

THE GEOLOGICAL SURVEY OF WYOMING

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SALINE LAKE DEPOSITS OF WYOMING

THE "DUPONT" OR INDEPENDENCE DEPOSITS.

NATRONA COUNTY, WYOMING

INTRODUCTION

These deposits have been described by Weeks (1., 553-554) and by Knight and Slosson (2, 98-102, 117-120). The information contained in this report is a summary of the data given in the Weeks, and Knight and Slosson reports. No independent investigations of these deposits have been made by the Geological Survey of Wyoming.

LOCATION

The "Dupont" or Independence deposits are located in the Sweetwater Valley near Independence Rock in southwestern Natrona County. The various deposits lie both east and west of Highway 87E, some 65 miles southwest of Casper and 55 north of Rawlins. The New York and Philadelphia deposits are located in section 12, T. 29 N., R. 87 W. The Wilmington and Wilkesbarre are located in sections 2, 3, 10 and 11, T. 29 N., R. 86 W. The Omaha deposit is located a mile and one half north of the Wilkesbarre. Three miles northeast of the Omaha deposit are the Berthaton deposits.

EXTENT OF THE DEPOSITS

Weeks (1., 553) gives the following description of the deposits:

"The soda deposits in Carbon County (now Natrona County) are situated in the Sweetwater Valley, near Independence Rock, and nearly 50 miles due north of Rawlins. These deposits contain both carbonate and sulphate of soda, and are generally known as the "Dupont Lakes." The lakes are four in number and vary from 6 to 2000\* acres in area, and are held by United States patents in the name of L. Dupont. There are five claims known as:

\*Probably should read 200. None of the deposits approximate 2000 acres.

	Acres
New York Soda Mine .....	160
Philadelphia Soda Mine .....	80
Omaha Soda Mine .....	20
Wilmington Soda Mine .....	160
Wilkes Barre Soda Mine .....	20

"The Omaha Soda Mine includes 20 acres, of which about 5 are covered with carbonate and sulphate of soda, mixed with a little chloride of sodium and sand blown in from the surrounding soil. Several bore holes were put down, and show an average thickness of about 6 feet.

"The Wilkes Barre claim is about one mile west of the Omaha, and the soda is in solution.

"The Wilmington claim is located one-quarter of a mile west of the Wilkes Barre, and covers 160 acres. The soda is also in solution. Its depth has never been determined. It has been sounded with a 40 foot rope without finding the bottom in the center.

"The New York and Philadelphia claims are both upon one lake, which is solid, and is 4 miles west of the Wilmington. Two bore holes have been put down in this lake. One, at a distance of 50 feet from the shore, showed 4 feet of soda; the other, at a distance of 230 feet from the shore, passed through 14 feet of solid soda without touching bottom."

W. C. Knight and E. E. Slosson (2) investigated these deposits and published a description of them in 1901. W. C. Knight (2., 100) states:

"The New York and Philadelphia claims are located on sec. 12, T. 29, R. 87, and are very near the granitic exposures that extend north from Devil's Gate. These claims are located upon one basin, which, according to survey of the owners of these claims contain 110 acres of deposit."

W. C. Knight describes the deposits as being nearly a mile in length and from one-fourth to one-half mile in width. He did not test the thickness of the deposit, but believed that "the entire deposit would average not less than four feet in thickness."

Five miles east of the New York and Philadelphia deposits are the Wilmington and Wilkesbarre. They are located, according to W. C. Knight, in sections 2, 3, 10 and 11, T. 29 N., R. 86 W. When examined by W. C. Knight, the Wilmington lake comprised 160 acres. It consisted of a lake, the water of which was highly charged with alkali. Solid salts may or may not have been present in the bottom of the lake. The Wilkesbarre claim lies to the east of the

Wilmington and is separated from it by a low narrow ridge. No deposits of consequence were observed in this claim.

The Omaha deposit lies one and a half miles northeast of the Wilkesbarre. Solid crystalline alkali covers an area of between three and four acres. When examined by W. C. Knight a drill hole near the middle penetrated  $4\frac{1}{2}$  feet of alkali.

The Berthaton deposits lie 3 miles northeast of the Omaha. A plant for the recovery of sodium bi-carbonate was erected on these claims some years prior to 1900. The claims (640 acres) are scattered along what appears to be an abandoned channel of the Sweetwater. When examined by W. C. Knight, most of the depressions were covered with water and the presence of solid deposits, if any, were not detected. Drainage through the channel has in all probability flushed the depressions from time to time. Consequently, no extensive accumulations of solid deposits are to be anticipated.

