NATURAL SCIENCE AND SPATIAL APPROACH OF REWILDING
Evolution in meaning of rewilding in Wild Earth and The Wildlands Project

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INTRODUCTION

The early evolution of rewilding spans the years from 1990 when the word **rewild** first appeared in print, to 2004 when Dave Foreman, a central character in that evolution, drew its conceptual foundations and actions together in his book on rewilding North America (1,2). A review of the book noted that Foreman had worked alongside some heavyweights in conservation biology, but that Michael Soulé and Reed Noss were cited so many times that they should almost have been co-authors along with Foreman (3). Indeed, it comes across strongly in the timeline of evolution of rewilding, that there was a core group of highly motivated activists for nature conservation and, amongst them, a group of scientists working at that time in landscape ecology and conservation biology. It would start with the establishment of the non-profit conservation periodical, Wild Earth (4). The aim was to blend traditional wilderness and wildlife conservation with the science of conservation biology; to link up conservation activists with conservation biologists and artists; to act as a platform for dissemination of the latest conservation science; and to provide a voice for those working on restoration and protection of all of the natural elements of wild nature (4,5). As the first issue was being published in 1991, a small meeting of environmental activists and conservation biologists came together to talk about an ecological vision for North America, out of which was created The Wildlands Project (2,6). They saw this non-profit conservation organisation as a way of merging sound science with practical action in their recognition of the need for conservation planning, restoration and protection at a large scale - a move beyond a concern with the preservation of islands of wilderness to articulating a broader vision for restoring wildness on a large scale (2, 7). It was thus a cross-fertilisation between the outputs of those scientists in their professional life with the strategy and actions of The Wildlands Project and its partners and followers, and the articles that they and others wrote for Wild Earth.

The meaning of rewilding was thus shaped by its first users, its etymology revealed through a contextual analysis of their writings in Wild Earth that cite rewilding. It may then be set against the plethora of contemporary definitions and meanings (8) as an underpinning that brings clarity and focus, thus circumventing the danger of the term becoming a panchreston (9) or plastic word (10) through being used in such a variety of ways as to become meaningless.

HEAVYWEIGHTS IN CONSERVATION BIOLOGY – THE 1980s

The terms **rewild** and **rewilding** must have been, by association, common parlance amongst activists involved in the radical environmentalism of the late 1980s in America, along with their sympathisers in the Sierra Club and Wilderness Society (11,12). During that decade, a group of scientists were shaping a new field in ecology that became known as conservation biology (13). It was because of a shared concern for recovery and conservation of wild nature that led a number of conservation biology’s most important thinkers to develop ties and become engaged with that radical environmental movement (14).

Biologist Michael Soulé is considered the founder of conservation biology having organised the first international conference in 1978 at the University of California, San Diego, and, two years later, edited a first book on conservation biology arising from the conference (15,16). Conservation biology was described in the book as a **“new field, or at least a new rallying point for biologists wishing to pool their knowledge and techniques to solve problems”** and that it was **“a mission oriented discipline comprising both pure and applied science”**. In a paper in the journal BioScience in 1985, Soulé further described conservation biology as crisis oriented, a **“crisis discipline”** in that practioners were often having to react quickly to advancing endangerment of habits and species (17). He showed that conservation biology was a holistic, multidisciplinary approach to ecosystem recovery that encompassed island biogeography, ecophilosophy, population biology, genetics, environmental monitoring and hazard evaluation, as well as social sciences. It was thus a new interdisciplinary field in biological sciences that was mission-oriented, crisis-driven, and problem solving (18). That same year, a second international conference on conservation biology was held in Ann Arbor, with the support of the University of Michigan, which gave rise to another book on conservation biology the following year (19) as well as formation of the Society for Conservation Biology with Soulé being its first President. Also, in 1986, Soulé and Simberloff would have an article published in Biological Conservation that would presage the direction in conservation thinking over the following decade ((20) and see (21)). It moved past discussions about optimal size of nature reserves based on whether it should be a single large reserve or several small ones (SLOSS) by instead emphasizing keystone species and population viability as essential to the task of designing nature reserves, the size of the reserve being determined by the area needed to sustain a minimum viable population of a keystone species whose disappearance would significantly decrease the value or species diversity of the reserve. Conservation Biology –the Society's journal -– followed in 1987 with David Ehrenfeld as founding editor (15,16). The following year, in 1988, Soulé would have published the first of two papers on the importance of wildlife corridors in overcoming mesopredator predation of birds in fragments of chaparral habitat in California (22) The second paper summarized conservation area design as follows: a large reserve is better than a small one; a single large habitat fragment is superior to several small fragments; retain large native carnivores; eliminate artificial habitat disturbance; maintain continuity and flow through corridors as a connected habitat is better than fragmented (see Fig. 5 in (23)). In 1989, Soulé, in an article in Earth First!, the periodical of a radical environmental advocacy group of same name (see later) questioned how effective conservationists were in convincing others to get involved in rescuing wild nature if they only dealt in cognitive values, a didactic approach of explaining the science (24). He would rather they relayed special, positive experiences - peak experiences that flowed from participating with others in doing something of great importance and value, a personal, emotional experience of nature. In a Perspective in the journal Science in 1991, Soulé defined the crisis facing conservation in America, where species diversity appeared to be declining at an accelerating rate (25). He opened by describing five levels of a biospatial hierarchy, a system of classification of the living components of nature that facilitated an approach to targeting protection of biological diversity. This was followed by six major classes of human interference, seven areas of biotic degradation, and an eightfold road to possible solutions. He concluded with the observation that progress in conservation was hampered by a lack of public policy on biodiversity, that America should join the nations that had developed a national conservation or biodiversity strategy.

Reed Noss was an early and regular contributor to Earth First! in the 1980s, the journal of the direct action environmentalist grouping of same name that was co-founded by Dave Foreman, Howie Wolke and others in 1979 (26). The founding members were all former mainstream environmentalists who were disenchanted with the political system, and believed that radical action was necessary to stop environmental crisis (26,27). Earth First! immersed itself in bioregionalism and the Deep Ecology thinking of Arne Naess that recognised the intrinsic value of wild nature (12,28,29). Its activism focussed on a disruptive ecotage (sabotage carried out for ecological reasons) such as tree sitting, road blockades, taking over federal buildings, and educational programs (11,12,26). In its second year of publication, the journal adopted a masthead motto that is still in use today, albeit that it is the second incarnation of the organisation – **"No Compromise in the Defense of Mother Earth!"** (30). Shortly afterwards, in 1983, Noss would define Earth First! as the ecological resistance embodiment of Deep Ecology (31). In the same year, Noss had a paper published in the journal BioScience advocating a regional network of reserves, with sensitive habitats insulated from human disturbance, as the means to perpetuate regional biological diversity (32). He would follow this in 1986 with a paper in the journal Environmental Management that advocated identifying nodes of concentrated ecological value, and then integrating these core areas into a functional network by establishing corridors that encouraged species movement between the core areas, the latter being surrounded by buffer areas of low intensity human utilisation (33).

In 1987, the Natural Areas Journal published Noss's article on a network of conservation areas in Florida that would protect and restore movement linkages for panthers and bears across the State, and which he first had published two years earlier in Earth First! as an example in Florida of wilderness recovery and ecological restoration (34.35) as well as it being reprinted later in the first edition of Wild Earth in 1991 (36). Noss had published in 1990 in the journal Conservation Biology one of his mostly highly cited articles on a hierarchical approach to indicators of biodiversity (37). This would expand on the three core attributes of composition, structure, and function, a compelling approach of Franklin and others in forest ecosystems (38) by a proposal of a series of steps in biodiversity monitoring at a regional scale, and which would provide feedback for adaptive management. Noss confirmed his commitment to landscape connectivity as a means to overcome threats to biological diversity from habitat fragmentation in a book chapter in 1991 where he addressed the broad concept of connectivity (39). He noted that the linkages between habitats, species, communities, and ecological processes occurred at multiple spatial and temporal scales, and thus argued that a comprehensive strategy to conserve these processes and elements must also encompass a diversity of scales. One kind of connectivity had to do with continuity of habitats and processes along environmental gradients. He observed that ecologists and conservationist too often looked at habitats as separate entities, whereas in reality they were interacting, functional components of the landscape ecosystem. Species diversity, Noss maintained, could only be appreciated by considering the gradient as a whole, as plant species usually were distributed independently along gradients, and disturbances and other ecological processes interacted with gradients of soil and moisture to determine the distribution. Also in 1991, Noss used a Comment piece in the journal Conservation Biology to argue that one of the many biological and ecological functions of wilderness was to provide habitat for species that did not get along well with humans (40). Thus Big Wilderness, large, roadless areas where there was little human impact, were important for maintaining a presence of large carnivores. In a cross-over, Noss would become the Science Editor of Wild Earth and, shortly afterwards, second editor of the journal Conservation Biology (41,42).

Foreman also cited in his book the work in the 1980s of John Terborgh, another conservation scientist. Terborgh contributed a paper to the first international meeting on conservation biology in 1978 that was subsequently published as a chapter in the book edited by Soulé (43) and he would be a member of the organizing committee of the second world meeting in 1985 (44) as well as contributing a chapter on keystone plant resources in tropical forests to the second conference book, also edited by Soulé (45). In 1988, he had published in the journal Conservation Biology a paper on the role of large carnivores in maintaining ecological integrity (46). He and his associates had 15 years' experience of studying what he described as the **"big things"** at a site in Amazonia, the peccaries, jaguars, harpy eagle and spider monkeys that he saw were an everyday part of that environment. It was his conviction, from these studies, that predation exerted a profound structuring influence on the ecosystem that went beyond just numbers of prey taken. He noted that if what he suspected was true, then the predators in this system were responsible for the stability and maintenance of its diversity of plants and animals through what he called **"indirect effects"** – **"This refers to the propagation of perturbations through one or more trophic levels in an ecosystem, so that consequences are felt in organisms that may seem far removed, both ecologically and taxonomically, from the subjects of the perturbation"**. Terborgh would have published in later years studies on the destructive changes in vegetation that occurred in predator-free forest fragments and land-bridge islands (47,48). He would eventually gravitate towards The Wildlands Project, becoming a Board member alongside Foreman, Soulé and Noss in 1996 (49).

THE BIRTH OF WILD EARTH AND THE WILDLANDS PROJECT – THE EARLY 1990s

Newsweek journalist, Jennifer Foote, writing in 1990 about a decade that saw a rise in environmental radicalism in America, is credited with introducing the term rewild to a world audience (1). Foote noted that many mainstream environmentalists, impatient with their own leadership, had defected to radical organisations like Earth First!, the Wolf Action Network, the Rain Forest Action Network, Virginians for Wilderness, and Preserve Appalachian Wilderness. She observed that a contingent of environmental scientists, some of them involved in the very government agencies that the militants despised, were also aligning themselves with groups like Earth First! Foote saw that while some were reluctant warriors in breaking laws, there was a common belief in biocentrism amongst them all, that every species had equal, intrinsic value, and that the planet could not be viewed solely as a resource for humans – the concept of Deep Ecology was finding increasing support. Foote noted that this new activism would be more than just vowing to end pollution, a more radical action would be to **"take back and "rewild" one third of the United States"**

Foote, while writing her account of environmental radicalism, may not have been aware of the dissension that had been growing within Earth First! at a dilution of its biocentric vision and agenda by a humanistic view based on social priorities, and which was leading some of the more conservation-minded Earth First! leaders – dubbed the **"Wilders"** by Bron Taylor - to consider breaking away to establish a new conservation magazine (12,27, 50-52). Thus after leaving Earth First!, Foreman and John Davis, a former editor of its periodical of same name, met in December 1990, to plan a new conservation magazine that they would call Wild Earth (5). The first issue was published in the spring of 1991, and within its Statement of Purpose were commitments to **"provide a voice for the many effective but little-known regional and ad hoc wilderness groups and coalitions in North America"** and to **"render accessible the teachings of conservation biology, that activists may employ them in defense of biodiversity"** (4). Davis became the first Editor of Wild Earth, Noss the Science Editor, and within a couple of years later, Noss was also editor of the journal Conservation Biology (53). Other ex-Earth First!-ers like Wolke, Jamie Sayen, Rod Mondt, David Johns, and George Wuerthner, were Editorial Advisors or Correspondents for Wild Earth (54).

Foreman brought with him to Wild Earth the regular column he wrote for Earth First! - Around the Campfire - a very personal **"broadside"** with which he aimed to educate, provoke, and activate conservationists on a sweeping range of ideas, issues, and subjects (55). In his first column, he explained that Wild Earth was **"here to help translate the theories and information of Conservation Biology into grassroots preservation activism. We are here to help all groups and individuals working to protect biological diversity"** (56). The theme of the first issue was Ecological Foundations for Big Wilderness, a reflection on the plea that Noss had made in his article in the then concurrent issue of the journal Conservation Biology (40). There were articles addressing the theme by Foreman, Wolke, Noss, Wuerthner, and Felix Pace. Foreman saw it as the imbalance between the areas of wild nature protected in America compared to the increasing area of land under concrete or turned into roads (57). The danger was that the designated Wilderness Areas and National Parks could not survive as effective sanctuaries if they remained island ecosystems, that habitat islands in a sea of development would lose the key species that require larger territories to maintain sustainable breeding populations. Foreman believed this showed a need to massively increase the area of designated wilderness, identifying significantly large areas on both sides of the Rocky Mountains. Moreover, he noted that "**wilderness proponents needed to learn from conservation biologists, who in turn needed to see grassroots conservation activists as their natural allies and the management of public lands as a vital opportunity"**. This would be the first of many references to public lands in Wild Earth as being central to the prospect of a recovering wild nature in America. Public lands were seen to be a vital opportunity for locating core areas within a network as they were where strictly protected areas such as wilderness were designated that gave wild nature its own space, and which could be expanded or new wilderness designated.

The second issue of Wild Earth had The New Conservation Movement as its theme. It was the conviction of Foreman and others that the conservation movement in America was being reshaped and renewed by the many grassroots conservation groups that had sprouted up over the 1980s (58). For Foreman, it was not the growth of the mainstream national groups, nor the high media profile of the Earth First! phenomenon that had driven this, although he regarded the latter as playing a key role in creating the necessary conditions for its emergence. Foreman's introduction to this movement in Wild Earth was followed by reports from 22 of what Foreman dubbed the "**Visionary Groups"**. Foreman subdivided the Visionary Groups into three categories: Regional and Local Groups that focussed on a particular territory, like the Alliance for the Wild Rockies; Issue Groups that were not territorial in scope but were oriented to a specific issue, like the Wildlife Damage Review; and then entities like Wild Earth that operated to assist the Regional and Issue Visionary Groups. To these could be added the **"Tough Mainstream Groups"** like the Southeast Alaska Conservation Council that was still working within the confines of the mainstream, but which were kicking against the principle of multiple use, and the **"Specialist Groups"** in science and ethics, the sum total making up **"The New Conservation Movement"**

Soulé wrote to Foreman while the first issue of Wild Earth was being published, to suggest a small meeting of citizen conservation activists, and farsighted conservation biologists, to talk about an ecological vision for North America (5). That meeting in San Francisco was organised by Mondt and hosted over 20-21 November 1991 by the late Doug Tompkins, founder of Esprit Clothing and The North Face, and with support from the Foundation for Deep Ecology (2). Amongst the 15 attendees were Davis, Foreman, Johns, Mondt, Noss, Tompkins, Sayen, Soulé, and Wuerthner (2). The assembled scientists and activists agreed that to fully protect biodiversity, land conservation would need to be practiced on a much more ambitious scale. However, no one was quite sure then what elements would comprise a wildlands network conservation plan, or the precise methodology to design one (59). Thus the North American Wilderness Recovery group was formed out of that meeting, with the express purpose of continuing with visionary conservation planning that would be grounded in recent ecological research and theory, but with a view to encompassing all of North America (2). There was a belief that producing Wildlands Network Designs informed by science, and with clear conservation visions, would lead to more effective practical conservation efforts by citizens, scientists, and agencies. In addition, they affirmed that this conservation had to be on a larger scale than ever before, that it needed to cross international boundaries, just as jaguars and grizzly bears do. At the time of inception in November 1991, it was known that North American Wilderness Recovery would only be a temporary name, and it was to be replaced in the summer of 1992 by the less cumbersome The Wildlands Project (60). The word wildlands was chosen for the name instead of wilderness to show a commitment to a landscape network and not just to isolated protected areas (2). Thus wildlands would include designated wilderness areas, other protected core areas, compatible-use areas as buffers to the cores, and wildlife movement linkages.

THE IMPACT OF WILD EARTH – THE DECADE FROM 1992

It is not recorded whether those attending the meeting saw this large scale conservation as synonymous with rewilding (but see later). Leanne Klyza-Linck, executive director of The Wildlands Project, in looking back over the decade to the first edition of Wild Earth in a Wildlands Project update in 2000, wrote that much had changed, that the language of conservation biology had made its way into the mainstream of conservation, thanks in large part to its promotion in Wild Earth (59). Another change had been in wilderness proposals that, ten years previously, were not designed with ecological boundaries, but they were now. Then she noted that rewilding hadn't even been a concept a decade before, and now it was. Another retrospective appeared in 2004 in the very last ever edition of Wild Earth, written by Tom Butler, a long-time editor of Wild Earth (61). He saw the most gratifying success had been in promoting a rewilding approach to conservation that was not merely defensive, oriented toward saving the last scraps of wild nature, but offensive, actively seeking to help nature heal. Butler ventured, but was happy to have been corrected, that the first use of the term rewilding came in Wild Earth in 1992, in an editorial by Dave Foreman. Butler noted that thereafter, rewilding became a standard part of the lexicon of Wild Earth, as various journal contributors advanced a notion of ecological restoration writ large, including recovery of wolves, jaguars, and other **"keystone predators across large parts of their native ranges"**. He had also observed the appearance of the word over the years in articles by such as the President of the Wilderness Society and the President of Defenders of Wildlife, as well listening to a segment on National Public Radio in the late 1990s about a conservation project in Asia, wherein its action was

to rewild the landscape between two existing protected areas so that wildlife could move unimpeded. Butler remarked:
“In less than a decade, the word rewilding that we introduced in Wild Earth had spread around the world, a memetic victory, and hopefully prophetic of the landscape that future generations of people and wolves will inhabit”

THE EARLY OCCURRENCE OF REWILDING IN WILD EARTH

Butler was wrong, because it would be Davis who first used the word rewilding in the winter edition of Wild Earth in 1991. In an editorial, Davis commented on the report in that issue by Johns of a first meeting of the steering committee that would begin to pull together a recovery strategy for wilderness restoration that had linking biological corridors for all of North America (6,62). This was the North American Wilderness Recovery group, the short-lived name that soon became The Wildlands Project (see above). Davis was at that meeting, but he took the opportunity in his editorial to give greater emphasis to the idea of expanding wilderness, one of the issues discussed at the meeting (6,62). He wanted the strategy to aim high because a limited preserve system, a system of bounded preserves and corridors in a developed matrix, would act like a sieve that would capture species with large populations, but many rare, sensitive and imperilled species could fall through the gaps. Davis instead wanted the matrix to be wild, and observed that the **“work of rewilding this continent is the work of many generations”.**

Rewilding and rewild were also used in that edition of Wild Earth in an article by Mike Biltonen and Rick Bonney of Finger Lakes Wild!, an Ithaca based environmental group dedicated to the ecological restoration of west-central New York State (63). Biltonen and Bonney noted that all the land designated as wilderness by the state of New York was in the Adirondack and Catskill Parks, with none in the west-central area of the state. It was their proposition that there could be wilderness elsewhere in the state – **“What it means is that we must rewild west-central New York, by identifying the largest tracts of undeveloped land, securing their permanent protection, connecting them with corridors, halting disruptive management activities, and providing buffer zones around them where only limited human activity is permitted”** The authors identified the Finger Lakes National Forest, an area of federally owned land, as a potential core of a **”wilderness network within which genetic material can flow freely and the processes of natural selection and evolution can continue undisturbed”**. They explained that Finger Lakes Wild! had recognised a number of steps that were needed in devising a plan for rewilding the Finger Lakes region. To begin with, the group was carrying out a mapping process to show federal and state land ownership, and all remaining wild lands under private ownership. These maps were to be used to identify lands that could be part of a connected wild lands system. Once identified, a plan for each parcel of a land would be developed that would focus on management for native biodiversity. Having done that, it would then be a process of working with local, state, and federal officials, as well as local citizens, to develop the wilderness network along with the studies, monitoring, and restoration work needed to make the Finger Lakes wild again. They intended shortly to hold a workshop where they would present their wilderness recovery strategy to a diverse audience of federal and state representatives, as well as citizen groups, and ask for help in proceeding with implementation, particularly in establishing corridors between the wilderness cores, and identification of the flora and fauna that should be reintroduced to the region. It was the intention that the Strategy would describe how to connect the Finger Lakes Wilderness Preserve with larger tracts of designated and de facto wilderness in the Catskills and the Adirondacks. This spatial approach of mapping for public land ownership as the means to identifying the core and the other wild land areas of a recovering, connected, wild land system, was to become a key feature of the rewilding approach of the Wildlands Project, as would also be the broad-based participation that would be embraced in turning an initial plan into a feasible and deliverable wild land network.

