

Landsmanship - ecology not technology creates 'habitat in common'

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Abstract

Only Nature working as an ecosystem can maintain the natural supply chain of Earth: the multiples of living species (diverse species, diverse species types, diverse functional roles and diverse environments), soil and water that connect and re-connect small natural cycles where we live and all of life on Earth. Nature also creates and maintains large natural cycles linking the biosphere and the atmosphere.

Species, soil and water co-exist functionally (productively), without human intervention. Where land is disconnected from natural cycles (i.e. cycles are broken), the land becomes dysfunctional. Single species dominance (monoculture) usually results in landscape dysfunction in both urban and rural landscapes. Replenishment of species, soil and water is greater than depletion, when land and water systems are functional (productive). Where land is functional, oceans, seas, lakes and rivers are also usually functional.

It is now essential for life on Earth to live and work as multiples of species together, making 'habitat in common' as local communities in functional land and water systems for all time. As a regenerative farmer, I daily put into practice the above principles.

Introduction

Biological diversity – biodiversity - has three functional states simultaneously: species diversity, genetic diversity and ecosystem diversity and function, all interconnected and interacting as an ecological system (ecosystem). For the health of each ecosystem, we must make sure that the number of species is diverse, the variation within each separate species is diverse and that the environment all organisms live in together is also diverse, functional and not dominated by any single species. The natural cycling of nutrients, carbon, minerals, water and other natural elements within the ecosystem must be maintained at all scales across the landscape. The sun's energy needs to be captured by plants in the most efficient manner whilst preventing the soil from overheating that decreases plant and animal production.

Ecosystem function

For any land and water system to be both healthy and profitable, there must be multiples of species living, working, dying and decaying together providing food and water for all species present within a functional ecosystem. Single species dominant ecosystems or monocultures in urban and rural landscapes are usually associated with a dysfunctional system. Nature works for human benefit with multiples of species together as the whole biological community, in continuous succession, without the need to spend significant amounts of money and human intervention. Nature, when dysfunctional, can however 'self-repair' by naturally increasing species numbers, soil development and water retention.

Habitat in common

I advocate as a farmer that we not only learn from ecologically literate people, but also from Nature through observations and trial and error. All plants and animals are our unpaid servants that increase our food and available water so that we do not need to work so hard to feed our family. All our soil, food, shelter and water are self-replacing by natural processes without

monetary cost in a Nature-made functional landscape, but not in a human-made dysfunctional landscape. Energy comes to an ecosystem as a free gift from the sun. 'Habitat in Common' means that all species within a particular landscape such as might be present on a farm are part of the local biological community, where we also live too.

As Nature's stewards, we only need to observe, learn, understand her working principles and supervise outcomes that are beneficial to humans and Nature.

Natural farming

Volunteer broadleaf plants are some of the most valuable functional plant species in any landscape, for they are the medicinal plants for the soil, and when recycled on farm into soil, are also the start of the food chain on earth. Volunteer plants can be rapidly trashed into the earth by meat sheep, feeding both the soil, the sheep and the people.

The land use crop programme sequence I follow uses no man-made agricultural chemicals consists of the following steps:

- A summer crop of vegetables/cereals/legumes is planted directly into well-established grasslands that are 'rolled down'/trashed to mulch winter growth at the end of the season, after broadcast or direct drill sown. Crop species are rotated each season and after each harvest. I keep my own locally adapted seed. In some seasons, all locally grown crop species are sown together as fodder crops grazed in situ by multiples of grazing species.
- Standing stubble is 'trashed' by a mob of farm animals usually sheep, cattle, pigs, goats, horses and chooks (chicken).
- I follow this with sowing/planting a winter crop. Vegetables/cereals/legumes are sown directly into 'rolled down'/trashed end of season grasslands. Each season, annual broadleaf/narrow leaf crops are rotated. Some seasons all crop species are sown together as multiples of species growing together as fodder crops, grazed in situ or harvested as seed together for feed/sowing.
- The stubble is again in turn trashed, short term, by multiple species of grazing animals, after direct seeding or broadcast sowing the next crop to harrow, mulch, fertilise and cover the seed. Long term rest until harvest enables optimum growth with some times a light pruning to graze out weeds and stool out crop plants.
- After harvest, the cycle of soil increase and replenishment continues using multiple species of plants and animals together in well-designed systems of farming land and water. Sheep are fed a continuous diet supplement of homegrown oats with ten per cent lupins, either by trail feeding with grass seed added to 'reboot' grasslands, or fed from a bulk lick feeder that moves with them as they go. This rotation, requiring no industrial inputs, is shown in Figure 1.
- Grasslands and forests are regenerated and 'managed' by multiples of species of animals, thinning weaker plants, and increasing soil health.



