Journal of the Adventist Theological Society, 25/1 (2014):43-74.
Article copyright © 2014 by Warren A. Shipton.

Ecosystem Community Health Initiatives and Care of Creation

Warren A. Shipton
Asia-Pacific International University
Thailand

Introduction

Communities of animals, plants, and other living organisms form part of an ecosystem and interact in complex ways that ensure the continuance of community members. The complexity of the interactions found in the system ensures that slight to moderate perturbations will be rectified and the system will return to its basal state. The terrestrial ecosystem includes humans as community members.

Humans were made last by God and placed in the Garden of Eden "to tend and keep it" (Gen 2:15). The position of mankind is remarkable in its distinctness from other created things in that they were made in the "image of God" (Gen 1:26-27) with acute reasoning powers (Gen 2:15, 19) and clear responsibilities to "have dominion" (Gen 1:28; Pss 86-88) over all creation. The emphasis we are placing on this instruction is as given by Matthew Henry.[1] "God designed hereby to put honour upon man, that he might find himself the more strongly obliged to bring honour to his Maker." The concept of being made in God's image and the responsibilities thus devolving on humanity to care for God's creation cannot be separated, for mankind possessed perfect moral sensibilities and lived in harmony with God's creation.[2] Sin marred God's image (character) in man and Christ sought to restore it. The

[1] Matthew Henry, *Commentary on the Whole Bible*, vol. 1, 11 (section V). http://www.ccel.org/ccel/henry/mhc.i.html (accessed 30/03/2012).

[2] Ellen G. White, *The Story of Patriarchs and Prophets* (Mountain View, CA: Pacific Press Publishing Association, 1958), 45.

apostle Paul reminds us that when the concept of being remade in God's image is abandoned the relationship with God and other animate community members can change remarkably (Rom 1:16-32; cf. Lev 18:22-24; Rom 12:1-2).

The apostle's discourse implies that abandonment of elevated ideas of God established through faith has lead to an inability in some to recognize the dimensions of man's God-given responsibilities to appreciate and care for His created works (Rom 1:20-21; cf. Rom 8:21-22). The alienation of mankind from the ecosystem in which he was placed commenced soon after the Fall. When sin entered this world, mankind experienced alienation from God (Gen 3:9-11), from mankind (v. 12), and from God's created works (vs. 17-19). The institution of the Sabbath rest was designed to keep ever before humanity the two truths that God's creation reminds us of—His prominent characteristics and that we are ambassadors for Him.[3]

The Mandate of Care

The dominion given to Adam by God (Gen 1:26) conferred upon him control over all living things and the resources of the earth. In the ideal world made by God we can reasonably assume that no fear existed between mankind and the creatures of the field (cf. Isa 11:6-7). God gave two significant instructions that pertained to the territories outside the Garden of Eden—"Be fruitful and multiply, and fill the earth" and "subdue" it (Gen 1:28, NKJV). These territories were unoccupied by man but were inhabited by a diverse variety of plants and animals (inferred by the information that God planted a special garden and that the animate creatures were to arise from the earth—no limitation given—Gen 1:11-12, 24; 2:8, 19). As the human race multiplied and moved progressively to other territories outside Eden change would occur. No doubt this would have involved changes in the diversity of species found in a particular habitat, for we imagine that the special germ-plasm found in Eden[4] would have been carried to other territories.

[3] Warren A. Shipton, *The Golden River That Flows through Time* (Tamarac, FL: Lumina Press, 2010), 24-27, 152-154.

[4] Human beings, the Tree of life and the tree of knowledge of good and evil were located initially in Eden. The apostle Paul informs us that mankind cannot imagine the things God is preparing for the inhabitants of the New Earth (2 Cor 2:9). Is it too bold to speculate, then, that the special garden that God planted in Eden contained many special treasures?

In other words, a succession would be seen and a new stable state of harmonious coexistence would be established (cf. Isa 65:21–25). No doubt mankind would have introduced unique plantings and design arrangements as time progressed. However, nothing disharmonious would be initiated or any life form destroyed. The inferred emphasis would seem to be on altering the structure of the ecosystem to support the simple living requirements of mankind. This is the emphasis that I have placed on the word "subdue" (cf. 1 Cor 9:27).

After the Fall the sad biblical record is that mankind forfeited his dominion to Satan by choosing to follow his suggestions (Gen 3:4-6; John 14:30; cf. 12:31). This led to a loss of moral sensibilities (Gen 4:8). It also meant that some changes inevitably would occur in the manner in which he would operate and still fulfil God's will. I have suggested some of these altered conditions in Table 1 and will discuss some of the details in the sections to follow. Humankind now was to be steward acting on God's behalf. The responsibilities exercised along these lines would guarantee the welfare of mankind, the land and its creatures (Ps 72).[5] There also would be a clash of goals—a great controversy would be seen on earth (Gen 3:15)—and ideas of mankind's duties and privileges would become contested issues in this clash of philosophies.

Conservation Dilemmas and Earth Curses

Satan's activities aimed at changing the face of nature commenced soon after the Fall. God warned of his attempts and of the limitations placed on him in the statement "thorns and thistles it [the ground] will bring forth to you" (Gen 3:18, NKJV). Since God is not the author of annoyance and pain (James 1:13; Rev 21:4), the activity leading to this result must be placed firmly at Satan's feet (directly or working through human agents).[6] This creates a dilemma in establishing conservation priorities. The difficulty is illustrated by considering how different plants such as pineapples, maize, tomatoes and bananas appeared in their place

[5] Hiliary Marlow, *The Earth Is the Lord's* (Cambridge: Grove Books Limited, 2008), 15.

[6] Consider the treatment of the "azazel" goat on the Day of Atonement (Lev 16:20-22; cf. Rev 20:1-3, 10). This goat did not participate in atonement (no blood was shed) but received all the confessed sins of the people, indicating that Satan would ultimately be held responsible for the temptations and misery inflicted on mankind and God's creation (Ezek 28:1-4, 12-16).

of origin before they were improved for human use in modern times. What was their original form at creation?

We can gain additional clues to the nature of the changes affecting the world and how these may have impacted on human existence by considering the nature of the curses pronounced on the earth after the Fall, after the first murder and after the Flood.

The first curse to descend on the earth. The general phenomenon of death was part of the curse pronounced in Eden as a result of sin (Gen 3:3, 18). Now aging, which generally precedes death, is thought to involve the accumulation of many mutations at critical points in the cell machinery.[7] Part of the first curse also involved denial of access to the Tree of Life (Gen 3:24). Here we have what appears to be a nutritional aspect introduced—perhaps an essential nutrient(s) was withdrawn (Rev 22:2) or a factor essential for the fidelity of the genetic code was no longer available. It also is possible that God loosened His regulatory management of nature or diminished His specific blessings (cf. Gen 3:3-5). Climatic changes possibly occurred and these would have contributed to wilting, drooping and senescence of flowers and leaves (cf. Gen 3:19). There were also other aspects to the curse pronounced.

The principal actors in the drama all received specific judgments. For example, child birth was suddenly transformed into a more difficult procedure (Gen 3:16). Then the serpent was reduced to a lowly existence crawling on its belly (v. 14) and the ground was rendered less productive for Adam and his descendents (v. 17). It could be argued perhaps that God made these changes as judgments on the principal actors in the Fall episode and their offspring to indicate that all wrong acts carry a consequence or, perhaps more reasonably to some, this may have been a simple statement of the consequences of separating from God. Ultimately, in this life such outcomes cannot be explained, for God's ways are beyond finding out.

[7] R. A. Busuttil, A. M. Garcia, R. L. Reddick et al., "Intra-organ Variation in Age-related Mutation Accumulation in the Mouse," *PLOS One 2 (9) (2007),* e876. doi:10.1371/journal.pone.0000876 (accessed 01/04/2012); H-C. Lee and Y-H. Wei, "Oxidative Stress, Mitochondrial DNA Mutation and Apoptosis in Aging," *Experimental Biology and Medicin*e 232 (2007): 592-606.

Table 1. Some changes made progressively in the responsibilities of mankind affecting ecosystem relationships.

