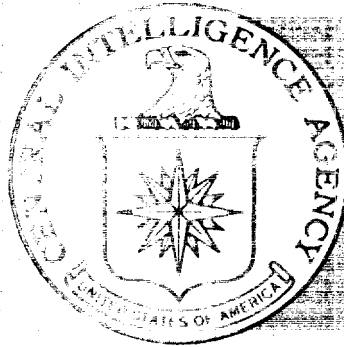


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GEOGRAPHIC NOTES ON TANNU TUVA



M-11

Published September 1950

DOCUMENT NO. _____
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NEXT REVIEW DATE: _____
AUTH: HR 70-2
DATE 8-27-79 REVIEWER: 372044

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Mountain Systems of Tannu Tuva and
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Resources, Land Utilization, and
Industries of Tannu Tuva (CIA 11056)

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GEOGRAPHIC NOTES ON TANNU TUVA

SUMMARY

Tannu Tuva is a remote area little known to any nation other than the USSR. It lies near the center of the Asiatic Continent between Siberian USSR to the north and west and Mongolia to the east and south. Tannu Tuva was incorporated into the USSR on 13 October 1944 and is known as the Tuvinskaya Autonomnaya Oblast' (Tuvinian Autonomous Oblast). Unconfirmed reports have indicated that Tannu Tuva might be a possible location for Soviet atomic plants.

Most of the available source materials on Tannu Tuva are based on Tsarist and Soviet surveys, which in the past were conducted spasmodically and without comprehensive plan. Tsarist surveys are old and incomplete; Soviet surveys are incompletely published, and some information is known to have been withheld for strategic reasons. The present report is based on such incomplete and unconfirmed data as are available.

As late as 1926, no comprehensive geological surveys had been undertaken. In recent years, however, geological surveying has increased considerably, but the results of the recent surveys are not available.

Note: The intelligence organizations of the Departments of State, Army, Navy, and the Air Force have concurred in this report. It contains information available to CIA as of April 1950.

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Tannu Tuva is known to have deposits of gold, copper, iron, coal, petroleum, graphite, silver and lead, platinum, iridium, asbestos, magnesite, salt, marble, kaolin, fine-grained sandstone, and gems. Radium has been reported in association with mineral springs.

There are seventeen known power stations in Tannu Tuva. Nothing is known of their capacities, and the source of energy is known for only one station. Tannu Tuva has fairly large coal deposits and some petroleum, both of which might be used to fuel thermal stations, as well as several good sites for hydroelectric plants.

The transportation system is primitive. There are no railroads. The road system includes a local network radiating from the capital to the provincial centers, and two improved trans-Tuvinian roads between the USSR and Mongolia. River transportation is developed only for local service. All improvements in transportation are Soviet-sponsored. Elaborate plans have been made for the extension and improvement of both land and water routes in order to channel Asiatic trade through Tannu Tuva to the USSR.

The country is sparsely populated, having an average density of nearly two persons per square mile. Over four-fifths are natives, most of them of Turkic origin. Russians constitute the largest foreign element.

Tannu Tuva is a rugged land of mountains and river basins, most of which is subarid to arid. Winters are long and cold, and seasonal and diurnal temperature ranges are large. Forests are found principally in

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the higher elevations and on north-facing slopes. Grasslands include luxuriant grass, tuft-dotted scrub, and alpine meadows.

The basic economic activity is nomadic animal husbandry, followed by hunting, fishing, and a little agriculture. In 1930, only about 25 percent of the households engaged in agriculture. Crop raising was introduced by Russian pioneers, but the expansion of cultivation under Soviet sponsorship did not begin until after the Tuvinian revolution of 1921. Soviet policy has encouraged the transformation of nomadic livestock raising into sedentary animal husbandry by fostering production of fodder crops, the improvement of cattle strains, the introduction of machinery, and by collectivization.

The surplus food potential cannot be estimated. Small increases in grain production may be expected through the introduction of early-maturing, drought-resistant crops or from the extension of the area under irrigation. A greater increase might be expected in cattle production through a more efficient use of the grasslands and by an increase in the production of drought-resistant forage crops.

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I. GENERAL DESCRIPTION

A. Relation of Tannu Tuva to the USSR.

Tannu Tuva¹ is a remote, undeveloped, and little-known area located near the center of the Asiatic continent. Nevertheless, Russian, Chinese, and Mongolian interests have struggled to gain domination over Tannu Tuva for more than three centuries. Since the defeat of the White Russian forces by the Red Army and native Tuvinians in 1921--the so-called Tuvinian People's Revolution--the Soviet Union has exercised dominant influence over the area. On 13 October 1944, it was incorporated into the USSR and became known as the Tuvinskaya Avtonomnaya Oblast' (Tuvinian Autonomous Oblast). Significantly, the Tuvinian AO is subordinated directly to the Russian Soviet Federated Socialist Republic rather than to either of the two krays that border it. Prior to the incorporation of northern East Prussia as Kaliningrad Oblast, Tannu Tuva was the only exclave of the RSFSR. This unusual administrative setup places Tannu Tuva under the direct control of Moscow.

After the revolution of 1921, progressively less information on Tannu Tuva has reached the outside world, even though economic development of

1. Also spelled Tana Tuva, Tanna-Tuva, Tannu-Tuva. Prior to 1921 it was known as Uryankhai. After the "people's revolution" of 1921, it became known as the Tuvinian Peoples Republic. In Soviet Literature it has frequently been called Tuva, the Tuva Basin, or simply the Basin.

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the area under Soviet influence had begun. Before World War II, Tannu Tuva was strategically located in relation to the newly developed industrial region of the Kuznetsk Basin and the rich agricultural lands of the Minusinsk Basin. In the postwar period, there has been some speculation concerning the suitability of Tannu Tuva as the site of a Soviet "Atomgrad."¹

Exaggerated claims have been made about the favorable climate conditions, inaccessibility, and wealth of resources of Tannu Tuva in order to indicate its suitability for the location of Soviet atomic plants. Although information on the area is inadequate and spotty, enough data have been collected to provide a more realistic and balanced picture of the geography and economy of Tannu Tuva.

B. Location and Size.

Tannu Tuva lies on the northwestern edge of the Mongolian plateau between 49° and 53° north latitude and 88° and 98° west longitude. Kyzyl, its capital, is located 2,899 air miles from Moscow, 2,520 miles from Tokyo, 1,865 miles from Delhi, India, and 1,785 miles from Kabul.

1. Feodor S. Mansvetov, "Tannu Tuva.... the Soviet Atom City," The Russian Review, Vol. 6, No. 2, 1947, pp. 9-19, translated into Chinese by Ho Shen and published in the Chinese periodical, New Nation, No. 12, 1 November 1947. The Chinese version was translated into English by the CIA and disseminated as OO-W-691, dated 3 August 1947. Albert Parry, "Russia's Three Atomgrads," Source Digest, December 1948, pp. 26-27. See also: Haagsche Post (The Hague), 24 July 1948.

The size of the country is difficult to determine because its boundaries have never been delimited or demarcated. Soviet maps published as recently as 1938-39 do not agree with later Soviet maps or with Chinese maps.¹

So far as is known, there has been no Tuvinian survey organization. It is probable that all surveying and mapping is now in the hands of the Voenno-Topograficheskoye Upravleniye General'nogo Shtaba Vooruzhënnnykh Sil SSSR² (Military-Topographic Administration of the General Staff of the Armed Forces of the USSR).

Official Soviet estimates of the area are not consistent. The 1945 estimate is 192,000 sq. km. (74,150 sq. mi.), an area slightly smaller than the state of Nebraska. The 1949 estimate is 171,300 sq. km. (66,122 sq. mi.), or slightly smaller than the state of Washington. The longest east-west extent of Tannu Tuva is approximately 420 miles; the north-south varies from 54 to 270 miles.

C. General Characteristics.

Tannu Tuva is a land of mountains and river basins. Over one-half of its area is mountainous. Plains are small and are found chiefly along rivers and between some small tributaries. Rolling land occupies a much larger area, chiefly in the large river basins.

1 Two Russo-Chinese treaties of 1727 were intended to delimit the boundary between Russia and China but left the area of Tannu Tuva a no-man's land. The treaties defined the boundary as following a mountain range. Unaware of the terrain of the area, the Russians placed their markers along the Northern Sayan ranges, while the Chinese placed theirs along the southern foot of the Tannu Mountains.

2 The name of this organization may have been changed as a result of the separation of the Navy from the other armed forces (Pravda, 26 February 1950).

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The mountains of Tannu Tuva separate the Western Siberian Lowland on the northwest and the Central Siberian Plateau on the north from the Mongolian hills and plains to the south and the southeast. Elevations are moderate to high, ranging from 500 m. (1,640 feet) in the lower areas to nearly 3,500 m. (11,500 ft.)¹. The mountains not only hinder land and river communications, but also cause great variations in local climate and vegetation.

Most of Tannu Tuva lies within the northern Asiatic drainage system. Only a small area on the southern slopes of the Tannu Mountains drains toward Mongolia. The headwaters of the great Siberian river--the Yenisey--rise within the mountains of Tannu Tuva, and in early Russian literature the area was known as the Upper Yenisey Basin.

In shape, Tannu Tuva resembles a sack tied near the middle. The larger part lies to the east and contains over three-fourths of the total area.

The region is surrounded by mountain systems: the Shapshal'skiy Khrebet (Shapshal Ridge) of the Russian or Eastern Altay on the west, the Western and Eastern Sayans on the northwest and northeast, the Ulaan-Tayga or Bain-Ola on the east, and the Tannu Mountains on the south.

1. In converting from meters to feet, the English equivalents are given in rounded numbers if the original Russian figures were estimates rather than exact measurements.

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A fifth mountain range, the Khrebet Ogarkha-Ola lies wholly within the country.

The four principal basins of Tannu Tuva are named after the rivers flowing through them. The Bey Kem¹ and the Khua Kem¹ rivers join to form the Ulu Kem² which farther on is joined by the Khemchik to form the Yenisey. Tributary rivers have carved out secondary valleys varying in character from small flat-bottomed valleys to narrow, steep-walled gorges.

1 The Bey Kem and Khua Kem are named Bol'shoy and Malyy Yenisey, respectively, on Soviet maps and in Soviet literature.

2 Identified as Yenisey on Soviet maps.

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II. MINERAL RESOURCES

Tannu Tuva is known to possess a variety of mineral resources, but information concerning them is scant. Up to 1926, the resources had not been studied or described systematically. There appears to have been no over-all plan for a mineral survey, although there were thirty-two exploratory expeditions between 1842 and 1924. Available descriptions of the expeditions are concentrated on the central or Ulu Kem valley and the surrounding areas. The larger western and eastern basins have been covered by only a few reconnaissance surveys.

What appears to have been a systematic program of geological surveys was begun in 1917 by the Russian Geological Committee and was continued after the Revolution under Soviet direction. A commission for the survey of Mongolia and Tannu Tuva was organized under the Academy of Sciences of the USSR, but its reports published in 1926 do not include information on Tannu Tuva. Since 1926, little or no information on expeditions has been obtainable, although the Commission has published "Osnovnyye Cherty Geologii Tuvy" (Basic Outlines of the Geology of Tuva) by Z. A. Lebedeva in Trudy Mongol'skoy Komissii (Transactions of the Mongolian Commission), No. 26, 1938. A bibliography appended to this

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Soviet study lists three works published in 1934. Two¹ give additional geological data on the Western Sayans and one² on geological explorations in a region of asbestos deposits in the Upper Yenisey.

The Institute of Geology of the Academy of Sciences of the USSR, according to its report for 1944, has undertaken a number of expeditions to study the structure of a vast area in Siberia and northern Mongolia for purposes of locating and analyzing the mineral resources. The Academy views the broad eastern Siberian area, including the Mongolian-Transbaykal section, as one of the chief mineral repositories of the USSR. Geologic prospecting was contemplated "in the Lake Kosogol (Höbsögöl Dalay) area and in the upper part of the Yenisey river"--presumably Tannu Tuva. The June 1946 report refers to five expeditions of the Eastern Tin Combine, which is engaged in exploration for non-ferrous metal, "in the eastern Sayan region" where important tin and wolfram deposits had been discovered.

There have also been geological surveys in areas surrounding Tannu Tuva. In the border region of the Irkutsk Oblast and the Buryat-Mongolian ASSR and in and around the northeastern foothills of the Eastern

1. O Vostraste Nizhnepaleozoyskikh Svit Zapadnogo Sayana (On the Age of the Lower Paleozoic Formation of the Western Sayan) by A. G. Vologdin. Vestnik Zapadno-Sibirskogo Gorno-Geologicheskogo Tresta Vyp. 3, 1934.

