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National Environmental Data Referral Service

Program Development Plan

Washington, D.C.
September 1981

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Environmental Data and Information Service

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U. S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary

National Oceanic and Atmospheric Administration
James P. Walsh, Acting Administrator

Environmental Data and Information Service
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PROGRAM DEVELOPMENT PLAN
FOR A
NATIONAL ENVIRONMENTAL DATA REFERRAL SERVICE

SEPTEMBER 1981

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PROGRAM DEVELOPMENT PLAN
FOR A
NATIONAL ENVIRONMENTAL DATA REFERRAL SERVICE

EXECUTIVE SUMMARY

The Environmental Data and Information Service is developing a National Environmental Data Referral Service in response to national needs for improved access to a broad range of environmental data. The service provides a readily accessible means for anyone who needs environmental data to find out whether the relevant data exist and, if so, where and how they may be obtained. The plan lists and discusses the requirements and benefits expected from unified management and improved access.

A set of design criteria is given. These include specification of the target user community, level of information needed, anticipated products and services, coverage and scope, conditions of use, service delivery requirements, and service quality measurements.

The plan proposes a structured environmental data referral system. The main features are (1) a computer-searchable catalog and index of environmental data which would complement the detailed inventories of individual organizations; (2) a cooperative network of organizations interested in the production, archiving, dissemination, and use of environmental data; and (3) a program of special products and services including a National Climate Information Clearinghouse.

Implementation actions for a five-year plan of development are discussed. Special emphasis is placed on the plan's continuing responsiveness and adaptation of the plan to the needs of users and data disseminators.

PROGRAM DEVELOPMENT PLAN
FOR A
NATIONAL ENVIRONMENTAL DATA REFERRAL SERVICE

1. INTRODUCTION

Environmental (oceanic, atmospheric, geophysical) data needed for planning, decisionmaking, and research in energy, agriculture, housing, commerce, health, natural resources management, and environmental protection are accumulating rapidly. Environmental monitoring technology has provided both more data and more types of data. These data are stored in many locations in the United States and elsewhere.

The potential uses of these data have multiplied as a result of greatly expanded needs in industry and government, but the existence and location of needed data frequently cannot be determined in timely and cost-effective fashion. Other agencies have developed referral systems to meet user needs for energy, water, and toxic substances data, but no system is available for natural environmental data. An effective solution would be to provide a nationally accessible data referral service to assist requestors in obtaining needed data.

Prompt action is needed in order to ensure the maximum benefits from existing environmental data. Development of a data referral service now will help to keep pace with demands for data.

The concept of what is required is very simple: to provide a readily accessible means for anyone who needs environmental data to find out whether the relevant data exist and, if so, where and how they may be obtained. This plan provides a program for developing such a service.

The functions of the proposed data referral service will be to identify sources of environmental data, to index the data held by these sources, and to promote and facilitate the exchange of data between those who store and those who use environmental data, especially by providing a publicly accessible environmental data referral database. NEDRES will cooperate and interact with existing data referral services in related fields such as water resources and energy.

2. REQUIREMENTS FOR A NATIONAL ENVIRONMENTAL DATA REFERRAL SERVICE

A means for locating data sources is a basic tool of any data and information program. The lack of such a tool for finding environmental data results in underutilization of existing data to solve problems and make decisions and unnecessary collection of new data.

2.1 Data Access Problems

The problem of access to environmental data is typical rather than unique. It has been recognized in such areas as economic, demographic, health, and energy data. The broadest recognition has come from the Office of Federal Statistical Policy and Standards:

> "The Federal statistical system produces a vast array of statistical information, a product which appears to grow each year. It is commonly observed, however, that these data are seriously underutilized both inside and outside of the Federal Government, and that this condition can be attributed primarily to the lack of adequate information about and access to the existing and available Federal statistical data bases. Notable symptoms of the problem include:
>
> --Data users express confusion and exasperation in trying to locate existing Federal statistics.
>
> --Agency personnel who work with data users report that for every actual data user they encounter they find many others who need Federal statistics but are unaware that they are available from the Federal Government.
>
> --Many of the more sophisticated users of Federal statistical data complain of lengthy delays and time-consuming obstacles in obtaining Federal data in usable form.
>
> --Some original data collection efforts have been launched to collect data which were already available or could have been readily available from an existing data base.
>
> These conditions have led to a growing collective belief within the Federal statistical system that the problems of ensuring access to Federally collected statistical data and providing adequate services to those who use the data are among the most serious facing Federal statistics in the 1980's." 1/

2.2 Environmental Data

A data referral system would address the long-recognized need for better coordination of environmental data. This need was reflected most strongly in the series of bills introduced in Congress by Rep. John Dingell between 1970 and 1974 to establish a National Environmental Data System. The complexity and dispersal of responsibility for environmental data in the Federal Government ultimately resulted in a Presidential veto of one of these bills. Nevertheless, a referral system of the sort envisaged here would provide a means for achieving some of the same goals without disturbing agency responsibility for maintaining data and servicing users.

In their report, Ecological and Environmental Data as Underutilized National Resources,[2/] Armentano and Loucks identified the lack of a way of finding data as a major problem:

> "The spiralling cost of acquiring new data and the increasing use of existing data for policy analysis and environmental assessment appear to be giving a new value to all reliable ecological and environmental data. As the costs of research and environmental monitoring increase, the need for mechanisms that facilitate access to existing data becomes greater. Because there is currently no system for rapidly searching ecological data bases, delays are incurred or time and money are expended unnecessarily for acquiring new data when, for many purposes, suitable data often already exist.
>
> "Lost Opportunities in Accessing Data: The lack of a comprehensive clearinghouse activity for environmental data has led to situations where data bases of value to many potential users go unrecognized and therefore unused. This appears to be especially true of certain federal data collection and information gathering activities.
>
> Evaluation of Apparent Needs: The survey of present services has identified needs for data and information that are currently unmet. Government agencies and researchers sometimes turn to federal computerized data bases but find access to be complicated and delays in obtaining results. Federal outreach initiatives often are pitched toward an agency-specific clientele and, overall have not been successful in alleviating the access problems.

"...the following mechanisms are being suggested for meeting the national needs for access to existing data bases. An immediate need in the national environmental assessment/research community is for a comprehensive, updated, but simple compilation of available data bases and models. The compilation would constitute a data 'catalog' of measurement programs, data base documentation, information on availability, and a short abstract describing the nature and goals of the work.

"The value of the catalog would be proportional to its timeliness and its visibility for a broad spectrum of potential users. To meet these criteria, the catalog should be revised at least annually for each region, and should be distributed systematically or made available to all users."

A National Environmental Data Referral Service would be responsive to the needs and requirements expressed above. Its primary function is to provide products and services that enable users of environmental data to determine whether specific data exist and, if so, where and how they may be obtained. These products and services will facilitate access to environmental data needed for decisionmaking in industry and government, and for university research.

NEDRES also will meet statutory and national program requirements for environmental data referral. In particular, NEDRES is intended to satisfy the need for an inventory service to implement the data and information referral provisions of the National Climate Program Act. The global dimensions of environmental data make worldwide coordination mandatory. NEDRES will serve as a resource for U.S. participation and exchange with international data referral systems, such as those of WMO, IOC, and UNEP. These programs in turn will provide a valuable link to international environmental data sources that are critical to the eventual success of a service for the United States.