Instruction/ statement	Before Fall	After Fall	After Flood
Dominion and stewardship	Dominion held by mankind under God's oversight—harmony (Gen 2:18-29)	Dominion forfeited to Satan– disharmony evident (Gen 3:5-10, implied). Stewardship role for humanity continued—Ps 115:16; Luke 16:10; 1 Cor 4:2	Satan's dominion unchanged—disharmony continued (John 14:30; cf. Isa 14:12, 17). Stewardship role for humanity continued—Ps 115:16; Luke 16:10; 1 Cor 4:2
Fill the earth	One couple present, multiplication required (Gen 1:28)	Instruction as in Eden–implied as no contrary instructions given	Four couples were present, multiplication was required (Gen 9:1, 7); limitations introduced over time
Subdue earth	Land outside garden setting was to be altered progressively (Gen 1:28). Measured use and exploitation of resources implied—"to tend and keep" (Gen 2:15)	Stubborn earth would need special attention (Gen 3:17). No additional information given	Conditions were as after the Fall and worsening, e.g., disease element introduced (Job 2:6-7); some guidelines introduced over time
Fear factor	No fear mentioned between man and animals (Gen 2:19-20)	No specific information given of a changed state but carnivorism inferred among animals (Gen 7:2—see text)	Fear element mentioned between man and animals (Gen 9:2)

In order to explain how thorns and thistles appeared on plants and also the perversions among animals, I suggest that as time passed Satan would have entered into the experimental sciences (cf. Isa 14:12, 17). We tentatively suggest that ingenious methods of manipulating genetic information[8] other than human-assisted crossings of animals and plants became available at least by the time of Job (date unfortunately not fixed by the historical record). It was then that pathogenic microbes were recorded. We might read several things into the account recorded in Job chapters 1 and 2. On the basis of the belief that God, angels and devils

[8] Warren A. Shipton, "Thorns Also and Thistles," *Journal of the Adventist Theological Society* 23/1 (2012): 16-43.

present in the unseen realm have unusual and superior powers to mankind, we can assert with reasonable confidence that Satan's knowledge was far in advance of contemporary mankind. Secondly, reworking the genetic code by ingenious methods could have delivered unusual results as predicted by God, as we will discuss later.

Acquiring the necessary scientific knowledge may have taken a relatively short time. For example, the discipline of microbiology emerged in the late nineteenth century, the genetic code was discovered by Watson and Crick in 1953, and genetic manipulations were common by the turn of the millennium. This sequence of events over a relatively short time frame informs us how quickly Satan could have acquired knowledge with his superior wisdom. Within less than 50 years of the discovery of the genetic code, modern scientists had acquired the ability to manipulate genetic information across species barriers. It might not be too rash to imagine that Satan and his minions already had achieved similar understandings well before the modern era. However, before we let our imaginations loose, it is also relevant to observe that Satan's abilities were limited by God's restraining hand (Job 2:5-6).

The second curse given after the first murder. The second curse was pronounced by God following Cain's murder of Abel (Gen 4:12). In this article the view is taken that the curse was general in its effects. After the earth had received Abel's blood, God declared that the ground would not "yield its strength" to the plants. This phrase can be interpreted variously. First, there may have been an element of further withdrawal of God's blessings or regulatory controls so that soil fertility was affected (Gen 4:11; cf. Deut 28; 29:19-29). Secondly, an additional factor appears to be involved, as Cain declared "You have driven me out this day from the face of the ground" (v. 14, NKJV) as a wanderer; and God added, as one marked (v. 15). His wandering lifestyle was not conducive to agriculture. Is it possible that the marking of Cain involved a specific physical impediment being experienced, as found with Jacob and Jeroboam following their encounters with God (Gen 32:25, 31-32; 1 Kings 13:4)? This could partly explain his disengagement from the land and devotion to city building (Gen 4:17), although it is admitted readily that a more convincing solution is needed. We notice at the same time that cities require abundant supplies of food from the surrounding countryside, suggesting that the basic fertility of the land was still substantial.

Since most plants depend on cooperative relationships with microbes to enhance their growth, I suggest the decline in productivity was due partly to a gradual process brought about by mutational changes and selective pressures on both plants and microbes. This functioned to make plants less able to take up essential nutrients and trace elements to satisfy their demands. I can illustrate the type of process from practical experience in agriculture. In the sand plain country of Western Australia, legumes and their associated beneficial nitrogen-fixing, nodule-forming bacteria are used to increase the fertility of soils. The first legume crop sown with strains of nodule-forming bacteria selected from other locations are able to form fully functioning nitrogen fixing nodules on their roots, leading to vigorous plant growth. However, by the second year the succeeding generations of plants often perform poorly owing to the inability of beneficial microbes to persist in the new soils. In other words, the selective pressures experienced effectively eliminated the useful microbes in favor of the less useful.[9] Nodulation ability may also be influenced by the transfer of genetic information between microbes in the natural environment.[10] I am suggesting that by similar processes the efficiency of nitrogen fixation was reduced. Another related example could involve mycorrhizal fungi. These microbes form helpful relationships with a large number of plants and provide them with essential nutrients that they are unable to access themselves in sufficient quantities to stimulate vigorous growth. Changes in the nutrient assimilation behaviour of these organisms theoretically can affect growth of selected plants to a marked degree.[11] Also mutations occurring in the plant can exert profound effects on mycorrhizal colonization and may even prevent it.[12] The postulated emergence of mutational changes is

[9] D. Chatel, W. A. Shipton and C. A. Parker, "Establishment and Persistence of *Rhizobium trifolii* in Western Australian Soils," *Soil Biology and Biochemistry* 5 (1973): 815-824.

[10] J. T. Sullivan, H. N. Patrick, W. L. Lowther et al., "Nodulating Strains of *Rhizobium loti* Arise through Chromosomal Symbiotic Gene Transfer in the Environment," *Proceedings of the National Academy of Sciences, USA* 92 (1995): 8985-8989.

[11] M. Govindarajulu, P. E. Pfeffer, H. Jin et al., "Nitrogen Transfer in the Arbuscular Mycorrhizal Symbiosis," *Nature* 435 (2005): 819-823.

[12] S. E. Smith and D. J. Read, *Mycorrhizal Symbiosis*, second edition (London: Academic Press Limited, 1997), 86; M. Bucher, S. Wegmüller and D. Drissner, "Chasing the Structures of Small Molecules in Arbuscular Mycorrhizal Signaling," *Current Opinion in Plant Biology* 12 (2009): 500-507.

highly significant as these would have given rise to many variations in the natural world and would have contributed to disease states arising.

The earth also may not have yielded "its strength" in response to changing weather patterns affecting both rainfall and temperature. Yet a more fundamental and dramatic change may be inferred, for we notice that before the Flood the animals had been classified as "clean" or basically herbivorous/seed-eaters and "unclean" or basically carnivorous/scavengers (Gen 7:2; cf. Lev 11:2-23). Both cooperative and antagonistic relationships (including the shedding of blood) now dictated the nature of the ecological balance achieved, at least among the more sophisticated forms of life. The present need for higher animal predation can be accounted for partially. If we take the modern felines as an example, in the natural environment they require meat in order to survive, as they lack the capacity to make the amino acids taurine and to a lesser extent arginine, which are vital to the maintenance of vision, cardiac function and immunological response.[13] It is conceivable that the present inability to produce these amino acids occurred as a consequence of mutation(s). This perhaps can be inferred from artificial mutations induced in mice involving taurine transport into the cell. Damaging this system leads to visual health issues in animals previously quite sufficient in such abilities.[14] However, I admit that there are many other issues involved and unanswered questions that are not useful to speculate about further here. Irrespective of these suggestions, the implications are that the relationship and responsibilities of humans to higher animals had changed also, as indicated by how many animals of each kind were taken into the ark. Some priorities of conservation had been established already.

The Flood brings a raft of curses. The final group of curses was associated with the Flood (Gen 8:21). The nature of these is not stated but can be imagined partially. Climatic changes undoubtedly were

[13] J. A. Sturman, A. D. Gargano, J. M. Messing et al., "Feline Maternal Taurine Deficiency Effect on Mother and Offspring," *Journal of Nutrition* 116 (4) (1986): 655-667; P. D. Pion, M. D. Kittleson, Q. R. Rogers et al., "Myocardial Failure in Cats Associated with Low Plasma Taurine: a Reversible Cardiomyopathy," *Science* 237 (1987): 764-768; G. B, Schuller-Levis, and E. Park, "Taurine: New Implications for an Old Amino Acid." *FEMS Microbiology Letters* 226 (2) (2003): 195-202.

[14] W. Huang, A. Abuin, J. Piggott et al., "Disruption of the Taurine Transporter Leads to Ocular Defects in the Mouse," *Investigative Ophthalmology and Visual Science* 43 (2002): E Abstract 1712.

experienced in association with or after this event, with gross change in glaciations and extinctions occurring.[15] Associated with the Flood there was wholesale movement of water and earth through mass flooding leading to a desolate landscape as may be seen in modern catastrophes. We can imagine the removal of the top layers of the soil horizon and exposure of bedrock or subsurface layers. Anyone who has tried to grow plants on the disturbed landscape created at a new building site knows firsthand some of the effects of the curse that most likely descended on the earth in a comprehensive manner. Extinctions of both plants and animals could be anticipated through such an upheaval. On account of the point nature of the recolonization of the earth by some plants (specifically those taken into the ark to feed the animals) and all the animals and mankind, dramatic successional changes would have occurred. Undoubtedly, some additional plant diversity would have been lost because of the loss of pollination vectors.[16]

Part of this curse may have related to the death of microorganisms through flooding. The survival of these organisms is necessary in order for vigorous plant growth to occur. The Flood recorded in Scripture lasted for 150 days (at least in some areas; some imagine in all areas) and was followed by a gradual return to a new biological balance (Gen 7:24; 8:4-14). In modern agriculture microbes may be killed through flooding the soil to eliminate unwanted organisms.[17] In mine site regeneration a related process takes place, the surface layers of soil that contain beneficial microbes must be preserved in separate locations if a speedy return to soil productivity is to be seen and even then it is not

[15] Refer to the following references for the type of changes that must be accounted for—Madelaine Böhme, "The Miocene Climatic Optimum: Evidence from Ectothermic Vertebrates of Central Europe. *Paleoogeography, Palaeoclimatology, Palaeoecology* 195 (2003): 389-401; A. C. Ravelo, K. Billups, P. S. Dekens et al. "Onto the Ice Ages: Proxy Evidence for the Onset of Northern Hemisphere Glaciations," in *Deep-Time Perspectives on Climate Change* (eds. M. Williams, A. M. Haywood, F. J. Gregory and D. N. Schmidt; London: The Geological Society, 2007), 563-573.

