Water Resources Development, Vol. 15, No. 4, 387–427, 1999

International River Basins of the World

AARON T. WOLF*[1], JEFFREY A. NATHARIUS[2], JEFFREY J. DANIELSON[3], BRIAN S. WARD[4] & JAN K. PENDER[5]

[1]*Oregon State University;* [2]*Alabama Office of Water Resources;* [3]*Raytheon, EROS Data Center;* [4]*Oregon State University;* [5]*Legacy, Inc.*

ABSTRACT *It is becoming acknowledged that water is likely to be the most pressing environmental concern of the next century. Difficulties in river basin management are only exacerbated when the resource crosses international boundaries. One critical aid in the assessment of international waters has been the* Register of International Rivers—*a compendium which listed 214 international waterways that cover 47% of the earth's continental land surface. The Register, though, was last updated in 1978 by the now defunct United Nations Department of Economic and Social Affairs. The purpose of this paper is to update the Register in order to reflect the quantum changes that have taken place over the last 22 years, both in global geopolitics and in map coverage and technology. By accessing digital elevation models at spatial resolutions of 30 arc seconds, corroborating at a unified global map coverage of at least 1:1 000 000, and superimposing the results over complete coverage of current political boundaries, we are able to provide a new register which lists 261 international rivers, covering 45.3% of the land surface of the earth (excluding Antarctica). This paper lists all international rivers with their watershed areas, the nations which share each watershed, their respective territorial percentages, and notes on changes in or disputes over international boundaries since 1978.*

Introduction

Water has been named as likely to be the most pressing environmental concern of the next century (American Academy of Arts and Sciences, 1994). As global populations and economies continue to grow exponentially, and as environmental change threatens both the quantity and quality of the world's fresh water resources, attention has increasingly focused on the state and management of those resources.

Waters which cross political boundaries have additional complexities brought on by strains in riparian relations and institutional limitations. Recent studies, particularly in the field of environmental security, have focused on the conflict potential of these international waters. Some stress the dangers of violence over international waters (see, for example, Westing, 1986; Gleick, 1993; Homer-Dixon, 1994; Remans, 1995; Samson and Charrier, 1997), while others argue more strongly for the possibilities and historic evidence of cooperation between

**Address for correspondence: Dept. of Geosciences, Oregon State University, 104 Wilkinson Hall, Corvallis, OR 97331–5506, USA. Fax: +1-541-737-1200; email: wolfa@geo.orst.edu*

0790-0627 Print/1360-0648 On-line/99/040387–41

co-riparians (see Libiszewski, 1995; Salman & de Chazournes, 1998; Wolf, 1998). Regardless of hydropolitical interpretations, interest in international waterways and the literature of comparative analysis is increasing rapidly.[1] Kliot (1995) and, later with colleagues (Kliot *et al.*, 1997), compares five international basins and evaluates their respective management institutions; Wolf (1997) offers hydropolitical lessons learned from 14 detailed case studies and 146 water treaties; Gleick (1998) includes a chapter on international waters in his biennial report on the world's water; and Elhance (1999) describes the transboundary waters of the Third World.

One critical aid in the assessment of international waters has been the *Register of International Rivers* (United Nations, 1978)—a compendium which lists 214 international waterways, covering 47% of the earth's continental land surface, compiled by the now defunct Department of Economic and Social Affairs of the United Nations. The Register lists all international rivers by continent, along with their watershed areas, the nations that share each watershed, and their respective territorial percentages. Subsequent sections list countries that share watersheds, rivers and lakes that form boundaries, and related treaties. Most literature that, even peripherally, addresses the issue of international waters refers to the Register, and uses its data for analysis. The Register, however, was last updated in 1978. The information it reported has become dated by the many geopolitical changes over the last 22 years, and by changes in map coverage and technology.

The purpose of this paper is to update the Register, taking advantage of global digital information that has become available, the detailed watershed analysis performed at the US Geological Survey EROS Data Center, the extensive holdings of map libraries at the University of Alabama and Oregon State University, and a thorough compilation of boundary changes since the Register was last updated. Our work is the result of four years of study and the close collaboration between the facilities and expertise at the EROS Data Center and Oregon State University,[2] and is a component of the Transboundary Freshwater Dispute Database. The Database is housed in the Department of Geosciences at Oregon State University, and includes a digital compilation of 150 international treaties and 39 US compacts, hard-copy files of negotiating notes and background material on 14 case studies of conflict resolution, news files on cases of acute water-related conflict, assessments of indigenous/traditional methods of water-conflict resolution, and an annotated bibliography on the state of the art of international water-dispute resolution.[3]

Methodology

The idea for the first Register of International Rivers originated with a 1958 United Nations panel of experts, whose report was entitled, 'Integrated River Basin Development', a revised edition of which included a world map showing 166 international river basins (United Nations, 1978). The next and last revision was the 1978 Register, which identified 214 international basins. Despite being a desk study using only a polar planimeter solely on maps available at the UN Map Library, it was quite a sophisticated document for its time.

Nevertheless, a great deal has changed since 1978, both in map coverage and technology—notably the addition to the cartographic arsenal of digital and remote sensing data—and in the political boundaries which rivers cross. Our

update, by necessity, took tracks along both lines: updating the river basins, and updating the political boundaries.

Updating the River Basins

Roughly following the 1978 Register, we define a 'river basin' as the area which contributes hydrologically (including both surface- and groundwater) to a first-order stream, which, in turn, is defined by its outlet to the ocean or to a terminal (closed) lake or inland sea. Thus, 'river basin' is synonymous with what is referred to in the USA as a 'watershed' and in the UK as a 'catchment'.[4] We define such a basin as 'international' if any perennial[5] tributary crosses the political boundaries of two or more nations.[6]

By defining these basins by their ultimate outlet, we often group systems together that are commonly thought of as separate, even when they are treated as distinct politically. This situation occurs whenever the confluence of even major river systems takes place upstream of the outlet, such as on the Tigris–Euphrates and on the Ganges–Brahmaputra–Meghna systems. The Meuse, commonly treated by Europeans (and by the 1978 Register) as separate and distinct, is hydrologically part of the Rhine system, and is listed as such here.

This methodology brings up an important point: a register such as this is useful only inasmuch as one recognizes its limitations. Its strength lies in its identification of the location and extent of international basins. The number of such basins is less important. As noted above, many major tributary systems are treated for all management intents and purposes as separate. In the most detailed critique of the 1978 Register, Biswas (1993) points out, for example, that India and Bangladesh have identified more than 140 common water systems, all of which are grouped here together under three hydrologic units: the Fenney, the Ganges–Brahmaputra–Meghna, and the Karnafauli. Biswas also points to the limited treatment of groundwater in the 1978 Register. This issue is of lesser concern, since the vast majority of groundwater used for human purposes is in relatively shallow, unconfined aquifers, where the surface divide coincides with the groundwater divide, and which would thus be captured in our listing (Newson, 1992; Postel, 1999; personal communication, 1999). Nevertheless, discussions of the management of international basins often revolve around issues not reported here, such as river flows and their contribution by each country, historic uses and future demand, and the social, ecological and economic needs of each nation.

As with any cartographic project, we needed a base map to guarantee a minimum scale for consistency across the globe. Our close collaboration with the US Geological Survey's EROS Data Center (EDC) gave us access to their ongoing advances in hydrologic applications of global digital elevation models (DEMs) for this purpose. EDC has recently released a global DEM, called GTOPO30. At a resolution of 30 arc-seconds, GTOPO30 was developed to meet the needs of the geospatial data user community for regional and continental-scale topographic data (Gesch, 1994; Gesch *et al.*, 1999).

A new geographic database developed at the EDC from GTOPO30 is HYDRO1K. It is designed to provide global coverage of topographically derived data sets at a nominal resolution of one kilometer. HYDRO1K provides a consistent base-line of hydrologic derivatives that are needed in many environmental, climatic and water-resource studies.[7] The core data layer is the hydrolog-

ically correct DEM, which is obtained directly from the GTOPO30 data set. In order for the DEM to correctly model water movement across the land surface, the elevation data were processed to remove spurious anomalies that interfere with hydrologically correct flow.[8] It is essential to develop a hydrologically correct DEM to ensure that derived drainage basins and synthetic streamlines closely represent real-world hydrology.

HYDRO1k provides a base map and minimum unified scale of at least 1:1 000 000 for this register. Nevertheless, these data sets are computer constructs and mathematical interpretations. As such, we found them to be extremely useful both as a starting point and as a basis for minimum standards, but also found that comparison with alternative sources, both digital and hardcopy, was necessary. Fortunately, other good spatial data sets exist, such as Environmental Systems Research Institute's (ESRI) Digital Chart of the World, and the 'Watersheds of the World' files included on the GlobalArc data set, developed by the Center for Remote Sensing and Spatial Analysis of Rutgers University, along with the US Army Corps of Engineers Construction Engineering Research Laboratory.[9] The US Geological Survey's EROS Data Center has also developed a DEM for the conterminous US at a scale of 1:24 000. This DEM features a spatial resolution of 30 m that covers a smaller area than GTOPO30 and allows for greater detail.

Finally, recognizing the limitations of digital data, particularly where topographic relief is low, we relied quite heavily on the extensive hardcopy holdings of the University of Alabama map library and the expertise of Tom Kallsen, the library's director. Between an array of air photos, topographic map sheets, and the detailed coverages of various nations, we were regularly able to delineate basins at scales of 1:100 000, often at 1:40 000, and occasionally at 1:20 000. The basins which were digitized for this register, then, include our best judgement of the data available at this time, and finally deviated from HYDRO1k about 20% of the time.[10]

Updating the Political Boundaries

Major geopolitical shifts have taken place since 1978, most of which are manifested in the boundaries between nations. These changes had the effect mostly of internationalizing national basins, notably the break-up of the Soviet Union and balkanization of the Balkans. To a much lesser degree, though, the opposite was true: two basins which were international in 1978 have become national, due to the unification of Yemen and of Germany.

The best digital set of international boundaries is those included in the Digital Chart of the World. However, given the political volatility of the times, this data set was not entirely up to date as we went to press, nor does it document where boundary ambiguities exist between nations. Since these ambiguities within international basins can have serious hydropolitical implications, we felt it important to document them, and to include them in area calculations wherever possible. As noted in the table footnotes, we relied heavily on the *CIA World Factbook* (1998), the *Columbia Gazetteer of the World* (Cohen, 1998) and, especially, on the work of the International Boundary Resource Unit of Durham University (1999; personal communications, 1999).

Summary of Findings

The 1978 Register listed 214 international basins, covering 47% of the world's land surface (excluding Antarctica).[11] Our update lists 261 international basins (see Figures 1–6 and Table 4, International river basins), covering 45.3%, broken down by continent as given in Table 1.

The net addition of 47 international basins as compared with the 1978 Register comes about for three reasons: (1) national basins were internationalized through political changes, such as the break-up of the Soviet Union and the Balkan states; (2) we were able to 'find' several new international basins, because of better access to both digital and hardcopy maps; and (3) the 1978 Register did not include many island nations. Because of these factors, we added a total of 51 new basins:

- *Africa:* Lotagipi Swamp, Mbe, Oued Bon Naima, and Umba;
- *Asia:* An Nahr Al Kabir, Astara Chay, Bangau, Beilun, Fenney, Har Us Nur, Kowl-E-Namaksar, Nahr El Kebir, Oral (Ural), Pandaruan, Pu-Lun-To, Sembakung, Song Vam Co Dong, and Wadi Al Izziyah;
- *Europe:* Barta, Castletown, Daugava, Dnieper, Dniester, Don, Elancik, Flurry, Gauja, Kogilnik, Krka, Kura-Araks, Lielupe, Mius, Narva, Parnu, Prohladnaja, Salaca, Samur, Sarata, Seine, Sulak, Terek, Venta, and Volga;
- *North America:* Alesek, Chilkat, Chiriqui, Firth, Taku, and Whiting;
- *South America:* Aviles, and Comau.

In contrast, four basins listed in the 1978 Register are no longer international, two due to the unification of Yemen (Tiban) and of Germany (Weser), and two due to our more consistent definition of 'international basins'. The four 'lost' basins are:

- *Asia:* Tiban;
- *Europe:* Meuse, Muga, and Weser.

Because our methods allow for a more careful delineation of basins than the 1978 Register, in some cases we were able to update the riparian nations which share international basins, along with updating the total number. These riparian relations are generally minor—often the contribution to the basin is more topographical than hydrological—and occasionally surprising. Such additions include Egypt on the Jordan, Saudi Arabia on the Tigris–Euphrates, and Libya on the Lake Chad system. While Botswana is listed as riparian to the Orange both in the 1978 Register and here, according to Conley & van Niekerk (1998) it is unclear whether Botswana territory actually contributes any water to the

Table 1. Number of international river basins

Continent	1999 Update	1978 Register
Africa	60	57
Asia	53	40
Europe	71	48
North America	39	33
South America	38	36
Total	261	214

Table 2. Percentage of area within international basins[12,13]

Continent	1999 Update (%)	1978 Register (%)
Africa	62	60
Asia	39	65
Europe	54	50
North America	35	40
South America	60	60
Total (excl. Antarctica)	45.3	47

Table 3. Percentage of nations within international basins

Percentage within international basins	Number of countries
90–100	39
80–90	11
70–80	14
60–70	11
50–60	17
40–50	10
30–40	10
20–30	13
10–20	9
0.01–10	11

system and, as such, its political status as an Orange riparian remains to be clarified.

Focusing on the number of international basins masks another important dimension to the issue of international waters: the flow generated within these basins. Shiklomanov (1993) lists the flows of 25 of the world's largest rivers, which total 19 200 km^3, or a little less than half of the world's total runoff. Of the total flow in these 25 rivers, 16 700 km^3, or 87%, is generated within the 20 of these which are international.

In addition to the number of international basins and their riparian nations, a striking aspect of international waters is the percentage of the land surface of the earth which is included within their basins: 45.3%, excluding Antarctica (see Figure 7 and Table 5, Percentage of a country's area within international basins). By continent, this ranges from 62% of Africa to 35% of North America, as given in Table 2.

