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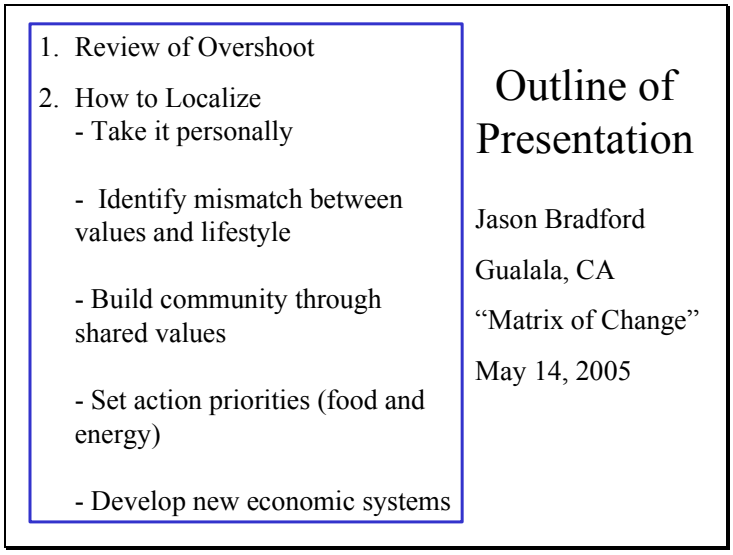
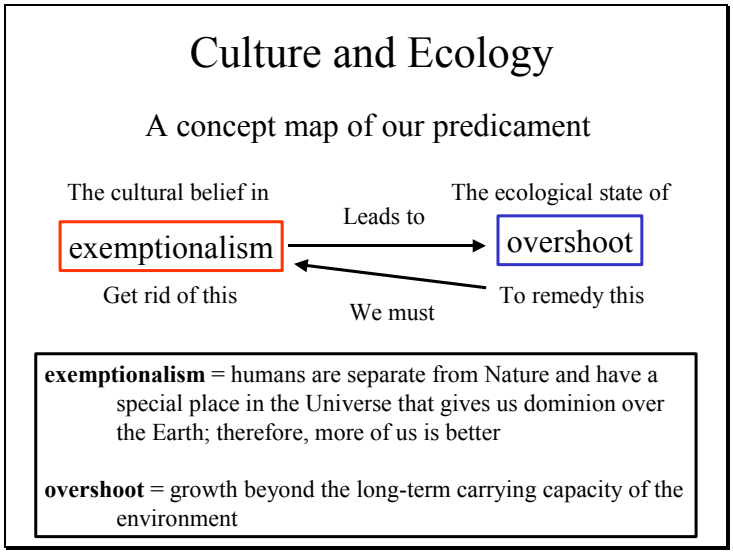


My presentation will briefly touch upon the essential concepts of overshoot and carrying capacity. It is also necessary for leaders to understand the psychological responses people have to this information, why denial is so common, and why it must be overcome. I will then describe why Economic Localization is the logical response to our predicament, and discuss the process of making this happen using examples from Willits.

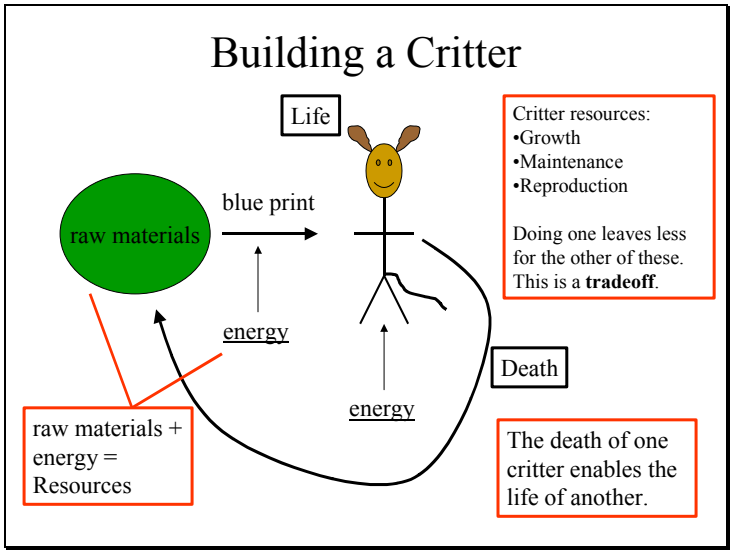
Slide 2



The problems are twofold: the ecological dilemma of overshoot, and the cultural belief called "exemptionalism."

To "solve" overshoot, we need to tackle the cultural belief system that has allowed it.

Slide 3



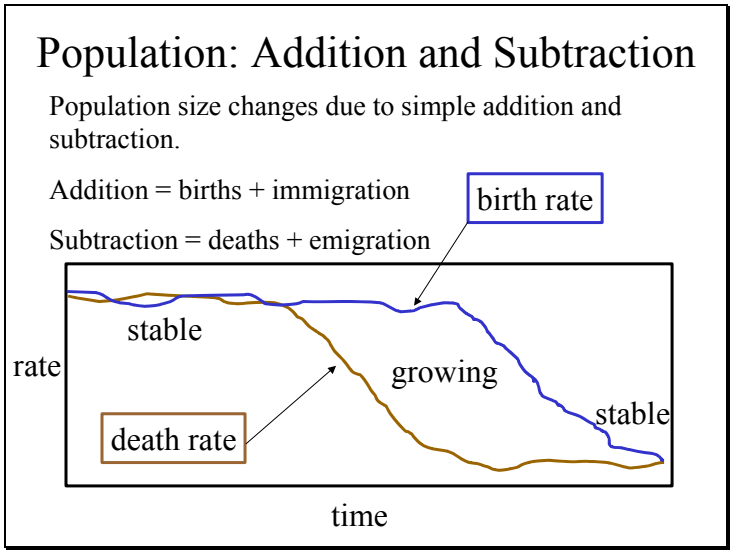
I am going to begin with some basics of biology.

Every critter requires materials and energy to construct.

The energy and materials that make up one critter become those of another. Everything eats something else.

But overall, there can be only so many critters in the world because the mass of the Earth and the input of energy (mostly solar) is finite.

Slide 4



Population change is really based on simple addition and subtraction. Additions include births and immigration, subtraction includes deaths and emigration.

A population changes when rates of birth or death (and immigration or emigration) are unequal.

Ignoring migration for simplicity, a stable population can have either high birth and death rates or low birth and death rates. Population growth can occur even when birthrates are falling as long as death rates remain lower.

Populations can grow when they can out compete others and incorporate more energy and nutrients into themselves.

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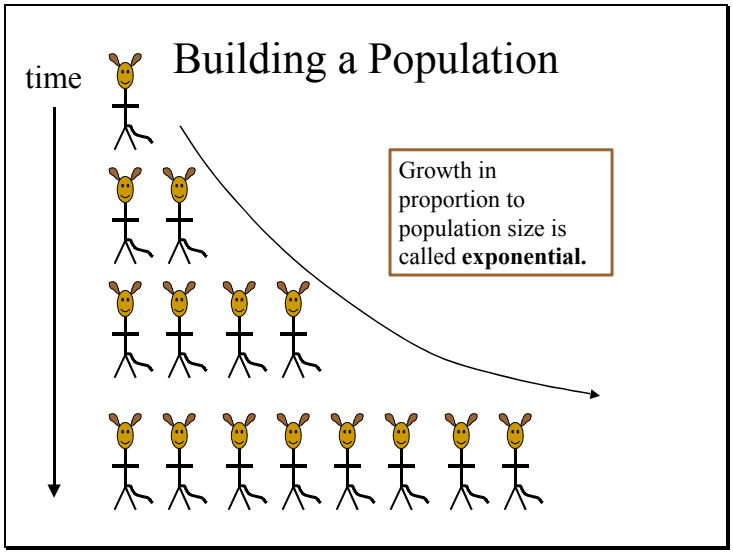
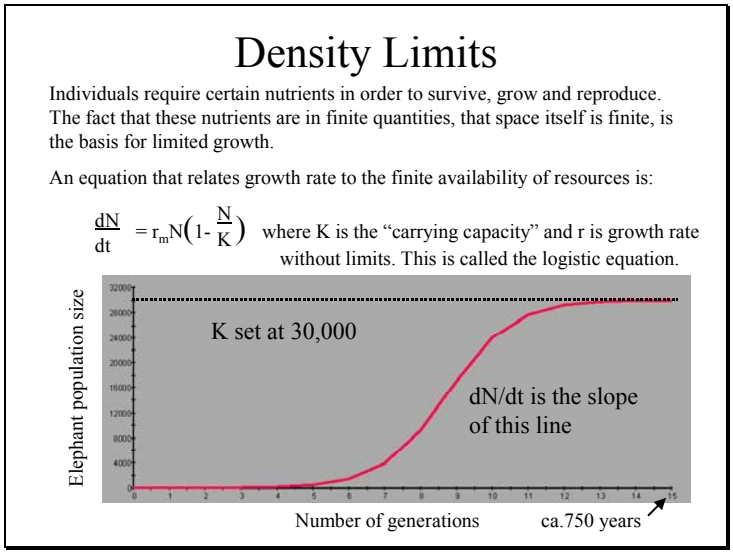


Populations of critters have the structural capacity to grow in proportion to their population size. This is called “exponential” or “geometric” growth.

You can get a sense of this by imagining two critters mating to produce four critters, those four mating to produce 8, those 8 produce 16, and so on….

The inherent capacity for this form of growth can be observed in nature and described by particular equations.

Slide 6



Individuals require certain nutrients in order to survive, grow and reproduce. The fact that these nutrients are in finite quantities, and that space itself is finite, is the basis for limited growth.

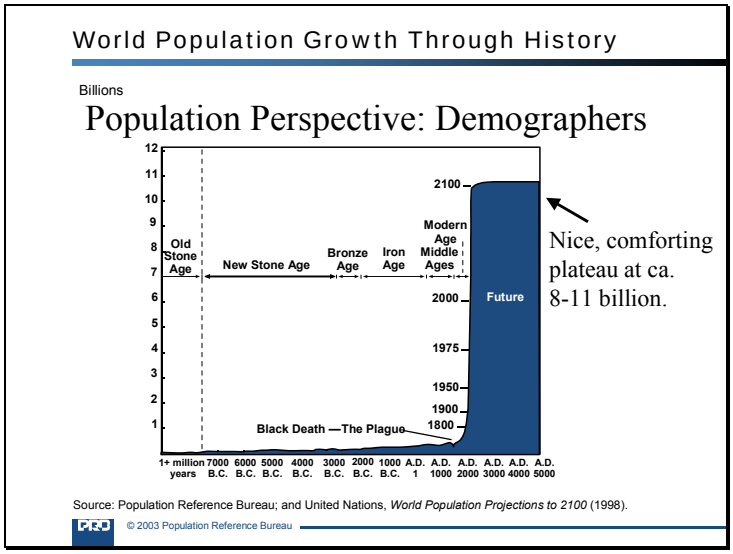
It simply takes more work to obtain resources when they are in short supply, and because there are tradeoffs between individual survival, individual growth and reproduction, the population reaches a point where it can no longer grow. Death becomes as frequent as birth.

For example, if there are only enough resources to support 30,000 elephants, an initial population of 2 will reach that level in ca. 750 years.

Looking at the equation, you see two components. The rN term means that the population will get bigger in proportion to its current size. This is what we already discussed.
The second term, in parentheses, shows that as N approaches K, the term 1-N/K becomes close to 0, meaning no more population growth. If N becomes greater than K, the population will decline.