[16] Carol A. Kearns, D. W. Inouye, N. M. Waser, "Endangered mutualisms: the conservation of plant-pollinator interactions," *Annual Review of Ecology and Systematics* 29 (1998), 83-112.

[17] J. B. Taylor and E. M. Guy, "Biological Control of Root-infecting Basidiomycetes by Species of *Bacillus* and *Clostridium*," *New Phytologist* 87 (1981): 729-732; R. J. Cook and K. F. Baker, *The Nature and Practice of Biological Control of Plant Pathogens* (St. Paul, MN: APS Press, 1983), 405-407.

guaranteed.[18] We might reasonably imagine from these examples that both plant, insect, and microbial life forms were dramatically affected by the Flood. Certainly there would have been regional survival differences and undoubtedly some species never returned after this event. Some of these life forms could have contributed to soil fertility as noted above.

Another expression of the curse was undoubtedly in the occurrence of zones of mineral insufficiency or excess occurring in soils leading to deficiency and toxicity symptoms being expressed in plants, animals and humans. I will touch on possible effects of such changes in a later section dealing with nutrition.

The account of instructions given to Noah after the great Flood suggests that a degree of savagery (and perhaps timidity) would develop in the animal kingdom and that, in order to provide protection to the fledgling human race, God would place the fear of humans on all higher members of the animal kingdom (Gen 9:2). In the study of domestication of animals, it has been shown that selective breeding, using tolerance for human presence as the sole selection criterion, can change the behavior and appearance in a remarkable fashion if it is continued over many generations.[19] Undoubtedly, the reverse is also true.

The second aspect that we notice is that population growth was necessary among both the animal and human cohorts in order to fill the earth. Mankind was instructed specifically to fulfil his part in this respect (Gen 9:1, 7). Now this would have introduced massive changes to the ecosystem over time as a consequence of the "invasion" of the meadows and forests by both mankind and animals from a point source. The situation was very different from that applying at creation. In saying this, I assume that the vegetation regrew after the Flood from rootstock surviving the flooding process (Gen 8:4-11), from seed banks, from debris islands, and from grain and plants used in the ark to feed the animals. Undoubtedly, many species did not survive and others would have survived only through seeds germinating or branches rooting and

---

[18] D. A. Jasper, L. K. Abbott and A. D. Robson, "The Loss of Va Mycorrhizal Infectivity During Bauxite Mining May Limit the Growth of *Acacia pulchella* R. Br.," *Australian Journal of Botany* 37 (1989): 33-42.

[19] Lyudmila N. Trut, "Experimental Studies of Early Canid Domestication," in *The Genetics of the Dog* (eds A. Ruvinsky and J. Sampson; Wallingford, UK: CABI Publishing, 2001), 15-42; Nicholas Wade, "Nice Rats, Nasty Rats: Maybe It's All in the Genes," *The New York Times*, July 25, 2006: 1-2. http://www.nytimes.com/2006/07/25/health/25rats.html (accessed 30/03/2012).

being carried on debris islands, particularly if continuously inundated by water for 150 days was experienced all over the earth (Gen 7:24)—God-assisted preservation also occurred.[20] The response of trees to flooding and water logging is highly variable and very little is known about total submersion survival.[21] What apparently was necessary was for rebellious humans to be eliminated and for higher forms of animal and bird life and creeping things to perish (vs. 21-23; cf. vs. 2-3), particularly those altered from the original creation by artificial manipulation.[22]

It is assumed by some that this filling of the earth by humanity was to be endless, yet others disagree.[23] I side with those who find that endless filling was not part of the ongoing instruction to mankind (cf. New Earth population dynamics—Matt 22:30). The instruction to multiply and fill the earth must not be seen as an excuse to reduce biodiversity through habitat destruction. The food given to mankind in the beginning was also to sustain the animals (Gen 1:29-30) and God's covenant after the Flood included all living things, not only human beings (Gen 9:10-12). We should be mindful of God's wishes and not frustrate His purpose.[24]

The outstanding characteristic of the human race is its ability to make critical observations, reason from cause to effect, communicate, plan and execute these plans. One of the most dramatic parables of Jesus highlights these abilities and our duties to use them. This is recorded in the parable of the talents (Matt 25:14-30). The only person condemned was the one who did not use his abilities to the maximum extent. God expects us to reason from cause to effect (cf. Isa 1:18; Rev 13:18; 18:4). The consequence of embarking on endless population increases is no exception; all our actions are meant to be under the control of reason.

---

[20] Ellen G. White, *Spiritual Gifts* (Washington, DC: Review and Herald Publishing Association, 1945), III: 77.

[21] Legesse Negash, "Vegetative Propagation of the Threatened African Wild Olive [*Olea europaea* L. subsp. *cuspidata* (Wall. ex DC.) Ciffieri]," *New Forests* 26, 2003: 137-146; T. T. Kozlowski, "Responses of Woody Plants to Flooding and Salinity," *Tree Physiology Monograph* No. 1, 1997: 1-29.

[22] Ellen G. White, *Spiritual Gifts*, III: 75.

[23] *Seventh-day Adventist Bible Commentary*, vol. 1 (eds. Francis D. Nichol, Raymond F. Cottrell, Don F. Neufeld and Julia Neuffer; Washington, DC: Review and Herald Publishing Company, 1953), 217.

[24] Richard Bauckham, "Reading the Bible in the Context of the Ecological Threats of our Time," 64th Annual Meeting of the Evangelical Theological Society, "Caring for Creation," November 14-16, 2012, Milwaukee, WI.

God's ideal after the Flood did not include the construction of cities and great commercial enterprises (Gen 11:2-5).[25] Sin has brought many pressures on humanity and the combined advice of Scripture involves careful consideration of a number of aspects before population increase is contemplated. These are as follows: a). The genetic heritage of the offspring (Lev. 18:6; Deut 27:22); b). The ability to provide for the family (1 Tim 5:8); c). The political/sociological environment surrounding the family (Matt 24:15, 19-20); and d). The commitment to training children in the principles of God's kingdom (Gen 18:19; Deut 6:7).[26]

Instruction about the resources of the earth given in Eden (Gen 1:28) was repeated in its entirety to Noah (Gen 9:1). However, one can read into the instruction given by God to build the ark that earth's resources could be used to satisfy the necessities for human survival needs, but that the fate of the animal population (basal kinds created) was vitally important and was in human hands (Gen 6:14-22). Furthermore, the Scriptures later inform us that all creation seeks deliverance and that an account will be required of the responsibility displayed by humanity (Rom 8:20-23; Col 1:16; Rev 11:18).[27] I suggest that this understanding also is resident in the fuller concept of the Sabbath rest, which included rest for livestock in the beginning.[28] We should not be found destroying evidences of God's character seen in His second book of information—nature.[29]

---

[25] See R. Stark, *The Victory of Reason* (New York: Random House, 2005), 57-68 on the rise of religious capitalism.

[26] Since God will require an account of our stewardship (Jer 13:20), particularly relating to the children we have brought into the world, there is an absolute necessity for parents to consider their responsibilities relating to the child's spiritual understanding and growth—the total educational experience. The question is: Would God be "glorified or dishonoured" by our acts in increasing the population? Refer to Ellen G. White, *Testimonies for the Church* (Mountain View, CA: Pacific Press Publishing Association 1948), 2: 380 and *Education* (Mountain View, CA: Pacific Press Publishing Association, 1952), 280.

[27] It often is argued that the later text does not apply primarily to activities involving destruction of the biosphere, but speaks of judgments on parties and individuals on account of their moral wickedness. Ultimately, however, moral decline impacts the environment (2 Sam 12:9-18; Hosea 4:1-10). Lack of stewardship on one area is followed by neglect in others.

[28] Gen 2:2; Shipton, *The Golden River*, 152.

[29] Rom 1:20; Warren A. Shipton, "Contending with Futile Thoughts and Identifying God's Invisible Attributes," *Asia-Africa Journal of Mission and Ministry* 4 (2011): 135-154.

This last group of curses associated with the time of the Flood continues to be fulfilled. In line with the details outlined in Deuteronomy 28 (vs. 15-68), nations and individuals have brought curses of pollution, disease, crime, war and unhappiness on themselves and the territories under their stewardship through their unhelpful and selfish behavior and disregard for God's instructions.

