OCEAN EARTH ACTIONS ON WATER

1. Cartographic inventory of all saltwater basins, including ocean-stream and regional-seas basins, in the world.

Since water flows downward, and since it carries nutrients and salts during its passage until it reaches a lowest point, Ocean Earth has charted all the catchments, or basins, within which waters carrying nutrients and salts could collect. This practice was well underway at the founding of the company, in 1980. The founder, Peter Fend, had been interested in charting saltwater catchments, such as the Gulf of Mexico or North Sea, as opposed to simply river catchments. By this means he thought he could account for all terrain and all water flows from terrain towards the sea (or salt lakes). At the time he began, he consulted with scientists at the Columbia University oceanographic institute, and they said that such ocean-basin mapping was conducted also by scientists in Russia. Fend was introduced to some of the scientists, from the Hydrometeorological Institute of Leningrad, and he concluded that. (1) his mapping, using Lambert-projection aeronautical charts, for geometric fidelity, was possibly more accurate; (2) he was evidently alone in the West in this survey work, and the East was, well, competition, so one may as well press on.

From the outset, in 1978, this basin-mapping has been consistently the most popular of all outputs by either Fend or Ocean Earth. In part, this results from a common view that the maps are "political." The producer is then labeled as a "political artist", in line with the spirit of the 60s and 70s. However--and this is vital--the ocean-basin maps intrinsically have no political content. They are documents of oceanographic and hydrographic facts. Their shapes are based solely on lines of maximum elevation, outside of which water cannot flow towards the same basin. Any "political" significance results solely from the historical fact that the basins have been inhabited, and that peoples wtihin each basin have contested the delineations of property for millenia. In collaborations with scientists, such as the Meteo-France satellite specialists who worked on monitoring the Iberian Currentn slope, we have found the maps to be used with no political significance.

The ideas leading to such basin mapping come from recent art. They come, more precisely, from practical questions of where to site large earth art projects. In 1977, when Dennis Oppenheim was requested to design earth works for Shah of Iran (shortly before the expiration of the Consortium concession, and therewith his fall from power), I conducted research on sites in Iran. I learned that Iran has many saltwater lakes and basins, each one with a salt flat and desert, and that each basin could become a microcosm of a circulatory system, a hydrologically-enclosed environment for earthworks in the Smithson-Oppenheim tradition. Relying on detailed maps published by the Cambridge University Press, I charted the different basins of Iran, then extended this to charting the Caspian Sea and Persian Gulf Basins. I showed these charts to all the different Iranian political factions I could find in New York and Washington: I showed them to the Embassy, and I showed them--with much more fruitful discussions and treatment--to several of the revolutionary, anti-Shah groups. No choices were made in to whom to show the basin charts. The questions were, What do they know about such basin outlines and the interior conditions? What do they think of such territorial analysis? What do they know about saltwater and freshwater processes in these basins? Where would they recommend that we work? Also at that time, Maya Hoffman expressed to Oppenheim and his then-dealer John Gibson a desire to build large hydrology-changing earth works on her property in the Camargue, a large marsh area near the mouth of the Rhone famous for its wild horses and birds. To determine the impact of any such project, I mapped the entire Rhone basin in the physical context of the western Mediterranean, and thereafter the entire Mediterranean. Other art-world sources justifiying such work, which were often cited, included (1) Jack Burnham's analysis of the ground over and against the pedestal, in "Beyond Modern Sculpture," (2) Burnham's analysis of earth art as related to the Marchand de Sel, a nickname for Marcel Duchamp, in "Great Western Salt Works," (3) Bruce Nauman's concavity

Adriatic Sea and, along its bird-flight nutrient corridor, the Baltic Sea. The first exhibition was at the Aperto in the 1993 Venice Bennale (along with TV monitors showing satellite observation of ocean bioproductivity and sea-surface temperature). The most recent exhibition was at a museum in Maribor, Slovenia, this past June; the exhibition has occasioned a series of discussions in Slovenia, chiefly with scientists at the Institut Josef Stefan in Ljibijana, about tests of the rig, attendant satellite monitoring, and harvesting leading to industrial-gas producction, all along the very small coast of Slovenia. The main instigator of talks, using his decades of scientific and image-processing contacts in Slovenia, has been George Chaikin.

