Documents written by Robert E. Jenkins at The Nature Conservancy, 1972 to 1992

These were provided from Archives at the TNC Library of Arlington, Virginia, in Jan 2003, thanks to Regina Perkins and other staff at that time. These documents are reformatted below in Times New Roman, 18-point font and landscape view; for originals see associated pdf. REJ was hired by TNC in 1970 but forced out in 1993. For further information about this remarkable man and his writings, see the following references.

Chapter 27 "Information Management for the Conservation of Biodiversity" in: E.O. Wilson, Harvard University, Editor; National Academy of Sciences/Smithsonian Institution. ISBN: 0-309-56736-X, 538 pages, 6 x 9, (1988). <http://www.ncbi.nlm.nih.gov/books/NBK219306/>
"The Natural Heritage Data Network is the furthest thing imaginable from a proprietary enterprise. It has been developed with the goal of serving the needs of anyone and everyone involved in the conservation of biodiversity, all of whom are cordially invited to work with the various operating units within the system as much as possible in the furtherance of the system's purposes and of their own."

"Robert Jenkins Accepts the 2010 NatureServe Conservation Award part 1 of 4"
<https://www.youtube.com/watch?v=3ABduiyv5Ic>
<https://www.youtube.com/watch?v=j84eCFNlnRA>

NatureServe, Jan 2, 2015: "We're Attempting to Build a Second Ark".
<http://www.natureserve.org/news-events/stories/were-attempting-build-second-ark>
"Confucius taught: 'The beginning of wisdom is to call things by their right names.' And Ghandi said: 'I once thought God was truth; now I think truth is God.' For something to really work, you have to get it almost exactly right. And the best approach to perfection, I believe, is incremental successful approximation—the Heritage concept in a nutshell."

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A PROPOSAL FOR SUPPORT IN CREATION OF A NATIONAL NATURAL AREAS INVENTORY AND DATA BANK

Submitted by: The Nature Conservancy [Robert E. Jenkins, ca. 1972]
1800 N. Kent Street
Arlington, Virginia 22209

PROPOSAL

At present the information on natural areas is so scattered, incompatible, and incomplete as to be of very limited utility to the action-oriented preservation movement. Synthesis of this information into a national natural areas inventory and data bank would fill a widely-felt need, involve the cooperative efforts of all the key natural areas organizations and agencies, and produce an organized body of data which could be maintained and used for a variety of purposes. The Nature Conservancy requests a grant of $154,730 over a three year period to establish such a data bank.

NATURAL AREAS INVENTORIES

One of the most important reasons for preserving natural areas is that they serve as reservoirs for a tremendous diversity of natural species and environmental features which cannot be saved in any other way. An analogy may serve to illustrate the importance of this function. Elements of natural diversity may properly be regarded as items of information and a collection of natural areas of many types as a library. Each datum in that library is a potential or actual contributor to human well-being and/or the health and stability of the ecosystems upon which we all depend. Each deletion from this library of life means that there is another question which can never be answered. As unanticipated questions arise, often from a critical need, the

only place we can turn is to the ecosphere. Thus it is critical that we save as encyclopedic a collection of this natural data as we possibly can. But while the smallest library has at least a card catalog, and larger ones have more sophisticated systems for avoiding losses and facilitating retrieval, the largest information storage and retrieval system mankind is ever likely to encounter hasn't yet even the simplest comprehensive index to its broader categories.

Some progress has been made in this direction. The initial steps have included a number of natural areas inventories. The first major survey of this type was conducted by the precursor body to The Nature Conservancy and published in 1926 as a "Naturalist's Guide to the Americas." Since that time there have been literally scores of inventories undertaken along related lines and some have been very useful. There are some state inventories, for example, which list protected areas and their characteristics. Utilizing certain classification systems (such as those for vegetation associations) in comparing these with the lists of prospective areas makes possible selection of new areas specifically to fill gaps in the system. Such a compendium of information is also useful in organizing management activities and heading off threats to existing preserves. The Nature Conservancy continues to participate in many of these inventories and has made extensive use of the assembled information.

There are some major shortcomings to this inventory process, however, at least as so far practiced. The surveys have not been comprehensive and nearly all of them have employed recordation and storage procedures which defy efficient maintenance and revision. They have corresponded, in the library.analogy, to indices for specific volumes whereas the entire library lacks a card catalog, or better, an effective and flexible/data management system. Because of the rapid aging of data;the differences of approach and definition; and the welter of over-lapping, conflicting, incomplete, and scattered surveys, the question of cfata management and

retrieval in the field is an absolute nightmare. It can be honestly stated that it is presently impossible to answer even the simplest and most obvious question about the status of natural areas preservation. There is no one who could say, for instance, how many prairie sites are being preserved in this country much less what characteristics might be common to a certain number. It would take months to answer any single question of this kind, the result would be of questionable accuracy, and the constantly changing situation would make the answer even less meaningful after any passage of time. Needless to say, preservation efforts are severely hampered by these deficiencies.

SYNTHESIS AND DATA BANKING

What is needed is a nationwide synthesis of the available and continuously growing body of information into a data bank permitting rapid retrieval, revision, and manipulation. This idea has been discussed for some time and there have been a few tentative beginnings which have collapsed for lack of coordination, leadership, or funding. It must be admitted that competition between groups and individuals has played a destructive role as well. Private action has been prevented by the prospect of well-funded programs under agencies of the federal government. There is an almost perennial reintroduction of proposed legislation to create a national natural areas system with the allotment of millions of dollars to implement national inventories and a registry. No such legislation has ever passed and present signs scarcely indicate that action is imminent. Over the last two years, however, a cooperative movement has been growing which sets the stage for initiation of a successful data banking operation.

A good bit of this cooperative movement has been due to Conservancy initiative, and has. involved both private and governmental groups. The International Biological Program's U.S. conservation section has been conducting several inventories and the participants have begun to

realize that they must avoid the pitfalls caused by aging and unmanageable data. Some reprograramed funds from .an IBP grant have been providing temporary support for pilot experimentation already under way. Part of the overall effort includes plans to take over the IBP conservation functions in this country when the entire program terminates in 1974.

Members of the Federal Committee on Research Natural Areas have also recognized the shortcomings of earlier approaches and are in support of this data bank project on a collective as well as an individual agency basis. At such time as a legislatively supported natural areas system is created, it is intended that the by then well-developed data bank will be merged into that effort and should provide a tremendous headstart on the large task to be confronted.

As an outgrowth of this gradual collectivation of effort, the Smithsonian Institution has just established a Natural Areas Center which may serve as an overall umbrella. As a quasi-governmental agency, its dual role can be usefully exploited as an ideal locus for cooperation between the public and private sector. In addition, the Smithsonian can-provide the physical space,.the computer capability, and other support functions necessary to this data banking operation.

PROPOSAL

The plan is to create a small staff, under the.direction of the science department of The Nature Conservancy, within the Smithsonian's Center. This staff, working initially from secondary sources and data supplied by the cooperators and ongoing inventories, will assemble these data into manageable form. Data salvage will utilize a standardized format and involve creation of master files from many sources. Certain standard records will be entered into a computerized storage and retrieval system previously developed at the Smithsonian for similar

cataloging of museum collections. Information will be included on both.projected and prospective sites as well as on the types of sites which should exist and as soon as possible regional syntheses will be produced and distributed to all legitimately interested parties for use and revision. Parallel records will be kept on important individuals and groups and communication channels will be established for continuous information flow so that instead of becoming less accurate with the passage of time, the data in the bank will be continuously improving.

In addition to using published materials, the data bank staff will communicate with those who will be soliciting information from primary sources in the near future, rather than doing the actual soliciting itself. Important sources of information will include the IBP inventories and participants, the Federal Committee on Research Natural Areas, the National Landmark Program of the National Park Service, the Engineer Agency for Resource Inventories of the Army Corps of Engineers, those working on inventories at the Smithsonian (within the Center), numerous state agencies or private groups conducting state inventories, and the staff and chapters of The Nature Conservancy. Among the data bank's many services, it should assist these and other groups in obtaining further data.

In spite of the plethora of surveys, much information on natural areas is still in the files of the natural scientists and others who originally collected it. Finding them and getting their data can be very difficult and the problem has been exacerbated by repetitive requests from different parties. Information so obtained has often been dissipated or allowed to age without any return to the individuals or relief from further inquiries. A data bank may solve this problem and reinvest many of these important figures with a cooperative spirit.

