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# BILLS AMENDING OR RELATED TO THE NATIONAL ENVIRONMENTAL POLICY ACT

GOVERNMENT

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## HEARING

BEFORE THE

### COMMITTEE ON

### INTERIOR AND INSULAR AFFAIRS

### UNITED STATES SENATE

NINETY-SECOND CONGRESS

FIRST SESSION

ON

### H.R. 56, S. 1216, and S. 681

BILLS AMENDING OR RELATED TO THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (PUBLIC LAW 91-190), TO ESTABLISH A NATIONAL ENVIRONMENTAL DATA SYSTEM, A NONPROFIT NATIONAL ENVIRONMENTAL POLICY INSTITUTE, AND STATE ENVIRONMENTAL CENTERS, AND FOR OTHER PURPOSES

NOVEMBER 19, 1971



Printed for the use of the  
Committee on Interior and Insular Affairs

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# BILLS AMENDING OR RELATED TO THE NATIONAL ENVIRONMENTAL POLICY ACT

FRIDAY, NOVEMBER 19, 1971

U.S. SENATE,  
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,  
*Washington, D.C.*

The committee met at 10:30 a.m., pursuant to notice, in room 3110, New Senate Office Building, Senator Lee Metcalf presiding.

Present: Senators Metcalf (presiding), Bellmon, Jordan, Anderson, and Burdick.

Also present: William Van Ness, chief counsel; Steven Quarles, special counsel; Suzanne Reed, staff assistant; and Charles Cook, minority staff counsel.

Senator METCALF. The hearing will come to order.

Today the committee will take testimony on three bills which amend or are related to the National Environmental Policy Act: Congressman Dingell's measure, H.R. 56, to establish a national environmental data system; Senator Jackson's bill, S. 1216, to establish a National Environmental Policy Institute; and Senator Bellmon's proposal, S. 681, to create a network of State environmental centers.

The President has called the seventies the decade of the environment. His first official act of the decade was to sign into law the National Environmental Policy Act of 1969, which was considered and reported by this committee. That act provided both a conceptual basis and legal sanction for applying to environmental management the high-level policy concern we apply to other areas of critical national importance.

However, the task of developing an adequate data base and analytical skills for environmental policymaking has not been completed.

The three bills before us refer to the three principal stages in completing that task. These stages are:

One, the collection, storage, retrieval, and dissemination of data—H.R. 56.

Two, the analysis of data, so retrieved and communicated to the analysts, in policy terms for use by the decisionmakers—S. 1216.

Three, research to meet needs identified in the above two stages—research where data has not yet been generated and thus cannot be collected and disseminated, and where analytical methods and/or knowledge are inadequate and therefore policy evaluation cannot be conducted—S. 681.

This hearing provides the committee with an opportunity to hear from the authors of these proposals. In addition, we have asked the Council on Environmental Quality and the Environmental Protection Agency to testify.

In particular, we would like to learn which agencies are presently conducting activities in these three areas—the generation of data through research and monitoring, the collection and dissemination of data, and the analysis of data in policy terms; whether present activities are adequate; and whether new institutional arrangements such as those suggested in these bills would facilitate the conduct of such activities.

In the next session of Congress, we propose to hold one or more additional hearings on these bills so that we might hear from all interested parties.

I direct that the text of the bills and department reports appear at this point.

(The bills and department reports referred to follow:)



1 vironmental Data System established by this title. The system  
2 shall include an appropriate network of new and existing  
3 information processing or computer facilities both private and  
4 public in various areas of the United States, which, through  
5 a system of interconnections, are in communication with a  
6 central facility for input, access, and general management. It  
7 shall also include all of the ancillary software and support  
8 services usually required for effective information system  
9 operation.

10 “(2) The term ‘Council’ means the Council on En-  
11 vironmental Quality established in title II of this Act.

12 “(3) The term ‘environmental quality indicators’ means  
13 quantifiable descriptors of environmental characteristics  
14 which will measure the quality of the environment.

15 “(4) The term ‘information, knowledge, and data’ shall  
16 be interpreted as including those facts which are significant,  
17 accurate, reliable, appropriate, and useful in decisionmaking  
18 in environmental affairs.

19 “SEC. 303. (a) There is hereby established a National  
20 Environmental Data System.

21 “(b) The purpose of the Data System is to serve as the  
22 central national coordinating facility for the selection, stor-  
23 age, analysis, retrieval, and dissemination of information,  
24 knowledge, and data relating to the environment so as to  
25 provide information needed to support environmental deci-

1 sions in a timely manner and in a usable form. Such informa-  
2 tion as shall be deemed appropriate and useful for the achieve-  
3 ment of the purpose of the system shall be made available by  
4 all Federal agencies and shall be collected and received,  
5 where available, from all Federal agencies, private institu-  
6 tions, universities, and colleges, State and local governments,  
7 individuals, and any other source of reliable information.

8 “(c) Information and data shall also be sought from  
9 international sources such as foreign governments, the United  
10 Nations, and other international institutions; and the Presi-  
11 dent is encouraged to enter into such agreements as may be  
12 necessary to accomplish this purpose.

13 “SEC. 304. (a) The information, knowledge, and data  
14 in the Data System and the analysis thereof shall be made  
15 available on request without charge—

16 “(1) to the Congress and all the agencies of the  
17 legislative and executive branches of the Federal Gov-  
18 ernment, and

19 “(2) to all States and political subdivisions thereof,  
20 except that, in any case where it is determined that  
21 the service requested is substantial, the payment of such  
22 fees and charges may be required as may be necessary  
23 to recover all, or any part, of the cost of providing such  
24 retrieval service.

25 “(b) The information, knowledge, and data in the Data

1 System and the analysis thereof shall be made available to  
2 private persons and entities—

3 “(1) upon payment of reasonable fees and charges  
4 as may be established as necessary to recover the cost  
5 of providing such retrieval service; and

6 “(2) subject to such terms and conditions as is  
7 deemed necessary to protect the interests of the United  
8 States.

9 “(c) In all instances the Data System shall perform its  
10 functions so as to protect secret and national security infor-  
11 mation from unauthorized dissemination and application.

12 “SEC. 305. (a) There is hereby created the position of  
13 National Environmental Data System Director, who shall be  
14 appointed by the President to serve at his pleasure, by and  
15 with the advice and consent of the Senate. The Director shall  
16 be a person who, as a result of his training, experience, and  
17 attainments, is exceptionally well qualified to analyze and  
18 interpret environmental data of all kinds and to appreciate  
19 its significance in the management of natural resources as  
20 required for the purpose of this Act. He shall serve full time  
21 and be compensated at the rate provided for level V of the  
22 Executive Schedule pay rates (5 U.S.C. 5313).

23 “(b) It shall be the function of the Director to—

24 “(1) administer and manage, under the guidance of

1 the Council, the operations of the Data System in all of  
2 its ramifications,

3 “(2) institute a study to evaluate and monitor the  
4 state of the art of information technology and utilize to  
5 best advantage new and improved techniques for accom-  
6 plishing the purposes of this Act,

7 “(3) utilize knowledge developed during such study  
8 to develop criteria and guidelines to govern the selection  
9 of data as to scope, scientific validity, quantity, and qual-  
10 ity, to be incorporated into the National Environmental  
11 Data System network, including the development of  
12 predictive ecological models,

13 “(4) develop and implement a plan to establish  
14 and maintain the environmental information network  
15 anticipated to accomplish the purposes of this Act,

16 “(5) develop, establish, and maintain, as neces-  
17 sary, general standards which will permit and facilitate  
18 the compatibility and integration of existing and new in-  
19 formation systems bearing on the environment to make  
20 them consonant and cooperative with the central facility  
21 established by this Act, and

22 “(6) develop and publish from time to time en-  
23 vironmental quality indicators for all regions of the  
24 United States, including its coastal and contiguous zones,

1 and for internationally significant environments such as  
2 the atmosphere and the oceans.

3 “(c) In carrying out his functions under this Act, the  
4 Director shall, to the fullest extent possible, provide the  
5 Council with statistical data and other information necessary  
6 for the preparation of the annual report of the Council re-  
7 quired under section 201 of this Act, and in the development  
8 of long-range programs for the enhancement of the environ-  
9 ment.

10 “SEC. 306. (a) The Director may employ such other  
11 officers and employees as may be necessary (1) for the effi-  
12 cient administration, operation, and maintenance of the Data  
13 System, and (2) to carry out his functions under this title.

14 “(b) The Director is authorized to provide such lawful  
15 incentives as may be required to achieve the purposes of this  
16 Act. These incentives may include, but shall not be limited to,  
17 grants of money, exchanges of information, sharing of facili-  
18 ties, specialized advice, programs and formats, and other like  
19 incentives. The Director shall also be authorized to enter into  
20 contracts with universities, individuals, and State and local  
21 governments when needed, and to purchase information,  
22 data, and personal services as required to fulfill its purposes.  
23 He is also authorized to employ consultants as required.

24 “SEC. 307. (a) The head of each department, agency,  
25 or instrumentality in the executive branch of the United

1 States Government shall make available to the Data System  
2 such information, knowledge, and data on the environment  
3 which such department, agency, or instrumentality may have  
4 as a result of its operations. Such information, knowledge,  
5 and data shall be made available for incorporation into the  
6 Data System, as the Director deems appropriate as soon as  
7 possible after it becomes known to such department, agency,  
8 or instrumentality.

9       “(b) In the administration of all Federal programs  
10 resulting in financial assistance to any cooperative interna-  
11 tional study or to any State, political subdivision, or other  
12 public or private entity, and, in all contracts in which the  
13 United States is a party, the head of the department, agency,  
14 or instrumentality administering such program, on enter-  
15 ing into such contract, shall take such action as may be  
16 necessary to insure that information, knowledge, and data  
17 on the environment which either directly or indirectly re-  
18 sults from such Federal financial assistance or contract will  
19 be made available to the Data System as soon as possible after  
20 it becomes known. In respect to federally assisted environ-  
21 mental programs conducted by foreign nations, it shall be  
22 the policy of the United States Government to encourage,  
23 to the fullest extent possible the availability to the Data Sys-  
24 tem of such information, knowledge, and data arising from

1 these programs which is appropriate to the purposes of the  
2 system.

3 “(c) The head of each department, agency, and instru-  
4 mentality in the executive branch of the United States Gov-  
5 ernment shall, to the fullest extent possible, permit the Data  
6 System Director to use, on a mutually agreeable basis, in-  
7 cluding the payment of compensation, personnel, facilities,  
8 computers, data processing, and other equipment within such  
9 department, agency, or instrumentality in carrying out its  
10 functions under this title; and, to the fullest extent possible,  
11 such computers, data processing, and other equipment shall  
12 be made compatible with all others in, and available for  
13 use by, the Data System.

14 “SEC. 308. There is authorized to be appropriated to  
15 carry out the provisions of this Act the sum not to exceed  
16 \$1,000,000 for fiscal year 1972, \$2,000,000 for fiscal year  
17 1973, and \$3,000,000 for fiscal year 1974.”

Passed the House of Representatives May 17, 1971.

Attest:

W. PAT JENNINGS,

*Clerk.*

92D CONGRESS  
1ST SESSION

# S. 1216

---

## IN THE SENATE OF THE UNITED STATES

MARCH 12, 1971

Mr. JACKSON introduced the following bill; which was read twice and referred to the Committee on Interior and Insular Affairs

---

## A BILL

To amend the National Environmental Policy Act of 1969 (Public Law 91-190), to fund and establish a nonprofit Environmental Policy Institute, and for other purposes.

1     *Be it enacted by the Senate and House of Representa-*  
2     *tives of the United States of America in Congress assembled,*  
3     That the National Environmental Policy Act of 1969  
4     (Public Law 91-190) is amended by adding a new title  
5     III to read as follows:

6             “TITLE III—ENVIRONMENTAL POLICY

7                             INSTITUTE

8             “SEC. 301. (a) The Congress hereby finds—

9                     “(1) that as presently constituted local, State, and  
10            Federal governments do not have an adequate capacity

II

1 to integrate and evaluate the growing body of en-  
2 vironmental research now underway, nor to develop in  
3 a systematic and critical manner the alternatives such  
4 research presents for the development of new and the  
5 restructuring of existing governmental policies and pro-  
6 grams; and

7 “(2) that there are no existing nongovernmental  
8 institutions capable of adequately performing this func-  
9 tion in an objective and comprehensive manner and on  
10 a full-time basis.

11 “(b) The Congress further finds—

12 “(1) that there is a need for objective, impartial  
13 policy analysis to be conducted by an appropriate insti-  
14 tute which is independent of government and private  
15 enterprise, including a broad program of research, and  
16 the identification and development of alternative solu-  
17 tions to existing and emerging environmental problems;

18 “(2) that the institute should be a center for sys-  
19 tematic environmental problem solving and policy-ori-  
20 ented research conducted on a broad, interdisciplinary  
21 basis;

22 “(3) that the institute should be available to local,  
23 State, and Federal governmental agencies to assist in the  
24 assessment, development, and presentation of policy al-  
25 ternatives, but should have the freedom and independence

1 to extend its studies to matters other than those speci-  
2 fied by its government sponsors; and

3 “(4) that it is a responsibility of the Federal Gov-  
4 ernment, in conjunction with appropriate charitable  
5 foundations, to establish, to assist, to encourage, and to  
6 fund such an Institute.

7 SEC. 302. There is hereby authorized to be created a  
8 nonprofit corporation to be named the Environmental Policy  
9 Institute (hereinafter referred to as the ‘institute’) which  
10 shall not be an agency or establishment of the Federal Gov-  
11 ernment. The institute shall be subject to the provisions of  
12 this Act and, to the extent consistent with this Act, to the  
13 District of Columbia Non Profit Corporation Act.

14 “SEC. 303. The incorporators of the Environmental  
15 Policy Institute shall consist of the Director of the National  
16 Science Foundation, the Chairman of the Council on Envi-  
17 ronmental Quality, the President of the American Bar Asso-  
18 ciation, and two persons appointed by the President of the  
19 United States, one of whom shall be an officer of a major  
20 charitable foundation, and one of whom shall by training  
21 and profession be especially qualified to participate in the  
22 establishment of an institute dealing with emerging and  
23 long-range environmental problems.

24 “SEC. 304. The institute shall have an eleven member  
25 board of directors consisting of individuals who are citizens

1 of the United States, of whom one shall be elected annually  
2 by the board to serve as chairman. Members of the board  
3 shall be—

4 “(a) the five initial incorporators;

5 “(b) four members appointed by the President of  
6 the United States, one of whom shall be chosen on the  
7 basis of professional competence and knowledge in each  
8 of the following areas—environment, consumer affairs,  
9 labor, and industry; and

10 “(c) two members elected by the board on the  
11 basis of their interest in environmental problems, and  
12 their professional competence in technology assessment  
13 or systems analysis.

14 “SEC. 305. The institute shall have a president who  
15 shall be named and selected by the board and such other offi-  
16 cers as may be named and appointed by the board, at rates  
17 of compensation fixed by the board, and serving at the  
18 pleasure of the board. No officer of the institute shall receive  
19 any salary from any source other than the institute during  
20 his period of employment by the institute.

21 “SEC. 306. The duties of the institute shall include, but  
22 not be limited to—

23 “(a) developing and analyzing policy alternatives  
24 for dealing with environmental problems, utilizing a sys-

1 thematic interdisciplinary approach, which will insure the  
2 integrated use of all relevant disciplines;

3 “(b) identifying and developing methods and pro-  
4 cedures, in consultation with the Council on Environ-  
5 mental Quality, whereby presently unquantifiable en-  
6 vironmental amenities and values may be given appro-  
7 priate consideration in policy evaluation together with  
8 technical and economic considerations in governmental  
9 and private decisionmaking;

10 “(c) making available to States, counties, municipi-  
11 palities, institutions, and individuals, advice and informa-  
12 tion developed by the institute which is useful in  
13 restoring, maintaining, and enhancing the quality of the  
14 environment;

15 “(d) undertaking, after consultation with the  
16 Chairman of the Council on Environmental Quality,  
17 contract studies for Federal agencies which involve prob-  
18 lems of policy analysis of regional or national signifi-  
19 cance.

20 “(e) identifying areas where additional environ-  
21 mental research and data collection is needed to deal  
22 with emerging and potential problems;

23 “(f) following on a continuing basis the national  
24 capability for technology assessment;

1           “(g) performing within the availability of funds  
2           provided under section 308(a) and by specific fund  
3           transfers for these purposes, such studies as the Council  
4           on Environmental Quality may request.

5           “SEC. 307. The president of the institute shall transmit  
6           to the Congress annually, beginning July 1, 1972, a report  
7           on the financial position and activities of the institute. The  
8           report shall be referred to all standing committees having  
9           jurisdiction over the subject matter therein.

10          “SEC. 308. (a) There are hereby authorized to be  
11          appropriated to the National Science Foundation, as provided  
12          in annual appropriation Acts, not to exceed a total of  
13          \$30,000,000 for fiscal years 1972 through 1977 inclusive,  
14          and \$6,000,000 for each fiscal year thereafter for the purpose  
15          of assisting the financing of the institute. Funds appropriated  
16          under the provisions of this section are to remain separate  
17          from other funds appropriated to the National Science Foun-  
18          dation and are to remain available until expended.

19          “(b) The institute is authorized to accept, hold, and  
20          administer grants and contributions from any source for as-  
21          sisting in the financing of activities for the purposes for which  
22          the institute is established.

23          “(c) Contracts with Federal, State, and local govern-  
24          mental agencies to conduct investigations and analyses pur-  
25          suant to section 305(d) shall be fully financed by transfers

1 of funds or payments. The conduct of such studies shall not  
2 interfere with the duties of the institute as set forth in section  
3 306.

4 “(d) All Federal agencies are authorized to enter into  
5 contracts with the institute for the conduct of policy analysis  
6 studies of environmental problems which will be of assistance  
7 in the performance of the agencies' missions.

8 “SEC. 309. This Act may be cited as the ‘National Envi-  
9 ronmental Policy Institute Act of 1971’.”

92<sup>D</sup> CONGRESS  
1<sup>ST</sup> SESSION

# S. 681

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## IN THE SENATE OF THE UNITED STATES

FEBRUARY 9 (legislative day, JANUARY 26), 1971

Mr. BELLMON introduced the following bill; which was read twice and referred to the Committee on Interior and Insular Affairs

---

## A BILL

To establish environmental laboratories within the States, regions, and Nation pursuant to policies and goals established in the National Environmental Policy Act of 1969.

1        *Be it enacted by the Senate and House of Representa-*  
2 *tives of the United States of America in Congress assembled,*  
3 (a) This Act may be cited as the "State Environmental  
4 Center Act of 1971".

5        (b) It is the policy of the Congress to support research,  
6 planning, management, and education and other components  
7 necessary to maintain and improve the quality of the en-  
8 vironment through the establishment of environmental cen-  
9 ters in cooperation with and among the States, to promote  
10 a more adequate program of environmental protection within

1 the States, regions, and Nation pursuant to policies and goals  
2 established in the National Environmental Policy Act of  
3 1969 (Public Law 91-190). It is hereby recognized that  
4 research, planning, management, and education in environ-  
5 mental areas are necessary to establish an ecological balance  
6 in intrastate and regional (interstate) areas to assure the  
7 Nation at all times of an adequate environment.

8       SECTION 1. The purposes of this Act are to stimulate,  
9 sponsor, provide for, and supplement present programs for  
10 the conduct of research, investigations, experiments, and the  
11 training of professionals in fields required for the protection  
12 and improvement of the Nation's environment. The Admin-  
13 istrator of the Environmental Protection Agency is hereby  
14 authorized and directed to cooperate with the several States  
15 for the purpose of encouraging and assisting them in carry-  
16 ing out comprehensive programs of environmental research,  
17 planning, management, and education, having due regard to  
18 the varying conditions and needs of the respective States.

#### 19       TITLE I—STATE ENVIRONMENTAL CENTERS

20       SECTION 1. There are authorized to be appropriated for  
21 the purposes of this Act such sums as Congress may from  
22 time to time determine to be necessary to assist each par-  
23 ticipating State in establishing and carrying out the work  
24 of a competent and qualified environmental center, or equiva-  
25 lent agency (hereinafter referred to as State center), not to

1 exceed one State center per State as designated by act of  
2 the Governor of the State concerned; subject to the deter-  
3 mination by the Administrator of the Environmental Pro-  
4 tection Agency that such State center has, or may reasonably  
5 be expected to have, the capability of doing effective work  
6 under this Act: *Provided*, That (1) funds under the Act  
7 shall be paid to the one designated State center in each  
8 State; (2) two or more States may cooperate in the desig-  
9 nation of a single interstate or regional center (hereinafter  
10 referred to as regional center), subject to the determination  
11 by the Administrator of the Environmental Protection  
12 Agency that such regional center has, or may be expected  
13 to have, the capability of doing effective work under this  
14 Act, in which either part or all of the individual sums pay-  
15 able to all of the cooperating States, and subject to designa-  
16 tion of fund amount by the State center, shall be paid to such  
17 regional center; and (3) a designated center or regional  
18 center may, as required for fulfillment of its responsibilities,  
19 arrange with universities and colleges as well as private in-  
20 dustry to participate in the work of said State center or  
21 regional center.

22 SEC. 2. (a) As used in this Act, the term "State center"  
23 or "regional center" means an organization that combines  
24 or coordinates the research capability of educational institu-  
25 tions. The center shall have a nucleus of administrative, pro-

1 fessional, scientific, and technical personnel capable of plan-  
2 ning, coordinating, and directing comprehensive programs  
3 required for the protection and improvement of the Nation's  
4 environment. It shall possess the capability of employing  
5 personnel to carry out research, planning, management,  
6 and education programs. It is not required that the center  
7 be a baccalaureate nor graduate degree granting educa-  
8 tional institution; however, it may be closely associated  
9 with such an institution. The State center or regional center  
10 must be established in part or in whole with an educational  
11 institution, private foundation, or public foundation. Such  
12 center shall be authorized to make grants to and finance  
13 contracts and fund matching or other arrangements with  
14 educational institutions, foundations, or other institutions,  
15 with private firms and individuals whose training, expe-  
16 rience, and qualifications are, in the judgment of the chief  
17 executive officer of the center, adequate for the conduct of  
18 specific projects to further the purposes of this Act; and with  
19 local, State, and Federal agencies, to undertake research,  
20 investigations, and experiments into any aspects of environ-  
21 mental problems related to the mission of the center.

22 (b) It shall be the duty of each such center to plan and  
23 conduct and/or arrange for a component or components of  
24 the universities, colleges, or foundations with which it is or  
25 may become associated to conduct competent research, in-

1 vestigations, and experiments of either a basic or practical  
2 nature, or both, in relation to the environmental pollution  
3 and/or other environmental problems and opportunities to  
4 provide for the training of environmental professionals  
5 through such research, investigations, and experiments; and  
6 training may include without being limited to: biological,  
7 ecological, economic, engineering, geographic, geological,  
8 legal, recreational, resource planning, social, and other  
9 aspects of environmental problems.

10 (c) The Administrator of the Environmental Protection  
11 Agency is hereby charged with proper administration of this  
12 Act and is authorized and directed to prescribe such rules  
13 and regulations as may be necessary to carry out the provi-  
14 sions of this Act, including participation in the coordination  
15 of research initiated under this Act by the center, from time  
16 to time to indicate such lines of inquiry as to him seem most  
17 important, and to encourage and assist in the establishment  
18 and maintenance of cooperation by and among the several  
19 centers; such encouragement to specifically include the devel-  
20 opment of (1) interdisciplinary teams within the colleges  
21 and universities as well as industry, and (2) interinstitutional  
22 arrangements among colleges, universities, private industries,  
23 and governmental agencies (all levels).

24 (d) Any sum made available by Congress for support

1 of work under this Act shall be distributed as follows: (1)  
2 47 per centum shall be allotted equally to each State; (2)  
3 50 per centum of such sums shall be allotted to each State  
4 based on the proportion of the population of the State to the  
5 total population of all of the States as determined by the last  
6 preceding decennial census current at the time such sum is  
7 first appropriated; (3) 3 per centum shall be available to the  
8 Administrator of the Environmental Protection Agency for  
9 administration of this Act.

10 (e) Not less than 25 per centum of any sums allocated  
11 to a State center shall be expended only in support of work  
12 planned and conducted by one or more interstate or regional  
13 centers as provided in section 3 (a) (2) of this Act.

14 (f) Of the first \$500,000 available annually under this  
15 Act for allotment to any State center or regional center, no  
16 matching funds by said centers are required; however, funds  
17 made available annually above \$500,000 must be matched,  
18 on a ratio of \$5 Federal to not less than \$1 of non-Federal  
19 funds.

## 20 TITLE II—TECHNOLOGY TRANSFER COMPONENT

21 SEC. 3. In order to initiate, to facilitate, and to expand  
22 greatly the development of a greater awareness, a clearer  
23 understanding, and more extensive, effective, and efficient  
24 application of useful information being generated by valid  
25 research programs, there is hereby created a technology

1 transfer component of the State Environmental Centers  
2 Act of 1971 hereinafter referred to as the extension and  
3 continuing adult education component. The Congress shall  
4 accomplish the above by establishing a national program of  
5 incentives and support to several States individually and in  
6 cooperation with one another as they attempt to create and  
7 maintain a high level of creditability and emotional equi-  
8 brium among people in the United States with respect to  
9 the topics in the field of environmental quality.

10 SEC. 4. (a) The target audiences for these programs  
11 include:

12 (1) the general public, including all age groups,  
13 sexes, races, religious beliefs, and other units;

14 (2) persons employed by specific units of govern-  
15 ment, such as township, county, municipal, State, Fed-  
16 eral, and other levels of government;

17 (3) personnel employed by business, industry, and  
18 commerce establishments; and

19 (4) others, such as persons involved with civic  
20 groups, fraternal organizations, and other special-in-  
21 terest groups in American society.

22 (b) Such State environmental center extension and  
23 continuing education programs of each of the cooperating  
24 States shall be administered by the chief executive officer of  
25 the center and shall consist of the giving of instruction to the

1 specified groups via a wide range of educational program  
2 techniques and with a generous use of the most modern tools  
3 of communication such as—

4 (1) workshops, seminars, clinics, courses for credit,  
5 field visits, short courses, individual consultation, and  
6 demonstrations, some of which can be handled by the use  
7 of telephone, television, or other combinations of audio  
8 and/or visual presentations;

9 (2) the development of a wide range of useful  
10 information made available in published reports of sev-  
11 eral different types, such as monographs, bulletins, fact  
12 sheets, and other types of printed material as well as  
13 microfilm, microfiche, computer tapes, tape cassettes,  
14 and by other devices that can be used by a specific  
15 audience; and

16 (3) the development and maintenance of a current  
17 and comprehensive reference service to facilitate the  
18 rapid identification and use of helpful information.

19 SEC. 5. The same formula distribution described in sec-  
20 tion 2 (e) shall apply to this title. Of the first \$500,000 avail-  
21 able annually under this Act for allotment to any State or  
22 center or regional center for purposes of technology transfer.  
23 no matching funds by State centers are required; however,  
24 funds made available annually above \$500,000 must be

1 matched, on a ratio of \$5 Federal to not less than \$1 of  
2 non-Federal funds.

3 TITLE III—MISCELLANEOUS PROVISIONS

4 SEC. 6. Sums made available for allotment to the State  
5 centers and regional centers under this Act shall be paid  
6 to their designated centers at such time and in such amounts  
7 during each fiscal year as determined by the Administrator  
8 of the Environmental Protection Agency, and upon vouch-  
9 ers approved by him. Each center shall have a chief ad-  
10 ministrative officer and a treasurer or other officer appointed  
11 by its governing authority. Such treasurer or other officer  
12 shall receive and account for all funds paid to the center  
13 under the provisions of the Act and shall report, with the  
14 approval of the chief administrative officer of the center, to  
15 the Administrator of the Environmental Protection Agency  
16 on or before the 1st day of September each year a detailed  
17 statement of the amount received under provisions of this  
18 Act and shall report, with the approval of the chief ad-  
19 ministrative officer of the center, to the Administrator of the  
20 Environmental Protection Agency on or before the 1st day  
21 of September each year a detailed statement of the amount  
22 received under provisions of this Act during the preceding  
23 fiscal year, and its disbursement, on schedules prescribed by  
24 the Administrator of the Environmental Protection Agency.  
25 If any of the moneys received by the authorized receiving

1 officer of the State center or regional center under the pro-  
2 visions of this Act shall by any action or contingency be  
3 found by the Administrator of the Environmental Protection  
4 Agency to have been improperly diminished, lost, or mis-  
5 applied, it shall be replaced by the center concerned and  
6 until so replaced no subsequent appropriations shall be al-  
7 lotted or paid to that center.

8       SEC. 7. Moneys appropriated under this Act, in addition  
9 to being available for expenses for research, investigations,  
10 experiments, and training conducted under authority of this  
11 Act, shall also be available for printing and publishing the  
12 results thereof.

13       SEC. 8. Bulletins, reports, periodicals, reprints of articles,  
14 and other publications necessary for the dissemination of  
15 results of research, experiments, and other investigations,  
16 including lists of publications available for distribution by  
17 the centers, shall be transmitted in the mails of the United  
18 States under penalty indicia: *Provided*, That each publication  
19 shall bear such indicia as are prescribed by the Postmaster  
20 General and shall be mailed under such regulations as the  
21 Postmaster General may from time to time prescribe. Such  
22 publications may be mailed from the principal place of busi-  
23 ness of the center or from an established subunit of said  
24 center.

25       SEC. 9. The Administrator of the Environmental Protec-

1 tion Agency shall make a report to the President and to the  
2 Congress during its first regular session each year of the re-  
3 ceipts and expenditures and work of the centers in all the  
4 States under the provisions of this Act and also whether any  
5 portion of the appropriations available for allotment to any  
6 center has been withheld, and, if so, the reasons therefor.

7       SEC. 10. The Congress may at any time amend, suspend,  
8 or repeal any or all of the provisions of this Act.

EXECUTIVE OFFICE OF THE PRESIDENT,  
OFFICE OF MANAGEMENT AND BUDGET,  
Washington, D.C., December 8, 1971.

HON. HENRY M. JACKSON,  
Chairman, Committee on Interior and Insular Affairs,  
U.S. Senate,  
Washington, D.C.

DEAR MR. CHAIRMAN: This is in response to your letters requesting reports on H.R. 56, the "National Environmental Data System Act"; S. 681, the "State Environmental Center Act of 1971"; and S. 1216, the "National Environmental Policy Institute Act of 1971."

On November 19, 1971, representatives of the Council on Environmental Quality and the Environmental Protection Agency testified before your Committee on these bills. They stated, in essence, that although the Administration supports most of the broad environmental quality objectives behind these bills, for a variety of reasons set out in their statements we cannot recommend the enactment of any of these measures.

The Office of Management and Budget fully endorses the views expressed before your Committee by the CEQ and the EPA, and we likewise recommend strongly against the enactment of H.R. 56, S. 681, and S. 1216.

Sincerely,

WILFRED H. ROMMEL,  
Assistant Director for Legislative Reference.

U.S. ATOMIC ENERGY COMMISSION,  
Washington, D.C., December 9, 1971.

HON. HENRY M. JACKSON,  
Chairman, Committee on Interior and Insular Affairs,  
U.S. Senate.

DEAR SENATOR JACKSON: Thank you for the opportunity to express our views on S. 1216, a bill "[t]o amend the National Environmental Policy Act of 1969 (Public Law 91-190), to fund and establish a nonprofit Environmental Policy Institute, and for other purposes."

The Atomic Energy Commission supports the bill's general objective of fostering serious policy analysis in the environmental field. However, we would defer to the views of the Council on Environmental Quality, the National Science Foundation, the Environmental Protection Agency, and the National Oceanic and Atmospheric Administration on the need for and desirability of enactment of legislation such as S. 1216 at this time.

As we understand it, S. 1216 would authorize the establishment of a nonprofit corporation to be known as the Environmental Policy Institute. Its Board of Directors shall consist of the Director of the National Science Foundation; the Chairman of the Council on Environmental Quality; the President of the American Bar Association; six persons appointed by the President of the United States, one of whom shall be an officer of a major charitable foundation, one of whom shall by training and profession be especially qualified to participate in the establishment of an Institute dealing with emergency and long-range environmental problems, and one of whom shall be chosen on the basis of professional competence and knowledge in each of the following areas—environment, consumer affairs, labor, and industry; and two members elected by the other nine on the basis of their interest in environmental problems, and their professional competence in technology assessment or systems analysis. The President and other officers of the Board would be selected by the Board.

Although there is no limitation on the source of funding for the Institute, the bill would authorize to be appropriated to the National Science Foundation, as provided in annual appropriation acts, not to exceed a total of \$30,000,000 for fiscal years 1972 through 1977 inclusive, and \$6,000,000 for each fiscal year thereafter, for the purpose of financially assisting the Institute.

The duties of the Institute would include (a) developing and analyzing policy alternatives for dealing with environmental problems, utilizing a systematic interdisciplinary approach, which will insure the integrated use of all relevant disciplines; (b) identifying and developing methods and procedures, in consultation with the Council on Environmental Quality, whereby presently unquantified

fiable environmental amenities and values may be given appropriate consideration in policy evaluation together with technical and economic considerations in Governmental and private decision-making; (c) making available to States, counties, municipalities, institutions, and individuals, advice and information developed by the Institute which is useful in restoring, maintaining, and enhancing the quality of the environment; (d) undertaking after consultation with the Chairman of the Council on Environmental Quality, contract studies for Federal agencies which involve problems of policy analysis of regional or national significance; (e) identifying areas where additional environmental research and data collection is needed to deal with emerging and potential problems; (f) following on a continuing basis the national capability for technology assessment; and (g) performing such studies as the Council on Environmental Quality may request.

The bill appears to be premised on the assumption that the Federal Government does "not have an adequate capacity to integrate and evaluate the growing body of environmental research now underway, nor to develop in a systematic and critical manner the alternatives such research presents for the development of new and the restructuring of existing Governmental policies and programs . . . [and] that there is a need for [this to be done] by an appropriate institute which is independent of Government and private enterprise."

AEC, for many years, has been conducting extensive research in nuclear-related health and safety areas, including environmental fields. Additionally, and without regard to nuclear considerations, we are now enabled by statute to perform research and development activities relating to the preservation and enhancement of a viable environment through development of more efficient methods to meet the Nation's energy needs. Under its nonnuclear-related authority, AEC is prepared to apply its unique facilities and its considerable scientific and technical resources in alleviating environmental problems.

Late last year, as you know, the Environmental Protection Agency and the National Oceanic and Atmospheric Administration came into existence to provide respectively a coordinated attack on pollutants and a more coordinated approach to the understanding and prediction of oceanographic and atmospheric conditions. Also, the Council on Environmental Quality has been coordinating Federal efforts in connection with the requirements of the National Environmental Policy Act and related matters.

We believe these are major steps towards achieving the objectives of S. 1216. We would defer, however, to the views of those aforementioned Federal agencies on the need for and desirability of enactment of S. 1216 at this time.

The Office of Management and Budget has advised that there is no objection to the presentation of this report from the standpoint of the Administration's program.

Sincerely,

JOHN A. ERLEWINE, *General Manager.*

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DEPARTMENT OF AGRICULTURE,  
OFFICE OF THE SECRETARY,  
Washington, D.C., December 20, 1971.

HON. HENRY M. JACKSON,  
*Chairman, Committee on Interior and Insular Affairs,  
U.S. Senate,  
Washington, D.C.*

DEAR MR. CHAIRMAN: This is in response to your letter of September 22, asking for the Department of Agriculture's views and recommendations on H.R. 56, a bill "To amend the National Environmental Policy Act of 1969, to provide for a National Environmental Data System."

The proposed legislation would establish a National Environmental Data System which would serve as the central national coordinating facility for the selection, storage, analysis, retrieval, and dissemination of information, knowledge, and data relating to the environment so as to provide information needed to support environmental decisions in a timely manner and in a useable form. Data would be obtained from Federal agencies, private institutions, universities and colleges, State and local governments, individuals, and international sources. The Data System would be administered by a Director, appointed by the President, who would manage the Data System under the guidance of the Council on

Environmental Quality. Responsibilities of the Director would include instituting studies to evaluate and utilize new techniques; developing criteria and guidelines for selecting data; developing and implementing a plan for an environmental information network; developing standards for integrating existing and new information systems; publishing environmental quality indicators for all regions of the United States; and providing statistical data and other information necessary for preparation of the annual report of the Council. Federal agencies would provide information, knowledge, and data on the environment which result from agency operations and which the Director deems appropriate for incorporation into the Data System, and would permit the use of agency personnel, facilities, computers, data processing, and other equipment on a mutually agreeable basis, including payment of compensation.

The Department of Agriculture supports the general objective of making better use of data and information in decisions that affect the quality of the environment. The Department engages in a number of data-collecting activities that are important to our mission responsibilities, and shares this information with other organizations requiring the information. For example, the Soil Conservation Service and the Agricultural Research Service engage in such activities. The Department also makes use of data and information on environmental conditions, obtained from other Federal agencies.

It should be recognized that data on environmental conditions are required for many purposes, and that these purposes would not necessarily be served more efficiently by the centralized storage, analysis, management, and coordination of data and information. Our experience has shown that data and information are most useful when collected for specific objectives and clearly defined requirements. In the absence of information on the specific objectives and requirements that would be served by the System proposed in H.R. 56, we do not believe the steps contemplated would improve upon existing arrangements.

For these reasons primarily and also because of the potentially costly and duplicative character of the envisioned System, the Department does not recommend passage of H.R. 56.

The Office of Management and Budget advises that there is no objection to the presentation of this report from the standpoint of the Administration's program.

Sincerely,

J. PHIL CAMPBELL, *Under Secretary.*

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THE WHITE HOUSE,  
Washington, D.C., December 13, 1971.

Senator HENRY M. JACKSON,  
*Chairman, Committee on Interior and Insular Affairs,*  
*U.S. Senate, Washington, D.C.*

DEAR SENATOR JACKSON: I have reviewed H.R. 56, an Act to amend the National Environmental Policy Act of 1969 to provide for a National Environmental Data System. This bill would establish a National Environmental Data System that would serve as the central authority charged with collecting, analyzing, retrieving and providing data on environmental issues to a number of parties, federal, state and private. The System would be under the "guidance" of the Council on Environmental Quality, but in effect would be a new agency of the Federal Government.

Clearly the idea of adequate data of good quality for environmental decisions is laudable. I question, however, the desirability of a separate, free-standing institution to serve this function and would urge instead that the capabilities of the environmental agencies be strengthened appropriately. As you know, activities currently being carried on by the Council on Environmental Quality, the Environmental Protection Agency, and other interested agencies, including this office, are intended to further this latter objective.

Accordingly, I do not believe that this bill is necessary and I recommend against its enactment. The Office of Management and Budget concurs with this recommendation.

Sincerely,

EDWARD E. DAVID, Jr., *Science Adviser.*

NATIONAL SCIENCE FOUNDATION,  
Washington, D.C., September 30, 1971.

HON. HENRY M. JACKSON,  
Chairman, Committee on Interior and Insular Affairs,  
U.S. Senate, Washington, D.C.

DEAR SENATOR JACKSON: This is in reply to your request of September 22, 1971 for comments of the National Science Foundation on H.R. 56, a Bill "To amend the National Environmental Policy Act of 1969, to provide for a National Environmental Data System."

The Foundation supports the bill's general objective of assuring the availability of required information and data on the environment. However, we do not believe that the steps proposed in this bill would necessarily contribute significantly to that objective. Data and information should be collected to satisfy clearly defined requirements, including operational and research requirements. Many agencies are involved in collecting and using data on the environment as a part of their statutory responsibilities and missions. Such data and information often do not and should not be expected to have general application that would warrant centralization of their storage, analysis or management. Centralization might even impede their use for fulfilling operational or research requirements.

In view of these considerations, we believe that before efforts are undertaken to centralize data and information responsibilities, as contemplated by H.R. 56, the requirements to be met should first be identified. At a minimum this should distinguish requirements for data that have general application from data required for more specialized purposes. We understand that the Council on Environmental Quality is working on the task of identifying requirements for data that would have broad application and which are not now being met by agency activities. The Foundation is cooperating with the Council in its efforts and will continue to do so. We are also supporting several research efforts that seek to define requirements for environmental data and are keeping the Council and other agencies informed of these efforts and our findings.

We believe that adequate authority to pursue the basic objectives of H.R. 56 is already available, and is being exercised. In view of the above comments, we do not see the need for the bill.

The Office of Management and Budget has advised us that there is no objection to the submission of this report from the viewpoint of the Administration's program.

Sincerely yours,

W. D. McELROY, *Director.*

Senator METCALF. I call on Senator Bellmon, my colleague on the Migratory Bird Conservation Subcommittee, and a longtime conservation friend of mine, to testify on behalf of his bill.

Senator BELLMON. Mr. Chairman, thank you. My statement is very short, so if there is no objection I would like to read it.

Senator METCALF. Please do so.

#### STATEMENT OF HON. HENRY BELLMON, A U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator BELLMON. The intense national interest in solving present environmental problems and in avoiding environmental crises in the future has produced many beneficial results. Already there is a body of law which, given a period of operation and adjustment, will make our Nation a far better place to live.

We have given various governmental agencies strong police powers to identify and punish individuals or entities guilty of needless desecration of the environment. We have made available large sums of money to clean up our atmosphere, our lakes, our rivers, and to make our countryside more pleasant.

Mr. Chairman, in my judgment one important element needed to insure continued national environmental excellence is still missing. To date we have not created a mechanism to continually monitor the Nation's environment and to provide wise and soundly based guidance for the many agencies charged with policing environmental conditions. Up to this time we have not provided a means to constantly keep check on environmental conditions and help avoid other environmental crises similar to the condition which erupted into the public conscience during the late 1960's.

S. 681 is designed to fill this void. The bill is drawn to build a system of environmental monitoring and research upon an existing, well-proven and highly successful foundation—the Nation's land grant universities. This system covers the entire Nation, it embraces a large percentage of the Nation's scientific community. These scientists are trained in all disciplines related to environmental matters. Most important, it includes an operational and highly successful method of transferring knowledge gained in the laboratory to the field where it can be applied. Probably no act of Congress has been more successful or has done more to foster our Nation's progress and development than the Morrill Act of July 2, 1862, which created this system. S. 681 simply extends the responsibility and authority of the land grant system into a vital new area.

Already the system has earned the respect of local and Federal officials who will be called upon to develop new policies to cope with changing environmental conditions. These officials will be greatly aided by the knowledge gained through the research efforts of the land grant system.

Without access to a sound and respected body of knowledge, future generations of Government officials will be hard pressed to keep up with developing environmental trends. Wise legislation and effective enforcement in the environmental field can only be accomplished if it is based on a widely understood and respected foundation of current scientific knowledge. S. 681 provides a means for developing this knowledge.

Mr. Chairman, that concludes my statement.

May I ask unanimous consent to have certain letters from various colleges, institutions, and individuals inserted in the hearing record at this point?

Senator METCALF. So ordered.

(The documents referred to follow:)

UNIVERSITY OF CALIFORNIA, BERKELEY,  
*Berkeley, Calif., November 15, 1971.*

HON. HENRY BELLMON,  
*Member of the U.S. Senate,  
Committee on Interior and Insular Affairs,  
Washington, D.C.*

DEAR SENATOR BELLMON: President Hitch has forwarded your letter of October 5 to some of the University of California Deans. Since I have charge of an area centrally concerned with the environmental field, it seemed incumbent upon me to acknowledge your leadership in this field and to comment on the proposals.

I think that any legislation in this field should build heavily upon the agricultural research and extension tradition. For nearly a hundred years, the United States prospered and grew more rapidly, with quicker adjustments to change, rapid adaptations of new technologies, and continuing concern for regional and other equities, because of the research, teaching, and extension activities of the agricultural research and extension system. The universities of the day demonstrated their capacity to engage in research in almost all of the critical areas then

affecting agriculture, including research in areas which proved to be controversial. They demonstrated a capacity to communicate the results of the research to farmers and citizens. They demonstrated a capacity to affect public and private policy without becoming involved too profoundly in partisan politics. Most importantly, however, they also trained generation after generation of young people generalists and specialists to an awareness of the issues, so that an enlightened public could reshape the policy through normal channels of citizen action and electoral processes.

This history is convincing enough, but it has been supplemented by the work of less adequately financed university centers in government studies, water resources planning, and, more recently and less broadly, in the whole field of atomic energy, the research aspects of which were conducted entirely through such university centers as Chicago and Berkeley. It was only a departure from this tradition through the launching of gigantic research and development industries connected to atomic energy, military production, and space that created giant special purpose lobbies uninhibited by the traditions of non-partisanship which led to the distortions in our national priorities which have recently rent our national consensus on many issues. I can think of nothing more likely to secure the further destruction of that consensus in the environmental fields than the creation at public expense of a new research and development industry dealing with those issues to replace the aerospace, atomic energy, and military industries, which appear to have exercised so disproportionate an influence in recent years.

This point is particularly urgent since the environmental issues involve the most delicate weighing of domestic costs and benefits and the most widespread understanding by an informed electorate of the issues involved. Unthinking environmentalists now often press for solutions which may be destructive of the economic welfare, indeed the livelihood of others, just as other unthinking special interests have seriously damaged the environment because they were unaware of or indifferent to the consequences of their actions.

This leads me to the conclusion that the urgently needed massive infusion of research effort into the environmental field should be centered in each state in its leading research and educational centers, and the primary emphasis should be given to linking of research, education, and extension activities in this field. To secure some concentration of expertise, Congress might specify a dozen major regional centers while it authorizes a center in each of the states. It might thus provide some concentration of effort where the problems are greatest and some dispersion of effort to secure nation-wide contributions and preserve the diversity which has characterized our country. If other tasks emerge which clearly require more purposive, sustained technological effort, these might be directed to the private R & D industry on a specific contract basis and in areas where the private R & D firms have clear-cut advantage in mission-oriented product development. To turn the development of national policy over to such firms is to fore-ordain distortions in policy of a most grave sort.

Finally, I should stress the urgency of establishing centers of the type you have proposed. On this campus, a quick inventory of environmental research efforts revealed no less than thirty project areas in which distinct faculty and graduate students were engaged in interested and potentially useful research, often with no awareness of the efforts of others and invariably with inadequate consideration of economic, political, and social policy framework implied in the research. No adequate financial support for this research exists outside very narrow technological fields. Geological research on earthquake hazards proceeds with no consideration whatsoever of the economic or social consequences of any regulatory system which might prevent building in high-hazard areas. This is a perfect example, if a dramatic one, of the foolish lack of coordination in environmental research. Millions are spent on the technology of anti-pollution devices for automobiles, but a distinguished economist trying to minimize the costs to society of different combinations of fuel, motor, utilization, and highway design mixes can't get his policy research financed by any federal agency. Indeed, he won't even waste time applying, since he could get money from the automobile industry promptly and it would cost him more effort to extract federal dollars than to complete the work. This argues that a decentralized research design procedure on the model of agricultural research and extension has very real advantages.

I earnestly hope that you succeed in your legislative efforts. I should also note that the hapless personnel situation faced by EPA today argues strenuously for a research program organization which will also train thousands of people needed to administer presently enacted policies.

Cordially,

WILLIAM L. C. WHEATON, *Dean.*

THE UNIVERSITY OF MICHIGAN,  
Ann Arbor, Mich., November 25, 1971.

Senator HENRY BELLMON,  
U.S. Senate,  
Washington, D.C.

DEAR SENATOR BELLMON: Thank you for giving me the opportunity to comment on your bill, S. 681, to establish environmental centers in the different states. I have read the bill and your remarks with great interest, and will proceed directly with the specific questions which you ask in your letter of October 27.

1. The bill provides for the possibility of pooling centers by states with a common interest. Therefore, I believe that it is feasible for the centers to be independent of each other in the administrative sense, although collaborative effort between them may be desirable for certain purposes.

A certain amount of supervision by the Environmental Protection Agency will be necessary for the maintenance of standards.

2. The centers will not be accredited in the sense of giving degrees. Hence, they will not compete with colleges or universities. I can visualize a highly cooperative arrangement, with advanced students undertaking research or even routine monitoring for the center with the center's help and support, and receiving college or university credit towards their degrees. This would also be an excellent way to involve the faculty member responsible for the student in the work and outlook of the center.

Relationships with industry are likely to be more difficult. On the one hand, the center might be a valuable source of information to industries needing help in solving pollution problems; on the other hand, the centers must monitor the environment and identify sources of any pollution detected, a duty which will put them in conflict with recalcitrant industries. The center's representatives should be empowered to inspect closely enough to identify the exact sources of any pollution.

3. The centers should be able to attack a specific problem at any level of sophistication required, but in general they should be oriented toward specific problems, perhaps acting as a stimulus to faculty and students in related universities to attack the more theoretical aspects of the problems.

4. Proper publicity for successful solutions of specific problems will cause users to seek the results from the centers. I visualize a "market place" approach here. If the centers do a good job first and then propagandize, they will get the public attention that they desire.

5. I have no idea how funding should be arranged.

6. I have little faith in the National Institute of Ecology.

I visualize no conflict with the activities of the National Science Foundation, which is primarily a granting agency. The unit within NSF called Research Applied to National Needs could overlap with the centers, and could be helpful by awarding grants to carry out research at the centers.

7. "Interdisciplinary" is a word that is much praised at present. I believe that it is essential to maintain such contacts, but I also believe that everyone should do it. When "representatives" of specialties attempt to organize interdisciplinary work, they tend to become zealous about it, and to lose contact with their own specialties. Any program promoting a very broad contact between disciplines is desirable.

I hope that my comments are useful to you.

Yours sincerely,

NELSON G. HAIRSTON, *Director.*

UNIVERSITY OF CALIFORNIA,  
Berkeley, Calif., October 5, 1971.

HON. HENRY BELLMON,  
*Committee on Interior and Insular Affairs,*  
Washington, D.C.

DEAR SENATOR BELLMON: Your letter of August 12 was acknowledged by my office and routed away for comments during my absence. Somehow it failed to return until just now, so I am very late in replying to you. Please accept my apologies.

I am sending copies of your letter and bill to the Chancellors of our nine campuses with the request that they make them available to the people on each

campus who would be concerned and interested. It may take some time, but I'm sure you will eventually receive some substantive comments from many of these people. In the interim, let me state my very general reactions to your proposal.

I think that the total Federal effort in this field need not and probably should not follow any single type or style of organization. Every approach, every type of research organization, has its own strength and weaknesses. The great strength of the American approach to applied research has, in my opinion, been its pluralism. I expect it would make very good sense in a field as new and undeveloped, as diverse and devoid of unifying theory as environmental research, to back organizational types, to spend some fraction of funds on research and training grants in universities and some on in-house research, and some on non-university associated center. Perhaps we need many types of centers with quite different styles.

Universities do have some great strengths as institutions supporting applied research. Let me mention a few points in support of this. I think first, and most important, the university is uniquely qualified to provide training as an integral part of the research effort. In one field after another, universities have created a whole new generation of professions where there were only dilettantes before. Perhaps attracting bright young minds to environmental work is one of the most urgent things to do. To find a person and lure him away from a university to do this to many of the productive scholars and teachers that we now have and to largely insulate them from students would be, I think, a great mistake.

Second, there are on campus now many of the facilities necessary for research and training in the environmental field. There are excellent library collections, computer facilities and laboratories. These are very expensive things to develop from scratch and given the existing university facilities, there may not be a need (although it may arise) to allocate substantial funds for building separate large centers either in universities or elsewhere. I think, for the most part, it is possible to use the facilities that are already there, and from my reading of your bill I gather you intend to make full use of these.

Third, universities have superior ability to supply research personnel, both because faculty appointments in combining research with teaching are highly attractive to many top people, and because faculty research can be supplemented by high-quality student research appointments.

Of course, there are plenty of things that universities don't do well and shouldn't be asked to do. By and large universities are not as good in the development end of R & D. I think that their public service activities probably ought to be limited to those closely associated either with their training function or with their research function. The weaknesses of universities for mission-oriented and interdisciplinary research are in most respects the counterparts of their strengths. The independence of a tenured university faculty member which is so desirable up to a point making him hard to bend in directions that he finds unacceptable. It is a well-known fact, too, that departmental loyalties make interdisciplinary cooperation in research hard to achieve even for well-heeled centers and institutes. Indeed, the difference between universities and non-university research organizations in these respects is one of degree not of kind, it seems to be endemic.

I conclude with this thought. I don't think that we have here a problem like the development of the atomic bomb. Contrary to that project in the environmental field the problems are many and not well defined. Only some of the disciplines that probably can contribute significantly to solutions are even identified; and they are short of well-trained professionals to address the problems. In these circumstances, there is everything to be said for a flexible, pluralistic approach. At this point I cannot say what proportion of the total effort should be undertaken in the universities, but it is clear to me that it should be a substantial fraction.

I hope these somewhat rambling comments may be of some use to you, and that you will receive later more specific replies from other University of California people. I wish you all success with this most worthy effort.

Yours sincerely,

CHARLES J. HITCH.

OKLAHOMA STATE UNIVERSITY,  
Stillwater, Okla., August 25, 1971.

HON. HENRY BELLMON,  
Committee on Interior and Insular Affairs, Washington, D.C.

DEAR HENRY: I have given considerable thought to your letter of July 20 regarding S. 681. As you are well aware, it is difficult to project all of the factors that one should take into account in considering the structure and possible impact of the environmental centers which are included in the bill. However, I am responding to the items which you mentioned. I hope that my comments will be useful to you and I will, of course, be glad to provide further input either orally or in writing if you wish.

For easy reference I am following your numbered items:

1. Independence, Size, Method of Funding, and Participants:

(a) *Independence*.—I believe that federal guidelines should be in general terms. I suggest that a coordinating committee be established for each center which would be composed of representatives from federal and state government, 25 per cent; higher education (institutions with demonstrated research and training competence), 25 per cent; business and industry 25 per cent; and professions other than those included above, 25 per cent. This committee should have nearly complete autonomy in shaping the programs and monitoring their execution.

(b) *Size*.—In monetary terms, I believe that funding at less than \$500,000 per annum would be inadequate to achieve significant impact on major problems, in a reasonable time frame. I believe that not more than 50 percent of the annual operating budget from all sources or more than \$250,000 per annum, whichever is the *lesser amount*, should be spent for in-house staffing—both administrative and professional. This would be exclusive of capital expenditures, and should provide support for 10-12 persons.

(c) *Method of Funding*.—I can see no chance of real success for the centers unless they are funded by appropriations from the Congress via the appropriate agency of the Executive Branch. However, I do think that they should be permitted to accept, administer, and expend funds from all legitimate sources, including other agencies of the federal government.

(d) *Participants*.—I believe that the best talent available in the state (or region for regional programs) should be mobilized for each project or major undertaking with major use of expertise in the universities. This could be done by grants or contracts with the universities, by split appointments in some instances, and by full-time employment for a limited period, e.g., full-time of a faculty member for a summer.

2. *Relation to Universities and Colleges*. Care must be used to assure that such centers do not compete with educational institutions for funding of programs or projects that could be pursued as well or better by a university or college—thus reducing still further already inadequate resources for higher education. The centers should be restricted to major problems which require more professional manpower of varied kinds than one university or college can provide. A center's major concern should be the application of existing knowledge to the solution of urgent problems. If additional basic research is required, support should be channeled to one or more institutions where the necessary expertise exists; to compete directly with the universities in their areas of competence would undoubtedly reduce the flow of trained manpower to meet future needs.

3. *Proper Balance*: I have covered this subject to some extent already. The crux of the matter is, I believe, to be sure that the centers are charged with strict avoidance of competition with the universities in those areas where the universities can have competence and will produce; further the centers should be positively charged to cooperate with and help to strengthen the institutions of higher education. As I have said before, a center should be mission-oriented and should attack only major problems for which solutions are urgently needed.

4. *Transfer of Research Results*: There always will be a need for researchers to communicate with other researchers which is done through journals, meetings, and private communications. However, we are all aware that new knowledge must be transmitted to users in a way that is meaningful to them if it is to be used for the betterment of society. In the university we put much emphasis

on our extension programs, in large part to accomplish this mission. I am more and more convinced that small "task forces" should be organized frequently and "isolated" for a period of time from their regular duties to study the "state of the art or science" in a particular area or related to a particular problem. I would call these "What does it mean?" groups and would include experts in the research area and qualified representatives of user organizations. I would charge them to search for possible applications and to state them in terms that can be readily understood and used by people who might not be familiar with all of the language of the professionals. The findings then should be disseminated in the form of down-to-earth bulletins and through follow-up conferences where practical applications would be stressed. I believe that the increased transfer of practical information would more than justify the cost.

To be most effective the centers should be located or on adjacent to the campus of the university in each state which is the locus of the Water Resources Researcher Institute. Thus there could be joint use of library and other facilities and *more important still* the program would benefit from day to day contact among a large group of competent persons interested in environmental problems.

5. Funding Arrangement: I have discussed this item under 1-b above. If the federal government does not provide enough support to undergird a viable program for each center, I have serious doubts that the program will be successful. The idea of step-wise funding over a three-year period should seriously be considered, i.e., one full year's funding plus two-thirds of that amount for the second year and one-third for the third year from the initial appropriation. Annual appropriations thereafter would be one-third for the then current year, one-third for the next, and one-third for the third year. Thus, if the Congress were late in its deliberations in any year, the centers would be sure of a certain amount that they could program while waiting to see what the full amount for the year would be.

6. Relationship of This Proposal to Other Emerging Proposals: Although I believe that caution should be exercised in centralizing responsibility for broad areas of national concern in too few people, I also believe that it would be unwise to fragment scarce resources by establishing a multitude of agencies with limited scope. Centers such as those proposed in your bill would be both broad in scope and responsive to local and regional needs. Without having made an in-depth study of all of the related proposals, it appears to me that adequate funding of the National Science Foundation and the Environmental Protection Administration, along with support for existing mission-orientated agencies of the federal government who may have special problems, would be a wiser course than to set up more agencies at the national level.

7. Conceptual Validity: I believe that a center in each state with a relatively small nucleus of in-house staff could provide leadership in approaching problems that are too broad for other single organizations to handle. As I have said before, I think that they should not compete directly in those areas that can be effectively pursued by existing organizations. I also believe that they cannot be effective unless provided sufficient funding on a continuing basis for an effective program; preoccupation with fund raising could seriously interfere with the proper exercise of leadership for the accomplishment of the central purpose of the centers.

We appreciate your wonderful interest and support in this, as well as in so many other areas.

Cordially,

ROBERT B. KAMM, *President.*

MICHIGAN STATE UNIVERSITY,  
East Lansing, Mich., April 1, 1971.

Hon. HENRY L. BELLMON,  
U.S. Senate, Washington, D.C.

DEAR SENATOR BELLMON: We have read with interest your Bill S-681 which will establish environmental laboratories within states, regions, and the nation. Environmental problems are among the most important that await solution. We commend you for the great amount of thought you have given to the issue.

The Bill follows closely the philosophy of the Hatch Act which established Agricultural Experiment Stations in all of the states. Agricultural Experiment Stations, as you know, were attached to Land-Grant universities. All the competencies of universities are thus brought to bear on each problem. If the proposed Centers were also attached to the Land-Grant universities so that all

of the resources of the university could be available in solving environmental problems, there would be the same advantages that Experiment Stations have found in being attached to Land-Grant universities. We suggest that consideration be given to attaching the proposed environmental centers to the Land-Grant universities in each of the states.

Sincerely,

L. L. BOGER, *Dean.*

COLORADO STATE UNIVERSITY,  
*Fort Collins, Colo., November 23, 1971.*

Senator HENRY L. BELLMON,  
*Senate Office Building, Washington, D.C.*

DEAR SENATOR BELLMON: We appreciate the opportunity to comment on S. 681 which calls for the establishment of environmental centers in each state.

In principle we agree wholeheartedly with the intent of the Bill to provide additional funds for environmental research and the dissemination of research data. If indeed we are to make rational decisions on environmental matters we will require new and additional research efforts which will tax the imagination of the scientific community. The crises we currently face in air and water pollution and in energy production provide ample evidence of our limited knowledge base for making what often may be irrevocable decisions.

The independence, size, interdisciplinary approach and potential participation provisions are sound. The methodology called for is one which Colorado and many other states are now attempting to follow insofar as educational institutions are concerned. For some time we have had an Environmental Resources Center at Colorado State University. Principal goals of this Center are to coordinate our research and educational efforts in environmental and natural resources and to administer the Water Resources Research Act funds allocated to us. Our efforts do include inter-university cooperation. However, to meet the somewhat broader objectives of S. 681 the effort would have to be expanded to include active participation by both industry and agencies.

We are aware of the political palatability of the concept of a center for each state. However, in an era of limited federal (and state) funding and in a climate of apparent lower priority on research in general, we suggest consideration of perhaps 10 to 12 strong, well financed regional centers for environmental research in lieu of 50 such centers.

There is ample precedent for the establishment of centers in each state. We currently have in each state the agricultural experiment stations supported in part by federal funds administered by the Cooperative State Research Service, USDA. Similarly, we have the McIntire-Stennis Forestry Research Act funds administered by the same agency at the federal level. We have in each state a water resources or natural resources (in our case Environmental Resources Center) center or institute which administers water resources research funds through the Office of Water Resources Research, U.S. Department of Interior. Environmental research is currently conducted under all three programs. It is our feeling that there could be substantial savings realized through a different method of administration. From the standpoint of the states' participation, one more agency administering research funds creates one additional agency with which we must all deal and which erodes funds available for actually conducting research. If indeed the fiscal picture for the next few years appears as bleak as it seems, perhaps the most efficient method of accomplishing the needed environmental research would be to seek increases in water resources research, forestry research, and agricultural research with provisions that specified increases be used for environmental research. Coupled with these efforts could be an increase in National Science Foundation research directed to the total spectrum of environmental science.

It is probable that existing federal agencies with established research programs or grant programs in or closely related to environmental efforts could provide enhanced programs by increased funding, without creating new bureaucracy.

With respect to the formula approach to fund allocation we are aware of the ease of using population figures and along with it its political expediency. However, for states like Colorado this could leave much to be desired in view of the very heavy national and regional use of our resources and environment, which is all out of proportion to our population. Moreover, the extremely wide variety of environments located here and the vociferous out-of-state demands for such

environmental features as wilderness areas, would not be considered in the Bill's formula.

It is felt that both regional and national problems and the attitudes of the scientific community are such that there should be a balance between basic and applied research efforts.

Regarding the technology transfer component of this Bill, consideration should be given to utilizing the long established Cooperative Extension Service organization. The employment of a corps of Environmental Extension Specialists who in turn could utilize the established network of county extension agents in every state could provide this knowledge transfer. In this connection, the Environmental Extension Specialists could provide special environmental courses for the county agents as well as initiating new environmental courses and training programs in the continuing education programs of the states. Because of the significance of such a potential program special attention should be given to TV and radio techniques as a means of mass public education.

Again, we appreciate the opportunity to comment on S. 681. If we can be of further assistance, please let us know.