Figure 1 A short rotation cycle that increases nutrients in the food chain, all without industrial inputs. The more diverse the species of plants and animals together in the rotation over time, the more production and higher the yields.

Photos: P. Newell

Work at scale

This method of farming can be carried out on a small scale, vegetable garden, or on a broadacre whole of valley catchment at the macro scale, for the land in form and function is the same at the square meter scale as at the square kilometre scale.

Valleys of different shapes and sizes dominate all landscapes. Australian valleys are very old, with millions of years of plants and animals cycling seasonally for their own comfort, converting them into a living ecosystem usually with a convex shaped valley floor (Figure2).



Figure 2 A functionally sound, mature convex formed valley floor with no incision or gully.

Photo: P. Newell.

Micro/macro-flood plains in a valley floor can also be sedimented and vegetated within seven days after a storm, but this only occurs in functional landscapes (Figures 3 and 4). Dysfunctional landscapes export water, soil, and plant and animal species as sheet and gully erosion. Functional landscapes accumulate natural resources with little or no erosion. Dysfunctional landscapes disperse natural resources. Figure 4 demonstrates that form and function are the same at the micro scale as at the macro scale. This photo could have been taken from two kilometres high or two metres high and at each scale would appear as the same pattern.



Figure 3 A functional farm valley floor with shallow water flowing as a wide and slowly moving stream, maintaining 'self-watering' floodplains with no incision or gully.

Photo: P. Newell.



Figure 4 A micro floodplain self-repairing after a storm, with newly deposited sediment and subsequent vegetation growth.

Photo: P. Newell

Landscape repair

Figure 5 demonstrates that wherever any single species, plant or animal, is dominant, any landscape becomes dysfunctional, as has happened in much of the central west after 150 years. Desertification is always the result over time. Dysfunctional landscapes can, however, be repaired if upslope accumulation of soil is enabled (Figure 6), resulting in healthy groundcover growth on the re-soiled and re-hydrated hill slope with nil runoff.

Multiples of species together (whole biological communities) reverses dysfunction to function once again. Note the vegetation bands that form along the contours that further slow water and optimise sediment retention. Contoured banded vegetation and accumulation of alluvium is a sure sign of a restored whole of valley ecology.



Figure 5 A once functional grassy woodland converted to a dysfunctional hillslope as a result of 150 years of single species dominance. Canowindra, NSW.

Photos: P. Newell

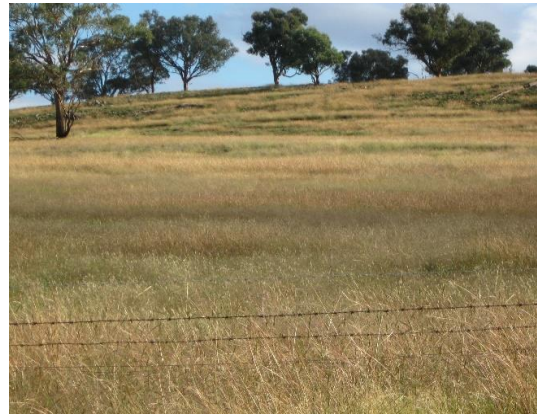


Figure 6 The same hillslope in drought but revegetated, re-soiled and re-hydrated by natural processes. Up-slope sedimentation-induced banded vegetation on the contour can be readily observed as a sure sign of function restored.

All plant species living in succession are the hospitality industry for the land and water. Replacing locally extinct species reconnects natural cycles. Recycling more of what we grow feeds all species present and increases function. All animal species together are the habitat builders and ecologists. Cows are a fermentation vat making soil organisms from grass. Earthworms are the intestines of the Earth. Pigs are the 'rooters' and cultivators of new deep soil. Insects are the 'professors' teaching us all they know about that we do not know. Chooks are an insecticide as well as a biological control for the sheep blowfly. Sheep are the seed sowers (in their droppings) and tip prune all plants on the run. Lambs are the specific herbicide for 'in-crop' weeds. These create a multi-species 'habitat in common'. Using biological farming processes such as these at scale, we can enable the self-repair of dryland salinity landscapes (Figures 7 and 8), severe gullying (Figures 9 and 10) and landscape dysfunction, whilst concurrently increasing vegetation density, yields and profits, lowering costs of production and eliminating debt.