The next use of rewilding in Wild Earth was not from Foreman either, because it would be the late Robert Mueller of Virginians for Wilderness, who put forward map-based proposals in the summer issue of 1992 for new wilderness areas, and extensions to existing wilderness areas, in the Monongahela National Forest in West Virginia, along with buffer zones and corridors (64). Browsing damage from deer was a limiting factor for restoration in this National Forest. Thus Mueller recommended a forest management approach on this federally owned land that had been proposed in Wisconsin for creating large scale reserves. It was based on reducing that deer pressure through concerted culling, but also through reducing their browse by excluding commercial-scale, clear-fell timber harvests in those areas as it would have the effect of increasing forest-edge browse. Mueller saw this as only the start – **"… this step should be regarded merely as a prelude to the complete rewilding of these forests with Cougars, Gray Wolves and other extirpated species".** Foreman's turn would come a few months later in his column Around the Campfire in the autumn edition of Wild Earth. That element of a reinstatement of large carnivores was also there in his recounting of a visit to one of the three separate areas of the Theodore Roosevelt National Park in North Dakota (65). He noted that in contrast to the cattle grazing and arable farming outside of the Park boundary, wild land was coming back inside the Park, as evidenced by the presence of bison, elk, pronghorn and coyote. He stated that the goal of Wild Earth was to offer the bold vision of The New Conservation Movement – **"It is time to rewild North America; it is past time to reweave the full fabric of life on our continent"**. He contemplated the interconnecting of the detached units of the Park through the Little Missouri National Grassland, by acquiring interspersed private land, removing cattle, taking down fences, giving the Bison and Elk room to roam, and then restoring wolf and Grizzly to what he thought were their rightful place – **"here is a vision for the twenty-first century. This is where tomorrow begins. This is why "Wild Earth" exists"**

A SPECIAL ISSUE - THE WILDLANDS PROJECT MISSION STATEMENT AND LAND CONSERVATION STRATEGY

No definition of rewilding was given in those early citations in Wild Earth. Instead, The Wildlands Project was developing its ideas on how to design connected wildlands and putting them out in both Wild Earth, and in journal articles. Foreman noted that one of the things that differentiated Wild Earth from other conservation periodicals was its long view, a distant vision that was the task of Wild Earth to spread in every issue (66). To compliment that, Foreman announced that a Special Issue of Wild Earth was to be published alongside the 1992 winter edition. It should be remembered that while there were many people in common between Wild Earth and The Wildlands Project, the two were at the time separate entities. The Special Issue had Plotting A North American Wilderness Recovery Strategy as its theme, a focus on The Wildlands Project, and giving for the first time its Mission Statement, prepared by Foreman, Davis, Johns, Noss, and Soulé, that noted that **"an audacious plan was needed for the survival and recovery of wildlife and wilderness"** in America (67). A feature of the design approach was that it rested on the spirt of social responsibility that had built great institutions in the past. Thus **"jobs were to be created, not lost; and land would be given freely, not taken".** In what would become very familiar, the spatial approach of large, wild core areas surrounded by buffers, and linked by biological corridors for natural dispersal of wide-ranging species, and for genetic exchange between populations, was seen as a way of overcoming the constraints of unconnected reserves existing as discrete islands of nature in a sea of human modified landscapes. The Mission went on to explain that The Wildlands Project was a non-profit organisation of conservation biologists and biodiversity activists from across the continent that worked in co-operation with independent grass-roots organizations throughout the continent to develop proposals for each bioregion.

There were articles in the Special Issue on proposals for a recovery strategy for wilderness in the Adirondack Park and in the Northern Rockies, on regeneration of the Caledonian Forest in Scotland, as well as a mapping of the largest remaining roadless areas in America (over 100,000 acres in the West and 50,000 acres in the East) and which could form the basis of search areas for new wilderness (68). There were, however, two articles that stood out in the Special Issue. In a brief essay, Soulé observed that an instantaneous ecological metamorphosis in North America was impossible because the continent was now too disrupted and fragmented, noting that the mountain ranges of the Southwest were isolated, that the national parks and wilderness were islands that were too small and too poached to sustain viable populations of predators. However, he sought to give hope for restoring wild nature in the face of the impact of a burgeoning human population through land-use planning on spatial and temporal scales never attempted before (69). He noted that this land-use planning had to occur at the regional level, and that it must be participatory – **"The restoration of the wildlands network will depend on the knowledge of people intimate with the mountains, canyons, forests, coves, rivers and creeks. Such planning will not work without grass-roots education and empowerment. Over time, each regional planning group will develop a map-based program for their bioregion. Later, representatives of the bioregional groups will meet and integrate their plans into a national, then continental strategy".** Noss, drawing on much from his own and fellow conservation biologists published research, enunciated The Wildlands Project Land Conservation Strategy. In this, he presented the scientific background, a conceptual overview, and general guidelines for developing a Wilderness Recovery Plan, and which in applying conservation biology to wilderness recovery, encompassed setting ecological goals, approaches to land conservation, survey and selection, and a detailed description of the components of a wilderness recovery network in an Appendix to the article (70). These would include strictly protected core areas; buffer or multiple use zones; and connectivity through linkages or corridors that were habitat specific, or for dispersal or seasonal movements, the sum total of the network enclosing and linking biologically critical areas in a continuous system of natural habitat. The aim of this network was to achieve four ecological goals, one of which was to maintain ecological and evolutionary processes – **"Fundamental processes critical to ecosystem function include cycling of nutrients and flow of energy, disturbance regimes and recovery processes (succession), hydrological cycles, weathering and erosion, decomposition, herbivory, predation, pollination, seed dispersal, and many more"**. The three other ecological goals Noss laid out were about the capturing of all native ecosystem types and sera stages across their natural range of variation; maintaining viable populations of all native species in natural patterns of abundance and distribution; and designing the system to be responsive to short-term and long-term environmental change, and to maintain the evolutionary potential of lineages.

Noss had noted, in relation to survey and selection for core reserves and primary corridors, that there were critical steps in selecting the most strictly protected areas and primary linkages in a wilderness recovery network. This would be field reconnaissance and interpretation of maps, aerial photographs, or satellite images to identify areas that appeared to be roadless, undeveloped, or otherwise in an essentially natural condition, and which of these areas were public lands. He did not rule out roaded areas that were relatively undeveloped and restorable, especially when adjacent to or near roadless areas, because addition of these would be important to increase core reserve size and to link roadless areas into larger complexes or networks. In the article by Foreman that followed, he laid out some practical points for activists in how to make use of Noss's model in starting to design such a system in their own regional area (71). One of these would echo Noss in that Foreman noted that maps were available from government agencies of the public lands that were National Parks, Wilderness Areas, National Forests and especially their roadless areas, and Bureau of Land Management lands, as he believed that all of these public lands had to play a major role in Wilderness Recovery Networks. Thus it was within the ambit of public land managers to modify their plans so that they closed roads necessary only for logging and grazing, allowing the logged areas to revegetate, and overgrazed watershed encouraged to heal. This prescription to public land managers to facilitate a recovery that would allow inclusion of lands in wild land networks was also a recommendation in an article in the Special Issue by Brownie Newman and others of SouthPAW, the southern extension of the Preserve Appalachian Wilderness (PAW) network vision (72). Their concentration was on the Blue Ridge Province where they recognised the importance the 3.5 million acres of the public lands of the Blue Ridge Mountains had as a bioregional habitat reserve, and which lent itself to their mapping of proposed core and corridor areas.

However, the achievement of this outcome would necessitate several changes in public land management policies to remove activities incompatible with heathy native forest communities, such as commercial logging and developed recreational facilities. They urged no further road construction within public forests, as well as closures of existing roads after cessation of logging, seeing this restoration and expansion of roadless area as the most direct way to maximise forest interior and maintain the region's native forest communities. They noted that the exiting public lands were of a small size, and isolated from other protected areas by private holdings. They proposed a gradual purchase of private holdings, giving priority to habitat scientifically determined to be of strategic importance. While their proposal covered only one part of the Southern Appalachian Bioregion, they believed that most or all of the public lands within the Southern Appalachians should be managed for maximum native biodiversity as core and corridor areas and, in looking at the existing public lands, they drew up another map for a proposed system of linked core areas, corridors, and buffer zones across the whole of the Southern Appalachian Bioregion.

The Special Issue of Wild Earth from winter 1992 didn't mention rewilding, and there was only one mention across the four issues of Wild Earth over 1993. This was in the winter edition where there were reports of the first vision mapping meeting of The Wildlands Project that took place in November at Sagamore Lodge in Adirondack Park, New York (73,74). Its scope was the Greater Laurentian Region of New England up to southeast Canada, and drew representatives from Nova Scotia, Quebec, Ontario, New England, New York, Pennsylvania and New Jersey, who used their knowledge of the region to produce a preliminary vision map of a system of protected cores, corridors and buffer zones. This map of a connected system of wildlands was to be used as a basis for more detailed work and to frame the discussion of what needed to be done to protect and restore native biological diversity. Foreman would describe working with **"two dozen of the region's leading ecologists and conservation activists on how to encourage the rewilding of the North Woods"** as a good **"send-off"** for the vision mapping process of The Wildlands Project (75).

Scott Mills, Soulé and Daniel Doak had an important article published in 1993 in the journal BioScience that was a clarification of the defining characteristics of a keystone species (76). The authors noted that close scrutiny of interaction strengths was first advocated in 1972 by Robert Macarthur who had defined a strong interactor as a species whose removal would produce a dramatic effect (77). Thus through reviewing published studies on the impact on community composition that followed from their removal, the authors sought to distinguish between species on the strength of their ecological interaction (76). Their conclusion was that the lack of data addressing both the range of interaction strengths within communities and the generality of trends across communities casted doubt on continuing to label certain species as keystone. Instead, they advocated the study of interaction strengths and subsequent application of the results into management plans and policy decisions **–"Emphasizing strengths of interactions instead of a keystone/non-keystone dualism is more than a semantic improvement; it recognizes the complexity, as well as the temporal and spatial variability, of interactions"**

MAP-BASED CONSERVATION PLANNING

The paper on keystone species did not mention rewilding, and while mention of rewilding was infrequent in Wild Earth over 1993, the mastery of The Wildlands Project in conveying its network approach to conservation was in evidence when Foreman, Noss, Soulé, and conservation biologists Howard Quigley and William Newmark, turned up in 1993 at the Society for Conservation Biology's annual conference in Tempe, Arizona. In front of a packed audience of over 300, they explained first how The Wildlands Project **"represented a loose coalition of regionally-based groups across North America, each of which was composed of conservation scientists and activists, and each interested in developing long-term strategies to restore native biological diversity, ecological integrity, and wildness to their region"** (78). They then outlined an overarching vision for public lands protection that would safeguard more than 50 percent of the lower forty-eight states in core wilderness areas with human buffer zones and interconnecting corridors stretching across huge tracts of land (53,79).

The technical approach used was a map-based conservation planning, involving an iterative process of reserve selection and reserve network design based on information on species distribution, and development of management and restoration plans (53). It was a vision of what North America might look like in 100 or 200 years if the scale of human activities could be reduced and wild nature was given a chance to recover. Described by one author as an **"audacious proposal"** it is said that the **"sweep of the idea elicited gasps from the audience"** (53). Following the presentation, a panel of scientists from academia, government, and the private conservation community were asked to critique The Wildlands Project. The Project was cautious in reporting the reaction it received, wishing to learn from criticism received so that it could modify its approach. Thus it was described as radical and politically unrealistic, a wildly utopian assumption about the future when set against human population growth and resource consumption, that the values held by the Project for wildness and biodiversity were not necessarily shared to the same degree by other citizens; that there was the potential for a backlash against these **"ambitious proposals"**, that the benefits of corridors and roadless areas, in particular, were insufficiently validated to form the basis of the approach, and that these proposals may drive people from their homes in the human use areas of the buffer zones and corridors (78,80). There was, however, little criticism of the scientific underpinning of the proposals in the need for big reserves and inter-linking corridors if biodiversity was to be protected. The boldness of the proposal drew new attention among conservation biologists, national environmental groups, as well as some controversy in newspapers when it was erroneously reported that the Project was trying to kick people off the land and even out of their homes in order to establish reserve networks (53,80).

There was also a major and largely favourable article about The Wildlands Project's proposal in Science magazine. The article described it as **"the most ambitious proposal for land management since the Louisiana Purchase of 1803"** (79) an allusion to a land purchase from the French in 1803 that nearly doubled the size of the United States (81). A map on the first page of the article showed a design for a reserve network on the Pacific Coast of Oregon, with a continuous band of core refuges, buffer zones and wildlife corridors delineated in different colours, the corridors on the inland edge of this band forming directional arrows for where they would link in with other networks (79). It gave a good impression of the approach. It had been taken from a paper in the Natural Areas Journal by Noss that had presented a preliminary case study of biodiversity conservation at the scale of the Oregon Coast Range Bioregion that was developed in cooperation with the Coast Range Association, a grassroots conservation group, and was **"intended for use as a model for proposals in other regions. It is already being used in this way by many groups"** (82).

Noss gave the context of the approach in the paper as being the **"emergence of grassroots regional groups that seek to protect and restore the ecological integrity of their respective bioregions".** He said that The Wildlands Project had been **"organized to provide technical guidance and support to those regional groups across North and Central America by linking conservation biologists with activists"** so that these **"alliances of conservation-minded people of varied backgrounds are then able to produce scientifically credible but ambitious conservation plans at minimal cost".** Noss explained that the goals for conservation at such a regional scale had been enunciated by The Wildlands Project for a long-range (planning over decades and centuries) biocentric (the needs of the native biota came first) and optimistic conservation strategy for North America. They included **"representation of all ecosystems across their natural range of variation; maintenance of viable populations of all native species; perpetuation of ecological and evolutionary processes; and adaptability to change, both natural and human-induced".** In what would set the pattern for the Wildlands Network Designs in years to come (see later) important sites for the reserve system were identified from mapping data overlays that included the distribution of threatened species and communities, late successional forests and the distribution of spotted owl as an indicator of functioning habitat of the latter, proposed watershed reserves, potential wildlife corridors, and significant remaining roadless areas. These sites were categorised as high priority reserve areas surrounded by secondary reserve areas, and bounded by multiple-use buffer zones, many of the latter being designed to provide connecting corridors between the high priority reserve areas, or to link the Coast Range to other regions (see Fig. 1 in (82)). The aim of the reserve system would be for it have a **"high probability of providing for all native species"** in the region by encompassing the **"full range of communities, ecosystems, physical habitats, environmental gradients, and natural seral stages"**.

The next map in the Science magazine article showed a series of continuous buffer zones and corridors criss-crossing the State of Florida to link up core areas so that the Florida panther could migrate between them – this was another network mapping by Noss, a monochrome version of this graphic having been published earlier in the first edition of Wild Earth (see above)(36). The third map illustrating the Science magazine article showed a vast reserve system of core areas, buffer zones and corridors encompassing the southern Appalachians in the Mid-Atlantic region, and which covered the two National Parks in Shenandoah and Great Smoky Mountains, and a number of designated wilderness areas in the regions National Forests. The scale of all three of these reserve systems, as represented by that mapping, was said by the authors of the Science magazine article to be consistent with the **"growing conviction among conservation biologists and other scientists that native species, especially big carnivores such as wolves, grizzly bears, and mountain lions, need enormous amounts of space to survive"** (79). In that respect, giving wild animals sufficient space was viewed as consistent with laws like the Endangered Species Act that allowed for the designation of **"critical habitat"** for an endangered species on the basis of the best scientific data available, and which prohibits any **"take"** (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of the endangered species (83). The Science article also gave a good cross section of the reactions to the various aspects of the proposals, and which were particularly tentative about the corridors where the greatest land use changes would have to occur. Outside of doubts of its political feasibility, many of the scientists interviewed could not fault its ecological approach to species survival – thus Fred W. Allendorf, a population geneticist at the University of Montana is quoted as saying **"at least it will help force people to make a conscious choice about what we are going to let survive"** (79).

A FIRST BOOK – A WILDLANDS ANTHOLOGY

It is not reported whether the term rewilding was heard at Society for Conservation Biology's annual conference in 1993, as it was not mentioned in descriptions of the meeting in Wild Earth or elsewhere (53,78-80). The citation of rewilding in Wild Earth became very patchy in the following years. Thus there would be only one mention of rewilding in Wild Earth over 1994, in an article by Christopher McGrory Klyza about two main lessons that could be learnt from **"Vermont and Eastern wilderness generally: about living with nature and about the rewilding of nature"** (84). There were a number of opportunities to get the term into print in 1994 outside of Wild Earth when members of The Wildlands Project contributed chapters to a book on environmental policy and biodiversity (85) as well as when Noss in collaboration with Allen Cooperrider produced a book on protecting and restoring biodiversity (86). In addition, a wildlands anthology was published where amongst chapters from Noss, Davis, and Sayen specifically about The Wildlands Project (87) only Davis referred once to rewilding (88):

"Wild Earth, the regular voice of The Wildlands Project, cannot in its overcommitted and overstuffed pages even begin to do justice to the many sociological and political questions ancillary to any discussion of rewilding the continent. Wild Earth stresses biology. The need was clear for a forum where players would discuss not so much nature per se (Wild Earth's main bent) but the human/nature interface—hence this anthology"

Davis went on to reaffirm the four ecological goals that Noss had prescribed (see earlier) including the maintenance of ecological and evolutionary processes (88). He described the wildlife reserve systems on the American continent as grossly inadequate, **"too small and isolated to maintain viable—let alone naturally fluctuating—populations of all native species".** Davis observed that there was **"a need to design a continental ecological reserve system consisting of large wild core areas surrounded by buffer zones and linked by habitat corridors to restore and protect biodiversity"**. He said The Wildlands Project work engendered by these premises, and others he had laid out, had been discussed at length, especially in Wild Earth's first special issue (see earlier). He noted that wildland proponents were working within their regions to formulate proposals that would describe with maps and text the reserves needed to restore and protect biodiversity – **"As they are completed, these proposals will be published in Wild Earth or as special publications"**

A SECOND SPECIAL ISSUE – PROGRESS IN THEORY, ADVOCACY, AND RESERVE DESIGN

The following year saw only two mentions of rewilding in Wild Earth over 1995, the first from Johns in the Spring issue noting a meeting of The Wildlands Project board where it "**discussed ways to focus staff work to better meet our goals for a rewilded North America"** (89). The winter issue had a report by Noss about The Wildlands Project presenting a second symposium at an annual meeting of the Society for Conservation Biology held in June at Colorado State University in Fort Collins (78). To another packed audience, an update was provided on the Project and several research efforts in progress were described. Noss had explained in his presentation that The Wildlands Project had a unique role in the sociology of science through its activities of putting forth a positive vision of the future from the perspective of all life, not just humans. This was to counter the self-fulfilling resignation of environmentalists and conservation biologists that the world was falling apart, and there was nothing that could be done about it. The Project was trying to identify the hot spots and vital points of the natural landscape using established and innovative methods of conservation biology, recognizing that further ecological damage was bound to occur, and joining with activists to establish long term restoration strategies and harmonious human-nature relationships for the rest of the landscape. As with the first symposium, it was not reported whether the term rewilding was heard at that event.

There was a reference to rewilding in the winter issue of 1995 from Mondt, writing as Outreach Director of The Wildlands Project, in what was a second issue of Wild Earth given over to The Wildlands Project as its theme. Foreman introduced the issue as being a catalogue of progress made both in theory and practice towards **"applying the science of conservation biology to design and establish a connected system of reserves throughout the continent"** (90). Foreman noted that in the three years since the first special issue of Wild Earth (see earlier) The Wildlands Project had held dozens of meetings around North America to begin the mapping of science-based reserve designs - **"We've spread the word about marrying conservation biology and conservation advocacy"**. He said that progress by The Wildlands Project could be measured in three areas: the influence it had on a variety of conservation groups in taking up science-based arguments to defend Nature and to apply The Wildland's Project model to reserve design and land management; that with its key operating groups, the Project had begun the real work of designing reserve networks in various regions of North America; and both the science and the politics of The Wildlands Project had become more detailed and sophisticated.

Foreman also pointed to an article in the issue by Johns and Soulé that gave an outline of the Wildlands Reserve Design Process which he said showed how to **"translate vision into reality"**. It was intended as a general guide to the steps needed to produce a regional proposal for a Wildlands reserve system. Johns and Soulé noted that it was based on an assessment of work underway in some regions, and extensive discussion with regional groups throughout the American continent (91). They stressed several important themes in the process: scientific credibility in proposals being able to stand up to review by outside scientists; broad-based support as they saw that both the conservation community and the public must understand and support Wildlands proposals for them to be successful, thus requiring potential allies to be identified and brought in early, that people need to be involved in the process, and not just have a completed proposal presented to them; professionalism in approach, combining the skills of grass roots activists with those with specialist skills in science, mapping, organisation, fundraising, public speaking, community leadership, arts, writers and others; and funding for the process of reserve design development. A table was shown of the multiple steps in the process indicating how joint responsibilities for each step could be shared between The Wildlands Project and the regional grouping, and the article text expanded on what each step entailed. In conjunction with the article, The Wildlands Project announced that it had compiled a selection of papers into a "**Reserve Design Framework Package"**, some as reports especially written for the Package, the first written by Steve Trombulak as a walk-through guide to ecological reserve design (92) and others already published in Wild Earth. A listing of the Package contents was given under the headings of Conservation Strategy, Mapping, Political Strategy, Implementation of Reserve Networks, and References and resource lists on biodiversity, mapping, corridors, and sources of materials such as base maps (see pg. 35 in (92)).The Package would be available to cooperating organisations and individuals, and it was hoped that it would answer important questions surrounding the reserve design process.

Mondt gave a report on the accomplishments of some of the individuals, groups, and coalitions that shared the Project's goal of **"biodiversity protection and rewilding through design and implementation of a core/buffer zone/corridor reserve system"** (93). These included the Canadian Parks and Wilderness Society, Yukon Wildlands Alliance for the Wild Rockies, Sky Island Alliance, RESTORE: The North Woods, American Wildlands (Rocky Mountains), California Wilderness Coalition, Minnesota Ecosystems Recovery Project, Southeast Wildlands Project, Southern Appalachian Biodiversity Project, and Heartwood (Ozark Forests). However, there was an admission from Mondt that it was impossible to concentrate on the entire North American continent with a small staff, and so the decision had been taken to divide and prioritize the regions, but without abandoning any – **"It means we will be working at different levels, with different time frames, depending on the status of reserve proposals already drafted, organizational structures, mapping, and other key elements of functional reserve design".**

Finally, for1995, Newmark had an important paper published in Conservation Biology about the extinction of mammal populations in western North American national parks, but while he broached the similarity of reserves with land-bridge islands and their loss of species, and the need for designing conservation and management strategies to overcome this, he did not mention rewilding (94).