2.3 Climate Data

In the National Climate Program Act (PL 95-367), the U.S. Congress found that

(1) Information regarding climate is not being fully disseminated or used.

(2) The United States lacks a well-defined and coordinated program in climate-related...information utilization.

The legislation declared that

[Section 5(d)(5)]: "The Program shall include...systems for the management and active dissemination of climatological data, information, and assessments, including mechanisms for consultation with current and potential users;"

[Section 5(d)(7)]: "The Program shall include...mechanisms for intergovernmental climate-related...services;" (many States already have initiated climate information programs, according to the NCP Five-Year Plan).

The implementation of the Act is spelled out in The National Climate Program Five-Year Plan which made generation and dissemination of climate information a principal thrust and listed a number of expressed needs.

The Climate Research Board of the National Research Council emphasized the need for improved access and referral to sources of climatic data and information:

> "It is essential that the U.S. Government ensure the continuity, geographical coverage, and reliability of climatic data as well as provide systems for the storage and dissemination of climatic data and information in forms easily accessible to users." 3/
>
> "The effort and expense of collecting climatic data are only worthwhile if adequate provisions are made for the storage and retrieval of climate information. The cost of doing this is small compared with the cost for the original collection of data.....As the U.S. Climate Program develops, it is important to examine whether present institutional structures will meet future demands. A growing need is apparent for a unified though not necessarily centralized archive. At

present, the most significant archives exist in NOAA and the Department of Defense (DOD), held principally at the National Climatic Center in Asheville, North Carolina, and the U.S. Air Force Environmental Technical Applications Center (ETAC). There are also large climatic data holdings in other federal agencies and in laboratories and universities. An attempt should be made to bring these into some unified archival system. The nerve center of such a comprehensive climate data archive needs to be at a single geographical location, although all the data need not be kept there. Modern computer and communications technology enables a data archive to be operated as an effective referral system. The center would at all times have an updated inventory of available climatic data, where they are located, how they can be obtained, and the cost of using them. A task of primary importance would be the compilation of an inventory of existing data bases." (emphasis added) 4/

2.4 Marine Pollution

Legislation in other environmental program areas also emphasizes the demand for better data access. The most recent of these laws is the National Ocean Pollution Research, Development, and Monitoring Planning Act (PL 95-273). The specific expressions of requirements found in this legislation are:

(1) "...provides planning for coordination of and dissemination of information with respect to such programs within the Federal Government." "...develop the necessary base of information to support and provide for the rational, efficient and equitable utilization, conservation and development of ocean and coastal resources;..."

Section 8: "The Administrator shall ensure that the results, findings, and information regarding ocean pollution research and development and monitoring programs conducted or sponsored by the Federal Government be disseminated in a timely manner, and in useful forms, to relevant departments, agencies, and instrumentalities of the Federal Government, and to other persons having an interest in ocean pollution research and development and monitoring."

(2) Federal Plan for Ocean Pollution Research, Development, and Monitoring Fiscal Years 1979-83: "...integration and acceleration of information dissemination..."

(3) Report of the Subcommittee on Ocean Pollution Data Collection, Storage and Distribution: "...a complete data and information service network...to support pollution research and development and monitoring activities..."

2.5 Benefits of the NEDRES Approach to Meeting the Requirements

NEDRES will benefit users of environmental data by saving time and money and making better use of existing resources. It will improve governmental program management by eliminating the need for the proliferation of environmental data referral services.

Information about environmental data sources will have a positive value to users if it is less costly than the next best source of the same information. The value of NEDRES to the user's decision will be based most frequently on time saved in locating data, cost avoidance in not having to collect data that are found to be available, and cost savings in being able to make decisions within tighter confidence limits. For example, the availability of data on maximum wave heights and forces at a particular location can save millions of dollars in the design of offshore structures.

NEDRES will provide better program management by integrating a variety of needs for environmental data referral into one service. Cooperation and coordination in data collection and data service efforts will be improved by unified management. The breadth of multidisciplinary coverage will make it easier for NOAA and other environmental organizations to respond to changing needs for data without having to organize new activities each time. NEDRES will facilitate the creation of integrated (tertiary) databases for problem solving and analysis. The resulting increase in use of data files that NEDRES should stimulate will benefit data centers, as well as the users, by providing cost recovery and better justification for their existence. Finally, the communication among data suppliers and users resulting from NEDRES should serve to help define and anticipate future user needs.

3. DESIGN CRITERIA

The needs expressed in the preceding section have been translated into a general design specification. This specification and associated parameters constitute a basis for preliminary implementation of NEDRES. However, the success of NEDRES ultimately will depend on close contact with the user community and adaptation to needs that only become evident with the use of NEDRES. The design criteria focus on defining the target user community to be served by NEDRES, the products and services to be provided, the breadth of coverage, the service delivery requirements, and what are the quality requirements.

3.1 Target User Community

NEDRES should be available for use by anyone in the United States who agrees to the terms of use, including user charges. Its products and services also should be available to cooperating organizations in other countries under suitable terms of exchange or cost recovery. The primary categories of users are expected to be

- Industry
  - agriculture
  - architecture, housing and urban planning
  - chemicals
  - defense
  - electric and gas utilities
  - energy exploration and production
  - environmental consultants
  - fishing
  - insurance
  - minerals and metals
  - transportation
- State Government
  - environmental and natural resources agencies
  - state climatologists

- o Universities
  - engineering
  - environmental studies
  - geography
  - geosciences
  - physics and astronomy
  - meteorology
  - oceanography
- o Federal Government
  - Department of Agriculture
  - Department of Commerce
    National Oceanic and Atmospheric Administration
  - Department of Defense
  - Department of Energy
  - Department of Housing and Urban Development
  - Department of the Interior
  - Department of Transportation
  - Environmental Protection Agency
  - National Aeronautics and Space Administration

Regular communication with these diverse user groups will need to be established, both directly by NEDRES program management and indirectly through specialized data user groups, such as the National Climate Program data committees.

3.2 Level of Information Needed for a Referral Service

The basic unit of output for NEDRES will be a reference to a source of data. This reference must be sufficiently detailed to permit a user to decide whether or not a data source is relevant to the need at hand. The basic unit also must contain appropriate terms to permit selection and retrieval of relevant references.

Based on past experience of EDIS data centers and other federal agencies, the level of detail of data source description must have the following content in order to be useful:

Content	Purpose	
	Search	Display
Measured environmental variable	X	X
Geographic area	X	X
Timespan	X	X
Instrument, Instrument Platform, Method	X	X
Storage medium		X
Organization holding the data		X
Description of data and quality		X
Terms of availability		X

Present knowledge of user needs derived from past EDIS experience and a study of other data referral systems indicates that this content will meet user needs. Mere indication that an organization holds a general type of data is not sufficiently specific. Detail beyond the amount proposed, on the other hand, is best left to personal contact between user and data source. For example, specific data formats may be negotiable according to the user's need.

