

# Grids & Datums

## REPUBLIC OF RWANDA

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“The original Rwandans, the Twa Pygmies, were gradually displaced by bigger groups of migrating Hutu tribes people from 1000 AD. Later came the Tutsi from the north, arriving from the 16<sup>th</sup> century onwards. The authority of the Rwandan *mwami* (king) was far greater than that of his opposite number in Burundi, and the system of feudalism that developed here was unsurpassed in Africa outside Ethiopia. Tutsi overlordship was reinforced by ceremonial and religious observance. The Germans took the country in 1890 and held it until 1916, when their garrisons surrendered to Belgian forces during WWI. During Belgian rule, the power and privileges of the Tutsi increased, as the new masters found it convenient to rule indirectly through the *mwami* and his princes. However, in 1956, *Mwami Rudahigwa* called for independence from Belgium and the Belgians began to switch allegiance to the Hutu majority. The Tutsi favored fast-track independence, while the Hutus wanted the introduction of democracy first” (*Lonely Planet, 2013*).

“In 1959, three years before independence from Belgium, the majority ethnic group, the Hutus, overthrew the ruling Tutsi king. Over the next several years, thousands of Tutsis were killed, and some 150,000 driven into exile in neighboring countries. The children of these exiles later formed a rebel group, the Rwandan Patriotic Front (RPF), and began a civil war in 1990. The war, along with several political and economic upheavals, exacerbated ethnic tensions, culminating in April 1994 in a state-orchestrated genocide, in which Rwandans killed up to a million of their fellow citizens, including approximately three-quarters of the Tutsi population. The genocide ended later that same year when the predominantly Tutsi RPF, operating out of Uganda and northern Rwanda, defeated the national army and Hutu militias, and established an RPF-led government of national unity. Approximately 2 million Hutu refugees – many fearing Tutsi retribution – fled to neighboring Burundi, Tanzania, Uganda, and Zaire. Since then, most of the refugees have returned to Rwanda, but several thousand remained in the neighboring Democratic Republic of the Congo (DRC, the former Zaire) and formed an extremist insurgency bent on retaking Rwanda, much as the RPF tried in 1990. Rwanda held its first local elections in 1999 and its first post-genocide presidential and legislative elections in 2003. Rwanda in 2009 staged a joint military operation with the Congolese Army in DRC to rout out the Hutu extremist insurgency there and Kigali and Kinshasa restored diplomatic relations. Rwanda also joined the Commonwealth in late 2009” (*WorldFactbook, 2013*).

Slightly smaller than Maryland, Rwanda is bordered by Burundi (290 km) (*PE&RS, November 2009*), Democratic Republic of the Congo (217 km) (*PE&RS, June 2005*), Tanzania (217 km) (*PE&RS, February 2008*), and Uganda (169 km) (*PE&RS, August 2012*). The lowest point is the Rusizi River (950 m), and the highest point is Volcan Karisimbi (4,519 m). Rwanda is comprised of “mostly grassy

uplands and hills; relief is mountainous with altitude declining from west to east” (*ibid. WorldFactbook*).

“Extending from west to east between the Rusizi (*Ruzizi*) and Kagera rivers, the Burundi–Rwanda boundary has a length of about 180 miles. Most of the boundary follows streams, of which the Ruwa (*Luhwa*), Kanyaru (*Akanyaru*), and Kagera are the principal rivers. It also passes through Lac Cohoha (*Lac Cyohoha–Sud*) and Lac Rweru (*Lac Rugwero*) and utilizes a number of straight-line segments between streams. There are no known boundary pillars demarcating the boundary” (*International Boundary Study, Burundi – Rwanda Boundary, No. 72 – June 1, 1966, U.S. Dept. of State*).

“The Congo (Leopoldville) - Rwanda boundary has a length of approximately 135 miles. Southward from the Uganda tripoint on Volcan Sabinyo (*Sabinio*), it crosses an area of volcanic mountains for about 37 miles, passes through Lac Kivu for 71 miles, and follows the thalweg of the Ruzizi (*Rusizi*) for 27 miles. The Burundi tripoint is located at the junction of the Ruzizi and Luhwa (*Ruwa*) rivers. A tripoint with Uganda was established initially in 1892 following a compromise agreement between the United Kingdom and Germany relative to their respective spheres of influence west of Lake Victoria. Article I, Paragraph 1 of the agreement provided that the boundary between British and German territories should follow the parallel of one degree south latitude across Lake Victoria and thence should continue westward, deflected only to include Mount Mufumbiro in the British sphere, to its intersection with the 30<sup>th</sup> meridian of longitude east of Greenwich. At this point the 30<sup>th</sup> meridian was the self-defined limit of the Congo Free State” (*International Boundary Study, Democratic Republic of the Congo (Zaire) – Rwanda Boundary, No. 52 – June 15, 1965, U.S. Dept. of State*).

“The Rwanda - Tanzania boundary is demarcated throughout by the Kagera or by pillars. In the south the Burundi tripoint is located at the confluence of the Mwibu and Kagera, and in the north the Uganda tripoint is located at the confluence of the Kagitumba (*Kakitumba*) and Kagera. Except for straight-line segments between pillars in the central part, it follows the thalweg or median of the Kagera. The boundary is about 135 miles in length (*International Boundary Study, Rwanda – Tanzania Boundary, No. 69 – May 2, 1966, U.S. Dept. of State*).

“The Rwanda - Uganda boundary has a length of approximately 105 miles, of which about 40 percent consists of streams. Eastward from the Congo (Leopoldville) tripoint on Sabinio (*Volcan Sabinyo*) peak, it passes through an area of volcanic mountains for about 29 miles, follows the thalweg of the Vigaga (*Kirurumu*) for 8 miles, crosses a second area of high peaks (including 3 miles of swamps) for 37 miles, and follows down-stream successively the thalwegs of the Lubirizi, Muvogero (*Tshinzinga*), and Kagitumba (*Kagitumba*) river for 31 miles to the Tanzania tripoint. The tripoint is located at the junction of the thalweg of the Kagitumba and the midstream of the Kagera.

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The boundary is demarcated throughout either by pillars or streams” (*International Boundary Study, Rwanda – Uganda Boundary, No.54 – July 1, 1965, U.S. Dept. of State*).

Thanks to John W. Hager, the classical geodetic origin of the Cape Datum/Arc 1950 Datum is at Buffelsfontein (in Port Elizabeth, Union of South Africa) where:  $\Phi_o = 33^\circ 59' 32.000''$  S,  $\Lambda_o = 25^\circ 30' 44.622''$  E, azimuth to Zuurberg measured from South:  $\alpha_o = 183^\circ 58' 15.00''$ ,  $\xi = -3.46''$ ,  $\eta = -0.59''$ ,  $h_o = 280.1$  m, and the ellipsoid of reference is the Clarke 1880 where:  $a = 6,378,249.145$  m, and  $1/f = 293.465$ . Rwanda is covered by the Congo Oriental Transverse Mercator Belt (*Fuseau*)  $30^\circ$  where  $\lambda_o = 30^\circ$  E,  $m_o = 1.0$ , False Easting = 220 km, False Northing = 565 km. The published relation between Arc 1950 Datum and WGS84 Datum near Rwanda (in Burundi) by the NGA is as follows:  $\Delta X = -153$  m  $\pm 20$  m,  $\Delta Y = -5$  m  $\pm 20$  m,  $\Delta Z = -292$  m  $\pm 20$  m, and this solution was based on 3 points in 1991.



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