Sincerely yours,

A. R. CHAMBERLAIN, *President.*

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PENN STATE UNIVERSITY,  
*University Park, Pa., November 17, 1971.*

Re Senate bill 681.

Dean GEORGE WALLER,  
*Oklahoma State University,  
College of Agriculture, Stillwater, Okla.:*

This matter was referred to the executive committee of the association with my understanding that it would be referred to an ad hoc committee to be appointed by the president of the association. In the meantime Penn State as an institution is fully supportive of Senate Bill 681 and also supports all cooperative efforts within the Commonwealth of Pennsylvania to be coordinated by Dr. Schein.

JOHN W. OSWALD,  
*President.*

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COMMONWEALTH OF PENNSYLVANIA,  
DEPARTMENT OF ENVIRONMENTAL RESOURCES,  
*Harrisburg, Pa., November 15, 1971.*

Hon. HENRY BELLMON,  
*Committee on Interior and Insular Affairs,  
U.S. Senate, Washington, D.C.*

DEAR SENATOR BELLMON: This is in response to your letter of October 22, 1971, concerning S. 681, a bill to establish environmental centers in the fifty states.

In general, it seems to me that there would be much merit in establishing environmental centers in the states which would provide a means of conducting applied and developmental research and conducting investigations on practical problem areas. It is increasingly evident that the strong legislative push on environmental regulatory and implementation plans has reached the point that the technology is being pushed to the absolute limit. In our day-to-day operations we are very often attempting to apply "the best possible technology" which is often untried and unproven.

At the same time, a widespread reaction is setting in among the personnel and staffs of the state environmental agencies because of increasing duplication of state activities by the Federal Government, particularly in the water pollution field, and concern about pre-emptive Federal actions in the area of decision-making. It is possible that the establishment of such state centers might offset some of the growing friction which appears to be developing. It is clear, of course, that such centers should emphasize primarily the types of research and investigations which would translate more basic studies into practical application. There is a great need for better problem-solving institutions which can handle the highly technical problems which are in need of solution.

Even though each state center would work on problems of particular concern to that state, the contributions of these investigations would substantially increase national capability.

With regard to Title II, I note the emphasis on adult education with regard to the environmental problems that are of concern. Perhaps it would be desirable to relate this proposed authorization to the existing Federal Environmental Education Act. It occurs to me that some of the activities being pursued under that statute are quite similar as to purpose.

If hearings should be held on this legislation I would be interested in pursuing some of these points in greater specificity.

Sincerely yours,

WESLEY E. GILBERTSON,  
*Deputy Secretary for Environmental Protection and Regulation.*

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PHILLIPS PETROLEUM Co.,  
*Bartlesville, Okla., Aug. 4, 1971.*

HON. HENRY BELLMON,  
*U.S. Senate,  
New Senate Building,  
Washington, D.C.*

DEAR HENRY: Thank you for your letter of July 12 asking for my views on Bill S. 681 and inquiring about the views of the National Association of Manufacturers. Although I have completed my term as Chairman of NAM, I have checked into the question of whether the NAM has adopted any views or recommendations toward the question of establishing environmental centers in each of our fifty states. I have learned that NAM has not taken any official position in respect to establishing of environmental centers for the purpose of conducting interinstitutional, interdisciplinary work.

I am not prepared to comment on your specific questions in detail. However, I would like to offer a few personal observations. It is my viewpoint that the role of the federal government should be to determine the effect of pollutants and to prescribe a reasonable criteria of air, water, and land quality needed to protect the health of the people of our country. Establishment of specific standards should be left to states or regions having similar problems, recognizing that pollution problems vary widely from area to area depending upon degree of industrialization, types of energy used, how it is generated, meteorological conditions and population density.

Presently the federal government establishes quality criteria and proposes standards leaving it up to the individual states to establish their own standards which must be at least as restrictive as the federal levels. An unfortunate situation exists whereby many states ignore cost-benefit relationships and engage in a "numbers game", each trying to outdo the other in attempting to develop the most restrictive standards. Although the 1967 Oklahoma Clean Air Act established a state Air Pollution Council charged with the responsibility of developing air quality standards, efforts are somewhat academic because of the overly restrictive federal standards with which our state standards must comply.

Presently EPA has direct responsibility for 30+ research and testing laboratories, including other research facilities where EPA is sponsoring research work, they are involved in a total of about 70 laboratories. Considering these large numbers, I question that centers in each state are needed but certainly centers in states having related and similar problems could be useful. Existing facilities, enlarged or expanded as required, should be used where possible. Coordination between different centers throughout the country should be encouraged as well as coordination with those in the federal government having similar concerns.

The success of environmental centers will require cooperation not only between government at both the state and federal level, but industries and universities as well. While universities could undoubtedly contribute much to the effective functioning of an environmental center, sound research to establish facts is needed before legislation—not after.

Attempting to specify a particular method by which given standards are to be achieved will normally lessen chances for optimum solutions. Encouraging individual innovation and free enterprise approaches will generally assist in arriving at optimum and cheapest solutions for the public.

The result of research studies and of realistic cost-benefit assessments will only be effective if there is devised a strong and positive method that insures coordination between different regional centers, the federal government and industry.

Kindest regards,  
Sincerely,

W. W. KEELER,  
*Chairman of the Board.*

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AMERICAN CAN Co.,  
*Greenwich, Conn., November 10, 1971.*

HON. HENRY BELLMON,  
*U.S. Senate,*  
*Washington, D.C.*

MY DEAR SENATOR BELLMON: I commend you for using the history and success of the regional agricultural laboratories as an example of how the environmental laboratories might be organized and what they might accomplish.

In response to the specific questions raised in your letter:

1. I believe the funding will have to come from Congress on a year by year approval basis rather than from an endowment as visualized by S. 1113.

2. The laboratories can draw upon, and contribute to, similar work being done by other scientific groups such as the universities, industry, the Bureau of Standards, etc. I do not see any conflict, but you can anticipate resistance from some of these areas.

3. The regional agricultural laboratories have developed a good ratio between basic and applied or mission research, and I think that with proper laboratory management this can be accomplished in the environmental laboratories. A small point here . . . the direction of these laboratories must be by broad based people who combine a political sense and economic judgment and a sensitivity to the changing life styles of our social as well as scientific ability.

4. The research results should be public property available to industry and government for applications.

5. I think I covered this point above; but on the annual appropriations—it might be well, for stability, to appropriate one or two years in advance; i.e. the laboratories would be funded from this date through 1973 and the appropriation being passed now would cover that for 1974.

6. I think that there does not have to be competition but there will be interaction between such groups as the National Institute of Ecology, The National Science Foundation and these laboratories.

7. It is conceptually beneficial to introduce research from all sources that impinge on environmental and ecological matters. This can be accomplished by visiting research or professional grants, establishment of fellowships and grants at other institutions and, of course, by publication.

I hope I have been of some help and if you would like to discuss some of these issues in greater depth, I find myself in Washington at relatively frequent intervals.

Sincerely,

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WILLIAM F. MAY, *Chairman.*

UNIVERSITY OF CALIFORNIA, SANTA BARBARA.  
*Santa Barbara, Calif., November 16, 1971.*

HON. HENRY BELLMON,  
*Committee on Interior and Insular Affairs,*  
*Washington, D.C.*

DEAR SENATOR BELLMON: President Charles J. Hitch has forwarded me your letter and bill (S681). As co-chairman of Environmental Studies at UCSB I wish to congratulate you on the directness of your attack on environmental problems. I strongly hope that the centers or laboratories you describe will be strongly interdisciplinary and strongly problem-oriented. I also hope that the centers might in some way become involved in the production of impact statements as called for by Public Law 91-90. The National Environmental Quality Act of 1969. Please be assured that our Environmental Studies faculty

stands behind your efforts and appreciate your recognition of a concern that has long been of special concern to us.

Please do not hesitate to contact me if I could be of further service.

Sincerely,

RODERICK NASH,  
*Associate Professor History,  
Cochairman Environmental Studies.*

UNIVERSITY OF CALIFORNIA, LOS ANGELES,  
*Los Angeles, Calif., November 22, 1971.*

HON. HENRY BELLMON,  
*Committee on Interior and Insular Affairs,  
Washington, D.C.*

DEAR SENATOR BELLMON: Copies of your letter of August 12 to President Hitch and Senate Bill S 681 were forwarded to the Chancellor at UCLA in October. I have in turn forwarded copies of each to the people on this campus concerned with UCLA's activities in environmental studies and asked them to respond directly to you.

As the bill rightfully points out, a variety of agencies will be required to deal with such a multifaceted problem. The university, as part of its traditional mission, must certainly be one of these agencies. One of the difficulties at present in attempting to specify the role of the university, or any other agency, is the lack of a clear understanding of the complexity of the problems involved. It would appear that universities might be most involved during the initial phase of the program, which will involve considerable effort being devoted to defining the scope of the problem. Much of this will be in the form of basic research and manpower development, which universities already carry out.

Several programs are already underway at UCLA which demonstrate how the university can play an effective role in studies on the environment.

First, we have a multidisciplinary graduate program leading to a degree of Doctor of Environmental Sciences. Several students are already enrolled in this program and considerable growth is expected as the program becomes more widely known.

Second, there is a campus-wide Institute of Environmental and Evolutionary Biology. This is a multidisciplinary group of faculty and students organized to do basic research in problems related to the environment.

Third, UCLA participates in a multi-university consortium whose function is coordinating the teaching programs related to air pollution studies. The consortium is designed to promote maximum benefit from existing resources.

Fourth, UCLA has many individual faculty members with basic research programs related to problems of the environment. These faculty are in several different schools and colleges, including Law, Public Health, Engineering, Architecture and Urban Planning, Medicine, etc.

Fifth, the undergraduate students have organized several effective programs related to teaching and action oriented studies. They have organized their own Office of Environmental Studies to coordinate their total effort in this area.

Finally, administrative organization of the total campus program has been undertaken. The Chancellor has appointed an Advisory Committee on the Environment. The Committee will keep the Chancellor informed about existing programs and provide advise on planning and coordination in this area. This effort will include coordination of the teaching, research, student programs and public activities related to the environment.

In summary, I would like to note that your concept of a pluralistic approach to environmental problems is a good one. Universities should certainly be involved in a very direct way and primarily in ways which are already recognized as part of the mission of the university, i.e. basic research and teaching. They should be heavily involved during the initial phases of planning and definition since they have the resources available to greatly aid in this effort.

I hope this brief summary is of help to you in moving forward on this worthy program. If I can be of further assistance, please let me know.

Sincerely,

ALBERT A. BARBER,  
*Assistant Vice Chancellor-Research.*

UNIVERSITY OF ILLINOIS,  
 URBANA-CHAMPAIGN OFFICE OF THE PRESIDENT,  
 Urbana, Ill., December 10, 1971.

HON. HENRY BELLMON,  
 Senate Office Building,  
 Washington, D.C.

DEAR SENATOR BELLMON: I am pleased to respond to your request, addressed to former President David D. Henry, for comment on the concept of state environmental centers as embodied in S. 681. The University of Illinois has been prominently involved in the research programs established by the Hatch Act and the Water Resources Research Act since their inception. We are fully aware of the impact of this type of legislation in focusing the intellectual resources of the nation on the issues supported by such programs. We strongly support the general objectives of S. 681.

The need for more intensive research on the nation's critical environmental problems is quite clear. Also evident is the need for involving a much broader array of intellectual talent which will holistically consider these complex environmental issues in terms of their total impact on society. There is need to engage the intellectual resources of all the institutions that can contribute effectively to these studies. Even more important, we feel, is the need to develop interdisciplinary research in which teams of qualified experts are truly working together on problem-oriented studies. The comments that follow are offered in the hope that they will be helpful in improving the proposed legislation.

We believe the effectiveness of any program of research support is heavily dependent on and in need of program evaluation and selectivity. The selection of the supported efforts should be based on the match between the potential accomplishment of the program and the goals established for it. Furthermore, incentive to plan research programs to accomplish significant results is heightened by competitive evaluation and selection. By contrast, distribution of funds to the various state and regional centers by formula provides no incentive for the state center to provide either high quality of scientific accomplishment or relevance to the regional social goals. Thus we feel that your legislation might be significantly improved and the national and regional aims better served by establishing a program of research support in which the state and regional centers would compete for funds on the basis of program effectiveness, and in which the administrator of the federal program could exercise some selectivity as a means to promoting program effectiveness.

We believe that to be successful, programs in environmental research must be responsive to specific social needs. To insure this responsiveness, the program management should include a strong entrepreneurial function, the purposes of which would be: (a) to identify a socially significant problem; (b) to associate that problem with a potential client or set of clients who would be in a position to implement solutions to the problem; (c) to bring together a team of qualified researchers from diverse disciplines who could conceptualize an intellectual attack on the problem and alternatives for its amelioration; and (d) to present a rational research plan to a potential sponsor for funding of the study. We feel that early and intimate involvement of the potential client in the conceptualization of the study is the best guarantee of its social relevance and the best means of extending the study to the ultimate goal of public or private decision-making. The latter is, we believe, the most effective kind of technology transfer. It also constitutes assurance as to the practicality of the study. We would recommend that this entrepreneurial function be a feature of federally-supported environmental studies; if it is, the technology transfer will take place automatically and as a by-product.

The variety of activities described under the Technology Transfer Component of S. 681 have certainly proven effective over the years in the context of agricultural extension and continuing adult education. We believe that some or all of such activities can well be applied in the field of environmental studies, but we believe that they may not be adequate to effect the transfer of newly gained understanding of complex environmental systems into action programs for the improvement of environmental quality. The reason for their inadequacy is that, unlike adoption of new agronomic practices by an individual farmer, *environmental decisions are usually made not by individuals but by policy-making groups in the public or private sectors*. Hence, the transfer of new knowledge and new understanding must occur in the context of the institutions or governmental

agencies involved, including state and local governmental units. We believe the early involvement of such clients in the investigation will be important in extending the results to their ultimate application. Technology transfer would, therefore, form an integral part of each investigative program.

Several key faculty members and administrative officers of this University who have been deeply involved in developing interdisciplinary research on environmental studies would welcome an opportunity to appear before the Committee on Interior and Insular Affairs to express their individual views.

Sincerely,

JOHN E. CORBALLY, Jr., *President.*

INDIANA UNIVERSITY,  
Bloomington, Ind., November 23, 1971.

Senator HENRY BELLMON,  
*Committee on Interior and Insular Affairs,*  
*U.S. Senate,*  
*Washington, D.C.*

DEAR SENATOR BELLMON: Upon my return from Europe this week I found your letter of October 22nd which my secretary had acknowledged in my absence. I would like to comment generally on S. 681 at this time, but would be happy to submit more detailed testimony at a later date when hearings are scheduled.

My general reaction to the bill and its purpose is highly favorable. Your statement on February 9th introducing S. 681 is a very good summation of the issue and the need. I would emphasize, as you have observed, that the states vary considerably in their environmental problems and, I would add, in their readiness to deal with them. Institutions of the kind you suggest in each state could add significantly to the readiness of the state to cope with environmental problems within its own area and to cooperate with other states and the federal government in regional and nationwide programs. I particularly like the flexibility implicit in your bill, which allows the state considerable latitude in the institutional structure of an environmental center and encourages the cooperation of the centers on an interstate and regional basis.

May I comment very briefly on some of the points mentioned in your letter of October 22nd.

1. I think it is important that the centers be independent of political, partisan, or other direct influence, and yet the centers should certainly be accountable for the results of their work. I would therefore prefer that they be associated with universities or groups of universities. Even when a center was established in a particular university it ought to invite and encourage the cooperation and collaboration of other schools and institutions, usually those within its immediate geographical area.

2. The center should differ from most other institutions in that they would be primarily designed for the analysis and formulation of alternative solutions to environmental problems. The problem-focus is certainly not unknown to research institutions or to the proposed federal environmental laboratories. It is, however, not the normal approach to research of the traditional faculties within universities.

However, universities have been increasingly concerned with the establishment of problem-focused research and many have been reorganizing their resources along the lines recommended in the study made by Dr. John Steinhart for the Office of Science and Technology. (The Universities and Environmental Quality--Commitment to Problem Focused Education. A Report to the President's Environmental Quality Council by John S. Steinhart and Stacie Cherniack. Office of Science and Technology. Executive Office of the President. September 1969)

The problem of how environmental centers should be different from other environment-focused institutions including the Institute of Ecology and the federal environmental laboratories deserves careful consideration. The growth of various kinds of institutions around the country for environmental and ecological studies has been quite rapid during the last year or two. Most of these institutions are inadequately funded and their relationships to one another are for the most part unclear. I think it would be desirable to have some over all appraisal of what the trends were and what kinds of institutions ought to be encouraged and assisted at different levels of organization, from the local to national and international. It might be useful for more than one group to look

at this problem of coordination, although I would think that the Senate Committee on Interior and Insular Affairs might well encourage such an inquiry. As Chairman of a newly created Section on Applied Ecology of the Ecological Society of America, I would be happy to propose that our Section consider the initiation of such an inquiry on its own part and in any case cooperate with and assist whatever other studies might be undertaken.

The inter-institutional aspect of the proposal is innovative and, I think, a highly desirable initiative. It is, however, difficult to implement. Another of my responsibilities involves the Environmental Studies Panel of the Committee on Institutional Cooperation (CIC), a multi-university arrangement consisting of the so-called Big Ten Universities and the University of Chicago. The purpose of this committee is to promote and assist inter-institutional cooperation among the eleven large universities involved. Under the sponsorship of the Environmental Studies Panel, assisted by a grant from the National Science Foundation, we have been able to undertake some useful collaborative projects.

I believe our experience and that of other multi-institutional programs would indicate that the cost of work undertaken on an inter-institutional basis may often be higher than that undertaken by various institutions separately. But the greater cost entailed in inter-institutional programs could very well result in proportionately greater benefits. In other words, I think that inter-institutional programs may cost more than programs organized separately in individual institutions, but the cost-benefit analysis might very well justify the higher cost of the inter-institutional effort. To put it simply, one may get more for his money! This collaborative effort of course does not guarantee that the benefits will in fact be greater, but it does afford an opportunity for optimizing the resources of a large number of institutions. I am convinced that it is possible to develop effective inter-institutional programs, even though at this point in time we have not developed sure ways of making this kind of effort effective. The area of environmental studies with a problem-focused mission might well provide a more effective formula or form for collaboration than has been characteristic of more traditional academic type efforts.

Another area in which we do not know as much as we should is in how to transfer the results of research to users. The National Space and Aeronautics Administration undertook a number of experiments with universities to transfer the results of aerospace innovation to primarily the industrial sector of the economy. I have the impression that the results of these efforts were not considered to be altogether satisfactory by NASA, although some effective results do appear to have been obtained. There is now a substantial literature on technology transfer, and I am sure that the people who have made special studies of this problem can be persuaded to relate the results of their findings to the planning of a network of environmental centers such as those contemplated by S. 681.

In conclusion, I congratulate you on an imaginative and constructive proposal. You might in passing be interested to know that I have for some years been a visiting member of the department of Political Science at the University of Oklahoma and have from time to time conducted seminars in public environmental policy and administration for the University on the campus at Norman and in a number of locations outside the state in which the University offers instruction under the Advanced Program.

With all good wishes,

Very sincerely,

LYNTON K. CALDWELL,  
*Arthur F. Bentley Professor of Political Science.*

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STATE UNIVERSITY OF NEW YORK AT ALBANY,  
*Albany, N.Y., November 18, 1971.*

Senator HENRY BELLMON,  
*U.S. Senate,*  
*Committee on Interior and Insular Affairs,*  
*Washington, D.C.*

DEAR SENATOR BELLMON: Dr. Louis T. Benezet, President of the State University of New York at Albany, has asked me, as the coordinator of the Environmental Studies Program, to answer your letter of November 2, 1971. These general views and specific recommendations concerning the state environmental center concept have been compiled with the advice of Mr. Jerry E. Passer of the New York State Department of Environmental Conservation.

In the State of New York, experience has shown the desirability of regional environmental centers (please see the enclosed brochures of the Rogers Conservation Education Center and the proposed Capital Area Environmental Education Center). Those centers that are now in operation have been very successful and highly praised. S. 681 appears to be a most timely bill in that every state could benefit from more environmental education centers.

The determination of the best sources and methods of funding has proven to be a complex problem. Current sources of funding include:

1. State fiscal budget
2. County, Town, and Village governments
3. Community Service Organizations
4. Federal grants
5. Private foundation grants
6. Dues of the members of non-profit corporations
7. Lump sum donations (from business and industry)
8. Benefactors

The selection of the most appropriate funding would appear to be best handled on a local basis, due to extreme variation in population, resources, environmental condition, etc.

The best centers provide aesthetic, recreational, and educational opportunities for all people of all ages—from pre-school to senior citizen. These centers' programs are very diverse, due to the great diversity of the dedicated participants in such programs. Participation comes in two different ways:

1. paid employees (state, civil service, local government, school districts, BOCES, etc.)
2. volunteer workers (interested adults, community organizations, students, etc.)

Environmental education centers differ from colleges and universities in that they provide scheduled and non-scheduled programs and activities, as well as guided and independent projects. The centers could relate to the colleges and universities in the provision of research facilities, teacher training, and programs in which partial requirements for various environmental degrees could be fulfilled.

It is impossible at this time to determine what method of research results transfer would be "most effective." The determination of a most effective method would depend upon the type of research, data, interpretation of the data, etc. Results are currently being disseminated in at least five different ways:

1. directly to a college or university (instructor or student)
2. Via state education departments
3. Via state departments of conservation
4. Via ERIC clearinghouse on Environmental Education
5. Via the communications media

It is difficult to determine the best funding arrangements. The determination of funding arrangements depends upon the nature of the organization running the center, the program content, the relationship between the center and the participants, and the center's relationship with the funding agencies. It appears best that each center explore their own funding arrangements. In the past, state and federal funding have proven desirable. When the funding agency is the federal government, state departments of education and departments of conservation may be called upon to review proposals.

Such organizations as the Ecological Society of America, NSF, AAAS, Conservation Education Association, AACI, Sierra Club, and the Audubon Society have traditionally favored the environmental center concept. These organizations' programs would complement the center's programs, and vice versa.

It appears conceptually beneficial to develop a method of introducing research involving individuals representing different institutions and different areas of professional competence. This concept will stimulate a spirit of cooperation which is essential for the success and validity of any environmental education effort.

Traditionally the sum of the responsive individual contributions far exceeds the funds that are fiscally appropriated. Often, even small grants serve as an active catalyst resulting in the establishment of such Environmental Education facilities.

We heartily endorse bill S. 681. We hope the federal government will play a large part in the cause of increased environmental awareness.

Sincerely yours,

PAUL G. BULGER,  
*Coordinator of Environmental Studies*

THE NATURE CONSERVANCY,  
Arlington, Va., December 6, 1971.

Hon. HENRY BELLMON,  
U.S. Senate, Committee on Interior and Insular Affairs,  
Washington, D.C.

SIR: In reply to your letter of 16 November to Mr. Thomas W. Richards, president of The Nature Conservancy, requesting recommendations on the state environmental center concept and specifically the bill which you introduced into the Senate, we heartily compliment you on your recognition of our problems in respect to the state of the environment. It is certainly true that we are in need of far more scientific information on the workings of our natural ecosystem in order to manage our environment in a rational and sustainable fashion. We hope that you will continue to actively participate in the affairs of your critical committee and be assured that The Nature Conservancy stands ready to assist you in any way that we can.

As for the bill you introduced, from our experience we believe that although the idea of a network of environmental labs is an excellent one, such labs would be more effective if distributed on a geographic environmental basis rather than a political one. There are certain natural land and environment regions in the United States the boundaries of which do not approximate those of the states and the allocation of lab facilities on a state basis would therefore lead to duplication of effort and submaximal division of resources for top efficiency. Another recommendation would be that the activities of these regional labs should be coordinated by some central body like the proposed Institute of Ecology. Such a central coordinating body could effectively participate in setting priorities, allocating resources and disseminating information resulting from the many studies. In many instances it might be more effective to establish such labs within existing institutions such as universities, state technological institutions, etc. rather than creating an entire structure *de nova*.

A last recommendation might be to utilize scientific (i.e., experimental) approaches in regard to such a scientific and technological development rather than the usual legislative procedures of creating a system and then finding out if it works. In other words, it would seem advisable to stage the program in such a way that a few labs would be designated and funded and their performance evaluated before an entire system was created. This would allow continuous improvement of the system throughout its developmental process and would permit alterations or even cessation of the program as dictated by the wisdom of experience.

I hope that these remarks may be of some assistance to you in promoting this very worthwhile concept.

Yours very truly,

ROBERT JENKINS,  
Ecology Adviser.

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THE ASSOCIATION OF INTERPRETIVE NATURALISTS, INC.,  
Derwood, Md., December 13, 1971.

Hon. HENRY BELLMON,  
Member, U.S. Senate, Washington, D.C.

DEAR SENATOR BELLMON: This is in reply to your letter of November 10 to Mr. Bert Szabo, former President of the Association of Interpretive Naturalists, regarding Senate Bill 681 entitled "The State Environmental Center Act of 1971." As you may know, the Association is a professional organization representing over 700 interpretive naturalists in the United States and Canada who have been working for many years to develop a public awareness program which provides an insight to all basic environmental functions and amenities. Since our defined purpose is, in fact, a form of environmental education, we are grateful to have the opportunity to comment on Senate Bill 681 which would establish state environmental centers.

As you have requested, we will speak to the seven points outlined in your letter.

1. In our view, a state environmental center as described in S. 681 should be administered by a board of trustees approved by the administrator of the Environmental Protection Agency and selected by the governor of each state. Representation on the board of trustees should include qualified representatives from appropriate state agencies, citizen organizations, educational institutions, and private

industries. Such a board would be responsible to the administrator of the Environmental Protection Agency and the governor of the state for the overall management of the center.

The size of each environmental center would seemingly be governed by the following:

a. Inventory of the states' existing environmental problems and the projection of immediate research needs;

b. The availability and capability of existing Federal, state, and local environmental research programs in each state; and

c. The establishment of short-term and long-term objectives and programs for each center based on the need to disseminate and interpret the results of updated studies for the purpose of enhancing land-use planning, environmental management, and educational programs at the state and local level.

We agree with the method of funding formulated in the proposed Bill. In addition, perhaps an equitable system of service charges could be developed and assessed against each project (private and governmental). The center should be a clearing house or focal point for environmental studies which may be stimulated by local communities with the results of such studies being returned to the said communities for implementation. The center *should not* be engaged in environmental research for the research's sake; it should, however, serve as a supporting arm for public and private land use and natural resource managers. Certainly, there are many states which already have the necessary in-house resources for this type of program. Perhaps the passage of this Bill will bring many of these existing research and education efforts into perspective.

2. The state centers' program would differ from existing collegiate, industrial, and governmental programs as it proposes the establishment of a *total interdisciplinary environmental research activity at the grass roots level*. Realistically, it would relate to all levels of government and industry since the work activity of the centers would directly involve the community-at-large from the town hall to the state house.

3. The maintenance of a proper balance of mission oriented research and problem solving could be accomplished by an activity review procedure provided by the Environmental Protection Agency working with a board of trustees and the state governors' office. In regard to regional centers, they may be more appropriate in rural and agricultural sectors of the Country than in the heavily urbanized Great Lakes and coastline regions. A balance of work activity at the regional level may be achieved by the establishment of a regional board of governors or trustees representing the appropriate disciplines and each state served by the regional center with coordination and review by the Environmental Protection Agency. In the final analysis, the priorities for basic research and problem solving at either a state or regional center would certainly be dictated by the seriousness of the environmental problems at hand and the public awareness and support of the centers' efforts.

4. Obviously, the key to the success of the state environmental center program is the transfer of research results to the users. However, efforts to interpret or transfer research results should not be limited to an on-site program at the centers. There are many state and local communication outlets that should be "turned-in" to the center program; e.g., nature centers, outdoor education centers, university extension facilities, conservation district offices, etc. The interpretive naturalists, the university extension agents, state conservation department field representatives, soil district conservationists, and local educators should all participate in the transfer of basic information from the centers to the public-at-large.

Methods of transferring information from the centers to the users and general public should include seminars, workshops, field demonstrations, and tours (or show and tell activities) for the local resource managers and political decision makers; mobile and standing interpretive exhibits, and production of audiovisual aids for public distribution; and development of guidelines, manuals, and other interpretive publications for the use of planners, land users, and resource managers.

5. The most equitable funding arrangement on a long-term basis for the centers might be a phase-out program which would gradually reduce the Federal five to one formula proposed in the Bill to a totally state funded program. One method might be a combination of service charges for services rendered, and the establishment of a state environmental tax base which could be equitably credited

against Federal payments by state and local governments. It is conceivable that the creation of state environmental tax funds would not only support the environmental centers but provide the necessary funding for implementing the results of the centers' studies.

6. The relationship of the proposed state environmental center programs to the National Institute of Ecology and the National Science Foundation would be one that would establish, for the first time, a truly local channel or outlet via the state centers to many of the top people in the scientific community working primarily at the National level.

7. We feel that it is not only conceptually beneficial to develop research methods involving individuals from different institutions and areas of professional competence, but this relationship must be established if we are to conceive and reasonably manage the total environment.

Individual research contributions obtained in the traditional manner have not been totally effective and meaningful because many of them have failed to identify all of the necessary environmental elements and parameters in a single purpose project.

Finally, we feel that environmental research when accomplished by state or regional centers should serve two meaningful purposes: (1) provide a base for more effective and comprehensive environmental management and land-use policies at the state and local level, and (2) provide the greatest possible public awareness of environmental or ecological needs and functions as confirmed by updated research conclusions and activities.

We wish to congratulate you for your efforts to establish this very realistic approach to environmental problem solving. If we can be of any further assistance, please let us know.

Sincerely yours,

ROBERT L. YOUNG,

*Secretary-Treasurer and Washington Representative.*

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NATIONAL RESEARCH COUNCIL,  
NATIONAL ACADEMY OF SCIENCES,  
NATIONAL ACADEMY OF ENGINEERING,  
Washington, D.C., December 7, 1971.

HON. HENRY BELLMON,  
*U.S. Senate,  
Committee on Interior and Insular Affairs,  
Washington, D.C.*

DEAR SENATOR BELLMON: I am most happy to respond to your letter of November 19 requesting comments on your S. 681 to establish a system of state and regional environmental laboratories. I wish to commend you for your initiative in introducing this important and urgently needed bill.

My response to your request will mainly take the form of attempting to answer those of the seven questions which are posed in your letter on which I feel competent to comment.

1. My principal comment with respect to your first question is that I can see greater reason for a limited number of regional laboratories than for authorization of 50 state laboratories. My main reasons are two: (1) environmental problems are regional in nature, varying from ecological region to region, rather than from state to state; (2) manpower in the environmental sciences is less than adequate to solve the environmental problems of the immediate future. It seems to me that a system consisting of something on the order of 10 regional environmental laboratories would make the most effective use of available environmental manpower and would provide the most economical mechanism for getting answers to environmental problems.

2. I can see the role of the centers as an integrative one that would bring to bear the scientific manpower resources of the region, whether those resources reside in academia or governmental agency or in private industry.

3. I believe that each regional laboratory should have three major activities, which is consistent with the intent of S. 681. These would be:

- (a) Basic research
- (b) Mission oriented problem-solving research
- (c) Dissemination of information

With respect to the basic research, each regional center might have as its main mission the formulation of systems models describing the functioning of the principal regional ecosystem or ecosystems. Predictive models and submodels for such systems are needed for environmental management and for use as baselines in monitoring the quality of the environment. The kind of ecosystem approach that has evolved in the course of the International Biological Program (IBP) in the United States provides a pattern. Excerpts from a paper describing the rationale and methodology of this kind of research are attached as an addendum to this letter.

It seems essential that organizational structure and allocation of funds within the budget of the regional laboratory clearly recognized and demarcate between the two major functions of basic research and of immediate, problem-oriented research.

With respect to the dissemination of information, I believe that Title II of S. 681 makes adequate provision for this function, which I regard as an essential function of the regional environmental laboratories.

4. I cannot improve on the proposals set forth in Title II.

5. The proposed core-funding of each laboratory, with provision for matching funds beyond that level makes good sense to me. If regional laboratories on the order of 10 or so were established, the core funding might preferably increase to \$1 million for each.

6. It is extremely difficult to predict the possible relationship between the environmental laboratories proposed under S. 681 and such emerging entities as The Institute of Ecology (TIE). The latter is presently involved in the somewhat tricky and hazardous process of "shaking down" into the role it will play in national and international environmental affairs. This being the case, any suggestions I might make must be highly speculative.

If TIE realizes its potential, it could provide the scientific planning, coordination and data synthesis for the integrated, multidisciplinary biome-type studies, which I believe should be a major activity of each regional laboratory. Thus, TIE and the proposed system of regional laboratories should fill complementary rather than competing roles.

7. As is evident from my statements above, I am completely convinced as to the potency of the multidisciplinary, multiinstitutional approach to the solution of major environmental problems. The biome studies under the U.S. participation in the IBP have solidly demonstrated the effectiveness of this method and are beginning to have world-wide acceptance.

I hope that these comments will be useful to you. If I can be of further assistance, please do not hesitate to ask.

Sincerely yours,

W. FRANK BLAIR, *Chairman.*

(Addendum: Excerpt from paper prepared by an *ad hoc* committee of the Special Committee for the International Biological Program for the International Council of Scientific Unions)

#### BIOME STUDIES

The emergence of multidisciplinary, integrated research programmes involving study and modelling of major ecosystems in several of the participant countries has been a major forward thrust in the field of ecology that can be largely attributed to the IBP.

The conceptual justification for undertaking the difficult task of modelling something as complex as an ecosystem is clear. The world's land surface is occupied by a number of major biomes (grasslands, deserts, tundra, deciduous forests, coniferous forests, tropical rain forests). These differ one from another in details of their structure and function, although all possess basic ecological processes in common. The same may be said for the world's fresh, brackish and salt waters, although the biome boundaries may be less readily apparent there. Each biome provides somewhat different life support resources for man, and different biomes are differentially responsive to man's activities. All have one thing in common, a relatively high degree of complexity and internal inter-relatedness. Perturbation in a seemingly unimportant component of the system may trigger a chain of cause-effect reactions which ultimately elicit profound changes in the whole system. Because ecosystems differ from one another human activities that might be wise and appropriate in one could be disastrous in

another. In view of the increasing pressures which man is imposing on the biomes of the world, the acquisition of the most sophisticated possible knowledge of the structure and function of the major ecosystems as a basis for man's wise utilisation and occupancy of them should have the highest priority.

The ecosystem modelling that is now being developed under the IBP has been made possible by availability of modern computers. An ecosystem itself is too complex to conceive intellectually in all of its detail, for the number of cause-effect sequences simultaneously reverberating through the system far exceeds what the unaided human mind can consider. However, with a realistic model of the whole system, developed from co-ordinated research on all of its parts, and with this model programmed into a computer, the computer can simulate the numerous, interrelated processes and predict changes in the system that would result from manipulation in any part of it.

The viewpoint underlying the strategy of ecosystem modelling is that the system is made up of numerous components: man, plants, animals, dead organic matter, inorganic gases and soil compounds. These components change continuously over a time scale which, depending on the process, can range from fractions of a second to hundreds of years. The total change taking place is the result of the sum-total of many concurrent processes within the components of the system including photosynthesis, water uptake, feeding interactions, growth, reproduction and mortality, micro-organism activity. These processes can be studied individually and such studies have been conducted in traditional ecology. The new developments in the systems analysis approach emphasise the need to study the most important processes within a system at the same time to provide an adequate basis for producing a single simulation model.

In the biome approach the research designs outline three major parts of effort: (1) Process studies that consist of co-ordinated projects by individual investigators. They are addressed to the important population, and energy- and material-moving processes in the components of the ecosystem. These processes are measured as rates, and are expressed as functions of the biotic and abiotic environmental factors that affect them. The total projects needed are decided in the course of planning the entire programme, and the individual investigators have considerable freedom in carrying out the research as long as they meet the objectives agreed upon at the outset and produce data that can be incorporated into the model.

(2) The second major part of the study is that of model development or "modelling". This phase consists of integrating the many functional equations and relationships produced by the process studies into a single computer model which simulates the functioning of the ecosystem.

(3) Validation studies constitute the third major part of ecosystems research. These studies are conducted on representative areas and provide checks on the predictions of the model. An initial inventory of the state of the system—in terms of the amount and nature of energy and materials; and spatial, age, and size distribution of the organisms—provides the original input to the model. The model will, given the inputs into, and outputs from, the system, simulate the changes over time of the ecosystem being studied. Periodic standing-crop measures of the site, which constitute the validation studies, provide checks on the accuracy with which the model simulates the real world, and feedback with which the model can be refined.

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NATIONAL ACADEMY OF SCIENCES,  
Washington, D.C., December 6, 1971.

HON. HENRY BELLMON,  
*Committee on Interior and Insular Affairs,*  
*U.S. Senate, Washington, D.C.*

DEAR SENATOR BELLMON: I find in your bill "The State Environmental Centers Act of 1971" an interesting and promising mechanism for dispersing environmental research and education through the states, and thus to assure a broad base for what will continue to be one of our important national concerns. S.681 indeed has ample precedent in the successes of the Hatch Act and the Water Resources Research Act—both of which, I understand, achieve their objectives effectively. S.681 would establish, in each state, a credible institution which could provide information to the public at large, as well as to public officials and other groups, on matters dealing with the environment.

We are all faced with the necessity to give up part of our standard of living to assure ourselves of a continuing high quality environment. Our people will have to be told that over and over again; they will have to hear it from sources in which they have placed their trust and over which they have a measure of control. Credibility is an important consideration when we deal with environmental questions; in many cases state centers might have it, whereas more remote national and regional institutions would not. This seems to me to be the principal virtue of embedding environmental centers in educational institutions in the fifty states.

The enactment of S. 681 would assure continuing and level support for a good number of our universities in this area and, no doubt, contribute to the overall strength of their educational affairs. It might well induce bright young people to study environmental problems, and to contribute personally to their solution through research. An added virtue of the concept of S. 681 is that the research, as well as the other activities of the center, would be carried out in an academic atmosphere which is as good a bulwark against partisan pressure as we have developed in our country.

There seem to me to be two aspects of the proposed State Environmental Centers Act which need strengthening. The first is to devise a mechanism which could assure that the research performed is of a high caliber, and that it meets the standards of the profession. The second is to avoid unnecessary duplication among the studies of the various centers in this program as well as between those centers and other laboratories in this country and abroad. I realize that a certain amount of duplication is not only inevitable but desirable. An excess, however, could jeopardize the entire program.

I would suggest, therefore, that you include in your Bill the creation of a special Coordinating Research Board in the Environmental Protection Agency to be responsible to the Administrator. Members of the Research Board should include government officials, from EPA, CEQ, NSF, Department of the Interior, HEW, and perhaps others. It should also include public members who would represent the scientific community and the public at large. The principal mission of the Research Board would be to review the work of the state centers and assure that the quality of the work measures up to high scientific standards. At the same time the Board could act so as to minimize duplication, and build a cohesive program of environmental research out of a multiplicity of research ideas but avoid "directing" the research programs of the individual centers. The Bill could then be responsive to points 3, 4, and 6 of your letter and assure the Administrator of EPA that the work going on in the states has the proper balance of mission-oriented and basic research, that it employs effective ways to transfer the research results to the users, and that the work is properly related to the existing and emerging institutions that deal with environmental questions.

Sincerely yours,

PHILIP HANDLER, *President.*

SIERRA CLUB,

*San Francisco, Calif., February 3, 1972.*

HON. HENRY BELLMON,  
*Senate Office Building, Washington, D.C.*

DEAR SENATOR BELLMON: I am sorry to be delayed so long in responding to your letter to our Executive Director, Michael McCloskey, informing the Sierra Club of your proposal, S. 681, to establish a network of 50 environmental centers throughout the country. We appreciate your taking the time to write us on this important matter and for inviting our comments on your proposal.

We believe that the establishment of centers such as you propose would create valuable communications' links, coordination on environmental efforts, additional assistance to some of the existing, overburdened ecology centers and expanded expertise in research of all sorts. Moreover, we see in your bill a vehicle to involve fresh faces and already enthusiastic environmentalists of all ages in all regions in the important work of ecological preservation.

We understand that the hearings have been completed on this legislation, and we would be interested in knowing whether further action will be pursued in view of the Senate passage of similar legislation, S. 1113. In any event, we appreciate your writing and will watch with interest developments on this proposal.

Sincerely yours,

CHARLES M. CLUSEN,  
*Assistant to the Conservation Director.*

SPORT FISHING INSTITUTE,  
Washington, D.C., December 21, 1971.

HON. HENRY BELLMON,  
Senate Office Building,  
Washington, D. C.

DEAR SENATOR BELLMON: The Sport Fishing Institute, a national non-profit, professionally staffed fish conservation organization supported largely by interested anglers and the sport fishing industry of the United States, feels that there is considerable merit in the establishment of environmental laboratories within the states, region and nation pursuant to policies and goals established in the National Environmental Policy Act of 1969.

The Institute supports S. 681, the "State Environmental Center Act of 1971," because it feels that in order to initiate, facilitate, and expand greatly the development of a greater awareness of the environment, as provided for in Title II (Technology Transfer Component) of the Bill, it is necessary to inform and educate the general public, persons employed by specific units of government, and personnel employed by business, industry and commercial establishments, and others such as persons involved with civic groups.

It will be much appreciated if this communication of views may be included in any record of related public hearings. Thank you.

Sincerely,

RICHARD A. WADE,  
Executive Secretary.

SOIL CONSERVATION SOCIETY OF AMERICA,  
Ankeny, Iowa, November 29, 1971.

HON. HENRY BELLMON,  
U.S. Senate,  
Washington, D. C.

DEAR SENATOR BELLMON: We appreciate receiving your letter of November 16, 1971, relative to S. 681, a bill to establish environmental centers in each of the 50 states.

The comments herewith represent my personal thoughts and not necessarily those of the Soil Conservation Society of America for there has not been time to solicit opinions of our governing body or of our members.

Additionally, I have admired your personal record as it relates to the conservation and management of our renewable natural resources and I'm pleased to see you taking an active role in environmental problems at the national level.

I should also tell you that the Soil Conservation Society of America is interdisciplinary in nature for many disciplines are represented in bringing about efficient use of our land. And we have always been interested in the interdisciplinary approach to the problems relating to the environment. I'm sure you are aware of this from your contact with our organization while you were Governor of Oklahoma.

In regard to S. 681, if the proposed centers can function as efficiently as the programs mentioned in your introductory speech of last February, they would be well worthwhile. I'm intimately acquainted with institutes that function under the Water Resources Act of 1964, having just served on their Advisory Panel for 1971. Also, the record of the Cooperative State Research Service has been noteworthy.

If I have a concern about the proposal under S. 681, it is that we will be creating an entirely new agency and organization when I believe we could have reoriented the existing agencies to accomplish this task. As you know the CSRS, OWRR, and other research agencies, have been suffering from lack of funds and a curtailment in personnel. Also, I agree we have not provided the leadership to reorient their efforts although most of the agencies have been re-directing their individual efforts to take advantage of the public concern for the newer problems relating to the environment. Any new research agency should be directed to take advantage of existing research and not repeat that for which we already have information.

It has just been called to my attention that the Agricultural Research Service has conducted research on pollution to streams from strip mine operations, the Forest Experiment Station has done the same—as has the new EPA research program. Similar programs have been conducted by OWRR Institutes. I'm for competition—but somehow this research must be coordinated and the taxpayer

assured he is not paying for duplicate effort. Actually, I have found the older established agencies have carried out more coordination than would seem evident to the casual observer. However, EPA, in its effort to become established, has not been as observant of existing research—at least in my observation.

To get to the questions in your letter:

1. The expertise to man research centers is to be found at our universities and I would favor some effort to have the centers located in a manner similar to the institutes operated under OWRR. Funding should be by Federal Grant with opportunity for matching funds.

2. To be different, I think broad provisions should be made for representation on an advisory panel for each institute. Such panels should basically be composed of university representatives from the area, industry and the private sector. I have questions about too many representatives from state regulatory agencies. Research should be oriented to solve problems needing regulation but many of our commissions and state boards are highly "inbred" today. These centers need new concepts.

3. If we maintain our prior research agencies and activities, then basic research might be left to them and coordinated through the new centers. The new centers would conduct the mission oriented activities.

4. The transfer of research results to users is already one of our major problems. In the CSRS program this was effectively carried out by the Cooperative Extension Service. I know that OWRR has this problem—in fact in today's "ecology binge" the scientist feels like the "forgotten man" for answers are being given, criticism extended that is frequently not based on fact.

In any new program there must be plans for personnel to meet with industries, municipalities, and with all segments of society to acquaint them with information resulting from sound research programs.

5. Funding should be based on some formula other than a state basis. Perhaps a minimum per state but it stands to reason, when we are considering the environment, the more populous states, and the states with the larger geographical areas, will have more environmental problems. Perhaps some plans for your regional concept could be incorporated in the funding.

6. I prefer your approach to that of Ecological Society of America primarily because of the broad spectrum of disciplines forecast for the proposed centers.

7. The concept to develop research involving different institutions and different areas of professional competence is a needed step. This is one of the strong points of the proposed legislation.

In summary, I favor the enactment of S. 681. I'm concerned, as I know you are, about the maintenance of existing research programs and their coordination with any new effort. I'm also concerned that the "track" record of EPA to date has not been noteworthy. In any new and reorganized agency the "shakedown" period results in many delays and in failure of the public to accept the "new" EPA is now in this dilemma and hopefully the record will improve.

I hope these comments are the type you are seeking and if I can assist you further, please call on me.

I'm taking the liberty of sending you some of our recent publications.

Sincerely,

H. WAYNE PRITCHARD, *Director.*

CENTER FOR THE STUDY OF SCIENCE,  
TECHNOLOGY, AND PUBLIC POLICY.  
UNIVERSITY OF VIRGINIA,  
Charlottesville, Va., December 2, 1971.

Re October 27, 1971, request of Senator Henry Bellmon for comment on S. 681.

Memo to: Mason Willrich, director.

From: Dennis Barnes, associate director.

In Senator Bellmon's words, S. 861, the "State Environmental Center Act of 1971," "provides for the establishment of a qualified environmental center in each State; or at the option of the participating States, establishment of a regional center to serve a group of States, requires that each center combine and coordinate the interdisciplinary and interinstitutional research capabilities within its area and arrange for consortium of institutions to conduct competent research. Third, it provides Federal funding of not less than \$500,000 per year to each center with additional funds available on a matching basis."

These remarks are very compatible with recommendations which have just been offered to Governor Holton in the report, "Environmental Policy for Virginia: Roles for Higher Education." Since the work on which the report is based was directed by the Center for the Study of Science, Technology and Public Policy, I suggest that a copy be sent to Senator Bellmon as part of your response to his letter of October 27, 1971. We have considered at some length the need for environmental policy analysis and supporting research at the State level, the types of research which are appropriate to a state environmental center, the improved utilization of existing Federal programs, a workable relationship between State government and higher education, and some of the recent related public service and public policy experiences of higher education in Virginia.

Senator Bellmon also recognizes the critical importance and responsibility of the Federal government in providing adequate resources for the conduct of the work of the state environmental centers. In our experience, finding funds is the major obstacle to realizing a Virginia Environmental Study Center (VESC), as is proposed in our report. We have suggested an initial \$145,000 *pilot* program in the hope that such a request might be met expeditiously. However, everyone with whom I have worked in the State government and the academic community realizes that realization of the full potential of the VESC will require much more money than that which we are requesting.

I believe that the \$500,000 of unmatched funding proposed for each State in Title I of S681 would be relatively close to what a State like Virginia currently might be able to apply productively and responsibly. Later, as our understanding of the nature and scope of environmental problems in the Commonwealth improves, we should be able to justify an increasingly large investment in what might well be the VESC. Governor Holton's Council on the Environment has issued its first annual report, which provides for the first time a baseline profile of the state of our environment. Now we are in a position to address the problem of determining and applying criteria for ranking problems and identifying the areas where more research and information are required. In other words, we now know enough to make use of a state environmental center.

Another limiting factor is the current inexperience of higher education in managing and conducting the larger scale, complex, interdisciplinary investigations which are required. In the first flush of interest in environmental problems, the difficulty in effecting the necessary synergism was painfully underestimated. Now, however, more appropriate organizational arrangements are available. Of the two largest graduate schools in the State, Virginia Polytechnic Institute and State University (VPISU) now has a Center for Environmental Studies and the University of Virginia has a Department of Environmental Sciences as well as the Center for the Study of Science, Technology and Public Policy. Considerable focus has thus been given to the environmental interests in the two schools. As these new organizational arrangements are modified and made more secure by experience, not only will the capability of each institution to participate in a state environmental center increase, but the more difficult path to interinstitutional cooperation will become easier. Fortunately the necessary forces are already in motion and could be given great impetus by a measure such as Senator Bellmon has proposed.

How large and productive could a Virginia Environmental Center become? The answer is uncertain right now, but some other states are already making bold commitments. A notable example is the Illinois Institute for Environmental Quality which was established under the State's Environmental Protection Act of 1970 (Section 6—Illinois Rev. Stat. ch. 111½, § 10006). In purpose and organization the Institute is very close to our proposed VESC and quite compatible with the state environmental center of S681. Of great significance is the \$2,000,000 which the Illinois legislature has appropriated for the new organization. Some 51 projects are currently underway.

Let me now make some specific comments on Titles I and II of S681 which are quite distinctive. The first, "State Environmental Centers," has been the subject of most of my comments, and provides on a State or regional basis, "an organization that combines or coordinates the research capability of educational institutions . . . to undertake research, investigations, and experiments into any aspects of environmental problems related to the mission of the center." In general I can certainly endorse the provisions of the Title since they are so compatible with the proposal for a VESC. There are however, some points, primarily of emphasis, with which I would take exception.

Sec. 2. (a) of Title I provides that "the center shall have a nucleus of administrative, professional, scientific, and technical personnel capable of planning, coordinating, and directing comprehensive programs required for the protection and improvement of the Nation's environment." I believe it is important that the center not build a permanent research staff of its own which would be drawn from or become a competitor of existing research groups in the various academic institutions. Better that the role of the center be primarily to identify the most significant areas in which research is required, locate the best qualified research capability in the State, provide the necessary resources to the researcher and feed the results of the research to the appropriate interested decisionmaker in the State government. In other words, the center would concentrate on managing, rather than conducting, research. In many cases, more than one research project might be funded and the results would have to be related and interpreted by the center or by another grantee to provide all of the information needed.

This is similar to the manner in which Virginia's Water Resources Research Center (WRRC), which is headquartered at VPISU, is operated. Since S681 is, in part, modeled after the Water Resources Act of 1964, I would hope the new centers would be operated similarly.

At the same time I suggest that clear provision be made to avoid one major limitation to the potential impact on State policy. The Virginia WRRC suffers now, I believe, from a lack of commitment on the part of the State government to make use of this valuable resource. A state environmental center should be a joint, active endeavor of higher education and the State government. The latter, either through a State planning or an environmental agency, should be responsible for identifying the informational needs of the primary governmental environmental decisionmakers, securing a well-defined request for such information, and providing the results of the completed research to the decisionmaker. The State higher education agency should undertake to identify the appropriate research capabilities within the academic community which can best provide the information which the State needs. If both State government and higher education are not attentive partners in this undertaking, the focus of the center's work will be lost. This issue is discussed in greater detail in Section II, "Relationship of Higher Education and State Government" and Section 1.3.3, "Utilization of Existing Resources," of "Environmental Policy for Virginia; Roles for Higher Education."

Sec. 2. (b) of Title I provides that the centers shall "plan and conduct . . . opportunities to provide for the training of environmental professionals through such research, investigations, and experiments; . . ." The academic community would appear to be best equipped to effect this end. However if problem solving is an equally desired goal, then there are industrial, consulting, etc. organizations on whose services the centers might wish to draw in addition or preference to those of the universities. If so, the need for management of the centers by State government, in addition to higher education, is more emphatic. This consideration is discussed in Sections 2.3 and 4.1 of "Environmental Policy for Virginia: Roles for Higher Education."

Sec. 2. (e) of S681 requires that 25% of the funds allotted to a State center "be expended only in support of work planned and conducted by one or more interstate or regional centers as provided in section 3(a)(2) of this Act." This may be a very important and debatable restriction. I would first like to clarify the reference to "section 3(a)(2)," which is not contained in S681.

Title II—Technology Transfer Component of S681 is referred to in the text as the "Extension and Continuing Adult Education component." The intent of this title is different from the term "technology transfer" might suggest, certainly if thought of in terms of the currently defunct State Technical Services Act of 1965, where the purpose was to promote commerce and encourage economic growth in the States through the more effective application of science and technology in business, commerce, and industry. Title II is perhaps closer in intent to the Environmental Education Act of 1970, which provides grants to citizens groups, volunteer organizations and other public and private non-profit agencies, institutions or organizations for "the educational process dealing with man's relationship with his natural and manmade surroundings, and including the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment." During the last fiscal year some \$1.7M in grants were awarded by the Office of Education for 74 projects in 32 states. An estimated \$3M

will be available in fiscal year 1972. However, I believe that there are some significant differences in S681. Under S681, a great deal more money would be provided and *every* state would be assured of some resources to implement its own program. Whether the Environmental Education Act and Title II of S681 could be made convincingly complementary and both be funded is conjectural.

In reviewing the target audiences in Section 4, I sensed that Title II may come in competition with other existing programs such as Title I (Community Education) of the Higher Education Act of 1965, Title VIII (State and Local Governmental Personnel) of the Housing Act of 1964, and the more recent Intergovernmental Personnel Act of 1970. Each of these acts provides for training and/or education which could conceivably include environmental quality.

I am not sure that, rather than generate more information on environmental matters, we don't need to reduce the quantity and improve the quality so that people can comprehend and assimilate the information which they really need to understand the most important environmental issues. The total of the resources already earmarked for environmental education may be adequate, but the distribution and utilization should be reappraised.

While Title II may present an attractive complement to Title I, the two seem separable. To me, the case for the "Extension and Continuing Adult Education component" is more equivocal than that for the "State Environmental Centers." If the former were abandoned, I believe Title I would remain a viable and possibly stronger proposal.

I have postponed addressing whether the Environmental Protection Agency is the best choice for administering the Act. The President's Reorganization Plan No. 3 of 1970 centralized much of the regulatory authority for *pollution* abatement in the new agency and leaves debatable whether such responsibility clearly encompasses the planning and research roles defined for the state environmental centers. More recently though, I have learned about EPA's focusing of their research program on systems research, e.g. social systems modeling, environmental social problems, and drawing on cultural anthropology, economics, and the like. If this focus becomes a major thrust of EPA, then they might well be attuned to the intent of S681.

Alternatively the President's Council on Environmental quality might be an appropriate Federal administering body. The duties and functions of the state environmental centers appear very compatible with those of the Council as they are laid out in Sec. 204 of the NEPA. However I do not believe that any significant growth of the CEQ is desired by the Executive, and therefore the Council could not administer a program as large as the State Environmental Center Act of 1971. More important, the recent testimony before the Senate Committee on Interior and Insular Affairs by Council member, Dr. Gordon MacDonald, clearly spelled out the opposition of the Council, if not the Administration, to any State Environmental Centers.

My general comments here on S681 and "Environmental Policy for Virginia: Roles for Higher Education," address most of the questions posed in Senator Bellmon's letter of 27 October 1971. I will, however, comment specifically on question 7, which requests a comparison of S681 with other related proposals "such as the Ecological Society of America's National Institute of Ecology and the related activities of the National Science Foundation."

As you know, the University of Virginia is one of the founding institutions of the National Institute of Ecology, which is now called the Institute of Ecology. As the University's representative, I am relatively well aware of the development of this organization. So far the following seem apparent: the research focus is primarily on large, general ecological problems such as the feasibility of aquaculture, recycling of nitrogenous wastes, global productivity, and conservation of ecosystems; the emphasis is heavily on the scientific rather than the public policy component of environmental problems; the Institute currently is allied primarily with the university community and not with State governments; and any large scale funding remains uncertain.

Although a judgment may be premature, the state environmental center appears to offer a State focus on environmental problems which the Institute would do only coincidentally. Even where the site of investigation is within a particular State the Institute does not appear organized to conduct its work in fulfillment of objectives and identified concerns of the host State. The only way to assure that every State can give deserved attention to its own problems is through a mechanism such as that provided in Title I of S681.

Since much of the emphasis of S681 is on mobilizing academic resources, perhaps another agency which is accustomed to dealing with the higher education community might be as appropriate an administering body for the program as EPA or CEQ. One possibility might be the Office of Intergovernmental Science Programs in the National Science Foundation. This relatively new effort is designed to help State and local governments strengthen their science and technology capabilities, and, as could be expected of the NSF, draws heavily on university participation. Perhaps because of their established relationship with universities, the Office of Intergovernmental Science Programs, or other academic-oriented agency, could assist in *establishing* the state environmental centers, which, once organized, would be administered at the Federal level by EPA.

A related major NSF effort is the Research Applied to National Needs (RANN) program. As with the Institute of Ecology the focus is on national problems, so that many states would not be provided a vehicle for addressing their peculiar concerns. A Virginia governmental agency, the Virginia Institute of Marine Science is associated with a significant RANN study of the Chesapeake Bay. However none of the Commonwealth's universities participated in the design or are included in the conduct of the program. This exclusion would not have occurred had the effort originated in a state environmental center.

This comparison of the state environmental centers with related efforts of the Institute of Ecology and the NSF is very incomplete. The Institute and the NSF tend to focus on elucidating the scientific phenomena of general ecological problems while the state environmental centers are better conceived to help a State government make public choices to improve environmental quality within its borders. The approaches are complementary rather than competitive.

What relationship the state environmental centers would or should have to other proposed Federal agencies such as the Administration's Environmental Institute or the National Environmental Labs, which Senators Baker and Muskie advocate, is even less clear. There are certainly potential common areas of activity. However, if the "new federalism" is a serious theme, the proposals of S681 appear to be the most responsive.

Certainly there is a great deal more about S681 which might be said, but the comments which I have offered should indicate the extent and nature of my support. If the bill were enacted tomorrow I believe the Commonwealth would be ready and able to organize and derive extensive benefit from a Virginia Environmental Study Center.

Senator METCALF. Mr. Bellmon, we appreciate your statement and, of course, we appreciate your introduction of this important legislation. I don't have any questions. Do you have some questions, Senator Jordan?

Senator JORDAN. No; I have none.

Senator METCALF. Thank you very much, Senator Bellmon, for your contribution.

The next witness is an old friend of mine with whom I served in the House of Representatives, a fighter for conservation, a warrior along with me on the Migratory Birds Conservation Commission, Congressman Dingell. Congressman Dingell has a bill which has already passed the House and is now before this committee as one of the bills to be considered.

John, we are delighted to have you here. We applaud your ability to get a bill on this matter through the House of Representatives, and certainly your legislation is going to be a matter of concern to us no matter what the Senate passes, and the Senate is going to pass something in this area.

STATEMENT OF HON. JOHN DINGELL, A REPRESENTATIVE IN  
CONGRESS FROM THE STATE OF MICHIGAN, ACCOMPANIED BY  
FRANK PORTER

MR. DINGELL. Mr. Chairman, I want to express my particular gratitude to you and the committee for the privilege of being here this morning. I would like to pay particular tribute to my distinguished friend, Lee Metcalf, who served with great distinction, not only in this body but over in the House. You know how much, over there, we do miss you. I want to state it is a privilege to see you and Senator Bellmon this morning.

I must say it is a distinct privilege to be here. I have just come from the room where the distinguished chairman of this committee is announcing his candidacy for the Presidency, and I must say, although it has nothing to do with my testimony here this morning, that his comments and the way he handled himself were of particular pleasure to me.

SENATOR METCALF. May I interrupt, there is no Senator that has a more distinctive record of conservation, for national parks, for wildlife refuges, for wilderness areas, than Senator Jackson. We are both in agreement on that.

MR. DINGELL. I agree with that. I would say he has most difficult competition from Senator Metcalf and Senator Bellmon.

SENATOR METCALF. He is the chairman.

MR. DINGELL. It is also a privilege to see my very distinguished friend, Senator Anderson, who is not only my friend but my father's friend before me. So it is a great privilege for me to be over in this room today.

MR. Chairman, my name is John Dingell, a Member of Congress from the State of Michigan. I am pleased and honored to be here to testify this morning in favor of H.R. 56, a bill passed by the House on May 17. The bill provides a much needed foundation for a national environmental data system, to serve as the central national facility for the selection, storage, analysis, retrieval, and dissemination of information and data specifically relating to the environment.

As you are aware, my Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries held extensive hearings on this proposal in the last Congress. We heard from agency witnesses, representatives from interested State organizations, and from members of the general public. To a considerable extent, the testimony, with one major exception, reinforced testimony received earlier in the same Congress with regard to the establishment of the Council on Environmental Quality, the bill which ultimately emerged as the National Environmental Policy Act of 1969.

As you recall, Mr. Chairman, that was a concerted act from this distinguished committee and our committee in the House.

The exception was, as might easily have been predicted, representatives of various executive agencies who testified that the idea was meritorious but that further study was required. They responded similarly when asked to submit statements on the bill in this Congress, and I will be very surprised if their position has changed from that day to this. Pleased—but surprised.

I might comment, Mr. Chairman, this is generally the kind of comment that was raised by the administration in connection with the legislation which created the Council on Environmental Quality and which ultimately became the National Environmental Protection Act of 1969.

The problem to which this bill addresses itself is by no means an obscure one. The Council on Environmental Quality has contracted for a long overdue study on the subject by the Mitre Corp., and the Office of Science and Technology has its own study effort, known as the SEQUIP study—short for the study of environmental quality information programs in the Federal Government. I am told that the Environmental Protection Agency has been looking into this question for about as long as it has been in existence. But, nothing happens within the executive branch.

I think, Mr. Chairman and members of this committee, that the time to act has arrived and I believe that H.R. 56 provides the means for appropriate action. I would state that the House of Representatives by its overwhelming vote on this legislation indicated so, too.

In brief, the bill establishes a national environmental data system, to be administered under the general guidance of the Council on Environmental Quality. This system would provide the necessary coordination for the establishment of a Government-wide system for the storage, analysis and retrieval of information and data. Except in designated cases involving secret and national security information, access to this information would be available to all at little or no cost.

It should be stressed that this system would not spring instantaneously into existence upon enactment of this bill. Notwithstanding all of the high-powered and expensive study that has already gone into this system, the Director and staff of the data system would be expected to review the existing situation—with this important distinction: they would be required to decide—not whether to do the job—but how to get on with a job that clearly has to be done.

I would very much doubt that anyone could provide this committee with even a rough estimate as to the degree of duplication of facilities and research effort which we are currently constrained to support—constrained by the lack of information that this bill would provide. Many agencies have their own computers and at present there is no way to transfer much, if not most, of this information between agencies other than by the time-honored technique of typing it out and carrying it from point A to point B. In the electronic era—one of the more polite designations for the age we are in—this makes very little sense.

