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**A Land Steward’s Paradox:
Nature’s Law v. Society’s Law (1/99)**

We have all grown up with the idea that Nature has laws. In Physics classes we learned the laws of gravity, motion, electricity, plus many others. These laws have fallen into the deep recesses of my mind and I have a very vague recollection of what they are. However, there are other laws of Nature, learned in several ecology classes, that are regularly applied, by habit, in my forestry work. The most basic is the conservation of energy law. From that arises understanding of nutrient cycles in the ecosystem including the cycles of: carbon, nitrogen, and phosphorous. Even more closely related to my work are the ecological laws of species stability, diversity, and succession.

As a land steward I serve my clients, owners of small forested parcels, by making land use recommendations that take full advantage of ecological laws to the client’s benefit. This sounds easy, and for the most part it is. However, the landowner’s implementation of my recommendations must be according to another set of laws, the “Law of the Land”. This is a law that “hears before it condemns, proceeds upon inquiry, and renders judgement only after trial” (Blacks Law Dictionary, 4th Edition, p. 1031). Herein lies the land steward’s paradox.

To say that law governs Nature has always appeared to me as an oxymoron. Never once has anyone been in a position to vote for, or against, a law of Nature. Nature has never once held a hearing or an inquiry on one of Her laws. To my knowledge, no jury has ever been asked to decide on litigation of Natural laws. Further, I do not think one of Her laws has ever been repealed. Is anyone aware of an instance where the Chief Natural Law Enforcement Officer has ever been impeached? Would it not be more appropriate to consider what we have learned to be Nature’s law, instead to be considered, “ecological principles”?

Perhaps, if educational institutions taught “ecological, or natural principles” instead of instilling students’ minds with a dogma labeled “Laws of Nature”, then there would be less confusion about how to live on earth. Some people ignore, challenge, and fight ecological principles in the same manner that they deal with the Law of the Land. Although they always lose against Nature, the prevailing philosophy may be that they can change ecological principles by a “vote” manifested in the way they use the land. In their failure to prevail over Nature, some people may conjure up from their sub-conscious a belief that they will have a hearing on their “rights” before a jury.

My intention in this article is not to go on with philosophical statements about my frustration with this troubling paradox. Actually, I wanted to increase awareness about the application of ecological principles to land use in the context of “Laws of the Land”. More to the point, I want to bring to my readers’ attention some of the laws

relating to trees. The following is a brief synopsis of tree law as I have come to know it. Some is statutory law passed by our legislature and other is law based on precedence. My remarks are general in nature and the reader should be aware that every situation is different. Anyone troubled by a question arising from their tree-related rights should see an attorney and a qualified tree expert.

I think one of the most widely misunderstood aspects of trees and the law relate to trees growing within the limits of highways. It is well established that, in most cases, private property rights extend to the center of highways so that the soil, rock, and vegetation belong to the landowner and the public has only an easement to travel on the highway and to maintain the highway. In a very early life experience, I learned about this law. My Dad was on his way to a neighbor's house, with me along, in the old '36 Ford truck. We came upon a person loading bolts of wood into a pickup truck; the wood was lying beside the gravel road adjoining land owned by my father. I do not remember the details of why the wood was there, but Dad quickly steered to the edge of the road behind the pickup truck and asked the man in a gentle tone, "Whose wood are you loading up?" The man replied, "I guess it belongs to the Town, it's in the road". Dad gibed in a not so gentle tone, "Well, I guess not, it belongs to me and I suggest you put it back and leave before I call Charlie Davis" (Charlie was police chief at the time). The man reluctantly complied. I'll bet he also learned a lesson about the ownership of wood in highways that day.

As a surveyor, I have measured lots of property lines that ran right through trees. Most often asked by my clients is the question, "Who owns the trees on the property line"? My response has usually been that "If a tree grows so that a property line runs through it, then the tree is common property of the adjoining owners. If one cuts these trees, or damages them without the consent of the other owner, it is a trespass". Trespass is a matter governed by statute and is often, in addition, litigated as a civil matter where the trees served a function of benefit to the landowner.

I have engaged in discussions with landowners in urban settings about the ownership of parts of trees extending beyond the property lines. Questions that most frequently come into the discussion include the following. "Who owns the branches of trees hanging over my neighbor's driveway"? Who owns the roots of trees causing cracks in my driveway"? This is a gray area in the law and I know of no case decided in the NH Supreme Court that would settle the issue. I think that ownership of the tree as a whole follows the trunk to point of attachment to the soil. Therefore, roots, limbs, and fruit are property of one to whose land the trunk is attached. Of course, these questions remain academic until someone is annoyed, or has a claim for damage from roots and limbs connected to a tree on the abutter's land.

In exercising land stewardship responsibilities I encourage people to be mindful of the ecological principles governing land use, and particularly tree growth. I try to help them understand that they can not change these principles. Nor, can they expect compensation when they loose money implementing practices that are contrary to ecological principles.

With regard to the Law of the Land, I urge people to be responsible tree stewards, especially on urban properties. Remember that trees grow old and die. A tree once beautiful and functional, may become an object of peril, especially when it hangs over areas where other people and other's property may be targets for falling limbs. A hazardous tree is expensive to remove, however, it may be more expensive as a liability when it falls and causes damage.

A Kitchen Anthology (2/99)

As I sit here with a full stomach and heartwarming memories of several feasts during the holiday season just passed, my thoughts center about the kitchen my wife so skillfully manages. Also passing through my imagination are the kitchens of my grandmother and great grandmother. Although the past “kitchens” occupy the same space as Laura’s kitchen they serve mostly as inspirational reminders of older technology. You may think this to be unusual gist for someone most apt to be thinking about the natural world. However, the joyful social gatherings of family and friends, drawn to the kitchen by the basic sense of smell and the instinct of hunger, have temporarily distracted my usual focus.

For the entire holiday season I was compelled to follow my nose to that venerable part of the house in which Laura spends so many hours crafting her own niche in the heritage of the place. Not only did I indulge in licking the bowls and “ravening” the scraps, my ear was turned to hear Laura express frustration about her needs for new appliances, especially a new cook top and a new oven. It seems our old equipment is not dependable in maintaining an even temperature. I was told in no uncertain terms that this situation could not continue. She gave me the ultimatum, “Bob, there is no way that I can entertain our family and friends next year with this stove and oven”. Suddenly, to my fearful imagination came a picture of handfuls of hundred dollar bills, passing from my hands to the corporate hands of Sears and Roebuck.

My fear of impecunious life soon gave way to a stronger fear of missing the luscious food and the sensual smells from baking, grilling, boiling, and sautéing. I feared also the loss of close family connections, stimulated by inhaling volatile oils wafting from spices and from fats in chocolate, fish, lamb and pork. My senses lead me to acknowledge what is really important in life. I listened to Laura and have resolved my internal conflict and have accepted the idea that we must soon buy a new stove and oven.