Additional Pressures on Ecosystem Communities

The earth as it came from the Creator's hand did not have within it anything that hurt or destroyed (as discussed already), for it was very good (Gen 1:31; Isa 65:25). The first indication that something unusual would happen was the pronouncement made by God that thorns and thistles would appear (Gen 3:18). In terms of consistency of argument, God is not the originator of evil but rather Satan (James 1:13; Rev 12:9). Our text in Genesis thus is telling us that Satan would be permitted to alter the face of nature within certain limits. A complete list of possibilities was not provided. In verse 18 we are being informed that in the plant kingdom hurtful elements would appear and, from our present experiences, it may be inferred that both ecological disturbances are thus indicated and the emergence of invasive species. Undoubtedly, changes were also anticipated in the animal kingdom, which may be inferred from a careful reading of Genesis 3:14 (first part).

In order to aid our understanding, I need to discuss the topic of disease organisms in greater detail. The biblical record does not permit us to suggest when the first disease-causing organism appeared. For our purposes, it is most informative to focus on the account given in the book of Job (possibly written by Moses)—this event was after the universal Flood. The emergence of pathogenic microbes may have occurred spontaneously due to the instability in copying genetic information in the parental types (due possibly to the withdrawal of God's blessings or adjustment of His regulatory management protection) or Satan may have experimentally produced pathogenic staphylococci. The instability proposition is based on knowledge that mutations are known to give rise

to pathogenic races in some categories of microbes.[30] On the other hand, the possibility of experimental modification is not unreasonable.

By the time of Job, bacteria capable of infecting humans existed (virulent *Staphylococcus*) and Satan was able to induce experimental infection at will (Job 2:7). In understanding the latter phenomenon it is fruitful to refer to relatively recent community outbreaks of boils where special environmental and contact conditions were shown to permit mass infection by these organisms to occur.[31] I am suggesting that Satan had discovered both the elements of genetic engineering and understood something about the ecology of bacteria[32] in order to have achieved the outcome described. His skills may have been very advanced.

How genetic engineering may be used to produce disease inducing microbes is illustrated by the relatively recent creation of a damaging (virulent) recombinant mouse pox virus. The virus was created through genetic manipulation. The virus particles had mouse derived molecules incorporated into them. When the virus was altered by receiving alien pieces of genetic information, it was able to undergo uncontrolled replication causing death in the experimental mice. This result caused a stir in the scientific community.[33] The experiments were abandoned because the recombinant virus suppressed the immune response of the animals leading to their death. This example naturally forces us to ask the question where viruses have come from, but this is beyond the reaches of this article. Suffice it to say that achieving a pathogenic status

---

[30] P. R. Day, "Mutation to Virulence in *Cladosporium fulvum*," *Nature* 179 (1957): 1141-1142; P. R. Day, S. L. Anagnostakis and J. E. Puhalla, "Pathogenicity Resulting from Mutation at the b locus of *Ustilago maydis*," *Proceedings of the National Academy of Science, USA* 63 (1971): 533-535; O. C. Yoder, "Toxins in Pathogenesis," *Annual Reviews of Phytopathology* 18 (1980): 103-129.

[31] M. G. Landen, B. J. McCumber, E. D. Asay et al., "Outbreak of Boils in an Alaskan Village," *Western Journal of Medicine* 172 (2000): 235-239; J. Wang, S. Barth, M. Richardson et al., "An Outbreak of Methicillin-resistant *Staphylococcus aureus* Cutaneous Infection in a Saturation Diving Facility," *Undersea Hyperbaric Medicine* 30 (2003): 277-284.

[32] Cf. V. R. Racaniello, "Emerging Infectious Diseases," *Journal of Clinical Investigation* 113 (2004): 796-798.

[33] R. J. Jackson, A. J. Ramsay, C. D. Christensen et al., "Expression of Mouse Interleukin-4 by a Recombinant Ectromelia Virus Suppresses Cytolytic Lymhphocyte Responses and Overcomes Genetic Resistance to Mousepox," *Journal of Virology* 75 (2001):1205-1210; A. Müllbacher and M. Lobigs, "Creation of Killer Poxvirus Could Have Been Predicted," *Journal of Virology* 75 (2001): 8353-8355.

is relatively simple with some microbes. For example, the bacterium causing diphtheria in humans (*Corynebacterium diphtheriae*) is relatively harmless until it acquires a bacterial virus that gives it a suite of genes that makes it capable of causing disease (virulent). Many other similar examples are known and include *Staphylococcus aureus*, which may cause boils and other disease states.[34] Further, blocks of genetic information found in harmless intestinal or soil bacteria commonly are found in pathogenic ones, which have led to the suggestion that transfer of the information from one group of bacteria to another has given rise to some disease-causing bacterial pathogens. How such horizontal transfer occurs in nature is not completely understood although in the laboratory it does not pose too many problems.[35] It is suggested that these aberrant organisms or entities were brought into existence by clever reworking of the genetic code by the mind of one who said: "Skin for skin! Yes, all that a man has he will give for his life. But stretch out Your hand now, and touch his bone and his flesh, and he will surely curse You to Your face" (Job 2:4-5, NKJV).

In the previous paragraphs I suggested that manipulation of genetic information in the simpler forms of life (microbial world) was responsible for the emergence of some disease organisms. However, Satan's abilities went beyond the microbial world to include the appearance of thorns and the generation of thistles. Today we can eliminate thorns from plants through genetic and artificial culture manipulation,[36] but not enough is known about the genetic structure of organisms to be entirely clear about all the circumstances surrounding

---

[34] J. W. Bass, "The Spectrum of Staphylococcal Disease. From Job's Boils to Toxic Shock," *Postgraduate Medicine* 72 (5) (1982): 58-74; H. Brussow, C. Canchaya and W. D. Hardt, "Phages and the Evolution of Bacterial Pathogens: from Genomic Rearrangements to Lysogenic Conversion," *Microbiology Molecular Biology Reviews* 68 (3) (2004): 560-602.

[35] J. Hacker and E. Carmiel, "Ecological Fitness, Genomic Islands and Bacterial Pathogenicity," *EMBO Reports* 2 (2001): 379; H. Ochman and N. A. Moran, "Genes Lost and Genes Found: Evolution of Bacterial Pathogenesis and Symbiosis," *Science* 292 (2001): 1096; S. O. Jensen, S. M. Kwong, B. R. Lyon et al., "Evolution of Multiple Drug Resistance in Staphylococci," *Microbiology Australia* 29 (2008): 121-123.

[36] Example: F. A. Canli and R. M. Skirvin, "Separation of Thornless Rose Chimeras into their (*Rosa* sp.) Consistent Genotypes *in vitro,*" *Pakistan Journal of Biological Sciences* 6 (2003): 1644-1648.

their appearance. Some prickles are expressed as recessive traits[37] and it is conceivable that they can arise through mutations or through complementation (a form of interaction between genes).[38] Others may arise when somatic hybrids are created involving different plants (e.g., potato and tomato and related species), even though neither parent possessed the trait.[39]

Using the techniques of genetic manipulation available today, the possibilities for changing the face of nature are enormous.[40] If we think about it carefully, Satan is the author of evil (Isa 14:12, 17; Rev 12:9) and he must possess the tools with which to produce disease and the abnormal. It stands to reason, then, that his knowledge must be superior to that possessed by modern scientists if we follow the account in Job.

No doubt Satan's abilities to change nature included the animal kingdom (cf. Gen 3:14, first part).[41] Today we have transgenic animals that hold genes from other sources incorporated in the genome (including from humans). Then there are chimeric animals that hold two or more populations of genetically dissimilar cells making up the organism (e.g., mixed sheep and goat or chicken and quail cells in the one animal). This has reached such a level that one commentator has said "the biological co-mingling of animal and human is now evolving into even more exotic

---

[37] T. Jinno, "Cytogenetic and Cytoecological Studies on some Japanese Species of *Rubus* II. Cytogenetic Studies on Some F_1-hybrids," *The Japanese Journal of Genetics* 33 (7) (1958): 201-209.

[38] R. N. Lester and G. N .W. Thitaiz, "Inheritance in *Solanum aethiopicum*, the Scarlet Eggplant," *Euphytica* 40 (1989): 67-74; M. Marcotrigiano, "Herbivory Could Unlock mutations sequestered in stratified shoot apices of genetic mosaics," *American Journal of Botany* 87 (2000): 355-361; R. N. Lester and M. C. Daunay, "Diversity of African Vegetable *Solanum* Species and its Implications for a Better Understanding of Plant Domestication," Proceedings of a Symposium Dedicated to the 100th Birthday of Rudolf Mansfield, Gatersleben, Germany, 8-9 October, 2001. *Schriften zu Genetischen Ressourcen*, 22 (2001): 136-152.

[39] M. Okamura, "Pomato: Potato Protoplast System and Somatic Hybridization Between Potato and Wild Tomato," in *Somatic Hybridization in Crop Improvement* (ed Y. P. S. Bajaj, vol. 1; Heidelberg: Springer-Verlag, 1994), 209-223; F. Bletson, D. Roupakias, M. Tsaksira et al., "Production and Characterization of Interspecific Hybrids Between Three Eggplant (*Solanum melongena* L.) Cultivars and *Solanum macrocarpon* L.," *Scientia Horticulturae* 101 (1-2) (2004): 11-21.

[40] David Concar, "Brave New Rose. It's 2000. You're Lying on a Lemon Scented Lawn," *New Scientist* 160 (October 31, 1998): 30-33.