3.3 Product and Service Requirements

The basic NEDRES output units, references to available data sets, will be provided to users in a variety of forms. These forms reflect the range of user needs for packaging the information, for flexibility and selectivity in finding information, for delivery at different locations, and for assistance in using the resources of NEDRES.

NEDRES will require the capability of generating products to serve national program and other specialized user group needs. These products are expected to be topical and/or regional catalogs comprised of subsets of the complete NEDRES holdings of data source descriptions. For example, NEDRES should be able to generate a publication consisting of references to all data sets containing measurements of sea surface temperatures over the continental shelf off Delaware. Other NEDRES products should include announcements of newly acquired data file references and news of developments in environmental data access.

NEDRES users will require two types of services. Some of the more active and technically sophisticated users will want direct access to the complete NEDRES holdings in a form that permits questions to be answered readily. (This design criterion is discussed more thoroughly under the headings on service delivery and service quality.) For these users, the required service is the establishment and maintenance of a system that permits their uses to take place as needed.

Other NEDRES users will require (or at least prefer) direct personal assistance in order to obtain satisfactory answers to their needs. Consequently, the second service that must be provided is an inquiry service or clearinghouse. The demand for this service is most evident in the National Climate Program plan, which calls for a clearinghouse to be established to provide user services.

3.4 Coverage and Scope

Environmental programs and activities are multidisciplinary and global in scale. The term "environmental data" implies a broad subject scope with no generally agreed upon limits. Likewise, the geographic scope is worldwide. For these reasons, fundamental design parameters are needed to define the extent of subject and geographic coverage of NEDRES.

The geographic coverage criteria include environmental data (1) relevant to locations in the United States, (2) collected anywhere by U.S. organizations alone or in concert with those of other nations, (3) collected anywhere and held by U.S. data centers because of interest by U.S. users, and (4) collected anywhere and of special significance to U.S. interests even though held elsewhere. NEDRES would rely on other data referral systems and sources to assist in referral to data not included among the listed categories.

Subject coverage should follow the dictates of NOAA's mission to

> "Operate and maintain a system for the storage, retrieval and dissemination of data relating to the state and resources of the oceans and inland waters including the seabed, and the state of the upper and lower atmosphere, of the earth, the sun and the space environment."

Taking into account this broad mission, NEDRES minimally should cover natural environmental data of the following types:

Types of Environmental Data Referenced by NEDRES

- climatological and meteorological
  - standard surface and upper atmosphere
  - atmospheric radiation, physics, and chemistry
  - air quality
- oceanographic
  - physical, chemical, biological
  - ocean mineral and energy resources
  - ocean pollution
- geophysical
  - geomagnetic and seismological
  - marine geological and geophysical
  - solar-terrestrial physics
- geodetic and cartographic
- glaciological
- aquatic ecological and limnological

Certain types of data should be excluded from coverage by NEDRES in order to avoid unnecessary duplication with other existing public referral services. References to data on surface and groundwater hydrology and on water quality of freshwater are provided by the National Water Data Exchange (NAWDEX), a parallel service operated by the U.S. Geological Survey; NEDRES would point users of such data to NAWDEX. Similarly, NEDRES will coordinate with other data referral services for fishery economic data, such as catch and landings; terrestrial mineral and energy resource assessment and production data; and toxic substances.

3.5 Conditions of Use of NEDRES

The design of NEDRES must take into account the policy of cost recovery for products and services provided to users. For the most part, it is anticipated that NEDRES products and services will meet the economic definition of "private goods," i.e., the users will be identifiable, will benefit from their use to a greater extent than the public as a whole, and can be excluded from use if they do not pay. Consequently the NEDRES system design must include a means to measure and to charge for usage of products and services according to the principles established by U.S. Code Title 31, OMB Circular A-25, and related Department of Commerce and NOAA policies.

3.6 Service Delivery Requirements

Some user requirements relate to the delivery system for NEDRES rather than the content. In order to succeed, NEDRES must be able to provide service where, when and in the form users want it. Likewise the means of delivery must be relatively easy to use and employ current technology. Users will not stay with a system that is difficult to use or one that appears to be antiquated.

Requirements for speed of delivery have increased significantly in recent years. Information users have become accustomed to electronic delivery of information at office, home, and library terminals. Few information users who have been exposed to this capability retain the patience to send a request elsewhere and wait a week or more for delivery of the requested information. No system designed today can afford to ignore this method of delivery.

One resulting design criterion is that NEDRES must be accessible to any qualified user who has a terminal and agrees to the conditions of use. Within the limitations of today's public telecommunications, the service should be available any place it is desired.

A second criterion is rapid, interactive service. No precise data for NEDRES users are available, but users of similar types of services are accustomed to

(1) nearly 100% chance of successfully connecting to the delivery system when desired;

(2) interactive dialog, with no more than 5 seconds response time;

(3) ability to complete an average query within about 15 minutes.

NEDRES must be able not only to meet these delivery expectations, but also to serve another set of users who lack the means or the motivation to query the system interactively. These users typically prefer to be assisted in finding the desired information. Because their preferences as to timely service at a convenient location are often similar to those of the former group, the delivery system should, if possible, provide local assistance centers in convenient locations where concentration of users exist. These local assistance centers may be existing information centers in industry, state agencies, universities, or research institutes.

This local assistance center approach should help to meet the criterion of an easy to use delivery system. Having both direct online access and assistance centers should provide a single delivery system that will accommodate the wide variety of expected users.

As a general design criterion, the NEDRES delivery system should require no more than one day's training for the user who wishes to have

direct access. (Others who do not have terminals or prefer not to learn the details of using an online system could be referred to local assistance centers.) No user need be confronted with a difficult-to-use delivery system.

3.7 Service Quality Requirements

The success of NEDRES will depend upon users' perception of the quality of the service over a reasonable period of time. The quality of a data referral service is comprised of a number of interrelated factors, discussed below. Quantitative measurement of NEDRES success in meeting these design criteria will be difficult, but regular management attention to quality and to user satisfaction will be important.

3.7.1 Record Quality. Each NEDRES description of a data source should be accurate, clear, consistent, complete, and up-to-date. Certain types (see Section 3.2) of descriptive information will be basic to every NEDRES record. This information should be quality controlled so that errors are detected by users in no more than 0.1% of the records. No sustainable complaints regarding consistency of form or completeness of information should be received after a permanent NEDRES service is offered. As a general goal, there should be no records that are more than one year out of date, barring special circumstances preventing updating. Resources, needs, and priorities will determine the actual frequency of updating for individual records.

3.7.2 Database Quality. Within its defined areas of subject scope and geographic coverage, NEDRES should be comprehensive. Achieving this goal is likely to be a long range effort that is heavily dependent on both resources and cooperation of other organizations to achieve completeness.

Selectivity is the second important design criterion related to database quality and is measured in terms of recall (the ability to retrieve all relevant references) and precision (the ability to retrieve only relevant references). Given an adequate information retrieval system (see 3.7.3), selectivity is a function of the quality of the input to the database. No system in common use is capable of achieving both perfect recall and perfect precision, but careful design and management can optimize the performance at any level of resources.