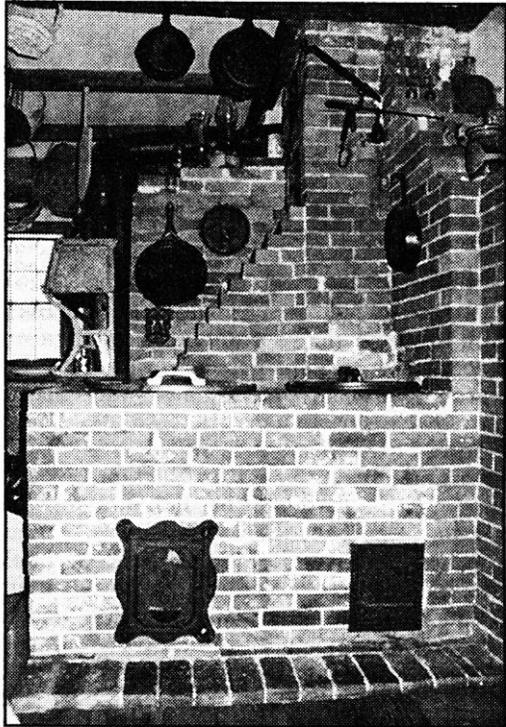
The omnipresence of great grandmother’s kitchen “appliance” entered our discussion, I mused, “Do our old stove and oven, having served this household so well for over twenty years, deserve to be displayed in the kitchen along side the antique kitchen technologies displayed here?” This idea was quickly dismissed. The old built-in oven and old cook top would add little to the character of our esteemed kitchen positioned alongside the cast iron range, or alongside the massive brick cooking “appliance” that dominates the ell of this house.

We reflected on the utility of the older “appliances” and on how difficult it must have been to prepare meals with these obsolete technologies. The kitchen range, made of very decorative cast iron with more chrome trim than a fifties classic car, stands in the narrow end of the kitchen. Although this is used to cook on during power loss, it is relegated to the function of “table” on which to pile things. Occasional use of this “appliance” serves our emergency needs, but it presents the same difficulty faced with the use of our old oven- maintaining uniform cooking temperature. This is in addition to the physical labor of fitting and handling the wood supply needed to keep the fire going.

The oldest and most impressive kitchen “appliance” is a beautiful architectural feature now providing limited utility. This mass of bricks (my recollection of grandfather’s story is that the bricks were made from clay excavated from the field off East Colburn Road, now owned by Dan Teague) is set upon a stone foundation below the level of the present kitchen and dining room floors. The visible brick structure has overall dimensions of about 8’ by 8½’ with a central chimney. The genius of the structure is that, from about 1853 until about 1880, it served the household as an oven, range, water heater, and room heater (both summer and winter).

Although massive in dimension and dominant in presence, the features are illusory. The wall separating the dining room from the kitchen is aligned with the front of the brick structure. From the dining room, only the fireplace, a 24-inch hearth, and a “dutch oven” are visible in an overall vertical plane 8 feet long and 5 feet tall. A “Franklin front” fireplace about 4½’ wide and four feet tall stands to the left side of the brick face. This cast
1999 “In the Country” by Robert Todd

iron device, set into the basic brick structure, was considered a great improvement over the brick fireplace as it efficiently radiates heat energy into the room. Two wrought iron cranes swing in and out of the fireplace from the hinges set into the bricks. It is easy to imagine how the cooks hung iron pots on the cranes to boil or stew the meals. With the aid of other cast iron utensils propped up in front of the fire, they would also bake breads and muffins. Although we have never cooked on this fireplace, it frequently provides comfort and gratification.



From about 1853 to 1880, this impressive kitchen “appliance” served the Todd household as oven, range, water heater and room heater.

The “dutch oven” is about 3 feet deep with an arched ceiling about 2½ feet tall. The 12-inch by 15-inch door, the doorframe, and the lintel are all cut from soapstone, quite likely mined in Francestown. My understanding of how the oven was used is limited to a vague memory of someone’s story (probably Grandmother Bessie, the last cook known to use it) that a fire was built in the oven and allowed to burn for several hours, thus heating the brick chamber walls. The pies, breads, and other foods were then, with the aid of a long handled wooden or wrought iron peel, placed inside to bake, usually overnight.

The major part of the brick structure protrudes into the kitchen. There, a perception of mass and aesthetics is more apparent than the function of the structure. The backside of the dutch oven rises from the floor nearly to the ceiling. We decorate these obtrusive brick surfaces by hanging skillets and muffin tins in interesting compositions. The amazing part of the structure is a waist high by 39 inch wide flat topped buttress in which are set two wooden covered copper kettles, each with a capacity of about 20 gallons. Under each kettle is a fire chamber with ankle high doors opening from the side of the brick buttress. A small void in the brick wall, adjacent to each kettle, allowed steam to enter the flues and mingle with the smoke as it ascended the chimney.

I believe this “water heater” was last used about 1947. My recollection, as an impressionable 7-year-old, is a vivid picture of my grandfather heating water in the kettles for the purpose of scalding pigs (hot water and rosin were used to loosen the hair so that it could be easily scraped off the hog’s skin in the butchering process). The picture fixed indelibly in my mind that day relates more to the butchering of the pigs than to the heating of the water, but that’s a story in itself.

Laura and I are overawed with thoughts about the amount of work necessary to prepare meals for the large family raised by my great grandparents. These thoughts well up great respect for them. We wonder also about the enchanting aromas and the happy family gatherings that centered about this enduring brick structure. Oh, if it could only speak words.

On The Threshold of Change (3/99)

James Redfield's book, The Celestine Prophecy, presents a common sense approach to living. The author delivers his message about achieving a more spiritually oriented human culture in the dialogue of a gripping adventure story. His nine prophecies are sequentially revealed as the story unfolds. From a friend, the story's main character learns about a lost manuscript, written in 600 BC, that predicts a massive transformation in human society during the last decades of the twentieth century. Now! Feeling compelled to recover the manuscript; the character begins a perilous search in the Andes of South America. He encounters governmental authorities wanting to destroy the manuscript because they fear the power of the ancient predictions. Religious leaders, also in fear that the manuscript would upset the conventional paradigm, attempt to thwart the hero's quest. I recently read the book and was particularly moved by the first Celestine Prophecy.

The First Insight is: "Awareness of similar thoughts by masses of people and the occurrence of similar events at the same time will manifest great social change". I believe that the First Insight will soon have a tremendous impact upon the relationship of man to his environment. From this belief flows great faith that our society is approaching a critical mass of understanding that man can live in harmony with nature and that by doing so he can also experience fulfillment of his spiritual and material needs. In my own lifetime, I can trace the progress of our society toward this threshold of change.

In the sixth decade of this closing century, messengers in the biological disciplines warned of severe risks to our ecosystem from careless use of chemicals and technological processes. I was an impressionable young man during that period and was deeply concerned about what I read in books by Rachel Carson, Barry Commoner, Paul Ehrlich and others. These visionaries went on to shine bright lights on the dark side of our society.