[41] The implication is that the curse would come on animals in general. On the serpent a specific and humiliating change came at God's direction.

and unsettling mixes of species, evoking the Greek myth of the monstrous chimera, which was part lion, part goat and part serpent."[42] In research involving chimeras, the ethical and legal questions have become centre stage. Successful interspecies manipulations have been made with some unusual outcomes achieved, but these are of no riveting interest as they do not breed true to the altered form.[43]

More intense issues surround human-animal cytoplasmic hybrids (cybrids). The future of such research is just opening before us and it is an area of intense ethical debate. Interest is focused primarily on the generation of embryonic stem cells using animal eggs as the incubator (e.g., a human nucleus may be introduced into an animal cell which previously has had its nucleus removed). The interest in the human-animal cybrids is to enable research into crippling diseases and related issues. The technique also is used in order to rescue endangered species.[44] It is undoubtedly true to say that for every well intentioned use, there are those who are prepared to push at any boundaries erected. After the successful insertion of human brain cells into a mouse, the debate has entered new territory. The question now has become: What proportion of human brain tissue can a recipient animal receive before it becomes part of the human family?[45] Where all the current experimentation becomes unethical is a much debated issue. God may or may not figure in the emerging discussion, but one thing we do well to remember is that He has promised to reward negatively those who fail to act as faithful

[42] Associated Press, "Scientists Create Animals That Are Part-human," April 29, 2005. http://www.msnbc.msn.com/id/7681252 (accessed 30/03/2012).

[43] S. Meinecke-Tillman and B. Meinecke, "Experimental Chimeras-removal of Reproductive Barrier Between Sheep and Goat," *Nature* 307 (1984): 637-638; Y. Xi, S. Fang, Y. Nada et al., "Peafowl-chicken Interspecific Chimera," *Journal of Poultry Science* 39 (2002): 149-158.

[44] Z. Beyhan, A. E. Iager and J. B. Cibelli, "Interspecies nuclear transfer: implications for embryonic stem cell biology," *Cell Stem Cell* 1 (2007): 502-12; S. Camporesi and G. Boniolo, "Fearing a non-existing Minotaur? The Ethical Challenges of Research on Cytoplasmic Hybrid Embryos," *Journal of Medical Ethics* 34 (2008): 821-825.

[45] A. R. Muotri, K. Nakashuma, N. Toni et al., "Development of Functional Human Embryonic Stem Cell-derived Neurons in Mouse Brain," *Proceedings of the National Academy of Sciences, USA* 102 (2005): 18644-18648; L. M. Silver, "Human-animal Chimeras: from Mythology to Biotechnology," 15 February, 2007. http://www.science20.com/quantum_diaries_survivor/superluminal_neutrinos_opera_spokesperson_resigns-88534 (01/04/2012).

stewards of the earth (Pss 115:16; 104:31; Hosea 4:1-10; Col 1:16; Rev 11:18).

At the time of the Flood, the evil imaginings and wickedness of mankind were inspired by Satan and led God to destroy them (Gen 6:5). Their unrestrained thoughts were generated from minds not receptive to God's Spirit (v. 3). They worshiped their own intellects just as modern mankind is prone to do.[46] They were intent on destroying the image of God and interfering with His created works. Mankind has contributed to the destruction of God's works through uncontrolled population increases, over-exploitation of natural resources, pollution, the creation of cities and complex financial and communication systems whose primary focus is on the creation of wealth. Few if any cultures, ancient or modern, have a clean slate regarding excesses in consumption and/or destruction.[47]

Conservation Principles

Preliminary conservation guidelines were introduced directly to ancient mankind and there are inferences made in Scripture that have become more meaningful in our day. This means that we perhaps are able to sense the significance of some biblical statements today better than previous generations. By mentioning them here, I am not inferring that anything near the full significance of these principles was realized at the time they were given.

Genetic diversity. The first conservation principle that we might highlight is the need to maintain genetic diversity and avoid founder effects. Recognition of this principle requires a little background. There is suggestive evidence that over a period of approximately 500 years in early human history significant changes began to occur in the human population causing God to instruct the race that inbreeding among closely related humans now was a restricted activity.[48] Perhaps the lack

---

[46] Clifford Goldstein, *By His Stripes* (Nampa, ID: Pacific Press Publishing Association, 1999), 19-20.

[47] Sandra Richter, "Environmental Law: Wisdom from the Ancients," 64th Annual Meeting of the Evangelical Theological Society, "Caring for Creation," November 14-16, 2012, Milwaukee, WI.

[48] Cf. Gen 12:13, Lev 18:6-14 and S. H. Horn, *Seventh-day Adventist Bible Dictionary* (Washington, DC: Review and Herald Publishing Association, 1960), 8-11, 99-100, 103-105, 737-742 on the topics of Abraham and Moses with A. P. Wolf and W. H. Durham, *Inbreeding, Incest and the Incest Taboo: The State of Knowledge at the Turn of the Century* (Stanford, CA: Stanford University Press, 2004), 49-54.

of fidelity to the original genome pattern was part of the reason for this instruction. In other words, operational deficiencies began to develop among the human population and reasonable changes needed to be introduced in breeding arrangements.

Support for the suggestion that the surviving population after or soon after the Flood possessed/developed deficiencies comes from the biblical record. It says simply that whereas Noah lived 950 years (Gen 9:29), the sons of Shem lived much shorter lives (e.g., Shem–600 years, Arphaxad–438 years, Salah–433 years, Eber–464 years, Peleg–239 years, Reu–239 years, Serug–230 years, Nahor–148 years; Gen 11:10-25). No doubt some of the children of Shem intermarried with the children of Ham and Japheth (Gen 7:13) giving the possibility that the frequency of defects became more pronounced leading to a progressive decline in the genetic robustness of the race. For those who are uncomfortable with God preserving a group of individuals carrying a genetic defect, it must be admitted by all that the genetic resources preserved by the people surviving the Flood were much less than those available in the entire population destroyed (the same applies to all the animal groups taken into the ark). In addition, a defect arising soon after the Flood event would have been amplified equally by the close interbreeding activities in the surviving community leading to an overall similar result. In support of this line of reasoning, induction of premature aging in mice may come through the introduction of mutational changes into a population. In this relatively recent experiment, it was found that when a vital enzyme was deleted premature death occurred (the mouse life span was reduced to about a half). The mouse population also showed baldness, osteoporosis, anemia, curvature of the spine and reduced fertility.[49]

Some of the life span changes may have been due to mutations, as commonly observed today in experimental animals, and this may have led to a corresponding loss of longevity in humans. Indeed, it is generally conceded that many small mutations contribute to lifespan changes,[50] although there are some rare mutations that have considerable negative

[49] A. Trifunovic, A. Wredenberg, M. Falkenberg et al., "Premature Ageing in Mice Expressing Defective Mitochondrial DNA Polymerase," *Nature* 429 (2004): 417-423.

[50] Busuttil et al., op. cit.; Lee and Wei, op. cit.

impacts on lifespan.[51] Another clue to the loss of longevity may be found in considering the close inbreeding that occurred after the Flood in conjunction with genetic defects arising. To all intents and purposes the immediate post-Flood population was isolated and the genetic diversity that they displayed was restricted for they represented a closely related family unit, at least on the male side.[52] Furthermore, they were forced to engage in inbreeding activity to ensure succeeding generations arose. This raises the real possibility that if this population already possessed or indeed developed a mutational defect, then the effects of the deficiency would have been amplified. This idea of defect amplification arising in populations coming from a small number of founders is amply supported by studies such as those involving the Ashkenazi Jews, the Amish and the Newfoundland population.[53] An early founder population identified was the Jews of the Babylonian captivity of the sixth century before Christ. The X-linked glucose-6-phosphate dehydrogenase disorder (important in red blood cell metabolism) present among them was accentuated by restrictions on intermarriage with non-Hebrews. Along similar lines, the continued ethnic isolation in Kurdistan Jews has led to an increased frequency of the deficiency in this group as opposed to the Yemen Jews who married more widely.[54]

---

[51] Example: K. Christensen, T. E. Johnson and J. W. Vaupel, "The Quest for Genetic Determinants of Human Longevity: Challenges and Insights," *Nature Reviews* 7 (2006): 436-448.

[52] Compare with animal studies—R. Frankham, "Do Island Populations Have Less Genetic Variation than Mainland Populations?" *Heredity* 78 (3) (1977): 311-327; M. D. B. Eldridge, J. M. King, A. K. Loupis et al., "Unprecedented Low Levels of Genetic Variability and Inbreeding Depression in an Island Population of the Black-footed Rock-Wallaby," *Conservation Biology* 13 (3) (1999): 531-541.

