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WILDLIFE INFORMATION SOURCES AND SEARCH METHODS ON THE INTERNET

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ABSTRACT: Vertebrate pest damage information is pulled from a variety of disciplines ranging from wildlife management to psychology. The Internet has opened the door to what seems to be an unending number of information sources. Researchers can become overwhelmed by the choices and different levels of information available. The correct use of search engines and a checklist of criteria to evaluate the quality of information obtained can help to eliminate the extraneous information and make the time spent on the Internet more productive. There are a large number of wildlife, biology, environmental, and other related sites that are especially useful to the wildlife damage management community.

KEY WORDS: Internet, search engines, wildlife damage, information sources

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INTRODUCTION

Vertebrate pest control research, by its very nature, is an aggregate of numerous disciplines—wildlife biology, ecology, zoology, bioelectronics, chemistry, botany, computer science, psychology, statistics, etc. This mosaic makes the work fascinating—information is pulled from many of these disciplines to find solutions to pest control problems. But what makes it fascinating also makes finding the information difficult. The Internet provides access to thousands of web sites that support the wildlife damage community and makes them readily accessible to users around the world.

Access to the Internet

Obtaining an Internet account and password has become fairly straightforward even in remote areas of the world. Many companies and universities maintain Internet links that are available to staff. Internet service providers (ISP) are listed in the yellow pages under "Internet Products & Services" and offer a wide range of service options. Public libraries now offer Internet access to patrons and are also a good source for training classes and online help.

Search Engines and Directories

It is easy to be overwhelmed by the amount of information on the web. Using search engines properly will help to eliminate false leads and extraneous material. Over 260 search engines are indexed on My Virtual Reference Desk (<http://www.refdesk.com>) a web page that ties together all of the search and reference tools. True search engines like Hotbot, Alta Vista, and Northern Light scan the web for word or phrase matches that are identified by computer robots or spiders. These are computer indexing routines that index major words in a web page. Web directories like Yahoo! (<http://www.yahoo.com>), WebCrawler (www.webcrawler.com), or OpenText (www.opentext.com) are indexed by people who review the information and arrange it hierarchically (Lidsky 1997; Bell 1997). Yahoo!'s strength is in its content and coverage. If you are looking for the Colorado State University web page, Yahoo! indexes it under "Regional:U.S. States:Colorado:Education:College and Universities:Public." Hotbot (<http://www.hotbot.com>)

is the most current search engine at the time of this publication, reindexing its database every two weeks. Hotbot allows you to use boolean logic and searches both the Web and Usenet which greatly expands its search results (Hock 1997). Special features include using a search modifier that searches for pages that have changed since you last used the program or within a specific time period, and the option to save searches for later use. Hotbot also has a great feature that lets you search to a specific depth in a page. This is important when you are digging for information that could be buried on the fourth level of a web page (Haskin 1997). Northern Light (<http://www.northernlight.com>) is the newest search engine on the web. Designed by librarians, it searches both the web and a database of more than 1,500 full-text journal titles. Search results are organized into folders that are sorted by subject, type, source, and language. A unique feature in Northern Light allows you to order any articles directly from them by e-mail for a reasonable cost (Notess 1998).

Separate news searchers are an excellent source for finding more up-to-date news stories in both regional, national, and international newspapers. They are updated throughout the day which puts them weeks ahead of regular search engines, and they focus specifically on news stories. Excite NewsTracker (<http://nt.excite.com>) has the most extensive and powerful news database with more than 300 publications indexed. NewsTracker has boolean searching and a special feature that tracks high-interest stories. Newsbot (<http://www.newbot.com>) is one of the more powerful news searchers currently available. Supplied by the Reuters News Service, Newsbot allows full-text searching of articles, customized user profiles, and free downloading of articles (O'Leary 1997b). Yahoo! and Infoseek also search the news wires on a more limited basis. Yahoo! stores articles for seven days, and InfoSeek does not have a browsing function which limits searching results.

Important information also lies with the personal knowledge and capabilities of biologists and technicians working in the field. Finding people on the web is easy using search utilities like WhoWhere (<http://www.whowhere.com>), InfoSpace (<http://www.infospace.com>) which will give you a map right to the location, and

Four11 (<http://www.four11.com>) which will make the telephone call if you have the equipment on your computer (Bell 1997).

Search Criteria

It is very easy to find information on the Internet. Unfortunately, many searches result in hundreds, if not thousands, of hits. The real trick is to find something that is relevant to your search topic. Listed below are some specific things you can do to make your search time more productive.