Figure 7 An example dryland salinity occurring when an ecosystem is dysfunctional due to single species dominance..



Figure 8 The same landscape after self-repairing with multiple species of plants and animals together, using the principles described, now with functioning ecosystem.



Figure 9 A single species dominated induced gully head-cut on Meadowland, Canowindra.

Photos: P. Newell



Figure 10 The same gully self-repaired with multiple species of plants and animals after two years using a 'stock balk' to stop stock tracking, enabling vegetation to grow, water flow to slow and soil to accumulate, rather than natural resources exported as erosion.

Figures 11a, b, and c demonstrate the stages of gully restoration on Meadowlands, Canowindra. 11a shows the 'before' resource as degraded and leaking; 11b shows the second stage where the incised gully is being revegetated; and 11c shows the sedimented and vegetated stream bed with vegetation density increasing through the use of plant/animal systems. Stream bed vegetation density induces long term natural hydration of whole flood plains and also facilitates valley fill, over time. Note the shallow slow-moving water through the vegetation of the new flood plain.



Figure 11a The incised gully before restoration

Photos: P. Newell



Figure 11c The stream bed now sedimented and revegetated.



Figure 11b The incised gully being revegetated

Landsmanship, restoration ecology and regenerative farming

The 'Landsmanship' approach to restoration ecology uses the biology of multiples of species of microbes, invertebrates, plants and animals that under appropriate conditions can work together to restore ecosystem function, production, profitability and landholder enjoyment. Landsmanship is the stewardship of species, land and water. People are not the 'creators' or labourers on the land; they are the stewards of Nature's creation, a natural living creation that so often is rapidly dwindling because of a lack of ecological understanding.

A new beginning

To begin any land-based 'people-built' project, I think that it is better to separate in our minds the funding/financial planning of any project from the farming/business side. Suffice to say that, in natural farming, we will be conducting both a benevolent learning institution for our own people and a self-sufficient, sustainable natural farm to support and increase both the bounty of Nature as well as support the livelihoods of the local biological community as a whole.

Improvisation

I always start to farm by improvising with what I have. I do not write budgets, seek a financial loan or gift funding from governments, spend money to make money or try to increase production. I only seek to learn from watching the land, whilst investing in imagination and effort to farm the land naturally as an ecosystem. My expertise is in using and investing my own self-replacing natural resources to work with and optimise existing natural systems and living communities. I self-resource and self-educate from Nature rather than learning from people alone. I am then in the enviable position of being in a spirit-lifting stewardship role, rather than a depressing labouring role.

Extinction of dogma

My family and I are in dynamic continuous evolutionary change as we each learn. We have now become the change we wish to see in our world (as Gandhi suggested) and keep continuously changing and increasing species numbers to a point where all living species are present as the whole local biological community, including people. We have regenerated our forests, our grasslands and the forage lands of our valley floors using plant/animal systems and management alone. Hygienic behaviour on farm is as vital to our working life as honey bees think it is to their hives. Our eco-structured land and water system is more critical to our multi-purpose bottom line than people-made environments with manufactured products and infrastructure, where there is only money-making from the exploitation of land, water and people. We are our own banker in our own productive profitable business, where two by two often multiply to multiples of thousands in a single season at no cost to our multiple bottom line. We self-resource and operate in low maintenance eco-structured Nature-made environments. The aims and the results of our endeavour are achieving sustainable, resilient rural landscapes using multiples of people, plants and animals in continuous succession by 'natural increase', as 'habitat in common'. Losses of natural resources are consequently also reversed naturally.

Always do the experiment

After a lifetime in experimental research, a study of natural phenomena (what Nature does over the surface of the Earth), I have found that Nature self-repairs from the dysfunction induced by modern-day land and water management practices. The greater the variability of functional plant and animal species present in any landscape, the more function (production) and natural

resources there are in that landscape. I have also found that each living species has an ecological role to play in creating and farming every land and water-based ecosystem. It is also crucial for us as people to realise that Nature uses each and every species, to work together as our servants, to benefit people so we do not need to work so hard to make a living.

Harnessing Nature

Because our family farms the land naturally (increasing, retaining and accumulating more soil, vegetation, animals and water every year with a minimum of erosion), we have no clinical symptoms of global warming and climate change on our land. We have no rainfall-induced runoff from our land, even from the heaviest storm rains (Figure 12).