If the negative feedback between population size and rate of growth is instantaneous the population will never go beyond K.

Slide 7



The academic discipline that studies the population of the human species is called demography. If you study the reports and literature from this field, you will see that it universally foresees a future of high but stable population. It looks like a plateau similar to the graph from the logistic equation, but it is not based on that equation and in fact uses a different set of assumptions. It assumes that people will become wealthy and chose to have fewer children.

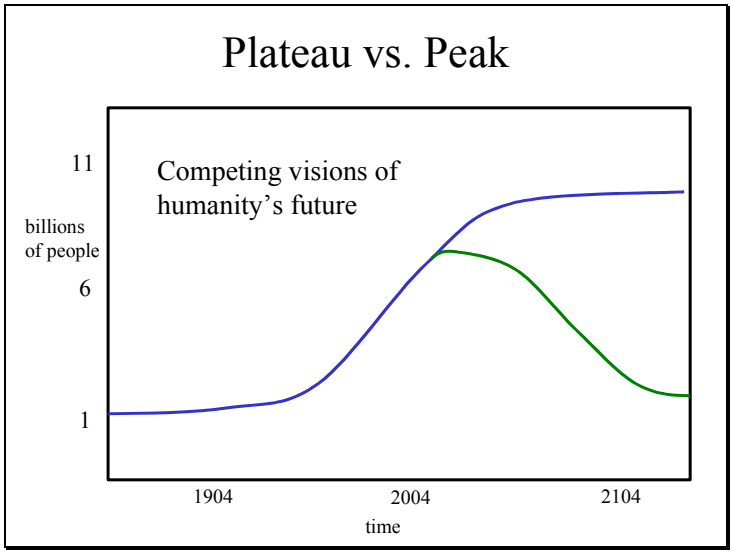
But models are only as good as their assumptions, methods, and underlying data. Demographers adhere to the Cornucopian paradigm, meaning that humans are exempt from natural laws.

Here you see the politically desirable plateau view from the United Nations population experts. The big upswing occurs about the time people begin using fossil fuels to build Industrial Civilization. Before this point, energy income was from above ground sunlight. Since then, our energy has come from below ground, buried sunshine—lots of it!

A more detailed note on methods of demographers. Human demography uses large data sets called "life tables" that are usually organized by nation. The number of males and females in a nation are sorted by their age, from 0-1, 1-2, 3-4….80-81…and so on. Estimates are then made, often using historical data, on the death rate (also called mortality rate) per age class. For example, a higher percentage of 80 year olds will die in a year than 20 year olds. Estimates are also made of the birth rates (also called fertility rate) of females. For example, 13 year olds will have a lower fertility rate (or births per year) than 25 year olds, and 40 year olds will also be lower than 25 year olds. The population growth is projected using these parameters. This method tends to be accurate for short time periods, say up to 10 years in the future, but adjustments are needed as the mortality and fertility rate functions change. The basic assumption of demography is that economic "development" will lead to both low mortality and fertility rates, eventually causing population stability. However, because mortality rates fall before fertility rates

do, a period of population growth is expected. The problem, from an ecological perspective, becomes the fact that this population growth has placed humans into an overshoot phase, meaning there will be no permanent plateau, only a decline. Because the environment, through carrying capacity factors, is not included in the human demography model they are largely blind to this dilemma.

Slide 8



In fact, there are differing views of the future of humanity in terms of population dynamics and means of livelihood.

One envisions a population plateau in which we are all well-off and the world is at peace.

The other envisions a population decline that will be disruptive to say the least. But how bad it will be depends upon how we plan and react. It may not be that bad at all, or even nice, if we do a good job at making a transition. I suspect some places will be horrible and others not so bad off.

Slide 9

Four Means of Overshoot in Humans

How overshoot can occur:	How they apply to humans:
1. Feedback lag	1. Demographic momentum
2. Decreased carrying capacity due to changing environmental conditions	2. Pollution, soil loss, and climate change affect food production
3. Ecological release from competitive and parasitic species interactions	3. Modern medicine, pesticides and herbicides, removal of predators and competitors for livestock and crops
4. Unsustainable drawdown of resources	4. Depletion of fossil fuel and ground water reserves

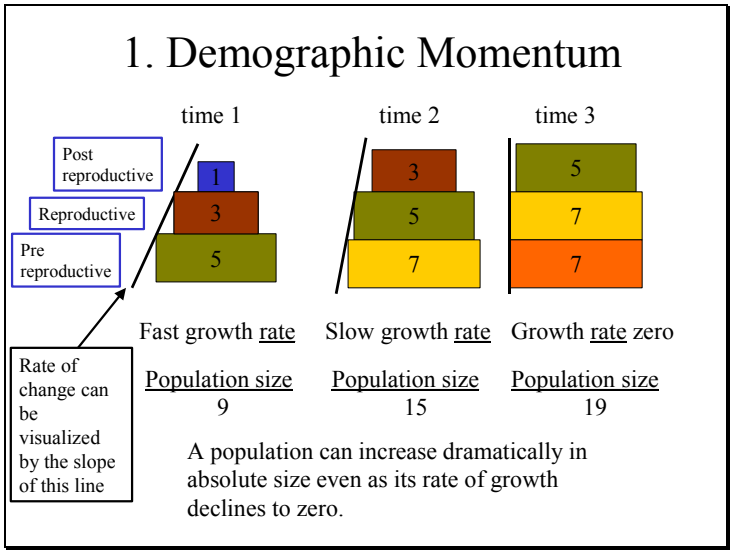
Let's look at human population with an ecological paradigm. What questions do we ask and what do we find?

First, the natural question arises: Have humans overshot the world's carrying capacity?

Overshoot can occur in the following ways:
a feedback lag on density-dependent mortality and reproduction
a lowering of the carrying capacity due to changing environmental conditions
a release from species interactions
an unsustainable drawdown of resources

There is compelling evidence that human population is in an overshoot for all these reasons.
Uneven age distributions causing demographic momentum
Pollution, climate change, soil loss and resulting threats to food production
Modern medicine, pesticides and herbicides, removal of predators and competitors for livestock and crops
Depletion of fossil fuel and ground water reserves
We will examine more closely the evidence for overshoot in humans.

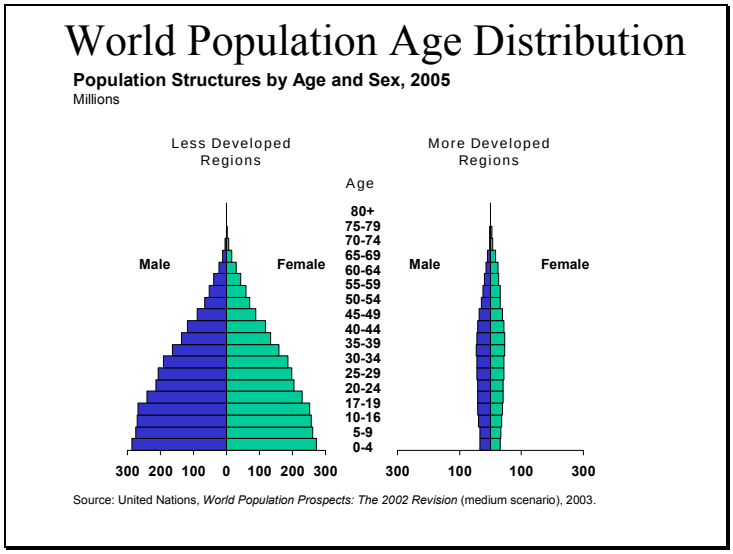
Slide 10



It is difficult to slow down the growth of a rapidly expanding population because of the age structure and its inherent capacity to grow. This is referred to as "demographic momentum," and it results from uneven age distributions.

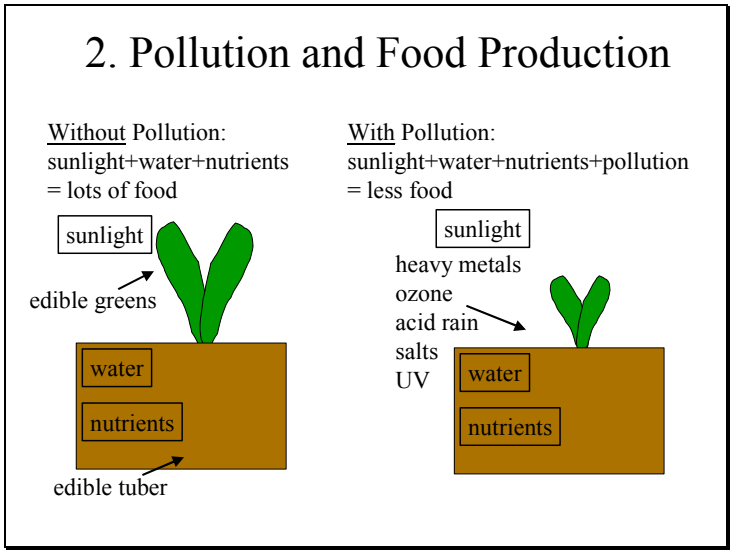
We see how this works if we simplify the age structure diagram into three classes: Post reproductive, Reproductive and Pre reproductive. Beginning with an uneven age structure and progressing over time to an even one still leads to large gains in absolute population size. This is because those in reproductive age are still likely to reproduce, even if it is at a lower rate than the previous generation, thereby "propelling" a population into a potential overshoot.

Slide 11



Most population growth is expected to occur in pre or early industrialized countries because of demographic momentum.
Roughly one-third of the population in less developed countries is under age 15. In many sub-Saharan African countries, this proportion rises to nearly one-half of the population. In contrast, less than one-fifth of the population in more developed countries is under 15. Today there are more than 2 billion young people below age 20 in less developed regions—the age cohort that will soon become the world's newest group of parents.

Slide 12



Wastes that are slow to decay in the environment and hinder biological growth or health are pollution.

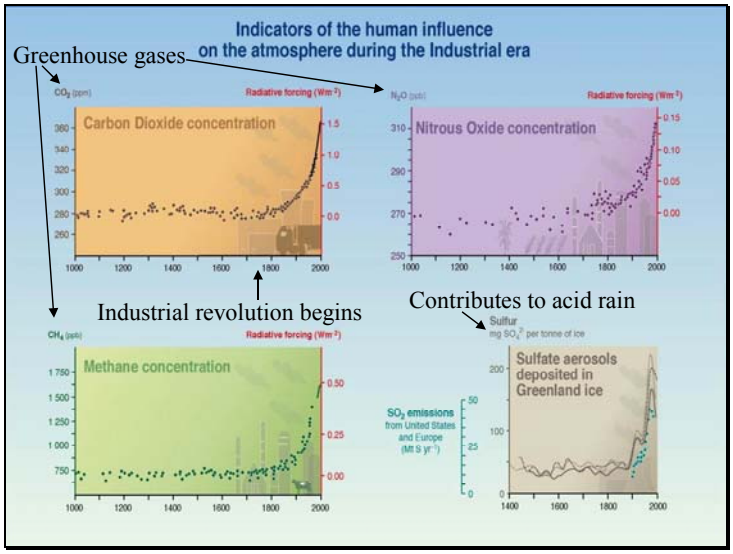
Pollution makes nutrients and water more difficult to obtain.

Energy spent coping with pollution is not spent growing. Remember the concept of tradeoffs.

We eat what plants can give us in terms of their growth and reproduction.

When populations create their own pollution, they are actually lowering their own carrying capacity.

