PART II

THE PROJECTS AND THE RESERVATIONS

The Dam and Reservoir Projects

Three rolled earth fill dams across the Missouri River which are being built by the U. S. Corps of Engineers--the Garrison, the Oahe, and the Fort Randall--will flood Indian lands on seven Indian reservations in North Dakota and South Dakota. Adverse effects of the flooding on five of these reservations are discussed in this report. The location of the dams, the extent of the reservoir areas back of the dams, and the Indian reservations affected by the reservoirs are shown on the map at the end of this report. Some comparative data regarding these multiple-purpose projects and the Fort Peck Project are presented in table 2.

Garrison Project

The Garrison Dam is located in west central North Dakota about 72 highway miles northwest of Bismarck. It will contain 70 million cubic yards of earth embankment. A highway will run along the 12,000-foot crest of the dam. The reservoir back of the dam will cut Fort Berthold Reservation from its southeast to its northwest corner and divide the reservation into five more or less isolated segments. The reservoir will extend beyond the reservation to within a few miles of the western border of North Dakota. The maximum operating pool back of the dam will be 1,854 feet above mean sea level. The surface area of the lake at maximum pool level will be approximately 410,000 acres.

Oahe Project

The site of the Oahe Dam is about 6 miles northwest of Pierre, South Dakota and 1,123 miles above the mouth of the Missouri River. The embankment, which will form the dam across the valley, will contain 78 million cubic yards of material. It will have an average height of 242 feet above the streambed. The crest, 9,300 feet long, will be 60 feet wide and carry a roadway.

The reservoir will extend for approximately 250 miles along the Missouri River from the Oahe Dam to the vicinity of Bismarck, North Dakota. This reservoir will flood lands along the eastern boundaries of the Standing Rock and the Cheyenne River Reservations and for miles up western tributaries of the Missouri--the Cannonball, the Grand, the Moreau, and the Cheyenne Rivers. The maximum operating pool level will be 1,620 feet above mean sea level. The lake surface at maximum pool level will be approximately 376,000 acres.

TABLE 2. SOME STATISTICAL DATA PERTAINING TO MAJOR MISSOURI RIVER DAM AND RESERVOIR PROJECTS 1/

ITEM	UNIT	FORT PECK	GARRISON	OAHE	FORT RANDALL
EARTH FILL USED IN CONSTRUCTION	MILLION CU. YDS.	126	70	78	28
LENGTH OF DAM	1,000 FT.	21	12	9.3	10.5
HEIGHT OF DAM ABOVE STREAMBED	FEET	250	210	242	160
MAXIMUM OPERATING POOL LEVEL	FT. M.S.L.	2,250	1,854	1,620	1,375
MINIMUM OPERATING POOL LEVEL	FT. M.S.L.	2,095	1,775	1,540	1,310
DIFFERENCE BETWEEN MAXIMUM AND MINIMUM POOL	FEET	155	79	80	65
LENGTH OF MAXIMUM OPERATING POOL	MILES	189	200	250	140
POOL SURFACE AREA AT MAXIMUM OPERATING POOL	1,000 ACRES	245	410	376	118
LIVE STORAGE CAPACITY	1,000 AC.FT.	18,795	19,600	18,100	4,900
ULTIMATE ELECTRIC GENERATING CAPACITY	1,000 KW	105	400	425	320

1/ INFORMATION FURNISHED BY U. S. CORPS OF ENGINEERS.

Fort Randall Project

The Fort Randall Dam is of rolled earth construction containing 28 million cubic yards of earth. Height above the streambed is approximately 160 feet. The dam is located near the Nebraska-South Dakota line. The northeast end of the dam is on the Yankton Indian Reservation.

The reservoir back of the dam will extend up the Missouri River Valley approximately 140 miles to the Big Bend of the Missouri River on Crow Creek and Lower Brule Reservations. The maximum operating pool will be 1,375 feet above mean sea level. At maximum pool level the surface area of the lake will be approximately 118,000 acres.

The United States has acquired by condemnation 2,851 acres of Indian trust land on the Yankton Reservation and 565 acres on the Rosebud Reservation for dam and reservoir purposes. It is now negotiating for Indian lands needed for reservoir purposes on Crow Creek and Lower Brule Reservations.

Land on Indian Reservations

Acreage of land under control of Indians generally has decreased since white settlement began. The original areas designated by treaties have been decreased by cession and by sale so that Indian ownership now represents but a fraction of the original holdings. Since Indians are continuously buying and selling land (mostly selling), acreages owned by Indians change from day to day. Data in tables in this report give acreages owned by Indians at recent dates.

The Great Sioux Reservation

Prior to 1889 the United States Government dealt with the Sioux Tribes as one people and included all the Dakota Sioux in the Fort Laramie Treaty of April 29, 1868[1/], ratified February 28, 1877[2/], when the boundaries of the Great Sioux Reservation were established. This vast territory was greatly reduced by the act of March 2, 1889[3/], which provided both for the restoration of much of the area to the public domain and the partition of the remainder into six reservations for the various bands of Sioux. By these acts the original boundaries of the Cheyenne River, Standing Rock, Lower Brule, Crow Creek, Pine Ridge, and Rosebud Reservations were established.

The partitioning act of 1887 and successive acts also established the authority for allotting[4/] tribal lands to individual members of the tribes and the opening of portions of the reservations to settlement by non-Indians through sale of tracts which had not been allotted. Soon thereafter, specific acts designating acreages to be allotted and eligibility therefor and Presidential proclamations declaring certain portions of the reservation open for homesteading followed for most of the reservations. The homesteading and sale of allotted land to non-Indians greatly reduced the trust acreage on all of the Sioux Reservations. In 1934 a restoration order[5/] authorized the Secretary of the Interior to return to tribal ownership all of the lands on these reservations that had not been sold. Some acreages were thus restored to trust status.

1/ 15 Stat. 635.

2/ 19 Stat. 254.

3/ 25 Stat. 94; 25 Stat. 888; 35 Stat. 451.

4/ See footnote 2 to table 3 for definition of allotment.

5/ Public Law No. 383, 73d Congress.

Standing Rock Reservation, South Dakota and North Dakota

The original area set aside for the Standing Rock Sioux totaled approximately 2,332,483 acres in North Dakota and South Dakota. The withdrawal for settlement by non-Indians under the act of May 29, 1908 took 1,061,500 acres.[1] Additional land was opened in February 1913.[2] These withdrawals and the sale of allotted lands which had been patented in fee reduced the trust acreage on this reservation to 1,026,655 acres by 1951--166,955 of which were in tribal ownership, table 3.