SCIENCE-BASED RESERVE DESIGN AND IMPLEMENTATION

There would be no mention of rewilding in Wild Earth across 1996. However, Soulé offered a note of caution in the spring issue that year of Wild Earth about the assumption that maintaining or restoring ecological processes by use of surrogate species was the same as putting back the native community – **"the processes of ecosystems are universal, but the species are not"** (95). Amongst the processes, he listed photosynthesis, nutrient transport, fixation of nitrogen, the water cycle, the decomposition of organic matter by invertebrates and microorganisms, the sequence of seasonal events (like budding, flowering, and seed dispersal), and disturbances such as fire and floods. These were generic, he said, because they occurred in nearly every terrestrial or aquatic ecosystem on Earth. He saw though that just because these processes could be instigated by surrogates -**"weedy species"** -it should not be used to justify the replacement or elimination of some or all of the native species that inhabited the landscape before its modification through human agency. In relation to this, Foreman was later to write in his book that **"without native species, the land is domesticated or feral, not wild. Unmanaged land without native species is not a wilderness, but a wasteland"** (2). Noss and colleagues had an article published in 1996 on carnivore conservation in the Rocky Mountains in the journal Conservation Biology. The authors observed that the indirect effects of carnivores on community structure and diversity could be significant, and that as umbrella species their habitat area requirements encompassed the habitats of many other species (96). Effective conservation would require restoration of wide habitat linkages between population centres for large carnivores, a key issue in proposals for regional reserve networks composed of wilderness core areas, multiple-use buffer zones, and some form of connectivity - but rewilding was not mentioned.

Rewilding, however, did make a number of appearances in Wild Earth over 1997, the most important being Foreman's observation that while there had been plenty of theorising about science-based Nature reserve design in Wild Earth, hard questions kept arising about the reality of producing and implementing **"a science-based reserve design that will rewild a landscape and protect the diversity of life"** given the constraints of funding availability; the speediness with which a design could be produced so that it could be used for current conservation issues; how citizen conservationists could be brought into reserve design so that they would have a feeling of ownership and that there would be a grassroots constituency to help implement the proposed reserve network; and would such a reserve design pass scientific Peer review?(97). Foreman noted that Soulé had suggested that a reserve design should be very specific in its stated objectives so that peer reviewers would have sure standards in measuring how well the reserve design met them. On that basis, Foreman observed that the Sky Island/Greater Gila Project in-the south- western United States and northern Mexico would undertake the drafting of a proposed plan of action that melded science-based reserve design with traditional Wilderness Area advocacy, and which may help others in designing their reserve projects. It would follow the approach of the core area, buffer zone, connecting corridor model developed by Noss (see examples earlier). Data would be accumulated on key species habitat requirements and existing habitat availability, as well as a consideration of species reinstatement; and use proposals for core reserve areas on federal lands as justification for wilderness designation or expansions of existing wilderness. The hope was, through this approach, to test how well the Sky Island/Greater Gila reserve design met the goals of eco system representation and protection of all plants and animals native to the region.

As an accompaniment to that, it was announced in Wild Earth that Soulé was organizing a science workshop that would involve 25-30 scientists in an open dialogue on the **"theories and principles of corridor design, compatible uses of buffer zones, the ecological importance of large carnivores, a peer review process for reserve designs, and exploration of the similarities and differences in the twin objectives of rewilding of landscapes and representation of biodiversity"** (98). The workshop of thirty invited experts took place at the Rex Ranch near Tucson, Arizona, in November 1997 (99). The workshop was designed so that the outcome would become a book that would be a guide to the science behind designing a more effective way to protect nature, wilderness, and biodiversity. Thus sessions were scheduled with each of the main chapter titles as their theme, such as scale in selecting and designing biological reserves, regional and continental conservation, the regulatory role of large carnivores, cores areas, connectivity, and buffer zones.

In the winter issue of Wild Earth in 1997, Steve Gatewood, executive director of The Wildlands Project responded to inquiries about human population growth, and the impact it may have for any wildlands reserve network. Gatewood explained that The Wildlands Project did not work directly on population issues because it was engrossed in the **"reserve design and rewilding arena - the thrust of our mission"** as the **"only group designing an interconnected system of conservation reserves on a continental scale"** (100).

In the first issue of Wild Earth in 1998, a workshop was announced for later that year that would discuss reserve network implementation using the Sky Island design proposal as a model (101). It was expected that biological and social scientists as well as experienced conservation activists would **"investigate and discuss the opportunities, challenges, and pitfalls of making rewilding and biodiversity conservation happen on the ground".** As it was, that three-day workshop took place in February the following year, at Rex Ranch, south of Tucson, Arizona, and hosted by The Wildlands Project and Sky Island Alliance (102). Amongst the 30 participants were conservation campaigners, economists, media consultants, biologists, ranchers, outdoor recreationists, hunters and fishers, federal and state agency staff, and social scientists, who discussed in detail how to implement a Wildlands Network Conservation Plan, and who gave suggestions on how to improve the draft Implementation Plan for the Sky Island Wildland Network. It was the intention that information from the workshop would be gathered into a loose-leaf binder that could be added to, or revised easily (103).

THE SCIENTIFIC BASIS FOR REWILDING

It would be in the autumn edition of Wild Earth in 1998 that Soulé and Noss presented the scientific basis for rewilding, described by Foreman as a **“landmark paper”** that drew together the three current streams of American nature protection – the aesthetic of the traditional wilderness movement, biodiversity conservation with emphasis on ecosystem representation and protection of biological hot spots, and island biogeography and connectivity in the landscape – and added rewilding as a fourth current idea that had an emphasis on core areas, connectivity and carnivores (104). Butler, in introducing the theme of the autumn edition - Agriculture and Biodiversity – saw that any solution to the **“problem of agriculture that fully addresses ecosystem health will entail a conscious stepping back-a reduction in both the intensity and amount of manipulated acreage. Natural communities would be allowed to recover: to rewild”** (105). He also noted the publication of Soulé and Noss’s article, and he anticipated that **“this paper will reach a large audience and will provoke much spirited discussion within the conservation community”**. Gatewood, in his update on The Wildlands Project, set up the duality explored in Soulé and Noss’s article between **“representation and rewilding as different approaches to ecological reserve design”** and then observed on the issue theme of agriculture and biodiversity that The Wildlands Project **“will continue to advocate for the design of conservation reserve systems that address the needs of Nature first”** (106). However, he recognised that reserve networks would be imbedded in, and be an integral part of managed landscapes that provided livelihoods and products for people – **“We just want to be sure that as people work the land, Nature doesn't get worked over”**

Soulé and Noss’s article on rewilding and biodiversity began by identifying what they saw as the two versions of science based methods for nature conservation (107). The older and more conventional of those stressed the representation of vegetation, or physical features diversity, and the protection of special biotic elements, in a focus on biodiversity conservation. They referred to the other version as rewilding, a fourth current in the history of conservation advocacy. They described the first current as monumentalism, the wish to preserve places of extraordinary natural beauty - the grand spectacles of nature that were the foundation of the National Park System. They noted that over time, that monumentalism had evolved into the wilderness movement. They traced the next important current as biological conservation, the protection of representative samples of all features, landforms, or vegetation types and successional stages in a reserve network that captured and protected most of a region’s species in separate reserves - it was a compositional approach to reserve identification. However, a representational approach might not be adequate because it did not justify the protection of sufficient space for a viable, regional network of natural areas. Thus in locations where vegetation diversity was low, a system of ecological reserves based only on vegetational diversity could end up being small, fragmented, and vulnerable. The authors gave the example of Idaho where a reserve system that protected samples of all vegetation types might sequester just eight percent of the state, much of it highly fragmented. This would not be sufficient area for the persistence of large carnivores, nor for the buffering of edge effects and area effects, whereas a network of connected reserves that maintained the viability of wide-ranging predators might require one-third or more of the landscape of Idaho.

The third current had arisen with the elucidation of island biogeography and its species area relationship, but more importantly the implications it had for quantitative prediction of extinctions in isolated habitat remnants and nature reserves. They noted that the principles of island biogeography were soon incorporated into the emerging new science of conservation biology, its adherents having identified weaknesses with the existing conservation approaches, based on an understanding of the scale on which ecological processes operated. Thus small, isolated populations of animals were vulnerable to accidents of demography and genetics, and to environmental fluctuations and catastrophe, underlining the need for bigness and connectivity.

They explained that rewilding, the fourth current, was a more inclusive strategy that incorporated special elements and phenomena such as hotspots of endemism, important migratory stopovers or breeding areas, old-growth patches, or roadless areas, elements that had such restricted distributions that they would not be captured by a representational approach alone. It was a non-representational methodology that emphasized the restoration and protection of big wilderness and wide-ranging, large animals—particularly carnivores. They noted that although all species interacted, the interactions of some species were more profound and far-reaching than others, such that their elimination from an ecosystem often triggered cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the foodweb. These were the keystone species that enriched ecosystem function in unique and significant ways, and were central to the rewilding argument. They gave the example of unpopulated or sparsely settled **"frontier"** areas, such as most of Canada, where reserve planning proceeded from a basis of securing entire unlogged or undeveloped watersheds, in part because such large, topographically diverse watersheds would contain virtually all of the vegetational diversity within the region. In finer scale, they noted that conservationists designing a nature reserve network for the Sky Island-Greater Gila region of southwestern America emphasized rewilding and ecological restoration rather than representation or other biodiversity-focused goals. The reserve design was based on the needs of focal species, some of which were large carnivores and ungulates, and some of which were indicators of the ecological resilience and restoration of particular systems or processes that had suffered from mismanagement, such as extirpation of some ungulates and large carnivores, the suppression of fire, and extensive overgrazing, particularly in riparian zones. The authors noted that it remained as yet untested whether such reserve networks would capture a similar proportion of species and habitat diversity as would those based on a representational methodology.

Soulé and Noss asserted that three major scientific arguments established the case for rewilding and justified the emphasis on large predators: the **"structure, resilience, and diversity of ecosystems is often maintained by "top-down" ecological (trophic) interactions that are initiated by top predators";** large areas are justified by wide-ranging predators because they require large cores of strictly protected landscape for secure foraging and seasonal movements; because core reserves were typically not large enough in most regions, they must be connected to insure long-term viability of wide-ranging species. They understood that the ecological argument for rewilding was bolstered by research on the roles of large animals, particularly top carnivores and other keystone species in many continental and marine systems, where studies were demonstrating that the disappearance of large carnivores often caused these ecosystems to undergo dramatic changes, many of which led to biotic simplification and species loss. Their view was that extensive networks of cores and habitat linkages also sustained a vast range of natural processes, and thus rewilding was a **"critical step in restoring self-regulating land communities"** that minimized the need for human management.

Soulé and Noss also claimed two non-scientific justifications for rewilding. First, there was the ethical issue of human responsibility in relation to the history of persecution and local extirpation of large carnivores, noting that their capacity to recover from over-hunting or extirpation campaigns was relatively limited. Because of that, there was a need for benign human intervention in the form of translocation or augmentation of carnivores. The second was an aesthetic appreciation from insuring the viability of large predators, as it would restore the subjective, emotional essence of **"the wild"** or wilderness. They argued that wilderness could hardly be wild in the absence of these large carnivores, that nature would seem **"somehow incomplete, truncated, overly tame. Human opportunities to attain humility are reduced".** There was, however, another goal set alongside rewilding in most regional reserve design efforts, of redressing the major wounds or ecological insults caused by abusive land uses of the past, a notion they said was easily traced to Aldo Leopold and other early ecologists. Amongst the list of these wounds to wildlands were the extirpation of large predators; overgrazing and destruction of riparian habitats; introduction of exotic species; draining or pollution of wetlands; and habitat changes stemming from decades of fire suppression. The authors noted that rewilding would not address all of these, but it was one essential element in most efforts to restore fully functioning ecosystems – **"Repairing all past insults requires a comprehensive effort."** They noted that timidity in conservation planning and implementation was a betrayal to the land, and that land - even in relatively populated regions like most of the eastern United States – could not **"fully recover from past and present insults and mismanagement unless its bears, cougars, and wolves return." It was their belief that the "greatest impediment to rewilding was an unwillingness to imagine it".**

Connectivity between strictly protected core wildland areas was a tenet in the scientific arguments that Soulé and Noss put forward for rewilding, a spatial approach of wildlife movement in corridors being the means to overcome the limitations of size of protected areas and their isolation – **"the rewilding argument posits that large predators are often instrumental in maintaining the integrity of ecosystems; in turn, the large predators require extensive space and connectivity"** (107). Noss, in his report of The Wildlands Project symposium at the annual meeting of the Society for Conservation Biology in 1993 (see earlier) noted that the panel of scientists invited to critique the Project had questioned whether the benefits of corridors were sufficiently validated to form the basis of its spatial approach to connectivity (78). Given the importance of connectivity to rewilding, Noss and colleague Paul Beier had a paper published in the journal Conservation Biology in 1998 that was a review of published studies where they sought to empirically address whether corridors enhanced or diminished the population viability of species in habitat patches connected by corridors (108). The paper did not reference rewilding. Its findings though were that almost all studies on corridors suggested that they provided benefits to or were used by animals in real landscapes, and that no study had yet demonstrated negative impacts from conservation corridors. In order to be able to make valid inferences on the empirical conservation value of corridors, the studies were categorised by the types of parameters measured (population, movements of individual animals, or the putative hazards of corridors) and whether the study used an observational or experimental approach. Because many of the studies suffered from design limitations, only about 12 of 32 studies allowed meaningful inferences of conservation value, 10 of which offered persuasive evidence that corridors provided sufficient connectivity to improve the viability of populations in habitats connected by corridors, leading the authors to conclude that a connected landscape was preferable to a fragmented landscape.

Beier and Noss then addressed the objection to the financial cost of corridors, that funds spent acquiring corridors of questionable or unproven value might be better spent acquiring habitat areas for imperilled species, even if such areas were isolated (108). They observed that many conservation projects were expensive, so that this criticism in terms of value had no unique relevance to corridor projects. They noted that some corridors were more expensive precisely because they occurred near large and growing human populations where corridors were essentially needed as a strategy to retain or enhance some of the natural connectivity in the face of the habitat loss and fragmentation that resulted from development. In a note of warning, Beier and Noss cautioned that **"those who would destroy the last remnants of natural connectivity should bear the burden of proving that corridor destruction will not harm target populations"**

REWILDING AND THE CONTEXTS WITHIN WHICH IT WAS USED

The frequency with which rewilding was mentioned in Wild Earth took off after Soulé and Noss's article, its meaning becoming clearer from the contexts within which it was used, those contexts themselves occupying more and more space, such as large carnivores; predators and prey; healing, health, wounds; connectivity, cores, corridors, linkage, permeability; ecological and evolutionary processes; effective densities/populations, large/viable populations; focal, keystone and umbrella species; highly, strong, biotic and ecological interactions; food web, trophic level, trophic interaction and trophic cascade; and native species distributions, their natural range of variation and natural patterns of abundance, maps, mapping, designs, networks. Within two years, The Wildlands Project formally resolved that **"the long-term goal of reserve design [for The Wildlands Project] is rewilding"** (102) and the decision was taken to merge The Wildlands Project and Wild Earth (59) leading to a masthead motto of **"reconnect restore rewild"** appearing a few months later in Wild Earth (109).

A formidable challenge – to rewild America

Before then, there would be a plethora of articles citing rewilding in the winter edition of Wild Earth of 1998. Thus John Elder, writing on the evolution of wilderness thought, and in reflection on Vermont wilderness, observed that **"recovering wilderness"** would perhaps have seemed an oxymoron, but that concept reflected an intriguing convergence between the environmental history of Vermont and the current emphasis upon rewilding within The Wildlands Project (110). He explained that a group of Vermont conservationists had recently begun discussing ways to expand the system of protected wilderness in that state, noting that any future proposal may well include wild lands in the stretch of the forest just below Bread Loaf in Vermont – **"On the level of corridors and rewilding, such designation would certainly make sense. This area already fosters robust populations of moose and bear. There have been credible reports made of catamounts [mountain lions] near the Bread Loaf building known as the Printer's Cabin—less than one hundred paces west of this meadow. Those big cats were tracking along in a band of rugged, heavily forested land —one that reaches down this ridge to connect the southern part of our state with the much less interrupted habitat of northeastern Vermont and Canada"**. He went on to say that that discussions on rewilding in Wild Earth described the need for certain forms of human agency, including careful scientific analyses and vigorous policies to protect or establish wildlife corridors. He said it was also worth noting that **"another kind of rewilding had already been accomplished in Vermont, more or less while people weren't looking. By the time the National Forest was established in 1932; the hill-farms, sheep pastures, and forges had long since been abandoned. The forests had returned without sponsorship"**.

Carl Pope, noting that a new century was coming, and with it would be **"a formidable challenge – to rewild America"** (111). He saw that it had been a long national debate about whether the American people wanted their continent **"tamed or wild".** He believed that the most important fact about the political landscape regarding conservation issues was that the American people had resolved that debate – **"They want wildness back. That's what the numbers in the public opinion polls mean to me. Now how do we help them get it?"** Pope observed that natural processes, such as alluvial deposition, succession, speciation, flooding, and fire, could work effectively to regenerate wildness, as long as they had space to do their work. As those protected places grew, fragmentation would be overcome by connectedness **– "We will see a wild landscape begin to re-emerge, a landscape that humans live within, not across. And space means, among other things, public land. Only public ownership can reliably, certainly, durably allow certain natural processes the room they need……Such an increase in public ownership should be funded by the public. This is both morally correct and politically pragmatic. It needs to be fully funded, not just for one year, but decade after decade-and our definition of fully funded needs to expand as our national commitment to the rewilding of America becomes more concrete"**

Kim Crumbo and Bethanie Walder, in writing about the restoration of wilderness in the Grand Canyon, noted that it required the best science, practical application, and conviction (112). They observed that the Grand Canyon National Park was a significant but ecologically isolated island of natural habitat that was not big enough to sustain viable populations of all its native wildlife, while the vast surrounding plateaus lacked adequate protection from development and resource extraction. There was, however, an emerging habitat conservation vision that was being promoted by the Grand Canyon Wildlands Council and other groups. It addressed the issue of long-term viability of all native species in the southern Colorado Plateau through identifying critical core areas in the shape of the region's National Parks, the new Grand Staircase-Escalante National Monument, and existing or proposed wilderness, all areas of publicly owned land. Ecological restoration of the 600,000-acre Kaibab Plateau was a key element of the plan – **"Restoring the Kaibab Plateau will require (at the least) returning natural fire regimes, protecting habitat for native species, reintroducing extirpated species, and removing hundreds of miles of deleterious logging roads. This vision looks beyond Wilderness designation of existing roadless areas and advocates the rewilding of lands connecting Grand Canyon National Park with other critical core protected areas"**. Jean Crawford wrote about the revitalised wilderness movement in New Mexico that was not just addressing road-less acreage, but also ecological values, and was allied with The Wildlands Project and the Sky Island Alliance in the **"vision to rewild North America"** (113). The commitment of the New Mexico Wilderness Alliance was to ensure that New Mexico's remaining wilderness was protected as such, so that natural processes can **"maintain and heal-the ecological integrity of this unique landscape".** Kristin DeBoer wrote about a turning point for wolf recovery in the North East when a meeting was convened in September 1998 to discuss the future of the eastern timber wolf (114). It had taken six years of advocacy to get the US Fish and Wildlife Service to the point where it would begin designing an eastern timber wolf recovery plan for Maine, New Hampshire, Vermont, and New York during the winter of 1999. A recovery plan would set the stage for the comeback of wolves - if the public supported the idea – **"And if wolves are allowed to return, the forest will regain a bit of its wildness. And if some of the wild seeps back into the forest, it will start to seep back into our souls. This is ultimately what wolf recovery will take--courage from our deep-felt convictions to complete the job of rewilding the Northeast"**

A rewilded earth would benefit humanity greatly

The Sky Island Alliance and its draft wildlands network design has already featured in articles cited above, and its major significance has yet to come. There were, however, key articles in Wild Earth before then that were important in laying down scientific foundations. Thus Brian Miller and colleagues explained the role that focal species had in planning and managing nature reserve design because their requirements for survival represented factors important to maintaining ecologically healthy conditions (115). In designing a reserve or reserve network (a regional system of connected reserves) they noted that conservationists generally used some combination of three approaches, three tactics that included mapping special elements, such as sites of high value such as Wilderness Areas, roadless areas, locations of rare species; seeking representation of all habitat types in a region as a coarse filter approach to protecting biodiversity; and evaluating the requirements of selected focal species. Soule and Noss had earlier explained that special elements such as hotspots of endemism, important migratory stopovers or breeding areas, old-growth patches, or roadless areas, had such restricted distributions that they would not be captured by a representational approach alone (see above). Alternatively, Miller and colleagues observed that focal species analysis was a means to identify high-value habitats and addressed the questions: **"What is the quality of habitat?"**, **"How much area is needed?"**, and **"In what configuration should we design components of a reserve network?"** The authors also noted that **"any conservation plan that fails to include the needs of native carnivores is incomplete".** They saw that focal species could contribute as keystones (an ecological definition) umbrellas (a management definition) flagships (public relations and fundraising) or indicators (monitoring quality) and, while the categories were functionally different, a species may fall under more than one heading. This emphasized the need to define the purpose of each focal species carefully. Thus it would be difficult to assess the level of wilderness quality without reference to the species most sensitive to human presence. In general, they recommended using a suite of focal species because no single species would assess habitat quality or quantity necessary for all other organisms of the reserve network, although the importance of umbrella/and wilderness indicator species would be guiding in how much high-quality land was necessary.