Mr. Chairman, I would point out also, with regard to the comments I have made, that one of the things that has appalled me as the chairman of the House Committee on Migration, is that the research is poorly utilized and installed and seldom made available in areas where it could be of value. I am satisfied there must be an incredible overlap of duplication and research and data collection and retrieval in this Government. I am satisfied, if we could have an addition of the kind before this committee, we could probably save vastly more than the operation and could much more efficiently utilize the operation with the environmental and economic advantages that would flow from that.

I would urge you to consider carefully, as we did in the Merchant Marine and Fisheries Committee, the important extent to which a bill such as H.R. 56 would enable the Congress to obtain more and better information on the consequences of executive proposals which we are now required to accept almost as a matter of faith. While I am not saying that I have no faith in the agencies downtown, Mr. Chairman, I can tell you that I feel more comfortable when I have independent sources of information to corroborate what they may tell us at a particular time.

The witnesses before our committee were strong in their support of the national environmental data system as an idea whose time was overdue. Paradoxically, by reducing the amount of information that would have to be reproduced and distributed, as for example in the case of controversial NEPA environmental impact statements, the bill would seem to reduce the administrative burden on Government agencies, and at the same time, increase its availability to the interested public. From this it seems to me that only good can result, and, of course, an immense saving of money.

Without a doubt, there is already a vast amount of useful and significant information lying in essentially unretrievable form in Federal filing cabinets and computers, and also, I might say, in the files and desk drawers of researchers who do research with federally financed programs.

Even more clearly, the amount of this material is going to increase drastically in coming years. If we act now, as this bill would permit, we will create a mechanism whereby this material will be preserved in usable form. This alone is adequate reason to support the bill. When there is added to this the additional incentives of decreased costs of information retrieval, and increased accessibility of useful information; the justification for this legislation becomes, to my mind at least, overwhelming.

I commend you for holding these hearings, and the committee and I are confident that favorable consideration of the pending legislation will be very much in the public interest.

I would point out, Mr. Chairman, I had an opportunity to view the other two bills before this committee, and I am satisfied that they could place all together in one piece of legislation. It would probably be a better legislative effort if the three bills were put together as one bill, since the three address themselves to the necessary parts of the solution of data shortage retrieval and the relation of this to the environment.

I would point out, Mr. Chairman, that not only does the bill deal with retrieval, but it does something else, and that is it goes to predictive environmental effects, and so that is to enable us to understand the effect of these things going forward.

I would further point out that H.R. 56 is drafted to provide an enormous flexibility to the administration in the way they would set up the proposal before us.

Senator METCALF. Thank you, very much, Congressman Dingell. I have long been an advocate of more computers in the Federal Government at the legislative level. We have all sorts of computers downtown and yet we haven't taken care of ourselves in having data banks and retrieval systems and so forth in our legislative committees. But

even today we rely on the memory of clerks, and they have to pull out vast files out of appropriation committees and so forth. I know of no area where more research has been filed and then forgotten than the area in which we are both interested, the area of conservation and wildlife, and in all of these matters.

Mr. DINGELL. You are absolutely correct. In Congress we do things the same way we did in the Lincoln administration. We don't utilize any of the new mechanisms.

Senator METCALF. I certainly approve of such an approach.

John, we have a vote going, I have a couple of questions, but I am going to defer to Senator Bellmon.

Senator BELLMON. Thank you, Mr. Chairman.

I would like to compliment you for a very fine statement which encompassed H.R. 56. I have been a little "startled," I guess is the word, at the lack of soundly based judgment upon which the Congress can base its decisions in many fields, particularly in the environmental field.

While we have gone through quite a body of law relating to environmental problems, I am of the opinion that many States are going to be entering this phase. Do you see the environmental data system as helping State legislation and State policing agencies?

Mr. DINGELL. Yes; most emphatically. May I digress briefly, to do something I should have done previously. I notice that Mr. Frank Porter, one of two counselors of my subcommittee, is here with me. The bill was not drafted to set up a national environmental data bank. To set up one gigantic bank of computers would be foolish. What it seeks to do is provide an intertied set of data centers around the country, seeking a generally compatible computer system, so that every State legislature, local government, the National Government, administrative agency, the executive branch, would have access to this information quickly and easily. It seeks to provide a device for evaluating so that useful stuff comes from it. The State of Maine, for example, is seeking to have access not only to its own information, but to other.

Senator METCALF. John, we appreciate your statement and your program. The bell just rang for a rollcall. I am going to recess the committee now and when I return we will hear from Gordon MacDonald, a member of the Council on Environmental Quality.

Mr. DINGELL. Senator, it was a privilege to be with you. Thank you. (Recess.)

Senator BURDICK (presiding). Our next witness is Mr. Gordon MacDonald, a member of the Council on Environmental Quality, accompanied by Robert Kahn, a member of the Council on Environmental Quality.

**STATEMENT OF GORDON MacDONALD, A MEMBER OF THE COUNCIL ON ENVIRONMENTAL QUALITY, ACCOMPANIED BY ROBERT KAHN, A MEMBER OF THE COUNCIL, AND TIMOTHY ATKESON AND CLARENCE DAVIES**

Mr. MacDONALD. Thank you Mr. Chairman. I would like to introduce Timothy Atkeson, and J. Clarence Davies.

I am glad to have the opportunity to discuss with you three important proposals: State environmental centers, the Environmental Policy Institute, and the national environmental data system. Actually Chair-

man Train wished that he could be here, but he has a commitment out of town.

Let me turn first to S. 681, the proposed State Environmental Center Act. This act would provide for the establishment of State or regional environmental centers to support expanded research, training, planning, management, and education in environmental matters. Funds appropriated for the centers would be distributed on a formula basis.

We fully support the general objectives of this bill. However, we find some unanswered questions and problems regarding the proposal that lead us to doubt its desirability.

Let me briefly review these:

First, extensive environmental research, planning, and training already are being carried out by a large number of Federal, State, and nongovernmental entities, not to mention research institutes associated with colleges and universities. It is far from certain, therefore, that there is a strong need for additional organizations of the type proposed in the bill.

Second, there already are many Federal programs which provide financial support for environmental research, planning, and training, including those administered by EPA, the NSF, the Departments of Interior, Agriculture, and Health, Education, and Welfare, as well as others. Accordingly, to the extent S. 681 would tend to duplicate the objectives of these other programs, the bill is unnecessary. Furthermore, it has not yet been demonstrated that research proposals of the general type envisioned in the bill cannot be adequately supported under these existing Federal programs.

Third, the bill seems to us to be rather vague in its description of the problems that are to be addressed and the activities that are to be undertaken by the propose environmental centers. Before serious consideration is given to statutorily establishing new organizations or other institutional arrangements, we think it is essential to more carefully identify the problems that need solving and the objectives of the activities proposed.

Fourth, if environmental research institutions of the type proposed in S. 681 are to be truly responsive to the interests and needs of the States they serve, there should be provision for strong State or local support and financial investment. Under the bill, however, there would be required up to \$50 million annually in new Federal funds before any non-Federal investment would be forthcoming.

Finally, there is a real doubt in our mind whether an across-the-board institutional approach of the type contemplated in the bill is the best way to expend the scarce financial resources and human talent available to us in the environmental field. It seems to us that the bill runs the risk of diverting these resources from dealing with the highest priority problems confronting us.

For these reasons we recommend against passage of S. 681.

Let me now turn to the second proposal. The proposal for an Environmental Policy Institute was first made by the President in his February 8, 1971 message to Congress. In that message he stated:

The solutions to environmental and ecological problems are often complex and costly. If we are to develop sound policies and programs in the future and receive early warning on problems, we need to refine our analytical techniques and use the best intellectual talent that is available.

After thorough discussions with a number of private foundations, the Federal Government through the National Science Foundation and the Council on Environmental Quality will support the establishment of an Environmental Institute. I hope that this nonprofit institute will be supported not only by the Federal Government but also by private foundations.

The Institute would conduct policy studies and analyses drawing upon the capabilities of our universities and experts in other sectors. It would provide new and alternative strategies for dealing with the whole spectrum of environmental problems.

We have been working on the Institute proposal. However, we have found the task of developing the Institute concept more complex than we originally thought. Questions such as its size, location, and the detailed nature of its mission have proved quite difficult, and these will have to be resolved before the Institute becomes a reality.

We are grateful for the support which S. 1216 shows for the idea of an Environmental Institute. However, we do not believe that any legislation is necessary; furthermore, legislation would introduce an element of rigidity and would thus reduce the flexibility required to establish and administer the Institute.

The Council on Environmental Quality will continue, of course, on an interim basis, to perform some of the kinds of analyses which would be undertaken by the Institute. Our limited resources and the other demands made on the Council do provide a constraint on our ability to undertake longer range tasks. Nevertheless, I think we have made a good start in this respect over the past 18 months. We have made significant progress with respect to environmental monitoring. We have laid the groundwork for a system to anticipate problems and control the effects of toxic substances, such as lead and mercury; we have prepared a report and recommendations to control ocean dumping; and we have underway a number of indepth policy studies on such diverse subjects as recycling, agricultural pollution, the economic effects of pollution control regulations, and predator control.

Let me turn to the third proposal, the proposal for a national environmental data system. Environmental monitoring has been one of the primary concerns of the Council. Not only does the National Environmental Policy Act make it one of our responsibilities, but we are convinced that adequate monitoring data is an essential prerequisite to rational decisionmaking in the environmental area. It is necessary for the identification of environmental needs, the establishment of program priorities, the evaluation of program effectiveness, the enforcement of environmental quality standards, the development of new standards, and the early detection of new environmental problems or trends.

Last year we gave a major contract to the Mitre Corp. for the development of environmental indexes and an environmental data system. We have circulated the resulting report to the Federal agencies and are now receiving and reviewing their comments and suggestions. As a followup to this work, we are in the process of letting contracts for the compilation of data to be used in establishing monitoring indexes in the areas of air and water pollution, pesticides, recreation, wildlife, and land use. Each of these contracts is designed to develop and provide the data for indicators to be published in next year's annual report of the Council on Environmental Quality. They are also designed to identify steps that are needed on the part of relevant agencies so that the appropriate data can be collected and provided to the Council on a regular basis in future years.

We are working with the Office of Science and Technology in reviewing and considering further steps to be taken on the recommendation made in the draft SEQUIP study, a study of environmental programs of the SEQUIP committee which reviewed all of the Government's environmental monitoring activities. That report has been reviewed by all concerned agencies and those comments are being considered by the SEQUIP committee. We are also working closely with the Deputy Assistant Administrator for Monitoring in EPA in his study of requirements for environmental pollution data, which will be discussed in more detail by Dr. Greenfield. We will shortly be initiating a series of discussions with a variety of interested parties to explore alternative possibilities for environmental indicators.

As a result of the Mitre study and our other work on monitoring, it is abundantly clear that the problems of environmental data monitoring, acquisition, analysis, and storage are extraordinarily complex and difficult. Among our conclusions are the following:

First, there is a need to define clearly data that are required for environmental indexes of the type that have broad national implications and which would provide the capabilities we identified above—for example, indicators of major changes in environmental quality. A large amount of data on environmental conditions is collected now by Federal and non-Federal organizations for a wide variety of operational and research requirements. This type of information will still be required and in some cases contribute to environmental indexes.

Second, the object of a data system is to provide answers to a given set of questions. Before any data system can be established, the questions which it is to answer must be defined. Each of the existing individual data systems, information systems, or facilities has been established with a fairly limited mission and has been designed to answer specific questions. The facilities involved; that is, the type of information system, the language in which the information is collected and stored, the software and, where available, the hardware, are specifically designed for their particular purpose. Often data in one system will not be compatible to those from another system, but this may not be a problem where the different purposes are adequately served. Consequently, it does not appear practical, even if it were determined to be desirable, to attempt to draw all of these systems together into one unified system.

Third, we have already identified a very large number of Federal agencies as well as State and other organizations which operate some type of information, collection, or monitoring system involving the environment. However, we must emphasize that although the data are as complete as possible, given the time and resources available, they do not by any means cover the whole field, and considerable more work must be done before a truly comprehensive picture of the collection of environmental data throughout the Nation is assembled.

Fourth, because of the variety of types of requirements, as well as variety of definitions of what is meant by environmental quality, there is no general agreement on the requirements for or nature of environmental quality indexes. Our study has taken a first cut at the problem and identified over 100 potential indexes indicates the complexity of the problem and underlines the need for careful definition of the requirements, implying the need for considerable further study and evaluation of the whole situation.

More generally, we believe there are three essential requirements which must be met: the collection and analysis of the data must be reliably done; the data must be processed in such a way that it meets the needs of the users; and finally there must be an efficient system for informing users of what data is available and getting it into their hands. Of these requirements, the first two present the greatest difficulties.

Much of the environmental data now being collected are of limited usefulness in developing overall indexes of environmental quality because it is collected for a particular purpose and cannot be used more broadly. For example, State and local air pollution monitoring sites are often located in the areas of most intense pollution so that the results can be used for enforcement purposes. The data from these sites are not reliable as an indication of general air quality conditions in the particular community. Faulty or inadequate instrumentation and lack of adequate analytical methods present further obstacles in the collection of reliable data.

Processing the data so that it can answer the right questions can be very difficult. There are now in existence several large accumulations of environmental data which contain relevant and important information but which are almost useless because the data has not been programmed or organized to meet specific user needs.

I recognized that H.R. 56 is designed to meet the third need, that of getting the data into the hands of the users. However, I question whether a centralized data system would be a more efficient means of satisfying this objective. Such a system might make it more difficult for the agencies to achieve improvements in their own systems which are needed to fulfill their specific missions.

In short, H.R. 56 would not fill the most significant gaps and needs which now exist in the monitoring area. Our Council and other agencies such as EPA are addressing the basic problems that must be solved in creating an efficient and effective environmental monitoring system. The problems do not lend themselves to sweeping solutions. We must go through the long and sometimes agonizing process of identifying requirements, improving existing data networks, asking the right questions, and building the processes and methods which can answer these questions. While it is not dramatic, we believe that this is the soundest way to develop a truly workable system.

Mr. Chairman, we welcome your criticism and your support in this effort. We shall need both. But we very strongly feel that it is unnecessary and unwise at this time to establish by law a data system of the type envisioned by H.R. 56, which would hamper our ongoing efforts to develop effective environmental data systems that will be truly responsive to our needs. Accordingly, we recommend against enactment of H.R. 56.

I will be glad to answer any questions.

Senator BURDICK. Thank you for your contribution this morning. Mr. Kahn, do you have anything you would like to add?

Mr. KAHN. No, Senator; nothing more to add.

Senator BURDICK. I have a few questions, and then Senator Bellmon will also interrogate you.

On the bottom of page 11 you say to establish by law a data system of the type envisioned by H.R. 56 would hamper our ongoing efforts to develop effective environmental data systems that will be truly responsive to our needs. Would you detail more what those efforts are at the present time?

Mr. MACDONALD. We have a number of efforts. First, there are efforts underway within the Environmental Protection Agency, which Dr. Greenfield will address himself to in his statements to you. In addition, as a Council, we are examining and working with the other agencies of government, such as the National Oceanic and Atmospheric Administration, to identify what programs they have underway that provide environmental data of one sort or another or to try to make sure this data is made available to the Environmental Protection Agency and other agencies that might make use of it.

As I say, we have had major studies, both of them have been completed and now undergoing comment by the Federal agencies. The Mitre study I referred to in my statement and the so-called SEQUIP study. Both of these studies have a number of recommendations to improve the data gathering efforts of the agencies and intercommunication among the agencies, and we are now evaluating these recommendations.

Senator BURDICK. In other words, what you are saying in your testimony this morning is that you have existing agencies and existing authority for doing the very thing these bills can do. Is that correct?

Mr. MACDONALD. Yes. We believe we do not have an environmental institute at the present time, but we believe we have statutory authority to set up one as the President proposed in his February message. We have a great variety of research centers scattered around the country, carrying on environmental research and I think they go a long way to meet the very fundamental needs pointed out by Senator Bellmon in his bill. And our current efforts with regard to data systems meet the needs spelled out in H.R. 56.

Senator BURDICK. You are contending this would be a duplicating layer?

Mr. MACDONALD. Particularly in H.R. 56, that would be an additional layer, that would be unnecessary in our view. We can accomplish the goals of H.R. 56 with the existing agencies, institutions, and organizations.

Senator BURDICK. The United States has made suggestions in the international community which call for an international environmental institute for data exchange. You have participated in such international meetings concerned with environment?

Mr. MACDONALD. Yes.

Senator BURDICK. Do you agree we must have the institutional capacity to generate the information here at home, before we can participate abroad?

Mr. MACDONALD. Yes; I agree with the statement, and agree we do have a national capacity, in some areas we have a very efficient way of communicating information to environmental organizations. For example, the weather information secured by NOAA is made available to the World Meteorological Association. The information we have can be made available to whatever overall international organization that might be set up to examine data and analyze it.

Senator BURDICK. As I understand the meaning of H.R. 56, a director of the data system will be required to conduct further studies. Would not this allow the executive branch and the CEQ to coordinate studies completed or already underway?

Mr. MACDONALD. Certainly the application of H.R. 56 would not interfere with the ongoing work. I noticed, however, it does introduce this additional layer, provides for functions we think can be accomplished through the existing mechanism.

Senator BURDICK. That seems to be your thesis all the way through, that you have your mechanisms.

Mr. MACDONALD. I think we have our mechanisms. We wouldn't argue they are perfect, by any means, they need improvement and we have studies underway to achieve these necessary improvements.

Senator BURDICK. As I understand it, two major administration studies concerning data collection and dissemination have already been conducted. The SEQUIP study and Mitre study. It would help our deliberations if such studies were made public.

Mr. MACDONALD. Mr. Chairman, both studies have been circulated to the Federal agencies for comment. I would expect that certainly the SEQUIP study, certainly after some stage, after receiving agency comments, taking into account their comments, that study would be made available. I am not as certain as to what our plans are for the Mitre study. We have not yet decided as to whether this should be or should have a very broad distribution.

Senator BURDICK. Senator Bellmon.

Senator BELLMON. Before I go to my questions, Congress and you are part of the same Government—what purpose is there in delaying release of the studies?

Mr. MACDONALD. We have made a copy of the Mitre study available to Representative Dingell in connection with his work on H.R. 56. We would certainly make it available to this committee. The question we have is whether to go into publication for wide public distribution. It is certainly nothing we are trying to hide in any way whatsoever.

Mr. BELLMON. What about the other study?

Mr. MACDONALD. The SEQUIP study will probably be made available through the National Technical Information Services. This is our current plan; it would be published and available through NTIS.

Senator BELLMON. Let me pursue a little different line of questioning. For many, many years in this country, clear up to the 1960's we have been concerned with developing our mines and farms and forests and building cities, and no one paid much attention to what was happening to the environment. Suddenly, in the 1960's, smoke and air pollution and polluted rivers, and all of these things suddenly broke into public consciousness and we had almost an emotional upheaval in trying to cope with these problems overnight.

My question is: How did we get into this kind of shape?

Mr. MACDONALD. That is a very deep question, one that I don't think has been adequately analyzed or even adequately thought about. I have read actually quite a number of Ph. D. theses that have tried to answer that specific question. I know what at least part of the answer is, that we have not focused enough attention in the past on the secondary and tertiary conditions of decisions we have made, that we decided to build a city or build a dam. Historically we have not tended

to look ahead and I think this is, of course, one of the great advantages of the environmental concern, that we are now much more aware that any acts that we take have—from any action flow a whole series of consequences.

We see this in section 102 environmental impact procedure for the Federal Government. We also see it to a decreasing extent in the work of universities, where the research activities are much more channeled into looking at the consequences of developments and technology, advances and in other fields.

I think this is one of the more important meanings of the environmental concern, that we are developing the necessary awareness, to distinguish between decisions which have immediate impact and those which have consequences for many years thereafter.

Senator BELLMON. I couldn't agree with you more, that that is what is needed. But I can't agree with you, when you say it is being done. We have in the last few years passed several laws to cope with the environmental problems, most of them policing laws. We created the EPA—the Environmental Protection Agency—at the national level, but what we are doing now is reacting to a crisis that never should have been allowed to build in the first place.

The purpose in back of the bills we are talking about now, is to take steps so we won't go to sleep when the emotion of this present crisis begins to diminish and we will have continued effort going on, not just here in Washington, not just in some great national institute, but all across the country to help particular individuals to make decisions that will have a net beneficial and desirable result.

What has happened that you know about, since we got into the present jam, that is going to keep us from getting into a new jam?

Mr. MACDONALD. I think many things have happened. First, the provisions of the National Environmental Policy Act will require at least the Federal Government to try to anticipate what will flow from their decisions.

Senator BELLMON. That is just the Federal Government?

Mr. MACDONALD. Yes. Second, several States have adopted procedures which are similar in kind to procedures that apply to the Federal Government, but most importantly, and this is what I think is really a key to the question, universities throughout the country are in process or have developed environmental research and educational programs—

Senator BELLMON. Before you go further, how are those programs supported?

Mr. MACDONALD. Through a variety of ways. One of the most important ways is through the National Science Foundation and the Rand program, research applied to national needs.

Senator BELLMON. How are those grants made?

Mr. MACDONALD. By applications from research workers at universities to the National Science Foundation.

Senator BELLMON. So if it is typical of past grants, most of them will go to MIT and these universities who have put together teams of highly trained grants men. How many went to North Dakota last year?

Mr. MACDONALD. I don't know.

Senator BELLMON. Certainly, you can have the National Science Foundation program, with its contacts with skilled grants men, but this leaves us out in the cold, a lot of us.

Mr. MACDONALD. I hope it is not a question of just skilled grants men. Again, I don't have the detailed distribution of how the grants—

Senator BELLMON. If you agree that it is desirable to have a university doing this kind of work, wouldn't you agree it is in the national interest to have the Federal Government provide universal support across the country, so every State could share in the desirable activity?

Mr. MACDONALD. No; I believe it would be preferable to support individual programs based on the quality of the program envisaged.

Senator BELLMON. What about the university that has a low quality program, what about the people that live in that State? Are they going to go downhill because they happen to be low quality? Is this your conclusion?

Mr. MACDONALD. No; I think what has happened in the last few years is that the universities who might have been thought of as being of a lower quality have been appreciably strengthened.

Senator BELLMON. With what?

Mr. MACDONALD. Through the program of the National Science Foundation.

Senator BELLMON. You mean they are giving grants to the low quality universities? You are about to reveal something—

Mr. MACDONALD. I am not saying that; I say they are giving grants to quality people in these universities.

Senator BELLMON. How much went to North Dakota last year?

Mr. MACDONALD. I don't have that information.

Senator BELLMON. How much went to Oklahoma, I bet I can tell you, not a dime for governmental purposes. The money isn't going to these universities because we can't compete with the skilled and experienced grants men.

As far as I know there has been nothing done in the Congress to make this kind of effort, a program of research and monitoring, available to our States. For instance in Oklahoma right now we are beginning to develop the Arizona Navigational System. Who is to monitor and develop this system? No one; there is not a dime available. It is not a State question, as the river rises in New Mexico and Colorado and runs through Kansas and Oklahoma and Texas and Arkansas. No one has done anything about it. What do you propose to do to help us with this problem?

Mr. MACDONALD. I would expect those agencies responsible for monitoring water quality would be involved in examining what is happening.

Senator BELLMON. How many people does the Environmental Protection Agency have working in Oklahoma or Arkansas?

Mr. MACDONALD. I don't know.

Senator BELLMON. I can tell you they don't have any. Do you expect all of this monitoring to be done from Washington?

Mr. MACDONALD. No. The monitoring activities are built around their regional structure. I am sure there are regional representatives of EPA.

Senator BELLMON. They are all in Texas.

Mr. MACDONALD. I mentioned another agency, the U.S. Geological Survey, I know they are working in Oklahoma.

Senator BELLMON. For instance, if I were a developer on the Arkansas River, how could I be certain that if I came in and made an investment which is to utilize a part of the land along the river, that some

day in the future the subsequent development up and down the river wouldn't make my investment totally worthless? We have had this struggle in the city there. In the city there are lots of investments now that are probably of no account because of the depreciated or declining areas. There is a lot more to environmental quality and a lot more to environmental development than just water quality control or air pollution or the problems that most people think of when they think of the environment.

For instance, land use planning, and there is no system in the country right now that deals with land use planning.

Mr. MACDONALD. As you know, Senator Bellmon, the committee has introduced a national land use plan.

Senator BELLMON. Why don't we approach the entire environmental problem, not one piece at a time?

Mr. MACDONALD. The key to many environmental problems is land use and we have to make progress in that area. We are not convinced that setting up a series of research centers in the States will necessarily solve that problem.

Senator BELLMON. How do you propose to solve it?

Mr. MACDONALD. In the case of land use we propose—

Senator BELLMON. Let us talk about the total problem, about environmental monitoring and all that goes with it.

Mr. MACDONALD. Well, overall environmental monitoring, I think will be in large part by EPA. There are many other aspects such as weather data and so forth that are outside EPA responsibility. We would be looking for EPA to develop this national overall look at environmental monitoring.

Senator BELLMON. You oppose the establishment of a center in each State?

Mr. MACDONALD. Yes.

Senator BELLMON. You support the establishment of a larger and larger EPA to deal with this whole thing with all Federal money and Federal people, is this year approach to it?

Mr. MACDONALD. No, I am looking—I wouldn't describe it that way.

Senator BELLMON. You said you want EPA to do it. How are they going to do it?

Mr. MACDONALD. They are going to do it without vastly expanded resources. I would hope and trust that EPA would be working with local institutions, the universities, the research institutions within the States. The Federal Government has a role to support the institutions within the State.

Senator BELLMON. If you were a member of the Oklahoma State Legislature, and had an environmental problem to cope with, where would you go today to get your information?

Mr. MACDONALD. It would depend, of course, on the specific problem. I would first turn to the regional office of EPA.

Senator BELLMON. Do you think it might be a lot more satisfactory if this local legislator could go to his local university where he has people he knows and where he has had in the past very excellent cooperation and generally high level services, rather than turn to some Federal agent?

Mr. MACDONALD. I think that the university could supply very useful information, but a university has other responsibilities, being educational. It is not at all certain that they would have the kind of com-

prehensive information that that legislator require. Hopefully EPA could provide that kind of information.

Senator BELLMON. If the Congress decides to provide something for a nationwide system of research centers to be placed within our land grant college-university system, I would expect that Congress would require them to use the environmental research. Would this be local?

Mr. MACDONALD. Yes, if Congress decides this is needed for the country, I could say such centers working in a manner analogous to the agricultural extension service programs that in the past have been quite successful. What I am saying here today is that we don't think this is necessary to get the kind of studies and information that you would desire. That we have a structure that could provide the tests, let's make this structure work.

Senator BELLMON. You have a structure all right.

Mr. MACDONALD. Yes, through the combination of the Federal agencies and their programs, whether it is the Geological Survey EPA—

Senator BELLMON. The EPA is primarily a policing operation as I understand it.

Mr. MACDONALD. They have an office of research and monitoring, which has responsibility for securing this kind of information which goes well beyond surveillance or police action. It is designed to obtain and analyze the kind of information that I think you would find helpful or a State legislator would find helpful.

Senator BELLMON. The bill that has been introduced, S. 681, has two primary purposes, to train professionals in the environmental field, which is being done right now in a somewhat haphazard fashion. The second purpose is to conduct as they do continuing adult education and awareness centers. Do you say EPA provides those kinds of services?

Mr. MACDONALD. I think EPA can help with the educational efforts. The office also has authority to provide the educational efforts you describe. I think the combined efforts to EPA, the Office of Education under programs undertaken by the Department of Labor or in other agencies, could provide the educational improvements that you indicate are required.

Senator BELLMON. If I follow your testimony properly, you are recommending that we create a massive Federal bureaucracy to take full charge of research, training, classification of the whole country, so far as environmental matters are concerned, and these other agencies that exist now be left out of this national concern, is this right?

Mr. MACDONALD. No, sir.

Senator BELLMON. What do you recommend?

Mr. MACDONALD. What we are recommending is—let me start off by saying the problem is a very complex one. No single sweeping solution is available. We would like to tackle the problem in a number of ways, one through strengthening the efforts of EPA in its research and monitoring effort. I think we could achieve a great deal with the present personnel levels or slightly increased levels.

Second, to increase our funding for environmentally related programs through the National Science Foundation.

Senator BELLMON. To be made available on a competitive basis?

Mr. MACDONALD. Available on the basis of the quality of the proposal.

Senator BELLMON. What happens in the States with low quality proposals?

Mr. MACDONALD. I tried to address myself to that earlier.

Senator BELLMON. They will be left out, that is the conclusion, you will have money for the good ones and the poor ones will be left out in the cold.

In our bill we are trying to get every State in the Nation to try to do this job.

Mr. MACDONALD. Yes, as you recall the administration proposed that the NSF program and the research applied to national needs be very substantially increased. It was cut back by Congress. However, we fully intend next year to come back and try to strengthen it further.

Another important point is that we are working with the State environmental agencies themselves in an attempt to strengthen their capabilities by providing a certain amount of Federal funding to the State environmental agencies. We think this approach can go a long way to meet the needs that you so quite correctly point out in your proposal.

Senator BELLMON. This money to the State environmental agency is being given universally? Every State shares in it?

Mr. MACDONALD. On a formula.

Mr. KAHN. We are proposing to increase it from \$10 million to \$30 million, sir. In the water pollution field.

Senator BELLMON. There we go again, a tiny part of the picture.

Mr. MACDONALD. Mr. Atkeson?

Mr. ATKESON. We are studying a question of the combination. It is quite true under an existing statutory authority there are a number of program grants to State agencies, of which the water program is the largest part.

Senator BELLMON. When do you think the Federal Government will get around to realizing the environmental concern is a broad concern, and it involves every State, and we ought to employ a system already in existence which has done a marvelous job of providing educational training and information to every State and that already has a good foundation upon which an environmental monitoring and research can be built.

You are trying to start something brand new to superimpose EPA on top of an existing institutional system that has the confidence of government generally and has the expertise to handle this problem, I really can't follow the reasoning that says the only kind of agency that can do this job has to be a Federal agency, that has to start from scratch.

Frankly, I am amazed at the position you have taken here this morning. Mr. Chairman, I am not at all satisfied. I would like to raise just one more question and then nothing any further at this time.

I notice in your annual report, you provide data which is entitled "Beer Containers by Type, 1937 to 1976," is this the kind of information you expect us to base our environmental decisions on, and is this what we should expect from governmental agencies?

Thank you, Mr. Chairman.

Senator BURDICK. What is that all about, the beer containers?

Mr. ATKESON. In our annual report we try to provide some sort of information as to the magnitude of the solid waste problem, beer cans contributed to the solid waste and litter program. We are trying

to point out in the report there has been a shift away from returnable bottles to nonreturnable cans, in making the solid waste and litter problem that much more of a serious problem. I think this information is useful in looking to decisions as to where one should go for deposits of containers or what other measure might be taken to lessen the solid waste and litter problem.

Senator BURDICK. I want to buttress what the able Senator said about North Dakota and Oklahoma being out in the cold on various environmental grants. Any time you can make use of our talents out there please do.

Mr. MACDONALD. Thank you.

Senator BURDICK. Thank you for your contribution.

Our next witness is Dr. Stanley Greenfield, Assistant Administrator for Research and Monitoring, the Environmental Protection Agency.

**STATEMENT OF DR. STANLEY GREENFIELD, ASSISTANT ADMINISTRATOR FOR RESEARCH AND MONITORING, ENVIRONMENTAL PROTECTION AGENCY, ACCOMPANIED BY WILLIS FOSTER, DEPUTY ASSISTANT ADMINISTRATOR**

Dr. GREENFIELD. I have with me Mr. Willis Foster, my Deputy Assistant Administrator.

With your permission, I will read my statement into the record.

Senator BURDICK. Proceed.

Dr. GREENFIELD. Mr. Chairman, members of the committee, I welcome the opportunity to appear before you today to testify on these three bills, H.R. 56, S. 1216, S. 681, of significant concern to the Environmental Protection Agency—and particularly to its research and monitoring programs of which I am the head.

We are pleased to note that there is support in this committee for establishing an independent public and privately financed institute for environmental policy research and analysis. Both the President and the Environmental Protection Agency are acutely aware of the need for such an institute.

In recognition of the need for such an organization, the President, in this 1971 environmental program, announced his intention to establish such an institute which would be supported through the National Science Foundation and the Council on Environmental Quality. I also envision that EPA in the future would be contracting with this institute for assistance in analyzing environmental policy issues that bear upon our mission. Since the administration has already announced its clear intention to promote the establishment of such an institute as that contemplated by this bill, we do not believe that any legislation is needed. We are, however, as I said earlier, glad to see that there is strong support in the Senate for this concept.

I would now like to turn to S. 681, the State Environmental Center Act of 1971.

As Dr. MacDonald has already stated, there are a number of questions and problems that need to be addressed.

I would like to reiterate the point that there are already available a large number of organizations to perform environmental research, planning, and training. These include Federal, State, and privately supported laboratories as well as institutes associated with colleges

and universities. In addition to EPA, such laboratories are operated or supported by Federal agencies such as the Departments of Health, Education, and Welfare, Interior, and Agriculture and the National Science Foundation. It is far from clear that there is a strong need for creation of additional organizations such as those suggested in S. 681.

I should note in passing that there is also pending before the Congress another related bill, S. 1113, which would establish a national environmental laboratory system. That bill, like S. 681, adds extensive environmental research systems in addition to the present and developing research programs of the EPA.

I come now to the third bill to be addressed by this hearing, H.R. 56, the National Environmental Data Systems Act.

This bill would establish a national environmental data system to serve as the central national coordinating facility for the selection, storage, analysis, retrieval, and dissemination of information, knowledge, and data relating to the environment. Information would be collected from all available public and private sources including international sources, and would be made available free to Congress and the Federal Government and for a fee to other requesters. The system would be headed by a director appointed by the President. The system would, in effect, be a new Federal agency, but it would receive guidance from the Council on Environmental Quality.

When the House Merchant Marine and Fisheries Committee held hearings on H.R. 56 last May, the Environmental Protection Agency was not asked to testify, but we did submit a letter expressing our views on the bill's proposed data system. Our views have not changed since those hearings and I will restate them before this committee.

The Environmental Protection Agency supports the intent of H.R. 56, to improve the management and use of environmental data and information. It is clear that both the complexity of the problems concerning environment and the scope and importance of the national program undertaken to cope with them requires the best possible generation and coordination of information function.

However, we believe it would be unnecessary to establish a specific organization for this purpose and to prescribe the procedures and functions which such an organization would follow. The position of the Environmental Protection Agency is that this legislation is not needed to reach the desired goal because steps are already well underway to accomplish these same ends.

Before I go on to tell you just what steps are being taken, Mr. Chairman, I want to repeat here the purposes underlying the formation of the Environmental Protection Agency.

In transmitting Reorganization Plan No. 3 which created EPA, the President said, and I quote:

This reorganization would permit response to environmental problems in a manner beyond the previous capability of our pollution control programs. The EPA would have the capacity to do research on important pollutants irrespective of the media in which they appear, and on the impact of these pollutants on the total environment. Both by itself and together with other agencies, the EPA would monitor the conditions of the environment—biological as well as physical. With these data, the EPA would be able to establish quantitative "environmental baselines"—critical if we are to measure adequately the success or failure of our pollution abatement efforts.

Reorganization Plan No. 3 consolidated in the Environmental Protection Agency environmental pollution, research, and monitoring programs and responsibilities from several agencies. EPA will be performing, as a central part of its activities, environmental protection functions very similar or identical to those proposed for the national environmental data system.

We have created within EPA as a part of my organization an Office of Monitoring. The Office of Monitoring is now engaged in a study which has three major purposes:

One, identifying clearly national requirements for environmental pollution data;

Two, comparing its requirements with data collection activities and resources already available within EPA and other Federal agencies; and

Three, identifying those requirements for environmental pollution data which are now being satisfied and which should have higher priority for the commitment of new resources.

EPA will soon be engaging a contractor to assist in carrying out this study.

Once this study is completed we will be in a position to design whatever systems are needed to coordinate and to improve the utilization of environmental data.

I must reiterate one point made in our letter to the House Merchant Marine and Fisheries Committee—and which has been made by other agencies commenting on H.R. 56. That point is that steps to create data systems and associated organizational arrangements must be preceded by clear definitions of the requirements that need to be satisfied. It is this crucial step that we are now addressing. When we proceed with the design of a system we will, of course, provide for the coordination of a environmental data collection activities of EPA with the activities of other Government agencies and include arrangements for making use of other agencies' data. As we proceed with our studies, we will also be implementing the appropriate recommendations of both the CEQ-sponsored Mitre study, "Monitoring the Environment of the Nation," and the "Study of Environmental Quality Information Programs"—better known as SEQUIP—which is now nearing completion.

In addition to our activities concerned with environmental pollution data collection and analysis, I would like to point out that EPA is improving its efforts in the area of information concerning ongoing and completed research. We are expanding the project information system it acquired along with the Federal Water Quality Administration to include information in all areas of concern to EPA. In addition, we are strengthening our relationship with the Science Information Exchange and are sponsoring the compilation and publication of a catalog of environmental protection research.

We are also developing plans for coordinating and making more effective the activities of existing information centers. As part of this program we intend to strengthen these existing centers and integrate them into a compatible, mutually supporting network. Following this network formation, we plan to expand their activities to form specialized information analysis centers. Of course, we will take maximum advantage of existing specialized information centers, such as the toxicology information program of the National Library of Medicine.

These activities are essential to EPA's operations. We must carry them out as a part of the responsibilities assigned to EPA by Reorganization Plan No. 3, and subsequent legislation. We believe it would be unwise to duplicate these activities by creating a new agency such as that proposed in H.R. 56.

I do not know what more I can add, Mr. Chairman, in the way of giving you my views on these bills.

In summary, I would like to point out that the three bills you are considering today involve considerable overlap not only with each other, but with the ongoing activities of EPA and other Federal agencies, and do not appear to be in the best interest of the Nation.

Mr. Chairman, I believe that existing authorities, and particularly those within EPA, can handle these jobs. Considering that we have been in existence for less than 1 year, I feel we have made excellent progress. And I would hope that what I have said here today together with your own further study of this group of bills will lead you to share my conclusion—that they are unnecessary.

Gentlemen, I am at your disposal for questions.

Senator BURDICK. Thank you for your statement this morning. I just have one question here and I would like to ask: The second annual report of CEQ states that EPA hopes to develop an integrated system to provide data required for pollution control. You have described EPA's many data generating activities, yet almost all refer to the hard scientific data such as pollution data.

What activities of yours are anticipated or are ongoing that are generating softer data on human economic and social needs, for example, land use data, resources availability data?

Doesn't this data have to be considered in environmental policy-making?

Mr. GREENFIELD. Certainly the economic and social information must be part of any actions taken by an environmental agency at the Federal or local level. We have, as part of our activities throughout the agency, activities in the economic and social study area. Every standard that we set today, every standard that we consider, has folded into it what economic analysis and social analysis are possible at this time.

In addition, within my own research part of the agency we have started two divisions; one called an implementation research division and the second an environmental study division. Both of these are looking at the broader impact of environmental effects as well as the secondary, the higher level of effect of man's activities and their impact on the environment.

We hope to bring these things in to a greater extent than they are brought in now.

Senator BURDICK. Can you state whether this area was embraced or encompassed in the two studies that were made under CEQ?

Mr. GREENFIELD. The two monitoring studies?

Senator BURDICK. Yes.

Mr. GREENFIELD. I am afraid I can't answer that question. I will ask Mr. Foster if he would care to comment on it.

Mr. FOSTER. These aspects were covered by the Mitre study and I really can't say for the SEQUIP study at this point.

Senator BURDICK. Senator Bellmon?

Senator BELLMON. Thank you, Mr. Chairman.

Dr. Greenfield, on page 10 you concluded by saying that you believe that existing authorities, and particularly those within EPA, can handle these jobs. The jobs you are referring to, of course, are the ones relating to the national environmental monitoring and research and the like. Now then, what can EPA do to help us with the problem in the Arkansas River?

Dr. GREENFIELD. I can answer that partially in the following way: In-house now we have a proposal from an organization that was recently formed as a private nonprofit organization, called the Mid-Continental Environmental Control Corp., which is proposing to us that it be funded to start looking at these specific problems we are talking about, and we are looking at this right now.

Senator BELLMON. Are you going to fund it?

Dr. GREENFIELD. I can't answer this until I completely analyze its capability, and the problem it intends to address, and the work it intends to address. If it does meet all these criteria, Senator, we will fund it.

Senator BELLMON. And if it doesn't, what will you do to help us with our problem?

Dr. GREENFIELD. I can answer that in several ways. We have a fairly large research program going on within EPA today. We have some 40 laboratories located in 19 States; one of them, as you know, within your own State, the State of Oklahoma.

Senator BELLMON. Water resources?

Dr. GREENFIELD. Yes, I have recently taken these 40 laboratories and produced national research environmental research centers. Each of these centers are now combined in one entity, in each center, all of the laboratories in the country.

In essence, what I am saying, if I take one center, such as the center at Corvallis, it has as part of the ongoing work at the center, several individual laboratories spread around this country. It has as a major theme assigned to this center the question of ecology research. It has the responsibility to get into the environment in a broad way and it approaches each laboratory.

I have asked each laboratory in the various States where they are concerned to be associated with their local university and start to bring the laboratory into closer association with these universities to start allowing their graduate studies to be inculcated with the environmental work to help upgrade these schools in the environmental area.

So, by a combination of the actual work done by these laboratories and the work done by the university in keeping up with them, we will raise both the State and Federal level.

Senator BELLMON. I would say that is a very admirable improvement. I am curious now, our laboratory is a water laboratory. If we have a problem, say, with air pollution under your system, where would our legislature go to get information?

Dr. GREENFIELD. It depends on what you mean by a problem with air pollution.

Senator BELLMON. Let's say we are trying to establish standards for the zinc emissions in Blackfoot, Okla. Where do we go for help?

Dr. GREENFIELD. You can come to the Federal center.

Senator BELLMON. Where is that?

Dr. GREENFIELD. In the case of zinc, and particularly the effect of zinc on people's health, you can go to our National Environmental

Research Center, in our Division of Health Effects Research, Research Triangle Park, Durham, N.C.

Senator BELLMON. So, every State legislature has to find out the answers to their problems in North Carolina?

Dr. GREENFIELD. You can find out the problem in your own State by helping to set up your own capability within your own State.

Senator BELLMON. That is just exactly what I would like to do. Now, does the Federal Government intend to help us with this effort?

Dr. GREENFIELD. Let me answer it this way, Senator. At the present time I am trying to work very closely with the land grant colleges around this country. I have had several meetings with them. I have had several meetings with them and with the Department of Agriculture. We have tried to develop a close cooperative effort which will help them upgrade themselves and move into the environmental area.

Senator BELLMON. To me, the problem of this whole business, and you bring it out fairly well in your statement, on page 2 you mentioned in addition to EPA you have such laboratories in the Department of Health, Education, and Welfare, Interior, and National Science Foundation. But the committee in our State, or the mayor of the city or some other official, is not sophisticated enough to know about all of these agencies, and I have a local problem. I would like to have a local source of information, and I can't see why the Federal agencies don't understand this and why this morning's testimony is negative as far as these three bills are concerned.

It would seem to me that an Environmental Quality Council would be pleased to have a part of this burden removed from their shoulders, and put it out in States where the local problems are.

Dr. GREENFIELD. I think the question you raise is one that is raised frequently. I think what sometimes is not realized is that in an environmental problem, in trying to understand what the problem is in the initial stages, is not a local problem or State problem, or even a national problem. It is a global problem.

Senator BELLMON. This zinc problem is a very local problem.

Dr. GREENFIELD. I want to step back one step further. That is for understanding what the standards on zinc should be, what the effects on people are, what the effect on the environment is of a parameter like zinc. First we have to understand that.

In the application of this knowledge to a local problem, I think that is a very local subject. I feel that the local people have got to be able to understand their own problems and apply the result of the research done at the Federal level to their local problems. That is far from the type of research that I am talking about that the Federal Government carries out.

We are interested, for example, in understanding the impact on the human being of certain air pollutants. We are interested in understanding the health effects, how it transports itself through the environment. When you understand that, then the local agencies should take that information and apply it to the problems.

Senator BELLMON. Where do they get it?

Dr. GREENFIELD. The information we develop is and will be very, very widely disseminated.

Senator BELLMON. Through what means?

Dr. GREENFIELD. Every means open to scientific and technical communities.

Senator BELLMON. I am a politician, I am not a scientist. And I want to know what kinds of standards are set for my own State. Unless I happen to be almost lucky, I won't know where to go for these.

Dr. GREENFIELD. That is true, Senator, but most of the States in this country already have set up local agencies, many with their own facilities, who match in very well with the Federal agencies and know where these data are.

Senator BELLMON. Do you approve of this development?

Mr. GREENFIELD. Yes.

Senator BELLMON. Are you willing to help support it?

Dr. GREENFIELD. We are supporting it in many cases. We create and support many of the monitoring devices that the States do today.

Senator BELLMON. On what basis?

Dr. GREENFIELD. We provide grants.

Senator BELLMON. On what basis? How does the State get the grant?

Dr. GREENFIELD. A State will come to us and request a grant to set up a local monitoring system.

Senator BELLMON. Do you grant this in every State?

Dr. GREENFIELD. We have granted them to almost every State that has come in and asked for our help.

Senator BELLMON. Do you think it is desirable that every State have such a facility?

Dr. GREENFIELD. I would think so long as it is not duplicative of what you are trying to do in this country environmentally today, because we have scarce resources, we can't afford duplication, but I think it is desirable.

Senator BELLMON. Isn't that what S. 681 provides?

Dr. GREENFIELD. It provides a lot more than just the nonduplicative parts. That is the question raised.

Senator BELLMON. Every one of our States has an agriculture research center, and they have worked out a system to avoid duplication. They have managed to avoid wasting money by duplication. Don't you feel environmental research systems could do the same?

Dr. GREENFIELD. I think there are specific problems at the local level that are not duplicated State to State. When you talk about pollution, they no longer respect State boundaries and you have got to consider them very often on a regional or national level.

Senator BELLMON. You are talking about the policing side of it and I am talking about—Mr. Chairman, I know we are running out of time. Let me ask this very quick question.

My bill calls for interdisciplinary research, both scientific and social, and for communitywide educational efforts. EPA's solution of monitoring and generating scientific data only does not answer these needs, in my judgment. You do research on water pollution or air pollution, but you don't cover the whole field. You are not in business training professionals, and as far as I can tell you don't do anything to educate the rank and file citizens about what this whole problem involves.

Do you have plans, or does the Administration have plans to enlarge EPA to meet these kinds of needs?

Dr. GREENFIELD. First of all, Senator, I take issue with your statement that EPA does not do interdisciplinary research. We are set up to do this. I deliberately set up my centers with the charge and order they will do that. We have something called a CHES program, community

health and environmental studies program. We are in the process of setting up a health effects program, which will cover all of the areas of pollution. We have a problem of how material transports itself through the environment, which deals with every part of the media we are talking about.

We are certainly involved very deeply in the whole question of interdisciplinary research, because the whole question is a question of environment, not just the air and water.

Senator BELLMON. If you take this position—which I am glad you do—it would seem to me you can see merit in the system which utilizes the scientific knowledge and the ongoing research programs of our State universities.

Dr. GREENFIELD. I do that right now, Senator. Of my research budget, roughly a little over \$100 million a year, \$40 million or thereabouts is in-house. \$60 million is extra, and one-third of that is for grants. And I am carrying out an exploratory program on the State land-grant policies.

I feel that the county land-grant agencies are a very appropriate place to carry the environmental message to the rural community and bring back their problems to be looked at. I think it has to be backed up by strong State land-grant programs.

Senator BELLMON. Mr. Chairman, it seems to me this is a good time to stop, where Dr. Greenfield and I agree on something.

Senator BURDICK. Doctor, I have just one more question.

Your thesis is very similar to that of the members of the council here before, that there is adequate authority and adequate mechanism to do this job. And you have also said you have only been in business now for a year. One of the things that bothers me in this whole fight for the environment is that we are not acting very fast.

Let me give you an example. One of the big problems we have in the western locality of this country, north and western, is the preservation of fresh water lakes. I started on this campaign long ago, but the records here from Congress show we started working on bills and authorities about 6 years ago. We finally, at the hands of Congress, received some authority to work on the preservation of these dying lakes. We got the bills passed and we got some money from the Appropriations Committee also passed.

It seems to me that nothing has happened. The weed growth in lakes now, after 6 years, has gone on in that period of time. Nothing is done about it. First under one administration that had to buck it around from department to department, and then we had a change of administration and then a change within this present administration. First, it was in Interior and now it is finally in your department. We have an application pending and it seemed that the last 5 or 6 months I am talking to a different man every time I call over there.

Do you have the thing established now so we know where we are?

Dr. GREENFIELD. Senator, if you want to call me, I am sure I will stand pat.

Senator BURDICK. You look at this program—that is the Detroit Lake, Minn., and we think this demonstration is the best way. The weed growth has taken over these lakes at a very rapid pace. A lot of people are willing to spend their money, but they want to know the right thing to do.

We have this demonstration project, but here we are, in 6 years we have moved no place on it. Can't we move it?

Dr. GREENFIELD. We do have one or two demonstration projects that are utilizing the funds we have to examine whether or not you can save a lake and turn it around. The question of why a lake goes sour is a very complex question. You have 15 or 20 different nutrients that go to cause the growth of biomass in a lake. The question of whether a lake is nutrient limited in any one of these 15 requires considerable analysis. We are doing the best we can and intend to accelerate it to pin these problems down.

Senator BURDICK. No one seems to be in opposition to this demonstration project. It is a question like quicksilver, you never know where it is.

Dr. GREENFIELD. It will not move out of my department, I can assure you.

Senator BURDICK. Thank goodness.

Senator BELLMON. Dr. Greenfield, this, to me, is a very good case in point, here it is a lake, a local problem. It seems to me ridiculous that the Federal Government isn't willing to provide some funds for the State of Minnesota so they can help solve these problems. I am really kind of marvelled at the mentality that says there is only one place to get answers and that is up here at the Federal Government. If you can help our existing State agencies in a financial way, and the reason we ask for that is the Federal Government has pretty well taken over most of the resources of our country through our tax system, then I can assure you you won't have any headaches to put up with.

Dr. GREENFIELD. Senator, I can't answer your question. This is a problem that requires many more people than we have in this country who are competent. It is a very large problem.

Senator BELLMON. Do you think there are some competent people who don't work for the Federal Government?

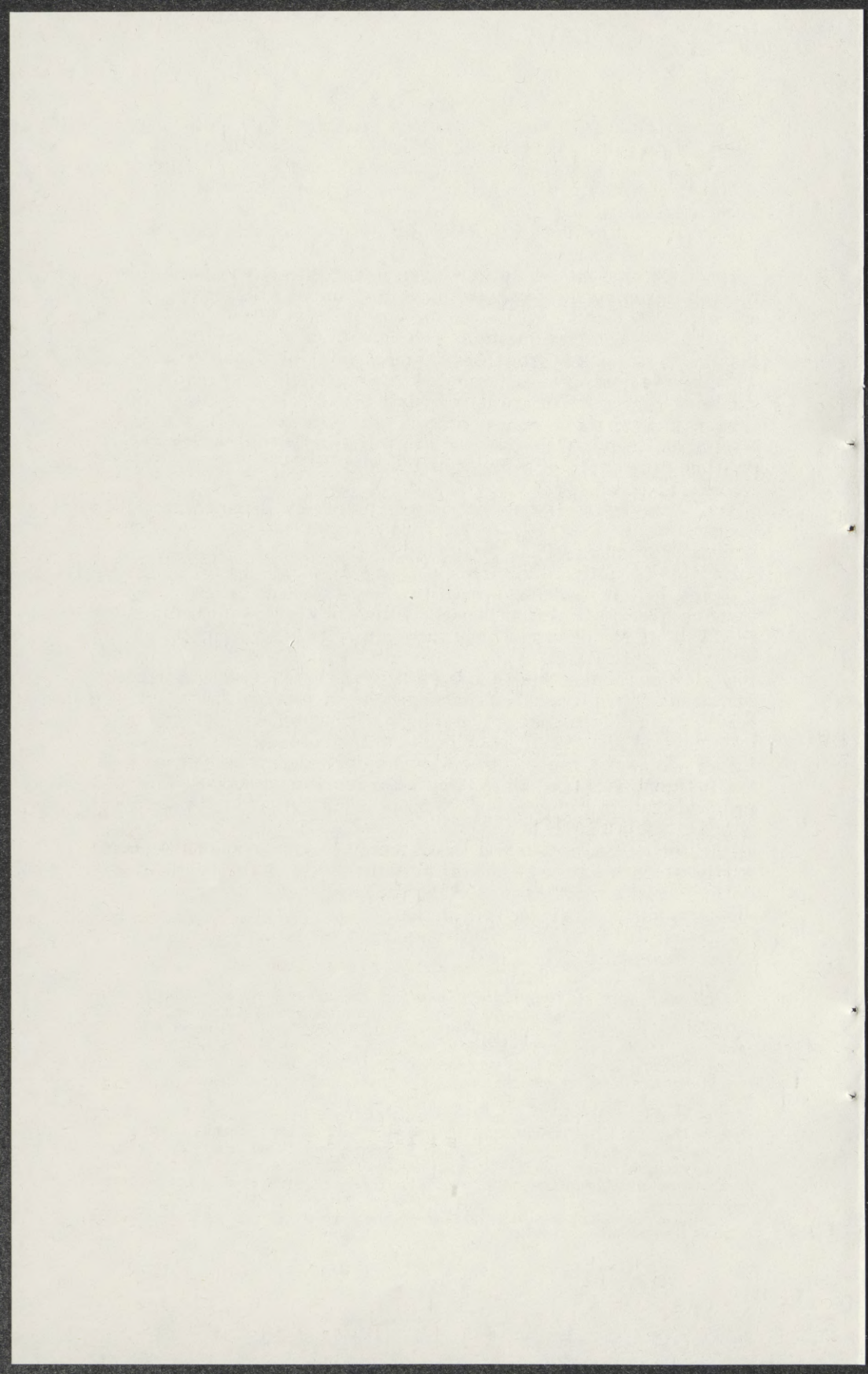
Dr. GREENFIELD. Having entered the Federal Government 10 months ago, of course I agree with that.

Senator BURDICK. Will you drop me a note on this particular case?

Dr. GREENFIELD. Yes, I will.

Senator BURDICK. Thank you.

(Whereupon, at 12:30 p.m., the hearing was recessed, subject to the call of the Chair.)



## APPENDIX

(Under authority previously granted, the following statements and communications were ordered printed:)

[From Congressional Record, Aug. 6, 1971]

STATEMENT OF HON. JOHN D. DINGELL OF MICHIGAN

NATIONAL ENVIRONMENTAL DATA SYSTEM

Mr. DINGELL. Mr. Speaker, on May 17, 1971, the House passed H.R. 56, the National Environmental Data Systems Act, to bring some order and accessibility to the growing body of information on environmental quality and natural resources. During consideration of this bill, I became aware of a project in the executive branch entitled, "Study of Environmental Quality Information Programs" or SEQUIP. The findings of the expert panel which performed that study have now been made available to me by Dr. Edward David, the science adviser to President Nixon.

It is gratifying and encouraging to my subcommittee that the SEQUIP report conclusions are virtually identical to the provisions of the legislation passed by the House and now awaiting action in the other body. Our original proposal was for a "data bank" but as the SEQUIP group concluded, a massive single information storage unit would be unrealistic. Instead H.R. 56 proposes a central national coordinating facility. This is comparable to the finding of the executive branch study:

"That the Council on Environmental Quality establish a new information organization in the Environmental Protection Administration which will take the lead, nationally, to implement an environmental quality information and data network based on the compatibility and interactive capabilities among existing information and data programs."

With this strong endorsement of our legislative concept, I urge the Congress to complete the passage of H.R. 56. While some executive agency testimony on the bill was less than enthusiastic, the thorough appraisal of this study must be accepted as confirming our original premise—that improved exchange of environmental information is essential in the fight against pollution. I would hope the administration will publish the entire SEQUIP report so that all interested parties may benefit from its findings. In the meantime, I insert the summary recommendations at this point in the RECORD:

"A STUDY OF ENVIRONMENTAL QUALITY INFORMATION PROGRAMS IN THE FEDERAL GOVERNMENT

"SUMMARY AND COMMITTEE RECOMMENDATIONS"<sup>1</sup>

"*General Findings* (Section II): The SEQUIP survey identified a large number of information and data handling organizations supporting the activities of those Government agencies directly concerned with *environmental pollution* problems. There were also several broad information programs, such as those of the National Libraries that support a variety of disciplines and perform services which are used by environmental pollution mission agencies in support of their own efforts.

"The overall impression gained in this study can be summarized by stating that in the area of environmental information and data programs, there exists a heterogeneous, probably wasteful, and certainly less than optimally effective, mixture of activities which will not spontaneously give rise to the coherent environmental information system which is clearly required so that the technical

<sup>1</sup>The roman numeral parts of the recommendation numbers refer to the Report Section in which the specific recommendation was made.

task of coping with environmental problems might be accomplished within realistic source limits.

"It is recognized that the findings and recommendations set forth in this Report sometimes pertain to information and data handling problems related to areas more general than the environmental quality field, and that many of these findings are not novel. However, many information problems noted on previous occasions, and for other areas of science and technology, are still unresolved and now affect those components of science and technology that relate to the environmental quality field. Therefore, the Committee deliberately chose to make this Report a vehicle for observations which pertain primarily to environmental quality but also touch on other aspects of what is being done—or not being done—in general with information and data in Government organizations. In fact the most fundamental observation of this survey was that most of the problems identified were general data- and information-handling problems, and not peculiar to the environmental quality field.

It was also found that a distinct difference exists between those organizations that handle mostly information, and those that are more deeply involved with data. This division is much more significant than the differences among the information programs supporting the subject areas of this Report; namely, air pollution, water pollution, solid waste management, agricultural chemicals, and radiation.

"The Committee found that *interactions* among similar or logically-related information programs are rare. Information and data programs which are part of mission agencies are often reluctant to advertise their services and product outside their own agencies. They fear being swamped with requests for these services without having the resources to comply with such requests, because they usually cannot recover the costs of services performed for other government agencies, industries, universities, or individuals. This situation often leads to the establishment of duplicative services in several organizations and works against the creation of networks and exchange of information and data. Procedures should be established whereby information programs in mission agencies can recover the costs of providing services for other Government or non-Government organizations. The Office of Management and Budget ought to become involved in the development of such procedures.

"*Recommendation II.1:* That the Office of Management and Budget explore better methods through which Government agencies could recover the cost of performing technical information services for outside users.

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"The creation of a new, independent, Government-wide information system—a 'National Environmental Data Bank' (cf. H.R. 56, formerly H.R. 17436)—has been proposed as a solution for the problems of duplication, incompatibility and organizational dispersion of environmental information and data programs. The Committee believes this solution to be unrealistic. Input to such an organization would have to come from the mission agencies, and while the central organization would be in direct competition with these agencies for resources, it could not replace the information programs which these agencies must contain within their own organizational structures in order to function.

"What is required, instead, is an optimum use of *existing* environmental information and data systems. These must be linked into networks in such a way that they can perform the services required of them by their parent agencies, and also serve each other and the environmental quality mission in its totality. To carry out the task of building and operating such networks in the environmental pollution information area, the Committee recommends creation of a new, central organization—named the National Environmental Protection Information and Data Services (NEPIDS)—in the Environmental Protection Administration (EPA).

"The overall mission of NEPIDS should be twofold. Inside EPA, it should: (1) identify and coordinate into a network the information and data programs in the organizations which were absorbed into EPA; (2) participate and give guidance to the establishment of new information and data systems, where required; (3) develop and apply standards which will aid in network formation and operation; (4) coordinate the R&D project reporting activities in EPA; (5) develop information and data handling technology in areas of particular importance to environmental problems; and (6) respond to requests for information and data from inside or outside EPA, either directly or by referral to other EPA information and data programs. Externally to EPA, the new or-

ganization should: (1) identify environmental data banks in other Government and non-Government organizations and initiate network operations with these organizations; (2) transmit R&D project reporting data from EPA to a Government-wide report information system; (3) respond to queries referred to it by the National Referral Center and (4) work with the National Bureau of Standards or other organizations on the development of general standards for hardware and data software systems.

*"Recommendation II.2:* That the Council on Environmental Quality establish a new information organization in the Environmental Protection Administration which will take the lead, nationally, to implement an environmental quality information and data network based upon the compatibility and interactive capabilities among existing information and data programs.

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*"Inter alia,* the network required for the environmental protection effort must have two basic characteristics: it should be planned for a growing population and expanding economy; and it should take into account the global nature of environmental pollution problems and be able to interact with systems organized by other countries.

*"Recommendation II.3:* That capabilities be built into U.S. environmental quality information and data systems to: (1) deal with conditions expected to prevail during the remainder of this century; and (2) interact with other national and international organizations to form global environmental systems.

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"In adapting existing systems and data stores for a national effort, standards will have to be researched, tested and adopted so that information and data coming from one agency can be linked to systems in other agencies, and eventually into a network of systems. Where such standards apply particularly to environmental protection problems, they should be established by NEPIDS, EPA. However, in most cases, standards for systems, files, and procedures are required by more than just one subject area. Therefore, establishment of standard should be carried out by a broadly-based information and data technology research organization and be coordinated with the environmental agencies. These latter organizations should set priorities for areas where standards are needed to support information and data transfer. They should also be required to support these standard setting activities with their own resources.

"Another task for an information and data technology R&D organization is research in the area of *assessment technology*. Under existing legislation, Federal agencies are required to evaluate the potential impact of their actions on the environment. However, reliable methods for impact assessment are not widely available to environmental data programs. Such methodology usually involves the use of computer simulation or modeling. These techniques should be developed and adopted to give environmental quality information and data centers a 'predictive capability.' Since the development of computer software, including models, is usually expensive, there is also a need for a clearinghouse function which would prevent duplication by keeping track of the development of such systems. The shortage of systems analysts in information centers could be alleviated if the information and data technology R&D organization could make systems analysis teams available to other agencies on an *ad hoc*, cost-recovery basis.

*"Recommendation II.4:* That the National Bureau of Standards be formally assigned the responsibility for developing: (1) standards for information and data systems (i.e., software systems); (2) standards for information and data banks; (3) assessment technology, including computer modeling and simulation, as a general tool for information and data centers; (4) a clearinghouse function for information about general software systems and computer modeling and simulation systems, with particular emphasis on those systems already owned by the Federal Government; and (5) systems analysis and computer programming team that could aid agencies who do not have sufficient in-house capabilities in these areas, in selecting and implementing computer systems. For environmental systems, priority assignments and financial support for these various activities should come primarily from the environmental mission agencies, EPA and NOAA.

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"The SEQUIP Workshop was valuable for participants because they learned of each others' activities and could exchange experiences. A workshop or sym-

posium-type meeting should be organized in this general subject area on a periodic basis.