[53] V. A. McKusick, J. A. Hostetter, J. A. Egeland et al., "The Distribution of Certain Genes in the Old Order Amish," *Cold Spring Harbor Symposia on Quantitative Biology* 29 (1964): 99-114; T-L. Young, M. O. Woods, P. S. Parfrey et al., "A Founder Effect in the Newfoundland Population Reduces the Bardet-Biedl Syndrome 1(BBS1) Interval to 1 cM," *American Journal of Human Genetics* 65 (1999): 1680-1687; J. Charrow, "Ashkenazi Jewish Genetic Disorders," *Familial Cancer* 3 (2004): 201-206; H. Chen and A. Laufer-Cahana, "Ellis-van Creveld Syndrome," *eMedicine*, November 6, 2007. http://emedicine.medscape.com/article/943684-overview (accessed 17/12/2008); L. B. Weinstein, "Selected Genetic Disorders Affecting Ashkenazi Jewish families," *Family and Community Health* 30 (1) (2007): 50-62.

[54] G. F. Stine, *Biogenetics: Human Heredity and Social Issues* (New York: Macmillan Publishing Company, Inc., 1977), 388.

Perhaps one highly significant factor influencing life span expectations was the emergence of infectious microbial diseases. Disease tends to sweep away the genetically most susceptible members of the population. This phenomenon of disease occurrence was noted by the time of Job and again in the experiences of the children of Israel in Egypt.[55] A variable proportion of the human population would have been eliminated at an early age. With some infectious diseases in the early stages of their introduction, it is possible that large numbers of individuals were eliminated. Such a phenomenon was experienced during the conquest of the Americas, the black plague in Europe, the influenza epidemic of 1918 and is being experienced in the current HIV-AIDS epidemic.[56]

The genotype of the population would itself have been changed by the continual presence of disease leading to genetic abnormalities and peculiarities. This scenario has been observed in animal and human populations in response to selected diseases.[57] Malaria has led to the emergence of a variety of genetic abnormalities among the human population[58] and the black plague has shaped the distribution of people suffering from iron overload.[59] Some of these genetic diseases of

---

[55] Deut 28:60; Job 2:7; E. Cockburn and T. A. Reyman, eds, *Mummies, Disease & Ancient Cultures*, second edition (Cambridge: Cambridge University Press, 1998), 38-58.

[56] Molly Billings, "The Influenza Pandemic of 1918," June 1997, modified February 2005. http://virus.stanford.edu/uda/ (accessed 02/01/2012); N. D. Cook, *Born to Die: Disease and New World Conquest* (Cambridge: University of Cambridge Press, 1998), 86-165; R. A. Bishop, "The History of Bubonic Plague," (2003). http://www.google.com/search?q=bubonic+pandemics&hl=en&start=10&sa=N (accessed 27/7/2007); M. T. Madigan, J. M. Martinko and J. Parker, *Brock: Biology of Microorganisms*, tenth edition (Upper Saddle River, New Jersey: Pearson Education International, 2003), 858-860, 892, 926; Mike Ibeji, "Black death," October 3, 2011 updated. http://www.bbc.co.uk/history/british/middle_ages/black_01.shtml (accessed 02/01/2012).

[57] Examples: myxomatosis in rabbits and malaria in humans—C. K. Williams, R. J. Moore and S. J. Robbins, "Genetic resistance to myxomatosis in Australian wild rabbits, *Oryctolagus cuniculus*," *Australian Journal of Zoology* 38 (1990): 697-703; L. H. Miller, "Impact of Malaria on Genetic Polymorphism and Genetic Diseases in Africans and African Americans," *Proceedings of the National Academy of Science, USA* 91 (7) (1994): 2415-2419.

[58] D. P. Kwiatkowski, **"**How malaria has affected the human genome and what human genetics can teach us about malaria," *American Journal of Human Genetics* 77 (2005): 171-192.

[59] S. Moalem, "Survival of the Sickest," *New Scientist* 193 (February 17-23, 2007), 42-45.

mankind may have survival advantages, such as sickle cell anemia trait that can protect against malaria. Other conditions lead to a greater risk of early death.[60] All this selective pressure of disease and other factors has led to genetic differences being found in the susceptibility of human populations and individuals to disease.[61] Restricting the robustness of the genetic pool in animals (such as in founder and in endangered populations) may lead to greater risks of the population being eliminated through infection. Similar outcomes may have been experienced among human population groups.

Repair and restoration of the environment. The late Albert Schweitzer once said, "Man has lost the capacity to foresee and forestall. He will end by destroying the earth." As we observe the effects man's actions have had on the ecosystem, many are inclined to believe that these words are prophetic. The web of life is intricate and delicate, as indicated by examples taken from the contemporary world.[62]

The apostle Paul under inspiration expressed it thus, "For we know that the whole creation groans and labors with birth pangs together until now" (Rom 8:22, NKJV).The psalmist reminds us that the heaven and earth "will all grow old like a garment" (Ps 102:26, NKJV). And in Isaiah 24 we have a prophetic vision of the consequences of man's folly in the earth (verses 3-12). The earth lies polluted under its inhabitants because "they have broken the laws, disobeyed the statutes, and violated the eternal covenant" (v. 5, NEB). The prophet goes on to describe the utter destruction of the world (vs. 19-20). This could mean that God's judgments will destroy the earth and its inhabitants or that man through his activities, under the guidance of Satan, will bring about his own destruction (and God will not intervene to prevent man's destruction). Man's rejection of the everlasting covenant is seen in his disregard of the

---

[60] D. Weatherall, J. Clegg and D. Kwiatkowski, "The Role of Genomics in Studying Genetic Susceptibility to Infectious Disease," *Genome Research* 7 (1997): 967–973.

[61] A. G. White, J. Bogh, W. Leheny et al., "HLA Antigens in Omanis with Blinding Trachoma: Markers for Disease Susceptibility and Resistance," *British Journal of Ophthalmology* 81 (1997): 431-434; A. F. Wright and N. Hastie, *Genes and Common Diseases: Genetics in Modern Medicine* (Cambridge: Cambridge University Press, 2007), 142-271; Y. Ghodke, K. Joshi, A. Chopra and B. Patwardhan, "HLA and Disease," *European Journal of Epidemiology* 20 (2005): 475-488; L. B. Weinstein, op. cit.

[62] Albert Schweitzer Quotes. http://www.brainyquote.com/quotes/quotes/a/albertschw104993.html (accessed 01/04/2012); David Tilman and Clarence Lehman, "Human-caused Environmental Change: Impacts on Plant Diversity and Evolution," *Proceedings of the National Academy of Sciences*, *USA*, 98 (2001): 5433-5440.

provision God has made for his salvation. In his supposed wisdom, he has presumed to find alternative explanations for origins and routes to a better life. He is not interested in the restoration of the image of God in mankind (Gen 3:15; Rom 9:21-23; Rev 14:6-7).

Man is still a steward of God's creation despite Adam giving dominion of the earth to Satan (Christ's sacrifice has enlightened human minds, sensitized them to the suffering of all creation, and given mankind responsibility to alleviate this misery—Rom 8:22; 2 Cor 4:4; Rev 11:18). The delicate structure of the natural world and the value of its preservation and study are recognised in Scripture.[63] A clear statement regarding the necessity for conservation is given in Deuteronomy 22:6-7. Here it is forbidden to snare and kill a female (bird) and it's young. The breeding stock was to be preserved although the young could be taken. It is not at all certain whether an argument can be made for the conservation of all species in their present form. If we believe in a literal devil who has malevolent designs and great power and skill (see Job 1:7-19), it is arguable that some of the present forms of life have undergone great changes at his hand since they came from the Creator. This speculation aside, the Scriptures clearly recognise the need to act wisely to control wild animals which may have increased to the point where they endanger agriculture and life itself (Exod 23:29; Lev 26:6). Such activities are to be done humanely, for we learn a principle of action in Proverbs 12:10 (NEB). It says, "A righteous man cares for his beast, but a wicked man is cruel at heart." The Jews were committed to the conservation of the productivity of agricultural lands and to the maintenance of tree resources. They practised spelling of agricultural lands every seventh year (Exod 23:11), which served to control diseases and increase productivity in the initial years of the next cycle. The practice also impressed upon them continually that they were not to exhaust the land. Resources were to be valued and used judiciously.[64] Their concern for fruit tree resources is shown by the strict instructions

[63] This is seen after a number of texts are examined—human activities are destroying the earth (Rev 11:18), ecological disasters can be due to environmental extremes, human extravagance and neglect (1 Kings 17:1, 7; 18:41-44; Prov 24:30-31; Ezek 14:13; Amos 4:6-9), ecological recovery is possible (Ezek 47:1-10), some animals require special habitats (Job 39:5-8), resources are to be used judiciously (Num 11:31-34; Isa 9:9-11), nature is God's second book of information about His character that should not be neglected (Ps 19:4; Rom 1:20), and all our activities are to bring glory to God (1 Cor 10:31).

[64] Richter, op. cit.

given to conquering armies. They were not to destroy them, "for the tree of the field is man's life" (Deut 20:19, NKJV). The children of Israel were also taught to value natural resources, and they were not to view them as inexhaustible. This is clearly illustrated by reference to Isaiah 9:9-10 (NEB), where the Lord in His anger with the Jews threatened to destroy them because, among other things, "in their pride and arrogance they say, the bricks are fallen, but we will build in hewn stone; the sycamores are hacked down, but we will use cedars instead." We can gain a brief glimpse of God's attitude towards restoration of the environment from Ezekiel chapter 47. If His representatives had followed His principles then lush pastures, forests and teeming multitudes of animals would have replaced deserts and sparsely populated regions at His command.