- 1) Be specific in your search and beware of search terms that may have a double meaning. Using the term "bears" will find articles on black bears and the Chicago Bears football team! *Urus americanus* will find sites directly related to the animal.
- 2) If you cannot be precise, use search engines like Northern Light or Infoseek that make it easy to refine your initial search.
- 3) Specialized search engines may give you better results than the big search engines.
- 4) Pick a search engine that you like and learn how to use it. Each product has special features and tools that make searching much more powerful (Haskin 1997).
- 5) Learn how to use Boolean logic—it will help in refining your searches. "Coyote and Yellowstone" will find hits that include both terms; "Coyote or Yellowstone" will find hits that have either term; "Coyote and Yellowstone not wolves" will find pages that include coyotes, Yellowstone, but not wolves.
- 6) Do broad searches using several search engines or a meta search engine that taps into a variety of sources.

As with all reference sources, you should rely on information from reputable sources. If you have a question about where something you found on the web came from, call the Webmaster to verify the source (Clark 1997).

Wildlife Damage Websites

Aquaculture. Aquaculture farms have grown in number over the past few years and have become an attractive food source for a variety of waterfowl. The National Agricultural Library's Alternative Farming Systems Information Center (<http://www.nalusda.gov/afsic>) has publications and links to aquaculture sites. AquaNIC (<http://ag.ansc.purdue.edu/aquanic>) and the California Aquaculture (<http://aqua.ucdavis.edu/links/links/html>) site include industry links, publications, management tips, and related information.

Bird/Aircraft Hazards. NWRC's Sandusky, Ohio field station (<http://www.rbcg.com/nwrscsandusky>) has been conducting research on bird aircraft collisions and is an excellent source for publications and links to other bird/aircraft sites. AirSafe.com (<http://www.airsafe.com/birds.htm>) includes links to articles about bird/aircraft strikes, airline information, and management documents. The Federal Aviation Administration (<http://www.faa.gov/arp/hazard.htm>) and Transport Canada (<http://www.tc.gc.ca/aviation/aerodome/birdstke/main.html>) are also rich sites for bird/aircraft information.

Wildlife Damage Links. The United States Department of Agriculture's National Wildlife Research Center (<http://www.aphis.usda.gov/ws/nwrc>) web page offers information on current Center research, publications, and contact numbers. You can contact the NWRC library directly for copies of all publications produced by Center scientists. The Jack F. Berryman Institute for Wildlife Damage Management (<http://sticky.usu.edu/~cnr/fishwild/berry.htm>) is the main web page for Utah State University's wildlife damage program. It links to Keeping Wildlife At a Safe Distance (<http://cc.usu.edu/~schmidt/welcome.html>), an excellent source for information on wildlife damage resources, government agencies, legislation, and how-to publications on wildlife damage. There is also a link to the Wildlife Damage Listserv. TEXNAT (<http://texnat.tamu.edu/atexnat.htm>), the Texas Natural Resource Web maintained by Texas A&M University focuses on natural resources in Texas. Information includes research and extension publications, management tips, educational programs, and symposium proceedings. Publications include the "Predation Guide" (<http://texnat.tamu.edu/ranchref/predator>), adapted from "Procedures for Evaluating Predation on Livestock and Wildlife" by Wade and Bowns, "Coyotes in the Southwest" and "Feral Swine: a Compendium for Resource Managers." North Dakota State University's excellent guide, "Prevention & Control of Wildlife Damage" can be found on the North Carolina Natural Resources webpage (<http://www.ces.ncsu.edu/nreos/wild/wildlife.html>). Rutgers' Cook College Wildlife Damage Control Center (<http://cook-college.rutgers.edu/www/cent-inst/wildlife.html>) lists faculty names and contact numbers. The Armed Forces Pest Management Board (<http://www-afpmb.acq.osd.mil>) offers information on the various pest control projects on military bases and publications. The Human Dimensions Research Unit (<http://www.hdru.cornell.edu>) at Cornell University includes the full text of reports done by the unit on human-wildlife conflicts.

State Wildlife Links. State and regional information can be found at the extension service, experiment stations, and university sites. Pages that include wildlife damage information are the Kansas State Wildlife Management Library (<http://www.oznet.ksu.edu/library/pub/library/wildlif/wldlfpub.htm>) which has an extensive library of bulletins, and information sheets; Mississippi Wildlife Damage Management (<http://www.ccs.msstate.edu/anr/wildlife.wildlife/wildlifedamage.html>); Missouri Division of Conservation (<http://www.state.mo.us/conservation/index.html>); the Virginia Department of Agriculture (<http://www.state.va.us/~vdacs/opps/opps/nuisance.html>) page on Nuisance Birds; and the North Carolina Division of Wildlife Management (<http://www.state.nc.us/wildlife/management>). The Texas Oral Rabies Vaccination Program (<http://www.tdh.state.tx.us/zoonosis/orvp>) reports information on the vaccination program and includes the full-text of reports on the project. The Texas Natural Resources Web (<http://texnat.tamu.edu>) has already been mentioned earlier in this article.