CHEMICAL NATURE OF THE DEPOSITS

The Omaha Deposit:- This deposit is a mixture of sodium sulphate, sodium carbonate, sodium bi-carbonate and sodium chloride. Samples taken at a varying depth show great variations in percentage composition.

Slosson (2., 121) gives the following analyses:

Analyses of samples from Omaha Deposit  
(Samples No. 76, 77, 78, 79 were collected in 1897, and No. 148 in 1899)

No.	79	78	77	76	148
Position of sample	Surface	Average Upper 10"	Average 10 to 14 inches	Average 14 to 17 inches	Depth of 2 feet
Water	36.67	45.21	49.97	53.17	39.46
Insoluble matter	.97	.71	19.04	18.29	30.30
Na <sub>2</sub> SO <sub>4</sub>	25.88	6.85	2.94	4.66	11.25
NaCl	4.83	.05	1.50	1.16	.95
Na <sub>2</sub> CO <sub>3</sub>	26.83	47.18	26.55	17.31	18.04
NaH CO <sub>3</sub>	4.82	—	—	5.41	—
Calculated as dry salts					
Na <sub>2</sub> SO <sub>4</sub>	41.51	12.67	9.49	19.36	37.20
NaCl	7.74	.09	4.84	4.05	3.14
Na <sub>2</sub> CO <sub>3</sub>	43.02	87.24	85.67	60.62	59.66
NaH CO <sub>3</sub>	7.73	—	—	18.97	—

Weeks (1., 554) gives the following analyses of dried samples from the Omaha deposit:

(Samples collected in 1885 or earlier)

Position of sample	Surface	Near Surface*	5' Below Surface	5' Below Surface
Insoluble matter	-----	1.20	-----	-----
NaCl	.81	.65	.32	.979
Na <sub>2</sub> SO <sub>4</sub>	17.02	59.29	65.08	64.05
Na <sub>2</sub> CO <sub>3</sub>	80.60	27.60	16.70	15.60

\*This sample contained 56.3% of water

Weeks reports on the amount of carbonate of soda contained in different samples as follows:

No. of sample	Position of sample	Carbonate of Soda
1	3½' from surface	24.62
2	Surface	41.55
3	" near shore	32.42

Wilkesbarre Claim:- Weeks (1., 554) reports that two samples of brine from this claim yield the following amounts of carbonate of soda:

	Grains per Gal.	Grams per liter
Sample No. 1	3,728	64.5
Sample No. 2	4,905	86.4

The Wilmington Lake:- Slosson (2., 119-120) states:

"The deposit along the shore of the lake (No. 152) shows the mixture of sulphate, chloride and carbonate characteristic of this group. A sample taken from the bottom of the lake (No. 153) is on the contrary nearly pure sodium sulphate with only a small quantity of chlorides. The water from the lake (1899) is a saturated solution of salts with a specific gravity of 1.104 and has the composition (No. 154) in grams per liter, which is approximately the same as parts per thousand."

Na <sub>2</sub> SO <sub>4</sub>	29.2
NaCl	21.2
Na <sub>2</sub> CO <sub>3</sub>	69.3
Total salts	119.7

"From these analyses it appears that the salt solutions that form these lakes deposit first pure crystals of mirabilite ( $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ ), and afterwards a mixture of mirabilite crystals with increasingly greater proportions of sodium carbonate ( $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ ) and sodium chloride. There is no proof of the formation of double salts of definite composition, but further study by experimental fractional crystallization will alone decide this point.

Slosson (2., 121) gives the following analyses of samples from Wilmington Lake:

(Samples collected in 1899)

No.	152	153	154
Water	51.99	55.10	-----
Insoluble residue	9.14	.74	-----
$\text{Na}_2\text{SO}_4$	21.42	42.34	-----
$\text{Na}_2\text{CO}_3$	2.92	.28	-----
$\text{NaHCO}_3$	14.55	1.54	-----
Calculated as dry salts			
$\text{Na}_2\text{SO}_4$	55.14	95.80	24.40
$\text{NaCl}$	7.47	.60	17.71
$\text{NaHCO}_3$	-----	-----	-----

New York and Philadelphia Deposit:- The following analyses of samples from this deposit are given by Slosson (2., 121). The samples were collected in November, 1899.

