

Climate, Energy and Community: Vermont 2013

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This is a compilation of my 2013 Weekly Planet columns (with an occasional feature article) from the Sunday Environment page in the Rutland Herald and Barre/Montpelier Time Argus. This series started five years ago in January 2008; and an overview paper is available¹. These columns go through the seasons, dealing with weather, climate, climate change, energy and policy issues. They blend science with a systems perspective, and encourage the reader to explore alternative and hopeful paths for themselves, their families and society. They are written so that a scientist will perceive them as accurate (although simplified); while the public can relate their tangible experience of weather and climate to the much less tangible issues of climate change, energy policy and strategies for living with the earth system.

I believe that earth scientists have a responsibility to communicate clearly and directly to the public² – as we all share responsibility for the future of the Earth. We must deepen our collective understanding, so we can make a collective decision to create a resilient future.

Footnote: All my articles can be freely reused under a Creative Commons license. Some old Herald web references have not been maintained. You can find articles at <http://rutlandherald.com/section/archives>. However, they charge for access.

List of topics in 2013 [*Index is live*]

a) The price we pay for ignoring climate change	(January 6, 2013).....	2
b) Reflections on our environment, five years later	(January 20, 2013).....	3
c) Accelerating climate change brings more extreme weather	(February 24, 2013).....	5
d) Climate change brings many surprises	(April 14, 2013).....	6
e) Spring resilience and fossil carbon taxes	(June 2, 2013).....	7
f) Extreme weather, climate change and the future of our planet	(July 21, 2013).....	8
g) Communities can build a more resilient society	(September 8, 2013).....	9
h) Collaboration can solve our Environmental Challenges	(October 27, 2013).....	10
i) Climate Change is a moral issue	(December 15, 2013).....	11

¹ Betts, A.K. and E. Gibson (2012), Environmental journalism revisited. *Environmental Leadership: a Reference Handbook*. Deborah R. Gallagher, Editor, SAGE publications Inc., Sept. 2012, ISBN: 9781412981507. Available at <http://alanbetts.com/research/paper/environmental-journalism-revisited/#abstract>

² Betts, A. K. (2011), Communicating Climate Science. *EOS Transactions*, 92, No. 24, 14 June 2011. Available at <http://alanbetts.com/research/paper/communicating-climate-science/#abstract>

a) The price we pay for ignoring climate change

(January 6, 2013)

<http://www.rutlandherald.com/article/20130106/ENVIRONMENT/701069861/>

In January, I reflect by the fire on the year that has passed. It is important to slow down enough to grasp what is happening to our world. The Earth has many timescales. Some are long and slow moving, and they take decades to unfold — like the melting of the Arctic ice cap as greenhouse gases warm the planet.

As the seasons change, we can adapt and try to fit in with what the Earth is telling us. But when powerful storms blow up or wild fires explode, all we can do is try to get out of the way. Sometimes it is too late, because we have ignored warnings and have put buildings in vulnerable places.

But it is hard to look back on 2012 without a sense of foreboding. Winter and spring temperatures were exceptionally warm, and precipitation and snow cover were very low across much of the United States. This led to major wildfires in New Mexico in May and Colorado in June. Extreme drought and record temperatures affected crops and food supplies in many areas. Later in the year, the waters of Lake Michigan and Huron were nearing record low levels, and the low water levels of the Mississippi River were severely impacting commercial traffic.

Then at the end of October, Hurricane Sandy turned toward the coast and merged with a mid-latitude storm. Powerful winds and a record storm surge devastated coastal New Jersey and New York City, flooding the subway tunnels of southern Manhattan. Reports had been predicting this disaster for 30 years, but protective measures were considered too costly.

As the momentum of climate change increases, we are sliding into the unknown. Twenty years ago, participants at the United Nations Climate Change Convention agreed to stop dangerous climate change, but every year the nations meet and fail to reach agreement on how to do this. Goals are set up for the future, such as keeping the global mean temperature rise below 3.8 F (2°C), but as we continue to burn more and more fossil fuels, these goals soon seem impossible to achieve.

