothermia are notoriously difficult for the victim to spot themselves, they will often strongly deny it.

As the condition evolves into moderate hypothermia, this shivering may progress to the point that it is uncontrollable and interferes with an individual's ability to care for himself. Walking becomes laborious and difficult with frequent stumbles and the victim may fall over. When the core temperature reaches 90-95°F (32-35°C), sluggish thinking, irrational reasoning, and a false feeling of warmth may occur. Most dangerous of all at this stage is perhaps the loss of ability to make rational decisions. There may be a desire to lay down in the snow and sleep, to discard a rucksack (that probably contains food and clothing) rather than carry it, and even to remove clothing due to an unawareness of the cold. Below 89.6°F (32°C) shivering stops as there is no energy left to keep it going, this causes the temperature to drop even further and more rapidly. The victim eventually unable to walk will curl up on the ground completely unaware of others, unconsciousness comes at around 86°F (30°C).

As the condition evolves into severe hypothermia, the body has effectively stopped trying to keep itself warm and some final steps are taken to avoid death. The heart rate and breathing slow so that they are hard to detect at all. Only one or two breaths per minute may be taken. The skin is very pale and icy cold to the touch. The limbs are stiff, pupils dilate and are unreactive to light. To all intents and purposes the person appears to be dead, metabolism has slowed so far that they are almost in a state of suspended animation. If the victim's core temperature falls below 77°F (25°C), death is almost certain. At a core temperature of around 82.4°F (28°C) heartbeat irregularities may occur - called cardiac arrhythmia - this can lead to an uncoordinated twitching of the heart muscle preventing it from pumping blood properly and so resulting in death. Even if this does not happen, the heart will stop beating completely at around 64.8°F (20°C) and cause death.

Reports of people who have died or come close to death with hypothermia describe them as becoming colder and increasingly numb, then drifting slowly off into oblivion. Some are described as having hallucinations before becoming unconscious, others of becoming "giggly" and regressing to a child-like

state. In some cases, hypothermia victims who appear to be dead can be successfully resuscitated. Generally these successful revivals occur in younger children.

When I was young man, I experienced moderate hypothermia. (When you are young you feel like you are invincible and tend to throw caution to the wind.) After being outside for almost an hour in the snow with only jeans and a short sleeve shirt on, I noticed that my body was began to shake uncontrollably. It was as if the furnace deep inside me went out. And I became very aware that I would die unless I could get it restarted again. I went indoors and crawled into my trusty down sleeping bag but my body couldn't stop shivering because my body was no longer generating sufficient heat to warm the sleeping bag. After an hour of uncontrollable shivering, I crawled out of the sleeping bag and found a fire. I sat next to the fire trying to warm myself for a half hour and finally the shivering stopped. A heavy sleep overcame me and I crawled back into the sleeping bag to a deep, deep slumber.

A person who is very old, malnourished or weak, an infant or sick child is more vulnerable to hypothermia. Age has the highest influence on survivability to cold injuries. Studies have shown that shivering and vasoconstriction to reduce blood flow to the body periphery are not so prominent in older people, putting them at greater risk. Also as we get older, we become less able to distinguish changes in temperature and so older people are more likely to start to lose heat early on before it may become a detectable problem.

Steps for warming a person with hypothermia:

- *Get the individual into a warm room or shelter, protected from the wind.*
- *If the individual clothes are wet remove them and replace them with dry clothing. Make sure head, feet and hands are covered.*
- *Warm the center of the body first - chest, neck, head, and groin - using an electric blanket, if available. Or use skin-to-skin contact under loose dry layers of blankets, clothing, towels, or sheets. One method is to wrap the victim in a warmed sleeping bag with another person who is already warm; both should be naked. But some caution is needed in that the individual placed in the sleeping bag with the victim could also become a hypothermia victim if left in the bag too long.*
- *If the person is conscious, give him hot, sweetened fluids. Honey or dextrose are best, but if they are unavailable, sugar, cocoa, or a similar soluble sweetener may be used. But never force an unconscious person to drink.*
- *After body temperature has increased keep the person dry and wrapped in a warm blanket, including the head and neck.*
- *Get medical attention as soon as possible.*

One method to treat hypothermia, rewarm the person by first immersing the trunk area only in warm water of 100-110°F (37.7-43.3°C). There are two dangers in treating hypothermia—rewarming too rapidly and "after-drop". Rewarming too rapidly can cause the victim to have circulatory problems, resulting in heart failure. After-drop is the sharp body core temperature drop that occurs when taking the victim from the warm water. Its probable cause is the return of previously stagnant limb blood to the core (inner torso) area as recirculation occurs. Concentrating on warming the core area and stimulating peripheral circulation will lessen the effects of after-drop. Immersing the torso in a warm bath, if possible, is the best treatment. Generally, rewarming the total body in a warm water bath should be done only in a hospital environment because of the increased risk of cardiac arrest and rewarming shock.

b. Frostbite

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling (numbness), causes a color change in the skin producing a dull white or grayish yellow coloring, and causes the skin to

feels unusually firm or waxy. Most often this occurs in the nose, ears, cheeks, chin, fingers, or toes. In frost bite, the skin actually falls below freezing point and ice crystals form within the live cells of the skin killing them in the process. On rewarming, the skin swells and blisters turning blue-purple to black - this then forms a hardened black carapace. If the damage is not severe, the dead layer is sloughed off revealing new healthy skin that has grown underneath. It is however very painful. This is known as superficial frost bite. More serious is when frostbite affects the deeper layers of muscle and bone. This almost always results in permanent tissue damage and may result in amputation of fingers, toes, even feet, hands and parts of the arm or leg. The risk of frostbite is increased in people with reduced blood circulation and among people who are not dressed properly for extremely cold temperatures.

