

WORKING PAPER

[Redacted]

25X1

18 December 1968

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MEMORANDUM FOR: [Redacted] Department of State

25X1

SUBJECT: Update of Information on Drought Conditions in Chile

REFERENCES: 1. COMIREX 448-69
2. [Redacted]

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1. This memo updates information derived [Redacted] in September 1968, and discusses the areas previously analyzed in middle Chile (Reference 2).

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2. KEYHOLE photography [Redacted] provides additional coverage of these areas since the September 1968 coverage. Drought conditions appear to be generally the same; however, relative vertical differences in water levels can be measured [Redacted] providing some additional quantitative information (See Attachment 1).

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3. The following annotated photographs are also enclosed: Lake Maule (Attachment 2); Lake Maule Dam (Attachment 3); Lake Laja (Attachment 4); Parral Area (Attachment 5); and Middle Chile (Attachment 6).

4. Any further inquiries should be directed to [Redacted] NPIC/IEG/SD, through [Redacted], Office of the Director, NPIC. (Telephone IDS Code [Redacted])

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[Redacted Signature]

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Chief, Imagery Exploitation Group
NPIC

Attachments: a/s

[Redacted]

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18 December 1968

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SUBJECT: Update of Information on Drought Conditions in Chile

Distribution:

- Cy 1 [redacted] Director of Engineering, AID, Dept of State
(Attachments 1-6) 25X1
- 2 - Dr. Steininger, Office of the Scientific Advisor to the President,
Executive Office Building (Attachments 1-6)
- 3 - Chairman, COMIREX (Attachment 1)
- 4 - TCO/OEGI (Attachment 1)
- 5 - CIA/OER/[redacted] (Attachment 1) 25X1
- 6 - NPIC/IEG/PCS/R&PCB
- 7 - NPIC/IEG/SD
- 8 - NPIC/PPES/REQ

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Attachment 1 to [REDACTED]

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DROUGHT CONDITIONS IN CHILE
NOVEMBER 1968

Talca Area (35-26S 071-36W)

This area was covered by Mission 1105 only. The water level in the Claro River and its tributaries appears to be the same as it was in September 1968, which approximated the February level of approximately 4 M³ sec (cubic meters per second). The normal November level is 19 M³ sec. Agriculture appears active in the area, with a noticeable tone difference between irrigated and nonirrigated agriculture.

Lake Maule (36-02S 070-33W)

The water level appears to be slightly lower [REDACTED] than it was in September 1968. The lake level is 37 feet (\pm 5 feet) below the spillway on the November coverage. The water was almost to the level of the spillway in February 1967, Mission 1039. Little snow remains in the surrounding area, and little improvement in the water level from this source can be expected.

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Vicinity (12 nm SE) of Parral (36-14S 072-05W)

The Perquilauquen River is slightly higher than in September, but is still at a very low stage compared to the February 1967 level. The average February flow is 5 M³ sec; the average November flow is 31 M³ sec. Agriculture appears active in the area, and many of the grain fields have turned in color and a few have been cut. Several threshing floors are visible, but none appears to be in use. The ripening of the fields may be somewhat early and could have been hastened by dry conditions.

Lake Laja (37-31S 071-22W)

This lake is very low, but this condition may have been created to facilitate work on hydroelectric projects in the area. The top of the small dam and spillway at the south end of the lake is 164 feet (\pm 5 feet) above the water level. The high water terrace is 140 feet (\pm 5 feet) above the water level. This condition is probably the result of drought conditions but this lake will provide little water for industrial and agricultural use.

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Sowell Area (34-06S 070-21W)

A small amount of snow remains on the surrounding peaks and protected areas; all lower slopes are bare. Little drought effect is visible.

Lake Quilletue (38-40S 071-18W)

This lake approximates its September level. Some snow is on the higher ridges.