Cheyenne River Reservation, South Dakota

The boundary lines of the Cheyenne River Reservation described by the act of 1889 encompassed an area which totaled 2,812,022 acres. The allotting of land started in 1906, after which approximately 1,158,010 acres of unallotted lands were opened to settlement under the authority of the act of May 29, 1908 [3] and Presidential proclamation of 1909.[4] The return to tribal status of land which had not been sold to homesteaders brought the acreage in trust status in 1951 to 1,612,122, nearly half of which was owned by the tribe.

Crow Creek Reservation, South Dakota

Reductions in the 285,930 acres set aside for the Crow Creek Indians by the partitioning act of 1889 occurred both through homesteading and sale of allotted land. A patent in fee for certain reservation land was granted to the Bureau of Catholic Indian Missions in 1909. The area in trust status in 1951 was approximately 159,053 acres, of which only 5,280 were tribally owned.

Lower Brule Reservation, South Dakota

The reservation boundaries established in 1889 covered 232,715 acres, but these boundaries were extended the following year. In 1898, 120,000 acres were ceded to the United States. About 37 percent of the original reservation is now owned by non-Indians. The allotted trust acreage is now 130,240 acres. Since 1938 the Lower Brule Tribe has acquired approximately 18,000 acres by purchase from non-Indians, bringing the total in tribal ownership to 47,360 acres.

1/ 35 Stat. 460.

2/ 37 Stat. 675.

3/ 35 Stat. 460.

4/ 36 Stat. 2500.

TABLE 3. INDIAN LANDS ON FIVE MISSOURI RIVER RESERVATIONS, NORTH DAKOTA AND SOUTH DAKOTA

RESERVATION	RESERVATION AREA 1/	REMAINING INDIAN TRUST LANDS			LAND OWNED BY U. S. 5/	TOTAL INDIAN ADM.
		TOTAL	ALLOTTED 2/	TRIBAL		
	ACRES	ACRES	ACRES	ACRES	ACRES	ACRES
FORT BERTHOLD 3/	644,008	584,718	556,169	28,549	1,860	586,578
STANDING ROCK 3/	2,382,483	1,026,655	859,700	166,955	11,020	1,037,675
CHEYENNE RIVER 3/	2,812,022	1,612,122	813,949	798,173	6,003	1,618,125
CROW CREEK 4/	285,930	159,053	153,773	5,280	20,619	179,672
LOWER BRULE 4/	232,715	130,240	82,880	47,360	14,291	144,531
FIVE RESERVATIONS	6,307,158	3,512,788	2,466,471	1,046,317	53,793	3,566,581

1/ IN 1825 THE UNITED STATES GOVERNMENT ENTERED INTO A TREATY WITH THE SIOUX, FIXING THE BOUNDARIES BETWEEN THEM AND OTHER INDIAN NATIONS. THIS AND OTHER EARLY TREATIES ASSUMED MOST OF THE TERRITORY WEST OF THE MISSISSIPPI TO BE INDIAN COUNTRY. THE VAST ORIGINAL TERRITORIES WERE GREATLY REDUCED BY SUCCESSIVE TREATIES WHICH DEFINED SPECIFIC BOUNDARIES OF AREAS TO BE RESERVED FOR THE SEVERAL INDIVIDUAL BANDS OF SIOUX. UNDER "RESERVATION AREA" ARE THE APPROXIMATE ACREAGES RESERVED TO THE TRIBES BY VARIOUS TREATIES AND CONGRESSIONAL ACTS DURING THE LATTER PART OF THE NINETEENTH CENTURY BEFORE ADDITIONAL LANDS WERE CEDED TO THE FEDERAL AND STATE GOVERNMENTS PRINCIPALLY FOR THE PURPOSE OF MAKING LAND AVAILABLE TO HOMESTEADERS. THESE LAND CESSIONS AND SALES OF ALLOTTED LANDS TO NON-INDIANS ACCOUNT FOR THE FURTHER REDUCTION IN TRUST ACREAGE.

2/ UNDER AUTHORITY OF THE ACT OF 1887 AND SUCCESSIVE ACTS, MOST OF THE TRUST ACREAGES ON THESE RESERVATIONS WERE ALLOTTED TO INDIVIDUAL INDIANS. ACRES UNDER ALLOTTED LANDS INCLUDE LANDS IN EXCHANGE ASSIGNMENTS AS WELL AS STANDARD ALLOTMENTS. UNDER THE STANDARD ALLOTMENT A TRUST PATENT IS ISSUED GRANTING ESSENTIALLY THE SAME PROPRIETARY RIGHTS AS A FEE TITLE EXCEPT THAT THE LAND MAY NOT BE SOLD OR HYPOTHECATED WITHOUT THE CONSENT OF THE TRUSTEE AND IS NOT SUBJECT TO PROPERTY TAXES. AN EXCHANGE ASSIGNMENT RETAINS OWNERSHIP IN THE TRIBE BUT OTHERWISE GRANTS THE INDIVIDUAL ESSENTIALLY THE SAME SURFACE USE-RIGHTS AS A TRUST PATENT.

3/ THE ACREAGES FOR THESE RESERVATIONS ARE TAKEN FROM RECENTLY REVISED PLAT BOOKS OF THE RESERVATIONS PREPARED BY MRBI PERSONNEL.

4/ THESE ARE THE APPROXIMATE ACREAGES SHOWN BY AGENCY RECORDS AS OF JANUARY 1, 1951.

5/ INCLUDES LAND ACQUIRED UNDER THE SUBMARGINAL LAND PURCHASE PROGRAM AND GOVERNMENT LAND USED FOR SCHOOL OR AGENCY PURPOSES BUT DOES NOT INCLUDE TRIBAL LAND RESERVED FOR AGENCY OR OTHER PURPOSES.

Fort Berthold Reservation, North Dakota

The unratified Treaty of Fort Laramie of September 17, 1851 defined the boundaries of the Gros Ventre, Mandan, and Arikara Nations in Dakota, Montana, and Wyoming. The area described totaled approximately 12½ million acres. Large reductions in this area were made when the reservation in Dakota and Montana was later established by Executive Order, April 12, 1870. An Executive Order of July 13, 1880 restored the portion of the reservation in Montana to the public domain but extended the boundary of the reservation to the north and east of the river. By Congressional Act in 1891 1/ other lands in North Dakota were ceded and the acreage reduced to approximately 1½ million acres.

The then existing reservation was further diminished by the opening of 227,504 acres to settlement under the act of June 1, 1910.2/ At this time sections 16 and 36 of each township were reserved for use of the common schools of North Dakota and South Dakota. This and later amending acts also provided for the allotment of lands to members of the tribes under existing laws and the sale to non-Indians of surplus lands, i.e., land which had not been allotted to members of the tribe.