No.	149	150	151
Position of sample	Surface	Average from surface to depth of 4 inches	Average from 4 inches to 12 inches
Water	53.02	36.66	47.58
Insoluble residue	.33	39.05	9.67
$\text{Na}_2\text{SO}_4$	36.80	17.87	40.86
$\text{NaCl}$	3.81	2.94	.77
$\text{Na}_2\text{CO}_3$	6.04	4.48	1.12
$\text{NaHCO}_3$	-----	-----	-----
Calculated as dry salts			
$\text{Na}_2\text{SO}_4$	78.86	70.66	95.58
$\text{NaCl}$	8.20	11.62	1.30
$\text{Na}_2\text{CO}_3$	12.94	17.72	2.62
$\text{NaHCO}_3$	-----	-----	-----

This is predominantly a sodium sulphate deposit.

Weeks (1., 554) gives the following analysis of samples collected in 1885 or earlier.

No.	1	1	2
Insoluble residue	22.82	47.50	19.03
Na <sub>2</sub> So <sub>4</sub>	71.37	44.74	72.40
NaCl	1.83	2.04	2.52
Na <sub>2</sub> Co <sub>3</sub>	3.10	5.00	5.10

Berthaton Deposit:— A sample of brine from the upper Berthaton Lake, collected by W. C. Knight in 1897, had the following composition:

	Grams per liter
Na <sub>2</sub> So <sub>4</sub> .....	17.25
NaCl .....	11.69
Na <sub>2</sub> Co <sub>3</sub> .....	55.50
Total salts .....	84.45

The following analyses of samples collected by W. C. Knight in 1897 are given by Slosson. (2., 121)

No.	80	81	82
Position of sample	Surface clear crystals	Representative of deposit in Tale Lake	Solution from upper lake
Water	51.21	53.87	-----
Insoluble residue	7.01	3.06	-----
Na <sub>2</sub> So <sub>4</sub>	15.61	14.75	-----
NaCl	2.63	2.66	-----
Na <sub>2</sub> Co <sub>3</sub>	21.00	59.55	-----
NaHCo <sub>3</sub>	2.54	-----	-----
Calculated as dry salts			
Na <sub>2</sub> So <sub>4</sub>	37.36	34.27	20.24
NaCl	6.30	6.16	13.84
Na <sub>2</sub> Co <sub>3</sub>	50.26	59.57	65.72
NaHCo <sub>3</sub>	6.08	-----	-----

The Berthaton deposits are chiefly a mixture of sodium carbonate and sodium sulphate. The composition of the two lakes is much the same.

SUMMARY

Deposit	Nature	Extent in acres	Reported max. thickness of solid deposit	Character of brine or salt deposit (percentages given as dry salt)
Omaha	Solid deposit	5	Average 6'	Variable - $\text{Na}_2\text{SO}_4$ from 9 to 41%; $\text{Na}_2\text{CO}_3$ from 43 to 85%; $\text{NaHCO}_3$ from 0 to 19%
Wilkesbarre Wilmington	brine brine & solid deposit	160	40' (brine)	$\text{Na}_2\text{SO}_4$ from 24 (brine) to 96% (solid); $\text{Na}_2\text{CO}_3$ from 4% (solid) to 5% (brine)
New York & Philadelphia	solid deposit	110	14'	$\text{Na}_2\text{SO}_4$ from 70% to 95% $\text{Na}_2\text{CO}_3$ from 3% to 13%
Berthaton	brine	?	Depression in abandoned river channel	$\text{Na}_2\text{SO}_4$ from 20% (brine) to 27% (solid); $\text{Na}_2\text{CO}_3$ from 50% (solid) to 66% (brine) $\text{NaHCO}_3$ from 0 to 6%

CONCLUSIONS

Extensive additional field investigations will have to be made before any estimates can be made as to amount of salts contained in the brines and solid salts of this group of deposits. Considerable change may have taken place in these deposits since they were last reported on some 40 years ago. The Geological Survey has been investigating the saline deposits of the state. The Downey Lakes and Rock Creek Lakes, Albany County, have been reported upon to date.

References

1. Weeks, Jos. D., Glass Materials, U. S. Geological Survey, Mineral Resources of the United States, Calendar Year 1885. Washington, 1886.
2. Knight, W. C. and Slosson, E. E., Alkali Lakes and Deposits, Wyoming Experiment Station, Bulletin No. 49, University of Wyoming, 1901.