



Bibliometric Analysis

for the U.S. Environmental Protection Agency/Office of Research and Development's Water Quality Research Program

This is a bibliometric analysis of the papers prepared by researchers of the U.S. Environmental Protection Agency (EPA) for the Water Quality Research Program. For this analysis, a total of 867 journal and 109 non-journal publications published from 1998 to 2008 were reviewed. The 867 journal publications were cited 8,697 times and the 109 non-journal publications were cited 279 times in the journals covered by Thomson's *Web of Science*¹ and Scopus². Of the 867 journal publications, 738 (85.1%) have been cited at least once in a journal. Of the 109 non-journal publications, 50 (45.9%) have been cited at least once in a journal.

Searches of Thomson Scientific's *Web of Science* and Scopus were conducted to obtain times cited data for the journal publications. 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. For this analysis, the *ESI* highly cited papers thresholds as well as the hot papers thresholds were used to assess the influence and impact of the Water Quality publications. *JCR* is a recognized authority for evaluating journals. It 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. The two key measures used in this analysis to assess the journals in which the EPA Water Quality papers were published are the Impact Factor and Immediacy Index. The Impact Factor 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 other journals in the same field. The Immediacy Index is a measure of how quickly the "average article" in a journal is cited. This index indicates how often articles published in a journal are cited within the same year and it is useful in comparing how quickly journals are cited.

The report includes a summary of the results of the bibliometric analysis, an assessment of the 867 Water Quality journal articles analyzed by *ESI* field (e.g., Chemistry, Environment/Ecology, Microbiology), an analysis of the journals in which the Water Quality papers were published, a table of the highly cited researchers in the Water Quality Research Program, information on the patents/patent applications that have resulted from the program, and an assessment of the 109 non-journal publications.

¹ Thomson Scientific's *Web of Science* provides access to current and retrospective multidisciplinary information from approximately 8,830 of the most prestigious, high impact research journals in the world. *Web of Science* also provides cited reference searching.

² Scopus is a large abstract and citation database of research literature and quality Web sources designed to support the literature research process. Scopus offers access to 15,000 titles from 4,000 different publishers, more than 12,850 academic journals (including coverage of 535 Open Access journals, 750 conference proceedings, and 600 trade publications), 27 million abstracts, 245 million references, 200 million scientific Web pages, and 13 million patent records.

SUMMARY OF RESULTS

- 1. More than one-seventh of the 867 Water Quality journal publications are highly cited papers.** 132 (15.2%) of the 867 Water Quality journal publications qualify as highly cited when using the *ESI* criteria for the top 10% of highly cited publications. This is 1.5 times the number expected. 9 (1.0%) of the Water Quality journal papers qualify as highly cited when using the *ESI* criteria for the top 1%, which is the number expected. 1 (0.1%) of the Water Quality publications qualifies as very highly cited when using the *ESI* criteria for the top 0.1% of highly cited publications, which is the number expected. 1 (0.1%) of the Water Quality journal papers qualifies as extremely highly cited when using the criteria for the top 0.01% threshold for the most highly cited papers, which is 10 times the number expected.
- 2. The Water Quality journal publications are more highly cited than the average paper.** Using the *ESI* average citation rates for papers published by field as the benchmark, in 9 of the 15 fields in which the 867 Water Quality journal papers were published, the ratio of actual to expected cites is greater than 1, indicating that the Water Quality journal publications are more highly cited than the average papers in those fields. For all 15 fields combined, the ratio of total number of cites to the total number of expected cites (8,697 to 6,826.3) is 1.3, indicating that the Water Quality journal papers are more highly cited than the average paper.
- 3. Nearly one-seventh of the Water Quality journal papers are published in high impact journals.** 120 of the 867 journal papers were published in the top 10% of journals ranked by *JCR* Impact Factor, representing 13.8% of the Water Quality journal publications. This number is 1.4 times higher than expected. 103 of the 867 papers appear in the top 10% of journals ranked by *JCR* Immediacy Index, representing 11.9% of EPA's Water Quality journal publications. This number is 1.2 times higher than expected.
- 4. There were 4 hot papers among the 867 Water Quality publications.** Using the hot paper thresholds established by *ESI* as a benchmark, 4 (0.5%) hot papers were identified in the analysis. This number is five times the number expected. Hot papers are publications that are highly cited shortly after they are published.
- 5. The authors of the Water Quality journal publications cite themselves much less than the average author.** 482 of the 8,697 total cites are author self-cites. This 5.5% author self-citation rate is well below the accepted range of 10-30% author self-citation rate.
- 6. 25 of the 1,716 authors of the Water Quality journal publications are included in *ISI Highly Cited.com*,** which is a database of the world's most influential researchers who have made key contributions to science and technology during the period from 1981 to 1999.
- 7. 1 patent was issued** to investigators from 1998 to 2008 for research that was conducted under EPA's Water Quality Research Program. The patent was not cited by any other patents.
- 8. The 109 non-journal publications were cited 279 times** in journals and there were no author self cites. When applying the *ESI* benchmark for journal publications to these 109 non-journal publications, 2 (1.8%) of the publications are highly cited when using the *ESI* criteria for the **top 10% of papers**. None of the non-journal publications meet the criteria for highly cited when using the *ESI* thresholds for the top 1%, 0.1%, or 0.01%.