Many of the potential benefits of this operation have already been mentioned. For conservation, organizations such as The Nature Conservancy, the output of the system will provide much needed guidance for continuing acquisition and public agencies should be able to employ it for the same use. Scientists and "educators will find much reason to refer to the synthesized information to locate research sites and areas needed for field work by themselves and their students. Environmentalists will be aided in the selection of suitable sites for use as natural baselines for comparison with altered systems, or for use in environmental monitoring. A variety of well-documented conclusions about land use and preservation will be made possible by this synthesis and such documentation should prove useful in decision making at many levels, particularly in land planning where the lack of information is usually a major impediment.

Through this impact on a variety of different constituencies, it is to hoped that this project will ultimately be an important factor in promoting public action to guarantee long-term preservation of nature and the natural environment.

REQUEST

In order to carry out the operations which have been proposed, a grant of $154,730 is requested over a three year period.

<u>Personal Services: Salaries</u> [per year]	
Director (Dr. R. Jenkins along with other duties at The Nature Conservancy)	$ 0
Assistant Director	14,500
Two clerical / machine operators	15,000
Employee benefits (8%)	2,360

Contractual Services [per year]	
Systems consultant (part time)	4,000
Travel	2,000
Computer time	5,000
Telephone	1,000
Postage	500
Office and Equipment	
Input/output machine rental	1,200
Furniture (first year only)	2,000
Office space and utilities (supplied free by the Smithsonian Institution)	0
Materials and Supplies	
Office supplies	1,000
Reproduction, printing	2,000
Reference books, maps, published inventories	1,000
Total, first year	$51,560
Total, second year (minus $2000 furniture, minus $1000 Systems consultant, plus 6% salary and bebenefit increments of $1,912)	$50,472
Total, third year (same as second year, plus 6% salary and benefit increments of $2,226)	$52,698
Total Request for three years	$154,730

NATURAL AREA [date unknown]

A natural area will be defined in this study as an area of land or water, or both land and water of any size, whether in public or private ownership in which natural processes are allowed to predominate. These areas may include (1) typical or unusual flora and/or fauna; (2) outstanding geologic, pedologic, or aquatic features and processes. These areas can contain features that in their undisturbed state may be placed in one of the following categories:

Botanical/zoological area - An area which contains species of plant and/or animal life, either as individuals , populations or communities which are significant because of their rarity, form, color, occurrence, habitat location, life history, arrangement, ecology, environment and/or other features.

Educational/scientific research area - An area which contains certain features, qualities, or conditions which may or may. not include any of the other classifications
which are accessable to the education and scientific communities for educational purposes, participation, experimentation and interpretation.

Historical/archaeological - An area which contains evidence of use by primitive people and/or has within the area evidence of life and activities of early Florida settlers.

Limited recreation/scenic area - An area that offers beauty such as streams, vistas, vegetation and wildlife, and solitude for humans so desirous, with the use of these areas limited to hiking, canoeing, photography, nature study, natural scenery appreciation, and if possible, primitive camping.

Geologic area - An area which has outstanding formations, of the earth's development, such as caves, limesinks, etc.

WILDERNESS AREA [date unknown]

A wilderness area will be defined in this study as an area of land or water or both land and water, whether in puplic or private ownership, which is of sufficient size to make practical its preservation. Land which has retained its primeval ecological characters and influences, and which may possess unique forms of flora, fauna, and geologic formations. It is further defined to mean (1) an area in which man has not made any noticeable impressions on the natural landscape or in the ecological balance (the impressions that have been made were made by the forces of nature); (2) an area which offers primeval solitude; (3) an area which contains features that can place them in one of the following categories:

Botanical/zoological area - An area which contains species of plant and/or animal life, either as individuals, populations -or communities which are , i significant because of their rarity, form, color, occurrence, habitat location, life history, arrangement, ecology, environment and/or other features.

Educational/scientific research area - An area which contains certain features, qualities, or conditions which may or may not include any of the other classifications which are accessable to the education and scientific communities for educational purposes, participation, experimentation and interpretation.

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Geologic area - An area which has outstanding formations of the earth's development, such as caves, limesinks, etc.

January 1991

PRESERVE SELECTION PROCESS by Robert E. Jenkins

The following describes the preserve selection process. The Science Division is the primary Conservancy unit charged with project selection criteria and actual project identification.

The Nature Conservancy (TNC) is entirely devoted to preserving biological and ecological diversity. We do this by identifying, protecting, and managing critical lands required by various "elements" of natural diversity for their survival. One of our mottos is "the last of the least and the best of the rest." The "last of the least" refers to lands which contain the last few examples or occurrences of rare elements, especially individual biological species and remnant community or ecosystem types. Also included here are unique landscape features or phenomena (which often have associated biodiversity values) and such things as migratory bird concentration points or breeding colonics. The "best of the rest" refers to the most outstanding examples of more abundant community types or landscape mosaics, especially in larger and more viable preserve units.

Our selection process is arguably the most systematic in existence and is based on large quantities of highly refined data. The Conservancy has a long history in conservation land inventories, going back to the establishment of our precursor body as a special committee of the Ecological Society of America in 1917. Since 1974, our efforts in this area have been concentrated on so-called Natural Heritage Programs or Conservation Data Centers in cooperation with State governments and other institutions. Such data centers now exist in all fifty states and dozens of countries outside the U.S. Each of these programs has been

established to be a permanent operating center for amassing and organizing biological and conservation data and making it available to all parties for many uses, especially for conservation and development planning.

Each Heritage data center utilizes a highly developed information system developed by TNC to gather and organize many kinds of information relevant to the selection of land Conservation projects and setting priorities among them. One Heritage function is to rank species and community Elements by their relative rarity and imperilment so that conservation resources can be efficiently allocated to their protection. The data centers gather extensive information about actual Occurrences in the landscape of the rare elements and of the outstanding Occurrences of more common ones. They ascertain the quality, condition, viability, defensibility, manageability, threats, and trends to the extent possible from which they draw additional conclusions about relative priorities. The Element/Element Occurrence information is assembled into an open ended "Natural Diversity Scorecard: showing what we believe to be the biodiversity conservation priorities in roughly descending order of importance.

Project selection is intimately interconnected to preserve design and for this a larger landscape unit called a Site is configured around one or more individual Element Occurrences. In addition to the land underlying the actual Occurrences these Sites include the land areas required for adequate protective bufferage, management operations, etc. Like the Elements, these Sites are ranked by biodiversity values (often combining many Occurrences), other values, and urgency (relating to threat and opportunity). "Priority Site Lists" are produced which are essentially inversions of the Scorecards with multiple Occurrences values.

The reason for including a Site rank for "other values" is that we try wherever possible to achieve as much public good through our projects as possible by considering what other uses or benefits a Site may have besides its potential contribution to biodiversity conservation. Such other values include ecological "service" functions, like aquifer recharge, erosion prevention, and water purification, as well as use benefits such as recreation, aesthetic enjoyment, and so on. Historic and archeological significance is also taken note of. Not only does this doubling up of values increase land conservation efficiency but it also provides for partnerships to increase the feasibility of implementing a project. I recall an example that illustrates the point. In the late 1970s an early Heritage program produced the first Priority Site list ever. When we undertook to conserve Sites from among the "top twenty" for the state, we wound up doing number twenty first because of the amazing combination of aesthetic, ecological, use, and biodiversity values it encompassed. The success of this project then set the stage for more effectively taking on the other nineteen.

Of course the Heritage programs can never know everything about the entire landscape so we are always open to considering land conservation opportunities not included on the Scorecards. On any parcel which comes to our attention, such as a proffered gift, we always do a field survey, using the Heritage data to inform us as to likely Elements to search for, and then compare the results with those of Sites already on our lists. Not infrequently this process turns up excellent Sites the significance of which was previously unknown.

Sometimes, of course, because of the great complexity of the landscape and its biota, as well as the many impinging forces of development, land use, and ambient environmental threats, the relative conservation importance of a Site or the potential sustainability of conservation action are not too clear. We do not assume in such cases that we are the repository

of all wisdom and we are often prepared to give a project the benefit of the doubt, especially if it is being championed by one or more of our conservation cooperators for plausible reasons. Sometimes this process leads to our pre-acquiring a boat ramp or some suburban open space for a public agency partner and this is just another way in which we try to contribute to the overall efficiency of land conservation.