Now gloomy articles are saying that a 7.6 F (4°C) warmer world is inevitable on our current energy path — with much higher temperatures over land and at high latitudes. We should not be surprised. Ten, 20 years ago scientists pointed out clearly that urgent action was needed. But societies find it much easier to set worthy, distant goals than to agree on binding actions now.

Again the excuse is that slowing the pace of climate change costs too much. The more honest answer is that wealthy fossil fuel industries control us and our political systems. The truth is that the cost of ignoring climate change is estimated to be 60 times higher than the cost of building an energy-efficient world much less dependent of fossil fuel. And the damage we are inflicting on the earth's ecosystem is far beyond measure.

It is time to stop complaining about all the deferred costs arising from using the atmosphere as a free waste dump. The bills are now coming due. We need an annually increasing charge on all fossil fuels used in the state to fund energy retrofits to our older buildings, to pay for more efficient transit systems, and to cover all the increasing costs of adapting to climate change. We need to fund the costs of rebuilding a more resilient infrastructure after storms like Irene. Higher costs for fossil fuels will nudge us towards greater efficiency and wiser choices.

It is morally unacceptable to sacrifice the Earth and our children simply because we are unwilling to face change. Instead, every day when the sun rises over the mountain we can look with joy at the world we love — and together choose a new path into the future.

Toward a global environmental ethic: The Blue River Declaration: <http://bit.ly/TZF1h1>

b) Reflections on our environment, five years later

(January 20, 2013)

<http://rutlandherald.com/article/20130120/ENVIRONMENT/701209892/>

By Alan Betts and Elizabeth Gibson

The topic of our environment is one that involves many complex issues and one that is hampered by a lot of misinformation. It is also a matter of increasing urgency that requires public understanding and participation. This is especially true in Vermont, where policy development involves extensive public input.

Five years ago today, this weekly environment page first appeared in the Rutland Herald and the Barre-Montpelier Times Argus. The idea was to present technical, timely information to the general public every week.

The format consisted of two basic articles: a factual feature and a Weekly Planet column contributed by various writers in the community with diverse perspectives on current environmental issues.

The realities of today's environment are forcing a transition to a more efficient and sustainable society. This transition is not simply inevitable — it is critical and requires that we understand the interconnections between climate, energy use, food and behavior.



Credit: Madeline Bodin

Everyone is affected: businesses, citizens groups, farmers and foresters, students and teachers, officials in state government, politicians, voters and our children. Adapting to climate change requires all of us to be informed, which means access to a wide range of articles presenting clear and accurate information about local and global environmental issues.

This was the original vision for this page and remains so five years later.

A snapshot of Vermont's environmental issues over the past five years emerges from taking all of the 260 feature articles that have been printed on this page during that time and considering what they represent:

- Vermont's natural environment, including such diverse aspects as birds, butterflies, marshes, meadows, forests, stream monitoring, and the land ethic — 26 percent of all articles.
- Technical solutions: renewable energy, efficiency, infrastructure changes — 22 percent.
- Community initiatives, projects and conferences, social transformation — 14 percent.
- Educational and school projects, climate and energy literacy issues — 10 percent.
- Forestry, agriculture and food issues, including biofuels, farmers markets, composting and the Vermont Farm to Plate movement — 9 percent.
- Impact of climate change on Vermont's seasonal climate and growing season — 8 percent.
- Legislative issues — 6 percent.
- Significance of personal lifestyle and energy use choices — 5 percent.

These categories are even more significant when the sources of the articles are considered — primarily community members who are directly involved in the stewardship of Vermont's environment: scientists, naturalists, teachers, community activists, engineers, policy makers, and concerned citizens.