The gross area of the Fort Berthold Reservation was finally stabilized at 644,008 acres, of which approximately 60,000 acres of allotted land had been sold to non-Indians before the taking for the Garrison Reservoir.

Federal Land on Indian Reservations

Some white-owned land on Indian reservations was purchased by the United States in the submarginal land purchase program during the thirties. Apparently one of the original intentions was to return those lands to tribal ownership, but this has not been done. Rather, they are rented to the tribes for a small fee. Such lands generally are included with Indian lands and subleased to Indian or other ranchers or are used by tribal livestock enterprises. A small acreage of government land is used for school and agency sites. Including government land, total acreage under Indian administration on the five reservations is 3,566,581 acres.

1/ 26 Stat. 1032.

2/ 36 Stat. 455.

Character and Use of Indian Lands

Nearly 94 percent of Indian land on the five reservations is classed as grazing land, table 4. Some land placed in this class may be suitable for cropping during periods of above-normal precipitation but the acreage is small. About 5 percent of the total is classed as cropland. Most of this is dry-farm land, leased to non-Indians. Timber occupies less than 2 percent of the total acreage, but its relative importance to the Indian economy is many times greater than its areal extent as is explained elsewhere in this report. It is apparent from the land classification that most reservation land owned by Indians is suitable only for livestock production.

Table 4. Acreage of Lands Under Indian Administration by Major Use Classification 1/

Reservation	Cropland 1/	Grazing 1/	Timber 2/	Other 1/	Total 3/
	Acres	Acres	Acres	Acres	Acres
Fort Berthold	55,876	508,002	22,700		586,578
Standing Rock	74,461	944,214	19,000		1,037,675
Cheyenne River	22,429	1,582,800	11,940	956	1,618,125
Crow Creek	4,381	171,243	3,511	537	179,672
Lower Brule	3,318	137,666	2,974	573	144,531
Total	160,465	3,343,925	60,125	2,066	3,566,581
Percent of Total	4.5	93.7	1.7	0.1	100.0

1/ With some revisions in grazing acreages to take account of revised timber acreages, sources of data are:

Fort Berthold figures from MRBI Fiscal Year 1950 Annual Report.
Standing Rock cropland and total from MRBI Report No. 124.
Cheyenne River from MRBI Fiscal Year 1950 Report and MRBI Report No. 117 Revised.
Crow Creek and Lower Brule from agency records as of January 1952.

2/ Acres of timber are recently revised estimates furnished by the Aberdeen Area Office.

3/ Total acres are from table 3.

Ownership Status of Allotted Indian Lands

The heirs of a deceased Indian usually inherit an undivided interest in his allotment. Since many of the original allottees have died, this inheritance practice has resulted in multiple ownership of much trust land. According to a recent report, the proportion of all allotments held by the original allottee was 26 percent at Crow Creek, 28 at Standing Rock, 40 at Lower Brule, and 49 percent at Cheyenne River Reservation. There were in addition other tracts in single ownership so that allotments in single ownership amounted to from 49 percent of all allotments at Standing Rock to 61 percent at Lower Brule Reservation. From 26 to 38 percent of the allotments had from two to five owners, while from 11 percent on Cheyenne River Reservation to 21 percent on Standing Rock Reservation had more than five owners, table 5.

TABLE 5. OWNERSHIP STATUS OF ALLOTTED INDIAN TRUST LANDS ON FOUR RESERVATIONS 1/

RESERVATION	ALL TYPES OF OWNERSHIP	SINGLE OWNERSHIP			MULTIPLE OWNERS		
		LIVING ORIGINAL ALLOTTEE	OTHER SINGLE OWNERS	ALL SINGLE OWNERS	2 TO 5	6 OR MORE	ALL MULTIPLE OWNERS
	NO. OF TRACTS	NO. OF TRACTS	NO. OF TRACTS	NO. OF TRACTS	NO. OF TRACTS	NO. OF TRACTS	NO. OF TRACTS
STANDING ROCK 2/	4,418	1,244	918	2,162	1,938	918	2,256
CHEYENNE RIVER	2,017	992	30	1,022	775	220	995
CROW CREEK	825	214	201	415	248	162	410
LOWER BRULE	480	190	102	292	125	63	188
	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT
STANDING ROCK	100	28	21	49	30	21	51
CHEYENNE RIVER	100	49	2	51	38	11	49
CROW CREEK	100	26	24	50	30	20	50
LOWER BRULE	100	40	21	61	26	13	39

1/ NUMBER OF TRACTS FROM TABLE VI, HOUSE REPORT NO. 2503, 82D CONGRESS, 2D SESSION, ENTITLED REPORT WITH RESPECT TO HOUSE RESOLUTION AUTHORIZING COMMITTEE ON INTERIOR AND INSULAR AFFAIRS TO CONDUCT AN INVESTIGATION OF THE BUREAU OF INDIAN AFFAIRS. EXCHANGE ASSIGNMENTS ARE NOT INCLUDED IN THESE DATA. FROM 1942 TO 1949 THE EXCHANGE ASSIGNMENT PROGRAM WAS CARRIED ON VIGOROUSLY AT CHEYENNE RIVER WHICH, IN PART, ACCOUNTS FOR THE SMALL NUMBER OF SINGLE OWNERSHIPS OTHER THAN THOSE IN THE HANDS OF ORIGINAL ALLOTTEES. PERCENTAGES COMPUTED.

2/ INCLUDING A LARGE NUMBER OF SMALL TIMBER ALLOTMENTS. THE OTHER THREE RESERVATIONS HAVE NO TIMBER ALLOTMENTS.

Percentage of exchange assignment and allotted tracts in single ownership in the taking areas was greater than that for allotments on the reservation as a whole, the difference being particularly large at Cheyenne River and Lower Brule Reservations. The large percentages in single ownership on these reservations are accounted for by active exchange assignment programs for the elimination of fractionated ownerships. These programs have reduced the number of tracts having more than 10 owners to a relatively small number on these two reservations, table 6. The largest number of persons holding interests in a single tract in the taking areas of these four reservations was 99.

TABLE 6. LAND OWNERSHIP STATUS OF ALLOTTED INDIAN LAND AND EXCHANGE ASSIGNMENTS IN TAKING AREAS OF FOUR RESERVATIONS

RESERVATION	NUMBER OF OWNERS							TOTAL NUMBER OF TRACTS
	1	2-5	6-10	11-15	16-20	21-30	30 +	
	No. TRACTS	No. TRACTS	No. TRACTS	No. TRACTS	No. TRACTS	No. TRACTS	No. TRACTS	
STANDING ROCK 1/	920	544	260	74	20	23	9	1,850
CHEYENNE RIVER	227	48	11	2		1		289
CROW CREEK	68	19	5	8	3	11	6	120
LOWER BRULE	46	9	8	2				65
FOUR RESERVATIONS	1,261	620	284	86	23	35	15	2,324
	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT
STANDING ROCK	50	29	14	4	1	1	1	100
CHEYENNE RIVER	78	17	4	1				100
CROW CREEK	57	16	4	7	2	9	5	100
LOWER BRULE	71	14	12	3				100
FOUR RESERVATIONS	54	27	12	4	1	1	1	100

1/ INCLUDES 1,596 TIMBER ALLOTMENTS.