3.7.3 System Quality. Users must be able to gain access, without difficulty, from any place in the United States. This means that the computer and telecommunication systems must be operational during normal business hours (at the minimum) over six time zones (including Alaska and Hawaii). Hardware and telecommunications must be sufficient so that 99% of attempts to gain access are successful on the first try and there is never more than one business day in any year when the system is not operational for more than four hours of normal operating hours.

The software is also important to the users' judgment of reliability of NEDRES. NEDRES will contain textual descriptions, some portions structured or coded and others in natural language. Consequently the design criterion calls for the flexibility of being able to search efficiently for character strings such as words and word roots (truncated words) and to use logical (and, or, not) and comparative (equal, greater than, less than) expressions to form search statements. The software also should permit users to modify searches interactively and to save search expressions for repeated use. This capability is found

in a number of systems originally designed for bibliographic and textual information retrieval. Some general database management systems have similar capabilities, but these perform free text search tasks less efficiently.

4. A STRUCTURED ENVIRONMENTAL DATA REFERRAL SYSTEM

NEDRES will be a central, integrating service in a network of the many organizations that now store and make available environmental data. It will have dual roles as:

- a switching mechanism for referral
- a linking mechanism for cooperation, exchange of information, and airing of needs

The first of these roles will be filled by a referral database, a clearinghouse, and special products and services. The second role will take the form of a cooperative network of producers and users of environmental data.

4.1 A Hierarchy of Data Referral and Inventories

NEDRES will be designed as the front-end portion of a structured or hierarchical data referral system, with each level providing information best suited to meeting a particular user's needs. The NEDRES referral database will be the broadest, most general level. It will point the user to the sources of relevant data. These data sources may range from large data centers that archive hundreds of data files in a variety of storage media to individuals with a single data file to published sources of data available in libraries or clearinghouses.

Other levels in the data referral hierarchy will be individual agency inventories. In some complex circumstances, an agency may need more than one level of inventories to manage its own data holdings effectively. In other cases, a single inventory may suffice.

What generally will distinguish these inventories from NEDRES is the level of detail. NEDRES will contain enough detail to permit the user to judge whether the subject matter of a data file (measured

environmental parameters, location, and time) are relevant to a requirement. Agency inventories, by contrast, will go into much greater detail regarding the physical and logical structures of data files. These inventories also may contain more detail than NEDRES about the sources of the data, data collection methods, and quality control by the originator or the data center. These relationships are depicted from an overall viewpoint in figure 1, as viewed by any individual cooperating agency data manager in figure 2, and as viewed by the user in figure 3.

The data referral database will be made easily accessible through a commercial online information retrieval system to those who agree to the conditions of use. Individual agency data systems that prefer to have the NEDRES database for use on their internal computers may choose this alternative instead of using the commercial system. These agencies would agree to provide descriptions of their data files as input to NEDRES or to pay a license and royalty fee or both.

The use of NEDRES will be promoted through an aggressive marketing program and through the development of a cooperative network of organizations interested in environmental data. The continuous updating of the data referral database will be supported by the cooperative program.

4.2 The Cooperative Network

An important feature of a structured environmental data referral system will be a cooperative network of major Federal, State, and local agencies, institutions, and programs interested in environmental data.

Figure 1
Overview of the National Environmental Data Referral System (NEDRES)