Novyye Dannyye po Geologii Zapadnogo Sayana (New Data on the Geology of the Western Sayan) by V. A. Kuznetsov. Ibid., Vyp. 2, 1934.

2. "Geologicheskkiye Issledovaniya v Rayone Aktovraskogo Mestorozhdeniya Asbesta v Verkhov'yakh Yeniseya" (Geological Explorations in the Region of the Aktovrak Asbestos Deposits in the Upper Reaches of the Yenisey) by P. M. Tatarinov, V. A. Kuznetsov, K. S. Filatov. Trudy Tsentral'no-Nauchnogo Geologo-Razvedochnogo Instituta, Vyp. 13, 1934.

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Sayan Mountains, a North Baykal Expedition started to survey deposits described as "important" and containing "high-quality ores." Pravda, in its edition of 22 March 1948, reports that the Western-Siberian branch of the Academy of Sciences of the USSR is sending forty-two expeditions to Western Siberia, the Buryat-Mongolian ASSR and the Tuva Autonomous Oblast, and that "a complex South-Yenisey expedition, which is studying the natural wealth of a vast area, is continuing its work." The Sovet po Izucheniyu Proizvoditel'nykh Sil SSSR (USSR Council on the Study of the Productive Forces) of the Academy of Sciences of the USSR was reportedly planning to send an expedition to the Krasnoyarsk area, the environs of Minusinsk, and the Tuva Autonomous Oblast in May 1948 "in search of minerals, iron ore in particular, and for developing improved methods of agriculture." There is reason to believe that these expeditions are not as sporadic as they appear, but that they are all carefully correlated within the framework of the Fourth Five-Year Plan.

The following description of mineral resources is based on information dated 1926 or earlier because no information is available on subsequent discoveries. Before 1926, the exploitation of known resources was primitive. Gold, the most widely mined mineral, had the greatest production value. Petroleum, coal, copper, salt, and magnesite were exploited to a limited degree.

A. Gold.

As early as 1838, alluvial gold deposits were discovered in the upper courses of the Systyg Khem, a right-bank tributary of the central Bey Kem, just across the Sayan mountains from Minusink, Siberia. Exploitation

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began in the 1840's, and gradually spread southward and westward into the Ulu Kem valley. By 1883, production totalled 19,404 pounds of gold per year. Exploitation extended into the northern slopes of the Tannu Mountains, particularly along the Elegest River, a left-bank tributary of the Ulu Kem, and eastward along the Tapsa valley. By 1912, gold production in Tannu Tuva amounted to over 25,000 pounds.

In 1924, gold mining was reported in small areas of several river valleys--the tributary valleys of the Bey Kem (chiefly the Systyg Khem, Uyuk, Oja, and Tapsa rivers), in the Ulu Kem valley (chiefly the Serlik and the Elegest), and in the Khemchik valley. A 1940 Soviet map (source of the map drawn for this report) shows five additional gold mining centers, which are located along the upper course of the Malyy Shibey, on the upper Kargy, a tributary of the Khua Kem northeast of the settlement of Boyarovka, and along a right-bank tributary of the lower Ulu Kem. Soviet reports describe the deposits as being very rich; some deposits have been reported as producing an ore ranging from \$18.00 to \$28.00 (US)¹ per short ton, and a few (including one along the Khoral River) as much as \$38.00. Additional deposits have been reported in the Khemchik Basin, and in the eastern regions along the Khamsara river, a right-bank tributary of the central Bey Kem. No production data for

1. At \$35.00 per troy ounce of gold.

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these regions are available. Lode gold deposits have been reported in the Systyg Khen valley, in the Tapsa valley, and in the region of the Elegest valley, but no production data are available.

B. Copper.

At one time copper rated next to gold in importance. Abandoned primitive copper mines have been mentioned by travelers, and copper artifacts that have been found indicated that copper was mined and smelted in ancient times. Deposits have been reported along two tributaries of the Khemchik River, where natives mine some copper and smelt it in primitive clay furnaces for the manufacture of small articles. In 1945, copper deposits were discovered in the region between the Bey Kem and the Khua Kem rivers. No information is available on the quality or extent of the deposits.

C. Silver and Lead.

Silver and lead ores have been worked since early times in the region of the Bol'shoy Ish-Kem and Malyy Ish-Kem rivers. Additional deposits have been reported along the Okol River, a right-bank tributary of the Ulu Kem.

D. Platinum.

Definite evidences of deposits have been found in the valleys of the Zolotoy River and the Alash River of the Khemchik Basin, and along the Khamsara River in the Bey Kem Basin.

E. Iridium.

Iridium has been found near the mouth of the Tapsa River.

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F. Radium.

Radium deposits were reported in 1924 by one Russian source¹ as follows: "In the course of time even more significance will be acquired by the platinum and radium ores of Uryankhay [a former name of Tannu Tuva] Judging by the very great radioactivity of some of the surveyed springs, the significance of Uryankhay's radioactive deposits may be extremely great." These springs are not located. Unconfirmed reports state that uranium deposits in the Tuva AO are being worked successfully. No details are given.

G. Iron Ore.

Iron ore is found along the Temir-suk River (whose name in Turkic means "iron brook"), in the upper course of the Uyuk River, and along the Ulu Kem just above the mouth of the Shagonar. Large deposits of hematite and magnetite have been reported in the Khemchik Basin, and in the tributary valleys of the Talat, Bengal'chik, and Ili Kem. No data on reserves or production are available. In 1945, iron ore deposits of unknown value and extent were discovered in the area between the Bey Kem and Khua Kem rivers.

H. Coal.

The coal deposits of Tannu Tuva are described as important, but the only deposit being mined in 1926 was one of three located in the Bey Kem

1. A. K. Lvov, "Sovremsnnyy Uryankhay" Novyy Vostok, No. 6, 1924, p. 11.

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valley not far from Kyzyl. In that year, 270 tons were produced by primitive methods. The coal is claimed to be high-quality bituminous, and reserves are estimated as equal in size to those of the Donets Basin in the USSR (a total of 88,872,000,000, metric tons of anthracite and bituminous coal). Other deposits have been discovered in the Elegest valley, along the Irbek River, and in other places. All deposits are said to be of excellent quality, with seams of workable thickness.

I. Petroleum.

There is an oil spring in the Ulu Kem valley just below the confluence of the Bey and Khua Kem. The oil has been used to fuel a thermal power station near Kyzyl. No additional information on production or on other occurrences is available.

J. Graphite.

Deposits of graphite have been reported in the Ulaan Tayga mountains between the Altryk and Balryk rivers, as well as near Höbsögöl Dalay.

K. Asbestos.

Asbestos occurs in deposits of serpentine along the left bank of the Ulu Kem 10 km. (6 miles) below Shagonar, and in the uplands between the Alash and Kemchik rivers. The latter deposits are claimed to be of better quality than those of Canada, and reserves are estimated at 1,600,000 tons.

L. Other Minerals.

Other mineral deposits are of local importance. Magnesite deposits near the mouth of the Barlyk on the Khemchik River have long been mined by the natives and by Russian merchants. Rock salt has been mined

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along the Torgalyg River on the northern slope of the Tannu Mountains. Precipitated salt is being produced from Lake Tuskul, 35 km. (20 miles) south of Kyzyl. Deposits of marble, kaolin, granite, fine grained sandstone, and gems are reported but their locations are not given.

There are numerous mineral springs in Tannu Tuva. The most important are located in the Toma-suk area about 4 km. west of Kyzyl. Carbonate springs and hot mineral lakes are located in the By-sug and Khamsara valleys. The hot sulfur spring (122° F.) and the carbonate springs of Arasay are located in the upper reaches of Tairis River in the Tannu Mountains.

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III. ELECTRIC POWER RESOURCES AND DEVELOPMENT

Information on current electric power development in Tannu Tuva is not available. During the period 1939-40, there were eleven power stations in Tannu Tuva. The "Large Soviet Encyclopedia," Vol. 55, 1947, states that there are seventeen but no information about them is given. Ten stations are located on or near rivers, which suggests that they may be hydroelectric stations. The one known thermal station is located near Kyzyl and is fueled by petroleum.

Although it is impossible to estimate the energy resources of Tannu Tuva, they appear to be considerable. The most likely region for power development would seem to be the Ulu Kem valley near Kyzyl, where there are known coal and petroleum resources. The coal resources, if estimates are accurate, are substantial and could fuel large installations. The petroleum reserves, which are now fueling one station, could provide supplementary power. Furthermore, the Ulu Kem is the closest and most accessible valley to the USSR for transport of the necessary equipment. Finally, the Ulu Kem is the most densely populated and the most important basin of Tannu Tuva.

Volume and gradient of the rivers seem to be adequate for large hydroelectric stations in four areas. The steep, narrow valley where the Bey Kem crosses the Taskyl offers a possibility that is well located in relation to the important Usinsk route which crosses the Sayans from Kyzyl to Minusinsk. Another possible site is in the valley of the Khua Kem about 40-50 km. southeast of Kyzyl above Bel'vey, where the river flows through the narrows of the Ogarkha-Ola. A third possibility might

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be in one of the gorges of the lower Khemchik River where it joins the Ulu Kem and Yenisey near the border of Tannu Tuva. A fourth possibility, which is north of Tannu Tuva in the Yenisey River, is the so-called Great Gorge. In the 150 miles of its length, the river drops in elevation from 570 m. to 300 m. (1,860-1,000 ft.) above sea level. The gorge is narrow, with canyon-like walls, and through it the water flows in a torrent. A hydroelectric project could be designed to produce power and at the same time provide a system of locks for river traffic.

The streams flowing down the northern slopes of the Tannu Mountains have sufficient gradients for power development, but irregularity of flow limits their value. There may be other suitable sites for hydroelectric stations, but there are not sufficient data to identify them.

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IV. TRANSPORTATION

Until recently, transport in Tannu Tuva has been very primitive. There are no railroads,¹ and the first motor road reached Kyzyl in 1926. The principal means of transportation has been overland by wagon, cart, and pack horse, and by rafts and small boats on the principal rivers. Trans-Tuvinian routes have never been important in Mongolian trans-continental transportation or in connecting Siberia to the north with Mongolia to the south.

According to 1925 data, roads passable for automobile transport measured about 2,100 km. (1,300 mi.) and surveyed navigable waterways measured 500 km. (300 mi.). The waterways were practically unused before 1925.

The slight development since the Tuvinian revolution of 1921 is undoubtedly the result of Soviet interest and initiative. Transport in Tannu Tuva is now administered by a government monopoly--Sovtuvtrans (Soviet-Tuvinian Transport). In 1942, the volume of Tuvinian transportation amounted to 2,193,000 ton-kilometers.

The entire transport system is focused on the Ulu Kem valley and river, where overland routes and river transport meet. Within the valley,

1. The nearest railroad is at Abakan about 110 air miles from the nearest border point of Tannu Tuva or about 190 air miles from Kyzyl. New railroad construction is now underway from Abakan to Abaza, a distance of about 40 miles. This will bring a railroad to within 21 air miles of the nearest border of Tannu Tuva.

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the trans-Tuvinian routes and the internal road net focus on two centers-- Kyzyl in the east and Shagonar in the west.

A. Roads.

The road system that serves purely local needs is not extensive. The "Large Soviet Encyclopedia" states that fourteen of the sixteen regional administrative divisions (Hoshuns) are connected with Kyzyl by graded and improved dirt roads. The main road of this system is an automobile road from Kyzyl Mazhalyk in the Khemchik valley to Kyzyl, which runs along the southern bank of the Ulu Kem following the old Soyote Steppe road. It has been described as "built from large chips of stone...."

Two trans-Tuvinian roads are also included in the road system of Tannu Tuva. The most important and most travelled runs north from Kyzyl to Minusinsk¹ in Siberia, and south to Tsagaan Olom on the trans-Mongolian Chuisk Highway² in Mongolia. The sector from Minusinsk to Kyzyl, about 400 km. (240 m.) long, is called the Usinsk Highway. The route begins at Minusinsk and continues via Grigor'yevka, Verkhne-Usinskoye, Tarlach, and Uyuk to the capital. It follows a tortuous route that crosses a number of ridges and valleys. Elevations

1. Located across the Yenisey River from Abakan, a terminus of the Trans-Siberian Railroad.
2. The Chuisk Highway is one of the historic trans-Mongolian routes which connects Kosh Agach, a terminus of a Trans-Siberian railroad feeder line in the USSR with Ulan Bator, capital of Mongolia.

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range from 225 m. (740 ft.) at Minusinsk to 1,926 m. (6,300 ft.) in the Turan Pass of the Western Sayans. The surface is reported to be gravelled. Although a Soviet map describes the road as an automobile route, parts are passable only in good weather, mainly during summer. According to one source, a trip from Minusinsk to Kyzyl by Russian cart required six days.