Slide 13



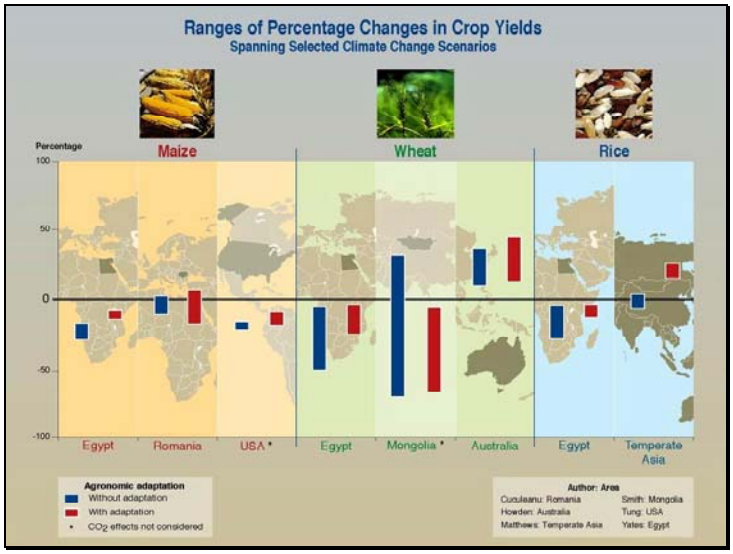
The rapid growth of industry has led to an equally rapid growth in environmental pollutants. This graph shows mainly those going into our atmosphere by fossil fuel burning. Many other pollutants could be looked at as well, such as heavy metals like mercury to artificially created persistent organic pollutants from the chemical industry.

All these pollutants are detrimental to human health and essentially undermine our ability to eat.

But why then have food yields been increasing? We'll get to that when discussing "drawdown."

Source:
http://www.ipcc.ch/present/graphics/2001syr/large/02.01.jpg

Slide 14



Greenhouse gases are a form of pollutants that change the atmosphere which in turn changes the climate.

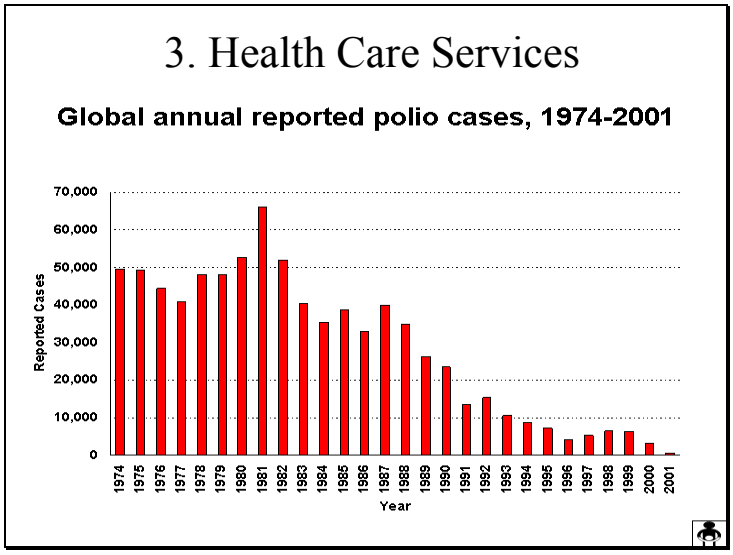
Most crops are expected to have a lower output of food given models of future climate.

Ironically then, our use of fossil fuels, which has given us such high crop yields, is also reducing our capacity to grow food.

Source:
http://www.ipcc.ch/present/graphics/2001wg2/large/08.01.jpg

Note on flawed assumptions of the crop models: 1) continued existence of unsustainable industrial agriculture, 2) only average temperature change modeled, not temperature variance nor precipitation, 3) for adaptation: temperature changes can be predicted and new strains can be bred and utilized in anticipation of future climate.
Even so, food output in most regions down 20% to 50%

Slide 15



Health care services have worked as intended. The most important inventions for preserving lives have been antibiotics and vaccines. This has essentially removed an element of species-interactions that usually keeps populations below carrying capacity.

We have done the same for those species we rely on for food, e.g., pesticides, herbicides, antibiotics for livestock, elimination of predation on livestock.

Source:
http://www.who.int/vaccines-surveillance/graphics/htmls/polcases.htm

Slide 16

4. Resource Drawdown

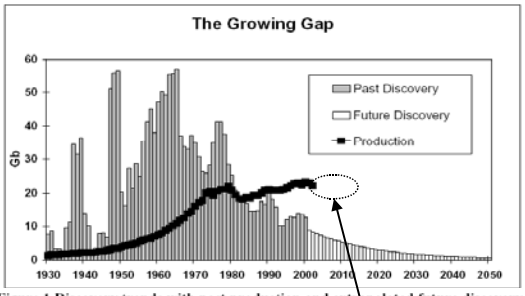


Figure 1 Discovery trends with past production and extrapolated future discovery

Rate of resource drawdown is now "peaking" while demand climbs.

"Peak Zone" ca. 2005-2010

We could discuss many resources here. Ancient stores of below ground water, or aquifers, are rapidly being depleted. Forests are being felled faster than they can grow back. Mineral ore deposits are declining in quality and abundance, etc.

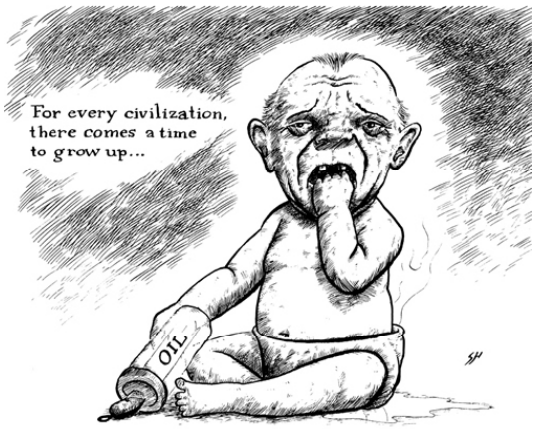
But I will focus on fossil fuels in particular for two reasons:
1. this example illustrates the same principles as all others, and,
2. energy availability largely enables the drawdown of other resources, e.g., pumps for water, chainsaws, bulldozers and drills for deforestation and mining.

Of course a resource needs to be found before it can be used. With oil, we are finding much less than we use.

Graphic from:
"Oil Depletion—The Heart of the Matter" by C.J. Campbell
http://www.oilcrisis.com/campbell/TheHeartOfTheMatter.pdf

Slide 17

Can We Not Throw Tantrums?

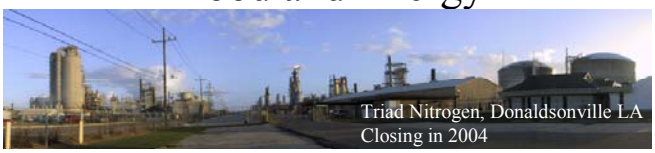


I am a bit worried about how people will react when they eventually realize they can't keep having more, that the Earth has gone bankrupt. We have a culture where many hope to get something for nothing. Will we grow up peacefully or throw tantrums?

Graphic from:
http://www.globalpublicmedia.com/art/381

Slide 18

Food and Energy



•Industrial fertilizer plants use **natural gas**

•Tractors, pesticides, water pumps, food processing, transportation, food storage—all rely on **fossil fuels**

•The "**Green Revolution**" is based on unsustainable farming practices

"Modern agriculture is the use of land to convert petroleum into food." Albert Bartlett

I also worry about real deprivation. To understand why, start thinking and doing some of your own research on how energy and food are connected.

Pictured here is a prime example. Fertilizer factories have doubled global the supply of nitrogen available to plants (mostly crops) and animals (mostly humans). This has provided an essential nutrient to agriculture that otherwise imposes a limit on the amount of food we can grow. In addition to artificial fixation of nitrogen, there's the mining of phosphate rocks and limestone using heavy equipment, and the shipment of these fertilizers around the planet.

In fact, for each food calorie produced in a "modern" farm, several fossil fuel calories are burned.

Quote from Albert Bartlett, Professor Emeritus, Physics Department, University of Colorado, Boulder, CO

See also:
Why Our Food is So Dependent on Oil by Norman Church
April 2nd, 2005 http://www.321energy.com/editorials/church/church040205.html

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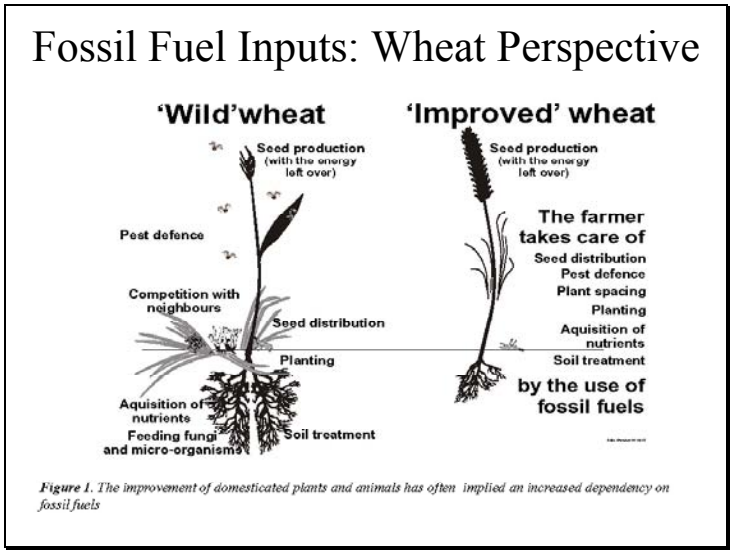

I am a biologist, so I understand that plants can only give us what they can produce in excess. This gets back to tradeoffs again. Our farming system has achieved high yields only by using fossil fuel energy to replace the work usually done by the plant.

Source of graphic:
http://www.holon.se/folke/written/stuff/ines/INES.pdf

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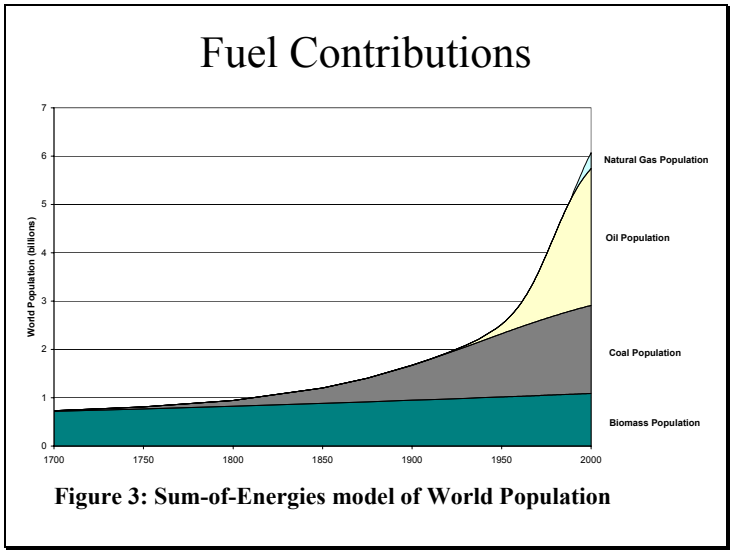


Figure 3: Sum-of-Energies model of World Population

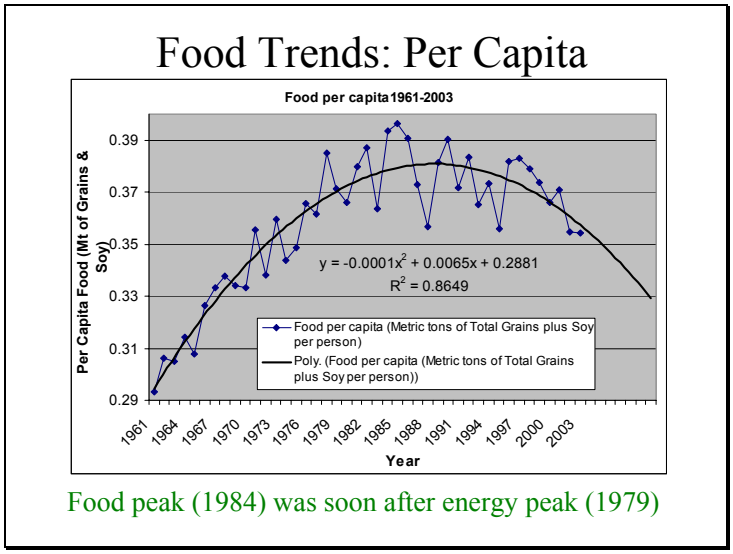
Fossil-fueled energy has enabled humans to raise food production and out compete other animals and take over more and more of the productive capacity of the Earth, so in a sense we are "eating fossil fuels." The contribution of different sources of fossil fuel towards human population increase has even been calculated over time.