Multiple and scattered ownerships are complicating factors to be overcome in consolidating land holdings and establishing operating units suitable for resettlement of farmers and ranchers who will have to move from the taking areas because of the reservoirs. The illustration on the next page showing the holdings of an Indian on the Fort Berthold Reservation presents a situation typical of many existing on all reservations.

DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS

FORT BERTHOLD INDIAN RESERVATION

NORTH DAKOTA

LAND OWNERSHIP

LAND HOLDINGS OF A TYPICAL RESIDENT INDIAN FAMILY SHOWING PROPOSED CONSOLIDATION OF INTERESTS

Proceeds from sale of land interests within reservoir area to be used for rehabilitation at proposed new homesite.

R94W R93W R92W R91W R90W R89W R88W R87W R95W

T152N T151N T150N T149N T148N T147N T146N

NORTHERN SEGMENT
NORTHEASTERN SEGMENT
WESTERN SEGMENT
EASTERN SEGMENT
SOUTHERN SEGMENT

Present homesite
Proposed homesite
Consolidated interests – 354 Acres

MISSOURI RIVER
LITTLE MISSOURI RIVER

LEGEND
- Indian owned
- Non-Indian owned
- Garrison project
- Sole ownership
- Unpartitioned interest

3-10-1948

PROPERTIES AND PEOPLE AFFECTED BY THE RESERVOIRS

Indian Lands in the Taking Areas

The three reservoirs will take one-third of a million acres of Indian land from the five reservations, nearly half of which is in the Garrison taking area. The taking amounted to more than one-fourth of all Indian land on the Fort Berthold Reservation before the taking. Around 6 percent of the Indian land of other reservations will be taken, table 7.

The kind of land taken is of greater significance than the acreage. Approximately four-fifths of the timberland of the five reservations is in the taking area. For individual reservations it varies from 63 to 94 percent. It is estimated that at least 90 percent of the commercial timber on each reservation is in the taking area.

Table 7. Acres of All Indian Land and of Timberland on Reservation and in Reservoir Taking Areas, Five Reservations

Reservation	Indian Trust Lands			Indian Timberlands		
	Total[1]	In Taking Area[2]		Total[3]	In Taking Area[4]	
	Acres	Acres	Percent	Acres	Acres	Percent
Fort Berthold	584,718	152,360	26.1	22,700	20,250	89
Standing Rock	1,026,655	55,994	5.5	19,000	14,199	75
Cheyenne River	1,612,122	104,420	6.5	11,940	7,577	63
Crow Creek	159,053	9,418	5.9	3,511	3,283	94
Lower Brule	130,240	7,997	6.1	2,974	2,497	84
Five Reservations	3,512,788	330,189	9.4	60,125	47,806	80

1/ Data from table 3.

2/ Data from table 8.

3/ Data from table 4.

4/ Data from MRBI timber cruise.

The 47,806 acres of timberland in the taking include only land having stands of commercial timber. Timbered areas, willow and brush areas, and the interspersed glades were classified as sheltered pasture in the MRBI appraisal made of the taking area. A total of 75,627 acres of sheltered pasture is in the taking areas, table 8. This probably constitutes from 70 to 90 percent of the sheltered pasture on individual reservations.

The reservation land classification (table 4) and the taking area classification (table 8) are not identical because meadow and pasture land are not separated from grazing land in the reservation classification. It is estimated that about one-fifth of the land classed as grazing on the five reservations would be classified as meadow or pasture under the MRBI classification. On this assumption, percentage distribution of land by classes on the reservations and in the taking areas would be approximately as follows:

Area	Approximate Percentage of Area Which Is				
	Cropland	Pasture 1/	Grazing 2/	Timber	Total
	Percent	Percent	Percent	Percent	Percent
Five Reservations, Before Taking	4.5	18.8	75.0	1.7	100
Residual Reservations, After Taking	4.2	17.5	77.9	.4	100
Taking Areas of Five Reservations	7.0	31.2	47.3	14.5	100
Percent Taking is of Reservation Total	14.4	15.4	5.8	79.5	9.3

1/ Meadow, open pasture, and sheltered pasture not included under timber.

2/ Grazing and other.

These figures point up the fact that a larger portion of the taking area than of the reservation consists of the better quality lands. An additional fact, often overlooked, in connection with the entire large-dam building program of our Nation, which affects the entire populace either directly or indirectly, might be mentioned here. It concerns the high quality of the young, strong, alluvial soils of the valley trenches in contrast to the poorer quality of the old, mature, leached, residual soils of the uplands. Although perhaps not of so much consequence in the subhumid and semi-arid portions of the central states, generally speaking these alluvial soils are the ones richer in minerals and easier tilled; whereas, the residual upland soils through their very maturity, and locally post-maturity, have been deprived of many valuable constituents. In addition, in many localities of the Dakotas where Cretaceous and Tertiary marine deposits form the parent materials of the residual upland soils, undesirable concentrations of noxious minerals as selenium are found.

Table 8. Acreages of Indian Land in Taking Areas of Five Reservations[1/] According to MRBI Classification[2/]

Reservation	Cropland	Meadow and Open Pasture	Sheltered Pasture	Grazing Land	Other	Total
	Acres	Acres	Acres	Acres	Acres	Acres
Fort Berthold	20,709	43,009	37,183	44,862	6,597	152,360
Standing Rock	1,379	15,145	18,938	18,840	1,692	55,994
Cheyenne River	403	12,360	12,412	75,087	4,158	104,420
Crow Creek	447	2,191	4,569	1,933	278	9,418
Lower Brule	245	2,507	2,525	1,952	768	7,997
Five Reservations	23,183	75,212	75,627	142,674	13,493	330,189
Percent of Total	7.0	22.8	22.9	43.2	4.1	100.0

1/ Includes small acreages of Indian land outside the reservations. Acreages of Indian land in the taking areas are from the following Missouri River Basin Investigations Project reports:

For Fort Berthold, MRBI Report No. 96 as revised for the Board of Appraisal appointed pursuant to Public Law No. 437.
For Standing Rock, Supplement to MRBI Report No. 134.
For Cheyenne River, MRBI Report No. 132.
For Crow Creek and Lower Brule, Supplement to MRBI Report No. 135.