*“Recommendation II.5:* That a formal mechanism be established, through the Council on Environmental Quality or COSATI, for stimulating direct communication between those concerned with environmental information programs. Such a mechanism might plan and support small informal workshops or symposia at appropriate intervals.

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“The Committee considered *the user* of environmental quality information and data. Existing and projected systems for this subject area will have to serve many users, both inside and outside the Government. Information support must be rendered not only to scientists and technologists, but also to managers who may not have technical training but who must make important decisions affecting the environment. Under existing conditions, access to environmental quality information can be quite difficult, particularly for individuals outside the Federal establishment. At present, the National Referral Center (NRC), Library of Congress, has the task of directing inquirers to locations in Government which might supply them with the information required. This capability should be strengthened and well-publicized.

“Every effort should be made by the mission agencies to insure that NRC’s referral banks are up to date and as complete as possible.

*“Recommendation II.6:* That specific responsibility and resources be assigned to the National Referral Center, Library of Congress, for the development of information tools and services which will provide extra-Government users with improved access to Government-generated and supported technical information in the environmental quality field. An early task within this over-all effort should be to compile and publish a *Directory of U.S. Information Resources in the Environmental Quality Area.*

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“In order to build compatible information and data networks and prevent duplicative activities for the environmental quality area, it is essential to know what is being done in the various Federal mission agencies. However, access to knowledge about on-going and completed Federal R&D activities is not easy. This is as true for activities pertaining to the environment as it is for most other government R&D efforts. In the non-defense areas, organizations such as the Science Information Exchange, the National Technical Information Service, and to some extent, the National Referral Center, have been given major responsibility for the storage and retrieval of information concerning on-going or completed Government-supported R&D work. However, these organizations, individually and in aggregate, have not been entirely effective in this effort. The major cause for this failure is attributable to the fact that the submission of such information about R&D projects in Government agencies to these depositories is sporadic, incomplete, and unreliable. Therefore, it is recommended that existing organizations charged with responsibility in the area of project reporting (i.e., SIE and NTIS), be merged and reorganized into a new Government-wide clearinghouse, perhaps located in NTIS, Department of Commerce. This organization would collect, store, index, and retrieve on demand, information about all ongoing and completed unclassified R&D work carried on in Federal laboratories and otherwise supported by Government funds. Submission of such data by Government agencies to the central system must become mandatory and should be checked through budgetary reporting methods available to the Office of Management and Budget. It is also suggested that NEPIDS, EPA, be given the task of setting up and operating a complete R&D project reporting system for EPA, and submit such information regularly to such a central Government-wide R&D report storage and retrieval system.

*“Recommendation II.7:* 1. That the following be consolidated into one organization: (a) the Science Information Exchange of the Smithsonian Institution, which stores and announces information on research-in-progress; and (b) the National Technical Information Service of the Department of Commerce, which stores, announces, and distributes reports on completed research. A consolidated organization would strengthen intra-Government mechanisms for exchange of

information and provide extra-Government users a one-point source for Government-wide information resources. Such an organization should study means for encouraging more widespread use of the Government report literature, particularly by that segment of the technical community that normally does not do contract work for the Government.

"2. That Government-wide mandatory requirements be established to provide the consolidated organization with current information in research-in-progress and copies of reports resulting from completed research in standardized formats, and that the enforcing of these requirements be assigned to the Office of Management and Budget.

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"The total information and data systems, supporting Government efforts in the environmental protection area, also must have the capability of alerting relevant Government agencies of the occurrence of an environmental emergency.

*Recommendation II.8:* That a National Early Warning System for Major Environmental Pollution be established as part of the Smithsonian Institution's Center for Short-Lived Phenomena, to act as a medium for rapidly communicating information from global monitoring systems to responsible U.S. Government agencies.

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"The system must also be able to furnish the information and data to support remedial action under emergency conditions. Many organizations at various Government levels have been created to deal with environmental emergencies in the U.S. However, it appears that additional technical information activities are required for emergencies resulting from the spillage of hazardous materials during transport. A *Hazardous Material Information Center* to be formed by the U.S. Coast Guard, Department of Transportation, should be able rapidly to furnish detailed information about how the accidental spillage should be handled; facts about the material; whether people should be evacuated; and how people exposed to the material should be treated. As far as possible, the center should derive the required information and data from industrial firms who can often furnish such emergency information when accidental spillage of their own product occurs. The data banks of the center also should be used to create current-awareness information services which could be distributed to local protection organizations.

*Recommendation II.9:* That a Hazardous Materials Information Center be established in the U.S. Coast Guard, Department of Transportation to store and make available to Federal, State, and local civil authorities on a continuing or emergency basis, current information on safe handling procedures, detoxification methods, and other emergency procedures on all hazardous materials which might be transported by air, land, or water within the U.S. or on the high seas.

\* \* \* \* \*

"The Committee gave some consideration to procedures which might be used to implement those SEQUIP recommendations considered worthwhile by the Office of Science and Technology. Also, as stated in the introductory section of this Report, the present SEQUIP Committee deliberately concentrated its efforts on information and data programs concerned with environmental pollution problems and did not study such programs supporting other areas of the environmental quality field (e.g. preservation of recreational space, desalination, population pressure, etc.). The present survey—or a series of such surveys—should be extended to these other areas in order to present the Office of Science and Technology with a complete picture of all ongoing Federal scientific and technical information activities that support the national environmental quality effort. A permanent *Cosati Panel for Environmental Quality Information and Data Systems* should be established and charged with achieving these objectives.

*Recommendation II.10:* That a new COSATI Panel on Environmental Quality Information and Data Systems be established to followup on implementation of the SEQUIP recommendations and to continue the SEQUIP survey into relevant subject areas not covered by the present Report.

CENTER FOR ADVANCED COMPUTATION,  
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN,  
*Urbana, Ill., December 16, 1971.*

Senator HENRY M. JACKSON,  
*Chairman, Committee on Interior and Insular Affairs,  
Washington, D.C.*

DEAR SENATOR JACKSON: We appreciate the opportunity to comment on these three bills before your committee. The Center for Advanced Computation and the State of Illinois Institute for Environmental Quality have, for the last year, been conducting a feasibility and desirability study of introducing computer aided techniques to environmental planners. The initial phase of this program will be completed in the next two months. We feel that significant insight has been gained into defining environmental planning needs and data problems in the State of Illinois. We would like to discuss our experience in more detail in future hearings before your committee.

H.R. 56 creates an administrative structure to establish a National Data System and directs a study to 1) determine the use of the System and its technical feasibility, 2) identify data to be contained within it, and 3) identify analyses of data necessary to provide environmental indicators for all regions of the United States. Senate Bill S. 681 recommends support of research at the regional level, on environmental problems in an administrative structure similar to the Hatch Act.

We are in complete sympathy with the intent of these two bills. However, our experience with the Advanced Research Projects Agency ARPANET is that a computer network such as suggested in H.R. 56 is feasible, but development of the software and implementation of the network to an operational phase will be a substantial technical and administrative effort. In addition, it appears to us that the present state of knowledge of environmental problems provides a less clear mission for S. 681 than the original mission of the Cooperative Extension Service. Creation of environmental indicators, as suggested by a recent study at MITRE under sponsorship by the Council for Environmental Quality, is in a very preliminary stage in terms of both the data and analyses required. We believe that a more complete understanding is required of the scope of environmental problems to be addressed, prior to the creation of new agencies. This requires further studies which can be initially supported under existing federal and state programs.

In regard to S. 1216, we feel that the establishment of a National Environmental Policy Institute is most desirable. Whether this can best be done through legislation or through establishment in an existing federal agency is a question for your committee to best address. If the Policy Institute now existed, it could most appropriately investigate the desirability of creating the administrative structures suggested in H.R. 56 and S. 681.

Thank you for the opportunity to express our thoughts on this important subject.

Sincerely yours,

D. L. SLOTNICK,  
*Professor of Computer Science, Director, Center for Advanced  
Computation.*

NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND-GRANT COLLEGES

ENDORSEMENT OF THE "STATE ENVIRONMENTAL CENTER ACT OF 1971" (S. 681) BY THE  
EXPERIMENT STATION COMMITTEE ON ORGANIZATION AND POLICY (ESCOP) NOVEMBER  
1971

ESCOP, in session at New Orleans, Louisiana, November 8, 1971, does hereby affirm its interest in and support of S. 681 proposing the establishment of a series of environmental laboratories and research centers within the various states and regions of the nation. For reasons detailed below ESCOP urges that consideration be given to establishment of these laboratories and research centers in conjunction with the Land-Grant Colleges in the various states.

1. The nucleus of a broad spectrum of research competence for dealing with the complex problems associated with restoring and maintaining the quality of the environment.

2. Divisions of the Land-Grant Colleges have developed procedures and expertise in coordinating both Research and Extension activities in solving regional and national problems, many in the area of environmental quality. They have the advantage of being located close to where the problems are.

3. A major focal point for research and problems related to the basic components of *environmental quality* are reflected in the research programs of the State Agricultural Experiment Stations and the organization of research programs in a research classification, research inventory, and research coordination system.

A. Current SAES Research Effort Directly Pertaining to Quality of the Environment (1970 Inventory)

TABLE 1.—RESEARCH PROGRAMS ON NATURAL RESOURCES

Research Problem area (RPA)				
Research program	No.	Title	SMY's	Total
1.01 Soil and land use.....	101	Appraisal of soil resources.....	95	\$3,411,000
	102	Soil, plant, water nutrient relationships.....	144	6,715,000
	103	Management of saline and sodic soils.....	8	314,000
	104	Alternative uses of land.....	14	545,000
	106	Efficient drainage and irrigation systems.....	1	42,000
	107	Watershed protection and management.....	2	160,000
	901	Alleviation of soil, water, and air pollution, and disposal of wastes.	45	2,081,000
1.02 Water and watersheds.....	103	Management of saline and sodic soils.....	2	81,000
	105	Conservation and efficient use of water.....	63	2,893,000
	106	Efficient drainage and irrigation systems.....	23	1,289,000
	107	Watershed protection and management.....	23	1,043,000
	108	Economic and legal problems in water management...	18	600,000
901	Alleviation of soil, water, and air pollution, and disposal of wastes.	43	2,741,000	
1.03 Recreation.....	902	Outdoor recreation.....	37	1,332,000
1.04 Environmental quality.....	214	Protection of man, plants, and animals against pollution.	30	1,323,000
	901	Alleviation of soil, water, and air pollution, and disposal of wastes.	128	6,359,000
1.05 Weather modification.....	109	Adaptation to weather and weather modification.....	26	1,230,000
1.06 Fish and wildlife.....	904	Fish and other marine life, fur-bearing animals, and other wildlife.	118	6,014,000
1.07 Remote sensing.....	113	Remote sensing.....	9	571,000
Total.....			759	38,690,000

<sup>1</sup> Includes value reported under 1.01 and 1.02.

Note: Forestry-related research adds 251 SMY's and \$10,149,000 to these totals. Definitions of the research problem areas and the kinds of problems included under each are included in a manual of research classification.

B. The State Agricultural Experiment Stations have a nucleus of administrative, professional, scientific and technical personnel capable of planning, coordinating, directing and carrying out comprehensive programs required for the protection and improvement of the nation's environment. Further, they have direct access to other disciplines and facilities associated with the Land-Grant Colleges and Universities.

C. Growing concern for the problems associated with environmental quality are reflected by: (1) changes in the research programs at the State Agricultural Experiment Stations, and (2) by ever broadening identification of specific problems and proposals for research to contribute to their solution.

For example, support for research in RPA 901, "Alleviation of Soil, Water and Air Pollution and Disposal of Wastes" increased from \$2,809,000 in 1966 to \$7,095,000 in 1970. This increased support resulted in an increase from 66 Scientist-Man-Years (SMY's) in 1966 to 128 SMY's in 1970.

STATEMENT OF DR. DIANA R. DUNN, DIRECTOR OF RESEARCH,  
NATIONAL RECREATION AND PARK ASSOCIATION BEFORE THE  
SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS ON  
H.R. 56 TO PROVIDE FOR A NATIONAL ENVIRONMENTAL DATA  
SYSTEM. NOVEMBER 19, 1971.

The National Recreation and Park Association is grateful for the opportunity to indicate our support for H.R. 56, which would create a National Environmental Data System.

NRPA is a citizen and professional research, educational, and service organization dedicated to expanding recreation and park resources, programs, and professional services to enhance the leisure of all Americans. It is the nation's largest nonprofit organization in the recreation and park field, and its more than 15,000 members belong to eight branches: American Association of Zoological Parks and Aquariums, American Park and Recreation Society, Armed Forces Recreation Society, Commissioners-Board Members, National Conference on State Parks, National Student Recreation and Park Society, National Therapeutic Recreation Society, and Society of Park and Recreation Educators.

We have a deep and basic interest in the environment, particularly as it relates to man's relationship to it during his leisure time. The quality of our parks has been diminished by pollution, and their very existence is threatened by highways, public utilities, and industrial development. Pollution, in all its forms, is decreasing the quality of the recreation experience for us all.

Among our members are the managers of our nation's public outdoor recreation land, which comprises approximately one-fourth of the land mass of the contiguous United States. NRPA also has a cadre of members dedicated to encouraging the use of the natural environment for play and recreation. A primary function of the Association is to create a balance between those whose duty it is to motivate recreational use of natural resources, and those whose responsibility it is to preserve the environment.

One of the problems faced by our profession is the present lack of effective means of systematic analysis and coordination of data and information relating leisure and recreation to other aspects of environmental quality. This need is felt with greater urgency in regard to outdoor recreation because we deal here with a multidimensional problem and must use a multidisciplinary approach in solving it. Data from the social and behavioral sciences must be combined with data from the physical and biological sciences and related to practical aspects of resource management, transportation, leisure services, and the like. In many ways this presents a unique challenge for development of systems for obtaining and analyzing information.

NRPA has been actively seeking to bridge the knowledge gap attending such problems as air, water, and noise pollution as they bear upon the recreation of people in our urban areas as well as in our state and national parks and other recreation environments. Toward this goal, for example, the Association publishes the Journal of Leisure Research, which serves as a major outlet for scientific papers of value to leisure and recreation researchers, educators, practitioners, and students as well as public land managers. This scholarly quarterly defines the challenges of leisure in multidisciplinary terms and creates a bridge between the social and natural sciences.

Earlier this year, NRPA published a new book, Islands of Hope: Parks and Recreation in Environmental Crisis. Written by William E. Brown for the Association, the book attempts to document the fact that if mankind is to survive, men must trim their demands on the Earth to fit the limits of the Earth. NRPA is pleased to make copies available to the Committee and staff.

The National Recreation and Park Association is concerned not only with how pollution and environmental degradation diminish the quality of man's recreation experiences but also with how man himself damages the environment, particularly during his increasing leisure. Later labor force entry, shorter work weeks, longer holiday weekends, extended vacations, more generous sabbaticals and leave programs, earlier retirement options, and longer life spans are among the many contemporary phenomena contributing to more leisure for Americans.

More people with more free time are stimulating new industries, but also new hazards to the ecology. Regretfully, we still know very little about the implications of these developments, but motorized recreation vehicles are an excellent example of the problem. NRPA is presently conducting a study of currently effective state and local laws and ordinances governing these vehicles. Here is an area where a National Environmental Data System could prove most useful. An interim report of this study was delivered at the Snowmobile and Off-the-Road Vehicle Research Symposium held at Michigan State University in June 1971. Entitled "Trends in Snowmobile and Off-the-Road Vehicle Legislation: Effects on Use and Environmental Impact," these remarks are attached for the hearing record. Among initial findings of particular concern to this Committee is the following:

I do not believe there is any doubt that legislation will have profound effects on the use of off-road vehicles and also on environmental impact. I am pessimistic enough to fear that some legislation will be counter-productive both to the user and the environment -- not because legislators are by nature destructive, but because they are -- by accident -- ignorant. Our own ignorance is implicit in the fact of this Symposium. On the brighter side, I am optimistic enough to think a good deal of the legislation on the books and in process will be beneficial both to the user, the environment and the nonuser, and that it will affect positively the future of the sport. I wish we could tell the difference today between constructive and detrimental legislation. The perils of over-simplification and the frailties of intuition militate against this.

Additional commentary on the problem is included in an article that appeared in the July 1970 issue of the Association's magazine, Parks & Recreation, entitled "Motorized Recreation Vehicles: On Borrowed Time." We respectfully ask that this article be included as part of the hearing record. It demonstrates the urgency of improved data

retrieval and dissemination systems dealing with environmental information. The article points out that public land managers at the federal, state, and local level have an awesome responsibility complicated by some of man's basic conflicts --controversies such as the rights of the individual versus the state, individual property rights versus common public rights, economic growth versus the quality of life, and recreational pursuits versus the quality of the environment.

Reconciliation of the diverse interests and needs involved in this problem will call for mobilizing a great deal of information about man and the natural environment which we simply do not have at the present time. The kind of system proposed by S. 1858 would do a great deal to bridge this communications gap. Indeed, one of the most serious weaknesses of our environmental efforts to date has been the lack of information on which to base standards, establish rules and regulations, establish enforcement procedures, and revise and create programs. This deficiency is particularly acute in the recreation and leisure field because of traditional inattention to such related problems as the impact of technology on individuals, society, and the environment.

Although a great deal of environmental legislation has recently been enacted and more is pending, we believe that an environmental data system is needed if all of the pieces of the package are to fit together and achieve effective results. We have watched with great interest the progress of this important legislative proposal, for the progress of the bill closely parallels an important Association project. In May 1970, NRPA held a three-day meeting of educators, librarians, and

researchers from American and Canadian universities, government agencies, and professional associations. These participants met at The Pennsylvania State University and sought to determine the status of systems, problems, and priorities of literature retrieval and dissemination as they relate to leisure and recreation. Information efforts were identified -- some having one or more aspects with recreation and leisure as a primary focus, others with some facet of recreation and/or leisure as a sub-function. These centers were located in many situations: colleges and universities, government agencies, professional associations, and under church auspices.

The National Recreation and Park Association was designated to coordinate subsequent work on behalf of the participants, and the acronym REALISE (Recreation, Environment, And Leisure Information Systems Exchange) was devised to describe the function undertaken. Through the summer of 1970 a steering committee representing government, academia, and the Association refined the scope and direction of the effort. One important modification of the original plan was a move to embrace a system or network concept as opposed to a central physical data bank.

A second meeting was held at the National Recreation and Park Congress in Philadelphia in September 1970. The session brought attendees who had not participated in the May consultation up to date and also provided opportunity for new and revised input from the expanded group. Additional centers dealing with recreation and leisure information were identified and merged into Project REALISE.

In December 1970, the steering committee convened a dialogue in Washington, D.C., with representatives from government, business, academia, and several operational information systems. The committee solicited the advice and counsel of the "pioneers" of U.S. information system personnel.

Proceedings from the three 1970 meetings have been published by the National Recreation and Park Association, and we are pleased to transmit copies for the reference files of the Committee and staff. You may wish to include portions of Recreation and Leisure Information Systems: Status and Priorities in the hearing record, especially pages 13-17, 35-39, 43-46, 59-61, 65-66.

NRPA cosponsored a conference on January 21-23, 1971, at the University of South Florida at Tampa which was interprofessional, multidisciplinary, and international. Over 200 researchers, college and university educators, students, government officials, planners, and consultants attended from Canada, Colombia, Czechoslovakia, England, France, West Germany, Sweden, Hungary, Switzerland, and the United States.

Supported in part by the W. K. Kellogg Foundation, the conference was cosponsored by the University of Rhode Island, Program in Gerontology; the Center for Studies of Leisure, University of South Florida; and the National Recreation and Park Association. It focused on leisure and recreation information systems, and two major projects formed the basis for the exchange: Project CIDOL and Project REALISE. Project CIDOL (International Centre for Documentation in Leisure), a

project on automated documentation systems in leisure and popular culture, was presented by French and Canadian members of the Research Committee on Leisure and Popular Culture of the International Sociological Association. Project REALISE was presented by the U.S. steering committee. After intensive discussions regarding the political, conceptual, technological, and financial aspects of national and international leisure and recreation information centers and systems, the conference passed the following resolution:

Resolved, that the Conference supports the development of international documentation and information systems for leisure and recreation, and endorses the further international cooperation of systems which will be of service to all who may benefit from this information. Every effort should be made to insure conceptual and technological compatibility of all systems through communications to include correspondence and interim meetings whenever possible.

The Tampa conference resolution is consistent with Section 303 (c) of the National Environmental Data System Act. Pursuant to it, and on behalf of the U.S. steering committee, I delivered a paper regarding the progress of Project REALISE in Prague, Czechoslovakia, in May 1971. Professor Premysl Maydl, director of the European Centre for Leisure and Education, extended the invitation to participate in a "Workshop on International Cooperation in the Field of Documentation in Leisure." The Centre was established by UNESCO and the Czechoslovak Academy of Sciences and has cooperative liaison with the Committee for Leisure and Popular Culture of the International Sociological Association.

There is a keen interest in other countries in developing processes for handling the increasing quantity of data and information germane to the problems of leisure, recreation, and the environment.

It seems certain liaison with professionals throughout the world can contribute much to our insight regarding international environmental issues as they bear on these interrelated issues.

These activities are cited to give special emphasis to the National Recreation and Park Association's conviction that only by creating an environmental data system will the task of mobilizing information in support of recreation and environmental problems take place. Such a system must, in our view, knit together the data-generating and data-using centers of government, industry, the professions, and the universities. Project REALISE now reflects these sectors.

S. 1858, as drafted, meets the principal objections raised by a number of Executive branch representatives during the 91st Congress. NRPA particularly endorses the system concept as described in Section 303 (b), and the international aspects outlined in Section 303 (c). Also favored is the concept that the proposed System cooperate with federal and state operating departments and offices but be free from control by any one of these.

NRPA hopes that the studies, plans, standards, and publications contemplated in Section 305 (b) of S. 1858 will give particular attention to the relationship of recreation and leisure to the environment, and that such efforts will emphasize the role of parks in this regard. With such a focus, the National Environmental Data System will be an important contribution to the quality of the recreation experiences of our people, and a great aid to the professional efforts of the National Recreation and Park Association.

In summary, NRPA is grateful for the opportunity to comment on S. 1858 and to support its early enactment.

"Trends in Snowmobile and Off-the-Road Vehicle Legislation:  
Effects on Use and Environmental Impact"

remarks by

Diana R. Dunn, Ph.D.  
Director of Research

National Recreation and Park Association

at

Snowmobile and Off-the-Road Vehicle Research Symposium

Michigan State University  
East Lansing

June 15, 1971

I would like to begin by commending the Michigan State University Department of Park and Recreation Resources Research and Planning Unit for sponsoring this research symposium. I believe it is a timely, well-conceived effort, and I am pleased to be a part of it.

The National Recreation and Parks Association is a citizen and professional research, educational, and service organization dedicated to expanding recreation and park resources, programs, and professional services to enhance the leisure of all Americans. Over 15,000 members belong to our eight branches: American Association of Zoological Parks and Aquariums, American Park and Recreation Society, Armed Forces Recreation Society, Commissioners-Board Members, National Conference on State Parks, National Student Recreation and Park Society, National Therapeutic Recreation Society, and Society of Park and Recreation Educators.

Our members include the managers of some 500,000,000 acres of our nation's public outdoor recreation land, approximately one-fourth of the land mass of the contiguous United States. A primary function of the Association is to create a balance between man and his environment. We are concerned not only with how man affects the environment, but also with how these impacts in turn affect man, particularly during his leisure time.

The study on which I am reporting this afternoon is "in process"; in point of fact, it probably cannot be concluded within this decade, or possibly

the lifetime of any of us. The project was initiated because NRPA, like the agencies you represent, is aware that the problems manifest by snowmobiles and off-road recreation vehicles will likely increase before they diminish. We have no crystal ball; we cannot prophesy whether we are over-reacting to this relatively new recreation phenomenon, or giving insufficient attention to it. Our initial approach to the problem is not unlike that of the majority of Washington-based agencies and institutions --check the grass-roots!

We began our barometer readings in early 1970, with a shotgun survey to obtain then-current information from a cross section of those involved with off-road vehicles. Federal, state, and local administrators; and representatives of conservation groups, vehicular trade groups, and sports associations were invited to present their views, concerns, and suggestions. An analysis of materials received was featured in NRPA's magazine, Parks & Recreation, in July 1970. The article was written from the perspective of the local land managers. It noted that some of man's basic rights are involved in the off-road vehicle issue --controversies such as the rights of the individual versus the state, individual property rights versus common public rights, and economic growth versus the quality of life. It pointed out that man, the steward of public lands, and man, the enabler of recreation on public lands, have historically had sometimes conflicting roles, and that off-road vehicles seemed to fall into this category. It is perhaps redundant to note that other respondent groups also sorted into opposing camps: one which viewed the vehicles as fun and desirable, the other which cursed them as damaging and disruptive.

It was obvious that no group had the strength or the right to unilaterally dictate policy --locally or nationally --and that the legislative arena was the proper one for democratic deliberations and decisions regarding the frequently volatile issues surrounding off-road vehicles. Therefore, in March 1971, NRPA began an extensive survey, focused primarily on the statehouses of the country, and with specific initial contact with the offices of the 50 state attorneys general. The purpose of our effort was to establish contact with appropriate representatives in those states where legislation relating to off-road vehicles was either existant, in process, or in some planning stage. Also, we wanted to eliminate from further immediate consideration any states which presently had no such legislation nor foresaw any in the near future. In short, we wanted to establish a benchmark in a reasonable number of states so that we could better know legislative status and assess trends in coming months and years.

We eliminated the study of local regulations and legislation for a number of reasons, some of which I will mention later.

We also decided not to further investigate the federal stance, as we reviewed most agencies in early 1970, and perceived each to be following an ad hoc procedure apparently resulting from a laissez faire departmental or administration attitude. We were, therefore, pleased when on April 5, one month after our state-level study was begun, the Bureau of Sport Fisheries & Wildlife announced that the environmental effects of off-road vehicles would be determined before they will be permitted on national wildlife refuge areas. Our pleasure mounted when, just nine days later, Interior Secretary Morton announced formation of a Departmental Task Force to investigate the use of

motorized off-road recreational vehicles on public lands. Morton said that the recommendations of the group will serve as a basis for the development of Departmental policy, and the Task Force will consider four issues, including legislation to establish uniform policy for use on federal lands. Another part of the review will include the examination of current policies and procedures of state and federal agencies, as well as the review of state and federal legislation enacted to provide for off-road recreational vehicle use. The policy review and management plan is to be completed in October 1971.

Despite possible overlap with the Interior project, and also because responses to our effort were rapidly coming in, we determined to continue our study. We found that in statehouses from Alaska to Maine to Florida to California elected officials have begun to wrestle with the thorny problems attending one or more off-road vehicles rapidly becoming indigenous to their jurisdictions.

As with most hastily conceived legislation, first efforts were seldom comprehensive. A few bills were obviously written and oiled through the political machinery by one group or lobby, only to be substantially amended in subsequent months or legislative sessions. In some states, unique or isolated incidents apparently provided leverage for bills dedicated to protect or enhance the position of one group --i.e. users, land owners, wildlife, conservationists, manufacturers, etc., --to be hustled through the political process.

Isolation also characterized initial legislation, and still does in states where bills are being considered for the first time. The nature of a

motorized recreation vehicle is that of a mobile machine. Such vehicles, and usually their owners or drivers, have little regard for arbitrary political boundaries, particularly if several of these present sometimes ridiculously conflicting rules and regulations to the itinerary of the day. Again, with legislative proliferation has tended to come at least a modicum of interjurisdictional coordination --within and across both state and national boundaries.

I mentioned that our initial contact in each state was the attorney general. Some were able to provide the information requested. A few, such as Rhode Island, New Hampshire, Maryland, Delaware, Kentucky and Montana, declined to provide information due to staff overload or other reasons. We are presently pursuing other avenues of information in these states. Some, such as Alaska, Oregon, Mississippi, Alabama, North Carolina, Arkansas, Virginia, Georgia, Louisiana, Texas and Florida, noted that no state legislation existed. Most frequently, the state attorneys general transmitted our request to the state agency judged to be most concerned, such as parks and recreation, environmental affairs, motor vehicles, conservation, or forests and parks. While all appeared to give serious consideration and effort to fulfilling our requests, it is doubtful that all pertinent legislation was reported. We assume, therefore, the existence of under-reporting, and, in fact, probably some errors in reporting. Both of these assumptions are based upon the fragmentation of reporting agencies, and also on the fact that about half of the fifty states had legislation in process during an ongoing session of the legislature.

A further confusion is introduced by what is meant by a law. Some

states have laws regarding one or more off-road recreational vehicles similar to those they have for private boats, planes, or automobiles. Other states have laws regulating such vehicles only on state lands or parks. Still other states have administrative regulations or rules devised by one or more state agencies, usually regulating the vehicles on state lands. Local jurisdictions have similar ordinances or administrative directives in many states.

One trend seems certain --the climate of the nation will eliminate the consideration of snowmobile legislation in a number of states --and, although the snow-belt states seem to be concerned first with snowmobile legislation, there seems little reason to expect that they will not ultimately need to write off-road vehicle regulations for a much more diverse cadre of recreation vehicles. The South appears to be well behind the nation from a legislative perspective at this time.

Second and third generation legislation, as mentioned earlier, appears to take on a more comprehensive and coordinated posture. With respect to snowmobiles, comprehensiveness is recognized in the legislation of Maine, Minnesota, Vermont, and Wisconsin --yet at least three of these have had amendments under consideration in 1971. With respect to other vehicles, I am hesitant to commend any law as approaching comprehensiveness, although the Act under consideration in Washington state presumes to approach this.

The closely related aspects of comprehensiveness and coordination of legislation deserve additional emphasis, and at all levels --local, state, and international. The second factor, coordination, appears to lead somewhat to-

ward comprehensiveness, although it is possible, or course, to write a broad, multi-faceted piece of legislation in a vacuum, I suppose! It seems, however, that the greater the coordination and cooperation across both interest groups and political boundaries, the greater the degree of comprehensiveness in legislation. It follows that the quicker such comprehensiveness is achieved the faster a balance will emerge which will offer a working framework for all the special interest groups involved. Erratic swings of the proverbial pendulum may be more modest and less convulsive.

A problem usually occurs when local laws or regulations, or state administrative regulations precede state legislation --all concerned are frequently faced with some modification of procedures or regulations. Interim or seasonal regulations are sometimes feasible, but the most desirable solution to this dilemma is to urge states to lead, or at least not lag unduly behind, the mounting need for state-wide legislation, as the use of vehicles increases within their boundaries.

Our study shows that local ordinances, rules, regulations and so forth are usually far more stringent than state legislation. My discussions with some of you confirm this. Yet I find a very few municipal, county, or other subdivision representatives here --either elected, appointed, or otherwise. Some 70 percent of the United States population live in metropolitan areas, and this area is where I predict the most severe regulation of off-road recreation vehicles in the next five years. Remember, local laws can not be less controlling or stringent than the state legislation.

I was asked to predict if legislation will have an effect on off-road

vehicle use and environmental impact. I must confess that I would be misleading you if I said our data and information could be made to answer this; my observations are based more on subjective analysis than on empirical data.

I do not believe there is any doubt that legislation will have profound effects on the use of off-road vehicles and also on environmental impact. I am pessimistic enough to fear that some legislation will be counter-productive both to the user and the environment --not because legislators are by nature destructive, but because they are --by accident --ignorant. Our own ignorance is implicit in the fact of this symposium. On the brighter side, I am optimistic enough to think a good deal of the legislation on the books and in process will be beneficial both to the user, the environment --and the nonuser, and that it will affect positively the future of the sport. I wish we could tell the difference today between constructive and detrimental legislation.

The perils of over-simplification and the frailties of intuition militate against this. While a handful of researchers are seeking basic answers to the basic dilemmas posed by off-road vehicles, monumental fundamental decisions affecting the user and the environment are being made across a good part of the country --in city halls and statehouses --by elected and appointed officials most of whom are acting in the best interest of all as they have the information to see that interest. Unfortunately, they have more heat than light available to them. One can, however, expect most elected officials to be sensitive to those who raise ecological questions and concerns. Still, the American way has been to place the burden of proof of damage or safety on the consumer advocate or environmentalist, not the manufacturer

or the user. The vehicle industry is in the role of waiting for the other shoe to drop, and not knowing if in fact there is one, or where, or when it will fall.

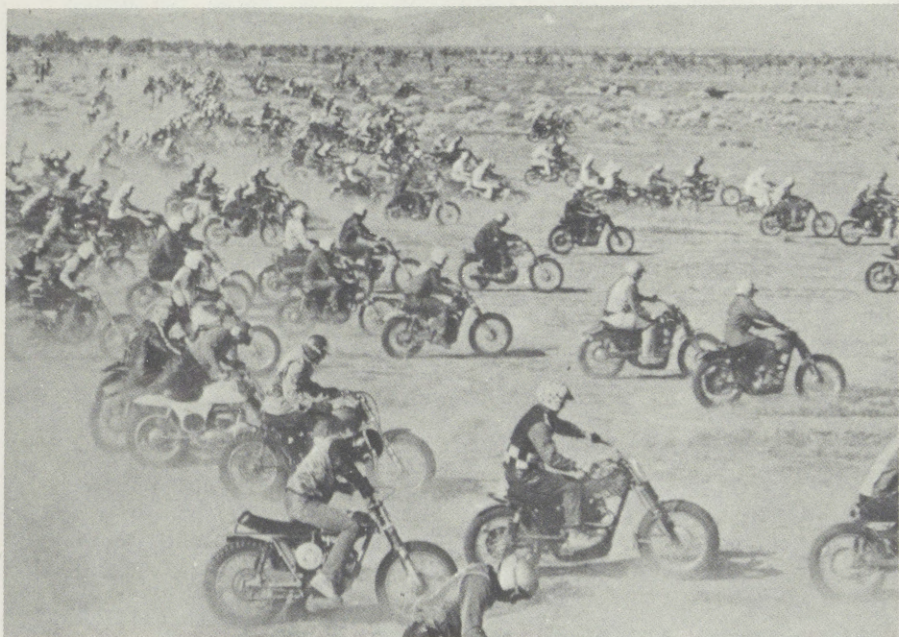
After this symposium, it will be clear from the proceedings that the findings of the individual studies presented here need to be analysed and the generalizations synthesized --then new research problems defined and researched. It should be clear too, that it is in the best interest of the user, the environment, and the special interest groups concerned that such research be continued and expanded in the coming months and years, and that it become an integral part of the legislative process at all levels of government.

To accomplish this, or at least to encourage it, I would like to make two modest suggestions for your consideration. First, I suggest that the proceedings from this symposium be given the widest possible dissemination. To encourage this, I invite an article, synthesizing the highlights, for our Parks & Recreation magazine which will reach our 30,000 readers. Further, I invite investigators to submit their formal research papers to our Journal of Leisure Research for consideration. We will, of course, be pleased to announce the availability of the full symposium proceedings in both of these publications. I commend similar actions to others here who can make such distribution available to one or more groups concerned with off-road vehicles.

Second, I suggest that all of us give attention to efforts to affect legislation which will secure funds from vehicle registration, operator

licensing, or other means to keep such revenues from going into a general fund. It is essential that vehicles not be used simply as a new revenue source for poverty-stricken local and state governments. If anything has emerged from our study of legislation to date, it is the conviction that funds need to be committed to major research efforts which will provide a sound basis for future legislation which will affect the use of the vehicles and the environment in the broadest sense. It is not enough to provide for trail construction and maintenance, or safety, or any other single operational aspect.

A total system of laws will emerge. To insure that it does not grow like Topsy, but is built on a knowledge base of causal research, is in the best interest of all, and demands the total commitment of both the public and the private sectors.



Bureau of Land Management photo

## *motorized recreation vehicles*

by DIANA R. DUNN

*Motorized recreation vehicles (MRVs) are a growing problem for park administrators throughout the United States and Canada. Motorcycles, snowmobiles, jeeps, trail bikes, ATVs (all-terrain vehicles), tote goats, airplanes, dune, beach, and swamp buggies, and others are all a part of this frequently volatile issue. The camp which views them as fun and desirable and the cadre cursing them as damaging and disruptive both seem to agree that they are here to stay. This article will challenge that premise.*

*In an effort to obtain current information from a cross section of those involved: federal, state, and local park administrators, and representatives of conservation groups, vehicular trade groups, and sports associations were invited to present their views, concerns, and suggestions. The response was overwhelming. Problems, solutions, programs, laws, regulations, angry protestations, and thoughtful evaluations of the challenge of these vehicles were received. By press time, the stack, including supporting pictures, was three feet high. After sifting and sorting, a new dimension began to emerge from the material — a philosophical one. It is from this perspective that the following is written. It is offered with sincere thanks to all who contributed.*



NASA photo

## ...ON BORROWED TIME

**O**N CHRISTMAS EVE 1968 pictures transmitted from Apollo 8 slammed home to millions of earthlings the fact that our planet is a very finite, very fragile, and very unique spaceship — “a grand oasis in the big vastness of space.”

Readers of *PARKS & RECREATION* include the managers of some 500,000,000 acres of our nation's public outdoor recreation land,\* approximately one fourth of the land mass of the continental United States. The Apollo 8 photos made it clear that these managers — federal, state, and local — have an awesome respon-

\*The role of the contemporary administrator is that of managing man's relationship with and impact on the land. The pioneer approach of controlling, dominating, and defeating the land is not tenable in 1970.

*Dr. Dunn is director of research, National Recreation and Park Association.*

sibility. So does this magazine. The fact that this burden is often complicated by conflicting responsibilities is the crux of this article.

Some of man's basic conflicts are involved in the MRV issue — controversies such as the rights of the individual versus the state, individual property rights versus common public rights, and economic growth versus the quality of life (Interior Secretary Hickel's Net National Environment versus the Gross National Product).

Critical factors in the MRV issue are the land, the vehicles, and man.

### *The Land . . .*

All land is biologically and geologically fragile. Enormous variances complicate measurement of fragil-

**Friends, either you're closing your eyes to a situation you do not wish to acknowledge,  
Or you are not aware of the calibre of disaster indicated by the presence of recreation vehicles in your community!**

(with apologies to Meredith Wilson)

ity, and we have only recently begun to show proper concern with the science which addresses the task—ecology. We are also just beginning, on a broad citizen scale, to understand and to believe that our planet is an exhaustible and irreplaceable resource.

The United States contains less than 6 percent of the earth's population, yet it is well documented that Americans contribute more per capita to irreparable ecological damage to our planet than do the people of any other nation. We have conquered frontier after frontier; each more expensive in terms of long term ecological cost than its predecessor. Our aggressive pioneer spirit *must* be redirected from its traditional focus: Nature.

#### *The Vehicles . . .*

The vehicles are too new to be a well-understood factor. Even if we discount the typically unquantified warnings of authorities who claim we should not waste frivolously the nonrenewable resources of man and earth necessary for the creation, use, and maintenance of these vehicles, knowledge gaps still exist. For example, research commitment to such attendant problems as pollution control, ecological damage, and user injury prevention have been on the same priority level as they were throughout the early days (roughly 70 years!) of the automobile. We have no "index" against which to measure these sins, or their successful (or unsuccessful) amelioration subsequent to remedial action (an exception is the sound level meter used to assess noise).

We do not know the exact numbers of each type of MRV now in use, but production projection graphs show nearly vertical annual output estimates to 1980. We do know that recreation vehicles are increasing at a faster rate than cars did during their first decade even when population variances are considered. We also know that there are now over one million snowmobiles in use, valued at over one billion dollars!

Positive and negative aspects of MRVs were liberally sprinkled through the letters and literature received. One outstanding recreation value of the vehicles was proclaimed: they are FUN. Utilitarian values reported included their convenience to land

managers, utility company personnel, physicians, researchers, ranchers, and rescuers.

Negative charges were leveled at both the users and the vehicles. The vehicles themselves were accused of tearing up trails and turf, creating fire hazards, frightening birds and animals, destroying wildlife habitat and plant life, causing the erosion of lands and the siltation of streams and lakes, creating air, water, and noise pollution, and ruining the dignity, beauty, and serenity of wilderness areas.

#### *Man . . .*

Man is by far the most crucial factor in the MRV issue, for he is responsible and can be held accountable for actions affecting the vehicles and the land. Man is manufacturer and user of the vehicles; he is manager and steward of the land.

Man, the manufacturer, has been given one supreme challenge in the economic picture of the United States: to make money (indeed, until quite recently, this has been a noble goal for all Americans). His social conscience was long separated from his product. Although signs point to some concern by industry in the social and environmental problems besetting us all, this concern frequently requires careful nurturing (tax incentives, good publicity, etc.). The Ford Motor Company is already planning an orderly transition from Ford's traditional and current products to ones which will better serve man's post-auto society. "Now that public expectations are exploding in all directions, we can no longer regard profit and service to society as separate and competing goals, even in the short run," says Ford. "Business should look upon the rising public standards as opportunities for profit." Coincidentally, MRV sales emphasis on "family fun," safety, and regulation encouragement is significant, although their admittedly pecuniary motives may distress conservation purists.

Man, the vehicle user, has received few good report cards; as with any group, the "bad guys" attract the publicity. MRV users have been accused of littering, poaching (alligators, waterfowl, frogs, deer, moose, wolves, eagles, and polar bears were among the reported victims), endangering highway motorists and pedes-

trians, harassing stock and wildlife, and ignoring safety regulations. The "good press" of vehicle users is less abundant, and one must turn to sports organization newsletters and other publications for copious documentation of virtues. Organized users, for obvious reasons, are the first line of defense for manufacturers. They serve as voluntary buffers between and among the abrasive groups which seem to gravitate toward conflict wherever MRVs proliferate. Their sword is service in behalf of the goodwill required to keep them in the driver's seat. They organize safety programs, raise money for charities, organize clean-up campaigns, work on trails, and perform similar service functions.

Man, the recreator, clearly requires more of the land both quantitatively and qualitatively when he is aboard an MRV than when he is on foot or otherwise

using his own power. The use of horses and burros is harder on the land than man on foot, as documented by stock grazing restrictions in our wilderness areas. One can envision a recreation area where annual carrying capacity might be:

1,000,000 man days on foot
250,000 man days with stock
100,000 man days with MRV

With the population increasing geometrically, and with a national commitment to serving more Americans on modestly arithmetically increasing public recreation land, man on foot or under his own power becomes progressively more desirable. This is simply because user saturation levels are higher.

*Beach buggy use disturbs the natural contours of dunes at lakes and seashores.*

Bureau of Sport Fisheries and Wildlife photo





Jack V. Hoene photo

*Serving a useful purpose—forest ranger Bob Minor uses snowmobile to patrol Superior National Forest, Minnesota.*

Another important dimension of carrying capacity is that of user and use diversity. MRVs tend to restrict large public areas to single use; areas which could be expected to service larger numbers of people, a wider age range of people, and a broader socioeconomic range of people. Further, these areas could be expected to provide opportunity for a fuller spectrum of recreation activities. Public land managers cannot ignore the social implications of these factors.

Man, the steward of the land, has always had a very difficult task, whether protecting royalty's forests from poachers, or the local, state, or national park from freeways. Perhaps nowhere is the conflict inherent in the task better exemplified than in the charges assigned the United States Secretary of the Interior—developer and steward! At the local level, the conflict is as old as "keep off the grass" signs. Man, the enabler of recreation on public lands, has had a complex assignment too. Generally, it has been to provide safe and legal recreation programs, services, and opportunities for all citizens. It is submitted that the permitting of MRVs on public recreation land, particularly at the local level, is not compatible with the intent of this trust, especially when viewed as an extension of the land stewardship function.

#### Where We Are

Many commonalities emerged from the information sent from across the country, and they eventually

formed a pattern. The message: by permitting interim use of land (marginal, extra, or otherwise), managers are actually creating a market in which investors, manufacturers, and users will flourish, creating a land demand which probably cannot be met now, and which will be even more difficult to satisfy as pressure mounts for other land uses in the future. To explicate the pattern, The Dismal Cycle has been outlined.

#### THE DISMAL CYCLE

1. MRV sales produce a small, identifiable group of owners of a particular vehicle displaying one common problem: no land of their own.
2. They begin to use public or private land, with or without permission.
3. The group grows, damage occurs, and initial conflict develops.
4. Either (A) Users are prohibited completely and no alternative site is offered (return to #2), or (B) some informal agreement is reached, usually with public land managers.
5. The existence of approved site is publicized by the users (to friends) and by vehicle dealers (to potential customers): more sales, more users.
6. "Bad apples" emerge to jeopardize the initial agreement; conservationists, neighbors, other user types form a coalition which forces a "shot-gun wedding" between recreation vehicle users and the manager. More sales, more users, and more outsiders begin to come.

7. "Self-organization and policing" as well as explicit management controls are initiated. Subtle co-optation of public agency has occurred, and the manager feels compelled to make the "marriage" work.
8. Publicity about favorable features is distributed; *Equilibrium* is attained; more sales, more users.
9. Too many "bad apples," too much damage, too few "police," and the *Saturation Point* is reached. The anticoalition reactivates. A "final straw" event occurs.
10. The manager declares total elimination of MRVs from the area. If alternate site is offered, go to #4B; if not, go to #2 and repeat cycle.

Camelot-like claims will no doubt besiege the editor, but the writer maintains that these claims only relate to situations where the cycle is at the *Equilibrium* state — #8.

Earlier, the claim was made that the premise that MRVs are here to stay would be challenged. The materials received from across the country give evidence that they have come and gone in many areas already. It would be foolish to suggest, however, that the demise of all MRVs is imminent, or even that it will occur within the decade. In many areas they are still increasing exponentially! Ultimately, however, they will go, for they will become increasingly philosophically untenable and physically nonsupportable. The secondary cause of their extinction will be related very much to that of endangered wild species — not enough land, and too many people. The primary cause of their end will be bitter irony to MRV buffs — success caused by too many vehicles.

As with threatened wildlife species, there will probably be a few types of recreation vehicles which will survive all onslaughts, much as the wild burro and the starling. Perhaps they have not yet been invented, but man's ingenuity is at work. Watch for the second and third generation MRVs which will include "amphicats" (capable of swamp, lake, and beach travel), and "hovercraft" (45 mph on water, 60 mph on land, 75 mph on ice). Of the current crop, a likely candidate for longevity seems to be the snowmobile (typical speeds of 30 to 50 mph, with at least one claim of 170 mph on a straight run).

#### Park and Recreation Manager Strategy

Park and recreation professionals have been far too ambivalent about their environmental commitment. Many have been co-opted by the very threats they were hired to regulate, becoming promoters as well as protectors of the presumed regulated group. Nearly all MRV-related "ecocatastrophies" result from successive nondecisions and nonactions. Being a nonmanager is no longer tolerable. Managers can no longer *not* look forward and *not* make decisions and *not* take stands. Isolated ad hoc holding actions and maneu-

vers against specific vehicular threats to the environment are not working. Particularly impotent are defenses where there has been inadequate consideration of potential alternate land uses. Managers must exercise appropriate interventions regarding potential disfunctions over which they have responsibility at the strategically expedient moment.

The choice is: will public land managers satisfy the demands of MRV users now, or will they severely limit present opportunity so that the land will not be monopolized and degraded, but will be available for broader use both today and for generations?

#### Ten Manager Strategies

The following strategies are offered as tentative; they are suggestive of some of the tactics which might be used by managers tired of reacting to new MRV challenges.

1. Support efforts to identify alternative, less destructive recreation forms. Surely if this country can reach the moon, other ways of having FUN can be found. The human race got along without MRVs for over a million years!
2. Support efforts to identify less objectionable MRVs and encourage their use over that of more destructive and dangerous types.
3. Become informed — be sure your agency has the informational capability to make intelligent decisions about the long-range social and environmental consequences of its actions. Look back to see if the ecological effects anticipated from past actions were accurate. If not, are you *still* using the same information source?
4. Inform the public and encourage them to inform themselves. If you have information and are basing decisions upon it which affect the lives of your constituents and their children, give them all the information they will absorb. You can't expect people to accept "no" for an answer without good reasons.
5. Don't confuse feasibility and advisability. If you're planning actions which will affect ecosystems and social systems, list the good reasons why NOT as well as the positive rationale.
6. Discourage proliferation of MRV sales by prohibiting use rather than entering into short-term compromise agreements which mislead buyers into a false sense of land supply security. Avoid the marginal or interim land-use trap. This is a very relative condition, and implies an obligation for further land provision when the interim or marginal condition has passed. (The proposed Everglades jetport site was less than marginal just a few months ago!)
7. Encourage private enterprise to meet the need for land. Private campground growth is helping to fill the gap near crowded national parks, and such supplemental effort will be needed even more in the future. Develop incentives to influence positive involvement from the private sector.
8. Pressure MRV manufacturers and dealers to increase vehicular safety and diminish those undesirable damaging capabilities through design modification.

9. Encourage special taxes and licenses for MRV manufacturers, dealers, users, and vehicles to pay for costs of added legislation, police patrols, damage, insurance, and ultimate product disposal.
10. If ensnared in The Dismal Cycle, try to reach *Equilibrium* quickly and maintain this condition as long as possible.

It may be argued that these strategies are Utopian, but as President Nixon said, "We have had too many visions and too little vision." And, as Pogo eloquently observed, "We have met the enemy, and he is us."

This article, and the selected comments which follow, offer insight into the current status of motorized recreation vehicles and bring into sharp focus the responsibility of the park and recreation administrator. When viewed collectively, they substantiate the thesis of this article: motorized recreation vehicles are operating "on borrowed time."

#### Selected Comments

The following observations and information were abstracted from materials received from individuals representing conservation groups, MRV associations, and federal, state, and local park and recreation agencies.

*1979 Congress for Recreation & Parks, Chicago, Illinois:* With more than one million snowmobiles in operation by the end of this winter, it is imperative that public park and recreation lands be adapted to the controlled use of snowmobiles, the National Recreation and Parks Congress was told by a top executive of the world's pioneer and largest manufacturer of the winter fun machines. "All of you in the recreational field must take a serious look at whether you are fully serving members of your community if your program does not include snowmobiling."

*Canadian Parks & Recreation Association:* Will snowmobile regulations be enacted before ruination of the sport? Some users are carrying chain saws to cut down any fencing that gets in their way. The answer may be to urge snowmobilers to organize themselves into many more closely knit, self-policing clubs, much like ski patrols.

*Michigan State University:* The Recreation Research and Planning Unit has started a pilot study of snowmobile use. Questionnaires concerning socioeconomic characteristics, use patterns, attitudes, preferences, and related activities are being mailed to a sample of users.

#### Conservation Groups

*National Audubon Society:* Perhaps most important of all, on public lands, laws and regulations must establish zones of use and access which will assure that off-road vehicles do not interfere with the enjoyment by nonmotorized users of a substantial part of our wild areas, do not destroy wilderness, and do not jeopardize the existence of other fragile ecosystems.

*Potomac-Appalachian Trail Club, Virginia:* Construction of the "Big Blue" trail to the west of the Appalachian Trail is underway. Some fallen logs are being removed from the trail, and others are being left as barriers to trail bikes.

*Save the Dunes Council:* Dune buggy use along the beach foredunes, and inland are becoming an increasing hazard and threat to the dunes region. The vehicles "tear up the beach grasses, wild flowers, and other vegetation, creating blowouts and erosion. They level dunes, disturbing the natural contours of the region. They are noisy, destructive, and dangerous." The Council is recommending that all beach communities pass ordinances prohibiting their use.

*National Parks Association:* Motorized vehicles are "a substantial threat to virtually all national parks, as they damage the ecology of the area they travel through or over." NPA supports the premise that parks are for people, not vehicles, and recommends that park traffic be restricted to official, emergency, and service vehicles which would bring visitors into and through the parks. Tourist accommodations should be provided outside the parks by the private sector.

*National Wildlife Federation:* NWF recommends "that federal, state, and local land-managing agencies adopt and strictly enforce regulations which zone governmental areas in manners so that uses of multiterrain vehicles will be restricted to suitable locations or trails which will result in the least possible impact on the environment or impairment to other legitimate uses of public properties."

*The Conservation Foundation:* The Foundation has prepared a publication, "Off-Road Vehicles and Environmental Quality." The document offers vehicle profiles, recreation, trail, and noise effects, effects on fish and wildlife, and discussions of trespass, vandalism, and thefts, safety, law enforcement, policy recommendations, and model state laws.

*The Salt Water Sportsman:* "We are witnessing the passing of the beach buggy in many areas due to stringent laws imposed primarily by local seashore communities. Self-policing had a beneficial effect for many years, but there are now too many vehicles, and too many other people on the beaches." The Massachusetts Beach Buggy Association was the first in the United States, and at one time its membership was over 2,000. This has declined as beach buggy operations have been restricted.

#### MRV Associations

*International Snowmobile Association:* "Our member clubs perform valuable services and cooperate with all government agencies and industry for the benefit of the user in safe and sane snowmobiling."

*National All Terrain Vehicle Association:* "ATVs have come a long way since John Gower's 'Jiger' was introduced back in the early '60s. Production in 1969 was a mere 15,000, but the estimated output for 1975 is 225,000! The world is the market — we are not hindered by seasonal restrictions."

*International Snowmobile Congress, Duluth, Minnesota:* Delegates attending the January 1970 Congress were urged to help states regulate the design and use of the vehicles before their numbers and indiscriminate operation became a public nuisance.

*International Snowmobile Industry Association, Minneapolis, Minnesota:* Report of the Committee on Environmental Quality, Major Recommendation One: "The land managing agencies should take the lead in designing, developing, and maintaining areas

and trails where snowmobilers can enjoy quality recreation experiences in harmony with other special interest groups."

### Federal Government

**Bureau of Indian Affairs:** America's Indians are determined to protect their environment. Some tribes have closed parts of their land to one or more specific vehicles; whereas others have closed areas to all motorized vehicles.

**Tennessee Valley Authority:** At TVA's Land Between the Lakes area, use of mini-bikes by large groups of unlicensed minors has prompted regulations banning their use. Regular motorbikes, motorcycles, and 4-wheel drive vehicles are restricted to developed roads. Future intent is to accommodate MRVs where practical.

**National Park Service:** "Operating a vehicle outside of established public roads, parking areas, or routes designated by the Superintendent is prohibited."

**Forest Service:** The anticipated increase in all-terrain vehicles could cause saturation and the beginning of extensive restrictions of the use of such vehicles on public lands. The Wilderness Act already bans all MRVs from these areas.

**Bureau of Land Management:** In addition to a 16-million acre garbage dump already in the Southern California desert, BLM is worried that motorcycles, dune buggies, 4-wheel drive vehicles, and other off-road vehicles traversing the desert may wipe out plant life, archaeological sites, and centuries-old Indian trails. A 15-member BLM off-road vehicle advisory council wants to mandate strict laws and regulations to protect these public lands. It is asking for a desert ranger force to patrol a beat from the Sierra Nevadas and Death Valley to Mexico, and from the Colorado River to the Pacific.

### Cities, Counties, and States

**Bryan, Ohio:** The Parks and Recreation Board passed a resolution to prohibit the use of recreational vehicles on parkland, but enforcement is difficult. "The vehicles have their place, but not in multiple-use local public parks."

**Hermosa Beach, California:** "The best idea is to have a very close study of the situation today and how it will shape up in the future. Then we can decide on some sane rules and regulations to be applied to all vehicles before greater destruction is realized."

**Kansas City, Missouri:** "Hundreds of cyclists weekly thrill to the jumps and banked curves in a marginal area between the Missouri River and river levee. We should set aside and develop such lands for motorcycle use to keep cyclists off other parklands and make issuing citations justifiable."

**Midland, Michigan:** A campaign is under way for larger license plates on recreation vehicles, especially motorcycles.

**Anchorage, Alaska:** "The problem is becoming acute—there are probably as many or more snowmobiles per capita and per square mile as in any other location in the country." The city manager has a committee working on the problem.

**Ardmore, Pennsylvania:** Motorized vehicles have been prohibited except at locations specifically designated for such purposes.

**Concord, New Hampshire:** Snowmobiles and the noise they make are the concern of a special committee working on new statewide regulations. Private development of facilities should be encouraged to reduce pressures on public lands which have more value for other use, according to the Governor's office.

**Winston-Salem, North Carolina:** The city is building a 91.5-acre "hobby park" to accommodate recreation "nuisances" including archery, rifle and pistol ranges, model plane, rocket, sky diving, go-cart, and motorcycle areas.

**Appleton, Maine:** The town was invaded by snowmobiles, causing extensive damage to blueberry bushes and forest seedlings. An improvement committee made 50 miles of trails, provided maps, and a warming hut, and proclaimed, "Don't fight 'em, join 'em!"

**Southern California:** Some cities are investigating the possibility of sponsoring cycle parks. A "mechanical park" is being considered by the Orange County Parks Department, and a study has been completed for a 24-acre cycle park along the Santa Ana River in Anaheim, possibly to be leased to a concessionaire. Costa Mesa has a motorcycle and mini-bike club for boys 16 and under, "designed to keep the kids off the streets, playground, and parks with their bikes."

**North Dakota State Outdoor Recreation Agency:** "The step by government to tighten up rules has been a direct result of foolhardy snowmobilers who cannot tell what time of night it is, or the difference between public and private property, or have any common sense for the safety of passengers, pedestrians, and the like. A cut fence, trampled crops, dead livestock, and assorted abuses have ruined the hunter-farmer relationship. Snowmobiling is approaching this unreconcilable plateau."

**New York State:** Steps are necessary to cut down the growing number of snowmobile-auto accidents, and to provide identification for the estimated 100,000 snowmobiles now in use. Mufflers to cut noise to 73 decibels by June 1974 is in pending legislation. ■

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- The nature of the article precludes any attempt at providing a complete bibliography. However, four recent publications are recommended to the attention of readers who desire to pursue some of the basic themes.
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# RECREATION AND LEISURE INFORMATION SYSTEMS

## Status and Priorities

*Proceedings from*

**NATIONAL RECREATION AND PARK  
LITERATURE RETRIEVAL CONSULTATION**

May 3-5, 1970

**RECREATION, ENVIRONMENT AND LEISURE INFORMATION  
SYSTEMS EXCHANGE SESSION**

September 30, 1970

**LEISURE/RECREATION INFORMATION DIALOGUE**

December 2, 1970

*Compiled and Edited  
by*

*Betty van der Smissen*

*Diana R. Dunn*

*Neil J. Stout*

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**NATIONAL RECREATION AND PARK ASSOCIATION  
1700 PENNSYLVANIA AVENUE, N.W.  
WASHINGTON, D.C.**

**RECREATION AND LEISURE INFORMATION SYSTEMS**  
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The Pennsylvania State University  
University Park, Pennsylvania

sponsored by

National Recreation and Park Association  
and  
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National Recreation and Park Association  
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convened by

Steering Committee of the Ad Hoc National Recreation  
and Park Literature Retrieval Committee

compiled and edited by

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**NATIONAL RECREATION & PARK ASSOCIATION**

## PREFACE

Scholars have identified stages and events common to the development of each of man's institutions. Whether in education, law, economics, politics or other human sphere, progress has largely been attributed to two factors: the need of the times and the interest of the participants.

During 1970, a group of concerned individuals from several nations, institutions, disciplines and professions devoted effort to analyzing what they perceived to be an emerging need: the development of an exchange system for information and data germane to the recreation and leisure of man. History will evaluate the timeliness of these efforts; this volume seeks to document their progress.

On May 3-5, twenty-five educators, librarians and researchers from American and Canadian universities, government agencies and professional associations attended a Literature Retrieval Consultation at The Pennsylvania State University. They sought to determine the status of systems, problems and priorities of literature retrieval and dissemination as they relate to leisure and recreation. The National Recreation and Park Association was designated to coordinate subsequent work on behalf of the participants, and Betty van der Smissen, Diana R. Dunn and Neil J. Stout assumed steering committee responsibilities.

The second meeting was held at the National Recreation and Park Congress in Philadelphia on September 30. A session titled by an acronym, REALISE (Recreation, Environment And Leisure Information Systems Exchange), updated attendees who had not participated in the May Consultation and also provided opportunity for new and revised input from the expanded group.

On December 2, the steering committee convened a Leisure/Recreation Information Dialogue in Washington, D.C. With representatives from government, business, academia and several operational information systems present, the steering committee, for the first time, solicited the advice and counsel of the "pioneers" of U.S. information systems personnel. The focus: an interdisciplinary/interprofessional exploratory meeting on the implementation of REALISE.

This publication documents the initial phase of a new stage for students of man's leisure and recreation institutions. It seems appropriate to close 1970 with this detailed review of progress to date. The observations and suggestions of the reader regarding subsequent steps are sincerely invited. Contact any member of the steering committee.

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SECTION I

Proceedings from

NATIONAL RECREATION AND PARK  
LITERATURE RETRIEVAL CONSULTATION

sponsored by

National Recreation and Park Association

and

Recreation and Parks Program  
College of Health, Physical Education and Recreation  
The Pennsylvania State University

May 3-5, 1970

J. Orvis Keller Conference Center  
The Pennsylvania State University  
University Park, Pennsylvania

## INTRODUCTION

Perspective

In 1969, informal communication channels among educators and researchers and others concerned with recreation and parks began to vibrate with a new concern. As the issue began to crystalize, the problem which emerged centered around information. Whereas the problem most pertinent to recreation and park information has been its acquisition, a new set of circumstances began to place emphasis upon its manipulation. Thus, information retrieval and dissemination was identified as a critical new dimension, commanding not only the attention of those in the field, but of a new cadre of support personnel from such fields as information, library and computer science. It was clear that many new alliances would need to be formed.

To facilitate an exchange of concerns and to determine the status, problems and priorities of literature retrieval and dissemination in recreation and parks, plans were finalized for a Literature Retrieval Consultation, sponsored by the National Recreation and Park Association and the Recreation and Parks Program of The Pennsylvania State University. The Consultation was held May 3-5, 1970, at the J. Orvis Keller Conference Center of the University, University Park, Pennsylvania.

Several parameters of concern were identified prior to the Consultation and included: (1) user and non-user needs; (2) descriptor words; (3) systems compatibility among institutions and agencies; (4) clearinghouses; (5) information methods of communication; (6) funding patterns; (7) interdisciplinary recreation clearinghouse desirability; (8) recreation and environment consideration; (9) input management and bibliographic control; and (10) index assignment and type.

Design of this section

The following section of this publication provides detail on each phase of the Consultation, generally in the order of events as they occurred.

Dr. Dunn presented opening remarks to define the scope of the Consultation. In order to establish a climate for discussion, Mr. Gordon W. Rawlings, Chief of Systems Development, Pattee Library, The Pennsylvania State University, keynoted the Consultation. The morning following this presentation, Consultation participants began a series of exchange sessions, during which each described his or her efforts in information systems and encouraged others to ask questions to achieve a better understanding of the total state of the new art. The final task of the Consultation included indepth discussions of the parameters of concern and an evaluation of directions for the future.

