

CHAPTER XXVI. WATER CONSERVATION AND IRRIGATION.

§ 1. Artesian Water.

1. **General.**—In every country subject to droughts, the provision of adequate systems of water conservation is a matter of prime importance. Much has been done in Australia so far as the supply of water to centres of population is concerned, and a description of the principal water-works in each State will be found in Chapter XVIII. "Local Government".

Interstate conferences on the subject of artesian water were held in 1912, 1914, 1921, 1924 and 1928, when combined Governmental action was agreed upon with reference to delimitation of the artesian basins, hydrographic surveys, reason for decrease in flow, analyses and utilization of artesian water, etc. A map showing the extent of the known artesian basins appears on pp. 885-6.

2. **The Great Australian Artesian Basin.**—The area known as the "Great Australian Artesian Basin" includes (a) considerably more than one-half of Queensland, taking in practically all that State lying west of the Great Dividing Range, except an area in the north-west contiguous to the Northern Territory; (b) a considerable strip of New South Wales along its northern boundary and west of the Great Dividing Range; and (c) the north-eastern part of South Australia, together with the extreme south-eastern corner of the Northern Territory. This basin (shown approximately by the map on pp. 885-6) is said to be the largest yet discovered, and measures about 600,000 square miles, of which 376,000 are in Queensland, 118,000 in South Australia, 80,000 in New South Wales, and 25,000 in the Northern Territory. The area of the intake beds is estimated at 60,010 square miles, comprising 50,000 in Queensland and 10,010 in New South Wales. A description of the basin and its geological formation appears in previous issues of the Official Year Book (see No. 6, p. 569).

3. **The Western Australian Basins.**—The Western Australian Basins fall naturally within five distinct groups, namely, the Eucla Basin, in the extreme south-east of the State, extending well into South Australia along the shores of the Great Australian Bight; the Coastal Plain Basin, west of the Darling Range; the North-West Basin, between the Murchison and Ashburton Rivers; the Gulf Basin, between Cambridge Gulf and Queen's Channel; and the Desert Basin, between the De Grey and Fitzroy Rivers.

The Recent and Tertiary strata which enter Western Australia at its eastern border, and which have a prevailing dip towards the Great Australian Bight, form the Eucla artesian water area. Where boring operations have been undertaken, the water has been found to be salt or brackish, and there are other conditions affecting the supply, such as local variation in the thickness of the beds, their relative porosity, and the unevenness of the floor upon which they rest, which so far have not been examined with sufficient thoroughness to enable many particulars to be given in regard to this basin.

In the Coastal Plain Basin to the west of the Darling Ranges, artesian boring has, on the other hand, been carried on successfully for many years.

4. **The Murray River Basin.**—The Murray River Basin extends over south-western New South Wales, north-western Victoria, and south-eastern South Australia. It is bounded on the west by the azoic and palæozoic rocks of the Mount Lofty and other ranges extending northwards from near the mouth of the Murray to the Barrier Range, and on the east and north-east by the ranges of Victoria and New South Wales. This tertiary water-basin is occupied by a succession of sedimentary formations, both porous and impervious. The waters of the Murray River are partly supplied by influx from the water-bearing beds of this basin; this is proved by the fact that, at low water, springs are observed at certain places flowing into the river bed from beneath the limestone cliffs from Pyap Bend downwards. Similar springs exist along the courses of other branches of the River Murray system, where they cut through the tertiary formation. On the Victorian side, bores have been put down, and water has been struck at various levels.

5. **Plutonic or Meteoric Waters.**—In previous issues of the Official Year Book will be found a statement of the theory of Professor Gregory* as to the origin of the water in the Australian artesian basins, together with the objections held thereto by a former Government Geologist of New South Wales† (see Official Year Book No. 6, p. 570).

6. **Artesian and Sub-Artesian Bores.**—(i) *General.* The following table gives particulars regarding artesian and sub-artesian bores in each State and in the Northern Territory. As a result of the war-time conditions the collection of data relating to artesian bores has been discontinued since 1939-40:—

ARTESIAN AND SUB-ARTESIAN BORES, 1939-40.

Particulars.	N.S.W.	Vic.	Q'land.	S. Aust. (a)	W. Aust.	N. Terr.	Australia. (b)
Bores existing .. No.	763	330	6,514	162	284	191	8,244
Total depth of existing bores .. '000 feet	(c) 1,167	11	3,099	116	231	63	4,687
Daily flow .. '000 gals.	(d) 68,653	3,000	260,000	12,972	(e)	7,723	352,348
Depth at which artesian water was struck—							
Maximum .. feet	4,338	3,000	6,000	4,851	4,006	1,760	6,000
Minimum "	100	50	10	233	30	42	10
Temperature of flow—							
Maximum .. °Fahr.	141	160	212	208	(e)	(e)	212
Minimum "	75	10	78	82	(e)	(e)	10

(a) Government bores only. (b) Incomplete. (c) Total depth of all bores. (d) Flowing bores only. (e) Not available.

