

US EPA ARCHIVE DOCUMENT

## Bibliometric Analysis for Papers on Topics Related to Ecosystems Research

This is a bibliometric analysis of the papers prepared by intramural and extramural researchers of the U.S. Environmental Protection Agency (EPA) on topics related to ecosystems research. For this analysis, 1,455 papers were reviewed. These 1,455 papers, published from 1995 to 2005, were cited 13,317 times in the journals covered by Thomson's Web of Science.<sup>1</sup> Of these 1,455 papers, 1,245 (86%) have been cited at least once in a journal.

The analysis was completed using Thomson's Essential Science Indicators (ESI) and Journal Citation Reports (JCR) as benchmarks. ESI provides access to a unique and comprehensive compilation of essential science performance statistics and science trends data derived from Thomson's databases. The chief indicators of output, or productivity, are journal article publication counts. For influence and impact measures, ESI employs both total citation counts and cites per paper scores. The former reveals gross influence while the latter shows weighted influence, also called impact. JCR presents quantifiable statistical data that provide a systematic, objective way to evaluate the world's leading journals and their impact and influence in the global research community.

### Summary of Analysis

**Nearly one-fifth of the ecosystems publications are highly cited papers.** A review of the citations indicates that 283 (19.4%) of the ecosystem papers qualify as highly cited when using the ESI criteria for the top 10% of highly cited publications. Twenty-nine (2.0%) of the ecosystem papers qualify as highly cited when using the criteria for the top 1%. Three (0.2%) of these papers qualify as very highly cited (in the top 0.1%). None of the papers meet the highest threshold (the top 0.01%) for highly cited papers.

**The ecosystems papers are more highly cited than the average paper.** Using the ESI average citation rates for papers published by field as the benchmark, in 15 of the 19 fields in which the EPA ecosystems papers were published, the ratio of actual to expected cites is greater than 1, indicating that the ecosystems papers are more highly cited than the average papers in those fields.

**Nearly one-fifth of the ecosystem papers are published in very high impact journals.** Two hundred eighty-one (281) of 1,455 papers were published in the top 10% of journals ranked by JCR Impact Factor, representing 19.3% of EPA's ecosystem papers. Nearly one-fifth of the ecosystem papers are published in the top 10% of journals ranked by JCR Immediacy Factor.

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<sup>1</sup> Thomson's *Web of Science* provides access to current and retrospective multidisciplinary information from approximately 8,500 of the most prestigious, high impact research journals in the world. *Web of Science* also provides cited reference searching.

Two-hundred eighty-eight (288) of the 1,455 papers appear in the top 10% of journals, representing 19.8% of EPA's ecosystem papers.

**Twenty-eight of the ecosystems publications qualified as hot papers.** ESI establishes citation thresholds for hot papers, which are selected from the highly cited papers in different fields, but the time frame for citing and cited papers is much shorter—papers must be cited within 2 years of publication and the citations must occur in a 2-month time period. Using the current hot paper thresholds established by ESI as a benchmark, 28 of the ecosystems papers, representing 1.92% of the ecosystems publications, were identified as hot papers in the analysis.

**The authors of the ecosystems papers cite themselves less than the average self-citation rate.** Eight hundred thirty-four (834) of the 13,317 cites are author self-cites. This 6.26% author self-citation rate is well below the accepted range of 10-30% author self-citation rate.

### Highly Cited Ecosystem Publications

The 1,455 ecosystem papers reviewed for this analysis covered 19 of the 22 ESI fields of research. The distribution of the papers among these 19 fields and the number of citations by field are presented in Table 1.

**Table 1. Ecosystem Papers by ESI Fields**

| No. of Citations | ESI Field                    | No. of EPA Ecosystem Papers | Average Cites/Paper |
|------------------|------------------------------|-----------------------------|---------------------|
| 7,986            | Environment/Ecology          | 954                         | 8.37                |
| 1,144            | Engineering                  | 148                         | 7.73                |
| 870              | Multidisciplinary            | 19                          | 45.79               |
| 741              | Biology & Biochemistry       | 49                          | 15.12               |
| 536              | Microbiology                 | 35                          | 15.31               |
| 524              | Geosciences                  | 53                          | 9.89                |
| 484              | Plant & Animal Science       | 56                          | 8.64                |
| 437              | Chemistry                    | 43                          | 10.16               |
| 182              | Agricultural Sciences        | 28                          | 6.50                |
| 165              | Pharmacology & Toxicology    | 19                          | 8.68                |
| 67               | Clinical Medicine            | 4                           | 16.75               |
| 41               | Mathematics                  | 22                          | 1.86                |
| 31               | Economics & Business         | 4                           | 7.75                |
| 30               | Physics                      | 7                           | 4.28                |
| 26               | Molecular Biology & Genetics | 3                           | 8.67                |

| No. of Citations      | ESI Field         | No. of EPA Ecosystem Papers | Average Cites/Paper |
|-----------------------|-------------------|-----------------------------|---------------------|
| 26                    | Computer Science  | 8                           | 3.25                |
| 21                    | Immunology        | 1                           | 21.00               |
| 6                     | Social Sciences   | 1                           | 6.00                |
| 0                     | Materials Science | 1                           | 0.00                |
| <b>Total = 13,317</b> |                   | <b>Total = 1,455</b>        | <b>9.15</b>         |