Construction of the road was begun by the Russians in the early 1900's. Progress was interrupted by the Revolution in 1917, but the Soviets resumed construction work in 1921, and the road reached Kyzyl in 1926. From Kyzyl, it continues southward and crosses the crest of the Tannu Mountains at the Khamar-Daban Pass (1408 m. or 4,618 ft.) to Samagaltay. Beyond this point it joins the automobile road from Tasgaan-Olom in Mongolia to Kultuk on the southwestern tip of Lake Baykal in Siberia.

The route as a whole is unsatisfactory for large-scale freight movement. The rugged terrain and severe mountain climate make travel hazardous and expensive. Although the Tannu Mountains have a permanent snow cover, the zone of snow increases in size in the winter and makes travel difficult south of Kyzyl. From Kyzyl north to Minusinsk, the road is practically impassable from the second half of October through December, and occasionally as late as May.

The potentially most important trade route connects one of the four east-west trans-Mongolian roads between Outer Mongolia and the Soviet Union (the Jirgalanta-Kosh Agach Highway) with Shagonar on the Ulu Kem.

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The section in Tannu Tuva measures about 640 km. (390 miles) in length. At Shagonar, freight is transferred to river boats or rafts and proceeds via the Ulu Kem and the Yenisey rivers, Navigation is hampered at all seasons by rapids in the Yenisey River where it cuts through the Western Sayans and is seasonally hampered by winter ice. Freight south from Shagonar across the Tannu Mountains is usually carried by carts of half-ton capacity. Although travel over the route is not considered especially rigorous, there is a stretch of about 20 km. (12 miles) through a zone of permanent snows that is difficult during the three winter months. The route will probably become the most important trans-Tuvian route if and when the Yenisey is opened to through-steamer navigation.

B. River Transportation.

Rivers have been little used for transportation in Tannu Tuva. In 1925, out of a total river freight turnover of 9,700 tons along the Ulu Kem between Ust'-Uyuk and Minusinsk, only 1,400 tons moved along the sector from Uyuk to Ust'Usinskoye (the Great Gorge).

The river routes of Tannu Tuva that are classified as navigable or potentially navigable include parts of the Ulu Kem and its two principal tributaries, the Bey Kem and the Khua Kem. The combined navigable length is estimated to be over 800 km. (490 miles), of which about 500 km. (300 miles) were surveyed in 1925 and are considered adequate for steamers. The remaining 300 km. (180 miles), though unsurveyed up to 1925, are considered navigable.

The estimated 500 km. of navigable routes in Tannu Tuva include 311 km. (190 miles) of the Ulu Kem from the Great Gorge upstream to the

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confluence of the Bey Kem and the Khua Kem at Kyzyl, 64 km. (40 mi.) up the Khua Kem to the "Uchzhory Rapids" (location unknown -- may be the Bel'vey Rapids), and another 125 km. (75 mi.) up the Bey Kem to the Ut Rapids. The Ulu Kem varies in width from 65 to 215 m. (200 to 700 ft.). The depth is adequate, as the low-water mark is 0.9 to 1.1 (2.9 to 3.6 ft.). The current is rapid, attaining a speed up to 6.4 km. (3.9 mi.) per hour and even to 10 km. (6 mi.) per hour in the narrower stretches. Because the river channel is narrow and winding below Cha Kul as far as Bol'shoy Porog (Great Rapids),¹ navigation is by medium-size steamers measuring up to 40 meters (131 ft.) in length, with a draft of 0.8 m. (2.6 ft.), a rating of 250 to 300 horsepower, and a freight capacity up to 82 tons.

The value of all water courses is limited by the large number of rapids and the shortness of the navigation season. The largest single obstacle is the Great Gorge formed by the entrenchment of the Yenisey in the Western Sayans. In that part of the Gorge where the river makes an S-swing for a distance of about 250 km. (155 mi.), rapids occur in six different places. The largest, Bol'shoy Porog, is reported as one kilometer (0.6 mi.) long and 50 m. (160 ft.) wide, with a current

1. Also known as the "Great Threshold."

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estimated at 8-9 km. (5-5.5 mi.) per hour. Because the Bol'shoy Porog is impassable for steamers, a portage road 1 1/4 km. (0.7. mi.) long has been built to bypass it. Below Bol'shoy Porog, the channel contains a variety of obstructions of all kinds and changes its course frequently. Navigation is by specially constructed rafts on which freight and passengers can be transported across the Great Rapid to Minusinsk. Because of ice conditions, the length of the navigation season is only 150 to 170 days annually. Some freight is moved in winter by sledge across the river ice.

As early as 1925, the Soviet Union showed interest in improving its transportation with Tannu Tuva. The Narodnyy Komissariat Putey Soobshcheniya SSSR (Peoples Commissariat of Routes of Communication, USSR) organized several interdepartmental conferences with various Soviet economic organizations in an effort to increase trade with Tannu Tuva. It was anticipated that, during the first year after the opening of improved navigation, up to 2,000 tons of raw materials (chiefly hides, wool, and minerals) would be shipped to the USSR annually. Furthermore, it was planned that a large portion of the commodities purchased by Soviet economic agencies in North China and Western Mongolia should be shipped via Tannu Tuva. This shift in freight movement was a part of Soviet plans to increase the use of Soviet waterways. The improvement of the waterways in Tannu Tuva was part of a plan to tie Mongolia to the USSR. Water transport would extend from the Great Northern Sea Route of the Arctic Ocean into inner Asia via the Yenisey. The extension of navigation to the upper reaches

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of the Yenisey system and the construction of a rail line from Abakan to Achinsk on the Trans-Siberian are both links in a major transportation artery that would connect the heart of Mongolia with the USSR.

Elaborate plans were formulated in 1925, and various investigations were made. In 1925, the Zapadno-Sibirskoye Gosudarstvennoye Parokhodstvo (Western Siberian States Navigation Authority), which had charge of the upper Yenisey, sponsored an experimental trip by launch across the Great Rapid and upstream to Kyzyl. On the basis of this trip and subsequent research, the following plans were projected:

(1) The removal of 11,500 cubic meters of rock for the elimination of the principal obstruction in the course of the river; the project was estimated to require two or three years;

(2) The building of a narrow-gauge railway to by-pass the Great Rapid and connect the upper and lower Yenisey;

(3) The establishment of freight-passenger routes between Kyzyl, the landing stations enroute, and the Great Rapid;

(4) The diversion of some of the freight moving from Mongolia westward overland via Biysk and Semipalatinsk and moving eastward via the Tunkinsk route to the Tannu Mountains -- Shagonary -- Ulu Kem route to Minusinsk;

(5) The construction of landings and warehouses at road and river junctions to facilitate increased shipments;

(6) An intensive study of river conditions and obstructions;

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(7) The training of pilots and navigators to cope with the special navigation problems along the Yenisey and Ulu Kem;

(8) The building of a 300-horsepower steamer for use in Tannu Tuva; as a result, the volume of freight between Tannu Tuva and Mongolia was expected to increase from 15,000 to 20,000 tons per year, of which 2,500 to 3,500 would be Tuvinian both in origin and destination. Information concerning progress on the plan is not available. A recent unconfirmed report, however, states that river transportation along the Upper Yenisey has been made possible by extensive blasting of the Great Rapids.

C. Communications

All of the khcshuns are connected with Kyzyl by a telephone network and radio communications. A telegraph line joins Kyzyl with Minusinsk.

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V. THE PEOPLE

There are no accurate population census data for Tannu Tuva.¹ The only figures available are estimates in Soviet sources, which are always given in rounded numbers. The 1939 population was given as 86,400² and the 1941 figure as "about 95,000."³ N.N. Baranskiy, in the 8th edition, 1947, of "Ekonomicheskaya Geografiya SSSR," reports the population as 100,000; in the 9th edition (revised), 1948, the figure is increased to 120,000. In neither book does Baranskiy indicate the dates for which the figures apply. The tenth edition of Baranskiy, 1949, omits all statistics on Tannu Tuva.

Since the data on the area and population of Tannu Tuva are not reliable, it is impossible to compute satisfactory estimates of population density. Assuming an area of 171,300 sq. km., and a population of

1. The use of election districts as a unit of population measurement may be questionable for Tannu Tuva. In 1945, Tuva AO was assigned one election district for the 1946 All-Union elections to the Soviet of the Union of the Supreme Soviet, USSR. The election districts were then apportioned on the basis of one per 300,000 population. It could be assumed, therefore, that the population of Tannu Tuva was between 300,000 and 600,000. For the 1947 Republic elections to the Supreme Soviet of the RSFSR, Tuva AO was again assigned only one election district although the population value for an election district was only 150,000. In the 1950 All-Union elections to the Soviet of the Union, Tuva AO was for the third time assigned one electoral district, on the basis of one district per 300,000 population. From this it appears possible that factors other than population governed the allocation of one electoral district.
2. Malaya Sovetskaya Entsiklopediya (Small Soviet Encyclopedia), Vol. 10, Moscow, 1940, cols. 866-871.
3. Bol'skaya Sovetskaya Entsiklopediya (Large Soviet Encyclopedia), Vol. 55, 1947, cols. 110-117.

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120,000, the average density would be 0.73 persons per square kilometer. The "Large Soviet Encyclopedia" gives an average estimated density of 0.47 per square kilometer for the country as a whole on the basis of an estimated population of "about 95,000" in 1941 and an estimated area of "about 200,000 square kilometers."

The density of population varies markedly between regions. The only statistics on variations in density are those for 1941 given in the encyclopedia. In the east, the average density is given as 0.04 persons per square kilometer and in the central and western regions 0.8. In 1934 about 45 percent of the population was concentrated in the Khemchik valley. The Ulu Kem valley, including the capital city of Kyzyl, contained about 26 percent, the lower Biy Kem nearly 10 percent, the Tes Kem valley and surrounding uplands nearly 9 percent, the Khua Kem 7 percent, and the middle and upper Biy Kem regions together had only 3 percent of the population.

Of the total population of Tannu Tuva, some 86 percent are Tuvinians, 12 percent Russians, and 2 percent Mongolians. The term "Tuvinian" as used in Soviet literature has no ethnic or racial significance and is applied to the natives of the country without regard to purity of strain or mixture of types.

A small group, numbering 3,000 or 4,000 people, probably consists of a little-mixed type of Yeniseian, which was pushed into the northeastern uplands of Tannu Tuva by more powerful groups. The Yeniseian group occupies the middle and upper reaches of the Bey Kem and the adjacent parts of the Ogarkha-Ola, and the Eastern Sayans. The economy of the group is

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very primitive, being based on nomadic reindeer-breeding, supplemented by hunting, fishing, and collecting wild foods.

foods.

Most of the native Tuvinians, however, are nomadic cattle-breeders of the steppe grasslands. They are Turkic in language and custom, but the people living near the border of Mongolia have been Mongolized. Over a third of these cattle-breeders live in the valleys and uplands between the Cha Kul and Shagonar rivers; nearly a third live in the Khemchik Basin, and the remainder are scattered throughout the Elegest and Khua Kem valleys.

Russian settlement in Tannu Tuva began in the 1870's. The first settlers were gold miners and merchants, but they soon were outnumbered by farmers. The nomads and their herds were pushed to higher areas less suitable for farming. The first settlers occupied the open valley steppes of the Uyuk and lower Bey Kem valleys, north of Kyzyl, on the historic Usinsk route that crosses the Sayans from Minusinsk. Settlement spread westward along the Ulu Kem and southeastward up the valley of the Khua Kem. Because the southern or left-bank lowlands of the Ulu Kem were too dry and rocky for agriculture, settlement spread upstream along the open steppe lands of the Cha Kul, Shagonar, and Elegest valleys.

Shortly after 1914, the Elegest valley ranked first in number of Russian settlers and farmsteads. The latest available data (1923) indicate that the Elegest still ranks first, having 33 percent of the Russians in Tannu Tuva; about 35 percent of the total is spread over the

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right (northern) bank of the Ulu Kem and along the Shagonar and Cha Kul valleys; and nearly 20 percent live along the valley of the Khua Kem. The eastern and western extremes of the country -- the Khemchik Basin and the middle and upper Bey Kem -- have the smallest Russian populations, amount to only 7 and 5 percent, respectively. Both areas are remote from the principal routes that lead into Tannu Tuva. Furthermore, the aridity of the Khemchik valley may have discouraged settlement, whereas early frosts and large forested areas may have discouraged settlement along the Bey Kem. The remainder of the Russian population is not accounted for.