Highly Cited Water Quality Publications

All of the journals covered by ESI are assigned a field, and to compensate for varying citation rates across scientific fields, different thresholds are applied to each field. Thresholds are set to select highly cited papers to be listed in *ESI*. Different thresholds are set for both field and year of publication. Setting different thresholds for each year allows comparable representation for older and younger papers for each field.

The 867 Water Quality journal publications reviewed for this analysis were published in journals that were assigned to 15 of the 22 *ESI* fields. The distribution of the papers among these 15 fields and the number of citations by field are presented in Table 1.

Table 1. Water Quality Journal Publications by *ESI* Fields

<i>ESI</i> Field	No. of Citations	No. of EPA WQ Papers	Average Cites/Paper
Agricultural Sciences	25	6	4.2
Biology & Biochemistry	137	16	8.6
Chemistry	265	29	9.1
Clinical Medicine	211	13	16.2
Computer Science	1	3	0.3
Engineering	98	21	4.7
Environment/Ecology	4,492	439	10.2
Geosciences	231	18	12.8
Microbiology	467	50	9.3
Molecular Biology & Genetics	0	1	0
Multidisciplinary	147	4	36.8
Pharmacology & Toxicology	162	7	23.1
Physics	12	1	12.0
Plant & Animal Science	2,432	254	9.6
Social Sciences	17	5	3.4
Total = 15	Total = 8,697	Total = 867	10.0

There are 132 (15.2% of the 867 journal papers analyzed) highly cited Water Quality journal publications in 11 of the 15 fields—Agricultural Sciences, Chemistry, Clinical Medicine, Engineering, Environment/Ecology, Geosciences, Microbiology, Multidisciplinary, Pharmacology & Toxicology, Plant & Animal Science, and Social Sciences—when using the *ESI* criteria for the **top 10% of papers**.

Table 2 shows the number of Water Quality journal publications in those 11 fields that meet the **top 10% threshold in ESI**.

Table 2. Number of Highly Cited Water Quality Journal Publications by Field (top 10%)

<i>ESI</i> Field	No. of Citations	No. of Papers	Average Cites/Paper	% of WQ Papers in Field
Agricultural Sciences	19	1	19.0	16.7%
Chemistry	92	3	30.7	10.3%
Clinical Medicine	98	1	98.0	7.7%
Engineering	45	5	9.0	23.8%
Environment/Ecology	2,082	51	40.8	11.6%
Geosciences	76	2	38.0	11.1%
Microbiology	253	7	36.1	14.3%
Multidisciplinary	147	4	36.8	100.0%
Pharmacology & Toxicology	134	2	67.0	28.6%
Plant & Animal Science	1,429	55	26.0	21.6%
Social Sciences	4	1	4.0	20.0%
TOTALS	Total = 4,379	Total = 132	33.2	15.3%