## CONSULTATION AGENDA

Sunday, May 3, 1970

7:00 pm REGISTRATION

8:00 pm INTRODUCTORY REMARKS

Diana R. Dunn, Director of Research  
National Recreation and Park Association

BASES OF RETRIEVAL AND DISSEMINATION: ESTABLISHING  
THE REFERENCE FRAMEWORK FOR CONSULTATION

Gordon W. Rawlins, Chief of Systems Development  
Pattee Library  
The Pennsylvania State University

Monday, May 4, 1970

8:30-11:30 am STATUS REPORTS OF RETRIEVAL AND DISSEMINATION  
and1:30-4:30 pm Each participant so desiring may report on the  
"status" of his retrieval and dissemination pro-  
gram at his institution or agency

Systems of retrieval and dissemination conducted  
by related fields

PARAMETERS OF CONCERN

A discussion of the scope, substantive content,  
sources of input users, et al regarding retrieval  
and dissemination for Recreation and Parks

Tuesday, May 5, 1970

8:30 am PARAMETERS OF CONCERN, continued

10:30 am DIRECTION FOR THE FUTURE

A discussion including coordination with estab-  
lished systems outside recreation and parks;  
strengthening and/or re-directing recreation and  
parks systems and/or operations; new developments  
needed

1:30 pm DIRECTION FOR THE FUTURE, continued

2:30 pm ADJOURNMENT

## Introductory Remarks - May 3, 1970

Diana R. Dunn

The computer has tipped the intellectual balance of power from those who simply possess data and information to those who can efficiently process it. Considering that the recreation and park field is virtually in the Dark Ages with respect to the possession of data and information, it may seem quite presumptuous of us to meet here for two days to engage the problems related to processing it. Perhaps we are all optimists.

Permit me to project what I most optimistically hope will emerge from our coming together.

First, I hope to see our individual perspectives jolted, so we leave here with an awareness of the total magnitude of the information problem we face -- not just self-satisfied because our personal niche seems in superior order.

I would like to see progress begun on the development of a common thesaurus of descriptors -- one which would span the entire field, and ultimately help to bring it together.

I hope we begin to grapple with the problem of data retrieval, for I suspect it will exponentiate in the "data decade" of the 1970's. Printed volumes of numbers are no longer feasible -- but what is?

I look forward to the establishment of mechanisms for enhancing the communication of information among ourselves. Further, I enthusiastically anticipate the consideration of improved delivery systems for transferring information to recreation and park practitioners, for they are our field to the majority of Americans.

The purpose which brought us each here was: "To determine the status of systems, problems and priorities of literature retrieval and dissemination as it relates to the field of parks and recreation." The charge is both awesome and urgent. I'm eager to get on with it!

BASES OF RETRIEVAL AND DISSEMINATION:  
ESTABLISHING THE REFERENCE FRAMEWORK FOR CONSULTATION

by

Gordon W. Rawlings

Mr. Calvin N. Mooers has hypothesized what has come to be known as "MOOERS' LAW" which states:

...an information retrieval system will tend not to be used whenever it is more painful and troublesome for a customer to have information than for him not to have it (information).

However, it is our desire as well as the desire of the customer, who has a definite information need, to have that need satisfied.

Many attempts have been made to design an information retrieval system to satisfy the requestor's information needs. Most systems have retrieved information according to the criteria and decisions of the system itself in direct proportion to the input and system structures. These systems have generated mountains of output having the greater percentage of disseminated information labeled as "false drops" or "noise" -- meaning useless.

At the heart of all information retrieval is indexing. The most familiar method uses subject-heading lists as do conventional libraries, but methods range considerably from the general conventional headings to specific single keywords. In the technical fields as well as in area of subject specialization special indexes have been devised to handle these materials.

Prior to the advent of the computer, manual information storage and retrieval techniques were developed especially from the subject point of view. Some of these systems are: (1) Pigeonhole; (2) Library Card Catalog; (3) Marginal Punched Card; (4) Peek-A-Boo; and (5) Uniterm. Following the advent of computers these manual systems were automatically executed by the computer.

The computer also encouraged the design of new and numerous information retrieval approaches such as automatic abstracting and indexing.

Also, with the advent of the computer came large private and government funding and the development of grand competition which resulted in program

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<sup>1</sup>Lawrence Berul, "Information Storage and Retrieval: A State-of-the-Art Report," Computer Notebook, Vol. 1, Sec. 2, p.5.

ineffectiveness. "At times it appeared that, like Stephen Leacock's horseman, each 'flung himself upon his horse and rode madly off in all directions.'"<sup>2</sup>

I have my doubts of seeing a retrieval system be so designed so as to produce automatically the exact information required by each requestor without any "noise" or "false drops."

I firmly believe that "no one but the user himself can compare output against the inherent need."<sup>3</sup> Therefore, I advocate (1) allowing the user to automatically query the information source according to a variety of dilimeters--subject, author, title, publisher, dates, editions, etc.--and (2) automatically disseminating the information to the requestor so that he can evaluate it according to his own inherent needs and thus determine for himself its usefulness.

The library science of precomputer days developed or accepted the fundamental concepts and processes that are the heart of the library science of the future. The methods used were so time consuming and the technical orientation so limited, however, that inefficiencies of method and of scale rendered the system almost self-destructing.

Today, I will attempt to concentrate my remarks on the "Information Network Requirements" of libraries and attempt to contrast the present with the immediate future.

Traditionally speaking, libraries have attempted to satisfy these requirements. In their attempt to share their information, libraries have extended equitable loan periods, provided the patron with renewal privilege, provided him with information regarding the materials status, provided the ability to personally reserve the material and provided him (the patron) with the option to have the material recalled for immediate use.

Nevertheless, oft times the information base is inadequate due to (1) the high demand placed on a particular item and/or (2) the size of the library's budget and building which restricts its purchase power and also its housing capability.

Another restriction inherent in the traditional library is brought about by the storage medium itself. Once a book is in the hands of a given patron all future use is dormant and dependent upon its return.

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<sup>2</sup>W. Kenneth Lowry, "Science Information Problems Needing Solution," American Documentation, July, 1968, p. 352

<sup>3</sup>E. Bryant, Progress Toward Evaluation of Information Retrieval Systems, A Report at the Fourth Annual Meeting of Information Retrieval Among Examining Patent Offices, p. 372.

The library is a traditional institution and established upon programmatic principles and practices. Two traditional symbols that you would expect to find in any library are the card catalog and the card catalog card. Using these mediums, several approaches have been taken to increase the accessibility of the library's collection. For example, librarians have divided their card catalog into a subject card catalog and an author and title card catalog.

This approach--the unit record approach--provides for (1) almost unlimited growth and expansion and (2) up-to-date maintenance with random insertion; but it is restricted to in-house use and use of a particular section, one person at a time. Due to its nature the patron must conform to its order--library filing rules--and succumb to its imperfections such as the changes in subject headings, changes in classification schedules and occasional missing card catalog cards due to removal or loss.

Likewise, the patron has no way other than to hand copy in order to secure the desired bibliographic and location information. Hand copying greatly contributes to transposition error which results in location and retrieval problems.

Libraries have provided access to a variety of storage mediums and have the ability to increase this capability. The recording formats, which we oft times take for granted, are not restricted to only textual information such as digital information stored within a computer; but pictorial and graphic information are also provided for.

With the help of duplication equipment, limited reproduction capability is afforded the user, but subject to copyright restrictions and control.

All of this has been provided to the user on a "no" or very "low" cost basis, but the cost of acquisition and processing continue to increase by great percentages.

So as not to confuse the concept of traditional libraries with my concept of libraries of the "immediate" future I have chosen the term "Information Network."

You will note that I prefaced my remarks about the future with "immediate." The state of the art of technological development has arrived today at a point where I feel libraries are going to be directly benefited. Note that I did not specify technology to mean "computer" technology because I do not adopt the use of computers as the complete answer to library for information problems. I am also pleased that other technologies such as microfiche, super and ultra microfiche, video tape, unit record retrieval systems, etc. share in this concept. The technology that I make reference to is a new era which marries the many varieties of technological breakthroughs into one marketable product which emerges with every desirable aspect of the traditional library but yet provides for a greater percentage of what has been desired and searched for for many years.

I am not attempting to bring any discredit to the many developments previously made or presently being made today in the library area such as the MEDLAR project and the MARC project. But my experience in the fields of Computer Science and Library and Information Science leads me to believe that computers alone do not hold the answer to our problems; but, if computers are successfully married with other technologies -- laser recording, super and ultra microforms, etc. -- thus, creating this new technology we will have this new medium upon which we can build "Information Networks".

The "if" used is a very real term but the technology referred to is today a reality. Before describing more in detail this technology, I wish to bring to your attention some of the problems inherent in today's "computer" technology. The big computer problem is "cost". I am sure that everyone is partially aware of the cost outlay in computer equipment designed to support automatic information retrieval systems. I make reference to the annual MEDLAR report for 1969. It states that the INITIAL phase of the MEDLAR II Project is scheduled for operation the end of 1970. It utilizes a good sized computer (IBM 360/50) with a core memory size of 512,000 bytes or characters plus an additional large core storage of 1 million bytes. It requires four of the largest direct access storage devices manufactured today holding approximately two hundred and thirty million (230,000,000) characters together with six tape drives, two printers and a card reader-punch. This equipment is being supported by legislative measures which provide for a funding increase during the next three years to a final level of thirty-five million dollars (\$35,000,000).

The second computer problem is storage capacity and access on an on-line real time basis. Storage capacity and access are in direct proportion to the amount of storage facilities permitted on a given computer installation or configuration plus the amount of funds available.

Another giant computer problem is that of "type fonts" and "diacritical markings". Breakthroughs are expected in this area this year for the Roman alphabet. Also, already announced are limited type font capabilities for Japanese and other oriental languages.

Of course, many optimists see the future as a glow of successful accomplishments in these computer areas. However, I am in favor of retaining the perfected superior quality of our graphic arts industry and utilizing the computer technology where it can most successfully benefit the library and the research community.

I again make reference to the direct access storage devices employed in the National Library of Medicine's MEDLAR Project. Assuming that bibliographic records describing one book averaged three hundred (300) characters, one computer storage device of this type would hold seven hundred and fifty thousand (750,000) bibliographic records. Therefore, the MEDLAR Project has storage capacity for approximately three million (3,000,000) bibliographic records available on and on-line real time basis. Each device carries a purchase price in excess

to three hundred thousand dollars (\$300,000). By dividing the cost of the device by the number of bibliographic records it could hold we find that each on line record would cost a minimum of 40 cents each. This does not take into consideration the costs of hardware interface, computer time, conversion or input.

Another problem not solved by the computer industry, but with breakthroughs forthcoming, is the provision for graphic and pictorial information with all of its gray shades.

Computers do not alone answer all of our problems neither do they comply with all of our requirements but, they force us to comply with them.

At this time I wish to share with you what I see as the future "Information Network." There are six requirements for the Information Network. In the presentation I will attempt to justify my use of terms.

#### INFORMATION NETWORK REQUIREMENTS

1. SHARED INFORMATION BASE
2. ACCESSIBLE INFORMATION BASE
3. VARIETY OF STORAGE MEDIUM
  - a. Hard copy
  - b. Microforms
  - c. Recordings
4. VARIETY OF RECORDING FORMATS
  - a. Pictorial
  - b. Textual
  - c. Graphic
  - d. Voice
5. REPRODUCTION CAPABILITY
6. LOW COST

Why should one institution house and monopolize the total system? Likewise, why should a sister institution be saddled with the same creation and conversion problems as the mother and/or sister institutions? For example: if the library or a library has already collected and converted its bibliographic data base why should another library or even a small departmental collection be required to elect to duplicate this effort or even be forced to an inferior approach?

Clawson, Marion, 1905-

Land for Americans; trends, prospects, and problems. Chicago, Rand McNally, 1963.

141 p. illus., maps. 22 cm. (Policy background series).

At head of title: Resources for the future.

"Based on the Resources for the Future study, Land for the future, by Marion Clawson, R. Burnell Held, and Charles H. Stoddard."

I. Land--U.S. I Resources for the Future. Land for the future. II. Title.

HD205 1963.C55

333.70973

63-17447

Library of Congress

5

#### BIBLIOGRAPHIC BASE

I propose sharing a common central information base which is unrestricted in nature. I would make this information base accessible automatically by means of a small scale or mini-computer which would interface the information base by the use of machine readable indexes and other reference files.

A patron or user should be permitted to use this information base in the library initially but also have the capability of accessing the information base remotely from his office, home, or place of preference. If one patron is using the file--or a particular portion of the file--other patrons should not be kept from having access to the same material.

The user or patron should not be required to succumb to the rules, etc. of a particular institution. Why should you (the patron) be required to keep abreast with the changes made by the Library of Congress for Cataloging, Classification, or Filing when you are pressed to just keep abreast with your own particular area of specialization? Likewise, why should you be required to learn these rules in the first place?

By providing the control of the information base internally the user is not subjected to these above mentioned traditional library policies and practices. For example, using such a system would not require the patron to understand library filing rules and would not force him to subscribe to them.

Also, by developing a separate subsystem the patron or sister library collection would be able to access its own reference files but still share the materials or information common to both systems. In like manner, the library patron would be able to commonly share the developments of a sister institution or department as it concentrates in a more specialized subject area.

The library's classification and identification might look like this: Suppose that a Recreation department had their own small collection. They could access the library's bibliographic information base (See top illustration on next page.) while at the same time their indexes could automatically attach the department's own identifiers and create unique and individually tailored accesses (See lower illustration on next page). As a result, the library patron could randomly retrieve immediately available materials from the Recreation department's information base such things as abstracts, indexes, critiques, etc., which had been created for a more concentrated use but not made available in the library.

In addition to having the material available on the T.V. screen in pictorial, textual, and graphic format, a variety of mediums would still be made readily available to the patron--original hard copy.

The user would also have the option of obtaining a hard copy reproduction automatically at any point during this process. By pushing a designated button on his access terminal he would receive a full size copy of the original text.

All this can be available at a very low shared cost. All the other phases of technical processing and information retrieval are also available through this type of an "Information Network."

So that you might understand more completely the storage medium and processes of this newly described Information Network I would like to take a few moments to describe it more in detail.

The core of this network is dependent upon three separate pieces of hardware: (1) the Digital Index Base and (2) the Facsimile Information Storage Base co-ordinated by (3) the Mini-Computer. (See diagram on page 12.

The Digital Index Base is a lazer storage system which stores a 1/4 trillion bytes or 10 times the storage capacity of the storage devices described in the MEDLAR system but only costing the equivalent of one. This index base is structured and accessed in exactly the same way as the conventional storage devices being used currently. The information is input to the computer which formats and structures the indexes.

The Facsimile Information Storage Base is processed in this manner. The original documents are acquired. They are then filmed and processed creating their images in microform formats. This significantly reduces the housing requirements. They are then placed into a storage cell which is placed into the storage unit. In this form they are automatically accessible and usable without any human handling.

This system does not require a large oversized and overpowered computer because it requires very little character manipulation or re-formatting. It performs only a direct search, retrieve, and disseminate function.

## Library Modifiers

0-8352-0001-9

HD 205 Clawson, Marion, 1905-  
1963 Land for Americans; trends, prospects, and problems.  
.C55 Chicago, Rand McNally, 1963.

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1. Land--U.S. I. Resources for the Future.  
Land for the future. II. Title

HD205 1963.C55 333.70973 63-17447  
Library of Congress 5

## Department's Modifier

P.REC Clawson, Marion, 1905-  
25-12 Land for Americans; trends, prospects, and problems. Chicago, Rand McNally, 1963.

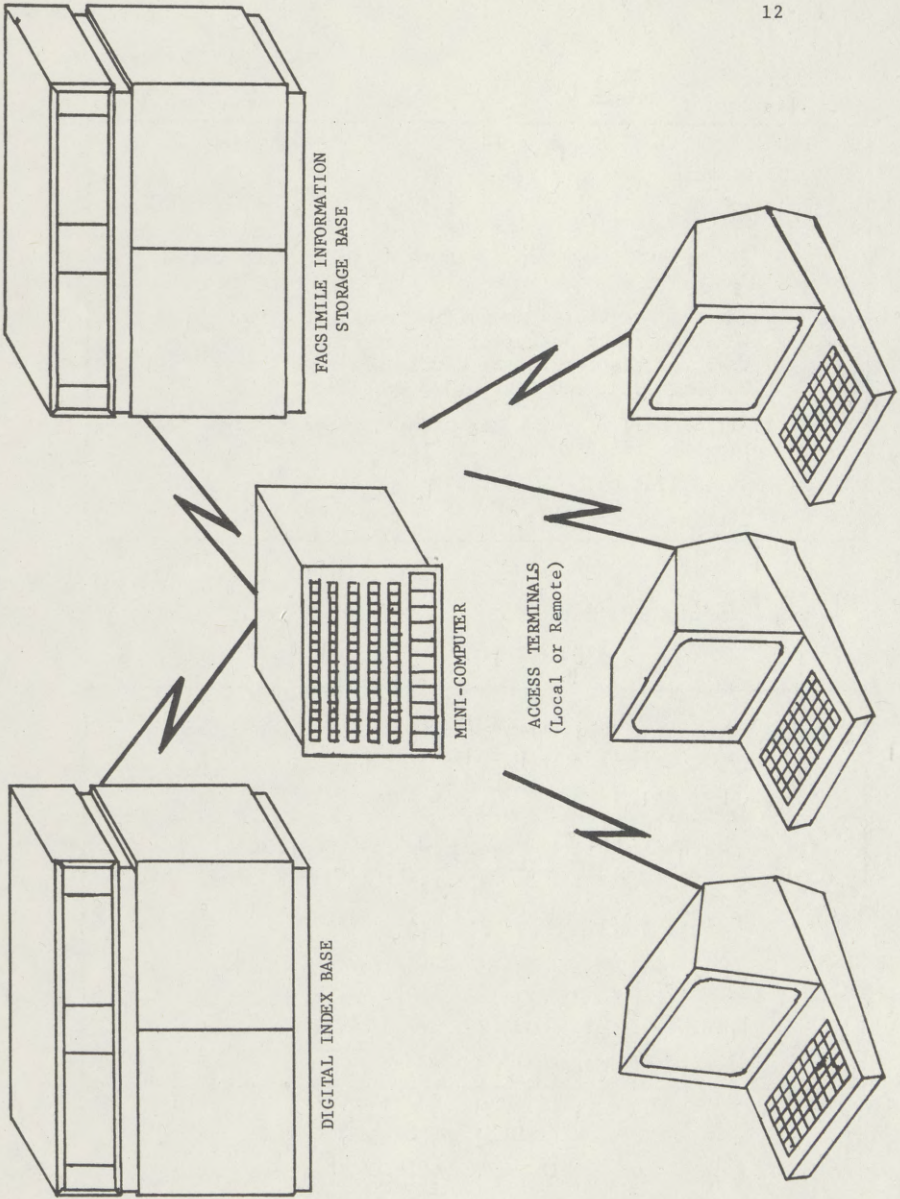
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1. Land--U.S. I. Resources for the Future.  
Land for the future. II. Title

HD205 1963.C55 333.70973 63-17447  
Library of Congress 5

BIBLIOGRAPHIC BASE  
with LOCAL MODIFICATION



STATUS OF RECREATION AND PARK  
INFORMATION SYSTEMS

One of the primary purposes of the Consultation was to assess the present status of information systems germane to recreation and parks. This section begins with an overview of the need for a nationwide system. This paper is followed by descriptions of operating systems by individuals representing universities, government agencies and other organizations.

THE NEED FOR A NATIONWIDE ORGANIZATION OF COMPUTERIZED  
BIBLIOGRAPHIC RETRIEVAL SYSTEMS

by

Robert B. Ditton

BACKGROUND

For the past three years, a computerized bibliographic retrieval system dealing with the recreational aspects of water resources use, planning and management has been under development. Initial funding came from the University of Illinois Water Resources Center under the Water Resources Research Act of 1964, P.L. 88-379. Under Sea Grant funding, the system is now maintained as a service function at the University of Wisconsin-Green Bay along with a research library of "hard copy". RECWAT, as the system is designated, has been designed as a support system for the Sea Grant Green Bay Research Programs as well as the several recreation research projects conducted under Sea Grant sponsorship.

Literature Retrieval

Water Resources and recreation agencies and academic departments have been systematically solicited for the pertinent publications and research literature. After three years of monitoring, a list of best indicators (150) has been established making the task of monitoring more manageable. Once "hard copy" has been manually gathered, each piece of literature is evaluated according to established inclusion-exclusion criteria which make a minimum number of judgements for the user.

Thesaurus Development

To establish a computerized retrieval system it was necessary to first develop a thesaurus or a specialized vocabulary that could be used for control over a certain body of information. Using thesauri

developed by the U.S. Office of Water Resources Research and the U.S. Bureau of Outdoor Recreation, the goal was to develop a specialized thesaurus that fit the literature.

#### Bibliographic Retrieval

A computerized bibliographic retrieval system was developed that would allow users quick access to the multi-disciplinary body of literature pertinent to water-based recreation. The system operates under the control of the IBM System/360 processing bibliographic data into a set of interrelated data subsets. The bibliographic retrieval system's program capabilities are described more specifically by the principal functions in each of the following areas:

Input Document Processing and Storage--Input document processing and storage encompasses the description of the data base and its input, and the initial processing of the input information into machine-readable language on IBM cards. The final input medium was a portable disc pack (rented from IBM) rather than cards.

1. Conventional indexing procedures are used by the project staff, who assign keywords to each document which suggest the contextual meaning of the author as well as best anticipate the wording of a researcher's search query.
2. Six fields of input information about each document are stored. They are:
  - a) Document number in ascending order from 000,001
  - b) Title of publication
  - c) Author of publication
  - d) Date of publication
  - e) Literature location
  - f) Keywords assigned

Since the system was not initially established as a research support function, publisher and place of publication was not included as input information. This is being remedied.

3. Documentation according to an established data format
4. Coding of bibliographic notations and assigned keywords
5. Key punching and reading onto portable disc pack
6. Disc storage

Search Processing--A search control statement routine interrogates the files of the data base, in response to certain specifications spelled out in search statements entered by the user. A search program then calls for a printed presentation of the requested documentary information. Finally, the search module causes a printout of bibliographic notations whose assigned keyword attributes match

the user's specifications. With a complete bibliography by keyword in hand, the investigator must then manually retrieve the actual pieces of literature prior to any review and analysis.

The RECWAT System presently contains 1500 pertinent documents in the subject area of water-based recreation use planning and development. This system is now available as a service to investigators concerned with water-based recreation.

#### PROPOSAL

Other retrieval efforts (either computerized or manual) are being mounted around the country to give individual departments bibliographic control (a systematic process of monitoring, classification, documentation, and retrieval) over a very diverse multi- and interdisciplinary literature. Such control is a prerequisite foundation to departmental research programs. Unfortunately bibliographic control is fragmented since none of the systems are interrelated. Texas A & M has become involved in site planning and estuarine literature retrieval. Illinois has developed a keyword in context (KWIC) system dealing with play. They also have a very modest manual system in therapeutic recreation. Penn State's efforts in literature retrieval are well known. Other systems (that we don't know about) surely exist.

It is proposed that we support a nationwide organization of computerized bibliographic retrieval systems (under SPRE, NRPA or whatever). Existing retrieval systems are presently of prime value only to individuals, researchers, consultants, and otherwise and agencies immediately involved -- their potential for dealing with our nationwide information crisis is untapped. As a part of a nationwide information system, each individual document processing center would be of much wider service to the field of recreation.

Such a system would be similar in organization to the ERIC system supported by the U.S. Office of Education. This system breaks up education into about ten segments. Each segment is then contracted to an institution willing to seek or provide some support. The multi- and interdisciplinary literature dealing with leisure and recreation can be broken up in much the same way.

Some suggested areas of concentration --

- Urban Affairs and Recreation
- Public Park and Recreation Systems
- Water Recreation Resource Use, Planning, and Development
- Therapeutic Recreation
- Philosophy and Sociology of Leisure
- Outdoor Recreation Site Planning (Park Planning)
- Play
- Program Planning
- Outdoor Education
- Outdoor Recreation -- Regional and Statewide Planning

Recreation Law  
 Tourism  
 Recreation Resource Management  
 Recreation Economics

This is only a tentative listing as some of the above are not mutually exclusive. If there is to be overlap between areas of information, it must be acknowledged and reconciled if the monitoring process is to be worthwhile.

Most of the existing systems dealing with leisure and recreation are funded by extra-university agencies (mostly Federal monies). A sanctioning organization is needed to join these systems together to meaningfully achieve bibliographic control. Such a sanctioning organization would be responsible for:

1. Defining the topical areas of literature requiring systematic monitoring and bibliographic control.
2. Naming institutions as document processing centers or centers of competence based on their ability to attain substantial levels of financial and other support.
  - (a) Sanctioning organization must be confident that the department in question can get the job done.
  - (b) Such designation would enhance a department's ability to gain more research funds in their specialty area.
3. Publicizing the nationwide system of document processing centers so individuals and agencies can make the appropriate contacts and requests for bibliographic data.
4. Forwarding requests for information that might come to the central office to the appropriate center of competence.
5. Sharing in the financial support of each document processing center.
6. Replacing departments that lose their continuous support or have their support cut back to undesirable levels.
7. Holding internal conferences that focus on the computer methods and techniques involved to optimize the system's storage, search, and display capabilities.
8. Authorizing up-to-date printout bibliographies as needed to meet national needs.

Once bibliographic control is achieved at each of the member document processing centers, they should be encouraged to seek funding for developing a critical analysis of the body of knowledge involved. This shouldn't be a one-shot effort but should be updated periodically to

give direction to instruction, advisory services, and future research efforts.

If the current literature explosion is to be meaningful, an information system must be devised that is capable of classifying, storing, and displaying bibliographic notations by keyword descriptions. Such an effort must go beyond the literature published by recreation departments and agencies. It must begin to recognize that many disciplines and even people without formal disciplines and affiliations contribute meaningful literature to our instruction, service and research functions. Our system must be comprehensive and efficient enough to deal with these complexities.

#### DEFINITION OF RETRIEVAL TERMS

Bibliographic retrieval is an automatic process whereby a user is provided with a complete bibliography (each bibliographical notation is accompanied by assigned keywords and library location of the piece of literature) for each keyword he has designated in his search control statement.

Data base. A data base is a major information category of stored input data. In this study the data base consists of data (bibliographic notations, library locations, and assigned keywords) dealing with the recreational aspects of water resources use, planning, and development.

Data set. A data set is a sub-set of the data base.

Description of the data base. The data base description is a spatial record of the format of all documents being input into the document processing system. The format for each document in this data base is the same.

Document. Each document in this system consists of an assigned document number, title of the publication, author of the publication, publication date, library location and the assigned keywords.

File of documents. A file of documents is the equivalent of one data base or major information category of stored input data.

Information retrieval. Information retrieval is an automatic process whereby a user is provided with the complete text or abstracts of pieces of literature relating to specific keywords he has designated. Because of the extensive funding that is required to establish such a system, information retrieval is not seen as a viable department effort.

Input document processing. Input document processing encompassing the description of the data base (format description of the input data) and the initial processing of the input bibliographic data (in machine readable language on IBM cards and later disc pack) into a set of intermediate work data sets prior to the utilization of the system's search capacity.

Interdisciplinary research. Interdisciplinary research investigates concepts and methods transcending one discipline. Interdisciplinary implies problem orientation rather than discipline orientation. Interdisciplinary research involves an integration of concepts during the various stages of a research project. Interdisciplinary research is needed when, after careful consideration of a problem, there is a feeling of need from outside one's own discipline or profession.

Keyword descriptor. Keyword descriptors are alphameric terms that are assigned to pieces of literature suggesting the contextual meaning of the author. Keywords should be assigned which best anticipate the wording of a researcher's search query. Keyword descriptors may be either a single word or several words in length. The terms keyword descriptor and keyword are used interchangeably.

Literature retrieval. Literature retrieval is considered to be a manual process of identifying and gathering literature pertinent to the recreational aspects of water resources use, planning, and development.

Search control statement. The control statement activates the document processing search capability. It names the data base to be searched and the optional data sets (of that base) that will be involved in the search process. These statements cause the system to yield data relating to selected keywords.

Search program. A search program is a computer routine which interrogates the files of a data base in response to specifications spelled out in a search control statement developed by the system user.

Thesaurus. A thesaurus is a specialized vocabulary that is used for a control over a certain body of information.

## DESCRIPTIONS OF OPERATING SYSTEMS

University of Missouri (Charles Denney)

We have no funds budgeted for such a project so it has just been worked on sporadically over the past two years. After a review of several programs we decided to use a Keyword in Context (KWIC) program. We started out just trying to find a system to cross index the materials we had in our files and bookshelves.

We have been primarily concerned with what information we have available within our department. Since the department is only three years old, the University's library does not have much material related to our field, so we are trying to build up the library and inventory the personal libraries of our faculty members.

We have started using our graduate students to collect the data. Card information includes author, title and key words, publisher, date of publication, number of pages, etc.. We decided not to use an abstract because of the additional storage space required. A code is given each reference. The code gives the source of the hard copy, i.e., who owns it and where it is kept.

The only other card punching was for a list of stop or non-significant words. We had the option of either telling the computer which words we felt were significant or key words; or designating which words were meaningless. We decided not to use the key words option. If our list of key words did not appear in the title or words added to the title, the computer would never be able to feed that publication back to us. We may also have a user-code to designate if a publication were available for use only to faculty members or others.

Of the three print outs (author, bibliography, and KWIC), the most useful is the KWIC index which provides an alphabetical listing of key words as well as those words appearing next to it in context in the title.

University of Ottawa (Jean-Marc Beauchéane)

What we have done is similar to that of Missouri. With a small grant from the Youth and Recreation Branch of the Ontario Department of Education we pursued exploration of possibilities of mechanizing processes of indexing, storing, and documentation.

In the past six or eight months we have done two projects: (1) collection, classification and indexing of over 11,000 titles related to leisure and culture; and (2) a small project relating to audio-visual material on leisure which includes 4,000 entries indexed by nature of the document, source, publishers and distributors, cost, accessibility, etc.

We've experimented with different formats, explored multilanguage manipulations, tried various forms of keypunching operations to simplify and speed up the operation, introduced abstracting, and combined both a KWIC index and KWOC index procedure.

The biggest problem with any computerized system we may come up with is that of the use it receives compared with its cost. Since it is so expensive it is imperative that an elaborate multi-agency system be set up as a sort of clearinghouse.

We presently are encouraging input by special interest subgroups to make the system more comprehensive and therefore more widely usable.

The Pennsylvania State University (Betty van der Smissen)

Three or four years ago the Penn State Literature Retrieval Project was officially established. It was a coordinated effort by the University Library and the College of Health, Physical Education and Recreation. The Library provided professional consultative services and space within the Library to house the work of the Project. The College provided the services of a director and some graduate assistant help. Some initial equipment was purchased through use of research funds within the University.

The Project has two thrusts: (1) the preparation of bibliographical materials, and (2) the development of the technical process for retrieval and dissemination.

In addition to preparation of selected bibliographies for some very specific uses, major bibliographical work has been done on the following:

- (a) Bibliography of Theses and Dissertations Related to Recreation and Parks, Camping and Outdoor Education. This was an integration and up-dating of previous bibliographies compiled by Dr. van der Smissen (Recreation 1962, supplement 1965 published by NRA; Camping 1962, supplement 1965 published by ACA); the Bibliography has been published by the NRPA and is available for \$7.50. It includes approx. 3800 entries partially annotated, with index by institution and topic.
- (b) Bibliographical materials for the Penn State aspect of the State Comprehensive Recreation Plan. The major compilations included standards, urban social plans, and program resources with emphasis upon materials for special groups and for nature-oriented programs in the inner city.
- (c) Research related to Recreation and Aging. This was part of a Project under sponsorship of the NRPA and financed by the Office of Aging. Publication will be available from Penn State approx. June, 1971.
- (d) Compilation of research concerned with Outdoor Education evaluation. This compilation will be formatted into an Evaluation Monograph which will present an analysis and current status of research and evaluative studies concerned with environmental and outdoor education. Also expected to be available from Penn State approx. June, 1971.

A fund for publications has been established and it is hoped that a research monograph series will become a regular part of our Project.

The second thrust of our Project is the technical development of the retrieval and dissemination process. We are extremely fortunate to have an outstanding systems man in our Library and are working closely with him. For the direction of developments, see Mr. Rawlin's presentation beginning on page 4. At the present time, efforts are focused upon preparation of a Data Bank so that when the technical aspects are operational (hopefully spring, 1972), the substantive portion will also be ready to go. The form on the next page represents the nature of the information being accumulated for the Data Bank. On the backside of the form are written a Summary and Reviewer's Comments. A major concern is the development of universal descriptors and linkages so that we may tie together with others also working with retrieval and dissemination processes and systems.

INVESTIGATOR \_\_\_\_\_

(agency) \_\_\_\_\_

TITLE \_\_\_\_\_

PUBLISHING AGENCY \_\_\_\_\_

(address) \_\_\_\_\_

STUDY REVIEWED: \_\_\_\_\_

DESCRIPTION OF STUDY: \_\_\_\_\_

Statement of Problem (purpose, objectives) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Procedures--Sample (subjects, geographic coverage)

\_\_\_\_\_

Methodology, instruments, techniques \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date of Publication \_\_\_\_\_ Number of Pages \_\_\_\_\_

Purpose: Doctoral Dissertation \_\_\_\_\_ Masters Thesis \_\_\_\_\_  
 Speech \_\_\_\_\_ Article \_\_\_\_\_

Format: Bound \_\_\_\_\_ Paper \_\_\_\_\_ Spiral \_\_\_\_\_  
 Book \_\_\_\_\_ Back \_\_\_\_\_ Bound \_\_\_\_\_  
 In Periodical \_\_\_\_\_ Microform \_\_\_\_\_  
 Pamphlet \_\_\_\_\_ Monograph \_\_\_\_\_

Print: Multilith \_\_\_\_\_ Mimeograph \_\_\_\_\_

Availability: Call \_\_\_\_\_  
 Pattee Library \_\_\_\_\_ Call Number \_\_\_\_\_  
 Interlibrary loan \_\_\_\_\_  
 Lawther Reading Room \_\_\_\_\_  
 Faculty \_\_\_\_\_  
 Other \_\_\_\_\_

Recommend ordering \_\_\_\_\_ Cost \$ \_\_\_\_\_  
 Free \_\_\_\_\_

DESCRIPTOR WORDS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Geographic Source of Information \_\_\_\_\_

Verified \_\_\_\_\_

The Pennsylvania State University (Computation Center) Kenneth D. Frandsen

The following was stated in response to a question as to how much cost is involved in getting into storage systems.

You must first decide (1) do you want material that is rapidly accessible, or (2) do you want material that can be permanently stored and for which you are willing to sacrifice some of the accessibility.

Rapid accessibility requires something like a random access disc which costs considerably more than magnetic tapes or cards which can be stored permanently but which are not readily accessible.

KWIC 360 is capable of producing a standing side head index and the name of a document that contains that word or a description which matches that word, as well as the wrap around kind of index. Titles are notoriously poor indicators of document content. Any of these kinds of indexes can be produced in a single run or for storage later on so you can merge new information with them.

Currently the KWIC 360 arranges the bibliographic output according to the document reference number. The user can also specify how many characters to the left or right he wishes to have printed in the output with the wrap-around title index.

The Go-Word feature of the KWIC index enables users to create a list of Go-Words which permit selective dissemination, or a "demand" bibliography for a particular individual.

Text Pac has advanced capabilities for retrospective research and maintaining a profile for a user based on specific key words in which he is interested. A consistent finding in studies of information retrieval and of the most sophisticated information disseminating systems is that approximately one out of every two documents indicated are irrelevant to the user. However, the problem may well be attributed to a change in the user's criteria of relevance.

The problem of developing an omission list or stop word list is a very critical one. KWIC 360 allows you to set up a stop word facility simply on the basis of number of characters in a word -- but you run the risk of losing some very relevant short words.

The secondary stop-word feature permits you to make exclusions in a manner parallel to the 60 word but in a negative context; you can request printing of everything but those titles with words corresponding to the secondary stop words. But the KWIC 360 in its present form does not allow using the secondary stop-words and go-words at the same time.

University of Illinois, Urbana-Champaign<sup>1</sup> (Shirley Tewes)

The Motor Performance and Play Research Laboratory, where I work as information scientist, is the research arm under the Department of Recreation and Park Administration of the University of Illinois. First, I will discuss the Motor Performance and Play Research Laboratory: what it is, how the researchers are meeting their information problems and our very exciting plans for next year. Then, I will discuss the projects that have been undertaken by the Department in the last five years under Dr. Sabora.

The MPPRL was established in 1966 to study the motor and play behavior of exceptional and normal children. Since then, the research program has become directed more towards the study of activity patterns in free range children supported by the Illinois State Department of Mental Health, and the social elements within the play situation. The latter is supported by the ongoing funds provided by NIMH.

Research in children's play as carried out in the Lab has been in two directions. The first involving methodology: that is, how do we "measure" play. The second on how do children play. The emphasis has been on basic research. Although children's play is an area in which most people would feel competent, the body of empirical research is very small. Child development experts and psychologists working with animals have been theorizing for many years, but it is only within the last few years with the aid of advanced technology, that we are getting results with actual children.

#### INFORMATION PROBLEM

Russia and France both have national central clearinghouses to receive and disseminate information but the American researcher is not that fortunate. If he was, our information problem would be easier to solve. When the Lab came into existence four years ago, it became immediately obvious that retrieving information was going to pose a serious problem to the researchers. The very nature of research that crosses the boundaries of the traditional disciplines to examine complex problems demands the collection and synthesis of information from a multiplicity of sources.

The problem was rooted in the proliferation of information in our subject area as well as the multiplicity of interests represented by the staff. Research on motor and play behavior of children is diffused through such disciplines as child development, industrial engineering, physiology, special education, psychology, recreation, etc.

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<sup>1</sup> This investigation was supported in part by a research grant to the Motor Performance Laboratory via the Adler Zone Center by the Department of Mental Health of the State of Illinois and by United States Public Health Research Grant No. NB-07346 from the National Institute of Mental Health.

The Lab's first action to solve the information problem was to hire a half-time librarian. Another solution to the retrieval problem has been to build a Keyword-in-Context (KWIC) index. 7,000 titles published between the years 1956 and 1966 were collected from a large variety of sources such as Psych. Abstracts, Index Medicus and other bibliographies. Foreign citations were included. These were screened according to a policy on potential interest. The KWIC index took 2½ years and roughly \$14,000 to complete. It consists of a computer print-out in three parts: master index which gives the complete citation, the author index and the KWIC index which alphabetizes the words in the titles of the citations. In connection with this, a play bibliography was also produced which is still available.

The Motor Performance Information Center has a wide variety of materials such as periodicals, microfiche, microfilm, technical reports, reprints and books. The government, as you know, has found microfiche to be the cheapest method of disseminating R & D reports. In choosing library materials the emphasis is on current interest to a particular research project and quality. A large part of my time is spent in consultation with the staff and conducting a current awareness service. They come to me with such questions as: who else is working in this area: Where can I get this government report? Where is this master's thesis? The foregoing gives you an idea of how the Lab is functioning now.

#### R & D CENTER

Our plans for next year are exciting! The Bureau for the Handicapped at the Office of Education has our proposal to establish an R & D Center for the study of recreation for the handicapped child. If we are funded, the Center will begin operation February 1971. The Center will be established as an interdisciplinary team of workers assigned to three main programs of activity. The dissemination program will be concerned with bridging the gap between research and practice by a staff of research utilization specialists and a journalist communicator. A Criterion Reference Testing Program will be concerned with developing and demonstrating a method of program evaluation that will lead to improved practice and the identification of critical research questions. The Research Program will contribute to the body of knowledge and be responsible for the synthesis and interpretation of findings via the Dissemination Program. A small project to develop and demonstrate strategies for the integration of handicapped children into community organized camp and recreation programs will be added during the second year of operation.

This R & D proposal numbers some 134 pages, so it won't be covered in detail. I just want to give you some of its flavor, particularly the Dissemination Program. The Dissemination Program will attempt to set up a two-way communication between the researcher and the practitioner. We want to give the results of research to the practitioner in everyday language so that he can adopt and utilize them in his everyday work. We want the practitioner to communicate to us his problem areas so that we are not just superimposing solutions on his problems.

To monitor and implement this two-way communication process, we believe that a human linkage agent is necessary. This concept lead early to the county agents of the Cooperative Extension Service of the Department of Agriculture and more recently to the appointment of Research Utilization Specialists within nine different states. This latter project is being funded by the Social and Rehabilitation Service of HEW. The program began about in the summer of 1969. The Office of Manpower Policy, Evaluation and Research of the Department of Labor also uses Research Utilization Specialists (RUS).

It is recognized that the RUS's have a difficult task in that resistance to attempts to change and upgrade programs depends on a number of factors that are often subjective. Logic and enthusiasm are often not enough. Therefore, we propose to identify key practitioners or opinion leaders who are identifiably influential and open to change. We were going to call these people, gatekeepers, which is a term coined by Allen at MIT, but we found that gatekeeper has a bad connotation at some state hospitals. So, for the present we are referring to them as opinion leaders. We have already been able to identify many of the opinion leaders among the practitioners of Illinois. Our RUS's will contact them personally and enlist their cooperation. Besides on-site visits, their ways will be paid to workshops at the R & D Center. The RUS's will also be readily available to the practitioners by telephone. Demonstrations will be held on the practitioner's home ground. Because the practitioner we are working with does have a reputation and influence among his colleagues, as he uses research results to change his programs, he in turn, will be acting as a RUS.

When we started investigating methods of disseminating information we thought about the traditional means of publishing journals, and abstracts but the more I searched, the more I found that these methods were not as effective or heavily relied upon as previously thought. In almost every field, informal communication accounts for more new ideas than formal communication, i.e., the literature. In a presentation at the Johns Hopkins University Conference on Communication Among Scientists and Technologists held last October, Allen reported that only 11 percent of all ideas on research and development projects came from the literature. This included unpublished as well as published materials.

We all know from our own experience that the informal discussions in the halls or hotel rooms at large conferences can be much more profitable than the formal speech going on in the conference room. Information scientists who are conducting research studies on how researchers and technologists get their information have found that information flow is basically between people, not subjects. Price reported this at that same conference in October. And so, we are on firm research ground to base our dissemination program primarily on informal communication patterns. We are, however, going to have one written communication. This will be a newsletter and will be published by our journalist communicator. Roberts has found that "about 2 to 4½ years elapse between initiation of a research report and its publication in a journal or in conference proceedings. Approximately 1½ years after this, a little over 50 percent of the

items have been covered in secondary publication." This project will shorten the time lag between completion of the research report and its publication in a secondary format. The communicator will interpret the R & D Center's research findings and translate them into a language free of scientific jargon. By doing this, we hope that a major barrier blocking practical implementation will be effectively eliminated.

We hope to publicize the program within our target states through television interviews, taped radio talks and newspapers. Our target area for the first year will be Illinois. In the second year, coverage will be extended to Indiana, Wisconsin, Missouri, Kentucky, and Iowa.

That's what the research arm is doing, now for the recreation department itself. Dr. Sapora, who is head of the Department of Recreation and Park Administration at Illinois, has long been aware of the need for some control of information in the field of recreation. There have been several projects involving information control at the University of Illinois, Champaign-Urbana campus.

One of the early projects was a pilot model index to the literature of leisure, recreation and parks. Dr. Sapora developed this with the aid of Mary Vance, who is the city planning librarian at Illinois. It was an effort to develop a subject heading list, a proposed format for a quarterly index showing specifically how the entries would be arranged and suggested list of source materials to be examined. It covered the year 1964 and was published in June of 1965. They identified 130 sources, i.e., periodicals, indexes and abstracts that should be checked for articles and book reviews. Their subject heading list was based on Library of Congress with the addition of more current or precise terms as they were needed. Their list contains 500 terms. The publication has an author and association index. Each citation is numbered and the arrangement is alphabetical by subject. Ample cross referencing is provided. 500 copies were run off by NRA. Dr. Betty van der Smissen was instrumental in getting NRA to fund this part of the project.

This was a tremendous undertaking and was the product of only one semester's work. Mary Vance and the graduate students she worked with put in many long hours developing this pilot model. Unfortunately, no further funding was available at that time.

In September of 1969, a graduate student was hired to search information sources generally outside our field but known from this previous investigation to include relevant information. The recreation staff has been invited to contribute references. In this way, a series of bibliographies has been generated. But the student is only part-time and so this is a small but nevertheless valuable project.

Our physical education librarian has a special card catalog indexing all games and sports to be found in her library. This allows quick access when a particular game is desired.

Dan Kennedy has developed a bibliography in therapeutic recreation, consisting of over 1000 references. Anyone is welcome to send to him and ask for all the citations on a particular subject. He will provide the citation only, not the item itself. It is basically the McBee Keysort method in which you assign a particular category or activity a number which is punched out. A spindle is inserted into the appropriate hole and all the cards on that subject drop out. It has one distinct advantage in that new addition cards need not be filed in any systematic order. It can be easily computerized by keyword indexing.

Bob Ditton's Ph.D. thesis on water resources was considerably more energetic undertaking. He will report on this but remember that it was done at the University of Illinois.

This has been a brief report on the status of information retrieval in recreation at the University of Illinois. These efforts are at best, only rudimentary. We recognize the need for a larger, cooperative effort in the field.

#### References

- Allen, T. Roles in technical communication networks. Presentation to John Hopkins University Conference on Communication Among Scientists and Technologists, Oct. 1969.
- Price, D. Some suggestions for the quantification of "scholarliness" and "hardness and softness" of scientific communication at the research front. Presentation to John Hopkins University Conference on Communication Among Scientists and Technologists, Oct. 1969.
- Roberts, A. The system of communication in the language sciences: present and future. Washington, D.C.: Center for Applied Linguistics, 1969.

Water Resources Scientific Information Center<sup>1</sup> (Logan O. Cowgill)

Origin. The Water Resources Scientific Information Center (WRSIC) traces its origin to the Water Resources Research Act of 1964 which created the Office of Water Resources Research (OWRR). The Center was formally established by the Secretary of the Interior on January 25, 1966. In December of that year the Federal Council for Science and Technology designated WRSIC as the national center for scientific and technical information in water resources.

Objective. WRSIC seeks to disseminate scientific and technical information to the national water resources community through:

- abstracting journal
- published indexes
- catalogs of active research projects
- topical bibliographies
- state-of-the-art reviews
- retrospective searching of information base

Operating Policy. The guiding principle is the use of existing research resources and competencies of Federal agencies, universities, and other organizations, including the major information and documentation services, as sources of processed information. All input is made machine-readable for the continuing job of searching, retrieval, and composition by computer, as well as to permit taking advantage of the advances in information handling, and toward integration into evolving national systems for information transfer.

Sources of Information Input. Input from published literature is derived from three principal sources:

- Universities with active research programs in water resources, either through direct arrangement with OWRR or indirectly through other Interior agencies supporting university research
- State water resources research institutes, and contractors and grantees of OWRR reporting on supported research projects
- Federal agencies with water-related research programs, through exchange agreements with OWRR

A directory of these sources appears in each issue of Selected Water Resources Abstracts. Input on current research is collected from principal investigators by the Science Information Exchange, Smithsonian Institution, which assembles data on active research projects.

Publications. There are four regularly published publications and several which are issued irregularly.

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<sup>1</sup> From information brochure "Water Resources Scientific Information Center"

#### 1. Selected Water Resources Abstracts

- published twice a month
- each issue has an abstract section (500 abstracts average), subject index, author index, organizational index, and accession number index
- official use subscriptions available to Federal agencies and their grantees in water resources on application to the Manager; paid subscriptions available at \$22 a year (\$27.50 foreign mailing) from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

#### 2. Selected Water Resources Abstracts - Annual Cumulated Indexes

- published once a year in January
- cumulative indexes from semimonthly issues
- supplied automatically as part of subscription to Selected Water Resources Abstracts

#### 3. Water Resources Research Catalog

- compiled annually through an arrangement with SIE
- lists active research projects on file at SIE
- available from Superintendent of Documents, U.S. Gov't Printing Office, Washington, D.C. 20402. Price varies from year to year

#### 4. Research Reports

- issued quarterly on fiscal year basis
- intended primarily for individuals and organizations directly associated with OWRR programs
- reports of research supported by Office of Water Resources Research under the Water Resources Act of 1964

Topical bibliographies, special indexes, and state-of-the-art reviews are published irregularly as demands and needs dictate.

Services. Three primary areas of services are:

1. Processing inquiries on existence, location, and availability of documents in the field of water resources.
2. Computer-searching of information base on any one, combination of several, or all data elements making up the abstract records, upon negotiated agreement with Federal agencies and their grantees in water resources.
3. Supporting studies towards compatibility and convertibility standards in information processing, and identifying and meeting the current and changing needs of users for information.

Bureau of Outdoor Recreation (Neil J. Stout)

Almost immediately following the establishment of the Division of Research and Education in the Bureau of Outdoor Recreation in 1963, the need for a system for monitoring on-going research efforts and for keeping abreast of the published scientific and technical outdoor recreation and leisure literature was recognized. Administrative approval of a program was forthcoming in 1964; however, budget problems prevented the start of the literature-retrieval projects until 1966. That year, two separate but interrelated projects were begun. These were the production of the Index to Selected Outdoor Recreation Literature and the Catalog of Outdoor Recreation Research. These activities were deemed an essential part of BOR's organic authority to "Assemble information concerning outdoor recreation, directly or by contract, or cooperative agreement; and disseminate such information" and, indirectly as part of its authority to conduct, coordinate and stimulate research.

The Index project was initially carried out in cooperation with the Interior Library under a transfer of funds arrangement. Some of the many steps necessary to the launching of the Index to Selected Outdoor Recreation Literature were: (1) development of working arrangements with the Library; (2) assist in the recruitment of professional librarians to head up the documentation aspects; (3) select and order subscriptions to the prime source materials to be scanned; (4) develop guidelines for abstract writing; (5) develop guidelines for consistent citations in accordance with accepted Library of Congress standards; (6) develop at least the beginning of a thesaurus of keywords; (7) arrange for cooperation with the Canadian Department of Indian Affairs and Northern Development.

The use of keywords taken from the thesaurus to identify subject content of articles and reports as well as many other features were planned so the information might later be stored in and retrieved from a computerized information bank. During 1967 and 1968, the Index was published and distributed by the Bureau and GPO to an eager audience of researchers, students, planners, and related professionals. Budget troubles began in 1968, and have continued since with the effect of gradually reducing the money and manpower which BOR could devote to this Project. First, the arrangement with the Library was terminated; then the BOR staff capability was progressively reduced through failure to refill positions vacated and provide funds for temporary assistance.

Concurrently, a cooperative project with the Science Information Exchange of the Smithsonian Institution has resulted in periodic compilations of on-going research summaries, three of which have been published in the form of Catalogs of Outdoor Recreation Research. This project is continuing and the scope has been expanded to include outdoor recreation research investigations emphasizing environmental quality of recreation lands and waters. The catalogs produced have served as useful references for researchers, writers, planners and students who need information on what research is being conducted where and by whom.

With regard to the continuation of something similar to the reference tool The Index to Selected Outdoor Recreation Literature, the Bureau is willing to consider seriously becoming part of a cooperative arrangement involving a number of centers which will each take a share of the review responsibilities of the scientific and technical published literature. The existence of a newly published Thesaurus of Outdoor Recreation Terms should be of help in coordinating the total program.

Office of Library Services, U.S. Dept. of the Interior (Signe M. Larson)

The Office offers two information services:

- (1) Monthly abstracting bulletin: Population Trends and Environmental Policy. Publications are selected from a policy-making viewpoint; only those that offer constructive information. The U.S. Government Printing Office prints 150 copies and one-half go to government agencies and officials, the other half to the clearinghouse for Federal Scientific and Technical Information where it is placed on sale at a subscription price of \$8/year.
- (2) The second information service is the Environmental Awareness Reading List (EARL), published for the Department of the Interior and tailored for the N.P.S. It lists outstanding journal articles, reports, speeches in the field of ecology. Also offers opportunity for copies of articles to be secured on request. Initial distribution was 200 copies but is presently up to 650.

The Library also has a regular bibliographic series that reflects all the interests of the Department of the Interior.

Southern Baptist Convention (Adelle Carlson)

We use DATA-DEX which is similar to several of the systems used by other groups. This is a key word index of the study, research, program design, field services, and management resources, documents and relevant materials found in collection in Dargan-Carver Library (the resource, historical, and research library for Southern Baptists). A Request/Transmittal form must have the document title, author (if available), issue date, and source code (if any). If approved for publication in DATA-DEX each document is assigned a control number. The Systems Staff has the responsibility to key punch and verify information. The Systems Staff working with the bibliography researcher (Dargan-Carver Library) prepares a monthly DATA-DEX print-out in triplicate of new storage of information. A complete print-out is planned for quarterly.

Awareness of research storage and retrieval is important. Every new employee, as part of his orientation, is introduced to the research personnel in the Library and alerted to the research materials and assistance available. Present computer capability, use of microfilm, and microfiche with print-out are explained and demonstrated when possible. This encourages a broader use of the research facilities and materials.

AAHPER (Don Hawkins)

We have three major concerns:

- (a) Health, dance, sport, physical education, and safety aspects of recreation.
- (b) Leisure and education.
- (c) Education related to man and his environment and also integration of (a), (b), and (c) substance with all other information resources which relate to leisure and the leisure environment.

Our present efforts focus on (1) our yearly document, Completed Research in Health, Physical Education and Recreation, (2) annual, ten-year, and periodic cumulative indices of the Research Quarterly, (3) cooperation with the Office of Education on a nomenclature study -- standardized terminology in the education profession, (4) International Health, Physical Education, Sports and Recreation abstracts, (5) contribution to ERIC clearinghouse in special education, and (6) ERIC clearinghouse on rural education, which retrieves and disseminates information about Outdoor Education.

We have a variety of dissemination resources -- 20 newsletters, periodicals, Research Quarterly, JOHPER, Kinesiology Review, School Health Review, and others.

Our research interpretive efforts include the Committee on Evaluative Concepts and Practices, the "What Research Says" series, monographs, etc.

Projects that are planned or presently underway include:

1. ERIC clearinghouse for HPER.
2. Study conference on information systems relating to HPER to be undertaken jointly with American College of Sports Medicine and the National Library of Medicine.
3. Something similar to Science Information Exchange for research in progress.
4. Checking out exploratory studies in cooperation with private industry.
5. Beginning of studies on user needs of professionals. Trying to identify questionable practices and concepts as perceived by the user professional, aimed at development of information packages.
6. Comparing all of our own (AAHPER) information diffusion processes, particularly in regard to effectiveness.
7. Developing a new dissemination resource, a quarterly professional journal on leisure and education.

CONSULTATION OVERVIEW  
CONCERNS AND DIRECTIONS FOR THE FUTURE

summarized by

Betty van der Smissen

The Body of Literature

There is a tremendous body of literature to be retrieved on behalf of the recreation and parks field. This literature relates to both the basic and integrated disciplines. It may not be labeled "recreation," "parks," or "leisure," literature; therefore, it must be searched and pertinent elements identified. The identification should be keyed to descriptors of an universal nature; thus, literature access via a thesaurus is essential. There should be not only universal descriptors but also descriptors with specialized identifiers for different aspects as carried on by the various retrieval centers. The descriptors will be ultimately refined by use in relation to policy, management, and research functions within the field. The search and identification process with application of descriptors must be subject to bibliographic control to assure quality and consistency. (See chart on page 37)

The definition and division of the scope of the literature also deserves attention, for this will be a concern both of an immediate and long range program of literature retrieval. This aspect will ultimately delimit any information system which may be developed. Several possible divisions of the substantive matter were discussed: (1) by service provided; (2) by area of interest; (3) by the subject interest of professional organizations and their branches; (4) by traditional discipline boundaries within colleges and universities; and (5) by divisions as reflected in organizational charts of the federal government. A matrix based upon the traditional discipline boundaries was developed as a heuristic exercise to illustrate one possible approach to the dilemma, and a portion of it appears on the next page.

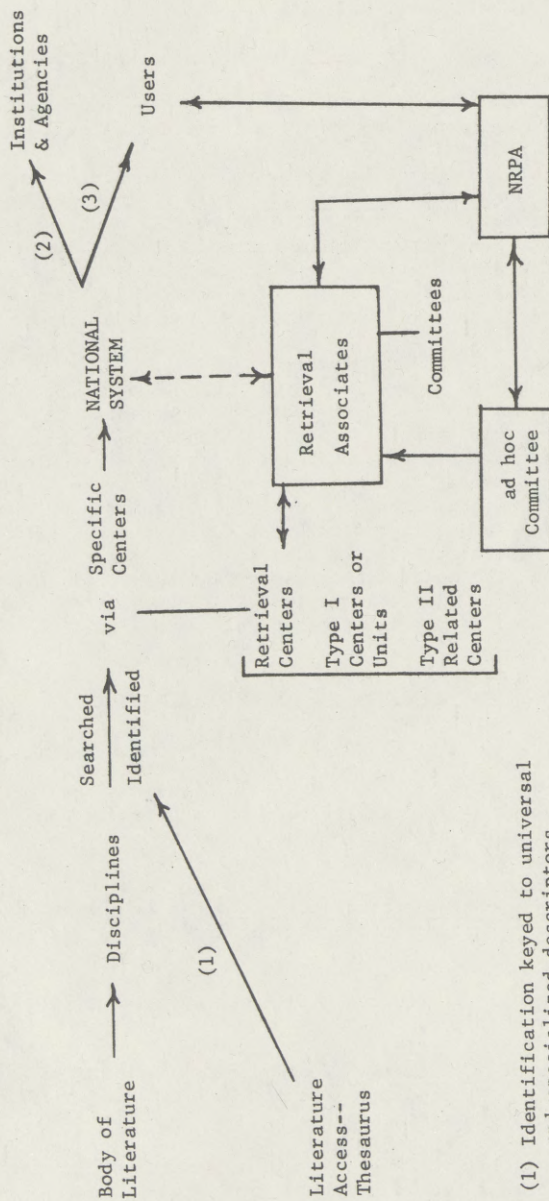
National Retrieval-Dissemination Organization (See chart, page 37)

No one retrieval center can cover the entire field; rather, the nature of centers is that each will focus upon some specific aspect. There are two basic types of centers. Type I centers or units include such operations as related to motor performance, play and children's therapy (University of Illinois now has such a center); water-based recreation (the University of Wisconsin at Green Bay has been working on this); leisure, education, aging, etc. There are others now in existence. While Type I centers focus with some specificity upon recreation as a primary concern, Type II centers essentially are concerned with a related aspect of which recreation is only a part. These might include such aspects as regional and urban planning, water resources, camp law, etc.



PRELIMINARY CHART

NATIONAL RETRIEVAL-DISSEMINATION ORGANIZATION



- (1) Identification keyed to universal and specialized descriptors
- (2) Hook-ins and facsimiles dissemination via
- (3) dissemination via bibliographic forms, including direct printouts

The individual centers or units may be funded by the sponsoring agency resources or by outside funding agencies, institutions, foundations, etc. Each center usually will have its own dissemination process.

It is not possible, with the field as diverse as it is, to have potential users know of all sources of literature or to utilize effectively many centers. It was deemed appropriate, therefore, to have a National System to undertake coordinative functions as well as operational ones. The National System would have the various centers feed in retrieved literature identified by appropriate descriptors. Institutions and agencies undertaking research would also contribute their bibliographic materials. The National System would then assimilate the information and make it available, perhaps through computer technology. Dissemination would be of two principal types: (1) hook-ins and facsimilies to institutions and agencies subscribing to the System's services, and (2) through bibliographic forms to users, including direct printouts. A National System would be operated by an institution or agency as an autonomous activity of that institution or agency.

Referring again to the chart, Retrieval Associates is a proposed organization to provide overall policy guidelines and coordination channels. It might be composed of center and executive personnel associated with retrieval. Its specific functions could include: (1) accuracy control, (2) definition of areas for centers, (3) action on applications for membership, (4) sponsoring of internal conferences on technical aspects of the retrieval process related to the overall system, and (5) decisions regarding the decay rate of information. Committees could focus upon aspects such as the development and maintenance of descriptors and the compatibility and up-dating of technical processing.

#### Implementation -- Recommendations and Interim Organization

The following are recommendations suggested by the participants at the Consultation:

- (1) The development of informal methods for continuing communication among Consultation participants and others who are interested must be devised.
- (2) Implications of the current funding pattern as related both to substantive centers and national coordinating systems should be assessed.
- (3) User needs should be studied, and a statement reflecting the results circulated.
- (4) The development of a thesaurus of primary descriptors, and the encouragement of technological compatibility among existing systems should be initiated.
- (5) The development of criteria for the management of input into any future network or system should be initiated.

Given the situation just described, the Consultation agreed it must be concerned with both the immediate future as well as the formation of structures which can deal with long range information requirements. An interim organization was felt to be urgently needed to perform planning and coordination now; therefore, the Consultation participants joined informally to organize an Ad Hoc National Recreation and Park Literature Retrieval Committee to (1) identify potential members, and (2) propose a temporary structure for organization. A Steering Committee representing government, university and professional organization segments of the Ad Hoc Committee was designated to lead efforts on behalf of the full committee. In order to better describe the intention of the group, the acronym REALISE was adopted meaning Recreation, Environment, And Leisure Information Systems Exchange.

The National Recreation and Park Association, in its unique role as the primary organization related to the total field, will serve as overall coordinator of REALISE. It will assist with information dissemination, provide publicity to potential users regarding services available, and forward inquiries to the appropriate existing information centers. Further, NRPA will serve as the executive secretary of REALISE, and endeavor to implement the acquisition of funds for the planning and development stage of the program. For current information regarding REALISE, write to Dr. Diana Dunn, Director of Research, NRPA.

## RECREATION AND PARKS LITERATURE RETRIEVAL CONSULTATION

May 3-5, 1970

The Pennsylvania State University  
University Park, Pennsylvania

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SECTION II

RECREATION, ENVIRONMENT AND LEISURE INFORMATION  
SYSTEMS EXCHANGE SESSION

September 30, 1970

National Recreation and Park Congress  
Philadelphia, Pennsylvania

## INTRODUCTION

In order to expand awareness of the efforts of the Ad Hoc National Recreation and Park Literature Retrieval Committee (composed of participants at the May Consultation), a session was held at the National Recreation and Park Congress. The REALISE session was held on September 30, 1970 in Philadelphia, and was conducted by the Steering Committee members. Betty van der Smissen opened the session by presenting a history and framework based upon the May Consultation proceedings and interim meetings and efforts by the Steering Committee (see final paper in the preceding section for details).

Following papers by Stout, Brunet and Bury, opportunity was given for an open exchange by session attendees.

