

A Review of Commercial Environmental Information Sources

Environment Agency, Thames Region

A Review of Commercial Environmental Information Sources.

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A REVIEW OF COMMERCIAL ENVIRONMENTAL INFORMATION SOURCES

Evaluation of the usefulness of commercial information sources to improve the effectiveness of the Agency's Environmental Toxicology Advisory Service.

EXECUTIVE SUMMARY

A feasibility study was established in 1996/97 to evaluate a number of environmental data and information systems in order to improve the efficiency of service offered to Agency staff and external customers by the Environment Agency's Environmental Toxicology Advisory Service.

The Environment Agency offers an internal advisory service providing information on the *impact of substances in the environment*, primarily the aquatic environment, in order to assist Agency staff involved in pollution incidents, consent setting and general water quality management. Established in 1993, the Environmental Toxicology Advisory Service (ETAS) operates through Regional Contacts and is now coordinated by the National Centre of Ecotoxicology and Hazardous Substances at Wallingford. The information held in-house relates to the use, physical/chemical properties, fate and behaviour, and aquatic toxicity of chemicals with information being sourced from internal reports, published literature, commercial on-line and CD-ROM databases.

The application of new information sources within ETAS began by building on recommendations made in previous reports of environmental data sources and concentrated mainly on subscription to online systems. A comparison of quality of data, usefulness of system, ease of access, cost effectiveness, and format of data was investigated. Although the focus of the Regional Water Quality Science team in Thames has changed, this review should provide useful information for the National Centre for Ecotoxicology and Hazardous Substances when considering procurement of future information systems.

KEYWORDS

Information Sources, Online Systems, CDROM, Diskette, ETAS.

1. INTRODUCTION

1.1 Background

In 1991, WRc plc was commissioned to review sources of environmental information available to the National Rivers Authority (NRA) (R&D Note 12 - Baker *et al* 1991) in an attempt to exploit these sources to their maximum potential. The conclusion reached by the review was that the acquisition of environmental data was most effective through the use of WRc's own Environmental Toxicology Advisory Service (ETAS) in their National Centre for Environmental Toxicology (NCET). This led to an increased reliance by Agency staff on NCET to assist in routine operations. However, this route of access to information was not standardised or controlled and an over-reliance on the service created considerable duplication of effort.

Consequently a new scheme was initiated whereby staff requiring environmental data had first to liaise with an appointed Regional Contact in the Agency, who would then forward the enquiry to the Environmental Toxicology Unit of the NRA's National Centre for Toxic And Persistent Substances (TAPS); satellite Unit based in Reading. The Unit could then refer to expanding in-house information sources, and past enquiries, and determine if the enquiry could be handled in-house or passed to NCET at WRc, thereby avoiding duplication of effort.

The number of enquiries forwarded to NCET (WRc) fell dramatically under the new scheme. However, there was still a need to gain access to a wide range of quality data sources to further improve the level of in-house service provided by the Agency to its staff. A report published in January 1996, entitled "A Review of Available Information Sources for Assessing the Hazards and Risks of Chemical Substances in the Environment" made recommendations for the acquisition of certain sources of environmental data. The report reviewed up-to-date sources of environmental information/data (primarily concerning substance identification, toxicity and fate/behaviour in the aquatic environment), both in printed and computer formats, and in many ways was an update of R&D Note 12. Following the production of the 1996 review, a feasibility study was established in October 1996 to deploy the recommendations made and investigate the usefulness of these products for one year. This document reports the results of the feasibility study.

1.2 The Changing Role of ETAS

The Review produced in January 1996 provided an assessment of the needs of the former Environmental Toxicology Unit; satellite group of the Toxic And Persistent Substances (TAPS) National Centre, based in Reading. The Environmental Toxicology Unit were the National contacts for ecotoxicological questions raised by Agency staff, and external bodies, although the service was not of a commercial nature. Over a period of four years (1993-1997) a comprehensive history of enquiries accumulated and provided a useful source of reference, accompanying the commercial literature and databases already in use within the Unit.

In October 1997, the National focus of the Environmental Toxicology Unit shifted to the newly created National Centre of Ecotoxicology and Hazardous Substances at Wallingford and the Reading Unit was renamed Water Quality Science Team [WQST] assuming a fully Regional role in Thames. With the overall responsibility of the National Environmental Toxicology Advisory role removed to the National Centre, the need for many of the information sources was diminished and much of the reference material went to the National Centre. The National Centre is currently considering how to progress ETAS with the remit of providing and/or coordinating information on all environmental media. As a consequence, the recommendations made in this document reflect the changing need of the Regional Unit and National ETAS.

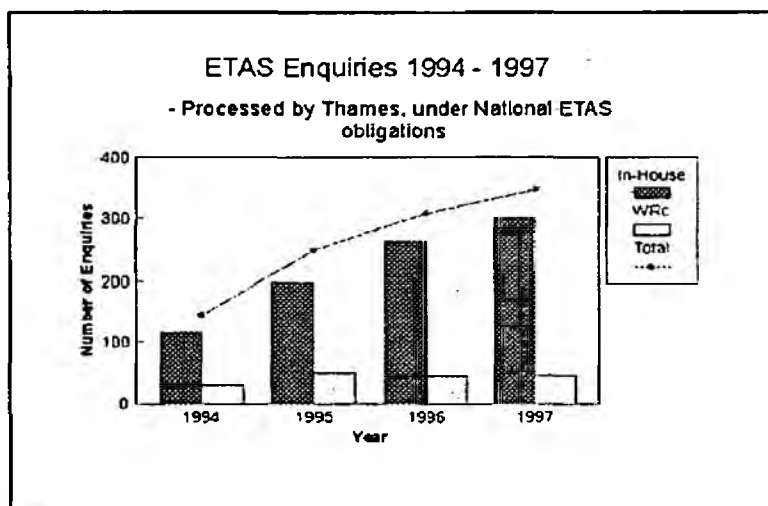


Figure 1

Figure 1 indicates the growing demand for environmental toxicological information within the Agency. The number of enquiries received by ETAS since 1994 increased by 260% by the end of 1997, but the proportion of enquiries referred to WRc has remained almost constant. This reflects the improved ability of ETAS to deal in-house with the increasing number of enquiries. This is partly due to enhanced information sources.

1.3 Existing Data Sources up to October 1996

Table 1 in Appendix A, provides a list of information sources available to the Water Quality Science Team before the feasibility study began. Many of the sources of reference were printed text. A single user copy of AQUIRE had been purchased, based on recommendations made in the 1996 review, and was installed on a single personal computer. The databases purchased in CDROM format; ECDIN, Sax's "Dangerous Properties of Industrial Materials" and Hawley's "Condensed Chemical Dictionary", were available for searching at any one time to all members of the group.

1.4 Recommendations from 1996 Review

The report "A Review of Available Information Sources for Assessing the Hazards and Risks of Chemical Substances in the Environment" made several recommendations to ETAS of how to improve the effectiveness of providing environmental data and advice. Following the production of the review, the feasibility study was established in October 1996 to deploy the recommendations made below :-

- ☛ Obtain the necessary equipment to access on-line hosts for subscription to
 - commercial environmental information providers
 - the internet, for access to environmental bulletin boards and communicate globally with other regulators and scientists.
- ☛ Purchase the communication software STN Express and subscribe to The Scientific and Technical Information Network (STN); *STN International*.
- ☛ Subscribe to the Chemical Information Systems network; *Oxford Molecular Group Ltd.*
- ☛ Purchase the Environmental Fate Databases on diskette; *Syracuse Research Corporation*.
- ☛ Purchase other CD-ROM/diskette products as and when necessary in line with on-going work of the Environmental Toxicology Unit.

2. EVALUATION OF INFORMATION SOURCES

A number of information systems were trailed in order to determine which sources were of most use to the Agency's Environmental Toxicology Advisory Service (ETAS). The groundwork for investigating which systems could be of most use was completed in previous reviews by contacting many scientific organisations with requests for information. This document presents an overview of the advantages and difficulties incurred with each of the commercial systems represented in the study.

From October 1996, the Environmental Toxicology Unit subscribed to two on-line information systems; Chemical Information Systems (CIS) and The Scientific and Technical Network (STN), plus the CD-ROM provider, Silverplatter for 12 months. The on-line systems offered access to a wealth of chemical data which was regularly updated and not available, in full, in any other format. A subscription was made to Silverplatter for the Chem-Bank CDROM. [All contact addresses of commercial information providers are listed in Appendix B]. The following subsections provide background information on the commercial databases and systems which were included in the study.

2.1 ON-LINE SYSTEMS

When compared with information offered on many CDROM products, online systems provided much of the same data concentrated together in just one or two commercial systems. Online systems work by dialling and making a connection with a host provider via telecommunication networks. The host contains a variety of databases or files which can be searched remotely from a desktop PC and data can usually be downloaded and printed at the user's terminal. To enable a PC to communicate with the host, a modem is required (Hayes or compatible, approximately). Also, subscription to British Telecom's Global Network Service (GNS) Dialplus, or Mercury's 5000 Datalink Dial Service, is necessary for dial-up access to a national data network providing gateways to over 160 international data applications and allowing data retrieval from over 80 countries. Specialist communications software installed on the PC is required to facilitate communication between the PC and modem.

☺ General Advantages

- ☺ The primary advantage of online systems are that they offer a range of information far greater than could be stored within the modern office. Such an enormous range of data can be searched for by cross-referencing keywords or substance names and culminate in data retrieval far greater than from physical hand searches.
- ☺ Data held online is frequently updated and enables users access to, for example, recent journal publications.
- ☺ Access to online systems often allows simultaneous searches of more than one database.
- ☺ Most UK operators offer a Help Desk service for further assistance and publish News Bulletins keeping the user up to date with system changes, enhanced search facilities and new databases available.

⊗ **General Disadvantages**

- ⊗ Knowledge of how to structure queries to get the most from any searches is fundamental to the success of the resulting references retrieved by the information system. Training may be required for users to get the most from the system.
- ⊗ There is always the possibility of disconnection through telecommunications failures when working online. In some ways, STN has overcome this with the STN Express software which allows the user to generate a structured query off-line, then simply run the query when connected, thus reducing connection time.
- ⊗ Many of the online systems have a DOS based format and can be confusing or difficult to manipulate.
- ⊗ Some databases offer data which has been quality assessed, but many contain data without giving any indication of quality.

2.1.1 Chemical Information System (CIS)

• Background

The Chemical Information System (CIS) is an integrated online system covering a variety of subjects related to chemistry. It was originally developed under the auspices of the National Institutes of Health and the US Environmental Protection Agency but is now wholly owned by Chemical Information Systems Inc. Made up of more than 30 databases, CIS largely comprises of numerical data, and most provide information pertaining to specific chemical substances. Types of data provided for each substance are listed below. Information is also available for companies, site or facility of chemical manufacturers.