Even more striking is a breakdown of each nation's land surface, as provided in detail as Table 5. A total of 145 nations include territory within international basins. Twenty-one nations lie in their entirety within international basins; including these, a total of 33 countries have greater than 95% of their territory within these basins. These nations are not limited to smaller countries, such as Liechtenstein and Andorra, but include such sizeable countries as Hungary, Bangladesh, Byelarus and Zambia. All told, percentages of nations within international basins are as given in Table 3.

A final way to visualize the dilemmas posed by international water resources

is to look at the number of countries which share each international basin (see Figure 8 and Table 6, Number of countries that share a basin). Nineteen basins are shared by five or more riparian countries: one basin—the Danube—has 17 riparian nations; five basins—the Congo, Niger, Nile, Rhine and Zambezi—are shared by between nine and 11 countries; and the remaining 13 basins—the Amazon, Ganges–Brahmaputra–Meghna, Lake Chad, Tarim, Aral Sea, Jordan, Kura–Araks, Mekong, Tigris–Euphrates, Volga La Plata, Neman, and Vistula (Wista)—have between five and eight riparian countries.

Conclusions

When water resources cross international boundaries, the challenges to integrated watershed management are compounded, the obstacles to political cooperation exacerbated. While interest in international river basins is growing along with global populations and economies, much in the way of basic data collection on these systems as a class remains to be done. We recognize too that this register is limited; that political boundaries will continue to shift; and that the technology of watershed analysis will continue to improve. The resolution of digital mapping data will continue to increase and the algorithms used to analyse them will become more robust. In the meantime, it is to be hoped that this updated register of the world's 261 international river basins, covering 45.3% of the land surface of the earth, will contribute to continued analysis of these basins and perhaps, through greater understanding, tendencies towards cross-boundary cooperation might even be strengthened.

Acknowledgements

This work was performed under the auspices of the Committee for International Collaboration of the International Water Resources Association, chaired by Asit K. Biswas, with funding from the US Institute of Peace and the Nippon Foundation, and is a component of the Transboundary Freshwater Dispute Database Project, directed by Aaron T. Wolf. The authors are especially indebted to Prof. Biswas and to these agencies, as well as to those which helped fund different aspects of the Database, including the US Agency for International Development, Pacific Northwest National Laboratory, the Alabama Water Resources Institute, the University of Alabama, and Oregon State University. Jeffrey Danielson's work was performed under US Geological Survey contract No. 1434-CR-97-CN-40274, for which we are grateful. We owe special thanks to Tom Kallsen, director of the map library at the University of Alabama, who helped us find everything from satellite photos to topographic map sheets of the most obscure reaches of the world, and to Ashbindu Singh, of the United Nations Environment Programme, without whose close collaboration this project would not have been possible. We are also grateful to Shira Yoffe, of Oregon State University, for her research skills and political insight; to Peter H. Gleick, of the Pacific Institute, for his close reading and advice; and to Martin Pratt and the staff of the International Boundaries Research Unit at Durham University, for their expedited assistance with boundary ambiguities. Finally, thanks to A. Jon Kimerling, of Oregon State University, for his cartographic expertise; to Sandra Postel, of the Global Water Policy Project, for a particularly helpful discussion about the world's irrigation; and to Jeff Albert, of Yale University, who provided the extra detail necessary to do justice to the Jordan River system.

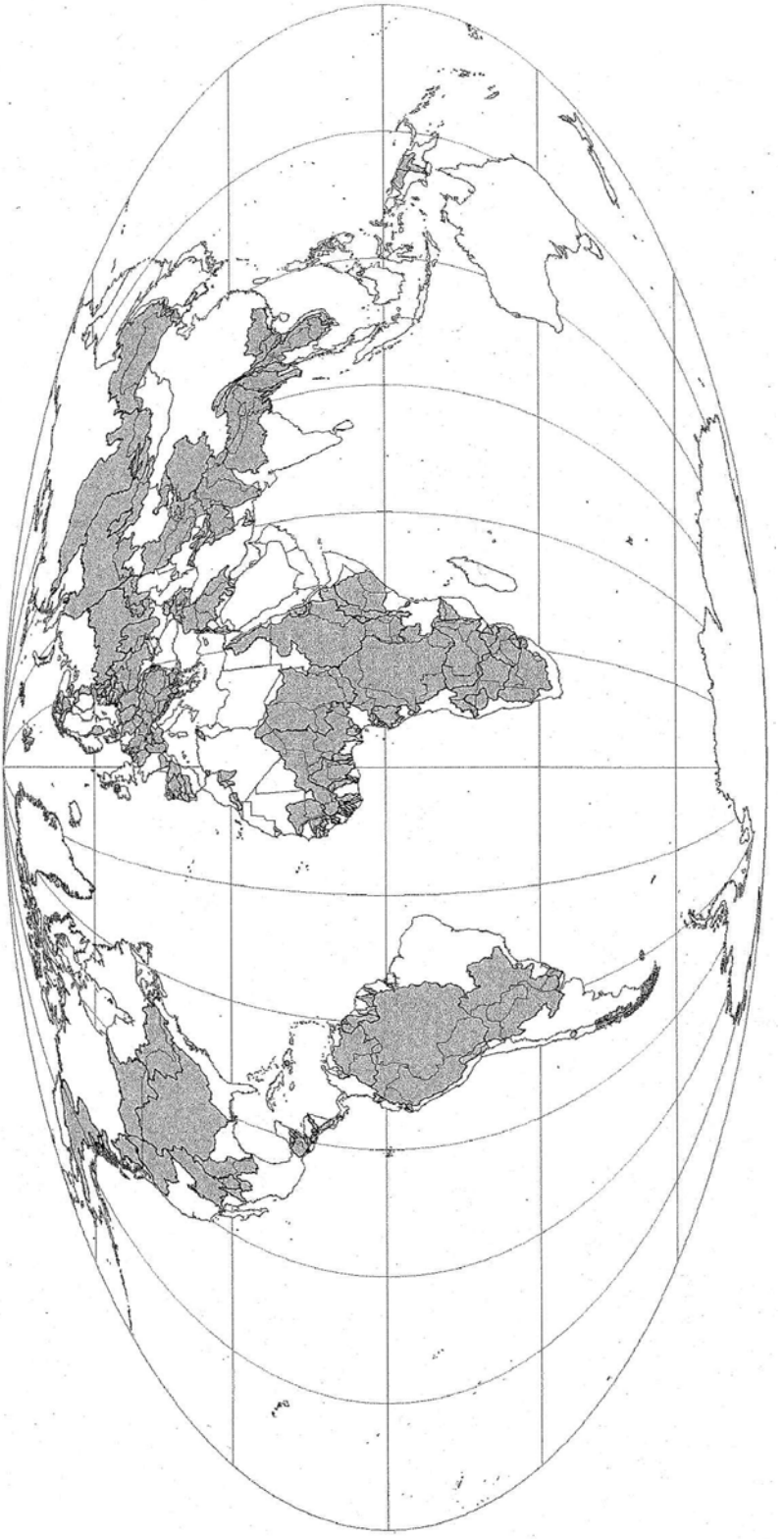

Figure 1. International basins.

Figure 2. Africa.

Table 4. International river basins

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Africa				
Akpa Yafi[2]	4 900	Cameroon	3 100	62.26
		Nigeria	1 900	37.74
Atul[3]	10 400	Mauritania	9 300	89.71
		Western Sahara	1 100	10.29
Awash	155 300	Ethiopia	144 000	92.71
		Djibouti	11 100	7.14
		Somalia	240	0.15
Baraka	66 600	Eritrea	41 800	62.84
		Sudan	24 700	37.16
Benito	12 600	Equatorial Guinea	11 100	88.57
		Gabon	1 400	11.16

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Bia	11 900	Ghana	6 900	57.83
		Ivory Coast	4 800	40.01
Buzi	27 900	Mozambique	24 700	88.81
		Zimbabwe	3 100	11.18
Cavally	30 600	Ivory Coast	16 600	54.31
		Liberia	12 700	41.48
		Guinea	1 300	4.21
Cestos	15 000	Liberia	12 700	84.54
		Ivory Coast	2 300	15.32
		Guinea	20	0.14
Chiloango	11 700	Congo, Democratic Republic of the (Kinshasa)	7 700	65.91
		Angola	3 700	32.11
		Congo, Republic of the (Brazzaville)	230	1.97
Congo/Zaire[4 5]	3 699 100	Congo, Democratic Republic of the (Kinshasa)	2 307 800	62.39
		Central African Republic	402 000	10.87
		Angola	291 500	7.88
		Congo, Republic of the (Brazzaville)	248 400	6.72
		Zambia	176 600	4.77
		Tanzania, United Republic of	166 800	4.51
		Cameroon	85 300	2.31
		Burundi	14 300	0.39
		Rwanda	4 500	0.12
		Gabon	460	0.01
		Malawi	90	0.00
Corubal	24 100	Guinea	17 600	72.89
		Guinea-Bissau	6 500	26.82
Cross	52 800	Nigeria	40 300	76.39
		Cameroon	12 400	23.56
Daoura	34 600	Morocco	18 300	52.82
		Algeria	16 300	47.18
Dra	54 900	Morocco	40 600	73.97
		Algeria	14 300	26.03
Etosha–Cuvelai	167 600	Namibia	114 300	68.24
		Angola	53 200	31.76
Gambia	70 000	Senegal	50 800	72.55
		Guinea	13 300	18.95
		Gambia, The	5 900	8.41
Gash	31 700	Eritrea	17 700	55.75
		Sudan	8 500	26.85
		Ethiopia	5 500	17.41
Geba	12 800	Guinea-Bissau	8 700	67.71
		Senegal	4 100	31.86
		Guinea	50	0.41
Great Scarcies	11 400	Guinea	9 000	79.30
		Sierra Leone	2 300	20.53
Gulr	79 100	Algeria	61 400	77.60
		Morocco	17 700	22.40
Incomati[6]	46 200	South Africa	29 200	63.19
		Mozambique	14 300	30.97
		Swaziland	2 700	5.84
Juba–Shibeli	805 100	Ethiopia	367 700	45.67
		Somalia	221 500	27.52
		Kenya	215 900	26.81

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Komoe	78 500	Ivory Coast	58 500	74.52
		Burkina Faso	17 100	21.74
		Ghana	2 300	2.93
		Mali	630	0.81
Kunene	110 300	Angola	95 500	86.57
		Namibia	14 800	13.43
Lake Chad[7]	2 394 200	Chad	1 082 000	45.19
		Niger	675 700	28.22
		Central African Republic	218 900	9.14
		Nigeria	180 800	7.55
		Algeria	90 000	3.76
		Sudan	83 100	3.47
		Cameroon	46 900	1.96
		Chad, claimed by Libya	12 300	0.51
		Libya	4 600	0.19
Lake Natron	55 600	Tanzania, United Republic of	37 300	67.06
		Kenya	18 300	32.94
Lake Turkana[8]	207 600	Ethiopia	113 600	54.75
		Kenya	89 900	43.28
		Uganda	2 600	1.23
		Sudan	1 500	0.70
		Sudan, administered by Kenya	70	0.03
Limpopo	415 500	South Africa	184 100	44.31
		Mozambique	87 300	21.01
		Botswana	81 500	19.61
		Zimbabwe	62 600	15.06
Little Scarcies	19 300	Sierra Leone	13 300	68.86
		Guinea	6 000	31.11
Loffa	11 400	Liberia	10 000	87.49
		Guinea	1 400	12.43
Lotagipi Swamp[8]	38 900	Kenya	20 500	52.52
		Sudan	10 000	25.58
		Sudan, administered by Kenya	3 300	8.44
		Ethiopia	3 200	8.30
		Uganda	2 000	5.16
Mana-Morro	6 900	Liberia	5 800	83.67
		Sierra Leone	1 100	16.31
Maputo[6]	31 300	South Africa	18 600	59.43
		Swaziland	11 000	35.02
		Mozambique	1 700	5.55
Mbe	7 000	Gabon	6 500	92.65
		Equatorial Guinea	500	7.18
Medjerda	23 100	Tunisia	15 600	67.28
		Algeria	7 600	32.72
Moa	22 600	Sierra Leone	10 900	48.16
		Guinea	8 700	38.58
		Liberia	3 000	13.27
Mono	23 400	Togo	22 400	95.43
		Benin	1 100	4.57
Niger	2 117 700	Nigeria	563 000	26.59
		Mali	541 600	25.58
		Niger	499 200	23.57
		Algeria	161 500	7.63
		Guinea	96 300	4.55
		Cameroon	88 200	4.17

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
		Burkina Faso	83 100	3.93
		Benin	45 200	2.14
		Ivory Coast	22 800	1.08
		Chad	16 600	0.78
		Sierra Leone	30	0.00
Nile[9]	3 038 100	Sudan	1 931 300	63.57
		Ethiopia	356 900	11.75
		Egypt	273 100	8.99
		Uganda	238 900	7.86
		Tanzania, United Republic of	120 300	3.96
		Kenya	50 900	1.68
		Congo, Democratic Republic of the (Kinshasa)	21 700	0.71
		Rwanda	20 800	0.69
		Burundi	13 000	0.43
		Egypt, administered by Sudan	4 400	0.14
		Eritrea	3 500	0.12
		Sudan, administered by Egypt	2 000	0.07
Ntem	35 000	Cameroon	20 400	58.26
		Gabon	9 400	26.99
		Equatorial Guinea	5 200	14.75
Nyanga	12 400	Gabon	11 500	93.30
		Congo, Republic of the (Brazzaville)	830	6.70
Ogooue	223 400	Gabon	189 800	84.93
		Congo, Republic of the (Brazzaville)	26 600	11.91
		Cameroon	5 100	2.30
		Equatorial Guinea	1 900	0.87
Okavango	708 600	Botswana	359 000	50.67
		Namibia	176 800	24.95
		Angola	150 100	21.18
		Zimbabwe	22 700	3.20
Orange[6 10 11]	947 700	South Africa	565 600	59.68
		Namibia	240 600	25.39
		Botswana	121 600	12.84
		Lesotho	19 900	2.09
Oued Bon Naima	510	Morocco	350	68.87
		Algeria	160	31.13
Oueme	59 500	Benin	49 500	83.24
		Nigeria	9 500	16.04
		Togo	430	0.72
Ruvuma[12]	152 200	Mozambique	99 500	65.39
		Tanzania, United Republic of	52 200	34.30
		Malawi	470	0.31
Sabi	116 100	Zimbabwe	85 700	73.88
		Mozambique	30 300	26.12
Sassandra	68 200	Ivory Coast	59 700	87.51
		Guinea	8 500	12.49
Senegal	437 000	Mauritania	219 100	50.14
		Mali	151 300	34.61
		Senegal	35 700	8.16
		Guinea	31 000	7.08
St John	15 600	Liberia	13 000	83.55
		Guinea	2 600	16.44
		Ivory Coast	2	0.01