Treatment for mild frostbite: If the skin feels soft when touched, the person probably has mild frostbite. Try to keep moving and get out of the cold as fast as possible. Warm the affected area using body heat. For example, place your hands under your armpits or place your feet next to your buddy's stomach. Do not rub the frostbitten area with snow or massage it at all. Do not use a heating pad, heat lamp, or the heat of a stove, fireplace or radiator for warming. Affected areas are numb and can be easily burned.

Treatment for severe frostbite: Do not start treatment for severe frostbite until you are in a place where the person's whole body can be kept warm during and after treatment. It is better to let a hand or foot remain frozen for several hours than to let it get warm and then refreeze again. When you get to a warm protected place, fill a large container with warm (not hot) water, water that feels comfortable when you hold your hand in it. Soak the person's frozen part in the water until it gets warm. If the water cools, add more warm water. But take out the person's hand or foot while you do this. Remember the individual cannot feel how hot the water is and you can easily burn the person. As the area gets warm, the individual will feel a lot of pain in the affected area. Give them an aspirin or other pain reliever. When the area is no longer frozen, the person must stay warm and rest. Be very gentle with the part that was frozen. Treat it as you would a severe wound or burn. Seek medical help. Sometimes dead parts of the body must be amputated through surgery.

My younger brother, Damian, lived in Kentucky when he was a teenager. There was a stream that crossed in the back of the property. One day in the winter when ice was starting to form on the stream, he decided to court a girl. But he had to cross the ice cold running stream. (After all love is completely blind) He temporarily took off his shoes and stockings and made the crossing. Later in the day when he arrived back home he noticed that his feet were numb. He had frostbite. Even after the condition appeared to heal, the pain would periodically come back year after year after year and haunt him.

Metals have high thermal conductivity. When bare skin comes in contact with metal at extremely cold temperature, the skin can instantly flash freeze to the metal. This generally occurs when the hand is a little sweaty such as when it is removed from a warm glove. This condition can produce severe frostbite.

The nose, ears, cheeks, fingers and toes aren't the only extremity that can be affected by the extreme cold. In Fairbanks, Alaska a boy was waiting outside for the school bus. The temperature outside was around -50°F (-46°C). The bus was late and he had to go. So he unzipped his pants and relieved himself in the snow. Later when he arrived at school, he began to feel a lot of pain. He went to see the school nurse. After examining him she let out a small chuckle as she informed him that he had an unusual case of frostbite.

c. Trench Foot and Immersion Foot

This condition results from many hours or days of exposure to wet or damp conditions at a temperature just above freezing. The symptoms are a sensation of pins and needles, tingling, numbness, and then pain. The skin will initially appear wet, soggy, white, and shriveled. As it progresses and damage appears, the skin will take on a red and then a bluish or black discoloration. The feet become cold,

swollen, and have a waxy appearance. Walking becomes difficult and the feet feel heavy and numb. The nerves and muscles sustain the main damage, but gangrene can occur. In extreme cases, the flesh dies and it may become necessary to have the foot or leg amputated. The best prevention is to keep your feet dry. Wash your feet and put on dry socks daily.

d. Dehydration

When bundled up in many layers of clothing during cold weather, you may be unaware that you are losing body moisture. Your heavy clothing absorbs the moisture that evaporates in the air. You must drink water to replace this loss of fluid. Your need for water is as great in a cold environment as it is for a warm one. One way to tell if you are becoming dehydrated is to check the color of your urine. If your urine is dark yellow, you are becoming dehydrated and need to replace body fluids. If it is light yellow to no color, your body fluids have a more normal balance.

e. Sunburn

Exposed skin can become sunburned even when the air temperature is below freezing. The sun's rays reflect at all angles from snow, ice, and water, hitting sensitive areas of skin—lips, nostrils, and eyelids. Exposure to the sun results in sunburn more quickly at high altitudes than at low altitudes. Apply sunscreen and lip salve to your face when in the winter's sun.

f. Snow Blindness

This condition is caused by the reflection of the sun's ultraviolet (UV) rays off snow-covered ground. The symptoms of snow blindness are a sensation of grit in the eyes, pain in and over the eyes that increases with eyeball movement, red and teary eyes, and a headache that intensifies with continued exposure to light. Prolonged exposure to these UV rays can result in permanent eye damage. You can prevent snow blindness by wearing UV protection sunglasses. To treat snow blindness, bandage the eyes until the symptoms disappear.

6. Cabin Fever

The term cabin fever derived from early American settlers who experienced long winters in their log cabins, snowed in until the spring thaw. Being stuck indoors in the gray dreary sunless days of endless winter can produce a claustrophobia like effect. While not an actual disease as the name suggests, is a state of restlessness, depression and irritability brought on by an extended stay in a confined space or a remote, isolated area. When heavy snowfalls and bone-chilling temperatures makes it too much a hassle to leave the home, cabin fever engenders frustration and defeatism. Some people experience a depressed mood because they are cut off from other people and the lack of interaction. People experience intense loneliness and solitude. Everyone starts to get on each others nerves. Some people can even become blooming lunatics.

Winter can lead to sensory deprivation. The range of colors normally seen during the Spring, Summer and Fall are replaced with dull shades of gray and white. Another sense that can be effected is the sense of smell which is deadened by low humidity. As humidity levels drop below 20 percent the nasal passages dry out which hampers the ability to capture and register the scent molecules.

When temperatures fall below freezing, outdoors humidity levels approach zero because the moisture is locked away in frozen form. Indoor humidity levels can also become low because heating systems can

dry out the house. Also the cold outside winter air is so dry, it affects the indoor relative humidity when it enters the house. Low humidity is one of the reasons why people get zapped by an electrostatic discharge during winter when the air is very dry. The low humidity problem can be corrected indoors by using a room humidifier, boiling a few quarts of water on the kitchen stove or wood burning stove or the method we use. We take an empty plastic spray bottle, fill it with a mixture of water and white distilled vinegar, set it to mist and periodically spray the house. This adds some humidity back into the house and also kills bacteria, mold and germs.