## PRACTICAL APPLICATIONS OF REALISE

by Neil J. Stout

Many of the kinds of uses that a joint and coordinated system of recreation, environment and leisure information exchange could satisfy have already been mentioned today. Those of us connected with Federal Government sometimes believe that every person seeking information on a recreation research topic or having related technical information needs writes to us. I am reasonably certain that the Bureau of Outdoor Recreation is just one agency among many that are ordinarily contacted. Indeed, many of you share in the responsibility of helping requestors with information. Our requests for information of all sorts averages, just for the Washington Offices of the Bureau, about 25,000 items per year. Many such requests for general information result from press releases or write-ups in popular magazines. There seems to be, however, a continually growing number of serious investigators seeking the latest in research findings, reports and technical articles. In short, qualified researchers need and rightfully expect us to help provide reliable information to guide decisions or to strengthen a research proposal, or to serve as background information for a special study. Today, such information seekers are forced to use a shotgun approach and even then to settle for a fraction of the existing knowledge on a given subject because such knowledge is scattered, fragmented and elusive. Many of you have probably had the disappointing experience of reviewing a research proposal which is aimed at remedying a serious problem or providing valuable new information in a field of investigation only to learn that, despite diligent efforts on the part of the investigator, some very significant published materials were overlooked in his literature search.

I believe that the hidden costs of not having a central computerized information storage center are far greater than realized. The problem of incomplete literature searches is just one example. Who knows how much is presently invested by the information requestors who first have their

research teams and other staff dig into local sources, following which messages asking for help are sent out to a multitude of service groups and information sources. I will speculate from observations and personal experience that between the time a research project is just an idea and the time it emerges as a completed research report (this involves searching the literature during the proposal development stage, reviewer's suggestions tracked down and essential follow through with the literature during the data collection and report writing phases) at least 25 per cent of the investigator's time is spent in quest of reference information, background and related data. In addition to being enormously time consuming, the present process is often inefficient and unrewarding, insofar as searches go. This means that in a National combined effort involving the estimated total expenditure of \$20,000,000 for recreation, leisure and associated environmental research, at least \$5 million is now devoted to background studies and search for related information.

The inadequacy of standard library approaches and systems toward overcoming the problems of technical information dissemination has been recognized by leading scientific groups for more than a decade. The Committee on Scientific and Technical Information (acronym COSATI) of the Federal Council for Science and Technology, in assessing the situation in the early 1960's stated that those agencies of government supporting programs of research and development have an obligation to improve the dissemination of scientific information to assure more efficient use of research dollars. Positive steps have been taken in many cases. One hundred nineteen Federally supported information analysis centers are described in the January 1970, Directory published by COSATI. Incidentally COSATI defines An Information Analysis Center as "a formally structured organizational unit specifically (but not necessarily exclusively) established for the purpose of acquiring, selecting, storing, retrieving, evaluating, analyzing, and synthesizing a body of information and/or data in a clearly defined specialized field or pertaining to a specific mission with the intent of compiling, digesting, repackaging, or otherwise organizing and presenting pertinent information and data in a form most authoritative, timely, and useful to a society of peers and management." The Federally supported recreation and leisure research activities appear to be so fragmented and disorganized that no single agency to-date could muster the support necessary to deal with the problem. Several prominent speakers at the National Conference on Recreation Research held at the University of Michigan in May 1963, cited the need for action and some even went so far as suggesting that the then newly created Bureau of Outdoor Recreation was the logical mechanism for a coordinated attack on the problem. History has shown that our Bureau grossly underestimated the size of the job trying to keep up with the explosion of outdoor recreation literature that has occurred. Our funds and manpower were inadequate at the onset and grew progressively worse over time. We are now convinced that the task is of such magnitude and importance that the solution lies only in the combined mobilization of everybody that has a stake in the results.

Before I identify some of the many practical applications of "REALISE," I would like to suggest a careful appraisal of the size of the community of users and an evaluation of the areas of prime interest to be

served by such an information exchange. I think the program's objective, stated simply, is to be able to let people know in a timely fashion what information exists in their areas of specialization.

Current awareness information programs and retrospective searches all are aimed at satisfying the user's need for information. The "information requirement" therefore becomes a fundamental factor. Frequently the user does not know exactly what information to look for, thus he must begin by browsing. Even when he does know what to look for, he may not know that the possibility exists for him to get what he needs from sources available. My experience with a few of the computerized retrieval operations has shown that a common language between the researcher-abstract writer-reviewer group (input to the data bank) on the one hand and the user-would be researcher-seeker of information group on the other hand is absolutely vital. The choice of keywords used in describing the document requires that the broad range of users and user interests be kept in mind. This is extremely important for it can mean success or failure for the person who interrogates the system. Even though a lot of technical and research report writing is aimed, quite appropriately, at the intelligent layman audience, I believe an information exchange program has to be geared to the scientific—professional-managerial level of user.

Here are a few of the types of applications which we consider significant enough to make frequent use of a central information bank. The research project proposal development and research proposal reviews, though already mentioned, bear repeating because of the absolutely essential requirement that all pertinent and current information is utilized. The more readily available such research findings are, the better the chances are for increasing our knowledge through investigative efforts. Research coordination surely depends upon knowledge of recent and on-going studies.

Administrative actions and decisions require quick answers—"instant information" as it is often called. Over time, the lack of an existing sure-fire information source has frustrated administrators. I believe the failure of conventional library methods and techniques to provide quick information in our field has had a lasting detrimental effect on the implementation of a functional computerized set-up. One cannot but agree with the administrator's complaint that current methods require a disproportionately large search time when compared to the quantity and quality of solid, useful intelligence derived. The administrator wants "the facts in a hurry."

Recreation area planners often need many different kinds of up-to-date information but they too, it seems, have developed a reluctance to struggling with the traditional cumbersome sources. Our Bureau's staff involved in special area studies are continually seeking new and useful information.

The field of recreation legislation has information requirements that are both extremely important and often demand retrospective searches to turn up historical intelligence. Budgeting and program planning, though

frequently relying on numerical data to a heavy extent, needs substantive background information and guideline types of research information.

Academic programs, often combining research and investigative efforts at the graduate level, have a continuing requirement for up-to-date information. These are but a few illustrations of what I think are applications aplenty for a centralized information network.

PROJECT CIDOL  
(International Center for Documentation in Leisure)

by

Lisa Brunet  
Documentalist, CIDOL

HISTORY

This project of an automated documentation system in leisure and popular culture has been set up by the Research Committee on Leisure and Popular Culture, member of the International Sociological Association<sup>1</sup> (referred to later as the Research Committee on Leisure).

Since its foundation in 1956, the Research Committee on Leisure has always considered the objective of documentation as its principal task. After a few bibliographic compilations, efforts of classification and revisions of sections dealing with leisure and popular culture in other projects for documentation in the social sciences, the Committee prepared a multilingual bibliography on the Sociology of Leisure. That document, published in 1968 with the assistance of UNESCO in the serial "Sociologie Contemporaine-Current Sociology," presented a retrospective annotated bibliography (1945-65), together with an analysis of the current trends in the area of research.

The publication of that bibliographic inventory, the most important up to that time, while providing searchers with an idea of the importance and wealth of the documentary production in the Sociology of Leisure, demonstrated at the same time the immensity of the problems of storing, retrieving and disseminating information. Moreover, while this publication could be of some help to searchers, it could not suffice to bring an answer to the documentation needs of searchers in other branches of the social sciences.

In pursuance of these considerations, a special meeting was held in November 1969, at the European Centre for Leisure and Education in Prague, to examine the possibilities of organizing the documentation in the field of leisure more systematically. Here, for the first time, a proposal for a specialized thesaurus on leisure and adult education, was presented and discussed. The need for an automated system, using computers, was also pointed out and a first list of descriptors was duly prepared.

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<sup>1</sup>The Secretariat of this Committee, based in Montreal since 1969, is under the responsibility of Marc Laplante.

In the meantime, the Secretariat of the Research Committee on Leisure was beginning to be organized in Montreal and an action program was being prepared for its first year of operation. Documentation was given top priority. A qualified documentalist, Mrs. Lise BRUNET, began, from October 1969, to assemble American and European efforts and experiments in documentation on leisure. Mrs. Claire GUINCHAT, who spent a month in Montreal to work with Mrs. Brunet, contributed her experience to the Secretariat and helped to establish contacts and initiate consultations with searchers and documentation specialists from all over the world. In February 1970, at the annual meeting of the twelve member-countries affiliated to the Research Committee on Leisure, the General Secretary was mandated to develop a project for an international information system for the social science of leisure.

In June 1970, the General Secretary drew up in cooperation with Mrs. Guinchat and Brunet the first outline of the project described following.

#### OBJECTIVES

The aim of the project, when completed, is to have a ready information system which would permit rapid access to any study, survey, statistics, bibliography etc. existing in the world in the field of leisure and culture. The service will be designed for the use of searchers, professors and research workers, practitioners and others interested in the field.

For the realization of this project, two major steps will be necessary:

- a) Construction of, and experimentation with, an international and bilingual thesaurus.
- b) Organization of a coordinating center for the collection, storage, processing and dissemination of documents and information.

The scope of this present document is concerned, above all, with the first phase which is projected for completion by the end of September 1971. The second phase, from 1971 to 1973, will focus on the operation of the documentation center:

- 1) developing a network of related centers (clearinghouses) for the indexing and storage of documents.
- 2) preparation of micro-documents (microcards and/or micro films).
- 3) publishing and distributing a periodical publication containing current output (union catalog).

- 4) occasional publication of retrospective bibliographies, lists of research projects, etc.
- 5) organization of an information secretariat.

#### REALIZATION OF THE FIRST PHASE: (July 1970 - September 1971)

The first phase, as outlined above, will center primarily around the construction of and experimentation with the thesaurus.

In the organization of a documentation/information system, the task leading to the construction of a thesaurus must be seen as necessarily essential step and the thesaurus itself must be seen only as a tool.

When one refers to the experiences of the United States, a country that has undoubtedly pioneered in the field of information automation, especially in science and technology, the use of automatic indexing procedures of the KWIC<sup>2</sup> type reveals the necessity for a work of authority in order to establish depth-indexing for documents. The use of a thesaurus has an added advantage in that it also permits the standardization of techniques for the treatment and analysis of documents thereby making the retrieval and dissemination of information both easier and more efficacious.

#### What is a thesaurus

A thesaurus is an authoritative list of descriptors which enables documentation specialists, on the one hand, to analyse and index documents for subsequent retrieval. On the other hand, it permits users of these same documents to formulate questions for their retrieval. The thesaurus thus differs from a system that simply classifies knowledge; it is, rather, a working tool that facilitates the storage and retrieval of documents.

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<sup>2</sup>This kind of system, operated by computer, makes it possible to build a list of keywords by extracting terms from the titles of documents (excluding prepositions, articles, etc.). As the titles sometimes tend to describe the contents of the documents inadequately, it becomes necessary in certain cases to reconstruct a new and more meaningful title. Even with such a correction, however, the indexing does not go further than the title and this kind of system is unfortunately not the most efficacious (only about 20% effective according to experts).

KWIC type of systems nevertheless have the great advantage of being very rapid and are capable of keeping pace with the literature production in a discipline or in a given field.

Although a thesaurus is arranged in the form of an alphabetical list of terms, the conception is not without a logical framework. However, the organization of a thesaurus is established principally not in regard to a collection of classes arranged hierarchically, but in regard to each descriptor, that is, each descriptor is in relation to other related descriptors included in the thesaurus. It follows that indexing a document by means of a thesaurus does not lead to the placement of a specific document in a particular class or sub-class; rather, it leads to the extraction of a maximum of document contents through the use of a relevant number of descriptors which reveal as many subjects or aspects which are necessary for it to be retrieved at the time of need.

#### Characteristics of our thesaurus

An international thesaurus in the social sciences of leisure. By an international thesaurus is meant a working tool which will serve to index and retrieve documents originating from all sources, that is, all countries.

The thesaurus is constructed to cover all of the main fields of the social sciences related to or dealing with the study of leisure (sociology, economics, politics, education, history, etc.). It is thus intended to serve the needs of a comprehensive public, that is, professors, research workers, practitioners, organizations, etc. If we admit, as indeed we should, that the study of leisure implies recourse to different disciplines, it becomes readily appreciated why a document must be analyzed and indexed from a multidisciplinary approach.

When considering the amount of energy, time and money involved in an enterprise such as the construction of a thesaurus, it would be a pity if the opportunity was not also taken to make it as complete and efficacious as possible.

A bilingual thesaurus. The thesaurus will be constructed concurrently and simultaneously in French and English. Consequently, although the thesaurus could be used to treat documents in different languages, it could only be used by indexers and searchers knowing either French or English.

Aware of the problems posed by the use of different languages, we arrived at the following general principle: the two descriptor lists will not be identical, but instead, equivalent.

#### Organization

Project CIDOL will not really be operational before the end of 1973 when between 8,000 and 10,000 documents will have to be expected. For this reason, it seems necessary that we have a flexible organization during the initial stages if only to get the project under way. The

framework of this organization can be summarized in accordance with the following six principles:

- a) Provisionally, and up till the first stage of the project, that is, September 1971, the Secretariat of the Research Committee on Leisure and Popular Culture continues to assume the responsibility for the coordination of the different tasks and for the administration. The General Secretary of that Committee will then act as the coordinator.
- b) In order to help him in this task so as to assure consistent quality of work, the General Secretary will request of the Research Committee on Leisure, assembled in Varna in September 1970, to form an hoc Committee of 3 members for this project.
- c) The first duty of the ad hoc committee will be to find and co-opt 3 other research workers interested in the problems of leisure and popular culture in disciplines other than sociology. These research workers obviously must have the requisite interest and special competence in documentation.
- d) These 6 research workers will then form, in collaboration with the General Secretary, what may be called The International Scientific Committee for Documentation in Leisure (COSIDOL). The first meeting of this Committee must be held towards the end of October 1970.
- e) This Committee (COSIDOL) will be provisional. Its mandate will be to bring to a close the first phase of the project, that is, the construction of, and experimentation with, a bilingual thesaurus in the social sciences of leisure. Where judged appropriate, the Committee will entertain such consultations as may be necessary for the fulfillment of its mandate. It will supervise the work of the team of documentation specialists engaged in the project. Finally, it will prepare the organization of the International Center for Documentation in Leisure (CIDOL) which will be created after September 1971.
- f) The structure and operation of CIDOL will be determined later. We suggest, however, that it be an organization independent of professional associations (International Sociological Association or others) but affiliated to specialized national and international centers concerned with research, education or cultural activities.

## A NEW PROFESSIONAL TOOL--THE OUTDOOR RECREATION THESAURUS

by

Richard L. Bury  
 Department of Recreation and Parks  
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A comprehensive, widely distributed vocabulary of terms for indexing, storage, and retrieval of information has been absent in the field of outdoor recreation, producing inefficient use of existing literature and difficulty in communication among professionals. To fill this need, the Thesaurus of Outdoor Recreation Terms is now available. This system follows a three-year effort by personnel in the U.S. Bureau of Outdoor Recreation, Department of the Interior Library, and Department of Recreation and Parks at Texas A&M University.

The thesaurus contains approximately 2,200 terms arranged in six arrays; potentially ambiguous terms are briefly defined by scope notes.

The Alphabetical List simply catalogs the terms in straight alphabetical order.

The Alphabetical List with Notes presents terms in alphabetical order, indicates broader or narrower terms associated with each term, and offers a scope note if clarification is required.

The Rotated Array permits the user to browse for descriptors without knowing the exact wording of a multi-word term. This array is constructed alphabetically about each word in the term. The term is listed as many times as it has words; a term with two words will be listed twice. For example, the term USER FEES will appear alphabetically under both U and F. Also, all terms with a particular word in them (for example, FEES) are listed together regardless of whether the word is first, second, or last in a term. An example follows this paper.

The Grouped Array, Rotated Within Groups divides the total list of terms into twenty-six groups to provide entry to the thesaurus from broad viewpoints and to cluster similar terms. Within each group, terms are listed in a rotated manner as above.

The Grouped Array, Alphabetical Within Groups presents terms in the same twenty-six groups as above, but terms are listed alphabetically within each group.

Finally, the Classified Array provides a grouping of terms in an heirarchical, indented fashion to indicate relationships among terms.

Use of the thesaurus for indexing, retrieval, and literature searches is explained with examples from representative portions of each array.

For example, the user interested in fees on recreation sites could first consult the Alphabetical List to discover whether the thesaurus contains the term FEES. He finds such a term listed as "Fees UF User Charges." This indicates to him that the preferred term is FEES and that the terms USER CHARGES is not to be employed in indexing.

At that point, he may wonder whether the thesaurus contains terms covering other types of fees. He could then consult the Rotated Array, where he would find also listed such terms as ENTRANCE FEES, GUIDE FEES, MEMBERSHIP FEES, TOUR FEES, and USER FEES. Notice that the Rotated Array provides adjacent location of all terms containing the word FEES.

If the user wished to search for terms other than FEES which might better suit his purpose, he could consult the term FEES in the Alphabetical Array with Notes. Indented under this entry would be the broader terms (BT) ADMINISTRATIVE REGULATIONS, EXPENDITURES BY USERS, and REVENUE SOURCES. In addition, Narrower Terms (NT) such as BOAT RENTALS, PERSONAL LICENSES, TRANSPORTATION FARES, and other such relevant terms would be shown. If none of these terms were satisfactory, he might enter the Alphabetical List with Notes under each of the above broader terms; the terms associated with those broader terms might well suit him.

Another alternative would be examination of the Grouped Arrays. The Contents page for these arrays indicates twenty-six groups. Scanning these titles, it seems likely that the desired terms would be in the group labelled Financing. Or the user could consult the Contents page that clusters the twenty-six groups into five broad areas of concern. Again, he would be most likely to select the Financing group, although he might also decide to examine terms in the Economic Aspects cluster. Upon examination of the Financing group, he would find an array of terms related to fees and user revenues; these arrays would contain, either in alphabetical or in rotated fashion, such terms as FUNDING and CASH FLOW as well as ENTRANCE FEES, TOUR FEES, and GUIDE FEES.

Finally, he might rather work with the Classified Array in order to gain a more general view of the heirarchical relationship of terms. In this array, many more clusters of terms are indicated than in the Grouped Arrays. Again scanning these titles, he would find a section titled Financing under the broad area of Administration. An examination of terms in this cluster would indicate that FEES occur under the broader term of REVENUE SOURCES, and that several narrower terms are available. Other related terms also appear in this cluster.

Terms judged as optimal by the user would then be employed in the usual manner for either indexing or retrieval. The user could select one or several terms to index materials for his own collection, and could later search his collection at appropriate times under the same terms. During retrieval, the user can search indexes and bibliographies which have been based on this thesaurus. For example, the Bureau of Outdoor Recreation has used preliminary editions of the thesaurus for indexing items reported in

their annual Index to Outdoor Recreation Literature. Under such coordinate indexing and storage, searches can be selectively narrowed by specifying that documents satisfy one or more indexed terms but not another—that is, searching through a Boolean form of logic.

Distribution of the Thesaurus is being arranged through the Director, U. S. Bureau of Outdoor Recreation. The initial printing was limited to 200 copies, hence distribution will selectively favor academicians, researchers, practitioners, and librarians most likely to use the thesaurus and to provide constructive criticism for further development. A second printing in the near future is anticipated. Comments and suggestions should be sent to the Director, Bureau of Outdoor Recreation, U.S. Department of the Interior, Washington, D.C. 20240.

We hope that this thesaurus will soon become a primary means to increase usefulness of recreation literature, and that communication among recreation professionals will be facilitated by this new tool for the profession.

## ROTATED ARRAY

Baggage Handling Facilities  
     Ballgame Facilities  
 Hunting and Fishing Facilities  
     Interpretive Facilities  
     Marksmanship Facilities  
     Nature Study Facilities  
     Outdoor Living Facilities  
 Outdoor Recreation Resources and Facilities  
     Facilities Design  
     Facility Planning  
     Comfort Factors  
     Destructive Factors  
     Economic Factors  
     Limiting Factors  
     Psychological Factors  
         Demand Factors USE Factors Affecting Use  
         Factors Affecting Use  
         Factory and Industrial Tours  
         Fairs USE exhibitions  
         Falconry  
         Falcons  
         Family and Kinship  
         Family Compositions  
 Enrichment of Family Living  
     Family Participation  
     Family Recreation  
     Family Units USE Camping Space  
 Transportation Fares  
     Farm Lands USE Farms  
     Farms UF Farm Lands; Vacation Farms  
     Game Farms  
     Pioneer Farms  
     Vacation Farms USE Farms  
         Feasibility  
     Economic Feasibility  
     Financial Feasibility  
     Technical Feasibility  
         Feasibility Studies  
     Federal Areas  
     Federal Government USE U. S.  
         Government  
     Federal Grants  
     Federal Statutes  
     Fee Purchases  
     Fee Rights  
     Fees UF User Charges  
     Entrance Fees  
     Grazing Fees  
     Guide Fees  
     Membership Fees  
     Tour Fees  
     User Fees

## ALPHABETICAL ARRAY WITH NOTES

- NT National Forest System
- National Park System
- National Recreation Areas
- National Scenic and Wild Rivers System
- National Wilderness System
- National Wildlife Refuges
  
- Federal Government USE U.S. Government
- BT Public Agencies
  
- Federal Grants
- BT Grant Programs
  
- Federal Statutes
- BT Statutes and Ordinances
  
- Fee Purchases
- BT Acquisition of Land
  
- Fee Rights
- BT Property Rights
  
- Fees UF User Charges
- BT Administrative Regulations
- Expenditures by Users
- Revenue Sources
- NT Boat Rentals
- Entrance Fees
- Grazing Fees
- Guide Fees
- Membership Fees
- Migratory Bird Hunting Stamps
- Personal Licenses
- Recreation Leases
- Tour Fees
- Transportation Fares
- User Charges USE Fees
- User Fees
  
- Ferns
- BT Vegetation
  
- Ferries
- BT Transportation Services
  
- Festivals USE Exhibitions
- BT Cultural Resources
- Spectator Events
- NT Fairs USE Exhibitions

## REALISE SESSION

September 30, 1970

Congress for Recreation and Parks  
Philadelphia, Pennsylvania

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SECTION III

LEISURE/RECREATION INFORMATION DIALOGUE

convened by

Steering Committee of the Ad Hoc National Recreation  
and Park Literature Retrieval Committee

December 2, 1970

held at

National Recreation and Park Association  
1700 Pennsylvania Avenue, N.W.  
Washington, D.C.



## HIGHLIGHTS OF THE DIALOGUE

In recent decades, uncoordinated subsystems became impractical in many fields. Universal banking, law enforcement, weather reporting and air traffic control are among the standardized systems which emerged as a result of necessity. Today, there is a critical need to coordinate information systems due to the enormous overlap among the many disciplines and professions.

Leisure and recreation information is widely scattered and uncoordinated, causing the potential consumer great frustration. Further, duplication of effort and costly mistakes undoubtedly occur. Most important, it is virtually impossible to identify crucial areas of inquiry which are now being largely overlooked by researchers. It is timely to undertake an exploration preliminary to the development of a system to better meet the information requirements of leisure and recreation researchers, educators and practitioners.

Highlights among the remarks made by DIALOGUE discussants are presented briefly.

- An information system, like a filing system, will specify alternatives and narrow the range of choices, but it will not make decisions.
- A successful information system must be dynamic; planning for today's needs is futile, information requirements three to ten years hence must be the guiding consideration.
- No agency of the Federal Government has the power to define or direct an information system, but the Federal Government has a strong interest in the development of information systems.
- Initially the program must avoid heavy investment in hardware. Also, mail response systems are less expensive but slower by two to four weeks.
- The fewer formalities and forms involved, the more responsive the system becomes to its users.
- Information system developers should never permit an information system to be pressured into operation prematurely.
- Go slowly; the data base alone will require at least a year to develop. The time lag from system conception to system operation may well be three or four years.
- The modification of an existing system may be desirable; the NIH factor (Not Invented Here) is not necessarily a negative one.
- Decentralized systems seem more expensive than centralized operations, but there are frequently off-setting advantages to the former.

- The "Iceberg of Operation" can never be overlooked. Continuing costs for personnel, software and hardware often exceed the initial expenditures required to actualize a system.
- An information bank or storehouse needs screening periodically to remove superfluous and outdated materials (one system representative reported a "decay rate" of 50 percent per year).
- It must be realized that user needs and user wants are seldom synonymous; both must be ascertained.
- While most systems were originally designed by and for researchers, in practice, practitioners now account for the majority of system use.
- The cooperative mobilization of everyone that has a stake in the system is imperative to the success of the operation.
- There is no such thing as a perfect information system which will satisfy the needs of every user. The significant point is to recognize this, make the best decisions possible, and begin.

#### THE HIGHWAY RESEARCH INFORMATION SERVICE BACKGROUND

remarks by

Arthur B. Mobley

Consider that:

A Ph.D. in physics is well on the way to being out of date five years after he has qualified and that the total body of human knowledge is doubling every ten years.

Between 1950 and 1970 the number of scientific periodicals available doubled.

Every minute of the day and night, two significant scientific papers are published totaling over a million a year.

A recent issue of the "World Bibliography of Bibliographies" listed more than 100,000 separately-bound volumes of bibliographies.

We have about 30 million books in the world today. The average person reading 12 hours a day for 50 years might be able to read 17,000 technical books in his lifetime.

The point is, those concerned with keeping abreast of what is going on in highway research and development activity need help.

Because of the proliferation of new information, it is especially important that we are capable of quickly recording and storing it. Such capability in turn will enable all of us to find out quickly what has been done and what is being done, worldwide, in order to preclude expensive and unnecessary research duplication, and to see that what we have learned is put to practical use with as little delay as possible. Thus, in early 1963, the Highway Research Board's Executive Committee asked for an investigation of the pros and cons of an automated information storage and retrieval system to supplement the existing information services of the Board. A comprehensive study involving talks with engineers and researchers in the highway field and a thorough examination of existing information systems and techniques made it plain that such a system would indeed be of great value.

Funds were made available in 1964 from the state highway departments through the American Association of State Highway Officials and from the Bureau of Public Roads. Work on the system began in April, 1964. The design and development of the Highway Research Information Service (HRIS) were under the direction of Dr. Paul E. Irick, HRB Assistant Director for Special Projects. Mr. A.B. Mobley is now manager of the Service. An advisory committee, made up of representatives of the potential users of the system and of specialists in information retrieval systems, reviewed staff decisions as the system was being developed.

On July 1, 1967, after an expenditure for development of \$800,000, HRIS became operational. Service is available to anyone who needs an up-to-date account of transportation technology. It represents one of the most complete compilations of information on highway-related research available in the United States. It is saving time, money, and duplication of research. And, just as importantly, the easily accessible storehouse of information is helping practicing engineers and administrators make the best possible use of research findings.

## LEISURE/RECREATION INFORMATION DIALOGUE

December 2, 1970

National Recreation and Park Association  
1700 Pennsylvania Avenue, NW  
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SECTION IV

LEGISLATIVE REVIEW OF BILLS TO CREATE A  
NATIONAL ENVIRONMENTAL DATA SYSTEM

LEGISLATIVE REVIEW OF BILLS TO CREATE A  
NATIONAL ENVIRONMENTAL DATA SYSTEM

by

Diana R. Dunn<sup>1</sup>

Legislation of concern to participants in the events previously described in this volume was introduced and passed by the U.S. House of Representatives during a period roughly coincident with the three meetings. Inasmuch as future legislative development may be even more important to these concerns, a summary of the actions undertaken during 1970 by the second session of the 91st Congress has been prepared for inclusion in these proceedings.

On April 8, 1970, Congressman John D. Dingell of Michigan introduced the National Environmental Information Bank Act (H.R. 16848) as an amendment to the National Environmental Policy Act of 1969 (Public Law 91-190). The function of the bank, to be established in the Smithsonian Institution, would be "to serve as the central national depository of all information, knowledge, and data relating to the environment." This bill was referred to the Committee on House Administration.

On May 5, 1970, Congressman Dingell amended his earlier bill and introduced another version. This second measure, titled National Environmental Data Bank Act (H.R. 17436), did not give the Bank an official home. This version was referred to Congressman Dingell's own Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries. Two other substantially identical bills, H.R. 17779 and H.R. 18141, were subsequently introduced, and hearings were held simultaneously on all three bills on June 2, 3, 25 and 26, 1970. While all non-governmental witnesses were favorable, the Federal agencies were unanimously opposed to the legislation.

The Committee on Merchant Marine and Fisheries extensively amended the measure, and a new purpose was outlined: "The purpose of the Data System is to serve as the central national coordinating facility for the selection, storage, analysis, retrieval and dissemination of information, knowledge, and data relating to the environment so as to provide information, needed to support environmental decisions in a timely manner and in a usable form." On November 25, 1970, the Committee reported favorably upon the amended bill, which had been re-titled National Environmental Data System. The Report suggested that a majority of the Federal agency objections had been met, and recommended passage of the bill.

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<sup>1</sup> Director of Research, National Recreation and Park Association. The assistance of NRPA Public Affairs Counsel, Linda K. Lee, in obtaining materials for this paper is gratefully acknowledged.

On December 7, 1970, the House considered the legislation under suspended rules. This procedure by-passes the House Rules Committee but requires a two-thirds majority of those present and voting for passage. The bill, as amended, was passed.

It is significant that during the progress of this legislation the Committee moved from the idea of a data bank with physical facilities in the District of Columbia to a national data system which would not require duplication of storage, but rather would provide a network of interconnections.

Because so much of this bill is important to those for whom this volume was prepared, the measure, as approved by the House of Representatives, is presented here in its entirety.

H.R. 17436

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the National Environment Policy Act of 1969 (Public Law 91-190) is amended by adding at the end thereof the following new title:

"TITLE III

"NATIONAL ENVIRONMENTAL DATA SYSTEM

"SEC. 301. This title may be cited as the 'National Environmental Data System Act'.

"SEC. 302. For the purpose of this title --

"(1) The term 'Data System' means the National Environmental Data System established by this title. The system shall include an appropriate network of new and existing information processing or computer facilities both private and public in various areas of the United States, which, through a system of interconnections, are in communication with a central facility for input, access, and general management. It shall also include all of the ancillary software and support services usually required for effective information system operation. •

"(2) The term 'Council' means the Council on Environmental Quality established in title II of this Act.

"(3) The term 'environmental quality indicators' means quantifiable descriptors of environmental characteristics which will measure the quality of the environment.

"(4) The term 'information, knowledge, and data' shall be interpreted as including those facts which are significant, accurate, reliable, appropriate, and useful in decision-making in environmental affairs.

"SEC. 303. (a) There is hereby established a National Environmental Data System.

"(b) The purpose of the Data System is to serve as the central national coordinating facility for the selection, storage, analysis, retrieval, and dissemination of information, knowledge, and data relating to the environment so as to provide information needed to support environmental decisions in a timely manner and in a usable form. Such information as shall be deemed appropriate and useful for the achievement of the purpose of the system shall be made available by all Federal agencies and shall be collected and received, where available, from all Federal agencies, private institutions, universities and colleges, State and local governments, individuals, and any other source of reliable information.

"(c) Information and data shall also be sought from international sources such as foreign governments, the United Nations, and other international institutions; and the President is encouraged to enter into such agreements as may be necessary to accomplish this purpose.

"SEC. 304. (a) The information, knowledge, and data in the Data System and the analysis thereof shall be made available on request without charge --

"(1) to the Congress and all the agencies of the legislative and executive branches of the Federal Government, and

"(2) to all States and political subdivisions thereof, except that, in any case where it is determined that the service requested is substantial, the payment of such fees and charges may be required as may be necessary to recover all, or any part, of the cost of providing such retrieval service.

"(b) The information, knowledge, and data in the Data System and the analysis thereof shall be made available to private persons and entities --

"(1) upon payment of reasonable fees and charges as may be established as necessary to recover the cost of providing such retrieval service; and

"(2) subject to such terms and conditions as is deemed necessary to protect the interests of the United States.

"(c) In all instances the Data System shall perform its functions so as to protect secret and national security information from unauthorized dissemination and application.

"SEC. 305. (a) There is hereby created the position of National Environmental Data System Director, who shall be appointed by the President to serve at his pleasure, by and with the advice and consent of the Senate. The Director shall be a person who, as a result of his training, experience, and attainments, is exceptionally well qualified to analyze and interpret environmental data of all kinds and to

appreciate its significance in the management of natural resources as required for the purpose of this Act. He shall serve full time and be compensated at the rate provided for level V of the Executive Schedule pay rates (5 U.S.C. 5313).

"(b) It shall be the function of the Director to --

"(1) administer and manage, under the guidance of the Council, the operations of the Data System in all of its ramifications,

"(2) institute a study to evaluate and monitor the state of the art of information technology and utilize to best advantage new and improved techniques for accomplishing the purposes of this Act,

"(3) utilize knowledge developed during such study to develop criteria and guidelines to govern the selection of data as to scope, scientific validity, quantity, and quality, to be incorporated into the National Environmental Data System network, including the development of predictive ecological models,

"(4) develop and implements a plan to establish and maintain the environmental information network anticipated to accomplish the purposes of this Act,

"(5) develop, establish, and maintain, as necessary, general standards which will permit and facilitate the compatibility and integration of existing and new information systems bearing on the environment to make them consonant and cooperative with the central facility established by this Act, and

"(6) develop and publish from time to time environmental quality indicators for all regions of the United States, including its coastal and contiguous zones, and for internationally significant environments such as the atmosphere and the oceans.

"(c) In carrying out his functions under this Act, the Director shall, to the fullest extent possible, provide the Council with statistical data and other information necessary for the preparation of the annual report of the Council required under section 201 of this Act, and in the development of long-range programs for the enhancement of the environment.

"SEC. 306. (a) The Director may employ such other officers and employees as may be necessary (1) for the efficient administration, operation, and maintenance of the Data System, and (2) to carry out his functions under this title.

"(b) The Director is authorized to provide such lawful incentives as may be required to achieve the purposes of this Act. These incentives may include, but shall not be limited to, grants of money, exchanges of information, sharing of facilities, specialized advice, programs and formats, and other like incentives. The Director shall also be authorized to enter into contracts with universities, individuals, and State and local governments when needed, and to purchase information, data, and personal services as required to fulfill its purposes. He is also authorized to employ consultants as required.

"SEC. 307. (a) The head of each department, agency, or instrumentality in the executive branch of the United States Government shall make

available to the Data System such information, knowledge, and data on the environment which such department, agency, or instrumentality may have as a result of its operations. Such information, knowledge, and data shall be made available for incorporation into the Data System, as the Director deems appropriate as soon as possible after it becomes known to such department, agency, or instrumentality.

"(b) In the administration of all Federal programs resulting in financial assistance to any cooperative international study or to any State, political subdivision, or other public or private entity, and in all contracts in which the United States is a party, the head of the department, agency, or instrumentality administering such program, on entering into such contract, shall take such action as may be necessary to insure that information, knowledge, and data on the environment which either directly or indirectly results from such Federal financial assistance or contract will be made available to the Data System as soon as possible after it becomes known. In respect to federally assisted environmental programs conducted by foreign nations, it shall be the policy of the United States Government to encourage, to the fullest extent possible the availability to the Data System of such information, knowledge, and data arising from these programs which is appropriate to the purposes of the system.

"(c) The head of each department, agency, and instrumentality in the executive branch of the United States Government shall, to the fullest extent possible, permit the Data System Director to use, on a mutually agreeable basis, including the payment of compensation, personnel, facilities, computers, data processing, and other equipment within such department, agency, or instrumentality in carrying out its functions under this title; and, to the fullest extent possible, such computers, data processing, and other equipment shall be made compatible with all others in, and available for use by, the Data System.

"SEC. 308. There is authorized to be appropriated to carry out the provisions of this Act the sum not to exceed \$1,000,000 for fiscal year 1971, \$3,000,000 for fiscal year 1972, and \$5,000,000 for each fiscal year thereafter."

#### The Senate

On June 30, Senator Warren G. Magnuson (Democrat, Washington) introduced a bill on behalf of Senator Philip A. Hart (Democrat, Michigan) and himself titled The Commercial Technology Assessment Act of 1970 (S. 4044). The act would establish an Independent Technology Assessment and Environmental Data Collection Commission with two main functions: (1) to make assessments, without regulatory force, as to the desirability of allowing adoption of proposed new technological developments, basing these assessments upon an evaluation both of the need for such technologies and of the probably environmental consequences of implementing these technologies, and (2) to collect, store and systematically make available all known environmental data relevant to making such assessments. Purposes of the act were fourfold: (1) to consider the long-range economic, environmental, and social impacts of new commercial technology; (2) to

develop an independent research capability that can serve as an "early warning system" to keep Government, industry and the public aware of possible economic, environmental and social costs of such technology; (3) to identify and evaluate alternatives to proposed technologies prior to the adoption of such technologies and prior to funding of Government programs employing or promoting such technologies; and (4) to develop a systematic and thorough collection of all environmental data, in order to assess the environmental impact of the technologies under consideration. The measure was referred to the Senate Committee on Commerce.

Senator Hart, on November 17, introduced a bill similar to S. 4044 (intensifying purpose number four as outlined above) and identical to H.R. 17436, to amend the National Environmental Policy Act to provide for a National Environmental Data System. The measure, S. 4496, was also referred to the Senate Committee on Commerce. In one of the final executive committee meetings of the session, Chairman Magnuson passed over the bill, and in effect killed it insofar as the 91st Congress was concerned.

The legislation will have to be reintroduced in the 92nd Congress, and, even if it is enacted, it seems unlikely that money would be appropriated for the Data System in the current fiscal year.

SECTION V

RESOURCE MATERIALS

on

LITERATURE RETRIEVAL AND DISSEMINATION

and

INFORMATION SYSTEMS

(COSATI). Committee on Scientific and Technical Information of the Federal Council for Science and Technology, Progress in Scientific and Technical Communications. Washington, D.C.: U.S. Government Printing Office, 1970.

Contains detailed reviews of the accomplishments of the COSATI panels and task groups as well as the individual Federal Agencies and bureaus which contribute to it. COSATI is the focal point for the discussion of Federal-wide issues and problems, and promotes the transfer of new ideas and improved techniques in scientific and technical communication within the Federal Government.

Department of Recreation and Parks, Texas A & M University and Bureau of Outdoor Recreation, Thesaurus of Outdoor Recreation Terms. Washington, D.C.: Bureau of Outdoor Recreation, Department of the Interior, 1970.

The result of an attempt to recognize and facilitate a common language for outdoor recreation planning, programming, research, and resource management. The purpose of this thesaurus was to provide a framework for the organization of information, and a tool for making access to information more efficient. See article beginning on page 52.

Educational Resources Information Center, Rules for Thesaurus Preparation. Washington, D.C.: U.S. Government Printing Office, 1965, 20 pp.

This publication contains the rules for expanding and modifying the Thesaurus of ERIC Descriptors, Second Edition. Guidelines are set forth for developing subject-indexing vocabulary outside the thesaurus, i.e., identifiers. Guidelines for the Descriptor Group Display and a description of the Rotated Descriptor Display are also included. Another publication which describes the use of ERIC is "How To Use ERIC." Washington, D.C.: U.S. Government Printing Office, 1970. A step-by-step description of the Educational Resources Information Center and the methods of using the information available through it.

Environment Center of Ecology Forum, Inc., Environment Information ACCESS. New York, N.Y.: Ecology, Forum, Inc., n.d.

ACCESS is an indexing, abstracting and information retrieval service that covers published and non-print information on environmental pollution, conservation and related fields.

Gillooly, William B., The Literature Search: Document Retrieval in the Behavioral Sciences. Somerset, New Jersey: Mariner Press, 1969. 20 pp.

A summary of a comprehensive literature search. Includes references to KWIC, ERIC, RISE, and DATRIX.

Highway Research Board, Highway Research Information Service. Washington, D.C.: Highway Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. n.d.

This service permits transportation administrators, engineers and researchers rapid access to information about highway-related research and the results of completed research throughout the world.

National Aeronautics and Space Administration. The NASA Scientific and Technical Information System. Washington, D.C.: National Aeronautics and Space Administration, Scientific and Technical Information Division, Office of Technology Utilization, n.d.

Describes the processes and the information available from NASA. Another publication which describes the NASA REMote CONsole is "What NASA/RECON Can Do For You."

National Institute of Municipal Law Officers (NIMLO), Codification-Computerization Project. Washington, D.C.: National Institute of Municipal Law Officers, n.d.

Describes the computerization of the process of updating of codes and ordinances. A service offered through the facilities of the National Institute of Municipal Law Officers.

National League of Cities/United States Conference of Mayors, The NLC/USCM Library Classification System: Index for an Urban Studies Collection. Washington, D.C.: National League of Cities/United States Conference of Mayors, 1970, 71 pp.

Devise of the Librarian of the National League of Cities/United States Conference of Mayors for the cataloging and classifying of materials to be included in the library of the organizations.

Ohio Education Association, Association Referral Information Service. Columbus, Ohio: Ohio Education Association, n.d.

Contains a numerical code which indicates subject matter and a letter code which represents grade level. These codes form the framework for retrieval of information on resource persons, school programs and library references.

Rickert, John E., Urban Thesaurus: A Vocabulary for Indexing and Retrieving Urban Literature. Kent, Ohio: Center for Urban Regionalism, 1968.

This thesaurus has been prepared as part of a project to develop a retrieval system for urban literature. The Kent State System is user oriented and has its emphasis on planning and renewal.

Sessions, Vivian, "The Cost and Costing of Information Storage and Retrieval," Information Storage and Retrieval. New York: Pergamon Press, 1970.

A presentation on economic aspects of information retrieval based on the URBANDOC experience.

Smithsonian Institution, Science Information Exchange. Washington, D.C.: Science Information Exchange (1730 M Street, N.W., Washington, D.C., 20036, area code 202, 381-5511). n.d.

SIE currently registers 100,000 one-page records of research each year, representing research projects that are planned or in progress. These are unpublished descriptions of work funded by all sources of support, public and private. They are up-dated annually. Each describes who supports the project, who does it, where, and when, and each has a technical summary of the planned work.

Stevens, Mary Elizabeth, Research and Development in the Computer and Information Sciences, Volume I. Information Acquisition, Sensing, and Input: A Selective Literature Review. Washington, D.C.: U.S. Government Printing Office (National Bureau of Standards, Monograph 113-1), March 1970. 170 pp.

One of a series intended to improve the interchange of information among those engaged in research and development in the fields of the computer and information sciences. This volume considers the specific areas of information acquisition, sensing and input, including the problems of character and pattern recognition.

Urban Management Assistance Administration, Selected Information Sources for Urban Specialists. Washington, D.C.: U.S. Government Printing Office (Department of Housing and Urban Development), June 1969.

This booklet describes some of the information sources that are available to planners, government officials, and others working in urban and urban-related fields.

U.S. Department of Agriculture, Current Research Information System. Washington, D.C.: Science and Education Staff, U.S. Department of Agriculture (in care of Director, CRIS, USDA, Washington, D.C. 20250). n.d.

CRIS will index 24,000 Research Work Unit (project) descriptions from the six USDA agencies.



THE AMERICAN INSTITUTE OF ARCHITECTS

ENVIRONMENTAL DATA, RESEARCH AND POLICY

A STATEMENT BY

MAX O. URBahn

THE AMERICAN INSTITUTE OF ARCHITECTS

TO

THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

UNITED STATES SENATE

WASHINGTON, D. C.

November 19, 1971

1785 MASSACHUSETTS AVENUE, N.W. • WASHINGTON, D. C. 20036 • (202) 265-3113

Mr. Chairman. I am Max O. Urbahn, a practicing architect in New York City and President of The American Institute of Architects.

Today, The American Institute of Architects, a professional society representing 24,000 licensed architects, wishes to express its views on the three bills pending before this Committee, H.R. 56, The National Environmental Data System Act, S. 681, The National Environmental Center Act, and S. 1216, The Environmental Policy Institute Act.

This legislation is directed toward developing environmental policy, establishing local research centers and gathering and disseminating environmental data. These proposals address themselves to the need of finding out more about environmental difficulties that exist today and developing means with which to correct them.

It is possible to identify at least two kinds of environmental problems now facing our nation and the distinction between them is well-drawn by this quote from Robert Sommer's book Personal Space:

"...Much of the environment affects us just outside of the focus of awareness."

There are those problems with which you know you will have to deal with as soon as they are encountered and those of which you may never be aware. Into this first category falls the flaming Cuyahoga River near Cleveland or the demise of pesticide-poisoned wildlife. These openly acknowledged problems now lend to solution. Insofar as these matters exist as educational problems, it is on the political end of things; not as cognitive issues (a group

of sheep killed by nerve gas has a way of forcing itself upon one's attention) nor as problems requiring mysterious solutions. The issues in this category simply require teaching people and organizations how to effect action after answering questions of the model, "Who is responsible for such-and-such act of indignity upon our environment?" This is essential. But it is also after the fact.

The real problem we have to face is the longer, overwhelming one alluded to in the Sommer quotation. Simply put, the reason why the environment is in such bad shape today is because we never noticed it happening. The psychological fact Sommer is talking about is that we are not connected with our environmental experience. We do not notice the ground we are walking on until we trip and fall to it. We have marvelously adapted to having our land raped, our life-styles determined, our every decision and mood set out by the unseen manipulators of our environment. We have even adapted to an *accelerating* rate of such exploitation and become deterministic and apathetic towards it. Here are some of our methods of unconscious adaptation:

- 1) We move to the suburbs so that only one member of our families need suffer the city;
- 2) We watch more-television to blot out the boxes we are expected to live in;
- 3) We encapsulate ourselves more and more in automobiles to seal out an annoying, loud, dirty and often dangerous outside world;
- 4) We travel more often and more eagerly to Europe and elsewhere, if we can, to satisfy an unconscious desire to touch the past in harmonic settings, to feel roots, although ironically foreign;
- 5) We no longer walk in our parks or downtown on Sunday afternoons--or any other day--and never at night;

- 6) In urban settings such as streets and subways we "cocoon"; building elaborate devices to avoid human contact. Eyes seldom meet, voices startle, and a touch may bring a scream;
- 7) This list is endless, and these responses creep into our lives for the most part "just out of the focus of awareness".

What is needed is not so much education as midwifery; helping people to connect themselves, as sentient beings, to the whole fabric called environment that either supports or neglects social and self-fulfilling tendencies.

We must draw everyone into examining the ways in which we live, the ways in which we relate to each other and ourselves, the ways in which we shop and sell, the ways in which we find security or challenge, the ways in which meaning enriches our lives, all in terms of the built and natural environment that formst the stage set on which we all live out our lives.

How has this happened and why is this necessary--in America, the most self-assured and successful country the world has ever witnessed?

Other countries, especially those in Scandanavia, are very meticulous about their environments. Some have made it essentially illegal to build ugly or in-human habitats or landscapes. Perhaps, it is our life-style that has brought this about or our form of government. But we are proud of the depth of our democracy and it has served us very well indeed. But there are special problems that come with a constituent democracy and they are problems we have not always been willing to face.

The environment in the United States has always been a market commodity. And in a democracy, emphatic about free enterprise, the state of the environment can never run consistently higher than the expectations of the consumers. Who is responsible for keeping it high?

On a more general level, there is no discernable tradition in America, either institutionalized or as a part of our general culture, for disseminating positive attitudes about the built environment. Our history is one of exploiting the environment, not enriching it. Such bodies of law as zoning and building codes are all negative proscriptions. There exists the need for germinating more positive attitudes and developing the machinery with which to spread them across the land.

One is the insidiousness with which a changing environment can affect all of our lives. We tend not to notice it until it is too late. The environment gets worse bit by bit, and we seem to be so busy that we notice only the chunks, and then only when they spall off and hit us on the head. Concern over the environment has to occur as a grassroots movement, and people must be literate enough about its efficacy to state it in personal terms.

The other is that our political process depends on a well-informed, sensitive constituency to determine policy through their elected officials. This problem architects have to face as well as paradigm client/professional relationships, only on a smaller scale. Just as an architect can not function without the support, confidence, and sensitivity of his client, neither can our statesmen expect to solve the great problems facing this nation without the support of their constituents. We would have it no other way; but with respect to our environment, it leaves a great job to do.

The point this gives rise to, and the point we bring before you for consideration, is that as we stand panic-stricken, looking out the window at the degraded natural environment, let us remember that is is the built-environment in which we stand.

Look around you. Is there anything you see that is not man-made or has not felt that hand of man? Gentlemen, we live in cities. We live in apartment buildings and work in office complexes. If our natural environment is crucial, it is primarily as an escape from what we have built and are forced to endure.

Too often environment is defined only in the context of resource conservation, natural ecology, and pollution. We feel that this definition is incomplete because it does not acknowledge the real concern: man's interaction with his environment. Whether he uses the environment for outdoor recreation or to tap its resources, whether he builds a road, a factory or a park, man interacts with the environment. The man-made environment is not separate or additional. It is integral to the total environment in which we live. Accordingly, we suggest that either in the bills or Committee report the word "environment" be defined to include not only natural resources but also the built environment.

The American Institute of Architects appreciates this opportunity to represent our views on this legislation. We trust that the Committee will review our recommendations closely and act favorably on them.

Thank you.

NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND-GRANT COLLEGES,  
*Washington, D.C., June 23, 1972.*

HON. HENRY M. JACKSON,  
*Chairman, Senate Committee on Interior and Insular Affairs,  
 New Senate Office Building,  
 Washington, D.C.*

DEAR MR. CHAIRMAN: I understand that a revised version of S. 681, Senator Bellmon's bill to establish state and regional environmental laboratories, will be offered as an amendment to H.R. 56 when that bill is considered in executive session by the Committee on Interior and Insular Affairs. I write to express support of the amendment.

The Executive Committee of this Association expressed strong interest in S. 681 when it was first introduced. An ad hoc committee appointed to consider the broad question of environmental research expressed some reservations, most of which I think have been met by changes made in the bill. I have asked the chairman of that committee, Dr. Roy A. Young (Vice President for Research of Oregon State University) to write you in more detail about the committee's views.

Thank you.

Sincerely,

RALPH K. HUITT,  
*Executive Director.*

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U.S. HOUSE OF REPRESENTATIVES,  
 COMMITTEE ON MERCHANT MARINE AND FISHERIES,  
*Washington, D.C., June 1, 1972.*

Senator HENRY M. JACKSON,  
*Old Senate Office Building,  
 Washington, D.C.*

DEAR SENATOR JACKSON: I understand that scheduling problems have prevented your Committee from holding the full and complete hearings on our bill H.R. 56, the National Environmental Data System Act. In order that your record may reflect what I believe to be the compelling arguments in favor of the bill, I should like to request that some of the testimony given before our Committee during the June, 1970 hearings on H.R. 17436, H.R. 17779, and H.R. 18141, bills providing for the creation of a National Environmental Data Bank be included in the record of your hearings, and made available to your colleagues.

It is worthy of note, I believe, that the unanimous feeling of the witnesses before our Committee, other than those of the Administration, was in favor of the bill. These included representatives of the State of Illinois, consultants, environmental organizations and others. Their position, which I completely endorse, was that the problems had been studied already and that any further study could and should be done within the context of an authorized program.

I understand that this legislation is also supported by the major conservation and environmental organizations. Since the bill passed the House early in this Congress, there was no occasion to request their support, but I am confident that this will be freely given if you should wish to request their views on this important bill.

With every good wish.

Sincerely,

JOHN D. DINGELL,  
*Chairman, Subcommittee on Fisheries and Wildlife Conservation.*

STATEMENT OF PROF. DAN SLOTNICK, DIRECTOR, CENTER FOR  
ADVANCED COMPUTATION, UNIVERSITY OF ILLINOIS; BRUCE  
HANNA, INSTRUCTOR, BIOLOGY DEPARTMENT; MRS. MARGARET  
KEOGH BRUCKER, INVESTIGATOR, CENTER FOR ADVANCED  
COMPUTATION; PROF. IAN MARCEAU, CENTER FOR ADVANCED  
COMPUTATION; AND PROF. BRUCE HANNON, ENGINEERING AND  
COMPUTER SCIENCE, UNIVERSITY OF ILLINOIS

Dr. SLOTNICK. Thank you.

I would like to summarize briefly the activity that we have had at the University of Illinois for the past 5 years. It started out and still has as a major goal the development of very large scale computer equipment.

The design for such equipment and a particular computer called Illiac IV, which will be operational at about the end of this year was the initial concern of this activity. Particularly in the past 2 years, however, we have assembled around this computational resource a group of investigators whose concern is the environmental application and use of this technology.

We will describe several of these activities this morning and in doing so express our convictions that bear on the bill being discussed.

We have one particular effort which is aimed in cooperation with eight countries in northeastern Illinois and specifically with the board and executive director, Ken Fiske of the Northeast Illinois Resource Service Center. We are in the process of putting together various kinds of data to be used for planning purposes, aimed primarily at preventing the further spread of urban blight and ecological nightmares. This has been our first priority and we still have the considerably more difficult problem of cleaning up the situations that already exist, inner city situations as a more distant and more complex objective. But at least we will try to use the technology and skills we have to prevent the further compounding of these problems.

Mrs. Brucker will talk about that system and how some classes of data dealing with soil types, hydrology, geology, forestry, and climatology will be employed for planning purposes and other uses that can be made of it.

Professor Marceau will indicate ways in which this bears on agricultural activities and other planning functions in siting major Federal facilities, highways, and in urban planning.

The other side of the coin involves uses of technology. Under present circumstances this is somewhat more distant in that one of the things that research in ecology has suffered from is a lack of data. It is possible for one to theorize endlessly, but unless one has reliable high quality measurements and observations, it is difficult, if not impossible, to know when you are there. The test of the theory is being able to first duplicate known results, but these known results are spread all over the place in nonuniform quality and are difficult to interpret. This is a significant deterrent to progress and to the process of being able to build theories and then models in order to predict. Before one has any confidence at all that one can predict, one must test the theory by being able to duplicate the observations that he has, the

historical observations, and in this particular area this is difficult due to the absence of something such as is being proposed.

Mr. ROGERS. Mr. Chairman?

Mr. KARTH. Mr. Rogers.

Mr. ROGERS. Professor, did I understand that you have made a study of an eight-county area? Is that what I understood you to say?

Dr. SLOTNICK. We are cooperatively working with the Northeast Illinois Natural Resource Service Center in an eight-county area on accumulating a special data bank for their purposes, which Mrs. Brucker will describe in a moment. She will tell you some of their intended uses and the details of what is in that data bank.

Mr. ROGERS. Thank you.

Mr. SLOTNICK. The more distant uses in modeling and in further research are further hampered by lack of scientific insights. I don't want to present the point of view that just having a well organized data bank will just overnight produce all the scientific insights to understand for instance, populations with many species and to be able to predict how they will interact in an environment, but I will make the statement that without reliable data available to the investigators progress will certainly be slower and perhaps not be made at all.

So, I think Professor Hanna can illustrate that kind of use with reference to a specific fish population. He has been studying for several years the interactions of climatological factors on fish population size for North Atlantic salmon.

Perhaps it would be just best to start off with these explanations of what we have been doing and as it bears on the matter before you. We would be happy to have your questions at any time.

Perhaps Margaret might begin with a description of this system which is called the Natural Resources Information System.

Mr. KARTH. Please proceed.

Mrs. BRUCKER. First, I would like to explain what NARIS is. It is an information system concerning natural resources. The way it is being developed right now is through working with an eight-county area coterminous to Chicago. They have a specific problem in that Chicago is expanding very rapidly in terms of urban population, industry, and so on. In many ways this expansion can bring benefits to them, but if it is allowed to develop in an unorganized and in an unplanned way they could have all sorts of long term problems and would end up with an environment that would not be very habitable. So the idea is to try and organize natural resource data in such a way that when decisions are made by the body politic as to where industrial plants and population centers and roads and parks and green belt areas are best located then the natural resource base will be considered as part of this decisionmaking process.

The kind of data that we are developing now covers eight broad classes of data which are soils, geology, hydrology—that is ground and surface water—forestry, climatology, water impoundments, which is chiefly lakes and ponds, the general topography of the land, and the land use.

The way we are doing it is by splitting the whole area into 40-acre tracts. We picked this particular unit because Illinois has a legal system of land division based on a section township basis in a very orderly

manner. So we then take each 40-acre tract and describe the resources that are on that tract.

At this point, I would like, if possible, to have as part of the record a brief description of the NARIS system describing what we are actually doing in Illinois.

Mr. KARTH. Without objection, it will be inserted in the record at this point.

Mrs. BRUCKER. Thank you.

(The document referred to follows:)

THE NATURAL RESOURCES INFORMATION SYSTEM (NARIS) : ILLIAC IV PROJECT,  
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

The steady expansion over many decades of our standard of living and of our population in both the U.S.A. at large and Illinois in particular has resulted in very heavy demand pressures on natural resources. Land resources in particular have been a main target of these pressures, primarily to satisfy residential, recreational, commercial and industrial needs. There has been a widening realization, however, that these pressures on our resources cannot be satisfied unilaterally without impunity to the quality of life for both ourselves and later generations.

To meet the needs of society and to ensure the protection and regeneration of the ecosystem, the rational use of natural resources requires planning to satisfy both short term demand and long term development needs. Planning is effective only to the degree that certain controls are institutionalized. The acceptance of these controls will depend on what is seen to be equitable in the political processes of our society. Equitable policies cannot be made without possession of accurate and consistent information, but given these prerequisites, policy issues can be clearly identified and the problem becomes more tractable. This enhances the probability of a higher order decision emerging and a consequent wider consent and deeper commitment of the electorate to such decisions.

To optimize this process, decision-making managers must have effective and timely access to all information on our natural resources. This is not possible at the present time with the myriad different sets of data variously classified on an assortment of formats and stored in a diversity of locations.

To aid in solving this problem, a National Resource Information System is now being developed by the ILLIAC IV Project at the University of Illinois. The design is such that it will be of optimum use to all decision-makers regardless of their technical or administrative training.

The ease in using this system is achieved by emphasizing speedy and simple access via remote teletype terminal to this one computerized source containing all the resource data for an area on a consistent basis, and by producing a literate, comprehensive report as output from the computer. At a later date it is expected that graphic output such as maps will be produced to further aid decision-making. Further flexibility in management will be ensured by a modular arrangement of the data base allowing different sets and interpretations of resource data to be added to NARIS as further knowledge of the environment is obtained.

#### *Operation of NARIS*

NARIS is a Natural Resources Information System under development at the ILLIAC IV Project of the University of Illinois in conjunction with the Northeast Illinois Natural Resource Service Center who initiated the idea of a computerized natural resource system to the University.

Before 1971 it is anticipated that a pilot system will be available consisting of all the natural resource data for Marengo Township (in McHenry County). Current projections then are for an effective system for all the eight counties<sup>1</sup> (served by the Service Center) to be ready in early 1972. Once the system is developed, expansion of the system to other counties or states is contingent only on collecting and modifying existing data to machine readable form. It is recognized that not all data variables for each resource in the eight counties will be available, but more than sufficient data would be available to give immediate benefits to the users. Not only would further data be incorporated in the system

<sup>1</sup> These counties are Cook, DuPage, Kane, Kankakee, Kendall, Lake, McHenry and Will counties.

as it became routinely available but it is believed that the availability of such a system would provide a nucleus for encouraging the collection and development of the needed data.

#### *Structure*

The structure of NARIS is to record all natural resource data of an area by describing the attributes of forty-acre tracts. The eight resources presently being recorded include soils, geology, hydrology (i.e., ground and surface water), forestry, climatology, water impoundments, topography and land use. As an example, the acreage of the different soil types within the tract would be known along with the corresponding slope of the soil and its erosion. Similarly, the amount of land being used for row crops, for multiple dwelling residences and for industrial use to mention some categories, would be recorded for land use data.

In addition to describing the actual nature of the resources of each forty acre block (recorded in a "tract file"), a series of library files would be stored, one for each resource. These will essentially describe the technical details of the resource and then would go a substantial step further to aid in the management and enhancement of the resource by describing their consequent uses and limitations. To use soils again as an example, for each soil type occurring in the tract file, the library file would fully describe the soil in terms of its family class and name, its texture, minerology, available water capacity, permeability and so on. From these soil characteristics soil scientists have already developed a series of interpretations, such that, given a particular soil type (and by specifying ranges for slope, erosion and climatological zones) specific questions can be answered as to the potential uses of the soil. Thus not only can advice be given as to whether the soil structure *could* sustain, for example, an airport, a wildlife habitat, a nuclear reactor site or a new reservoir and sewage treatment plant, but also as to what problems would be faced in building on such a soil and the consequent price or reward that would devolve to both the contractors and managers of such a facility in the short-run and to society at large over present and future generations.

Similarly the library files for the other resources would be used to predict the impact on the other resources by placing the facility in this area. If, after considering all the natural resources together, it was found that the site proposed would be inherently unsuitable for the facility or that the costs would be too great, then NARIS is so designed that the data base can be searched to find suitable sites that would meet the given criteria. This kind of positive alternative response will provide decision makers with an effective tool to effectively consider the total resource base whilst still achieving their own specific needs.

#### *The Need for a Computerized Natural Resource Data System*

On all data requirements for the planning process, the first need is probably for natural resource data. The condition of the natural resources and their corresponding implications for Man are generally the most unalterable of all the limitations that face a community. Man cannot change the underlying geological structure or re-route an underground drainage system. To drastically change soil productivity, gradients or forest areas is usually also impossible, unless almost unlimited finances are available. On the other hand, owners can, with sufficient incentives, be persuaded to sell, neighborhoods can be reinvigorated, landscapes can be beautified, and zoning ordinances can be changed—common problems faced by planners.

If these essential data can easily be obtained by decision makers the length of the planning process and the corresponding work burden can be measurably lessened while producing an informed decision. In addition, the ease of obtaining natural resource data should permit a wider consideration of many planning problems, thus leading to decisions involving less destructive use of the community's resources both for this and for later generations.

#### *Development of NARIS*

Many state, local and federal agencies in Illinois have been working for many years on the classification, organization and collection of natural resource data. Scientists with both the academic training and the practical experience have developed a considerable body of methodology and standards to categorize what resources Illinois has. NARIS will be building on this extensive base of technical knowledge. In addition, considerable ongoing assistance and advice is being generously provided for in the development of the system by the following agencies:

*Consultations and/or contacts have been made with the following agencies and personnel*

*I. Data Suppliers: (These agencies are also expected to be users of NARIS)*

*A. Illinois State Agencies*

1. State Geological Survey—(geology and ground water data): Principal Geologist—J. A. Simon, J. C. Bradbury, S. VanDyck, R. E. Bergstrom, M. C. McComas, P. Dumontell, and R. Hackett.
2. State Water Survey (for surface water and climatology data): Chief—W. Ackerman; Hydrologist—H. F. Smith; Climatologist—S. A. Changnon and R. Sasman.
3. Dept. of Conservation—Div. of Forestry—(forestry data): E. Werhane and L. Sohaney.
4. Dept. of Conservation—Div. of Fisheries—(surface water impoundments, fish life, recreation facilities): Chief—J. Harth, A. C. Lopinot, and six area biologists.
5. Dept. of Conservation—Div. of Wildlife and Game—(game and wildlife): J. Piazza and G. Tizacek.
6. Dept. of Public Health—(pollution data): Director—Dr. F. Yoder and K. Bauman.

*B. Federal Agencies*

1. U.S. Soil Conservation Service—(U.S.D.A.) (soil and geophysical data): Chief (in Illinois)—Howard Busch, L. Tyler, E. Voss, D. Overholt, R. Deusterhaus, W. Fitzgerald, D. Swanson, and K. Hinkley.
2. U.S. Geological Survey (geophysical and flood data): Chief (in Illinois)—W. Mitchell and R. Dosch.