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
St Paul	21 200	Liberia	11 800	55.47
		Guinea	9 500	44.52
Tafna	9 500	Algeria	7 000	74.16
		Morocco	2 400	25.84
Tano	14 300	Ghana	13 900	97.07
		Ivory Coast	420	2.93
Umba	8 200	Tanzania, United Republic of	6 900	83.83
		Kenya	1 300	16.17
Umbeluzi[6]	5 400	Swaziland	3 100	57.17
		Mozambique	2 300	41.63
		South Africa	70	1.19
Utamboni	7 700	Gabon	4 600	59.81
		Equatorial Guinea	3 000	39.31
Volta	414 000	Burkina Faso	174 200	42.07
		Ghana	166 500	40.21
		Togo	25 900	6.25
		Mali	18 900	4.57
		Benin	15 000	3.62
		Ivory Coast	13 400	3.24
Zambezi[13 14]	1 388 200	Zambia	577 900	41.63
		Angola	255 500	18.40
		Zimbabwe	215 800	15.55
		Mozambique	163 800	11.80
		Malawi	110 700	7.97
		Tanzania, United Republic of	27 300	1.97
		Botswana	19 100	1.38
		Namibia	17 100	1.23
		Congo, Democratic Republic of the (Kinshasa)	1 000	0.07
Total area	18 682 410			
Asia:				
Amur[15]	1 884 000	Russia	1 005 300	53.36
		China	849 900	45.11
		Mongolia	28 700	1.52
		Korea, Democratic People's Republic of	120	0.01
An Nahr Al Kabir	1 200	Syria	730	60.60
		Lebanon	470	39.40
Aral Sea[16 17]	1 319 900	Kazakhstan	923 500	69.97
		Uzbekistan	236 700	17.93
		Kyrgyzstan	138 000	10.46
		Tajikistan	13 000	0.99
		Turkmenistan	1 500	0.12
		China	40	0.00
Asi/Orontes	18 200	Syria	10 100	55.63
		Turkey	6 600	36.13
		Lebanon	1 500	8.21
Astara Chay[18]	560	Iran	450	81.33
		Azerbaijan	100	18.67
Atrak[17]	34 200	Iran	23 500	68.64
		Turkmenistan	10 700	31.36
Bangau[19]	430	Malaysia	230	53.04
		Brunei	200	46.26

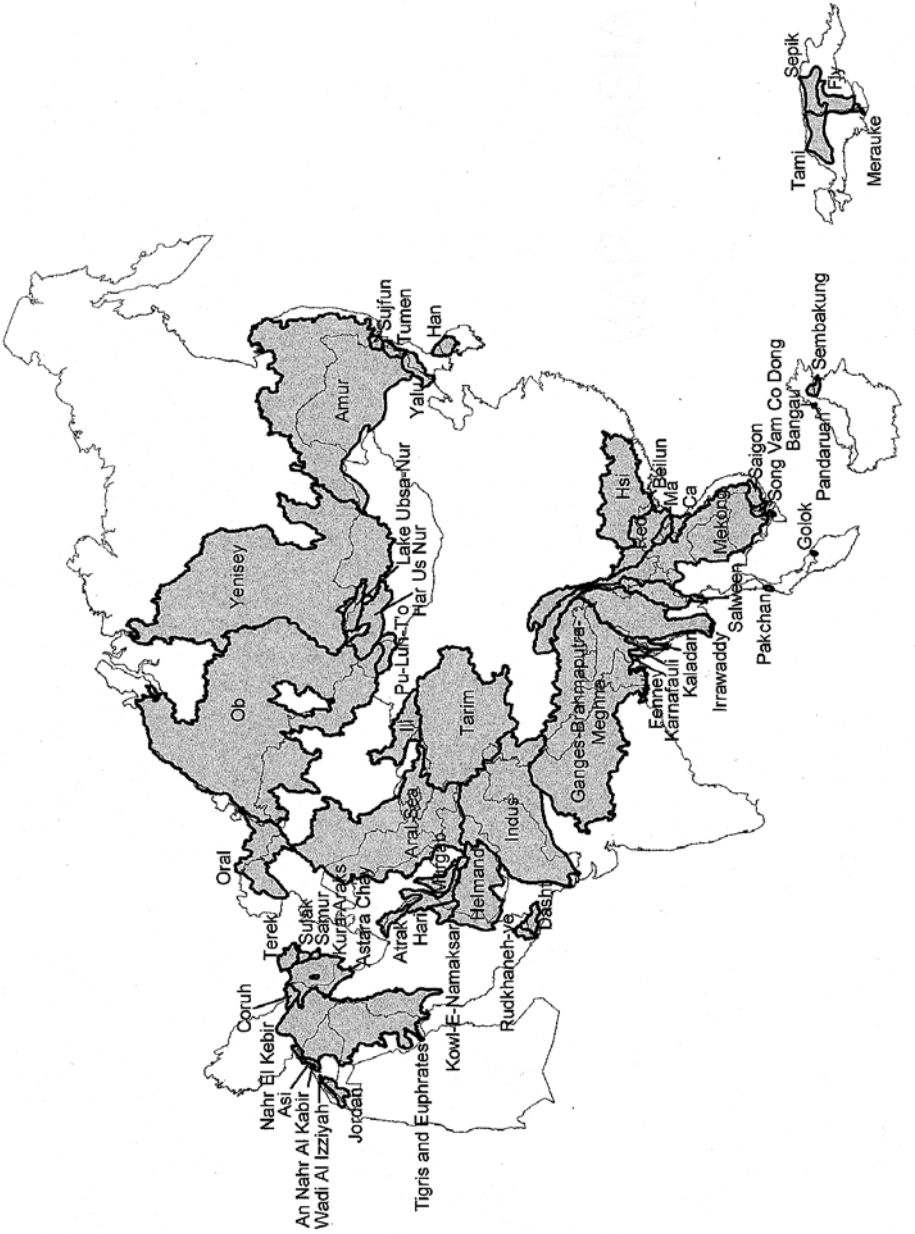

Figure 3. Asia.

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Beilun[20]	960	China	700	73.61
		Vietnam	250	26.39
Ca/Song-Koi	33 800	Vietnam	19 600	57.83
		Laos, People's Democratic Republic of	14 300	42.12
Coruh[18]	20 700	Turkey	18 800	90.93
		Georgia	1 900	9.07
Dasht	31 800	Pakistan	25 100	78.87
		Iran	6 700	21.13
Fenney	2 800	India	1 800	65.88
		Bangladesh	950	34.12
Fly	64 600	Papua New Guinea	60 400	93.42
		Indonesia	4 300	6.58
Ganges–Brahmaputra–Meghna[21 22]	1 675 700	India	974 300	58.14
		China	320 400	19.12
		Nepal	147 300	8.79
		Bangladesh	123 400	7.36
		India, claimed by China	67 100	4.00
		Bhutan	39 900	2.38
		Myanmar	2 100	0.13
		Indian control, claimed by China	1 200	0.07
Golok	1 800	Thailand	1 100	58.09
		Malaysia	780	41.91
Han[23 24]	35 300	Korea, Republic of	25 100	71.18
		Korea, Democratic People's Republic of	10 100	28.63
Har US Nur	197 800	Mongolia	195 400	98.77
		Russia	2 300	1.17
		China	120	0.06
Hari/Harirud	92 600	Afghanistan	41 100	44.33
		Iran	35 400	38.17
		Turkmenistan	16 200	17.50
Helmand	345 200	Afghanistan	283 800	82.23
		Iran	48 300	13.99
		Pakistan	13 100	3.78
Hsi/Bei Jiang[20]	361 500	China	351 700	97.28
		Vietnam	9 800	2.72
Ill/Kunes He	161 200	Kazakhstan	97 200	60.28
		China	55 300	34.31
		Kyrgyzstan	8 700	5.40
Indus[25 26]	1 086 000	Pakistan	609 100	56.09
		India	282 200	25.98
		China	111 000	10.22
		Afghanistan	72 500	6.68
		Chinese control, claimed by India	9 600	0.89
		Indian control, claimed by China	1 600	0.15
Irrawaddy	404 100	Myanmar	368 400	91.15
		China	18 600	4.60
		India	14 200	3.52
		India, claimed by China	1 200	0.29
Jordan[27 28 29] (Dead Sea)	42 800	Jordan	20 600	48.44
		Israel	9 100	21.35
		Syria	4 900	11.54
		West Bank	3 200	7.40
		Egypt	2 700	6.39

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
		Golan Heights	1 500	3.54
		Lebanon	570	1.34
Kaladan	30 500	Myanmar	22 700	74.39
		India	7 400	24.24
Kamafauli	15 000	Bangladesh	11 200	74.78
		India	3 700	24.98
Kowl-E-Namaksar	40 100	Iran	26 600	66.50
		Afghanistan	13 400	33.50
Lake Ubsa-Nur	74 800	Mongolia	52 700	70.48
		Russia	22 100	29.52
Ma	24 600	Vietnam	16 800	68.20
		Laos, People's Democratic Republic of	7 800	31.80
Mekong[30 31]	780 300	Laos, People's Democratic Republic of	198 400	25.42
		Thailand	194 100	24.87
		China	168 400	21.58
		Cambodia	157 000	20.11
		Vietnam	35 000	4.49
		Myanmar	27 500	3.53
Merauke	6 500	Indonesia	4 000	61.35
		Papua New Guinea	2 500	38.65
Murgab	60 900	Afghanistan	36 400	59.78
		Turkmenistan	24 500	40.22
Nahr El Kebir	2 000	Syria	1 700	81.77
		Turkey	370	18.18
Ob[18]	2 734 800	Russia	2 109 600	77.14
		Kazakhstan	573 400	20.97
		China	50 400	1.84
Oral (Ural)[18]	260 400	Kazakhstan	142 400	54.69
		Russia	118 000	45.31
Pakchan	2 700	Thailand	1 600	59.64
		Myanmar	1 100	38.86
Pandaruan[19]	810	Brunei	410	50.25
		Malaysia	400	49.75
Pu-Lun-To	88 400	China	76 300	86.27
		Mongolia	12 100	13.65
		Russia	40	0.04
		Kazakhstan	40	0.04
Red/Song Hong[20]	164 600	China	84 400	51.28
		Vietnam	79 000	47.98
		Laos, People's Democratic Republic of	1 200	0.75
Rudkhaneh-ye /BahuKalat	20 600	Iran	20 600	99.68
		Pakistan	50	0.25
Saigon /Song Nha Be	29 400	Vietnam	25 000	98.93
		Cambodia	230	0.92
Salween	244 100	China	128 000	52.43
		Myanmar	107 000	43.85
		Thailand	9 100	3.71
Sembakung[19]	15 200	Indonesia	8 200	53.53
		Malaysia	7 100	46.46
Sepik	73 400	Papua New Guinea	71 100	96.94
		Indonesia	2 200	3.06

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Song Vam Co Dong	15 300	Vietnam	7 700	50.22
		Cambodia	7 600	49.72
Sujfun	16 800	China	9 800	58.39
		Russia	7 000	41.61
Tami	89 900	Indonesia	87 600	97.54
		Papua New Guinea	2 200	2.46
Tarim[16 17 25 26]	950 200	China	901 700	94.90
		Kyrgyzstan	23 900	2.51
		Chinese control, claimed by India	21 500	2.27
		Pakistan	1 900	0.20
		Tajikistan	1 000	0.11
		Kazakhstan	110	0.01
		Afghanistan	20	0.00
Tigris–Euphrates[32] /Shatt al Arab	793 600	Iraq	318 900	40.19
		Turkey	197 100	24.84
		Iran	155 600	19.60
		Syria	119 400	15.04
		Jordan	2 200	0.28
		Saudi Arabia	240	0.03
Tumen	33 000	China	22 600	68.56
		Korea, Democratic People's Republic of	10 200	30.90
		Russia	180	0.54
Wadi Al Izziyah	580	Lebanon	380	65.91
		Israel	190	33.74
Yalu	63 000	Korea, Democratic People's Republic of	31 700	50.38
		China	31 200	49.59
Yenisey/Jenisej	2 497 600	Russia	2 169 800	86.88
		Mongolia	327 600	13.12
Total area	16 930 840			
Europe:				
Bann	5 600	United Kingdom	5 400	97.15
		Ireland	160	2.85
Barta	1 800	Latvia	1 100	60.86
		Lithuania	670	37.73
Bidasoa	530	Spain	470	89.52
		France	60	10.48
Castletown	380	United Kingdom	290	76.12
		Ireland	90	23.88
Danube[33 34 35 36 37]	779 500	Romania	228 800	29.35
		Hungary	92 800	11.90
		Yugoslavia (Serbia and Montenegro)	81 000	10.40
		Austria	80 300	10.30
		Germany	52 100	6.68
		Bulgaria	47 300	6.06
		Slovakia	46 800	6.01
		Bosnia and Herzegovina	37 800	4.85
		Croatia	34 000	4.37
		Ukraine	25 600	3.29
		Czech Republic	21 300	2.74
		Slovenia	16 400	2.10
		Moldova	12 100	1.55