Editions of Wild Earth across 1999 also had many articles in which there were references to rewilding. Thus Harvey Locke in the spring edition addressed the doubt amongst conservationists that enough was being done to stem the **"species selfishness"** of appropriating most of nature to human use (116). He foresaw that until humanity embraced Nature as something more than an object of greed, then an extinction event equivalent to the death of the dinosaurs would be inflicted on Earth. He noted that while The Wildlands Project proposed following a different path, toward reconnection and health for North American ecosystems, the **"vision of connected reserves and rewilding does not alone create the societal conditions that will result in the implementation of that brighter vision. How do we create such conditions?"** His proposal was that the answer may lie in a return to the roots of the conservation movement and in embracing the spiritual community. Butler, in an introduction to the spring edition, observed that the central task facing American conservationists was to help damaged ecosystems regain health, but also fashion a culture that would allow wildness to flourish. He ventured that the **"bulk of a continental conservation strategy for the next hundred years must focus on allowing ecological and evolutionary processes to reassert themselves across a diminished land - -on "rewilding" North America "** (117). Butler pointed the reader towards an article from conservation biologists Terborgh and Soulé that was a pre-publication excerpt from their then forthcoming book Continental Conservation in which the authors asserted that much of the scientific and practical understanding of how to protect the living fabric of North America was already in hand. Thus to Butler, what lay ahead was **"the real work of saving wild Nature, is more a matter of finding the vision and courage to let the rewilding begin".**

Carl Esbjornson writing about the relationship humans had with wild nature, noted that modem alienation from wild Earth was a product of the wrong kind of anthropocentrism (118). He differentiated an ideological anthropocentrism that was characterised by unlimited development of natural resources, from a postulated biological anthropocentrism whereby people learnt to live in a way that left room for bears, wolves and whales; how they could inhabit ecosystems and watersheds without destroying them; and how those could be altered by people without simplifying them – **"A rewilded earth would benefit humanity greatly; it would be in our self-interest. And it would serve the interests of our fellow creatures a lot more".** Kelpie Wilson proposed using the myth of Noah's Ark as a metaphor for the call to stewardship in protecting biodiversity (119). He noted that maps were the myths for secular environmentalists, as they showed where biological treasures were, and they were help in determining the dimensions of the core reserves that were needed to set aside to protect wilderness and wildlife. However, he did not think maps were a universal language, and that most people responded better to colourful stories than to technical diagrams – **"Accordingly, as we create our map-based rewilding visions, we ought to consider recalibrating our maps in mythical cubits. Since we now know that landscape-sized arks of habitat rather than zoo-sized arks are what is needed to harbor genetically diverse, healthy populations of all animals and plants, we might redefine the new cubit as the watershed".** Davis took the Ark as a metaphor further as a platform for another vision - of a North America that not only was spared utter annihilation by man, but was on its way to recovery with the cooperation of humans (120). He laid out 10 steps that he saw were needed to secure the continent's biological diversity: five of them related to wild protection of public land, the other five were about wildlands philanthropy to secure undeveloped private lands. Alongside these 10 steps, Davis observed that there should be completion of ecological reserve designs for every region, and protection of local natural areas in every town in the country, as well as lowered human birth rates and resource consumption levels – **"Various conservationists have noted that a big part of the work of rewilding North America can be done by local churches , schools, town planning commissions, and concerned citizens pooling their charitable gifts and minds to ensure that all kids (human and otherwise) enjoy the educational, spiritual, and recreational benefits of nearby natural areas to explore"**

To rewild the land is, perhaps, society's highest - if least appreciated – calling

Wolke, in his argument that true restoration meant rewilding the land, wrote that with a few notable exceptions, agencies, the media, and most conservation groups failed to embrace wilderness restoration – **“After all, real wilderness is an illusion in a fragmented landscape devoid of big hairy predators and the natural disturbance regimes that delineate true wilderness from the tame managed tracts of roadless quasi-wilderness for which we settle today”** (121). He believed that **“to rewild the land is, perhaps, society’s highest - if least appreciated – calling”**. He deprecated the apparent derailment of wildland ecosystem restoration by the conning of many dedicated conservationists into supporting unwise forest stand micromanagement under the guise of a deceitful forest health campaign to allegedly **"restore pre-settlement forest conditions"**. Wolke felt this **“illustrates the danger of failing to equate restoration with rewilding the land…….I believe that because rewilding is so much more of a political challenge, conservation groups should emphasize it. And, as I've pointed out, by failing to emphasize rewilding, it becomes easy to be derailed into unnecessary and potentially destructive micromanagement”.** Wolke recognised that wilderness advocacy was a **“rough path fraught with obstacles”** and that in the context of three or four thousand years of civilization's momentum, wilderness remained a revolutionary concept in spite of considerable advances in conservation. Nevertheless, while it would not be easy to convince society, Wolke believed that it’s **“greatest challenge for the next millennium will be to roll back the previous millennia's momentum in order to rewild some of this tiny living spinning speck of cosmic dust called Earth”**

Connie Barlow’s essay considered the evolutionary arguments for wilderness protection, believing that the evolutionary value of wilderness could become one of the strongest arguments in its favour – **“Evolutionary value would thus join biodiversity preservation and ecological self-regulation as supports for rewilding”** (122). To Barlow, rewilding must be undertaken because, next to outright species extinctions, the greatest crime against nature would be for surviving lineages to skew their future evolution substantially in response to human kind. Barlow was aware of the argument that said that when conservationist spoke of the **“evolutionary value of rewilding”** when pushing for remnants of America to be set aside from the impacts of settlement, logging, and mining, then for consistency, they should also be free of grazing, hunting and voyeuristic tourism. Barlow had a simple answer – **“Rewilding for evolution, in its purest form, would thus challenge common assumptions about compatible human uses of Wilderness”.** It was thus her belief that wilderness was the arena of evolution, especially for the megafauna, but that large herbivores and carnivores could not be expected to survive, much less evolve, in small areas of tamed nature. Wuerthner, who often wrote about agriculture in Wild Earth, argued that accommodation of destructive land uses by conservationists ignored the entrenched altitudes of those in agriculture, which were almost universally about **"controlling"** Nature – **“Such control is the antithesis of the goal of many conservationists, including myself, who seek to "rewild" the West. I want to restore ecological processes and native wildlife to the majority of the American West. I don't want "domesticated" open space. I want wild landscapes”** (123). He believed consensus would only be possible when the goals were the same, but the goals of many agricultural producers were in complete opposition.

Re-wilding. Rewilding. To return to a state of wildness

Gatewood, in his update on The Wildlands Project, opened with a simple definition of rewilding – **“Re-wilding. Rewilding. To return to a state of wildness. To help degraded lands and waters regain health. To help Nature heal”** (103). He noted that this spring issue of Wild Earth in 1999 provided a **“forum to advance discussion of rewilding and begin to tease out how people and organizations will receive, defend, debate, accept, or attack it as an approach to protecting Nature”.** He averred that the dialogue dedicated to the evolving concept of rewilding had begun with Soulé and Noss’s landmark paper on rewilding and biodiversity, and noted that the Project had been discussing rewilding among its science professionals and with the rest of the staff and board for more than a year – **“It has been an often lively conversation, and as with the concept of connectivity that came into the limelight only a decade ago, we wonder why rewilding took so long to be recognized as a fundamental principle for Nature conservation”.** He also pointed to the article following his from Terborgh and Soulé that was the pre-publication of an adapted final chapter from the forthcoming book Continental Conservation: Scientific Foundations of Regional Reserve Networks. He described the book, the output of a Science Workshop held in November 1997, as a compendium of large-scale reserve design principles.

In spite of the article by Terborgh and Soulé in Wild Earth not citing rewilding, its themes would echo many of the contexts within which rewilding was used in Wild Earth. The article was based on the premise that **"humans and nature can coexist"**, but that this coexistence would not come about until there was **"establishment of a network of large nature reserves across North America**" noting that reserve networks would be designed around strictly protected core areas that received further protection from buffer zones, and that corridors or habitat linkages between cores and buffers would eliminate their isolation and maintain or restore functional connectivity by providing a thoroughfare for mobile elements of Nature (124). They explained that corridors may be many things, such as the route of an abandoned railroad, conservation easements on private lands that closed the gap between public lands, highway underpasses, or even a mosaic of fields and woodlots. Thus these networks were needed to **"ward off a host of ecological pathologies"** like pernicious influences emanating from nearby human settlements, pollution, over-exploitation of useful species, the consequences of habitat fragmentation, domestication of landscapes, and alien species. Terborgh and Soulé feared that if these ecological pathologies continued unchecked, the number of imperilled species in North America would escalate until it became overwhelming. They explained that the vision propounded throughout the forthcoming book was the goal of bringing wildness back to North America by healing the wounds of past excesses and indifference, and with a more specific objective of ensuring the persistence of all native species by providing ecological conditions that would sustain them indefinitely. They presented a series of requirements for this to happen, and identified the related chapters in the book that described how the restoration of wild America could be accomplished through the establishment of a continental system of reserve networks constructed of core wilderness areas afforded the highest level of protection, buffers, and corridors. Wildlands would have to be recreated through a program of adaptive management. The goal was to restore, over large portions of the continent, the abiotic and biotic processes that sustained biodiversity. Essential processes included fire and flooding that shaped the physical environment, predation, movements such as migration and dispersal, and others that defined the interactions between plants and animals. This restoration implied not merely the qualitative reestablishment of such processes, but-the quantitative reinstatement of the mechanisms that stabilized natural biotic communities and helped them resist invasion by exotics.

The summer edition of Wild Earth in 1999 had two articles that referenced rewilding. Andrew Kroll and Dwight Barry opened their article by noting that **"an important aspect of rewilding is the reintroduction or augmentation of predator populations"** (125). They had plans for carnivore conservation in the Caprock Mountains of the High Plain, but due to the low proportion of land that was protected in federal and state holdings, they had to propose ideas for a conservation plan that would preserve both the human and natural communities of west Texas. They recognised that the scale of planning in the Caprock had to be large enough to include not only self-maintaining populations of bison, elk, and antelope, but also their large predators such as mountain lions and - in the future - wolves. They were conscious that restoration of wolves would be, by necessity, a long term project, but were needed because they had been the main nonhuman predator on plains bison herds. Mountain lions, while they seemed to be recovering from decades of predator control, and benefiting from the healthy populations of deer and feral sheep, were infrequent predators of bison. Given that they saw that current land-use practices were impeding the recovery of ecological health in the Caprock, their recommendations for a regional management plan included acknowledgement of the keystone roles of bison, prairie dogs and gophers in the function and trophic structure of short-grass and semi-arid grassland ecosystems; allowed for natural fluctuations in pronghorn, bison, and elk population; that it provided a spatiotemporal scale necessary to sustain populations of larger carnivores; and that it focused on the restoration of natural disturbance regimes such as wildfires and flooding. Timothy Ingalsbee wrote about Warner Burn, an area in the Williamette National Forest in Oregon, being on the brink of permanent protection as the nation's first Research Natural Area devoted to fire disturbance and -recovery processes (126). It was as a result of advocacy after a major fire in Warner Creek to eschew the-prevalent rationale of logging-for-firefighting that was the Warner Fire Recovery Project, and instead devote the area to natural landscape disturbances and dynamic successional processes. The resistance included a group of citizen-scientists who proposed designating the Warner Burn as a fire ecology Research Natural Area – **"The 28 plantations that were utterly consumed by the Warner Creek Fire attest to the fact that fire is marvellously effective at rewilding landscapes, but old roads and clearcuts may alter the pattern and process of some fire events, and thus affect scientific data"**. Ingalsbee noted that the Research Natural Area strategy fitted well into the goals of The Wildlands Project for protecting and rewilding landscapes.

A SECOND BOOK – CONTINENTAL CONSERVATION

The summer edition of Wild Earth would include another foundational article underpinning the approach of Wildland Network Designs. It was another chapter taken from the book Continental Conservation: Scientific Foundations of Regional Reserve Networks that had by this time been published (127). Terborgh and others wrote extensively in this article in Wild Earth on the role that top carnivores played in regulating terrestrial ecosystems and, while it did not cite rewilding, it will have shaped much of the thought within The Wildlands Project on carnivore ecology and conservation (128). The authors acknowledged that the role that top predators played was considered ill-defined and contentious, pointing to one review that had concluded that top-down community regulation, as envisioned by trophic-level theories, was relatively uncommon in nature. However, Terborgh and others asserted that after reviewing an overlapping body of literature, they had come to the opposite conclusion. Thus the evidence they had reviewed overwhelmingly supported the strong top-down role of large carnivores in regulating prey populations and thereby stabilizing the trophic structure of terrestrial ecosystems. Loss of top predators resulted in hyperabundance of consumers playing a variety of trophic roles (herbivores, seed dispersers, seed predators) and in mesopredator release. Hyperabundance of consumers and mesopredarors, in turn, resulted in trophic cascades that led to multiple effects - including the direct elimination of plant populations from overbrowsing/grazing, reproductive failure of canopy tree species, and the loss of ground nesting birds as well as probably other small vertebrates. They explained that simple predator/prey models describe feedback processes leading to a stable point or stable limit cycle, in which the numbers of predators and prey came to equilibrium or oscillate within circumscribed limits. Thus top predators were often essential to the integrity of ecological communities, their influence felt by way of a cascade of interactions extending through successively lower trophic levels to autotrophs at the base of the food web. Widespread elimination of top predators from terrestrial ecosystems had disrupted the feedback process through which predators and prey mutually regulated each other's numbers, and which may cause a cascade of ecological effects that speeded extinction. Terborgh and his colleagues believed that efforts to conserve North American biodiversity in interconnected mega-reserves would have to place a high priority on re-establishing top predators wherever they had been locally extirpated.

The autumn issue of Wild Earth in 1999 would have only one reference to rewilding, which was in a response by Wuerthner to a letter from David Willey that had critiqued Wuerthner's article on agriculture in the spring issue. Wuerthner had identified the need for someone to calculate the minimum amount of land necessary to meet the needs of food, shelter, fuel, and fibre of Americans. Willey pointed out that this had already been done using the methodology of eco-foot printing. Wuerthner responded that although it was difficult to get concise figures, it appeared that Americans may use more than a billion acres in growing livestock forage and for grazing by domestic livestock – **"Thus, it is not unreasonable to believe that a reduction in meat consumption particularly beef-would free up huge acreages for rewilding. This alone would be a tremendous step toward ecological recovery"** (129). The final issue of Wild Earth for 1999 had two references to rewilding, the first from Soulé in an article on the emerging theme of The Wildlands Project vision of reaching a healthier balance between Nature and human society--one that grounded people in

Nature as much as it sustained the actual ground of the natural world (130). His premise was that it was necessary to cultivate a sense of participation and ownership in Nature protection through personal involvement in the development of regional wildlands networks, because he believed that nothing less than an extensive network of wildlands would ensure the survival of full and robust wildlands and ecosystems – **"The rewilding argument provides the ethical and scientific-justification for the restoration of large networks of self-willed Nature, including large carnivores".** This would be a nurturing of networks of people to nurture networks of wildlands. The article was a re-publication of a book chapter that Soulé had written in 1995 that did not reference rewilding, presumably because it was written three years before he and Noss would have formulated its scientific justification (131). Andy Kerr proposed a new legislative strategy that would take the best of existing strategies and turn it into a legislative vehicle for conserving and restoring wildlands in America (132). He called his strategy Big Wild, and explained how it would evolve and succeed in being enacted, noting that there was no chance then of persuading Congress to **"order the rewilding of half the nation, no matter how scientifically justified"**. What would be needed would be for conservationists to persuade Congress to ask the big questions themselves if "rewilding on the scale necessary" was to have any political chance.

As might be expected, the book that resulted in 1999 from The Wildlands Project Science Workshop - Continental conservation: scientific foundations of regional reserve networks - had a number of references to rewilding in various chapters, in particular in the first chapter on the policy and science of regional conservation by Soulé and Terborgh (133). In discussing what they saw as one of the central issues of the book, they observed that the viability of ecosystems often depended on the viability of species whose interactions regulated the systems. Thus the size of the system, its configuration of boundaries and corridors, must accommodate the needs of a critical handful of highly interactive species, these species often including large carnivores. They noted that the **"goal of maintaining viable populations of keystone species, particularly large carnivores, has been referred to as "rewilding"".** They observed that rewilding was the latest element in the history of scientific conservation, and that it complemented rather than replaced other approaches for designing regional networks of nature protection as it contributed an independent justification for large scale and connectivity. Moreover, like certain other methodologies, rewilding facilitated design and management of protected areas because it obviated the need to consider every species in detail – **"Thus rewilding is both an end (because of our duty to repair past mistakes in management) and a means by which the viability of conservation units is achieved. This unusual conjunction of means and ends is, perhaps, the most intellectually compelling feature of rewilding"**. Their observations on rewilding and connectivity exemplified this - **"Nature is now in pieces, and rewilding is a justification for restoring connectivity on a regional or landscape level".** They emphasised that connectivity was not just another goal of conservation because it was the natural state of things. Thus the isolation created by the consequences of fragmentation at the habitat and landscape scale needed reversal to restore the effective exchange of individuals and materials among sites for genetic maintenance, for demographic stability, for migration, and for the sake of other ecological processes.

An article on conserving nature at regional and continental scales in the journal BioScience by Soulé and Terborgh in 1999 that was also based on that Science Workshop, did not refer to rewilding, but it reinforced that large scale and connectivity were the two elements that constituted the foundation for any meaningful program of wildlands or biodiversity conservation at a regional or continental scale to ensure effectiveness (134). They observed that the on-the-ground realization of a program of large core areas and landscape connectivity would, however, require research, planning, and bold advocacy at unprecedented scales. They went on to describe the scientific bases for this new stage in the protection of nature, major points of which included recognition of top-down regulation in ecosystems and the need for large core areas and regional connectivity, recognition of the need for ecological restoration on unprecedented scales, and a critique of fashionable alternatives, such as sustainable development. Rewilding wasn't mentioned also in a letter published that same year in the journal Nature by Kevin Crooks and Soulé, and which was a further study on testing the mesopredator release hypothesis connected to avifaunal extinctions in a fragmented system (135). Nor did a paper on the evolution of conservation biology by Noss in the journal Ecography, which sought to distinguish the conservation planning schemes arising out of conservation biology from The Wildlands Project, as they were less oriented towards immediate crises (see conservation biology as a crisis discipline above) and more toward building long-term conservation networks over decades and centuries (16). Noss with colleagues from the Conservation Biology Institute in Oregon developed a process of reserve selection and design based on a conservation assessment of the Klamath-Siskiyou Ecoregion of the Pacific Northwest prepared by the Siskiyou Regional Education Project. The map-based study published in the Natural Areas Journal in 1999 used the locations of special biological elements such as rare species hotspots, old-growth forests, and key watersheds; representation of physical and vegetative habitat types; and the maintenance of viable populations of a focal species in the fisher (*Martes pennant*) to identify a system of moderate to strictly protected areas (136). This was a continuation southwards into Northern California of the reserve mapping that Noss had carried out for the Oregon Coast Range in 1993 (see earlier) but like that study, rewilding was not mentioned.

In contrast, however, Foreman would have published an article in the Denver University Law Review in 1999 that copiously referred to rewilding (137). Foreman charted the rise of conservation biology and the ecological concepts that informed it, before detailing how that science underpinned the rewilding approach to nature reserve design of The Wildlands Project. This had brought together citizen conservationists and conservation biologists to formulate a new idea of conservation in protected areas, to apply science in the development of theory and methodology of how nature reserve networks should be designed and managed. Foreman noted that the ecological renaissance in conservation had come about because of five interrelated lines of scientific inquiry: extinction dynamics, island biogeography, metapopulation theory, large carnivore ecology, and natural disturbance ecology. He reiterated many of the scientific arguments for rewilding that had been put forward by Soulé and Noss in Wild Earth the year before, including the importance of connectivity in overcoming the limitations of island biogeography (107). In regard of the latter, Foreman noted that while conservation had traditionally focused on public lands, there was now a realisation in The Wildlands Project that private lands must play a major role in nature reserve networks if connectivity was to be built back into the landscape, and if all ecosystems and biological hot spots were to be represented. In concluding, Foreman reflected on an observation of Aldo Leopold, that **“one of the penalties of an ecological education is that one lives alone in a world of wounds”** (138). Leopold thought that much of the damage inflicted on land was quite invisible to layman, but that the **“ecologist…must be the doctor who sees the marks of death in a community**”. Foreman believed that The Wildlands Project and other conservationists and scientists must become Leopold's doctor (137). Thus identifying the major ecological wounds to a region allowed conservationists to develop clear goals and objectives for a conservation plan, Foreman noting - **“Regional conservation strategies supported by the Wildlands Project in the southwestern United States have as their goals healing these ecological wounds. The approach we are using blends traditional wilderness area advocacy, focal species planning, and rewilding”**

A THIRD SPECIAL ISSUE - ALLOWING OR HELPING ECOLOGICAL AND EVOLUTIONARY PROCESSES REASSERT THEMSELVES ACROSS THE LANDSCAPE

The new millennium would start with another Special issue of Wild Earth that this time was full of references to rewilding, as it was devoted to The Wildlands Project's vision and progress in drafting a blueprint for North American wilderness recovery (139). It contained articles on the scientific, strategic, and spiritual underpinning of its shared conservation agenda. Regional reports were provided from Wildlands Project co-operators around the continent, including Wildlands Network proposals for the San Juan Mountains of Colorado as well as for the central coast of British Columbia, and with the proposed Maine Wildlands Reserve Network said to be appearing in a later issue. The highlight though of the issue were the four articles on the Sky Islands Wildlands Network of south-eastern Arizona and southwestern New Mexico, and one on its complementary initiative in Mexico, the Sierra Madre Occidental Biological Corridor. The centre-fold of the issue was a brochure that presented a map of the draft proposal for protecting nature in the Sky Islands, and text that explained the various aspects of the Conservation Plan, such as healing the wounds to the land; the mission and goals; focal species planning; wilderness cores; conservation on private lands; complementary plans in the region; and a typology and brief management guidelines of the 200 individual units of land, including federal, state and privately owned parcels that were proposed or recognized as cores, linkages, and compatible use areas, (140). Compatible use areas were what Noss had originally called buffer or multiple use areas zones (see above). The reason for the change in name was in reaction to the over-wide interpretation of multiple use by government agencies, prompting greater consideration of what uses would have the least impact for the core areas (2). The repeated emphasis on the Sky Islands arose because The Wildlands Project decided early on that it needed direct experience with conservation area design in order to learn how to do it (102). Only then would it feel that it could help others.