A review of fossil fuels and food titled "Eating Fossil Fuels" is available here:
http://www.fromthewilderness.com/free/ww3/100303_eating_oil.html

Graphic from:
http://dieoff.org/page199.htm

A published paper related to this url is:
Campbell, Colin J., "Petroleum and People," *Population and Environment* 24(2), November 2002, pp.193–208.

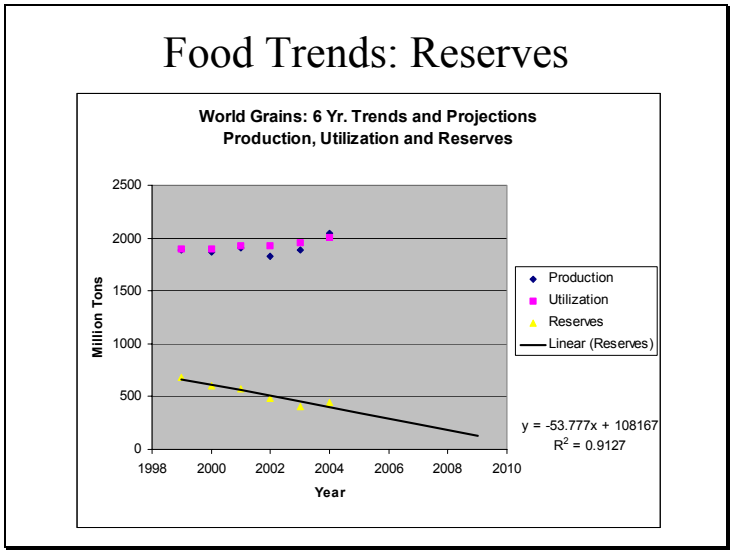
Slide 21



Even with fuel supplies still abundant, the destructive activities of modern agriculture and showing diminishing returns. Global per capita food availability, measured as total grains (wheat, rice, corn, barley, oats, sorghum) plus soy, peaked in 1984 and is on a steady declining trend with 2003 levels at a 27 year low (data from: http://www.fao.org/waicent/portal/statistics_en.asp). A second order polynomial regression of the data suggests not an increase or near-term stability of food supply but a steep per capita decline. The same data used in this figure show a decline in total (not just per capita) food production since 1999; with grain reserves now considered dangerously low (FAO, 2003). Most likely, fisheries have also peaked in absolute catch levels (Hilborn et al., 2003).

We still have lots of food, plenty to feed everyone and more in fact, but are now likely entering a decline. Trying to overcome this by deepening our dependence on modern agriculture would be the worst response. The best response would be to: 1) transition to sustainable agricultural systems and moderate the decline rate, 2) improve food distribution efficiency to avoid social instability due to rising food costs, and 3) focus on reducing fertility rates so that total human population declines no slower than the decline in food supply. If we falter, population will eventually decline due to higher mortality rates, a more painful “solution.”

Slide 22



For most of the past several years, consumption of food (measured in grains, which are ca. 80% of world food supply) has been greater than production. This over consumption has been possible by drawing down reserves. It is quite possible that grain reserves will run out by the end of this decade. Prices would skyrocket and there would be no cushion remaining for emergency relief.

Grains are used very inefficiently. The global trend has been towards greater meat consumption. More than half of grains (70% or so) are used for animal feed in the U.S. A change in the average diet away from meat consumption would provide more time to alleviate this trend.

Data used in this graph from the FAO http://www.fao.org Look for the Food Outlook publications, available online.

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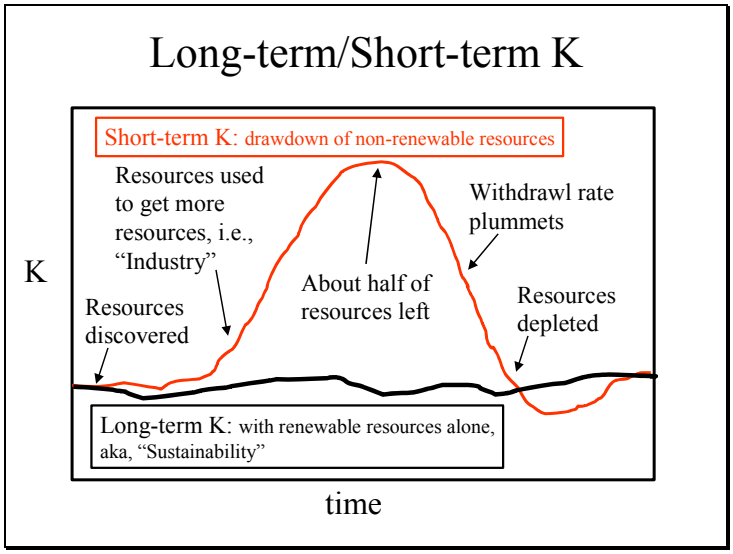


Some resource pools are replenished naturally at such low rates relative to meaningful human time scales that we call them "non-renewable." Fossil fuels and ancient aquifers are a couple classic examples.

Essentially what happens with the drawdown of non-renewable resources is that K is temporarily increased. This is the "short-term K" and may be referred to as a "windfall."

When populations use only renewable resources, and do so carefully, this can be viewed as the "long-term K," and also goes by the name of "sustainability."

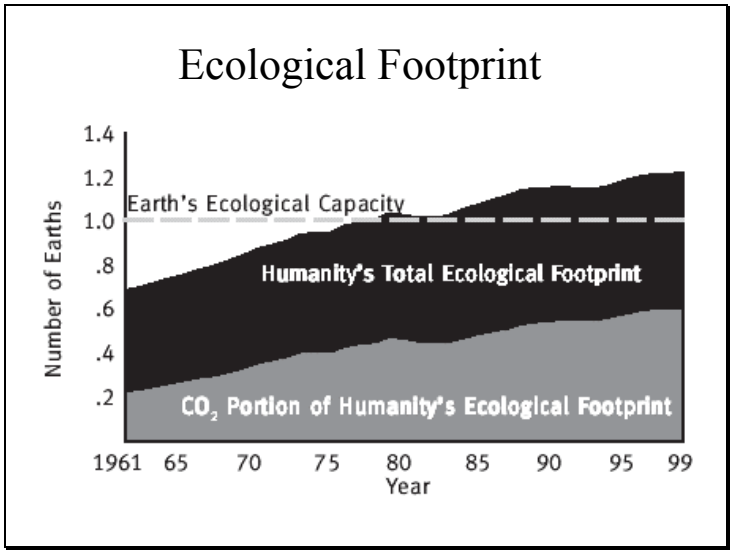
The excess carrying capacity provided by short-term K is called "temporary" or "phantom" carrying capacity by Catton.

See: http://www.greatchange.org/footnotes-overshoot-graphs.html
http://www.greatchange.org/footnotes-overshoot.html

Populations in overshoot damage the renewable resources, such as topsoil loss, polluted air, land and water, and K eventually drops below the level it would have been if the population had only relied upon renewables for its maintenance.

Note that with humans, many people utilize far more resources than are required for basic necessities. Less people can be supported with high rates of resource consumption than with low rates of resource consumption. So asking the question: "What is human carrying capacity," will receive the reply, "What is the per capita resource consumption rate?"

Slide 24

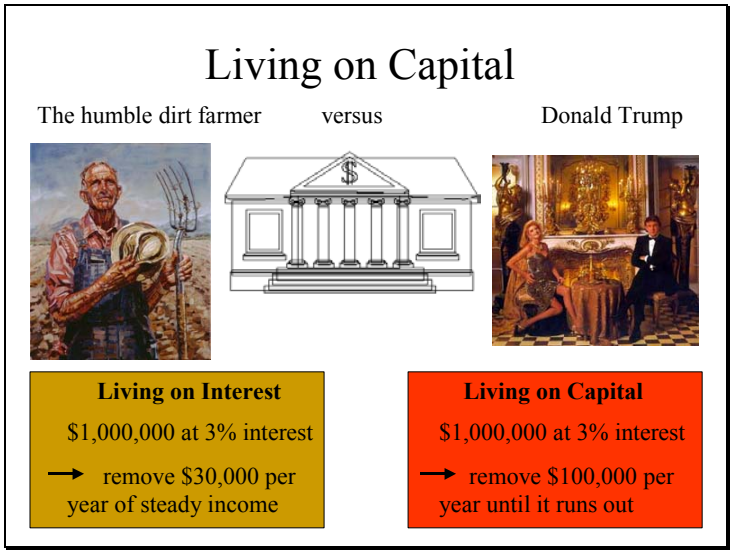


How far overshot are we? A very conservative estimate comes from the Ecological Footprint analysis. In 1999 humans were at least 20% beyond a sustainable economy. The Ecological Footprint is conservative because it does not measure the erosion of topsoil, the influence of pollution on biological productivity, or the dependency of an economy through its built infrastructure on the rapid drawdown of non-renewable resources. It does measure the biological production capacity needed to absorb some of the wastes of economic processes (e.g., acres of forests needed to counter fossil fuel emissions). In reality then, our overshoot is probably much higher than suggested here.

See:
Wackernagel, M., et al. 2002. Tracking the ecological overshoot of the human economy. Proceedings of the National Academy of Science 99(14): 9266-9271. http://www.pnas.org/cgi/content/abstract/142033699v1

Also:
http://www.myfootprint.org

Slide 25



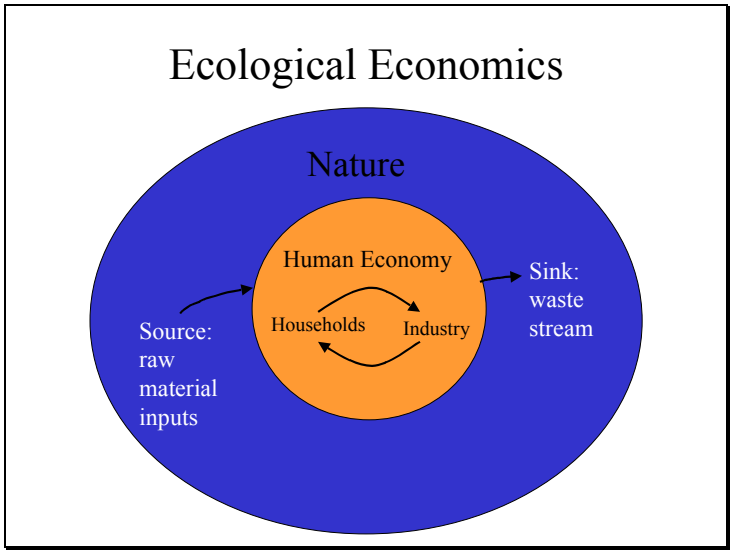
How does a population survive if more than one Earth is required to support it? The analogy often used to explain this goes as follows: Imagine you have a bank account with a large endowment. If you withdraw only a modest amount, you can live off the interest accrued. On the other hand, if you spend wildly you can have fun but burn into the capital and then go bankrupt. Many people seem to want the short-term prestige of wealth even at the expense of their long-term security. Maybe it has something to do with so-called sexual selection?