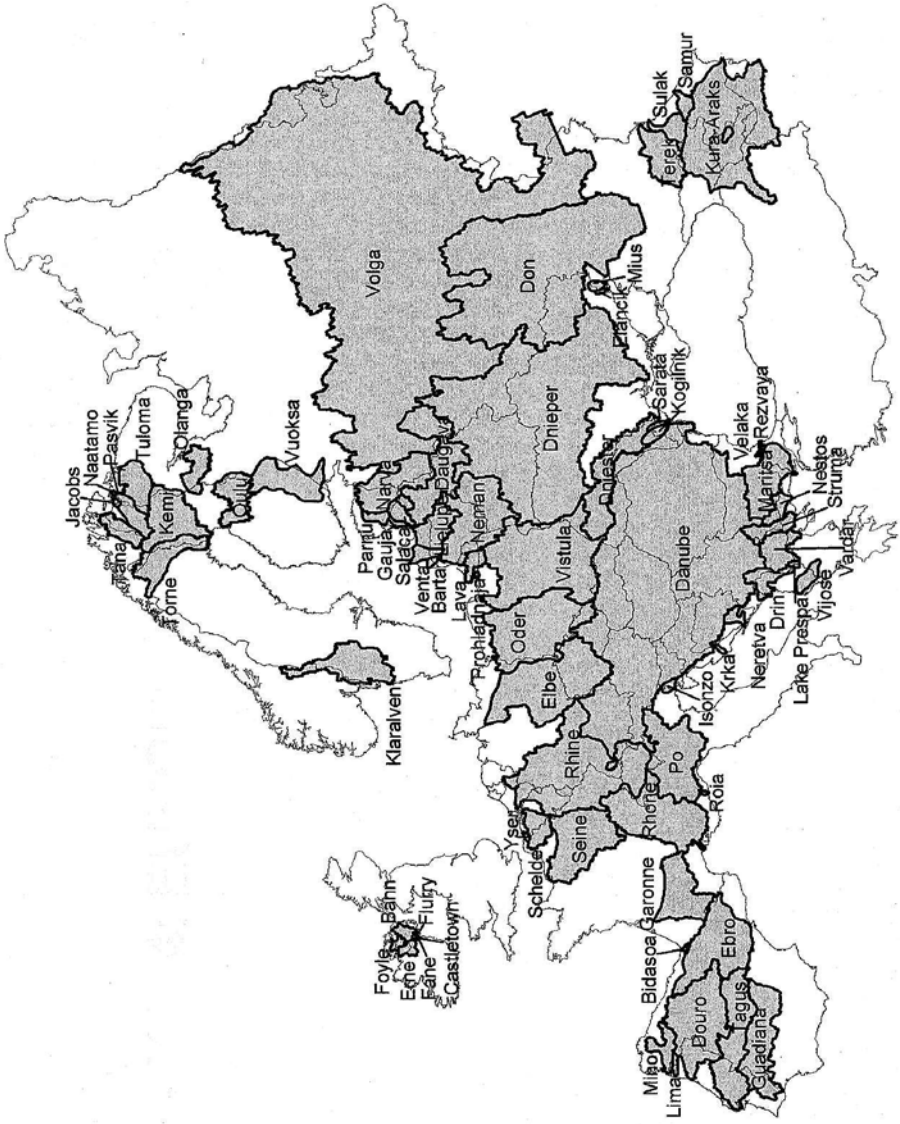

Figure 4. Europe.

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
		Switzerland	1 700	0.21
		Italy	740	0.09
		Poland	550	0.07
		Albania	140	0.02
Daugava[38 39]	79 600	Byelarus	28 300	35.55
		Russia	27 100	34.02
		Latvia	23 200	29.14
		Lithuania	1 000	1.29
Dnieper	495 500	Ukraine	296 800	59.90
		Byelarus	116 700	23.55
		Russia	81 900	16.53
Dniester[37]	72 200	Ukraine	52 900	73.37
		Moldova	19 200	26.60
		Poland	20	0.03
Don	425 600	Russia	371 200	87.21
		Ukraine	54 400	12.78
Douro/Duero	96 200	Spain	77 900	81.01
		Portugal	18 300	18.99
Drin[36]	18 500	Yugoslavia (Serbia and Montenegro)	9 000	48.55
		Albania	7 200	39.23
		Macedonia	2 300	12.21
Ebro	85 100	Spain	84 200	98.96
		France	470	0.55
		Andorra	410	0.49
Elancik	1 400	Russia	940	68.19
		Ukraine	440	31.81
Elbe	139 500	Germany	88 600	63.54
		Czech Republic	49 600	35.60
		Austria	1 100	0.77
		Poland	140	0.10
Erne	3 500	Ireland	2 000	56.39
		United Kingdom	1 500	43.59
Fane	200	Ireland	190	96.46
		United Kingdom	10	3.54
Flurry	60	United Kingdom	50	73.77
		Ireland	20	26.23
Foyle	2 900	United Kingdom	2 000	67.23
		Ireland	960	32.77
Garonne	55 800	France	55 100	98.80
		Spain	620	1.11
		Andorra	40	0.07
Gauja	8 100	Latvia	6 900	85.87
		Estonia	1 100	14.13
Guadiana	65 700	Spain	55 300	84.13
		Portugal	10 400	15.87
Isonzo	3 000	Slovenia	1 800	59.55
		Italy	1 200	40.05
Jacobs	440	Norway	300	68.55
		Russia	140	31.45
Kemi	55 800	Finland	52 700	94.38
		Russia	3 100	5.56
		Norway	10	0.01
Klaralven	51 500	Sweden	43 400	84.15
		Norway	8 200	15.84

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Kogilink[37]	6 100	Moldova	3 600	57.85
		Ukraine	2 600	42.15
Krka	1 300	Croatia	1 100	89.84
		Bosnia and Herzegovina	110	8.96
Kura–Araks[18]	193 800	Azerbaijan	59 800	30.86
		Georgia	34 500	17.78
		Iran	33 500	17.28
		Armenia	29 900	15.42
		Turkey	28 500	14.70
		Russia	110	0.06
Lake Prespa	1 400	Macedonia	610	42.76
		Albania	420	29.54
		Greece	390	27.71
Lava–Pregel	8 800	Russia	6 400	72.54
		Poland	2 200	25.36
Lielupe	27 200	Lithuania	19 000	70.03
		Latvia	8 100	29.71
Lima	2 300	Spain	1 200	50.88
		Portugal	1 100	49.04
Maritsa	52 800	Bulgaria	35 000	66.38
		Turkey	14 300	27.16
		Greece	3 400	6.46
Mino/Minho	16 600	Spain	16 000	96.42
		Portugal	590	3.56
Mius	7 100	Ukraine	4 800	67.83
		Russia	2 300	31.53
Naatamo	710	Norway	530	74.08
		Finland	170	24.37
Narva[40 41]	58 200	Russia	29 300	50.26
		Estonia	16 800	28.84
		Latvia	12 200	20.89
		Byelarus	10	0.02
Neman[38 39]	93 000	Byelarus	41 500	44.64
		Lithuania	39 700	42.73
		Poland	6 600	7.10
		Russia	4 800	5.15
		Latvia	330	0.35
Neretva	10 800	Bosnia and Herzegovina	9 900	91.99
		Croatia	500	4.68
		Yugoslavia (Serbia and Montenegro)	360	3.32
Nestos	12 000	Greece	8 500	70.88
		Bulgaria	3 500	28.75
Oder/Odra	116 500	Poland	103 000	88.43
		Czech Republic	7 400	6.35
		Germany	6 100	5.22
		Slovakia	10	0.00
Olanga	18 800	Russia	16 800	89.38
		Finland	2 000	10.62
Oulu	24 800	Finland	23 600	95.25
		Russia	1 200	4.75
Parnu	5 900	Estonia	5 900	99.78
		Latvia	10	0.22
Pasvik	16 900	Finland	16 200	95.71
		Norway	700	4.13
		Russia	30	0.15

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Po	87 100	Italy	82 600	94.83
		Switzerland	4 100	4.71
		France	380	0.44
		Austria	30	0.03
Prohladnaja	620	Russia	480	77.06
		Poland	140	22.94
Rezvaya	670	Turkey	500	74.66
		Bulgaria	170	25.34
Rhine[42]	195 000	Germany	106 800	54.74
		Switzerland	34 700	17.78
		France	25 400	13.00
		Netherlands	11 900	6.11
		Belgium	11 200	5.74
		Luxembourg	2 500	1.29
		Austria	2 300	1.19
		Liechtenstein	160	0.08
		Italy	140	0.07
Rhone	84 700	France	84 000	99.08
		Switzerland	730	0.86
		Italy	50	0.06
Roia	660	France	450	67.78
		Italy	200	30.09
Salaca	4 000	Latvia	2 700	66.27
		Estonia	1 400	33.71
Samur[18]	6 800	Russia	6 300	92.74
		Azerbaijan	430	6.38
Sarata[37]	1 800	Ukraine	1 100	63.78
		Moldova	640	36.16
Schelde	17 500	France	8 900	51.11
		Belgium	8 400	48.22
		Netherlands	80	0.46
Seine	86 100	France	84 200	97.78
		Belgium	1 800	2.13
		Luxembourg	80	0.09
Struma[36]	16 800	Bulgaria	8 400	49.84
		Greece	6 000	35.45
		Macedonia	1 800	10.63
		Yugoslavia (Serbia and Montenegro)	690	4.08
Sulak[18]	14 800	Russia	13 800	92.02
		Georgia	1 000	6.70
		Azerbaijan	20	0.11
Tagus/Tejo	69 900	Spain	55 500	79.29
		Portugal	14 500	20.71
Tana	16 100	Norway	9 400	58.34
		Finland	6 700	41.60
Terek[18]	43 800	Russia	41 800	95.43
		Georgia	2 000	4.57
Torne/Tornealven	37 300	Sweden	25 300	67.86
		Finland	10 600	28.50
		Norway	1 400	3.64
Tuloma	26 100	Russia	23 400	89.91
		Finland	2 600	10.04
Vardar[36]	33 200	Macedonia	20 400	61.29
		Yugoslavia (Serbia and Montenegro)	8 900	26.79
		Greece	4 000	11.92

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Velaka	1 100	Bulgaria	780	72.47
		Turkey	300	27.53
Venta	7 700	Latvia	5 400	70.20
		Lithuania	2 200	28.33
Vijose	9 000	Albania	6 500	72.00
		Greece	2 500	27.60
Vistula/Wista	193 900	Poland	169 200	87.28
		Ukraine	13 000	6.70
		Byelarus	9 700	5.03
		Slovakia	1 900	0.99
		Czech Republic	10	0.00
Volga[18]	1 553 900	Russia	1 849 800	99.74
		Kazakhstan	2 400	0.15
		Byelarus	1 600	0.10
Vuoksa	62 700	Finland	54 100	86.26
		Russia	8 600	13.74
Yser	920	France	500	53.63
		Belgium	430	46.37
Total area	5 695 590			
North America				
Alesek	8 300	Canada	7 200	87.27
		United States	1 000	12.42
Artibonite	8 800	Haiti	6 600	74.37
		Dominican Republic	2 300	25.55
Belize[43]	11 500	Belize	7 000	60.86
		Guatemala	4 500	39.14
Candelaria	12 800	Mexico	11 300	88.24
		Guatemala	1 500	11.74
Changuinola	3 200	Panama	2 900	91.29
		Costa Rica	270	8.34
Chilkat	4 100	United States	2 400	58.01
		Canada	1 700	41.99
Chiriqui	1 700	Panama	1 500	86.17
		Costa Rica	240	13.83
Choluteca	7 400	Honduras	7 200	97.68
		Nicaragua	170	2.32
Coatan Achute	2 000	Mexico	1 700	86.27
		Guatemala	270	13.73
Coco/Segovia	25 400	Nicaragua	17 900	70.52
		Honduras	7 500	29.48
Colorado	651 100	United States	640 700	98.40
		Mexico	10 400	1.60
Columbia	668 400	United States	566 500	84.75
		Canada	101 900	15.24
Firth	6 000	Canada	3 800	63.60
		United States	2 200	36.40
Fraser	239 700	Canada	239 100	99.74
		United States	620	0.26
Goascoran	2 800	Honduras	1 500	53.36
		El Salvador	1 300	46.64
Grijalva[43]	126 800	Mexico	78 900	62.26
		Guatemala	47 800	37.73

Figure 5. North America.

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Hondo[43]	14 600	Mexico	8 900	61.14
		Guatemala	4 200	28.50
Lempa	18 000	El Salvador	9 500	52.45
		Honduras	5 800	32.01
		Guatemala	2 800	15.54
Massacre	800	Haiti	500	62.03
		Dominican Republic	290	35.96
Mississippi	3 226 300	United States	3 176 500	98.46
		Canada	49 800	1.54
Motaqua	16 100	Guatemala	14 600	90.85
		Honduras	1 500	9.11
Negro	2 500	Honduras	1 300	52.34
		Nicaragua	1 200	47.66

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Nelson–Saskatchewan	1 109 400	Canada	952 000	85.81
		United States	157 400	14.19
Paz	2 200	Guatemala	1 400	64.47
		El Salvador	770	35.53
Pedernales	360	Haiti	240	67.32
		Dominican Republic	120	32.68
Rio Grande	548 800	United States	325 100	59.25
		Mexico	223 600	40.75
San Juan	42 200	Nicaragua	30 400	72.02
		Costa Rica	11 800	27.93
Sarstun[43]	2 100	Guatemala	1 800	87.63
		Belize	260	12.37
Sixaola	2 900	Costa Rica	2 500	88.68
		Panama	290	9.96
St Croix	4 600	United States	3 300	70.86
		Canada	1 400	29.14
St John	55 100	Canada	35 600	64.60
		United States	19 400	35.25
St Lawrence	1 055 200	Canada	559 000	52.98
		United States	496 100	47.02
Stikine	50 900	Canada	50 000	98.32
		United States	850	1.68
Suchiate	1 600	Guatemala	1 100	68.79
		Mexico	490	31.21
Taku	18 000	Canada	17 600	98.20
		United States	320	1.80
Tijuana	4 400	Mexico	3 100	70.57
		United States	1 300	29.43
Whiting	2 600	Canada	2 000	80.06
		United States	510	19.94
Yaqui	74 700	Mexico	70 100	93.87
		United States	4 600	6.13
Yukon	829 700	United States	496 400	59.83
		Canada	333 300	40.17
Total area	8 863 060			
South America				
Amacuro	4 000	Venezuela	3 400	85.15
		Guyana	600	14.61
Amazon[44]	5 866 100	Brazil	3 672 600	62.61
		Peru	974 600	16.61
		Bolivia	684 400	11.67
		Colombia	353 000	6.02
		Ecuador	137 800	2.35
		Venezuela	38 500	0.66
		Guyana	5 200	0.09
		Suriname	20	0.00
Aviles	260	Argentina	230	88.72
		Chile	30	11.28
Aysen	13 300	Chile	11 300	85.06
		Argentina	2 000	14.94

Figure 6. South America.