Before those Sky Island articles, Locke made the case for a balanced approach to sharing North America, once that balance had been restored, so that humanity could be reconciled with Nature and both could flourish together (141). He saw the means of restoration as being the conservation planning of The Wildlands Project that identified lands that were most critical to protect for wildlife, and where connections should be maintained or restored. Thus unneeded roads could be closed, unlogged forests protected, missing species reintroduced, and weedy species eliminated in a coordinated way. Humanity would become aware of its most damaging activities, and human creativity would be able to find solutions that met the intertwined needs of both humanity and Nature. He averred that helping large carnivores recolonize parts of their former range, both through reintroduction efforts and by restoring habitat linkages between existing populations, was not only the right thing to do, but necessary for the survival of many other species. He noted that The Wildlands Project called this rewilding and which was considered fundamental to meaningful conservation because **"the presence of carnivores often played a key role in keeping other species alive. The aim of rewilding is to preserve or restore species at the top of the food chain, and allow natural ecological and evolutionary processes to reassert themselves across the landscape"**

Apart from the scientific justification for rewilding of Soulé and Noss (see earlier) the latter sentence constituted the closest to a conceptual definition of rewilding that had ever appeared in Wild Earth. It would be partially repeated in a later article in the issue, but before that there was confirmation in an Introduction on the Greater Sky Islands Region in the centre-fold brochure that the Sky Islands Wildlands Network had been designed using a rewilding approach (140). The brochure also explained that the Sky Islands Wildlands Network Conservation Plan provided a conceptual design for a very long-term effort to restore and maintain the region's native wildlife and ecological processes – **"The design is based on rewilding and focal species planning, and specifically seeks to heal six major wounds the region has suffered".** Operational meanings were given to rewilding in that it was based on the argument that functional wildlands networks required the presence of their native keystone species, particularly large carnivores, because they stabilized prey and smaller predator populations, and maintained ecological diversity, that rewilding also required ecological restoration, management guidelines, and compatible economic use standards, as well as reinstatement of those extirpated native keystone species. A subsequent article by Foreman and others used the Sky Islands Wildlands Network Conservation Plan to explain the different pieces or elements that should be included in each conservation area design in America if it was to be comprehensive and contribute to real world conservation (102). It noted that a wildlands network was a proposed system of strictly protected cores, landscape linkages, and compatible use zones in an ecologically defined area, and gave management guidelines for the different sorts of land unit classification in the proposal. Thus the public lands of core areas would have the restrictions on activity that were implicit for their protected area type, such designated wilderness, National and State Parks, but with the additional proviso that grazing be phased out in wilderness. However **"rewilding a landscape requires more than a mapped wildlands network"** since it also called for reinstatement of extirpated species, and ecological restoration. The article acknowledged that **“rewilding as a general term has been used by wilderness advocates for many years”** and, as noted earlier, it was announced that The Wildlands Project had formally resolved that the long term goal of reserve design was rewilding. The repetition of the conceptual definition came when expanding on that generality – **“In this sense it refers to "allowing or helping ecological and evolutionary processes reassert themselves across the landscape"”** – the phrase this time being cited as arising from a personal communication from Butler, who had used the phrase earlier in Wild Earth (117). This was not, the authors noted, a scientific or testable goal –**“In a narrower sense, rewilding is a scientific concept”** and later “**Rewilding, therefore, is “the scientific argument for restoring big wilderness based on the regulatory roles of large predators,” according to Soulé and Noss”.** This reluctance in defining rewilding in any other way than as an aggregate of distinctly operational terms continued throughout.

HEALING ECOLOGICAL WOUNDS AND REWILDING

Two more elements described in the article for the Sky Islands Wildlands Network Conservation Plan - Healing-the-Wounds Goal Setting and Focal Species Planning - were inter related (102). It was noted by the authors that in his essay Round River, Aldo Leopold had called for ecologists to heal the wounds of the land (138). Consequently, they observed that the ecological integrity of the Sky Island region had suffered six great wounds: extirpation of wildlife, damage to watersheds and streams, fire suppression, habitat fragmentation, exotic species, and forest degradation (102). Thus the mission of the Conservation Plan was to be **“Leopold's doctor and heal these six wounds from a rewilding approach”** and later **“”Healing-the-wounds" goal-setting also directs the selection of focal species. We have tried to select focal species whose viability or recovery is tied to our six goals**”. Focal Species Planning was a key element of the Network Conservation Plan – **“The rewilding approach to science-based conservation area design uses carefully selected focal species for planning”**. In further confirmation under a section on design methodology, it explained that the methodology was based on **“strategies used for years by traditional conservation groups in developing Wilderness Area proposals, on the healing-the-wounds goal-setting process, and on the rewilding approach as developed by Soulé and Noss, with an overlay of focal species and landscape linkages”.** The description of how the Focal Species Planning was carried out for the Sky Islands Wildlands Network Conservation plan relied heavily on information from an earlier article in Wild Earth by Miller and others (115). Following a literature review on the characteristics of the natural history of species for the Sky Island Greater Gila Reserve, the suitability of each as a focal species was discussed using information on status, range, and habitat preferences; justification for selection as a focal species; and management recommendations (102). The resultant list of 28 potential focal species chosen for the Sky Islands Wildlands Network drew together carnivores, ungulates, raptors, rodents, fish, birds and a frog, all of which were either an Umbrella or Habitat Quality Indicator species, or both (see above). Thus amongst the carnivores, Mexican wolf and the jaguar were chosen as Umbrella species to represent utilisation of two differing habitats, as well as reflecting the reality of the cross-border dimension of the Network area. The Southwestern willow flycatcher and Yellow billed cuckoo were chosen as Habitat Quality Indicators, as they respectively utilise lower brushy areas and the canopy for the highly threatened cottonwood-willow riparian gallery forest community. Conservation of these focal species would be combined with ecosystem representation to point to which areas should be included in reserves, and would be a much better indicator of the size of areas required compared to the latter.

In a second article, on healing the wounds, Foreman and others noted that with the arrival of Europeans in the Sky Islands region less than 200 years ago, the land again suffered deep and debilitating wounds – **“Of these ecological wounds, we have identified six as major. Each of these has more than one cause, and several of the causes contribute to more than one wound. The overall impact of these wounds is greater than their sum”** (142). Elimination of natural fire was the third wound, noting that it was a **“natural disturbance regime vital to the health of forest,**

woodland, and grassland ecosystems in the Sky Islands region" that had largely been eliminated by over a century of livestock grazing and fire suppression. They went on to say that the goals of the Sky Islands Wildlands Network Conservation Plan were based on its mission of healing the ecological wounds of the region – **"Healing-the-wounds goal-setting also directs the selection of focal species. We have tried to select focal species whose viability or recovery is tied to our six goals. Each of our established six goals is tied to healing a major wound".** The third article was about the implementation of the Sky Islands Wildlands Network, in which Foreman and others explained that it approached the **"rewilding of the landscape (Soulé and Noss 1998) by means of focal species planning (Miller et al. 1999) and healing-the wounds goal-setting (Foreman et al. this issue), all of which are explained in other articles in this section"** (143). The reference to Soulé and Noss may suggest again an emphasis on the scientific aspect of an operational term for rewilding.

There were three other articles in the Special issue of 2000 that referenced rewilding. Rurik List and others reported on the project in Mexico that was the cross-border partner to the Sky Islands – **"Our efforts to rewild the northern Sierra Madre Occidental of Mexico now involve many Mexican conservationists and scientists. We are preparing a proposal for a regional system of interconnected conservation areas, the Sierra Madre Occidental Biological Corridor"** (144). He explained that this proposed network would include core areas; corridors for wildlife movement, especially large carnivores; areas where functional keystone processes were still present (e.g., prairie dog colonies); and areas of great biodiversity importance. Mark Pearson, in similar fashion reported on the Wild San Juans Wildlands Network – **"Proponents of rewilding the southern Rockies do not accept the idea that Nature, once degraded, must remain that way. The southern Rockies is an obvious place to begin rewilding, for only recently have humans extirpated large carnivores in Colorado's San Juan Mountains…..It's time we got on with the job of rebuilding populations of these magnificent carnivores, rewilding the San Juans in the process"** (145). A mapping was given that showed core reserve areas, buffer and sustainable use areas, and corridors. Jim Jontz, writing on roadless area protection in the public lands of the National Forests, recounted a grassroots get together of The Wildlands Project where Soulé and Noss spoke about rewilding strategies (146). Jontz had asked them what three current policy issues were most important to the rewilding of North America? The answer from Noss, with Soulé's concurrence, was **"Roads, Roads, Roads".** Even given that conservationists had made substantial progress in inserting roadless areas protection into the then current political lexicon based almost entirely on the characteristics of individual roadless wildlands, Jontz wasn't sure whether there would be a broader understanding of the urgency of protecting large blocks of the land scape across North America with roadless areas at their core – **"Perhaps elected officials are not ready for this discussion of "rewilding" in its broadest sense"**. However, now that the debate was framed over roadless areas as one step toward protecting the wildlands networks that conservation biology suggests are necessary to maintain biodiversity, he felt it ought to be kept it there - **"It's not just the value of this or that roadless area by itself, we must argue. It's the network of roadless areas, and the broader land scape of wildness, that will make it possible for the lynx to survive"**

There were five references to rewilding over the remaining issues of Wild Earth in 2000. In the summer issue, Leanne Klyza Linck gave an update on The Wildlands Project Update where she introduced an article that would be about the restoration of the North Woods in Maine (147). Klyza Linck explained that intensive human activity over the last 200 years had taken its toll on the great North Woods and that the trend would not be reversed or the wounds healed by a ten-year campaign – **"It will take decades to rewild Maine -and courage to confront the obstacles of the hour. Public policy debates are about differences of opinion. Into this debate The Wildlands Project offers a comprehensive, scientifically defensible conservation plan that can steer the conversation towards legitimate ecological needs for a healthy and wild future"**. Robert Long and Paula MacKay wrote about the science-informed conservation vision that was being developed for Maine where the **"Maine Wildlands Network is built around the concept of rewilding"** (148). They referenced Soulé and Noss's scientific justification for rewilding - large, strictly protected core areas, functional connectivity, and keystone species - and then noted that much of the support for the rewilding approach was based on recent studies suggesting that ecosystem integrity was often dependent upon the presence of large carnivores. They asserted that recovery of Maine's wide-ranging predators was a central component of the Maine Wildlands Network, and in particular their modelling analysis for the Timber wolf identified secure habitat for the wolves based on a function of road and human density. The authors used a **"building block"** approach to define preliminary cores and linkages, as was recommended in the Wild Earth Special Report by Trombulak on ecological network design that was in the Reserve Design Framework Package (see earlier)(92). They identified cores through a mapping approach as the largest roadless areas containing existing conservation lands, and those in townships with no human population (148). Then remaining conservation areas in the state were evaluated relative to the location of adjacent roadless areas, wetlands, areas of low human population density, and industrial timberlands, adding many of these to the previously delineated cores, or including them as separate cores. Lastly, they added known stands of remaining old-growth forest to the cores. For linkages between cores, they identified suitable connectivity in roadless areas not included in cores, as well as watercourses and ridgelines with intact native vegetation, and plant communities that would maintain some connectivity through areas of significant human development.

Leanne Klyza Linck recorded in The Wildlands Project Update in the autumn issue of Wild Earth that a packed room of around 120 leading wilderness advocates from around the country had attended a half-day workshop in September at the National Wilderness Conference in Denver where the newly released first comprehensive Wildlands Network Conservation Plan was presented (149). This was the Sky Islands Wildlands Network Conservation Plan, Klyza Linck noting that **"The Wildlands Project's approach to conservation planning was distinctive because it was based on healing ecological wounds and rewilding, helping to restore ecological processes across the landscape, particularly natural predation regimes".** Christopher Wilhite wrote in the same issue about a Texas Hill Country region where livestock grazing and fire suppression had changed the vegetation and led to a decline in species diversity, as well as most of the large vertebrates hunted to local extinction (150). He observed that each of the problems noted by local biologists and conservationists regarding the hill country ecosystem would be manageable, if not solved, were there a system of interconnected preserves of adequate size. He foresaw that once a vision map was established, based on gathered ecological data, by connecting wildlife preserves and hypothesizing enlargement or buffer zones, then the next process would begin, of forming an alliance of private landowners, land trusts, and conservationists – **"The restoration and rewilding of the Texas Hill Country may be a long and winding trail (as most are in these parts), but folks here have enough love for the land and common sense to hike the full loop"**

In the winter edition, the late M.C. Davis wrote about the Mallory Swamp Restoration Project in Florida, the largest privately owned and funded wetland protection and restoration effort on the continent (151). Davis noted that it was particularly exciting to consider the potential of Mallory Swamp as a landscape scale conservation project, a hub for connecting several other, larger protected areas in the vast swamp system in Florida's northwest Gulf Coast region. Davis described that he had formed the concept for the project in 1994, and began purchasing land the following year. The potential of the project was greatly enhanced when Sam Shine and the Suwannee River Water Management District (SRWMD) joined as joint venture partners – **"The rewilding began in earnest after Shine purchased an adjoining 20,000 acres and placed them in the Mallory Project, and the SRWMD purchased a conservation easement on the two combined parcels. With this public funding, the expansion and overall effort was accelerated and magnified; it underlines the value of private seed money attracting governmental support and the need for ongoing public/private partnerships"**. Restoration was focussed on restoring hydrology by placing ditch blocks, closing water control structures, and filling in some ditches, these efforts helping to restore natural flow regimens and benefitting rare wading birds that nest within a short distance. Fire suppression had altered vegetation coverage that was poor-quality habitat for wildlife – **"prescribed burning, which mimics the natural frequency of lightning-caused fires, is an essential step toward rewilding Mallory Swamp"**

The last reference to rewilding in Wild Earth from 2000 was by Soulé who set out to address the response of conservation organizations to the principle driving force behind the contemporary wave of habitat destruction and species loss (152). He cited three interacting human agencies - growing population, accelerating technological innovation, and the globalization of commerce – that he thought were the driving forces that were causing massive habitat destruction everywhere, but particularly in the species-rich tropics. He believed the popular **"sustainable development paradigm"** of harmonizing human economic needs and ambition with long-term social and economic stability had done more harm to nature than good. He proposed that there was one common sense tactic for saving nature in places where the survival of a protected natural area would be doubtful without the participation of local people, and that was ensure that the human communities shared in both the management and benefits of the protected wildland. It was no surprise that Soulé saw conservation biologists assisting in the resurrection of an effective conservation policy, as it actively addressed those dissipative forces through guidelines that minimized the loss of species diversity. Soulé asserted that the newest of these guidelines called for the **"protection or reintroduction of large keystone species- the major element of "rewilding""** He justified this by pointing to the evidence that ecosystems often underwent rapid loss of diversity without large carnivores **- "The central goal of rewilding is to maintain or restore ecologically effective populations of large carnivores and other keystone species".** Until this article, authors in Wild Earth had variously used terms such as restore and maintain viable or healthy populations of native species, this being one of Noss's ecological goals (70). In his interpretation of that goal, Soulé was setting an ecological objective in terms of population density for the necessary functional traits of carnivore - ecologically effective populations (152). He then provided a series of other ecological guidelines that included **"Maintain the optimum scale, intensity, and frequency of natural disturbances"** and **"Restore natural ecosystems, including their ecological and evolutionary processes"** which were also ecological goals that Noss had asserted (70).

THE LATER STAGES OF WILD EARTH

The spring 1999 edition of Wild Earth had announced that a conference on the science of wilderness was to take place in May of that year, and at which a number of The Wildland Project members would be speaking (153). The write up of presentations was published in September 2000 in the US Forest Service Rocky Mountain Research Station Proceedings and included articles by Foreman, Noss and Johns, all of whom cited rewilding.

What habitat and connections were needed to recover and rewild places?

Foreman's contribution was to a session devoted to contemporary criticisms of the idea of wilderness, and where he provided an alternative perspective, both promoting the value of traditional wilderness concepts and suggesting ways in which the wilderness idea had evolved over time (154). He noted that the muddying of the meaning of wilderness was not always due to simple ignorance, but was a witting tactic by anti-conservationists who could not abide self-willed land. Foreman then used the metaphor of a river's watershed to explain how rewilding contributed to conservation. Thus the headwater streams that flowed together to make up the River Wild were wildlife protection, stewardship, beauty protection and forest protection – **"Downriver, the streams of wilderness protection, ecosystem representation, carnivore protection, connectivity and rewilding flow in"**. He was aware that wildlife protection, stewardship, beauty, forest protection and wilderness streams had mixed fairly well, but that the currents of ecosystem representation, predator protection and connectivity had not mixed as well – **"Now a new stream—Rewilding—has entered. Unlike the other currents, this rewilding stream mixes all the other currents together into a deep, wide, powerful river"**, the whole affording protection of land and wildlife from threats of development and exploitation. Foreman then rehearsed the scientific argument that the rewilding approach for restoring big wilderness based on the regulatory roles of large predators was built on recent scholarship that showed that ecosystem integrity often depended on the functional presence of large carnivores.

Noss talked about wilderness in relation to the new conservation movement that had united scientists and activists in looking again at the role of protected land (155). He saw that this new conservation movement was seeking to redefine the role of protected areas in conservation strategy through basing a greatly expanded network of wilderness and other protected areas on the principles and findings of conservation biology. He noted that in the reserve designs associated with The Wildlands Project and cooperating regional groups, **"the goal was not just to save existing wilderness, but to re-wild much of what had been lost. Amongst other things, this means bringing large carnivores, wildfire and other inconveniences back into landscapes where they had been eliminated or reduced".** Johns examined the experience of The Wildlands Project and its co-operators in attempting to marry science and advocacy to achieve large-scale conservation goals (156). Accepting that not every place could be protected, Johns posed a number of questions that would be a guide to the choice of places, such as where would best ensure functioning ecosystems and healthy populations of all native species into perpetuity; would allow the recovery of top predators that were essential to ecosystem regulation; allow disturbance regimes and succession to operate unencumbered; and where human uses were compatible in multiple-use or transition zones lying between human settlements and protected areas? Johns also asked that **"if habitat and fragmentation were problems, what habitat and connections were needed to recover and rewild places?"** He noted that conservation biology, island biogeography, and ecology had helped to recognize and define the problems associated with species and ecosystem decline, and that they were also in a position, along with restoration ecology and other disciplines, to help define the solutions. In a Summary to the article, Johns observed – **"To protect and rewild much of the planet requires at root a passionate commitment to life—to the beauty, spontaneity and creativity of the evolutionary process. But our love must not only be deep. It must be an informed love, an intelligent love. The primary role of science is to make us informed"**

We need to let the land rewild, to let natural processes dominate the land

References to rewilding in Wild Earth tailed off after 2000, but there were three in the Spring issue and one in the Fall/Winter issue of 2001. The Spring issue had as its theme the Wild, Wild East, a series of articles on the progress of and prospect for wild forest recovery in the East (157). It explored some of the ecological attributes of eastern forests, including natural disturbance, the nature of the pre-settlement landscape, the prospects for cougar recovery, the extent of eastern old growth and how those relict tracts might be the seedbed of recovery for ancient forests across the East. In an extensive Viewpoint article, adapted from a chapter in a forthcoming book, Klyza gave his vision of a north-eastern wilderness, noting that the region had been significantly modified by human actions over the last few hundred years (158). However, there were areas of wildness resulting from restoration or rewilding, and other areas had the capability to recover ecological integrity when natural processes dominated the land – **"As soon as we begin to speak of restoration or rewilding, we need to specify what it is we are holding up as our model. What does it mean for the land to be restored? What has to return for land to be wild again?"** Klyza thought it unlikely that the land could be restored to its state before the arrival of Europeans, that the goal should not be the elimination any traces of past human use to, but rather to restore the primacy of natural forces to a particular landscape, and for the native plants and animals to flourish– **"we need to let the land rewild, to let natural processes dominate the land - natural disturbances, species interaction (including predation), and the development of old-growth forests**". He thought that rewilding and restoration in the north-eastern land scape should proceed through a series of steps, firstly in working to make sure that the rewilding that had occurred by good fortune was allowed to continue, and then protecting more land – **"We should strategically protect land for cores and connectivity as the keys for rewilding. And, finally, when biological and social conditions are fitting, we should reintroduce those species missing from the region. The mountain lion, the wolf, the wolverine - when these natives return to the Northeast, wilderness will have finally come**

home". He averred that while creating a system of connected wilderness reserves in the Northeast, and embedding such a system in a landscape of sustainably managed farmland and forestland may seem a radical proposal at the beginning of the twenty-first century, it was paradoxically in many ways a conservative proposal – **"It is about conserving Nature, about conserving ways of living on the land, and about conserving a meaningful, balanced way of life for humans in a natural setting. In the rewilded landscapes of the Northeast, a model for healthier human and natural communities applicable to wide areas of the globe can arise"**

Tom Rooney and colleagues had begun revisiting the northern hardwood forest stands in Wisconsin that were first surveyed by Curtis in the 1940s and 1950s to assess what species had been lost, and potentially understand why (159). Logging over the past 150 years had dramatically altered these woods anyway, so that a conspicuous change had occurred in the relative abundance of tree species - aspen and paper birch were now common throughout the landscape, though they were historically confined to areas that had recently experienced fire or some other stand-replacing disturbance. In contrast, some late-successional species such as eastern hemlock and white pine had declined precipitously. They had revisited 59 of the survey locations, noting from one particular site that there had been at least a 36% loss in understory plant diversity - the geophyte *Trillium grandiflorum* that was once common had disappeared under high browsing pressure from deer and been replaced by a forest floor dominated by grasses and sedges. As they continued their resurvey, they expected that species loss would be highest at sites where deer browsing intensity was greatest, the understory species composition converging into a few resistant groups, such as the graminoids. They also suspected species loss would be highest at sites invaded by exotic plants. They opined that if their general line of thinking was correct, they foresaw different forest communities converging in their species composition - they would start to see the same plants in an oak-maple stand that could be found in a hemlock-beech forest, indicating that the regional flora was becoming more homogenous. Thus numerous native and often locally distributed species would be replaced by a few widespread, weedy species leading towards a homogenised biosphere. It came as no surprise to them that many of North America's weeds first emerged as winners in Europe's historic biotic homogenisation, one example they gave being massive soil disturbance resulting from advancing waves of exotic earthworms. They did not see that this trend had to be destiny, as they had a formula to halt and reverse the process of biotic homogenisation – **"Parks and reserves are needed, but they alone are not sufficient. We also need restoration and rewilding (Soule and Noss 1998). We need to preserve or restore the important biotic interactions that have maintained biodiversity since time immemorial. We need to limit the emissions of pollutants to the level where production equals the rate at which ecosystems can absorb, degrade, or assimilate them. This is the task of biological conservation"**

David Maehr was studying elk restoration in Kentucky (stated as *Cervus elaphus* in the text but now considered to be *Cervus canadensis*)(160). This was a partnership project between the Rocky Mountain Elk Foundation, the Kentucky Department of Fish and Wildlife Resources, the University of Kentucky, and private landowners, that was nearly halfway to the goal of importing roughly 2,000 animals from wild western populations. He observed that elk restoration could be justified because it added community complexity through returning an interspecific tension by their dominance over white-tailed deer (*Odocoileus virginianus*) and which led to ecological separation through a behavioural modification that promised to alter the regional distribution of plants and animals, even if only subtly. It was also a different grazing and browsing influence from the primarily forest-dwelling, browsing white-tail deer, elk being able to consume plants and plant parts that were uneaten or otherwise out of the reach of deer. Maehr speculated about the other missing members of a large mammal fauna that recently included wolf (*Canis lupus*), black bear (*Ursus americanus*), and mountain lion (*Puma concolor*) and pondered, given the ability of elk populations to grow quickly, whether all of the ecological components were in place to facilitate a naturally regulated herd of elk? Could this work of restoration be considered complete without the additional complexities and regulatory potential imparted by large carnivores that regularly kill and consume an animal as large as an elk, and that might limit the ecological changes that could be caused by unchecked and widespread herbivory? Maehr discounted the black bear as a candidate, as it did not exert a selective force on large, sympatric ungulates such as deer and elk because it was an omnivore, often only opportunistically scavenging meat, and hibernating for up to half of the year. Even though the wolf would be the appropriate choice as the primary top-down regulator for restoring evolutionary relations and landscapes, he ruled it out because of their pack-living habits and diurnal tendencies made them an easy target for intolerant humans that would frustrate their successful reinstatement. He considered the cougar (otherwise known as mountain lion, puma, catamount, and panther) was fundamentally different from the wolf in terms of its behaviour and its place in folklore, held in higher esteem than their carnivorous canid and ursid relatives, but it likely was also because of the more secretive nature of the cougar – **"With these characteristics of North American predators in mind, and in view of the ancient cultural animosity directed toward wolves by Europeans and their descendants, the cougar becomes the most logical flagship for rewilding eastern North America. The return of elk to the East is an important but insufficient step toward recreating the community dynamics under which many of our remaining plants and animals evolved. Herbivory without predation will demand increasing attention from managers as forests suffer the consequences of a missing large carnivore"**

Alan Watson Featherstone writing on the restoration of the Caledonian forest in Scotland in the Fall/Winter issue of 2001 stated. – **"We envision the rewilding of a substantial part of the Highlands in Scotland"** (161). He noted that the target area would need to be linked via natural habitat corridors to other core areas of wild land in the Highlands for there to be adequate space to support genetically viable populations of large, wide-ranging mammals such as the wolf.