Gradually the Conservancy's capacities have grown over the years and this has enabled us to undertake larger and larger conservation projects. The passage of time has also exposed many of our smaller preserves to the effects of intensifying uses of adjacent lands, from which they need require better protection through enlargement or some other means. In some places an accumulation of smaller preserves forms a sort of archipelago in a sea of multiple use lands. All of these factors are causing the Conservancy to turn more of its attention to conservation endeavors at the level of entire landscapes.

We are referring to such megasite projects as "Bioreserves" Such landscape projects often involve a complex mosaic of preserved and non-preserved lands and are functionally equivalent to the Man and the Biosphere Reserve concept (or to the Adirondacks or the British Greenline National Parks, for that matter). In turning to larger landscape projects, we are in synch with the current conservation trend toward integrating man into the conservation equation through sustainable development schemes and cooperative management strategies for multi-use landscapes. Our Bioreserve initiative means that in the future our project selection process probably will favor Sites which are or can be included in such landscape complexes over isolated Sites of more dubious long-term viability.

A PROPOSAL FOR THE REORGANIZATION OF TNC SCIENCE PROGRAMS
Robert Jenkins, 15 January 1992

Synopsis

The status of biodiversity on this planet worsens daily. The Nature Conservancy is one of the most effective conservation organizations attempting to save it. Over its forty year history the Conservancy has focused all its energies on biodiversity conservation, played a strong role in bringing the extinction crisis to wide attention, developed a powerful biodiversity habitat protection program by establishing preserves, and built a highly respected program in the management and application of conservation information.

The science part of our business has been two faceted. On the one hand we built a network of Heritage data centers to consolidate biodiversity information to guide TNC and other decision makers. On the other hand we have attempted to apply science to the design and management of our own preserves to maximize their contribution to maintaining biodiversity. These two efforts have been complimentary and coordinated but they focus on different audiences and objectives. As the conservation crisis and the Conservancy have grown, it has become increasingly difficult to meet the growing demands from both sides. With a cap on our gfowth potential we are falling short across the board. Heritage has started into an ominous decline and the clamor for applied science from the field increases daily.

The Conservancy now stands at a decisive point. We need to enhance the integration of science within the organization and to bring it to bear more effectively on our own conservation project without undermining the indispensable Heritage data network. The best and perhaps

only way to do this is to transfer the Heritage responsibility to a newly created cooperating institution while consolidating and refocusing Conservancy science to address its own pressing needs.

This proposed reorganization offers the Conservancy a wonderful opportunity to become more efficient, expand the resource base for conservation science, minimize the cost of this expansion on its own overstressed budget, and internally develop the improved ecosystem science so long called for by staff and board. The Conservancy will be even more truly the "most science driven conservation organization" Simultaneously it will benefit from improved conservation information systems and an expanding Heritage network, of which it will remain an interactive part.

The Conservancy and the biodiversity conservation movement have much to gain by the above proposal. The Conservancy will be strengthened and biodiversity conservation will be advanced. We must shake off the temptation to cling to the status quo.

Introduction

TNC is often called the most "science driven" conservation organization and interestingly, this may be literally true. The organization evolved out of the biological sciences and the rationale for its land conservation program has stayed there. Being science driven does not mean necessarily that we are the most "scientific" conservation organization; WRI, IUCN, and various others have a higher proportion of scientists on staff, these people do more of what is commonly characterized as scientific research than we do, and they publish more of their results. They do this, however, mainly to recommend actions someone else might take (the vast

majority of which are never taken). TNC has been unique in having a program of direct conservation action and in allowing scientific data to dictate a large part of this program. One can't conceive of TPL [Trust for Public Lands], for instance, allowing scientific data to greatly influence their choices or to approach the business the way we try to — with systematic project identification, meticulous land record keeping, scientific element stewardship, etc. Imagine, for instance, what TPL's project data must be like. Having defined no particular objectives for their conservation efforts they can't care to know very much about the lands they handle.

Science in TNC has always been two pronged — scientific inventory and data management on the one hand and science applied directly to preserve protection and management on the other. The former has been the province of our Science Division (hereafter just "Science," with a capital S) which has produced the network of Natural Heritage Data Centers upon which so much of our conservation agenda depends. Science has specialized in biological and conservation data systems and data management. The systems it has developed are used internally by TNC to manage its conservation and real estate data as well as by the independent Heritage network. The Conservancy field offices are increasingly able to exchange data usefully with the rest of the network cooperators. The applied science side — preserve design, ecological management planning, element and preserve monitoring, creating ecosystem models, etc. — has been split between Science and the Stewardship unit it spun off in the 1970's, with the latter taking on more of the responsibility over time. Much of this work is carried out by TNC field office staff who are not directly supervised by either Science or Stewardship at the national level, so much of this work is locally conceived, planned and executed. Science and latterly Stewardship have tried to provide guidance, assistance, and coordination to these decentralized efforts in various ways.

The inventory and information management side, embodied in the Heritage business, is generally acknowledged to have been a great success — producing an unparalleled operating network of data centers for the amassment and application of mainly biogeographical knowledge to biodiversity conservation. This effort was designed from the outset to provide an indirect benefit to The Nature Conservancy by getting partner organizations to undertake an immense job that TNC could not afford to do on its own. In this way we have used the leverage of our coordinating role to mobilize and direct the expenditure of hundreds of millions of dollars from public agencies, spending tens of millions in private funds as a necessary lubricant. Set up originally with the idea of systematic biodiversity conservation planning, the methods and data have proven just as applicable to development planning and conflict avoidance, which has made them the most useful data sets in the conservation business and has engendered appreciation from many quarters, including for example, the corporate community.

The Nature Conservancy's Strategic Plan states that the Hritage enterprise constitutes "a discrete and powerful conservation initiative" that "exists in tandem with our land-based protection activities." The plan calls on TNC to "promote the continued growth and viability of the existing Heritage/CDC network." However, the Strategic Plan goes on to say that "although short term funding needs are approachable, it is doubtful whether TNC could adequately fund a truly global conservation information initiative and a multi-national land protection program simultaneous." This is proving to be the case and the Heritage enterprise is in serious trouble because of it. The plan goes on the state that "every effort should be made to assure ourselves that both these ventures are funded and carried out for their maximum effectiveness." There is a clear way out of this dilemma which this proposal elucidates.

The Applied Science side of our business depends on and uses the systems and data of the Heritage side but can best be thought of as part of the land protection program referred to above. The Conservancy actually invests a great deal more of its private sector resources in this side of the business than into Heritage — consider the high percentage of TNC employees who are state "science and stewardship" staff and the substantial part of the even the Science Division's work that is directly applied to TNC projects. However, carrying on the highest volume of land project activity and managing the world's largest private preserve system as it does, the Conservancy's need for science support for its land business is insatiable and there has been a rising chorus of dissatisfaction with the amount of progress made on "conservation biology," "conservation science," or "integrating science into The Nature Conservancy." The Heritage network, instead of being appreciated for what it does is increasingly criticized for not doing the rest of this as well (or instead).

As the Strategic Plan observed, it is impossible to maximize both these things at the same time. Attempting to do so has been compromising both, in the Heritage case, because of its cogs and & wheels aspects, potentially fatally. The central point of this paper is that although the Conservancy has done better on virtually all aspects of conservation science than any other organization it cannot afford the science it and the biodiversity crisis require. The Heritage business is stalling badly for lack of funds, the growth of our Science staff has failed to keep pace with expanding demand, the problem is being compounded by distracting demands for Science and Heritage to focus more on applied science, the Science "wasting endowments" are nearly used up, and applied science itself is not developing in TNC with sufficient rapidity or coherence. If we don't alter the current course of events we are headed for a train wreck.

Heritage

The Conservancy grew out of a committee of the Ecological Society formed to assess the status of ecosystems and biodiversity. Early in its independent history TNC realized that it needed much more and better information if it was to pursue its conservation mission efficiently and well. In the early 1970's it stumbled into a way to get it — by cooperating with state governments to establish permanently operating data centers to amass, organize, analyze, and update biodiversity and related conservation data. This turned out to be such a good idea that we have subsequently emplaced such Natural Heritage data centers in all fifty states and nearly half of Latin America and Canada. Except for partial funding of start-up costs and partial support of the Conservancy's Science Division to serve as the national technical support unit for the whole network, almost all costs are borne by the government or other cooperating partner.