There were 283 (19.4% of the papers analyzed) highly cited EPA ecosystems papers in 14 of the 19 fields—Environment/Ecology, Multidisciplinary, Engineering, Biology & Biochemistry, Plant & Animal Science, Microbiology, Geosciences, Chemistry, Agricultural Sciences, Pharmacology & Toxicology, Economics & Business, Clinical Medicine, Mathematics, and Computer Science—when using the ESI criteria for the **top 10% of papers**. Table 2 shows the number of EPA papers in those 14 fields that met the **top 10% threshold in ESI**.

Twenty-nine (2.0%) of the papers analyzed qualified as highly cited when using the ESI criteria for the **top 1% of papers**. These papers were categorized in five fields—Environment/Ecology, Multidisciplinary, Biology & Biochemistry, Engineering, and Plant & Animal Science. Table 3 shows the 29 papers by field that met the **top 1% threshold in ESI**. There were three (0.2% of the papers analyzed) very highly cited EPA ecosystems papers in two fields—Environment/Ecology and Engineering. These three papers met the **top 0.1% threshold in ESI**. None of the ecosystems papers met the highest threshold for highly cited papers (i.e., the **top 0.01% threshold**) in ESI.

**Table 2. Number of Highly Cited Ecosystems Papers by Field (top 10%)**

| No. of Citations | ESI Field              | No. of Papers | Average Cites/Paper | % of EPA Papers in Field |
|------------------|------------------------|---------------|---------------------|--------------------------|
| 4,457            | Environment/Ecology    | 164           | 27.18               | 17.19%                   |
| 853              | Multidisciplinary      | 14            | 60.93               | 73.68%                   |
| 739              | Engineering            | 48            | 15.40               | 32.43%                   |
| 514              | Biology & Biochemistry | 8             | 64.25               | 16.33%                   |
| 348              | Plant & Animal Science | 14            | 24.86               | 26.92%                   |
| 258              | Microbiology           | 6             | 43.00               | 17.14%                   |

| No. of Citations     | ESI Field                 | No. of Papers      | Average Cites/Paper | % of EPA Papers in Field |
|----------------------|---------------------------|--------------------|---------------------|--------------------------|
| 227                  | Geosciences               | 9                  | 25.22               | 16.98%                   |
| 215                  | Chemistry                 | 6                  | 35.83               | 13.95%                   |
| 101                  | Agricultural Sciences     | 5                  | 20.20               | 17.86%                   |
| 85                   | Pharmacology & Toxicology | 2                  | 42.50               | 10.52%                   |
| 27                   | Economics & Business      | 1                  | 27.00               | 25.00%                   |
| 49                   | Clinical Medicine         | 2                  | 24.50               | 50.00%                   |
| 13                   | Mathematics               | 3                  | 4.33                | 13.64%                   |
| 3                    | Computer Science          | 1                  | 3.00                | 12.50%                   |
| <b>Total = 7,889</b> |                           | <b>Total = 283</b> | <b>27.88</b>        |                          |

**Table 3. Number of Highly Cited Ecosystems Papers by Field (top 1%)**

| No. of Citations     | ESI Field              | No. of Papers     | Average Cites/Paper | % of EPA Papers in Field |
|----------------------|------------------------|-------------------|---------------------|--------------------------|
| 1,140                | Environment/Ecology    | 16                | 71.25               | 1.68%                    |
| 463                  | Multidisciplinary      | 3                 | 154.33              | 15.79%                   |
| 355                  | Biology & Biochemistry | 2                 | 177.50              | 4.08%                    |
| 301                  | Engineering            | 5                 | 60.20               | 3.38%                    |
| 146                  | Plant & Animal Science | 3                 | 48.67               | 5.36%                    |
| <b>Total = 2,405</b> |                        | <b>Total = 29</b> |                     |                          |

The citations for the highly cited papers in the top 1% are presented in Tables 4 through 8. The citations for the very highly cited papers are listed in Table 9.