Miller with other members of The Wildlands Project had a paper published that year in the journal Endangered Species Update that discussed some of the potential pathways through which carnivores contributed to ecosystem processes and species diversity (162). Their concern was that policies on large carnivores were driven by paradigms that viewed them as pests to agriculture, sport hunting, and development, that **"carnivores have little ecological value".** They argued instead that the policies should be informed by ecological science of strong interaction between trophic levels if there was not to be a continuing decline in their numbers. Thus in an echo of the fundamental oscillations between predator and prey of an earlier article in Wild Earth (128) the authors noted that the **"dichotomous rubric of ether *top-down* or *bottom-up* is counterproductive. It is clear that forces flow in both directions simultaneously and interact while doing so"** that interactions among species are not static**,** but continuously vary within the bounds of the opposing processes and primary productivity. They warned that while an incremental approach through trying to protect small numbers of a top carnivore in a few locations may prevent taxonomic extinction, it did little to mend ecosystems - **"We contend that it is not a question of whether or not carnivores play an important role. It is a question of how they play their role in trophic interactions "**. This paper did not reference rewilding, but publication in a book of an updated version of the article on the Sky Island Wildlands Network from the Special Issue of Wild Earth in 2000 (see above) firmly set it as a rewilding-based conservation plan - **"In short, rewilding uses large predators and their prey to restore ecosystem integrity throughout a system of large interconnected reserves"** (163).

A BOOK ON REWILDING THE NORTHEAST

In addition, in 2001, a number of Wild Earth authors provided chapters for a book edited by Klyza on rewilding New England and the northeast more generally, but only Klyza, Sayen and Elder cited the terms rewild or rewilding, along with a chapter by Nora Mitchell and Rolf Diamant (164). An adaptation of the introductory chapter of the book, a vision of a northeastern wilderness written by Klyza (165) had been published earlier in the spring edition of Wild Earth in 2001 (see above (158)). In the second chapter, Klyza gave details of the current and pending wilderness areas in the northeast, identifying the extent of public land and other wild lands in each state, and listing proposals for wilderness, such as the Maine Woods National Park and Preserve (166). He looked to

New York State as an exemplar, even though it had little federally owned land and only one federally designated wilderness. What it did have was 1.26 million acres of state wilderness in the Adirondack and Catskill Parks, as well as wild forest lands that when included raised the amount of protected wild lands to 2.9 million acres. This total acreage put it amongst the leading states in both proportion of land area protected, as well as total area protected. Klyza opined that the protected wilderness and wild forest in the Adirondack and Catskill Parks were the wild heart of the Northeast. These wild lands were a pivot or elbow around which the potential wild lands system of the Northeast could coalesce, connecting to northern New England to the east, and to Pennsylvania and the Appalachians to the south. In addition, Klyza saw that by way of the Algonquin to Adirondack Connectivity Zone, a means for wolves to pass from the Algonquin Provincial Park to the Adirondacks, these wild lands could connect to the vast wild lands of Canada. It was thus clear to Klyza that these protected wild lands in New York were the foundation for wilderness in the Northeast. He observed – **"As we seek to rewild and restore other lands in the region, it is to New York that we must turn for guidance and inspiration". In considering the potential for wild lands in Massachusetts, Klyza noted the largest area, the land around the Quabbin Reservoir, and which had been free from farming and forestry since 1928, had been managed by the Metropolitan District Commission (MDC) to ensure water quality - "MDC has focused on controlling public access, and despite some timber cutting on the land, the area has substantially rewilded. It is home to deer (far too many), moose, beaver, coyote, bobcat, fisher, and bald eagle, among other species. Hence, this land is ripe for wild lands protection. Management activities inimical to wilderness are timber management, fire control, and the lack of predators to control the overpopulation of deer (now controlled to some degree by hunting)"**

For his chapter, Trombulak wrote about ecological reserve design in the northeast, applying what he had outlined in his Special Report written for the Reserve Design Framework Package of The Wildlands Project some years earlier (see above). He noted in this chapter that conservation biologists generally recognized four operational goals as necessary for the protection and restoration of life on Earth, such as the **"operation of natural ecological and evolutionary processes with their natural range of frequency and magnitude"** (167). These were the four ecological goals that Noss had laid out for conservation strategies (70) to which Trombulak reflected (167) - **"A growing consensus among conservationists is that one of important tools to achieve these goals and to protect and restore biological integrity is the development of a system of ecological reserves within entire regions, and functionally linked to systems in other regions across the continent"**. He did not refer to rewilding, but he gave examples of the approaches of various reserve design initiatives in the Northeast, including Vermont Biodiversity Project, Algonquin to Adirondack Connectivity Zone, New Hampshire Ecological Reserve System Project, Maine Wildlands Reserve Network, and Northern Forest Alliance Wildlands.

Sayen's chapter offered a strategy for restoring wilderness and a land-based culture that reflected respect for and knowledge of the wild, natural qualities that made the Northern Appalachians so distinctive (168). In justification, Sayen reflected on what he saw where the misconceptions of the writings in 1893 of historian, Frederick Jackson Turner, who had suggested that the distinctive quality of American history and culture were explained by the influence of the frontier, that the American character was shaped in the struggle to subdue the wilderness. Moreover, Turner had asserted that the democratic institutions that set America apart from eighteenth and nineteenth-century Europe were forged on the frontier. Sayen refuted that democracy was forged on the anvil of wilderness destruction; instead wilderness destruction had stunted the development of democratic institutions. Sayen believed that the restoration of ecological health and biological integrity to the Northern Appalachians required large tracts of wilderness, that the condition of America's wild lands mirrored the condition of its culture, especially its democratic institutions. His prescription to make this happen revolved around the recent history of a decade of large land sales of timberlands, more than half of it having been sold two or three times as the paper mill industries of the region were stripped of their assets. In contrast to the realisation of monetary value by the fragmentation of the latter process, Sayen believed that ecology taught the opposite lesson, that the whole - the ecosystem, the landscape - was greater than the fragmented pieces. Thus it was not just about protecting native species and restoring the missing pieces that depended upon mature and old-growth forests, it had to be protecting and restoring the relationships between and among species assemblages in natural communities, assuring the viable functioning of natural processes such as predation, polination, decomposition, and the hydrological, nutrient, and disturbance cycles. Sayen noted that public opinion surveys taken in the region over the last decade of the twentieth century had consistently demonstrated strong support for public acquisition to transform these battered timberlands into wilderness, as it had also shown public support for the reintroduction of wolves to the Northern Appalachians – **“The huge paper company land sales in the Northern Appalachians afford us an opportunity to reopen the wild frontier—to rewild a large segment of the northeastern United States. Instead of a false dichotomy between wilderness and civilization, between wild and managed lands, we need to merge these seeming irreconcilables on the new frontier. One of the paradoxes of Turner's pioneers was that in "abandoning settled society for wilderness," they replaced the wilderness with the civilization they had abandoned. Today, we must again abandon settled society for wilderness by withdrawing our exploitative activities from lands so they can begin to rewild. Some day we will become a wilderness-loving civilization”**

Nora Mitchell at the University of Vermont, and Rolf Diamant, Superintendent of the Marsh-Billings-Rockefeller National Historical Park in Woodstock, Vermont, explored the concept of a **"middle landscape"**, and probed its value for cultivating stewardship and learning sustainability (169). They defined the middle landscape as the humanized landscape between civilisation and wilderness, the working landscape that provided a connection between remote areas of wilderness and the places where most people lived and worked. Their belief was that an opportunity existed in the middle landscape to sustain and cultivate knowledge of wildness close to home and to explore the relationship with more remote wilderness. It was a place where people could learn to live on the land in a sustainable way. Their perspective was shaped and informed by the history of land stewardship in places such as Mount Tom, on the edge of Woodstock Village. Forest had returned to the barren hillsides of Mount Tom in the late nineteenth century almost as dramatically as it had disappeared after having been cleared for agriculture and lumber. Frederick Billings had returned to Vermont with his fortune made in California, and in 1869 he purchased George Perkins Marsh's former estate. Billings had read Marsh's pioneering volume on ecology called Man and Nature, and put into practice Marsh’s theories on conservation (170). Billings and his heirs bought many failing farms and reforested much of the surrounding hillsides, as well as demonstrated a way of farming that replaced the sheep-based economy, uncompetitive because the transcontinental railroad allowed easy access for western ranchers to eastern markets (169). Billings also created a network of carriage roads and trails with scenic vistas from the forest, thus combining recreation, a template for farming, and timber harvest, without ruining the land. Mitchell and Diamant noted that recent literature was rich in celebration of the rewilding of Vermont and other areas of the Northeast. They described Terborgh and Soulé’s a vision of large-scale networks and megareserves employing a strategy of linking core areas with corridors as **“an exciting new approach to conservation biology that had a focus on keystone species that ranged over large geographic area**” (see above)(124).

They noted that The Wildlands Project, allied with Wild Earth, a **“quarterly journal on conservation biology and wild lands activism**”, was **"drafting a blueprint for an interconnected continental-scale system of protected wildlands linked by habitat corridors"**(169). It was here that the authors got to the crux of their thesis around middle landscapes – **“This vision of large-scale reserves creates a future for wild lands dependent upon and interconnected with the cultivated middle landscape. In this vision, the humanized landscape is a critical component in the strategy and is recognized for its important role as corridor and buffer for the wild lands of the core”**. Thus they saw that the lessons of land management described by Marsh in the nineteenth century, were today **“written on the rewilded forest landscape of Vermont and many places in the Northeast. Past land management efforts tell stories of sustainability — some through failure and others through**

continuity. These stories can be used as guides and as encouragement to seek sustainability alongside rewilding. Viewed in this light, our northeastern landscape can be our compass for new directions in environmental thought and development of a broader, more inclusive conservation ethic"

Elder's chapter on the evolution of wilderness thought that had observed the convergence between the environmental history of Vermont, it's **"recovering wilderness"**, and the current emphasis upon rewilding within The Wildlands Project (171) had been published previously in the winter edition of Wild Earth of 1998 (see earlier – (110).

A SECOND WILDLANDS NETWORK VISION

In the following year, in 2002, Barlow, in reflecting on the issues in Eternal Frontier, a book on the ecological history of North America by Tim Fannery (172) commended deep time awareness as a means to understand the history of America, and which invited a new relationship to the land (173). However, Barlow questioned whether Americans could learn a key lesson from the roll-call of lost life forms over the long span of ecological time. Focussing on the extinct American cheetah, she noted that it was an ecological anachronism that no current predators (save humans in pickup trucks) can match the speed of pronghorns. However, she observed that Flannery in his book had joined with Martin and Burney in their prior article in Wild Earth (174) in proposing repatriation of the elephant, the biggest land mammal alive – **"This convergence of ideas suggests that perhaps the time has come to seriously consider repatriation of extirpated megafauna as part of rewilding North America".** Also in 2002, Terborgh explored whether forestry practices and a working forest could deliver any benefits to biodiversity (175). He thought it was possible if restraint was exercised in harvesting trees; that trees could be extracted one at a time from uneven-aged stands with minimal intrusion of heavy equipment and care taken to minimize collateral damage to surviving stems, but it would inevitably add to the cost of the products harvested. Terborgh thought it a difficult task garnering the public support necessary to reform forestry practices, and conserving biodiversity required large tracts of land that were free from commercial exploitation. He saw it as impractical to restore large, ecologically intact wildlands in a single step, and so development of regional networks of conservation lands would be incremental. The immediate imperative was to prevent further degradation of the best of what remained of partially altered and semi-wild lands – "**We can't readily undo damage that has already been done, but we can work to prevent further damage and to give Nature time to heal. In the mid-term future, restoring landscape connectivity and rewilding are needed on a large scale with the ultimate goal being self-willed lands supporting native plant and animal communities free of alien species"**. He noted that the land was too fragmented and too replete with alien species to assume that Nature will heal spontaneously if merely left alone, but that the science of eliminating exotic species and restoring native communities was in its infancy – **"Until the science of rewilding attains maturity, the endangered species list will continue to grow, and intensive management will be required to avert further extinctions"**

Terborgh considered that the best option immediately available for rescuing Nature in North America was land acquisition through both public and private purchase. He noted that for Maine and other sections of the country lacking much public land, the best that could be hoped for was that the legislatures and philanthropists would step up and help land conservancies acquire the most crucial tracts when they became available, an approach he thought uncontroversial – **"Habitat connectivity and recovery of intact food webs-including large carnivores-remain distant goals for many parts of the Americas, but as progress is made toward consolidating larger and larger tracts of self-willed land, the time will come when wolves, wildflowers, and salamanders - when all members of the land community - will flourish".** The year 2002 would also see completion and publication of the second Wildlands Network Conservation Plan, a Network Vision for the state of Maine, the goals of which were to use a rewilding approach to design, restore and establish an interconnected system of core protected areas, a proposal map showing the components of the wildlands network design (176). The document echoed Terborgh when it said that Maine had the smallest proportion of public land of any forested states, with only 0.09% of the land as federally designated Wilderness. The implications were that the quantity and quality of public lands in Maine were inadequate to meet the needs of biodiversity, despite the rarity of many of Maine's natural communities and species, and the threat posed by more forest fragmentation and destruction. The observation was that more public lands with higher levels of protection were clearly needed for core wild areas without resource extraction, and where natural processes were untrammelled – **"The chance has never been better to set aside large tracts of land to protect and restore ecological integrity, whether through public acquisition, purchase of "forever wild" conservation easements, or other mechanisms"**

ECOLOGICALLY EFFECTIVE POPULATIONS OF HIGHLY INTERACTIVE SPECIES

There were three references to rewilding in Wild Earth over 2003. Wolke wrote about the creeping degradation of the public lands in the National Wilderness Preservation system in America from such as non-conforming uses, exotic species, and motor vehicle encroachment (177). He noted that in his early years in conservation action, he viewed wilderness stewardship as a body of issues that could wait, as there were more pressing issues – **"So my conservation efforts focused on roadless area defense, wilderness designations, and rewilding**". However, a lifetime of wilderness exploration had convinced him that in the face of perceptible systemic decline from inappropriate uses of wilderness, that rather than just securing substantial additions to the Wilderness System, it was an imperative to take care of existing designated wilderness. Elder, writing in the same issue, reviewed the legacy of the environmental vision of George Perkins Marsh (178). Marsh had written Man and Nature in 1864, wherein he was an early advocate of preserving the Adirondacks, and which would also give protection of the streams flowing into the Hudson River and the Erie Canal (170). Elder noted that the environmental history of Vermont showed a remarkable recovery when whole communities of farmers failed and emigrated, becoming more heavily forested than at any time in the past two centuries (178) This recovery supported an increasing diversity of wildlife, such as beaver and deer, fishers, otters, bears, and bobcat, and with the prospect of wolf and mountain lion returning. Elder remarks that **"Such rewilding has been accompanied by a host of state and local conservation initiatives. Several of the most notable of these have been centred in Woodstock, the town where George Perkins Marsh was born in 1801; they can be related directly to his vision and accomplishments"**

Foreman would announce in the winter issue of Wild Earth, 2003, that with the support of The Wildlands Project Board of Directors, he had set up The Rewilding Institute, an independent non-profit **"think tank"** and he would be leaving to become its executive director (5). The Institute's overarching goal was to combat the extinction crisis through developing and promoting ideas and strategies that advanced continental-scale conservation in North America. Foreman wrote about the Thelon Game Sanctuary in northern Canada's Arctic region, which he described **"as wild as land comes today - untrammelled, self-willed, self-regulating"** (5). He noted that it had set a new standard of land health for him, what he thought Leopold would have called a new **"base datum of normality".** Given that all native species were present in the Thelon in ecologically effective population densities, and were free to wander over hundreds of miles of unfettered lands- **"for whim or ancient urges"** – then Foreman considered that the Thelon was normal- **"It's what land should be like. It's what land was like before we began to stomp our will over it"**. He noted that a lesson from the Thelon on what was a characteristic of healthy land, normal land was that native species thrived there in more or less their natural density – **"Highly interactive species, such as wolves, are here in ecologically effective populations. They play their role in shaping and regulating other species and the ecosystem"**. A second characteristic was such a large area unfragmented by the works of humans – **"Whether you are a muskox, Arctic tern, lake trout, or blackfly, the landscape is permeable for your movement for hundreds of miles".** It was these characteristics – **"ecologically effective populations of highly interactive species and landscape**

permeability" that Foreman believed were the **"foundation for continental-scale conservation- for rewilding"**

Ecologically effective populations was a term Soulé had used previously in Wild Earth (see above (152)) and Foreman was to note that Soulé and his fellow researchers had laid out the concept of ecologically effective populations of highly interactive species in a recent issue of the journal Conservation Biology (179). Foreman would later, in his book, describe that paper in Conservation Biology as **"a big step forward for conservation science and practice"** (2). He also noted that Soulé now preferred the term highly interactive species to cover keystone and foundation species, and that the Rewilding Institute had replaced the term **"keystone"** with **"highly interactive"** for the North American Wildlands Network. Soulé and colleagues had published two papers on interactivity that were advances on his earlier paper in BioScience on strength of interaction (76) and the article in Wild Earth where he assessed the impact of species and their population densities (152). The first focused on ecological effectiveness within ecosystems of two predators, one of which was the wolf (179). Their conclusion was that a primary mission of conservation should be to identify and restore species that interact strongly with others, ensuring a geographic representation of interactions through an extensive geographic persistence of highly interactive species. Thus conservation plans should call for recovery or repatriation of **"highly interactive species"** at **"ecologically effective densities"** because the often rarity or absence of those species **"leaves a functional void that can trigger linked changes leading to degraded or simplified ecosystems".** In the second paper, published in the journal Bioscience, greater detail and examples were given on what was meant by strongly interactive species, laying out some guidelines for assessing interactivity based on the impacts of the absence or decrease in abundance of the species, as well as how to estimate ecologically effective densities for a sample of species – wolf and coyote were two of their examples- so that they could be maintained above thresholds for ecological effectiveness (180).

THE SPINE OF THE CONTINENT

Two more wildlands network visions developed in collaboration with The Wildlands Project were published in 2003, one for the rewilding of the Southern Rockies - "The mission of our Vision is **to protect and rewild the regional landscape"** (181) the other a rewilding approach for the highlands of New Mexico – **"The New Mexico Highlands Wildlands Network Vision follows this rewilding approach—consequently NMHWN proposes a network of protected areas that will safeguard and restore the ecological integrity and the human wilderness experience of an ecologically diverse and remarkable landscape"** (182). The significance of these two visions was that the New Mexico highlands adjoined the Sky Islands to the south, and the Southern Rockies to the north, thus providing continuous connectivity between the Sky Islands and the Southern Rockies, a substantial length of continental linkage that was at the time named the Spine of the Continent (183). This was one of the four North American MegaLinkages envisaged by The Wildlands Project, but which now is expanded and referred to as the Western Wildway (183,184). It is not surprising that these two Wildlands Network Visions, along with the earlier Network Vision for the state of Maine (see above – (176)) went into some detail on the meaning of rewilding, seeing the organisation of wild nature in its food chains, food pyramids, food webs, trophic levels, or trophic cascades. It was commonly framed as the scientific approach of rewilding that sought to heal ecological wounds and emphasized large, strictly protected, core wild areas, compatible-use lands around the cores, and functional connectivity across the landscape by way of wildlife movement linkages.