The network of Heritage centers has developed into the best apparatus for managing biodiversity information in the world. It has the widest coverage, the strongest institutional base, the soundest and best integrated methods and systems, and the most voluminous, accurate, and useful information. Without it our knowledge of the status of most species and ecosystems would be anecdotal at best. The Federal agencies with the mandate to know these things have never developed the capability and, in fact, depend highly on the Heritage programs when they need it. The programs provide the best guidance on biodiversity conservation needs available and their data is consulted hundreds of thousands of times a year in conservation and land use decision making. Without these data centers the Conservancy's project selection would be a matter of guesswork, as it used to be.

The Heritage network thus provides an indispensable indirect benefit to the Conservancy's conservation business. There have also been ancillary benefits. For instance, the Science staff do a lot of direct work on Conservancy projects and preserves, as discussed in the next section of this paper. The Biological and Conservation Data system (BCD) developed by Science initially for Heritage work has also been extended to manage TNC's project, real estate, preserve, and stewardship data. In fact, it is significant in the context of this paper that three quarters of the modifications to the BCD over the last three years have been to improve its performance for Conservancy applications.

The plan has always been for the Heritage network to grow geographically until it blanketed the globe, in scope until it mastered all of the knowledge important to maintaining biodiversity, and in institutional range until every appropriate user or contributor was connected. This was a tall order but one made plausible by the strength of the concept. No other mechanism seemed likely to achieve the necessary results and although there has been many other start-ups in the biodiversity data field since we began, outside the Heritage network it is pretty much chaos. If we don't do it, we have always believed, no one will be able to and that large fraction of biodiversity that knowledge could have saved will be lost. Until a few years ago we were on track and measurably advancing, we hoped inexorably, toward these goals.

Unfortunately this advance was not destined to continue and several years ago the Heritage momentum reversed and started into an accelerating decline. Most Conservancy people don't clearly perceive this yet because the Heritage network is like a large ecosystem that dies around the edges and in patches, and with gradual loss of certain constituents, without the overall attrition being very perceptible. Like the biosphere itself, some portions of the Heritage system still appear to be thriving, some even expanding, but the overall fabric is

losing its coherence and dynamism. This is coming about almost entirely as a result of the faltering of the Conservancy's Science Division which has undermined the technical and coordination functions it has to perform for the whole network. Things began to go wrong at the exact moment three or four years ago when relative growth of the Science Division ceased and we went from a surplus to a deficit budgetary situation. Unless this problem can be corrected I am quite certain that the grand Heritage experiment will fail, with damaging effects on biodiversity conservation in general and on TNC as an institution.

What is happening and will happen if current conditions continue? Some Heritage and Conservation Data Centers will go on indefinitely — possibly all of them will, because they do locally useful work and have a foothold in bureaucratic organizations with strong survival capacities — but they will evolve in many different directions and into many forms. Data system standardization will break down — this has already started. At least a half dozen of the State Data Centers have drifted (or willfully leapt) into the use of increasingly incompatible information systems. Inadequately coordinated use of various Geographic Information Systems is apt to incrementally pull the rest in all directions. Without the continued development and networking of superior integrated systems by the central Heritage original edition; we cannot afford to install Heritage in National Parks fast enough to keep up with demand; we are not adequately maintaining the Spanish version of BCD and we have discontinued our efforts on Portuguese and French versions; we have failed to extend our coverage into the marine realm or to follow up on promising opportunities with the NOAA and USGS; we have failed to develop a names/taxon database as a bridge to EPA and other Federal agencies; we have not had the surplus energy needed to respond to urgent entreaties for us to extend the CDC network to Africa; we have failed to implement important BCD improvements such as uncoupling Element and EO codes and developing the Notes to the Master Record concept; etc.; etc.

I debated about including this litany, of woes. It could have been longer and I could have could gone into greater detail. I put it in because I want to try to convey some sense of the intricacy of our business and maybe also something about how different it is from what the rest of the Conservancy does. I would love to have the Management Committee sit through one or two Operating Procedures Group meetings so as to convey a sense of what we really do and of the extraordinarily complex fabric of our lives. Unfortunately, I know you would run screaming. Even within the Science Division there are only a handful of people that can stomach the gut-wrenching complexity of the whole business on a daily basis, so you have to take my word for it that it is upon this welter of complicated little details that the success and viability of this whole enterprise depends. Once the numberless pieces are allowed to get sufficiently out of kilter they will never be put back in order again. Unless we can garner substantially larger resources and apply these without distraction to the Heritage business it is going to collapse into some of the grandest wreckage the conservation field has seen.

What if this apocalypse happens? Who should care? So what if a few deluded biologists have wasted twenty years of grinding toil trying to roll this big rock up this high hill? If it rolls back down again now, what does the world or the Conservancy really lose?

Well, first of all, conservation and development agencies will lose the ability to rely on local data centers to identify and track biodiversity needs and priorities. This won't be lost all at once or in all places (the existing scorecards alone will be of some use for the next decade), so it won't affect the "next quarterly earnings." But eventually, through divergence, collapse, and transformation, standardization will break down. Different kinds of rankings will mean different things in different places. Priorities will no longer be so systematically derived. In many places poor information will lead to false advice, as Heritage programs have shown that it

did everywhere before their advent. Things deemed rare won't really be, those deemed common will actually be diminishing undetected, and biodiversity conservation resources will be misallocated to duplicative and unworthy objectives while real needs go unidentified. Things we used to be able to depend on Heritage to remember, like what's protected and what isn't, will be forgotten and it will be up to each institution to remember for itself, a line of work wherein they didn't used to shine. Among institutions affected, the Conservancy will be among the harder hit because we try to do our work in many different jurisdictions. This means that not only will we lose accuracy and reliability but also the efficiency of getting the same kinds of services in the same terms all over. The Conservancy will have to begin contending with as many ways of thinking as there are places.

Next, we lose the ability to combine data from multiple Heritage programs to achieve wider perspectives. Our great plan has always been for the coalescence of a national biological and conservation survey out of the Heritage network, and eventually a hemispheric and global one. Our path to achieving this was clear but it will never happen once the network breaks down except by some giant and expensive duplicative effort — highly unlikely in our lifetimes or the lifetimes of the biodiversity that could have benefitted from it. I think myself that our opportunity to achieve the global objective may already have been lost to ehtropic forces. In 1988 the outside Science review panel endorsed our global objective but warned us that we had no more than three or four years to propagate our methodology before local centers began to spring up and incompatible systems to be launched. Unfortunately the panel also gave us a competing goal of developing an "expanded scientific dimension" (essentially what I am calling the Applied Science business). Dividing our limited resources between these two goals has compromised them both. The predicted proliferation of unconnected and incompatible data centers is now occurring. Even the multistate and multinational analyses we already have

underway, such as endangered species status reviews, multistate community classifications, range-wide planning for ecosystems (e.g., prairies, long leaf pine savannahs) will eventually be overtaken by divergent data standards and procedures.

The Nature Conservancy also stands to suffer an important loss in its own internal ability for careful record keeping. The BCD and associated procedures are used to manage all the Conservancy's complex and extensive project and real estate data, and increasingly its preserve and stewardship information. It benefits in this by the ability to exchange common information in common terms and formats with data centers throughout the network, of which its own field offices are becoming operating parts. The parts of BCD system that deal with real estate have developed as a cost-effective extension of the evolving Heritage systems and have thus been heavily subsidized by government investment and Science Division fund raising. The first thing to go will be the ability to obtain data and services from non-TNC parts of the network. At some point, it is likely that TNC's own record-keeping will itself break down, having been almost entirely built and maintained for all functions by the efforts of the Central Heritage task force. This is an extremely large and intricate body of data. Once the system breaks it will be difficult, expensive, or possibly impractical to ever repair or replace it. Some might think this no great inconvenience; it will just mean that TNC won't have any greater mastery of project information than TPL or the land trusts. Perhaps the more serious effect will be on scientific and stewardship information and the functions that depend on them. Here the Conservancy may simply become like some of the Federal land agencies without any real corporate memory. It doesn't seem to bother the agencies except in the pursuit of their supposed missions. It would hinder the Conservancy in its pursuit of mission as well, but not necessarily in its growth as an organization.

Arguably, if the Conservancy feels it can live with the above consequences, it may be to the Conservancy's advantage to let the Heritage enterprise collapse. Or even to obliterate what we call the Science Division outright. By doing so, the $2.5 million in general funds that go towards the approximately $10 million overall Science Division budget could be saved. Obviously some of these general funds would have to be reprogrammed back to support any of the current internal functions the Conservancy decided to continue. Of course, it is possible that some of these functions are actually toeing cryptically subsidized from the self-funded part of the budget, and if so, their cost would actually increase. Some of the Science staff might be redirected to other Conservancy duties; the self-funded fraction could be laid off, alleviating space congestion and reducing the burden on personnel, finance, and other services. I am not being facetious in this paragraph. If we are not going to make the commitment that is needed to do the job the resources expended on half-way measures are likely to be wasted.