While employed as a land manager at Fort Devens, during the late "sixties", I became a disciple of Marion Stoddard, the founder of the Massachusetts based Nashua River Watershed Association. I was so impressed with her success in cleaning up the Nashua River, once considered to be the most polluted river in America, that I introduced her doctrine to New Boston and the other towns in the Piscataquog River watershed. The seeds took root and the Piscataquog Watershed Association grew to maturity. During this period, I had many other intuitions and ideals about how man should live with nature. I wondered how it might happen, but in discussions with others about my ideas no action resulted-lacking was a critical mass of similar thinking. However, I never lost faith that change would eventually occur.

I can not explain the current feeling I have about noticing a revolution in social thinking that seems to have been molded by ecologists that were considered radical minds in the 1960's. What coincidences are bringing our society to the cusp of change?

On the highest level, President Clinton announced in his State of The Union Address an initiative to spend \$1 billion on a "Livability Agenda" to help communities save open space and to ease traffic congestion. A second \$1 billion "Lands Legacy" initiative, also introduced in the Address, intends to preserve places of natural beauty whether it be in a city park, or a remote wilderness. The President proposes \$50 million in his Y2K budget for this program.

In New Hampshire, the legislature has established a Land and Community Heritage Commission. This Commission is expected to study ways to preserve critical land parcels and unique cultural features in the state. The Commission will, most likely, introduce a \$12 million perpetual appropriations bill during the 1999 session. If passed, the program will probably be administered in a manner similar to the highly successful five-year program recently completed, called the Land Conservation Investment Program (LCIP).

Awareness of another coincidence comes from reading papers written by representatives of the NH Office of State Planning and of the NH Municipal Association. Statements made in a particular document entitled, How to Prevent Sprawl, by Christopher Northrop and Bernard Waugh, point out opportunities for which I searched twenty years ago. This document illustrates specific ways for society to preserve the quality of life we all say is important, but that our land use regulations work to destroy. A feeling of mystery and great excitement comes over me as I realize that this pending change may be manifestation of the “First Celestine Prophecy”.

Finally, on the local level, the 1999 Town Meeting will consider 5 articles that reflect a desire by a major segment of the community to make changes in the way man relates to his environment. Article 15 seeks an appropriation for developing computer-mapping tools. The tools will be used, primarily, to study all forested parcels in town greater than 25 acres in size and to rank them according to the inherent capabilities of each to produce forest products, wildlife habitat, and recreational opportunities. This intelligence will enable the town to make decisions about how to sustain the flow of these benefits from the forest parcels. A secondary benefit of the appropriation will be the establishment of a digital basemap for assessing and land use planning. By using this computer technology, the Town will realize savings in annual revisions of the assessors’ maps.

Article 11 seeks to authorize the annual appropriation of 50% of the land use change tax for use by the Conservation Commission in funding projects. This should be considered an investment in the land with measurable benefits. Wise stewardship of town lands requires surveying and marking of property lines, the construction and maintenance of recreational use trails and picnic areas, and acquiring easements and other rights to land.

Article 10 requests an appropriation to establish a capital reserve fund to be held until needed for use in acquiring lands and rights to lands. Most believe the state will appropriate funds to match funds from local sources, thereby leveraging land and cultural resource preservation initiatives. To be effective in preserving critical parcels, the town must be in a position to compete with development interests in the market place. A dollar invested in acquisition of open space avoids expenditures on town services attributable to residential land parcels. In Deerfield, a Cost of Community Services study, accomplished by the University of New Hampshire Cooperative Extension Service in 1994, showed that services provided to residential land parcels cost \$1.18 for each dollar of tax revenue generated by the same parcels. The same study showed that open space land parcels cost the town only \$0.35 for each dollar of tax revenue received from these parcels. The payback on an open space investment should be quite obvious from this study.

The final action on resource management issues will be on Articles 8 and 9. No appropriation is requested in this proposal to authorize the Selectmen to accept a gift of a conservation easement on the Carolyn Morgan land. The proposal would also discontinue the portion of Cochran Hill Road running from Old Coach Road to the Greenfield Road intersection. The old roadway is to be reserved from the conservation easement so that its use by people enjoying non-motorized modes of recreational travel shall continue.

The coincidences predicted in the 1st Celestine Prophecy are burgeoning from Washington, DC to this little town in New Hampshire. The few coincidences and thoughts mentioned above are only a small demonstration of pending change. Many New Bostonians have come to understand what underlies the quality of life in this town. They understand that growth is inevitable, that growth is not necessarily undesirable, but must be directed, or it will occur everywhere and New Boston will look and feel like anywhere.

Join the many residents ready to embark upon this course of change in land use philosophy by supporting the above initiatives, on the local level as well as the state and national levels.

Of Mice, Moose and Men (4/1999)

Foreword: I credit John Steinbeck with the inspiration for this title. His 1937 novel, *Of Mice and Men*, heartbreakingly depicts how men, desperately engaged in eking a living from the earth, can react violently toward other men. Similarly, my essay is about man's struggle to live in harmony with the earth, but with no tale of human tragedy.

Although the images of the forest, fixed on my retinal nerve endings are now blurry, I think I see, in my mind, more clearly than in my youth. This is particularly true in "seeing" the cause and affect of subtle forest habitat changes observed during the past thirty years. My "vision" has been especially enhanced during the past several months. I have been annoyed, entertained, and thrilled by encounters with wild creatures- species not encountered before. This has welded my awareness of the effect of forest habitat change on wildlife and has caused me to think about the influence future change may have on the local wildlife community.

One forest creature, the white footed mouse, invaded the old homestead and is in direct competition with Laura and I for food and shelter. Never before this winter has this species been seen in the cellar, or heard in the partitions. I do not object to sharing habitat with other creatures, in fact I revere that relationship, but I want them to respect my den as I respect theirs.

Last November, I vowed to trap these mice, thinking they would number no more than a few. One evening, I baited my small "Hav-a-Hart" trap with oatmeal and placed it on the cellar floor. The next morning the metal trap contained one pretty little white-footed mouse. I repeated the baiting and trap placement the second evening. Much to my surprise, a second animal had tripped the plate, closing the doors to his escape. The process became routine over the next five days to surpass my first estimate of the population. Soon, we decided that it was time to obtain more traps. I purchased two more, one being the next bigger size, for the cellar and the attic. Nightly, mice sacrificed themselves for a spoonful of oatmeal. For several days in a row, all three traps were tripped. I found that the bigger trap had a wire mesh too large to prevent a mouse from slipping through, even with a full stomach. My capture count soon hit twenty before moderating. By the end of February, the capture rate was one every four or five days. At this writing there are thirty-six notches carved in my tally stick.