All three Wildland Network Designs identified adequate habitat and linkages for populations of focal species, as one of the tactics of the three-track planning approach to designing a regional reserve network described earlier by Miller and colleagues (see above (115)). It was explained in the Maine Wildlands Network Vision that its emphasis on those species stemmed from persuasive evidence that large predators and other keystone species played an important role in ecosystem functioning (176). The Maine Vision selected and used nine species in its Network Design, all Umbrella species bar the Common loon that was regarded solely as a Habitat Quality Indicator species. Two of the Umbrella species, Eastern timber wolf and Eastern cougar, were also Keystone species. The lynx was regarded solely as an Umbrella species. Four of the Umbrella species were also regarded as Habitat Quality Indicator species: American marten, otter, Northern goshawk, Red-shouldered hawk, and Atlantic salmon. Nine focal species were also used to plan for cores and connections in the Southern Rockies Wildlands Network Design (181). While some of these focal species were seen to fall into a number of categories, including Wilderness Quality Indicator and Keystone species, in simple terms grizzly bear, black bear, gray wolf and lynx were regarded as Umbrella species; beaver, bighorn sheep and cutthroat trout were seen as Habitat Quality Indicator species, and pronghorn where seen as a Flagship and a Prey species. The New Mexico Highlands Wildlands Network Vision chose a suite again of nine species that represented most of the region's ecological communities and natural processes, and also addressed the major habitat threats (182). The suite in simple terms included gray wolf, grizzly bear, mountain lion, black bear, otter and elk as Umbrella species, and American marten, bighorn sheep and beaver as Habitat Quality Indicator species.

The use of focal species planning in all three visions to identify the areas for elements of the Network Designs gave recognition to the vital role of keystone species and processes, especially ecologically effective populations of large carnivores, in the maintenance of ecological and evolutionary processes, such as such as disturbance regimes, hydrological processes, nutrient cycles, and biotic interactions. As Foreman was later to reflect, it had been Noss that had described the management/restoration guidelines for different kinds of units in a protected network in an Appendix to the Wildlands Project Land Conservation Strategy back in 1992 (70) noting that these had become the recipe for the wildlands network design approach of the Network Visions (2).

Because of relatively larger amounts of public lands in the two vision areas compared to that for Maine, both saw that their wildlands networks were anchored by a core system of Wilderness Areas on public lands (181,182). In the case of the Southern Rockies, large protected wild areas were central to the vision for the Southern Rockies, whereas other public lands should be managed as wildlife movement linkages and low to medium compatible-use lands (181). A map was shown containing those components identified for the Southern Rockies Wildlands Network Design, and which included core areas, low use compatible areas and wildlife linkages. It should be noted that one of the methods used to identify the wildlife linkage elements was a measure of landscape permeability for the relative ease with which the wolf and the grizzly bear could travel through the landscape, thus in determining the most probable dispersal linkages that each species would take to travel between core population areas. The proposed New Mexico Highlands Wildlands Network included 4.5 million acres of core wild areas on federal public land (2.3 million acres of current wilderness areas or equivalent, and 2.2 million acres recommended for wilderness designation); and 9.6 million acres of compatible-use lands on existing public land where the recommendation was for more ecologically benign management (182). In similar fashion, habitat suitability for key mammal species, as well as old growth forests and areas of vegetation representation, important sites for birds and roadless areas, were all mapped in the process of identifying and mapping components of the New Mexico Highlands Wildlands Network Design, such as core areas, compatible use lands and wildlife linkages. Both Network Vision documents considered communication was critical to their plan’s success, that it would be helpful for partner organization to understand, amongst a number of things, that **the “vocabulary (core wild areas, compatible use areas, linkages, connectivity, rewilding, etc.) is drawn both from science and from our vision for the future”**.

The invocation of the maintenance of ecological and evolutionary processes that Noss early on had laid out as one of the four ecological goals for The Wildlands Project Land Conservation Strategy (70) was restated in many other articles in Wild Earth (see above). It also appeared in the quasi-conceptual definition of rewilding that was given by Locke (141) and by Foreman and co-authors (102) in articles in the Special issue of Wild Earth in 2000 (see above). This conceptual definition of rewilding was also restated in the New Mexico Highlands Wildlands Network Vision (182). In this general sense, it referred to **"allowing or helping ecological and evolutionary processes reassert**

themselves across the landscape" again, like the citation in Foreman and co-authors, indicating that it came as personal communication from Butler (117). It would thus seem that one of the ecological goals that Noss had laid out in the early years of Wild Earth that had been co-opted by Butler (see above) and had become a conceptual definition of rewilding that found common usage.

THE SEEMING RELUCTANCE TO CITE REWILDING IN JOURNALS

While Foreman had made reference to rewilding in relation to ecologically effective populations of highly interactive species, the two papers by Soulé and his colleagues did not. The strength of interaction between species or between trophic levels was a common topic in ecology, but relating it to effective species density was an advance in describing and understanding why rewilding gave such prominence to large carnivores – it could overarch the operational definition given by the scientific justification. Noss would appear to have been the first to break that seeming reluctance - as evidenced above and throughout this account - of the scientists involved with The Wildlands Project to reference Wild Earth or The Wildlands Project in the literature. Nor had they associated rewilding with the scientific concepts that they were having published in peer reviewed journals, when they and others had rightly associated it in writing about ecological restoration by rewilding in Wild Earth from 1991 onwards. Thus in 1999, in an invited mini-review in the journal Ecography on what was special about conservation biology in relation to other disciplines in conservation, Noss had noted that The Wildlands Project was a conservation planning scheme that had arisen out of conservation biology, and which was orientated towards building long-term conservation networks over decades and centuries (16). While he did not cite rewilding in this mini-review, Noss did reference three articles in Wild Earth. In contrast, that same year, Foreman had been less reluctant in citing rewilding in an article in the Denver University Law Review, as well as The Wildlands Project, and referencing articles in Wild Earth (137).

Subsequently, Noss had published a checklist for Wildlands Network Designs in the journal Conservation Biology in 2003, and in which he cited rewilding, The Wildlands Project and Wildland Network Designs, as well as referencing six articles in Wild Earth, one of which contained the Sky Islands Wildlands Network, as well as referencing the Wildland Network Vision for Maine and the New Mexico Highlands Wildlands Network Vision (185). In his article on the checklist, Noss reflected that systematic conservation planning required rigorous methods and scientific defensibility that were enhanced by conceptual frameworks, standards, and criteria for guiding and evaluating individual plans. In this, the Wildlands Project had been developing Wildlands Network Designs in various regions across North America, **"based on the goals of rewilding— restoration of wilderness qualities and intact food webs and biodiversity conservation".** It had involved a mixture of scientists and activists committed to ambitious, long-term conservation that, compared with other conservation groups, put more emphasis on maintaining, buffering, and connecting existing wilderness areas **– ""rewilding" landscapes that have been compromised by such factors as habitat fragmentation and loss of large carnivores and natural disturbance regimes; and communicating the ecological values of wilderness".** He went on to note that protecting and restoring populations of large carnivores and other potential umbrella and keystone species had been a dominant theme of all Wildlands Network Designs - **"Reconciling the rewilding approach, with its emphasis on carnivores, other large animals, and broad-scale natural processes, with the more traditional methods of biodiversity conservation has been one of the greatest challenges for the Wildlands Project, but it is also what distinguishes its approach from that of most other conservation groups"**

Noss explained that the Wildlands Network Designs applied a three-track methodology of protecting special elements, such as occurrences of concentrations of rare species; representing ecosystem types; and meeting the spatial needs of focal species, particularly carnivores and other wide-ranging animals. He had developed the checklist as a means to assist The Wildlands Project staff, its contractors and co-operators, in developing regional conservation assessments and Wildlands Network Designs that would be consistent with accepted standards for systematic, science-based conservation planning. It would be a means of quality control in guiding their development along scientifically defensible paths and for assuring some consistency, as well as providing a practical and convenient means for their peer review. While he did not wish to assert that it was the one best way to do conservation planning, Noss wanted to present the checklist to a broader audience in the hope that the general approach and some of the criteria would be adapted by other scientists, activists, organizations, and agencies involved in regional and continental conservation planning. Indeed, Noss noted that The Wildlands Project encouraged creativity and innovation so that the methodology would continue to improve. Moreover, there was a recognition that regions that differ in their physical environment, biogeography, ecology, and land-use history would also differ in the kinds of analyses and plans appropriate for them, examples being in **"the relative weight given to protecting existing wildness versus rewilding, or to each of the three tracks of special elements, representation, and focal species"**

Thus the checklist consisted of eight general standards and their associated specific criteria: the involvement of scientists and other experts and, in some cases, its implementation; that the methodology was rigorous and sought to address the stated goals and questions; that it included the three tracks of special elements, representation, and focal-species analysis, as well as addressing existing or potential threats to biodiversity; that it was well documented and replicable; that there was analytic rigor in interpretation and application based on the principles of conservation biology and other relevant literature and theory; that it was peer reviewed and made available for public review; that elements of the methodology and results were publishable to ensure scientific defensibility; and that the design process was iterative and adaptive and can be refined and improved with feedback from research, monitoring, peer review, and practice. It was the third standard, in terms of the biological aspects of ecological restoration, that emphasised the spatial approach of Wildland Network Designs, and in particular in the use of focal species where it was noted that a set of 3–10 focal species was probably optimal in most regions. Noss would put this spatial aspect into a wider context – **"As a means to the end of rewilding North America, The Wildlands Project has consistently invoked the concept of a continental-scale network of core reserves connected by broad habitat linkages"**

The reluctance by the scientists to reference rewilding in their peer reviewed articles may have been because of an implicit understanding amongst them that rewilding was derived from the principles of conservation biology, itself a young branch of science then in applying ecological knowledge to the conservation of diversity, and that it was the science that they were publishing that was the important thing. There may also have been a sensitivity at that time about those scientists not wishing to sacrifice their standing as impartial observers by seemingly getting into advocacy other than in the overarching cause of conservation of biological diversity, and so their articles were as value-free as in any other scientific discipline (16,78,186)(and see the discussion in the Special Section on the role of advocacy in the science of conservation biology (187)). On the contrary, Wild Earth was able to give space for leading edge articles that may have had difficulty in getting published in academic journals. Thus it is interesting to note that in 1992, Paul Martin was an early contributor to Wild Earth in a discussion of his Overkill Hypothesis – **"Our late Pleistocene legacy means we can imagine more, not fewer, kinds of large animals on public lands, on the western range and in our national parks"** (188). Later, in 1999, space would be given to him to expound his ideas on Pleistocene rewilding (174) because Martin had found it difficult to get it into the mainstream academic literature – it would take him another six years before it would appear in the journal Nature (189).

CROSSING OVER: CONNECTIVITY, CORRIDORS, AND LINKS ACROSS THE LAND

In 2004, the last year of publication of Wild Earth, Foreman had been winding down his involvement with The Wildlands Project, but his usual homily was in the last ever issue of Wild Earth, along with a message from the editors. The cost of producing Wild Earth had outstripped income derived from it, and so the decision had been taken by the Board to close Wild Earth and direct more of its funding to outreach in supporting on-the-ground conservation programs (190). The Foreman article was an adaptation of the introductory first chapter from his then recently published book Rewilding North America (191). It gave a wide-ranging review of his engagement with and understanding of the bigger issues there had been for conservation in America, and how he saw rewilding emerging out of those issues as a response. He urged conservationists to make protected areas more effective, to work on very large landscapes, probably continental in scope, and undertake ecological restoration based on rewilding. Thus instead of island-like protected areas, there was a need for a continental wildlands network of core wild areas, wildlife movement linkages, and compatible-use lands to meet the habitat needs of wide-ranging species, maintain natural disturbance regimes, and permit dispersal and reestablishment of wildlife following natural events such as fires. Foreman wrote that this **“network must be based on the scientific approach of rewilding, which recognizes the essential role of topdown regulation of ecosystems by large carnivores, and the need that large carnivores have for secure core habitats, largely roadless, and for landscape permeability (habitat connectivity) between core areas. Fully protected cores such as wilderness areas are at the heart of this strategy”.** He noted that The Wildlands Project summarized this approach in its slogan, **"reconnect, restore, rewild”**

Two further articles in the issue were evidence of rewilding providing a solution. Susan Walker and others were faced in Patagonia with the reverse problem of native carnivores persisting and doing well in some areas where their native prey species had been extirpated, but where the carnivores had by default moved on to predating domestic livestock (192). Their challenge was to **“take advantage of this “gift” of carnivore recovery”** by re-focussing on native herbivores and choosing the more threatened guanaco (*Lama guanicoe*) and the choique (*Rhea pennata*) the largest-bodied and widest-ranging herbivore and omnivore, as the focal species for the Wild Patagonia Reserve Network – **“This Patagonian version of rewilding is distinguished from the North American version by the necessity of focusing on large-bodied herbivores, in addition to carnivores”**. The other article was from Barlow and Martin in a proposal for the assisted migration of *Torreya taxiolia*, an endangered tree found in Southeastern America, further north to restore what they considered was its once-native range (193). This assertion was based on macrofossils unearthed in North Carolina and Georgia and identified as the genus *Torreya* from the upper Cretaceous – **“hence, our suggestion that assisting T. tax to rewild in North Carolina would be assisting the return of a deep-time native”**

The theme of this very last issue of Wild Earth was Crossing Over: connectivity, corridors, and links across the land. It is fitting therefore that Noss wrote a reflective article on what had been learned about connectivity over the many decades before even the theory of island biogeography and island-like patches of habitat had shown up the need to overcome the isolation of individual nature reserves (194). He noted that wildlife biologists were well aware in the 1930’s that particular game mammals and birds, such as squirrels and quail, made use of wooded corridors in agricultural landscapes, and that pioneering American ecologist Victor Shelford, had recommended the protection of corridors, such as forested riparian strips, between reserves in the 1940. He also pointed to a paper in 1962 by Frank Preston in the journal Ecology that presaged island biogeography in its observations on the depauperate fauna and flora of oceanic islands compared to a continental landmass, noting that that islands, if sufficiently remote, acted as **"isolates"** (195). Preston extrapolated this phenomena to the limitations of wildlife preserves in continental landmasses, such as State or National Parks, predicting that it would not be possible to preserve a complete replica on a small scale of the fauna and flora of a much larger area – **“The only remedy is to prevent the area from becoming an isolate by keeping open a continuous corridor with other preserved areas**”. Noss did not cite rewilding, even though he noted that corridors or linkages had become well-accepted components of conservation plans. He was concerned that corridors had perhaps become too well accepted, that they had essentially become a fad when conservation activists and planners incorporated them into their designs with apparently little thought to which species might benefit and which would not, a contrast to the more considered approach of rewilding to wildlife habitat linkages. Thus Noss believed that what conservationists should be interested in was not corridors per se, but rather functional connectivity for species sensitive to habitat fragmentation – **"Functional connectivity involves the flow of individuals and their genes among habitats and populations, and is determined by the intersection of a species' life history characteristics, including its behavior, and the structure of the landscape. Hence, connectivity is a highly species-specific and landscape-specific property"**

Noss observed that well-designed studies of conservation corridors generally showed that they provided connectivity for the species being targeted, but that they may act as a barrier to another. He gave the example of river that would be a barrier to many terrestrial animals, but was a corridor to aquatic species as well as those terrestrial and amphibious species that inhabited the riparian zone. Thus what was critically important was that corridor design had to thoughtfully consider the needs of the species most in need of conservation. Noss went on to describe new techniques being used to identify suitable corridors for species of concern based on habitat and population modelling. One such technique was to identify potential travel routes along which an animal would have the best chance of survival based on a habitat suitability model - the higher the suitability, the lower the predicted resistance to moving through the landscape. This was a method used to identify wildlife movement linkages for wolf and grizzly bear in the Southern Rockies Wildlands Network (see above (181)). However, Noss saw the static nature of habitat conditions in this modelling as a drawback for considering population persistence over time. Thus he noted that the dynamic simulation of spatially-explicit population models were more useful, as they could be used to examine potential patterns of population growth and dispersal over large areas, and to predict the effects of changing landscape structure on the viability of populations. Noss said that a former student of his was using these modelling approaches to help The Wildlands Project and other organizations to develop regional conservation plans and identify priority areas for linkages.

A CONTEXTUAL ANALYSIS TO IDENTIFY THE MEANING OF REWILDING

A number of objectives in the conservation of wild nature became axiomatic with rewilding during the life time of publication of Wild Earth from 1991 to 2004:

Habitat fragmentation, island biogeography, core wild areas, wildlife movement linkages, and compatible-use lands: mapping, public lands, roadless areas, connectivity

Reed Noss brought to The Wildlands Project a track record of publications on the concept of ecological networks as a landscape-level conservation strategy to overcome threats to biological diversity from habitat fragmentation, a threat that would constantly be returned to (39,102,108, 111,124,133,156,176,185,194). He set a pattern with his article in the first issue of Wild Earth where he laid out a conceptual plan and map for a state-wide network of core areas and corridors in Florida so that the Florida panther could migrate between them (36). Within a few issues, Biltonen and Bonney, in explaining the steps needed to map a connected wildlands system for the Finger Lakes region in New York State (63) and Mueller's map-based proposals for new wilderness areas, and extensions to existing wilderness areas, in the Monongahela National Forest in West Virginia, along with buffer zones and corridors (64) had tied the approach to rewilding. Noss with others later laid out the spatial approach of large core areas surrounded by buffers, and linked by biological corridors for natural dispersal in the Mission Statement of the Project in the first special issue of Wild Earth in 1992 (67). He explained that this approach was seen as a way of overcoming the constraints of unconnected reserves existing as discrete islands of nature in a sea of human modified landscapes, the biological corridors allowing for the natural dispersal of wide-ranging species, for genetic exchange between populations, and for migration of organisms in response to climate change. Noss would greatly expand on this in the Wildlands Project Land Conservation Strategy in the same issue of Wild Earth, providing extensive details in an Appendix of the characteristics of the network components of strictly protected, core wild areas, multiple use zones or buffers, and corridors (70). Connectivity between strictly protected core wildland areas was one of the three scientific arguments that Soulé and Noss put forward for rewilding, a spatial approach of wildlife movement in corridors being the means to overcome the limitations of size of protected areas and the consequent vulnerability of isolated populations of animals to accidents of demography and genetics, and to environmental fluctuations and catastrophe (107). The emphasis on connectivity had thus come about when conservation biologists took on the principles of island biogeography, and recognised the weaknesses within existing conservation approaches because they did not match the scale on which ecological processes operated. Through a review of studies, Beier and Noss identified that there was empirical evidence that that corridors provided sufficient connectivity to improve the viability of populations in habitats connected by these linkages (108). Klyza saw protecting land for cores and connectivity as the keys for rewilding (158). Corridors would later be described as habitat linkages or wildlife movement linkages, and multiple use zones or buffers would be more appropriately described as compatible use lands (2,98,102,107,127,133,140, 181,182).

While ecological networks were not unique to rewilding (see (196)) The Wildlands Project was the only group in America designing an interconnected system of conservation reserves on a continental scale (100). This emphasis on a design-led spatial approach to nature conservation would be a constant factor in its interpretation, as is evidenced by the consistent recourse to mapping of species distributions as a means to identify the best location of the elements or components of a Wildlands Network Design and to portray the design itself (36,63,64,68,69,71,72,74,93,119,140, 145,150,176,181,182). Public lands were seen to be a vital opportunity for locating core areas within a network as they were where strictly protected areas such as wilderness were designated that gave wild nature its own space, and which could be expanded or new wilderness designated (57,63,64,71,72,97,111,112,140,145,146,176,177,181,182). In regard to the public lands of the National Forests, there were often entreaties in Wild Earth to retain roadless areas, remove non-conforming activities like logging and grazing and closing unnecessary roads, and modifying management plans to facilitate a recovery that would allow inclusion in Wildland Networks (40,68,70,72,107,112,142,146,177,191). The period of impetus over the 1990s in considering habitat connectivity between protected areas paralleled that of the recognition of rewilding as a fundamental principle for Nature conservation (100). Connectivity between core areas in a Wildlands Network was an essential component, the sophistication in the means of identifying functional connectivity increasing with the years (63,65,70,73,74,103,104,107,111,112,116, 133,144,150,151,158,175,176,183,184,185,194).

Ecological and evolutionary processes

Size was a key factor in the spatial network of protected areas, Noss along with other conservation biologists recognising that ecological and evolutionary processes needed sufficient area for them to be of a significant impact. He saw maintaining ecological and evolutionary processes as being one of the ecological goals in the Wildlands Project Land Conservation Strategy that would add to the success of that strategy, and listed some of the processes such as disturbance regimes, hydrological processes, nutrient cycles, and biotic interactions, including predation (70). Davis would echo this objective (88) as did Trombulak (167). Allowing ecological and evolutionary processes to reassert themselves would later be co-opted to become a conceptual definition of rewilding by Butler (117) Locke (141) and Foreman with others (102) with Soulé offering the restoration of natural ecosystems, including their ecological and evolutionary processes, as one of his ecological guidelines arising from rewilding and conservation biology (152).

Natural disturbance regimes

Noss regarded disturbance as a fundamental process critical to ecosystem function, as in maintaining ecological and evolutionary processes, one of his four objectives that were consistent with the overarching goal of maintaining the native biodiversity of a region in perpetuity (70). Davis would echo this objective (88) and Soulé would characterise it as being fire and floods (95) Kroll and Barry as wildfires and flooding (125). Wolke saw that the presence of predators and natural disturbance regimes were what delineated true wilderness (121). Kroll and Barry in their recommendations for a regional management plan for the Caprock Mountains urged a focus on the restoration of natural disturbance regimes (125) and Ingalsbee recorded the success of advocacy of having the Research Natural Area in the Williamette National Forest in Oregon be devoted to natural landscape disturbances and dynamic successional processes (126). Foreman and others described Natural Fire as a natural disturbance regime vital to the health of forest, woodland, and grassland ecosystems in the Sky Islands region (142) and one of Soulé 's ecological guidelines for networks of protected wildlands in critical regions was maintaining the optimum scale, intensity, and frequency of natural disturbances (152). Klyza saw the need to rewild the land, to let natural processes dominate the land, such as natural disturbances and species interaction (158). Noss in his checklist for wildlands network designs noted that The Wildlands Project had placed emphasis on maintaining, buffering, and connecting existing wilderness areas; rewilding landscapes that have been compromised by such factors as habitat fragmentation and loss of large carnivores and natural disturbance regimes; and communicating the ecological values of wilderness (185). Foreman noted that Instead of the island-like protected areas currently in place, there was a need for continental wildlands network of core wild areas, wildlife movement linkages, and compatible-use lands to meet the habitat needs of wide-ranging species, maintain natural disturbance regimes, and permit dispersal and reestablishment of wildlife following natural events such as fires (191).