2/ The following comparison of acreages of Indian land on reservations before and after takings is based on the assumption that 20 percent of the land classed as grazing in Agency Reports would be classed as meadow or pasture under the MRBI classification:

Five Reservations	Cropland	Pasture *	Grazing & Other **	Timber	Total ***
	Acres	Acres	Acres	Acres	Acres
Before Takings	160,465	668,785	2,677,206	60,125	3,566,581
Takings	23,183	103,033	156,167	47,806	330,189
After Takings	137,282	565,752	2,521,039	12,319	3,236,392
After Taking	4.2%	17.5%	77.9%	.4%	100%

* Meadow, open pasture, and sheltered pasture not included under timber.

** Grazing and other, including agency reserve, waste, etc.

*** Includes 53,793 acres of land owned by the United States and administered by the BIA which are not included in tables showing only trust land.

Thus the inundation of the alluvial lands constitutes to the Nation as well as to the Indians an irrevocable loss of good soil. Making available to Indians corresponding acreages of uplands or upland areas sufficient to produce the quantity of production lost to Indians by reason of the taking would not fully replace their loss.

Land Between Taking Line and Water Line

The taking line of reservoirs generally is described in terms of rectangular subdivisions, which cause the inclusion in the taking areas of small tracts above the maximum pool level all along the reservoir margins. The reservoir will be near maximum pool level only for short periods of time and only during a small percentage of the years. Land between the taking line and the maximum pool level will not be damaged by the pool and will be useful for grazing of livestock. Considerable land below the maximum pool level also will be suitable for such purposes much of the time.

An important consideration in negotiations between the Indians and the United States is the use-right to land between the taking line and the actual water line. A proposed contract for the Fort Berthold settlement covering this matter provided that "the grazing areas delimited for use of reservation livestock shall be permanently reserved to the tribes and the members thereof," . . . and that, except for elimination of any feature which would interfere with the operation of the Garrison Project, "no reservation of land below the taking line of the Garrison Reservoir for park, recreational, or wildlife conservation . . . shall operate to interfere with the prior right of tribes and the members thereof to the grazing areas."1/ In the appendix to the proposed Standing Rock contract "the tribe requests that it and its members be granted the exclusive right, without charge, to graze stock, harvest hay and to remove timber from" the taking area "at such time and in such manner as will not interfere with the construction and operation of the Oahe Reservoir."2/ Indians on other affected reservations are likely to make similar requests.

Land between the taking line and the water line constitutes a valuable asset on all reservations. The amount of land above the pool will vary from year to year and within the year. During series of drought years, when livestock feed generally is in short supply, the area above water probably will be greater than during periods of high precipitation.

1/ Article X of proposed contract agreed to by Corps of Engineers, the Three Affiliated Tribes of the Fort Berthold Reservation, and the Secretary of the Interior, dated May 20, 1948.

2/ By Tribal Resolution, the Standing Rock Negotiators approved said contract on May 6, 1953.

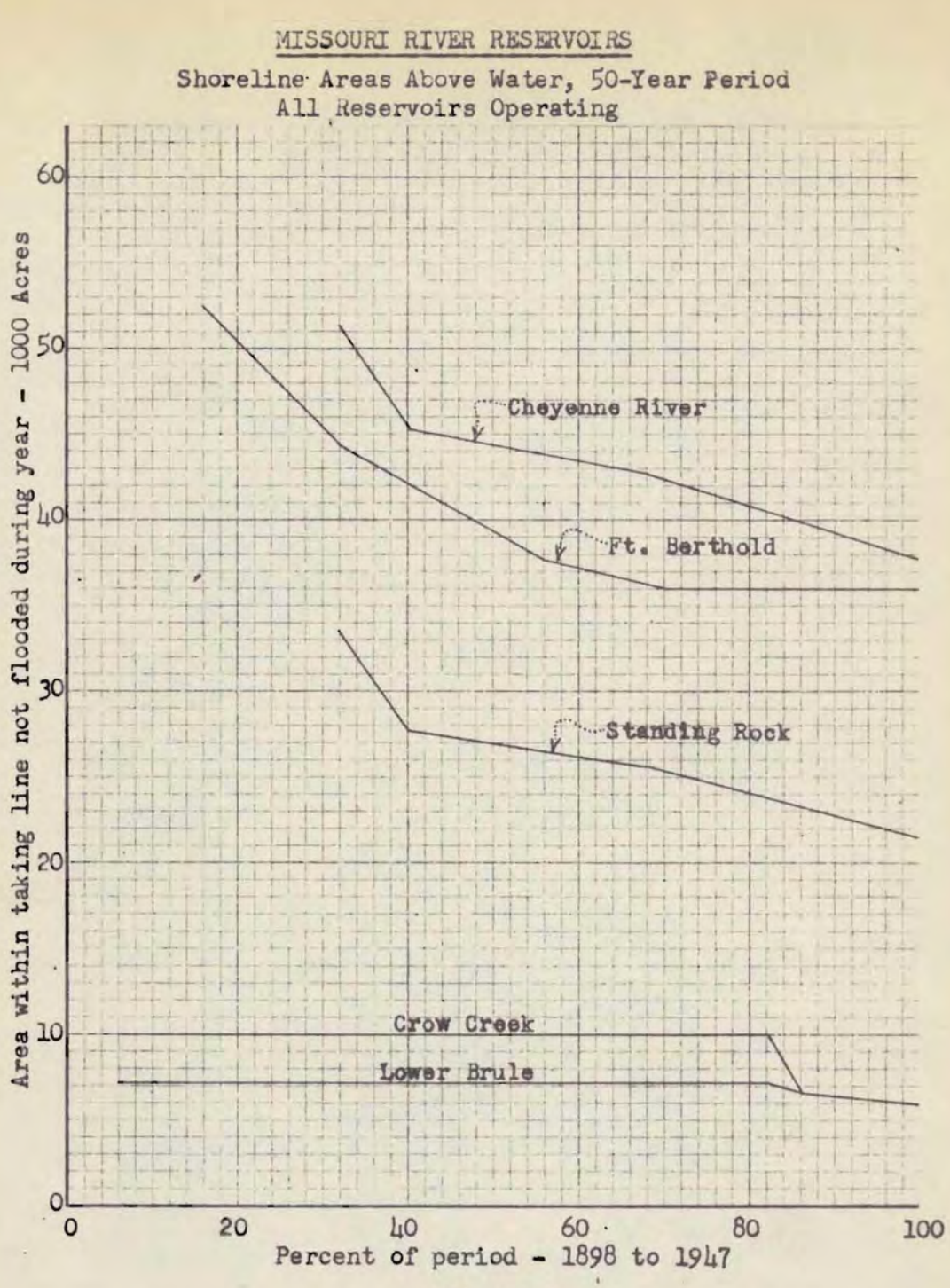


Figure 2.