Example of data fields in CIS databases:-

- Chemical structure and nomenclature information
- CAS Registry Number and regulatory codes and designations
- Chemical-physico properties
- Health and safety effects information
- Toxicology information, including carcinogenicity
- Hazardous materials information
- Environmental effects information
- Analytical data
- Pharmacological data
- Regulatory information

There are over 30 databases which are held on CIS and they are all listed in Appendix A. However, some of the more useful ones, relevant to ETAS, are listed with a brief description in Table 2.

• **Installation**

The Chemical Information System (CIS) was subscribed to for one year and a User's Guide was delivered with confirmation of User ID and password. Communications software called Smartcom LE was installed on the PC terminal, allowing the PC to communicate with the modem. This was installed and set up by the Agency's Corporate Information Systems team to dial a local number and connect to Chemical Information Systems in the USA. Based on cost, the Environmental Toxicology Unit decided to subscribe to Mercury's 5000 Datalink Dial Service for its National gateway provider. Mercury Datalink provide dedicated connections at speeds ranging from 9.6 kbit/s to 128 kbit/s which matched the rates at which STN and CIS could transfer data (9.6 kbit/s). The network is advertised as highly resilient and even when the primary route to a destination is lost, the network will re-route data through the next available path. The network is supported by round-the-clock network monitoring and an integrated fault management system.

• **Cost**

On balance, the Mercury service was cheaper than the data network link offered by British Telecom [See Table 3].

Table 3 Costs for one year of data network access.

Mercury 5000 Datalink Dial Service	Charges	British Telecom GNS Dialplus	Charges
Registration	£40.00	Connection Charge	£60.00
Rental Per Annum	£40.00	Monthly Rental Charge	£5.00 @ 12 = £70.00
<i>Usage</i>	<i>Peak Per Hour*</i>	<i>Usage</i>	<i>Peak Per Hour*</i>
National	£3.00	National	£3.20
International - Europe	£2.60	International - Europe	£4.45
International - North America	£6.40	International - North America	£10.00

*Peak Per Hour for Mercury is between 8am-8pm [Mon-Fri] and for BT is between 8am-6pm [Mon-Sat].

Both BT and Mercury offer reduced rates at nights and off-peak times, and also on volume of use per month (Mercury at >150 kilosegments; BT at > 167 kilosegments of data).

Cost of Subscription

to CIS System:	\$ 300	£ 200 per year	Annual Subscription Fee
	\$ 0.08	£ 0.05 per day	Password Fee
	\$ 75-165	£ 50-110 per hour	Hourly Search Fee
	\$ 12	£ 0.08 per hour	Communication Charge to SprintNet
	\$ 90	£ 60	Valet Searching Fee
	\$ nil	£ nil	Normal First Class Shipment
	1 Free Manual		
	Free online demonstration		

CIS User Support provided in UK

As an example, the total cost of a 20 minute search in AQUIRE on CIS was approximately \$36 or £24. Many searches were shorter than this and ranged from 2 to 20 minutes. This make searching on CIS significantly cheaper than STN.

• Training

Online training is available by booking a Training Workshop with CIS. The cost is \$120.00 per hour. Two day training workshops are available to CIS customers but they are all held in the USA. However, a basic knowledge of Boolean Logic is all that is required for simple searches. A help desk is available to CIS users offered by the Oxford Molecular Group in the UK.

• Usefulness

With more than 30 databases available, Chemical Information Systems (CIS) is a powerful information tool. The databases on CIS offer a greater emphasis on providing numerical data, some of which is quality-assessed. This is a major advantage over the Scientific and Technical Network which offers mainly bibliographic information and is of less use to ETAS. In particular, the database AQUIRE, already existing as a single user copy in the Environmental Toxicology Unit at the time of the study, proved to be a very useful information source. The availability of AQUIRE on CIS alone is a good reason to subscribe, but the existence of the database already within the Unit decreases the immediate value of CIS. However, an advantage of online information sources is the maintenance of regular updates, so future subscriptions to CIS for up to date versions of AQUIRE should be considered.

The Chemical Information System proved to be reasonably easy to use for simple searches and comparatively cheaper than STN. The format of the search screens were very basic and suffered from the lack of a good windows format allowing the user to rapidly learn navigation techniques.

In summary, the level of usage of CIS during the study period did not justify the costs associated with subscription and online charges incurred.

Table 2 Useful databases on the Chemical Information System (CIS) Network

Database: Acronym	Database: Full Name	Contents
AQUIRE	Aquatic Toxicity Information Retrieval	Data extracted from aquatic toxicity studies with an indication of quality assessment. Includes data on bioaccumulation, sublethal effects, acute and chronic toxicity, covering approximately 114,000 substances.
CESARS	Chemical Evaluation Search and Retrieval System	Provides detailed information (185 fields per substance) and evaluations on a group of chemicals of particular importance in the Great Lakes Basin.
CHRIS	Chemical Hazard Response Information System	Information on approximately 1,200 chemical substances for use in spill situations.
EnviroFate	Environmental Fate Database	Environmental fate and behaviour of chemicals released into the environment, e.g. transformation rates, phys/chem properties.
HSDB	Hazardous Substances Data Bank	Comprehensive data on 4,400 hazardous chemicals including coverage of toxicology and the environmental effects of chemicals. Information includes emergency handling procedures, environmental impacts, detection methods, manufacturing, and regulatory requirements.
IRIS	Integrated Risk Information System	Risk assessment data from the EPA including oral reference doses (RfD) and inhalation reference doses (RfC) for non carcinogen and summaries of selected EPA regulation.
ISHOW	Information System for Hazardous Organics in Water	Covers 6 types of physical property; MP, BP, VP, Log P, and acid dissociation constant.
OHMTADS	Oil and Hazardous Material, Technical Assistance Data	Data gathered from published literature on over 1,400 materials which have been designated as oil or hazardous materials.
RTECS	Registry of Toxic Effects of Chemical Substances	RTECS provides toxicity data on more than 100,000 common chemicals and natural products, including drugs, hormones, and agrochemicals. RTECS also covers TLVs and LD50s, general toxicity reviews, carcinogenicity risk assessments, and U.S. Department of Transportation shipping and labelling regulations.

2.1.2 Scientific and Technical Network (STN)

• Background

The STN network is operated cooperatively from three international centres of science and technology in America, Germany and Japan. The service centres are linked by sea cable and allow users access to a worldwide information service covering published information in scientific journals, reports, books and patents. Reference journals are published in which title, a short summary and bibliographic references to the article are listed. There are over 200 individual databases or files, often with overlapping coverage, although each database is designed to provide a unique perspective. A broad range of scientific and technical topics are covered (see below) and databases of particular relevance to ETAS are listed in Table 4.

- | | |
|------------------------------------|---|
| • Agriculture | • Geoscience |
| • Bioscience | • Health, Safety and Government Regulations |
| • Chemistry | • Materials Science |
| • Chemical and Physical Properties | • Medicine and Pharmaceuticals |
| • Engineering and Technology | • Scientific and Technical Business |

► STN Express

A front-end software package, STN Express, has been produced for use on a personal computer providing a streamlined searching of databases on STN. The advantages of the Express software are given below :-

- create offline structure, reaction and functional group queries
- multiple windows available so it is possible to build two or more structure queries, or connect to more than one host while browsing a transcript.
- provides a convenient interface for ordering documents.
- higher speed connections (up to 57.6 kbps)
- TIFF images can be rotated
- extensive toolbar, user-defined function keys, real-time changes for fonts and colours.
- autosaving of transcripts.

► STN Easy

STN Easy is a new Web-based service, providing point-and-click World Wide Web access to selected databases on STN International. STN Easy provides two levels of searching; a basic level that requires no experience in scientific searching or with the World Wide Web itself, and an advanced level for users with intermediate skills. A basic search means simply selecting a subject category or database and entering a few words indicating the topic to be searched. An advanced search allows the user to select a category or database, select Boolean operators, and specify other qualifiers such as the name of the author or company.

Existing STN customers have immediate access to STN Easy using User IDs and passwords already assigned to them, but new users can establish accounts on the STN Easy Web page, which will assign a User ID and password.

• Installation

A twelve month subscription to STN was paid and a copy of STN Express was purchased to provide enhanced facilities for effective use of STN. Three large manuals are provided with confirmation of user ID and password. The manuals contained a profile of each database with examples of typical searches and one manual are a guide to commands.

There were a number of problems incurred when trying to establish access to STN. Initially, an unforeseen problem occurred when STN only supplied information for accessing their network through British Telecom (BT). Their literature clearly stated non-BT networks could be used but STN expected all their customers to use BT. Following discussions between STN and Mercury a solution was forwarded to the Environmental Toxicology Unit and connection to STN was established using the Mercury network provider. A second warning should be noted that the STN Express software was not very user friendly to install and establish an automatic login procedure for access to STN.

• Cost

STN System:	£ nil	Subscription Fee	
	£ 21.50	Start-Up Fee	
	£ 64.50	Start-Up Package	
	£ 16-35	Connect Fee*	* Each database has a Connect, Search and Display Fee.
	£ 0.08-30.50	Search Fee*	
	£ 0.11-3.51	Display Fee*	
	£ 160	STN Express, Single User Licence	
	£ 500	Mercury 5000 Datalink Dial-Up Service Account	
	Free Manual		
	£50-130 Training Courses (Cambridge or London)		
STN Easy:	£	Flat Rate Search Fee	
	£	Display Fee for each answer viewed	
	£	Cost of connection to server (local telephone call)	

The approximate costs incurred during a typical search of many databases on STN was about £60. A search using just one file was typically between £7 and £20.

• Training

Once connected, the use of STN Express was straightforward. The training course attended by two members of the Environmental Toxicology Unit (STN Basics, Cambridge - April 1997) was very helpful and provided a greater insight into the formulation of queries in STN and the types of data available. A number of hands-on training exercises were performed and there was ample opportunity for raising questions. At the end of the session there was an opportunity to view STN Easy, accessible via the Internet. Accessibility to STN Easy looked very straightforward.

Following our training course, a representative of STN visited the Agency to talk through some of our installation problems and give a better indication of searching for numerical data on STN.

- **Usefulness**

The Scientific and Technical Network (STN) is a system containing bibliographic, full-text and numeric files. The bibliographic databases (e.g. BIOSIS, life science file) contain abstracts from journals. For more complete information about experimental data, procedures, or results, the full-text databases are better (for example, MSDS-CCOHS, Materials Safety Data Sheets from the Canadian Centre for Occupational Health and Safety). Numeric files complete the STN health, safety and environmental collection. A wide range of toxicity and safety data is available in, for example, Registry of Toxic Effects (RTECS) and Hazardous Substances Data Bank (HSDB) and these are by far the most useful to ETAS. The databases offered by STN are mainly bibliographic text with very little numerical data available. The majority of requests for information placed with the ETAS service require numerical toxicity data for specific substances. This sort of data, especially quality-assessed information, is not available on STN.