**Table 4. Highly Cited Ecosystems Papers in the Field of Environment/Ecology (top 1%)**

| No. of Cites | First Author  | Paper                                                                                                                                                                                             |
|--------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 181          | Sakai AK      | The population biology of invasive species. <i>Annual Review of Ecology and Systematics</i> 2001;32:305-332.                                                                                      |
| 172          | Huston MA     | Local processes and regional patterns: appropriate scales for understanding variation in the diversity of plants and animals. <i>Oikos</i> 1999;86(2):393-401.                                    |
| 156          | Burkholder JM | <i>Pfiesteria piscicida</i> and other <i>Pfiesteria</i> -like dinoflagellates: behavior, impacts, and environmental controls. <i>Limnology and Oceanography</i> 1997;42(5):1052-1075.             |
| 111          | Morel FMM     | The chemical cycle and bioaccumulation of mercury. <i>Annual Review of Ecology Evolution and Systematics</i> 1998;29:543-566.                                                                     |
| 91           | Oberdorster G | Pulmonary effects of inhaled ultrafine particles. <i>International Archives of Occupational and Environmental Health</i> 2001;74(1):1-8.                                                          |
| 74           | Moran MA      | Carbon loss and optical property changes during long-term photochemical and biological degradation of estuarine dissolved organic matter. <i>Limnology and Oceanography</i> 2000;45(6):1254-1264. |
| 65           | Chase TN      | Simulated impacts of historical land cover changes on global climate in northern winter. <i>Climate Dynamics</i> 2000;16(2-3):93-105.                                                             |
| 49           | Phillips DL   | Incorporating concentration dependence in stable isotope mixing models. <i>Oecologia</i> 2002;130(1):114-125.                                                                                     |
| 46           | Law BE        | Environmental controls over carbon dioxide and water vapor exchange of terrestrial vegetation. <i>Agricultural and Forest Meteorology</i> 2002;113(1-4):97-120.                                   |
| 39           | Davidson C    | Spatial tests of the pesticide drift, habitat destruction, UV-B, and climate-change hypotheses for California amphibian declines. <i>Conservation Biology</i> 2002;16(6):1588-1601.               |
| 34           | Ollinger SV   | Regional variation in foliar chemistry and N cycling among forests of diverse history and composition. <i>Ecology</i> 2002;83(2):339-355.                                                         |
| 33           | Wiens JA      | Riverine landscapes: taking landscape ecology into the water. <i>Freshwater Biology</i> 2002;47(4):501-515.                                                                                       |
| 29           | Law BE        | Changes in carbon storage and fluxes in a chronosequence of ponderosa pine. <i>Global Change Biology</i> 2003;9(4):510-524.                                                                       |
| 20           | Cohen WB      | An improved strategy for regression of biophysical variables and Landsat ETM+ data. <i>Remote Sensing of Environment</i> 2003;84(4):561-571.                                                      |

| No. of Cites | First Author | Paper                                                                                                                                     |
|--------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 20           | Mazdai A     | Polybrominated diphenyl ethers in maternal and fetal blood samples. <i>Environmental Health Perspectives</i> 2003;111(9):1249-1252.       |
| 20           | Gray MJ      | Effects of agricultural cultivation on demographics of Southern High Plains amphibians. <i>Conservation Biology</i> 2004;18(5):1368-1377. |

**Table 5. Highly Cited Ecosystems Papers in the Field of Multidisciplinary (top 1%)**

| No. of Cites | First Author    | Paper                                                                                                                                    |
|--------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 185          | Matson PA       | Agricultural intensification and ecosystem properties. <i>Science</i> 1997;277(5325):504-509.                                            |
| 184          | Stoddard JL     | Regional trends in aquatic recovery from acidification in North America and Europe. <i>Nature</i> 1999;401(6753):575-578.                |
| 94           | Wolfenbarger LL | Biotechnology and ecology – the ecological risks and benefits of genetically engineered plants. <i>Science</i> 2000;290(5499):2088-2093. |

**Table 6. Highly Cited Ecosystems Papers in the Field of Biology & Biochemistry (top 1%)**

| No. of Cites | First Author | Paper                                                                                                                                               |
|--------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 245          | Aber J       | Nitrogen saturation in temperate forest ecosystems – hypotheses revisited. <i>Bioscience</i> 1998;48(11):921-934.                                   |
| 110          | Driscoll CT  | Acidic deposition in the northeastern U.S.: sources and inputs, ecosystem effects, and management strategies. <i>Bioscience</i> 2001;51(3):180-198. |

**Table 7. Highly Cited Ecosystems Papers in the Field of Engineering (top 1%)**

| No. of Cites | First Author | Paper                                                                                                                                                                                   |
|--------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 130          | Mason RP     | Uptake, toxicity, and trophic transfer of mercury in a coastal diatom. <i>Environmental Science &amp; Technology</i> 1996;30(6):1835-1845.                                              |
| 50           | Amyot M      | Production and loss of dissolved gaseous mercury in coastal seawater. <i>Environmental Science &amp; Technology</i> 1997;31(12):3606-3611.                                              |
| 47           | Reuter JE    | Concentrations, sources, and fate of the gasoline oxygenate methyl tert-butyl ether (MTBE) in a multiple use lake. <i>Environmental Science &amp; Technology</i> 1998;32(23):3666-3672. |

| No. of Cites | First Author | Paper                                                                                                                                                                                                 |
|--------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46           | Douglas EM   | Trends in floods and low flows in the United States: impact of spatial correlation. <i>Journal of Hydrology</i> 2000;240(1-2):90-105.                                                                 |
| 28           | Schneider AR | Recent declines in PAH, PCB, and toxaphene levels in the northern Great Lakes as determined from high resolution sediment cores. <i>Environmental Science &amp; Technology</i> 2001;35(19):3809-3815. |