Data on the size and distribution of settlements are lacking, but there are no large cities in Tannu Tuva. The only settlement of any size, the capital, was founded by the Russians in 1912, following the signing of the Russian-Mongolian treaty. The settlement was originally called Belotsarsk (City of the White Tsar), but was renamed Kyzyl (in Russian, Krasnyy, meaning "red"). According to 1939 estimates, the population is about 10,000. According to 1949 information all other "populated places" have populations of less than 2,000. Three cities -- Chadana, Shagonar, and Turan -- have populations between 1,000 and 2,000. The population of all other settlements numbers less than 1,000¹. Four additional

1. Politiko-Administrativnaya Karta SSSR (Political-Administrative Map of the USSR), I:5,000,000, Glavnoye Upravleniye Geodezii i Kartografii pri SM SSSR (Chief Administrator of Geodesy and Cartography Attached to the Council of Ministers, USSR), [1949].

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settlements -- Naryn, Khoral, Bay-Syut and Emi -- are classified as workers settlements.¹ The Russians founded nearly all of the other settlements, locating most of them along the rivers. All are small, their size being dependent upon the prevailing local system of land tenures. Most of the Russians carried over their native pattern settlement in agricultural villages. In some localities, however, isolated farmsteads are common. In 1923, the valleys of Cha Kul and Shagonary contained 47 Russian settlements, with a total population of 1,300. In the Khemchik valley, a smaller number of Russians was divided among 81 settlements and 148 individual farmsteads.

Recently the settlement pattern of Tannu Tuva has been changing as a result of Soviet efforts to create permanent settlements among the nomadic natives. The extent of such changes is not known.

1. Defined in Soviet terminology as "populated places numbering at least 400 adults of whom a majority (no less than 65 percent) are wage earners." Slovar'-Spravochnik po Sostsial'no-Ekonomicheskoy Statistike (Dictionary reference [book] on Social-Economic Statistics), Moscow, 1944, p. 243.

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VI. CLIMATE AND NATURAL VEGETATION

A. Climate.

The climate of Tannu Tuva can be described only in general terms, as detailed observations are lacking. Two main factors influence the climate: the location in the interior of Asia at a great distance from any ocean, and high altitude and mountainous terrain. The interior location results in a climate with greater extremes of temperature and less rainfall than in areas of European USSR at the same latitude; and the high altitude and mountainous terrain result in low average annual temperatures and great variations in local climates.

The mean annual temperature is 22° F. (Winnipeg, Canada, 35° F.). July is the hottest month with an average temperature of 67° F. and a maximum of 90° F. at Kyzyl; temperatures reach 100° F. in the steppes. January is the coldest month, with an average of 27.4° F. and a minimum of 62.6° F. at Kyzyl. Daily ranges are also large. At Tolbukskaya, the diurnal range 59 degrees in January and 67 degrees in July.

Most of the precipitation occurs in summer. August is the rainiest month, receiving about one-third of the total annual precipitation. February, March, and April are the driest months. Rainfall is unevenly distributed over the area. Moisture-laden winds from the north bring rainfall to the north slopes but leave the south slopes dry. The dryness of the south-facing slopes is intensified by the greater amount of direct sunlight they receive and by the hot desert winds that blow out of Mongolia.

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In eastern Tuva downpours are common, and the only large swamps of the country are located there. The mean annual precipitation at Kyzyl is 7 inches; on the slopes at Tolbukskaya it increases, but only to 12 inches. Snowfall varies widely. Valleys receive only a thin cover, whereas mountains receive heavy falls. The snowfalls of the forest zones of eastern Tuva are heavy enough to halt even horseback traffic.

Winters are long and severe, lasting up to 170 days. Calm days are especially cold. Continuous frosts last for long periods. Spring begins in April, when daytime temperatures rise rapidly, but the nights remain cold. Rainfall increases in the spring, and winds grow stronger, frequently bringing dust storms from Mongolia. Summers are hot, with maximum rainfall--most of it in thunderstorms. Autumns are short. In September temperatures drop sharply, and frosts become frequent. Winds are weaker; precipitation tapers off, and clear skies are more frequent.

The length of the growing season, which numbers 139 days in the Ulu Kem valley, diminishes from west to east. The upper limit of pasture land declines correspondingly from west to east. Pastures stop at 1,428 m. (4,683 ft.) in the west, at 1,233 m. (4,044 ft.) in the center, and at 1,020 m. (3,345 ft.) in the east.

Valleys experience greater extremes of climate than do mountainsides. On summer days, valley bottoms are subject to hot drying winds. During clear nights, cold air collects in the valley bottoms--retarding crops in the summer, bringing earlier frosts in the fall, and making the winters

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extremely cold. This means that the best crop land, which is located in the valleys, has a shorter growing season than the less-usable land on the slopes.

B. Natural Vegetation.

The Tuva Basin is a region of transition between the humid Siberian forests (taiga¹) to the north and the dry grasslands (steppes²) of Mongolia to the south. Within Tannu Tuva there are three main vegetation grassland (steppe), forest (taiga), and alpine meadow. The distribution of each type is determined by elevation and available moisture. Northern slopes generally are more humid than the southern and support forests. On the drier southern slopes, steppe grasslands predominate, and trees are lacking. Western Tannu Tuva is so dry that forests are rare and steppe grasslands in places extend up to the alpine meadows.

Soils vary with the vegetation and climate. The steppe soils include some black earth or chernozem; the forest soils are ashlike podsolis or gray clays; and the alpine soils are swampy or rocky.

1. Taiga is a term applied to a forest consisting primarily of coniferous trees (chiefly spruce, fir, larch, and cedar). It may also contain a secondary growth of deciduous trees (chiefly birch, aspen, and alder) and sphagnum or cranberry bogs.
2. According to Leo. S. Berg, a leading Soviet geographer, the term "steppe" is applied to areas more or less flat, not subject to spring flooding and not swampy. The usual vegetation cover is a dense grass growing on black earth (chernozem) soils, with the grass cover lasting throughout the growing season. On the northern margins, grass may be intermixed with forests, thus forming a transitional forest-steppe. The southern margins may grade off into semidesert steppes or even deserts. Steppes also occur in scattered spots in mountains. The term is loosely used by Soviet writers. Some use it in a physiographic sense as an alternate word for plain. Others use it to describe the vegetation cover regardless of the landform on which it occurs.

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1. Grassland.

Steppe grasslands occupy about one-third of the area of Tannu Tuva. They occur chiefly on plains and slopes of the larger valleys. The grasslands are not always continuous, being interrupted by forested ridges that rise above the plains. The largest areas of steppe are in the western, southern and central parts of the Tuva Basin, particularly along the Ulu Kem and Khemchik rivers.

The Tuvinian steppes resemble the dry Mongolian steppes more than the Siberian steppes. Barren ground occupies more of the area than in the Siberian steppes, and sands are anchored by grassy vegetation rather than by pine groves. Grasses cover the lowlands and even many of the higher hillocks. Streams are bordered by brushwoods.

The steppe vegetation varies with elevation, relief, groundwater, and soil. Lowland areas with relatively high water tables have dense, bright-green feather grass and plumed, hairy, mixed grasses. Higher and drier areas take on a desert-like appearance and contain numerous Mongolian species of grasses. Grasses and sedges reach about 15 cm. (6 in.) in height. In depressions near rivers, where the water table is high, are saline meadows.

The soils of the Tuvinian steppes are developed from fine-grained shale, alluvial clays, and loess-covered clays. Productive black earth (chernozem soils are found in spots, rather than as a continuous zone. The clay soils of the desert steppes contain calcium and adequate amounts of phosphoric acid and potash, but have a low nitrogen content.

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Good yields can be obtained with the aid of irrigation. Salt pans are scattered about in small patches.

2. Forests.

Forests occupy nearly one-half of the area of Tannu Tuva, generally occurring between elevations of 1,000 m. (3,300 ft.) and 2,000 m. (6,600 ft.). The northern slopes are the most thickly wooded. On the southern slopes, forests occur at higher elevations or may be completely lacking. Forests are rare in western and southwestern Tannu Tuva.

The trees of Tannu Tuva are of the same species as those found in the Siberian taiga--principally larch, fir, spruce, and cedar. Pine is very rare. Individual species grow at different elevations on different ridges. In general, cedar, fir, and alder grow in the moist areas whereas larch, pine, and birch are found on the steep drier slopes. The larch has the largest vertical distribution. Although it may grow up to the timber line, it is characteristic of the lower margin of the forest zone, and extends far into the steppes in narrow valleys and on shaded slopes. Sometimes individual trees are scattered through the border grasslands, giving them a park-like appearance. High-grass and low-grass meadows are scattered through the forest. In river valleys, peat bogs and swamps occur, the peat bogs giving some areas a tundra-like appearance.

The character of the forests varies from east to west. The eastern regions are covered by almost continuous forest broken only by rivers and lakes. At lower elevations, broad-leaved trees such as birch, mountain ash, and alder are intermixed with conifers. At higher

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elevations, beech is the only deciduous tree in a coniferous zone of cedar, fir, and spruce. Mosses and small berries grow on the forest floor.

About 65 percent of the uplands of the Khemchik basin in western Tuva are covered with groves of larch. On the Tannu Mountains, larch parkland occurs mainly on the northern slopes. On the southern slopes, forests are rare, and larch completely supplants cedar near the upper limits of tree growth.

Native animals of the forest are brown bear, wolverine, sable, otter, ermine, fox, squirrel, beaver, mountain goat, elk, stag, musk-deer, and reindeer. The animals constitute a valuable natural resource, and furs are an important export. The squirrel and sable are said to equal the trans-Baikal varieties in quality. Wild reindeer are found in large numbers in the Sayan Mountains of northern Tuva, and domesticated reindeer support the nomadic herdsmen of the northeast.

3. Alpine Meadows.

The lower limit of alpine meadows ranges from 1,900 to 2,000 m. (6,000-6,200 ft.). The meadows are not continuous but occur as scattered islands or as narrow zones above the forests. Although the alpine plants (gloveflower, columbine, violets, etc.) reach their greatest development above the timber line, they begin to appear in the forests at about 1,200 m. (3,900 ft.). At the timber line is a narrow transitional brush zone of low-growing polar beech, alder, willow, cinquefoil, and rhododendron, with an intermixture of partridge grass, dragon's head, and other alpine plants.

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Above the alpine meadows, a tundra of mosses and lichens occurs in humid or poorly drained stretches. Reindeer moss is the predominant vegetation.

Still higher, sparse tundra appears in patches on rock debris or rocky soils. Scattered tufts of whitlow grass, alpine flowers, or alpine willow extend up to the snow line. In dry areas, only mosses and lichens are found on the otherwise barren rocks.

VII. TERRAIN AND DRAINAGE

A. Mountain Systems.

1. The Sayan Mountains.

The Sayan mountain system curves in a wide arc along the northern frontier of Tannu Tuva. The western part of the arc trends northeast-southwest and is known as the Zapadnyy Sayan (Western Sayan). The eastern part trends northwest-southeast and is called the Vostochnyy Sayan (Eastern Sayan).

The Sayans are not a single ridge but a broad zone of more or less parallel ridges, ranging from 60 to 200 m. (200 to 660 ft.) in width. The ridges slope gently toward the north but are considerably steeper on the south. Numerous spurs spread out irregularly into northern Tannu Tuva. The spurs, which in some places rise to heights of nearly 2,000 m. (6,500 ft.), are separated by steep-sided valleys. A deep, steep-walled gorge has been cut through the Western Sayans by the Yenisey River.

Within the Sayans, altitude and relief vary considerably. The northernmost ridges are higher than the southern, ranging up to nearly 3,300 m. (10,800 ft.) as contrasted to 1,900 to 2,100 m. (6,900 ft.) in the south. The Eastern Sayans are higher than the Western, with a maximum elevation of 3,490 m. (11,500 ft.). The higher ridges, eroded by local glaciation, have an alpine character with saw-tooth crests, pointed summits, and steep precipices. The lower ridges, which predominate, are rounded, massiflike blocks with dome-shaped summits.

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The Sayans are the most important mountains of Tannu Tuva, since they affect the climate, vegetation, and land use of all areas lying to the south and southeast. The prevailing northerly and northwesterly winds lose much of their moisture in going over the mountains and have little left for regions to the south and east.

2. The Shapshal Ridge of the Altay Mountain System.

The Altay mountain system consists of a mass of ridges formed principally by the erosion of a broad plateau. Numerous rivers have cut steep-sided valleys deep into the plateau. About 10 percent of the area is made up of alpine-type ridges with sharp-pointed peaks and steep-sided mountain walls.

The eastern Altay is the water divide between the Ob' and Yenisey rivers. The crest of the Shapshal Ridge, one of the Altay ridges, forms the boundary between Siberian USSR and Tannu Tuva. The elevation of the ridge exceeds 3,200 m. (10,500 ft.), and Shapshal Pass (Pereval Shapshal) has an elevation of 3,177 m. (10,420 ft.). Spurs with rounded plateau-like tops extend eastward into Tannu Tuva for distances of 30 to 60 km. (20-30 mi.), and in some instances reach the Khemchik River itself.