Progress has been at least as difficult as it has been for other world-rank pioneers, like Dr. Wheeler North at Caltech, Dr. Neushul from UC Santa Barbara, Dr. Wilcox from the US Navy Undersea Warefare Center and General Electric, Dr. Fang from the People's Republic of China, Dr. Brinkhuis from the State University of NY at Stony Brook, Drs. Perez and Kaas at the Institut francaise de recherche pour exploitation de la mer. All of these pioneers have either died or left the field. The main problem, at least according to Drs. Perez and Kaas, and--we conclude from his 29 March letter to us--Dr. North, has been Vested-Interest Opposition.

The French scientists, for example, were forced to stop their highly-successful experiments with Macrocystis in the mid-1970s, due to sharp objections from the United Kingdom, led by a Dr. Gerald Boalch of the marine laboratory in Plymouth. Working with the British Admiralty, Dr. Boalch has campaigned for decades--with considerable global effect--against any giant-algae industry, particularly one with high-growth plants like Macrocystis, on grounds that such would, like agriculture, alter the biochemistry and speciation of the oceans, with probably damaging results. A first effort at large-scale cultivation of giant seaweed was made in Scotland in 1950, but that was immediately stopped by the Admiralty, then on grounds that it would impede both military and civil navigation We think the true grounds are geopolitical: the British Admiralty does not want to undermine its achievements in the 20th century, namely of making global access to liquid or gas hydrocarbons dependent chiefly on the Anglo-American control of naval passages to remote sites like the Persian Gulf, Venezuela, Indonesia, Nigeria and so on. We conclude thus from the following facts:

a. The British military has itself been the world pioneer in giant algae harvesting, specifically of Macrocystis. During World War I, it cleared out a large portion of the natural Macrocystis crop in southern California, to assure a supply of potash for gunpowder (supplies in Germany were of course unavailable). It learned all the dynamics of giant-algae growth, including the important fact that such algae do not, unlike the harmful, eutrophicating species, "spread". In sum, the British military has known full well the industrial potential of giant algae, but has chosen to make its development illegal. It has succeeded, for example, in effecting a blanket prohibition throughout the European Union.
b. In Australia early in 1995, we attempted to deal with naturally-existing stands of Macrocystis and Ecklonia, linking up with relevant scientists and even working out details of submersibility in the offshore rig with a proposed manufacturer, Australian Submarine Industries. But suddenly some of the scientists made an abrupt about-face, writing that they could not work on such a project, and soon after a man from the Australian Defense Intelligence Organisation told us that no such project should be undertaken now, or even be publicized, as it might jeopardize the vital relation between Australia and countries like Japan with exports of coal. We left the country frustrated, and our last outdoor site proposal, for working with the color qualities of a kerosene-rich freshwater algae, was met with a letter that such would be politically unsuitable.
c. In Australia also, as we found out with some research following discussions with the military-research institute on biological sources of kerosene (that freshwater algae), we learned that the pioneer in this field, a Dr. Basedow immigrated from Germany, had campaigned for such renewable hydrocarbon energy from as early as 1912, but was continually frustrated--as he said--by visitors from Great Britain. He died of murky

causes in 1935, and the next year those visitors from Great Britain established the (still British controlled) government's "Oil Control Board."

