

Anniversaries

Bailey Willis in Patagonia 110 years ago



THE ROLE OF BAILEY WILLIS (1857–1949) IN THE DEVELOPMENT OF NORTHERN PATAGONIA

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This year marks the 110th anniversary of one of the most important surveys carried out in relation to applied geology in northern Patagonia, central to the project works developed by Bailey Willis in the area during 1911–1913.



Figure 1. Bailey Willis with his dog "Feo" (c. 1912)
(Museo de la Patagonia Dr. Francisco P. Moreno Archives,
San Carlos de Bariloche)

Bailey Willis (Fig. 1) was born in 1857 in New York City and died in Palo Alto, California in 1949. He earned degrees as a Mining Engineer and Civil Engineer from Columbia University. He worked as a geologist in the "Northern Pacific Railroad" and the US Geological Survey and taught geology at Johns Hopkins, Chicago and Stanford Universities. He specialized in structural geology and seismology

He first worked in the Appalachians and his studies resulted in his book "The Mechanics of Appalachian Structure". He also played a key role in getting Mount Rainier designated as a national park in 1899. In 1903 he accepted an invitation from the "Carnegie Institution" to direct an expedition to northern China. His trip, which covered many countries, lasted more than a year and resulted in a four-volume report, which constituted one of the first major contributions to the geology of China. A popular version of this trip was published in his last book, "Friendly China".

He also worked in the "Cascade Range" in Washington and in the "Glacier Park" region in Montana. Later he dedicated himself to the study of the "coast ranges" and especially to issues related to the supply of water to San Francisco and other cities, to the foundations of the "Golden Gate" bridge, damage to buildings by earthquakes and problems of military importance in relation to the two world wars. His structural studies became related to old and recent active faults, such as the San Andreas Fault and resulted in his book "Geologic Structures" and in a map on the faults known in California.

He was a member of the National Academy of Sciences and President of the Geological and Seismological Societies of America. He received many recognitions of his work including an honorary Ph.D. degree from the University of Berlin and the Gold Medal of the Société de

Géographie of France in 1910, the Legion of Honor of Belgium, in 1936, and in 1944 he was awarded the Penrose Medal by the Geological Society of America.

Between 1910 and 1914 he was based in Argentina where he chaired a Commission for Hydrological Studies of the General Directorate of Railways of the Ministry of Public Works, that carried out the first detailed mapping of the south of the Province of Rio Negro in northern Patagonia. The main objectives were to provide drinking water to the town of San Antonio Oeste on the Atlantic coast and to build a railroad line from there to Lake Nahuel Huapi in the Andes and to Chile. Work in the field would comprise topographical, geological and economic studies.

The first task assigned to the Commission, in 1911, was to study the geological structure of the area in San Antonio, with the aim of discovering groundwater.

When geological investigations showed that there was not enough water, topographic and hydrological investigations were begun, of what was called the Valcheta Reclamation Project, in order to use the waters of the Valcheta stream for the supply of San Antonio, the needs of the railroad and for irrigation. The report, presented on October 10, 1911, included the technical specifications of three reservoirs, the final course of a pipeline to San Antonio and the schedule of the works to be carried out.

The commission continued the works westwards from Valcheta, with the purpose of prolonging the railroad to Lake Nahuel Huapi in the Andes and even the Chilean border, to build, with the cooperation of Chile, an international and transcontinental line that reached Valdivia on the Pacific coastline. The final report on the "Cordilleran section of the Transcontinental Railroad of San Antonio in Argentina to Valdivia in Chile" was presented in January 1912. The project was that the railway would arrive to the future city of Nahuel Huapi and through the northern shore of Lake Nahuel Huapi reach Lake Villarino and from there, through Chilean territory, Valdivia and Puerto Corral. The set of maps resulting from these studies covered an area stretching from the Atlantic to the Chilean border. For this purpose, a 10 km wide strip was measured in a 1: 100,000 scale with contour lines with 10 m of equidistance. Outside this belt the scale was 1:200,000 with contour lines with an equidistance of 20 meters. As the work in geographical extension advanced, its sphere of action also grew, to cover all natural resources for industries that could over time give life to the transcontinental railroad.