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Baker	30 800	Chile	21 000	68.29
		Argentina	9 800	31.69
Barima	8 700	Guyana	7 700	87.86
		Venezuela	1 000	11.79
Cancoso/Lauca	32 100	Bolivia	26 200	81.57
		Chile	5 900	18.43

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Catatumbo	26 100	Colombia	16 700	64.02
		Venezuela	9 400	35.97
Chico	1 700	Argentina	1 000	59.70
/Carmen Silva		Chile	680	40.30
Chira[44]	16 700	Peru	9 200	55.33
		Ecuador	7 500	44.67
Chuy	180	Brazil	110	64.57
		Uruguay	60	32.57
Comau	920	Chile	840	90.91
		Argentina	80	9.09
Courantyne[45]	67 700	Suriname	36 900	54.46
/Corantijn		Guyana	30 800	45.45
Cullen	590	Chile	490	83.00
		Argentina	100	17.00
Essequibo[46]	154 300	Guyana	115 400	74.79
		Venezuela	38 800	25.12
		Brazil	140	0.09
Gallegos–Chico	11 600	Argentina	7 000	60.15
		Chile	4 600	39.85
Jurado	820	Colombia	580	70.52
		Panama	240	28.75
La Plata[47 48]	2 966 900	Brazil	1 366 700	46.08
		Argentina	817 900	27.57
		Paraguay	400 100	13.49
		Bolivia	270 200	9.11
		Uruguay	111 600	3.76
Lagoon Mirim	54 900	Uruguay	31 200	56.75
		Brazil	23 700	43.18
Lake Fagnano[49]	3 800	Argentina	2 800	74.95
		Chile	950	25.05
Lake Titicaca–Poopo	116 500	Bolivia	61 700	52.99
		Peru	53 600	45.96
		Chile	1 200	1.05
Maroni[50]	65 900	Suriname	37 000	56.20
		French Guiana	28 100	42.66
		Brazil	640	0.96
Mataje	730	Ecuador	540	73.98
		Colombia	190	26.02
Mira	11 700	Colombia	7 100	61.00
		Ecuador	4 600	38.99
Orinoco	958 500	Venezuela	607 400	63.37
		Colombia	351 100	36.63
Oyupock	27 100	Brazil	14 200	52.38
/Oiapoque		French Guiana	12 800	47.28
Palena	13 300	Chile	7 300	54.58
		Argentina	6 100	45.42
Pascua	13 700	Chile	7 400	53.72
		Argentina	6 300	46.22
Patia	21 300	Colombia	20 900	97.97
		Ecuador	430	2.03
Puelo	8 200	Argentina	5 100	62.33
		Chile	3 100	37.63

Table 4. *Continued*

Basin name	Area of basin (km^2)[1]	Country	Area (km^2)	%
Rio Grande	7 900	Chile	4 000	50.86
		Argentina	3 900	49.14
San Martin	640	Chile	580	90.22
		Argentina	60	9.78
Seno Union	6 500	Chile	5 700	87.93
/Serrano		Argentina	670	10.34
Tumbes–Poyango[44]	5 000	Ecuador	3 500	71.04
		Peru	1 400	28.96
Valdivia	11 400	Chile	11 300	99.09
		Argentina	100	0.89
Yelcho	10 600	Argentina	6 900	65.06
		Chile	3 700	34.88
Zapaleri[51]	3 600	Chile	2 400	68.42
		Bolivia	610	16.99
		Argentina	520	14.59
Zarumilla[44]	670	Ecuador	580	87.29
		Peru	90	12.71
Total area	10 544 710			

Notes to Table 4:

1. The numbers referring to basin areas have been rounded to significant digits and, as a result, the numbers for area within each basin do not necessarily add up to the total area for that basin. Also, the percentages were calculated based on raw data, and therefore do not reflect the rounding of the areas.
2. The dispute between Nigeria and Cameroon, over land and maritime boundaries in the vicinity of the oil-rich Bakasi Peninsula, was referred to the International Court of Justice, which gave a ruling in 1998. Nigeria has filed an appeal on the ruling and the dispute has yet to be resolved. The Bakasi Peninsula, in the south-west province of Cameroon, is divided by the Akpa Yafi river and lies to the west of Cameroon's Rio del Ray (CIA, 1998; Cohen, 1998).
3. Morocco claims and administers Western Sahara, but the region's sovereignty is unresolved and the UN is attempting to hold a referendum on the issue. A UN-administered ceasefire remains in effect since September 1991 (Biger *et al.*, 1995; CIA, 1998).
4. It has been informally reported that the indefinite segment of the Democratic Republic of the Congo (Kinshasa)–Zambia boundary has been settled. Therefore, the Democratic Republic of the Congo (Kinshasa)–Tanzania–Zambia tripoint in Lake Tanganyika also may no longer be indefinite (CIA, 1998).
5. A long segment of the boundary between the Democratic Republic of the Congo (Kinshasa) and the Republic of the Congo (Brazzaville) along the Congo River remains indefinite, as no division of the river or its islands has been made (CIA, 1998).
6. Swaziland has asked South Africa to open negotiations on reincorporating some nearby South African territories that are populated by ethnic Swazis or that were long ago part of the Swazi Kingdom. (CIA, 1998).
7. Lake Chad varies in extent between rainy and dry seasons, from 50 000 to 20 000 km^2. Demarcation of international boundaries in the vicinity of Lake Chad is complete and awaits ratification by Cameroon, Chad, Niger and Nigeria. Determining the boundaries of sectors involving rivers draining into Lake Chad is complicated by flooding and the uncovering or covering of islands. The lack of demarcated boundaries has led to border incidents in the past. (Biger *et al.*, 1995; CIA, 1998).
8. The administrative boundary between Kenya and Sudan does not coincide with the international boundary (CIA, 1998).
9. Egypt's administrative boundary with Sudan does not coincide with the international boundary and creates the 'Hala'ib Triangle', a barren area of 20 580 km^2 north of the 22nd parallel (CIA, 1998).
10. Although topographically Botswana is riparian to the Orange River basin, it is unknown whether Botswana territory contributes water to the Orange River. Botswana's political status as riparian

to the Orange River basin remains to be clarified among the basin states (Conley & van Niekerk, 1998).

11. Namibia and South Africa are undergoing negotiations to confirm the exact positions of their boundary along the Orange River (Conley & van Niekerk, 1998).
12. Malawi is in dispute with Tanzania over the boundary in Lake Nyasa (Lake Malawi) (CIA, 1998).
13. The quadripoint between Botswana, Namibia, Zambia and Zimbabwe is in disagreement (CIA, 1998).
14. The dispute between Botswana and Namibia over the uninhabited Kasikili (Sidudu) Island in the Linyanti (Chobe) River is presently before the International Court of Justice. Botswana and Namibia are also contesting at least one other island in Linyanti River (CIA, 1998).
15. Two disputed sections of the boundary between China and Russia remain to be settled. China holds that the main channel of the Amur River is followed north-east to a point opposite the city of Khabarovsk. Russia claims that the line follows the Kazakevicheva channel south-eastward to the Ussuri River. The two countries dispute control of islands in the Amur and Ussuri Rivers, despite a 1987 agreement that established the line as running through the median lines of the main navigable and unnavigable channels. The five disputed islands in the Amur—Popov, Savelyev, Evrasikha, Nizhne-Petrovskiy and Lugovskoy—amount to 3000 km^2 of territory. Also in dispute are the Tarbarov and Bolshoy Ussuriyskiy islands, located in a 30 km section of the boundary at the confluence of the Amur and Ussuri rivers, and the Bolshoy Island, located in the upper reaches of the Argun river (Biger *et al.*, 1995; CIA, 1998; IBRU, 1999).
16. Most of the boundary shared between China and Tajikistan is in dispute, including in the Pamir mountain region (CIA, 1998; IBRU, 1999).
17. Kyrgyzstan and Tajikistan have a territorial dispute regarding their boundary in the Isfara Valley area (CIA, 1998).
18. The boundaries of the Caspian Sea remain to be determined among Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan (CIA, 1998).
19. Brunei may wish to purchase the Malaysian salient that divides the country (CIA, 1998).
20. Sections of the land boundary between China and Vietnam are indefinite (CIA, 1998).
21. India and China dispute approximately 83 000 km^2, including three of the four political divisions of the Northeast Frontier Agency—the Sumdurong Cho sector. This region falls in the Ganges–Brahmaputra basin. (Cohen, 1998; IBRU 1999).
22. Portions of the boundary between Bangladesh and India are indefinite. Much of the boundary between the two countries is based on administrative units that do not shift with the rivers as they change course or level over time. Alluvial or 'char' land that is exposed as a river shifts often leads to dispute, as the land is highly valued for agriculture (CIA, 1998; IBRU, 1999).
23. A 33-km section of the boundary between China and North Korea in the Paektu-san (mountain) area is indefinite. North Korea claims territorial rights to two-thirds of Chonji, the crater lake on Mount Paektu (CIA, 1998; IBRU, 1999).
24. The demarcation line between North Korea and South Korea is in dispute (CIA, 1998).
25. Disputed boundaries between China and India include approximately 25 900 km^2 in the regions of Sang, Demchok, and Aksai, China (Biger *et al.*, 1995; Cohen, 1998).
26. India and Pakistan dispute the status of the Jammu and Kashmir region, an area of approximately 220 000 km^2 (Biger *et al.*, 1995; CIA, 1998).
27. The West Bank and Gaza Strip are Israeli occupied with the exception of territories under control of the Palestinian Authority, as delineated in the 1995 'Israeli–Palestinian Interim Agreement on the West Bank and the Gaza Strip', commonly referred to as 'Oslo II', and in the 1998 agreement signed at Wye. Permanent status is to be determined during further negotiation (CIA, 1998).
28. Israel and Syria dispute the Golan Heights, which is currently administered by Israel (CIA, 1998).
29. Topographically, Egypt is riparian to the Jordan River basin; however, Egyptian territory does not contribute water to the basin, except for the possibility of intermittent, seasonal wadis.
30. Parts of the boundary between Cambodia and Thailand are indefinite, including overlapping claims in the Gulf of Thailand, an area potentially containing oil and gas deposits, and an island located near the boundary between Cambodian Koh Kong and the Thai province of Trat (CIA, 1998; IBRU, 1999).
31. Parts of the boundary between People's Democratic Republic of Laos and Thailand are indefinite. The two countries have an agreement to demarcate their boundary, but demarcation was suspended in February 1998 (CIA, 1998; IBRU, 1999).
32. Iran and Iraq restored diplomatic relations in 1990, but work continues on developing written agreements to settle outstanding disputes from their eight-year war, including boundary demarcation, prisoners of war, and freedom of navigation and sovereignty over the Shatt al Arab waterway (CIA, 1998).

33. Disputes are ongoing between Bosnia-Herzegovina and Serbia, over Serbian-populated areas. According to the Serbian Republic of Bosnia-Herzegovina (SRBH), the external boundaries are marked by the Una river in the west, the Sava river in the north, the state boundary with the Federal Republic of Yugoslavia in the east, and Croatia and the Serbian Republic Krajina in the south (CIA, 1998; IBRU, 1999).
34. Eastern Slavonia, which was held by Serbs during the ethnic conflict in the former Yugoslavia, was returned to Croatian control by the UN Transitional Administration for Eastern Slavonia on 15 January 1998 (CIA, 1998).
35. Under an International Court of Justice (ICJ) ruling, Hungary and Slovakia were to agree on the future of the Gabcikovo Dam complex by March 1998. The dispute, however, has yet to be resolved. Completion of the dam system would alter the boundaries between Hungary and Slovakia established under the 1920 Treaty of Trianon (CIA, 1998; IBRU, 1999).
36. The boundary commission formed by Serbia and Montenegro, and the Former Yugoslav Republic of Macedonia in April 1996 to resolve differences in delineation of their mutual boundary has made no progress so far (CIA, 1998).
37. Romania considers certain territories of Moldova and Ukraine—including Bessarabia (45 600 km^2) and Northern Bukovina—as historically part of Romania. This territory was incorporated into the former Soviet Union following the Molotov–Ribbentrop Pact in 1940 (CIA, 1998; Cohen, 1998).
38. Border problems between Byelarus and Lithuania in part lie in the fact that the new boundary is different from the old Soviet administrative division between the two republics. Areas of dispute include the land around the Adutiskis railway station and the Druskininkai resort claimed by Byelarus. Demarcation of the boundary between Byelarus and Lithuania is under way (CIA, 1998; IBRU, 1999).
39. The 1997 boundary agreement Lithuania and Russia remains to be ratified (CIA, 1998).
40. The December 1996 technical boundary agreement reached between Estonian and Russian negotiators remains to be ratified. Estonia claimed over 2000 km^2 of territory in the Narva and Pechory regions of Russia, based on the boundary established under the 1920 Peace Treaty of Tartu (CIA, 1998).
41. Latvia claimed the Abrene/Pytalovo section of the border ceded by the Latvian Soviet Socialist Republic to Russia in 1944, based on the 1920 Treaty of Riga. A draft treaty delimiting the boundary between Latvia and Russia has not been signed. The Abrene/Pytalovo region is crossed by the Utroya River, a tributary of the Vclikaya river (CIA, 1998; Cohen, 1998).
42. While the Meuse basin is topographically part of the Rhine basin, European nations treat it as a politically separate basin (Huisman *et al.*, 1998).
43. The boundary between Belize and Guatemala is in dispute. Talks to resolve the dispute are ongoing. Changes in the boundary between Guatemala and Belize could impact on the Hondo, Belize, Grijalva and/or Sarstun basins (until 1991, Guatemala claimed all of Belize) (CIA, 1998; Cohen, 1998; IBRU, 1999).
44. Three sections of the boundary between Ecuador and Peru have been in dispute. The areas cover over 324 000 km^2 and include portions of the Amazon and Maranon rivers. The districts of Tumbes, Jaen and Maynas are claimed by Ecuador and administered by Peru. In December 1998, Peru and Ecuador signed a joint agreement on the implementation of a permanent development policy for the border region. A joint commission was created to determine their common land boundary (Biger *et al.*, 1995; CIA, 1998; Cohen, 1998; BBC Summary of World Broadcasts, 3 December 1998; Xinhua News Agency, 11 December 1998).
45. The boundary upstream from the confluence of the Courantyne/Koetari (Kutari) River with the New (Upper Courantyne) River remains unsettled. Guyana administers the triangle formed by the two rivers, while Brazil and Suriname continue to claim the area. Suriname also claims the west bank of the Courantyne River below the New River as the boundary, but *de facto* the boundary continues to follow the thalweg (Biger *et al.*, 1995; CIA, 1998).
46. Talks are ongoing between Guyana and Venezuela regarding their boundary dispute. Venezuela claims all of the area west of the Essequibo River (CIA, 1998; IBRU, 1999).
47. A short section of the boundary between Brazil and Paraguay, just west of Salto das Sete Quedas (Guaira Falls) on the Rio Parana, has yet to be precisely delimited (CIA, 1998).
48. Two short sections of the boundary between Brazil and Uruguay are in dispute: the Arroio Invernada (Arroyo de la Invernada) area of the Rio Quarai (Rio Cuareim) and the islands at the confluence of the Rio Quarai and the Uruguay River (CIA, 1998).
49. A short section of the south-eastern boundary of Chile with Argentina, in the area of the Beagle Channel, remains unclear. The 1991 Aylwin–Menem Treaty delineates the boundary between