*C. Local Agencies*

1. Northeast Illinois Natural Resource Service Center (land use and water impoundments): Executive Director—K. Fiske.
2. Northeastern Illinois Planning Commission (NIPC): Deputy Director—R. G. Ducharme, L. B. Christmas, S. Al Chalabi, and R. Mariner.
3. Metropolitan Sanitary Commission: Data Processing Manager—W. Soback and W. Macatis.

*II. Planning, Modeling, and Systems Advice*

*A. University of Illinois*

1. Dept. of Landscape Architecture: Prof. T. Harkness; Prof. D. Walker; J. Anthony, Graduate Student; B. Ernzer, Graduate Student, and D. Berg, Graduate Student.
2. Dept. of Recreation and Park Administration: Prof. J. VanMeter and R. Irvine, Graduate Student.
3. Dept. of Architecture: Prof. A. R. Williams, N. Macindoe, and M. Egan.
4. Dept. of Urban Planning: Prof. L. Blair.
5. Forestry Department: Prof. I. I. Holland.
6. Coordinated Science Laboratory: P. Weston.
7. ILLIAC IV Project: Director—Prof. D. Slotnick, D. McIntyre, Prof. I. Marceau, and M. Brucker. *Systems analysis and programming*: S. Yardley, D. Reisler, L. Parker, and T. Mason. *Ecology*: B. P. Hanna and B. M. Hannon. *Geology*: T. Dowell and A. Meyers. *Graphics*: J. Bouknight and M. Sher.

*B. Cornell University*

1. Center for Aerial Photographic Studies (work in natural resources): Director—R. Sheldon, P. Dimock, and E. Hardy.

*C. University of Pennsylvania*

1. Dept. of Landscape Architecture: Chairman—Prof. I. McHarg, B. Pradham, and L. Hopkins.
2. Computing Center: Associate Director—B. McDougall.

*D. Government of Canada*

- Dept. of Regional Economic Expansion—Canada Land Inventory: Chief—R. McCormack and E. L. Ward.

*E. Provincial Government of Ontario*

- Dept. of Lands and Forests, Ontario Land Inventory Program: Director—W. Jennis and M. Cressman.

*III. Potential Users Contacted* (this list is exclusive of the agencies listed on the previous pages who will also be users of NARIS)

*A. Illinois Highway Department*

D. Corling, J. Knafl, and R. Wehner.

*B. Chicago Area Transportation Study (CATS)*

Data Processing Manager—W. F. McLallen and H. Haack.

*C. Soil and Water Conservation District*

C. Macke.

*D. County Board of Supervisors*

C. Pontius and W. Dean.

*E. Will County Planning Commission*

D. Henning, D. G. Hinds, and A. A. Wicklein.

*F. McHenry County Planning Commission*

J. R. Quay and R. Melody.

*G. Kankakee County Planning Commission*

I. C. Fritz.

*H. Kendall County Planning Commission*

H. Shoger and D. Young.

*I. U.S. Army Corps of Engineers*

S. Bellew.

*J. University of Illinois—Co-operative Extension Service*

B. Hutchins.

*K. Morton Arboretum*

Director—M. Hall and W. Browley.

*L. McHenry Junior College*

Dept. of City and Regional Planning: P. Beltermachis.

*M. Rodney Wright and Associates (private developer)*

S. Wright.

*N. Realtor and Private Developers*

R. Gwaltney and L. Goldschmidt.

Mrs. BRUCKER. So the idea, then, is to cover these broad ranges of data such that various questions can be asked concerning the natural resource base. If you have a specific area, the question could be asked, "I have this area of land and I would like to build a subdivision on it; is this possible?"

The way our system is organized, the 40-acre tracts are all listed one by one with the associated details of this resource, then in addition to that we have some technical files on, say, soils and so on, which describe in scientific terms what each soil type is, for instance, and what the uses and limitations of that soil would be for various ranges of characteristics like whether it is useful for a golf course, to build an airport, to support wildlife, farming, and so on. So the way it would be organized is if you had this question and knew where your tract was you could answer the question, "Is the natural resource base good to build a housing subdivision on this area?" by querying the system. And our computer system would search through the files, find out what particular resources were on that part of the land. Then it would go to the library files to find out the capabilities of these resources so that the answer might come back, "Well, you have this kind of soil and geology and vegetation and, yes, you could if this is the case build a housing subdivision here. However, the water table is very high and

you would have to take engineering precautions and extra costs in building a basement," and so on.

So we would give them some idea of the kind of costs, not in dollar terms, but the kind of problems they would face.

The second part of this is that if it is unsuitable we could say, "This is unsuitable but if you want to build a subdivision in this area we can perhaps locate a tract for you that is presently vacant land that would satisfy your requirements."

Then we could give them some positive alternatives.

This ability to search for a location to meet the user's needs is perhaps the most vital contribution of our system. For it recognizes that users will have as their first priority the responsibility for achieving their own specific goal. NARIS, through this search ability, provides a creative tool for allowing the decision maker to meet these priorities. Yet, at the same time, it encourages him to incorporate ecological considerations into the routine of the decisionmaking process.

The second broad type of question that is frequently asked is, "The local school board needs a new school, but where should they build it? The local Federal agencies, the FAA, needs a large airport. Where should this be located in terms of the town and so on and the natural resources?"

What we will do in that case is ask, for instance, "What does it take to build an airport? What are the kinds of things you need?"

As an example, and Professor Marceau will later give some more examples you need a certain land area. You need to consider wind factors. The ground has to be level. It has to be also, of course, accessible. These are some examples of the kinds of conditions that must be met. Knowing these criteria, we could then search through the whole file and come up with areas that would be suitable.

Then they have a list of alternatives of where to consider building such facilities which, as you can imagine, is a great cost saving if you consider, for instance, a highway. I gather that the costs are \$2 million to build 1 mile of interstate highway. If you can help them locate a route that would avoid engineering problems like going over swamp-land or a thin layer of mud 300 feet below the surface, things that can drastically increase engineering costs, you have saved a lot of money as well as, of course, hoping to route the highway to avoid existing areas which should be preserved.

The kind of people who are using our system in northeast Illinois are a variety of planners and local citizens and farmers and so on, and I have a list in the previously submitted record of the people who would initially be using this system.

I should explain how we are able to do this system. We are able to get all this information because, to a large extent, the data already exist. In Illinois, we have a number of State and Federal agencies that have been collecting data over many years on these resources and have it available in one form or another. So our task has been to go around to these agencies to find out what they have, tell them what we need and try to get some help in this way.

I would like to state that the cooperation in this effort has been outstanding and absolutely indispensable to the development of a system like this. We have had to ask people not only for data but for their suggestions as to what soils practices are important in consider-

ing the location of an airport and so on, what is needed. So that they have given us considerable guidance on the kind of things we should be recording so that we are not recording, I hope, irrelevant things, for our purposes at any rate.

Mr. KARTH. Mrs. Brucker, what percentage of data of this kind do you find is readily available by going to the municipalities and what percentage requires research on your own part?

Mrs. BRUCKER. Well, given the fact that the eight counties are very eager to have a system immediately that would help them in some way rather than having an ideal system that would take 10 years to get, we have tended to build on the existing data which we have found to be largely available.

One of the problems has been that it has not been available in the form that we wanted, so that we have had to pull out figures and make interpretations. This is where many agencies and individuals have again been generous with their help. By and large, the data exists at the State and county level. At the local level they are collecting some data like the land use data and they have done some survey work. At the State and Federal level this has been done, too.

Mr. ROGERS. Mr. Chairman, may I ask a question?

Mr. KARTH. Mr. Rogers.

Mr. ROGERS. How many people are involved that you have used in your studies, approximately?

Mrs. BRUCKER. In consulting with people?

Mr. ROGERS. No, I was thinking of on your staff.

Mrs. BRUCKER. On our particular project right now, I think there is a total of six or seven of us in various capacities. There are three of us that presently are employed full time.

Mr. ROGERS. I see. What is the time element? When do you anticipate that you will have the information? I presume you will have to be adding to it all the time, but what would be the time element involved for a basic amount of information that you think would be sufficient to be useful for eight counties?

Mrs. BRUCKER. The situation right now is that we are developing the system for one township as a pilot project to see the kind of data that is available and how to organize it. We hope to have a system that is useful and effective by the end of the year. The system to go into the eight counties, then, essentially, is contingent on just collecting together the data and preparing it ready for the computer. We would hope that this would be done with the help of the county, State, and Federal agencies with their present existing staff and the present existing commitments within 2 years.

Mr. ROGERS. I see. Thank you.

Mrs. BRUCKER. Perhaps now, if you like, I could continue to explain some of the problems that you may encounter if you were to consider a system like NARIS to the whole of the United States. Would that be useful to you, do you think?

Mr. KARTH. Yes.

Mrs. BRUCKER. Fine.

From some very preliminary conversations, it would appear that the pattern of data availability in Illinois is reasonably typical for all over the Nation. In Illinois we have very good, excellent data in some areas but in other areas we have less data than other States. This

is a consequence of the different historical, economic, and social forces that have occurred in individual States. For instance, in the States where forestry is very important, as in California and Oregon, the data is not only available but often also it is already computerized and in data banks.

In the farming area, especially in the Midwest, there is extensive soils information available and a lot of water data.

In the urban areas, within a State, land use data is collected.

Now, with the recent sewage problems many States have also increased their data on waters and streams in the urban areas, too. So that by and large Illinois is a typical State in that it has some weaknesses and some strengths.

So that is the kind of situation that would be met all over the United States.

Now, the key question has to be answered, what is really needed to help answer some questions now?

We could say that if this was a goal that a lot of data could be made available in a quite brief time. What you would then hope to do, I would presume, would be to get a group of people together to try to develop long term objectives of perhaps new data collection and so on.

I think that is all I needed to say at this point. If there are any questions, I would be glad to answer them.

Mr. KARTH. On the basis of your experience in the eight-country area in Illinois, have you made any judgment as to what we are talking about in terms of time to accomplish the objectives of the bill that you are here testifying in support of?

Mrs. BRUCKER. I have made some very brief estimates which I would like to stress. I am, of course, not familiar with the 50 States and have not had time to contact all the agencies to find out exactly what they would have, but I would say that you could have a considerable amount of data that would be useful in the making of the many, many decisions and could be put on a machine within a couple of years. Now, this data, I would stress, would be more for, say, the kind of areas where people already live and you can expect to continue living. In areas like Alaska and the mountain areas and the desert areas, I would say that the data would generally not be very available at this point and to get that kind of data even in a gross form would probably take perhaps getting on to 10 years. But if you had an action-oriented mission, you could probably zoom in on the kind of data that you want and develop that first as we already have some ideas of what our priorities are, you could begin to get a system operating in a reasonable period of time.

Does that answer your question?

Mr. KARTH. Yes; thank you very much.

How long have you been working on this project in Illinois?

Mrs. BRUCKER. The people in Illinois in these eight counties came to us last December (1969) and we have been working on it really since then.

Mr. KARTH. Up to this point you have been concentrating on one township within those eight counties that are interested. Is that correct?

Mrs. BRUCKER. We have concentrated our actual data collection effort for this one township but the question of what data say for the

## SUGGESTED WATER IMPOUNDMENT DATA TO BE RECORDED FOR THE NARIS TRACT FILE

1. Name
2. Location (by tract)
3. Type (natural or artificial)
4. Area (to nearest 1/2 acre)
5. Maximum Depth (to nearest foot)
6. Shoreline Length (to nearest 0.1 mile)
7. Presence of Islands (insulosity) (size)
8. Year Constructed
9. Major Species of Fish
10. Fish Population Analysis
11. Date of Last Analysis
12. Ownership:
  - Name
  - Federal
  - State
  - Public
  - Organizational
  - Private
13. Major Use or Purpose:
  - Recreation—what type?
  - Municipal—what for?
  - Industry—what for?
  - Livestock
  - Irrigation
  - Agricultural
14. Public Access? Yes No
15. Location of Access
16. Facilities:
  - Boat ramp
  - Marina
  - Fuel
  - Food
  - Picnic area
  - Campground
  - Laundry

## SUGGESTED GEOLOGY DATA TO BE RECORDED FOR THE NARIS TRACT FILE

- | <i>Variable</i>                 | <i>Manner in which to be recorded</i>          |
|---------------------------------|--|
| 1. Mineral Resources:           |  |
| Type of resource-----           | Paragraph (sand-gravel-peat-clay-metal).       |
| Thickness of overburden----     | Digital (feet, yards, meters).                 |
| Thickness of deposit-----       | Digital (feet, yards, meters).                 |
| Areal extent of deposit-----    | Digital (square feet, acres, square miles).    |
| 2. Ground Water:                |  |
| Depth to water table-----       | Digital (feet, meters).                        |
| Depth to aquifer-----           | Digital (feet, meters).                        |
| Thickness of aquifer-----       | Digital (feet, meters).                        |
| Hydrogeologic parameters--      | Digital (special units).                       |
| Potential yields-----           | Digital (gallons per minute, gallons per day). |
| 3. Engineering Characteristics: |  |
| Foundation Conditions-----      | Paragraph (but can be digital).                |
| Drainage character-----         | Paragraph (but can be digital).                |
| Flooding hazard-----            | Paragraph (but can be digital).                |
| Depth to bedrock-----           | Digital (feet, meters, yards).                 |
| 4. Pollution Potential:         |  |
| High-----                       | Paragraph.                                     |
| Moderate-----                   | Paragraph.                                     |
| Low-----                        | Paragraph.                                     |

Mr. McDONALD. Mr. Chairman?

Mr. KARTH. Mr. McDonald.

Mr. McDONALD. How is this being financed? Have the eight counties contracted with the university for this service?

Mrs. BRUCKER. They approached us. Professor Slotnick is more familiar with the technical details of this.

Dr. SLOTNICK. Initially it was financed using very informal means, cooperation of several departments of the university, individual faculty members contributing their time and out of existing budgets of various kinds. More recently the university put together a proposal to the Ford Foundation which seems likely to receive an award for the work to be carried on over the next year in this area.

Mr. McDONALD. But there is no financial assistance coming from the governments involved?

Dr. SLOTNICK. No, other than some moderate, modest inputs from the State out of State budgets. There is no Federal Government assistance.

Mr. McDONALD. This is a formal group of counties, these eight counties in the area in which you are working? What are the attitudes there? Have they been in constant contact with you concerning this data bank? Have they been asking questions? Are they anxious to make utilization of the information?

Mrs. BRUCKER. Yes. I should stress in fact that it is a very new group. What really happened is that these eight counties cooperatively realized the extent of the problem and got together and established out-of-county funds a bureau called the Northeastern Illinois Natural Resource Service Center. This has been importantly a voluntary thing on their behalf and they have received some financial assistance and office facilities, I gather, from the Morton Arboretum. I think they have also made application for State funds. This was the background.

Then they approached the University of Illinois with the idea of computerizing natural resource data for layman users. What we are doing is providing a system right now for them to meet their specific needs. So that the cooperation has been very intense. We have made several visits to them and talked to the people in the area. This could be seen on the first part of the record I entered, the planners there, the architects, the metropolitan sanitary commission, the county planning commissions and the Northern Illinois Planning Commission, and a variety of individuals such as private developers and realtors, conservationists, and foresters and so on. So the NARIS system is very much a product of this kind of interaction cooperation and interdisciplinary effort from both the wide diversity of users and data suppliers as well as from the considerable interdisciplinary resources available at the University of Illinois.

As we are not all ecologists we are not always quite sure ourselves what variables need to be considered. Here we have used the technical and academic resources of the university staff and the local surveys and agencies.

Mr. McDONALD. Thank you very much.

Mrs. BRUCKER. May I make one further point, please?

Mr. McDONALD. Yes.

Mrs. BRUCKER. I should have stressed that this system is extremely user oriented. We are assuming that the average person may not know anything about natural resources. The system is so designed that the output will be in a very literate way and will say, "You have this kind of soil in the area you are considering which has these characteristics," and we will describe this more in layman's terms, "it has a high water

table and is a soft soil which means you will have foundation sinking problems for large buildings." This user orientation should insure the wide use and acceptability of the system. However, on the technical library file in the computer we also have the technical backup information. For instance, on the soils we can say what the soil temperature factor is, the depth of the water table and the very technical information as a backup from which the interpretations are derived. These interpretations were provided by the soil scientists and geologists working in Illinois for general use. But the technical library will be very useful to these scientists for their own uses and research in their field. This data then is also reaching a technical audience.

Mr. McDONALD. Thank you.

Mr. KARTH. How does the average John Doe become aware of the fact that this information is available? How does he become aware of the procedure that he must go through to acquire the information? Can you give an evaluation of that?

Dr. SLOTNICK. The education of potential users is being planned as part of the joint effort of the Northeast Illinois Natural Resource Service Center and the university. There is to be some training conducted for the potential users of the system and the system is being designed to make that training requirement just as minimal as possible as Margaret has stressed, answers will be prepared in both nontechnical and technical forms.

Mr. KARTH. Do you see this information leading to various code initiations on the part of the municipalities? For example, if you have a high water table obviously, of course, they may develop building codes. Is this going to be part of the system?

Dr. SLOTNICK. We certainly hope so. The system would not really deliver its potential until planners and people responsible for forming zoning ordinances have made extensive use of the system so that they can use this information as an aid for them to develop such codes. We anticipate that they will use such a user-oriented system but that remains to be seen.

Mr. KARTH. That would be one of the real values of it so that builders don't just ignore whatever data you have and proceed to build in areas where there is a high water table and lower percolation.

Dr. SLOTNICK. That is correct.

What we have been addressing ourselves to is trying to make the information they ought to know about available to them in an understandable and useful way. We at the university of course, are not contributing directly to anything that would see that such use is made of the data, that is any judicial or legislative approaches, but we hope that such actions by the local communities will accompany this.

Mr. KARTH. The objective is to set aside certain areas for green acre purposes, parks, playgrounds, or what have you, and it seems to me that it would be extremely valuable to municipalities and predicated upon that data, they would initiate ordinances prohibiting building in certain areas and setting aside land for these purposes.

Dr. SLOTNICK. We could scarcely agree more to that conclusion. I would like for Professor Marceau to indicate some other uses that could be made of this kind of data.

Professor Marceau is in the field of agricultural economics but has ranged broadly over environmental issues in the past several years,

particularly, and played the principal role in initiating the project that Margaret just described.

Mr. KARTH, Professor Marceau?

Dr. MARCEAU. I would like to add a couple of things to what Margaret has said.

We don't want to leave you with the impression that the country is very well off with respect to natural resources data. Quantitywise, we are well off. Qualitywise we are very poorly equipped. In Illinois, we are dealing with a very unique region. It is a highly agricultural area. It was well laid out, well surveyed, and there has been a recognition for a long time that the type of data we are talking about is required.

However, even in Illinois with the eight counties with which we are dealing, we are faced with an even more unique situation. These counties have been an area in which much advanced survey work has been done. The data there are much better than in other parts of Illinois and considerably better than in other parts of the country. So we don't want to minimize the data collection problem.

There is a very great problem. Much of the problem that has occurred with respect to data in the past is that data have been collected in a very disorganized fashion. They have been collected because somebody thought they should be, not because there is a demonstrated need. So much of the data that exists is in a form that is irrelevant for environmental decisionmaking. I think one of the functions, the primary, initial function of this data bank board will be to establish some standards for data collection.

There are two types of problems with respect to the data bank. There are several types of problems but I will describe a couple. The data bank would provide information which could be used to evaluate policy decisions that may be made by the legislation. This is something that you have pointed out. At the moment, many decisions are made from the Federal level down to the local level on the basis of political and economic considerations. Consequently, we have gross environmental degradation. We have almost open warfare going on between conservationists and industry and government. Much of this is irrational.

We have had many court cases in the environmental area which have been based upon emotion, some data, and have been decided without data. A recent decision in the Rulison Case in Colorado was based upon the fact that the AEC had not done a needed systems study. Now it is suddenly discovered that there are insufficient data available to do a systems study on the effects of radionuclide pollution.

So what we need is to collect the data which will enable the legislator, the court and the governmental decision-maker to evaluate the effects; the biological, social, economic, psychological effects of activities.

Mr. KARTH. Is this generally true with the AEC?

Dr. MARCEAU. I wouldn't like to make that statement. The AEC is a very cautious agency. They do what they do in the public interest. Unfortunately, we as scientists still do not know enough about radionuclides and thermal pollution to say with certainty.

Mr. KARTH. I think they do what they think would be in the public interest. I am not so sure that they accomplish their goal.

Dr. MARCEAU. Yes.

Dr. SLOZNICK. I would just like to remark that the situation with the Atomic Energy Commission is just starting. The power projections, and we have some people who have been concerned with this, including Professor Hanna, are that by the year 2,000 or so, on the order of 90 percent of all electric power will be generated by nuclear means and this will be roughly eight times the current amount of power generated, not due exclusively to population increase, but due more to increase in per capita use of power. These facilities will be underway now. The quantities of such facilities will be urgent over the next decade or two.

Compared to location of a few research reactors and a few plants for manufacturing fissionable material, this problem makes those look utterly insignificant. So the main problem of locating nuclear facilities for power reactors is yet in front of us and, if anyone is apprehensive about what has been done by the Commission in the past, that is a full 1 percent of the problem that lies before us with regard to location of nuclear facilities.

So this problem is now a very urgent one and one of which I hope this kind of data collection will play a prime service role. Whether they are water cooled reactors or whether you use atmospheric transfers of heat, these are complex problems which require much data to get satisfactory answers.

I wanted to point out that the bulk of that problem lies ahead. It is not behind us.

Mr. KARTH. I certainly tend to agree with you that the great bulk of it lies ahead of us.

Dr. MARCEAU. This, for example, is a very significant problem and at the moment there is really no basis on which we can say with certainty that a certain action is good or bad, environmentally.

Now, in the siting of a nuclear reactor, whether it be a powerplant or research reactor, we have to consider several factors. First of all, there is geology. We must know that the area is geologically stable. We must know the permeability characteristics of the soils so that we can site it in an area where there will be a minimum spread or minimum dissemination of radionuclides should there be a spill. We need to know the hydrology of the area. We need to know the flow of the surface waters. We need to know about the existence or nonexistence of aquifers, which are water-bearing strata, which may be used for water supply by communities. We need to know about the atmospheric characteristics of the region so that we can predict with a reasonable degree of certainty the dispersion of the plume from the stack of the powerplants, which is also a source of radionuclide pollution.

We need to have a very large water supply and need to know the characteristics of the output of the coolant waters which almost inevitably, with present technology, becomes polluted and we need to know the thermal dispersion characteristics of the water coolant sink. Mr. Hanna will probably mention the effects of thermal pollution on an ecosystem.

These are all data types that should exist in such a data base.

Then if we go to an Air Force base or an airfield, and there have been several examples of these recently where they have created huge political battles, we need to know, again, geology, hydrology. We need to know whether or not we are going to put the great hunk of concrete

on top of an aquifer recharge area because there are only certain areas where an aquifer can recharge. If we cover these, the aquifer cannot recharge and we will find lower levels of water for water supplies. We will find we are getting high levels of pollution and concentration of pollutants in these water supplies.

These are important considerations. We also need to know the effects on the ecosystem itself. If we are considering low cost housing we must consider geology, soils and hydrology, which impact on the use of septic filter fields or sewage systems. We need to know the special characteristics in relation to centers of population, recreational facilities and transport. We need to know population density characteristics such as the psychological factors which become extremely important. We need to provide a data base for national decisionmaking. For example, the United States Department of Agriculture currently administers an agricultural support system which is based upon incentives and disincentives for production, use of fertilizers, et cetera. Presently the criteria that are used are economic and physical. We do not consider the ecological (or esthetic) effects of certain actions. For instance, we don't consider the ecological effects of reducing the agricultural acreage for a crop and thereby producing incentive for the farmer to increase his nitrogenous fertilizer use to maintain a high yield, and the effects of this increased nitrogenous fertilizer use. These effects are becoming evident in the Midwest where we are getting increased nitrogenous pollution of waters.

We don't have the data base to keep track of these. This must be done. We need to also consider the effects of agricultural chemicals. Currently, the recommendations are made on the basis of tests which may or may not be conclusive, or, as demonstrated in the case of DDT, are not conclusive.

The recommendations say, "If it pays, use it." This isn't good enough. We must know the effects on the ecosystem of the use of these things.

Mr. Hanna will discuss the process by which you model these types of effects. So that what we in effect have in this data base is, one, the requirement to collect data for decisionmakers who are making decisions today and tomorrow and we must also collect a data base which will provide information for predictive models.

I have no more to add.

Mr. BIAGGI (presiding). Thank you, Dr. Marceau.

Mr. SLOTNICK. I would like to introduce Professor Hanna, who will try to discuss and present a flavor of some of the more distant, but perhaps more important, uses which can be made of such data in trying to achieve models which would have predictive value.

Mr. HANNA. Gentlemen, I am a biologist. I have had some experience in attempting to define a model, a predictive model of an ecological situation and I have experienced the need for collecting vast amounts of data in this process and for utilizing computers to try to process this data.

I would like to say a few words about what modeling is, the process involved, and perhaps when I am finished you might structure my discussion by asking further questions.

Generally, consider a model as an expression about some natural phenomenon which is based on a general understanding of in this case the biology involved and theories about the biology involved but which

needs to be verified heavily by data involved. For instance, I will put some models on the blackboard here. These will be simple models one might encounter in chemical or physical systems. I have three models, perhaps, equations of simplified physical systems.

For instance, the relation between pressure times volume of a gas is equal to the number of moles or quantities of gas involved times the constant  $r$  plus the temperature. This is a very simple model of a physical situation which fully describes it.

Models are not at all new to science. It would not progress far without them. Consider a chemical model, a general model or discussion of the process of respiration: sugar plus oxygen yields carbon dioxide and water. Numbers and data and many observations have gone into the creation of such models. These are verifiable. These have meaning. The final equation is a very simplified statement of the growth of populations. The number at some time is equal to the number at a previous time, multiplied by  $e$ , the base of natural logarithms, raised to the power  $rt$ , which involves a growth factor,  $r$ , and  $t$ , a unit of time.

Now, the difference between these models is that in the physical and chemical systems, a simple model is very descriptive of the phenomenon which needs to be described. However, in the last case, we become involved in much more severe problems. Clearly, this simple expression of numbers does not yet involve any environmental considerations.

The kind of models which will be required for consultatory use in defining environmental quality, predicting the environmental consequences of certain actions, or utilizing the environment optimally, are more complex. One must appreciate the dynamic character of the environment. The extent to which it can be used for various activities cannot be defined without reference to biological populations encountered. A plant or animal has many biochemical, physiological, and behavioral characteristics, most of which change through time.

One has to look at populations because an organism is within a group of organisms which is spread through time and space. At the population level then there are many interactions between the organisms of a population, many interactions between members of separate populations. These are all affected very heavily by climatological factors and in general the existence of physical-chemical parameters of the environment. One can see that in terms of defining a model with any predictive value for environmental problems such as the ones we are now encountering, one needs basic data at many levels with a high degree of resolution in order to fit this data together into a model which can describe the whole situation.

I would like to discuss briefly an example of such a model. Suppose one wanted to ask a simple question about a population of salmon, like what is the effect of a pollutant, perhaps DDT, on the salmon population? There are many qualities of pollutants which have to be considered in environmental situations. For instance, what is the duration of the toxicity of a pollutant in the environment? What happens when it is put in the environment? Does it stay, does it degrade, how long does it exist?

Secondly, what are the mechanisms and rates of transfer of this pollutant into the organisms in the environment?

Third, what kind of metabolic transformations occur once the organism takes in the pollutant?

And fourth, what happens through food chains and networks to concentrate the pollutant?

This is obviously now known to be the problem with DDT where organisms eat other organisms which have ingested DDT and concentrate it. Organisms at the top of a food chain such as humans face a high concentration of DDT which may become critical even though it is not at lower levels.

In the case of Atlantic salmon, which I have studied, consider, first of all, just an identification of the environmental variables that are important to salmon.

To make even preliminary statements about what is controlling the salmon population, one needs to get data from many sources. I have received data from the Fisheries Research Board of Canada, many branches of the Department of Fisheries, the Meteorological Branch of the Inland Waters Branch of Department of Transport, the Department of Mines, Energy, and Resources. This has been a very time-consuming process involving mail, telephone, and personal communications over about 3 years and several months of preparation of the existing data into such form so that I might analyze it.

There are many interactions between the environmental variables at all life stages of the salmon and the survival of the salmon. One has to understand basically the interrelationships of these factors before he can model the overall picture. The kinds of data required include daily stream flow records over as much as 50 years or more of data. Unfortunately, when one looks at a population within a river system having a drainage area of 4,000 square miles it is not adequate to receive data from one source on the river to describe the environment. One needs to address the sampling problem of simply assessing rainfall at one point in the drainage basin by combining records from many sources. Also, existing records often just do not have enough resolution or clarity for the use required of them in models. This situation cannot be amended unless the various agencies which collect data are coordinated.

In addition to stream flow records, I have been using monthly summaries of temperature, air temperature, daily records of temperature and precipitation over again a large number of stations throughout a watershed, humidity, cloud cover, visibility, wind. Also one must consider break-up of ice and freeze-up of ice for rivers, water temperatures established at particular points of the river, chemical conditions such as Ph of the water due to the acidity of underlying rocks, and the overall mineral constituency of the river.

The problem encountered and the time involved in trying to prepare the data are vast. This is one of the prime problems in trying to model environmental situations now which needs to be changed if we are to create predictive models so that we can avoid negative consequences in the environment.

I want to stress again concerning predictive ecological models there is a problem because one cannot observe the total environmental situation in a laboratory. One has to rely upon some aspects which can be studied in laboratories or experiments which provide hard data to validate and test the theories involved in his model. Perhaps the primary and immediate function which could be served by the National Environmental Data Bank is heavy involvement in examining the prob-

lems in coordinating data and the consideration of major data that is actually needed for some of the most important problems we encounter. For instance, at the moment there is a proposed study of the effects of urban pollution on precipitation processes in the St. Louis, Mo., area. It has become clear that existing data do not offer the sampling needs required for a precipitation model, because of their limited time and space resolution.

The quality of the existing data needs to be examined in all agencies and perhaps the most important point is that the effort involved must be heavily coordinated among Federal agencies both in terms of assembling existing data which are relevant to environmental problems and in terms of defining objectives and methods for collecting the data that will be required for future predictive models.

Thank you.

Mr. DINGELL (presiding). Mr. Hannon, would you have some comments you would like to give us at this time?

Dr. HANNON. I would like to pass it on to Professor Marceau and Professor Slotnick.

Dr. MARCEAU. I would just like to sum up what has been said.

We have pointed out that there are data programs both in quantity and quality. We have pointed out that there are problems in utilizing the data that exist. We have pointed out that there is a great need in a great variety of areas for accurate data which can be used by decision-makers, both in modeling of the future and in planning everyday activities.

Now, there are certain problems which will be faced by a National Environmental Data Bank. These problems will be: how do we maintain and expand the data base and how do we in fact define the data base initially; where and how do we site the computer facilities that will be necessary?

I will leave the computer facilities question to Professor Slotnick, but on the question of maintaining or expanding data and in fact-finding it initially, one of the first functions of the board that is proposed to be established will, I think, be to actually inventory the data that already exist in the many Federal and local agencies and come up with standards for collection and for identification of the data sources. I think this is a necessary prerequisite to the actual functions of the data bank.

The benefits to be achieved by having a national data base are, one, that it will reduce inefficiency in data collection and will provide a direction for data collection, a direction which doesn't currently exist. It will reduce the tremendous overlap and waste of resources which has arisen because of the fragmentation of the data collection authorities and the decisionmaking authorities and will give a national direction which can perhaps be followed in the question of environmental control. At the moment this is impossible because the data that do exist, exist in fragmented, unusable, unidentifiable, and in large case unobtainable form.

The data are buried in file cabinets, buried in people's drawers, buried in computer systems to which nobody else has access.

This must be changed. We need the data. We must use the data and I think the National Environmental Data Bank will provide the facility necessary.

Now, I would like to hand it over to Professor Slotnick who will talk about the computer end of it.

Mr. DINGELL. Professor?

Dr. SLOTNICK. I would like to just make some summary remarks about our thoughts.

Firstly, there is one thing that has not been said by someone like myself who design computers and use them. There is a problem here that we have not faced before. In other words, computers have been used in very large scale planning activities before but in the scale that we are discussing now, I think we have to be particularly attendant to the data quality problem, to the reliability of the data, to the reliability of the calculations made on the data.

For if we want to secure the participation of people to take this data into regard as we feel they must and should in their decision-making, then the margin for error is very small indeed and this is something we have been conscious of from the beginning of this effort. We are not just giving an answer back to an astronomer who might miss in the last digit the exact location of some celestial object in the year 3070. The consequences of errors are very pronounced and we have to be particularly attentive to them, and I believe the technology permits us to now. There is no question in my mind that the technology required for a National Environmental Data Bank is readily at hand. It has not been so for long, but the timing of your proposed action with regard to the state of the technology is excellent. The technology is prepared to do its share of the work.

With regard to data collection, Mrs. Brucker has described data categories of interest to these eight Illinois counties. If we were simply to want to collect the same data nationwide the costs would be very large. A first cut at an estimate would be on the order of from \$20 million to \$40 million for data collection costs. I think that no one would want to recommend this expenditure without first carefully analyzing what data would be of the greatest use and structuring the data collection function over a multiyear period to first accumulate that data that would be most useful and to demand a cost benefit analysis in any of these data collection functions. For example, geological data is very expensive to collect. Perhaps half of the total amount of the estimate would be just geological data and a great deal of this would not be needed for many of the purposes for which such a data bank would be used, and could be deferred or perhaps eliminated for a considerable period of time.

The computer costs are probably moderate over the long term with comparison to the data collection cost. That is, the data would cost more money than the equipment which stored the data and made it accessible.

I would hope that ultimately one would contemplate a system where there would not be a single computer in the system but a network of computers. Our Illiac IV computer will be a computer in an existing network of computers so that the need to worry a great deal about physical location of equipment is one that I think the technology has relieved us of. A computer can be a thousand miles away from the user and it functions indistinguishably to the user as if it were right at hand.

I think that this is yet another problem that the computer technology has now relieved us from worrying about excessively.

Mr. DINGELL. Doctor, what you are really saying is that we are not setting up a data bank, but we are setting up also a computer network in the same thing.

Dr. SLOTNICK. I would hope that it would take this direction, because there are many centers which would contribute to the long-range progress in ecological modeling, for example, each of which would want to be, and some already are, provided with computers of their own, so that they could be given access to this new data bank electronically by an appropriate hookup. Then you could draw upon the research resources and data collection resources of existing centers to enrich the system, and in so doing would not have to centralize the system; that, is to put it all in one place, and hence one could get the advantages of access to all the data without having to pay for centralization.

That is, if a university has a strong speciality in some area of biological modeling, and has some computational means, they could be electronically connected to the system, and have all the benefits of immediate access to this data bank without physically moving people or equipment, and this is a benefit.

Mr. DINGELL. Is this going to produce economies, Doctor? Would it save money in operation? Would it increase the capacity of systems?

Dr. SLOTNICK. Very greatly. If these capacities had to be built in a single location from start, as opposed to the point of view that we have just been discussing, the savings are dramatic. The line costs, the cost of this electronic connection, are very modest and effectively can make a remote center a part of this system at very little incremental cost, just the cost of the connection.

These are very modest costs compared to equipment or personnel costs.

Mr. DINGELL. Would we run into computer language problems?

Dr. SLOTNICK. Well, if there were a centralized function for the data collection such as the data bank proposed, and some uniformity was achieved, a uniformity based on cooperation, consensus, which I feel Margaret has demonstrated is possible in this eight county area, where it can be clearly seen that it is in everyone's interest to be cooperative, and if the data could be organized so that everyone knew what was there, and how to use it, then the particular computer programs written that would use this data could still be written in a variety of languages.

There would be no need to impose intellectually repressive measures on the authors of computer programs, provided that there was reasonable consensus and understanding of format and structure of the data contained in the central bank.

Mr. DINGELL. Would this kind of system help you at the University of Illinois in your work?

Dr. SLOTNICK. Well, without something like this, ultimately our work is probably largely wasted.

I know I am saying something more strong than what you said.

Without such a thing, our work will have very limited value, and it is, in fact, predicated explicitly on the availability of such a data collection.

Mr. DINGELL. You mean what you are doing?

Dr. SLOTNICK. Yes. Without having this data in the eight-county area, without having a simultaneous plan to get it for these eight

counties, we would not be in this program, and our own individual aspiration is to see this extended to a national basis or predicated upon the existence of such a centralized collection as you propose.

Mr. DINGELL. What would something of this kind do for you in terms of savings and magnification of your capacity and ability?

Dr. SLOTNICK. Our experience in the eight-county study is such that an inordinate amount of scurrying around and coordinating and convincing and explaining at considerable cost and effort is involved in order to get these few categories of data available to us, and hence available to the ultimate users in a suitable form.

What is proposed by this piece of legislation would have in fact spared us all of that work. It would have accomplished it at one time and made it available to us. We could have started from there instead of starting from the problem of doing what you propose on a national level in this very small area.

Mr. DINGELL. Wouldn't it have had the practical effect of giving you a direct tie, let's say, to ESSA, to the Bureau of Mines, to other colleges and universities, to the Federal Water Quality Administration, the Federal Air Pollution Control Administration, the National Institute of Health, the Food and Drug, and all the other institutions that have a present computer capacity and capability and have data which would have been of use to you?

Dr. SLOTNICK. It would have served such a purpose, but I would like to say that without extensive prior preparation between all these agencies, meetings, agreements, detailed discussions, the advantage would not be as great.

There is no single place where all of these agencies do or can get together and confer on mutual data requirements and so the data in these agencies now would not have been as useful as they would be were there some central rallying point, some focal point for standards on data structures and data quality.

Mr. DINGELL. What you are saying is that there is no central place where data are collected, interrelated, and made available to scholars in this area, and this is badly needed. Am I correct?

Dr. SLOTNICK. That is correct.

Mr. DINGELL. It also becomes necessary to have this information interrelated in a computer system so that it is more readily available to persons who are doing this kind of work, isn't it?

Dr. SLOTNICK. Yes, it is, and as I said, there seems to be no theoretical obstacle, no technological obstacle, no scientific obstacle, in fact no personnel obstacle among the various workers in these fields to achieve that, other than the absence of a focal point.

Mr. DINGELL. Mr. Dellenback.

Mr. DELLENBACK. I found this very interesting. I have read the bill and listened to that which has been said while I have been here, and listened to your questions, Mr. Chairman.

I don't think I have any questions at this time. Frankly, this is a field in which I must do some additional research, and I am facing in my mind some of the obvious questions, such as how would what we might do here tie to other departments, how would it tie to the Environmental Council, and what would be the inner blend which, as shown by some of the questions you have asked, is in your mind.

As far as the witnesses are concerned, I do not have any questions to ask.

Mr. DINGELL. Doctor, perhaps you and the panel would like to give some comments on some other things that concern me.

There is presently no central place where the Congress or the Council on Environmental Quality or any of these Federal agencies may get the kind of information that would be retained in a computer bank; is there?

Dr. SLOTNICK. No, there is not.

Mr. DINGELL. And there is no place that you could go to get the information for the work you have been doing in ILLIAC. Am I correct?

Dr. SLOTNICK. That is correct.

Mr. DINGELL. This would provide the kind of ready printout of readily available, properly evaluated information that would be necessary for you to function, and also for instrumentalities like the Council on Environmental Quality to really have the data at hand as they need it to come up with their annual report, or to engage in the computation of environmental effects of many activities that take place in the Federal Government. As I correct?

Dr. SLOTNICK. Were it set up with sufficient circumspection, were it to receive the cooperation of all these agencies, were it to have the appropriate spirit and depth of knowledge within it, then you are absolutely correct, that it would serve this purpose.

In our investigation, for example, for these eight counties, we would have started out with one phone call, which would have been a lot easier.

Mr. DINGELL. And one computer tie, which you already had on the premises?

Dr. SLOTNICK. Yes, rather than this period of groping around.

Mr. DINGELL. Wouldn't it have been a fact that since a large part of the research you would have engaged in would have been federally financed, your input would have gone into this system readily, and you would have been able to derive all of the federally financed research and research that was done inhouse to achieve data and information within the Federal Government itself, as opposed to that which would also be available which would have been done by contract with other universities and private laboratories and individual researchers?

Dr. SLOTNICK. Again predicated on the fact that there was consensus on how such data were to be structured and made available to the central system, and again I feel there are no obstacles to that.

Mr. DINGELL. You made some comments earlier to me about the necessity for ecological modeling to avoid some of the horrors that we have visited upon ourselves in terms of pollution of the environment and in terms of perhaps not only correcting past sins and errors but also in terms of avoiding future mistakes.

Would you want to make some comments on how a system of this kind would be able to function with regard to that particular point?

Dr. SLOTNICK. Dr. Hanna and Mrs. Brucker both have things they would like to say about that, if I may just ask them.

Dr. HANNA. In terms of that question, there are many functions for which a central national organization of a different nature than any government agency now existing would be very helpful.

First of all, consider the problem of pollution of some kind surrounding a large city, for instance Chicago. Such a problem, and

indeed problems on a larger scale than that do not stop at political boundaries, so that the agencies and research groups involved, and the data involved in trying to define the problem and cope with the problem must be coordinated from many different institutions and many different governmental agencies.

In terms of doing a model, there are many individuals who have to be considered, have to be brought in on the problem, and there are many different research groups existing around the country which have tremendous capacity to do certain kinds of models, but at this point, without any central organization or coordination of their activities great redundancy is encountered in the kind of work they do.

Mr. DINGELL. You are saying that there is overlap, waste, and duplication?

Dr. HANNA. That is right, great overlap.

Mr. DINGELL. Wouldn't that be true both in terms of data procurement and in terms also of the work which is done with the data?

Dr. HANNA. Very definitely.

Mr. DINGELL. Would a device of this kind provide a means for avoiding that kind of waste and duplication and overlap?

Dr. HANNA. Some device of this kind I think is the only way to avoid that.

Mr. DINGELL. Would it in fact help obviate that problem of overlap, waste, and duplication?

Dr. HANNA. Very definitely.

Mr. DINGELL. Would you want to address yourself just briefly to that point, please?

Dr. HANNA. In terms of collecting the data that exist, without forming some organization which does not have existing limitations such as only geological information or hydrological information, future data that need to be collected and coordinated would have some bias to them, some definite line along which they had been collected for a particular use.

But the use of the data in the future is going to involve coordinating many different kinds of data into one model. Therefore, in terms of getting the data which needs to be combined, the whole effort has to be planned by many different kinds of research groups representing many different disciplines. This kind of coordination simply does not exist now.

Mr. DINGELL. This would provide, then, an effective mechanism for coordinating research, would it not?

Dr. HANNA. That is right, the only kind of coordination. There is certainly a lack of any type of coordination like that presently.

Mr. DINGELL. It would even have a mundane application, as helping somebody who is going to write a master's or doctoral thesis, to prevent duplication of the work, could it not?

Dr. HANNA. This would be a more difficult problem. I think initially one might consider data in terms of the environmental data, physical, chemical nature of the environment. Computers do a tremendous job of organizing such data.

In terms of the collection of essentially library types of materials such as research reports, if this could be done, this would be a tremendously valuable thing in terms of avoiding all sorts of research overlap, and in terms of finding in effect what has been done in a given problem area.

This has been clear in terms of statements one reads about the environment on a daily level, that there is very much conflicting information, conflicting theory, and conflicting data which is not being coordinated right now.

However, in terms of the technological capacity to utilize computers to transfer that information, this could be visualized as a future consideration.

Perhaps some form of index or indices of research reports could be stored by computer, but this is a very difficult kind of problem. It might be well to consider some more conventional type of environmental library situation, perhaps, for this kind of function, and then work toward computerization of retrieving research documents and things like that.

At least at this point, some form of indexing would be possible, however, by computer.

Mr. DINGELL. Could you indicate to us any idea of what this waste and overlap in research and data collection through failure to have a device like an environmental data bank is costing this country?

Dr. HANNA. I can't provide dollar costs today, but costs in terms of time and effort.

Without such coordination, some of the problems which appear to be very time dependent, problems which may be causing irreparable damage to the environment right now, which we have to look at quickly, would be difficult to coordinate in time to assess whether or not in fact they were causing irreparable damage.

Without some kind of coordination quickly of existing data, it is almost impossible, I would say, to react quickly enough so that any kind of administrative policies can be based upon consultatory roles of models, so that they can perform an innovative function instead of reacting to a negative situation.

Time is very important.

Mr. DINGELL. Can you discuss perhaps time with regard to research? Isn't one of our main problems in terms of environmental research the inability to relate research to the enormous time frame from which geological or biological or climatological changes take place?

Dr. HANNA. I am not sure I understand your question.

Mr. DINGELL. Let me give an example not necessarily related to what you are talking about. Let's take the question of long-term climate change related to pollution. There is reason in the scientific community to believe that this may be a fact. In fact, very good reason to think this probably is a fact.

One of our problems is to have an understanding of the general climatological trend over the last, let's say, 200 years. The only way this can properly really be done is through an appropriate computer study relating data with regard to weather to the levels of different pollutants in the air.

For example, if they found now that there is 16 percent less sunlight lighting the streets in the city of Washington, D.C., than in the early 1900's, the researchers assign this to being caused by pollution. We then come to a situation where we have these two isolated fragments of situations, but can't relate them to the total climate pattern of the last 100 or 200 years.

Through cooperative analysis, we might come to the conclusion that perhaps levels of carbon dioxide or particulates is causing these changes.

This may be a matter on which the life of man may ultimately depend. Am I correct?

Dr. HANNA. Yes. In those terms, in order to objectively and scientifically determine atmospheric effects, one has to go through a tremendously broad and deep data retrieval. Data over very large areas and a long time scale have to be considered.

In your example, particulates might be expected to affect precipitation directly by serving as condensation nuclei. If so, a partial relationship between measured or extrapolated particulate effluents and precipitation could be documented with the appropriate data.

Data, of course, are collected at individual weather stations. Sampling in this case is a statistical problem, because one small station might represent in terms of rainfall only a small tin cup, perhaps four inches in diameter. If one is interested in problems over an entire airshed, all of the existing data over this area must be compiled and examined together simultaneously over a long time period in order to get the problem defined.

Mr. DINGELL. Doctor, isn't it fair, then, to say that a device of this kind would afford us the ability to do these very long term studies with a fair degree of simplicity technically? We do have the data in the bank and be able to retrieve it relatively quickly and in a simply usable and fairly well developed form for a very long-range study of climatological changes.

Dr. HANNA. The answer is "Yes."

However, now we are getting into the problems of can we coordinate, do we need to coordinate all of the data and get all of the data in the data bank before we start answering such questions, and this I would say I couldn't answer "Yes" to at the moment.

In terms of identifying the data which is most important for the pressing problems we face today, we still need a great degree of coordination, and the function of the national data depository would be tremendous in aiding just this definition of what variables are most important to include.

Mr. DINGELL. Dr. Slotnick.

Dr. SLOTNICK. One other consequence of a focal point for this data would be in a more clear identification of what the data requirements are in order to solve our most pressing problems. Some of these data right now may not be available. Some of it might be very expensive, but that situation changes.

Measurement technology, talking now about the technology by which means we accumulate data, has been very slow in the area of biological measurements. It is very easy in other areas, for example, physics, because a great deal of effort has been expended to make available these certain classes of measurements.

We can for instance with great refinement measure events that occur on the subatomic level in particle accelerators, but we can't count with any accuracy the number of fish of a given species in a pond, you see. That does not mean that that problem is intrinsically more difficult. In fact, I think in this particular case it is clearly not. It is just that the energy has not been expended, the resources have not been allocated to that problem.

I think such a data bank would serve this purpose, also. It would help focus our attention on major measurement gaps, measurements we most keenly miss, measurements we must improve the quality of, reduce the cost of, and those are important aspects of this problem. Those situations have been very static in the biological sciences because their importance has not been sufficiently understood and noted.

Mr. DINGELL. You are discussing matters now related to a suggestion that I received not long back. In addition to what we are discussing in the data bank, we need to begin to establish some indicators, some indices, and some fundamental base points from which measurements may be made. Am I correct?

Dr. SLOTNICK. That is correct.

Mr. DINGELL. And a data bank of this kind would be absolutely essential to the creation of environmental indicators upon which we might begin to predicate judgments as to whether the environment is better or worse, and how much, and how fast it is going toward the end point where life will be extinguished, and matters of that kind. Am I correct?

Dr. SLOTNICK. That is correct. By focusing our attention on the data that is most useful to us on trying to plan these aspects of our society, we would also be focusing our attention on the lacks that are in this data.

That is, if something is experimentally observed to be a good indicator of some environmentally important event, such as life or death, then the absence of such measurements would just stand out in bold relief and direct attention to securing those measurements. Right now, even that is lacking.

Mr. DINGELL. Mrs. Brucker.

Mrs. BRUCKER. You were asking an earlier question about overlapping and waste, and I think I might be able to give you a specific example of this from what I know about Illinois.

Presently in Illinois, there are at least four major agencies that I know of that are concerned with collecting water data: the U.S. Geological Survey, the Illinois State Geological Survey, the Illinois State Water Survey, and the Department of Conservation.

Mr. DINGELL. There also is the Federal Water Quality Administration, and ESSA, the Environmental Science Services Administration. I suspect the Public Health Service also collects data dealing with matters like the safety of public water systems.

I wouldn't be surprised if the State Board of Health also gather some sort of data on this matter. I would suspect that the Department of Agriculture also gathers information on this, related to pesticides and agricultural runoff, and matters of this kind.

I couldn't tell you how many others, but I would suspect that the Corps of Engineers might also have some interest.

Mrs. BRUCKER. I think you are right. I was emphasizing those where it is quite a large portion of their activity, and you are certainly right in saying that these other agencies also do it.

This is a case where they have different missions, and they do try to work with each other. That is very definite. It can be seen.

But the mechanisms of their being able to do this are rather difficult, so they are not able to coordinate enough in their planning processes, because of their different aims, to eliminate some of this waste.

If there were a computerized system, we would hope that we could all get together and say, "Firstly, what data do we need to collect?" And together we could all say what we need to collect, and then we could assign specific responsibility for who collects this part, and who collects this part, and if one agency knew that the other agency would be going to get that data, and equally importantly within a specific time limit—the present lack of a time-frame is one of the problems now—then they would have the assurance that the necessary work would go ahead and it would leave them free to concentrate on their real priorities and other activities, and the consequent amount of communications and waste that would be saved is overwhelmingly evident.

Mr. DINGELL. We would also provide an orderly device whereby the agencies would be compelled to establish intelligent coordination of their programs, an intelligent coordination of their data gathering activities, and last of all, an intelligent coordination and intelligent evaluation of the data and information they have stored. Am I correct?

Mrs. BRUCKER. Well, I would say there wouldn't even be needed any element of compulsion, because they already want to work together and to try to, but they have such different missions to fulfill, such different obligations, and different projects, and different priorities that they are not often able to help each other at the right time with the right data.

If there were some specific time table or mechanism set up where every year this data would be provided for a certain area, then I think this problem would be solved.

Mr. DINGELL. This would simply provide a mechanism whereby they would just naturally do this thing which does need very much to be done.

Mrs. BRUCKER. Yes, and I would emphasize the outstanding cooperation that I have received from individuals and agencies at every level and would say that they would overwhelmingly endorse such an effort to try and get a more formal, reliable, and simple mechanism for working together.

The present processes for keeping these informal communications channels open are very time consuming. For instance one has to call up one's correspondent in another agency and say, "How far have you gotten? I am doing this now. Will you have the data I need ready in time for me?" They are very conscientious and busy men who could do well without this present necessary harassment.

The other question that I would like to answer referred to the diversity of ways in which this would be used. I wanted to say that we have just started the system in Illinois, are still developing it and already three different departments in the University have come to us and said, "We realize the importance of our students learning about this now, while they are at college, so that in their later professional training, if they are architects and urban planners or foresters, later they will be taking this into consideration," and they come to us and ask us to help them to try and incorporate the material that we are doing into a course to work with their students.

So that I think we are really by this alone helping to train a new generation of professional people that will be considering the environment in their professional life as a first priority.

One last point that I would like to mention was some examples of the kind of ecological disasters that could be really avoided in this system, by the use of built-in protective devices. These devices would protect certain fragile or unique resources that an unsuspecting layman might unwittingly obliterate. For instance geologists know certain dangers about an aquifer recharge zone which is not known widely. Let me explain what this is. Water is stored underground in the porous zones of certain soils and rock strata, and these are called aquifers. This underground water is continually renewed by what is called a recharge zone. The recharge zone is those areas of soil on the upper surface through which the water can percolate. In many soils, the water will not percolate. Clay, for instance, is a very tight soil. So there are only certain areas where the water can percolate through, and fill out these underground water areas.

If you wished to build, say, a Federal airport on top of this aquifer recharge zone, and you were searching for positive airport-related resources, the system would alert you about this region. That is, if areas that lie in the recharge zone happen to meet all the airport criteria, the output will also specify, "This is an aquifer recharge area," and specify what this means.

Let me say what would happen if you built on such a zone. If you were to build an airport that would completely cover the soil, the water cannot percolate through. Immediately there are problems which contribute to flooding hazards, in addition to the mundane factor of straining your city sewage system.

Secondly, if the water is not percolating through, your whole water table level decreases. This immediately affects the farmers in the area. It immediately affects the level of water in wells and water supplies. It affects the level of water in the streams which also are fed by these underground sources, such that if you have a sewage plant that is relying partly on the diluting ability of the stream, now you are more likely to get pollution. If there is not so much water, and there is more pollution, the fish and aquatic life is going to die.

In addition to all these things, if the rock is no longer holding the water over a period of years, as it is happening in Kansas right now, the rock structure actually collapses, so that in future that rock could never again hold water. It is made useless as an aquifer, and the whole surface area of that area will just subsequently fall.

So these are some tremendous effects of just one thing that might very easily be overlooked, unless you were to build it into a system such as this.

I think that is all I have to say.

Mr. DINGELL. I think you have given us a very good cause for thought.

Mr. Everett.

Mr. EVERETT. I wonder if you could give us some idea again on the cost aspects, and more of a breakdown. I think you indicated that, based on what Mrs. Brucker had done in Illinois, it could run in the neighborhood of \$20 to \$40 million.

I wish you could break it down with respect to the national environmental data center that would be planned here in Washington in regards to equipment costs, personnel and staff costs, and so forth.

Dr. SLOTNICK. What I described was roughly \$20 to \$40 million, which would be to duplicate the data, just the data costs, not equipment costs, that Margaret has in her eight-county system, to duplicate that nationwide. Of course it must be stressed that these are once-only costs as, due to the evolutionary nature of natural resources, little updating is required and the costs of that would be trivial.

Mr. DINGELL. Would it be necessary to do that, or could they just arrange a computer plug into Mrs. Brucker's computer?

Dr. SLOTNICK. This is the cost of data where data does not exist.

We have assumed in developing this cost that we have made use of existing information where available. These are data gathering costs to do it on a U.S.-wide basis.

Of course, a lot of this would not be of immediate interest to do. We don't have to have this desert data and all of the mountain data, or Alaska, all of it, for immediate purposes.

This is a figure which is estimated to give us the same kind of data over the whole 50 States of the United States.

What it might cost to make a useful start in the way of data collection could be quite modest. We have not estimated that, because it is so dependent upon what purposes one would posit as being the most important immediate purposes.

Mr. EVERETT. Can you give any idea as to the cost of equipment?

Dr. SLOTNICK. Yes. The equipment costs to operate a center capable of serving this function might run on the order of from \$7 million to \$10 million a year. That would be a figure including both personnel and equipment.

Again, these are figures which you must understand as being rough estimations, and which could be refined once purposes were enunciated, so that they could be focused on.

This would include a large and very capable computer system and sufficient personnel.

Mr. EVERETT. You may have answered this, but has a computer system been developed yet, or is it in the process of being developed, that would satisfy the needs of this legislation?

Dr. SLOTNICK. Yes. The computer that we worked on at Illinois. ILLIAC IV, is the highest capacity data processor currently being done. That will be available at the end of this year.

A great many tasks could be satisfied with lesser machines which could be purchased directly.

I have heard nothing discussed which is beyond the capability of the largest equipments that we currently have available. In other words, I think there is no wait involved at all for technology to develop. We have adequate technology.

Mr. EVERETT. With respect to cranking up costs and getting this program underway should the legislation be enacted into law, could you give us some indication as to the amount of funds that would be needed on an annual basis until we get to operating at full capacity?

In other words, this legislation is open ended. We would like to indicate at some point the annual cost, which you estimate would be from \$7 million to \$10 million. When would we reach this level? The second year, third year, fourth year, or just when?

Dr. SLOTNICK. Depending completely on what decisions are made with regard to data collection, that could be reached in the second or third year of such an activity.

It is again very sensitive to this principal item of cost, the data collection, and, were a decision made to go out and actively seek to get all of these kinds of information on a 50-State basis, then those costs would start being incurred when that decision was made.

They are deferrable, however. I think perhaps it is even wise to defer that decision until 1 year of very close scrutiny has been given to this subject in terms of what data would be of the most value to get, where would the payoffs be.

Ultimately, I personally think it is a public expense that would be most definitely justified, all of it, but there is a matter of determining the sequence of priorities.

Mr. EVERETT. The legislation would require private persons and agencies to pay, and when the request from States is substantial, the Board would be authorized to make a charge for this information. Do you see any problem with collecting this fee? Do you think that these people would be willing to pay the reasonable charge that would be stipulated by the Board?

Dr. SLOTNICK. No problem whatever in everything from a township zoning board to State regional planners of every description.

Mr. DINGELL. Wouldn't it be cheaper for them to buy this information direct out of this kind of data bank than to go out and do this on research?

Dr. SLOTNICK. By factors of hundreds of thousands. Essentially, it would quickly become an essential service without which these organizations couldn't continue to function.

Mr. EVERETT. This system that you say has been developed, will it be able to select out the random, disorganized, nonessential information that has been assembled so that you will be compiling mainly the high quality information?

Dr. SLOTNICK. Not immediately, and not automatically. In other words, problems of maintaining the integrity of the data bank are significant, and a great deal of effort has to be expended on this. It doesn't come easy. It comes with great labor. Reasonableness checks, and all sorts of checks as to errors that might be introduced during processing or transcription, a great many means exist for making this kind of check, but there are not available a set of uniform procedures to cover every potential for error. Maintaining quality standards is a continuing responsibility, and a major one, I feel, of any set-up to make sure that the information that they are collecting and disseminating is good information. People would be making very important decisions based on this information.

Mr. DINGELL. Does a computer system of the kind we are talking about provide the best way for sorting out the bad information we have on the environment, and holding in the good? Isn't this probably the best and most efficient way we have for getting rid of the inadequate or incorrect data?

Dr. SLOTNICK. It is in fact the only way. What I mean to say is that I am not saying that there are other, better means. There are, in fact, none.

But I am saying that the computer means are not perfect, and it is not a thing which takes care of itself. It is a thing which must be carefully attended to by capable operators of such a facility.

Mr. DINGELL. Could you give us, Doctor, some understanding of the volume of information that is available for a facility of this kind, and the volume of information that a facility of this kind is necessary to store?

Dr. SLOTNICK. No, I cannot estimate the number of bits of information that would need to be stored but let me say that the entire Library of Congress contains something like 10 to the 14th, bits.

I doubt it would take a Library of Congress, certainly not initially, for the first several years. Existing storage can store efficiently 10 to the 12th bits, which is a trillion bits. That, for example, could be adequate to duplicate the narrowest information nationwide.

Such storage means already exist, and are available. There may be an ultimate size of 10s of trillions but the initial size perhaps would be 10 to the 9th, 10 to the 10th, 10 to the 11th bits of information which are still manageable sizes, even if nearing the outside of what is manageable.

In other words, the technology is just responsive to the requirement. There is no very comfortable margin.

Mr. DINGELL. Initially, the computer system, or the national data bank, could simply function quite well and usefully by serving this computer intertie for the first few months, or even years, between existing Government computers and existing computers like Illiac IV. Is that correct?

Dr. SLOTNICK. It would serve a major function just as a communication device.

Mr. DINGELL. Even if it did just that for the first year or so?

Dr. SLOTNICK. Yes, even if it served just this communication function, it would have a considerable payoff.

Mr. DINGELL. And it could do this while the library of data itself was being built?

Dr. SLOTNICK. Was being defined and built, yes.

Mr. DINGELL. Do you have anything further?

Mr. EVERETT. I believe the Illiac IV has 64 units to it.

Dr. SLOTNICK. Yes, it has 64 units, each of which can process data simultaneously, and each of which processes data at a very high rate, so that the overall processing rate is very high, something on the order of 200 million instructions per second.

Mr. EVERETT. I believe you indicated that you could install some of these units at different locations throughout the country. Would you envision the location of these units in the District of Columbia area?

Dr. SLOTNICK. I would not think that the physical location would be a major problem. Because of the communication means that exist today, whether the actual unit was located in the east coast, the west coast, or in the middle of the country would not matter very much to the people using the information. Their access to it would not be governed by its physical location.

Mr. EVERETT. With respect to the information that Mrs. Brucker collected, how are you storing it at this time?

Mrs. BRUCKER. We plan to store it on disks, not the core of the computer, such that you can store a different region on different disks, and if you only want to consider the Midwest region, you need only search that particular disk.

STATEMENT OF MAINE DEPARTMENT OF INLAND FISHERIES AND GAME; MAINE DEPARTMENT OF SEA AND SHORE FISHERIES; COMPUTER APPLICATIONS INCORPORATED

PRESENTED BY

Donald K. Christie, Director, Planning and Coordination, Department of Inland Fisheries and Game.

Phillip L. Goggins, Director, Planning and Coordination, Department of Sea and Shore Fisheries.

Michael J. Mahoney, Director, Planning and Transportation Systems Division, Computer Applications Incorporated.

Robert E. Dragoo, Consultant, Computer Applications Incorporated.

Like many, we in the State of Maine are concerned with the utilization of our natural resources, or as the case may be, the mis-use of these resources.

We realize that we are no longer an isolated state in the world community, but an important partner in the industrial-education-recreational complex of the Northeast.

We are experiencing changes in our rural-urban pattern and feel more than ever the pressures of urbanization and the competition for use of our natural resources both on the land and in the sea.

Recognizing our position in the world community, for that is what it is, when one considers our importance as a major state bordering our Canadian neighbors to the north and our relationship to the North Atlantic community, we have accepted the challenge to do something about the resources for which we are interested.

We in the state realize that there is a delicate balance between economic development and the preservation of our resources. We do not shy away from this balance but appreciate the opportunity, knowing full well that we can, with properly planned allocation of our resources and through use of the most up to date technology improve our economic base while at the same time in most instances enhance and preserve our most valued natural land and marine resources.

What we have to say today directly concerns the action we have taken and from the committee's standpoint the application of computer technology in helping us all to define our problem areas more adequately, monitor those factors which may adversely affect us and plan with more assurance how our economic structure, natural resources and, most important, our living standards will be affected by the decisions we make today.