The works along the eastern slope of the Andes, between San Martin de los Andes (lat. 39° 40' S), in the north and Corcovado (lat. 43° 40' s), in the south, were completed for April 1913. As a result, Bailey Willis drafted a proposal setting out a series of conditions to colonize the "Cordilleran Province ", between the 38° and 44° S, which he considered could sustain 3,000,000 inhabitants, with land suitable for agriculture, forests, grazing fields, and especially hydraulic power, for the establishment of industries that would allow the country to become independent of foreign manufactures. The studies also included an assessment of the possible links north and south of the San Antonio railroad.

In relation to these ideas Willis synthesized the main features of the region studied, both in their geographical and physiographic aspects, in two works that were presented at the XII International Geological Congress, held in Toronto in 1913. In March of the same year the Commission completed the study of the railway layout from San Martin de los Andes to the south and from the Epuyen to the north and in May the reports were prepared, the maps were completed, and the lands were classified on them for their possible uses.

The results of these studies were included in a book, entitled "El Norte de la Patagonia", of which the first of the two intended volumes was published in Spanish in the U.S. by Scribner Press in 1914.

This work comprised 4 main sections, the first two dedicated to the description of northern Patagonia, one of them from the extra-Andean region and the other from the Andean region. In the third section the natural riches of the Andes between 39° and 44° S were described and

the fourth was dedicated to Lake Nahuel Huapi as the seat of future cities and included a general description or sketch of the Project of a National Park. Finally, a report was presented on sites suitable for touristic resorts and for an industrial city (Fig. 2), the details of which were to be included in Volume II, which remained unpublished until a century later. An appendix to Volume I included maps at a 1:200,000 scale with contour lines with an equidistance of 20 m that covered the entire region studied in the report, between San Antonio Oeste and the Andes.

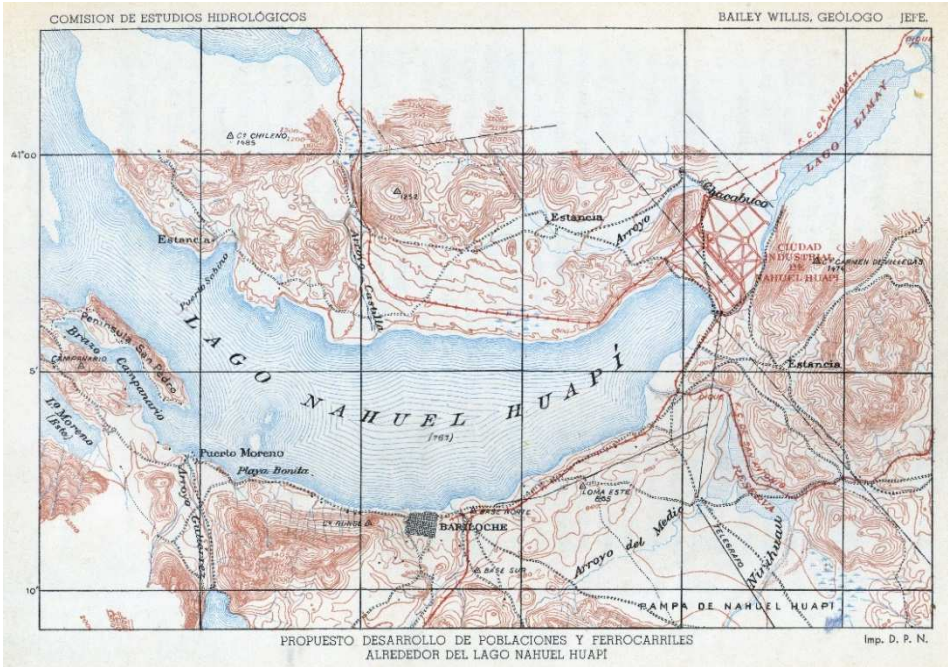


Figure 2. Development project of towns and railways around Lake Nahuel Huapi (in Willis 1914a, p. 42).