Scientists are telling us that our economy is essentially living irresponsibly off of Nature's Capital instead of drawing from it modestly as an endowment.

See:
Herman E. Daly & Joshua Farley. 2004. Ecological Economics: Principles and Applications. Island Press: Washington, D.C.

http://www.ecoeco.org/
http://www.steadystate.org/

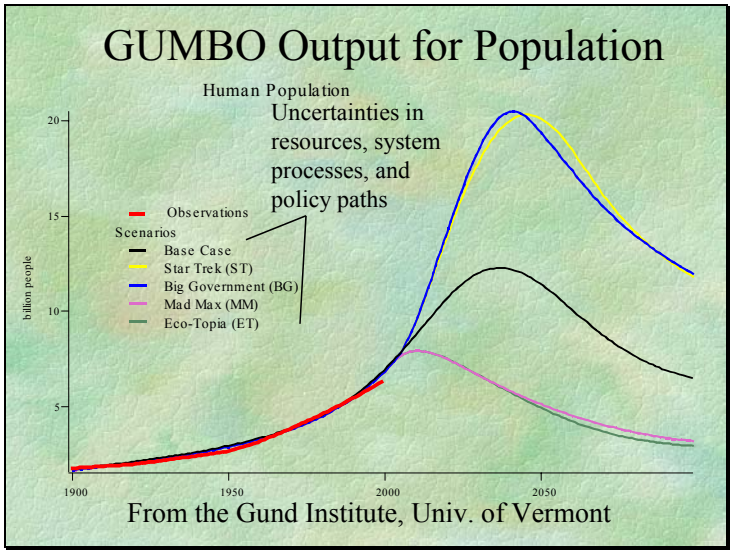
Slide 26



In the conceptual framework of Ecological Economics, the human economy is a subset of the Earth system. Nature provides the inputs to the human economy, and the outputs are wastes that nature must deal with. The human economy should not become larger than the ability of nature to support it, either with respect to the generation of raw material resources (Source) or the build-up of waste (Sink). Once this basic principle is understood, questions regarding the appropriate scale of human activities are paramount. If the human economy gets too big, nature can't provide for all our demands indefinitely.

Note that the current form of dominant economic thought, neoclassical economics, tends to restrict itself to the domain of the orange circle. The "circular flow" model between households and industry is not placed within the context of natural resources or effects of pollution on ecosystems.

Slide 27



Ecological Economic models can be applied to questions of human population. The GUMBO model permits exploration of a range of uncertainties in both resource availability (including technological gains) and public policy investments (e.g., education, health care, built infrastructure, ecological restoration).

This is called a systems model, and in such models cause and effect are obscure. The interactions and feedback loops defy simple cause-effect relationships.

Note: Given what I've seen of food production trends and fossil fuel depletion data, I believe the Mad Max or Eco-Topia scenarios are more likely than the others—which assume few resources limits. Data regarding peaks in energy and food are more in-line with the low population scenarios.

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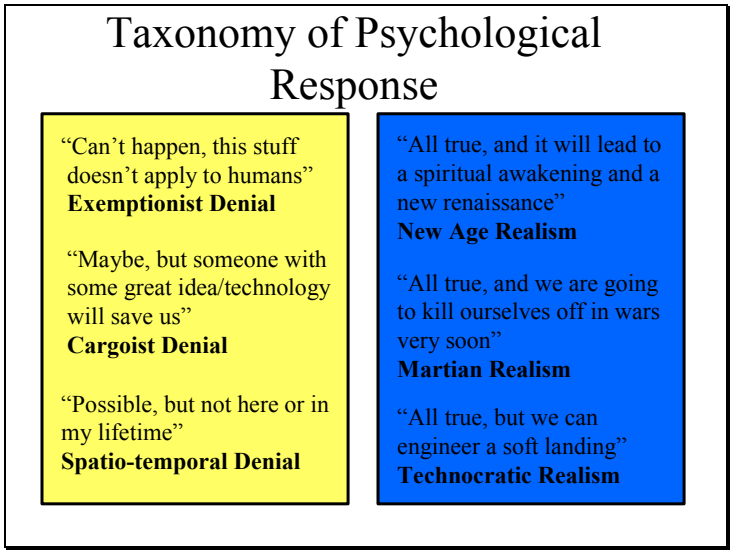
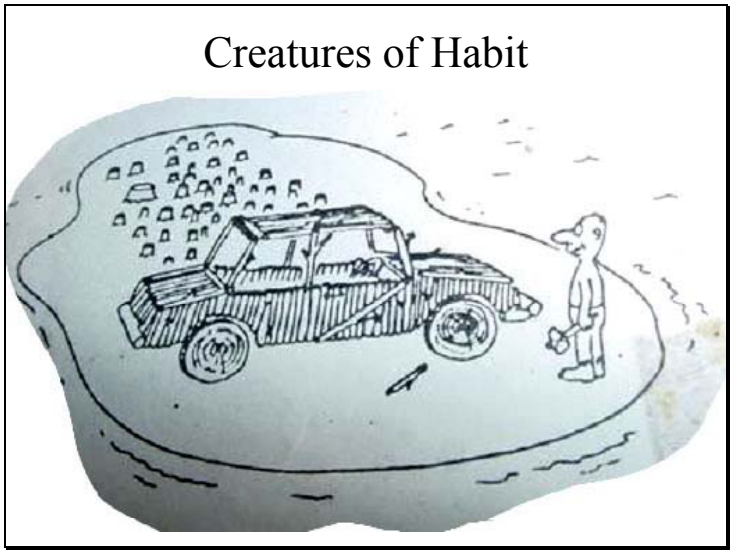


These are a range of typical responses one finds in reaction to the concepts of overshoot. Very often, people will find a bit of all of these within them, but many tend to gravitate towards one or a pair of these and look for information that supports their view.

Slide 29

It is important to move people out of denial. The trouble with denial is that it leads to complacency. If we carry on as we are, everything is not going to be okay. So we must accept change.

Slide 30



We are creatures of habit and these habits can lead to irrational behaviors in the face of new circumstances. If we think of Earth as our island will we be more careful with it? A local economy allows us to see the consequences of our actions, as if we were on an island.

Slide 31

We are awed by our technology, but this can lead to dangerous hubris. Does our technology rely on a non-renewable resource base? If so, why do we always expect it to rescue us?

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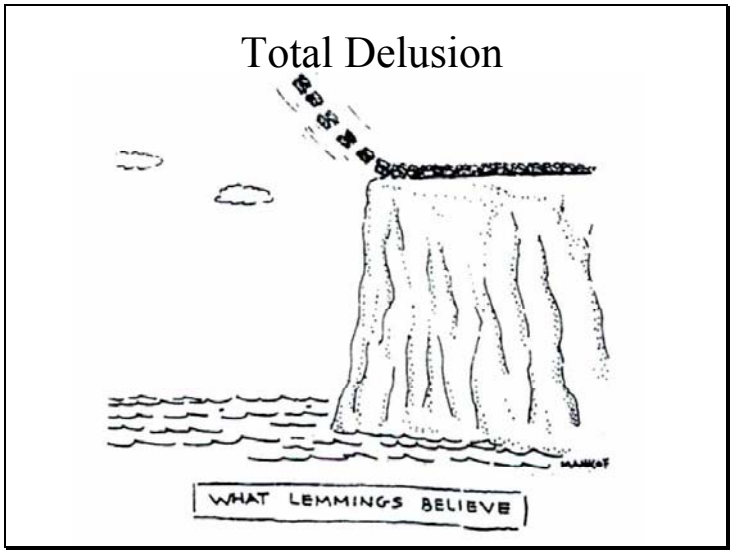
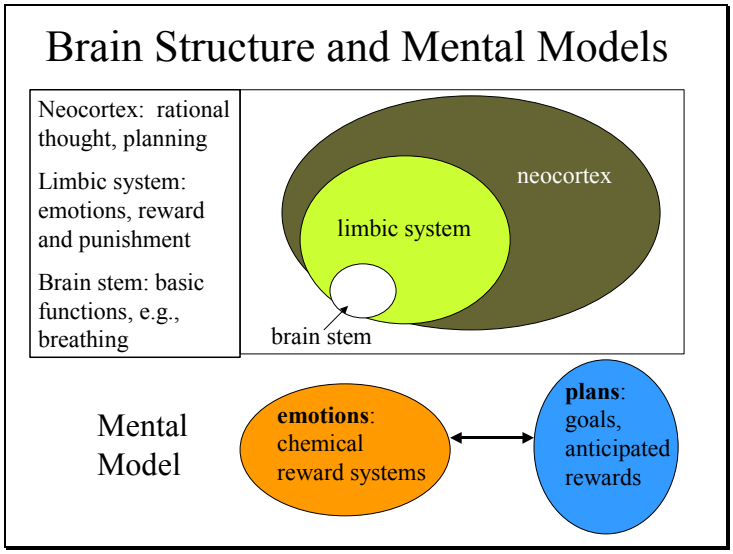


Group dynamics can lead to mass delusion. History shows how common this is. From suicide cults to national support of genocide. Is our culture deluding us? Do we think Progress is inevitable? Do we expect to get something for nothing? Do we never expect a bad consequence for our damaging actions? Isn't it time to "grow up" and behave with a sense of maturity and responsibility?

Slide 33



Given all the resistance to change, how does behavioral change happen?

The brain has three major functional layers: stem, limbic system and neocortex. The neocortex and limbic systems interact to create mental models. The neocortex creates plans and concepts about how the world works and establishes goals in this context. When goals are met, the limbic system rewards the brain with chemical signals that "feel good." Failing to make a goal releases a different set of chemicals that "feel bad." This is how the neocortex and limbic systems interact to reinforce mental models. Even thinking about failure or the illegitimacy of a mental model is stressful, whereas fantasizing about success is pleasurable.

Denial can be understand as a normal response to information that contradicts an accepted mental model. Mental models are what people use to navigate through life, establishing goals, setting up personal reward systems based on these goals, and then filtering out distractions from these goals. Grief results when an established mental model is undermined or destroyed. Denial is a form of grief avoidance.