3. The Ulaan Tayga or Bain-Ola.

The Ulaan Tayga or Bain-Ola is a broad upland along the eastern border of Tannu Tuva. The upland cannot be described exactly because Soviet maps dated 1937 and 1939 do not agree.

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The mountain system runs southward from the Eastern Sayans just west of H^öbs^ög^öl Dalay to approximately the southern tip of the lake. From here it extends westward for some 140 km. (85 mi.) and again turns southward for about 40 km. (25 mi.) to its junction with the Tannu Mountains. The Soviet name for the system is the Ulaan Tayga, although usage divides the system into three distinct units: Bain-Ola along H^öbs^ög^öl Dalay; Ulaan Tayga, the westward extension; and Haan Tayga, the short southern section.

The Ulaan Tayga, together with the Tannu and Altay mountains, forms a part of the continental divide between the Arctic drainage and the interior drainage of Mongolia.

The Ulaan Tayga has been described as a lofty tableland rising above the timber line to areas of permanent snow. Wide areas have elevations exceeding 2,000 m. (6,500 ft.) with some ridges reported to be just under 3,000 m. (9,800 ft.). Approaches to the tableland are steep. On the western shore of H^öbs^ög^öl Dalay, elevation rises sharply from 1,668 m. to 2,000 m. (5,471 to 6,506 ft.).

4. The Tannu Mountains.

The Tannu Mountains extend in an east-west direction along the southern boundary of Tannu Tuva from its southeastern corner to the Altay Mountains on the west. The Tannu Mountains have been estimated as 475 to 600 km. (290 to 370 mi.) in length and 25 to 50 km. (15 to 30 mi.) in width. Elevations range from 1,400 to 4,000 m. (4,500 to 13,100 ft.).

The Tannu Mountains are a system of ranges with varied geologic structure and terrain features. The three terrain subdivisions are the western, central, and eastern areas. The western, locally known as Tsagaan Shibeete, is a collection of ranges with narrow, steep summits reaching elevations of 4,000 m.(13,100 ft.). The most conspicuous terrain features are the typical alpine crests, with pyramidal and conical forms, and the morainic landscape. This is the only part of Tannu Tuva in which mountain glaciers are still found.

The central sector of the Tannu Mountains arches northward in a broad, gentle arc. It is a wide massif with smooth, rounded, domelike summits, whose elevations do not exceed 2,500 m. (8,200 ft.). Only occasional bare peaks rise to altitudes above the timber line, but not beyond the snow line. In this sector, low and easily accessible mountain passes provide easy transit across the Tannu Mountains by automobile in summer and in winter, also, if snowfall is not heavier than average.

The eastern sector of the Tannu Mountains is made up of a series of alpine ridges similar to those in the western sector in outline but of lower elevation. Only a few scattered elevations exceed 2,500 m. (8,000 ft.). Glacial troughs, moraines, and the lake-studded landscape bear witness to the extent of ancient glaciation.

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Unlike the eastern sector of the Tannu Mountains, the southern slopes of the western sector are much steeper than the northern, and are terraced. Many streams, most of them seasonal, flow down the northern slopes of the Tannu Mountains. Because of the steep gradients, seasonal flood waters have eroded deep, V-shaped gorges. Some of these valleys lie within broad, longitudinal fault basins; a few of the larger basins even form local centers of interior drainage.

In Soviet geographic literature, the Tannu Mountains are considered as the southern limit of Siberia because there the natural landscape changes from the Siberian to Mongolian type. Through the centuries, it has been a cultural barrier that has isolated Tannu Tuva from Mongolia, and has played various roles as a political frontier. Early maps show the Tannu Tuva boundary along its crest. Recent Chinese maps still show the boundary in that position, but recent Soviet maps (1947) place the border along the crest for about 90 miles eastward from the western edge of Tannu Tuva; the border then leaves the crest and runs generally eastward south of the Tannu Mountains, and finally turns abruptly northward across the Ulaan Tayga to the Western Sayans.

Vegetation follows the vertical zonal pattern typical of most mountains. Forests of the northern slopes of Tannu Mountains vary in density. The stands are sparsest in the lower forest-steppe zone and in the high tundra zone. Above the timber line, which occurs between 1,700 and 2,000 m. (5,600 to 6,500 ft.) elevation, is a tundra zone

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where the cover is either rock and marsh or thin alpine vegetation. On the southern slopes, forests are rare. Where they do occur, the cedar is replaced by the larch, which grows in open parklike stands. The plain south of the Tannu Mountains, a part of which lies within Tannu Tuva, has a definitely semidesert appearance. Its surface of weathered rock or fine gravel has a sparse, thin, uniform cover consisting of an Asiatic grass (Lasiagrostis), gray strips of wormwood, dense tufts of halophytes, and, in the hollows, small clusters of yellowish feather grass.

5. The Ogarkha-Ola.

The Ogarkha-Ola is an extensive mountain area that forms the divide between the two tributaries of the Ulu Kem, the Bey Kem and the Khua Kem. The mountain system is a complex series of discontinuous but parallel ridges arranged in a southward-bending arc. The main divide appears to be a plateau-like, rounded upland. The elevations, in general, are lower than those of the other mountain ranges, though large areas lie at elevations of 2,000 m. (6,500 ft.) or more, and some ridges rise to nearly 3,000 m. (9,800 ft.). Some of the ridges are snow-covered.

The western end of the system is connected to the Western Sayans by the Taskyl ridge, through which the Bey Kem has cut a deep gorge.

B. Rivers and River Basins.

In Russian literature, Tannu Tuva is usually described as a basin. In reality, the so-called "basin" is made up of four river basins named after the rivers which flow through them: the Khemchik in the west; the

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Bey Kem in the northeast; the Khua Kem in the southeast; and the Ulu Kem¹ in the center. A small portion of Tannu Tuva lies within the interior drainage system of northwestern Mongolia. Most of the area of the southern slopes of the Tannu Mountains drains into the Ubsa Nuur lowland.

The drainage system of Tuva is typical of mountain drainage in dry climates. Many streams are intermittent, but the flood waters of the rainy season flow swiftly and have cut narrow gorges on the mountain slopes. The perennial streams are slower moving. They choke their own channels with sediment, build sand bars, and subdivide into many shallow, braided channels. The flat, swampy flood plains contain ox-bow lakes, cut-offs, and abandoned channels. Such features are noticeable along some of the larger rivers, such as the Khamsara River, a tributary of the Bey Kem, and the Ulu Kem, which in one place bears the name "Forty Yeniseys."

The greatest volume of water is gathered by the Bey Kem and the Khua Kem, whose tributaries rise in the rainiest part of Eastern Tuva. Because the stream flow is regulated by numerous lakes and by the most extensive forests in Tannu Tuva, both rivers have a steady flow even during the warm, dry periods of summer. In contrast, the Khemchik, which drains the large and arid region of western Tuva, has a smaller

1. Called the Yenisey in Soviet literature.

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volume and a greater seasonal fluctuation in flow. The Ulu Kem has a volume of 918 cu.m. (32,405 cu. ft.) per second, whereas the Khemchik has a volume of 220 cu. m. (7,766 cu. ft.) per second.

Throughout Tannu Tuva, the rivers are very important in the lives of the people, even though they are at present little used for transportation. Most of the sedentary population lives along the rivers, and the routes of the nomads follow the river valleys. The rivers flowing through the steppes, particularly in the central and western basins, provide water for irrigation during summer droughts. Numerous irrigation canals (called "mogachi") criss-cross the steppes in different directions, watering grain fields and pastures. Without irrigation, most of the agriculture could not be carried on, and livestock grazing would be greatly curtailed.

1. The Bey Kem River Basin.

The Bey Kem, in volume the largest headwater tributary of the Ulu Kem, rises in the southern and western slopes of the Eastern Sayans and the northern slopes of the Ogarkha-Ola. The easternmost tributaries, as well as the upper course of the Bey Kem, flow from east to west. At about longitude 96° E, the Bey turns northward for about 60 km. (35 mi.) and then arcs northwest-west-southwest. While flowing southwest, the river breaks through a series of ridges nearly 40 miles in width that link the Ogarkha-Ola with the Western Sayans.

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The river has a large volume and a fast current. In its upper courses the river flows at a speed of 10.5 miles per hour, and where it breaks through the ridges, at about 13 to 14 miles per hour.

The terrain of the basin varies considerably. In its upper reaches, it is mountainous, particularly in the headwaters area and along the left bank of the Bey Kem. The slopes of the Ogarkha-Ola, where the left-bank tributaries of the Bey Kem rise, are rugged and steep. The tributaries are short, with steep gradients. They are separated by large ridges, which in some places extend down to the main stream. In the uppermost reaches of the Bey, the terrain is mountainous with abrupt slopes close to the river, which break sharply at the flood plain. The basin of the Bey Kem between the Khamsara and the point where the Bey turns abruptly northward is made up of low, rolling hills that extend in an east-west direction. These separate a series of westward flowing tributaries of the Bey. Glacial features are conspicuous and include moraine ridges, sandy terraces, swampy disarranged stream patterns, and glacial lakes. In the Iy Sug valley, a chain of interconnected lakes extends for nearly 50 miles. From the Khamsara River downstream to the town of Sevi, the Bey flows variously between open floodplains or high sandstone cliffs. In some places, the river has eroded its channel below the floodplain, leaving high, sandy terraces. In other parts of its valley, the Bey has formed large, flat, swampy floodplains. For nearly 40 miles from Sevi to the Uyuk River, the Bey is entrenched in the Taskyl

Mountains and flows in a rushing torrent through a series of gorges whose steep walls rise to the snow line. The largest rapids occur just south of the Ut River and are known as Utinskiy Porog or the Ut Rapids. South of the Uyk River, the mountains become lower and more rounded, and broad floodplains border the river on both sides. The lower hills and undulating terrain continue to the confluence of the Bey Kem and the Khua Kem.

The vegetation of the Bey valley, like its terrain, is highly varied. The southern slopes of the Western Sayans and the western slopes of the Eastern Sayans are covered with a continuation of the taiga but with a sparser cover than is found to the north and east. The lower limit of the taiga, however, is much higher -- 800 to 1,700 m. (2,600-5,600 ft.) -- and below it the forest thins out into an open wooded steppe and finally disappears in the steppe. Taiga vegetation occurs again, though considerably modified in stand and variety, on the higher and moister north-facing slopes of the Taskyl Mountains and the Ogarkha-Ola. The south-facing slopes, located in the rain shadow of the mountains, are conspicuous because of their contrasting barrenness.

The region south of the Khamsara River and east of the Bey, known as the Dora Steppe, has a cover of distinctly central Asiatic type of vegetation consisting of open, scattered wood-steepes and treeless steppe. Although this sparsely settled area is considered the best and

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richest part of Tannu Tuva for settlement and development, it has climate limitation. The luxuriant grasses of spring are destroyed by drought in midsummer or by early frosts in late summer.

South of the Taskyl Mountains, the humid taiga of the north-facing slopes gives way first to a brief transitional wood-steppe and finally to the dry, stiff, steppe grass of the Soyote Steppe¹, which continues into the Ulu Kem valley.

2. The Khua Kem River Basin.

The Khua Kem rises in the western slopes of the Ulaan Tayga (or Bain-Ola) and in the northern slopes of the Tannu Mountains. It follows a westerly course to its confluence with the Bey Kem. The sources of the Khua Kem are the easternmost headwaters of the Yenisey drainage system. One of the two source branches, the Khysyl, rises in Ulaan Tayga (at one point less than 10 miles west of the lake, Hóbsögöl Dalay) and drains a little-known region vaguely described as a steppe-land. The Khysyl flows northward to lakes Dodo Nuur and Tuurga Nuur, then turns west-southwestward to its junction with the other source of the Khua Kem.

The second source branch of the Khua Kem begins in Teri Nuur, a lake fed by streams that rise on the northeastern slopes of the Tannu

1. The Soyote Steppe of the Ulu Kem Basin is also known as the Central Uryankhay Basin or the Central Uryankhay Steppe.

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Mountains. The lake lies in a flat-bottomed basin at an altitude of 1,400 m. (4,600 ft.) at the foot of the Tannu Mountains and is bordered by mountains on the south and east.

From the confluence of the two headwater streams, the Khua Kem flows through a narrow gorge with few floodplains. Below the junction with Bel'vey River, the valley broadens out into low, rounded, rolling hills. South of the Khua Kem is an extensive floodplain, more than half of which is steppe land. As the river meanders, it leaves occasional ox-bow lakes on the floodplain.