A major advantage of STN (with STN Express) is that searches can be formulated before going online which can reduce costs. There is a Multifile Search capability with the option of specifying the databases the user wants to search together or select from a group of predefined clusters of databases. STN have generated an 'environment' cluster. It is also possible with multifile searches to enter a control function in the query statement which will avoid duplication of records being displayed, an advantage over terrestrial databases.

STN Easy proved to be easy to connect to, via the Internet. Although the number of databases available in STN Easy are restricted, the ones of most importance to ETAS are represented. Conducting a basic search, applied to a limited predefined number of databases, was very straightforward. The advanced searching facility using Boolean operators helped to narrow searches and if applied to the same initial search terms, meant additional search charges were not incurred.

Table 4 Useful databases on the Scientific and Technical Network (STN) System

Database: Acronym	Database: Full Name	Contents
Analytical Abstracts	-	Worldwide coverage of analytical chemistry from the Royal Society of Chemistry.
ASFA	Aquatic Sciences and Fisheries Abstracts	ASFA brings together complete contents of the UN-sponsored ASFIS database which includes Biological Sciences and Living Resources; Ocean Technology, Policy and Non-living Resources; and Aquatic Pollution and Environmental Quality - offering 440,000 citations and abstracts.
Beilstein		Critically reviewed and evaluated documents from the Beilstein Handbook of Organic Chemistry, providing structures and CAS Numbers for substances.
Chemcats	Chemical Catalogues Online	Catalogue of commercially available chemicals and their worldwide suppliers.
HSDB	Hazardous Substances Data Bank	Comprehensive data on 4,400 hazardous chemicals including coverage of toxicology and the environmental effects of chemicals. Information includes emergency handling procedures, environmental impacts, detection methods, manufacturing, and regulatory requirements.
Registry		Chemical structure and dictionary database containing unique substance records that are produced as new substances are identified by the Chemical Abstracts Service (CAS) Registry system.
RTECS	Registry of Toxic Effects of Chemical Substances	RTECS provides toxicity data on more than 100,000 common chemicals and natural products, including drugs, hormones, and agrochemicals. RTECS also covers TLVs and LD50s, general toxicity reviews, carcinogenicity risk assessments, and U.S. Department of Transportation shipping and labelling regulations.
Toxline	Toxicology Literature Online	Bibliographic database covering pharmacological, biochemical, physiological and toxicological effects of drugs and other chemicals (1965-present).

2.2 CDROM

A number of databases were ordered from Silverplatter Information Ltd for trial and subscription. These included, Chem-Bank, Aquatic Sciences and Fisheries Abstracts, and Analytical Abstracts. With all Silverplatter products on CDROM, specialised front-end software, WinSpirs, is provided to enable the user to easily search, read and manipulate the information in the databases. WinSpirs is a Windows product and can be setup to particular user specifications. All 30 day trials of Silverplatter products are free.

2.2.2 Chem-bank

- **Background**

Chem-bank is sold as the leading single source of data on thousands of potentially hazardous chemicals and includes five important data banks designed to complement each other: IRIS, RTECS, HSDB, OHMTADS, and CHRIS (profiles of these are provided in Table 2). In this instance a twelve month subscription was ordered through Silverplatter Information Ltd.

- **Installation**

The Chem-Bank CDROM is delivered with a copy of WinSpirs, the software necessary to run the Chem-Bank database. WinSpirs is easy to install and once the user interface has been personalised, for example, establishing the language as English, then searching the Chem-Bank database is simple.

Chem-Bank can be viewed, through WinSpirs, in Windows format and either particular databases or all five databases can be selected for searching. Search terms, either CAS Numbers or substance names, can be entered with keyword terms and retrieved records viewed in full field or brief field format. Records of interest can be marked and sections of text cut and paste straight into documents, or entire records downloaded to disk or printed.

- **Cost**

Cost of annual subscription with quarterly updates from Silverplatter is £1272 (+222.60 VAT).

- **Training**

The WinSpirs software is simple to install and use, by anyone with basic PC skills, and any questions can be answered by reference to the software manual.

- **Usefulness**

The CDROM proved to be a simple, easy to use and useful information source. The ability to be able to copy and paste chunks of text straight into word processed documents is a valuable asset and speeds up the ETAS reporting time. By the very nature of the CDROM format, searches can be performed as frequently as is desired, without the pressure of time and as few or as many databases can be searched at any one time without the additional costs incurred with online systems.

The data on Chem-Bank is not quality assessed but it gives a good overview of health and safety associated with chemicals as well as additional numerical environmental data. Of all the databases on Chem-Bank, the Hazardous Substances Data Bank (HSDB) and OHM-TADS were of most value to ETAS. However, HSDB is also available online through STN and the 'valet service' offered by CIS. OHM-TADS is available online from CIS too.

2.2.3 Analytical Abstracts

- **Background**

Analytical Abstracts provides worldwide coverage of analytical chemistry from the Royal Society of Chemistry and focuses exclusively on the most leading edge methods for chemical analysis. The methods are abstracted from over 1,100 journals from 1980 to present, also including books, conference proceedings, standards and technical reports with up to 26 fields per item. The CD is updated on a quarterly basis and contains records from 1980 to present.

- **Installation**

The installation procedure for Analytical Abstracts is the same as for Chem-Bank above. The database is supplied with the WinSpirs software, common to Silverplatter products.

- **Costs**

The price of a twelve month subscription to Analytical Abstracts, through Silverplatter, is £1083 (+ £214.98 VAT).

- **Training**

The WinSpirs software is simple to install and use, by anyone with basic PC skills, and any questions can be answered by reference to the software manual.

- **Usefulness**

Analytical Abstracts is a useful CD and by the very nature of being in CD format, it allows the user to query the database at length and as frequently as required. The data held in Analytical Abstracts are useful for chemists and to ETAS for requests concerning analytical methodologies. As with Chem-Bank, the Winspirs software ensures the data is easy to read and manipulate.

2.2.4 Aquatic Sciences and Fisheries Abstracts

- **Background**

Aquatic Sciences and Fisheries Abstracts (ASFA) is advertised as the premier database in aquatic sciences, produced in collaboration with four United Nations agencies and a network of national research centres. ASFA offers over 440,000 citations and abstracts to the world's literature in aquatic science. Cited by most marine science librarians as their primary database, ASFA provides unparalleled access to global developments in the science, technology and management of marine, freshwater and brackishwater environments and organisms.

Developed in cooperation with United Nations agencies which include the Office of Ocean Affairs and the Law of the Sea; the Food and Agriculture Organization (FAO) of the U.N.; the Intergovernmental Oceanographic Commission; and the UN Environment Programme, ASFA provides access to worldwide research archives. ASFA contains the complete contents of the UN-sponsored ASFIS Database which includes Biological Sciences and Living Resources; Ocean Technology, Policy and Non-Living Resources; and Aquatic Pollution and Environmental Quality.

The bibliographic reference date back to 1978 and the CD is updated on a quarterly basis.

- **Cost**

A twelve month subscription, including quarterly updates, from Silverplatter costs £ 2,627 (+459.73 VAT).

- **Training**

The WinSpirs software is simple to install and use, by anyone with basic PC skills, and any questions can be answered by reference to the software manual.

- **Usefulness**

The abstracts referenced on Aquatic Sciences and Fisheries Abstracts (ASFA) are quite comprehensive, describing aquatic research, but any numerical values are missing. The data most frequently requested by ETAS requires numerical values, however, the abstracts in ASFA would be useful for identification of papers where a generic enquiry was not urgent. The major advantage, from the Agency's perspective, is ASFA is now available on the Internet for free. Hence it was thought unnecessary to subscribe to ASFA through Silverplatter following the free 30 day trial.

2.3 DISKETTE

2.3.1 Environmental Fate Databases (EFDB)

- **Background**

A number of databases are available from Syracuse Research Corporation (USA) either as a PC version of the databases or online access. The databases are separated into two groups; Environmental Fate/Exposure databases (EFDBs), or the Environmental Fate/Exposure Estimation Programmes. The EFDBs can be purchased as a group of four inter-related files providing physico-chemical properties and environmental transformation rates for PCs - DATALOG, CHEMFATE, BIOLOG, BIODEG. The data in these databases is compiled by Philip H. Howard, author of the "Handbook of Environmental Fate and Exposure Data for Organic Chemicals; Volume I: Large Production and Priority Pollutants, Volume II: Solvents, Volume III: Pesticides, Volume IV: Solvents 2". This series of books were already in use by the WQS team in Reading. All the EFDBs and the Estimation Programs were available online. Databases held in the Estimation Program system include LOGKOW, DERMAL, WS/KOW, MPBPVP, PC-KOC and a further 9 more. A demo disk was ordered for appraisal [free of charge].

- **Installation**

The installation of the EFDBs from diskette was straight forward using the demonstration disk.

- **Cost**

Environmental Fate Databases on *diskette*:-

Estimation Programs	£ 3,100	Windows version
EFDBs	£ 3,533.33	PC version; DOS only
	£ 660	Biannual updates

The EFDBs from Syracuse Corporation are available *online* in DOS format only:-

\$ 25	£ 16.70	Initial Subscription Fee
\$ 150	£ 100 per hour	Connect Fee

- **Usefulness**

The EFDBs and EF Estimation programmes proved to be difficult to manipulate with the demonstration data the Agency was sent. The data was only viewable in a DOS format and it was impossible to scroll back up the screen to view entire datasets. To add to the unhelpfulness of the program, print setup was not an option. This meant searches had to be performed several times in order to view all the data. Much of the data available on the EFDBs was of little use to ETAS and the Estimation Programmes were even less use. Of the four databases on offer in the EFDBs, two of these only listed references of published data. BIODEG contained numerical data but the data was not of great use to ETAS. Chemfate provided physico-chemical data for 1700 chemicals which could be useful to the Service, but this data is covered comprehensively in other information systems in a user-friendly format.

In conclusion, much of the data was presented in a meaningless way on a difficult front-end application. The referenced articles listed many obscure journal sources which would take some time to trace and acquire. In the event of an emergency, ETAS would not be able to use this system successfully.