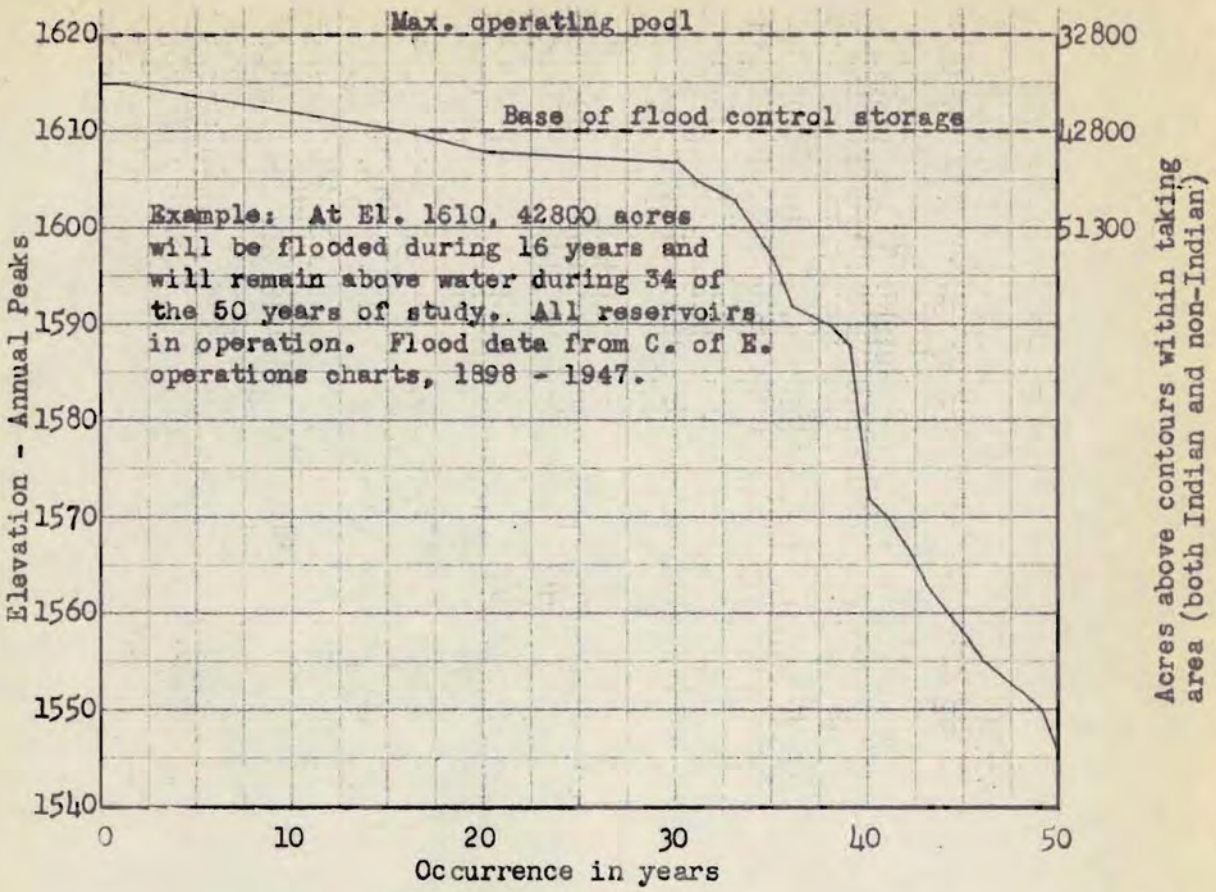
The percent of the years in which various acreages will not be flooded at sometime during the year is shown graphically in Figure 2. The graph was prepared from the operation study made by the Corps of Engineers which was based on ultimate development of storage on the Missouri River with Fort Peck, Garrison, Oahe, and Fort Randall Reservoirs in operation. The study covered the period 1898-1947. Acreages were determined from contour maps of the reservoir sites prepared by the United States Army Mapping Service.

The upper portion of figure 3 shows the number of years in the 50-year period during which the peak elevation of the pool at the Cheyenne River Reservation would have reached various elevations if the reservoirs had been in operation. The number of acres in the taking area which are above various elevations also can be estimated from this chart. The lower part of the figure presents similar information for the Crow Creek Reservation, which is at the upper part of the Fort Randall Reservoir. During the 1898-1947 period, the maximum operating pool level would never have been reached if these reservoirs had been constructed and operating according to the projected plan.

The production of forage on most land that will be flooded for not to exceed one month in 8 out of 10 years probably will not be damaged materially by reservoir operations. Approximate acreages of such land in the taking areas of each of the five reservations are shown in table 9. The acreage is substantial for each reservation. On Crow Creek and Lower Brule this acreage constitutes about three-fourths of the acreage in the taking compared with one-fifth for the Fort Berthold Reservation. Acreages include both Indian and non-Indian lands, but the larger part of the takings within the reservations is owned by Indians.

CHEYENNE RIVER RESERVATION

CAHE RESERVOIR



CROW CREEK RESERVATION

FORT RANDALL RESERVOIR

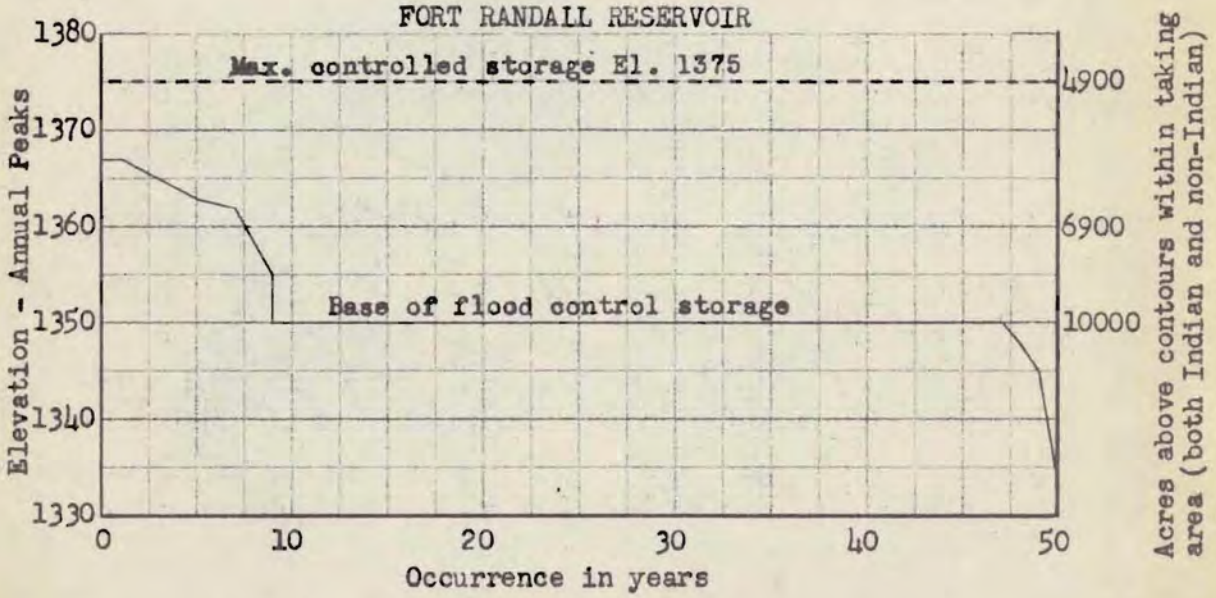


Figure 3. Occurrence of annual peaks in pool levels at Cheyenne River and Crow Creek Indian Reservations.