The northern or right-bank tributaries that rise on the slopes of the Ogarkha-Ola have a different character. The streams are shorter, and the steep ridges between them extend south to the Khua Kem itself.

The volume of the Khua Kem is less than that of the Bey Kem. The tributaries that flow from the Ogarkha-Ola are reported as carrying more water than those that flow from the Tannu Mountains.

The vegetation of the Khua Kem Basin is more like that of the Mongolian steppe than is the vegetation of the Bey Basin. In the Bey Basin, the grass cover of the steppe is sparser; the trees are fewer, and areas of barren stony ground are larger. The Tannu Mountains have dense stands of forest on their north-facing slopes, but the variety of trees is much smaller than in the Siberian tayga.

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3. The Khemchik River Basin.

The Khemchik River rises in the slopes of the three mountain systems that border it: the southern slopes of the Western Sayans; the eastern slopes of the Shapshal'skiy Khrebet (Shapshal Ridge) of the Altay system; and the northern slopes of the Tannu Mountains.

The width of the stream varies from 60 to 150 m. (200-500 ft.) and its speed from 4 to 9 miles per hour. Although the headwaters are typical mountain streams; the river flows through rolling steppe farther downstream. For the last 46 miles of its course, before joining the Ulu Kem, the Khemchik, flows through a narrow gorge known as Khemchik Bom.¹

The Khemchik system is treelike in pattern, with the main stream flowing northeastward. The northern or left-bank tributaries are longer, more numerous, carry a larger volume of water, and generally have lower gradients than the right-bank tributaries.

The Khemchik Basin is the driest of the four basins of Tannu Tuva. The river carries a smaller volume of water than any of the other rivers -- 220 cu. meters (7,700 cu.ft.) per second -- and is subject to considerable seasonal fluctuation. Many of its tributaries are intermittent and do not reach the Khemchik during dry seasons. The divides

1. Bom -- steep cliff.

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between left-bank tributaries are broad and rounded, in some cases extending to the main stream. Between right-bank streams, the divides are narrow and steep and are arranged in a series of parallel crests.

The basin is predominantly a steppe grassland, with open forests on the northern slopes of the higher ridges, particularly on the ridges north of the Khemchik, and with scattered groves along the perennial streams.

4. The Ulu Kem River Basin.

The Ulu Kem Basin is the smallest of the four basins of Tannu Tuva. It is a fault basin 200 km. (125 mi.) long and 40-150 km. (25-95 mi.) wide, and lies at an elevation of 500-750 m. (1,600-2,500 ft.) above sea level. It is bordered on the north by the block mountains of the Western Sayans and on the south by the Tannu Mountains. A spur of the Tannu Mountains separates the Ulu Kem from the Khemchik at the point where the Ulu Kem cuts through the Western Sayans in its northward course. The Bey and Khua Kem Basins adjoin the Ulu Kem Basin on the east and the Khemchik Basin on the west.

The Ulu Kem is a large river formed by the junction of the Bey Kem and Khua Kem, both streams of considerable size. Most of the other tributaries are small and insignificant streams that cross arid areas before joining the Ulu Kem. The left-bank or southern tributaries draining the slopes of Tannu Mountains are fewer but larger than the right-bank tributaries. The most important left-bank tributary is the

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Elegest, which enters the Ulu about 15 miles below the confluence of the Bey Kem and Khua Kem. Because of several perennial tributaries, the Elegest contains enough water to enable it to reach the Ulu, even though it crosses dry steppe-land in its lower reaches. Several of the tributaries down stream from the Elegest, such as the Barlyk (left bank) and the Bayan Gol (right bank), are intermittent. Some of the intermittent tributaries on the right bank erode their valleys so slowly that they form hanging valleys and so enter the Ulu Kem as waterfalls.

The Ulu Kem valley has three pronounced terraces. The flood-plain is covered with brushwood; on it the Ulu Kem flows in a meandering course, occasionally dividing into multiple channels (giving it the name of "Forty Yeniseys" in one stretch). The two higher terraces broaden out to the left of the Ulu Kem and form a plain several kilometers in width that continues up several of the larger tributary valleys. Most of the valley is rolling to hilly. Its widest expanse is at the confluence of the Bey and Khua Kem, which unite to form the Ulu Kem. The capital of Tannu Tuva, Kyzyl, is located here. The plain extends upstream along the Bey to the Taskyl Mountains, and upstream along the Khua for about 40 miles.

Downstream to the west, the Ulu Kem flows through rugged but rather low-lying and completely treeless country covered with typical steppe vegetation. The terrain of the valley includes barren rock-steppe

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slopes and large areas of barchane dunes usually anchored by steppe vegetation. Small saline lakes are scattered throughout the valley. The river winds across an extensive floodplain in a channel bordered on both sides by terrace bluffs of various heights. In the middle courses of the valley, the bluffs are steep, 30 to 35 ft. in height. Toward Shagonar, the river meanders, forming many ox-bow lakes and alluvial islands. The alluvial plains broaden and merge into the rolling plains of the left-bank tributary valleys of the Cha Kul and Torgalyg.

Along the right bank of the Ulu Kem, elevations increase and reach their highest altitudes in the steep mountain slopes of the Kurtushibiniskiy Khrebet (Ridge), a large east-west spur of the Western Sayans.

The terrain south of the Ulu Kem and west of the Elegest is broken and mountainous. Deep V-shaped gorges have been cut into the slopes of the Tannu Mountains. Some valleys wind along great fault lines; others are open and flat-bottomed.

Most of the Ulu Kem Basin is treeless. In areas where the ground water is high, the vegetation varies from swamp grass to bright, lush feather grasses. The Mongolian grasses of the higher terraces give them a more desert like appearance. In other places, the landscape has the appearance of a true desert, especially where barchane dunes are present. Desert-steppe brush suggestive of Mongolian vegetation is the characteristic vegetation, however. Sagebrush and wormwood,

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reaching up to 15 cm. (38 in.) in height, cover much of the area. In other places, the soil is covered with a dense, grayish-green carpet above which rise poor, scrubby brushes about 10 or 12 inches high. Small, dark green cosses dot the river banks. Broad expanses of meadow along the river valley provide pasture for large herds of livestock of all types, including camels, yaks, and droves of horses that are famous for their endurance.

5. The Ubsa Nuur Basin.

The Ubsa Nuur Basin lies in northwestern Mongolia at the southern base of the Tannu Mountains. The portion of Tannu Tuva lying within the limits of the basin ranges from 700 to 800 m. (2,300 to 2,600) above sea level. A portion of the Tes Khem, the largest river of the Ubsa Nuur system, drains a part of southern Tannu Tuva.

The Ubsa Nuur Basin has all the characteristics of a desert. Most streams are only seasonal. The Tes Khem is largest in the spring when its right tributaries are swollen by melting snow from the mountains. In summer, the dry and stony river beds are a conspicuous feature of the landscape. Wherever the mountain streams enter upon the lowland plain, they deposit sediment, leaving a series of alluvial fans. Soils are predominantly gravelly.

The southern foothills of the Tannu Mountains, however, have the appearance of a typical desert steppe. Patches of feather grass are scattered over broad areas of gravelly terrain. The only continuous

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stretches of grass are the meadows along the rivers. The oasis of the Tes Khem River valley is the largest grassy area. The meadows are interspersed with stands of poplars and birch, below which the ground is covered by undergrowth. The meadows are important as winter pastures.

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VIII. LAND UTILIZATION AND ECONOMY

The basic economic activity of Tannu Tuva is nomadic animal husbandry. Of lesser importance are hunting, fishing, agriculture, and industry. More than 70 percent of the adult rural population engages in supplementary occupations, chiefly hunting (48 percent).

In 1939 the livestock population totalled almost 1,500,000 head, consisting of:

615,000	sheep
405,600	goats
244,900	cattle
112,400	horses
17,300	elk
8,000	hogs
7,200	reindeer
730	camels

Postwar Soviet sources are not in agreement on the livestock population. According to one 1947 source the livestock population for 1941 was 1,462,000 head. Another 1947 source gives 2,500,000 head, of which 1,000,000 are sheep; the 1948 edition of this same source changes the figure to "nearly 1,000,000 head, of which more than 500,000 are sheep and the rest cattle and horses."^{1/} The animals

1. "Large Soviet Encyclopedia," Vol. 55, 1947; and N.N. Baranskiy, Economic Geography of the USSR, eighth edition, 1947, and ninth edition, 1948. The tenth edition of Baranskiy, 1949, gives no statistics on the animal population of Tannu Tuva.

are raised on the extensive steppe grasslands that cover about one-third of the area of Tannu Tuva. The most important livestock areas are in the west -- in the Khemchik valley and in the Cha Kul and Shagonar valleys (tributaries of the Ulu Kem) -- where the economy centers almost entirely around meat, milk, wool, skins, and hides provided by the cattle and sheep. In contrast, in the middle and upper Bey valley, reindeer breeding is the chief occupation but is supplemented by hunting and fishing. The sparsely populated eastern region could support many more livestock than it does at present.

Hunting provides Tannu Tuva with some of its most important exports. In the period just preceding 1914, squirrel pelts exported numbered between 700,000 and 800,000 per year; and more than 40 tons of wild fowl and game were exported to the USSR in 1934.

Fishing is important in the Bey Kem and Khemchik areas. There are two commercial fishing areas, in the glacial lakes region of the Bey Kem Basin and in the lake region north of the Alash River in the Khemchik valley. In 1934, over 80 tons of fish were exported to the USSR.

Agriculture in Tannu Tuva is relatively unimportant. In 1947, less than 0.5 percent of the area was under cultivation. In 1930 only about 25 percent of the households were engaged in farming. Agriculture was introduced by Russian colonists at the beginning of the twentieth century. The first farming settlements were established in the Bey

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valley and the tributary Uyuk valley, from which they spread into the valley of the Ulu Kem and its tributary valleys -- the Cha Kul, the Shagonar, and the Elegest -- and into the lower Khua Kem. These valleys are still the most important agricultural areas of Tanna Tuva. Over 75 percent of the agriculture is carried on by irrigation. The principal crops are wheat and millet. Wheat occupies 34 percent of the sown area and millet 27 percent. Oats and barley are also grown but the proportion of the area devoted to them is not known. No more than 3 percent of the sown area is in potatoes, fruit, industrial crops, and grass.

In the Cha Kul valley millet, rye, and some wheat are cultivated in small patches. Farming is precarious because irrigation is impossible when the river dries up during hot spells. The Elegest valley, which was settled after 1914, soon became the most important agricultural region in the country. Within a short time, it ranked first in the number of settlements, and second in extent of cultivated area.

The importance of the agriculture in the Ulu Kem Basin is not clear. In 1913, agriculture was limited to scattered areas of ploughed land largely in the hands of the natives. One recent source, however, says it is an area of "widest development in grain cultivation."

In the Bey Basin grain cultivation reaches its highest development in the Uyuk valley. The most productive areas are the transitional stretches between the humid taiga and the dry steppe. Rye, wheat,

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millet, and oats are the most important crops, but some potatoes and other vegetables are grown. Cultivation is precarious because of water shortages and early frosts. The upper limit of grain cultivation is 1,020 m. (3,900 ft.).

Russian peasant immigrants also introduced agriculture based on canal irrigation along the lower reaches of the Khua Kem, where it is still carried on. Early frosts are a definite threat, although not as frequent as in the Bey Kem valley. The Khemchik valley as a whole has little agriculture; but there is some cultivation in its lower stretches. Drought-resistant millet and barley are the principal grain crops. Some grain is grown on the southern slopes of the Tannu Mountains. A recent Soviet source (1947) describes the Khemchik valley as most favorable for agriculture because of the higher summer temperatures, rainy springs, and drier summers. The upper limit of cultivation is given as 1,428 m. (4,680 ft.).

Four land-use regions can be distinguished. The first and most productive is the region of livestock raising (all types) in combination with relatively well-developed cultivation of grains -- chiefly millet, wheat, and oats. The region is centered on the Ulu Kem, with extensions to the middle of the Khua Kem, the lower courses of the Bey Kem, and the lower courses of the Khemchik. The second region produces chiefly small types of livestock -- sheep and goats -- and grain cultivation is less well-developed. This region occupies the southern

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slopes of the Tannu Mountains. Agriculture is limited to the Tes Khem valley. The third region also has a predominance of the small types of livestock but an insignificant amount of grain cultivation, chiefly millet and barley. It is located in the drier middle and upper portions of the Khemchik valley and extends to the western borders of Tannu Tuva. The fourth is predominantly a region of reindeer breeding and hunting. It is centered on the middle and upper courses of the Bey Kem and extends southwards into the eastern portions of the Ogarkha-Ola and the upper Khua Kem valley system.

