

WATER-RELATED INFORMATION SOURCES: HIGHLIGHTS

by

Linda M. White

GENERAL MACHINE SEARCH SERVICES

Since the mid-1960's numerous technological developments in the machine-readable data base field have had a decided impact on the types of search services provided to users. Far more data bases exist today than at any time in the past, and far more users are receiving search services from machine-readable data bases than at any time in the past (Williams 1975). Although there is not an accurate listing of all existing bibliographic machine-readable bases, the number would probably run close to 300. Computer information systems are derived from a variety of sources, including governmental agencies, abstracting and indexing companies, national or regional libraries, professional societies, universities, public libraries, and private business firms. Although these base generators may differ in their data base formats and purposes, they all are interested in improving the dissemination of information.

Historically, when computers first started being used in connection with bibliographic information systems, they were used primarily for SDI (selective dissemination of information) services (Mauerhoff 1974, Williams 1975). The principle behind SDI is to develop an interest profile for a user--for example, evapotranspiration measurement studies for Southwest U.S. areas--and periodically run this profile against the current data file. The end product is a series of current references to articles or project descriptions on that topic. When bases are first being developed, it is reasonable to use them for SDI services, since the base frequently does not have enough references to run a retrospective search.

The second type of service, being used much more extensively today with computer bases, is the on-line or off-line retrospective search. The longer a base exists, the easier it is to use it for retrospective searching. A retrospective search is somewhat similar to the SDI search in that a user interest profile is developed. The profile can, in fact, be identical in appearance to the SDI profile. The difference is that a search is run only one time, against the entire holdings in the data file, and one printout is obtained. As bases which first evolved in the early 1970's have increased in their number of references, retrospective searching has increased in popularity. It was estimated that 700,000 retrospective searches were conducted in 1974, and the figure was projected to be 1,000,000 for 1975 (Williams 1974).

BASES FOR DISCUSSION

Keeping in mind that systems can provide either SDI searches or retrospective searches, or both, I would like to now focus on five information bases: the Water Resources Scientific Information System (WRSIC), the Watershed Management Information System (WAMIS), the Smithsonian Science Information Exchange (SSIE), the Current Research Information System (CRIS), and the National Technical Information Service (NTIS). Each of these was selected because of their accessibility to most persons in the Southwest or because their subject coverage includes water and water-related research.

DEVELOPING ORGANIZATIONS

The importance of support from the U.S. tax dollar is shown by examining the developing organizations for each of these five bases.

WRSIC now functions as part of the Office of Water Research and Technology in the U.S. Department of Interior. It facilitates the dissemination of scientific and technical information on water through a variety of services, including state-of-the-art reviews and computer-aided retrieval of references. A network of regional centers permits access to the WRSIC computer base through remote terminals.

WAMIS was developed by the School of Renewable Natural Resources, University of Arizona. The system serves land managers and researchers in the Southwest and western United States, faculty and students, and other individuals working with the University of Arizona's natural resources program.

SSIE is a central clearinghouse for on-going research sponsored by both federal and non-federal organizations. Its early predecessor was established in 1949, but SSIE has expanded in scope considerably since then. Operating as part of the Smithsonian Institution, SSIE is intended to facilitate planning and management of scientific research activities, especially those supported by federal agencies and institutions.

The author is Information Systems Specialist, Center for Quantitative Studies, The University of Arizona, Tucson. Approved for publication as Journal Paper No. 190, Arizona Agricultural Experiment Station.

CRIS performs a similar function for the U.S. Department of Agriculture, providing access to the research activities of the USDA, the state agricultural experiment stations, and other cooperative institutions (among these being the Forestry School at Northern Arizona University).

Prior to 1970, NTIS was known as the Clearinghouse for Federal Scientific and Technical Information. NTIS operates within the U.S. Department of Commerce. It was established to consolidate and improve information services of the U.S. Department of Commerce and numerous other governmental organizations, while increasing and simplifying public access to some types of government publications and data.

SCOPE BREAKDOWNS

A discussion of scopes, dates covered, and sizes of the bases will give a further orientation to each of these bases (Table 1).

WRSIC covers primarily published literature in an interdisciplinary mix of natural, physical, and social sciences related to water resources and water management. The specific category codes used in WRSIC are: (1) nature of water, (2) water cycle, (3) water supply augmentation and conservation, (4) water quantity management and control, (5) water quality management and protection, (6) water resources planning, (7) resources data, (8) engineering works, (9) manpower, grants and facilities, and (10) scientific and technical information. Although WRSIC does cover some foreign studies and research, most of the research reported has been conducted within the United States. WRSIC began development of its abstracts and associated citations in machine-readable form in 1968, and therefore most of the references are to documents published since that date. At the present time, there are some 96,000 references in the WRSIC file, with 15,000 added each year.