**Table 8. Highly Cited Ecosystem Ecosystems Papers in the Field of Plant & Animal Science (top 1%)**

| No. of Cites | First Author  | Paper                                                                                                                                                           |
|--------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 75           | Zak DR        | Elevated atmospheric CO <sub>2</sub> , fine roots and the response of soil microorganisms: a review and hypothesis. <i>New Phytologist</i> 2000;147(1):201-222. |
| 51           | Burkholder JM | Overview and present status of the toxic <i>Pfiesteria</i> complex (Dinophyceae). <i>Phycologia</i> 2001;40(3):186-214.                                         |
| 20           | Andersen CP   | Source-sink balance and carbon allocation below ground in plants exposed to ozone. <i>New Phytologist</i> 2003;157(2):213-228.                                  |

**Table 9. Very Highly Cited Ecosystems Papers (Top 0.1%)**

| Field               | No. of Cites | First Author | Paper                                                                                                                                                          |
|---------------------|--------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment/Ecology | 181          | Sakai AK     | The population biology of invasive species. <i>Annual Review of Ecology and Systematics</i> 2001;32:305-332.                                                   |
|                     | 172          | Huston MA    | Local processes and regional patterns: appropriate scales for understanding variation in the diversity of plants and animals. <i>Oikos</i> 1999;86(2):393-401. |
| Engineering         | 130          | Mason RP     | Uptake, toxicity, and trophic transfer of mercury in a coastal diatom. <i>Environmental Science &amp; Technology</i> 1996;30(6):1835-1845.                     |

### Ratio of Actual Cites to Expected Citation Rates

The expected citation rate is the average number of cites that a paper published in the same journal in the same year and of the same document type (article, review, editorial, etc.) has received from the year of publication to the present. Using the ESI average citation rates for

papers published by field as the benchmark, in 15 of the 19 fields in which the EPA ecosystems papers were published, the ratio of actual to expected cites is greater than 1, indicating that the EPA papers are more highly cited than the average papers in those fields (see Table 10).

**Table 10. Ratio of Average Cites to Expected Cites for Ecosystems Papers by Field**

| ESI Field                    | Total Cites | Expected Cite Rate | Ratio |
|------------------------------|-------------|--------------------|-------|
| Environment/Ecology          | 7,986       | 5,379.63           | 1.48  |
| Engineering                  | 1,144       | 369.46             | 3.10  |
| Multidisciplinary            | 870         | 70.71              | 12.30 |
| Biology & Biochemistry       | 741         | 518.15             | 1.43  |
| Microbiology                 | 536         | 319.39             | 1.68  |
| Geosciences                  | 524         | 289.37             | 1.81  |
| Plant & Animal Science       | 484         | 234.84             | 2.06  |
| Chemistry                    | 437         | 319.87             | 1.37  |
| Agricultural Sciences        | 182         | 110.53             | 1.65  |
| Pharmacology & Toxicology    | 165         | 110.98             | 1.49  |
| Clinical Medicine            | 67          | 39.95              | 1.68  |
| Mathematics                  | 41          | 27.63              | 1.48  |
| Economics & Business         | 31          | 8.06               | 3.85  |
| Physics                      | 30          | 50.02              | 0.60  |
| Molecular Biology & Genetics | 26          | 47.29              | 0.55  |
| Computer Science             | 26          | 19.23              | 1.35  |
| Immunology                   | 21          | 21.11              | 0.99  |
| Social Sciences              | 6           | 4.30               | 1.40  |
| Materials Science            | 0           | 5.66               | 0.00  |

### **JCR Benchmarks**

The Impact Factor is a well known metric in citation analysis. It is a measure of the frequency with which the *average article* in a journal has been cited in a particular year. The Impact Factor

helps evaluate a journal's relative importance, especially when compared to others in the same field. The Impact Factor is calculated by dividing the number of citations in the current year to articles published in the 2 previous years by the total number of articles published in the 2 previous years.

Table 11 indicates the number of ecosystems papers published in the top 10% of journals, based on the JCR Impact Factor. Two hundred eighty-one (281) of 1,455 papers were published in the top 10% of journals, representing 19.3% of EPA's ecosystems papers.