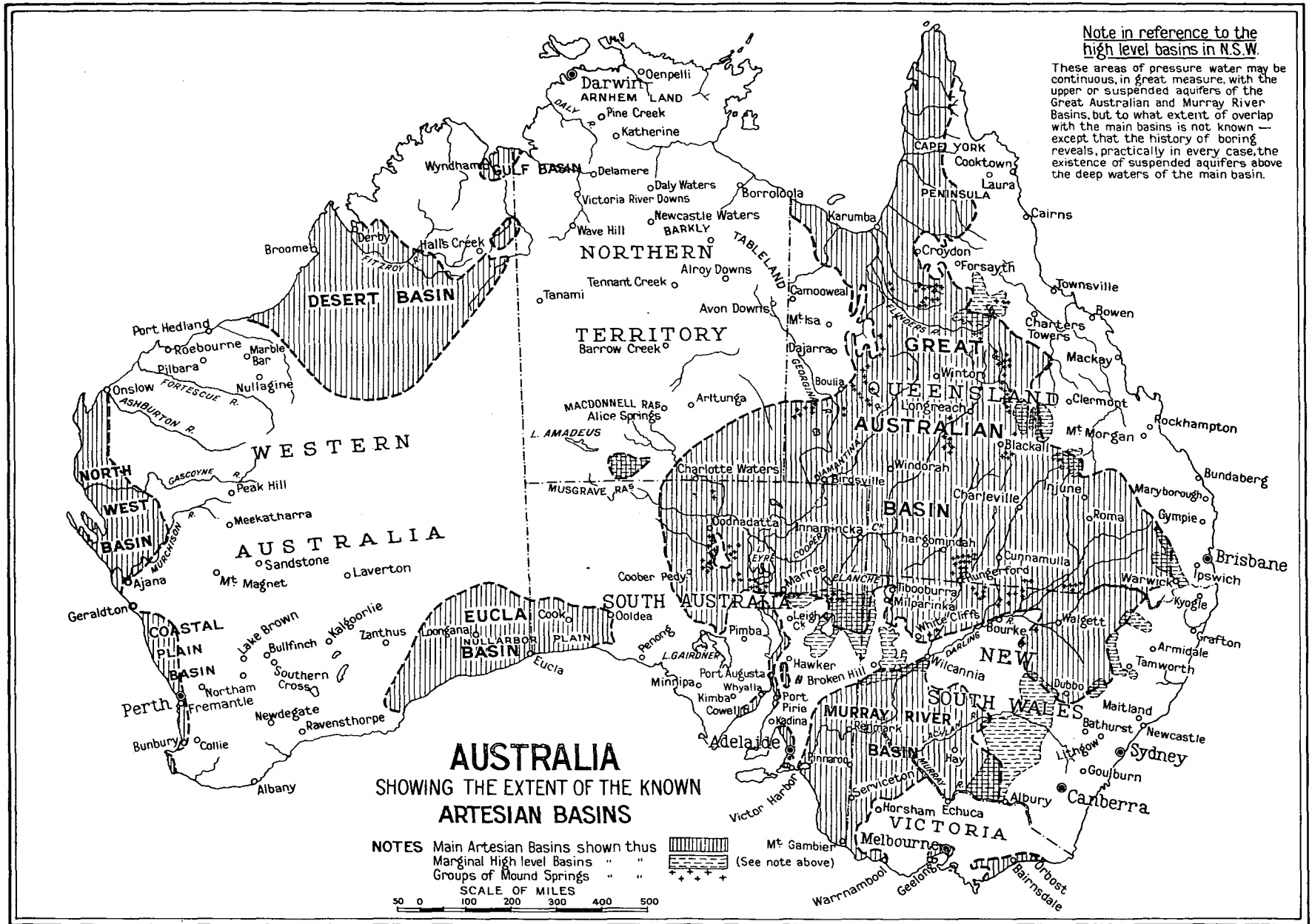
(ii) *Details for States.*—Considerations of space preclude the insertion of separate particulars of operations in the States during 1939-40. Details for earlier years appear in issues of the Official Year Book prior to No. 23, 1930.

§ 2. Irrigation.