International Wildlife. International sites hold a wealth of information on wildlife damage management and pesticide use. The Canadian Wildlife Service

(http://www.ec.gc.ca/cws-scf/cwshom_e.html); the Australian Commonwealth Scientific and Research Organization (<http://www.dwe.csiro.au/research/progv/progv.htm>); and the Vertebrate Biocontrol Cooperative Research Center (<http://www.dwe.csiro.au/crcs/vbc>) cover information on Australia's vertebrate pest control projects. The Consortium for International Crop Protection (<http://www.IPMnet.org>) goal is to reduce food-crop losses by pests while also safe-guarding the environment. Information on African wildlife can be found at Wildnet Africa (<http://www.wolfe.net/~scat/index.html>) and African Wildlife (<http://www.wolfe.net/~scat/main.html>).

Animal-Related Web Sites

The ultimate animal-related source on the Internet is NETVET: Veterinary Resources & Electronic Zoo (<http://netvet.wustl.edu>). The authors have done an outstanding job of indexing publications, sites on specific animals, organizations, newsgroups, etc. Sites cover the gamut from pet care to wildlife research on both a national and international scale. Some sites that are of special interest to the wildlife damage control community are: BirdSource (<http://birdsource.cornell.edu>) and the Cornell Laboratory of Ornithology (<http://birds.cornell.org>) have links to bird research sites, publications, slide collections, and a library of bird sounds. DuckData (<http://www.nwrc.nbs.gov/duckdata/duckdate.html>) is a searchable bibliographic data base of North American waterfowl from the Biological Resources Division of U.S. Geological Survey. The Ornithological Council's BIRDNET (<http://nmnhgoph.si.edu/BIRDNET/index.html>) and North American Breeding Bird Survey (<http://www.mbr.nbs.gov/bbs.html>) are invaluable for information on bird migration, surveys, and other information on bird research. Llama Web (www.webcon.com/~degraham/uses/welcome.html) covers everything about llamas including breeding information, show announcements, and a section on guard llamas. DeerNet (<http://www.deer.rr.ualberta.ca/about.html>) is maintained by the University of Alberta, Canada. It covers the ecology, management, and utilization of hoofed mammals. The International Wolf Center (<http://www.wolf.org>) is a great source for links to wolf research and management. The World Wide Web Virtual Library on Herptology (<http://xtal200.harvard.edu:8000/herp>) has links to everything creepy crawlie on the web (Johnson 1997).

Agriculture

Sites related specifically to agriculture on the Internet are numerous. The National Agricultural Library (<http://www.nalusda.gov>) is a good place to start if you are looking for literature or links to other agriculture related sites. The Agriculture Network Information Center (<http://www.agnic.nal.usda.gov>) indexes both industry and research sites on agriculture and related industries. The World Wide Web Virtual Library on Agriculture (<http://ipmwww.ncsu.edu/cernag/cern.html>) has hundreds of links on biological control, agricultural economics, biotechnology, and ag sites around the world. The National Agricultural Statistical Service (<http://www.nass.usda.gov>) is accessible through the Agriculture Department or Cornell's Mann Library ([\[manlib.cornell.edu/reports.nassr\]\(http://mann77.manlib.cornell.edu/reports.nassr\)\). The Cooperative State Research Education & Extension Service \(<http://www.reeusda.gov/new/csrees.htm>\) links to all the state extension service units and contains reports, bulletins, flyers, and other informational material on wildlife control.](http://mann77.</p></div><div data-bbox=)