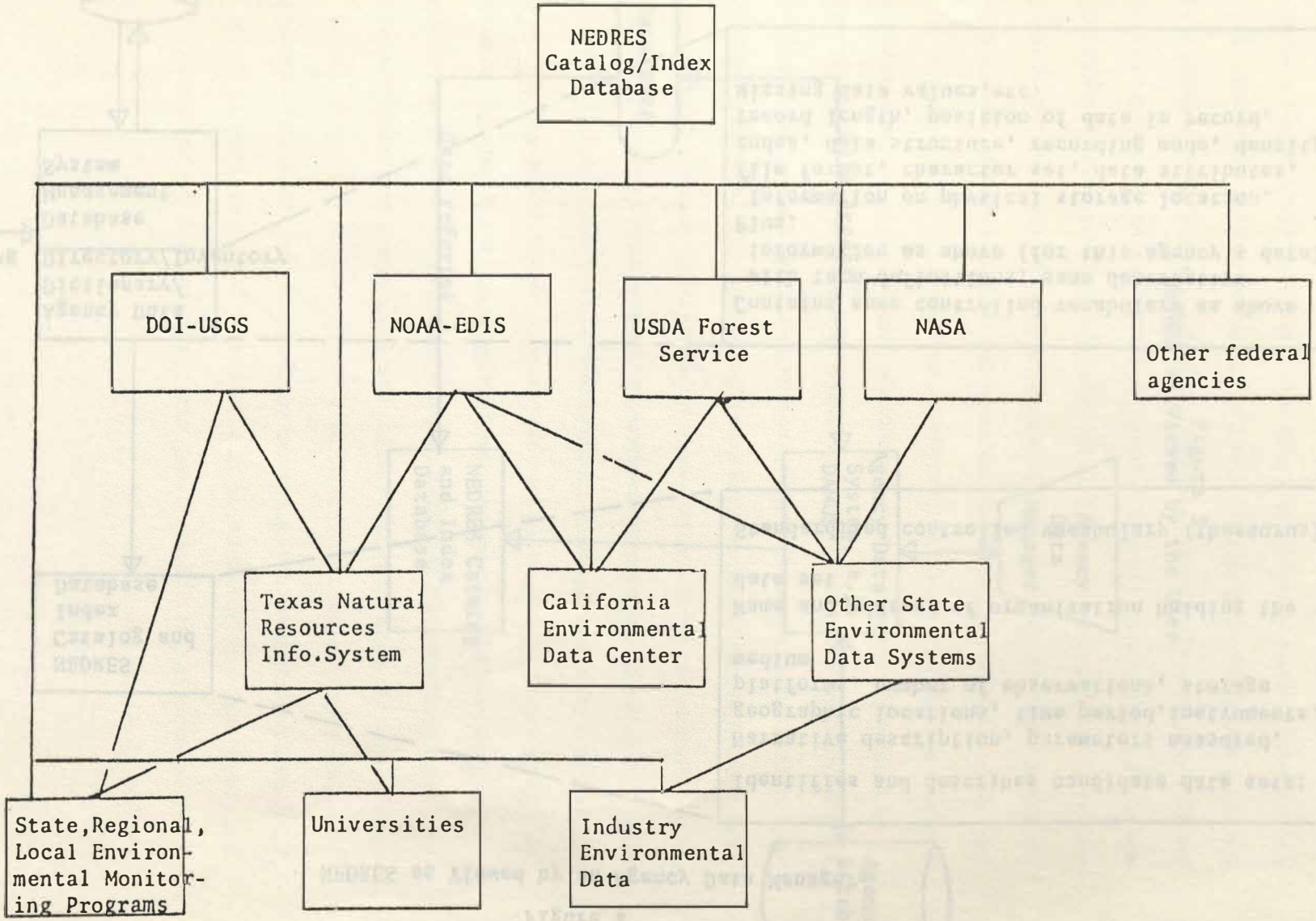


Figure 2

NEDRES as Viewed by an Agency Data Manager

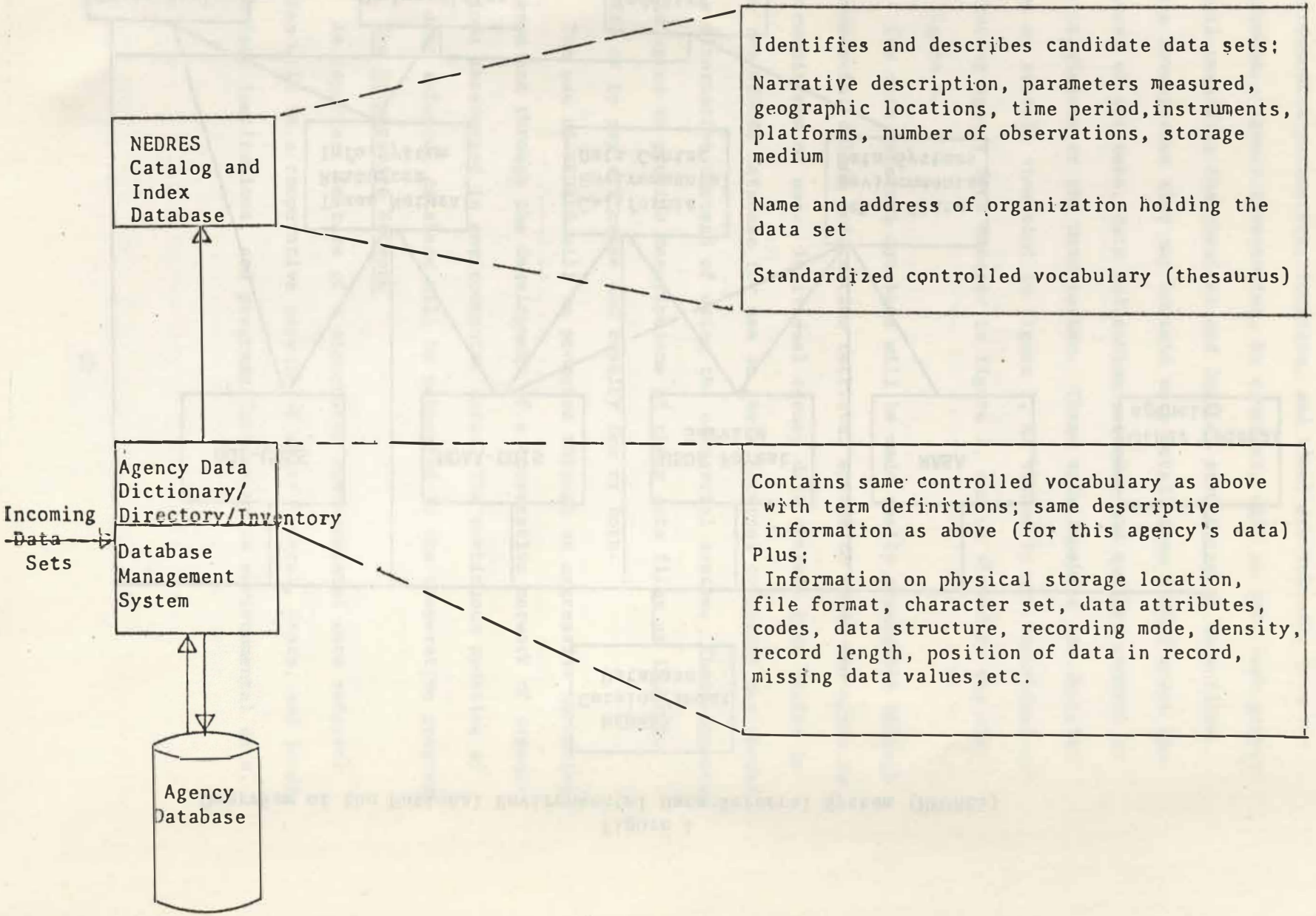
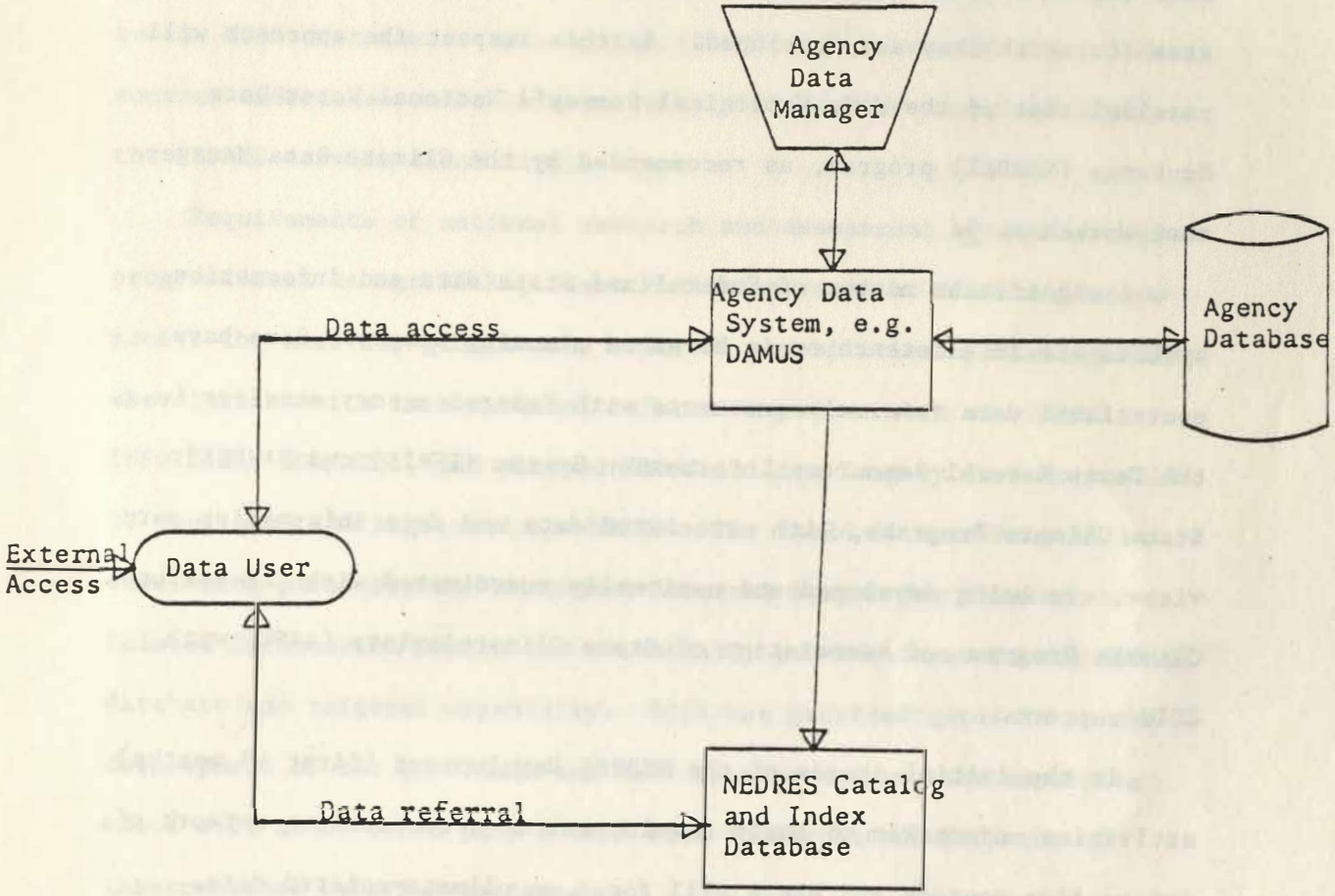