The Soviet Union has had a strong influence on the reorganization of the economy of Tannu Tuva. In the rural economy, the system of land tenure has undergone great change, and Soviet technical direction and material assistance has increased productivity.

The system of land tenure is taking on the forms of the Soviet system. All land is under the control of the state. As of 1947, there are four forms of land holdings: individual, state farm (sovkhoz), collective (kolkhoz), and cooperative (artel, tozhzem). The last three forms are basic in the Soviet system. Up to 1947, about 60 percent of the area was in individual holdings. Of the communal forms, the cooperatives accounted for 42.3 percent of the total sown area in 1943. In 1947, there were five large sovkhozes engaged in livestock raising, 24 kolkhozes, and 131 tozhzems.

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The Soviet Union has provided technical advice and material assistance to agriculture and has introduced modern machinery. In 1941, there were 37 tractors, 2 combines, 6,700 steel plows, and 1,200 hay-mowers. By 1945, there were 4 Soviet-type machine-tractor stations (MIS) and the number of tractors had increased to 115.

Under Soviet influence, the area in cultivation as well as production has increased. The cultivated area increased from 13,600 hectares (136 sq. km. or 33,592 acres) in 1927 to 63,000 hectares (630 sq. km. or 155,700 acres) in 1947. By 1935, production from 70,000 acres included 10,500 short tons of wheat, 7,400 tons of oats, 6,400 tons of millet, and 2,500 tons of barley. Since 1939, Tanna Tuva has been self-sufficient in grain and has even had small amounts available for export.

Similar improvements have been experienced in livestock breeding. Under Soviet influence, nomadic livestock breeding has been undergoing a change in the direction of sedentary livestock raising. Fodder crop production for winter feeding was begun; wide-spread use of cattle sheds and pens was encouraged; improved strains of livestock were introduced, and veterinary care was organized. Fodder crop production increased from 125,000 tons in 1930 to 210,000 tons in 1942 and to nearly 330,000 tons in 1945. In 1931, there were only eleven pounds of stored fodder per head of livestock; by 1947, 1,620 pounds. In 1930, there were no improved cattle pens; by 1939, there were 52,000. In 1947, there were

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sixty-seven veterinary districts and headquarters. There were no veterinarians in 1928; by 1943, there were ten with fifty assistants and 298 veterinary orderlies. In 1942, it was possible to vaccinate 120,000 head of livestock and provide other much-needed care. As a consequence of all these measures, the number of cattle increased from 1,030,000 head in 1930 to 2,500,000 in 1947, or from fifty-nine to seventy-five head per farm.

The prospects for a continued expansion in agriculture are difficult to estimate because climatic data and adequate production statistics are lacking. Even though a recent Soviet source estimates that up to 1,000,000 hectares (2,471,000 acres) are available for agriculture, fertility alone is not an adequate index of productive capacity. The cultivation of certain crops may be increased, but climate conditions will prevent any great amount of expansion.

Ordinarily, wheat cultivation is considered precarious at 10 inches of rainfall without irrigation. Kyzyl, however, receives only seven inches annually, and Tolbukskaya, nearly 2,000 feet higher at an elevation of 3,017 feet, receives only twelve inches. Moreover, the seasonal and areal distribution of rainfall are unfavorable. Over one-third of the annual total precipitation occurs in August, at harvest time and not during the period of maximum growth. Precipitation is heaviest on north-facing slopes and at the higher elevations where crops are not grown. Although the amount of precipitation increases from west to east, the length of the growing season decreases from west to east.

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Temperature conditions are also unfavorable to agriculture. The severe winters last 170 or more days. The growing season is only 139 days in the Ulu Kem valley and becomes shorter to the east. Because of the rugged relief, cold air collects in the valley bottoms where the land, in other respects, is best suited to cultivation. This is particularly critical in the early spring, when frosts frequently occur during the flowering stage of grain growth. Because of the severe winters and the scant snow cover, grain cannot be planted in the fall. Spring sown crops receive inadequate precipitation during the early growing stage and are little benefited by the increasing seasonal precipitation because high daytime temperatures in the summer are accompanied by high rates of evaporation.

Although climatic conditions will prevent any great expansion of agriculture, some is possible. According to one Soviet source, the most promising region for agricultural development is western Tannu Tuva, where the springs are rainier and the summers are drier and hotter than in other parts of the country. Such development would have to be based on new irrigation facilities whose installation is expensive and time-consuming. Slight increases in production might also be obtained by the introduction of early maturing, frost-resistant grains from the high altitudes of neighboring Mongolia.

Conditions in eastern Tuva favor livestock breeding more than agriculture because the heavy snows of winter, the drier springs, and rainier summers are conducive to the growth of luxuriant meadows. Grain

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cultivation is hazardous because spring frosts are frequent. Crop failures are common. Under Soviet programs for the settlement of the nomads, greater strides will probably be made in livestock production than in tillage.

How much surplus Tuva might have available for shipment to the USSR is difficult to estimate because of lack of data. The pre-1914 cattle export is reported at "more than 6,000 head." The Tuvinian revolution so disrupted trade that, as late as 1927, the Soviet Union was looking forward to an increase in the export of cattle to 2,500 head and of sheep to 5,000 (out of somewhat less than 900,800 head in Tannu Tuva at the time), of wool to 400 tons, of hides to 570 tons, of sheepskins to 53,000, and of butter up to 90 tons. These expectations had not been reached by 1935, at which time the USSR imported 1,651 head of livestock, 113 tons of wool, 164 tons of raw leather, and 66 tons of dairy products and game from Tannu Tuva.

In 1947, industry represented 26.5 percent of the total production of all economic goods in Tannu Tuva. The leading industry is mining, which forms about 50 percent of the total value of industrial production. Gold is the greatest source of income from mining. In addition to mining, there are plans for processing agricultural raw materials, lumber mills, brick kilns, a building trust, an automobile repair shop, clothing shops, and several small food-processing plants. All industrial

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enterprises belong to the state or artisan cooperatives. In 1938, there were 25 artisan-industrial cooperatives (artels). There is also a small homecraft industry for the production of felt boots, sheepskin coats, and leather. The value of industrial production in 1938 amounted to about 1,600,000 rubles.

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APPENDIX

GAZETTEER OF TANNU TUVA

<u>Name</u>	<u>Designation</u>	<u>Approximate</u>		<u>Area</u>
		<u>Lat. N</u>	<u>Long.E</u>	
Ak Kul	lake	50 14	89 35	Tannu Tuva
Ak Sug	river	51 15	91 24	Tannu Tuva
Alash	river	51 10	91 05	Tannu Tuva
Altay	mountain range	50 00	87 00	USSR
Altryk	river	50 22	99 58	Mongolia
Arasay (Gol)	stream	51 20	99 25	Mongolia
Azhik Takh	mountain	52 16	97 40	Tannu Tuva
Azyut	town	51 55	93 36	Tannu Tuva
Balryk	river	50 48	99 04	Tannu Tuva
(Barlyk)	river	50 50	90 46	Tannu Tuva
Bayan Gol	village	51 36	93 34	Tannu Tuva
Bayan Tagna	mt. pass	51 00	92 34	Tannu Tuva
Bay-Khak	village	51 10	94 30	Tannu Tuva
Bay-Syuk	city	51 38	95 22	Tannu Tuva
Bel'vey	village	51 20	95 47	Tannu Tuva
Bey Kem	stream	51 40	94 26	Tannu Tuva
Bol'shoy Ish-Khem	river	51 24	91 30	Tannu Tuva
Boyarovka	village	51	95	Tannu Tuva
Buluk, Ozero	lake	52 06	98 18	Tannu Tuva

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<u>Name</u>	<u>Designation</u>	<u>Approximate</u>		<u>Area</u>
		<u>Lat. N</u>	<u>Long. E</u>	
Cha Kul	village	51 36	92 30	Tannu Tuva
Chadana	town	51 14	91 46	Tannu Tuva
Chagatay	lake	51 02	94 40	Tannu Tuva
Chikhacheva	village	51 50	94 30	Tannu Tuva
Chulyshman	river	51 15	87 40	USSR
Darhadiin Hüryee	village	51 05	99 35	Mongolia
Dejeeleng Hüryee	monastery	49 33	93 42	Mongolia
Doodo Nuur	lake	51 25	99 20	Mongolia
Dordogoyñ Huryee	monastery	50 01	98 32	Mongolia
Elegest	river	51 12	93 42	Tannu Tuva
Elegest	village	51 19	93 50	Tannu Tuva
Emi	city	50 03	97 49	Tannu Tuva
Ervek	village	51 37	94 10	Tannu Tuva
Grigor'yevka	village	53 12	92 49	USSR
Haan Tayga	mountain	50 25	97 20	Tannu Tuva
Hadhal	settlement	50 24	100 11	Mongolia
Hamar Dábaa	pass	50 42	95 10	Tannu Tuva
Höbsögöl Daley	lake	51 00	100 30	Mongolia
Iy Sug	stream	52 32	96 12	Tannu Tuva
Jibhalanta	city	47 45	96 49	Mongolia
Jirgalanta (Mongolian); Kobdo (conventional)	center of Aymag, town	48 01	91 38	Mongolia
Jirgalanta	nomad camp	50 32	97 25	Tannu Tuva

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Name	Designation	Approximate Lat.N. Long.E	Area
Kargy	river	50 45 96 45	Tannu Tuva
Kazyr	river	53 50 93 05	USSR
Kék-Khak	village	51 27 94 49	Tannu Tuva
Khamsara	village	52 46 95 51	Tannu Tuva
Khamsara	stream	52 42 95 48	Tannu Tuva
Khemchik	stream	51 40 91 47	Tannu Tuva
Khindiktig, Ozero	lake	50 21 89 48	Tannu Tuva
Khoral	river	52 01 96 26	Tannu Tuva
Khoral	city	51 56 96 30	Tannu Tuva
Khua Kem	river	51 41 94 06	Tannu Tuva
Khysyl (Tannu Tuva) Shishhid Gol (Mongolia)	stream	51 02 97 15	Mongolia Tannu Tuva
Kultuk	village	51 42 103 42	USSR
Kurtushibinskiy Khrebet	mountain range	52 18 93 42	USSR and Tannu Tuva
Kyzyl	city	51 40 94 04	Tannu Tuva
Kyzyl Aryg	village	50 58 95 06	Tannu Tuva
Kyzyl Mazhalyk	village	51 06 90 48	Tannu Tuva
Malyy Ish-Khem	river	51 26 91 33	Tannu Tuva
Malyy Shibey	river	51 09 96 14	Tannu Tuva
Mondy	village	51 40 100 59	USSR
Mörönii Hüryee	monastery and administrative center	49 33 100 08	Mongolia

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Name	Designation	Approximate		Area
		Nat. N	Long.E	
Mustag-Daban, Pereval	pass	53 43	97 04	Tannu Tuva - USSR
Nariin Gol	stream	50 20	93 10	Mongolia
Nerkha	village	53 33	98 16	USSR
Nizhneudinsk	town	54 54	99 03	USSR
Ogarkha-Ola, Khrebet	mountain range	52 00	96 00	Tannu Tuva
Oja	river	52 30	94 30	Tannu Tuva
Gorno-Altaysk (form. Tuva)	Oyrot- town	51 58	85 57	USSR
Pogranichnyy, Pereval	pass	52 15	94 00	Tannu Tuva
Samagaltay	village	50 42	95 00	Tannu Tuva
Saryg-Sep	village	51 30	96 42	Tannu Tuva
Saykhen-Daban, Pereval	pass	52 18	98 38	USSR - Tannu Tuva
Serlik	river	53 45	95 30	Tannu Tuva
Sevi	village	52 31	94 56	Tannu Tuva
Shagonar	village	51 33	92 48	Tannu Tuva
Shapshal, Pereval (Russian); Chabchan Dabann (Mongolian)	pass	50 30	89 50	USSR and Tannu Tuva
Shapshal'skiy Khrebet	mountain range	51 00	89 30	USSR and Tannu Tuva
Systyg Khem	village	52 40	95 19	Tannu Tuva
Systyg Khem	river	52 43	95 26	Tannu Tuva
Tairis	river	50 21	98 12	Tannu Tuva
Tannu Mountains	mountain range	51 00	94 00	Mongolia and Tannu Tuva

