



# **CHAPTER 39**

## **ASSISTED BIOTIC COLONIZATION TO PRESERVE THE PRESENT BIOSPHERE**

 ***“MANKIND PERCEIVES THAT IT HAS EVOLVED WITHIN A CERTAIN MOSAIC OF ECOSYSTEMS UPON WHICH IT HAS SLOWLY COME TO REALIZE THAT IT IS DEPENDENT. BUT IT ALSO SHOWS A BIOLOGICALLY IMPERATIVE PRAGMATISM WHEREIN WE, ALBEIT ANTHROPOCENTRICALLY, BELIEVE THAT THE EARTH’S PRESENT LIFE-SUPPORTING CAPABILITIES PROVIDE THE BEST OPPORTUNITIES FOR THAT COMPONENT OF ORGANISMS AND THAT MOSAIC OF ECOSYSTEMS WITH WHICH WE MOST WANT TO SHARE OUR LIVES DURING OUR REMARKABLY SHORT PERIOD OF TENURE-SHIP ON EARTH.”<sup>1</sup>***



# SEA LEVEL RISE AND OTHER CONSEQUENCES OF GLOBAL CLIMATE CHANGE MAY NEGATE MANY ECOLOGICAL RESTORATION PROJECTS TO A PREDISTURBANCE OR ECOLOGICALLY IMPROVED CONDITION.





- 🌐 For example: *“Salt water chewed away at thousands of acres of cypress swamp”* in Louisiana, USA.<sup>2</sup>
- 🌐 *“The restoration project — divided into three tiers — aims to restore or protect 57,000 acres of habitat . . .”*<sup>2</sup>
- 🌐 *“. . . ‘as sea level rises, benefits of the federally identified plan diminish and would cease’ under the worst case scenario.”*<sup>2</sup>



# **MUST ANY COMPONENT OF THE PRESENT BIOSPHERE BE LOST BECAUSE ECOLOGICAL RESTORATION WILL BE NEGATED BY SEA LEVEL RISE?**

- ① **No! As the sea level rises, potentially comparable habitat sites will become available inland and, if properly prepared and colonized by appropriate species, could replace all or most of the damaged habitat.**
- ① **Because the present Biosphere is hospitable to *Homo sapiens*, the primary goal of assisted biotic colonization is to keep present ecosystems and their species functional and alive for the longest possible span of time.**
- ① **If the present Biosphere collapses because of unsustainable anthropogenic practices, another Biosphere will replace it in evolutionary time if past events are repeated.**
- ① **Since the species and ecosystems are likely to be markedly different, they are not as likely to be as hospitable to *Homo sapiens* as the present ones are.**


# **SOME PREVIOUS RESEARCH ON CREATED WETLANDS INVOLVED ASSISTED COLONIZATION, AND SOME OF THE WETLANDS HAVE PERSISTED FOR 20 YEARS, WHICH SUGGESTS THE POTENTIAL FOR SELF MAINTENANCE.<sup>3,4,5</sup>**



-  **Assisted biotic colonization requires: (1) a statement of justification, (2) an explanation of the ecological concepts, (3) a detailed description of the goals and conditions, and (4) an explanation of the risks and uncertainties.**
-  **Assisted biotic colonization should be both goal and process oriented.**
-  **All ecosystems have successional processes that require continual colonization of species, so assisted biotic colonization may need to be a long-term management responsibility if no natural sources of colonizing species are within an appropriate range.**
-  **The expected ecosystem services (e.g., biomass production, assimilation of pollutants) should be identified before construction/assisted biotic colonization and verified once the ecosystem has been completed.**









**BIOLOGICAL/CHEMICAL/PHYSICAL MONITORING SHOULD BE A MANDATORY COMPONENT OF ALL ASSISTED BIOTIC COLONIZATION UNDERTAKINGS. MONITORING IN THIS CONTEXT IS “SURVEILLANCE” UNDERTAKEN TO ENSURE THAT PREVIOUSLY ESTABLISHED QUALITY CONTROL METRICS ARE BEING MET (SIMILAR IN PRINCIPLE TO HOSPITAL INTENSIVE CARE AND INDUSTRIAL PRODUCTION MONITORING).**

- 🌐 **A monitoring system is useless unless a rapid response team is available and empowered to initiate immediate corrective action when the previously established quality control conditions are not being met.**
- 🌐 **In the initial stages of monitoring complex systems, both false positive (indication that conditions are deviating from established norms, when they are not) and false negative (indication that conditions are not deviating from established norms, when they are) signals should be viewed as opportunities to improve the monitoring system**
- 🌐 **Monitoring should be regarded as an essential safeguard to ensure that a critical system (e.g., the Biosphere) is not at risk.**

 ***“IF ONE ACCEPTS THE HYPOTHESIS THAT HUMAN SOCIETY’S LIFE SUPPORT SYSTEM REQUIRES BOTH TECHNOLOGICAL AND ECOSYSTEM COMPONENTS, THEN IT IS DIFFICULT TO VISUALIZE SUSTAINABLE USE OF THE PLANET AT THE PROJECTED POPULATION DENSITIES AND EXPECTATION OF AFFLUENCE WITHOUT ROBUST DELIVERY OF BOTH TYPES OF SERVICES.”<sup>6</sup>***




-  Even if assisted biotic colonization replaces lost coastal ecosystems, sustainable use of the planet will not be possible until the nine interactive global crises are eliminated.
-  For example, assisted biotic colonization requires suitable colonizing species, and they will not be available at necessary levels if biodiversity loss and biotic impoverishment continue at present rates.