Table 9. Land Remaining Above Water as Specified, Missouri River Reservoir Taking Areas, Five Indian Reservations

Reservation	Total Reservation Taking 1/	Remaining Above Water at Least 11 Months During 80 Percent of the Years		Indian Lands in the Takings 2/
		Acreage 1/	% of Total Taking	
	Acres	Acres	Percent	Acres
Fort Berthold (Garrison Res.)	175,716	37,500	21	152,360
Standing Rock (Oahe Res.)	71,460	24,900	35	55,994
Cheyenne River (Oahe Res.)	117,100	42,000	36	104,420
Crow Creek (Ft. Randall Res.)	9,890	7,200	73	9,418
Lower Brule (Ft. Randall Res.)	13,070	10,000	77	7,997
Five Reservations	387,236	121,600	31	330,189

1/ Includes both Indian and non-Indian land. The proportion of Indian land in the total reservation taking is as follows: Fort Berthold 87 percent, Standing Rock 78 percent, Cheyenne River 89 percent, Crow Creek 95 percent, and Lower Brule 61 percent. The acreage of Indian land is given in table 8.

Data were compiled from:

Reservoir Storage and Outflow Operation Studies, 1898-1947, Corps of Engineers, 1949.

Reservoir Capacity Tabulations, Corps of Engineers, 1952.

Contour Maps, Army Mapping Service, 1943, 1947, and 1949.

Total reservation taking at Fort Berthold is from H.J. Res. 426, 80th Congress, 2d Session, June 14, 1948.

2/ From table 8.

Appraised Value of Indian Properties

An appraisal of properties in the taking areas of the five reservations was made by appraisers on the MRBI staff. The same supervising appraisers had charge of the appraisals on all reservations and appraisal criteria were essentially the same on all. The appraisals for Standing Rock, Cheyenne River, Crow Creek, and Lower Brule were based on the level of farm real estate values in November 1951--that for Fort Berthold a year or so earlier.

Appraisal procedures and results are described in detail in MRBI reports listed in footnote 1 to table 8. A summary of appraised values is given in table 10. Three-fourths of the value of Indian property in the takings is for land. If timber on the land is included, land values amount to over four-fifths of the total.

Table 10. Appraised Value of Indian Properties in Taking Areas of Five Reservations 1/

Reservation	Land	Improvements	Severance	Timber	Total
	Dollars	Dollars	Dollars	Dollars	Dollars
Fort Berthold 2/	2,973,561	509,439	64,523	175,789	3,723,312
Standing Rock	1,122,486	250,480	34,840	205,648	1,613,454
Cheyenne River	1,590,574	342,485	38,570	81,488	2,053,117
Crow Creek 3/	197,608	126,995	16,550	57,200	398,353
Lower Brule 4/	149,016	63,490	15,800	42,304	270,610
Five Reservations	6,033,245	1,292,889	170,283	562,429	8,058,846
Percent of Total	75	16	2	7	100

1/ Appraised values are those reported in MRBI reports referred to in the footnote to table 8. See especially MRBI Report No. 132, pages 8 and 21 to 31 for discussion of land values; page 12 for discussion of improvement values; page 15 for discussion of severance damages; pages 15 to 18 for discussion of commercial value of standing timber.

2/ Includes $67,995 coal and mineral values and $985 severance damage to tribal properties.

3/ Includes $240 severance damages to tribal properties.

4/ Includes $6,600 severance damages to tribal properties.

Appraisals for Fort Berthold, Crow Creek, and Lower Brule Reservations were made by field examination and appraisal of each tract of land and improvement by experienced appraisers. Appraisals for Standing Rock and Cheyenne River were made on the basis of a land classification prepared by a reviewing committee composed of representatives from the Tribe, the MRBI, and the Corps of Engineers. This committee made use of a commercial appraisal prepared by Mr. Hart, 1/ a soil survey of the taking areas made by MRBI soil scientists, and spot appraisals made by MRBI and by the committee.

To assist in the appraisals, a 20 percent cruise of all timber was conducted and soil surveys were made of most areas. Where soil surveys were not made, soil scientists assisted in the field appraisal work.

Timber values were based on quantities determined by a 20 percent timber cruise on each of the reservations. Timber values for Standing Rock, Cheyenne River, Crow Creek, and Lower Brule were on essentially the same basis--$7 per Mbf. of sawtimber, $1 per cord of cordwood, and from 10 cents to 25 cents per post depending on the kind and quality of posts. Values for the Fort Berthold appraisal were $5.50 for sawtimber, $1 for cordwood, and 4 cents per post.

No severance damages on tribal properties were included for Cheyenne River and Standing Rock Reservations, and no mineral values for any lands except $67,995 for coal and minerals at Fort Berthold. The total appraised values of Indian properties in the taking areas exclusive of mineral values and severance damage to tribal land for each of the five reservations are:

Fort Berthold Reservation	$3,654,332 2/
Standing Rock Reservation	1,613,454
Cheyenne River Reservation	2,053,117
Crow Creek Reservation	398,113
Lower Brule Reservation	264,010
Five Reservations	$7,983,026

1/ See footnote page 14.

2/ See footnote 2, page 17 for further statement.

People Affected by Reservoir Takings

All Indians affiliated with the five reservations will be affected by the flooding of Indian land. All have a direct interest because tribal properties are involved. Many own interests in properties in heirship status and some are full owners of properties in the takings. Approximately 13,000 individuals are on the tribal rolls of these reservations. Two-thirds of these reside on the reservations--but the percentage living on the reservation ranges from 53 on Cheyenne River to 86 on Crow Creek Reservation, table 11.