The lack of sunlight can physically affect your health. Most people meet their vitamin D needs through exposure to sunlight. Vitamin D is produced when ultraviolet rays (UV-B radiation with a wavelength of 290-315 nanometers) from the sun strike the uncovered skin and trigger vitamin D synthesis. A lack of Vitamin D can cause rickets in children and osteomalacia in adults. These diseases produce a softening of bones leading to fractures and deformity. This condition can lead to bone pain, dental deformities, impaired growth & short statue, increased bone fractures, muscle cramps, and skeletal deformities such as odd shaped skulls, bowlegs, bumps in the ribcage, pigeon chest, pelvic deformities and spine deformities including scoliosis.

If the winter prevents exposure to sunlight then it is important to provide the body with an alternate source of vitamin D. Vitamin D is abundant in fish (such as cod, salmon, tuna, and mackerel) and to a lesser extent in beef liver, cheese, and egg yolks. Many foods are fortified with vitamin D including milk, orange juice, ready-to-eat breakfast cereals, yogurt, and margarine. Check the product label for nutrient contents. Food supplements such as cod liver oil and capsulated Omega 3 fish oil are excellent sources for vitamin D.

Several approaches exist to combat the effects of cabin fever. The first is vigorous physical activity. People need exercise all year round. Hibernation is for the bears. During the cold days of winter, it really is bracing to get outside and breathe that crisp, cold air. It's invigorating! Muscles contract and produce more body heat by shivering and more blood goes to the heart and brain. Enjoy outdoor activities. Go sledding, ice skating, ice hockey, snow shoeing, snowmobiling, or cross-country skiing, take a walk in the silence of winter woods, making a snowman or have an old-fashion snowball fight.

Exercise also bolsters your immune system. Studies show that moderate exercisers get 20 to 30 percent fewer colds than non-exercisers do. Cold weather does not suppress the immune system. The outdoors is relatively free of disease-causing microorganisms. Viruses and bacteria thrive when individuals are crowded into enclosed areas with stale air, where they cough up and sneeze out these organisms, and spread the microorganisms with their unwashed hands.

Other suggested antidotes to cabin fever are to eat dinner by candlelight; bake homemade cookies, muffins, and breads; indoor board games & puzzles; and a cup of hot cocoa.

6. Drinking Water

Cold weather can trip off problems affecting the water supply. During winter storms the electricity can fail and the loss of electricity can equate to the loss of water. When temperatures fall to extremes, water pipes can freeze. One can become stranded in a storm for days, cut off from water. Individuals can only survive for approximately 3 days without drinking water. This need for water is true even during cold weather. One method of coping may be as easy as collecting falling snowflakes. Clean snow and ice can be melted and used for drinking water.

But sometimes fresh snow is unavailable. Contaminated snow, ice or water can also be used but additional steps are required to purify the water. After the snow or ice is melted, one will need to filter out the large contaminant particles. One method is to filter the water using clean cloths. Other water

filtering alternatives include coffee filters, paper towels or a cotton plug in a funnel. Another method is allow the contaminants to settle, and draw off the clear water.

Once the large contaminants are removed, the water must be treated to kill the dangerous bacteria. Two methods are available: boiling and chlorination. Boiling water will kill most types of disease-causing organisms that may be present. Boil the water for one minute, let it cool, and store it in clean containers with covers. The second method is to treat the water with liquid bleach to kill the dangerous bacteria. Use only non-scented regular liquid bleach (such as Clorox) to disinfect water. Avoid using bleach that contains perfumes, dyes, cleaners or other additives. Read the label. Household bleach is typically between 5 percent and 6 percent chlorine. The amount to add is 1/4 teaspoon of regular, household bleach for each gallon of water. This works out to 5 drops for a quart (or liter) of water; one teaspoon for 5 gallons; 11 teaspoons for 55 gallons. (This applies to surface ground water, cloudy water and very cold water; otherwise if the water is clear, then only half that amount of bleach is needed for disinfecting). In small containers, shake the container after adding the bleach and allow it to sit for 30 minutes before drinking.

III. Governmental Response

A. Farming

During a Grand Minima the Earth begins to slowly cool. The start of the planting season is delayed and in the fall early frost limits the harvest. Earth's abundant bounty is put on hold and starvation takes its ghastly grip. Great famines sweep across the globe and many perish. A global cooling event will put great stress on the farming industry. This battle will be won or lost by the American farmer. So give them the tools they need to fight the good fight.

Currently there is a war on food production being waged in this country. http://www.breadandbutterscience.com/Starvation.htm. This war is being waged by radical environmentalist, vegetarians, animal rights activist and the organic food industry. They have targeted high-yielding, genetically modified (GM) crops, the use of agricultural pesticides and herbicides, and the manufacture and use of nitrogen fertilizers. This silliness needs to stop.

Genetically modified crops hold a very important key to food production. With some effort through biotechnology, seeds can be tailor-made to counter many of the effects brought on by the adverse weather experienced during a Little Ice Age (constant rainfall, colder temperatures, continuous cloud cover and a shortened growing season). The technology is here but some would not want us to use it. http://www.breadandbutterscience.com/Fear32.htm. This biotechnology is safe. In the United States, we have been using it for decades without ill effects. It is another example of overblown fear being promoted to frighten us away from the benefits of anything created by humans; in this case - bioengineered crops.

A solar "Grand Minima" will produce greater rainfall. This rain will leech nitrates from the soil further diminishing farm productivity. Fertilizers have been an important contributor to food production. But there are some that desire to put restrictions on nitrogen fertilizer production and use. http://www.breadandbutterscience.com/Fear7.htm. Farm fertilizers are safe. To restrict farm production during a Great Famine falls within my definition of pure evil.