Figure 3
NEDRES as Viewed by the User



Coordination with existing environmental and natural resources data and information services will provide a source of input and updating as well as additional service capabilities for NEDRES. In turn, NEDRES will be capable of providing referral services to specialized data and information sources not well known outside of the geographic area for which they are developed. In this respect the approach will parallel that of the U.S. Geological Survey's National Water Data Exchange (NAWDEX) program, as recommended by the Climate Data Management Workshop. 5/

A significant number of Federal and State data and information systems are in existence or in advanced planning stages. Some have operational data referral agreements with Federal agency services [e.g. the Texas Natural Resources Information System (TNRIS) and NAWDEX]. State Climate Programs, with associated data and data information services, are being developed and nationally coordinated with the National Climate Program and Association of State Climatologists (AASC) with EDIS support.

In the initial stages of the NEDRES Development (first 18 months) activities undertaken to begin development of a cooperative network of information sources and users will focus on climate-related data.

The broad scope and interdisciplinary aspects of the National Climate Program provides a unique opportunity for intergovernmental and institutional coordination at all levels. The established committee and coordinating structure under this program will be important to the NEDRES development.

State Climate Programs can provide data referral outlets to local agencies and the general public and feedback on requirements for data information services. Specifically, the Intergovernmental Climate Program is planning a computer-assisted message switching/conference system for data and information exchange which will have an active link to the EDIS distributed data system (DAMUS). A survey of states' data sources undertaken under this activity will provide important input to the NEDRES service capability.

Requirements of national research and assessment activities under programs such as AgriSTARS, Ocean Pollution, and the Climate Program accent the need for global data referral capabilities. Existing EDIS coordination with international referral services such as UNEP/INFOTERRA, IOC/MEDI, and planned FAO/Satellite Imagery Inventory will be continued and augmented by NEDRES. The World Climate Program is developing plans for an "Automated Referral System for Climate Related Information" which can potentially provide input to the NEDRES database and referral capability. EDIS has provided guidance in the development of the INFOTERRA and MEDI systems and has the expertise which will allow it to play a lead role in further development of international referral systems.

5. IMPLEMENTATION ACTIONS

The program will be implemented through three interdependent projects. The goals of these projects are structured as follows:

5.1 Develop and maintain a nationally-accessible environmental data catalog and index. As its major product, the program will produce a computerized catalog and index of publicly available environmental data held by organizations throughout the United States. This database will be made available through a commercial online information storage and retrieval system, making it readily accessible to anyone with a terminal. EDIS and its cooperators will search out sources of environmental data; index the data in order to make clear its characteristics, source, and conditions of availability; and build the database. There are six objectives to be reached in meeting this goal. Individual tasks for each objective are shown in Figure 4.

5.1.1 Objective 1: Establish an interim online database. Two existing databases will be used to test user requirements. These are the EDIS Environmental Data Base Directory (EDBD) and the Interim Climate Data Inventory (ICDI). EDBD contains descriptions of some 13,000 environmental data files, with a special emphasis on data pertaining to U.S. coastal areas. ICDI has approximately 700 descriptions of climatological data files. Developed as a prototype of a data inventory to meet National Climate Program Act requirements, ICDI was published by EDIS in December 1980.

The EDBD and ICDI databases will be loaded on a commercial online retrieval system. All EDBD records which describe EDIS data files will be corrected, revised, and brought into and maintained in total

alignment with the EDIS Data Dictionary. Once online, the databases will be used to provide selective online search services.

5.1.2 Objective 2: Review and evaluate other referral services. Other existing data referral services and their associated systems will be studied and evaluated to assist and improve the design and operation of NEDRES. Exchange of (1) referral technology, (2) access to referral systems, (3) data referral records, and (4) standards will result.

5.1.3 Objective 3: Develop user charge accounting system and user statistics collection system. EDIS will develop a set of user charges to comply with general NOAA policies. In general these charges will be based on recovery of marginal costs for services provided and of market value for published products. For example, for the direct use of the online referral database, users will pay a charge for the computer resources used (measured in connect time) and for the references chosen (measured in number of references printed or displayed). In order to encourage participation in the cooperative network, an alternative user charge policy may be based on exchange of services of relatively equal value.

The system also will be designed to collect statistics on the amount of use of NEDRES. These statistics will be reported in the form of a matrix of products and services versus standard user categories. The collection of statistics will be integrated from the start with the EDIS Management Information System.

5.1.4 Objective 4: Establish data referral vocabulary and standards activity. Authoritative lists of descriptive terms and names will be established and maintained for use in building data file

descriptions to assure consistent and satisfactory retrieval of referral records (user services) from the NEDRES database. These lists will be used extensively as a basis for quality control of system input.

5.1.5 Objective 5: Design and implement permanent NEDRES database structure and procedures. An operational NEDRES database will be designed, developed, and loaded on a commercial online system. The design of the operational database will be based upon findings from an evaluation of the interim (pilot) online database and a separate user needs survey (see 5.3.1).

5.1.6 Objective 6: Provide public access through online vendor. Public access to the NEDRES database will be made available when Objective 5.1.5 is met. The commercial online vendor will open access to its public online clients when requested to do so by EDIS. Both EDIS and the online vendor will market the database.

5.2 Provide special products and services. The NEDRES program also will provide special products and services to users upon request. These activities stem from the special requirements of certain federal environmental programs as well as from individual user needs.

5.2.1 Develop a National Climate Information Clearinghouse. A priority special service objective will be to establish a National Climate Information Clearinghouse. Consonant with the requirements of PL 95-367 and the National Climate Plan, this clearinghouse will improve the accessibility of existing data and information on a national and international scale. The National Climate Information Clearinghouse program elements will include (1) special priority on

inventory of climate data and information holdings, (2) development of a long-range plan for a national climate information system, and (3) cooperation with the World Meteorological Organization (WMO) to develop an international climate information system.

5.2.2 Produce topical and regional catalogs of data sources. Some requests to generate special products are anticipated. These requests are likely to be for topical or regional catalogs. Owing to the possible size and the need for printing and distribution of many copies, users probably will turn to the NEDRES program office for assistance rather than producing copy via a computer terminal.

5.2.3 Provide NEDRES inquiry and search service. Many users' needs will be satisfied by being able to access the NEDRES computerized catalog and index directly, but there will be others who require special assistance because of either the nature of the request or their personal preference for help from an expert intermediary. NEDRES will accommodate the latter by providing a fee-based referral service and, if required, assistance in delivery of data files held by EDIS and other cooperating centers.