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<u>Name</u>	<u>Designation</u>	<u>Approximate</u>		<u>Area</u>
		<u>Lat. N</u>	<u>Long. E</u>	
Tarlach	village	52 08	93 42	Tannu Tuva
Taskyl, Khrebet	mountain range	52 30	94 15	USSR
Taspy	river	51 51	94 26	Tannu Tuva
Teletskoye Ozero	lake	51 32	87 12	USSR
Temir-Suk	river	51 40	93 00	Tannu Tuva
Teri Nuur	lake	50 38	97 28	Tannu Tuva
Tes	river	50 31	92 48	Mongolia
Tesiin Huryee	monastery	49 49	97 24	Mongolia
Tes Khem	nomad camp	50 52	93 42	Tannu Tuva
Toji Kul	lake	52 25	96 40	Tannu Tuva
Tora Khem	village	52 25	96 18	Tannu Tuva
Torgalyg	village	51 22	92 49	Tannu Tuva
Torgalyg	river	51 36	92 46	Tannu Tuva
Tsagaan Nuur	settlement	49 30	89 40	Mongolia
Tsagaan Olom	village	46 45	96 30	Mongolia
Tsagaan Shibeete	mt. range	50 20	91 15	Mongolia
Turan	town	52 08	93 56	Tannu Tuva
Turta	village	51 30	100 39	Mongolia
Tus Tag	nomad camp	50 54	92 34	Tannu Tuva
Tuurga Nuur	lake	51 31	99 25	Mongolia
Ubsa Nuur	lake	50 18	92 36	Mongolia
Uda	river	51 47	107 35	USSR
Ulaan Goom	village	49 58	92 02	Mongolia

Name	Designation	Approximate		Area
		Lat.N	Long.E	
Ulaan Tayga	mountains	50 45	98 30	Mongolia
Ulu Kem	river	51 45	92 10	Tannu Tuva
Ust'-Algiyak	village	53 10	94 50	Tannu Tuva
Ust'-Usinskoye	village	52 08	92 17	USSR
Utinskiy, Porog	rapids	52 24	94 40	Tannu Tuva
Uyuka	village	52 05	94 01	Tannu Tuva
Verkhne-Usinskoye	town	52 13	93 00	USSR
Vostochnyy Sayan	mountain range	53 00	97 00	USSR
Zapadnyy Sayan	mountain range	53 00	94 00	USSR

Location of the following places is not known:

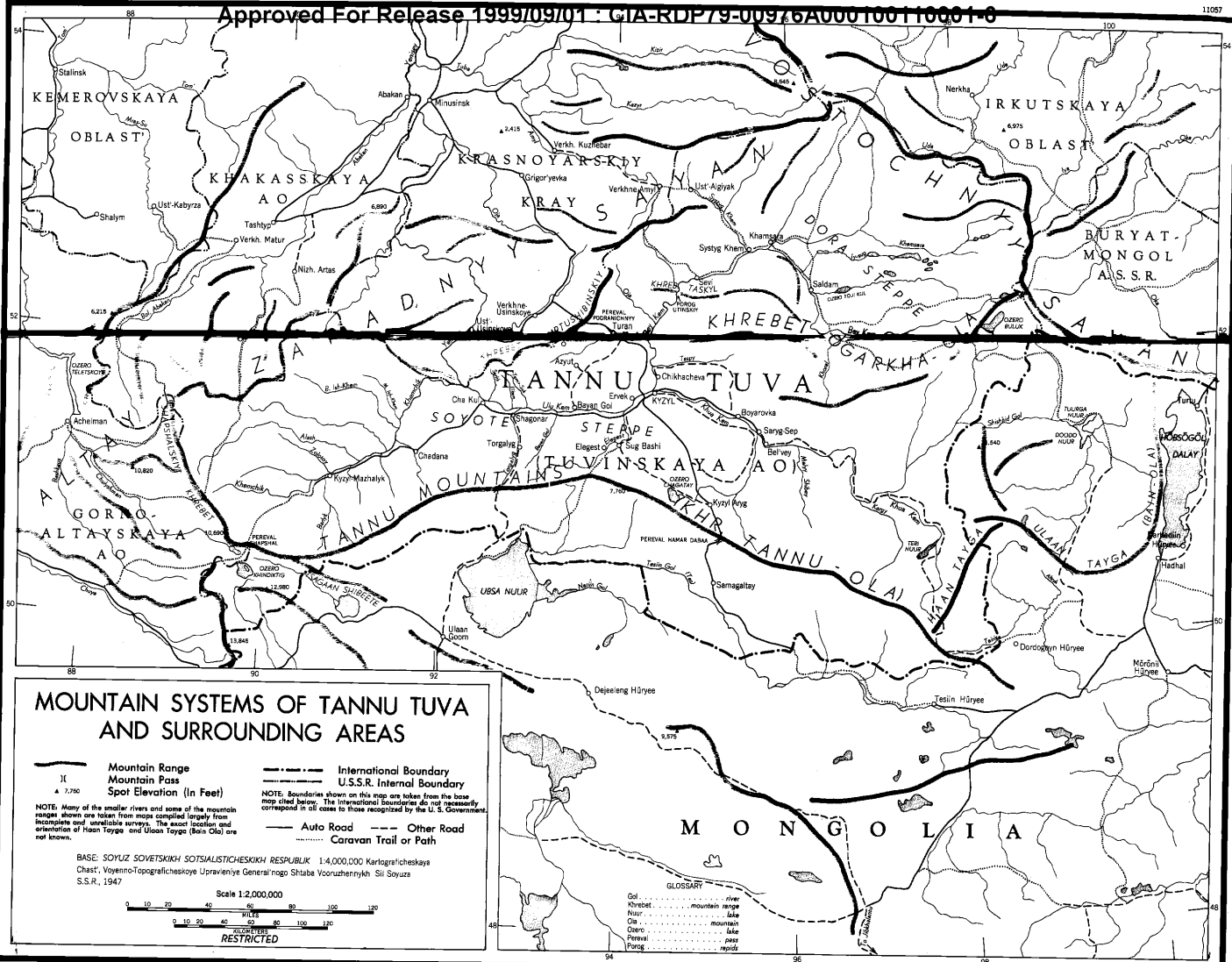
- Bengal'chik
- Dzhangis-Taiga
- Ilikem
- Irbek River
- Lake Tuskul
- Okol
- Talat River
- Tolbukskaya
- Toma-suk
- Uchzhory Rapids
- Zolotoy River

PROVISIONAL

RESTRICTED

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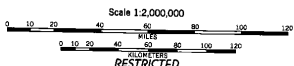
MOUNTAIN SYSTEMS OF TANNU TUVA AND SURROUNDING AREAS

- Mountain Range
- Mountain Pass
- Spot Elevation (In Feet)
- International Boundary
- U.S.S.R. Internal Boundary
- Auto Road
- Other Road
- Caravan Trail or Path

NOTE: Many of the smaller rivers and some of the mountain ranges shown are taken from maps compiled largely from incomplete and unreliable surveys. The exact location and orientation of Tsam Torpa and Ulsan Torpa (Bain Oia) are not known.

NOTE: Boundaries shown on this map are taken from the base map cited below. The international boundaries do not necessarily correspond in all cases to those recognized by the U. S. Government.

BASE: SOYUZ SOVETSKIKH SOTSIALISTICHESKIH RESPUBLIK 1:4,000,000 Kartograficheskaya Chast', Voenno-Topograficheskoye Upravleniye General'nogo Shtaba Vozruchennykh Sli Soyuz S.S.R., 1947



GLOSSARY

Gol	river
Khibat	mountain range
Niur	lake
Or	mountain
Qara	lake
Perval	pass
Portog	repass

11057 Map Branch, CIA, 9-49

U. S. GPO-S

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RESOURCES, LAND UTILIZATION, AND INDUSTRIES OF TANNU TUVA

KNOWN MINERAL DEPOSITS

- Gold
- Petroleum
- Copper
- Asbestos
- Mineral Spring

REPORTED MINERAL DEPOSITS

- Gold
- Magnesia
- Silver, Lead
- Asbestos
- Coal
- Copper
- Graphite
- Iron
- Platinum
- Iridium

LAND UTILIZATION*

- Cattle and small-type livestock raising; most cultivation of grain in Tannu Tuva
- Small-type livestock raising; predominantly less cultivation of grain
- Small-type livestock raising; predominantly insignificant cultivation of grain
- Reindeer raising and hunting
- Area of Commercial Fishing
- State Farm

INDUSTRIES*

- Food
- Lumber
- Brick
- Power Station
- Leather and Sheepskin Coat
- Auto Road
- OTHER ROAD
- CARAVAN TRAIL OR PATH
- Auto Repair

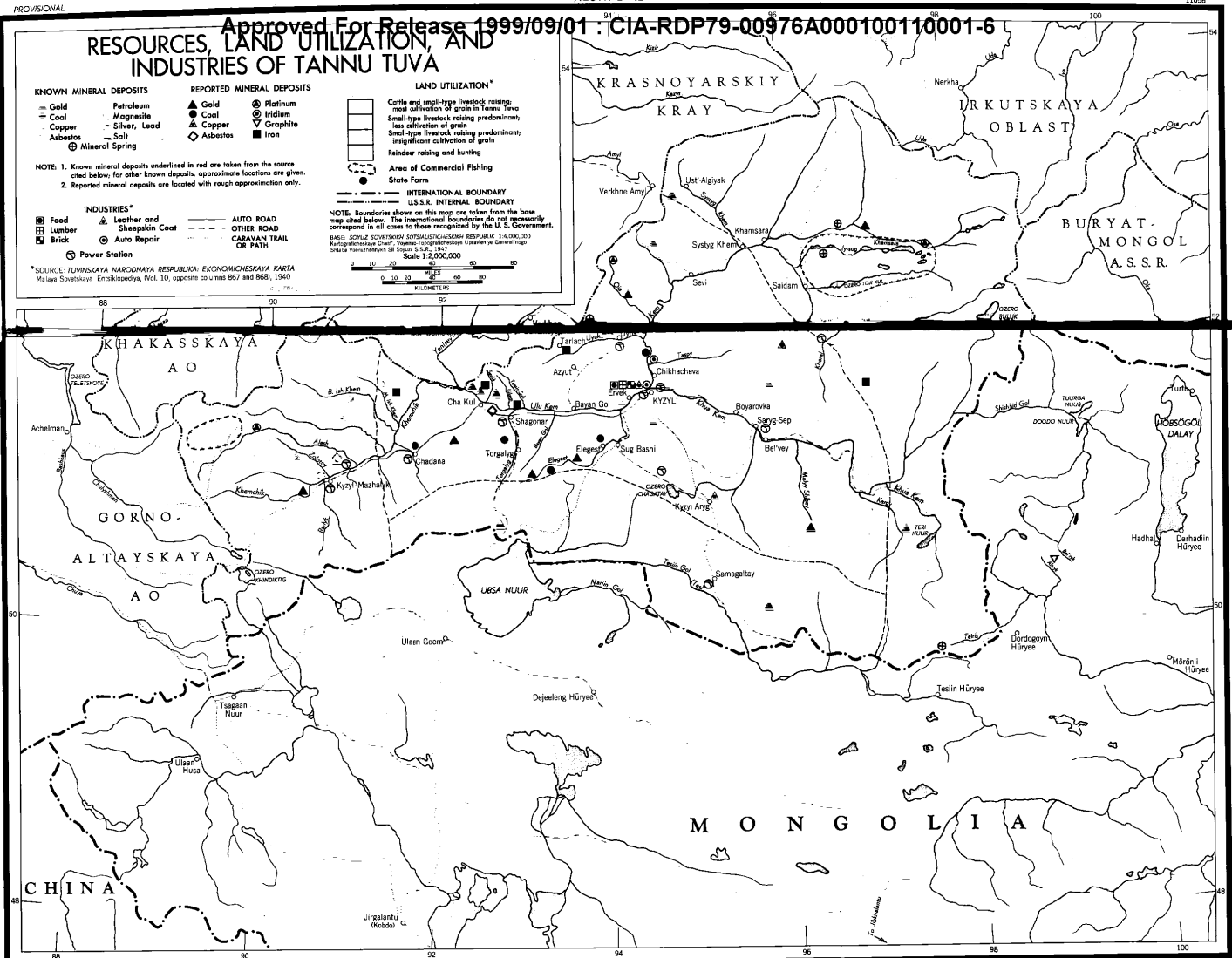
NOTE: 1. Known mineral deposits underlined in red are taken from the source cited below; for other known deposits, approximate locations are given.
2. Reported mineral deposits are located with rough approximation only.

NOTE: Boundaries shown on this map are taken from the base map cited below. The international boundaries do not necessarily correspond in all cases to those recognized by the U.S. Government.

BASE: SOVIET UNION, SOVIET MINERAL RESOURCES, 1:4,000,000
 Kartograficheskoye Upravleniye, Vostochno-Sibirskiy Nauchno-Issledovatskiy Tsentr
 Sibirskiy Nauchno-Issledovatskiy Tsentr, S.S.S.R., 1957

Scale 1:2,000,000

0 10 20 30 40 50 60 70 80 90 100
KILOMETERS



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