In these reports the requirements for the selection of a place to build an industrial city were indicated, as well as the project of a dam with which the flow of the Limay River could be regulated and used to produce electrical power. A National Park was planned between Junín de los Andes (lat. 40° S) and Esquel (lat. 43° S). The city would be built upstream and was planned for a population of 40,000 inhabitants with a capacity of increase to 100,000. To this end, a detailed map of the city (Fig. 3) with streets and avenues was presented, indicating the area of manufacturing establishments, another of shopping centers, a residential area and one of railway workshops and military reserve.

Water supply, sewerage and park systems were also drafted in the plans and construction materials were to be sourced, according to local availability. For the water supply for the city, on an estimated need of 700 liters / person / day, it was considered that the most advantageous alternative was a reservoir and a dam to be built to the south on the Ñirihuau River two kilometers from its mouth in Lake Nahuel Huapi, with a storage capacity of 4 million cubic meters.

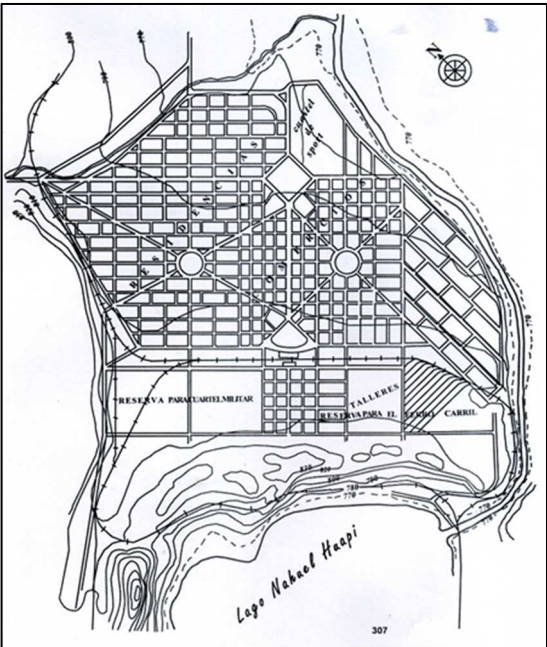


Figure 3. Nahuel Huapi industrial city, project (Willis, 2017, p. 307)

By the end of 1914 Willis was in the U.S. working on the preparation of the second volume of the "North of Patagonia", but in January 1915 the President of the country refused to extend the contract, and the Hydrological Studies Commission ceased to exist. The unpublished documentation was delivered by Bailey Willis in 1938 to the Argentine National Parks and only became available on Internet in 2017.

That Volume II included all unpublished documents produced by Willis, such as a project to create a "South National Park" that was to have approximately 11,000 Km², from Lake Lacar (lat. 40° S), in Neuquén, to the Cordón de Cholila (lat. 43° S), in Chubut. After finishing his work in Argentina, Bailey Willis wrote an account in which he synthesized his vision of the country, mainly in its aspects of economic geography. Finally, his experiences in the four years he spent in Argentina were recounted in his book "A Yankee in Patagonia", published in 1947.



Figure 4. Commission for Hydrological Studies, 1912. Left to right, below: W.L. Lewis, W. Graenacher, Ch. W. Washburne; centre: C.L. Nelson, E. Frey, B. Willis, O. Luginbuhl, W. Eschmann; behind: J.S. Mercer, J.R. Pemberton, W.D. Jones. (from Willis, 1943, p. 10-11)

The surveys and works developed in northern Patagonia by Bailey Willis and his 10 collaborators (Fig. 4) over a span of less than three years can be considered an exceptional achievement. From a geological point of view these were mainly applied, ranging from hydrogeology and hydrology, to the construction of dams and bridges, the layout of roads and railways, soil studies and urban planning.

Thus, these studies were the first and probably the most important of their kind, due to their extension, thoroughness and variety, that were carried out in Argentina between the nineteenth and the earliest twentieth century.

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Publication online: Posted IUGS Website / INHIGEO Website Anniversaries
October 2022
IUGS E-Bulletin Issue 191, October 2022.

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