To our great annoyance, the rumble in the walls continued and Laura was concerned that a much larger creature was using the partitions as turnpikes. She was right! One morning in late January, I checked my trap in the cellar and saw more than the usual fur. My first thought- I have caught a rat! I tipped the trap with my foot to more clearly see the animal. I was shocked to see a flying squirrel. The following night a second flying squirrel fell as prey to Mr. Hollis, our large black cat.

On an evening soon after, Laura saw our two cats watching the fireplace. The scene brought laughter to both of us. Peering over the rim of one of the cast iron kettles on the crane, was another of those squirrels. As I approached, he gave up the standoff and swiftly departed through a crack in the flue damper. Before work the next morning, I startled the comedic squirrel in the kitchen while he was filling his cheek pouches with Science Diet cat food. He retreated to the pot shelf. I hurried to put on gloves then slowly removed his "cover". There in the shelf corner he submitted to his fate- a quick grab and a tight squeeze by my gloved hand. The house has been less noisy lately.

"What about the moose?" you ask. While growing up in the country, I spent a great amount of time in the forest. In my adult life, especially during my consulting career over the past 27 years, I have hiked in the forest, over hills and into swamps and marshes. Not once have I encountered a moose. Not until October of 1998 did I come upon a moose. I have difficulty expressing my feeling at the moment I saw that huge bull moose not fifty feet away. Eyeball to eyeball with a moose during the rutting season was not where I wanted to

be. So, I slowly turned and walked away. On March 4, I had a second eye to eye encounter with a very large cow moose. She was a lot more insecure in my presence than had been the bull moose and she shied away. I conducted my business for the next few days in an aura of curiosity. Why would I see two moose in the woods over a period of four months, with no previous encounters in my lifetime? Why would my home be suddenly overrun with white-footed mice and flying squirrels?

Intent on understanding the implications of my experiences, I arranged to have lunch with an acquaintance, John Lanier. John has been a wildlife biologist with the US Fish and Wildlife Service, the US Forest Service, and the NH Department of Fish and Game. In his career, spanning over thirty years, he has gained great knowledge about the habitat requirements of wildlife and about wildlife behavior.

As we ate ensalada and enchilitos with one side of our mouths we conversed with the other side. In less than an hour I became confident that I understood the habitat dynamics at Todd's Corner. John laughed at my story about the white-footed mice and flying squirrels. Jokingly, he said, "Your old house has a lot of holes in it and the creatures can easily enter". Grinning, he added, "Their preferred habitat is derelict buildings and debris". I admitted seeing some holes between the foundation stones that need to be filled with concrete, but quizzed him about what was really happening. In a more serious tone, "Bob, the white-footed mouse is found primarily on the edge of mature mixed forests where he nests in tree cavities, in stonewalls, and under stumps and logs". Then he asked, "What kind of habitat do you see around your house?" Immediately, I understood what was going on. I told him that the forest near my home is mature and there are numerous den trees and stonewalls close by.

We went on to discuss the unusual behavior of the flying squirrel and concurred that it was responding to the same dynamics. The white-footed mouse and flying squirrel have displaced the gray house mouse and the rat because of a change in the habitat surrounding the old house.

"John, why am I now meeting moose in the forest?" I asked. He replied, "Moose are thriving in this area because they are finding habitat conditions favorable. Moose require a large amount of woody browse to sustain them during fall and winter months when aquatic vegetation and herb growth are not available. The managed forests in southern New Hampshire have an abundance of red maple saplings, a food (browse) preferred by moose". I agreed with John and stated that his answer was consistent with my observations.

We then entered into a dialogue about how "sprawl" would affect wildlife in New Boston. John said, "Fragmentation of large managed forest parcels into small parcels, followed by residential development, will result in a new habitat preferred by an entirely different wildlife community. Moose will disappear because they are not tolerant of people and there will be no browse in the urban forest". He predicted that fewer foxes and coyotes would be seen, but there would be more skunks and raccoons. A second prediction he made was that wood thrushes, hermit thrushes, grouse, veeries, and most warblers would be less prevalent. Thereafter, less appealing species such as mockingbirds, brown-headed cowbirds, blue jays, and English sparrows would flourish.

Having swallowed the last of the salsa, I spoke to John about the interest held by many in New Boston to achieve a balance between land used for residential purposes and the land used for forestry. Then I asked, "What guidance can you give on establishing this balance?" As I attended to the check and tipped the waitress, John replied, "In Southern NH, a lot size of 25 acres is necessary to have a working forest in which species diversity can be realized". He went on, "These parcels should be situated along riparian borders, a much preferred wildlife habitat component. Further, they should be connected to form linear corridors around residential areas. New Boston should consider linking forested corridors with the land mass in the Satellite Tracking Station and with other protected lands".

Too soon, the need to return to daily routines ended our reunion. During my ride home, I gave a lot of thought to how the FLESA study in New Boston could facilitate creation of a forest habitat corridor. I dreamed about how this corridor could be set against other land uses in a way that would provide natural beauty, clear water, clean air, diverse wildlife, and forest products. As I returned to the homestead, I recalled John's recommendations. A feeling of reassurance filled my consciousness. I was confident that with the help of scientists like John Lanier, plus the will of fellow residents, my dream would become reality.

CREATURES FROM LITTLE PONDS IN THE WOODS (5/99)

Longer days, swelling plant buds, the flow of sap, and the return of migratory birds, are all signals of renewed life raised by the soul of Nature. For me, the event that validates the arrival of spring has always been the beginning of the breeding season for the spring peeper, Hyla c. crucifer, and the wood frog, Rana sylvatica. These creatures express their high hormone levels in vocals disproportional to their size. The spring peeper has a shrill "jingle bell" chorus, conversely the wood frog has a bass croak similar to the quack of a duck. I often think of spring peepers as the "Vienna Boys Choir" and wood frogs as the "Oak Ridge Boys" of the amphibian society. Both species are special representatives of a species group that have unique habitat requirements. I have become alarmed, as have others in the field, because these habitats are disappearing and the species populations declining.

Each spring, during my childhood days at Todd's Corner, I was attracted to a certain small wetland in the forest behind Grandpa's barn. The wetland is in a small depression with no outlet or inlet and is surrounded by large trees. Today, I know that the wetland is called a "kettle hole" and was caused by the melting of an isolated ice block separated from the glacier at the end of the ice age. The depression is the void left by the melted ice block. It now collects runoff and may intercept the ground water. It was the shrill song and the loud croak from the "pond" that attracted me to investigate the source. I am sure the sights and impressions that I hold in memory today are exaggerated, but my recollection of the "lesson" I learned there is quite vivid.

As I approached the pond, the songs stopped and I saw, even with ice still in the center, hundreds of gelatin masses with dark spots throughout. I remember seeing many frogs in the water clutching one another. By that age, my father had taught me, in vague terms, but with explicit example from the life of farm animals, about the story of life. It was not difficult for me to extend this lesson to what I saw in progress at the pond.