5.3 Establish and operate a cooperative network of data producers and users. EDIS will establish a voluntary confederation of federal, state, local, and private organizations representing both sources and users of environmental data. The availability of the services and products will be an inducement to cooperate for these organizations. Cooperative input will be less costly for EDIS than conducting nationwide surveys. The program will be interfaced with the U.S. Geological Survey's National Water Data Exchange (NAWDEX) and will borrow from its successful experience in organizing a similar program.

5.3.1 Determine user requirements. Specific requirements for content, format, method of delivery, product/service mix, timeliness, coverage, flexibility of access, and other factors need to be understood thoroughly. Operating an interim online database service (see 5.1.1) will be one method of determining these requirements. However, user requirements also need to be studied through a means that does not constrain the user's choices by an existing product (the online database).

To study the requirements independently, EDIS first will review the proceedings of several recent workshops. These include meetings on climate data uses and management, satellite data, climate and health, climate and fisheries, and marine pollution.

In addition, EDIS will conduct a nationwide survey of actual and potential users of environmental data to determine how their needs for referral to sources of data best can be met. This survey will identify a representative sample of users in private industry, federal agencies, state agencies, universities, and major research centers. The selection from private industry will include at least the following: consultants; transportation; electric and gas utilities; agriculture; housing and urban planning; defense; energy exploration, production, and distribution; fishing; mining; and chemicals. The sample from universities and state agencies will include a representative selection of state climatologists. The survey instrument will elicit the following information:

- o Anticipated demand, including volume and frequency of requests and willingness to pay
- o Preferred method/medium of inquiry and response
- o Types of services, special products and/or formats desired

EDIS also will work directly with members of the Interagency Climate Data Subgroup of the National Climate Program Policy Board. These two surveys will complement the data available from use of the interim referral database and form a basis for decisions on the long-range development of NEDRES.

5.3.2 Establish a cooperative network. The precise form of a cooperative network will depend on the user needs and the incentives to and interest of other organizations to participate. For planning purposes, EDIS envisages the network as a voluntary confederation of organizations that independently produce, archive, disseminate, or use environmental data. The network will serve three purposes: (1) to provide a continuing source for identifying new data files and updating the record of existing files, thereby keeping the NEDRES referral database up to date; (2) to provide a geographically distributed set of local assistance centers for users who wish to call on the help of expert intermediaries; and (3) to serve as a means for exchange of information among the participating organizations.

Responsiveness to its membership will provide a permanent constituency for NEDRES with EDIS as the coordinating organization. As the network develops, EDIS will begin to hold regular (probably annual) membership meetings.

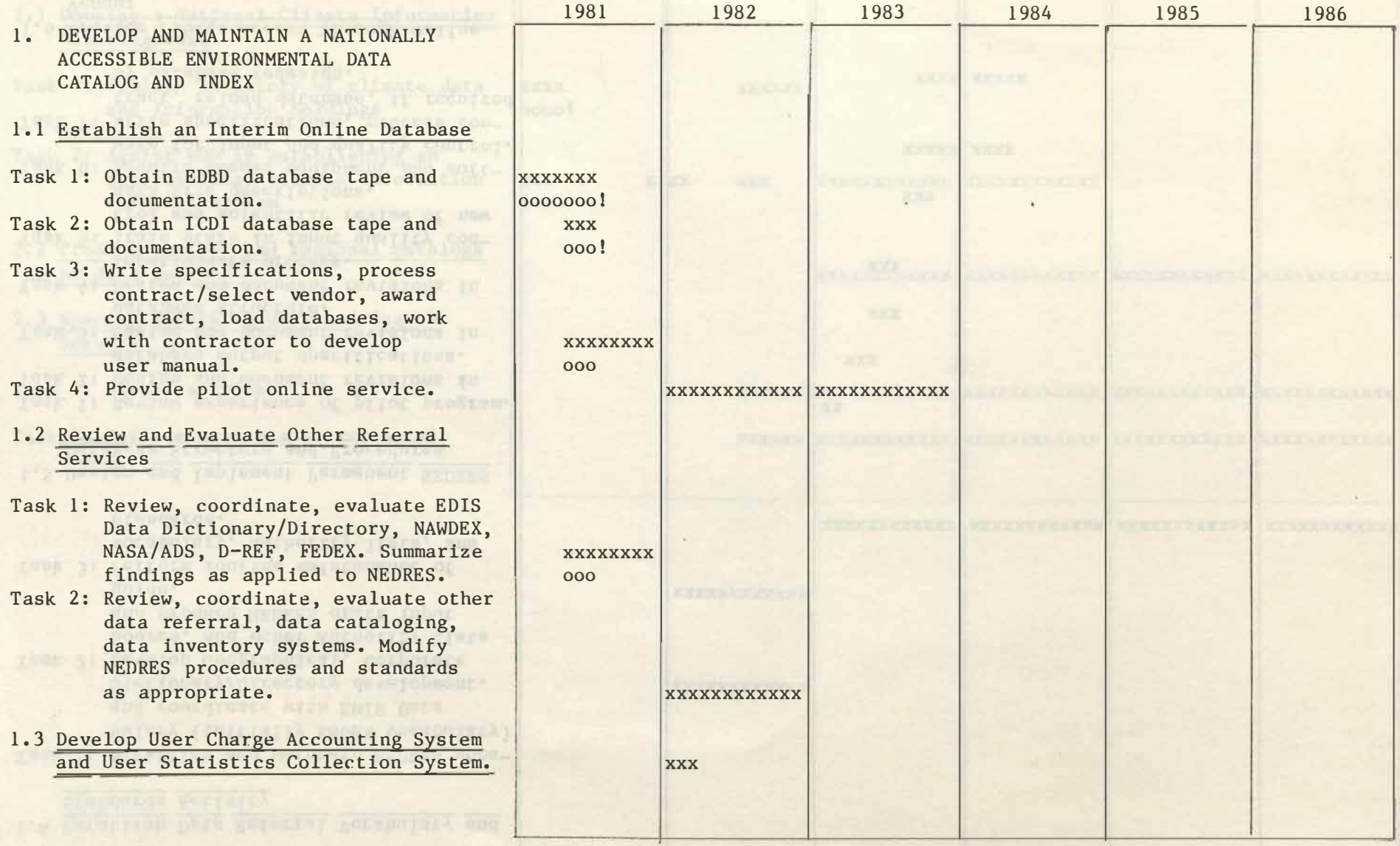
These meetings will be designed to facilitate the development of the voluntary network, obtain user feedback, identify new or missing

data sources, provide a forum for discussion of environmental data access issues, and arrive at a consensus on future directions for NEDRES. As a means of continuing communication for members of the cooperative network, NEDRES also will issue a newsletter to keep co-operators abreast of new developments in environmental data access, new data sets available, and the capabilities of participating organizations.

The overall work plan for the development of NEDRES is shown in Figure 4. Goals and objectives are shown by numbers which correspond with those of Section 5 in the text. Tasks are identified as such.