More info:
http://www.tcd.ie/Psychology/Ruth_Byrne/mental_models/
http://tip.psychology.org/models.html
http://kamares.ucsd.edu/~arobert/BD/brainEngDiagram.html
http://www.med.harvard.edu/AANLIB/home.html
http://www.newhorizons.org/neuro/zull.htm
http://www.eurekalert.org/pub_releases/2003-06/pu-srn061103.php
http://www.energybulletin.net/3948.html

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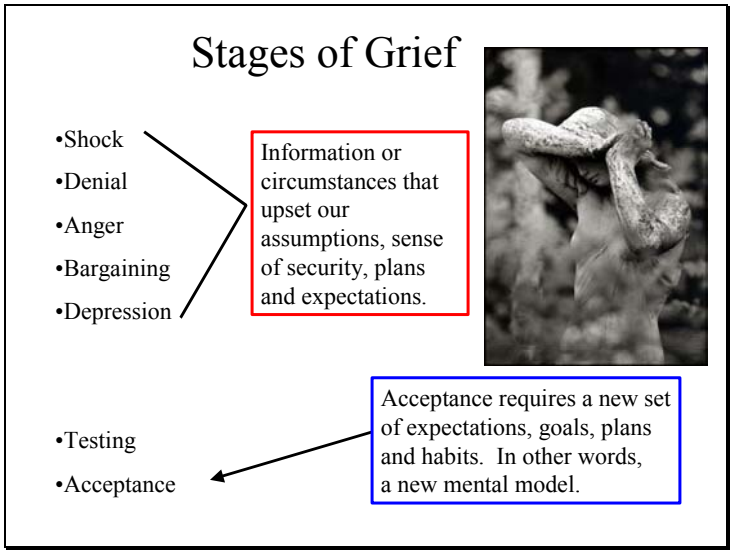

If one newly accepts that overshoot is real and near-term collapse is likely, the stages of grief will follow. Fear is also normal and should be acknowledged. This is a natural response to the loss of one mental model and the creation of a new one. The brain changes physically during this process as old neurological networks are replaced by new ones. It is a lot of work.

Someone experiencing grief needs to be validated or they will withdraw and become more angry and depressed. Trouble is, our culture does not recognize the grief of people who are aware of overshoot. They may be shunned as "doom and gloomers," "too negative," etc. But these folks aren't crazy or abnormal, just more aware and sensitive than most. As William Burroughs said, "Paranoia is having all the facts."

Image from:
http://www.stefankostka.de/bilder/bilder_artefakte/Grief_came_riding.jpg
For a discussion of the grief cycle see:
http://changingminds.org/disciplines/change_management/kubler_ross/kubler_ross.htm

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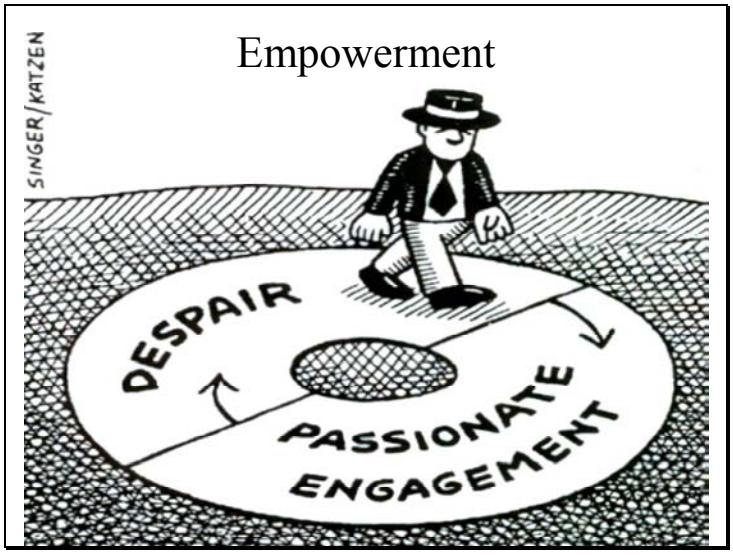

Those who go through this process are the greatest of allies. Once acceptance occurs, people tend to feel empowered again. It is important to help people move beyond denial and through the grief stages so that they can be positively engaged.

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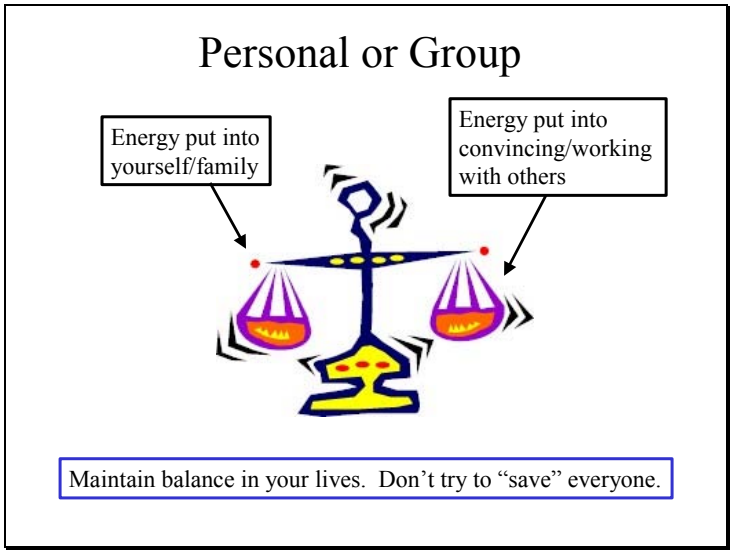

Now I will move onto the group process and what we've been doing in Willits. It is difficult to get a group of people to agree on a problem, let alone agree on a solution to an agreed upon problem. So if you form a group, don't put all your eggs into this basket. Take care of yourself as well. Do what you want to do and see if the group supports it, but also be open to the feedback of a group as to whether what you are doing makes sense. That will enhance rather than sap your energies.

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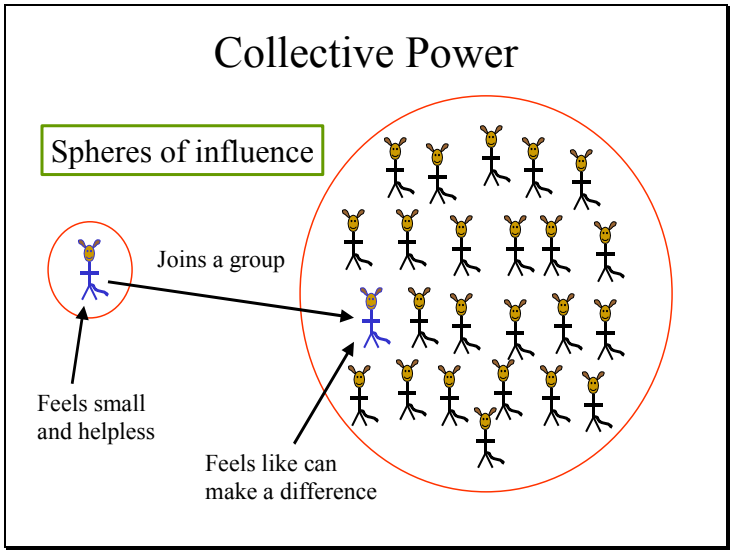

However, do form groups! The nice thing about a group is that it empowers individuals. Also, there's also more security in a group where people know and respect you, e.g., "circling the wagons." Groups working towards sustainable, local systems are desperately needed.

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A simple way to describe economic localization is that we consume in our community what we also produce in our community. This is most important for the essentials, like food. Trade for perfume, perhaps, but not potatoes.

Start by localizing the economy of your own life as much as possible. Grow some of your own food. Have water storage at your home. Be more self-reliant in whatever ways you can manage. Join small groups of like-minded people to do this more broadly and make it attractive to others.

See:
http://www.postcarbon.org for more about "Global Relocalization."

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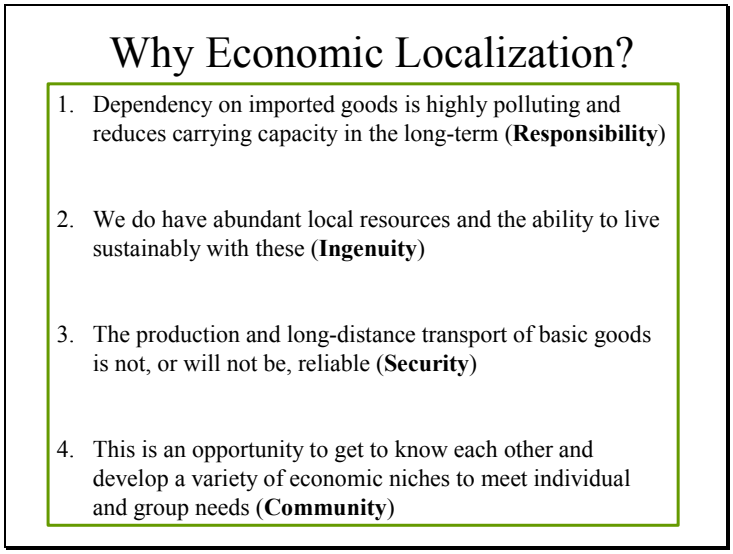

I offer four basic reasons why economic localization is the logical response to overshoot.

Note that point 2 may not apply everywhere. People often ask me, "What about the cities?" Sorry, but I don't have an answer for that. Most cities in America can't be made sustainable. Their infrastructure is too energy dependent. Skyscrapers and modern office buildings with sealed envelopes don't function without power. They demand too much food from areas too far from where they are. The surrounding "countryside" has been paved over by suburbia. They are resource sinks and pollution sources.

But for a while, cities may fare better than rural areas. Much of rural America has lost its productive base as the global economy has sent local farmers into bankruptcy. These areas are now dependent upon imported food and energy too, but they are not part of the distribution hubs. Shortages will hit the import-dependent, country town before it hits the major port city.

Slide 40

Now how to prioritize what to do, since it can be overwhelming (Can we localize toilet paper!).

Do something, if only because psychological health is improved by taking positive actions to deal with perceived threats. This level of focused action can be very fulfilling as it clarifies what really matters in life and helps one appreciate the wonder of the present.

I'll discuss three priority areas for individuals and communities to address.

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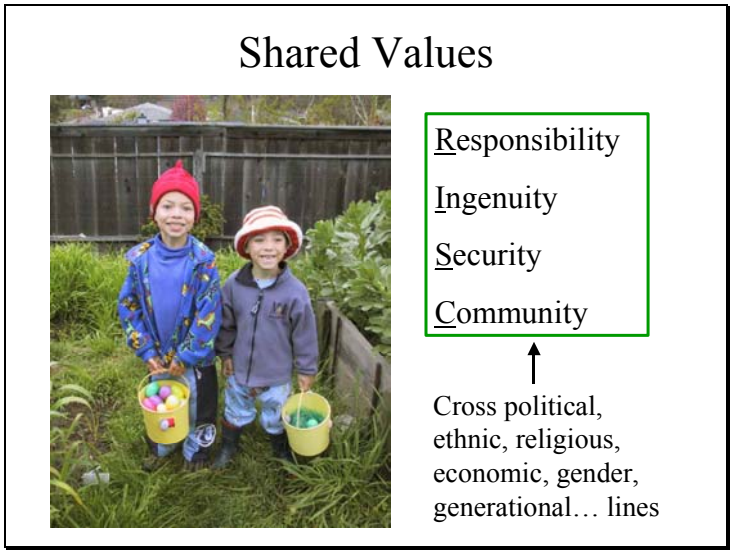

Individual change and Community Building begins by recognizing and promoting what unites us, our shared values.

Life has risks. We manage these by acting **r**esponsibly, solving problems through **i**ngenuity, thinking about long-term **s**ecurity, and by seeking mutual support through **c**ommunity.

If people with different worldviews and ideas can at least agree on this shared set of values, community can build through shared experiences even when visions of the future may differ.

I suggest four common values (RISC): Responsibility, Ingenuity, Security and Community that should have broad appeal.

Whenever difficulties arise, remind each other about what you share.

Groups will go through phases of honeymoon, chaos, and renegotiation. The shared values will be the glue that helps groups move into productive stages. Only after struggle, will true communities emerge.