**Table 11. Ecosystem Papers in Top 10% of Journals by JCR Impact Factor**

| <b>EPA<br/>Ecosystems<br/>Papers in that<br/>Journal</b> | <b>Journal</b>                         | <b>Impact<br/>Factor<br/>(IF)</b> | <b>JCR IF<br/>Rank</b> |
|----------------------------------------------------------|----------------------------------------|-----------------------------------|------------------------|
| 37                                                       | Environmental Science & Technology     | 3.557                             | 540                    |
| 37                                                       | Ecological Applications                | 3.287                             | 623                    |
| 19                                                       | Applied and Environmental Microbiology | 3.810                             | 470                    |
| 19                                                       | Bioscience                             | 3.041                             | 730                    |
| 19                                                       | Limnology and Oceanography             | 3.024                             | 737                    |
| 12                                                       | Ecology                                | 4.104                             | 394                    |
| 12                                                       | Remote Sensing of Environment          | 3.185                             | 666                    |
| 10                                                       | Environmental Health Perspectives      | 3.929                             | 439                    |
| 10                                                       | Conservation Biology                   | 3.672                             | 504                    |
| 10                                                       | Ecosystems                             | 3.283                             | 624                    |
| 8                                                        | Journal of Chromatography A            | 3.359                             | 602                    |
| 7                                                        | Nature                                 | 32.182                            | 9                      |
| 7                                                        | Science                                | 31.853                            | 10                     |
| 7                                                        | Analytical Chemistry                   | 5.450                             | 243                    |
| 7                                                        | Global Change Biology                  | 4.333                             | 358                    |
| 7                                                        | Ecology Letters                        | 3.914                             | 445                    |
| 6                                                        | Journal of Climate                     | 3.500                             | 558                    |
| 6                                                        | New Phytologist                        | 3.355                             | 603                    |

| <b>EPA<br/>Ecosystems<br/>Papers in that<br/>Journal</b> | <b>Journal</b>                                                                     | <b>Impact<br/>Factor<br/>(IF)</b> | <b>JCR IF<br/>Rank</b> |
|----------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------|------------------------|
| 4                                                        | Annual Review of Ecology Evolution and Systematics                                 | 9.429                             | 102                    |
| 4                                                        | Ecological Monographs                                                              | 5.016                             | 282                    |
| 3                                                        | Molecular Ecology                                                                  | 4.375                             | 351                    |
| 3                                                        | Electrophoresis                                                                    | 3.743                             | 482                    |
| 3                                                        | Toxicological Sciences                                                             | 3.391                             | 591                    |
| 2                                                        | Evolution                                                                          | 3.719                             | 490                    |
| 2                                                        | Proceedings of the Royal Society of London Series B-<br>Biological Sciences        | 3.653                             | 509                    |
| 2                                                        | Plant Cell and Environment                                                         | 3.634                             | 517                    |
| 1                                                        | JAMA-Journal of the American Medical Association                                   | 24.831                            | 15                     |
| 1                                                        | Lancet                                                                             | 21.713                            | 20                     |
| 1                                                        | Gastroenterology                                                                   | 13.092                            | 61                     |
| 1                                                        | Proceedings of the National Academy of Sciences of the<br>United States of America | 10.452                            | 88                     |
| 1                                                        | Reviews of Geophysics                                                              | 8.667                             | 114                    |
| 1                                                        | Molecular Biology of the Cell                                                      | 7.517                             | 151                    |
| 1                                                        | Plant Physiology                                                                   | 5.881                             | 214                    |
| 1                                                        | Emerging Infectious Diseases                                                       | 5.643                             | 230                    |
| 1                                                        | Biochemistry                                                                       | 4.008                             | 421                    |
| 1                                                        | Environmental Microbiology                                                         | 3.995                             | 427                    |
| 1                                                        | Epidemiology                                                                       | 3.840                             | 459                    |
| 1                                                        | Drug Metabolism and Disposition                                                    | 3.836                             | 461                    |
| 1                                                        | Geochimica et Cosmochimica Acta                                                    | 3.811                             | 468                    |
| 1                                                        | Mutation Research-Reviews in Mutation Research                                     | 3.667                             | 506                    |
| 1                                                        | Climate Dynamics                                                                   | 3.497                             | 561                    |
| 1                                                        | Journal of Experimental Botany                                                     | 3.366                             | 597                    |

| EPA Ecosystems Papers in that Journal | Journal                           | Impact Factor (IF) | JCR IF Rank |
|---------------------------------------|-----------------------------------|--------------------|-------------|
| 1                                     | Journal of Applied Ecology        | 3.266              | 629         |
| 1                                     | American Journal of Public Health | 3.241              | 642         |
| <b>Total = 281</b>                    |                                   |                    |             |

### Immediacy Index

The journal Immediacy Index is a measure of how quickly the *average article* in a journal is cited. It indicates how often articles published in a journal are cited within the year they are published. The Immediacy Index is calculated by dividing the number of citations to articles published in a given year by the number of articles published in that year.