Famines will not only affect mankind but also affect domesticated livestock due to a severe lack of livestock feed. I recommend we reduce our herds of livestock and channel grains towards human consumption during the famine years. Only breeding stocks should be maintained. It is of great importance for ranchers to be able to reconstitute their livestock during the kinder years.

The climate during the Little Ice Age will make some ranch land suitable for farming. The government should exploit this zonal benefit and aid the rancher in this transformational task.

Many people in the United States and the world have pets (cats, dogs, horses, reptiles, birds, fish and other creatures). They provide us comfort and companionship. But does it make a lot of sense when a great famine strikes to feed these pets and as a consequence deprive food to small children and babies somewhere else in the world, or even a neighbor close at home. This is an area where individuals can sacrifice a little until the sunny days should reappear again.

After the lean years of the Great Famine, governments should restock their strategic reserves (grains, corn, beans, rice, etc.). This is in preparation for the cyclical pattern of famines that will plague the Earth for the next several decades. This is also the time to reconstitute the herds of livestock.

I recommend gamma ray food irradiation process to extend shelf life to foods. Irradiation is a process in which radiation is applied to food products to destroy insects and microorganisms that cause food to spoil quickly. Radical environmentalists have caused producers to shun the process due to unfounded and distorted claims. http://www.breadandbutterscience.com/Fear61.htm. But it is time to put this silliness behind us. This process is safe. The irradiation process should be performed in an oxygen excluded environment and an environment where the temperatures are kept very low in order to minimize the loss of natural vitamins. Irradiation of meat followed by vacuum packaging can produce large quantities of shelf stable meat without the need for refrigeration.

Farmers are the lifeblood of a nation. A Little Ice Age will produce many crop failures and therefore threaten the financial survivability of many farms. This will translate into many farms going bankrupt. Abraham Lincoln on one of his better days said a “government of the people, by the people, for the people, shall not perish from the Earth." As a government for the people, we should ensure that farmers are not driven into bankruptcy. Our survivability is tied to their survivability. We want to maximize food production. Farmers will need to take greater risk to accomplish this goal. We should ensure they are financially incentivized to take these risk and are cushioned from the effects of failures.

B. Energy

Adequate supplies of fuel (coal, fuel oil, LPG) should be stockpiled at electrical generation power plants by September 15 of each year to power the generators over the harsh winters. This in many cases will necessitate the construction of additional fuel storage facilities.

We should learn from the Chinese experience. In January and February 2008, the heaviest levels of snowfall and freezing rain in 50 years struck China. Heavy snow and sleet paralyzed transport and coal shipments. Many trains were unable to move and deliver coal to their electrical power plants. At one point, coal reserves were down to emergency levels and stockpiles were only sufficient for eight days of power generation. Damaged power lines and shortages of coal produced electrical blackouts affecting over 30 million people. Blackouts, brownouts and rolling blackouts lasted weeks.

The electrical outages had a cascading effect by instantly creating acute water shortages for millions of people. This is because most city water systems require electricity to operate.

C. Natural Resources

In general, more energy is required to heat a home or business than to cool it. This is because of the temperature differences between outdoor temperatures and human comfort zone temperatures is far greater on the cold side than on the hot side. (For example, it takes approximately 3.7 times more energy

to raise temperature from -40°F (-40°C) to a comfortable 70°F (21°C) than it does to lower temperatures from 100°F (38°C) to the same 70°F (21°C).) The falling temperatures associated with a Little Ice Age not only produce colder winters but also extending the length of the winter season. As a result, in order to adapt to the cold, greater quantities of fuel (coal, oil, natural gas and uranium) will be desperately needed to ensure survivability and livability.

Since a "Grand Minima" can last for several decades (even several generations), it makes common sense for individuals and families in the northern tier of States to relocate further south. This migration will spark one of the greatest building booms in modern times. Vast amounts of natural resources (timber, concrete, iron ore, etc.) will be required to feed this construction. Environmental laws and regulations restricting access for these resources should be eliminated. Building standards should promote energy efficiencies. Some federal lands should be made available to the public.

The saying "To jump out of the frying pan and into the fire" is common to many languages. Some of its forms date back to the second century A.D. This saying is very appropriate in the here and now. It carries a measure of wisdom. For those that decide to relocate to a better climate during a Grand Minima consider the fact that past Little Ice Age conditions produced an abundance of great storms, drowning hundreds of thousands of people. Therefore, in my opinion, it would be unwise to relocate to housing on the 1000-year flood plain, downstream of large dams or within 50 miles of the Atlantic or Gulf coastline.

D. Plagues

One of the threats observed during pass global cooling events, is the sudden reappearance of great plagues. In humans, this threat generally takes the form of the bubonic plague (the black death) and the expanding spread of malaria.

Historically, solar "Grand Minima's" produced a significant increase in floods. This flooding created new swamplands that became mosquito breeding grounds and in the past introduced tropical diseases such as malaria throughout Europe.

I feel that the appearance of bubonic plague is associated with a genetic mutation of the Yersinia Pestis pathogen from nuclear radiation from enhanced GCR (galactic cosmic ray) levels. The increased radiation levels mutate the pathogen into a very lethal strain. Generally this mutation would appear in the high deserts where there is less atmospheric shielding and lower moisture levels, such as the high deserts of China. The strain once produced would spreads slowly (several decades) across the populations around the globe.

There is no reason to believe that modern medicine is not up to the task of combatting these threats. But in the event that it falls short, I recommend the following two approaches:

Malaria is transmitted by mosquitoes. When a mosquito bites an infected person, it ingests microscopic malaria parasites found in the person's blood. When the mosquito then bites another person, the parasites go from the mosquito's mouth into the person's blood. Within a human, the parasite goes to the liver, replicates, and moves into the bloodstream, where it attacks red blood cells for their hemoglobin. Toxins from the parasite are then released into the blood, making the person feel sick. Malaria produces fever and flu-like illness, including shaking chills, headache, muscle aches, and tiredness. Nausea, vomiting, and diarrhea can also occur. Malaria in children can produce anemia, jaundice, kidney failure, seizures, mental confusion, coma, and death. The World Health Organization estimates that currently 300-500 million cases of malaria occur and more than 1 million people die each year from malaria, mostly children in sub-Sahara Africa. To compound this threat, several drug resistant forms of malaria have appeared and are spreading.