The largest group of articles covers how the Vermont environment is changing and speaks to our role in caring for the natural world. Many articles address technical solutions to broad environmental issues. Supported by incentives from the state, Vermont is building a renewable energy infrastructure, developing solar resources, retrofitting homes for greater winter efficiency and exploring new wind and hydropower. The many articles on community initiatives reflect the fact that significant change is happening at the grassroots level.

The importance of educational and school projects is also clear, as Vermont looks for ways to address climate and energy literacy issues and retrofit schools to use less electricity and especially less fossil fuels for winter heating. Many articles cover changes in the agricultural sector, as the local food movement, farmers markets, community-supported agriculture and local food processing systems are growing rapidly. Vermont also has extensive forest resources and an expanding wood energy industry producing wood pellets and chips for winter heating.

Climate change features in a substantial number of articles as Vermont's seasons are changing and as severe weather impacts the state. And since Vermont leads the nation in addressing environmental issues, a significant number of articles cover legislation and governance issues. Relatively few articles address core issues of personal lifestyle and energy use, even though this is a major challenge for a society accustomed to abundant supplies of cheap fossil fuels. The Weekly Planet columnists have written the most on this challenging topic.

Compiling these articles for the past five years has confirmed our perception that an informed public facilitates environmental leadership within the community. A sense of connection is empowering for individuals and community groups.

But for the relation of our society to the Earth, the issues are deeper. The stability and resilience of complex natural systems depend on a network of interdependent connections. Creating a similar system with honest flows of information for our complex human society is essential, but difficult.

Power structures have traditionally controlled and manipulated information flows, fostering confusion and mistrust. But now that humanity is driving rapid environmental change that adversely affects the global ecosystem, the consequences of such misinformation are not just unsustainable — they are self-destructive.

In this context the role of the environment page is to facilitate an honest web of information imbued with a deep sense of our interconnections, one that inspires communities to reconnect to the Earth and face the critical challenges before us.

Looking ahead, we continue to seek feature articles that convey a story about the Vermont environment in a way that relates to global concerns. We also encourage articles linked to upcoming events: workshops, conferences, planning forums, rallies and other activities that offer opportunity for community involvement.

The realities of today's environment are daunting. But as we inform ourselves and work together we become empowered to face the many challenges of the 21st century and leave the world a better place for our children.

The writers would like to thank Randal Smathers for all his support of this project and our faithful Weekly Planet columnists over the years: Carol Tashie, Robin Chesnut-Tangerman, Elizabeth Courtney, Paul Scheckel, Sue Allen, Mark Skakel, Louis Porter, Steve Spatz and our newest columnist Sandy Levine. Thanks also to the many community members who have contributed feature articles about Vermont's environment.

c) Accelerating climate change brings more extreme weather (February 24, 2013)

<http://rutlandherald.com/article/20130224/ENVIRONMENT/702249905/>

This winter we have been experiencing alternate periods of freezing and thawing. I thought my gardening was over for the year when the ground froze hard by Christmas, until heavy snow fell and insulated the ground. Air temperatures fell below minus 10 degrees at night, but under the snow my garden soil thawed again.

Then when temperatures rose to 50 degrees, the snow melted. On Jan. 15, I was able to dig under more of my rye cover crop and prepare a bed for planting peas in a couple of months. Four out of the last seven winters, I have had the delight of digging the soil on warm days in January.

Winters are very variable. But on average, mean winter temperatures are warming twice as fast as in summer. The winter minimum temperatures are rising much faster than mean winter temperatures. This matters a lot because as the coldest nights get warmer, more pests can survive the winter. On the other hand, peaches can now be grown in parts of Vermont.

Paradoxically, warmer temperatures can mean more snow because warmer air can hold more vapor before it condenses. For this to happen, surface water must be available for evaporation. The Great Lakes, for example, are freezing much later than they used to. When cold air blows across ice, very little evaporates. But when cold air blows across open water, it picks up a lot of moisture — and this increases the lake effect snowfall downwind. This extra snow may actually help the forests of northwestern New York as the climate warms, because it supplies them with water from Lake Erie and Lake Ontario for winter and spring melt.