Environmental and Life Sciences Sources

General information on the ecology, biology, and related sciences can be found at some of the following sites. Envirolink (<http://www.envirolink.org>) is an award winning index to environmental groups and sites. The Environmental News Network's (<http://www.enn.com>) goal is to be the world's premier source of original environmental and science news. Photographs, video, and audio are attached to the text articles and can be downloaded. The World Wide Web Virtual Library (WWW-VL) on the Environment (<http://ecosys.drdr.virginia.edu/environment.html>); Virtual Library of Ecology, Biodiversity, and the Environment (<http://conbio.rice.edu.vl>); and WWW-VL Biosciences (<http://golgi.harvard.edu/biopages.html>) link to reference tools, industry contacts, research and government pages, and hundreds of other related sites (Clark 1997). The Natural Resources Research Information Pages (<http://sfbox.vt.edu:10021/Y/yfleung/forlit.html>) is a directory to hundreds of environmental research databases, literature, and websites. The List of WWW Sites of Interest to Ecologists (<http://www.biol.uregina.ca/liu.bio/Ecology-www.html>) is a great list of sources but is hampered by a lack of subject indexing. Infomine: Comprehensive Biological, Agricultural and Medical Internet Resource Collection (<http://lib-www.ucr.edu>) is a fully indexed and annotated guide to over 1,500 reference sources. My Virtual Reference Desk ENVIRONMENT (<http://www.refdesk.com/cgi-bin/refsrch.cgi/search/me?environment>) has numerous environmental dictionaries and indexes available for searching. Natural Resources-International Government Agencies (<http://sfbox.vt.edu:1002/Y/yfleung/agency.html>) indexes natural resource agencies around the world by country or region (Weaver 1997).

Commercial Sites

There are several commercial sites on the Internet that have been used by librarians and researchers to locate wildlife information. Dialog Select (<http://dialogselect.krinfo.com>) has 250 databases including BIOSIS™ and the Zoological Record™ accessible through an Internet subscription. The search engine is easy to use and copies of articles are available for purchase (O'Leary 1997a). NISC (<http://www.nisc.com>) now offers access to their CD-ROM products through the Internet on a subscription basis. Wildlife Worldwide™ is touted as the largest index to literature on wild animals, birds, reptiles, and amphibians and is considered a better information source than Dialog's Zoological Record (Chrisman 1996). You can obtain copies of articles you find on the Internet from CARL Corporation's UNCOVER (<http://uncweb.carl.org>) site. CARL also has an automated alerting service that delivers the table of contents of journals you select to your e-mail box. Users can create subject searches, run them on the database, and then receive weekly alerts of new citations as the database is updated.

There are many "hidden" databases on the Internet that contain information that typical search engines will not find. These sites may require registration before using them like the New York Times (<http://www.nytimes.com>) or the Thomas Register (<http://www.thomasregister.com>), a gem of a site for locating product and supplier information. You have to be a detective and go to the specific company or agency site to find these storehouses of information (Notes 1997b).

Industry Links

Locating industry information has become easier as many organizations and commercial companies have created web sites. A few related to wildlife damage management are the American Sheep Industry (<http://www.sheepusa.org>) and the Cattlemen's Association (<http://www.ncanet.org>). Wildlife Control Technology Magazine's (<http://wctech.com>) webpage lists new products, National Wildlife Management Association meeting announcements, and has an index to the articles that have appeared in the magazine.

Animal Rights Groups

Many environmental and animal rights groups have an interest in wildlife damage control and have a presence on the web. The Humane Society of the United States (<http://www.hsus.org>), Animal Protection Institute (<http://www.api4animals.org>), the Animal Defense League (<http://php.indiana.edu/~adl/adl1.html>), Defenders of Wildlife (www.defenders.org), Friends of Animals (<http://www.envirolink.org/orgs.foa>), Coalition for the Prevention of the Destruction of the Canda Goose (<http://www.icu.com/geese/coalition.html>), and Fund for Animals (www.fund.org) all have information about their organizations, contact names and telephone numbers, and details about current campaigns. Groups that have a specific interest in predator control are the People for the Ethical Treatment of Animals (<http://www.envirolink.org/arrs/peta>), the Predator Defense Fund (<http://www.envirolink.org/arrs/pdi/index.htm>), the Predator Project (<http://www.wildrockies.org/predproj>), and Sinepau (<http://www.smapu.org>). Predator Protection (<http://www.arkonline.com>) focuses on predators in the northwest United States and has videos on bear poaching and fox hunting available for viewing.

Additional sites within the U.S. Government are shown in the list below.

Agriculture Department	www.usda.gov
Bureau of Land Management	www.blm.gov
Environmental Protection Agency	www.epa.gov
Federal Aviation Administration	www.faa.gov
Fish & Wildlife Service	www.fws.gov
Forest Service	www.fs.fed.gov
Library of Congress	Lcweb.loc.gov
National Biological Resources (USS)	www.nbs.gov
National Park Service	www.nps.gov

SUMMARY

The Internet offers a wealth of information that can drown the user if you do not use judgment and skill in searching through the myriad of websites. There are many tools that have been collected by libraries, universities, and other groups to help you find the information you are looking for. You should always use judgment in citing references and only use reputable resources.

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