Figure 4

NEDRES WORK PLAN



1 (continued)

	1981	1982	1983	1984	1985	1986
1.4 Establish Data Referral Vocabulary and Standards Activity						
Task 1: Establish and maintain NEDRES vocabulary (initially ENDEX vocabulary) and coordinate with EDIS Data Dictionary/Directory development.		xxxxxxxxxxxx				
Task 2: Develop Geographical, Corporate Source, and other Authority Lists and produce NEDRES draft input guide.		xxxxxxxxxxxx				
Task 3: Perform routine maintenance of vocabulary, authority lists, and standards.			xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx
1.5 Design and Implement Permanent NEDRES Database Structure and Procedures						
Task 1: Review experience of pilot program.			xx			
Task 2: Design and document revisions in database output specifications.			xxx			
Task 3: Design and document revisions in database structure.			xxx			
Task 4: Design and document revisions in input/update process.			xxx			
Task 5: Train staff in input quality control and scientific review of new data file descriptions.			xxx			
Task 6: Acquire needed equipment and software for input and quality control.			xxxxx	xxxx		
Task 7: Write specifications, process contract, reload database, if required by database redesign.			xxxx	xxxxx		
1.6 Provide Public Access Through Online Vendor						
Task 1: Market pilot database through brochures, user aids, and training sessions (online vendor also performs to some extent).				xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx

	1981	1982	1983	1984	1985	1986
2. PROVIDE SPECIAL PRODUCTS AND SERVICES						
2.1 Develop a National Climate Information Clearinghouse						
Task 1: Publish inventory of climate data and information holdings	xxxx oooo!	xxxxxx				
Task 2: Assist WMO in establishing an international climate information referral system	xxx x ooo!	xx xxx	xxxxxxxxxxxx	xxxxxxxxxxxx		
2.2 Produce topical and regional catalogs of data sources			xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx
2.3 Special NEDRES Inquiry and Search Service						
Task 1: Market service.		xxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx
Task 2: Perform searches as requested.		xxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx	xxxxxxxxxxxx

3. ESTABLISH A COOPERATIVE NETWORK OF DATA PRODUCERS AND USERS

3.1 Determine User Requirements

Task 1: Determine requirements of Federal agencies through Interagency Climate Data Subgroup.

Task 2: Survey user requirements of State agencies, industry, and universities.

Task 3: Deterimine willingness of data centers and services to cooperate.

3.2 Establish Cooperative Network (Federal Groups, State Groups, Professional Societies, Associations, etc.)

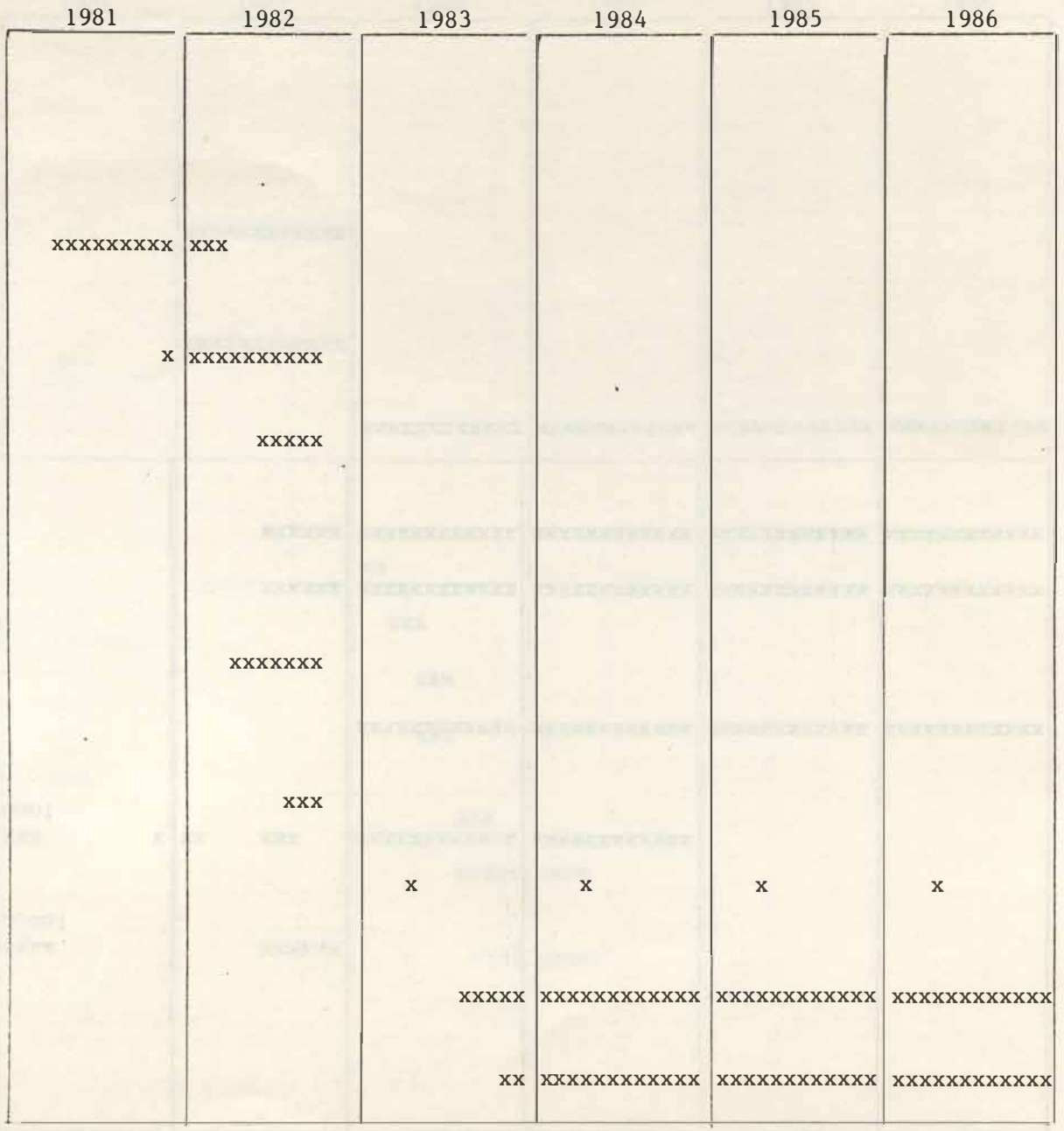
Task 1: Evaluate alternative approaches to cooperative network development. Select best approach.

Task 2: Define responsibilities of and benefits to local assistance centers, central NEDRES program office, and other affiliates.

Task 3: Hold invitational membership meetings.

Task 4: Receive evaluate, and process input from local assistance centers.

Task 5: Distribute products to local assistance centers.



REFERENCES CITED

1/ J. Timothy Sprehe, "A Federal Policy for Improving Data Access and User Services." (unpublished) January 1981.

2/ Indianapolis, The Institute of Ecology, 1979.

3/ National Research Council, Climate Research Board. Toward a U.S. Climate Program, Washington, National Academy of Sciences, 1979, p. 4.

4/ Ibid., p. 23.

5/ National Climate Program Office and Environmental Data and Information Service. Report of the Climate Data Management Workshop, Harper's Ferry, WV, May 8-11, 1979. Washington, n.d. pp. 158-171.