We have developed a miracle insecticide to combat many types of plagues; but in our great wisdom, we have banned its use. The insecticide is called DDT. This chemical is very effective at killing parasites (mosquitoes, lice, mites and ticks) responsible for majority of deadly plagues experienced by mankind (malaria, typhus, yellow fever, dengue fever, sleeping sickness, encephalitis [such as West Nile virus], elephantiasis, leishmaniasis, Lyme disease, Chikungunya virus and yaws). DDT when used in moderation does not pose a significant health risk.

The health consequences of using DDT were greatly exaggerated by the environmental community and as a direct result the use of DDT has been essentially banded worldwide. Many false claims were leveled against DDT. The allegations raised were (1) DDT was a carcinogen, and (2) it endangered the environment, in particular for certain birds. After three decades of study, DDT has never been credibly linked with cancer or non-cancer health effects in humans. No scientific experiment has ever shown that typical levels of DDT found in the environment cause the thinning of bird egg shells – a mechanism by which DDT was alleged to have harmed birds. It is interesting that the bird populations actually rebounded during the period of the greatest DDT use. In the end, the ban on DDT was never validated with hard science and instead was grounded in junk science. As a result of this insecticide ban, a million people each year are condemned to a needless death. Most of these are children. DDT was credited with eradicating malaria in Western Europe and North America. http://www.breadandbutterscience.com/DDT.htm.

One method to combat this threat is to destroy a critical link in the transmission route, namely the mosquitos. Indoor residual house spraying (IRS) is a malaria control intervention targeted at the malaria vector mosquito. Trained spray operators equipped with hand held pumps, spray the inside surface of the walls with a residual insecticide (DDT short for dichloro-diphenyl-trichloromethylmethane). The insecticide then dries and forms a crystalline deposit on the sprayed surface. The insecticides used in IRS effects the malaria vector mosquitoes in several ways. When a house is sprayed mosquitoes are repelled and deterred from entering and biting. In houses sprayed with DDT, approximately 60% of the mosquitoes are repelled by the DDT and deterred from entering. The excito-repellent effect causes discomfort to mosquitoes that do enter houses and that come into contact with the sprayed surface causing the mosquitoes to either die or to exit before biting. DDT causes the mosquito to become disoriented, and as a result they tend to cling to the wall and remain there until they die.

In the event of a reintroduction of the malaria threat in the U.S., I recommend the immediate lifting of the DDT ban (a miracle man-made chemical) and the implementation of the indoor residual house spraying program to curtail the spread of the malaria disease. Over the years, mosquitos have built up some resistance to DDT. But because DDT works at so many levels, this insecticide is our best shot at combating this disease.

The second threat is the **Bubonic Plague**. Yersinia Pestis is a pathogen that has undergone large-scale genetic flux. Global cooling at the beginning of the Dark Ages began in 536 A.D. An outbreak of the Bubonic Plague struck Constantinople 6 years later. It was caused by a very deadly variant of the Yersinia Pestis bacillus that used fleas (and rats) as a plague transport mechanism. This plague was referred to as the Plague of Justine. As it swept from the Middle East to the Mediterranean Basin, approximately 50 percent of population perished.

Global cooling at the beginning of the first Little Ice Age began in 1315 A.D. An outbreak of the Bubonic Plague struck the Chinese Gobi Desert 15 years later. This deadly variant of the Yersinia Pestis bacillus killed 35 million Asians and spread westward where it killed approximately 1/3 of the European population. The plague was known as the Black Death. It came in three variants: bubonic plague, primary septicemic plague, and the pneumonic plague. To date, this deadly bacillus has been responsible for 200 million human deaths.

The flea/rat/human plague route still exists today. As a result, the Earth is a fertile ground for the next great plague. If a mutated form of the bubonic plague were to infect the rat population, the results could

be devastating. For example, it is estimated that the number of rats living in New York City alone is in the 44-96 million range. The estimated rat population in the United States may exceed 300 million.

One method to combat this threat is to destroy a critical link in the transmission route, namely the fleas. Over the past few years, many inexpensive pesticides that have been shown to be highly effective in flea control have been driven off the market. I recommend we reevaluate the safety concerns with these products in relationship with the benefits that might be gained by halting the spread of the bubonic plague. (I suspect these safety concerns have been overblown by the radical environmental movement and will not stand up to real scientific scrutiny.)

Another approach is immunization. While going through basic training in the military, I underwent a series of immunization shots. One of these was for the bubonic plague. Of all the immunizations that I received in my lifetime, this was the only one that physically affected me. Almost immediately after receiving the shot, I could feel my body going wobbly. Several individuals in my squad fainted. It underlies the potency of the bubonic plague to produce death. The immunizations should be voluntary. Some individuals will have a severe reaction to this immunization. The shot is several times more potent than the Smallpox vaccination. I recommend individuals not underestimate the lethality of the Bubonic Plague and obtain this immunization.

E. Environmental Protection Agency

During the past century, the environmental movement has been transformed from organizations centered around a natural love of birds, animals, fish and trees, of the wondrously beautiful world that surrounds us; of environmental conservation concerned with problems such as air & water pollution and protecting wildlife -- into a radical religious movement, called *Deep Ecology*, which at its core abhors man and all his achievements.