2.4 INTERNET

- **Background**

Information available on the World Wide Web (WWW) was not initially included in the feasibility study because at the time of initiation, an internet connection was not available to the Environmental Toxicology Unit. However, part way through the twelve month study, a stand-alone PC with a Pipex Dial provider, was installed and accessible by the Environmental Toxicology Unit. Through connection to the Web, it was possible to access a huge range of information sources, primarily Web sites of scientific organisations, universities and government agencies, for example the US Environmental Protection Agency. Also, the Internet connection enabled the team to access STN Easy and assess information available, costs and ease of connection comparisons to be made with the other STN connection routes.

A list of useful Web site addresses is available in Appendix C but is by no means exhaustive. The information provided on the Internet was correct, to the best of my knowledge, at the time of writing. It is important to remember, however, the dynamic nature of the Internet. Resources that are free and publicly available one day may require a fee or restrict access the next, and the location of items may change as menus and homepages are reorganized.

- **Installation**

The Agency's Corporate Information Systems team procured the Pentium standard PC, with internal CDROM drive and external modem. The CIS Operations Team installed Windows 95, Netscape (WWW browser) and set up the connection with Pipex Dial. The desktop PC was stand-alone and set up to the Agency's standard for machines with Internet access.

- **Cost**

The cost of the standalone PC with associated software and hardware peripherals was covered by Thames Region for use ultimately by the Regional Information Services Team. Any ongoing costs are incurred through connection time whilst browsing the World Wide Web and are charged at the price of a local telephone call.

- **Training**

The ability to successfully browse the Internet and locate specific Web sites was an existing skill within the Environmental Toxicology Unit and after basic demonstrations and general usage, all members of the team were competent 'surfers' without formal training.

- **Usefulness**

The Internet facility within the Environmental Toxicology Unit proved very useful and allowed the Unit to access the World Wide Web and STN Easy. Within the framework of Netscape, useful Web sites can be 'bookmarked', meaning the Netscape software stores Web site addresses allowing the user to quickly return to sites without unnecessary browsing. When a site is bookmarked, for example STN Easy, the bookmarking procedure reduces connection time by connecting directly to the site. STN Easy is described fully in Section 2.1.2.

The variety of information available on the WWW is staggering and it is beyond the realms of this report to debate the usefulness of the Internet. However, to ETAS the Internet provided a forum for communicating with international, national and local governmental departments, research organisations, educational establishments and specialist scientific bodies. A cautionary note should be made concerning the quality of data available on the Internet. Much of the scientific information available on the Internet is bibliographic, and usually any numerical data is not quality assessed. The Internet is really only a powerful tool for ETAS to locate information, for example, reports and referenced publications where generic enquiries are concerned and deadlines are extendable.

Some of the scientific databases currently available commercially are slowly becoming available at no cost through the Internet. This can only be good news for public funded bodies like the Agency.

Table 5, gives a brief overview of a small number of databases available from multiple sources. It hopefully provides a clearer picture of where the information sources overlap and can help the user target the most useful sources by identifying databases of interest.

Table 5: Comparison of overlapping databases available through commercial information systems.

<i>SYSTEMS</i>	<i>D A T A B A S E S</i>	<i>R T E C S</i>	<i>A Q U I R E</i>	<i>I R I S</i>	<i>I N T E R N E T</i>	<i>C H R I S</i>	<i>H S D B</i>	<i>O H M - T A D S</i>	<i>A S F A</i>	<i>R E G I S T R Y</i>	<i>Env. Fate Data- Bases</i>
STN							•		•	•	
CIS		•	•	•		•	•	•			•
Chem-Bank		•		•		•	•	•			
Internet					•		•		•	•	
Environmental Fate Databases											•

3. SUMMARY OF FEASIBILITY STUDY

In summary, the feasibility study was useful in identifying the technical information sources in order of importance and the applicability of on-line information systems to ETAS.

The CDROMs purchased by the Environmental Toxicology Unit proved to be very useful and extremely easy to use. Following the initial subscription charges, the CDs were searchable for unlimited lengths of time, and data or text could easily be downloaded to a word processed document, disk, or local printer. The CD of most use was Chem-Bank which held numerical data, although not quality-assessed, was comparable with data retrieved from quality-assessed sources. The CD contains five technical databases with the Hazardous Substances Data Bank being the most comprehensive including toxicological and environmental effects information.

Available on disk, already purchased prior to the study by the Environmental Toxicology Unit, was AQUIRE (Aquatic Toxicity Information Retrieval). This database was used extensively by the Unit and contained an invaluable collection of numerical toxicity data searchable by chemical substance or biological organism. Due to the database being purchased as a single version, stand-alone copy it is not regularly updated. As AQUIRE is available from the online scientific information providers, Chemical Information Systems (CIS), it will be prudent to subscribe to CIS for access to a regularly updated version of AQUIRE.

The applicability of subscription to online systems by the Environmental Toxicology Unit proved to be more difficult to justify. There were downpayments required initially for registration purposes, followed by quarterly invoices for usage time on the systems. Connections to the systems were difficult to establish and navigation within them proved lengthy and inevitably costly. Subsequently, the online systems were used infrequently during the 12 month trial and proved unpopular with the team. The lack of numerical data available was also a major cause for disinterest. Using the Agency's access to online systems in comparison with the benefits of using WRc's services through the Technical Service Contract are summarised, by example, in the next paragraph.

During 1996, ETAS nationally dealt with 264 enquiries and 44 were handled by WRc through their NCET Service. Of the 44 enquiries, some were made by the Scottish Environment Protection Agency (SEPA), others as a response to emergency incidents occurring outside normal office hours and some were mammalian related enquiries. However, using figures provided by WRc plc in their Quarterly Progress Report for the last quarter of 1996, a total of 8 enquiries were dealt with from NRA Regions. Using this benchmark figure, an estimated 32 enquiries could be dealt with per annum by WRc, from NRA Regions.

The estimated costs of handling 32 enquiries using on-line searching by WRc, or hypothetically by the Environmental Toxicology Unit, the following figures have been calculated :-

WRc plc Enquiries Staff	£ 1,489.22
WRc plc Enquiry on-line charges	£ 53.35

£ 1,542.57 per quarter for 8 enquiries,

or, an estimated £6,170.28 per annum.

Agency On-line Charges	£ 1,920.00	STN*
	£ 768.00	CIS*

£ 2,688.00 an estimate per annum.

* calculated using the estimated costs for average complexity and length of STN and CIS searches [set out in Sections 2.1.1 and 2.1.2].

There appears to be a substantial saving by using the Agency's own staff and resources for answering enquiries through on-line searching. However, this has to be balanced with the emergency 24hr service offered by WRc in the Technical Service Contract which is costly but the benefits of relieving the Agency of this duty are worthwhile.

Ultimately the usefulness of online systems to ETAS is dependent upon the frequency of use and any pressures placed upon ETAS to be self-sufficient (from the NCET service offered by WRc plc). Databases which are used frequently prove cost-effective to buy on CDROM format. However, those information sources accessed less than once a fortnight would probably be more efficiently subscribed to online. The on-line systems proved to be comparatively expensive for the short periods of use incurred through 1997. Some costs could be reduced over time as the users become better practised at searching for data and familiar with manipulating the information systems.

4. RECOMMENDATIONS

As already explained in Section 1.2, the focus of the defunct Reading Environmental Toxicology Unit has changed from a National advisory role to a wholly Regional role within the Environmental Toxicology Advisory Service (ETAS) and the information requirements of the Unit and Service have changed also. The Service is increasingly receiving enquiries concerning the effects of substances in all environmental media. The Regional Contact in Thames now only receives requests for information from Regional employees and the frequency and variety of enquiries has diminished to approximately one eighth of all calls handled by the National contacts of ETAS. Consequently, as a result of the reorganisation, and dichotomy of the Regional and National roles, a two-pronged approach has been taken for recommendations for the future.

Regional Information Sources

- ☛ To maintain current information source levels of EQS reports, including EQS Manual and new summaries, when available.
- ☛ Invest in replacing some important and useful sources diverted to the National Centre which offer value for money and address frequently asked questions (FAQs), for example, Principles of Ecotoxicology, Volumes I&II.
- ☛ Cancel subscriptions to STN and CIS online technical information systems.
- ☛ Renew subscription to Chem-Bank and Analytical Abstracts CDROM.
- ☛ Maintain and develop links on the World Wide Web for broadening the information base both within and outside the ETAS role.

National Centre Information Sources

- ☛ Maintain and develop current information sources, electronic and published literature.
- ☛ Consider future subscription to Chemical Information Systems (CIS) online information for an up to date version of AQUIRE and the environmental fate databases.
- ☛ STN can now be accessed via the internet, through STN Easy, and most of the databases pertinent to the Environment Agency are accessible via this route. Subscription to STN Easy is only recommended if ETAS is going to fully develop the information service.
- ☛ Retain the information services of WRc plc under the Technical Service contract, unless in-house information systems are fully developed with dedicated information officers. Alternative external expertise are still available from Zeneca (Brixham Environmental Laboratory) and the AEA Technology (National Chemical Emergency Centre).

APPENDIX A

	Publisher	Date of Publication	Author (if necessary)
LITERATURE			
Proposed Environmental Quality Standards for Substances in Water	WRc for NRA/ Environment Agency, DoE/ DETR, SNIFFER and EC	Various	Various
Dictionary Of Substances and their Effects; Volumes I-VII	The Royal Society of Chemistry	1992-1994	Richardson, M.L. and Gangolli, S. (Eds.)
Environmental Hazard Assessments	Building Research Establishment (BRE) for DETR	Various	Various
Environmental Health Criteria	World Health Organisation [available from HMSO]	Various	Various
Handbook of Environmental Data on Organic Chemicals	Van Nostrand Reinhold Company	1983 (Second Edition)	Verschueren, K.
Chemical Safety Data Sheets; Volume I-VI	The Royal Society of Chemistry	Various	The Royal Society of Chemistry
The Pesticide Manual (incorporating the Agrochemicals Handbook)	The British Crop Protection Council	Tenth Edition, 1994	Tomlin, C. (Ed.)
Pesticides 1996	HMSO	1996	MAFF
The UK Pesticide Guide 1996	CAB International	1996	CAB International
The Merck Index	Merck and Co. Inc., US	Eleventh Edition, 1989	Budavari, S. et al.
Handbook of Ecotoxicology, Volumes I & II	John Wiley & Sons Ltd.	1993	(Ed.) by P. Calow
Surfactants Europa	George Goodwin, London	1982	Hollis, G.L.