WAMIS covers primarily published literature on watershed management with emphasis on the western United States. WAMIS was developed in conjunction with another project, a literature review on the water yield improvement potentials in Arizona through vegetation management. This analysis involved a review of Arizona and Southwest watershed research since 1956. More specifically, it focused on land management practices (such as clearcutting, thinning, burning, or herbicide use) and the effects on water yield, timing of the runoff, and water quality, in addition to other effects on other resources of the same area, such as timber production, grazing use, wildlife habitat, or recreation. Since the initial core of WAMIS references comes from this review, WAMIS covers these same topics. Because of its specialized nature, there is no date restriction on input to WAMIS. However, most of the references cover research completed in the last ten years. Currently, the base has some 2,400 citations and abstracts.

SSIE is particularly designed to meet the prepublication information gap, by maintaining a data base of information on on-going and recently completed projects in basic and applied research in the life, physical, and engineering sciences. The current file, which covers the past two U.S. government fiscal years, contains records on more than 200,000 on-going or recently completed projects; annually it processes information on some 100,000 research projects. Major categories in SSIE are agricultural sciences, behavioral sciences, biological sciences, chemistry and chemical engineering, earth sciences, electronics and electrical engineering, materials, mathematics, medical sciences, physics, and social sciences and economics. A few examples of the more specific subjects covered are pest control measures, fish and wildlife biology, wastewater treatment, air pollution, market structure, forestry, and soil mechanics. Project information is voluntarily submitted by some 1,300 organizations, including U.S. government agencies, private investigators, associations, foundations, universities and colleges, state and local governments, and, to a more limited extent, from private industry and foreign organizations.

CRIS reports on current research conducted or sponsored by the six USDA research agencies (Agricultural Research Service, Forest Service, Economic Research Service, Cooperative State Research

Table 1. Scopes for selected bases.

<u>BASE</u>	<u>SUBJECT</u>	<u>DATE</u>	<u>BASE SIZE</u>
WRSIC	U.S. water research	1968 to date	96,000
WAMIS	land management practices and effects on resources	1960's to date	2,400
SSIE	current research projects in U.S.	most recent 2 government fiscal years	200,000
CRIS	current research projects in USDA	research projects of past 5 years	24,000
NTIS	U.S. research and development reports (government sponsored)	1964 to date	460,000

Service, Farmer Cooperative Service, and Statistical Reporting Service), by 56 state agricultural experiment stations, by 30 forestry schools, and by other cooperating institutions. All types of research sponsored by these agencies are reported. Since CRIS is designed to access current work, research is only reported in CRIS from the time the project is initiated until two years beyond the termination date. Currently there are about 24,000 project descriptions in CRIS. Each year some 4,000 new projects are initiated and the same number retired. Reference to a particular project is maintained in the bank on the average of five years. All CRIS material is sent to SSIE, which changes the format some and has different user groups.

NTIS gathers and processes into its base U.S. government sponsored research and development reports and analyses prepared by federal agencies, contractors, or grantees. These are unclassified, unlimited distribution reports (often project completion reports) from such agencies as NASA, DDC, HEW, HUD, DOT, and ERDA. Subject coverage is broad and interdisciplinary, with some to the topics being agriculture and food, behavior and society, building technology, chemistry, earth sciences, economics, energy, engineering, environmental pollution, medicine and biology, natural resources, and oceanography. NTIS deals only with reports submitted to it for processing, storage, and distribution on demand. Many federal agencies use NTIS as a secondary distributor for reports. Reports identified in NTIS may also be issued by the Government Printing Office (GPO), but all GPO materials are not in NTIS. The machine readable base for NTIS now numbers more than 460,000 citations (since 1964) with an input of about 60,000 entries each year.

OUTPUT DIFFERENCES

The outputs or projects disseminated by each of these bases again show differences in scope and purposes.