Nine (1.0%) of the journal publications analyzed qualify as highly cited when using the *ESI* criteria for the **top 1% of papers**. This is the number of papers expected to meet this threshold. These nine publications are in two of the *ESI* fields—Environment/Ecology and Plant & Animal Science (see Table 3). The citations for these papers are provided in Tables 4 and 5. One (0.1%) of the Water Quality journal publications meets the **top 0.1% ESI** threshold for highly cited papers, which is the number expected to meet this threshold. This publication is listed in Table 6. One (0.1%) of the Water Quality journal publications actually meets the **top 0.01%** threshold in *ESI*, which is 10 times the expected number of publications to meet this threshold for this program.

Table 3. Number of Highly Cited Water Quality Journal Publications by Field (top 1%)

<i>ESI</i> Field	No. of Citations	No. of Papers	Average Cites/Paper	% of WQ Papers in Field
Environment/Ecology	957	8	119.6	1.8%
Plant & Animal Science	8	1	8.0	0.4%
TOTALS	Total = 965	Total = 9	107.2	1.0%

Table 4. Highly Cited Water Quality Journal Publications in the Field of Environment/Ecology (top 1%)

No. of Cites	First Author	Paper
141	Paerl HW	Ecosystem responses to internal and watershed organic matter loading: consequences for hypoxia in the eutrophying Neuse river estuary, North Carolina, USA. <i>Marine Ecology-Progress Series</i> 1998;166:17-25.
616	Daughton CJ	Pharmaceuticals and personal care products in the environment: agents of subtle change? <i>Environmental Health Perspectives</i> 1999;107(Suppl 6):907-938.
103	Simpson JM	Microbial source tracking: state of the science. <i>Environmental Science & Technology</i> 2002;36(24):5279-5288.
40	Kemp WM	Eutrophication of Chesapeake Bay: historical trends and ecological interactions. <i>Marine Ecology-Progress Series</i> 2005;303:1-29.
25	Stoddard JL	Setting expectations for the ecological condition of streams: the concept of reference condition. <i>Ecological Applications</i> 2006;16(4):1267-1276.
8	Lackey RT	Science, scientists, and policy advocacy. <i>Conservation Biology</i> 2007;21(1):12-17.
10	Peterson SA	Mercury concentration in fish from streams and rivers throughout the western united states. <i>Environmental Science & Technology</i> 2007;41(1):58-65.
14	Danz NP	Integrated measures of anthropogenic stress in the US Great Lakes basin. <i>Environmental Management</i> 2007;39(5):631-647.

Table 5. Highly Cited Water Quality Journal Publications in the Field of Plant & Animal Science (top 1%)

No. of Cites	First Author	Paper
8	Litaker RW	Recognizing dinoflagellate species using ITS rDNA sequences. <i>Journal of Phycology</i> 2007;43(2):344-355.

Table 6. Very Highly Cited Water Quality Journal Publications (top 0.1%)

No. of Cites	First Author	Paper
616	Daughton CJ	Pharmaceuticals and personal care products in the environment: agents of subtle change? <i>Environmental Health Perspectives</i> 1999;107(Suppl 6):907-938.

Table 7. Extremely Highly Cited Water Quality Journal Publications (top 0.01%)

No. of Cites	First Author	Paper
616	Daughton CJ	Pharmaceuticals and personal care products in the environment: agents of subtle change? <i>Environmental Health Perspectives</i> 1999;107(Suppl 6):907-938.

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 9 of the 15 fields in which the EPA Water Quality journal papers were published, the ratio of actual to expected cites is greater than 1, indicating that the Water Quality journal publications are more highly cited than the average papers in those fields (see Table 8). For all 15 fields combined, the ratio of total number of cites to the total number of expected cites (8,697 to 6,826.3) is 1.3, indicating that the Water Quality journal publications are more highly cited than the average paper.