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Copiapó Area (27-22S 070-20W)

This is an arid environ which will usually display evidence of drought. Agriculture is not a major industry and is restricted to the river valley. Fields on the periphery are often fallow in dry years and this appears to be the present case. The grass in the athletic stadium is dark in tone, indicating that there is enough water available for such irrigation.

Regional Observations

[redacted] an overall view of middle Chile on the 10th and 11th of November 1968. The 10 November coverage indicates a greater extent of snow cover than that of the 11th. The rapid change is indicative of an extensive, but light, snowfall. The extent of snow cover on 11 November is comparable to mid-December 1966, which would indicate that there was either a rapid melt-off or less snow. Since a rapid melt-off would result in a higher reservoir and stream level, it appears that there was less snow this winter. The streams emptying into the Pacific Ocean show only a light discharge.

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Opinions

It appears that the stream levels are about the same as the September levels, which approximated the summer low water stage. This river stage probably is maintained by subterranean sources which are not immediately dependent upon precipitation. The snow melt did not cause a significant change in reservoir level. Agricultural activity continues; the ground tones indicate that the crops are not lost. An occasional small amount of rain could sustain the vegetation but could not support even an average yield.

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Attachment 1 to

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Related Document

Ministerio de Obras Publicas, Chile, Inventario de Recursos Meteorológicos Superficiales de Chile, Publicacion No 12, Mayo 1963
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WORKING DRAFT



16 October 1968

Drought Conditions in Chile

Available KEYHOLE photography was reviewed to determine any evidence of the reported drought in Chile and the amount of available surface water in reserve in reservoirs and in the form of snow. This analysis was hampered by the lack of comparative coverage. Ideally, September 1968 photography would have been correlated with September coverage and available data for several prior years. Available system photography could provide only a comparison of September 1968 coverage with that of February 1967. Non-system photography from 1955 through 1961 in the December to April time frame was reviewed but was of little value.

[Redacted] provided medium-scale coverage of seven areas germane to the drought region, as well as complete coverage of the region by the index camera which yields very small scale photography. Mission 1039, February 1967, covered the southern two-thirds of middle Chile, [Redacted] Each area covered [Redacted] will be discussed individually, and the evidence observed on the index camera photography will be described from a regional viewpoint.

The following definitions apply to the terms used in describing snow cover:

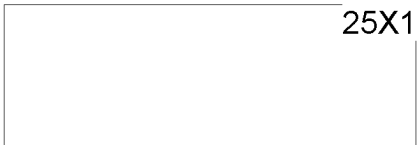
Light--exposed ridges with small vegetation clear of snow; small stream and gully outlines clearly discernible; no drifting or large accumulation observed obscuring minor land features.

Medium--most areas covered with the exception of exposed, bare, steep slopes; general outlines of minor land features visible with some drifting in protected areas; shrubs and small trees generally not covered.

Heavy--all areas covered except extremely steep exposed slopes; minor land features obscured and small vegetation covered; usually considerable drifting is evident.

Talca Area (35-26S 071-36W)

Clear coverage of an area of approximately 7 by 8 nautical miles (nm) reveals the town of Talca, major tributaries of the Maule River system,



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and agricultural activity. The principal indicator of surface water available on this photography is the Claro River. Collateral information 1/ indicates that this river carries a maximum of 40 cubic meters per second (m^3/sec) in August, 29 m^3/sec in September, and a minimum in February of 4 m^3/sec . The level of this river on 15 September 1968 approximates that of 24 February 1967, indicating that it is abnormally low. The Lircay River, which empties into the Claro just above Talca, has a small dam near its mouth with a spillway that diverts the water to a canal ending in the city. There is water flowing in this canal; however, it appears to be utilizing nearly all the flow of this river.

The Perquin River, a small river flowing through the south edge of Talca, has water in it, although many of the small streams appear dry. Farming in the area appears to consist mainly of medium and large farms growing a variety of crops. These farms appear to be active, and future coverage should provide additional information on this. It appears that irrigation water is in short supply for this time of year but agriculture is continuing.