d. In early 1994, efforts were well underway through a contract with Inga Svala Thorsdottir to start a giant-algae system in Iceland. We told the government of the EU rules against such a system, but they said they would decide the matter on their own. They were also interested in our proposal, then being discussed at the French Embassy, to bring in the French scientists Drs. Kaas and Perez, pursuant to our understanding with them that they work wherever we could find a suitable and permitted site, at near zero expense to us. But when I was in London, I received a warning from Dr. Boalch personally. He said, "I've heard about this project you want to do in Iceland, and we are going to stop it, even if it means using the UN machinery to do that." The problem, underscored by Boalch, is that any introduction of species, or other such change in speciation, would be blocked. We are not, he said, going to be allowed to start destroying the ocean. For these reasons, we turned out attention to where Macrocystis, in particular, was abundant: the temperate Southern Hemisphere.

e. Late in 1994, on the eve of a departure to Australia in this effort, I telefaxed a summary of our strategy, entitled "Global Action," to the two main colleagues at that time, Inga Svala Thorsdottir (with a presence in China as well as Iceland) and Rob Scholte, who was most interested in sites in Tenerife (at his residence) and Japan. Less than two weeks later, Scholte was car-bombed. I visited the Dutch Embassy in Paris (where I was at the time) to present some possibly useful background information, and they told me to go visit the police in Amsterdam. I did so, for a two-week duration. I also visited Rob. Much has been said, this way and that way, by sources in Holland, in France, in the US. The true cause of the bombing will remain officially unknown. I only know the main effect for us: a serious financial and structural setback in efforts to set up giant algae system. Such is most clear in the interview published of Scholte in Blvd., appearing in January 1995 but actually conducted before the bomb-attack, in November. Therein, Scholte boasts of his engagement with "architect Peter Fend" in Giant Algae System, a James Bond adventure or "Mission Impossible." He also declares an intention to start the project in Japan. Beforehand, we had warned him that the geopolitical implications of launching a post-mineral-fuel energy system in Japan might be too daunting for the Western alliance.

f. In 1996, Ocean Earth was invited to Japan to present the Giant Algae System. By good fortune, sufficient funds were amassed to pay the naval architect for much-more thorough technical drawings, leading to a capacity to build not just a model but a sea-worthy rig. But by misfortune, our patron--the Tokyo Metropolitan Government--judged that funds could not be used to build the real rig, as was intended, but must only be used to build a maquette version of the real rig. The rationale was that since we were "artists" and since they were sponsoring an "art exhibition," any entry into real-world practices could not be sanctioned. Such would constitute a policy step by the Government. The same rule was applied to canceling our use of videotapes of our conversations with Japanese marine officials about how and where one could install the real rig in Japanese waters, mainly near Tokyo. No real-world voice has been allowed. However, at least we have the technical preparations for building a real test rig, and at least we have made arrangements with fabricators (in Denmark), leading to construction already of certain parts.

g. Early in 1994, in an exhibition at the Marc Jancou Gallery in London, scenarios for giant-algae industry were presented, with table models and ocean-basin maps, for Great Britain and the Ukraine. Scenarios were also presented for hydrological engineering and marsh-meander development projects high upstream on the Yangtze, Nile and Vardar (Macdeonia) rivers, to be coordinated with large coastal marsh projects affording large fish and algae populations offshore, in Giant Algae System. On the opening day of the exhibition, the Wall Street Journal ran a front-page story about the ecological and economic dangers in the current Chinese Yangtze development scheme, namely the giant Three Gorges Dam project. This project, as I was learning then, had been pushed upon the Chinese Government in 1986 by the Canadian

foreign-aid agency. Of course it had been envisioned by people like Sun Yat-Sun, from long ago. But the notion of going ahead, as I was discovering, seems to have come substantially from foreigners officially linked with... the British Crown. The London exhibition was substantially reduced on the day before and after the opening: most the work regarding the British Isles and Chernobyl was removed; nearly all news articles meant to underscore the exhibited works were removed; any citations about the Three Gorges Dam and its history were removed. I published a renunciation of the exhibition in "Art Monthly"; the dealer, in turn, was incensed when he learned that I had sent copies of the show description to project investment companies and the Chinese Embassy. Clearly, in outlining alternatives to current energy scenarios, like those adumbrated by the London-based "World Energy Council", is to invite censorship. We send a copy of the text describing works in the exhbition, at least as regards China. showing how prescient was the presentation vis-a-vis the 1998 events there.