Deep Ecology is a pantheistic religion, a form of neopaganism. Ecologists superstitiously imbue “life” into inanimate objects like the soil, the oceans, or the planet. *Deep Ecology* claims to be a major paradigm shift in civilization, for it makes the Earth’s ecosystem the new center of all value. *Deep Ecology* from its inception has been interested in values and justifications of values. Ecologists crusade to turn “ecological ideals” into widely accepted moral standards. Ecologists claim moral obligation and moral authority to impose drastic remedies on humanity. Ecologists argue that the desecration of Nature results from a sinful craving for the unnecessary Western consumerist. Ecologists demand sacrifice. They demand withdrawal from the exploitation of nature. Ecologists believe in a mythical essential harmony of nature...to which man may have to be sacrificed. They believe that humans should be rooted in one place, most trade is unnecessary and wastes resources, self-sufficiency and bio-regions are *good*, exploitation of nature and modern civilization is *evil*.

Deep Ecology is centered around a religious belief in Gaia viewing the Earth and its biosphere as a single living organism. The concept was named after the ancient Greek supreme goddess of Earth, Gaia. This eco-religion incorporates a set of religious beliefs many of which are solidified into religious dogmas. One of the primary beliefs is that we have an ecological responsibility of uniting to preserve the health of the Earth. We must be in harmony with nature. It has prophets and heretics and individuals who believe their duty is to proselytize their faith on impressionable young minds and enforce their religious convictions on others. This eco-religion has a perverted sense of good and evil, of guilt and sin, of a need for sacrifice, and redemption. This religion holds a vision of a paradise on Earth, a mythical primitive utopian world of yesteryear. They make apocalyptic predictions of environmental doom. This religion has even formed its own religious holiday, called *Earth Day*.

This eco-religious movement is characterized by its opposition to the production of energy (coal, oil, natural gas), to the electrical infrastructure (coal power plants, hydroelectric dams, natural gas power

plants, nuclear power plants, renewable energy and the electrical grid), to advancements in food production. It promotes ecological doomsday fears around man-made chemicals using unfounded/ distorted claims in an effort to regulate and eliminate technology and innovation. It promotes the belief in a utopian world, without human industry, science and technology, with humans living like animals. Nor is it shy in trying to indoctrinate our children into its religious beliefs even using public education to advance its religion. It promotes and funds ecology anarchist: eco-fundamentalist, such as the Earth Liberation Front (ELF).

Deep Ecology views animals as equal and no different than humans. They want to make vegetarianism "obligatory" on moral grounds and ban the use of animals for agriculture, science, and commerce. They advocated bestowing on animals the rights of humans (animal rights). Some advocate even giving these rights to trees and plants. By seeking animal rights, the end-goal of *Deep Ecologist* is to destroy the unique status of man and devalue human life. Once man is demoted to merely another animal in the forest, universal human rights will have to be tossed out and new criteria devised to determine which human/animal lives matter and which individuals can be treated like animals. Should that come to pass, our social order based on the sanctity and equality of human life would crumble. In its place would emerge a society where people would willingly sacrifice human prosperity and welfare on the altar of Gaia to save the planet from an ecological doom supposedly created by man.

The idea of nature possessing an intrinsic value inexorably implies a desire to destroy man and his works because it implies a perception of man as the systematic destroyer of the *good*, and thus as the systematic doer of *evil*. Just as man perceives coyotes, wolves, and rattlesnakes as *evil* because they regularly destroy the cattle and sheep he values as sources of food and clothing, so on the premise of nature's intrinsic value, the *Deep Ecologist* view man as *evil*, because, in the pursuit of his well-being, man systematically destroys the wildlife, jungles, and rock formations that the *Deep Ecologist* hold to be intrinsically valuable.

This eco-religion is fiercely anti-human, characterizing man as a scourge that literally threatens the existence of “the planet.”. The world is viewed as out-of-balance. We are running out of natural resources. Mankind is viewed as a destroyer, threatening the very existence of Gaia. All human activity is portrayed as negative; whereas the rest of nature is viewed as *good*. (This results in alienation from nature and subverts the most important lesson of ecology; that we are all part of nature and interdependent with it.) This aspect of environmental extremism leads to disdain and disrespect for fellow humans and the belief that it would be far better for the planet, if man did not exists at all.

Deep Ecology is also fiercely anti-technology and anti-science Man’s works (science, technology, industry) are viewed as *evil*. Its believers are constantly driving fear into the hearts of many on new technological innovation or advancement that are “man-made”. They have especially focused these fears around environmental toxicity of man-made chemicals. Its believers dream of returning to some kind of technologically primitive society, a utopian world like the Garden of Eden. In its essence, this eco-religion rejects virtually everything about modern life. We are told that nothing short of returning to primitive tribal society can save the Earth from ecological collapse. No more cities, no more airplanes, no more polyester suits! The Southern Hemisphere Native Forest Network summarizes this belief as "it is necessary to adopt a global phase-out strategy of consumer-based industrial capitalism."

Another belief in *Deep Ecology* found in James Lovelock’s Gaia theory is hostility toward farming and the domestication of plants and animals. Farming "abrades the living tissue" of Gaia's "skin" and hampers her "ability to regulate the Earth's climate." *Deep Ecologists*, love all things wild, not domesticated. Cats & dogs and cows & horses are out but wild wolves are in.

This eco-religion has a very dark side. It promotes a culture of death. It advocates sacrificing an enormous number of human beings on the altar of Gaia. Its precursor was the eugenics movement of a century ago that imposed birth control and forced sterilization on the supposedly "unfit", which eventually over time led to the creation of gas chambers and crematorium ovens at Auschwitz & Dachau.

Once flora and fauna are elevated to the level of human importance, it wouldn't take long to brand human exceptionalism as arrogant and harmful to nature. Identifying ourselves as the villains, in turn, opened the door to a demoralizing nihilism that likens humanity to a vermin infestation or a viral infection afflicting the planet.