1. **General.**—Australia's first experiments in irrigation were made with the object of bringing under cultivation areas in which an inadequate rainfall rendered agricultural and even pastoral occupations precarious and intermittent, and, although these original settlements have generally proved fairly successful, most of the States, instead of promoting new settlement in unoccupied regions, are adopting the policy of making existing settlements closer, by repurchasing large estates, sub-dividing them into holdings of suitable sizes for cultivation, and selling the land upon easy terms of payments. It is in connexion with this Closer Settlement policy that the special value of irrigation is recognized. Information regarding the various irrigation schemes in operation is given in some detail in preceding issues of the Official Year Book (see No. 23, pp. 637-61).

* See J. W. Gregory, F.R.S., D.Sc.: "The Dead Heart of Australia," London, John Murray, 1906; and "The Flowing Wells of Central Australia," Geogr. Journal, July and August, 1911.

† E. F. Pittman, A.R.S.M., formerly Government Geologist of New South Wales: "Problems of the Artesian Water Supply of Australia, with special reference to Professor Gregory's Theory." (Clarke Memorial Lecture, delivered before the Royal Society of New South Wales, 31st October, 1907); "The Great Australian Artesian Basin," Sydney, 1914; and "The Composition and Porosity of the Intake Beds of the Great Australian Artesian Basin," Sydney, 1915.



This map was re-drawn from that published in the Report of the Fifth Interstate Conference on Artesian Water, Sydney, 1928.

2. **Areas Irrigated.**—The following table gives the areas irrigated in each State during the years 1931-32 to 1941-42. The area shown for New South Wales refers only to crops irrigated. It does not include pasture land and fallow land which may have been irrigated and consequently the area is not strictly comparable with that shown for other States.

IRRIGATION : AREAS IRRIGATED.

Season.	N.S.W. (a)	Victoria.	Queensland.	S. Aust.	W. Aust.	Tasmania.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1931-32 ..	114,777	418,415	28,414	42,813	6,104	7,768	618,291
1932-33 ..	130,977	474,716	31,409	42,556	6,434	7,605	693,697
1933-34 ..	131,772	435,324	29,363	42,898	7,640	9,194	656,191
1934-35 ..	125,423	494,226	34,138	39,594	8,861	7,786	(b)710,054
1935-36 ..	138,016	495,835	44,283	42,672	11,396	8,987	(b)741,312
1936-37 ..	151,683	518,827	44,509	42,292	13,295	9,987	(b)780,663
1937-38 ..	170,719	590,112	49,154	44,250	14,284	8,428	(b)876,953
1938-39 ..	183,518	515,357	48,953	43,602	14,278	8,599	(b)814,357
1939-40 ..	120,753	517,903	55,153	44,470	15,443	8,556	(b)762,641
1940-41 ..	158,337	596,662	60,961	46,268	14,513	8,821	(b)885,953
1941-42 ..	(c)	602,074	(c)	45,757	15,060	6,975	(c)

(a) Excludes pasture and fallow lands. (b) Includes Australian Capital Territory, 1934-35, 26 acres; 1935-36, 123 acres; 1936-37, 70 acres; 1937-38, 6 acres; 1938-39, 50 acres; 1939-40, 263 acres; 1940-41, 391 acres; and 1941-42, 48 acres. (c) Not available.

3. **Crops on Irrigated Areas.**—A classification of the crops grown on irrigated areas in each State during 1940-41 will be found in the next table. Lucerne, grasses and green fodder accounted for 33 per cent., cereals for 25 per cent., orchards and vineyards for 27 per cent., and root crops, market-gardens, etc., for 15 per cent. of the total area of crops under irrigation in 1940-41. The area in Victoria does not include 352,556 acres of pasture land which were irrigated in 1940-41. Likewise 6,270 acres of pasture land are also omitted from the Tasmanian figures for the same year.

With the development of irrigation, rice growing was introduced into the Murrumbidgee Irrigation Area about 1924-25, and with the increased demand due to the occupation by Japan of the rice-producing countries north of Australia the area of this crop has been greatly increased and extended to the Wakool Irrigation Area. For further particulars see § 8, Chapter XXII.

IRRIGATION : CROPS ON IRRIGATED AREAS, 1940-41.

Crop.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Total. (a)
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Cereals	77,461	53,499	413	131,373
Lucerne, Grasses and Green Fodder ..	40,018	105,809	8,063	(b) 10,173	8,824	67	173,255
Orchards and Vineyards ..	29,568	72,403	10,207	29,590	2,218	961	144,947
Root Crops, Market- gardens and other Crops	11,290	12,395	(c)42,278	6,505	3,471	(d)1,523	77,552
Total	158,337	244,106	60,961	46,268	14,513	2,551	527,127

(a) Includes 391 acres Australian Capital Territory as follows:—Green Fodder, 301 acres; and Market-gardens, 90 acres. (b) Includes pasture land. (c) Includes Sugar-cane, 39,768 acres; Cotton, 1,066 acres; and Tobacco, 1,430 acres. (d) Includes Hops, 967 acres