h. In Eastern Europe and Russia, first on our own initiative (1996) and this summer (1998) on a Soros Foundation Artslink Grant, we found engineers able to execute the technical drawings for the Giant Algae System, and we have lined up facilities for manufacture. Then we learn that the gas or petrol companies with which we are speaking are also receiving visitors from Chevron (Standard Oil of California), from driling and exploration companies in London and Aberdeen, and from British Petroleum. Their advice to the Russians and Eastern Europeans: don't bother with renewable energy, just concentrate on exploration and development of the fossil reserves. This does not cancel our overtures, but it does blunt them. In one case, we know of a British expert specifically saying our proposals shoud be "tabled", i.e., not be discussed. This, in spite of the fact that Russia, for example, has more nutrient-rich cold waters suitable for brown algae growth than any other country in the world. We cite, for example, the Sea of Okhotsk (Sakhalin construction sites), Barents Sea, Bering Sea, and Sea of Japan (together with Korea). Result: what goes on now in eastern Europe is secret, within communication circles probably not visible to western monitors.

i. Given that the heyday of giant algae research was in southern California during the 1970s and early 1980s, and given that natural conditions there (despite the WW I mass clearing by the British) are good, one would have thought that experiments in southern California could be conducted with ease. After all, there had been work sponsored by General Electric, by Southern California Edison, by the US Navy (fuel for ships away at sea), and especially by an independent company on the Santa Barbara Channel. But all the efforts have come to nearly nothing. Visits were made to Southern California in October 1994 (in tandem with efforts by Rob Scholte), and then in April 1998. These facts were discovered. (1) A French scientist, despairing of difficulties with the EU, left France and ventured to set up a giant-algae system in California, but he encountered so much bureaucratic red tape that he has ended up only being albe to build offshore fish habitat with spare tires and cars. (2) The independent company, named after its founder Dr. Neushul, had concentrated on building a near-shore industry, but this has failed so far, largely due to regulatory barriers, despite their being numerous near-shore structures (in the Santa Barbara Channel) for petroleum. Dr. Boalch told me he wrote a report on Neushul's venture and how it was "too idealistic." (3) Major legal battles are shaping up on use of the California coast, one issue being that the environmentalists have access under state law to only a 3-mile zone, while the oil companies, etc., which get concessions from the US Government, can have access to an "economic zone" extending from 3-miles on to 200 miles out. (4) As reported to us by scientists at the marine-algae center in Monterey, the only development work now with Macrocystis or such brown algae is in China--where the plants, despite whatever Dr. Boalch might say--would be introduced. (5) As reported to us by the frusttrated pioneer Dr. Wheeler North, who for some years seemed (according to the NY Times and world press) to be on the verge of building a new resource industry, the only serious projects now pending (not underway) in the United States are extremely vast enterprises requiring huge amounts of capital, inaccessible to any villages or cities on the coast. One project, now awaiting final approval in Washington, would be for an algae

as exhibited in his famous 1977 three-gallery exhibition, as a paradigm for sculptural practice; (4) Meg Webster's water-collecting bowl, discovered much later, in the mid 1980s; generally, the work of Robert Smithson. The viewpoint was architectural. If the earthworks are art, then what would be the architecture ensuing therefrom? What would be the space which can accomodate such earthworks? That space, architectural analysis concluded, would be the saltwater basin. This thinking crystallized, leading to the first earthworks schedules for multi-structure and multi-site construction (exhibited as "Earth Net: An Economic System" at Caltech in 1978), during a frenzied night of work immediately following a lecture by architecture historian and critic Vincent Scully at Columbia University entitled "Garden & Fortress: The Shape of France." It was clear, from an architectural viewpoint, that a logical successor to the French nation carre accomodating formal garden designs would be the saltwater basin accomodating 20th century earth art "saltworks" projects. Throughout, the logical process has been architectural, based in art, rather than political.