The intensification of coastal storms that we are seeing is also related, as ocean temperatures are warming. In the case of Hurricane Sandy in late October, we had heavy rain on the coast and heavy snow in the Appalachian Mountains.

Another example is the big winter storm, nicknamed Nemo, that dumped several feet of snow on southern and eastern New England a couple of weeks ago. Nemo formed when a frontal system coming from the west merged with a storm coming from the Gulf of Mexico that carried a lot of moisture. A powerful coastal storm — a nor'easter — developed and moved up the coast with strong winds and heavy precipitation that fell as snow over land.

Warmer temperatures over the Gulf Stream again caused more evaporation. A lot of energy is required to evaporate water. Over the ocean this energy comes from the sea, which has stored the sun's energy from the summer before. When the rising water vapor condenses again in clouds, this stored energy is released to the atmosphere. The result is intensified winter storms, with stronger winds and more snow.

We are less than a month from the spring equinox, and the days are getting noticeably longer. I still have plenty of garlic and butternut squash from last year that are delicious when baked. My spinach under glass is doing well — and to my surprise, a little unprotected kale is still surviving. Soon it will be time to plant my peas and get ready for another spring.

Climate change is accelerating, and we must prepare for greater extremes. This year I am thinking about how we can build more resilience into our communities.

What will you do differently this year to help the Earth and mitigate some of the damage from past decades? We need the Earth's help. That means working with her, rather than simply following our self-interests.

d) Climate change brings many surprises

(April 14, 2013)

<http://rutlandherald.com/article/20130414/ENVIRONMENT/704149916/>

This winter in Pittsford was again warm. Very few days had minimum temperatures below -10F. Periods of cold and snowy weather alternated with thaws that melted the snow.

In winter, cold air temperatures freeze the water in the first foot or two of soil. The deep soil temperature stays near 45F, much warmer than the air in winter. When snow cover insulates the ground from the frigid air above, the upward flow of heat from the deep soil can start melting the frozen soil from below. This happened more than once last winter.

I keep track of how long my garden soil is frozen by taking a shovel to my rye cover crop. To my surprise, I was digging again this year on March 11, the same date as last year when the winter was exceptionally warm. This year the unbroken period of frozen soil lasted a remarkably short 55 days, a new record. By March 24, I had turned over all my cover crop and was ready for spring — but until this past week, it was still too cold to plant!

March was generally cold in both North America and northern Eurasia because of a strong high pressure over Greenland, where it was unusually warm. This pushed the jet stream further south over North America, leaving us on the cold northern side. Models suggest that reduced Arctic ice cover contributes to this pattern. But oceans, ice and atmosphere are all linked together, and the climate is fast changing and showing new patterns.

Scientists are always a few years behind the curve in figuring out what is going on. We have been trying to understand why the strong global warming in the last 30 years of the 20th century appears to have slowed in the past decade.

Several recent volcanic eruptions have put aerosols into the stratosphere that scatter sunlight back into space, and this cools the earth a little. In the last decade rapid industrialization in China has spewed increasing clouds of pollution into the air, and this also stops some of the sun's warmth from reaching the ground. Unfortunately a new satellite designed to measure these aerosols failed on launch in 2011.

Meanwhile the deep oceans seem to be warming faster than before, but again we have little data. The sun has been a little weaker, and we have almost no idea what is happening inside it. The reduced ultraviolet light from the sun affects the upper atmosphere.

You may at this point think that we are getting in over our heads, and indeed we are. The earth system is extremely complex and mysterious. There is so much to learn — and so little time. But of course this approach is much too limited.

Society and many scientists are living in a dream world, thinking that if we could only understand what is happening to the Earth, we could fix it, or at least adapt to it — or perhaps even change our ways! We humans get fearful when we face something beyond our understanding or outside our control. It is not surprising that some find denial easier than facing an uncertain future.