 **“TO COMPENSATE FOR THE RATE OF GLOBAL BIOSPHERIC DESTRUCTION,” BOTH ASSISTED BIOTIC COLONIZATION AND ECOSYSTEM CONSTRUCTION “MUST BE CARRIED OUT IN A LANDSCAPE CONTEXT WHENEVER POSSIBLE.”<sup>6</sup>**







-  **“Large systems are more likely to be self maintaining” than smaller systems.<sup>6</sup>**
-  **“Economies of scale” are generally available in large systems.<sup>6</sup>**
-  **Large undertakings are more likely than small undertakings to generate public interest, which may offer a degree of protection less likely to occur in small systems.<sup>6</sup>**
-  **Patch dynamics (e.g., shift from a species sink to a species source) is more likely to function in a large system.<sup>6</sup>**
-  **Species dispersion is more likely to be effective in large systems, thus enhancing the colonization rate.<sup>6</sup>**



# HUMANITY'S RELATIONSHIP TO THE BIOSPHERE MAY BE IMPROVED BY ASSISTED BIOTIC COLONIZATION AND ECOSYSTEM CONSTRUCTION IN AN INTERACTIVE URBAN CONTEXT.

-  **Ecological restoration case studies should have significant citizen and environmental organization involvement.**
-  **The process of ecological restoration shares much with assisted biotic colonization, and ecological construction involves a variety of professions and interest groups.**
-  **Considerations in restoration programs include (1) a landscape perspective, (2) adaptive planning and management (analysis of alternative strategies, review of new scientific data, reanalyzing management decisions), (3) evaluation and ranking of alternatives based on an assessment of opportunity-cost rather than on traditional benefit-cost analysis, (4) the objective of returning an ecosystem to a close approximation of its condition prior to disturbance, (5) agencies to coordinate restoration programs in local areas, and (6) a unified strategy for all involved.<sup>7</sup>**

# **SCIENTISTS, RESOURCE MANAGERS, POLICY ANALYSTS, AND DECISION MAKERS MUST BE INVOLVED INTERACTIVELY IN DESIGNING RESOURCE MANAGEMENT PROGRAMS.<sup>8,9</sup>**

-  **Humanity should be using both a landscape and global perspective for all biospheric issues, but is poorly prepared to do either.**
-  **Academe is divided into “*zealously defended specialized tribal units*” (disciplines).<sup>10</sup>**
-  **The financial component of human society is divided into tribal units with a strong focus on economic growth and profit.**
-  **Political subdivisions (e.g., townships, nations) have a strong motive to optimize the well being of a particular region as opposed to the common good.**
-  **Other special interest groups usually have a single major focus.**
-  **All the above serve a useful purpose or they would not exist, but consilience is rarely one of the strong points.**

# AS LONG AS DAMAGE TO THE BIOSPHERE EXCEEDS REPAIR, HUMANKIND IS IN GRAVE DANGER.

- 🌍 The Biosphere is a large, interactive system, and repairing only parts of it is not enough.
- 🌍 The basic units of the Biosphere are species and ecosystems, and the extinction of species initiates irreversible damage to an ecosystem.
- 🌍 The Biosphere is the source of renewable resources, without which the human economy will crash.
- 🌍 *Homo sapiens* evolved in the present Biosphere and is a part of it — not apart from it.

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## References

- <sup>1</sup>Curry, R. R. 1977. Reinhabiting the Earth. Pages 1-23 in *Recovery and Restoration of Damaged Ecosystems*, J. Cairns, Jr., K. L. Dickson and E. E. Herricks, ed. University Press of Virginia, Charlottesville, VA.
- <sup>2</sup>Snell, J. 2012. Concern about rising seas threatens MRGO restoration. Fox 8 Live 3Aug  
<http://www.fox8live.com/story/19184484/concern-about-rising-seas-could-doom-part-of-a-major-coastal-project>.
- <sup>3</sup>Atkinson, R. B., C. E. Zipper, W. L. Daniels, and J. Cairns, Jr. 1997. Constructing wetlands during reclamation to improve wildlife habitat. Virginia Cooperative Extension Service Publication 460-129, Virginia Tech, Blacksburg, VA.
- <sup>4</sup>Atkinson, R. B. and J. Cairns, Jr. 2001. Plant decomposition and litter accumulation in small depressions; functional performance of two wetland age classes that were created via excavation. *Wetlands* 21(3):354-362.
- <sup>5</sup>Atkinson, R. B., J. E. Perry and J. Cairns, Jr. 2005. Vegetation communities of 20-year old created depressional wetlands. *Wetlands Ecology and Management* 13(4):469-478.
- <sup>6</sup>Cairns, J., Jr. and J. R. Heckman. 1996. Restoration ecology: the state of an emerging field. *Annual Review of Energy and the Environment* 21:147-189.
- <sup>7</sup>National Research Council. 1992. *Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy*. National Academy Press, Washington, DC, p.4-5.
- <sup>8</sup>Holling, C. S. 1978. *Adaptive Environmental Assessment and Management*. John Wiley & Sons, New York.
- <sup>9</sup>Walters, C. 1986. *Adaptive Management of Renewable Resources*. Macmillan, New York.
- <sup>10</sup>Cairns, J., Jr. 1999. The diminished charge on the intellectual electric fence. *The Social Contract* 9(3):spring issue.