<p>Handbook of Environmental Fate and Exposure Data for Organic Chemicals Volume I: Large Production and Priority Pollutants Volume II: Solvents Volume III: Pesticides Volume IV: Solvents 2</p> <p>Dangerous Properties of Industrial Materials, Volumes I-III</p> <p>Past Enquiries (mainly paper, but some electronic)</p>	<p>Lewis Publishing Inc., US.</p> <p>Van Nostrand Reinhold Company</p>	<p>1989, 1990, 1991, 1993 (Volumes I-IV, resp.)</p> <p>1992-present</p>	<p>Howard, P.H. et al.</p> <p>Sax, I. & Lewis, Sr., R.J.</p> <p>Various at National ETAS</p>
<p>DISKETTE</p> <p>Aquire</p>	<p>Spectrum Research Inc.</p>	<p>1972-1992</p>	
<p>CD-ROM</p> <p>Sax's Dangerous Properties of Industrial Materials</p> <p>Hawley's Condensed Chemical Dictionary</p> <p>Environmental Chemicals Data Information Network (ECDIN)</p>	<p>Environmental Sciences Electronic Resources, Van Nostrand Reinhold Company</p> <p>Environmental Sciences Electronic Resources, Van Nostrand Reinhold Company</p> <p>European Community</p>	<p>1996</p> <p>1996</p> <p>1993</p>	<p>Lewis, Sr., R.J.</p> <p>Lewis, Sr., R.J.</p> <p>Joint Research Centre for the Commission of the European Communities</p>

APPENDIX B - Suppliers

Silverplatter Information Ltd.
10 Barley Mow Passage
Chiswick
London
W4 4PH

Tel: 0181 995 8242
Fax: 0181 995 5159

Chemical Information Systems
Oxford Molecular Group Ltd.
Oxford Science Park
Oxford
OX4 4GA

Tel: 01865 784600
Fax: 01865 784601

**Scientific and Technical Information
Network**
STN Agency UK
The Royal Society of Chemistry
Thomas Graham House
Science Park
Milton Road
Cambridge
CB4 4WF

Tel: 01223 420066
Fax: 01233 423429

WRc plc
National Centre for Environmental
Toxicology (NCET)
Henley Road
Medmenham
Marlow
Bucks.
SL7 2HD

Tel: 01491 571531
Fax: 01491 579094

**DATATOX, for ACQUIRE;
Spectrum Research Inc.**
4915 E. Superior Street
Suite 100
Duluth
Minnesota
USA 55804

Tel: [USA Code] 218 525 5322

**For Environmental Fate Databases;
Syracuse Research Corporation**
Merrill Lane
Syracuse
New York 13210-4080
USA

Tel: [USA Code] 315 426 3200

Unipalm Pipex
PO Box 64
Stevenage
Herts.
SG1 2YX

**For ECDIN;
Springer Verlag**

Tel: 01420 86848
Fax: 01420 89889

APPENDIX C LIST OF INTERNET SITES; Related to the Environment.

THE ENVIRONMENT AGENCY	
"http://www.environment-agency.gov.uk"	Environment Agency
SEARCH ENGINES	
"http://www.excite.com"	Excite Search Engine (voted most comprehensive search engine by New Scientist in 1997)
"http://altavista.digital.com"	AltaVista Search Engine
"http://www.lycos.com"	Lycos Search Engine
"http://www.yahoo.com"	Yahoo Search Engine
JOURNALS, MAGAZINES AND NEWSPAPERS	
"http://www.newscientist.com"	New Scientist
ENVIRONMENTAL ORGANISATIONS	
"http://www.ends.co.uk/"	Environmental Data Services (ENDS); also connect to their list of links at "endsites.htm"
"http://www.epa.gov/"	US Environmental Protection Agency; and their list of links at "links.htm"
"http://golgi.harvard.edu/htbin/biopages"	Biopages Index of new biological resources
"http://www.greenpeace.org/uk"	Greenpeace; and their links "gplist.htm".
"http://www.foe.co.uk"	Friends of the Earths, plus links at "foelnk.htm"
"http://www.foe.co.uk/cr/"	FoE Chemical Releases Inventory
"http://www.nerc.ac.uk/"	NERC Homepage; NERC links at "corp_int.htm"
"http://www.nerc.ac.uk/ncs/monks.html"	ITE Monks Wood; plus "ite/lcm.htm" ITE's Land Cover Map of UK
"http://wiua.nwi.ac.uk/"	Institute of Freshwater Ecology
"http://www.nwl.ac.uk/ih/prototype/products/cis.html/"	Countryside Information System

<p>ONLINE CHEMICAL INFORMATION SERVICES</p> <p><i>Please Note, these are the Homepages of these companies, you cannot access their dialup services from here yet.</i></p> <p>"http://www.oxmol.co.uk/prods/cis/"</p> <p>"http://library.usask.ca/hytelnet/fce/fce023.html"</p>	<p>Oxford Molecular Inc. supplier of Chemical Information Systems (CIS)</p> <p>STN, (Scientific and Technical Information Network)</p>
<p>GEOGRAPHICAL INFORMATION SYSTEMS</p> <p>"http://www.mapinfo.com/"</p> <p>"GISWWW.htm"</p> <p>"http://research.umbc.edu/~roswell/mipage.html"</p> <p>"http://www.gisnet.com/gis/"</p>	<p>MapInfo Home Page</p> <p>Association of Geographic Information's pretty comprehensive links at "resources.htm"</p> <p>Useful sites for Mapinfo users</p> <p>This page is authored by MapInfo partner Bill Thoen. There are many links to GIS information in general and specific links to MapInfo resources.</p>

[Last Update 26/3/97]

<p>UK SERVICES</p> <p>"http://www.corp_innere.html"</p> <p>"http://www.doc.mmu.ac.uk/aric/arichome.html"</p> <p>"http://www.doc.mmu.ac.uk/aric/gcciphm.html"</p> <p>"http://www.muscat.co.uk/ccdp/spri/wdceg.html"</p> <p>"http://www.netskills.ac.uk/"</p> <p>"http://www.icbl.hw.ac.uk/itti/"</p> <p>"http://www.mailbase.ac.uk/"</p> <p>"http://midas.ac.uk/"</p> <p>"http://www.nhm.ac.uk/"</p> <p>"http://www.niss.ac.uk/"</p> <p>"http://www.railtrack.co.uk/travel"</p> <p>"http://www.hensa.ac.uk/"</p>	<p>Natural Environment Research Council</p> <p>The Atmospheric Research and Information Centre</p> <p>The Global Climate Change Information Programme</p> <p>Ice and Snow database (part of the World Data Centre C (Galciology) section.</p> <p>Internet for Everyone, a WWW-based learning course on using the Internet (part of the Netskills ITTI initiative).</p> <p>ITTI</p> <p>Mailbase</p> <p>MIDAS</p> <p>Natural History Museum</p> <p>NISS Information Gateway</p> <p>Railtrack Travel Information & Journey Planner</p> <p>UK Higher Education Software Archive (HENZA)</p>
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"http://www.epsrc.ac.uk/hpc/introduction.html"	UK High Performance Computing facilities
"http://src.doc.ic.ac.uk/all-uk.html"	UK World Wide Web servers
"http://www.qub.ac.uk/sigweb/"	"sigweb" A Special Interest Group for the UK and Ireland on the World Wide Web
SERVICES OUTSIDE THE UK	
"http://www.ncsa.uiuc.edu/SDG/Software/Mosaic/StartingPoints/NetworkStartingPoints.html"	Starting points for Internet exploration
"http://webcrawler.com/"	Web Crawler - a searchable catalogue built by a Irobot/I which searches and indexes the contents of documents on the Web
"http://lycos.cs.cmu.edu/lycos-form.html"	Lycos is another useful Web searching tool; it is also a searchable catalogue built by a robot which searches and indexes the contents of documents on the Web
"http://nearnet.gnn.com/gnn/wic/newrescat.toc.html"	The Whole Internet Catalogue
"http://cuiwww.unige.ch/w3catalog"	A searchable WWW catalogue
"http://www.cs.colorado.edu/home/mcbryan/WWW.html"	WWW Worm - another searchable catalogue
"http://kaos.erin.gov.au/other_servers/category/server_category.html"	Environmental servers

AQUATIC ECOLOGY

Note that the majority of these links are related to aquatic systems in one way or another. There are so many links they have been broken down into sub-sections of information.

Links of Interest:

Organizations and Biological Station

General Aquatic Information

Plants

Algae

Ichthyology and Herpetology

Insects

Birds

General Biology & Ecology

Manuals, Companies & Products

ORGANIZATIONS AND BIOLOGICAL STATIONS	
"http://www.inhs.uiuc.edu/nabs/nabs.htm"	North American Benthological Society (NABS); the ultimate benthos and everything related source

"http://www.nalms.org"	North American Lakes Management Society (NALMS)
"http://aslo.org/"	American Society of Limnology and Oceanography
"http://www.ntu.edu.au/science/mdouglas/asl_home.html"	Australian Society for Limnology; information from down under plus some other pertinent sites
"http://www.setac.org"	Society of Environmental Toxicology and Chemistry (SETAC)
"http://www.utexas.edu/ftp/depts/asih"	American Society of Ichthyologists and Herpetologists
"http://www.utexas.edu/depts/tnhc/www/fish/dfc/dfc_top.html"	Desert Fishes Council
"http://www.esd.ornl.gov/FS/index.html"	American Fisheries Society
"http://www.colostate.edu/Depts/Entomology/esa.html"	Entomological Society of America
"http://www.acnatsci.org/"	Academy of Natural Sciences
"http://www.sdsc.edu/~ESA/ESA.html"	Ecological Society of America
"http://www.sws.org/"	Society of Wetland Scientists
"http://www.earthwave.org"	Earthwave Society; topics include endangered/threatened organisms
"http://www.tnc.org/"	The Nature Conservancy
"http://www.nbs.gov/"	National Biological Server
"http://www.epa.gov/"	EPA
"http://www.fws.gov/index.html"	U.S. Fish and Wildlife Service; for general information
"http://kingfish.ssp.nmfs.gov/"	National Marine Fisheries Service
"http://www.dep.state.fl.us/index.html"	Florida Department of Environmental Protection
"http://www.state.mo.us/conservation/welcome.html"	Missouri Department of Conservation
"http://jasper.stanford.edu/OBFS/"	Organization of Biological Field Stations; a complete listing of stations in the USA
"http://www.brandonu.ca/CNSC/welcome.html"	Churchill Northern Studies Center; a listing of Canada's biological stations
"http://www.nbs.gov/mesc/mesc.html"	Midcontinent Ecological Science Center; eastern US info