Some things are very difficult to accept, such as the reality that even as we are responsible for climate change, we are not in control. We cannot manage the Earth — we can only manage ourselves and minimize our impacts on the Earth. We are so many people, and our industrial impact and our unmanaged waste streams are now so large that the Earth's atmosphere and oceans cannot absorb them.

We have the skills and resources to re-engineer our society, so why be stuck in the wasteful ways of the past? The sooner we realize this, the better — and the easier the transition will be for us all.

Spring calls us to take heart and plant new seeds of hope. My spinach that wintered over under glass is ready, and perhaps I can plant my peas this week.

e) Spring resilience and fossil carbon taxes

(June 2, 2013)

<http://rutlandherald.com/article/20130602/NEWS08/706029893/>

Spring was cool until the end of April and beginning of May, when maximum temperatures rose into the mid-70s with two weeks of bright sunshine. When there are no clouds in spring, the daily range of temperature between maximum and minimum reaches 35F. Night-time temperatures fell sharply under clear skies, but only to around 40F so we got no frosts. I planted my peas, lettuce and more spinach – since we had eaten all the spinach that wintered over under glass.



Then a slow moving vortex came up from the south, with a sudden shift to clouds and rain. This coincided with the spring transition that occurs when the burst of transpiration from the leaf-out of the forests cools the local climate. With more cloud cover reflecting the sun, daytime temperatures fell and there was less cooling at night. As a result, the daily range of temperature dropped to 20 degrees. We had a couple of light frosts in mid-May – so I covered the two cherry tomatoes I had planted.

Summit meetings have been popular this spring. Since it is politically incorrect to change our way of life and slow the pace of climate change, discussions have shifted to talking about adaptation and building communities that are resilient to climate change and weather-related disasters. This is absolutely necessary after our experience with tropical storm Irene.

For two decades, despite signing the 1992 Framework Convention on Climate Change, our country has postponed reducing our fossil carbon emissions. The argument is that we have always dumped our emissions at no cost into the atmosphere and oceans, so it is unfair to start charging for this now.

This policy has committed the Earth to a more extreme future climate. But the future has arrived, and the costs are mounting. Society is wondering how the costs can be paid — preferably by someone else — and whether we can avoid the worst consequences with better planning.

The frame of reference at one recent summit I attended was that we must do our best with the limited resources that are available and within the political constraints. Yet the Earth is not listening to what is politically correct, nor following economic models that discount the future. Essentially by burning the fossil carbon removed from the air by plants long ago in the Carboniferous Era, we are returning the climate this century to the tropical hothouse that existed 350 million years ago.

In the dark days of the Second World War, Winston Churchill said: “It is not enough that we do our best; sometimes we must do what is necessary.” We are not close to doing what is necessary. We are not having an open and honest discussion of the need to tax fossil carbon, both as an incentive for change and to build a fund to pay for the deferred costs. We consider that our way of life has been grandfathered in, that the Earth will somehow absorb all our waste streams. We consider it acceptable to discount the future — the future of the Earth and our grandchildren.

We create the future by our collective choices. Climate change is not an Act of God — it is the future we are choosing through our policies. If we reengineer our society to be more compatible with the Earth’s natural cycles, our communities will become more resilient. Every spring the Earth bursts into life, soaking up fossil carbon dioxide. But it is not enough to absorb all our current emissions.

Plant a garden to build local resilience in our food supply. The new solar farms are a step in the right direction for our electrical supply. But we need to demand a tax on the billions that Vermont pays for fossil fuel to pay for the deferred costs of increasing severe weather, and to nudge our economic system in new directions.

f) Extreme weather, climate change and the future of our planet (July 21, 2013)

<http://rutlandherald.com/article/20130721/Environment/707219943/>

When the pattern of the jet stream winds slows down, extremes increase. A nearly stationary jet stream pattern settled across North America this spring, and Vermont set new rainfall records for May and June.