Table 12 indicates the number of EPA papers published in the top 10% of journals, based on the JCR Immediacy Index. Two hundred eighty-eight (288) of the 1,455 papers appear in the top 10% of journals, representing 19.8% of EPA's ecosystems papers.

**Table 12. Ecosystems Papers in Top 10% of Journals by JCR Immediacy Index**

| EPA Ecosystems Papers in that Journal | Journal                            | Immediacy Index (II) | JCR II Rank |
|---------------------------------------|------------------------------------|----------------------|-------------|
| 37                                    | Ecological Applications            | 0.747                | 466         |
| 37                                    | Environmental Science & Technology | 0.623                | 617         |
| 32                                    | Hydrobiologia                      | 0.681                | 532         |
| 19                                    | Bioscience                         | 0.863                | 356         |
| 17                                    | Journal of Geophysical Research    | 0.617                | 630         |
| 13                                    | Freshwater Biology                 | 0.664                | 558         |
| 12                                    | Ecology                            | 0.590                | 676         |
| 10                                    | Ecosystems                         | 2.048                | 76          |
| 10                                    | Environmental Health Perspectives  | 1.202                | 202         |
| 10                                    | Conservation Biology               | 0.744                | 468         |

| <b>EPA<br/>Ecosystems<br/>Papers in that<br/>Journal</b> | <b>Journal</b>                                                                  | <b>Immediacy<br/>Index (II)</b> | <b>JCR II<br/>Rank</b> |
|----------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------|------------------------|
| 8                                                        | Climatic Change                                                                 | 1.235                           | 195                    |
| 7                                                        | Science                                                                         | 7.379                           | 3                      |
| 7                                                        | Nature                                                                          | 6.089                           | 5                      |
| 7                                                        | Analytical Chemistry                                                            | 0.885                           | 346                    |
| 7                                                        | Ecology Letters                                                                 | 0.754                           | 459                    |
| 6                                                        | New Phytologist                                                                 | 0.876                           | 349                    |
| 5                                                        | Ecotoxicology                                                                   | 1.450                           | 151                    |
| 3                                                        | Ambio                                                                           | 1.435                           | 156                    |
| 3                                                        | Aquatic Sciences                                                                | 0.800                           | 413                    |
| 3                                                        | Molecular Ecology                                                               | 0.674                           | 545                    |
| 3                                                        | Aerosol Science and Technology                                                  | 0.595                           | 668                    |
| 3                                                        | Electrophoresis                                                                 | 0.575                           | 697                    |
| 2                                                        | Natural Resources Journal                                                       | 1.034                           | 262                    |
| 2                                                        | Plant Cell and Environment                                                      | 0.605                           | 653                    |
| 1                                                        | JAMA – Journal of the American Medical Association                              | 5.499                           | 9                      |
| 1                                                        | Lancet                                                                          | 5.017                           | 12                     |
| 1                                                        | Gastroenterology                                                                | 2.529                           | 51                     |
| 1                                                        | Proceedings of the National Academy of Sciences of the United States of America | 1.923                           | 89                     |
| 1                                                        | Reviews of Geophysics                                                           | 1.714                           | 110                    |
| 1                                                        | Molecular Biology of the Cell                                                   | 1.641                           | 119                    |
| 1                                                        | Journal of Paleolimnology                                                       | 1.581                           | 132                    |
| 1                                                        | Emerging Infectious Diseases                                                    | 1.350                           | 169                    |
| 1                                                        | Ecology Law Quarterly                                                           | 1.174                           | 213                    |
| 1                                                        | Mutation Research-Reviews in Mutation Research                                  | 1.125                           | 224                    |
| 1                                                        | Hydrology and Earth System Sciences                                             | 1.069                           | 242                    |

| <b>EPA<br/>Ecosystems<br/>Papers in that<br/>Journal</b> | <b>Journal</b>                                    | <b>Immediacy<br/>Index (II)</b> | <b>JCR II<br/>Rank</b> |
|----------------------------------------------------------|---------------------------------------------------|---------------------------------|------------------------|
| 1                                                        | Plant Physiology                                  | 0.961                           | 296                    |
| 1                                                        | Bulletin of the American Meteorological Society   | 0.895                           | 341                    |
| 1                                                        | Epidemiology                                      | 0.864                           | 354                    |
| 1                                                        | Marine Geology                                    | 0.842                           | 373                    |
| 1                                                        | American Journal of Botany                        | 0.768                           | 445                    |
| 1                                                        | Biochemistry                                      | 0.737                           | 477                    |
| 1                                                        | American Journal of Public Health                 | 0.723                           | 489                    |
| 1                                                        | Journal of Applied Ecology                        | 0.718                           | 493                    |
| 1                                                        | Geochimica et Cosmochimica Acta                   | 0.680                           | 535                    |
| 1                                                        | Environmental Microbiology                        | 0.677                           | 539                    |
| 1                                                        | Tellus Series B-Chemical and Physical Meteorology | 0.610                           | 646                    |
| 1                                                        | Drug Metabolism and Disposition                   | 0.590                           | 676                    |
| 1                                                        | Journal of Physical Oceanography                  | 0.565                           | 718                    |
| 1                                                        | Theoretical and Applied Climatology               | 0.564                           | 718                    |
| <b>Total = 288</b>                                       |                                                   |                                 |                        |