"http://www.umanitoba.ca/DeltaMarsh/ufshome.html"	Delta Marsh Biological Station; Manitoba, Canada
"http://research.nwfsc.noaa.gov/nwfsc-homepage.html"	Northwest Fisheries Science Center
"http://www.epa.gov/r10earth/offices/oca/aqbioass.html"	Northwest Biological Assessment Workgroup Homepage
"http://www.enviroindustry.com/index.html"	Environmental Industry Web Site
GENERAL AQUATIC INFORMATION LINKS	
"http://www.streamnet.org/"	Streamnet
"http://www.neis.com/epaindex.html"	EPA Test Methods; info on rapid bioassessment
"http://www.neaq.org/internet.html"	Aquatic Internet Resources
"http://www.paulsmiths.edu/aai/aai-link.html"	Adirondack Aquatic Institute
"http://wiua.nwi.ac.uk/"	Institute of Freshwater Ecology
"http://lake.canberra.edu.au/crcfe/crhome.html"	CRC for Freshwater Ecology
"http://libinfo.ume.maine.edu/In_houseaquatic.html"	Aquatic Science Resources; info online
"http://www.envirolink.org/EnviroLink_Library/Earth/Ecosystemsaquatic_Ecosystems/"	Envirolink Library of Aquatic Ecosystems
"http://www.cciw.ca/glimr/intro.html"	Great Lakes Information Management Resource
"http://www.igc.apc.org/igc/www.water.html"	EcoNet's Seas and Water Directory
"http://www.kelly-springfield.com/outdoornet/search/government/"	Outdoornet-Government Sites
"http://www.stir.ac.uk/aqua/fishing/freshwat/fw_web.htm"	WWW Sources for Freshwater Science
"http://humboldt.kent.edu/~dipin/"	Great American Secchi Dip-In
"http://www.deltawetlands.com/"	Delta Wetlands Project
"http://www.nwi.fws.gov/"	National Wetlands Inventory
"http://www.erin.gov.au/land/wetlands/newslett.html"	Wetlands Australia
"http://nais.ccm.emr.ca/~medaglia/vetlands/ewetland.html"	Wetlands Canada
"http://www.keil.ukans.edu/~worms/annelid.html"	A.C. Worms
"http://www.nfrcg.gov/zebra.mussel/"	Zebra Mussel Resources
"http://www.flmnh.ufl.edu/natsci/malacology/malacology.html"	Malacology; Florida Museum of Natural History malacology collection

"http://www.inhs.uiuc.edu/cbd/main/collections/mollusk.html"	INHS Mollusca
"http://www.york.biosis.org/zrdocs/zoolinfo/grp_moll.html"	Mollusca
"http://www.rollanet.org/~streams"	Missouri Stream Team
"http://w3.one.net/~rzutt/index.html"	Internet Pond Society; check out the newsletter for pond aficionados
PLANT LINKS <i>This list was compiled with the help of Heather Sullivan and David Allen at the University of Southern Mississippi.</i>	
"http://aquat1.lifas.ufl.edu/"	Aquatic Plants; more academic
"http://www.npsc.nbs.gov/resource/othrdata/plntguid/species.htm#group4"	Midwestern Wetland Flora
"http://www.mobot.org/"	Missouri Botanical Garden
"http://www.wane-leon.scri.fsu.edu/~mikems/"	The Florida Wildflower Page; has some very nice bloom pictures
"http://www.mangonet.com/~doog/sofl_plants/"	Native Plants of South Florida; again nice pictures
"http://bluehen.ags.udel.edu/udgarden.html"	University of Delaware; has some great pictures including aquatics
"http://hotx.com/wildflowers/"	Texas Wildflowers
"http://www.teleport.com/~salem/trees/index.html"	Oregon's Heritage Trees; oldest trees in the U.S.
"http://trident.ftc.nrcs.usda.gov/npdc/index.html"	USDA,NRCS National Plant Data Center; BVERY/B informative
"http://www.bot.astrouw.edu.pl/EDEN/BG.html"	The Botanical Garden Plant Database; lots of info and pictures
"http://www.isc.tamu.edu/FLORA/cronang.htm"	Base Angiosperm Listing

"http://nabalu.flas.ufl.edu/kperkins/botselec.html"	Selected Botanical Sites on the WWW; LOTS of stuff here
"http://www.allware.com/kdepew/botany.html"	Internet Directory or Botany; BVALHALLA/B
"http://www.helsinki.fi/kmus/index.html"	Finnish Museum of Natural History: Botanical Museum; overseas, but lots of info on U.S. plants
"http://www.rbgekew.org.uk:80/others.html"	Royal Botanic Gardens, Kew.
"http://www.wisc.edu/botany/Orchids/Orchids_of_Wisconsin.html"	Orchids of Wisconsin; nice key.
"http://astrpi.difi.unipi.it/Orchids/Minishow/Orchids.html"	Orchids of Italy; has some really nice orchid pictures
"http://www.sccs.swarthmore.edu/~ikorn/wildflowers/Oindex.html"	Wildflower Photography
"http://www.Wild-Flowers.com"	Wildflower Sites; one of the most complete wildflower pages I've seen.
"http://isaac.engr.washington.edu/software/eduimg/botanyicons.html"	Basic Botany Images
"http://www.vt.edu:10021/forestry/wildlife/stein/plants.html"	Stein's Virtual Herbarium
ALGAE LINKS	
"http://hjs.geol.uib.no/html/diatoms/"	Eureka: Diatoms
"http://www.indiana.edu/~diatom/diatom.html"	Diatom Page
"http://WWW.bgsu.edu/Departments/biology/algaelgae_Images.html"	BGSU Center for Algal Microscopy
"http://www.paulsmiths.edu/aai/phyto.html"	Adirondack Aquatic Institute Phytoplankton Image Library
"http://www.marbot.gu.se/engMBlinks.html"	Algae related WWW sites
"http://www.indiana.edu/%7Ediatom/branch.html"	Palaeontology and Diatoms
"http://www.indiana.edu/%7Ediatom/branch.html"	Home Page
"http://www.calacademy.org/research/diatoms/diatoms.html"	Diatom Collection of the California Academy of Sciences
"http://megasun.bch.umontreal.ca/protists/protists.html"	Protist Image Data
"http://133.86.56.18/www/Servers/ForeignServers/Protistology.html"	Protistology
"http://seaweed.ucg.ie/seaweed.html"	Seaweed: lots of info other than marine stuff

<p>ICHTHYOLOGY AND HERPETOLOGY LINKS</p> <p>"http://www.ssp.nmfs.gov:80/nmfs/noaaf.html"</p> <p>"http://silva.snr.missouri.edu/fish.html"</p> <p>"http://pasture.ecn.purdue.edu/~staley/alaska.html"</p> <p>"http://www.actwin.com:80/WWWVL-Fish.html"</p> <p>"http://www.flmnh.ufl.edu/natsci/herpetology/herpetology.html#Top"</p> <p>"http://www.state.mo.us/conservation/nathis/herpetol/snake/snake.html"</p> <p>"http://home.ptd.net/~herplink/org.html"</p> <p>"http://www.unc.edu/~dtkirkpa/stuff/NEHS/otherHS.html"</p>	<p>NOAA Fisheries Web Sites</p> <p>Fisheries Servers</p> <p>Pacific Northwest Fish Sites; Lots on Alaska, but HUGE link listing!</p> <p>WWW Virtual Library:Fish</p> <p>Herpetology</p> <p>Snakes of Missouri</p> <p>Herpetology Link Organization</p> <p>Herpetology Society Web Page Index</p>
<p>INSECT LINKS</p> <p>"http://www.entm.purdue.edu/entomology/mayfly/dir.html"</p> <p>"http://www.famu.edu/mayfly/"</p> <p>"http://www.hsrl.rutgers.edu/http_bobs_home.html"</p> <p>"http://www.clarku.edu:80/~tartiss/odonate.html"</p> <p>"http://www.capecod.net:80/~bnikula/on4.htm#US_and_C"</p> <p>"http://www.afn.org/~iori/oinlinks.html"</p> <p>"http://www.our-town.com/dragonfly/Welcome.html"</p> <p>"http://www.mc.edu/~stark"</p> <p>"http://biowww.clemson.edu/ento/databases/trichoptera/trichintro.html"</p> <p>"http://bio-www.tamu.edu/beetles/"</p> <p>"http://www.ex.ac.uk/~gjlramel/diptera.html"</p>	<p>Mayfly Researchers and Enthusiasts Directory</p> <p>Ephemeroptera Galactica</p> <p>Odonatology Home Page</p> <p>Odonate</p> <p>Dragonfly and Damselfly Links</p> <p>Odonata Information Network</p> <p>Digital Dragonflies; very nicely scanned dragonfly pics</p> <p>Plecoptera; systematic list of NA stoneflies</p> <p>World Trichoptera Checklist</p> <p>Water Beetle World; the information site for world water beetle workers</p> <p>Diptera; this site describes all Diptera, as well as, takes you to many other dipteran links</p>

<p>"http://www.york.biosis.org/zrdocs/zoolinfo/grp_dipt.html"</p> <p>"http://oksw01.okanagan.bc.ca/fwsc/iwalker/intpanis/"</p> <p>"http://gause.biology.ualberta.ca/craig.hp/simuliid/simul.hp"</p> <p>"http://www.freenet.columbus.oh.us/ROL/Insects.html"</p> <p>"http://www.ent.iastate.edu/List/"</p> <p>"http://biowww.clemson.edu:80/Ento/EntomologyInternetsites/otherentweb.html"</p> <p>"http://www.colostate.edu/Depts/Entomology/www_sites.html"</p> <p>"http://www.ucmp.berkeley.edu/collections/otherent.html"</p> <p>"http://www.public.iastate.edu/~entomology"</p> <p>"http://iris.biosci.ohio-state.edu:80/inscoll.html"</p> <p>"http://www.inhs.uiuc.edu/cbd/main/collections/insect-hold.html"</p> <p>"http://www.vt.edu:10021/forestry/wildlife/stein/insects.html"</p>	<p>Diptera; more dipteran info</p> <p>Chironomid Page; info on larval midges, workers and reference materials</p> <p>Simuliidae; images</p> <p>Aquatic Insect Page; nice pictures and notes on aquatic insects</p> <p>Entomology Index of Internet Resources</p> <p>Entomology & Related Web Sites</p> <p>Entomology on the WWW</p> <p>UCMP Other Entomology Collection Catalogues</p> <p>Iowa State Entomology; a good listing of web sites if you look around</p> <p>OSU Insect Collection; general info on species listings of Ohio taxa</p> <p>Illinois Natural History Survey; insect holdings that are helpful in verification</p> <p>Stein's Virtual Insectary; nice insect pictures</p>
<p>BIRD LINKS</p> <p>"http://magneto.cybersmith.com/vbirder/"</p> <p>"http://www.bright.net/~vfazio/the-owl.html"</p> <p>"http://www.bright.net/~vfazio/avesohio.html"</p> <p>"http://www.petersononline.com/"</p> <p>"http://www.phys.rug.nl/mk/people/wpv/index.html"</p> <p>"http://compstat.wharton.upenn.edu:8001/%7Esiler/birding.html"</p> <p>"http://www.acnatsci.org/bna/"</p> <p>"http://compstat.wharton.upenn.edu:8001/%7Esiler/birdlinks.html"</p> <p>"http://weber.u.washington.edu/~dvictor/images.html"</p> <p>"http://dizzy.library.arizona.edu/users/mount/birds.html"</p>	<p>Virtual Birder</p> <p>Ornithological Web Library (OWL)</p> <p>AVES</p> <p>Peterson Online</p> <p>Birdlinks</p> <p>Birding the Next Generation</p> <p>Birds of North America</p> <p>BirdLinks</p> <p>Bird Images</p> <p>Jack Mount's Bird Page</p>