If, on the other hand, the Conservancy were to choose to maintain and expand the Heritage enterprise as called for in the Strategic plan, some means need to be found to substantially increase funding to the effort. I have appended copies of the needs statement part of the Finance Division's Science cost analysis. This estimates that just to hold our own (the "maintain" part of the Strategic Plan mandate) with the existing network, complete installation, training, and operation of BCD in Conservancy field offices, and keep the Heritage network from actively continuing its current backward slide, the Science Division needs an increase of about $2.5 million per year plus an additional $700 thousand to cover current annual erosion of the "wasting endowment" for a total of over $3 million per year. The needs statement goes on to note an anticipated growth need of another $million per year to be achieved within the next two or three years. One of the reasons for the steep immediate need is that this represents deferred needs from at least the last several years, Science having requested over a million a year more in general funds than the Conservancy has been able to allocate in the last three fiscal years.

Applied Science

Applied Science in TNC is a broad topic. Essentially it means science applied to TNC projects and preserves. This grades into other needs and services. The connection of Applied Science to broader needs bears some thinking about and is referred to again in the proposal section. Applied Science is the province mainly of the Science Division and Stewardship Department but a lot of it is done in the field outside the sphere of the functional departments. At the same time Science and Stewardship also supply some services that don't exactly fall in the science realm at all. For example, the Science Division, as noted above, supports the BCD computer system to manage real estate data and Stewardship tries to provide some guidance on the custodial management of lands. Stewardship also takes a lead role in managing files and information about Conservancy projects and preserves and the state Stewards may even be responsible for such things as the tracking and administration of real estate property taxes. The time thus spent cannot be treated as though it were available to do conservation biology and, at the same time, someone has to do these things.

First for the actual science. The Heritage network deals mainly with the standing question, "What is the state of biodiversity in our territory and what needs to be done about it." Its main function is prescriptive and as such, not always that much appreciated. Who really wants to be told what to do all the time? To some extent, the Heritage personnel are also reactive in that they will agree to answer questions from a TNC field office if they know the answer or if they have the time and resources to find out. Thus most Heritage programs do a lot of work for the Conservancy in surveying opportunistically-arising land projects when they have the time to spare from other duties. Where they conclude that a site is of value they may turn prescriptive again, but on a highly targeted basis, by studying the site and proposing a preserve design

and/or making suggestions about the management needs of the species or community elements found there.

The Science Division actually wrote the Preserve Selection and Design Manual which, to the degree that this process is standardized in the Conservancy, establishes policy and procedures for this work. However, much of this work is actually done by state land stewards or what are increasingly referred to as “science and stewardship” staff. State and national Stewardship staff also do most of the site and element management planning, although the Heritage databases and expertise are drawn on as applicable and available.

Stewards are not only suppliers of Applied Science but consumers of it as well. It falls to them to worry about whether the Conservancy’s land protection and management endeavors actually preserve biodiversity and whether this is accomplished as efficiently as possible. The Stewards are hungry for advice and assistance in developing and implementing “decent management plans.” A recent innovation in the Stewardship department has been to hire specialized experts who can help the Stewards wrestle with problems in their particular fields. Areas of specialization represented so far are fire ecology, hydrology, weed control, monitoring, and ecological modeling. Plans call for adding specialists in karst and ground water hydrology, landscape fragmentation ecology, and population biology. These subject matter experts are to amass and organize knowledge in their fields, travel around to participate in expert planning teams, and answer phone calls and correspondence. A fire management manual has been produced and a monitoring manual is under development. The feedback I get is that all of these things are immensely appreciated by the recipient Stewardship staffs in the field offices and on the staffed preserves.

Science and Stewardship staffs have been trying to improve our plans for biological management of the preserves for many years and have gone through several cyclical efforts to achieve this. Undoubtedly much has been accomplished, and by just agonizing over these things we reinforce the image of TNC being science-driven. The bioreserve initiative has now stimulated what might be considered another enhancement cycle, this time with an enlarged scope and scale. The regional Science task forces dropped everything a couple years ago and in cooperation with the data centers and field offices took a crack at assessing megasite priorities for the western hemisphere. To a large extent the bioreserve projects undertaken by the Conservancy since have been selected from this list. At the same time, Science and Stewardship people in the headquarters began considering what things they could do to assist in design and implementation of such bioreserve projects.

In planning for the capital campaign the two departments were mandated to develop plans for bringing Science to bear on bioreserves. An additional $10 million dollars of operating funds was to be raised for this purpose as a part of the campaign. Stewardship plans focused mainly on special studies and the development of specialized expertise along the lines mentioned above, but much larger in scope. Science, with its focus on information management systems, decided that the best things we could do would be to develop bioreserve computer applications both in the BCD databases and in the form of new computer mapping capabilities and the use of Geographic Information Systems (GIS). Our idea for the BCD was to improve our abilities to track the welter of land ownership data associated with bioreserves, facilitate conservation biology applications like population viability analysis and ecosystem modeling, and explore ways to begin mastering and sharing information concerning things like compatible land uses. On the GIS side, multi-factor geographic analysis and dynamic mapping of continuous project change are virtually necessitated by the huge size, variability, and

complexity of these landscapes. In addition, the GIS capability offers the potential for TNC to make use of remote sensing for the first time. Satellite imagery and scanned aerial photographs can be processed to provide a great deal of information about the character of larger landscapes and to display this in an easily appreciated form.

Although operating funds have not emerged from the campaign in the way originally envisioned, we have managed to make good progress anyway. Stewardship was able to reprogram the regional stewardship slots wiped out in an earlier budget crunch to begin developing the pool of experts mentioned above. On the Science side, we have cobbled together our initiative with one development grant from the Pew Foundation (to focus mainly on the Virginia Coast), close collaboration in individual bioreserve planning grants on Altamaha, ACE [Ashepoo-Combahee-Edisto], and Gray Ranch, the solicitation of hardware and software donations, and bootlegging funds and capabilities originally allocated to Heritage support. In this way we have managed to establish substantial GIS capability in headquarters Science and to install satellite capabilities in the Southeastern and Western task forces and the Latin American Science Program. The intention is to do the same in other regional offices as resources become available, with the more powerful GIS capabilities in headquarters used for analysis and product generation while the satellite centers concentrate mainly on synthesis, dynamic change mapping, and production of display products. Many of the bioreserve projects are also employing GIS capability in cooperation with local universities and other agencies and we have been trying to provide advice and assistance to them as well. With our usual concern for operational continuity and institutional memory we aspire to build up a permanently useful digital library and a process for exchanging digital products among operating units.

Probably the mokt successful aspect of this so far, or at least the part the field people seem to appreciate most, has been the imagery-based Rapid Ecological Assessment (REA) of various regional sized areas, mainly in support of Parks in Peril Planning as an adjunct to Latin American CDC's. The initial experimental focus has been on Jamaica but REA's are also underway in the Pantanal, Canaima, and Sierra de las Minas. Four other areas await funding. In the U.S., Science and the Heritage programs have been cooperating with the FWS on a form of REA they call "gap analysis" in a number of western and lately a few eastern states. Remote sensing and REA are also being done on individual bioreserves, since many of them are big enough to constitute mini-regions in themselves. REA products are also expected to add to the digital library of useful mapping aids.

More disappointing but instructive has been our experience in trying to provide tools for dynamic planning and tracking on individual sites. Bioreserves are enormous and complex and will occupy our attention forever — in essence, "lifetime jobs." Over the life of such a project something will change every day and unless we have the means to track these changes the cumulative effects will probably overwhelm our ability to implement these projects in an orderly way. The Conservancy has never been very good at staying on top of such things in our traditional work. Busy field people depend on themselves to remember what they need to know and are disinclined to invest energies in careful record keeping. Manual files in most offices are not reliably maintained and with staff turnover and the passage of time much information is lost in them and from them. Except from the BCD system, assuming that data has at least been abstracted into it, retrieving information that we once had at hand is often impossible. This has been damaging even in the Conservancy's traditional business of smaller projects and preserves, but it is apt to be disastrous on a bioreserve where one thing always has to lead to

another with no break in the chain. The Science Division takes the view that what is needed is for each bioreserve to be its own data center, using BCD, standard manual methods, and eventually GIS to dynamically master their data. Unfortunately no one seems to think we can afford to devote much personnel and resource to this job so it begins to look like the field office experience all over again. A budgeted data manager for the Gray Ranch, for example, was deleted from the plan. Heritage data centers or particularly meticulous field offices may be able to partly make up for the absence of a site data center, but only on some factors and to some extent. I do not know of a cheap alternative solution to this problem and making elaborate plans for elaborate bioreserves is not going to work if we lose track of our information.