In the western United States, drought and extreme high temperatures persisted. Record temperatures in Alaska exceeded 90 degrees. Fires devastated forests in Colorado, New Mexico and Arizona, with tragic loss of life. In Death Valley, daytime highs in late June reached 128 degrees.

People ask me: “Is this weather the new normal?” To understand what is going on with the Earth’s weather and climate we must look beyond the flooded valleys and cloudy skies of Vermont, take a global perspective and remember that everything is connected.

Because it is warmer in the south and cooler in the north, our winds generally blow from the west and get stronger with altitude. In past decades the jet stream winds typically blew strongly from west to east, and storms used to move quickly in the same direction – with a day of rain perhaps only once or twice a week.

For several years now the jet stream patterns in the northern hemisphere have been changing. The north-south amplitude of the waves in the jet stream has been growing, and the motion of the waves from west to east has slowed down. Forecasters talk about more frequent “blocking patterns,” meaning that the high and low pressure patterns slow down or stop moving.

Last month we had an extreme, persistent pattern where the jet stream went all the way north of Alaska, down into the Gulf of Mexico and then back up the Eastern United States. This created a warm ridge over the west that brought drought, record temperatures and forest fires.

But in our part of the country, storm after storm grew in the trough of this nearly stationary big wave pattern, bringing record rainfalls and some severe storms.

Once the ground is soaked, evaporation from the wet ground and wet forests feeds more thunderstorms the next day – and the cycle of more evaporation, more storms and more rain goes on. Flash floods become common because the saturated soil cannot soak up any more water.

This is a global shift affecting all of us that live in the Northern Hemisphere. Last month the British Meteorological Office held an emergency meeting of climate experts, because last summer, the wettest in a century, was followed by a prolonged winter and the coldest spring in 50 years.

Will it keep raining in Vermont? To break the pattern, we will need several weeks without rain to dry out the soil. In the past decade, nine out of ten summers have been wet. Last year was the driest in Vermont — but rainfall amounts were still average. But the central United States experienced severe drought last summer. In future years we too may get some dry summers.

Why is the weather changing? We think that the jet-stream patterns are shifting because the Arctic is warming and melting. But this change is new, and the links between Earth, atmosphere and oceans are complex. Years of observation and research will be needed to fathom what is happening. Scientists all over the world are working hard to understand this web of connections — much harder than most politicians.

When we drive an unstable climate system by burning 100 million years of fossil carbon in a century, we should expect some nasty surprises. It is past time to put a rapidly rising price on fossil carbon pollution to try and stabilize the climate system.

We all teach our children to share. It seems strange that we are so unwilling to share this beautiful planet that we inherited from our ancestors with our children and grandchildren.

g) Communities can build a more resilient society (September 8, 2013)

<http://rutlandherald.com/article/20130908/Environment/709089893/>

This summer I spent a week at Lake Bomoseen in western Vermont. Each morning I watched the sunrise and the wildlife, the fishermen, the children playing — and the power boats zipping by, having fun but going nowhere.

Without a clear vision societies drift. Our society has been drifting for some time, politically paralyzed because we cannot accept that the dream based on economic growth, fossil fuel and debt is unsustainable. Finding social consensus on a new vision is essential but difficult. New concepts have to meet general approval and not offend our sacred dogmas. They must be broad enough to embrace real world complexity and subtle enough that few oppose them.

One attempt: “We need to construct a sustainable society” did not get far, since many cannot accept that the historic post-war system is unsustainable. A new vision is: “How can we build a resilient society?” This is more subtle, as it is a way of recognizing that society is becoming more vulnerable without having to agree on why.

Building resilience is a multistep process. When disasters like Tropical Storm Irene devastate a community, governments and towns work together as part of the recovery process. It is fairly easy to reach consensus on reducing vulnerability to disasters that are fresh in our memory. There is debate, but out of that a common view can emerge. For example, it’s clear that rebuilding in floodplains makes no sense.