Table 8. Ratio of Actual Cites to Expected Cites for Water Quality Journal Publications by Field

<i>ESI</i> Field	Total Cites	Expected Cite Rate	Ratio
Agricultural Sciences	25	34.6	0.7
Biology & Biochemistry	137	276.9	0.5
Chemistry	265	253.4	>1.0
Clinical Medicine	211	224.3	0.9
Computer Science	1	2.5	0.4
Engineering	98	70.0	1.4
Environment/Ecology	4,492	3,719.7	1.2
Geosciences	231	139.6	1.6
Microbiology	467	449.6	>1.0
Molecular Biology & Genetics	0	35.6	0
Multidisciplinary	147	21.6	6.8
Pharmacology & Toxicology	162	85.5	1.9
Physics	12	8.1	1.5
Plant & Animal Science	2,432	1,487.0	1.6
Social Sciences	17	17.9	<1.0
TOTAL	8,697	6,826.3	1.3

JCR Benchmarks

Impact Factor. The *JCR* 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 9 indicates the number of Water Quality journal publications published in the top 10% of journals, based on the *JCR* Impact Factor. One hundred twenty (120) of 867 journal papers were published in the top 10% of journals, representing 13.8% of EPA’s Water Quality journal publications. This indicates that about one-seventh of the Water Quality journal publications are published in the highest quality journals as determined by the *JCR* Impact Factor, which is 1.4 times higher than the expected percentage.

Table 9. Water Quality Journal Publications in Top 10% of Journals by JCR Impact Factor

EPA WQ Papers in that Journal	Journal	Impact Factor (IF)	JCR IF Rank
1	Nature	28.751	10
2	Lancet	28.638	11
1	Gastroenterology	11.673	81
2	Proceedings of the National Academy of Sciences of the United States of America	9.598	114
1	Journal of the American Chemical Society	7.885	156
1	Current Opinion in Microbiology	7.654	167
3	TRAC-Trends in Analytical Chemistry	5.827	261
11	Environmental Health Perspectives	5.636	279
5	Analytical Chemistry	5.287	309
1	Progress in Nuclear Magnetic Resonance Spectroscopy	5.205	324
1	Molecular Ecology	5.169	326
4	Ecology	4.822	370
3	Critical Reviews in Environmental Science and Technology	4.615	414
1	American Naturalist	4.543	423
19	Environmental Science & Technology	4.363	465
4	Frontiers in Ecology and the Environment	4.269	493
1	Proceedings of the Royal Society of London Series B-Biological Sciences	4.112	535
4	Bioscience	4.083	543
10	Applied and Environmental Microbiology	4.004	571
1	Journal of Organic Chemistry	3.959	586
2	Conservation Biology	3.934	587
4	Toxicological Sciences	3.814	622
1	Geochimica et Cosmochimica Acta	3.665	685
1	Journal of the American Society for Mass Spectrometry	3.664	686
6	Journal of Chromatography A	3.641	695
2	Electrophoresis	3.609	710
8	Ecological Applications	3.571	721

EPA WQ Papers in that Journal	Journal	Impact Factor (IF)	JCR IF Rank
9	Water Research	3.427	777
1	Talanta	3.374	800
9	Limnology and Oceanography	3.277	836
1	Chemical Geology	3.231	859
Total = 120			

Immediacy Index. The JCR 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 10 indicates the number of Water Quality journal publications published in the top 10% of journals, based on the JCR Immediacy Index. One hundred three (103) of the 867 papers appear in the top 10% of journals, representing 11.9% of the Water Quality journal papers. This indicates that nearly one-eighth of the Water Quality journal papers are published in the highest quality journals as determined by the JCR Immediacy Index, which is 1.2 times higher than the expected percentage.