The Science Division has expended a good bit of money and effort over the last couple years at VCR and other bioreserves -: attempting to provide information services and information management support. Not much of it has taken root. At VCR our GIS products are apparently not thought sufficiently picturesque for presentation purposes, the main use they want to make of maps, and perhaps our turn-around time is too slow. And there are complaints about us “not being responsive enough to the real needs.” Experimental manual files we set up several years ago fell into disarray with the turnover of key staff. The use of BCD seems to be felt onerous and not enough of a priority to allocate sufficient staff to stay on top of it.

What I think we are learning from this is important. First, although good scientific information is valued and good preserve designs or ecological models will be followed to the extent practicable, many of the pressing operational exigencies that arise at bioreserves are not solved by having science information. Most of the daily work doesn’t really have to do with science at all. There is no use fooling ourselves about this or calling for science when what we really want is something else, or calling for more science products which will wind up not

being used or followed. Second, these projects are so large and diverse that the scope of action may be almost unlimited. Needs for information or assistance often also arise quickly and without being sought out. Therefore, not many of the answers are likely to have been anticipated in any standard cookbook or database that TNC could devise. Instead the project staff go to the yellow pages like anyone else. Third, much of what comes up is so particular to the locale that there is often little useful assistance that can be supplied from far away. Local institutions and experts are preferred whenever there are any. Fourth, the project staff generally are not looking for prescriptions. They will follow a scientific plan to the extent they, feel persuaded by it and are able to, but events will nearly always make it impossible to follow to the letter and circumstances change faster than plans can. Then who else is around to decide what to do? They must usually decide for themselves, and besides, they want to.

This last point deserves some elaboration. The truth is that people who have the power to decide want to decide, regardless of any lack of scientific information or sometimes even in disregard of it. Many project staff in the Cbnservancy seem to feel just as justified in going with their gut instincts or preferences as they do in accepting a scientific analysis. What they generally want is assistance, sometimes advice, but almost never, guidance. Conservancy scientists trying to provide advice and guidance frequently encounter justifications-shopping. Project people, if they look long and hard enough can invariably can find an expert to argue for the importance of virtually anything they might want to do. If this is the reality, then Conservancy scientists shouldn't have to waste their time developing plans beyond the point where there is any actual hope of them being followed. And the time spent concocting scientific justifications for what are really programmatic or arbitrary decisions is a waste of resources. We may have to dress up our actions some for the outside world but the primary rule of the "One Conservancy" is that "you don't B.S. the family."

With this combination of factors operating we need to take a hard look at just how science can be usefully applied in our work. Scientific investigation and planning must clearly be more iterative, especially on the bioreserves, and carried out in a very interactive way with the project managers. We must devise scientific plans with as much flexibility as we can because circumstances and human cussedness won't permit an orderly linear progression.

Another important consideration is that bioreserves are so big and complex that essentially nothing falls outside their scope. Years and years ago we used to talk about a "conservation county" wherein we would try to sustainably balance ecological, social, and economic benefits. Bioreserves may be thought of as attempts to accomplish this. In the international sphere it is increasingly clear that attempts to manage Biosphere Reserves or "protected areas and their buffer lands," in Madagascar for instance, are beginning to be outright attempts to manage local government. Considered in this light bioreserves present TNC with an enormous challenge extending beyond conservation biology and land protection to sustainable land use and local economic intervention. To operate successfully at this level will require a great increase in the resources available to the Applied Science side of our business if we are to make the widely called for advances in conservation science, per se, and also contend with this tremendous expansion in our scope. Moreover, the operational factors referred to above mean that for this increase in expertise to help us we must develop the even more complex ability to be usefully reactive to the onthe-ground realities, as opposed to any more theoretical prescriptive mode of operation. This is probably what many people have on their mind when they talk about "integrating Science into the business of The Nature Conservancy."

This need for greatly increased funding and a more flexible way of operating in the Applied Science side of our business collides directly with the need for much greater funding

for Heritage with an intensifying focus on network standardization. The rest of this paper proposes a way to accomplish both objectives.

Proposed plan of action

The upshot of the prior discussion is that Conservancy is not in a position to come up with the increased funding needed to carry out Science on the scale or scope its mission requires. But it can't just decide that this amount of Science isn't really necessary either. You can't fool mother nature. The Conservancy must find the means to get the needed science done, and since it can't do it by itself it will have to be done in cooperation with other institutions.

`The first and best opportunity along these lines is to create a new partner of its own design to more vigorously take over responsibility for the specialized Heritage burden. The truth is that Heritage has never really been a good fit in the Conservancy. The rigidity and specialization demanded by its system standardization goal has always been alien to the flexible and generalist corporate culture. Its purpose, methods, and institutional relationships are so different it has needed to administer a separate operational line and this has created rivalries and friction. It focuses on a subset of the business that has never been considered a priority by the staff leadership or the board. Until about three years ago the Science Division never received more than 5 or 10% of its total budget from the general fund, in contradistinction to every other headquarters department. Even in the current fiscal year, after three years of stridency about its dire budget crisis, the Division received a 9.2% increase, compared to an avetage of 17% for all other divisions. Heritage has been a "business within the business" and has been able to develop just to the degree that it was able to fund itself. The current funding problem was long foreseen and explicit promises were made to take up the

slack from the general fund. The increases received from the general fund have not covered the difference and the additional funds received have been accompanied by an increased applied scienfce workload and demands to become more integrated into The Nature Conservancy or, in other words, “to change into something else.” This cannot be done with the amounts of resources available, however, except by abandoning the Heritage mission. We are repeatedly told that the problem is that our “priorities are not those of The Nature Conservancy.”

From the Heritage perspective, the Conservancy made a pretty good home until the internal competition for fund-raising began to pinch off its options. There was always a clash of cultures, and it has been a continuous struggle to retain the necessary control over the technology, but we were happy and felt useful to the conservancy and to its mission. Our main problem is simply that we have developed to a point where we can no longer get resources to even hpld the ground we’ve already gained much less realise our full potential. This is particularly galling because we don’t just envision limping along; we aspired to greatness! We have always been driving toward creation of a huge program, in keeping with the enormous and complex mission we have undertaken. The seemingly big numbers in the Science cost studies, even those in the future growth columns, are only the tip of the iceberg of the program we have always envisioned. We believe that it is entirely possible to create a conservation data operation that would dwarf the existing one and we were busily expanding in this direction when we ran into the current bottleneck.

The Heritage initiative now finds itself in the position of an under-capitalized company, unable to improve its product, seize its market, or even retain the loyalty of its existing customers. It is our perception that there ha$ always been much more of a market for the Heritage business than could be exploited from within the Conservancy. For example, in

reviewing minutes of one meeting of the development committee (which Science doesn't attend) almost every one of the active prospects under discussion had good potential for Heritage funding but none were targets for Heritage proposals.

Spinning off Heritage into an organization of its own, where it can have a board who consider its business of paramount importance, where it can seek support from all sectors without restriction, and where it can escape distractions from uncontrollable demands for alternative services, seems to me to be a win-win proposition all around. The Conservancy should think of it like the transfer of big property to a government agency for management. It is done because we care about the property but we don't want to use our scarce resources managing it and we see that another agency with different priorities and access to other resources can do it better. Sometimes the government agency doesn't do as well as we would like but generally they do at least as well as we might have and we always have the option of pressing them to do better. In the same way, the parent Nature Conservancy has nothing to lose and a great deal to gain by emplacing Heritage in a cooperating institution with continuing connections. A better Heritage enterprise means more and better conservation information services and better data systems for the Conservancy's own use. The Conservancy will still be the most science driven conservation organization based on Applied Sciehce (greatly expanded), the continued use of Heritage data, continued involvement in the Heritage network, and by actually continuing to carry out a systematic biodiversity conservation mission. It can even continue to claim Heritage accomplishments as its own, with its own audience, just as it claims credit for all of its projects, including the great majority which are paid for and managed by public agencies.