My lesson at the pond was repeated during my teen years. I remember returning to the pond several times each spring and seeing the dark spots in the gelatin grow into tiny specks with tails. Then the specks grew quickly into swimming heads with longer tails. Soon small stubs of appendages appeared and the tails began to shrink. Then, mysteriously the creatures disappeared entirely and the pond lay still.

As an adult, I learned that this mystery is the normal process of metamorphosis in the lives of frogs and salamanders, members of the amphibian group. Amphibians, a term that means, "double life", must have a wetland habitat in which to reproduce, and they must also have an upland habitat in which to grow and mature. This group of creatures is divided into two groups, one without tails and the other with tails. Frogs are an example of the first and salamanders are an example of the second. Each amphibian species has a specific niche in the ecosystem. The habitat niche for Wood frogs and salamanders is the small pond in the woods commonly referred to as a vernal pool.

The physical aspects of my special vernal pool, so alluring to me as a child, are unchanged today. However, the ecological function of the pool seems quite different. Recent visits to the vernal pool reveal a different scene- one that is in stark contrast to that welded in my recollection from childhood. I have not observed the great number and variety of egg masses that I saw there as a child. This spring, I only saw three egg masses. I identified two as being deposited by wood frogs, and a salamander deposited the third. I have

read that the amphibian population is declining statewide, but I had dismissed the idea until this confirming personal observation.

During the past several years, I thought the absence of the peepers' song resulted from my failure to detect high-pitched sounds. But, I have not heard the wood frog either. I know that my hearing is normal in detecting bass sounds. I can only conclude that the decline in amphibian populations is a reality.

In New Hampshire, biologists are disturbed by their observation of significant numbers of amphibians with mutations. Multiple appendages, missing appendages, or appendages in abnormal locations are more numerous than would be expected. Scientists are now studying these malformed creatures and their habitat in an attempt to find the cause. There is conjecture in the scientific community that acid rain, increased ultra-violet light passing through the thinning ozone layer, or pollution may be the cause. I see the phenomenon as an indicator that the ecosystem has a functional disorder. I support further study so that an answer can bring action to prevent a ripple effect through the ecosystem.

As a citizen and a natural resource practitioner, I resolve to increase public awareness about the value of vernal pools and to pay more attention to them in my work. The public needs to know that vernal pools and the lands immediately surrounding them, even though small in size, are highly valuable to amphibians, particularly the wood frog and several species of indigenous salamanders. These species will breed only in vernal pools. If the pools disappear, or if the surrounding uplands are subject to major alteration, then these species will surely diminish. The effect of this decline upon the ecosystem is not understood, but my intuition tells me that we may have "popped another rivet". I do not recall how I became aware of the analogy between the ecosystem and an airplane. The saying is, "Individual rivets in the airplane's structure can break without causing the airplane to fail, but how many can break before it does fail?" How many ecological functions, performed by plant and animal species, can we lose before our health and welfare are diminished?

In my work I intend to identify and make known the location of all vernal pools I encounter. Forestry operations under my control will respect the integrity of the pool and the integrity of the surrounding forest. Shade over the pool, plus an undisturbed forest around the pool, are critical for amphibian survival. I will do this with hope that my grandchildren and great-grandchildren will have an opportunity to learn biology at these pools and to connect with nature as I did.

I have observed that vernal pools do not survive in an environment of changing land use. Although a pool may maintain its appearance in a subdivision development, the habitat value for amphibians will certainly diminish. This is due primarily to the grooming of the landscape and removal of the forest litter that is the upland habitat for frogs and salamanders. The worst situation occurs when the pool is filled with earth and/or debris during land development. You may ask how this can happen with an ever-increasing level of land use regulation.

The appearance and character of vernal pools contribute to the demise of this valuable habitat. Vernal pools are not usually connected to wetland systems, they may be dry for 8 to 9 months during the year, and they may not support wetland vegetation. In short, they do not have a "wetland" appearance in the eye of an untrained person. Further, it is not uncommon that vernal pools lack the criteria to classify them as a jurisdictional wetland under state law. In some cases, consultants, developers, and regulators overlook vernal pools because hydric (wetland) soil in the pool area is non-existent, or too small in area to "catch the eye".

I believe that amphibian survival is directly linked to our success in maintaining large areas of forest habitat. Vernal pools are another habitat niche threatened by land parcel fragmentation. The Forest Land Evaluation and Site Assessment (FLESA) committee has begun its work and I urge you to support the endeavor. The results of this study will be useful in planning and implementing a program for keeping intact significant forest holdings in New Boston.

Land Use Visions – Past and Future (6/99)

My most enjoyable times are when walking over the landscape – through the forest and wetlands of New Boston and other towns in the area. Even though most of my trekking is connected with my livelihood, I gain additional pleasure from those trips into the forest made just for the fun of it. Much of this pleasure is gained from reading the signs I see on the landscape that summon clear visions of that land in times gone by. Out of my visualizations fall lingering thoughts about what affect man had on the ecosystem two hundred years ago and what we can expect for ecological changes at the beginning of the next two hundred years of land use. I believe there is a big difference between what has occurred and what will occur in the future.

During a recent hike across a high drumlin, not far from my home, I was struck by distinct signs left on the land by forces guided by men of several generations past. As I walked northeasterly along the “hog back” ridge, now covered with trees, I paralleled a long straight stonewall, a beautiful memorial of those generations. Just east of the wall, a distance of about five feet, I noticed a ridge in the soil. From experience and anecdotal knowledge I have come to recognize this mark as a “plow ridge”. I believe that my Dad was the first to tell me how this was formed. He said the ridge was a “windrow” rolled into a neat line by a moldboard plow which, over a period of more than a generation, increased in depth with each season of tillage. The wall and the plow ridge were the only clues that this was valuable cropland.

While thoughtfully in the presence of what was caused by those generations before me, a visualization came over me that began with a ghostly sound of a teamster guiding his workhorses with the directions “gee” and “haw”, then a sound of the powerful stomp of the horses’ hooves. Before me the forest disappeared and I saw, as vividly as if watching a videotape, a large team-the foamy sweat gathering on the animal’s haunches under the breeching strap and traces- pulling a plow not fifty feet from where I stood. As the mirage passed me by, I could smell the sweet breath of newly turned earth and I scanned the panorama before me and the entire country-side was perceived as open land in rectangular patches patterned by stonewalls enclosing herds of sheep and other farm animals. All the neighbor’s farms were visible on other drumlins across the valley. I remained in a nearly transcendental state for what seemed a long time, then my consciousness was rudely restored to the present by annoying black flies.

Along my return to The Homestead, I thought about the ecosystem and how it may have responded to the clearing of about 80% of the land and the practice of intensive agriculture by our early settlers. The first ecological function that came to mind was the hydrologic cycle. Without trees on the hills, rainfall would impart its energy directly to the soil. Closely cropped sheep pastures and croplands would offer little resistance to the force of gravity upon the falling rain. As a result, I believe erosion would have been severe. Further, there would be little infiltration of rainfall into the soil and the plants would have had less moisture to sustain growth. Stream flow would have been “flashy” and I presume that flooding was common in low-lying areas.