Figure 12 Depicting Rainfall- effective rainfall, over time under drought conditions. Any rainfall on the left side of the fence evaporated to the atmosphere within 24 hours at summer temperatures. The same rainfall on the right side of the fence was retained as ‘in soil/in ground’ water for much longer periods, away from evaporation. Heat radiation induced evaporation from bare ground surfaces, is greater than transpiration from dense vegetation, anywhere in Australia.

Photo: P. Newell

Our soils are so absorbent that all water infiltrates, adding to in-ground water and leaching salt (sodium chloride) to the bottom of the water table. There is a dew every morning at our place due to either localised condensation and/or guttation – the exudation of droplets pumped out of leaves due to root pressure. Even on the hottest day, there is a cool breeze as all sunlight is absorbed and used by green growing photosynthesising leaves transpiring water vapour to the passing air. We have green grass growing the whole year through. Very little of the energy from sunlight is lost by radiation of heat from bare surfaces of the farm at any time of the year

or wasted on heating bare soil to temperatures that depress plant and animal life. The regeneration of multiples of species of plants is now very dense, covering the increasing new, high organic water-holding soil. Our land, five or so years ago was a non-growing, dysfunctional land-water system which was up to eighty per cent bare. It was historically overgrazed and cropped out during droughts, wildfires and flooding rains. This situation has now been reversed due to a deeper ecological understanding acquired through well researched experience-based learning by many people over many lifetimes.

Was it ecological ignorance, industrialised thinking, single species dominance, greed or perhaps a combination of many human logic decisions that was the reason/cause for previous generations of people to overgraze, crop out and/or excessively export resources from their own Australian land during droughts, rabbit plagues, wildfires and flooding rains?

Enterprise

In our rural enterprises, we seek to develop self-resourcing whole-of-valley catchment landscape ecosystems at farm scale and only sell surplus resources to local communities. Any resources we produce for which we cannot gain adequate return are retained and returned to the soil through microbes, plants and animals as our 'soil bank' to increase more natural input/output. In my own farming ventures, whenever I stopped applying technology, spending money and applying industrial skills and started applying ecological principles and using ecological skills, my farms became self-organising.

Stocking to capacity ration

Our farming environment is continuously changing, and we reassess progress and productivity monthly. As required, we sell down or breed up the stocking rate to current carrying capacity. Rapid growth of grassland is regarded as accumulation to rest country and grow root systems to increase resilience and succession. All livestock are held in prime condition continuously, and surplus animals are sold locally, regularly topping the sales prices. We only buy privately from local farmers and sometimes 'opportunity deal' in stock and produce to buy, use or sell at a profit as this adds to our business, soil health and adds diversity to our genetics. As our cost of production is low, our profit from the natural increase is high. Stock, crop, grasslands and forest are maintained as vegetation dense productive multi-species regenerating communities. We do not buy in manmade chemicals, or mass medicate stock or sell farm-made hay, silage or grain, and we use all produce yields on farm.

Ecology, not technology

In my multiple species, plant-animal rotational cropping program, when I stopped using fertilizer, my yields went up; chemical fertilizer kills soil organisms and reduces soil water-holding capacity. When I stopped using herbicide, my costs went down. Now I am my own banker, and I am able to fund any and every enterprise I wish. The land and water system then, in turn, reversed ecosystem dysfunction naturally to become, once again, productive, profitable and healthy. Every dead and decaying organism can be used to increase the biological activity of the soil and every living organism can be used as a task-specific tool to farm the land and water system, as Nature does when we know how to use our ecological tools.

When, by management alone, I began increasing the number of microbes, plant and animal species (fifty or more species /ha above ground - no doubt hundreds of thousands underground) all working together, my workload decreased significantly. We do use technology judiciously in our farming operation as many human-made things can be used to benefit people. Mainly

we use technological methods to overcome some works previously implemented on the land that are restricting landscape function.

Propagation

As a family, we propagate all the plant and animal species we farm and improve our own suitable, productive, low maintenance, calm-disposition genetics of each domestic species. We also have developed our own multi-species plant/animal nursery that each one of us works in for short periods every day. We all learn the characteristics of each animal species and each plant species and their specific requirements. This operation is the 'engine room' of our operation. We not only use multi-species of both plants and animals together to grow our nutrient-dense food, but work to increase species diversity, increase genetic diversity within species and increase the whole of landscape biodiversity within the area we farm. By farming naturally, with a very low cost of production, our family is also able to double our acreage every ten years or so from our farm efforts, profits, imagination and expertise (as was always possible in Australia before industrialisation).