See:
http://www.fce-community.org/community_building.php

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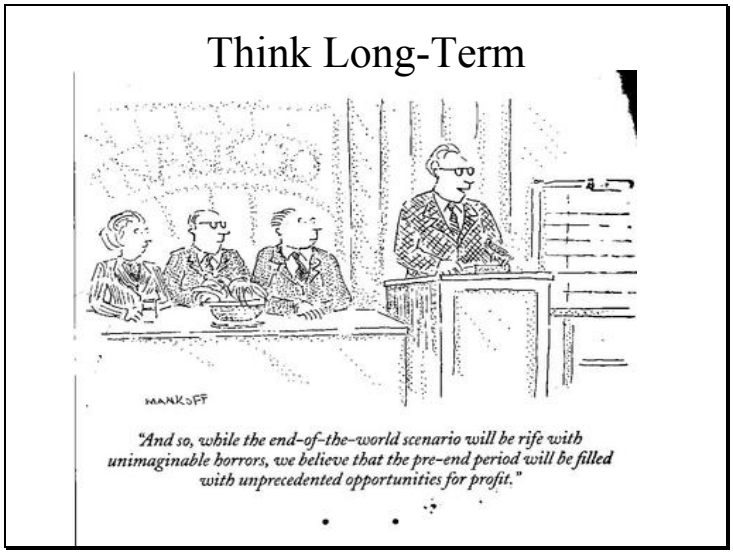

If we hold the values of Responsibility and Security, then our perspective should be long-term, not myopic. Short-sightedness, as in getting a quick profit, is part of the problem and conflicts with our more core values.

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The easiest thing to do is conserve. Americans are awash in "cheap" energy. The term "Energy Slave" is used for this calculation of how many people it would take to replace our mechanized tools.

And the rest of the world is trying to duplicate our model!

We need to prioritize our needs and cut out excessive wants. However, built infrastructure constrains people to have greater needs than they should, e.g., car dependency. It takes broad public awareness and political will to change the infrastructure and rules to enable fewer needs.

More about Geodestinies at:
http://healthandenergy.com/geodestinies_review.htm

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WELL Energy Group

- inventory of the Willits area (95490) energy consumption
- included natural gas, propane, electricity, gasoline, diesel and firewood
- ca. $28 million annual costs, or 21% of median after tax household income
- 136,127 total tons of carbon dioxide emitted, about 10 tons per person

http://www.greentransitions.org/WillitsEnergyUsage.mht

It is obvious that we use a tremendous amount of energy in the Willits area and that this is not sustainable. It is also very costly. If we were to take the money we spend on non-renewable energy and invest in renewable infrastructure, more funds would be available locally and our security would be enhanced.

We are now working on a renewable energy vision that prioritizes based on essential services, such as food, water and some manufacturing.

Image from:
http://www.artlex.com/ArtLex/s/images/sphere_escherhand.lg.jpg
Willits energy inventory at:
http://www.greentransitions.org/WillitsEnergyUsage.mht

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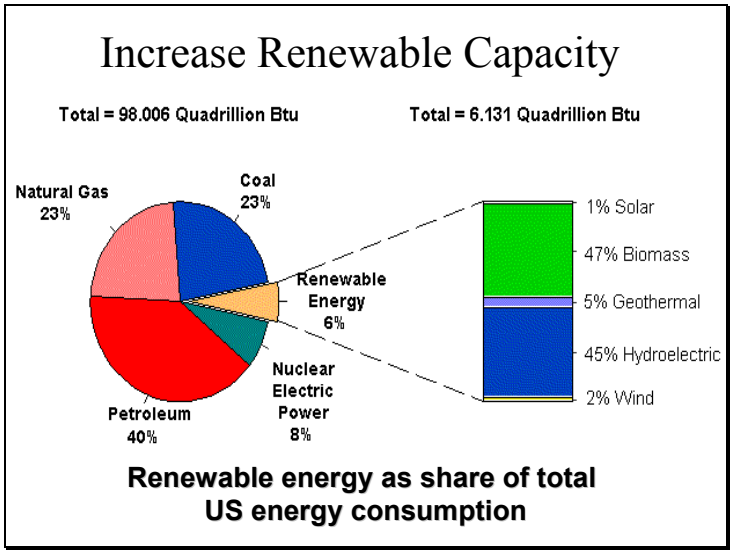

In addition to conservation, it is a no-brainer that more renewable energy infrastructure is needed. For the US, solar and wind are 1% and 2% of renewable energy capacity of 6%, for a combined capacity of 0.18%!

If we increase renewable capacity 100 times current levels, we'd reach 18% of current energy output. To do this would require a growth rate of 100% for about 9 years.

Source of graphic:
`http://www.eia.doe.gov/neic/infosheets/renewableenergy.htm`

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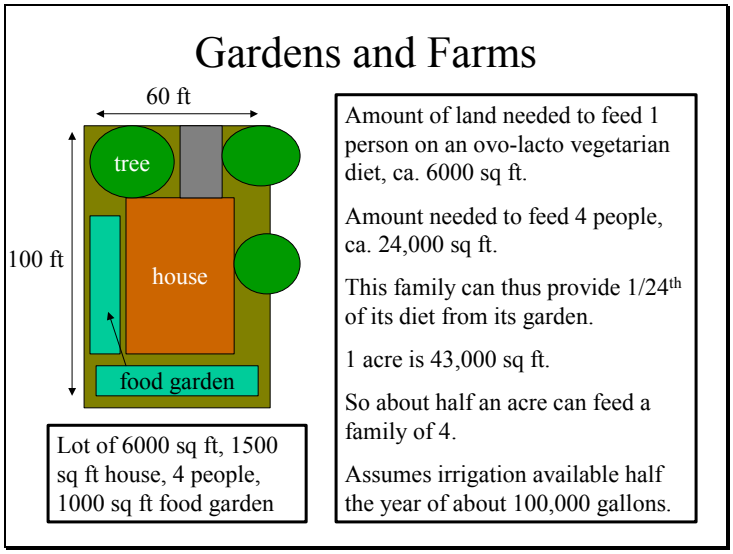

Now about food. I want to set aside some common, hopeful assumptions. Many people imagine they can take care of their personal food needs from their own yards if needed. This is highly unlikely. Most lots are not big enough to feed a family. In Willits the typical lot is about 6000 sq ft and has a modest size home. Shade trees are common, and the home casts its own shadow, so usually only a few to several hundred sq ft receive the necessary 6 hours of sunlight per day. Because each person needs about 6000 sq ft for their food, home gardens can only be minor players in the diet of a population.

By all means, plant a garden (I have one), but farms are a must.

About the 6000 sq ft figure for a person's food needs. This comes from the experience of Ecology Action at Ridgewood Ranch on fertile soil, where 4000 sq ft is needed for a person's annual food needs if a vegan diet is allowed, and not including the path space between beds. Because most people aren't as good at growing food, and most would like some animal protein, I've added area to this figure. Also, one should grow about 20% more food than they need in case of crop failure. So 6000 sq ft is likely an underestimate. Consider that the current US diet requires 30,000 sq ft per person.

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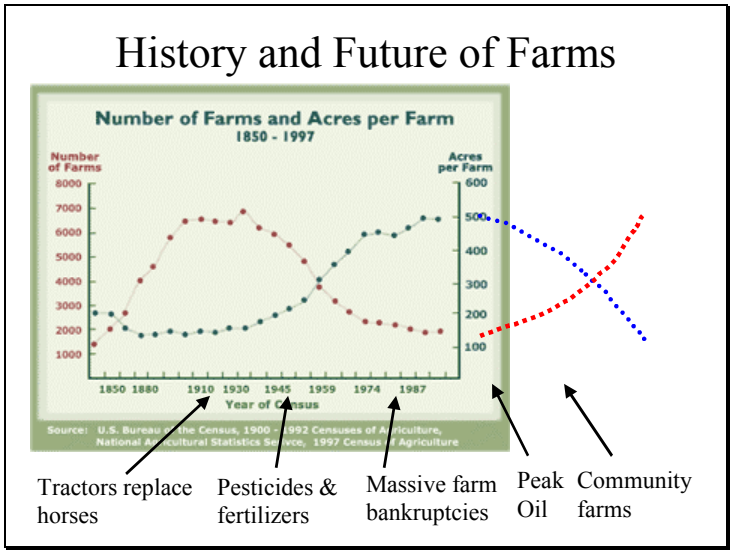

Now let's look at future of farming. The 20th century saw the adoption of mechanized, chemical agriculture. These techniques permitted very high yields, but only if farmers had access to expensive forms of capital and a constant supply of off-farm inputs. Many small farmers couldn't come up with this capital and were absorbed by those who could. As food output rose, prices dropped, further stressing farmers. The wave of farm bankruptcies in the mid-80's (e.g., Farm Aid concerts) occurred as the amount of food produced per capita was highest in history.

Because this system, and the associated transportation system it relies on for distribution, are only possible with surplus oil and natural gas, post Peak conditions will require a downscaling in farm size and farms will need to be located nearer the people they feed. For example, a thousand acre farm will need to be broken into sections managed by people and animal power. This means more barns and tool sheds closer to where the land is worked. Such changes take new investments. I expect an upsurge in so-called "Community Supported Agriculture."

Graphic from:
http://nationalatlas.gov/agriculture.html

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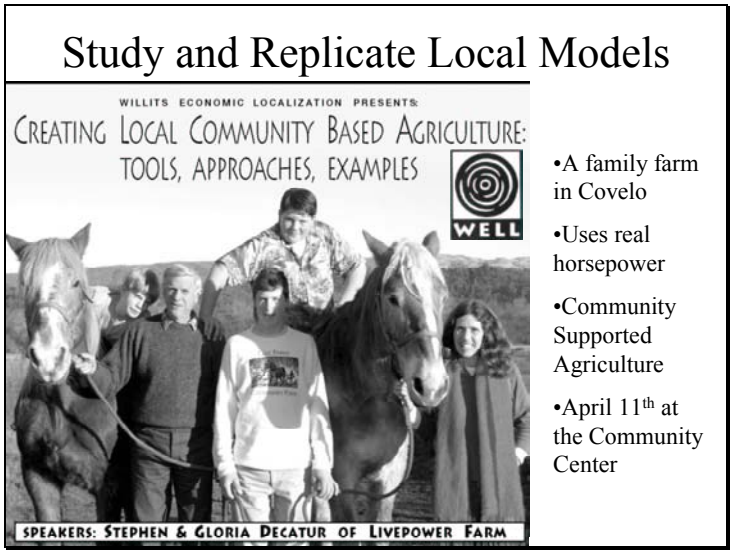

Find the local leaders who inspire and can help us sort out the details we'll need. WELL is sponsoring presentations by such experts. John Jeavons spoke about sustainable agriculture, and the Decaters provide an experienced example.

http://www.growbiointensive.org
http://www.covelo.net/agriculture/farm/pages/farms_lpf.shtml
For an interview with Steve Decater see:
http://www.globalpublicmedia.com/interviews/364

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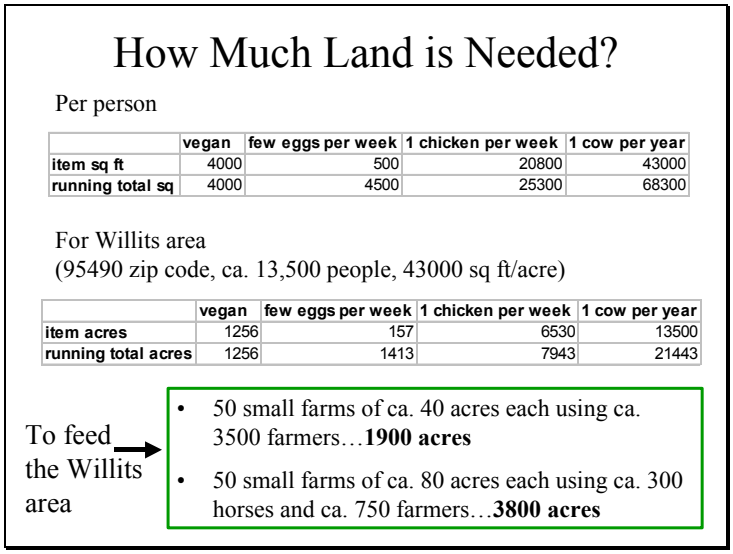

These charts are per person land requirements assuming GROWBIOINTENSIVE methods and intermediate yields. Requires prime ag land and skilled farmers. The Little Lake Valley can support our population on a low meat diet. The farm area calculations in the green box include an additional ca. 25% for roads and other infrastructure, not just cultivated space as given in the table calculations. Note that the average American diet requires ¾ of an acre per person currently.