My thoughts went on to the wildlife habitat conditions in that period. Stated bluntly, there would have been little cover for the animals we find so prevalent today. It is a fact that many species were extirpated during this period in our history. It is not hard for me to understand that the land without forest resulted in hotter summers and colder winters, characterized by strong winds and drifting snow. I am sure that my ancestors gave little thought to cause and effect in their discomfort.

Although the soil was another resource nearly depleted in this era, the industrial revolution and the settlement of government land on the “frontier” (Midwest) saved our soil resource from more serious depletion. In less than a century a land use dominated by subsistence agriculture gave way to industrialization. A mass movement to cities and to more suitable agricultural lands in the Midwest left the drumlins, so common in New Boston, to revert to forest growth.

It was this cultural reversal that gave back functional integrity to the hydrologic cycle and to wildlife habitat. I believe that because the state is now about 80% forested, we enjoy a more moderate climate consisting of less severe winters and cooler summers than did our ancestors 150 years ago. I do not know if this assumption will stand up against the argument of “global warming”, but my logic is based upon valid ecological principles. Much to our comfort and satisfaction, the ecosystem has nearly recovered from the effects of European migration and settlement beginning here about 1750. It was the removal of people from the landscape that gave our environment a reprieve.

My vision of the future is real fuzzy compared with my visualization of the past. I can only project the experiences of my life, plus the insight gathered from others. What comes of this is a prediction that our natural resources will be the subject of intense competition for use. Without significant changes in policy, I think that non-consumptive resource uses will win out on the local level. This means that there may be much less harvesting of forest products on private lands. Such use will be criticized on the grounds of aesthetic appeal, inconvenience, and environmental disturbance. Further, providing land areas for recreational use will be a great challenge. Managing lands for specie diversity and a healthy ecosystem will become more important as the population increases. The quality of human life hangs in the balance beam on this issue.

Lastly, I believe that New Boston residents will debate land use planning goals (the initial stage of this debate is in progress) and will concur on objectives for a sustainable balance between development and open space. This will involve the much-dreaded decision regarding where intensive development will be allowed and where it will not be allowed. Related to the decision on where intensive development will occur is the question of how it will be structured. I have faith that innovative residential housing design will be allowed. This will mean a design with smaller lots, variable setbacks, reduced frontage, and shared infrastructure (driveways, septic systems, wells). The town will encourage “nodes” of service facilities to be established in the neighborhood of development projects. I strongly believe that such conscious planning is the only way the town can retain any semblance of desirable living opportunity.

The change now appearing on the landscape is more of a threat to ecological functions than the subsistence agriculture period of development in New Boston. Population growth with the resultant intensive use of land for residential purposes is a phenomenon that is not reversible. If we do it wrong, then there is no second chance- no second reprieve. It is most certain that there will not be a second removal of “settlers” from the beautiful drumlins on New Boston’s landscape.

New Science – Same Old Crap (7/99)

On return from a recent seminar, my mind was full of thoughts about how much we have learned in very recent times about environmental science. That my mind was stimulated by the seminar is good, but I was troubled that my consciousness is not always hearing the voice of science. Do I take too much for granted? Yes! I think this is typically human. One aspect of the world of natural science (ecology) that is most frequently taken for granted is human waste disposal.

In my own lifetime, waste disposal science has progressed from use of the cute little house with a half-moon over the door to the “one size fits all” seat in the house. Now we tilt the magic handle to summon that fabulous, always counter clockwise, vortex which sluices away everything subject to its action. The destination of the flush never comes to mind, nor do we care.

My grandparents, as did all of their contemporaries, relied upon an outhouse. Theirs was an addition to a long shed at the north end of the building and had the standard “three hole” seat; the user selected the size most comfortable. Each seat had a cover over the 6-foot deep pit dug in the ground. There was a trap door

accessible from the outside of the building. This allowed for easy removal, about once every three years, of well-composted organic matter that Grandpa spread on the hayfield as fertilizer.

The inside of the little “outhouse” was decorated with old newspapers and there was always a good supply of Sears and Roebuck catalogs within reach. I am not sure whether the main function of the catalogs was for reading, or for utilitarian uses- I often noticed pages had been ripped out. Cardboard sheets were nailed over cracks in the wall to insulate exposed behinds from the north wind, but I still got “goose bumps”.

The stench was not pleasant, especially in the summer, but it was minimized by the use of lime. We all were obliged to top off the pile with a tomato soup can (Campbell’s) full of Lee Limestone kept handy by.

One of my most embarrassing moments occurred in the old “outhouse”, I must have been about eight years old. One evening, just after dusk, I was playing in the yard when the urge came upon me and I went to Grandpa’s outhouse instead of going home. It was dark in the shed and I had to rely more on my familiarity with the route than upon visual cues. I paid no mind that the door was closed and in one swift motion opened the door, lifted the wooden cover over the smallest hole, and dropped my pants. I was well along in my mission before I realized the presence of another in pursuit of a similar objective. It was my grandfather! Neither of us said a word- I hurried out and he remained. Not a mention was ever made by either of us to the other about the incident. I suppose that he was as embarrassed as I had been, or that he was sensitive to my feelings.

Locally, all homes are now served by a soil absorption system adjacent to the house. I doubt that there are any old homes still using the “outhouse”. The soil absorption system consists of a bed, pit, or trench composed of natural, or man-made materials, placed in or upon some combination of natural soil or man-placed soil materials. The systems are based upon sound design and installation procedures approved by the State of New Hampshire Department of Environmental Services.

I wondered about the magnitude of wastewater entering the ground from the approximately 1500 households in New Boston. An estimate of this, I reasoned, would program my brain to recall the importance of the soil-based ecosystem to our health and well being. If the homes in Town average three bedrooms each (the State has determined that bedroom count is the best indicator of the amount of sewage emanating from a dwelling), then from each home would flow 450 gallons per day. A simple multiplication reveals that the soil accepts, purifies, and delivers to the groundwater, a total of about 675,000 gallons each day. That is enough to fill about 25 in-ground swimming pools!

I am convinced that waste disposal in the soil is one of the most valuable services provided by nature. All that man has to do is to install a simple tank and piping to disperse the liquid into the soil medium. Well, this may sound simple, but we are just learning how to do this reliably and without failure.

We have learned that the septic tank has to be a certain size to function properly. The primary function of the tank is to contain the sewage for proper settling of solids and to store sludge and scum. Further, the sewage must remain in the tank long enough for the anaerobic bacteria (capable of life without oxygen) in the tank to alter about 40% of the solids before passing it on to the soil absorption area. A tank too small will certainly lead to failure.