It is much harder to change our way of life to reduce the likelihood of future disasters, such as the ones we face as climate change accelerates. Here wise action often conflicts with business as usual. In deeply divided societies, government has much less power — and the farsighted must lead their communities in creating new options for the future.

A transition movement is spreading around the world. A major theme is one of helping communities plan for the future and build resilience. The Transition Network handbook lists two ingredients of a resilient community: diversity and modularity. (www.transitionnetwork.org)

Diversity of land use, economic opportunities and skilled people enable a community to respond flexibly to future challenges. The idea of modularity is that the collapse of one part does not bring down the whole.

Many of our globalized networks are becoming fragile because shocks can travel rapidly through them. The price of food or oil on the global market can change around the world in days. We saw the spreading economic collapse that followed the crash of the global financial system. A big solar flare could bring down our satellite-based communication, financial and navigation systems.

Resilience allows key aspects of the local community to be decoupled from the global system. This is where localization is important. Can we build a local smart electrical grid that can be decoupled from neighboring regions? Can our local food system support us if climate extremes threaten key crops elsewhere? Can our local banking system be protected from the vulnerable and speculative global system? Can we reduce our dependence on fossil fuel to minimize pressure on the climate and keep precious dollars in our community? Can we recycle more of our waste to cut down on its environmental impact?

Local control also builds resilience because it brings responsibility close to home and tighter connections with our neighbors. The farming networks in our communities can both build soil fertility and be responsive to our needs. Locally we can ensure pesticides and pollutants are kept out of our food. But we have little knowledge and no control if our food comes from far away, where costs are lower and environmental regulation is weak.

We can draw on experience and wisdom from across the world, as we support and encourage those who are building our local communities and resources. Caring for each other will create a living future for Earth’s children.

h) Collaboration can solve our Environmental Challenges (October 27, 2013)

<http://rutlandherald.com/article/20131027/ENVIRONMENT/710279870>

Although a few colder areas in Vermont had a frost in September, we had no killing frost in Pittsford until practically the end of October. This past week my garden was still producing a few summer squash on long vines, and a second crop of volunteer tomatoes was ripening. These sprouted out of the compost made from the organic waste from the Rutland Food Co-op.

The beauty of gardening is the close contact with the natural world and its endless surprises. The first fall frosts have been getting noticeably later this past decade. My latest so far was October 27 in 2011. So far this season I still haven't planted my winter rye cover crop.

High above the flood plain of the Otter Creek, I can contemplate the surreal collapse of the federal government from afar.

The long weekend of October 9-13 was gloomy in the nation's capital. Furloughed government employees suffered in silence through more than 6 inches of rain, while a frustrated tea party slowly drowned in the dismal deluge. The remains of tropical storm Karen formed a Nor'easter which stalled over Congress for five days, as a reminder that the Earth's changing climate does not answer to the so-called leaders-of-the-free-world. Memories are so short – Congress has long forgotten the blizzard that crowned the January 1996 shutdown! And with the government computers inaccessible, real data was missing.

The United States was founded with a Constitution that divided responsibilities and powers, because the colonists were fearful of monarchs and dictators. They set up a collaborative democracy, where no one person was in command, to debate and decide what would benefit the people. It was a powerful vision that has worked for a couple of centuries – as long as the President, Congress and Supreme Court, remember that the good of the whole, the nation and now the planet, depend on their collaboration. As that has decayed into polemical narcissism, gerrymandering and financial extortion, the American dream and constitution are crumbling. Trampling on the U.S. Constitution is a bit like destroying an ecosystem – it is very hard to put it back together.

What can the natural world teach us about our interdependence and about being grounded in the real world? When I talk to groups in Vermont — whether high school students or citizens groups — I remind them that we need roots in the natural world, if we are to work with the Earth and solve some of our complex environmental challenges. This connection is a source of trust and hope that frees us to be creative, responsive and make wiser choices.