Of course this isn't the first time new organizations have developed from TNC. We may not be completely satisfied with the examples of The Trust for Public Lands, the Conservation Fund, and Conservation International, but none of them were created by our own design nor with enough careful consideration to long-term cooperative commitments or plans for an efficient division of labor. The forementioned organizations were all established, in my analysis, pretty much for the same reason I am proposing this one — in order to escape internal constriction of fund-raising channels, to focus more intensely on something marginal to the Conservancy's main thrust, and to fully exploit a special market. It is quite possible that all three of them could have been more effective long term cooperators with the Conservancy and more efficient performers of special functions within the biodiversity conservation business if they had been created through a more deliberate process and if linkages had been more carefully designed.

The proposed Heritage institute (not its proposed name — suggestions are welcome) is intended to be more of a structural change than a functional one — what has been called an "experiment in creative institutional forms." I would expect the institute and the Conservancy to cooperate closely with each other on a long term basis, along functional lines similar to those that currently operate. The Heritage ,institute would continue to start and support Heritage and Conservation Data Centers (sometimes in cooperation with TNC), maintain and enhance central conservation databases to which TNC would have access, develop and support the BCD and other computer systems that The Nature Conservancy would continue to use as it does now, and continue to consult with TNC about upcoming needs and opportunities.

To reiterate, the main point is to increase the resource base devoted to the biodiversity conservation mission by providing an institutional base from which Heritage can raise

substantially more funds without doing so at the expense of other Conservancy departments and programs. Two organizations can simply raise more money than a single one, because of the check-listing behavior of most funding sources, including private foundations, individuals, and corporations, which makes "double dipping" a rarity. Some people have expressed to me the fear that Heritage on its own would be unable to raise money without the umbrella of Conservancy credibility. I don't think this is the case, based on two kinds of historical experience. First, the other TNC progeny — TPL [Trust for Public Land], CF [Conservation Fund], and CI [Conservsation International] — all managed to establish their own credibility quite quickly without any TNC help at all. The Heritage network itself is not unknown and the Conservancy's endorsement would lend a lot of added credibility to the new institution. Second, it has been my perception that the funds we have raised directly over the years for support of the Science Division have rarely depended on its being part of TNC. It has nearly always appeared that the success factor was the appeal of the concept involved and almost never the institutional connection. Direct assistance from Conservancy development staff has been a rarity, except from some field offices and the Latin American Division in raising funds for individual Heritage and CDC [Conservation Data Center] campaigns. In the great majority of cases, being part of the Conservancy has been an actual impediment to fundraising simply because the Conservancy priority for the approach to the source was something other than Heritage. From a separate organizational base, obviously, every source would be fair game. None of the above is intended to take anything away from The Nature Conservancy, the hottest ticket in conservation fund-raising, but only to objectively assess the potential of a new institution. I think the potential is great.

One almost-certain opportunity for a new Heritage institution would be to establish a parallel corporate associates program. The conflict-avoidance aspect of the Heritage business

has shown itself to be very appealing to corporations. On the other hand, so is the business-like land acquisition program of TNC (just look at any issue of natural assets), so the parent organization should have no trouble retaining their own corporate support. The two organizations should thus be able to double their revenues from corporate sources, which they can't do with a single institutional appeal. There is a possibility that a Heritage institute could engender a broad enough appeal to individuals to support its own membership and direct mail program and we would certainly give it a try. TNC and the institute could perhaps exchange lists. There is even the potential for twice the public relations opportunities by having two separate identities.

Various people have insisted to me that the institute I envision should really be funded, all or in part, by government. We would certainly try to obtain as much government support as we could just as we do now, and it is easy to surmise that our potential might be greater outside the Conservancy than within. The Conservancy has always been reluctant to accept a government charter, for one factor, although this has been urged on it repeatedly over the years. The National Trust for Historic Preservation, on the other hand, has a government charter and an annual Federal appropriation. A separate Heritage organization would be likely,to accept a charter if necessary. Moreover, the last time we took a run at Congressional funding, through the bill to create a National Biodiversity Center, the Conservancy backed off from the fight because of a concern that other parts of its business might be impacted. This is another form of the same "needs and prospects" bottleneck that we face in fund-raising and shows one of the disadvantages of being part of a larger organization. On top of this, one problem we had in the Congress was the perception that we were pursuing our own self interest since there was no one else to speak for us. If the Conservancy had been able to speak for the Heritage institute it would have been powerfully helpful.

An indispensable resource for raising funds is a capable board. Every time we have a board meeting one hears how critically important it is. No disrespect is intended to the members of the Conservancy's able board, however, in pointing out that they have not been selected because of an interest in conservation information management so it shouldn't be any surprise that they don't come hang around the Science floor when they are in town. Before the elimination of the Board's Science and Stewardship Committee that committee was always considered a minor assignment and its members showed much greater interest in Applied Science and anything else relating to the Conservancy's project business than in Heritage. It has never been a board objective to help promote or raise funds for the Heritage effort and the last direct donation to the Science Division from a Conservancy board member came from George Cooley. Anything of such size and scope as the Heritage enterprise needs a board of its own, composed of movers and shakers who are selected because they think this is important stuff and will devote themselves to its problems and the opportunities they can help it to seize. Some sort of adjunct board for Heritage might be organized inside the Conservancy but since part of a board's motivation is to have a policy role this is unlikely to attract the sorts of heavyweights that we need.

A lot of hard thought has gone into this proposal and I see no reasons not to do what is proposed. Moreover, I am convinced that nothing else will work. The Conservancy does not have the funds from which to simply give Heritage the amount of support it has to have and there are too many other worthy claimants for what is available. The Government Relations study, for instance, is undoubtedly going to recommend large increases in its staff, an idea I myself have long favored. Even with Heritage in a separate institution it would expect to benefit from the Conservancy's increased lobbying muscle just as the Forest Service did when it got its botanical funding and the DoD did when the Legacy appropriation passed. In my

judgment, the same problem of other worthy claimants applies to any possible commitment by the Conservancy to help us raise new funds in the amounts we need under The Nature Conservancy letterhead. Expanded Heritage fund-raising from within could only be done at the expense of other Conservancy needs, would still fall short of the opportunities we can exploit from an independent institution, and given the strength of competing interests, the effort would be most likely to create additional stress, conflict, animosity, and overhead. I am certain that two cooperating organizations can simply raise more money than one can and with greatly reduced friction.

Besides the advantages to the Conservancy and its mission of a strengthened Heritage network separating Heritage will also provide a vital and timely opportunity to reorganize and transform its internal science program, to bring it into line with current needs without having to accommodate the unwieldy encumbrance of Heritage. This brings me to the other part of this proposal.

In my view, removal of the Heritage information system stringencies and coordinative burden of the Heritage data center network would permit TNC to reorganize its science activities into a more flexible program and one devoted more or less entirely to TNC conservation projects and preserves. There are a number of forms that this restructuring could take but to begin with, not all of the Science Division would go into the new Heritage institute, and one would certainly combine what was left with the current Stewardship Department to create a new Conservation Science Division. The two entities should probably have been recombined years ago. This Division, freed of the burden of the Heritage networking, would not need to have an operational role. A clear separation could thus be established between it and the Operations Division by completely turning over the custodial aspects of land

stewardship to the individual field offices, which has become the de facto reality anyway. The Division would become a scientific support unit to the field offices, preserves, and other operating units.

This Conservation Science Division would still supervise the use of the BCD data system inside TNC, oversee scientific inventory on preserves, and cooperate with the Heritage institute in defining further information system needs, participating in the Operations Procedures Group process, for example, to encourage the development of modules and modifications to assist the Conservancy in its ecosystem conservation business. The Division would be freed, however, from the agonizing business of computer system development and network standardization. It could concentrate instead on analysis and use of such data to design better nature preserves, develop ecosystem management models, carry out targeted research, and contend with all the conservation science problems that arise in the Conservancy's business. The Division would amass expertise, compile technical aids, participate heavily in project planning teams, take a lead role in an expanding Conservancy training program, and undoubtedly fit in with the corporate culture better than Science ever did. The current Stewardship initiative of hiring subject matter specialists, such as the fire ecologists, hydrologists, exotic species; specialists, restoration ecologists, landscape fragmentation ecologists, etc. would be continued and expanded and these specialists might constitute the bulk of the Division's staffing. These specialists would be mainly dispersed around the country, especially at staffed preserves where the problems of conservation could be accessible daily for direct investigation and experimentation. Perhaps some would be at universities (we need to avoid the mistakes of the Federal agencies, whose cooperative research units at the universities have made the publication of academic papers their measure of success). They would also travel widely to participate in project design and planning teams. Since it is evident that not all the expertise

required to carry out effective biodiversity land conservation can be internalized in the Conservancy, a major task for the Division would be to develop better ways to tap outside experts and obtain the assistance we require in the most cost effective manner possible. And the Division should work with the field staff to better understand the operational realities of our tough business so they can help devise mechanisms which efficiently meet real needs instead of hypothetical ones.