What we have done with the aid of our consultants is to develop a plan, a process and a system which will assist in meeting our state objectives.

We have accomplished this by selecting our objectives carefully, developing a plan of action and seeing that plan executed.

The time for talk is past, the time for action is long overdue. We intend to accomplish what we set out to do for we know that our plan and system is sound; and will provide us with the capability to meet our resources planning objectives.

## 1.0 INTRODUCTION

### 1.1 State of Maine

The Maine Department of Inland Fisheries and Game is an agency charged by law with the responsibility for management of all species of inland fish and wildlife including reptiles, resident to or frequenting the territorial limits of the state. This includes the recreational, economic, ecological, intrinsic, scientific and educational value of those resources. This is as cited in the Revised Statutes of 1964, Title 1, Chapters 301-335 and related subject matters, as amended by the public laws of 1965 and 1967; compiled by the Director of Legislative Research in accordance with the Revised Statutes of 1964, Title 1, Section 1963. In order to perform said functions the Department is composed of the following divisions:

1. Administration.
2. Inland Fisheries Research and Management.
3. Wildlife Research and Management.
4. Conservation Law Enforcement.
5. Engineering.
6. Propagation.
7. Planning and Coordination.
8. Land Acquisition.
9. Information and Education.

The Maine Department of Sea and Shore Fisheries is established for the purpose of conserving marine life, for the purpose of scientific research, promotion and development of the Maine coastal fishery industry and for the purpose of

implementing, administering and enforcing the laws of the State relating to sea and shore fisheries.

This is cited in the Maine Revised Statutes of 1964, Title 12, Chapters 401-417 and related subject matters as amended by the public laws of 1965 and 1967; compiled by the Director of Legislative Research in accordance with the Revised Statutes of 1964, Title 12, Section 1963. The Department is composed of the following divisions to fulfill its responsibilities.

1. Promotion and Marketing Research.
2. Marine Oceanography Research.
3. Estaurine Research.
4. Conservation Law Enforcement.
5. Administration.

Atlantic Sea Run Salmon, shad, alewives and smelts, wherever found, that migrate from the ocean to fresh water are under the concurrent jurisdiction of the two sister agencies.

### *1.2 Computer Applications Incorporated, Planning and Transportation Systems Division*

CAI's Planning and Transportation Systems Division is under contract to the State of Maine to analyze, design and implement a statewide Environmental Resource Planning System that will serve the State's requirements.

CAI's credentials for such an undertaking are represented by their accomplishments in developing large scale management and computer systems, particularly in the Space Sciences (Apollo, Nimbus, Tiros, etc.); statewide physical and recreation planning, transportation planning and highway safety; statewide social planning studies (Vermont, Illinois, New York), telecommunications (United Airlines, ticket reservation systems) and engineering applications. The staff available to Maine includes geologists, biologists, water pollution experts, cartographers, space scientists, land use planners, engineers and system engineers.

CAI recognizes that the development of this system has and will have a profound impact upon the ability of the state to manage its land and marine resources. CAI is fully committed in terms of its staff and physical plant to successfully implement the Maine Resource System and provide whatever technical resources are required by those groups concerned with proper utilization of our natural resources.

### *1.3 Major Points Covered in Our Presentation*

Our joint statements deal directly with four major points:

1. Maine's Functional Planning Program.
2. Application of System Analysis and Computer Technology for Environmental Planning.
3. Recommendations Concerning H.R. 17436.

### *1.0 Maine's Functional Planning Program*

Through coordinated comprehensive planning for inland fish, wildlife and marine resources, the Department of Inland Fisheries and Game and the Department of Sea and Shore Fisheries will evaluate existing programs, develop alternative procedures, or suggest new approaches to bring existing supply and demand for the stated resources closer to equilibrium.

The resource manager will be provided with a tool for executing and suggesting programs consistent with overall development objectives of the state, and the law making bodies of the state will be provided with more meaningful data on which to base decisions and legislation.

The first level objective of the Comprehensive Fish, Wildlife and Marine Plan is to insure that all species of wildlife and the living marine and aquatic resource are perpetuated to be used and enjoyed by the people in Maine now and for the foreseeable future.

The second level objectives are to maintain all species of wildlife and the living marine and aquatic resource for their intrinsic and ecological values as well as their direct benefits to man; to provide for an economic contribution of wildlife and the living marine and aquatic resource in the best interests of the people of the state; to provide for diversified recreational use of wildlife and the living marine and aquatic resource; and to provide for scientific and educational use of wildlife and the living marine and aquatic resource.

A blueprint of the elements of the plan are as follows:

*Work Plan I.*—Inventory of Current Land and Water Use in Maine. Land and

Water use data will be collected for the purpose of determining the overall environment of inland fish, wildlife and marine species.

*Work Plan II.*—Inventory of Current Inland Fish, Wildlife and Marine Habitat.

The objective of this work plan is to describe basic characteristics of currently available habitat for species and to determine the amount and distribution of these basic habitat types.

*Work Plan III.*—Current Inland Fish, Wildlife and Marine Species Use. The current hunter and fisherman use, recreational (bird watching, nature walks, etc.) use levels of the primary species of the state will be estimated.

*Work Plan IV.*—Land and Water Use Projections.

Land and Water use trends will be estimated to the year 1980, and a method will be developed for periodic update of these trends.

*Work Plan V.*—Projection of Future Habitat Availability.

The quality and quantity of the habitat for the major species of the state will be projected to the year 1980, and a method will be developed for periodic update of these trends.

*Work Plan VI.*—Current Inland Fish, Wildlife and Marine Species Abundance. The objective of this work plan is to determine current population levels and trends for the major species as well as their distribution.

*Work Plan VII.*—Current Human Use Opportunity Estimate for Inland Fish, Wildlife and Marine Species.

Current human sport and recreational and commercial use opportunity will be determined by species.

*Work Plan VIII.*—Current Human Use Demand Estimate for Inland Fish, Wildlife and Marine Species.

The objective of this work plan is to estimate current demand for hunting, trapping, and fishing on a statewide and county basis and to estimate current demand and analyze the supply of the commercial marine resources.

*Work Plan IX.*—Project Future Use Opportunity for Fish, Wildlife and Marine Species.

The objective is to project future use opportunity on a statewide and county basis; and project economic supply of commercial species to the year 1980.

*Work Plan X.*—Projecting Future Demand for Fish, Wildlife and Marine Species Use.

Developing projections of future demand will be of considerable benefit for guiding current programs and is a necessity for justifying the development of new programs.

*Work Plan XI.*—Analyze Current Demand vs Current Use Opportunity for Inland Fish, Wildlife and Marine Species.

The objective of this work plan is to compare current demand with use opportunity for recreational and commercial use of inland fish and marine species.

*Work Plan XII.*—Analyze Future Demand vs Future Use Opportunity for Inland Fish, Wildlife and Marine Resources in 1980.

This analysis will reveal what amount of species will be available for use in the future and what demands people will place on these species.

*Work Plan XIII.* Inland Fish, Wildlife, and Marine Resource Problem Identification and Evaluation.

Before planning can proceed in a logical manner, problems of the resources must be identified and evaluated.

*Work Plan XIV.*—Species Management Plan and Program Evaluation.

Existing programs will be evaluated and species management plans will be developed for fish, wildlife and marine species.

*Work Plan XV.*—Coordination of Fish, Wildlife and Marine Resources Planning Process.

The objectives of this work plan are to coordinate the planning efforts of the departments of Inland Fisheries and Game and Sea and Shore Fisheries and to coordinate the Fish and Game and Sea and Shore Fisheries planning with that of other natural resources agencies through the State Planning Office.

## 2.0 Application of system analysis and computer technology for environmental planning

Included in Maine's overall plan is the requirement to develop a computer oriented data resource system which will provide the state with the capability to collect, analyze, monitor and simulate conditions affecting Maine's land and marine resources. To meet these requirements the state contracted with GAI to conduct:

1. A systems analysis of all relevant data bases which would form the data system.

2. A detailed design of both a manual and computer system.
3. Implementation of the system on a statewide pilot basis.

CAI has completed the analysis and design and is presently implementing the system. As a result of the analysis and design, definite products have been developed which can be expanded to provide a base capability for a regional or national system. These include an overall plan of action, a system analysis process (oriented toward resource planning), data selection and evaluation criteria, master data resource element indices (computer loaded), management control procedures (collection, processing, update) a uniform coding process, a master location geographic system and an English language computer capability which is simple from the user viewpoint yet sophisticated in application.

The systems analyses, conducted by CAI and the State, bears a direct relationship to H.R. 17436. The criteria, analyses and final design of the Maine system include most, if not all, of the problems and data requirements associated with the establishment of a National Environmental System.

Our testimony therefore reflects the results of this analysis and design which sets the framework and possibly a prototype process for accomplishing the objectives set forth in H.R. 17436.

In the technical sections that follow it should be evident that the investment already made by Federal and State agencies, in the Maine project, and other agencies which will provide data input to the system, demonstrates the desirability and the technical feasibility of establishing a National Environmental Data System.

### *3.0 Recommendations concerning H.R. 17436*

In the final sections of our testimony we address ourselves directly to the questions raised on page 3 of Congressman Dingell's letter of June 9, 1970. It is important we specify those steps which are essential in developing a National Environmental Data System.

#### *2.0 Establishing a hierarchy of resource requirements*

Prior to determining the specific data required to support a planning program the project team developed a broad overview of the various levels at which analysis could take place. This perspective is important in order to comprehend the magnitude of the data elements which are required to support analysis at each level. Also there are direct relationships between the size of the "data system" and the functions required to collect, analyze, store and update the data.

Chart 1 illustrates these various levels. At the highest level the resource planner must be able to conduct analysis of the factors affecting three major classes: Species Resources (Wildlife, Fish and Marine Organisms); Habitat (Land, Water and Atmosphere and Vegetation); Consumers (Human Resources). The interaction of these three general classes represents graphically how decision makers at the state level can readily understand and relate various functional programs within their departments to specifics such as, sources of funding, revenue from licenses, strata of the consumer groups affecting each program and the departmental resources necessary to provide these needs, budgeting requirements for each program associated with each major class, monitoring the effectiveness of programs (e.g. water quality, enforcement, etc.) and information necessary for drafting legislation for statewide purposes. This ability to evaluate programs easily on the highest level may be considered policy-program-objective orientation and does not require detailed data bases for decision making.

The next level, sub-categorizes the three general classes to ten functionally oriented data classes which closely parallel functional responsibilities usually allocated in units in state government.

As a result of the analysis it was clear that a number of data bases were not housed in resource planning agencies. These were, however, considered by the project team as extremely important for analytical purposes. Data which fall into these categories include U. S. Census Data, statewide and private highway data, cartographic applications, water and air quality data, and public utility data. The second level deals with classes of data which most of us are familiar with, particularly those involved in planning programs at the federal and state level. However, at this level one has quickly expanded the degree of detail required for analysis and program evaluation. There is also an added element of sophistication required to comprehend the interaction of these ten classes of data, along with the necessary support services for data collection, processing

and effective utilization of the data. State agencies involved in resource planning do, however, require this type of information. Past experience indicates that different emphasis may be placed on each of the data classes depending on the state's priorities. Thus diversity of needs must be considered in developing a data resource base. The next two levels clearly show the rapid expansion of the size and content of data that could conceivably be input to a data resource system. As one would expect, the difficulties in achieving widespread support on a national scale to the relative importance of which files and data elements should be incorporated into the system may appear paramount. However, the question must be asked if this level of detail is required. Table I is an indication of some of the data files and elements that are included in the Maine system. This problem confronted us in Maine. Several hundred data bases and thousands of data elements were identified, catalogued and analyzed as part of the study. Most bases had different origins, many were duplicate. The coding structures and degree of reliability *nearly* precluded success in establishing a data base which could be used for statewide functional planning.

TABLE I.—MAINE DATA ELEMENTS

Total Land Area Inventory.  
 Urban and Industrial Land Inventory.  
 Recreation Land Use Inventory.  
 Current Forest Land Use Inventory.  
 Agricultural Land Inventory.  
 Transportation Use Inventory.  
 Mining Use Inventory.  
 Wetland Inventory.  
 Water Use Inventory.  
 Posted Land Acreage Inventory.  
 Inland Fisheries—Habitat Inventory—Rivers, Brooks Streams.  
 Inland Fisheries—Habitat Inventory—Lakes and Ponds.  
 Marine Species Habitat Inventory.

The project team was able to select those files (data elements) most critical to a statewide environmental resource data base.

The methods and results of the analysis are contained in reports available in the near future from the two departments.

In summary, the establishment of a National Environmental Data System will face many of the same problems encountered in the Maine Environmental Study. It was, however, found that by placing the data problem in an overview perspective we could more clearly delineate the scope of the problem. By applying evaluation criteria, analysis and the rise of large scale computers, a design of an environmental resource system which responds to policy-planning and specific research needs of the resource planners was developed.

### 3.0 *Method of data selection, analyses and management control*

The generation of data should not be an end in itself. It must be directly applied to a specific functional need.

As part of the study the systems analysis included the establishment of data selection criteria; analysis of data requirements of units within state agencies; procedures utilized by those agencies in collecting, storing and manipulating data and the applicability of current methods and data to a central resource planning unit which would be responsible for developing a functional master resource plan for managing the state's natural resources. Included in the effort was a survey and analysis of state, federal, institutional and private organizations that either produce or require resource data. All possible agencies or sources of information have by no means been exhausted, but it is felt that a considerable inroad has been made in defining the location and type of information being collected.

This section sets forth in general our methods and findings which may have a direct bearing on the problems which will be faced in establishing a National Environmental Data System.

### 3.1 *Present methods of data collection in Maine*

Analysis showed that there are almost as many data files as there are data collectors. This fact held true for all agencies involved in collecting or disseminating data on the environment. At the state level there was no focal point for housing environmental data which could be used by state planners in formulating a statewide profile of Maine's natural resources. A considerable amount of

data was, however, being collected that could be used as an environmental data base.

### 3.2 Data selection criteria

The project team applied specific criteria to the multitude of files located in the various state agencies, private companies, federal agencies and universities. These criteria are shown on Table 2.

A structured inventory format was used during the survey phase which forms part of Maine's data base of files and data elements usable in an information system. This base will be updated periodically by the Departments' staff.

These criteria and inventory methods could be used by other groups in analyzing and selecting information for inclusion in a resource system.

### 3.3 Span of Control

The detailed analysis and selection of pertinent data files revealed that 170 file sources containing several hundred data elements could be used as part of the information base.

As shown in Chart 2, more than 70 percent of all files were located in the two departments.

The distribution chart also shows that more than eight percent of all files come from federal agencies. It would be interesting to see what the percent distribution would be on a national scale. Conjecture leads us to believe that the distribution would not change significantly.

TABLE 2.—CRITERIA

File Name.  
File Type.  
Data Source.  
Map Data.  
Purpose of File.  
Base Year of File.  
Use Cycle.  
File Standards.  
Geographic Coverage.  
Geographic Locators.  
Unit of Measurement.  
Automatic Data Processing.  
Electronic Data Processing.  
Hardware Configuration.  
Disk File Organization.  
Software Configuration.

### 3.4 Analysis requirements

It has been determined that for the two departments to manage, protect, use and define species of fish, wildlife and marine resources along with their requirements, three primary elements must be compared.

3.41 These three elements are (1) Human Resources, earlier referred to as consumers, the (2) Species Resources (fish, wildlife and marine organisms) and (3) the land, water and atmosphere that make up the habitat in which they exist. By comparing these three elements, the agencies can better determine what the primary problems are of maintaining the resources and establishing the position of these resources in relation to man's requirements and demands.

3.42 The use of electronic data processing provides a means of obtaining more relevant environmental information in a more readily usable form. The management research, administration and operational divisions of the two agencies therefore will have a greater capability to evaluate the environment.

3.43 The regional, national and international implications of this resources planning system include a nationally standardized geocoding locator system, cross referencing of environmental files and capability of analysis for optimal use.

3.44 With such an information base, more refined simulation modeling can be performed to demonstrate and predict effects of natural or man-made changes on the broad area of total environment as well as the more obvious effect on a local scale.

The system allows an agency or group, at any governmental or private level, to: (1) orient its organization and structure to the specific activity being dealt with. (2) Perform position analysis of the activity in the real day to day world.

(3) Determine the purpose and objectives of the undertaking and the future direction necessary for success. (4) Provide criteria for establishing the best time and method to achieve specific objectives. (5) Provide framework for a systematic check of results to update information and reduce the uncertainty of operation projections.

#### 4.0 *Application of Computer Technology*

Our testimony in this section details the *factors* which shaped the Maine Environmental System, a description of the *system*, the management control necessary to augment the system and a concept which basically expands upon the Maine system to create a National Environmental System.

#### 4.1 *Factors Shaping the Maine Environmental System*

As a result of our analysis certain factors became evident which had a profound effect upon our system design. These factors may prove to be representative of the nation as a whole and possibly shape the design of the national system.

These factors were found to be:

1.0 *Mandated Responsibilities and Organizational Structure.*—State law clearly specifies the role of the resource agencies in Maine. If a decision is made to create a natural resource agency, the aggregative statutory responsibilities of the proposed agencies which may come into the new agency defines the *minimum* data requirements necessary to carry out those obligations.

2.0 *Size of Data Files Selected.*—The number of data files and elements exceed several hundred and several thousand respectively. The size of the data base must be taken into consideration in formulating a system.

3.0 *Present Methods of Collection.*—At present there are many agencies that collect data earmarked for inclusion in the system. The methods used by these agencies present a control problem which must be solved.

4.0 *System Application.*—One of the most important factors uncovered was the wide diversity of application which would be demanded of the data system. Applications range from simple inventory tabulations to multivariate analyses of factors affecting various habitat and wildlife species.

5.0 *Geographic Coverage.*—A major requirement was that the system must provide the state and the Department of the Interior with a geographic location capability which could be adopted on a regional or national scale. GAI adopted Universal Transverse Mercator (UTM) as its geographic locator.

6.0 *Aggregation Capability.*—We found that the diverse needs of resource users dictated that the user must be able to restructure the data base to correspond to a multitude of geographic configurations. It must be flexible enough so that data captured by one geographic system (such as county boundaries) could be cross referenced to other boundaries (biological regions for example) without changing the software.

7.0 *Update Requirements.*—One of the most critical elements was the fact that the system must incorporate an efficient update and data validation process. Dependent upon the data base, update requirements ranged from one week to one year.

8.0 *Response Cycle.*—Factors affecting the environment vary from those which occur over a long period of time (land use changes) to those which require almost immediate response (measures necessary to combat a forest fire or an oil spill).

9.0 *User Characteristics.*—Our analyses identified a wide variety of potential users ranging from game wardens in the field to central office planners. Their training, experience and computer orientation varied greatly. Thus the system had to be responsive to a clientele with different backgrounds as well as data needs. The system design reflects this need by incorporating an English language computer language.

10.0 *Technological Developments.*—The design must take into account anticipated technological developments which will have a direct bearing upon the data system. The design team made provision for accepting data resources that will be forthcoming from the Earth Resources Technology Satellite, Earth Resources Observation Satellite and the Climatological Satellite already in operation.

11.0 *Present State and Federal Programs.*—Where feasible and when we knew about a program, the design team attempted to make maximum utilization of those programs which are already funded by state and federal programs. Some of these include the current Department of the Interior programs, the Highway programs, the Federal Water Quality Administration programs, the 1970 Census and Department of Housing and Urban Development programs. We would hope that any federal environmental system look first at federal programs that are already providing a computer support service prior to establishing a new program.

12.0 *Costs Restraints*.—A factor in the development of any large scale system is the cost of that system. Costs are reflected in personnel, software, and hardware. Trade-offs between optimum system capability and costs must be considered prior to the commitment of resources to full scale implementation of the system. In the same light, costs of not developing the system should be taken into consideration in light of alternative courses of action. The aforementioned factors are indicative of some of the most important considerations that shaped our system design.

#### 4.2 *The Maine Environmental Resource Planning System*

The Maine system incorporates certain unique capabilities :

1.0 *English Language Information Analysis System*.—A user oriented computer language written in English. The language utilizes only eight statements.

2.0 *Supervisor Control*.—A special supervisor language written by CAI specifically for Maine to control all independent modules in the system.

3.0 *Master Geographic Location Sub-system*.—A self-contained computer module that cross references all geographic data. The file will be maintained on disk. This provides the state with the capability to cross reference or reaggregate data elements to a wide variety of geographic configurations.

4.0 *Utility Sub-system*.—A statewide computer tape file which provides a monitoring capability of the number of new service units in the state by location and land use.

5.0 *A Master Data Element Index*.—Stored on tape will be a dictionary and description of all data elements in the system. A control field will identify the source agency, type data and source document of the data element.

6.0 *A Master Coding Input Guide*.—CAI developed a sub-system to input desired coding values into all data fields almost simultaneously. Since these were (and will be) thousands of data elements which were germane to more than one file, a process was developed so that data coding compatibility could be achieved throughout all files.

7.0 *Maine Information Display Analysis System*.—An overall system concept which includes the Data Sub-system, Management Control and Software Configuration. It is MIDAS which integrates the interaction of data, people and machines.

#### 4.3 *A system overview*

A graphic representation of the system is presented in Chart 3. In the center one sees the three major system components at their highest level; namely, Resource, Habitat and Demand (Consumer).

On the periphery of the Chart are the sub-systems which contain all the data files. It should be noted that there are separate modules. However, as depicted in the Chart the user may select and integrate one or all of the data files in the system.

The sub-systems include :

- |                    |                       |
|--------------------|-----------------------|
| 1.0 Species.       | 7.0 Access.           |
| 2.0 Harvest.       | 8.0 Utility.          |
| 3.0 License.       | 9.0 Satellite.        |
| 4.0 Habitat.       | 10.0 Population.      |
| 5.0 Environmental. | 11.0 Master Location. |
| 6.0 Enforcement.   | 12.0 Cartographic.    |

The circle in the center entitled "User Oriented System" consists of the English Language Information Analysis System. Basically, it is ELIAS which ties everything together and acts as the technical support sub-system.

#### 4.4 *Maine information display analyses system (MIDAS)*

The organization of MIDAS includes three dynamic elements, each with a particular functional role. Chart 4 illustrates the framework of MIDAS as defined by the client Departments and the system design team. Three sub-systems are evident :

1. The Information Source Sub-system (Data).
2. The Resource Management Control Sub-system (People).
3. The Technical Support Sub-system (Computer).

The *Information Source Sub-system* represents the assemblage of information which is required by the client departments for natural resource management and planning. This sub-system feeds un-edited raw data into the Resource Management Control.

The *Resource Management Control Sub-system* performs the data assembly, flow control and quality assurance functions for MIDAS together with its primary responsibility for the design, execution and analysis of natural resource management and planning studies.

The *Technical Support Sub-system* is ELIAS—the English Language Information Analysis System—which provides all the services required for the activities of MIDAS.

The client Departments are expected to provide the largest contribution of data for processing by MIDAS. In this context MIDAS will be performing as both the data base manager and as a research and planning tool. As illustrated in Chart 5 when other agencies and institutions process their data through the system, these data will follow the standards for coding and terminology that are defined in the MIDAS dictionary. This dictionary contains approximately seven hundred (700) entries and provides information on source of a term, the reason that term is used, the scheme adopted for its coding into machine-recognizable form and the specifications of its electronic data processing field size.

#### *Resource management control sub-system*

As noted previously, this sub-system has a dual role. First, it must assemble, schedule and supervise the processing of all data from the Information Source Sub-system into the Technical Support Sub-system.

Second, it acts as principal investigator or project manager for studies which require an evaluation of the MIDAS data base. These studies, which could range from general problem solving computations to complete resource management models, which will be executed by ELIAS within the Technical Support Sub-system. A schematic of this network is shown in Chart 5, also.

#### *Data coding and control functions*

An office of Coordinated Natural Resource Planning, consisting of scientific, managerial and technical staff assembled from the two Departments, could form an Executive Control group. It would be expected that the staff of this office will include the Departments' representatives who have worked with the system design team to develop MIDAS.

The pattern of collection, coding and control used by this Office is generalized and includes four main stations: *Input Control*, *Numeric Coding*, *Geographic Coding*, and *Processing Control*. Each station logs-in and logs-out each data source form it processes. This control logbook provides a quick assay of such management keys as flow control, quality assurance, staff capability and reliability, cost of processing forms of different styles, and other information. The research biologist, warden supervisor or natural resource planner must have these key elements to assist him in his programs and studies. Thus, Data Coding and Control provides information for system reliability and sensitivity analysis while also completing the operational function of data preparation. Each station contributes to this dual utility.

The *Input Control Station* is responsible for assembling and scheduling data source documents received from regional personnel within the two Departments as well as those received by planning and coordination units from sources outside the Departments. This station also maintains logs and other records of the progress of the various studies using the data system. This is a master control station and can be continuously monitored for information on the status of the entire system.

The *Numeric Coding Station* is responsible for translation of unstructured information into numeric codes following the standards and procedures spelled out in the system dictionary. This station consists of several substations, each with a specialty in a particular area such as pollution, harvest, etc. It is likely that such substation responsibility would optimize the coding quality control effort.

The *Geographic Coding Station* accepts the flow from the Numeric Coding Station and expedites the coding of all geographic elements on each data source document. This translation of geographic reference systems to machine-processable codes would complete the usual coding procedure.

The *Processing Control Station* is responsible for the direct interface between coded data and the hardware, software and personnel of the Technical Support Sub-system. While this station appears as a function unit, it is, like the Input Control Station, part of the management function of the Data Resource Management Control Sub-system.

Special studies and surveys might require other types of coding stations and these would be organized as needed.

#### 4.5 English language information analysis system (ELIAS)

The supervisor will control processing by recognizing commands directed toward specific actions to be performed on files contained within the system. Communication to the Supervisor will be through simple English language command statements punched in cards. The actions that can be performed consist of the following:

**Sample**—Will instruct the Supervisor to execute a module to select a sample from any file.

**Create**—Will instruct the Supervisor to execute the appropriate processing module to build a file.

**Edit**—Will instruct the Supervisor to execute a module that will perform edit checks on the data fields contained in a file.

**Update**—Will instruct the Supervisor to either add processing modules that can be called for new files, or to execute a module that will add, delete, or change records on a file.

**Expand**—Will instruct the Supervisor to execute a module that will add data to a file from the Master Location System through code matching techniques.

**Report**—Will instruct the Supervisor to execute the retrieval software for report writing or computer graphics.

**List**—Will instruct the Supervisor to execute a module to print a complete file.

**Copy**—Will instruct the Supervisor to execute a module to produce a duplicate copy of a file on tape.

The ELIAS concept is illustrated on Chart 6.

The Supervisor program will also perform other functions:

1. Identification of errors made when instructing operations to be performed. Explanation of errors will be through clear, concise English language messages. For example, the error message that will be printed when an invalid command for action is requested will be:

An invalid command action has been requested. This request was for (the erroneous word will follow the statement).

2. Communications to the operator of the computer giving information as to the status of operation and requesting any limited special intervention required to perform certain tasks will be displayed on the computer console.

3. Maintain a status-of-files index for system performance review and utilization.

4. Perform certain "automatic" functions such as edit runs immediately after updating and initiation of expansion routines if fields involving expandable codes have been altered during a normal update run.

#### Input-Output Modules

All functions for reading card, tape and disk files and for writing tape and printed reports will be performed by the Supervisor program. The modules, however, will not be written as part of the Supervisor program, but will be coded and compiled separately and included with the Supervisor at compilation time. The reason for keeping these modules separate is to eliminate modifications to both the Supervisor and processing modules when changes must be made to the I-O environment under which the system is operating. Another reason is to minimize the number of places where a change must be made. One change to one I-O module will be reflected in all processing modules that use the file for input and output.

#### Processing Modules

Systems designers have used the criteria of organizational simplicity, commonly used languages, and efficient utilization of core in order to make the system as flexible and dynamic as possible. All modules will be linked with the Supervisor program to perform data file creation, data editing, data updating, field expansion and functional reporting. These modules will be called, overlaid and executed by the Supervisor program. These modular programs can be written in any language that is acceptable to the object computer. Any changes to existing modules requires modification to the functional module affected only, thereby eliminating costly, time consuming modifications to the entire system or extremely complex programs that would be part of a monolithic system. The amount of core required to operate the system under this concept will be reduced drastically since the only elements that are core resident simultaneously are the Supervisor, I-O modules and one processing module that has been activated to perform a specific function on one file in the sub-system.

### *Expansion Capability*

Additional modules may be linked with the system without involving the other processing modules. The only limit placed upon the total number of processing modules that can be linked with the Supervisor is imposed by the capacity of the libraries established within the *object* computer. The core restraints placed upon the modules will be influenced by the size of the Supervisor and I-O modules which cannot be determined until these portions of the system have been implemented. The design employed in this system will eliminate complete rebuilding of the system due to hardware changes.

### *Retrieval Software*

In the design of the data retrieval software, complete utility is necessary to satisfy the undefined and unknown requirements of the user. The retrieval software is designed to permit each user to design his own report formats to meet his needs. Communication to the computer consists of English language, free-form statements that supply the following kinds of information:

1. The report requestor.
2. The records that will be used in preparing the request.
3. The sequence of reporting the data.
4. The calculations to be performed on the data for the report.
5. The format of the report.

### *Reporting Versatility*

While some data can be presented in tabular form, CAI realizes that graphic presentations are, in some cases, more meaningful and useful to the user. Therefore, in addition to tabular reports, the user may request that a bar graph or a computer-produced dot map be generated. The bar graph program will convert each line of tabular data into percentages, and produce graphs that are scale flexible based upon the highest percentage value contained on the graph. Dot maps will present data in both density values and numeric values with the scale of mapping equal to one inch to the mile. An option will exist to draw geographic boundaries of Minor Civil Divisions even though this technique will distort the data presented on the map.

To increase system effectiveness and efficiency, the retrieval software will be capable of producing up to 256 reports with one "pass" of the data files. Production of reports can then be scheduled and batched for production instead of processing one report whenever the need arises. All *valid* requests for reports will be processed; requests that do contain errors will be ignored during processing. Simple, concise English language messages indicating the request error(s) will be printed. In order to reduce reporting errors, an option exists to check the requests for validity and continue into the production phase.

### *Dictionary Concept*

The purpose of the Dictionary is to describe all data that can be processed by the system. Unique English words that have similar meaning to each user are used in describing these data. The same data element can be described by two or more completely different names. The Dictionary is established initially when the system is loaded, and does not have to be created each time a report is produced. Names can be added, deleted, changed, or resequenced within the Dictionary at any time. The entire Dictionary can be listed at any time.

In summary, the system designed and presently under implementation provides Maine with a powerful tool; namely, a responsive data analysis system.

The system requirements appear to be very similar to those outlined in H.R. 17436.

### *5.0 Prototype Configuration for a National Environmental Data System*

Chart 8 illustrates a prototype configuration for a national environmental data system. The system would basically consist of a national data center and several sub-centers resident in selected states. The location of the centers would be based on such criteria as population to be served, area to be served and degree of local cooperation. Each sub-center would have computer capability and support personnel to serve both local information requirements and national information requirements.

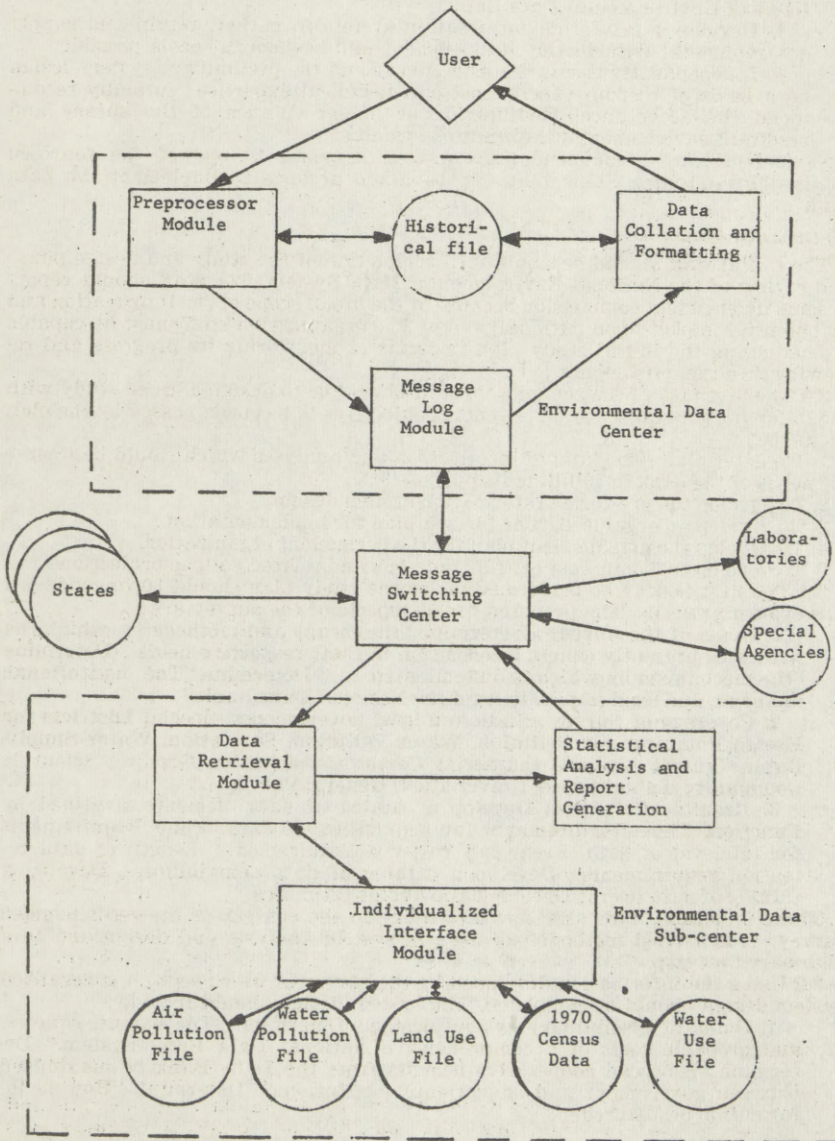
### *Data Gathering*

Initially most data would flow into the system at the sub-center level from states, universities, laboratories and special agencies such as water quality control boards. The local sub-center would verify and standardize the data and incorporate it into the sub-center data bank at the detail level. Summaries

and/or abstracts of the information would be transmitted to the National Environmental Data Center. At the national center the data would be evaluated and incorporated into the national data bank. Data developed at the national level such as EROS developed land use information would be incorporated into the national data base at a detailed level and that portion of the information required by a particular sub-center would be transmitted to that sub-center.

#### Data Retrieval

The national user would prepare a request for information which would be automatically processed and, if the information were retained at the national center, the data would be selected and reported back to the requestor. If it was available at the sub-centers the requesting information would be transmitted to the appropriate sub-centers and the data returned to the requestor. A similar procedure would be followed for users of the sub-center.



## 6.0 Recommendations for Implementing a National Environmental Data System as Proposed by H.R. 17436

1.0 *General Comment.*—Our response is directed to the requirements of H.R. 17436 and even more specifically to the 14 points enumerated on page 3 of Congressman Dingell's memorandum of June 9, 1970. In our previous testimony we covered one of these points "Review of past efforts and accomplishments of Information systems similar to the data bank" by receiving the progress accomplished in the State of Maine through development of MIDAS—the Maine Information Display Analysis System.

Our recommendations concern four broad areas of endeavor, namely:

1. Establish an organization to have both technical and managerial control of the Environmental Data Bank during its initial phases.
2. Develop a study plan to survey the information requirements of the Users of Environmental Data Bank.
3. Develop a pro-forma information system to gather, retain and supply environmental data in the most efficient and economical basis possible.
4. Independently assess the user survey and the preliminary system design on a basis of responsiveness, cost and technical expertise; formally recommend the acceptance, modification or non-acceptance of the survey and resultant environmental information system.

*Summary.*—Our recommendations are in response to one of the fourteen points—"Preliminary Steps that can be taken at once to implement the data bank".

### 2.0 Organization

The initial staff should be small until completion of the study and design phase and review of the National Environmental Data System. The staff should report to some independent commission because of the broad scope of the information and its potential impact upon national policy. The organization staff must be capable of conducting the initial study plan in terms of monitoring its progress and reviewing its accomplishments.

3.0 The first task of the commission staff should be to design a broad study with the following general scope. Five general objectives to be encompassed by the plan should be:

1. To determine "The kind of information and analyses which would best serve the needs of the bank in fulfilling its purpose."
2. To develop the pro-forma information system design.
3. To develop an organized, time-phased plan for implementation.
4. To develop the management plan for the permanent organization.
5. To develop economic cost benefit trade-offs and related volume projections.

3.1 The first task to be performed under the study plan should be to conduct a survey of user needs. The proposed broad aspects of the survey are:

1. Goals of the Survey: Determine "the means and methods by which the witnesses presently collect information in their respective fields." Determine "the mechanism by which is disseminated . . ." Determine "The institutional, financial, and legal implications of the National Data Bank."
2. Coverage of Survey: State and local governments, Special Districts for Health Planning, Air Pollution, Water Pollution, Sanitation, Water Supply, Rapid Transit System; Industrial Users; Conservation Groups; Scientific Community, Laboratories, Universities; General Public.
3. Results of Survey: Develop a catalog of data elements stratified by Function, Time Requirements for acquisition of data. Time Requirements for retrieval of data, Frequency response requirements, Length of data retention requirements; Develop a catalog of data contributors; Develop a catalog of data users; Develop data volume estimates.

There is nothing radically new or strange in the content of the recommended survey. It is a tried methodology used in system analysis and design and is a necessary first step.

3.2 Using the information developed by the survey of user needs; a generalized system design should be completed. The system design should include:

1. Goals of preliminary system design: Determine "The extent, sources, and probable costs of a comprehensive National Data Bank System." Determine "How can cooperative benefits from the Data Bank be maximized between government and educational institutions." Determine "How is information best stored?"

2. Content of system design package: Narrative of process, Flow Charts, Data Record Layouts, Data Dictionary, Volume Estimates, Machine Requirements.

3.3 The next step is to develop a time-phased plan for implementation. This plan should be developed taking into consideration the following factors:

1. User needs in terms of priority.
2. The proposed system design.
3. Modular incrementation of the data base.
4. Availability of personnel.
5. Availability of support, personnel and data.
6. Availability of funding.
7. Available technology.

3.4 A management plan should be developed to provide for

1. Proper integration of local, state, regional and national requirements.

2. Control over the gathering and dissemination of the environmental information.

3. An assessment of the numbers and skill levels of personnel requirements.

4. Location of supporting data bases on a regional or state level.

5. Establishment of a system of processing priorities on an objective basis.

3.5 Using the information developed in sections 3.1 to 3.4 economic models should be constructed of various alternatives to the management and technical questions so that the economic tradeoffs can be ascertained.

4.0 An independent group should review the work accomplished in items 1.0, 2.0 and 3.0 to determine its adequacy. This review would have the following broad goals:

Goals of the Review: Determine "Possible alternatives to, and consequences of not establishing such an information system". Determine "The impact of the National Environmental Data Bank on the various federal, state and local programs of environmental preservation and enhancement." Determine "Further work that should be done to augment the effectiveness of the Data Bank."

Upon completion of the review, the independent group should make recommendations to the Congress through its committee: To implement the National Environmental Data Bank as proposed. To implement the National Environmental Data Bank with modifications. Discard the concept as: Impractical technically, Impractical to manage, Too expensive.

Mr. DINGELL. The Chair also notes that you have alluded to the memorandum from the Chair dated June 9, 1970, relating to a number of points regarding H.R. 17436.

Mr. CHRISTIE. That is correct.

Mr. DINGELL. Without objection, that document will be inserted in the record at this point in order that it might be an appropriate and fully adequate record.

(The memorandum follows:)

U.S. HOUSE OF REPRESENTATIVES,  
COMMITTEE ON MERCHANT MARINE AND FISHERIES,  
Washington, D.C., June 9, 1970.

MEMORANDUM

From: Hon. John D. Dingell, Chairman, Subcommittee on Fisheries and Wildlife Conservation.

Subject: Background information concerning hearings on H.R. 17436, to Establish a National Environmental Data Bank.

Attached is a copy of a memorandum dated May 26, 1970, concerning hearings held by my Subcommittee on Fisheries and Wildlife Conservation on June 2 and 3 on the National Environmental Data Bank bill.

This is to advise that additional hearings have been scheduled for Monday, June 22 and Thursday, June 25. The hearings will be held in Room 1334 of the Longworth House Office Building beginning at 10:00 A.M. each morning. Should you desire to testify at the hearings please contact Mr. Ned Everett of the Committee staff. His telephone number is (202) 225-6785.

Please note that witnesses scheduled to testify should deliver 35 copies of their prepared statement to the Committee Clerk at least 24 hours prior to their scheduled appearance.

U.S. HOUSE OF REPRESENTATIVES,  
COMMITTEE ON MERCHANT MARINE AND FISHERIES,  
*Washington, D.C., May 26, 1970.*

MEMORANDUM

From: Hon. John D. Dingell, Chairman, Subcommittee on Fisheries and Wildlife Conservation.  
Subject: Background Information concerning hearings on H.R. 17436, to Establish a National Environmental Data Bank.

On June 2-3, 1970 the Subcommittee on Fisheries and Wildlife Conservation of the House Committee on Merchant Marine and Fisheries will hold hearings on H.R. 17436, a bill amending the National Environmental Policy Act (P.L. 91-190) to provide for the establishment of a National Environmental Data Bank.

At present there is a great deal of data concerning the environment on record and being collected for specific projects. Little of this information becomes available to decision makers in a timely manner and in a useful form; hence they frequently must act in the absence of best information. The potential for less than optimum environmental management is greatly magnified under these circumstances. It is the intent of this amendment to the National Environmental Policy Act of 1969 to provide a central repository for data and information pertinent to the needs of the Council on Environmental Quality and other similar bodies, State and Federal, in discharging their responsibilities.

The legislation also would provide for the creation of the National Environmental Data Bank Board. The function of the Board would be to administer the Data Bank. It would collect all available information, knowledge, and data relating to the environment from all domestic and international sources. All executive agencies would be required to submit appropriate information to the Bank as they may acquire it. Further, all information generated as a result of a study or activity supported by Federal funds would be entered into the Bank.

In addition to this passive accumulation of information, the Board would conduct research and studies to develop predictive ecological models as well as actively seek and procure useful environmental information in any other practical way. They would be required to analyze legislative and operational proposals of the various executive departments as to their probable impact on the environment and then to submit recommendations for assuring that the impact of such proposals would enhance the quality of the environment. In turn, it would be the responsibility of the Board to make this information and the analyses available to any or all user groups, be they Federal, State, or private. In some cases, the Board would be authorized to charge a user fee.

The Subcommittee is especially interested in obtaining information and views from the witnesses concerning the following topics:

The kind of information and analyses which would best serve the needs of the Bank in fulfilling its purpose.

The mechanics of a system of data input and retrieval which would serve the greatest number of decision makers in the most meaningful way.

The means and methods by which the witnesses presently collect information in their respective fields.

The mechanism by which information is disseminated, eg: can witnesses readily obtain data collected by the Federal Government?

How is information best stored?

The extent, sources, and probable costs of a comprehensive National Data Bank System.

The institutional, financial, and legal implications of the National Data Bank.

Preliminary steps that can be taken at once to implement the Data Bank.

Possible alternatives to, and consequences of not establishing such an information system.

A review of past efforts and accomplishments of information systems similar to the Data Bank.

The impact of the National Environmental Data Bank on the various Federal, State and local programs of environmental preservation and enhancement.

How can cooperative benefits from the Data Bank be maximized between government and educational institutions.

Further work that should be done to augment the effectiveness of the Data Bank.

The scheduling of additional hearings will be announced as soon as possible. Witnesses wishing to testify should contact Mr. Ned Everett of the Committee staff, telephone number 225-6785.

The hearings will be held in Room 1334, Longworth House Office Building, beginning at 10:00 a.m. each morning. Witnesses scheduled to testify at the hearings should deliver 35 copies of their prepared statement to the Committee Clerk at least 24 hours prior to their scheduled appearance.

#### STATEMENT OF HON. STEWART L. UDALL, FORMER SECRETARY OF THE INTERIOR

Mr. UDALL. Thank you very much. I do not have a prepared statement. I apologize. My life is not significantly less hectic than it was a couple of years ago, I find, but I am very much interested in this legislation, and I welcome the opportunity to make some brief comments on it.

It seems to me as a former Cabinet officer who had, I think, what can accurately be described as the major responsibility in environmental matters, one of the things that was always confronting you was not only the complexity of environmental problems, but the great mass of data that was available and the failure even in a department such as my own—the difficulty, simply, of bringing the data, the information together in an organized, rational way, and it always seemed to me as an environmentalist and one responsible in this field, there was a great deal of talk in the 1960's about the computer, about systems analysis, about what this was going to do.

The reason I am enthusiastic about this bill is that this proposes to stop talking about what systems analysis and the computer might do, and to give us a method of actually accomplishing the assembling and collating and organizing data that is available in order to serve all of the public agencies and all of the committees of Congress and the nation as a whole.

There are two or three things that I would like to say about this legislation. I am sure the committee is aware of this, but I want to stress it, and that is that the data that will be needed to go into this kind of bank is not only in the Federal Government—much of it is in the universities, and as we all know, they have done and are doing some of the most significant work in this field.

Some of it is being done under grants from the Federal Government, some of it is being done on their own initiative, and probably as a plain repository of information, we may find that the universities and some of the State agencies may have information just as valuable as some Federal agencies have.

Therefore, the discussion that I understand has taken place with regard to how this might be accomplished, I think it is probably not

so much a matter of gathering everything in Washington as it is a matter of creating the kind of network of information, of systematizing in such a way that not only the people in Washington who are trying to make decisions can gather the data that they need, but the people at the State level, or the regional level, who are also attempting to make decisions and make predictions, that they would have an opportunity to do so.

I would also throw in one other cautionary remark, and that is that many of the departments, I am sure, although this is much too limited in degree, are already using the computer in some of their work.

There have been some beginnings, and I think it is probably important that this legislation be written and be accomplished in such a way that it is not disruptive of on-going work.

I am sure that is not the attempt of this legislation. But here when I look at the overall picture, the rapid strides that we have been making in recent years, it does seem to me that this is a very logical next step after the enactment here last year of the Environmental Policy Act—which set up the environmental quality control council with its new functions, which is also very definitely serving a vital role in my judgment, providing this kind of information, data bank capability, that does not exist in this country today.

I think that is a very vital second step, and I simply want to lend my voice as one who feels that if this is done in the right way it can be a very useful tool and it can be very effective.

I would then like to add, Mr. Chairman, I think the other thing that we are going to need, and again I see a feed-in and an interrelationship between this kind of data bank and the kind of work that I hope is going to be done in the next few years, I believe we are going to need a much higher level of research and environmental problems almost across the board, but I think we are particularly going to need very heavy effort in research and development on new pollution control methods, both with air pollution and water pollution, on developing a process that will enable us to recycle and reuse our wastes and our water.

I think that this kind of research and development can best be done if we have a method of pulling together all of the data that is available in order to know how best to proceed.

So, again, I think that this can serve a very vital function at many levels of the environmental battle. It can serve a vital function for the departments, for the State governments in trying to better understand their problems and make decisions and I think it can help the Congress in making decisions and help the Federal Government to pull together all of the disparate information that is available, and bring it into a coherence that will enable the right decisions to be made.

So as one former executive in the vineyard, it pleases me to see the leadership that Congress is providing, and I think that is a very wise followup step to the action last year establishing the National Environmental Policy Act.

Thank you very much.

Mr. DINGELL. Mr. Udall, the committee is grateful to you for your presence and your very helpful question this morning.

Mr. Everett?

Mr. EVERETT. Mr. Udall, we have had several witnesses who stated they thought maybe a study should be carried out first. I was wondering if you would agree with me that the study could be carried out simultaneously with the developing of the system as called for by this legislation, and that we are now ready to go forward with the study and the development process.

Mr. UDALL. I have no doubt at all that one of the first things that would have to be done if you enacted this legislation would be to concentrate on what most effective and most economical way was to set up this kind of environmental data bank.

This is a complex problem, and naturally you are going to want to study it, but to me, the need is so clear that to enact the legislation and then to proceed with a study, naturally moving at a deliberate pace, and being sure of what is done and how this is established, and that this is done in the right way.

If there were any doubt in my mind as to the wisdom of this legislation, I would say that the argument of well, it should be studied before we do anything, should—would have some point.

My feeling is, on the basis of my experience, that the idea is clearly sound, and I would simply caution those if the legislation is enacted that of course they are going to have to study very carefully.

This again is a very necessary phase of it. But I don't see any real urgency, any real urgent need to study whether something like this would be valuable and would be useful.

I think it is very clear to me that it is urgently needed at this time.

Mr. DINGELL. What you are saying is that the study is going to show we need exactly the kind of device that the legislation proposes to set up, but that a study would be useful to establish the mechanism to be set up, how the mechanism is going to function, the precise fashion in which it will proceed to collect and evaluate information and make it available, the kind of equipment that will be used, and really the study that is needed is one more or less ministerial in nature, rather than one on fundamental policy.

Would you agree with that?

Mr. UDALL. That is what I am trying to say, Mr. Chairman.

STATEMENT OF J. W. PENFOLD, CONSERVATION DIRECTOR, IZAAK WALTON LEAGUE  
OF AMERICA

Mr. Chairman, I am J. W. Penfold, conservation director of the Izaak Walton League of America. The League is a nation-wide organization of citizens dedicated to the conservation and wise use of the Nation's resources and to the perpetuation of quality of America's environment. The League heartily supports the purposes and objectives of H.R. 17436.

The Congress in enacting P.S. 91-190 decided that the Nation is concerned with the quality of the American environment and will act positively to prevent its deterioration, and to enhance its potentials to contribute to the well-being of all citizens. This objective challenges the Council on Environmental Quality and all agencies of Government. At best, it is a tremendous job. But, it will be an impossible job, if the Council does not have readily available all information, knowledge and data relating to the environment on which to base its findings and recommendations. By the same token, every agency—Federal, state and private—should have available from some one central source all such information, knowledge and data as it plans for any activity that might affect the environment for good or ill. It is therefore a matter of but simple logic that there should be established a central bank for the orderly deposit and rapid retrieval of these data. The technology of computers and data processing now makes this feasible. It would be ridiculous not to proceed forthwith to establish and operate such an environmental data bank.

H.R. 17436 does not specify under what Federal jurisdiction the Bank would be located, so presumably the Bank and the Board would operate as an independent agency responsible directly to the President. The Bank could operate in this manner, or under the Smithsonian Institution (as suggested in another similar bill) or within a department such as Interior. We believe it would make most sense, however, to place it in the Council on Environmental Quality which would be a prime user of the Bank, and which is an independent unit already established and which cuts across all agencies of the Federal Government. Moreover, the potentials of the Data Bank and the responsibilities of the Council complement each other almost exactly.

If the Data Bank is assigned to the Council, there will be no immediate need for a Data Bank Board because the Council itself would fill that same role. This would not only save money directly but would also eliminate a further and probably costly liaison function for every agency of Government concerned with environmental matters. Additionally, the Data Bank should not be locked into a new agency and bureaucracy before its dimensions are fully understood and its most efficient manner of operation has been determined. The total environmental quality function will undoubtedly be dynamic, and will create new channels of communication between the public, political subdivisions, industry and the Federal government. Certainly its initial format should be as simple and direct as possible so that adjustments can be effected quickly and easily as experience will dictate. We believe this could best be achieved if the Data Bank responsibility is assigned to the Council.

It is not clear to us whether or not section 307 of the bill in fact provides for the employment of short-term consultants. If the present language is not sufficiently broad to cover such, it should be so amended, because unquestionably the Council (or Data Bank Board) will need to employ top consultants during the process of setting up the Bank and its operating procedures.

In conclusion, Mr. Chairman, we support the concept, and the purposes and objectives of H.R. 17436 and appreciate the opportunity to express our views.

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STATEMENT OF PAUL B. KANOWSKI, PH. D., DIRECTOR FOR ECOLOGICAL STUDIES,  
AND PROFESSOR OF BIOLOGY, THE UNIVERSITY OF NORTH DAKOTA

In a time when our news media daily chronicle instances of environmental destruction and mismanagement, it is singularly important that we address ourselves to the problems of the capacity of the environment to sustain human activities. The ecological stresses brought about by a steadily increasing human population, by an ever expanding economy, and by too rapid technological development are severely limiting the diversity of nature and the quality of all life. If we hope to enjoy the beauty of the natural environment as well as leave as much as possible for future generations, and if we hope to continue to enjoy

the benefits of utilization of natural resources—which are steadily decreasing in availability, then we must act now to learn fully about how the natural environment works and how our present activities are affecting the proper functioning of that environment.

As an ecologist, I am well aware of the limitations of researchers in this field. Ecology is such a broad and complex field that most ecologists are specialists in only one or several aspects of it. They cannot efficiently gather data on all aspects of an environmental study. Consequently, most ecological studies have been of limited scope and application.

Today's environmental problems demand comprehensive research investigations and immediate solutions. A system making available to competent researchers relevant data obtained by others would enhance the probability that ecological destruction might be controlled and solutions to environmental mistakes might be applied before irretrievable damage has been caused. Data from a wide range of environmental conditions is needed in order to create models of environmental systems, on the basis of which environmental effects of human activities may be predicted.

The National Environmental Data Bank proposed in H.R. 17436 would be a tremendous boon to ecologists if it would provide us with a central site for the storage, retrieval and correlation of environmental data, and if it would serve to disseminate information by publishing bibliographies on selected research topics as well as lists of publications received by the bank.

The establishment and proper organization of the data bank are of greater urgency to me than the location within the federal structure. If a cabinet-level natural resources department incorporating all of the many scattered environmentally related agencies were established, it would be the logical location for the data bank. However, under the present federal organization the Smithsonian Institution seems to me to be the most appropriate agency to house it.

While a central data bank is the most urgent national need, there is a need for additional centers of a regional nature. I recommend that a series of regional centers serving as satellite units to the national center be authorized. Regional centers should be organized around environmentally cohesive regions such as the Upper Great Plains, Great Lakes, New England, etc. Each of these centers should be responsible for obtaining raw data from that region, storage and retrieval of that data for scientists and governmental officials, and transmitting data to the national center for storage and utilization in more comprehensive studies. Because a large amount of ecological data has primary applications in regionally restricted environments (biomes), and because the operation of the smaller, regional centers may be more efficient, the establishment of regional centers represents a redundancy that will be valuable to ecologists as well as local and regional governmental officials.

I support the establishment of a National Environmental Data Bank. The complexity of environmental problems and the urgency to act on them mark this as a major environmental need and one that can be successfully accomplished only by forceful action at the federal level.

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DAVIS, CALIF., June 5, 1970.

HON. JOHN D. DINGELL,  
*Chairman, House Subcommittee on Fisheries and Wildlife Conservation,  
 House Office Building,  
 Washington, D.C.*

DEAR CONGRESSMAN DINGELL: I am pleased to submit the following information in support of your H.R. 17436, to Establish a National Environmental Data Bank. Before discussing any substantive issues, it is noteworthy that the pressure by the public and technical organizations to collate and disseminate information on the state of the environment has become so intense that several universities are now doing this. Noteworthy are "World facts and trends" distributed by Dr. John McHale, Director, Center for Integrative Studies, School of Advanced Technology,

State University of New York, Binghamton, New York, 13901, and "An Environmental Atlas" distributed by Dr. C. S. Holling, Chairman, Resource Science Centre, The University of British Columbia, Vancouver 8, British Columbia. These two documents give some idea of the types of information which need to be collated and distributed. They show surprising overlap in coverage with each other, and with the document, "A model of society" distributed by my group, the Environmental Systems Group, Institute of Ecology, University of California at Davis. While all three documents do not cover each of the topics in the following list, each of them covers most of them. This list would appear to represent a consensus as to the important variables that should be monitored, and on which statistics, models, analyses, interpretations and forecasts should be distributed to appropriate government agencies, universities, and research units.

1. Population size, age, sex, economic composition, migration rates, birth rates by age, sex; and cause of death. We also need to know the age and sex composition of migrant populations, and where they come from and go to.

2. Supply and demand trends for all resources: water, land, by soil type and potential use category, wood, minerals, and fuels, including uranium ores by ore grade.

3. Public health statistics by age, sex, economic level and migration history.

4. Statistics relating to the structure and dynamics of society: taxes, government expenditures for all levels of government, energy flow through society, the state of technology.

5. Measures of environmental degradation of all kinds as it affects soil, water, air and the weather. Trends in the disposition of refuse.

It may seem self-evident that the preceding statistics are necessary, and one would expect that they would be readily available. In fact, if one puts a liberal interpretation on what is meant by these five categories of data, we have complete information on none of them, and in many subcategories of data, the true state of the world is so little known that massive changes in government policy would result immediately if the true state were known.

One tremendously important example will make clear the magnitude of our information compilation and dissemination deficiency. Almost all current economic thinking and planning for at least the next 15 years is based on the explicit assumption that supply shortages for energy and minerals will not be limiting to the growth of the U.S. economy. It is specifically assumed that if limitations should develop, they will be met by appropriate increases in research and development so that alternate sources of supply will be found. Politicians, in general, follow this same position. Consequently, when the House recently supported development of the S.S.T., I doubt that it even occurred to many Members that shortages of aviation kerosene might even be a factor. In fact, if present trends continue, *all crude oil in the entire world will probably be gone in 2000*. To indicate the magnitude of the world energy problem, the Alaska North Slope strike, about which there has been so much wild optimism, will keep the world in crude oil for about 45 days in the year 2000. Indeed, the House, the Senate and the Executive in the U.S. are living in a dream world with respect to energy supplies. This situation is developing into such an obvious nightmare that it has now burst outside the pages of the technical journals and attained front page headline status on the Wall Street Journal on June 2, 1970. Not only are we living in a dream world with respect to fossil fuels, but the public, and government has somehow concluded that mankind has available an infinite energy supply from nuclear sources. This type of thinking would be acceptable during a particularly inebriated party, but we now have a desperate need for morning-after-the-party thinking, of the type so eloquently and cogently expressed by Preston Cloud on page 109 of the Texas Quarterly, Summer 1968 issue. He injects a necessary note of realism into the discussion about availability of uranium ores at economically meaningful prices. The public, and much of government has not yet grasped a simple principle about all resources: no energy source

is economically available to us if the energy in the resource is less than the energy required to obtain it.

Similar massive problems are developing with respect to prime agricultural land, wood, and a host of critical minerals.

With respect to public health statistics which could be used to measure the impact of environmental factors on humans, there are gross deficiencies. For example, most diseases typically attack particular age, sex, economic and racial groups differentially. Consequently, in order to ascertain the significance of health statistics for a county or a metropolitan area, or section thereof, one must have demographic and health statistics showing the incidence of each disease by population subgroup. Further, since many groups of diseases, such as the cancers and chronic obstructive respiratory diseases are characterized by cumulative effects and lag effects, in which effect shows up long after environmental cause has been effective, and in response to continuous application of the cause over a long time, we need detailed migration histories on people. This information is not impossible to obtain: one good study has been done by the California State Department of Finance which is extremely revealing. For example, the low incidence of many lung diseases in Los Angeles County would suggest that air pollution there is not serious. In fact, this low incidence is because an unusually high incidence of the population migrating into Los Angeles County consists of young women, the demographic group least susceptible to chronic obstructive respiratory diseases.

Also, our understanding of the effect of environmental factors on stress diseases, for which high blood pressure is a leading variable, is minimal. Only a very few comprehensive studies which have analyzed large numbers of people in entire corporations, or counties have given us any insight into the mechanisms involved. We need large numbers of blood pressure readings, collected in a scientific sample program, as the Census or a professional polling organization would take a sample.

One would expect that given the great deal of discussion amongst scientists about the effects of air pollution on weather, and possible ominous implications for worldwide crop production, there would be ample measurements of the concentration of air pollutants at high altitudes, taken in a constant manner for many years. Nothing could be farther from the truth. We have been so busy collecting moon rocks and conducting mars fly-bys that we have overlooked the possibility that our own planet might freeze to death because of global increases in atmospheric turbidity. We desperately need to redirect satellite experimentation into this more socially and immediately relevant type of activity. Reed Bryson, Chairman of the Department of Meteorology at the University of Wisconsin in Madison could give you frightening testimony on this point.

You have asked about the mechanics of a system of data input and retrieval. I suggest that you poll about 200 environmentalists inside government and universities as to those measures which could most usefully be collated and issued in documents at regular intervals. The prospective users will be the best guides as to the design of the service.

The approach of my group to collecting data indicates the nature of the problems now encountered. First, we must spend an immense amount of energy gathering data from an amazing variety of sources. Second, much of the data collected by government agencies is not published in a useful form. A simple example: state agencies publish mortality rate statistics by year, disease type, county, or by year, disease type, age and sex. Clearly, the coarsest breakdown of any use to the analyst is by year, disease type, and age and sex within county. Consequently, we must bother the agencies for specially prepared compilations they make for us from their master magnetic tape files. A third problem is that many government agencies have a budget which just barely allows them to collect data, and publish very sketchy results. Their budgets are too marginal to allow them to actually do anything useful with the data. This means for example that a massive public health hazard may exist in a county, but neither county, state, local nor private agency budgets allow for the kind of statistical and epidemiological research required to isolate and identify the cause of the hazard.

Information is only best stored on magnetic tape if there is budgetary provision to get it off tape when needed. This may seem so self-evident as to be not worth stating, so we will not mention any culprit agencies to avoid their being embarrassed.

One could not even set up a pilot project on a National Data Bank for less than \$500,000 per annum. A useful data bank which did not collect its own data, but promoted necessary data collection programs by other agencies, then collated the data, published them, and conducted analyses that would serve as a national catastrophe warning system, and maintained liaison with various agencies in government and universities would cost between \$2,000,000 and \$5,000,000. It is noteworthy that a considerable proportion of the time of the Environmental Quality Council goes into such liaison. This is a laudable and necessary activity, but it costs money, and a reasonable budget should be prepared for this purpose.

As mentioned in the first paragraph, at least three universities in North America are now beginning to collect data of the type necessary for building comprehensive computer simulation models of the world. Each of these three groups is woefully underfunded, none to my knowledge having a budget in sight of more than \$225,000 per annum. What all three groups are showing up is that society has a great many problems developing that are not generally recognized, and that those problems which are recognized by politicians typically have a quite different root cause than the suspected cause. For example, a wide variety of the most politically sensitive problems in society at the moment are the product of the tax consequences of distortions in the age structure of the population produced by excessive rates of population growth coupled with a high and rising standard of living and inflation. This trio of causes is creating an economic and social time bomb for our society. All ecological data bank projects in North America are bringing out the fact that society is headed for a catastrophe unless atomic energy from breeder and fusion reactors can be made widely available quickly, and many experts have presented arguments showing why this is unlikely.

The best way to achieve integration of the efforts of a national environmental data bank group, and corresponding groups in universities is by means of a newsletter, and annual meetings.

Yours very truly,

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KENNETH E. F. WATT.