### **Hot Papers**

ESI establishes citation thresholds for hot papers, which are selected from the highly cited papers in different fields, but the time frame for citing and cited papers is much shorter—papers must be cited within 2 years of publication and the citations must occur in a 2-month time period. Papers are assigned to 2-month periods and thresholds are set for each period and field to select 0.1% of papers. There were no hot papers identified for the current 2-month period (i.e., September-October 2005), but there were 28 hot papers identified from previous periods.

Using the current hot paper thresholds established by ESI as a benchmark, 28 hot papers, representing 1.92% of the ecosystems papers, were identified in the fields of Environment/Ecology, Engineering, Plant & Animal Science, Mathematics, and Multidisciplinary. The hot papers are listed in Table 13.

**Table 13. Hot Papers Identified Using Current ESI Thresholds**

| Field                   | ESI Hot Papers Threshold | No. of Cites in 2-Month Period    | Paper                                                                                                                                                                                    |
|-------------------------|--------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment/<br>Ecology | 6                        | 8 cites in April-May 2002         | Watts JM, et al. Thermal, mixing, and oxygen regimes of the Salton Sea, California, 1997-1999. <i>Hydrobiologia</i> 2001;466(1-3):159-176.                                               |
|                         | 8                        | 8 cites in May-June 2000          | Polsky C, et al. The Mid-Atlantic Region and its climate: past, present, and future. <i>Climate Research</i> 2000;14(3):161-173.                                                         |
|                         | 7                        | 8 cites in May-June 2003          | Sakai AK, et al. The population biology of invasive species. <i>Annual Review of Ecology and Systematics</i> 2001;32:305-332.                                                            |
|                         | 7                        | 7 cites in September-October 2004 | Brooks JR, et al. Hydraulic redistribution of soil water during summer drought in two contrasting Pacific Northwest coniferous forests. <i>Tree Physiology</i> 2002;22(15-16):1107-1117. |
|                         | 7                        | 7 cites in January-February 2001  | Huston MA. Local processes and regional patterns: appropriate scales for understanding variation in the diversity of plants and animals. <i>Oikos</i> 1999;86(3):393-401.                |
|                         | 7                        | 7 cites in September-October 2002 | Oberdorster G. Pulmonary effects of inhaled ultrafine particles. <i>International Archives of Occupational and Environmental Health</i> 2001;74(1):1-8.                                  |
|                         | 5                        | 6 cites in September-October 2001 | Glasgow HB, Burkholder JM. Water quality trends and management implications from a five-year study of a eutrophic estuary. <i>Ecological Applications</i> 2000;10(4):1024-1046.          |
|                         | 3                        | 5 cites in April-May 2004         | Hulse DW, et al. Envisioning alternatives: using citizen guidance to map future land and water use. <i>Ecological Applications</i> 2004;14(2):325-341.                                   |
|                         | 3                        | 4 cites in April-May 2004         | Baker JP, et al. Alternative futures for the Willamette River Basin, Oregon. <i>Ecological Applications</i> 2004;14(2):313-324.                                                          |