A functionally stable ecosystem

No clinical symptoms of disease or parasitic organisms exist on our land. Not only do multiples of species promote an increase in production, but they also reduce the incidence of dysfunction. Honey bees are self-organising with the minimum of intervention, and nothing goes into their hive unless the bees put it in. Honey and wax are harvested regularly to maintain hive hygiene and the vitality of the expanding and contracting brood nest, and nothing is added to the harvested honey but the price at the farm gate. The incidence of fruit fly is removed by multiples of species of grazing animals that trample or remove all decaying fruit before fruit fly can multiply. The intestinal worm burdens are reduced by the multiple species variation in the diet with which the animals self-medicate. There are so many earthworms in the soil that no root disease can exist, and we can grow perennial potatoes in the same ground every summer and grow cereals or brassica species on top of the potatoes store during the winter months. The sheep blowfly is eliminated by domestic fowl and wild birds who eat all maggots directly off the sheep who stand to be de-flied every day until the fly strike is controlled. No blowfly is ever produced from any dead carcasses. Birds visit each carcass site every day and break down the dead body, eating all the meat and maggots until only the bones, hair, feathers and wool are left as mulch to return to the soil eventually. So-called weeds all decline as forests and grasslands are regenerated and managed by multi-species of animals to maturity. My grasslands too increase in density by being repeatedly pruned, fertilised and multi-species cropped on our own 'food farm/gold mine'.

The Landsmanship method of restoring the natural ecology of Australia converts from an open arterial haemorrhage of nutrient-rich resources to a self-repaired enclosed flowing braided veins of retained biological rich 'blood' streaming for the benefit of the whole Earth. This method is being successfully applied, already densely vegetating the open gully system of dysfunctional creeks and inland rivers of Australia to stop the leaking of natural ecosystem resources. The Common Reed, *Phragmites australis* as shown in Figure 13 is a native giant grass of all alluvial flood plains in Australia and is a 'keystone species' in all functional valley floors areas. In the absence of this giant grass that grows under dry or wet conditions, reverse of dysfunction cannot occur. This is the most valuable plant species in Australia for farmers, but was locally extinct within a century of European settlement. It is recognised worldwide as thatching material and for its ability to filter solutes and sediments from flowing water and to reduce erosion. It is a nutrient-dense food for all grazing animals. The perennial plant root was an abundant source of carbohydrate and made into flour by Aboriginal Australians.



Figure 13 The Common Reed growing competitively in multiple levels of vegetation.

Photo: P. Newell

All landholders who wish to be an asset to themselves and Australia, can now slow water flow, enable all the plants to grow and observe where the animals go, all in natural cycles.

Agrarian science education, landscape literacy, ecological skills and training by doing.

As an expanding family farm enterprise, we as new pioneers in Australia are now working with live-in jackaroos (intern/apprentices), and many interested people as partners on our land and their own land, based upon short-term land-share/resource-share/profit-share principles, under expert guidance of master craftsmen and craftswomen.

Over the last few years each person that has been engaged, under a short-term partnership arrangement, living on our land and or living on their land, has been very successful in learning Landsmanship management principles and establishing their value-adding business as part of our business. They each learn to farm, using a wheelbarrow and a shovel, before scaling up, and only use plant/animal systems to do most of the work in restoring food-producing soil, water and vegetation on land for the benefit of all species present, including people. In this way, working at every scale, we don't need to make much fuss to influence larger and larger scale areas of Australia and, while learning, there are no politics or money involved. However, we all increase our ecological capital every year, as real wealth.

Also, we are involved in the rollout of regenerative farming as a peaceful subversive grassroots movement right across Australia. We supplement the cost of our operation by a continuous intake of interested paying tourists seeking an adventure 'boot camp' holiday, learning also how we farm Australian and to self-resource ourselves, applying the principles of Landsmanship.

Self-resourcing communities.

The future of Australia belongs to small, self-resourcing, self-sustaining communities living well in comfort for the long term. Those that grow, make, use and accumulate their own appropriate requirements locally with their multiples of plant and animal species. There is a lot to learn about farming naturally, and we must all learn more about how the ecosystem of which we are an integral part, works every day. As peaceful, thinking people, we continue to learn for as long as we shall live in community together with microbes, plants and animals as 'habitat in common' on Earth.