A complete set of ocean-basin charts at 1:2,000,000 scale, organized in a geologically-correct spiral array emanating from the Bering Sea, was produced for the Global Forum conference in Manchester in 1994. All the works, entitled "Global Spiral", are now with Rob Scholte bv for a publication venture.

Analysis of the relation between the Arctic Ocean and the Antarctic Ocean, initiated during those meetings with Russian scientists, particularly ones from the Arctic and Antarctic Research Institute of Leningrad, led during the 1980s to a modeling of the Atlantic Ocean as a trans-polar ocean pump. In recent years this analysis has been broadened to include the other main oceans of the world, namely the Indian and Pacific Oceans. The result is a map of the world centered not on the North Pole, as is conventional (e..g., with Buckminster Fuller or the UN), but on the South Pole. All ocean basins, including hte interior basins of Asia, Africa and the Americas, are incorporated in this Antarctic-centered global map. Geometric projections are based on separately photographed ocean basins, mosaiced with the Lambert-projection 1:2,000,000 aeronautical charts, so the scale of distances is quite uniform. Chart enclosed.

2. LANDKRAFT. Given that soil and wastes are carried down to the sea, and given that these outflows gradually accumulate, we conclude that a comprehensive soil harvesting program for an ocean basin should include the systematic,non-depletive havesting of the ocean organisms which can take up the accumulating nutrients: fish and algae. In 1995, at the Kunstlerhaus Palais Thurn & Taxis in Bregenz, we presented this ocean-basin centered form of resource extractoin as "Landkraft." It would be distinguished from "Wasserkraft", which exploits the energy of falling water, "Kernkraft", which relies on radioactive elements for power, and what might be called "Fossilkraft", which also on accumulate organic materials, but from eons ago, as stored up in sedimentary deposits. Our aim has been to capture the accumulating nutrients in living tissue, and harvested animals and plants, before they become sedimentary deposits, and in phase with the natural cycles of carbon absorption and release. In sum, we seek the development of a highly efficient, comprehensive marine-biological industry.

The concept first appeared during the 1970s, with news reports of scientists in California and France attempting to set up giant algae farms, using chiefly the mammoth, floating brown algae, Macrocystis, in order to produce various industrial and nutrient products, the most prominent of them being Clean Fuel. The fuel would result from fermentation or other chemical conversion, either as Hyodrogen or as Methane. Over the decades, we have met with and correspondend with most of the prominent pioneers in this field. Since early 1993, with then a long-term support from the FRAC Poitou-Charentes and the Ministry of Culture in France, we have surveyed all past efforts, then worked with a naval architecct to design a relatively-small, mass-producible rig for the growth far from shore of giant brown algae, preferably Macrocystis, with consequent fish habitat for commrcial fishing. Preliminary models of the offshore rig were produced in France and, with a subvention from Peter Weibel, in Austria. The latter model has been targeted on sites of interest to Austria, notably the

Ocean Earth has reasoned that the art world could be a sound basis for public appeal. Joseph Beuys had called himself "Chief of the Hunters." Video art and other digital arts lent themselves to handling the masses of aerial or satellite data needed for large scale ecosystems management. Earth art, such as Heizer's negative cuts and Oppenheim's Death Hole and Branded Mountain, seemed to indicate specific construction vocablaries for a landscape accomodation large numbers of wild animals, ready to sustainably crop. In 1984 in Paris, after showing its satellite imagery of giant structures in the Persian Gulf to the then mediating diplomats, from Algeria, Ocean Earth was asked if it could fraw up plans for use of the military in Algeria to help restore the Sahara to its pre-neolithic state, namely, animal-rich savannah. Hitherto, only one exhibition had been made on this subject, at the California Institute of Technology ("Earth Net: An Economic System") in 1978. Not until 1994 could a second exhibition be made with this intention, at the then Galerie Metropol in Vienna. The art-academic system, together with the cycles of the art market and art-world taste, had provided no basis for exhibition or promotion of such ideas about earth art. (One resounding source of resistance, in 1979, despite the recommendation of Jenny Holzer, was the heads of Artists Space in New York.) Even after the 1994 exhibition, which presented a scenario for earthworks engineering in the Grand Erg Oriental of Algeria, as connected by bird-insect nutrient pathway with Austria and Baltic Europe, there was substantial resistance to this attempt at a practical, technological usage of High Art. Prominent collectors expressed strong disapproval over what we were attempting to promote . Especially after the London version of this exhibition, with earthworks presesnted as de-desertification constructions, the art reviews (e.g., Artforum, September 1998) were hostile.