Lake Maule (36-02S 070-33W)

All of the lake except the southeast tip is covered, but there are thin clouds over the dam and spillway area. The level of this lake is well below that of February 1967, and there is some flow out of the lake. There is light to medium snow cover in the area which will provide additional surface water. It would appear that this lake will provide irrigation water, but the available amount is probably well below normal.

Vicinity of Parral (36-14S 072-05W)

An area of approximately 7 by 8 nm located 12 nm southwest of Parral is covered on clear photography. It appears to be a relatively desolate region where medium-size farms are cultivated in a rotation of small grain, pasture, and/or fallow. The agriculture in this area is apparently active. A small segment of the Perquilauquen River is visible. Collateral information 1/ indicates that this river carries a volume of 3 m^3/sec in

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16 October 1968

February at its minimum flow and peaks in both June and October at 31 m³/sec, with a flow of 28 m³/sec in September. This river appears to be slightly lower than its February 1967 flow; however, a small stream in the area, the Vega Honda, appears to be at a near normal flow.

Lake Laja (37-21S 071-22W)

The southern third of this lake is covered on clear photography. The level of the lake appears to be considerably lower than in February 1967. Several lacustrine terraces are visible, indicating a low level. The only effluent visible is flowing from the tailrace. There appears to be medium snow cover on the surrounding hills.

Lake Gualletue (38-40S 071-18W)

This lake appears to be lower in September 1968 than it was in February 1967. Both the streams flowing into and the effluent from this lake are at a moderate level. There is light to medium snow cover on the surrounding area which will provide some surface water.

Area North of Santiago (33-08S 070-40W)

A small area of approximately 3 by 7 nm located 15 nm north of Santiago is covered on clear photography. The area is mostly arid foothills, and the few fields that are in this vicinity appear to be under cultivation. All of the small stream beds are dry, although there is some evidence of irrigation. No snow is observed in the foothills.

Sewell Area (34-06S 070-21W)

An area of approximately 7 by 8 nm near Sewell is covered. This is a rugged mountainous section lying about 11,000 feet above sea level. It provides few indicators of the drought except for stored water in the form of snow. The snow cover here appears to be light with many of the lower slopes bare.

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Attachment 1

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Regional Observations

The index cameras [redacted] provided nearly complete coverage of the problem region at a very small scale. However, this coverage does provide some general information. The snow cover displayed in September 1968 begins at an elevation of approximately 4,000 feet above mean sea level; snow cover in December 1966 began at an elevation of 8,000 feet. The February 1967 coverage indicates that except for a few high peaks and protected areas there was then a complete melting of snow. Two small streams in the drought area are fed by glaciers and should provide a minimum flow throughout the summer. These are the Olivares, a small tributary in the Maipo River system, and the Los Cypreses, a small tributary of the Cachapoal River.

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Some indication of river flow is also furnished by a comparison of September 1968 and December 1966 coverages. The 1966 coverage shows a tone difference where fresh water is being discharged into the Pacific Ocean by several of the larger rivers, including the Maule, the Itata, and the Bio-Bio. The area of tone difference on the September 1968 coverage is considerably smaller, which would indicate less flow.

Opinions

A review of the limited amount of available photography has resulted in several opinions based on photographic evidence. These opinions follow:

A. It has been a very dry winter in middle Chile, causing the rivers and reservoirs to be very low when they are usually high.

B. Snow cover in the mountains can be considered moderate at the most and in some places light. This will provide some water, but probably less than normal, to an already critically low surface water system.

C. Many fields appear to be under cultivation but repeated photographic coverage, preferably with some near-infrared and color systems, is needed to make a reliable estimate of drought damage.

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D. The lack of surface moisture will increase the hazard of forest fires, since lakes and streams may not provide the natural barriers they do under normal conditions.