- Paul F. Watson is co-founder of Greenpeace, and a former member of the Sierra Club board of directors, the founder and president of the Sea Shepherd Conservation Society writes: *The planet's ecosystem is a collective living organism and operates very much like the human body. . . . Humans are presently acting upon this body in the same manner as an invasive virus with the result that we are eroding the ecological immune system. A virus kills its host and that is exactly what we are doing with our planet's support system. . . . Curing a body of cancer requires radical and invasive therapy, and therefore, curing the biosphere of the human virus will also require a radical and invasive approach.*
- David M. Graber, a research biologist with the National Park Service stated: *I know social scientists who remind me that people are part of nature, but it isn't true. Somewhere along the line — at about a billion years ago, maybe half that — we quit the contract and became a cancer. We have become a plague upon ourselves and upon the Earth.*
- *We're no better than bacteria!* University of Texas biologist Eric R. Pianka recently announced. He went on and discussed the collapse of human population due to the threat from Reston Ebola virus (so named because it was first detected in monkeys in Reston, Virginia). *Things are gonna get better after the collapse because we won't be able to decimate the Earth so much*, he added. *And, I actually think the world will be much better when there's only 10 or 20 percent of us left.*
- James E. Lovelock states that something like nine-tenths of our population must vanish: *Personally I think we would be wise to aim at a stabilized population of about half to one billion*. To accomplish this goal, both the birth rate and death rate would have to be "regulated" as "part of population control." So we are to be bred, managed, and put down just like a herd of animals on a farm.
- A study recently performed by the London School of Economics suggests that, to fight climate change, governments should focus on another pollutant: *humans*.
- Sara Parkin, a former leading Green Party activist and Optimum Population Trust patron complained: *There are no Nobel prizes for preventing births, only for preventing deaths. Yes, that is because, call us crazy, mankind has traditionally valued the creation of life over the destruction of it.*
- The curator emeritus for botany at Chicago's Field Museum of Science, William C. Burger, discussing the devastation humans are currently imposing upon our planet, wrote *Surely, the Black Death was one of the best things that ever happened to Europe.*

Deep Ecologists push radical depopulation, perhaps to as few as 500 million people worldwide, as the best medicine to cure the human infection and again permit nature to flourish. Some believers have become advocates of thinning the world's population through genocide, abortion, euthanasia, pestilence, famine and war. But some *Deep Ecologist* are actively pursuing this objective now with whatever means are available as we stand by and watch idly from the sidelines.

Science shows that adding chlorine to drinking water was the biggest advance in the history of public health, virtually eradicating water-borne diseases such as cholera. Every year, nearly 1.5 billion people -- mostly children under five -- suffer from preventable water-borne diseases such as cholera, typhoid fever, amoebic dysentery, bacterial gastroenteritis, giardiasis, schistosomiasis, and various viral diseases such as hepatitis A. Yet now there is a mounting campaign, led by environmental activists in wealthy industrialized nations, to eliminate every last man-made chlorine molecule from the face of the earth. As Greenpeace's Joe Thornton explains, *There are no uses of chlorine which we regard as safe.* Yet chlorination -- considered one of the greatest advances ever in public health and hygiene -- is almost universally accepted as the method of choice for purifying water supplies. In the United States alone, 98 percent of public water systems are purified by chlorine or chlorine-based products

In 1991, an epidemic of cholera started in Peru and spread to the rest of Latin American. This epidemic reached the U.S. in 1992 via an outbreak among 75 commercial airline passengers from Peru. This epidemic is reported to have caused as many as 1 million cases of cholera and as many as 10,000 deaths. Although the epidemic was reportedly started by a ship which dumped its bilge within reach of Peruvian waters, the epidemic's spread has been credited in part to the Peruvian government's decision to stop chlorinating drinking water supplies under the urging of environmental activists. http://www.junkscience.com/news/cholera.html, http://reason.com/archives/1996/05/01/dirty-water
Ten thousand people were killed and 10 to 15 million left homeless when a cyclone slammed into India's eastern coastal state of Orissa in October 1999. The U.S. Agency for International Development provided corn and soy meal as humanitarian aid to thousands of hungry storm victims. A staunch member of this eco-religion, Vandana Shiva, of the Research Foundation for Science, Technology, and Ecology demanded this food aid distribution immediately be halted because it contained genetically modified (GM) food and accused the United States of using the people of India as guinea pigs. This is despite the fact that Americans have been growing and eating biotech crops for years with no ill effects (about one-third of all the corn grown in the United States has been genetically modified). http://reason.com/archives/2001/01/01/dr-strangelunch

In 2002, eco-religious groups from Greenpeace, Friends of the Earth and Comers International convinced the government of Zambia to block the distribution of American-donated genetically enhanced corn to its starving people. As 3 million people in his country face starvation, the president of Zambia let some 15 million metric tons of donated corn sit untouched in storage because some of it was genetically modified. http://www.activistcash.com/news_detail.cfm?hid=2244, http://www.heartland.org/policybot/results/11314/Africans_Starve_Rather_than_Accept_Bounty_of_GM_Corn.html, http://www.activistcash.com/news_detail.cfm?hid=2936

In 2008 a cholera epidemic in Zimbabwe has sickened more than 100,000 and killed at least 4,500. A simple innovation, using GM rice plants, to produce a rice-based oral rehydration solution was developed. This innovation has been shown to cut the duration of disease in children in Peru. But its introduction and use in Zimbabwe was opposed by various eco-religious groups. http://www.truthabouttrade.org/content/view/13612/54/

Environmental activist urged Chad to fight global warming and the government responded by banning the manufacture, importation and use of charcoal – the sole source of fuel for 99% of Chadians. Women giving birth could not even find a bit of charcoal to heat water for washing. http://www.irinnews.org/Report.aspx?ReportId=82436.

Another dark aspect of this religious movement is it spawns religious fanatics, such as the Earth Liberation Front (ELF), that believe terrorism such as the destruction of property and threatening human lives, are justified in the name of their eco-religious beliefs. http://www.breadandbutterscience.com/Agent11.htm.