WRSIC is a bibliographic information system, and therefore the product is bibliographic references, referring to research project reports or published literature. Each reference gives information on the author, author affiliation, date, title, source, keywords, identifiers, and an abstract, which can be informative or indicative, depending on the document. A sample printed reference is as follows:

19/0/0001-00176// 126
70R04916 WRA-W3-12 03.BC

W70-04916/

MANIPULATING VEGETATION FOR WATER CONSERVATION/

WARSKOW, WILLIAM L./MOORE, ROBERT E./WILSON, DAVID S., JR./

SALT RIVER VALLEY WATER USERS' ASSOCIATION, PHOENIX, ARIZ./

AGRICULTURAL ENGINEERING, VOL 50, NO 1, P 24-25, JANUARY 1969. 2 TAB./

VEGETATION MANIPULATION/SALT RIVER VALLEY WATER USERS' ASSOCIATION/

03B/

VEGETATION MANIPULATION IS AN IMMEDIATE AND DIRECT METHOD OF AUGMENTING WATER SUPPLIES THROUGH INCREASING RUNOFF. IN ARIZONA EXPERIMENTS ARE IN PROGRESS WHICH STUDY THE WATER GAIN FROM JUNIPER ERADICATION, CHAPARRAL CONVERSION, AND TIMBER HARVEST TECHNIQUES. THE SALT RIVER VALLEY WATER USERS' ASSOCIATION IS FUNDING THESE STUDIES IN CONJUNCTION WITH THE U. S. FOREST SERVICE. (CARR-ARIZONA)/

W3 12/

RANGE MANANGMENT/RUNOFF/WATER CONSERVATION/WATER YIELD IMPROVEMENT/BRUSH CONTROL/JUNIPER TREES/CHAPARRAL/FOREST MANAGEMENT/LUMBERING/CLEAR-CUTTING/ARIZONA/ ARID LANDS/GRASSES/

WAMIS is also a bibliographic information system and its product is a computer printed bibliography of citations and abstracts. Each citation gives the author, date, title, and source. No author affiliation is given. Abstracts can be either indicative or informative, again depending on the original document length and content. A sample printed reference is as follows:

WARD, R. C.

1971 SMALL WATERSHED EXPERIMENTS; AN APPRAISAL OF CONCEPTS AND RESEARCH DEVELOPMENTS.

UNIVERSITY OF HULL(ENGLAND), OCCASIONAL PAPERS IN GEOGRAPHY 18. 254 P.

IN THIS REVIEW OF OVER ONE THOUSAND PUBLICATIONS, VARIOUS CATEGORIES OF SMALL EXPERIMENTAL WATERSHEDS ARE DESCRIBED AND DISCUSSED, TOGETHER WITH THE STRENGTHS AND WEAKNESSES OF THE METHOD, AND ALTERNATIVES TO THE TECHNIQUE, INCLUDING PLOT STUDIES AND MODELS. THE AUTHOR CONCLUDES THAT A SMALL WATERSHED PROGRAM IS ESSENTIAL AND WILL PROBABLY INCREASE IN IMPORTANCE AS THE GENERAL RESEARCH EFFORT IN HYDROLOGY CONTINUES TO INCREASE. THE BIBLIOGRAPHY IS PRESENTED BOTH ALPHABETICALLY BY AUTHOR AND BY TOPIC. THE LISTED BIBLIOGRAPHIES AND TEXTUAL CONTENT SHOW A STRONG LEANING TOWARDS NORTH AMERICAN STUDIES.

WAT-C/WATERSHED MANANGMENT/WATERSHEDS (BASINS)/HYDROLOGY/BIBLIOGRAPHIES/MODELS/WATER MEASUREMENT/ NORTH AMERICA

The basic record of information used in SSIE is the single page Notice of Research Projects, (NRP) illustrated in Figure 1. The NRP contains information on the supporting agency for the project, grant or contract number, title, principal investigator and speciality, performing organization, funding (if included), and in most cases a 200-word summary of the project.