The strife can be summarized in this phrase by a collector who became hostile to the work after being told that our intention was to produce such earthworks worldwide, as forms of hydrological and ecosystem engineering: "God forbid anyone would build something like Litghtning Field twice." (Lightning Field, as Walter De Maria confirmed to me, has interested some scientists as a means for building up higher-species immunology; or, why should an intuitive innovation not have practical psssibilities?) To this collector, a Harvard-trained art historian, the uniquness of an art product was vital to its museological and archival worth. But for the writer her, speaking on behalf of an attempt, styled after the Futurists and Russian Constructivists, at corporate practice of art and at industrial-scale realization, the reproducibility and multiple-diffusion of a first art probbe was more vital to its worth. After all, we reasoned, the Greek temple has not become valuable in art history because it was built only once.

At this point in art history, and in the traditions of collecting and exhibiting dominant in cities like New York, we have started to approach directly, outside our US context, the foreign ministries or science and technology ministries of various sovereign states. The sheet labeled "Global Action" shows, in summary form, what we are now tendering to the foreign ministries of Austria and certain other countries which have shown interest, like Slovenia and Algeria. In addition to the Giant Algae System projects, which have been described above (Part 2), we have been focusing on projects concerned, ultimately, with freshwater. Nearly all the projects have been essentially hydrological. They have been designed either to help concentrate and stabilize underground aquifers, in de-desertification schemes using oases as nutrient-transfer nodes, or to help push freshwaters past salt-lake concavities or sloughs on to the ocean, where they can enter the overall ocean-air global hydrological cycle.

Rather than describe each project, we set forth our working assumptions, our essential propositions, from which the respective projects would be site-specific manifestations. These assumptions, or propositions, are not universally shared. They have been hotly contested, sometimes directly at us. Our reasoning is our current best defense.

I. Rivers are not water. They are more like blood, in that they contain virtual nutrients, minerals and even organisms, all required for the biological well-being the areas in which they flow.

amount of the waters and nutrients flowing into the ocean, but without that flow the ocean would soon start breaking down.

This is a bold assesrtion. A Dr. Derek Spencer at Woods Hole, now deceased, had told us in 1983, when we were doing an Amazon project for Turner Broadcasting and The Cousteau Society, that the Amazon, even as a giant river, was only a "drop in the bucket" of the ocean. It had no important consequence. Fortunately for us in our work with Cousteau, there were scientists at Princeton who took an opposite stance. They argued, as did we, that rivers are the major source of nutrients and mixohaline waters for the breeding grounds where much marine life spawn, and that rivers create a dynamic in what might otherwise be a static system. We speculate even that the influx of freshwater and new nutrients, incorporated often in coastal marshes and estuaries, as super-organisms on their own, might explain how through all the eons the ocean has maintained a constant volume. Neither do the seas grow steadily larger, nor do they evaporate and then dissociate into separate atoms of hydrogen and oxgen, causing a drying up. Rivers, washing off one-time seafloors back down to the sea, with literally "fresh" waters, might be essential to this constancy. They depend in turn, of course, on precipitation.