What has this discussion to do with the Environmental Protection Agency?

> The First Amendment to the U.S. Constitution reads "Congress shall make no law respecting an establishment of religion".
>
> It can be argued that this First Amendment clause also applies to the psudo-religion, *Deep Ecology*. The EPA is a government organization that has enacts regulations that support *eco-religious* beliefs and then enforces regulatory controls on individuals and organizations to ensure these regulations are adhered to. The role of the U.S. government in supporting and enforcing these eco-religious beliefs is at variance with the First Amendment of the U.S. Constitution.
>
> The Environmental Protection Agency is promoting the establishment of religion, a function that the U.S. government is strictly prohibited from doing by the Constitution. The EPA is in violation with the First Amendment. As a consequence, the EPA should be dissolved.

The EPA was very instrumental in banning DDT and declaring Carbon Dioxide as a pollutant. Was this based on sound science or a religious belief imbedded in *Deep Ecology*? The decisions had nothing to do with science but everything to do with establishing religious dogmas. From its inception in 1970, the EPA has targeted a maze of chemicals for regulatory control built on a foundation of junk science. The organization has systematically attacked and banned one unnatural man-made chemical after another. Since these chemicals are man-made they must be feared and be *evil*. Refer to the list under "Prolonged Psychological Fear Based on Unfounded/Distorted Claims" in http://personals.galaxyinternet.net/tunga/LEM.htm

DDT - Death from malaria means convulsions and delirium, retching and diarrhea, joint and abdominal pain so excruciating that a coma can be a blessing. The parasitic infection destroys the body's red blood cells and clogs its capillaries, depriving vital organs and the brain of blood. Malaria strikes some 300 million people annually, and kills an African child every 30 seconds.

This is is all the more tragic given the fact that it is very preventable. DDT is a miracle insecticide that can protects millions of people from this deadly scourge. The use of DDT was directly responsible for eradicating malaria from Western Europe and North America. So why was DDT banned? The EPA was the architect declaring DDT a lethal poison and spearheaded imposing a global ban on the chemical. It was based on the belief that the chemical was a carcinogen and it endangered the environment in particular for certain birds. Those fears turned out to be unfounded. But the ban was never lifted. For over 35 years, the EPA has known that DDT when used in moderation does not pose a significant health risk, but this organization has taken no steps to rescind the ban. The reason is because DDT became an eco-religious symbol, a dogma. As a consequence of this ban over 30 million innocent young children, mostly in Africa, needlessly died from malaria. http://personals.galaxyinternet.net/tunga/DDT.htm.

One must ask the question - was the decision to continue the ban due to governmental incompetence or was it due instead to an alignment with the goals of this *eco-religion* demanding global depopulation? Was the death of 30 million innocent young children just the first step along that path?

Carbon Dioxide - Although I am writing this in the year 2009, the effects of natural global cooling caused by the sun going magnetically quiet, a solar grand minima, should be observable to all but to a few die-hard religious fanatics, within a decade-or-so from now. At that point it will become self-evident that the

anthropological (man-made) global warming theory was nothing more than a grand hoax fostered by an eco-religious movement combined with one-sided reporting from a broad spectrum of mainstream media, and by self-serving politicians. The thrust of this hoax was to destroy our nation's electrical infrastructure, our oil/gas/coal production, our industry and our jobs, essentially the American lifestyle and our way-of-life. http://personals.galaxyinternet.net/tunga/OSGWD.htm and http://personals.galaxyinternet.net/tunga/Fear4.htm. One of the grand players in this scheme is the Environmental Protection Agency (EPA). The EPA unscientifically declared carbon dioxide a pollutant, one that needed to be controlled. This gas is essential to life on Earth. It is definitely not a pollutant. Dramatic global climate change has occurred for millions of years without any help from mankind. Our climate system is very robust, not fragile. Carbon dioxide does not cause global warming; water vapor does. Without this moisture, our planet would be as cold as a dead tomb. The EPA was warned by prominent scientist that the Global Warming Theory was set on a foundation of quicksand. But they ignored the scientific evidence.

The sun's magnetic field wrapped in the solar winds shields Earth from Galactic Cosmic Rays (GCRs). These GCRs cause cloud formation. When the sun is weak, Earth experiences more cosmic rays, greater cloud cover and falling temperatures. But when the sun is strong, the Earth experiences fewer cosmic rays, less cloud cover and warmer temperatures. The minor changes in atmospheric carbon dioxide have minimal affect on climate change. Rather temperature has an effect on atmospheric carbon dioxide levels by releasing the dissolved gas from the vast reservoir called the ocean. The EPA has aspired to classify carbon dioxide as a pollutant in order to affix bureaucratic control over this gas effecting the lives of its citizens and industries. The net effect is that when the world should be preparing for the next solar "Grand Minima" the EPA has kept its focus on global warming hysteria. How many American lives will be forfeited through famine, starvation and plagues because the EPA adopted this irrational approach?

Environmentalists have been disingenuous. The radical environmentalist focus in promoting the global warming scare were not uttered in the interest of man's life and well-being, but rather for the purpose of leading him to his own self-destruction.

Why is it important to eliminate the EPA now?

- The EPA is playing the role of obstructionist.
- The EPA has created and enforced regulations that inhibit us from using our technology, our resources and our industrial and scientific might to survive and even thrive during a Little Ice Age.
- The EPA was warned that its policies in classifying carbon dioxide as a pollutant were unsound and unscientific. And that their finding and follow-on regulations would weaken our ability to withstand and cope with the next global cooling period brought on by a magnetically quiet sun, but they blindly went forward with their regulations. http://www.breadandbutterscience.com/EPAComments.pdf.
- The last thing we need in an Little Ice Age crisis is a governmental organization driven by an eco-religious movement whose apparent goal is to exterminate humans from the face of the Earth.

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