SMITHSONIAN
 SCIENCE INFORMATION EXCHANGE, INC.
 1730 M STREET, N.W. PHONE 202-377-1111
 WASHINGTON, D.C. 20540

FORM APPROVED
 GSA FPMR (41 CFR)
 101-11.6

5010-108

GBP-1502

NOTICE OF RESEARCH PROJECT

SUPPORTING AGENCY		AGENCY'S NUMBER	
U.S. DEPT. OF COMMERCE NATL. OCEANIC & ATM. ADMIN. NATL. MARINE FISHERIES SERVICE		CONTRACT 04-3-042-43	
TITLE OF PROJECT			
DETERMINATION OF FRESH WATER QUANTITY STANDARDS FOR THE GUADALUPE ESTUARY AND SAN ANTONIO BAY SYSTEM, TEXAS			
PRINCIPAL INVESTIGATOR, ASSOCIATES AND DEPARTMENT OFFICIALS			
E BRADLEY			
PERFORMING ORGANIZATION		PERIOD FOR THIS NRP	
STATE PARKS & WILDLIFE DEPT. JOHN H. REAGAN STATE OFFICE AUSTIN, TEXAS 78701		7/74 TO 6/75 FY75 FUNDS \$89,500	
SUMMARY OF PROJECT			
<p>Objectives: To determine the parameters to be monitored within the estuarine system; to establish a data storage and retrieval system; and to determine salinity, temperature gradients and determine changes in nutrient levels associated with variations in river flow.</p> <p>Procedure: Aerial photography missions will be flown over the study area on a regular basis. Data obtained from aerial remote sensing equipment will be analyzed. Stations will be established within the study area for sampling on a regular basis to obtain data on the physical, chemical and biological conditions as related to river flow. Biological samples will be taken on a regular basis to determine changes in the abundance and species composition of the estuarine fauna.</p> <p>Progress: Hydrographic studies have indicated that 1) salinity in San Antonio Bay increases with depth; 2) turbidity is mostly influenced by wind; and 3) evaporation rate is essentially the same as for fresh water lakes.</p> <p>Aerial photography data obtained from NASA is essentially complete and has been mapped. Man-made alterations include: 38.3 miles of dikes have been constructed, 1,366 acres of salt water lakes have been isolated or drained, 3,000 of emergent spoil has resulted from channel dredging, 75 miles of drainage ditches have been dredged, and 10.5 square miles of bay bottom has been dredged.</p>			

Figure 1. Sample output page from SSIE.

The CRIS printout contains much the same sort of information, although its appearance is a little different. The Standard Technical Retrieval (Figure 2), provides the following: the status of the research, title, responsible agency, investigator(s), contract or grant number, objectives of the research, and a brief description of the approach and progress to date (depending on the status of the research). Citations to publications reporting research results may also be included as part of the retrieval. If a request is too broad, an abbreviated printout of titles and objectives only is sent; after the user identifies the research projects of particular interest, a Standard Technical Retrieval can be received.

Since the NTIS base is a bibliographic base with citations and abstracts to research and development reports, it is similar in appearance to the WAMIS or WRSIC printout (Figure 3). Since copies of all NTIS references are available from NTIS, in paper copy or microfiche, ordering information (including pricing) is given with the citation. The abstracts tend to be indicative in nature.

AD-357 (4-71)		U.S. DEPARTMENT OF AGRICULTURE COOPERATIVE STATE RESEARCH SERVICE		CRIS ID NO. 605820	
RESEARCH WORK UNIT/PROJECT ABSTRACT				DATE 03 MAR 1976	
CURRENT RESEARCH INFORMATION SYSTEM				TERMINATION DATE 31 AUG 1976	
POWER-PLANTS/THERMAL-POLLUTION/ENVIRONMENTAL-EFFECTS		START DATE 01 APR 1971			
ACCESSION NO. 0060593	WORK UNIT/PROJECT NO. TEXO1869	CONTRACT/GRANT/AGREEMENT NO.		AGENCY IDENT. SAES TEX	
STATE TEXAS		77843		PERFORMING ORGANIZATION FISHERIES & WILDLIFE	
LOCATION TEXAS A & M UNIV COLLEGE STATION TEXAS		77843			
INVESTIGATORS STRAWN K		ALDRICH D V			
TITLE EFFECTS ON SELECTED ORGANISMS OF WATER PASSING THROUGH THE CEDAR BAYOU GENERATING STATION.					
OBJECTIVES: Determine the suitability of electric power plant cooling water for growth, food conversion, and survival of selected species of crustaceans and fishes in cages, ponds, and temperature-controlled tanks.					
APPROACH: Animals will be held in cages in front of the plant intake and in the discharge canal; in fish ponds located near the start of the discharge canal; and in aquaria in a laboratory to be built near the fish ponds. After the construction of the cooling pond, animals will be kept in cages in its first and last compartments and occurrence and distribution of selected organisms in the cooling pond will be determined. Temperatures in the aquaria will span the range of temperatures usually occurring in Trinity Bay. The influence of the effluent on phytoplankters both in the field and in culture will also be determined.					
PROGRESS REPORT: 74/01 74/12 Gas bubble disease will limit cage culture of fishes at many power Only a few species of fish such as striped mullet can survive the highly variable salinities in culture ponds located at the heads of estuaries. Summer temperatures of heated effluent are too high for most species of estuarine organisms to survive passage through canals discharging into Galveston Bay, Texas. Vegetation of the Bacliff, Texas area has been mapped. A preliminary check list of native and cultivated plants has been prepared.					
PUBLICATIONS: 01 ADDITIONAL PUBLICATIONS REIMER, R.D. and R.K. STRAWN. 1973. The Use of Heated Effluents from Power Plants for the Winter Production of Soft Shell Crabs. World Mariculture Society Workshop. p. 87. LUEBKE, R.W. and R.K. STRAWN. 1973. The Growth, Survival, and Feeding Behavior of Redfish (<i>Sciaenops ocellata</i>) in Ponds Receiving Heated Discharge Water from a Power Plant. World Mariculture Society Workshop. p. 143. GOULD, R.A., D.V. ALDRICH and C.R. MOCK. 1973. Experimental Pond Culture of Brown Shrimp (<i>Penaeus aztecus</i>) in Power Plant Effluent Water. World Mariculture Society Workshop. p. 195.					
If this information is reproduced, published, or quoted, credit must be given to the project leader and the organization conducting the research. For progress reports, it must be clearly stated that the information reflects only the results obtained during the period specified and final results are subject to completion of the investigation.					