Argentina and Chile in the continental glaciers area. As of March 1999, the treaty has not been ratified by the Congresses of either country (CIA, 1998; IBRU, 1999).

50. Suriname and French Guiana are in dispute over which of the upper tributaries of the Maroni River was originally intended to carry the boundaries down to the Brazilian boundary. The disputed area is administered by France as a region of the overseas department of French Guiana and claimed by Suriname. The area lies between the Riviere Litani and the Riviere Marouini, both headwaters of the Lawa (Biger *et al.*, 1995; CIA, 1998).
51. Bolivia has desired a sovereign corridor to the South Pacific Ocean since the Atacama desert area was lost to Chile in 1884. The creation of such a corridor could impact on territory in the Zapaleri basin or create a new international basin (CIA, 1998; IBRU, 1999).

Table 5. Percentage of a country's area within international basins

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Afghanistan (641 869)	Hari/Harirud, Helmand, Indus, Kowl-E-Namaksar, Murgab, Tarim	447 252	69.68
Albania (28 755)	Danube, Drin, Lake Prespa, Vijose	14 291	49.70
Algeria (2 320 972)	Daoura, Dra, Guir, Lake Chad, Medjerda, Niger, Oued Bon Naima, Tafna	358 230	15.43
Andorra (452)	Ebro, Garonne	452	100.00
Angola (1 252 421)	Chiloango, Congo/Zaire, Etosha–Cuvelai, Kunene, Okavango, Zambezi	849 457	67.83
Argentina (2 781 013)	Aviles, Aysen, Baker, Chico/Carmen Silva, Comau, Cullen, Gallegos-Chico, La Plata, Lake Fagnano, Palena, Pascua, Puelo, Rio Grande, San Martin, Seno Union/Serrano, Valdivia, Yelcho, Zapaleri	870 449	31.30
Armenia (29 872)	Kura–Araks	29 872	100.00
Austria (83 739)	Danube, Elbe, Po, Rhine	83 739	100.00
Azerbaijan (85 808)	Astara Chay, Kura–Araks, Samur, Sulak	60 357	70.34
Bangladesh (138 507)	Fenney, Ganges–Brahmaputra–Meghna, Karnafauli	135 569	97.88
Belgium (30 480)	Rhine, Schelde, Seine, Yser	21 895	71.83
Belize (22 175)	Belize, Hondo, Sarstun	8 743	39.43
Benin (116 515)	Mono, Niger, Oueme, Volta	110 829	95.12
Bhutan (39 927)	Ganges–Brahmaputra–Meghna	39 324	98.49
Bolivia (1 090 353)	Amazon, Cancoso/Lauca, La Plata, Lake Titicaca–Poopo, Zapaleri	1 043 143	95.67
Bosnia and Herzegovina (51 403)	Danube, Krka, Neretva	47 839	93.07

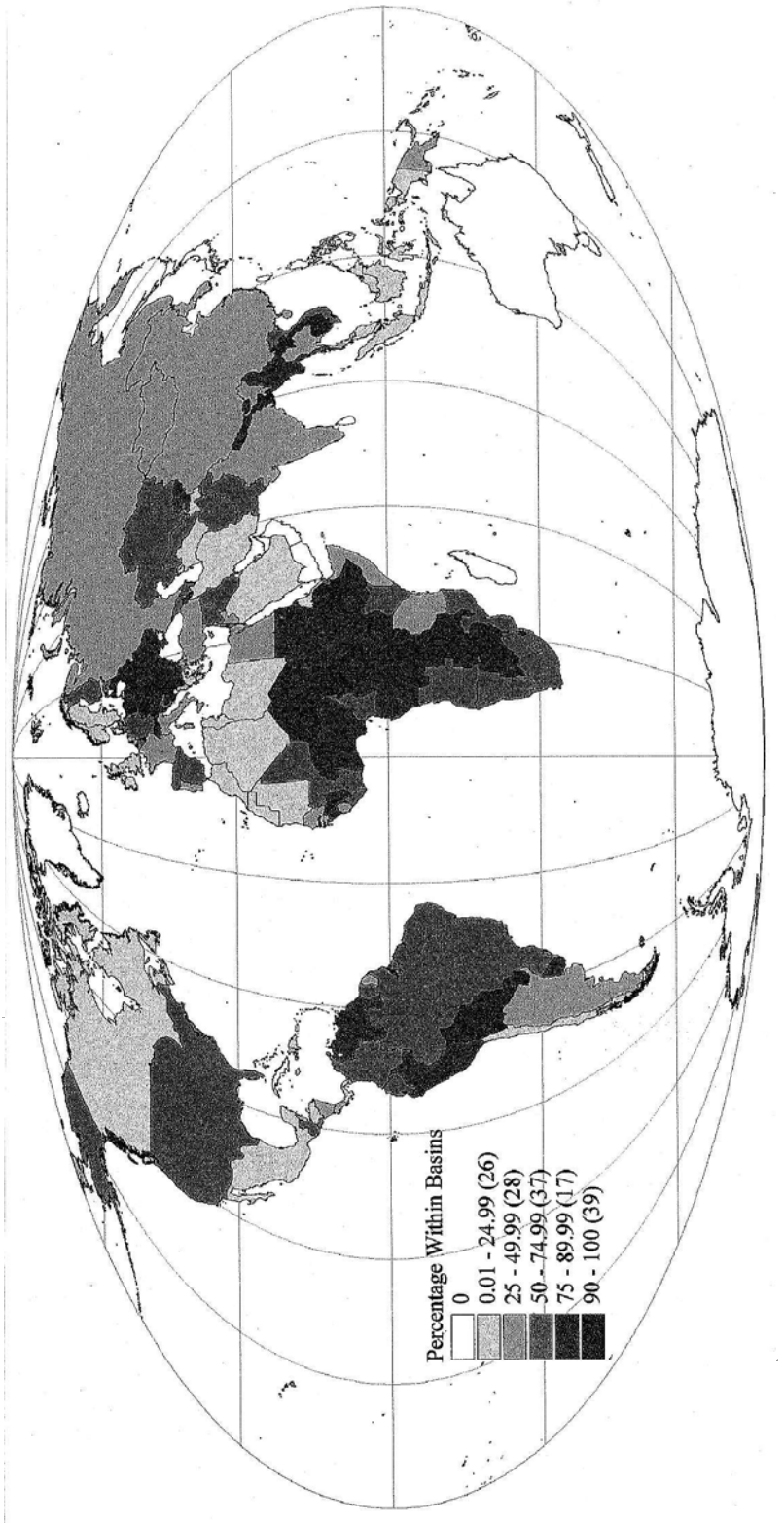

Figure 7. Percentage of a country's area within international basins.

Table 5. *Continued*

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Botswana (580 011)	Limpopo, Okavango, Orange, Zambezi	580 011	100.00
Brazil (8 507 128)	Amazon, Chuy, Essequibo, La Plata, Lagoon Mirim, Maroni, Oyupock/Oiapoque	5 078 034	59.69
Brunei (5 770)	Bangau, Pandaruan	638	11.06
Bulgaria (110 802)	Danube, Maritsa, Nestos, Rezvaya, Struma, Velaka	95 106	85.83
Burkina Faso (273 719)	Komoe, Niger, Volta	273 719	100.00
Burundi (27 254)	Congo/Zaire, Nile	27 254	100.00
Byelarus (206 681)	Daugava, Dnieper, Narva, Neman, Vistula/Wista, Volga	197 800	95.70
Cambodia (182 612)	Mekong, Saigon/Song Nha Be, Song Vam Co Dong	164 797	90.24
Cameroon (466 307)	Akpa Yafi, Congo/Zaire, Cross, Lake Chad, Niger, Ntem, Ogooue	261 507	56.08
Canada (9 904 700)	Alesek, Chilkat, Columbia, Eirth, Fraser, Mississippl, Nelson–Saskatchewan, St Croix, St John, St Lawrence, Stikine, Taku, Whiting, Yukon	2 354 445	23.77
Central African Republic (621 499)	Congo/Zaire, Lake Chad	621 499	100.00
Chad (1 168 002)	Lake Chad, Niger	1 110 821	95.10
Chile (742 298)	Aviles, Aysen, Baker, Cancoso/Lauca, Chico/Carmen Silva, Comau, Cullen, Gallegos–Chico, Lake Fagnano, Lake Titicaca–Poopo, Palena, Pascua, Puelo, Rio Grande, San Martin, Seno Union/Serrano, Valdivia, Yelcho, Zapaleri	92 557	12.47
China (9 338 902)	Amur, Aral Sea, Beilun, Ganges–Brahmaputra–Meghna, Har Us Nur, Hsi/Bei Jiang, Ili/Kunes He, Indus, Irrawaddy, Mekong, Ob, Pu-Lun-To, Red/Song Hong, Salween, Sujfun, Tarim, Tumen, Yalu	3 018 678	32.32
Colombia (1 141 962)	Amazon, Catatumbo, Jurado, Mataje, Mira, Orinoco, Patia	749 595	65.64
Congo, Democratic Republic of the (Kinshasa) (2 337 027)	Chiloango, Congo/Zaire, Nile, Zambezi	2 337 027	100.00
Congo, Republic of the (Brazzaville) (345 430)	Chiloango, Congo/Zaire, Nyanga, Ogooue	276 097	79.93

Table 5. *Continued*

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Costa Rica (51 608)	Changuinola, Chiriqui, San Juan, Sixaola	14 829	28.73
Croatia (56 288)	Danube, Krka, Neretva	35 660	63.35
Czech Republic (78 495)	Danube, Elbe, Oder/Odra, Vistula/Wista	78 380	99.85
Djibouti (21 638)	Awash	11 088	51.24
Dominican Republic (48 445)	Artibonite, Massacre, Pedernales	2 660	5.49
Ecuador (256 932)	Amazon, Chira, Mataje, Mira, Patia, Tumbes–Poyango, Zarumilla	154 871	60.28
Egypt (982 910)	Jordan (Dead Sea), Nile	280 241	28.51
El Salvador (20 697)	Goascoran, Lempa, Paz	11 532	55.72
Equatorial Guinea (27 085)	Benito, Mbe, Ntem, Ogooue, Utambonl	21 769	80.37
Eritrea (121 941)	Baraka, Gash, Nile	63 046	51.70
Estonia (45 545)	Gauja, Narva, Parnu, Salaca	25 152	55.23
Ethiopia (1 132 328)	Awash, Gash, Juba–Shibeli, Lake Turkana, Lotagipi Swamp, Nile	990 989	87.52
Finland (333 797)	Kemi, Naatamo, Olanga, Oulu, Pasvik, Tana, Torne/Tornealven, Tuloma, Vuoksa	168 686	50.54
France (546 729)	Bidasoa, Ebro, Garonne, Po, Rhine, Rhone, Roia, Schelde, Seine, Yser	259 366	47.44
French Guiana (83 811)	Maroni, Oyupock/Oiapoque	40 907	48.81
Gabon (261 689)	Benito, Congo/Zaire, Mbe, Ntem, Nyanga, Ogooue, Utamboni	223 688	85.48
Gambia, The (10 678)	Gambia	5 890	55.16
Georgia (69 943)	Coruh, Kura–Araks, Sulak, Terek	39 335	56.24
Germany (356 109)	Danube, Elbe, Oder/Odra, Rhine	253 536	71.20
Ghana (239 981)	Bia, Komoe, Tano, Volta	189 579	79.00
Greece (131 852)	Lake Prespa, Maritsa, Nestos, Struma, Vardar, Vijose	24 750	18.77
Guatemala (109 502)	Belize, Candelaria, Coatan Achute, Grijalva, Hondo, Lempa, Motaqua, Paz, Sarstun, Suchiate	79 942	73.01
Guinea (246 077)	Cavally, Cestos, Corubal, Gambia, Geba, Great Scarcies, Little Scarcies, Loffa, Moa, Niger, Sassandra, Senegal, St John, St Paul	205 171	83.38