"http://gsbjdh.uchicago.edu/personal/birdpage.html" "http://www.holli.com/~sgreene/birdlink.html" "http://www.wam.umd.edu/~losinp/birding.html" "http://whale.simmons.edu/enviromet-stuff/monitoring/bird_url.html" "http://www.ucmp.berkeley.edu/collections/otherorn.html" Ornithological Collection Catalogues "http://www.ucs.mun.ca/~dave/birds.html" "http://ice.ucdavis.edu/US_National_Park_Service/NPS_birds.html"	Birding Page Greene's Birding Links Birding Links Internet Resource for Bird Study. UCMP Other Newfoundland Bird Pictures Birds at selected National Parks
GENERAL BIOLOGY & ECOLOGY LINKS "http://www.igc.apc.org/econet/" "http://arnica.csustan.edu/" "http://www.npsc.nbs.gov/" "http://www.nccn.net/~mtnsong/" "http://www.clark.net/pub/lshank/web/enviro.html" "http://conbio.rice.edu/vl/" "http://ecology.umsi.edu/links.html" "http://frankenstein.worldweb.net/mtvernon/biology.html" "http://www.webdirectory.com/" "http://www.bio.uea.ac.uk/WWWsites.html" "http://www.lib.kth.se/~lg/eindex.html" "http://www.panda.org/index/eindex.html" "http://commtechlab.msu.edu/CTLprojects/dlc-me/zoo/zwp0530.html" "http://www.york.biosis.org/zrdocs/zoolinfo/zoolinfo.html"	EcoNet; look around to get listings CSU BIOWEB North Prairie Science Center Placer & Nevada counties Ecology Page; West Coast ecology information (all kinds of neat stuff) Environment and Ecology Biodiversity, Ecology and Environment Links to Ecology Biology Links Environmental Organization Directory List of WWW Sites of Interest to Biologists Environmental Sites on the Internet General Environmental Index; listing of environmental organizations Digital Learning Center-Microbial Ecology Internet Resource Guide for Zoologists

"http://www.microscopy-uk.org.uk/"	Microscopy and Biology Sites in the UK
"http://silva.snr.missouri.edu/ecology.html"	Ecology Server
"http://www.keil.ukans.edu/"	Biodiversity and Biological Collections Webserver
"http://cccweb.com/wildlife.html"	Bill's Wildlife Links; lots of West Coast info and links
"http://www.envirolink.org/pubs/"	Sustainable Earth Electronic Library
"http://www.ecology.com/"	The Ecology Channel
MANUALS, COMPANIES & PRODUCTS	
"http://www.emtc.nbs.gov"	Environmental Management Technical Center
"http://www.epa.gov/OW/"	EPA Office of Water Homepage; order EPA publications here
"http://www.cais.com/tne/neis/water.html"	NEIS Water Documents
"http://www.balogh.com/~balogh/"	Balogh Scientific Books
"http://www.elsevier.nl"	Elsevier Books
"http://www.nhbs.co.uk/booknet/su42.html"	NHBS BookNet
"http://www.booknotes.com/ledlie/homepage.html"	Patricia Ledlie Bookseller; natural sciences catalogue on-line
"http://www.springer-ny.com"	Springer-Verlag Publishers
"http://www.erm.com/"	Environmental Resources Management
"http://www.dnr.cornell.edu/hydro2/hydro2.html"	Hydroecology and Fish Biology
"http://www.execpc.com/~aqsys/index.html"	Pond and Lakes Management

BIOLOGY WWW SITES

"http://rivers.oscs.montana.cdu/dlg/aim.html"	
"http://www2.netdoor.com/~pinky/aquatic.html"	Aquatic Ecology Page
"aquatic.html"links	
"http://www.ch.emdnet.org/jam/jam.html"	Biocomputing Survival Guide
"http://golgi.harvard.cdu/htbin/biopages"	Biopages
"http://www.ch.embnet.org/bio-www/info.html"	Biopages - Index of new biological resources on the net or try
"http://www.blacksci.co.uk"	Blackwell Science Homepage

"http://ourworld.compuserve.com/homepages/Bowburn_Consultancy"	Bowburn Consultancy, Dr. Martyn Kelly
"http://www.ciagri.usp.br/~scb"	Brazilian Entomological Society
"http://www.westlake.co.uk/eco/bes/bes.html"	British Ecological Society (BES)
"http://www.via.ac.be/v/intpanis/index.html"	Chironomid Homepage
"http://www.elsevier.nl/locate/estoc"	Elsevier Science Table of Contents
"http://www.colostate.edu/Depts/Entomology/www_sites.html"	Entomology WWW Sites
"http://entowww.tamu.edu/research/neuropterida/neuroweb.html"	Neuropteran Homepage (Neuroweb)
"http://www.inhs.uiuc.edu/nabs/nabs.html"	North American Benthological Society Homepage
"http://www.afn.org/~iori/"	Odonata Web Pages
"http://ourworld.compuserve.com/homepages/slitichfield" or	Psion stuff
"http://www.bris.ac.uk/~wmokg/psion/"	More Psion stuff
"http://www.uwin.siu.edu/"	University Water Information Network (UWIN)
"http://www.fws.gov/" or	U.S. Fish and Wildlife Service
"http://www.fws.gov/@r9ecosys/eco.html"	U.S. Fish and Wildlife Service - ecosystem approach to fish and wildlife conservation
"http://www.inhs.uiuc.edu/~brigham/my-home.html"	Water Beetles on the Net
"http://www.inhs.uiuc.edu/biod/waterbeetles/haliplidae/family-html"	More water beetles

SUSTAINABLE DEVELOPMENT INTERNET RESOURCES

Sustainable Development Internet Resources Borrowed from the EPA

"http://csf.colorado.edu/"
Communications for a Sustainable Future

"ftp://csf.colorado.edu"
CSF Colorado Environmental Files Collection, Mailing list, subscriptions and information topics including: ecology and environment, education and service-learning, international studies, peace and conflict, progressive sociology, and sustainable economics.

"http://w3.ag.uiuc.edu/infoag/cyberfarm/"
Cyberfarm: The *CyberFarmer*... is a partner in receiving and sending information that enhances decision-making on the farm, within the community, and at home. Bulletin boards post school and church announcements, production databases create farm histories, and electronic access to numerous resources create an agricultural exchange that yields benefits for all partners.

"<http://www.ecouncil.ac.cr/>"

Earth Council: The Earth Council is a non-governmental organization founded as a direct result of the Earth Summit held in Rio de Janeiro, Brazil, in June 1992. Its creation was motivated by the need to empower civil society organizations, to monitor, review and assess the implementation of the Earth Summit results and to promote greater public awareness and support for the needed transition to more sustainable patterns of development worldwide.

"<http://ecosys.drdr.virginia.edu/EcoWeb.html>"

EcoWeb: EcoWeb is devoted to facilitating access to local recycling and environmental information as well as more comprehensive environmental resources.

"<http://165.254.130.15/>"

Environmental Defense Fund Online - The Web of Life. EDF provides environmental information by mail and electronically, participates in environmental education projects, maintains the Member Action Network to influence national environmental policy, and works with grassroots groups at the local and regional level in the U.S. and abroad.

"<http://envirolink.org/enviroed/>"

The Environmental Education Network (EEN) is a collaborative effort to bring environmental education on-line, and into a multi-media format.

"<http://infolanc.com/infolanc/geosphere/geospher.html>"

The GeoSphere Project Report: The purpose of The GeoSphere Project is to make complex global systems understandable. Through the use of technology we are creating visualizations that illustrate and enhance our understanding of Earth processes. By visualizing and understanding these processes we can evolve from Earth resource users to Earth resource managers.

"<http://infolanc.com/infolanc/geosphere/geospher.html>"

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"http://h2o.seagrant.wisc.edu/advisory/GLOBAL_CHANGE/global.html"

Global Change Education, The University of Wisconsin Sea Grant Institute: The Global Change Education web site offers a valuable resource to both formal and informal educators who focus on environmental and global climate change issues. It is sponsored by the University of Wisconsin Sea Grant Institute, Advisory Services office, in Madison, Wisconsin. The site puts users in touch with trained Global Change Educators in their area (the Madison office covers the Great Lakes region) and provides links to other sites of interest.

"<http://gcmd.gsfc.nasa.gov/intro.html>"

The Global Change Master Directory (GCMD): This project now in progress will establish a hierarchical structuring of "federated" directories *down* into all levels of government, beginning with directories concerning environmental data and algorithms. When completed, it will provide a comprehensive resource for researchers who can up/download new data, analyses, and use the shared applications software.

"<http://www.gnet.org/>"

Global Network of Environment & Technology (GNET) Home Page: GNET is the gateway to constantly updated information on innovative environmental technologies, business and news, with leads to marketing intelligence, financing and contracting opportunities. GNET seeks to promote sustainable development and environmental remediation through technological innovation, with a focus upon commercializing Department of Energy developed applications. Featuring moderated discussion forums as well as full-text search capabilities, GNET is an interactive community as well as in-depth data source for the environmental marketplace.

"<http://www.gn.apc.org/>"

GreenNet Home Page: GreenNet is part of the only global computer network specifically designed for environment, peace, human rights and development groups. It offers email and its own special conferences, as well as the usual range of dial up internet services. The interface is designed to be easy and quick to use for those who don't know much about computers. Staff have extensive experience with, and contacts in, political/social movements, coupled with expertise in information technology and its applications.

"<http://www.frt.fy.chalmers.se/amsterdam>"

INES Congress: Challenges of Sustainable Development (Conference) Information about the conference on the "challenges of sustainable development" being organized in Amsterdam next August.

"<http://csf.Colorado.EDU/authors/hanson/index.html>"

A Modest Proposal to Save the World Authored by Jay Hanson.

"<http://www.islandnet.com/~ncfs/ncfs/homecmenu.htm>"

National Centre for Sustainability: The Centre's mission is to sponsor and foster public education and scientific research relative to the apparently growing imbalance between human economy and lifestyles and nature's elasticity or resilience.