Figure 2. Sample output page from CRIS.

CONTACT SOURCE AND USER RESTRICTIONS

When considering contact sources and accessibility of these bases, it is important to distinguish those bases which maintain control over their own data files from those which rent or sell their files to information brokers or intermediaries. Many of the national bibliographic or information files which have developed in the last few years are accessible through brokers, via an institution or individual setting up contract arrangements with that broker. Two such brokers, well known in the field, are System Development Corporation (SDC) and Lockheed Information Systems. If a base is available through such brokers, an individual can do his own searching on the base through his own terminals.

There are five regional centers in the U.S. that provide access to the WRSIC base file. The University of Arizona has a terminal which serves 11 western states: Arizona, California, Colorado, Hawaii, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, and Washington, at no charge. The Office of Arid Lands Studies is currently in charge of these searches for the University of Arizona terminal. Any person may use the service, from this geographic area. Only retrospective searches are available, and WRSIC does not lease it base to Lockheed or SDC.

AM - Pb-237 683/8St
 TI - Effect of Mixed-Grass and Native-Soil Filter on Urban Runoff Quality.
 TM - Master's thesis
 AU - Popkin, Barney Paul
 CS - Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.*office of Water Research and Technology, Washington, D.C.
 PD - 1973; 124p
 PR - pc \$5.25/Hr \$2.25
 CC - 8H; 13B; 48G; 68D
 DE - *surface water runoff; *sewage treatment; *grasses; *food control; Urban areas; Fluid infiltration; Soils; Arizona; Coliform bacteria; Biochemical oxygen demand; Fisheries; Recreation; Wildlife; Irrigation; Arid land; Theses
 ID - Tucson(Arizona); *storm water runoff; *water quality data; Ntisdqvrt
 SA - W75-01395; Owr-E-023-Ariz(2)
 AP - U75C2
 CG - Ei-14-31-0001-3556
 PM - Owr-E-023-Ariz
 SA - W75-01395; Owr-E-023-Ariz(2)
 AB - A grass-covered soil filter of native calcareous loam, 200-feet long, four-feet wide and five-feet deep, was tested for effectiveness as a water-quality treatment for Tucson urban storm runoff. Water was pumped from Arcadia Wash and applied to the filter in four trials in fall 1971. Inflow and outflow volumes were measured, sampled and analyzed for important water-quality variables.

Figure 3. Sample output from NTIS.

WAMIS has no user restrictions, and is at present offering searches for no cost to the user. Primarily retrospective searches are done. All searches are done at the University of Arizona, and the tapes are not available through Lockheed or SDC.

SSIE may be accessed by any individual willing to pay for the search services. Two types of retrospective searches are available. One is the custom search, which is a specialized search against the current SSIE base, oriented to the needs of an individual request. A fee of \$50.00 covers the first 50 NRPs; a charge of \$10.00 is made for each additional 1 to 50 NRPs. The other type of retrospective search is a custom search of the historical files. Searches can be made of the most recent five years of historical files. Search results are reproduced in hard copy from the microfilmed records of these older NRPs, and are reviewed by SSIE staff for relevancy to the request. This costs \$200.00 plus \$.50 per project notice reproduced in hard copy from microfilm.