Table 5. *Continued*

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Guinea-Bissau (33 635)	Corubal, Geba	15 117	44.94
Guyana (211 241)	Amacuro, Amazon, Barima, Courantyne/Corantijn, Essequibo	159 682	75.59
Haiti (27 157)	Artibonite, Massacre, Pedernales	7 303	26.89
Honduras (112 852)	Choluteca, Coco/Segovia, Goascoran, Lempa, Motaqua, Negro	24 746	21.93
Hungary (92 782)	Danube	92 782	100.00
India (3 089 282)	Fenney, Ganges–Brahmaputra–Meghna, Indus, Irrawaddy, Kaladan, Karnafauli	1 367 871	44.28
Indonesia (1 910 842)	Fly, Merauke, Sembakung, Sepik, Tami	106 314	5.56
Iran (1 624 760)	Astara Chay, Atrak, Dasht, Hari/Harirud, Helmand, Kowl-E-Namaskar, Kura–Araks, Rudkhaneh-ye/BahuKalat, Tigris–Euphrates/Shatt al Arab	350 528	21.57
Iraq (436 422)	Tigris–Euphrates/Shatt al Arab	318 912	73.07
Ireland (69 384)	Bann, Castletown, Erne, Fane, Flurry, Foyle	3 403	4.90
Israel (20 774)	Jordan (Dead Sea), Wadi Al Izziyah	10 790	51.94
Italy (300 980)	Danube, Isonzo, Po, Rhine, Rhone, Roia	84 965	28.23
Ivory Coast (322 216)	Bia, Cavally, Cestos, Komoe, Niger, Sassandra, St. John, Tano, Volta	178 483	55.39
Jordan (89 275)	Jordan (Dead Sea), Tigris–Euphrates/Shatt al Arab	22 842	25.59
Kazakhstan (2 715 976)	Aral Sea, Ili/Kunes He, Ob, Oral (Ural), Pu-Lun-To, Tarim, Volga	1 739 057	64.03
Kenya (584 429)	Juba–Shibeli, Lake Natron, Lake Turkana, Lotagipl Swamp, Nile, Umba	396 722	67.88
Korea, Democratic People's Republic of (122 473)	Amur, Han, Tumen, Yalu	52 127	42.56
Korea, Republic of (98 339)	Han	25 104	25.53
Kyrgyzstan (199 340)	Aral Sea, Ili/Kunes He, Tarim	170 614	85.59
Laos, People's Democratic Republic of (230 566)	Ca/Song-Koi, Ma, Mekong, Red/Song Hong	221 662	96.14
Latvia (64 299)	Barta, Daugava, Gauja, Lielupe, Narva, Neman, Parnu, Salaca, Venta	59 840	93.07
Lebanon (10 240)	An Nahr Al Kabir, Asi/Orontes, Jordan (Dead Sea), Wadi Al Izziyah	2 913	28.45

Table 5. *Continued*

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Lesotho (30 352)	Orange	19 854	65.41
Liberia (96 296)	Cavally, Cestos, Loffa, Mana-Morro, Moa, St John, St Paul	68 932	71.58
Libya (1 620 515)	Lake Chad	4 580	0.28
Liechtenstein (165)	Rhine	165	100.00
Lithuania (64 849)	Barta, Daugava, Lielupe, Neman, Venta	62 616	96.56
Luxembourg (2 594)	Rhine, Seine	2 594	100.00
Macedonia (25 321)	Drin, Lake Prespa, Struma, Vardar	25 017	98.80
Malawi (119 028)	Congo/Zaire, Ruvuma, Zambezi	111 234	93.45
Malaysia (330 270)	Bangau, Golok, Pandaruan, Sembakung	8 458	2.56
Mali (1 256 747)	Komoe, Niger, Senegal, Volta	712 452	56.69
Mauritania (1 041 570)	Atul, Senegal	228 438	21.93
Mexico (1 962 939)	Candelaria, Coatan Achute, Colorado, Grijalva, Hondo, Rio Grande, Suchiate, Tijuana, Yaqui	408 513	20.81
Moldova (33 567)	Danube, Dniester, Kogilnik, Sarata	33 567	100.00
Mongolia (1 559 176)	Amur, Har Us Nur, Lake Ubsa-Nur, Pu-Lun-To, Yenisey/Jenisej	616 438	39.54
Morocco (403 860)	Daoura, Dra, Guir, Oued Bon Naima, Tafna	79 377	19.65
Mozambique (788 629)	Buzi, Incomati, Limpopo, Maputo, Ruvuma, Sabi, Umbeluzi, Zambezi	423 969	53.76
Myanmar (Burma) (669 821)	Ganges–Brahmaputra–Meghna, Irrawaddy, Kaladan, Mekong, Pakchan, Salween	528 413	78.89
Namibia (825 632)	Etosha–Cuvelai, Kunene, Okavango, Orange, Zambezi	563 706	68.28
Nepal (147 293)	Ganges–Brahmaputra–Meghna	147 293	100.00
Netherlands (35 493)	Rhine, Schelde	11 991	33.78
Nicaragua (129 047)	Choluteca, Coco/Segovia, Negro, San Juan	49 637	38.46
Niger (1 186 021)	Lake Chad, Niger	1 186 021	100.00
Nigeria (912 039)	Akpa, Cross, Lake Chad, Niger, Oueme	795 581	87.23
Norway (316 962)	Jacobs, Kemi, Klaralven, Naatamo, Pasvik, Tana, Torne/Tornealven	20 418	6.44

Table 5. *Continued*

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Pakistan (877 753)	Dasht, Helmand, Indus, Rudkhaneh-ye/BahuKalat, Tarim	649 238	73.97
Panama (74 697)	Changuinola, Chiriqui, Jurado, Sixaola	4 941	6.61
Papua New Guinea (466 161)	Fly, Merauke, Sepik, Tami	136 246	29.23
Paraguay (400 089)	La Plata	400 089	100.00
Peru (1 296 912)	Amazon, Chira, Lake Titicaca–Poopo, Tumbes–Poyango, Zarumilla	1 038 875	80.10
Poland (310 715)	Danube, Dniester, Elbe, Lava–Pregel, Neman, Oder/Odra, Prohladnaja, Vistula/Wista	281 897	90.73
Portugal (92 098)	Douro/Duero, Guadiana, Lima, Mino/Minho, Tagus/Tejo	44 898	48.75
Romania (236 654)	Danube	228 826	96.69
Russia (16 851 940)	Amur, Daugava, Dnieper, Don, Elancik, Har Us Nur, Jacobs, Keml, Kura–Araks, Lake Ubsa-Nur, Lava–Pregel, Mius, Narva, Neman, Olanga, Ob, Oral (Ural), Oulu, Pasvik, Prohladnaja, Pu-Lun-To, Samur, Sujfun, Sulak, Terek, Tuloma, Tumen, Volga, Vuoksa, Yenisey/Jenisej	7 923 626	47.02
Rwanda (25 228)	Congo/Zaire, Nile	25 228	100.00
Saudi Arabia (1 960 175)	Tigris–Euphrates/Shatt al Arab	236	0.01
Senegal (196 911)	Gambia, Geba, Senegal	90 543	45.98
Sierra Leone (72 531)	Great Scarcies, Little Scarcies, Mana-Morro, Moa, Niger	27 693	38.18
Slovakia (48 648)	Danube, Oder/Odra, Vistula/Wista	48 648	100.00
Slovenia (20 246)	Danube, Isonzo	18 184	89.82
Somalia (639 065)	Awash, Juba–Shibeli	221 757	34.70
South Africa (1 223 111)	Incomati, Limpopo, Maputo, Orange, Umbeluzi	797 512	65.20
Spain (505 674)	Bidasoa, Douro/Duero, Ebro, Garonne, Guadiana, Lima, Mino/Minho, Tagus/Tejo	291 100	57.57
Sudan (2 490 409)	Baraka, Gash, Lake Chad, Lake Turkana, Lotagipi Swamp, Nile	2 064 458	82.90
Suriname (145 498)	Amazon, Courantyne/Corantijn, Maroni	73 952	50.83
Swaziland (17 164)	Incomati, Maputo, Umbeluzi	16 762	97.66

Table 5. *Continued*

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Sweden (443 800)	Klaralven, Tome/Tornealven	68 679	15.48
Switzerland (41 178)	Danube, Po, Rhine, Rhone	41 178	100.00
Syria (187 937)	An Nahr Al Kabir, Asi/Orontes, Jordan (Dead Sea), Nahr El Kebir, Tigris–Euphrates/Shatt al Arab	136 792	72.79
Tajikistan (142 410)	Aral Sea, Tarim	14 024	9.85
Tanzania, United Republic of (944 977)	Congo/Zaire, Lake Natron, Nile, Ruvuma, Umba, Zambezi	410 705	43.46
Thailand (515 144)	Golok, Mekong, Pakchan, Salween	205 847	39.96
Togo (57 300)	Mono, Oueme, Volta	48 653	84.91
Tunisia (155 402)	Medjerda	15 573	10.02
Turkey (779 986)	Asi/Orontes, Coruh, Kura–Araks, Maritsa, Nahr El Kebir, Rezvaya, Tigris–Euphrates/Shatt al Arab, Velaka	266 523	34.17
Turkmenistan (471 429)	Aral Sea, Atrak, Hari/Harirud, Murgab	52 956	11.23
Uganda (243 050)	Lake Turkana, Lotagipi Swamp, Nile	243 049	100.00
Ukraine (596 041)	Danube, Dnieper, Dniester, Don, Elancik, Koglinlk, Mius, Sarata, Vistula/Wista	451 715	75.79
United Kingdom (243 137)	Bann, Castletown, Erne, Fane, Flurry, Foyle	9 235	3.80
United States (9 450 720)	Alesek, Chilkat, Colorado, Columbia, Firth, Fraser, Mississippi, Nelson–Saskatchewan, Rio Grande, St Croix, St John, St Lawrence, Stikine, Taku, Tijuana, Whiting, Yaqui, Yukon	5 895 293	62.38
Uruguay (178 141)	Chuy, La Plata, Lagoon Mirim	142 846	80.19
Uzbekistan (445 711)	Aral Sea	236 695	53.11
Venezuela (916 561)	Amacuro, Amazon, Barima, Catatumbo, Essequibo, Orinoco	698 462	76.20
Vietnam (327 123)	Beilun, Ca/Song-Koi, Hsi/Bei Jiang, Ma, Mekong, Red/Song Hong, Saigon/Song Nha Be, Song Vam Co Dong	193 152	59.05
West Bank (5 816)	Jordan (Dead Sea)	3 152	54.20
Western Sahara (269 602)	Atul	1 100	0.41

Table 5. *Continued*

Country/territory (area in km^2)	International basins	Total area of country/territory falling within international basins (km^2)	Percentage of country/territory area falling within international basins
Yugoslavia (Serbia and Montenegro) (101 945)	Danube, Drin, Neretva, Struma, Vardar	99 950	98.04
Zambia (754 773)	Congo/Zaire, Zambezi	754 773	100.00
Zimbabwe (390 804)	Buzi, Limpopo, Okavango, Sabi, Zambezi	390 804	100.00

Table 6. Number of countries that share a basin

Number of countries	International basins
17 (1)	Danube
11 (2)	Congo and Niger
10 (1)	Nile
9 (2)	Rhine and Zambezi
8 (2)	Amazon and Lake Chad
6 (8)	Aral Sea, Ganges–Brahmaputra–Meghna, Jordan, Kura–Araks, Mekong, Tarim, Tigris and Euphrates (Shatt al Arab), and Volta
5 (3)	La Plata, Neman, and Vistula (Wista)
4 (17)	Amur, Daugava, Elbe, Indus, Komoe, Lake Turkana, Limpopo, Lotagipi Swamp, Narva, Oder (Odra), Ogooue, Okavango, Orange, Po, Pu-Lun-T'o, Senegal, and Struma
3 (49)	Asi (Orontes), Awash, Cavally, Cestos, Chiloango, Dnieper, Dniester, Drin, Ebro, Essequibo, Gambia, Garonne, Gash, Geba, Har Us Nur, Hari (Harirud), Helmand, Hondo, Ili (Kunes He), Incomati, Irrawaddy, Juba–Shibeli, Kemi, Lake Prespa, Lake Titicaca–Poopo System, Lempa, Maputo, Maritsa, Maroni, Moa, Neretva, Ntem, Ob, Oueme, Pasvik, Red (Song Hong), Rhone, Ruvuma, Salween, Schelde, Seine, St John, Sulak, Torne (Tornealven), Tumen, Umbeluzi, Vardar, Volga, and Zapaleri
2 (176)	Akpa, Alesek, Amacuro, An Nahr Al Kabirm, Artibonite, Astara Chay, Atrak, Atui, Aviles, Aysen, Baker, Bangau, Bann, Baraka, Barima, Barta, Beilun, Belize, Benito, Bia, Bidasoa, Buzi, Ca (Song-Koi), Cancoso (Lauca), Candelaria, Castletown, Catatumbo, Changuinola, Chico (Carmen Silva), Chilkat, Chira, Chiriqui, Choluteca, Chuy, Coatan Achute, Coco (Segovia), Colorado, Columbia, Comau, Corubal, Coruh, Courantyne (Corantijn), Cross, Cullen, Daoura, Dasht, Don, Douro (Duero), Dra, Elancik, Erne, Etosha/Cuvelai, Fane, Fenney, Firth, Flurry, Fly, Foyle, Fraser, Gallegos–Chico, Gauja, Goascoran, Golok, Great Scarcies, Grijalva, Guadiana, Guir, Han, Hsi (Bei Jiang), Isonzo, Jacobs, Jurado, Kaladan, Karnafauli, Klaralven, Kogilnik, Kowl-E-Namaksar, Krka, Kunene, Lagoon Mirim, Lake Fagnano, Lake Natron, Lake Ubsa–Nur, Lava (Pregel), Lielupe, Lima, Little Scarcies, Loffa, Ma, Mana-Morro, Massacre, Mataje, Mbe, Medjerda, Mino, Mira, Mississippi, Mius, Mono, Motaqua, Murgab, Naatamo, Nahr El Kebir, Negro, Nelson-Saskatchewan, Nestos, Nyanga, Olanga, Oral (Ural), Orinoco, Oued Bon Naima, Oulu, Oyupock (Oiapoque), Pakchan, Palena, Pandaruan, Parnu, Pascua, Patia, Paz, Pedernales, Prohladnaja, Puelo, Rezvaya, Rio Grande (North America), Rio Grande (South America), Roia, Rudkhaneh-ye (BahuKalat), Sabi, Saigon (Song Nha Be), Salaca, Samur, San Juan, San Martin, Sarata, Sarstun, Sassandra, Sembakung, Seno Union (Serrano), Sepik, Sixaola, Song Vam Co Dong, St. Croix, St. John, St. Lawrence, St. Paul, Stikine, Suchiate, Sujfun, Tafna, Tagus (Tejo), Taku, Tami, Tana, Tano, Terek, Tijuana, Tjeroeka/Wanggoe, Tuloma, Tumbes–Poyango, Umba, Utamboni, Valdivia, Velaka, Venta, Vijose, Vuoksa, Wadi Al Izziyah, Whiting, Yalu, Yaqui, Yelcho, Yenisey (Jenisej), Yser, Yukon, and Zarumilla.