E. A significant drop in river levels from their present stage would probably result in serious industrial and municipal shortages, as well as having a profound effect on irrigated agriculture.

Document

1. Ministerio de Obras Publicas, Chile, Inventario de Recursos Hidrologicos Superficiales de Chile, Publicacion No 12, Mayo 1963
(UNCLASSIFIED)

Related Document

Smole, William J., Owner-Cultivatorship In Middle Chile, University of Chicago, Department of Geography, Research Paper No 89, 1963
(UNCLASSIFIED)

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CHILI

AREA OF INTEREST IS CENTRAL VALLEY
of CHILI ~~of~~ (C. 33°S - 42°S) AND
MOUNTAINS TO EAST (ANDES) WHICH
CONTRIBUTE RUN-OFF TO THE VALLEY.

SPECIFIC TARGETS COVERED

14 SEPT. MINERAL DEL TENIENTE 3406S 7021W

15 SEPT. LAGUNA DE MAUL 3602 S 7033W

15 SEPT. LAGUNA DE LA BAJA 3721S 7122W

15 SEPT. RIO DEL BIL 3840S 7115W

3846S 7115W

2 COPIES PRINTS - TARGET AREAS -

(SNOW)
SNOW PEAKS; INTEREST IN DROUGHT, WATER RESOURCES

C 10 X 12 - 11 X 14

WORKING FILE

[Redacted]

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16 October 1968

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(UNCLASSIFIED)



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WORKING PAPER

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MEMORANDUM FOR: Director, NPIC 23 Sept. 1968
DATE

FROM : Department of State, AID
(AGENCY) (OFFICE) (DIVISION)

THROUGH : COMIREX

REFERENCE : COMIREX 448-69
(REQUESTER'S REQUIREMENT NO.) (REQUESTER'S NAME AND PHONE)

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1. CHILE VARIOUS -- SEE ATTACHMENT I
(COUNTRY) (PLACE NAME) (COORDINATES) (WAC)

2. BACKGROUND INFORMATION: (Include degree of urgency and any facts bearing thereon, pertinent references, enclosures, etc.)

a. There is great concern within the State Department relative to the drought in Chile. If the drought continues and extends beyond the near future, a substantial change in our current AID program will be necessary to allow for food imports. Therefore, there is an urgent need for any information which may contribute toward an early assessment of the problem.

b. Background data, to include ground photography, can be made available through

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c. A comprehensive imagery report is required on 14 October 1968. The report will be of decreasing utility after that date, and after 1 November 1968 will be of little, if any value.

d. The report must be published in two versions; a Code-Word unsanitized report, and a sanitized report classified no higher than CONFIDENTIAL and preferably OFFICIAL USE ONLY.

e. Report distribution should be to Director of Engineering, AID, Dept. of State, Room 4528", and include two (2) copies of the Code-Word report and six (6) copies of the sanitized report. A single copy of each report should also be sent to the Chairman, COMIREX.

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3. SPECIFIC REQUIREMENT:

For each of the target areas listed in Attachment I, accomplish the following readout:

- a. Measure the area of snow-cover observed
- b. Compare the extent of current snow-covered area with that observed during the same time period in 1966 - 1967.
- c. Compare the extent of cultivation observed with that observed during the same time period in 1966 - 1967.
- d. Describe any evidence of and the extent of irrigation observed in the target areas.

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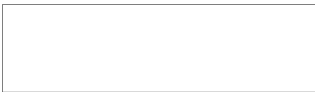
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ATTACHMENT I

Selected Target Areas in Chile



<u>NAME</u>	<u>GEO. COORD.</u>
MINERAL DEL TENIENTE	3406S/7021W
LAGUNA DEL MAULE	3602S/7033W
LAGUNA DE LA LAJA	3721S/7122W
RIO BIO BIO (NORTH)	3840S/7115W
RIO BIO BIO (SOUTH)	3846S/7115W

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CPYRGHT