In conclusion

Nature teaches us from multiples of sources that all profitable farming and grazing operations need to follow the principles of not spending money on infrastructure and imported industrial

materials to farm our land. We need to employ multiples of plant and animal species to farm our land and water systems and allow regular seeding down of all plant species, to create eco-structure. As well we should manage our farm using the principle of short-term disturbance (graze/sow/harvest periods) and long-term rest (growth/reproduction periods). We also continuously, monitor stock numbers monthly, and subsequently reduce or increase our multi-species stocking rate to equal the required carrying capacity, in good seasons or bad. These land use principles of management simultaneously promote growth, regeneration, production and conservation, while promoting ecosystem health and function, and a stable climate in the place where we live and farm. Whole of valley catchment vegetation density increases whole of valley soil, living species and water by accumulation. Landsmanship is applied ecology and at the heart of the evolutionary process of regenerative farming. The Landsmanship method of restoration ecology that I use on my properties repeatedly engages Nature to farm our land and water system and also to simultaneously restore degraded landscapes. This is achieved by breaking dormancy and single species dominance as well as reconnecting natural cycles, using multiples of species of plants and animals together as a whole biological community.

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Bibliography – the following books have greatly influenced my thinking

- Albrecht, W.A. (2015) *Loss of Soil Organic Matter and its Restoration* Source: U.S. Dept. of Agric., *Soils and Men, Yearbook of Agriculture 1938*, pp. 347-360.
- Berry, W. (1996) *The Unsettling of America: Culture and Agriculture*. Tandem Library.
- Berry, W. (2015) *Our Only World – Ten Essays*. Berkeley: Counterpoint.
- Coannouer, J. A. (2015) *Weeds, Guardians of the Soil*. Midwest Journal Press.
- Cribb, J. (2010) *The Coming Famine: The Global Food Crisis and What We Can Do to Avoid It*. Berkeley: University of California Press.
- Fukuoka, M. (1978) *The One- Straw Revolution*. Emmaus: Rodale Press.
- Fukuoka, M. (1985) *The Natural Way of Farming: The Theory and Practice of Green Philosophy*. Bookventure.
- Howard, A. (2018/1940) *An Agricultural Testament*. London: Albatross Publishers (Fascimile of 1940 Edition).
- Kravcik, J., Pokorny, J., Kohutiar, J., Kovac, M. and Toth, E. (2007) *Water for the Recovery of the Climate - A New Water Paradigm*. Kripta Print, Zilina. Available online at: [http://www.waterparadigm.org/download/Water for the Recovery of the Climate A New Water Paradigm.pdf](http://www.waterparadigm.org/download/Water%20for%20the%20Recovery%20of%20the%20Climate%20A%20New%20Water%20Paradigm.pdf) (Accessed 25th March, 2019).
- Kuhn, T. S. (2012). *The Structure of Scientific Revolution*. 50th ed. University of Chicago Press.
- Leopold, A. (1949) *A Sand County Almanac – and Sketches Here and There*. Oxford University Press.
- Main, G. (2005). *Heartland - The Regeneration of Rural Place*. Kensington: UNSW.
- Massy, C. (2007) *The Australian Merino: The Story of a Nation*. 2nd rev. ed. Random House.

- Massy, C. (2016) *Breaking The Sheep's Back: The Shocking True Story of the Decline and Fall of the Australian Wool Industry*. Brisbane: UQP.
- Massy, C. (2017) *Call of the Reed Warbler - A New Agriculture, a New Earth*. Brisbane: Chelsea Green Publishing.
- Mollison, W. (1988) *Permaculture: A Designer's Manual*. Bill Mollison Publisher.
- Pearce, F. (2006) *When the Rivers Run Dry – Water the Defining Crisis of the Twenty-first Century*. Boston: Beacon Press.
- Savory, A. and Butterfield, J. (2016). *Holistic Management – A Common Sense Revolution to Restore Our Environment*. 3rd ed. Washington: Island Press.
- Schumacher, E.F. (1993) *Small is Beautiful: A Study of Economics as if People Mattered*. London: Vintage press.
- Suzuki, D. (2007) *The Sacred Balance - Rediscovering our Place in Nature*. Vancouver: Douglas and McIntyre.



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He has maintained his focus on the intense study of evolution ecology contributed greatly to restoration ecology and innovative practices at low monetary cost.