In seeking to restore the environment and protect various life forms a difficult question is: What exactly are we seeking to protect and restore? The life forms we have with us today are not the originals. Indeed, some forms may have been changed remarkably by both human manipulation and by satanic agencies. Perhaps we might suggest that priorities be given to those activities that are devoted to preserving/restoring beauty (Luke 12:27), promoting helpful/cooperative elements (Gen 7:2)[65] and assisting establishment of harmonious relationships (Isa 65:25; cf. Gen 7:2, Leviticus 11:2-23). In making these statements, I certainly acknowledge the value of protecting the total gene pool available if possible, for valuable genes conferring resistance to disease or ability to survive tough environments may be found there. In addition, some seemingly unprofitable organisms may prove to be of considerable value in the future.[66]

Highlighting some of these ideas might be promoted by way of illustration. The native wildflower *Telopea* (waratah), which is the floral emblem of New South Wales, Australia, has been improved for conservation and commercial purposes by selecting cultivars superior in

[65] The instructions given by God to Noah on the arrangements for the continuation of various animal kinds after the Flood event can be taken as indicating the preservation priorities we might follow today.

[66] H. Büssow, *The Quest for Food* (New York: Springer Science+Business Media, LLC, 2007), 639-647; K. V. Krishnamurthy, *Textbook of Biodiversity* (Enfield, New Hampshire: Science Publishers, Inc., 2003), 47-50.

symmetry and colour characteristics.[67] Wild celery (*Apium graveolens*) possesses toxins that make it acrid and bitter. However, milder strains selected do not possess these traits and makes them safe for eating. The banana (*Musa acuminata*) anciently was filled with hard seeds. Mutants can be seedless but still susceptible to vegetative propagation, making them a delight.[68] The famous experiment conducted by Russian scientists on wolves and foxes demonstrated that friendliness towards humans could be selected for. The tamer animals selected developed physical changes evident in coat colour, ear and tail characteristics, and cranial features. They became more dog-like.[69]

Health awareness and predisposition to disease. The Christian view of conservation goes beyond what we have discussed. A commitment to preventive medicine and the conservation of health are essential components. Here I wish to discuss briefly issues of health awareness and minimizing predisposition to disease. We can discover information about this subject by examining some of the causes of the life-span decline after the great Flood. I will briefly develop this principle by considering the human population, but hasten to add that application of the principle does not stop there.

The precipitous decline in longevity noted in the biblical record (Gen 9:28-29; 11:10-26) perhaps points to fundamental changes. As noted already, it is generally conceded that many small mutations contribute to lifespan changes. I am suggesting that mutational and other genome changes were exacerbated by nutritional factors. We will mention something about nutritional factors, for one of God's last messages of warning to the world directs readers to creation and by inference the Edenic diet (Rev 14:6-7).

Adding animal-based foods to the diet would have introduced comprehensive nutritional changes impacting on longevity.[70] The factors involved with such a decline may have been several such as the carriage

---

[67] C. A. Offord, "Analysis of Characters and Germplasm of Significance to Improvement of Australian Native Waratahs (*Telopea* spp., family Proteaceae) for Cut Flower Production," *Genetic Resources and Crop Evolution* 53 (2006): 1263-1272.

[68] Noel Kingsbury, *Hybrid: The History and Science of Plant Breeding* (Chicago, IL: University of Chicago Press, 2009), 26, 36.

[69] Trut, op. cit.

[70] Gen 9:3-5; W. J. Craig, *Nutrition and Wellness* (Berrien Springs, MI: Golden Harvest Books, 1999), 7-15; C. Campbell and T. M. Campbell, *The China Study* (Dallas, TX: Benbella Books, 2004), 69-108.

of disease-causing microbes in meat on the one hand and the occurrence of food components predisposing to disease on the other. In addition, it is conceivable that after the Flood the nutritional adequacy of many foods was compromised on account of the gross disturbance of the earth's surface and associated mineral unavailability and loss leading to nutritional deficiencies appearing among animal and plant populations. Then again changes in the genetic composition of plant varieties may have led to a decline in the nutritional adequacy, as has been seen over the last 50 years in the United States.[71] As part of the postulated changes, it is also conceivable that specific dietary components able to quench the damaging effects of reactive oxygen species were reduced with knock-on effects for longevity. Reducing the impact of reactive oxygen species (quenching) can occur in the presence of plant vitamins E and C.[72] A reduction in the intake quantities of such vitamins could be significant to longevity.

Mineral deficiencies and excesses may have been experienced. Deficiencies arising as a result of the Flood's rearranging of the surface crust of the earth undoubtedly occurred. Zones of mineral insufficiency in soils may lead to deficiency symptoms developing in plants, animals and humans. The latter may be illustrated by reference to the Dani tribe in the Valley of the Castoffs of West Papua. Here people living for around two years and longer develop goiter and the associated symptoms of mental deterioration because of iodine deficiency.[73] Similar changes to the environment have been noted in other regions of the world involving this and dissimilar nutrients (e.g., iodine and selenium).[74] Such deficiencies would have added to the disease burden experienced by the human population and contributed to the decline in longevity. It is also

[71] D. R. Davis, M. D. Epp and H. D. Riordan, "Changes in USDA Food Composition Data for 43 Garden Crops, 1950 to 1999," *Journal of the American College of Nutrition* 23 (2004): 669-682.

[72] S. F. Gilbert, *Developmental Biology*, eighth edition (Sunderland, MA: Sinauer Associates, Inc., Publishers, 2000), 587-589.

[73] S. Horne, *An Hour to the Stone Age* (Chicago, IL: Moody Press, 1976), 106-108.

[74] Example: Iodine and Selenium—J. Köhrle, F. Jakob, B. Contempré et al. "Selenium, the Thyroid, and the Endocrine System," *Endocrine Reviews* 26 (2005): 944-984.

conceivable that nutrient overload issues may have emerged giving rise to toxicity problems (e.g., cadmium and mercury).[75]

Part of the conservation information that I wish to highlight is that nutrition is significant to the health and longevity of species.[76] Predisposition to disease is a vital segment of this topic. At the outset it is clearly stated that predisposition to disease cannot be separated from nutrition, neither can it be limited to nutrition. In the following sections I will develop briefly some ideas surrounding predisposition to disease.

Predisposition to infectious diseases is influenced by a number of population characteristics as follows: genetic background, general health, age, gender, immunity to the pathogen, and religious and cultural practices.[77] I have indicated already that the genetic background of a population has some significance in predisposing to disease. And I also have indicated that nutrition is significant, for this influences general health. Additional information that I now mention is that the very young and very old are more susceptible to infectious diseases and that the sexes may differ in their susceptibility. Our immunity to infectious diseases is something we can alter by being immunized against various disease agents. Non-immune individuals are at greater risk of contracting an infectious disease and also they can act as reservoirs of disease for others, which can be viewed as not representing a particularly responsible position if the capacity to change the dynamics exists. This brings us to our last point that relates to religious and cultural practices.

Religious and cultural practices cover a considerable amount of territory, which means the subject cannot be given adequate justice here. On cultural practices, two examples can be given. Breast fed infants are less likely to suffer from diarrhea due to infectious agents and those groups given to eating traditional foods that possess raw meat ingredients are more likely to contract particular diseases than those groups not

---

[75] Example: Mercury and Cadmium—National Research Council (US), *Toxicants Occurring Naturally in Foods*: *Committee on Food Protection, Food and Nutrition Board, National Research Council,* 2nd edition (Washington, DC: National Academy of Sciences, 1973), 64-72; K. Nogawa and T. Kido, "Biological Monitoring of Cadmium Exposure in Itai-itai Disease Epidemiology," *International Archives of Occupational and Environmental Health* 65, supplement 1, (1993): S43-S46; Madigan et al., *Brock Biology*, 672.

[76] Stephen J. Simpson and David Raubenheimer, "Macronutrient Balance and Lifespan," *Aging* 1 (2009): 875-880.

[77] Eugene W. Nester, Denise G. Anderson, C. Evans Roberts et al. *Microbiology: A Human Perspective*, fourth edition (New York: McGraw Hill, 2004), 492.

subscribing to such practices.[78] Religious practices or principles embedded in the Bible lead us to recognize a number of valuable concepts.

The Jews possessed some correct ideas about the control of infectious diseases long before the so-called scientific era by adhering to the principles of sanitation, quarantine and disinfection. In the camp of the Israelites, disposal of waste was regulated, and strict rules prevented the accumulation of putrefying and unclean materials. The camp was to be kept holy, and the inhabitants urged to be clean in body, apparel and mind (Exod 19:6, 10; 30:18; Deut 23:13, 14; Prov 23:7). One purpose of the laver being placed between the tents of the congregation and the altar in the sanctuary was to keep the idea of carefulness in regard to cleanliness ever before the people. If contagious diseases were contracted, thorough cleansing of clothes and person were mandatory (Lev 15:2-12), and in the case of a disfiguring disease like leprosy, special quarantine arrangements were made (Lev 13:46-52). The dwellings were to satisfy strict health requirements, and, if through dampness, fungal growths appeared on the walls, then the situation was to be remedied or, failing this, the house was destroyed (Lev 14:34-45).