Those real needs and realities suggest that such a technical support Division might advantageously be expanded to include more than just conservation biology in their portfolio. Anyone who has worked with the land protection and stewardship staff in the field, especially those involved in the large multiple use landscape problems of the bioreserves, realizes that many of the technical questions that confront them don't even fall in the biological science realm. A more expansive reorganization might create a Conservation Science and Technology Division, to include technical assistance of every sort required in the Conservancy's conservation business. One of the great gaps in the organization, for example, has been in the area of protection technology. TNC has never managed to establish or maintain a department whose job was to master the land conservation tools themselves, train field staff, and assist them in their use. Some work along these lines has been done in the Legal Division, the Science Division, and the Stewardship Department but it might strike an outsider as surprising that the largest land conservation organization in the world has not developed land protection itself into more of a discipline. Undertaking to do so might be advantageously added to the duties of such an expanded technical support unit. Thus the Division would combine conservation biology, stewardship science, and land protection technology.

Further, as the Conservancy's research arm there is no limit to the problems that could usefully receive the Division's attention. One enormous area for future investigation, for instance, is in compatible and sustainable uses of bioreserve buffer lands. And the conservation biology business itself will always present endless problems in species ecology, population viability analysis, restoration, landscape patch dynamics, etc., etc., and etc.

Conclusion

There are other issues that still could be discussed, but the main points are made. We need to transfer responsibility for information system development and coordination of the Heritage Conservation Data Center network to a new cooperating institute. We could then transform our internal science program into a much more applied and flexible unit to address the problems of Conservancy projects and preserves.

If these proposals can be accepted in principle, we can begin moving forward immediately to develop detailed plans. Preliminary plans for this restructuring could be ready for further action at the next meeting of the Management Committee. For example, just which functions of the current Science Division ought to go to a new Heritage institute and which should stay a part of the new Conservation Science Division remain to be determined. Details aside, I think we all know that new challenges face us and we have delayed too long already in responding to them. The worsening biodiversity crisis demands that we move forward as fast as we can.

SCIENCE PROJECT [budget with data from original figures]

Funds needed by activity (100 percent = $3.5 million)

Data Mgmt	14.5%
System Support	9.7%
Mgmt	6.3%
Admin	12.5%
System Devpmnt	25.3%
Field	5.5%
R&D	20.2%
Product generation	6.0%

Funding gap for long-term budget: 1992 US Dollar millions

General Fund Allocation	2.5
Endowment draw down	0.7
Self Funded	6.9
TOTAL FY 92 Budget	10.1
Immediate need	2.5
Growth based need	1.0
Projected Science Budget	13.6
Funding Gap	4.2 [definition not clear]

Notes.
Immediate and growth-based need projections based on interviews of HQ and HTF managers. Growth-based need reflects new positions required within the next 2-3 years in addition to immediate needs.

SCIENCE PROJECT - Needs Assessment

Department	Short-term needs	Level	Salary
MIDWEST HTF	Spatial Info Manager (electronic mapper)	6	29,669
Steve Chaplin	Half-time community ecologist	5	12,579
	Half-time regional botanist	5	12,579
	Half-time regional zoologist	5	12,579
WESTERN HTF	Administrative assistant	4	21,700
Bennett Brown	Director - to share Ben's responsibilities	9	53.787
	Ecological Modeler	5	25.158
	GIS Specialist	6	29,669
EASTERN HTF	Half-time Administrative assistant	4	11.937
Larry Master	Regional botanist	7	39,114
	MIPS/GIS Technician	6	32,639
SOUTHERN HTF	Spatial info & GIS technician	6	32,639
Joe Jacob	Aquatic Zoologist	6	32,639
SITE INFO MGMT	Microfiche preparation - Admin assistant	4	23,873
Adrian Burke	BCD Trainer - Field/regional office	5	27,677
	Data entry assistant - LAD projects	4	23,873

Department	Short-term needs	Level	Salary
CENTRAL	Central Data Tech.	4	27,677
DATABASE	Manager of Network Data Bow	6	32,639
ADMIMISTRATION	Data exchange technician - NA Heritage	4	23,873
Richard Warner	Data exchange technician - TNC field O	4	23,873
	Data exchange technician - NA Satellites	4	23,873
	Administrative assistant	4	23,873
SYSTEMS DEPT	Administrative Assistant	4	23,873
Keith Carr			
DATA ADMIN. /	Technical Writer - Heritage	6	32,639
DOCUMENTATION	Data Technician	5	27,677
Steve Taswell			
CNTRL. /			
MULTISTATE	System engineer - Multistate BCD	6	32,639
BCD DEVPMT	System engineer - SIM Databases	6	32,639
Anderson			
STD/SPANISH	System engineer - RAD	6	32,639
BCD DEVPMT	System engineer - Spanish BCD	6	32,639
Brune	System engineer – Stewardship	6	32,639

Department	Short-term needs	Level	Salary
BCD HELP/TRAINING			
INSTALLATION	System engineer - Heritage/ FEDS	6	32,639
Lewis			
INTEGRATION	UNIX specialist	6	32,639
Meyer	Telecommunications specialist		32,639
SPATIAL DATA	GIS Programmer	6	32,639
GIS MIPS	Support engineer - field office	6	32,639
Solomon	Central spatial database administrator	6	32,639
HERITAGE FA	Training coordinator	7	39,144
Robert Chipley	Administrative assistant	4	23,873
LASP CDC	Project Manager (Caribbean)	7	35,000
Bruce Stein	Regional Ecologist / REA Specialist	7	35,000
	Regional Ecologist / REA Specialist	7	35,000
ECOLOGY CENTER	Administrative assistant	4	23.873
Dennis Grossman	Data Mgmt technician	6	32,639
	Marine community specialist	7	39.144
	Freshwater community specialist	7	39,144
	Classification / Data analysis technician	6	32,639

Department	Short-term needs	Level	Salary
	Remote sensing intern		
BIOLOGY CENTER	Assistant botanist	6	32,639
Larry Morse	Assistant botanist	6	32,639
TOTAL SALARY NEED			1,356,593
Benefits (@ 22%)			298,450
Total Salary and Benefits			1,655,043
Additional Operating Expenses (50% of Salary and Benefits)			827,521
Total Need of Science Department			2,482,564

Department	Long-term needs	Level	Salary
MIDWEST HTF	Half-time community ecologist	5	12,579
Steve Chaplin	Half-time regional botanist	5	12,579
	Half-time regional zoologist	5	12,579
EASTERN HTF	Chief Zoologist	8	47,734
Larry Master			
CENTRAL	Information Response Coordinator	6	32,639
DATABASE	Data exchange technician - NA Heriuge	4	23,873
ADMIMISTRATION	Data exchange technician - TNC field O	4	23,873
Richard Warner	Data exchange technician - LAC CDCs	4	23,873
DATA ADMIN. /	Technical Writer - Protection	6	32,639
DOCUMENTATION	Technical Writer - Stewardship	6	32,639
Steve Taswell			
SPATIAL DATA	GIS technician	6	32,639
Solomon	GIS MIPS Support engineer – Heritage	6	32,639
LASP CDC	CDC Project Manager	7	36,000
Bruce Stein	Image processing/GIS technician	6	30,000
	BCD Specialist	5	32,000
	Administrative assistant	4	23,000

Department	Long-term needs	Level	Salary
ECOLOGY CENTER	Terrestrial community technician	6	32,639
Dennis Grossman	Remote sensing technician	6	32,639
	Field ecology/REA project manager	7	39,144
	Field ecology/REA technical writer	6	39,144
	Community ecology intern		
TOTAL SALARY NEED			584,851
Benefits (@ 22%)			128,667
Total Salary and Benefits			713,518
Additional Operating Expenses (50% of Salary and Benefits)			356,759
Total Need of Science Department			1,070,277