The most recent advancements in science relate to siting of the soil absorption area. Study and experience have confirmed the separation distance between the groundwater and the bottom of the absorption area. Study and experience have also confirmed the distance from the absorption site and wet soils. These separation distances must be allowed, or the soil can not provide the service.

The person making the site evaluation must carefully interpret the soil profile revealed in a deep soil test pit dug in the area proposed for the absorption system. The evaluator can detect signs of ground water

levels in the pit and can calculate the elevation of the absorption system relative to the groundwater. He must also examine the soil to determine the boundary of wet soil areas. This boundary is then used to control lateral siting of the system.

Carefully designed and installed soil absorption systems insure that the soil ecosystem will safely and efficiently provide a most valuable service. A new homeowner can expect that the wastewater he generates will be treated and released to the groundwater where it will be diluted and made safe before it flows off his property. Then, he can take nature for granted and forget that part of his home, right? Not right! The homeowner has a responsibility equal to that borne by the designer and installer.

I will list some elements of the homeowner's responsibility without elaboration (column inches are limited):

1. Pump the septic tank regularly, every three years;
2. Do not dispose of harsh chemicals in the toilet (these kill bacteria in the system);
3. Do not put solid objects in the system (they clog pipes);
4. Large quantities of grease and fat overwhelm the bacteria and may pass through to the absorption field where it will clog the soil medium;
5. Repair leaking plumbing fixtures so that the system will not be overloaded (soil absorption rate is limited);
6. Have your plumber install a filter at the outlet of the septic tank (this is a new idea and even recently installed systems will not have this feature);
7. Do not use a garbage grinder unless the system is designed for it (compost instead).

I've learned that the great challenge in life is to decide what's important and to disregard everything else. I firmly believe that our natural systems are probably the most important in life and I will try not to disregard them in my work. I hope that my readers will not take their soil absorption systems for granted and will maintain them for a lifetime of safe and efficient use.

Why does the vortex flow counter clockwise?

Property Lines: Gravesites and Homesites

A recent review of Cemetery records brought to my consciousness that I have been Clerk of the New Boston Cemetery Trustees for 25 years. With that thought came the realization that during this time I have prepared well over a hundred deeds for gravesites and not one has been the subject of a boundary dispute, nor have any of the boundary markers been destroyed. On the other hand, my work as a surveyor has been "spiced" with problematic experiences involving trespass, boundary disputes, and spiteful destruction of boundary markers. The reflection in this simple comparison is that there may only be one category of land having eternal, undisputed boundaries: gravesites. Recollections of several surveying experiences add credence to this thought.

As a young surveyor, I was idealistic and my head was full of mathematical and legal principles relating to placing upon the ground abstract lines described in deeds, or in establishing new lines through subdivision. Early in my career, I took pride in laying out these lines and had great confidence that they were finite and absolute. I felt good that my clients and all their successors on the land could stand on their side of the line and assertively defend their rights against all threatening to trespass. Further, I felt good about my contribution to everlasting harmony and order in the neighborhood. Only a few years passed before I became less adherent to my ideals and more influenced by practical realism.

That my survey lines and those established by my colleagues are eternal was the first notion to be trashed. Markers set by surveyors at property corners seem to be favored targets for destruction. I feel paranoia
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each time I set a marker. Sometimes, at night, I am awakened by the sound of a bulldozer rumbling along to destroy the bounds I set that day. I suppose this is a conditioned response to the many times that bounds have been accidentally destroyed by heavy equipment. On other occasions angry abutters disputing marker locations spitefully destroy bounds. One such experience sticks with me like a “choke sandwich” (all peanut butter-no jelly).

On this occasion, I was engaged by a landowner to do a survey on his residential property and to replace a missing bound. My client had become frustrated by his neighbor who was, for the purpose of storing old cars and parts, increasingly making use of land belonging to my client. Complaints to the neighbor by my client had remained unheeded and were countered by the neighbor’s claim of ownership. Fortunately, my client’s lines were easily re-established and I set the bound by reference measurements to other bounds on the property. The bound was a piece of granite 4” by 4” by 36” and I set it proudly at ground level. My client was pleased and I returned to New Boston with my usual feeling of gratification.

Within a month, I was called back to replace the bound allegedly pulled up by the neighbor. My client accused his neighbor of pulling the bound with a chain, but he did not witness the act and could not prove it. Having done the work once, it was a cinch to replace the bound a second time.

Much to my amazement, I was soon called a third time by my client who was ripping mad, but rational in his approach to the problem. In his call to me he assured that I would not be called a fourth time. Although, I would miss his regular payments for my services, I was, by now, bored by the lack of challenge this job offered and was happy that he had figured out some means to end this dispute.

On arrival at the site I was surprised to see a backhoe with operator at the ready and an enormous piece of granite lying on the lawn nearby. This piece of granite I estimated to be about 8 feet long and, on average, about 12 inches square in cross-section. I was directed to stake the marker location and stand by while the operator excavated the very deep hole in which to plant this granite. Before the hole was completed, a police cruiser, with blue lights flashing, screeched to a halt at the scene. The officer emerged from the cruiser just as the neighbor stormed out of his house. He was obviously very upset and began hollering at my client who commenced to holler back with profanity appropriate for the affair. I stood back half amused and half concerned that violence would erupt.

The officer handled the situation very well – sending each assailant to opposite sides of their properties while he calmly interrogated me about the situation. I gave him the whole story and he suggested that the work continue while he stood by to keep the peace. The huge bound was set upright at the corner with my guidance, then the operator carefully back-filled the hole. Finally, I marked the precise point in the top of the granite by making a shallow hole with a stone drill. To my knowledge and belief there has been no further need to mark that property corner and I have not been called as a witness in a lawsuit over that boundary.

That a survey line is finite and absolute was the second notion to succumb to realism in my career. Too many times I have been called to mark a property line for the purpose of guiding the construction of a fence, building, or swimming pool, only to fail in finding sufficient points of reference (markers) in the area. These tasks are conceptually simple, but with no markers to go by, they become extremely complex. I am embarrassed to tell my clients that the entire subdivision project must be resurveyed to re-establish the one short line about which they are concerned. I am even more reluctant to say out loud that the estimated cost will sum to thousands instead of hundreds of dollars as they had expected.

The concept of property rights is a complicated keystone of our society. The basics came to us from European culture- here they have been modified by land use customs of the several ethnic groups responsible for settling New England. Still, the customs of contemporary landowners reveal many perceptions of property rights. Some make it clear that they want every square inch they can possibly claim and will fence it off to the

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exclusion of everyone else. At the other extreme are those who feel no insecurity with others making use of their property. The first group feels that land is valued mostly as a commodity- the second group feels that land is valued mostly for the benefit of natural functions and amenity.

These often-conflicting concepts of property rights are difficult to resolve. Just when I think I have reached the pinnacle of knowledge the concepts change by act of legislature, local land use regulations, a change in “culture” brought on by the influx of people in new subdivision projects, or by precedence established by Court decisions.