The Christian is committed to the conservation of health because he/she believes in the sanctity of the body. The apostle Paul teaches in 1 Corinthians 3:16, 17 that "God will destroy anyone who defiles his temple, for his temple is holy—and that is exactly what you are!" (Phillips). The extent of our concern reaches to "whatsoever you do, eating or drinking or anything else, everything should be done to bring glory to God" (1 Cor 10:31, Phillips). To elaborate specifically, it is instructive to note Paul's words in this our age, which is characterised by infatuation with and glorification of sex. "Each one of you must learn to gain mastery over his body, to hallow and honour it, not giving way to lust like the pagans who are ignorant of God" (1 Thess 4:4-5, NEB). It is a well-known scientific fact that physical and mental health function interdependently. Consequently, it is difficult for the Christian to understand or fulfil his/her duties fully when he/she possesses a diseased mind in a decrepit body.

The principles upheld in the Bible designed to maintain health and happiness and a clear realization of our responsibilities have been

[78] Ibid., 152.

outlined in depth in another forum.[79] These principles encompass the physical, mental, social and spiritual dimensions of health. In the context of this essay, the spiritual dimension is paramount as pointed out by king Solomon as follows: "Trust in the Lord with all your heart . . . in all your ways acknowledge Him . . . fear the Lord . . . . It will be health to your flesh and strength to your bones" (Prov 3:5-8, NKJV). The nub of the argument put by Solomon is that those who acknowledge God's claims and seek an understanding of His ways and commit to right doing will find peace and health (Prov 3:1-35; Ps 37:1-8). There is a wealth of information in the action words "acknowledging," "fearing," and "keeping" God's moral principles and guidelines. I would argue that realization of the principles of human health and their adoption by Christians ultimately will lead to a desire to improve ecosystem health, for nature informs us of the character of God (Rom 1:20).

Implications of Conservation Principles for Community Health

I will examine and summarize under principles the points mentioned above in relation to community health in the ecosystem context.

Genetic diversity. Such diversity has been altered through the continual presence of disease. This phenomenon has been observed in animal and human populations in response to selected diseases.[80] Sometimes the interactions between host and pathogen lead to the emergence of milder strains of the disease organism and more resistant hosts. At other times, changes are noted in the host that may lead to deleterious effects on physical performance. More worrying are instances where, through restricted outbreeding and other factors, a more susceptible population to disease has emerged.[81] This means that it is possible that restriction in the robustness of the genetic pool in animals (such as seen in founder and endangered populations) may lead to greater risks of the population being eliminated through infection. Indeed, this has been found with captive cheetahs where a high proportion of the

[79] Warren A. Shipton, *Clear Minds in Healthy Bodies* (Muak Lek, Thailand: Institute Press, 2007).

[80] Example: Myxomatosis in Rabbits and Malaria in Humans—Williams et al., op. cit.; Miller, op. cit.

[81] White et al., op. cit.; Wright and Hastie, op. cit.; Ghodke et al., op. cit.; Weinstein, op. cit.

population may be susceptible to virus disease and elimination.[82] More interestingly the rats on Christmas Island were rendered extinct by an introduced protozoan parasite and the Tasmanian devil population currently is endangered by disease.[83] Similarly, in agricultural crops, planting large areas to a single genotype invites disaster from disease agents.

One honourable approach to the problem of genetic diversity is to reduce the ability of damaging microbes to adapt to the changing environment hence making them less robust. The ultimate goal is to eliminate them such as accomplished with the smallpox virus. Reduction of the robustness of an infectious plant disease has been achieved in the United States through the regional elimination of barberry bushes that are necessary for sexual reproduction of a devastating cereal pathogen (*Puccinia*). Elimination of sexual reproduction and the possibility of recombining existing genetic information have reduced the effectiveness of the microbe as a pathogen.[84] Similar outcomes may be achieved by using biological or natural control strategies.

Principle 1: The first conservation principle that we can enunciate is that genetic diversity must be maintained at all costs for higher forms of life by preserving populations of animals (including humans) and plants in the various locations in the world where they occur.

Preserving and repairing the environment. Few areas of the world retain an ecosystem in a pristine condition. Where such are present, they should be preserved in order to maintain genetic diversity on the one hand and to give additional examples to humanity of the handiwork of God—His second book of information is to be preserved! Indeed, the Sabbath links the creation event to mankind's acknowledgment of being made in the image of God and it continues to instructs us to preserve His

[82] S. J. O'Brien, M. E. Roelke, L. Marker et al., "Genetic Basis for Species Vulnerability in the Cheetah," *Science* 227 (1985): 1428-1434.

[83] M. E. Jones, A. Cockburn, R. Hamede et al., "Life-history Change in Disease-ravaged Tasmanian Devil Populations," *Proceedings of the National Academy of Sciences, USA* 105 (20) (2008): 10023-10027; K. B. Wyatt, P. F. Campos, M. T. P. Gilbert et al., "Historical Mammal Extinction on Christmas Island (Indian Ocean) Correlates with Introduced Infectious Disease," *Plos One* 3 (11) (2008): e3602.doi:10.1371/journal.pone.0003602.

[84] Y. Jin, "Role of *Berberis* spp. as Alternate Hosts in Generating New Races of *Puccinia graminis* and *P. striiformis*," *Euphytica* 179 (2011): 105-108.

second book of information—nature.[85] The prophet Ezekiel presents a fascinating picture of what God would have done for His people in past ages if they had followed His ways and understood their commitments as ambassadors (Ezek 47). The invitation to experience similar blessings is still open.

Principle 2: The second conservation principle that we can enunciate is that conserving and repairing the environment is a responsibility of every Christian, for it represents an essential part of preserving God's second book of information—nature—and bringing honour to Him.

Health awareness and predisposition to disease. Health in humans is vital for the preservation of God's creation, for it leads to clear thinking. Maintaining the marvellous machinery in peak condition brings glory to God (1 Cor 10:31). The Bible principles of health enunciated for the human population have implications for both the animal and plant populations. For animals, both balanced nutrition and social health are vital to their proper functioning and to assist in protecting them from disease. For plants, balanced nutrition is vital to give them the best advantages in resisting disease.[86] A wholistic approach to health brings the responsibilities of the human instrument into focus concerning his/her ambassadorial role (2 Cor 5:20) and response to God's generous offer of salvation (Heb 2:3). Our responsibilities to care for God's creation become clearer as we accept God's salvation make-over (2 Cor 3:18; 4:6) and understand that God's redemptive act was to rescue all of creation (Rom 8:19-21). This is also clearly evident in the Sabbath rest, which is meant to embrace not only mankind but domestic animals too (Exod 20:10; 23:12).

Principle 3: The third conservation principle that we can enunciate is that the maintenance of good health maximizes the possibilities of avoiding disease in animals (including human) and plants and assists in their survival and optimal functioning.

Two obvious instructions are given in Scripture about the responsibilities of the human race to care for creation, one in the Old Testament and the other in the New (Ps 8:6; 1 Cor 10:31). These are not in conflict. Dominion can be understood correctly only in terms of glorifying God and recognizing that the Flood experience teaches the

[85] Rom 1:20; Shipton, *The Golden River*, 152-156.

[86] Lawrence E. Datnoff, Wade H. Elmer and Don M. Huber, eds, *Mineral Nutrition and Plant Disease* (St. Paul, MN: APS Press, 2007).

principle that God is interested in the survival of all the kinds He preserved in the ark. He claims ownership over them and provides food for all His creatures (Pss 50:10-11; 145:16). Exploiting nature through the advances of science and technology in enslavement to commercial forces is a present reality and has resulted in desertation, salination, pollution, global warming, habitat destruction, extinction of species, abandonment of an agrarian lifestyle in favour of city living, and glorification of human imagination, wealth and excess. God has given the earth to us in trust (Ps 115:16). Since all creatures glorify God (Pss 96:10-13; 150:16), it is our responsibility, as human beings made in God's image, to recognise and preserve His creation, for destroying it diminishes from His glory (Rom 1:20). In the present world, which has been altered by sin, conservation cannot be separated from the concept of adopting a sound population growth model. Unlimited human population increase and continually increasing consumer demand do not accord with the "covenant of survival of all"—the mandate proclaimed by the Flood episode.[87] The mental acuity of the human race is in serious need of attention. Acknowledging the principles of wholistic health outlined in Scripture, with the initial emphasis on spiritual health, would be a first step in redressing the deficiencies observed (cf. Jer 9:12-16; 1 Cor 10:31).

Warren A. Shipton (BScAgr, PhD, MEd, FASM) received his education in Australia and the United Kingdom. He is a scientist, educator and administrator and has worked in agriculture, biomedical science and tertiary education. He has taught in both the public and private educational sectors and served as president of Asia-Pacific International University, Thailand (2006-2010). Currently, he is associated with the faculties of Science and Education and Psychology at that University and until recently was a director on the Board of South Queensland Adventist Schools. wshipton@gmail.com

[87] Richard Bauckham, op. cit.