| Field                   | ESI Hot Papers Threshold | No. of Cites in 2-Month Period    | Paper                                                                                                                                                                        |
|-------------------------|--------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment/<br>Ecology | 3                        | 4 cites in April-May 2004         | Schumaker NH, et al. Projecting wildlife responses to alternative future landscapes in Oregon's Willamette Basin. <i>Ecological Applications</i> 2004;14(2):381-400.         |
|                         | 3                        | 4 cites in April-May 2004         | Berger PA, Bolte JP. Evaluating the impact of policy options on agricultural landscapes: an alternative-futures approach. <i>Ecological Applications</i> 2004;14(2):342-354. |
|                         | 3                        | 4 cites in April-May 2004         | Dole D, Niemi E. Future water allocation and in-stream values in the Willamette River Basin: a basin-wide analysis. <i>Ecological Applications</i> 2004;14(2):355-367.       |
|                         | 3                        | 4 cites in April-May 2003         | Breitburg DL, et al. The pattern and influence of low dissolved oxygen in the Patuxent River, a seasonally hypoxic estuary. <i>Estuaries</i> 2003;26(2A):280-297.            |
|                         | 3                        | 4 cites in September-October 2003 | Leibowitz SG, Vining KC. Temporal connectivity in a prairie pothole complex. <i>Wetlands</i> 2003;23(1):13-25.                                                               |
|                         | 3                        | 4 cites in April-May 2002         | Wiens JA. Riverine landscapes: taking landscape ecology into the water. <i>Freshwater Biology</i> 2002;47(4):501-515.                                                        |
|                         | 3                        | 4 cites in April-May 2002         | Detwiler PM, et al. The benthic invertebrates of the Salton Sea: distribution and seasonal dynamics. <i>Hydrobiologia</i> 2002;473(1-3):139-160.                             |
|                         | 3                        | 3 cites in April-May 2004         | Van Sickle J, et al. Projecting the biological condition of streams under alternative scenarios of human land use. <i>Ecological Applications</i> 2004;14(2):368-380.        |
|                         | 3                        | 3 cites in April-May 2002         | Rogerson A, Hauer G. Naked amoebae (Protozoa) of the Salton Sea, California. <i>Hydrobiologia</i> 2002;473(1-3):161-177.                                                     |

| Field                   | ESI Hot Papers Threshold | No. of Cites in 2-Month Period     | Paper                                                                                                                                                                          |
|-------------------------|--------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment/<br>Ecology | 3                        | 3 cites in March-April 1999        | Karr JR. Defining and measuring river health. <i>Freshwater Biology</i> 1999;41(2):221-234.                                                                                    |
| Engineering             | 6                        | 6 cites in June-July 2002          | Douglas EM, et al. Trends in floods and low flows in the United States: impact of spatial correlation. <i>Journal of Hydrology</i> 2000;240(1-2):90-105.                       |
|                         | 4                        | 5 cites in October-November 2002   | Thomas-Smith TE, Blough NV. Photoproduction of hydrated electron from constituents of natural waters. <i>Environmental Science &amp; Technology</i> 2001;35(13):2721-2726.     |
|                         | 4                        | 5 cites in November-December 1997  | Mason RP, et al. Uptake, toxicity, and trophic transfer of mercury in a coastal diatom. <i>Environmental Science &amp; Technology</i> 1996;30(6):1835-1845.                    |
|                         | 2                        | 3 cites in September-October 2004  | Karr JR, Yoder CO. Biological assessment and criteria improve total maximum daily load decision making. <i>Journal of Environmental Engineering-ASCE</i> 2004;130(6):594-604.  |
| Plant & Animal Science  | 3                        | 10 cites in October-November 2001  | Glasgow HB, et al. A second species of ichthyotoxic <i>Pfiesteria</i> (Dinamoebales, Dinophyceae). <i>Phycologia</i> 2001;40(3):234-245.                                       |
|                         | 3                        | 4 cites in July-August 2000        | Zak DR, et al. Elevated atmospheric CO <sub>2</sub> , fine roots and the response of soil microorganisms: a review and hypothesis. <i>New Phytologist</i> 2000;147(1):201-222. |
| Mathematics             | 3                        | 3 cites in September 2005          | Drake JM. Allee effects and the risk of biological invasion. <i>Risk Analysis</i> 2004;24(4):795-802.                                                                          |
| Multidisciplinary       | 11                       | 31 cites in September-October 2001 | Stoddard JL, et al. Regional trends in aquatic recovery from acidification in North America and Europe. <i>Nature</i> 1999;401(6753):575-578.                                  |

| Field             | ESI Hot Papers Threshold | No. of Cites in 2-Month Period    | Paper                                                                                                                                      |
|-------------------|--------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Multidisciplinary | 5                        | 5 cites in September-October 2004 | Kolar CS, Lodge DM. Ecological predictions and risk assessment for alien fishes in North America. <i>Science</i> 2002;298(5596):1233-1236. |

### **Author Self-Citation**

Self-citations are journal article references to articles from that same author (i.e., the first author). Because higher author self-citation rates can inflate the number of citations, the author self-citation rate was calculated for the ecosystems papers. Of the 13,317 total cites, 834 are author self-cites—a 6.26% author self-citation rate. Garfield and Sher<sup>2</sup> found that authors working in research-based disciplines tend to cite themselves on the average of 20% of the time.

MacRoberts and MacRoberts<sup>3</sup> claim that approximately 10% to 30% of all the citations listed fall into the category of author self-citation. Therefore, the 6.26% self-cite rate for the ecosystems papers is well below the range for author self-citation.

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<sup>2</sup> Garfield E, Sher IH. New factors in the evaluation of scientific literature through citation indexing. *American Documentation* 1963;18(July):195-201.

<sup>3</sup> MacRoberts MH, MacRoberts BR. Problems of citation analysis: a critical review. *Journal of the American Society of Information Science* 1989;40(5):342-349.