The global environment won't wait for the foolish who are disconnected from reality. We have a short window left – a decade or so – when we can work with the Earth, reduce our waste streams, particularly our CO₂ emissions from fossil fuels, build an efficient society and reduce the climate change we face.

This speculation leads me to another: We the people could impose a congressional wasted-time tax. We would stop paying federal income taxes whenever the government shuts down and put the money into a trust fund to build climate change and disaster resilience. This month's shutdown would give us a good start of \$50 billion. We could invest this wisely on the local scale.

Meanwhile, let us bring the fruits of our harvest to support those community groups who lead where our 'leaders' fear to tread. We will need new forms of adaptive governance to build resilience in changing times. The creative vision will have to come from us.

i) Climate Change is a moral issue

(December 15, 2013)

<http://rutlandherald.com/article/20131215/ENVIRONMENT/712159897>

As winter arrives, my Brussels sprouts are still doing well. I've planted more lettuce, spinach, and kale in cold frames to see what will come up in the spring.

For years I have suggested that more snow means colder winters, since snow reflects sunlight. Last Christmas I was given 60 years of data from the Canadian Prairies, and I found the cooling of the climate with snow was even larger than I had expected.

When snow falls on the prairies, the temperature drops by as much as 18 degrees. As a result, the mean temperature of the cold season is directly related to the fraction of days with snow cover. Less snow means warmer winters.

Snow cover acts like a climate switch that shifts the climate to a much colder state. In Vermont the drop of temperature with snow cover may be less than for the Canadian prairies. Here we have much more forest cover, and snow under trees reflects less sunlight.

But there is a second cooling effect that is the same everywhere: Snow on the surface evaporates very slowly. This means that the air in winter contains less water vapor, which is a strong greenhouse gas. Consequently the Earth can cool more at night.



Fresh snow (16 December 2013)

This month I have been thinking about how climate change is no longer a scientific or technical issue, but a moral issue. Twenty years ago humanity made the commitment to reduce greenhouse gases from the burning of fossil fuels, but we have not kept this promise. We know what to do — double our energy efficiency and move towards renewable energy as the primary source for our power.

We have done a little. But even in Vermont the protests against wind power and now photovoltaic panels have been growing. People don't like change. Why can't we do things the way we have always done? Please don't make us pay more for the long-term costs of fossil energy.

The Earth is responding with increasing extreme weather, and people are suffering. All we have really done is push the ever-rising costs into the future, where they far exceed anyone's ability to pay for them.

To avoid change now and to save some money now, we are condemning our children, the poor and the Earth to immense suffering later this century. This is clearly unjust and immoral, when we know what we could and should do.

Add to this picture the proposed new gas pipeline south to Middlebury and west to Ticonderoga, N.Y. The ads say it will bring cheaper fossil fuel, because of the current boom in fracking. They also point out that burning natural gas, methane, produces fewer CO₂ emissions than burning oil.

But the ads are silent on the key Earth issues. The fossil fuel we have already extracted has committed us to large changes in the climate. It is time to stop developing new fossil reserves.

Nor do the proponents of the natural gas pipeline mention that most areas have moved ahead on fracking with little regulation — and that every new gas well pollutes the water and leaks some methane, a much stronger greenhouse gas than CO₂. Nor are we told that production from these wells declines in a few years, so the cheap supply depends on continually drilling new wells that will also leak methane.

Global atmospheric methane is rising with the boom in fracking. But because the industry is not obliged to measure the leakage from its wells and infrastructure, we cannot yet show the causal link. The refrain is the same — save money now and don't worry about the long-term costs.

The cold weather has arrived. Last session the Vermont legislature failed to pass a measure that would tax heating oil to pay for home energy efficiency improvements — even though the return on investment through reduced fuel costs is only a few years. This too shifted costs that are 50 times greater to our children and grandchildren, and to the Earth itself. Clearly this is a moral issue.