Table 10. Water Quality Journal Publications in Top 10% of Journals by JCR Immediacy Index

EPA WQ Papers in that Journal	Journal	Immediacy Index (II)	JCR II Rank
2	Lancet	8.636	6
1	Nature	7.385	9
1	Gastroenterology	2.595	74
2	Proceedings of the National Academy of Sciences of the United States of America	1.724	136
1	Fisheries Management and Ecology	1.586	162
1	Journal of the American Chemical Society	1.397	212
1	Pedobiologia	1.290	245
1	Progress in Nuclear Magnetic Resonance Spectroscopy	1.250	253
2	Botanica Marina	1.231	268
1	Current Opinion in Microbiology	1.121	310

Bibliometric Analysis of the Water Quality Research Program Publications

EPA WQ Papers in that Journal	Journal	Immediacy Index (II)	JCR II Rank
2	Environmental Modelling & Software	0.976	410
11	Environmental Health Perspectives	0.958	425
1	Proceedings of the Royal Society of London Series B-Biological Sciences	0.955	428
1	Agriculture Ecosystems & Environment	0.915	463
1	American Naturalist	0.914	465
5	Analytical Chemistry	0.911	471
4	Frontiers in Ecology and the Environment	0.907	476
1	Journal of Organic Chemistry	0.886	498
3	TRAC-Trends in Analytical Chemistry	0.863	524
5	Continental Shelf Research	0.780	605
1	Ambio	0.777	610
1	Journal of Statistical Software	0.767	623
5	Journal of Environmental Monitoring	0.763	625
4	Bioscience	0.761	626
2	Conservation Biology	0.745	651
1	Molecular Ecology	0.732	663
3	Critical Reviews in Environmental Science and Technology	0.727	670
1	Geochimica et Cosmochimica Acta	0.719	685
1	Journal of the American Society for Mass Spectrometry	0.700	713
1	Environmental Pollution	0.699	716
1	Vadose Zone Journal	0.689	730
1	Diversity and Distributions	0.663	783
2	FEMS Microbiology Ecology	0.643	819
4	Environmental Research	0.632	845
19	Environmental Science & Technology	0.615	876
2	Hydrological Sciences Journal-Journal des Sciences Hydrologiques	0.613	881
6	Journal of Geophysical Research	0.613	881

EPA WQ Papers in that Journal	Journal	Immediacy Index (II)	JCR II Rank
1	Talanta	0.611	886
Total = 103			

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.

Using the hot paper thresholds established by *ESI* as a benchmark, 4 hot papers, representing 0.5% of the Water Quality papers, were identified in three fields—Engineering, Environment/Ecology, and Plant & Animal Science. The number of Water Quality hot papers is 5 times higher than expected. The hot papers are listed in Table 11.

Table 11. Hot Papers Identified Using *ESI* Thresholds

Field	<i>ESI</i> Hot Papers Threshold	No. of Cites in 2-Month Period	Paper
Engineering	5	6 cites in August-September 2005	Cardoza LA, et al. Separations coupled with NMR detection. <i>TRAC-Trends in Analytical Chemistry</i> 2003;22(10):766-775.
Environment/Ecology	7	11 cites in March-April 2008	Danz NP, et al. Integrated measures of anthropogenic stress in the US Great Lakes basin. <i>Environmental Management</i> 2007;39(5):631-647.
Plant & Animal Science	4	5 cites in October 2001	Burkholder JM, et al. Overview and present status of the toxic <i>Pfiesteria</i> complex (Dinophyceae). <i>Phycologia</i> 2001;40(3):186-214.
	4	10 cites in October 2001	Glasgow HB, et al. A second species of ichthotoxic <i>Pfiesteria</i> (Dinamoebales, Dinophyceae). <i>Phycologia</i> 2001;40(3):234-245.

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 Water Quality papers. Of the 8,697 total cites of the 867 journal publications, 482 are author self-cites—a 5.5% author self-citation rate. Garfield and Sher³ found that authors working in research-based disciplines tend to cite themselves on the average of 20% of the time. MacRoberts and MacRoberts⁴ claim that approximately 10-30% of all the citations listed fall into the category of author self-citation. Kovacic and Misak⁵ reported a 20% author self-citation rate for medical literature. Therefore, the 5.5% self-cite rate for the Water Quality papers is well below the range for author self-citation.

Highly Cited Researchers

A search of Thomson’s *ISIHighlyCited.com* revealed that 25 (1.5%) of the 1,716 authors of the Water Quality papers are highly cited researchers. *ISIHighlyCited.com* is a database of the world’s most influential researchers who have made key contributions to science and technology during the period from 1981 to 1999. The highly cited researchers identified during this analysis of the Water Quality publications are presented in Table 12.