III. Deserts, where rivers and streams are scarce or non-existent, may be practically judged to be man-made. For the globe overall, they are harmful. They should be un-made, particularly wherever they have been man-made.

Prompted by the Vincent Scully 1977 lectures on "Garden & Fortress: The Shape of France," this writer--already accustomed to view processes historically--reasoned that Earth Art, as a successor to Renaissance or even Romantic landscape paradigm, would spawn an entirely new practice in landscape design and development. The logic was that if visual paradigms from Alberti and Micelangelo could culminate in French gardens and defense systems, then visual paradigms from Smithson, Oppenheim and Beuys would culminate in a process-art treatment of terrain as ecoystem, and of defense as based in outer space. What would be the architectural--that is, practically constructed--consequences of Earth Art? This question was answered with a sudden flury of drawings, produced in a construction sequence, for the restoration of desiccated and ruined ecosystems through precision-sited earthworks based on the ideas, or consruction vocabulary and attitudes, of Earth Art.

Worldwide today, as we all know, there has been an unprecedented destruction of living terrain. Some of the destruction is due to pollution. Most of it, however, is simply due to large-scale, commodity-directed agriculture. Given what we understand from scientific studies about agriculture versus multi-species, wild systems land use, the destruction and drying up the uplands does not result necessarily from the quantity of human beings on Earth. It results, rather, frrom a large quantity of human beings on Earth persisting in a use of land and water which wastes both and replenishes neither.

The ocean is vast. It might even survive our abuses of it, providing we stop soon enough. What would make us stop, what serves as the limiting factor in our continuing as we have, is less what we might do to the oceans than what we might do the seafloors upheaved now above the oceans. Our survival will probably depend more on how we restore the vigor of the upheaved lands, the dry-land upon which we live, than on how we prevent destruction of the ocean. For at the rate we humans are proceeding with agricultural conventions on the upland, it will be denuded of vegetation, of topsoil and of abundant freshwater. This process happened in the Fertile Crescent. It happened in North Africa. It is happening now in western China. It is happening in the Great Plains and West of North America.

Sensing this problem, forward-thinking Americans like Robert Smithson, Michael Heizer, Walter De Maria and Dennis Oppenheim all went out to the desert, out to the drying up grazing lands, out to the West as long-known, and undertook what critic Jack Burnham called "Great Western Salt Works." Of course the artists were not all conscious of what might be scientific or

ecological implications of their work. Such is not required of them. But two of these artists had fathers with professional careers in hydrological engineering. Their independent lines of activity would of course grow in a dialectic with what their fathers had done before. The father of one, Oppenheim, had been a chief engineer for the largest power and irrigation dam project in the United States. One of the effects, after the initial wonders of irrigation, has been a saltificatio and drying up of large stretches of watered terrain. The artist focused on this with his late 1970s outdoor works with air-viewed labels like "Dryed Up." He went on to deal with responses earnestly, but again probably not so consciously, with his proposals for Iran in 1977.

An ecological and hydrological analysis of those works proposed for Iran, or somewhat different works proposed during the same late-1970s for California's Central Valley and southern deserts, or other works simply site-labeled for "Western United States," has led this writer to the belief, informed by the remarks of many scientists consulted, that these works, if built repeatedly as conceived, could function as practical structures for helping save marshlands, helping restore and build up oases and other animal-plant convergence zones, and help revive once-flowing but now sporadic rivers. A detailed report on many of the art-generated projects or porposals can be made, e.g., of "Dry Wells" or "Bird Cages" or "Dead Furrow."

Other artists' works also contribute to the body of potential architecture. Lightning Field, by Walter De Maria, has been assessed by scientists to be a design for building up immunological polarities for higher species. Robert Smithson's Amarillo Ramp, together with Spiral Jetty, have been vital to designing systems which accomodate fluctuating freshwaters and accumulating salts. But rather than delve into the details, we shall list the types of projects derived from these Earth Art projects, all useful to the restoration of freshwater cycles on the uplands, upstream from the oceans to which they descend.