I believe that we can all benefit from lessons learned in life. My career experiences have taught me that we must respect each other’s concept of property rights and be tolerant of land use activities by others that we may think are “different”. Only respect and tolerance will foster neighborliness and harmony in our community. In managing our properties we must be diligent in maintaining the markers and insist that survey professionals establish enduring markers. There is truth in the old saying about the relationship between “good fences and good neighbors”. This too will foster harmonious communities.

Revelation In The Tomato Patch (9/99)

I kneeled beside a tomato plant to get a closer look at the struggle that was taking place. The sight caused me to utter an excited cheer, “Yes”! A small wasp was attaching her eggs to the back of a hornworm. In a few moments the worm stopped struggling, apparently paralyzed by the wasp’s sting. I also noticed another paralyzed worm with several small silken cocoons “spiked” to its back. I realized that, in this wasp, I had an unknowing ally in my war against those beautifully decorated, four inch long, all mouth and gut, hornworms ravenously stripping the plants and “wolfing” down tomatoes for desert. Beyond this realization, I felt a greater awareness- a concept that I have been studying for some time was at once poignantly embraced in my thoughts. Here was biodiversity in action! Natural pest control- one of the many benefits of the web of life, was being demonstrated, as if by design, before my eyes.

Biodiversity (a short definition: the total variety of life on earth) is a scientific concept developed since I studied ecology in college. During the last ten years, more or less, it has become the focus of multi-level natural resource management, particularly within the federal agencies having land management responsibilities. Throughout this period, I sensed some need to retrain myself and to redirect my approach to natural resource management, but I was not compelled to do so until now.

While watching my buddy, the terminator wasp, many other valuable functions of biodiversity thundered in my mind like ocean waves breaking upon the shore. Waste disposal is one of the more important natural functions. All organic waste is “recycled” by actions of a host of species at all levels of taxonomy, from bacteria to bears. Can you imagine what our environment would be like if organic waste just piled up on the surface of the earth?

The pollination of plants by bats, bees, butterflies, birds, and other allies is, perhaps, the foundation of our food supply. Incidentally, I like the idea that the flowers in our garden attract butterflies. Without the numerous species involved in this process, how could we enjoy peach shortcake and apple pie?

Soil productivity depends on the activity of organisms within about 18 inches of the surface. This mantle of unseen “life” including; bacteria, fungi, worms, burrowing animals, and insects are responsible for the fertility supporting plant growth. I do not intend to single out this function as the keystone of life support, but I imagine that our planet would be like the moon without it.

Water purification in the ecosystem is a function attributed to the many organisms that filter, consume, and transform materials and chemicals that enter our water supplies. Human health is directly at stake in this function, not to mention our economic well being. The construction of water purification systems, as a substitute for the natural function, is very expensive. Clams and mussels work free!

Trees and other plants are particularly capable of filtering out harmful gas and particles from the air we breathe. I would not want to pay the price of substituting technology for plants in purifying air. This natural function may be the one I most often take for granted.

The production of commodities may also be taken for granted by those not connected to the land. It is difficult to see the source of food, medicines, and clothing when purchased at Wal-Mart. In comparison to all existing plant and animal species, very few have been studied as a possible source of material for human consumption and use.

The more I read about biodiversity, the more certain I become that it is relevant to my consulting business and to human welfare as a whole. Two publications endorsed by state agencies have particularly influenced my thinking. New Hampshire's Living Legacy: The Biodiversity of the Granite State (Taylor et al, 1996), is written in a style that is easily understood and strongly states the affect of man upon natural processes influencing biodiversity. The New Hampshire Forest Resources Plan (Forest Resources Plan Steering Committee, 1996) has an entire section listing recommendations for conserving biological diversity in this state. Although the recommendations are directed toward management of state owned resources, there is one that would provide financial and other incentives directly to private landowners agreeing to carry out practices to promote biodiversity on their land. For instance, a landowner may be reimbursed for work done to maintain openings in his forest, or for nurturing trees and shrubs that provide food and shelter to wildlife. The New Hampshire Fish and Game Department is the lead agency in implementing this program.

In recent conversations with Steve Najjar, the enthusiastic and insightful Natural Resources Planner at the New Boston Air Station, I became more keenly aware of how much natural resource management has changed in recent times. Steve was instrumental in directing the Biodiversity Survey (1997) on the Station land, then he followed this up by authoring the Integrated Natural Resources Management Plan (1998) for the station. Taking Steve's advice that I read these documents, I borrowed from Betsey Dodge, Chair of the New Boston Conservation Commission, the copies he had given the town and then I delved into the data. To put the importance of these works into perspective, I calculated that the Station land area within New Boston's boundary comprises nearly 10% of the total area of the town.

I found several astounding facts in the Biodiversity Survey, authored by a team of scientists, mostly Ph.D.'s, from the Argonne National Laboratory. 450 plant species were identified on the land, and of the many insect species found, 3 rare moth species and 3 rare butterflies were found. The portion of the Station within New Boston contains 8 sites with rare plant communities, 4 of these were found on the face of Joe English Hill. I understood that Joe English is unique in its landform, but was surprised to learn that the plant communities growing on it have been singled out as "rare". In one of these plant communities there was found a plant named, fern-leaved false foxglove. This plant is considered critically imperiled, because of extreme rarity, by the State of New Hampshire Natural Heritage Inventory. The rank given by that agency to the plant is S1, which means that it is especially vulnerable to extinction. I was very pleased that this exemplary work has been done and I believe the results are extremely valuable to future land planning initiatives in New Boston.

From my reading, I have a vague understanding of a fundamental principle of biodiversity. The operation of this principle is necessary to sustaining the functions that I have listed. Each function is dependent upon a community of interacting species. The community is analogous to a team with one or more "star" players. If the "stars" become ineffective (lost due to exploitation, extirpation, or extinction), then another species will substitute for the "star". This substitution will continue until the "bench" is cleared and the team is

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diminished to the point that the function is no longer played out. This principle is a good argument for encouraging the survival of the greatest possible number of species. All the brains in the natural science disciplines do not know how many substitutes are needed to play the game of life.

The great importance of all the functions of biodiversity combined, dictates that I turn the corner at this juncture of my “old” approach to resource management and the “new”, more comprehensive, approach. It is humiliating, but clear, to me that this new approach is way beyond my ability to direct alone, or for any single discipline to direct. Any meaningful natural resource management program promoting biodiversity will require a great team of scientists from many disciplines. I am eager to participate in a team approach to resource management.

One thing is certain, I will pay more attention to the little “things” I see in the many habitats in which I work and I will appreciate their needs in the decisions I make. I wonder where that wasp lives and what I can do to help her be a stronger ally in my war against the hornworm? “Hmm”, perhaps the hornworm, in its adult (moth) stage of life, is a star player for another function important to my well being. The web of life is so complex!