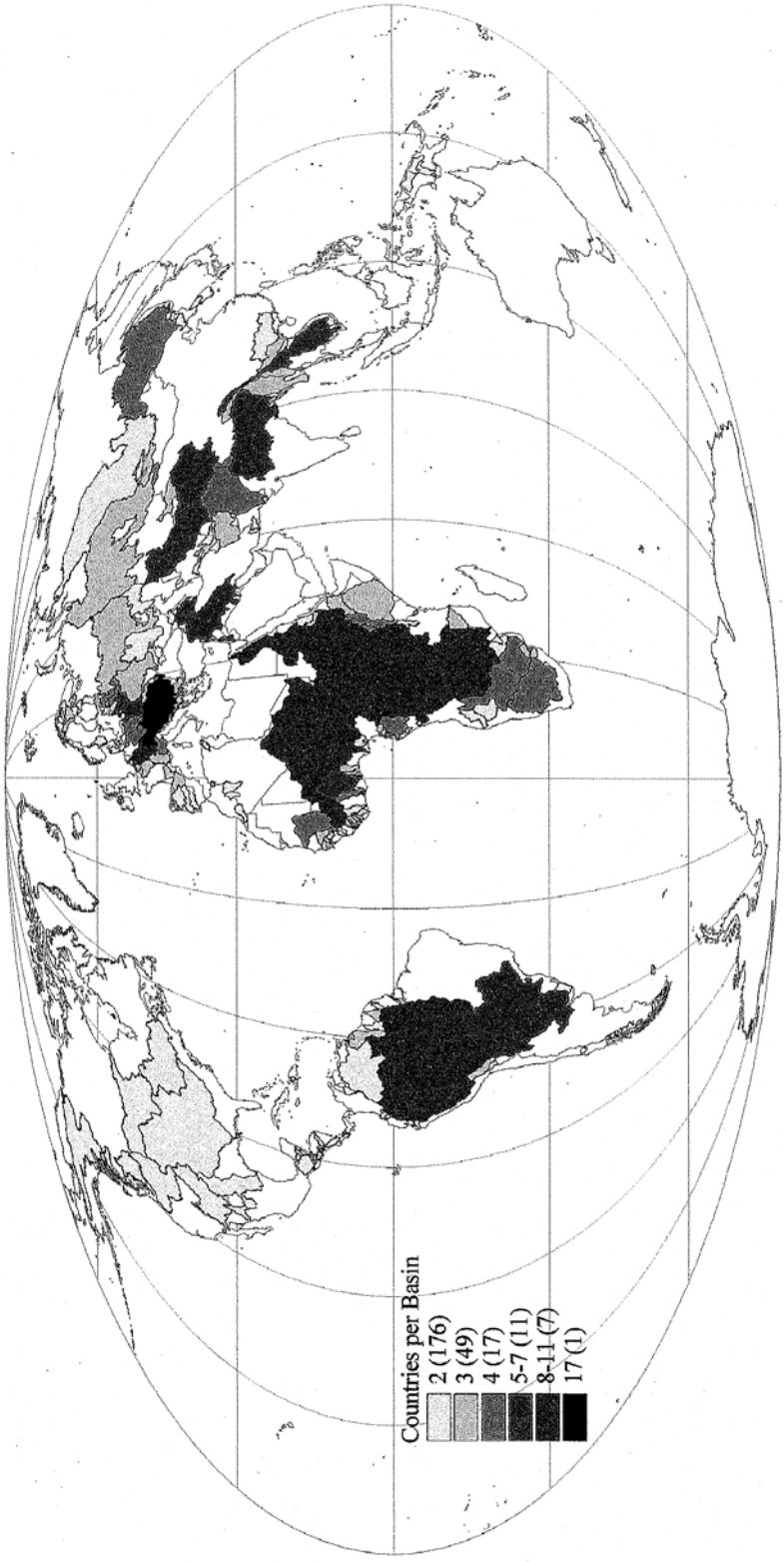

Figure 8. Number of countries that share a basin.

Notes

1. The literature on individual watershed studies is too extensive to cite here. See Beach *et al.* (2000) for more information.
2. Work on this study began when Wolf was with the University of Alabama's Department of Geography.
3. Much of the Database is available at <http://terra.geo.orst.edu/users/tfdd/>. The annotated bibliography grew from the work of Beach *et al.* (2000).
4. Similarly, the 1997 UN Convention on Non-Navigational Uses of International Watercourses defines a 'watercourse' as "a system of surface and underground waters constituting by virtue of their physical relationship a unitary whole and flowing into a common terminus". An 'international watercourse' is a watercourse, parts of which are situated in different states (nations).
5. Perennial streams flow year-round, as opposed to intermittent streams, which have periods of no flow.
6. This definition, which we feel is the best available, does allow for one occasional inconsistency: If a basin is shared by only two nations, and *all* tributaries which cross the boundary are intermittent, we do not include it in the Register. If, however, a basin is shared by three or more nations, and tributaries which cross *any* of the boundaries are perennial, we include both the basin and all the countries within its territory, even if one or more of those countries contributes only intermittent streams. For example, Egypt is listed as riparian to the Jordan, even though no perennial streams cross its boundary with Israel. (These special cases are noted in the footnotes of their respective basins.)
7. Eight data layers form HYDRO1K. The six raster layers are the hydrologically correct DEM, flow directions, flow accumulations, slope, aspect, and compound topographic index (wetness index). The two vector layers include the drainage basins and synthetic streams. The traditional procedures for extracting drainage features are iterative and well established (Verdin & Greenlee, 1996). New methods for DEM surface drainage processing have been documented in Verdin & Greenlee (1996), and supported by Danielson (1998). HYDRO1K is available at <http://edcwww.cr.usgs.gov/landdaac/gtopo30/hydro>.
8. To ensure accurate area representations, the first step was to project the DEM into an equal-area map projection. The second step identified real and artificial depressions (sinks) greater in area than a predetermined threshold, such as Lake Chad or the Dead Sea. Determinations were made as to which of the sinks were natural or spurious, by creating a sink mask and overlaying existing mapped hydrography. Once all depressions were verified, the DEM was filled using an approach developed by Verdin & Greenlee (1996), from which naturally identified sinks were maintained and spurious anomalies were removed.
9. The 'Watersheds of the World' files included on the GlobalARC data set provided an excellent first approximation reference for this project as the HYDRO1k data set was being developed, and we acknowledge the developers of this dataset with gratitude.
10. We recognize the limitations of our process by reporting the size of basins not as raw data, as is common with digital data, but by rounding the last significant figure in basins 1–99 km^2 and the last two significant figures in basins 100 km^2 or larger.
11. The 1978 Register actually lists 215 international basins, but the Juradó is included in both North and South America. To avoid such ambiguity, we include the Juradó only in South America.
12. Total land surface of the earth = 148 940 000 km^2 (*CIA World Factbook*; US CIA, 1998); total land surface within international basins = 60 710 000 km^2; percentage of total land surface within international basins = 41.02%; total earth land surface excluding Antarctica = 134 940 000 km^2; percentage of total land surface within international basins, excluding Antarctica = 45.31%.
13. Our percentages of land surface within international basins, both within continents and globally, are vastly different than the 1978 Register for some continents, because that publication did not include island nations, either in its register or in its calculations of land surface. Our percentages for Asia, for example, are significantly lower since, apparently, the 1978 Register did not include the land surface of many Pacific islands in its calculations.

References

American Academy of Arts and Sciences (1994) Introduction, *Bulletin*, Vol. XLVIII #2, November.

Beach, H.L., Hamner, J., Hewitt, J.J., Kaufman, E., Kurki, A., Oppenheimer, J.A., Wolf, A.T. (2000) *Transboundary Freshwater Dispute Resolution: Theory, Practice and Annotated References* (Tokyo and New York, United Nations University Press) (forthcoming).

Biger, G. in collaboration with the International Boundaries Research Unit, University of Durham,

UK (1995) *The Encyclopedia of International Boundaries* (Jerusalem, Israel, Jerusalem Publishing House).

Biswas, A.K. (1993) Management of international waters: problems and perspectives, *Water Resources Development*, 9(2), pp 167–188.

Cohen, S.B. (Ed.) (1998) *The Columbia Gazetteer of the World*, Vols 1–3 (New York, Columbia University Press).

Conley, A. & van Niekerk, P. (1998) Sustainable management of international waters: the Orange River case, in: H. Savenije & P. van der Zaag, *The Management of Shared River Basins: Experiences from SADC and EU* (Delft, The Netherlands, Ministry of Foreign Affairs).

Danielson, J.J. (1998) Verification of drainage basins from 1 km GTOPO30 digital elevation data, Reviewed Poster Session, 17th Annual ESRI Users Conference, San Diego, California, 8–11 July 1997, in: *ESRI Map Book, Vol. 13* (Redlands, CA, Environmental Systems Research Institute).

Elhance, A. (1999) *Hydropolitics in the Third World: Conflict and Cooperation in International River Basins* (Washington, DC, US Institute of Peace).

Gesch, D.B. (1994) *Topographic Data Requirements for EOS Global Change Research*, US Geological Survey Open-File Report 94–626, 60 pp.

Gesch, D.B., Verdin, K.L. & Greenlee, S.K. (1999) New land surface digital elevation model covers the earth, EOS, Transactions, *American Geophysical Union*, 80(6), pp. 69–70.

Gleick, P.H. (1993) Water and conflict: fresh water resources and international security, *International Security*, 18(1), pp. 79–112.

Gleick, P.H. (1998) *The World's Water: The Biennial Report on Freshwater Resources* (Washington, DC, Island Press).

Homer-Dixon, T. (1994) Environmental scarcities and violent conflict, *International Security* (Summer), pp. 4–40.

Huisman, P., de Jong, J. & Wieriks, K. (1998) Transboundary cooperation in shared river basins: experience from Rhine, Meuse and North Sea, in: H. Savenije & P. van der Zaag (Eds), *The Management of Shared River Basins: Experiences from SADC and EU* (Delft, Netherlands, Ministry of Foreign Affairs).

International Boundary Resource Unit (IBRU), University of Durham, England, International Boundaries Database, accessed March 1999, <http://www-ibru.dur.ac.uk/database/data.html>

Kliot, N. (1995) Building a legal regime for the Jordan–Yarmouk river system: lessons from other international rivers, in: G. Blake, W. Hildesley, M. Pratt, R. Ridley & C. Schofield (Eds) *The Peaceful Management of Transboundary Resources*, pp. 187–202 (London and Dordrecht, Graham & Trotman/ Martinus Nijhoff).

Kliot, N., Shmueli, S. & Shamir, U. (1997) *Institutional Frameworks for the Management of Transboundary Water Resources*, 2 vols (Haifa, Israel, Water Research Institute).

Libiszewski, S. (1995) *Water Disputes in the Jordan Basin Region and their Role in the Resolution of the Arab-Israeli Conflict*, Occasional Paper No. 13 (Zurich, Center for Security Studies and Conflict Research).

Newson, M. (1992) *Land, Water and Development* (London, Routledge).

Postel, S. (1999) *Pillar of Sand: Can the Irrigation Miracle Last?* (New York and London, W. W. Norton & Co).

Remans, W. (1995) Water and war, *Humantäres Völkerrecht*, 8(1), pp. 4–14.

Salman M.A. & Boisson de Chazournes, (Eds). (1998) *International Watercourses: Enhancing Cooperation and Managing Conflict*, Technical Paper No. 414. (Washington, DC, World Bank).

Samson, P. & Charrier, B. (1997) International Freshwater Conflict: Issues and Prevention Strategies, unpublished Green Cross Report, May.

Shiklomanov, I.A. (1993) World fresh water resources, in: P.H. Gleick (Ed.) *Water in Crisis* (New York and Oxford, Oxford University Press).

United Nations (1978) Register of international rivers, *Water Supply Management*, 2(1) (New York, Pergamon Press).

United States Central Intelligence Agency (1998) *CIA World Factbook* (Washington, DC, CIA).

Verdin, K.L. & Greenlee, S.K. (1996) Development of continental scale digital elevation models and extraction of hydrographic features, in: *Proceedings, Third International Conference/Workshop on Integrating GIS and Environmental Modeling, Santa Fe, New Mexico, January 21–26, 1996* (Santa Barbara, CA, National Center for Geographic Information and Analysis).

Westing, A.H. (Ed.) (1986) *Global Resources and International Conflict: Environmental Factors in Strategic Policy and Action* (New York, Oxford University Press).

Wolf, A. (1997) International water conflict resolution: lessons from comparative analysis, *International Journal of Water Resources Development*, 13(3), pp. 333–366.

Wolf, A. (1998) Conflict and cooperation along international waterways, *Water Policy*, 1(2), pp. 251–265.