SSIE offers two types of SDI services. In the standard SDI service, a search is conducted automatically once a month by the computer and the results forwarded directly to the user; this cost \$180.00 per year. The custom SDI service is available quarterly, for \$50.00 per quarter for up to 50 NRPs and a charge of \$10.00 for each additional 1 to 50 NRPs sent on any quarter. With the custom SDI service, computer output is reviewed first by staff for relevancy prior to sending to the user. Generally, most searching of SSIE is done by the SSIE staff in Washington, D.C.; it is possible, however, to have on-line access to the SSIE bases on one's own terminal, through contract arrangements with SDC. This costs \$110 per hour of computer connect time and \$.25 per NRP printed.

CRIS is the most restrictive in its user group. Only persons affiliated with the USDA network or contributing CRIS reports are allowed to use the CRIS system. Searches are done by the headquarters in Washington, O.C. For persons in the network, there is no charge for the searches. For persons outside of USDA, the same information can be obtained by a SSIE search, for the fees charges by SSIE.

NTIS has the most access points. This base is available through the brokers of System Development Corporation (\$60 for on-line computer connect time, and \$.15 per citation printed off-line) and Lockheed Information Systems (\$35 for on-line computer connect time and \$.10 per citation printed off-line). Retrospective searches can also be obtained through NTIS itself (U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161), for a charge of \$50 for up to 100 abstracts. NTIS provides a special SDI service called SRIM (Selected Research in Microfiche). Through SRIM a user is sent automatically microfiche copies of reports in a set category as they are input into NTIS. SRIM retrievals are done against 500 subject categories and 150,000 descriptive terms, for a cost of \$.45 per fiche received.

HOW DIFFERENCES AFFECT RETRIEVALS

These outlined differences in scope, orientations, outputs, and user restrictions illustrate how

these five bases differ from each other. It is important, in terms of getting the best results from a base, to also understand that the differences will affect how requests are phrased.

To begin with, differences in scope should be kept in mind. A system such as WRSIC, only dealing with water research, will have more in-depth indexing and coverage of water topics than a base such as SSIE or NTIS, which cover all aspects of science and technology. Similarly the larger the base is in size (number of entries) frequently the more specific one would have to be in the search request, in order to keep the citations down to a reasonable number. For example, asking for water quality documents from WAMIS would give about 300 references, but from WRSIC there would be over 7,500 references.

A second factor to consider is how specific the search should be. A search on Arizona and New Mexico studies of seepage control with clay sealants would be more restrictive than a broader search of all seepage control studies in Arizona or New Mexico, or use of clay sealants in any semi-arid or arid region. The more restrictive or specific a search is, the fewer number of citations will probably result. Obviously, it is the user who will have to decide whether to be specific or general.

A third factor to consider is how the indexing is done. All of the bases described here rely on indexing based on the document contents, and not, for example, on words used in the title. There are some bases, such as the National Agricultural Library's Cataloging and Indexing System, which are basically title indexed only. When searching a title indexed system, the user must think of all possible synonyms for his topic, since authors can be talking about the same thing but use different words in the title.

Information systems are becoming increasingly popular, because they are a time-saving device. They can speed up the communication exchange process and help eliminate duplicative research. But information systems are not magical. The quality of a retrieval is affected both by the quality of the input and the correct phrasing of a request. An intelligent user should know what to expect from an information base, in order to make the most use of it.

REFERENCES

- Herner, Saul and Matthew J. Vellucci, eds. 1972. Selected federal computer-based information systems. Information Resources Press, Washington, D.C. 215 p.
- Kruzas, Anthony T., ed. 1974. Encyclopedia of information systems and services, 2nd international edition. Anthony T. Kruzas Association, distributed by Edwards Brothers, Ann Arbor. 1,271 p.
- Mauerhoff, Georg R. 1974. Selective dissemination of information, p. 25-62. IN Advances in Librarianship, vol. 4, edited by Melvin J. Voigt. Academic Press, New York.
- Schneider, John H., Marvin Gechman, and Stephen E. Furth, eds. 1973. Survey of commercially available computer-readable bibliographic data bases. American Society for Informations Science, Washington, D.C. 184 p.
- Williams, M.E. 1974. NEWSIDIC--Information Bulletin of EUSIDIC (European Association of Scientific Information Dissemination Centres). Issue no. 4, October, 1974, p. 10-11.
- Williams, Martha E. 1975. The impact of machine-readable data bases on library and information services. Paper prepared for the U.S. National Commission on Libraries and Information Science, April 27, 1975. 32 p.