Healing ecological wounds

Wounds, ecological insults, healing, ecosystem health, ecologically healthy conditions, healthy populations and other phrases reflecting on the degradation and restoration of ecological processes would appear often in Wild Earth, but it would not be until the landmark article by Soulé and Noss in 1998 that rewilding and the redressing of the major **"wounds"** or ecological insults caused by abusive land uses of the past were linked (107). Amongst the list of these wounds to wildlands were the extirpation of large predators; overgrazing and destruction of riparian habitats; introduction of exotic species; draining or pollution of wetlands; and habitat changes stemming from decades of fire suppression. The authors noted that rewilding would not address all of these, but it was one essential element in most efforts to restore fully functioning ecosystems. Gatewood, in his Wildlands Project Update in the spring issue of Wild Earth in 1999, opened with a simple definition of rewilding – **"Re-wilding. Rewilding. To return to a state of wildness. To help degraded lands and waters regain health. To help Nature heal"** (103). By the following year, 2000, the healing of wounds would become an established element of wildland network visions through the development of the Sky Islands Wildlands Network Conservation Plan. Thus a centrefold brochure in the Special Issue of Wild Earth noted that the design of that Conservation Plan was based on rewilding and focal species planning, and specifically sought to heal six major wounds the region had suffered (140). The process would be healing-the-wounds goal-setting, which would also direct the selection of focal species in that their viability or recovery was tied to the six goals. Leanne Klyza Linck observed that the wounds in the North Woods from intense human activity would not be healed by a ten year campaign, but that it would take decades to rewild Maine (147). She would later observe that The Wildlands Project's approach to conservation planning was distinctive because it was based on healing ecological wounds and rewilding, helping to restore ecological processes across the landscape, particularly natural predation regimes (149). In a retrospective in the last issue of Wild Earth, Butler saw the that the most gratifying success of Wild Earth had been in promoting a rewilding approach to conservation that was not merely defensive, oriented toward saving the last scraps of wild nature, but offensive, actively seeking to help nature heal (61).

Scientific justification for rewilding

Soulé and Noss described rewilding as a science based method for nature conservation, a non-representative methodology that had learnt the lessons of species area relationships and the threats from isolation that arose with island biogeography, and which led to an emphasis on the restoration and protection of big wilderness and wide-ranging, large animals—particularly carnivores as highly interactive species (107,133). They justified this scientific underpinning for rewilding based on large carnivores by asserting that the structure, resilience, and diversity of ecosystems was often maintained by **"top-down"** ecological (trophic) interactions that were initiated by top predators; large areas were justified by wide-ranging predators because they required large cores of protected landscape for secure foraging and seasonal movements; because core reserves were typically not large enough in most regions, they must be connected to insure long-term viability of wide-ranging species. They understood that the ecological argument for rewilding was bolstered by research on the roles of large animals, particularly top carnivores and other highly interactive species, in many continental and marine systems where studies were demonstrating that the disappearance of large carnivores often caused these ecosystems to undergo dramatic changes, many of which led to biotic simplification and species loss (46,76,107,128). Their view was that extensive networks of cores and habitat linkages also sustained a vast range of natural processes, and thus rewilding was a critical step in restoring self-regulating land communities that minimized the need for human management.

Later, Soulé would maintain that the rewilding argument provided the ethical and scientific-justification for the restoration of large networks of self-willed Nature, including large carnivores (130) and this would be echoed by Foreman and others who wrote that rewilding was the scientific argument for restoring big wilderness based on the regulatory roles of large predators (102,154). Kroll and Barry maintained that an important aspect of rewilding was the reintroduction or augmentation of predator populations (125). Locke that the presence of carnivores often played a key role in keeping other species alive, so that the **"aim of rewilding was to preserve or restore species at the top of the food chain**" (141). Dugelby and others that rewilding used large predators and their prey to restore ecosystem integrity throughout a system of large interconnected reserves (163) and Foreman that a network must be based on the scientific approach of rewilding, which recognized the essential role of topdown regulation of ecosystems by large carnivores, and the need that large carnivores had for secure core habitats, largely roadless, and for landscape permeability (habitat connectivity) between core areas (191).

Highly, strongly, or ecologically interactive species

In a footnote to one of his regular columns in Wild Earth, Foreman had pointed to an article in the journal Conservation Biology that Soulé and others had published on the concept of ecologically effective populations of highly interactive species (5). Soulé and colleagues had years before reviewed the impact on community composition that followed from the removal of keystone species by distinguishing between species on the strength of their ecological interaction (76). Their conclusions cast doubt on continuing to label certain species as keystone, and instead they argued for emphasizing the strengths of interactions, as it recognized the complexity, as well as the temporal and spatial variability, of interactions. Soulé and Terborgh observed that the viability of ecosystems often depended on the viability of species whose interactions regulated the systems (133). Thus the size of the system, its configuration of boundaries and corridors, must accommodate the needs of a critical handful of highly interactive species, these species often including large carnivores. They noted that the goal of maintaining viable populations of keystone species, particularly large carnivores, had been referred to as rewilding. The Wildland Network Vision for Maine noted that some species of animals—keystone species - were especially interactive with their environment, such that their disappearance left not just a physical void in nature, but a functional one that can trigger chain reactions ending with degraded or simplified ecosystems (176). The Wildland Network Vision for the Southern Rockies noted that the removal of an ecologically interactive species initiated changes in ecosystem structure by changing various interactions and processes, triggering cascades of direct and indirect changes, including losses of diversity on more than one trophic level (181). Soulé and co-authors wrote that a species was highly interactive when its virtual or effective absence led to significant changes in some feature of its ecosystem (179). In a second paper, examples were given on what was meant by strongly interactive species, as well as how to estimate ecologically effective densities for a sample of species so that they could be maintained above thresholds for ecological effectiveness (180). In both papers, wolves and coyotes were used as examples of a highly interactive species (179,180). Foreman noted in his book that Soulé now preferred the term highly interactive species to cover keystone and foundation species, and that the Rewilding Institute had replaced the term **"keystone"** with **"highly interactive"** for the North American Wildlands Network (2).

Ecologically effective populations

Maintaining viable populations of all native species across their natural range of variation and in natural patterns of abundance and distribution were two of the ecological goals that Noss had formulated for the success of conservation strategies (70). Soulé and Terborgh would later write that the goal of maintaining viable populations of keystone species, particularly large carnivores, had been referred to as rewilding (133). Soulé would then add to the specificity of populations by asserting that the central goal of rewilding was to maintain or restore ecologically effective populations of large carnivores and other keystone species (152). In this, Soulé was setting an ecological objective in terms of population density for the necessary functional traits of carnivores. The Wildland Network Vision for Maine noted that recovery goals for keystone predators and other highly interactive species must consider ecologically effective population density and distribution (176). It would be echoed by Foreman when he wrote about the Thelon Game Sanctuary, that it had all native species present in ecologically effective population densities that were free to wander over hundreds of miles of unfettered land (5). He noted that a lesson from the Thelon was that native species thrived there in more or less their natural density; that highly interactive species, such as wolves, were there at ecologically effective populations so that they played their role in shaping and regulating other species and the ecosystem. He concluded that **"ecologically effective populations of highly interactive species and landscape permeability are the foundation for continental-scale conservation- for rewilding"**

Carnivores

The focus on carnivore reinstatement was grounded in the persuasive evidence that large predators and other keystone species played an important role in ecosystem functioning; that the indirect effects of carnivores on community structure and diversity could be significant; that their elimination from an ecosystem often triggered cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the foodweb; that as umbrella species their habitat area requirements encompassed the habitats of many other species; that the ecological argument for rewilding was bolstered by research on the roles of large animals, particularly top carnivores and other keystone species, in many continental and marine systems where studies were demonstrating that the disappearance of large carnivores often caused these ecosystems to undergo dramatic changes, many of which led to biotic simplification and species loss; that evidence overwhelmingly supported the strong top-down role of large carnivores in regulating prey populations and thereby stabilizing the trophic structure of terrestrial ecosystems by preventing an hyperabundance of consumers; that simple predator/prey models described feedback processes leading to a stable point or stable limit cycle, in which the numbers of predators and prey came to equilibrium or oscillate within circumscribed limits; that efforts to conserve North American biodiversity in interconnected mega-reserves would have to place a high priority on re-establishing top predators wherever they had been locally extirpated; that functional wildlands networks required the presence of their native keystone species, particularly large carnivores, because they stabilized prey and smaller predator populations, and maintained ecological diversity; that the presence of carnivores often played a key role in keeping other species alive; more locationally, that browsing damage from deer was a limiting factor for restoration in National Forests, and culling should be regarded merely as a prelude to the complete rewilding of these forests with cougars, gray wolves and other extirpated species; that land - even in relatively populated regions like most of the eastern United States – could not fully recover from past and present insults and mismanagement unless its bears, cougars, and wolves returned; that the three separate areas of the Theodore Roosevelt National Park should be interconnected, cattle removed, fences taken down so that bison and elk could roam, and wolf and grizzly were restored to their rightful place; that an important aspect of rewilding was the reintroduction or augmentation of predator populations; that when biological and social conditions were fitting, those species missing from the Northeast - the mountain lion, the wolf, the wolverine - should be reintroduced and wilderness would return; that the cougar, because of the cultural animosity directed toward wolves, was the most logical flagship for rewilding eastern North America; the aim therefore of rewilding was to preserve or restore species at the top of the food chain, and allow natural ecological and evolutionary processes to reassert themselves across the landscape; and thus a central goal of rewilding was to maintain or restore ecologically effective populations of large carnivores and other keystone species (46,64, 65,79,96,107,125,128,140,141,150,158,160).

The strength of interaction between species or between trophic levels was a common topic in ecology, but relating it to effective species density was an advance in describing and understanding why rewilding gave such prominence to large carnivores – it would overarch the operational definition given by the scientific justification (5,152,176). As in many continents, it had mostly been strongly interactive species like the wolf that had been extirpated from landscapes in America as an inconvenience to human land use (197,198). Gray wolves currently occupy less than 10 percent of their historic range in America and roughly 30 percent of currently suitable habitat arrived at through modelling (198-200). Cougar (mountain lion or panther) suffered similar persecution and range contraction such that its main distribution is in western states, and is considered functionally extinct in Eastern states, except for the Florida panther (201-203).

One of the non-scientific justifications for rewilding that Soulé and Noss claimed was the ethical issue of human responsibility in relation to the history of persecution and local extirpation of large carnivores, noting that their capacity to recover from over-hunting or extirpation campaigns was relatively limited (107). Because of that, and given their beneficial impact on native ecosystems, there was a need for benign human intervention in the form of translocation or augmentation of carnivores – the reinstatement of large carnivores was a priority, especially as they were umbrella species so that their habitat area requirements encompassed the habitats of many other species (96). Since the wildland system of connected core areas of The Wildlands Project was about rebuilding complete ecosystems/food webs as the best way of protecting all of wild nature on a regional and transcontinental basis, then it was not just about large carnivore conservation, but all highly interactive species. This was exemplified by the Wild Patagonia Reserve Network where it was explained that there were extant large carnivores that in the absence of native prey were thriving on predating domestic livestock (192). It was the native prey, two herbivores, that needed reinstatement, but the overall principle of reinstating the complete range of native species to full trophic occupancy was the same.

Focal species planning

Noss and colleagues had an article published in 1996 in the journal Conservation Biology on carnivore conservation in the Rocky Mountains in which the authors observed that the indirect effects of carnivores on community structure and diversity could be significant, and that as umbrella species their habitat area requirements encompassed the habitats of many other species (96). Soulé and Noss noted that reserve design was based on the needs of focal species, some of which were large carnivores and ungulates, and some of which were indicators of the ecological resilience and restoration of particular systems or processes that had suffered from mismanagement (107). Brian Miller and colleagues explained the role that focal species had in planning and managing nature reserve design because their requirements for survival represented factors important to maintaining ecologically healthy conditions, that focal species analysis was a means to identify high-value habitats, as well as how much area was needed for wide-ranging species (115). Foreman and others wrote that the rewilding approach to science-based conservation area design used carefully selected focal species for planning (102). The list of 28 potential focal species chosen for the Sky Islands Wildlands Network drew together carnivores, ungulates, raptors, rodents, fish, birds and a frog, all of which were either an Umbrella or Habitat Quality Indicator species, or both (102). Foreman associated the use of focal species in the design of reserve networks in the rewilding approach of The Wildlands Project (137).

Three more Wildland Network Designs identified adequate habitat and linkages for populations of focal species as one of the tactics of the three-track planning approach to designing a regional reserve network described earlier by Miller and colleagues (see above (115)) each Design being based on a combination of predominantly Umbrella and Habitat Quality Indicator species. It was explained in the Maine Wildlands Network Vision that its emphasis on the nine focal species selected stemmed from persuasive evidence that large predators and other keystone species played an important role in ecosystem functioning (176). Nine focal species were also used to plan for cores and connections in the Southern Rockies Wildlands Network Design as the habitat needs of their requirements for survival represented factors important to maintaining ecologically healthy conditions (181). The New Mexico Highlands Wildlands Network Vision chose a suite again of nine species that represented most of the region's ecological communities and natural processes, and also addressed the major habitat threats (182). Noss in his checklist for Wildland Network Designs had noted that protecting and restoring populations of large carnivores and other potential umbrella and keystone species was one of the three-track approaches for regional reserve design and had been a dominant theme of all those designs (185). He recommended that that a set of 3–10 focal species was probably optimal in most regions. Walker and others explained that the Patagonian version of rewilding was distinguished from the North American version by the necessity of choosing the locally extirpated large-bodied herbivores as the focal species for the Wild Patagonia Reserve Network, in addition to carnivores, to ensure complete food webs and full trophic occupancy (192).

Food chain, food web, trophic level and trophic cascade

The terms food chain and food web appeared from the start in Wild Earth, most often in relation to aquatic systems as a result of the research by Robert Paine on food web complexity, species diversity, interaction strength and community infrastructure in coastal inter-tidal and sub-tidal ecosystems (204,205). Edward Grumbine, in his review of the scientific roots of biodiversity in the winter 1996 edition of Wild Earth, would use terms like food chains and trophic levels to illustrate how the understanding of ecosystems had moved on from observations of natural history – **“Qualitative, descriptive ecology was being superseded by a more quantitative ecology of energy and nutrient flows, food chains, and trophic levels”** (186). He noted the contribution of Aldo Leopold to this change in his use of the **“new ecological concepts of biotic pyramids, energy flows, and food chains to point out defects in prevailing balance-of-nature perspectives on ecosystems”.** The term rewilding was not used in relation to those aquatic systems, nor in Grumbine’s review, but what Grumbine was tracking was the scientific comprehension and environmental awareness of ecological interrelationships, a critical threshold being the genesis of conservation biology (13). It would be Soulé and Noss who used the terms trophic level and food web in relation to rewilding in their landmark article of 1998 in Wild Earth (107). They noted that one of the scientific arguments for rewilding was that the structure, resilience, and diversity of ecosystems was often maintained by **“top-down ecological (trophic) interaction”** that was initiated by top predators, and that the ecological argument for rewilding was buttressed by research on the large carnivores that showed that their **“elimination from an ecosystem often triggered cascades of direct and indirect changes on more than a single trophic level, leading eventually to losses of habitats and extirpation of other species in the food web”**

Terborgh and co-authors, using the lexicon of conservation biology, described the negative ecological consequences ensuing from the perturbation of ecosystems through the extirpation of top predators as a **“trophic cascade”** from precipitating a rush of **"distorted ecological interactions that, in the long run jeopardize biodiversity”** (128). The article used a panoply of trophic-related terms, but missed out on the opportunity to relate them to rewilding. However, Locke in 2000 noted that the **"aim of rewilding is to preserve or restore species at the top of the food chain, and allow natural ecological and evolutionary processes to reassert themselves across the landscape"** (141). Writing later about the mismatch between industrial forestry and biodiversity conservation, Terborgh noted that restoring landscape connectivity and rewilding were needed on a large scale for recovery of intact food webs-including large carnivores (175). Noss had published a checklist for Wildlands Network Designs in the journal Conservation Biology in 2003 that retraced in detail much of the knowledge and methodology that had been documented in Wild Earth (185). He noted that The Wildlands Project was developing Wildlands Network Designs in various regions across North America, **"based on the goals of rewilding— restoration of wilderness qualities and intact food webs and biodiversity conservation".** Wildlands Network Visions saw the organisation of wild nature in its food chain (176,181) food pyramid (182) food web and apex trophic layer (181) trophic level (181,182) or trophic cascades (181) with that of the Southern Rockies expounding that the removal of an ecologically interactive species could trigger cascades of direct and indirect changes, including losses of diversity on more than one trophic level (181).

A SYNTHESIS OF THE MEANING OF REWILDING

The explanations of rewilding in the four Wildlands Network Visions between 2000-2003 - Sky Islands, Maine, Southern Rockies and New Mexico Highlands - were indicative of the way that the term had evolved and taken on meaning over the years, since they exhibited an updated synthesis of the foregoing axioms (102,140, 142,143,176,181,182,206). Rewilding was commonly framed as the scientific approach to nature restoration and conservation that sought to heal the six ecological wounds, and that emphasized a map-based spatial approach grounded in focal species planning based on species distribution to design a connected wildland reserve system. It was a Wildlands Network Design that was comprised of large, strictly protected, core wild areas on predominantly public lands with intact food webs; compatible-use lands around the cores; and functional connectivity across the landscape by way of wildlife movement linkages; the whole maintaining native species distributions, their natural range of variation and natural patterns of abundance, and ensured the vital role of keystone species and processes, especially highly or strongly interactive species, like large carnivores, at ecologically effective populations, in the maintenance of ecological and evolutionary processes, such as gene flow and exchange, disturbance regimes, hydrological processes, nutrient cycles, and biotic interactions, including predation.

Foreman was to echo the progression in meaning of rewilding in his book of 2004 when he explained that The Wildlands Project and Wild Earth magazine had worked to bring together citizen conservationists and conservation biologists to craft an evolved idea of conservation, and to apply science to the design and stewardship of protected areas (2). A well as working directly with many regional conservation groupings, The Wildlands Project had acted as a source of information for how to carry out reserve network designs, such as an early article in the first Special Issue of Wild Earth that was a primer on how to start designing a regional recovery plan for wilderness; providing a guide for the Wildlands Reserve Design Process based on an assessment of work underway in some regions, and on extensive discussion with regional groups throughout the American continent; a Reserve Design Framework Package to accompany the guide; the article by Soulé about the emerging theme of The Wildlands Project vision of reaching a healthier balance between Nature and human society in which he asserted that it was necessary to cultivate a sense of participation and ownership in Nature protection through personal involvement in the development of regional wildlands networks – it would be a nurturing of networks of people to nurture networks of wildlands; a substantial part of the third Special Issue of Wild Earth given over to articles describing the process of design and implementation of the Sky Islands Wildlands Network Conservation Plan; a checklist for wildlands network designs; as well as Wild Earth publishing numerous accounts from regional groupings of their activities over the entire lifetime of its publication from 1991 to 2004 (71,90,91,93,130,137, 102,140,142,143,185).

Foreman wrote that this ecological renaissance in conservation had come about largely because of new research and theory in several branches of biology (2,137). In a retrospective synthesis of rewilding he saw that six interrelated lines of scientific inquiry had led to the sort of wildlands networks that were proposed by The Wildlands Project and its partners: extinction dynamics, island biogeography, metapopulation theory, natural disturbance ecology, large carnivore ecology, and landscape-scale ecological restoration. Detailed explanations were then given on each inquiry. However, in a later chapter he would foreshorten those (2):

"Our knowledge of the Sixth Extinction tells us what the problem is—the mass extinction of species caused by humans—and what our task is—to stop it. Island biogeography tells us that we can't practice successful conservation in isolated areas but rather that we must look at the whole landscape. Metapopulation theory further warns us that when an isolated, small population of wildlife blinks out, it is unlikely to be reestablished by dispersers from another population. Understanding the necessary role of large disturbance events (such as fire, windstorms, and flood) makes it clear that our goal must be big, self-regulating ecosystems. The role of large carnivores and other highly interactive species in top-down regulation of ecosystems tells us that we need wolves and big cats, and that they need vast, unroaded habitat. And ecological restoration argues that it is not enough to protect wild places—we need to restore their health as well. Together, these six areas of research unmistakably warn us that to halt mass extinction and to have an enduring resource of wilderness we need to protect and restore sprawling wild landscapes with linked populations of keystone species, where natural ecological and evolutionary processes can roll on unhindered into wilderness-forever"

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This etymological history of the early evolution of the concept of rewilding was undertaken because it is not captured in academic literature - It can only be obtained by analysis of the writings of its early developers and their activities recorded in Wild Earth and The Wildlands Project. Wild Earth was a printed subscription periodical, and complete sets of the paper copies can be found in repository reference libraries in America, Australia, Britain, Canada, Germany and New Zealand. A digital archive of Wild Earth has been made available by the Rachel Carson Center for Environment and Society based in the Ludwig-Maximilians-Universität in Munich, Germany. The Rachel Carson Center also provides a digital archive of EarthFirst!, the journal of the environmental group of same name. The Wildlands Network, the successor name of The Wildlands Project, provides a partial digital archive of Wild Earth, as well as digital copies of the first Special Issue of Wild Earth and the Wildlands Network Designs.

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