Table 12. Highly Cited Researchers Authoring Water Quality Journal Publications

Highly Cited Researcher	Affiliation	ESI Field
Anderson, Donald M.	Woods Hole Oceanographic Institution	Plant & Animal Science
Ankley, Gerald	U.S. Environmental Protection Agency	Environment/Ecology
Birnbaum, Linda S.	U.S. Environmental Protection Agency	Pharmacology
Burger, Joanna	Rutgers, The State University of New Jersey	Environment/Ecology
Campana, Steven E.	Bedford Institute of Oceanography	Plant & Animal Science
Caron, David A.	University of Southern California	Plant & Animal Science
Cole, Jonathan J.	Institute of Ecosystem Studies	Plant & Animal Science
DiToro, Dominic M.	University of Delaware	Environment/Ecology
Eisenreich, Steven J.	Rutgers, The State University of New Jersey	Engineering Environment/Ecology
Giger, Walter	Eawag, the Swiss Federal Institute of Aquatic Science and Technology	Environment/Ecology

³ Garfield E, Sher IH. New factors in the evaluation of scientific literature through citation indexing. *American Documentation* 1963;18(July):195-210.

⁴ MacRoberts MH, MacRoberts BR. Problems of citation analysis: a critical review. *Journal of the American Society of Information Science* 1989;40(5):342-349.

⁵ Kovacic N, Misak A. Author self-citation in medical literature. *Canadian Medical Association Journal* 2004;170(13):1929-1930.

Highly Cited Researcher	Affiliation	ESI Field
Gray Jr., Leon Earl	U.S. Environmental Protection Agency	Pharmacology
Groffman, Peter M.	Cary Institute of Ecosystem Studies	Environment/Ecology
Gschwend, Philip M.	Massachusetts Institute of Technology	Engineering Environment/Ecology
Guillette, Louis J.	University of Florida	Environment/Ecology
Hansen, Dave J.	Formerly of the U.S. Environmental Protection Agency	Environment/Ecology
Hopkins, Theodore L.	Kansas State University	Plant & Animal Science
Jones, Kevin C.	Lancaster University	Engineering Environment/Ecology
Landrum, Peter F.	U.S. Department of Commerce	Environment/Ecology
Morse, John W.	Texas A&M University	Geosciences
O'Neill, Robert V.	Oak Ridge National Laboratory	Environment/Ecology
Paerl, Hans W.	University of North Carolina	Plant & Animal Science
Peterson, Richard E.	University of Wisconsin	Pharmacology
Prospero, Joseph M.	University of Miami	Geosciences
Thurman, E. Michael	U.S. Geological Survey	Engineering Environment/Ecology
Stoecker, Diane K.	University of Maryland Center for Environmental Science	Plant & Animal Science
Total = 25		

Patents

There was one patent issued to investigators from 1998 to 2008 for research that was conducted under EPA's Water Quality Research Program. The patent was not cited by any other patents (see Table 13).

Table 13. Patents from the Water Quality Research Program (1998-2008)

Patent/Patent Application No.	Inventor(s)	Title	Patent Date	Patents that Referenced This Patent
U.S. Patent No. 6,655,402	Fan, C-Y	System and method for vacuum flushing sewer solids	12/2/03	Referenced by 0 patents

Non-Journal Publications (Reports, Books, and Book Chapters)

One hundred eleven reports, book chapters, and other non-journal publications produced by the Water Quality Research Program from 1999 to 2008 were included in the analysis. The 109 non-journal publications were cited 279 times in journals and there were no author self cites. When applying the *ESI* benchmark for journal publications to these 109 non-journal publications, 2 (1.8%) EPA publications (i.e., The Stressor Identification Technical Guidance Document, EPA/822/B00/025; and Microbial Source Tracking Guide Document, EPA/600/R-05/064) were highly cited when using the *ESI* criteria for the **top 10% of papers**. None of the non-journal publications met the criteria for highly cited when using the *ESI* thresholds for the top 1%, 0.1%, or 0.01%.

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