Each 40 acre farm could minimally employ 70 people full time, for a total of 3500 farmers among all 50 farms. This does not include employment in administration, distribution, marketing and processing of food. Nor does this include the people involved in farm equipment supply. The number of farmers is based on the approximate area that a person can farm using hand tools, which is about half an acre. Of a 40 acre farm, 35 acres are cultivated, requiring 70 people, times 50 farms=3500. This would be about a quarter of the total population, compared to about 1% as farmers today. Given comparative historical data within the US and elsewhere, this is likely an underestimate of the actual number of farmers needed.

In the green box I also estimate land and labor needs if draft animals are used. Of course the land requirements go up and the labor pool needs decline. Here I am estimating that one draft horse needs about 5 acres of prime ag land for hay and other feed. And that about 15 people can work a farm of 80 acres with 6 draft horses. The horses require about half the land for their own food needs. Oxen may be more efficient but less agile than horses. However, oxen can come from cattle breeds that can supply milk and meat as well. Much more work is needed to refine these calculations and check my assumptions. The math goes as follows: 80 acres minus 10 acres for infrastructure leaves 70 acres for production. The horses need 30 acres for feed, leaving 40 for cultivation. 15 people times 50 farms=750 farmers.

Note how in both cases the approximate area available for human food per farm is similar, but the human labor is reduced by a factor of 4.7 with draft animal power. The question is whether we have the area available to make draft animals a local option, let alone the local skill base and equipment to manage animals.

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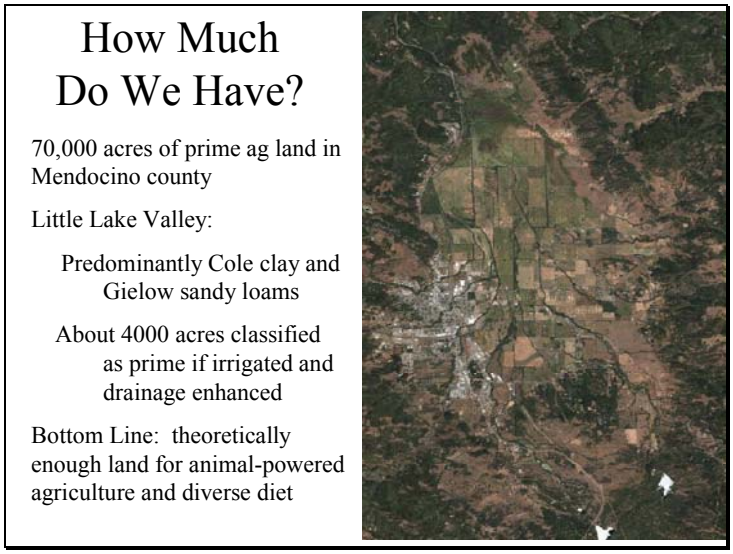

The main area of Little Lake Valley is about 2.5 miles wide and 5 miles long, with extensions on either side of Hilltop as well. The total area of valley fill is about 18 square miles, or ca. 12,000 acres. I estimate about a quarter of this area is wetland habitat, mostly in the northern section, another quarter is housing and roads, mostly to the west, and another couple thousand acres is forested, riparian zone, or non-prime ag land due to soil texture. This gives about 4000 acres of potential prime ag land. However, irrigation water may be rate-limited in the southern portion of the valley, and water availability and quality may limit irrigation along the valley margins where boron, arsenic and other minerals reach high concentration. Dry-land farming methods need to be studied, but it is safe to assume that non-irrigated land would have significantly lower productivity, perhaps only half of irrigated areas.

See the following publications for detailed information:
Farrar, C.D. 1986. Ground-water resources in Mendocino county, California. U.S. Geological Survey Water-Resources Investigations Report 85-4258

Howard, Richard F. and Roy H. Bowman. 1991. Soil Survey of Mendocino County, Eastern Part, and Trinity County, Southwestern Part, California. United States Department of Agriculture, Soil Conservation Service.

Image from:
http://www.google.com/maps?ll=39.416370,-123.328829&spn=0.129776,0.088062&t=k&hl=en

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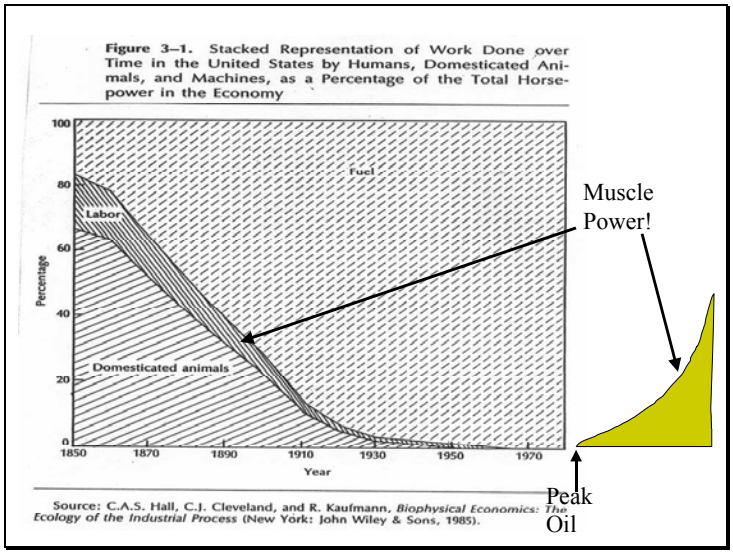

And who will work on these new farms? As fossil fuels become scarce, to get work done we will use more muscle power. Consider that a gallon of gasoline has the energy potential of 175 hours of human labor (111,000 BTUs per gallon, versus 635 BTUs per hour of human work)! No wonder machines replaced people and animals. We will need a lot of local farms to power our muscles!

This is the sunshine economy.

For a discussion of our economic future and farming see:
"The Long Emergency" by James Howard Kunstler
http://www.energybulletin.net/4856.html

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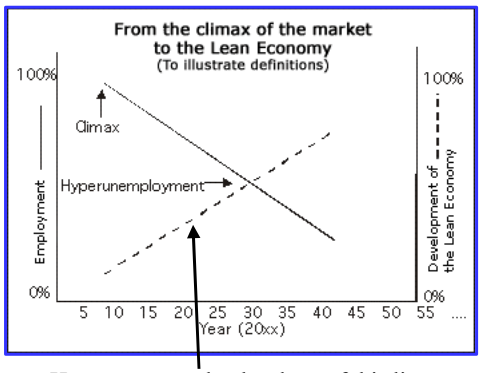
Globalized Jobs to Localized Jobs

Replace jobs lost from the global economy with those of a local "lean" economy

Community Supported Agriculture

Community Supported Manufacturing



How can we make the slope of this line very steep?

Local communities with foresight can improve their future by creating an infrastructure of agriculture, renewable energy, manufacturing and financial institutions that support local needs. The goal should be to replace jobs lost from the global economy as rapidly as possible with local jobs in a "lean" economy.

Source of graphic and discussion of the Lean Economy:
http://www.feasta.org/documents/review2/fleming.htm

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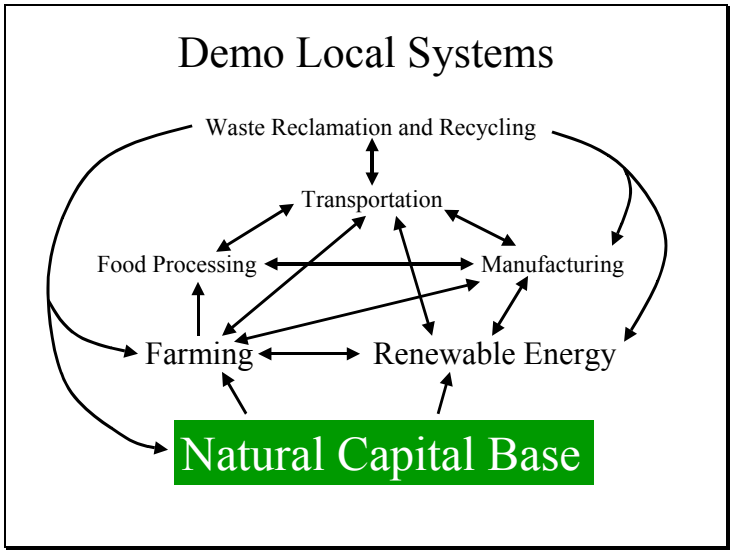

Try to understand how food, energy, manufacturing, transportation and waste systems are interwoven, and consider how to form local economic relationships that support each other. For example, if you need a tool, can someone locally make it?

Here's a concept map of how a localized economy might be structured. Getting these systems in place is going to be necessary for an "easier" transition to the local, lean economy. Perhaps start with a farm and figure out how to support that farm using local resources that become new local businesses.

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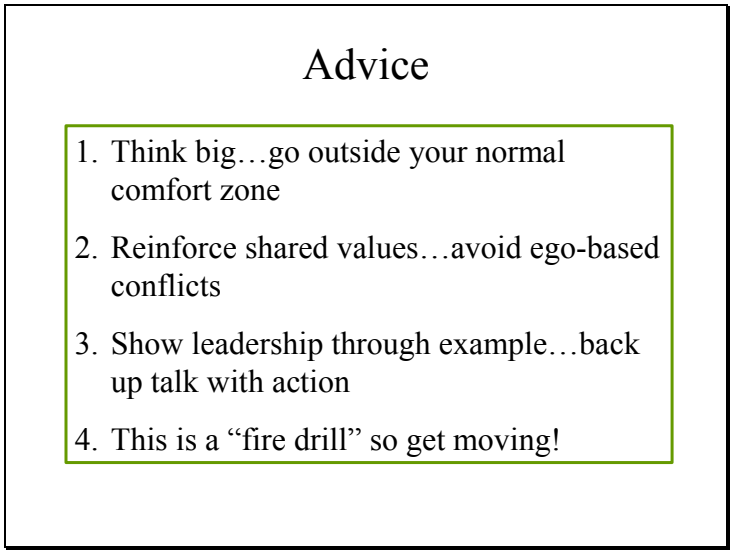

Think big…go outside your normal comfort zone. We need to organize a grand slam. Find people with the skills, confidence and capital to make major new investments in sustainable, life-supporting infrastructure and legal arrangements.

Reinforce shared values…avoid ego-based conflicts. Power struggles and personality conflicts almost always arise in groups. Get over these fast by knowing what the shared values are and agree on the need to work for the common good. There's no time to waste, "the river is rising and the town is at risk." Work as a team.

Show leadership through example…back up talk with action. Talk is not cheap, but it is also not enough. Find some short term demonstrable actions even while making long-term plans. Begin at the personal level, step up to the group, then you'll have the credibility to help change the town.

Buckminster Fuller said, "You never change anything by fighting the existing. To change something, build a new model and make the existing obsolete."