"<http://opr.princeton.edu/popindex/>"

Population Index: The Index covers all fields of interest to demographers, including fertility, mortality, population size and growth, migration, nuptiality and the family, research methodology, projections and predictions, historical demography, and demographic and economic interrelations. Input is derived from original publications including monographs, journal articles, other serial publications, working papers, doctoral dissertations, machine-readable data files, and relevant acquisitions lists and bibliographies.

"<http://www.whitehouse.gov/WH/EOP/pcsd/index.html>"

The President's Council on Sustainable Development: The United States President's Council on Sustainable Development is charged with developing new approaches to integrate economic and environmental policies to meet the needs of the present without compromising the ability of future generations to meet their own needs.

"<http://www.vanderbilt.edu/psychology/cogsci/chaos/espls.html>"

Society for Chaos Theory in Psychology and the Life Sciences: This resource has been erected by the Society for researchers and interested others concerned with nonlinear dynamical systems, complex systems, fractals, chaos, bifurcations, and related concepts. Applications span the full range of biological and social sciences, including ecology, economics, and social development.

"<http://www.Laurentian.Ca/www/psyc/SDG.html>"

Strategic Decisions Group at Laurentian University: The Strategic Decisions Group is an interdisciplinary group conducting applied research on decision making as it applies to health problems, environmental management, policy debates and social issues.

"<gopher://sunsite.unc.edu:70/11/./pub/academic/biology/ecology+evolution>"

SUNSITE gopher: ecology+evolution: Archives of information and guides to resources of interest to research ecologists and evolutionary biologists.

"<http://web.mit.edu/cupid/www/tbc/>"

Technology, Business and Environment at MIT: The Technology, Business and Environment Program was founded to help companies meet the dual challenges of achieving environmental excellence and business success. The Program's mission is to elucidate a new preventive environmental management paradigm, centering on business practices and linking technological change with sound environmental management.

"<http://www.iisd.ca/linkages/topics/05topicec.html>"

The United Nations Commission on Sustainable Development (CSD): United Nations Commission on Sustainable Development was established to develop mechanisms for effective review and monitoring of the implementation of Agenda 21 and the other Rio agreements, to enhance international cooperation and the rationalize the intergovernmental decision-making capacity for the integration of environment and development issues.

"http://www.undp.org"

The United Nations Development Program Web Site (UNDP)

or, **"gopher://gopher.undp.org"**

The United Nations Development Program Gopher (UNDP): Information about the United Nations Development Program.

"http://www.vita.org/"

Volunteers in Technical Assistance WWW

or **"gopher://gopher.vita.org/"**

Volunteers in Technical Assistance Gopher: VITA is primarily involved in technology adaptation. A brief about their low earth orbiting satellite project, which will link many of the world's remote villages to central communications sources appears in the Sustainable Development Forum 3 Proceedings.

"http://www.psy.uwa.edu.au/wave/"

WAVE: The World-wide Academic Visitor Exchange: WAVE is a free service provided by the Department of Psychology at the University of Western Australia in order to facilitate international contact between travelling academics and prospective hosts.

"http://ccosys.drdr.virginia.edu/Environment.html"

WWW Virtual Library: Environment: Subjects include; biodiversity and ecology, earth sciences, energy, environmental law, forestry, landscape architecture, and oceanography.

"http://www.epa.gov/swerosps/bf/"

Brownfields Home Page: The Brownfields Initiative is an EPA effort to "empower states, communities, and other stakeholders in economic development to work together in a timely manner to prevent, assess, safely clean up, and sustainably use brownfields." Brownfields are defined as "abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination." This website offers answers to frequently asked questions about brownfields, overviews of the 28 national and 12 regional pilot projects, information on submitting a proposal for a pilot project, and a list of brownfields contacts. Liability guidance documents and other brownfields related publications can be viewed or downloaded from the webpage. The website is under construction, and visitors are advised to check back for new features.

"http://www.epa.gov/r3chespk/"

Chesapeake Bay Program Home Page: The Chesapeake Bay Program (CBP) is a unique partnership between Maryland, Virginia, Pennsylvania, the Chesapeake Bay Commission, citizen groups, and the U.S. EPA. The mission of the program is to protect and restore the Chesapeake - this nation's largest and most productive estuary - focusing on restoration of the Bay's "living resources" such as fish and shellfish. The webpage offers access to the CPB's GIS data for portions of Maryland, Virginia, Pennsylvania, Delaware, West Virginia, New York, and the District of Columbia. Also available are water quality monitoring results and a "slide show" on environmental indicators. Visitors to the site can keep up to date through options such as "Catch of the Day: the latest in Politics, Fisheries, and Research" and the Bay Journal, along with other newsletters. Upcoming events are also detailed, and contacts are provided through the "Who's Who in Bay Program Management" feature. Particularly notable is the extensive "1995 State of the Bay" report.

"<http://www.fws.gov/~r9dec/ecprog.html>"

Environmental Contaminants Program: The U.S. Fish and Wildlife Service, through its Environmental Contaminants Program, seeks to "improve the quality of fish and wildlife resources through identification, prevention, and correction of environmental contaminants." This new website provides basic information about the program: mission, organization of the program, a historical review of the program's development, and a directory of personnel broken down by region. In addition, two elements of the program, contaminant identification/assessment and natural resource damage assessment/restoration, are outlined. Information on the third element of the three-pronged program, contaminant prevention, is slated for the future. The environmental contaminants identification/assessment section includes a link to the Contaminant Information Management and Analysis System (CIMAS). This is a web-based application capable of interfacing with DBMS and GIS software and allows users to access the data by refuge, contaminant, contaminant study, or trust species. There is, however, a warning that this represents the initial release of the system, not a final release, and that accuracy of the data is not guaranteed at this time. The CIMAS system is scheduled for future enhancements. The role of CERCLA in natural resource damage assessment and restoration is also discussed.

"<telnet://fedbbs.access.gpo.gov/>" *Federal Bulletin Board*

"<http://www.sti.nasa.gov/>"

NASA Scientific and Technical Information Server: The National Aeronautics and Space Administration's (NASA) Scientific and Technical Information (STI) program is moving toward increased electronic dissemination of NASA information products. From the Scientific and Technical Information (STI) Program webpage, users can access and search a WAIS database of technical reports and aerospace-related open literature from 1970, the CASI Technical Reports Server; search and review issues of Selected Current Aerospace Notices (SCAN); use the NASA Thesaurus, currently in test mode; and choose from a list of full-text STI publications that are available for downloading as Adobe(tm) Acrobat(tm) Portable Document Format (PDF) files. Telnet access to two NASA databases, NASA Reports CONnection (NASA RECON) and the Aerospace Research Information Network (ARIN) is also provided, although an existing username and password are required. Tech Brief Indexes, a field searchable WAIS database of NASA's research and development activity that would facilitate technology transfer, and links to other sites are also featured.

"<http://www.great-lakes.net/partners/glc/projects/air/swlm/swlm.html>"

Southwest Lake Michigan Pilot Study: Toxic air pollutants that threaten the health of humans other Great Lakes ecosystem are the focus of a recent report released by the Southwest Lake Michigan Pilot Study. Representing a cooperative effort of three states - Indiana, Illinois, and Wisconsin - and the Great Lakes Commission, the report "summarizes and analyzes the combined toxic emissions from small, often unregulated, sources in 12 counties in the Chicago, Milwaukee, and Gary urban areas." The entire text of the 300 page final report is available for downloading from the website listed above. The data are presented in both chart and tabular format, cover 49 toxic compounds, and are analyzed by source category, pollutant type, and county. The downloadable version offers text and tables in either WordPerfect 5.1 or 6.1, and large pie charts and tables in Excel 5.0. The original cover is available as a PageMaker 5.0 file. The Southwest Lake Michigan Pilot Study was funded by the U.S. EPA and included "substantial in-kind contributions of staff time and resources" from the participating states.

"<http://www.millennianet.com/round/>"

State Education and Environment Roundtable: Eleven states currently participate in the State Education and Environment Roundtable, whose goal is to incorporate environmental curricula into K-12 education. The Roundtable conducts research and seminars toward this end, focusing on ways to include the environment in content, principle and method; coordinates professional development in this area; disseminates technical resources; and maintains a network of state educational professionals to facilitate the sharing of information and lessons learned. Reports summarizing recent research efforts are provided at the website, as well as a "Bibliography for Educational Change." The titles in the bibliography are linked to substantial abstracts of the publications when this option is available. The website also presents topics for discussion, and a directory of participating state contacts. There are apparently future plans to implement a technical assistance register providing a network of expertise in environmental education and educational reform.

"http://web.mit.edu/ctpid/www/tbe/"

Technology, Business and Environment at MIT: Two substantial offerings have been added to MIT's Technology Business and Environment website - Industrial Ecology and Design for the Environment. These additions provide lengthy "living" bibliographies on the two topics. The Industrial Ecology bibliography includes citations on topics such as parks, architecture, industrial metabolism, structural economics, ecofeedback for self-regulation, and I/O models, to name a few. Under Design for the Environment, visitors to the site will find references for case studies, methods and tools, life cycle analysis, industrial ecology and design, and environmentally conscious manufacturing, as well as general works in the area of study. Both bibliographies contain complete citations, are arranged topically, then alphabetically by author. Titles are "hotlinked" whenever a summary or abstract of the publication is available. New citations, abstracts, annotations, and comments are invited from the user community.

"http://www.lib.kth.se/~lg/sustain.htm"

This is one of the more interesting selection of links to sites related to Sustainable Development.

"easusdev.htm"

Links to Sustainable Development.

"links.htm#susdev"

Sustainable developments links from the EPA.

"endsites.htm#susdev"

Sustainable developments links from ENDS.

"http://www.channell.com/users/tellus/scib.html"

The Stockholm Environment Institute, Boston.

"http://www.cwra.org/cwra/sustprin.html"

Canadian Water Resources Association

"http://www.ct.tudelft.nl/iwm/iwm.html"

IW: Homepage Integrated Water Management

"http://atlenv.bed.ns.doc.ca/soc/cha6.html"

Earthwatch 1996 Sustainable Development Field Projects	Descriptions of several of the sustainable development field projects Earthwatch is supporting in 1996
"http://gaia.earthwatch.org/WWW/Xbecker.html"	Community Forestry in Ecuador
"http://gaia.earthwatch.org/WWW/Xshenggao.html"	Farms Along the Yangtze
"http://gaia.earthwatch.org/WWW/Xsuharta.html"	Indonesian Sun Cooking
"http://gaia.earthwatch.org/WWW/Xchao.html"	Ornamental Fishes of the Amazon
"http://gaia.earthwatch.org/WWW/Xkammen.html"	Wind and Sun Power for Kenya