Economic resources and income vary from reservation to reservation but particularly among individual Indian families. Family incomes range from less than $500 to more than $10,000 per family. The spread in actual level of living is much less than in income because the custom of sharing is strongly ingrained among Indians. Substandard housing is characteristic of all reservations. A large proportion of the houses are of one or two rooms and the number of occupants ranges from one to twelve or more. Most domestic water is carried from a distance. The source of supply frequently is the river or a creek.

Fort Berthold

The Fort Berthold Reservation was established for the Three Affiliated Tribes of Mandan, Arikara, and Gros Ventre. The largest number of the enrolled Indians today identify themselves as Gros Ventre, the smallest number as Mandan. As a result of intermarriage both among the tribes and with non-Indians, the number of fullblood members of any individual tribe is actually small. Approximately 42 percent of the enrollees are listed as fullblood Indians.

In many respects the social, economic, and cultural levels of the Fort Berthold Indians compare favorably with those of non-Indians of the area, but even within a single community there are great differences from one family to another. During the past few years income from agriculture, land leases, and wage employment has been relatively high and most families have been able to finance a satisfactory level of living. The average income per family reported in 1948 was $2,274 and it has been considerably higher since that time. The most conspicuous lag in living facilities has been in adequacy of housing. Many houses are small, and others are in poor repair. Crowding is frequent. In the past, the population has been concentrated principally along the Missouri River and the smaller streams where the house was sheltered and a fuel supply was readily available. Many adjustments will be required in the previously unsettled areas where families will have to relocate if they remain on the reservation. Of the 370 resident families, 289 (78 percent) resided in the taking area before the movement from the Garrison Reservoir area began.

Table 11. Indian Families Residing on Reservation and in Taking Area and Enrolled Individuals, Five Reservations 1/

Reservation	Families Resident on the Reservation	Families in Taking Area		Enrolled Individuals		
		Total	% of All Resident Families	Total	Resident	
	No.	No.	Percent	No.	No.	Percent
Fort Berthold	370	289	78	2,368	1,920	81
Standing Rock	680	170	25	4,324	2,774	64
Cheyenne River	600	181	30	4,307	2,290	53
Crow Creek	248	84	34	1,132	980	86
Lower Brule	118	19	16	705	500	71
Five Reservations	2,016	743	37	12,836	8,464	66

Source of data:

1/ The total enrolled population figures are taken from House Report No. 2503, Report with Respect to the House Resolution Authorizing the Committee on Interior and Insular Affairs to Conduct an Investigation of the Bureau of Indian Affairs, Pursuant to H. Res. 698 (82d Cong.), December 15, 1952.

Other figures are from the following MRBI reports:

No. 46 - Social and Economic Report on the Future of Fort Berthold Reservation, North Dakota, January 15, 1948.

No. 124 - Report of Socio-Economic Survey - 1951, Standing Rock Indian Reservation, North Dakota and South Dakota, November 9, 1951.

No. 117 Revised - Socio-Economic Report and Costs of Removal from Oahe Taking Area, Cheyenne River Reservation, South Dakota, June 15, 1951.

No. 136 - Problems of Indian Removal and Rehabilitation Growing Out of the Fort Randall Reservoir Taking on the Crow Creek and Lower Brule Reservations, South Dakota, May 1953.

Standing Rock and Cheyenne River

These reservations are populated by subtribes of the Dakota Sioux, principally of the Teton and Yanktonai bands. The principal differences in cultural levels on these reservations reflect not so much contrasts in tribal heritage as in contacts with non-Indians. The populations in different portions of each of the reservations are dissimilar, marked cultural lags being apparent in communities which are relatively isolated from contacts with non-Indians because of poor roads and long distances.

Isolated communities composed largely of fullblood Indians occur on Standing Rock and Cheyenne River Reservations. On Standing Rock Reservation, Bull Head (in the approximate geographical center of the reservation) is composed largely of fullbloods who have retained their identity as an Indian group. On Cheyenne River Reservation there are several such communities--all in the western half of the reservation. Bridger, in the extreme southwest corner of the reservation, has little opportunity for contact with non-Indians. Located more than 100 miles from the agency, and 25 to 35 miles from a town, these fullbloods live largely as a group apart, even removed from other Indians. In the same general area, a little to the north and east, the communities of Cherry Creek and Red Scaffold are almost equally isolated. Also in the western half of the reservation, but north of Highway No. 212 are the largely fullblood communities of Iron Lightning, Thunder Butte, Bear Creek, and Green Grass. Fifty-four percent of the Standing Rock enrollees, and 51 percent of the Cheyenne River enrollees are classified as fullbloods.

The economic status of less isolated communities where mixed bloods usually predominate ordinarily is better than that of the isolated communities. The communities east of, and including White Horse, along the Moreau River, and also those along the Missouri River from Cheyenne Agency north to the Moreau, are populated largely by mixed bloods. Though there are exceptions in each community, the economic status of these Indian families generally is much higher than that of the families in other parts of the reservation and the number who are quite competent to manage their own affairs is comparatively high. According to recent surveys the average annual income per family is approximately $1,350 on Standing Rock Reservation and $1,600 on the Cheyenne River Reservation.

Crow Creek and Lower Brule

The Indians on these reservations have been in close contact with non-Indians for many years. Possibly because of this, a large percentage of the employables from both of these reservations have left to find employment in areas of greater opportunity. The resident Indian populations therefore include an unusually high percentage of unemployables--a residual group for whom relocation poses many problems.

The enrollment on the Lower Brule Reservation includes fewer fullbloods than any of the other reservation populations (167 individuals, representing approximately 23.6 percent of the total enrollment). About 48 percent of Crow Creek enrollees are fullbloods. The number of resident Lower Brule families has increased since 1938 because families have returned to the reservation to take advantage of opportunities to use reservation resources. The average income per family on the Lower Brule Reservation is reported to be considerably higher than on the other reservations because of the benefits of the Tribal Beef Cattle Enterprise and greater participation in agriculture and wage work. The average income is $1,500 per family on the Crow Creek, and $2,800 on the Lower Brule Reservation.

Families in the Taking Areas and Vicinity

A total of 743 Indian families were residing in the taking areas at the time the surveys listed in footnotes to table 12 were made. In addition to these, it is estimated that an additional 58 families residing along the shores of the reservoirs will find it necessary to move because of relocation of roads, severance of livestock units, flooding of community facilities, and other changes caused by flooding of the reservoir areas. This brings the estimated number of families who will have to move to 801, of which 311 are agricultural families, 290 are families with employed family heads, and 200 are families dependent on rental income, pensions, or on welfare payments because age, sex, physical disability, or other causes render the head of the family incapable of profitable employment. The proportion of dependent families is particularly large on the Crow Creek Reservation where agricultural families are relatively few in number.

Table 12. Number of Indian Families to be Re-established Because of Missouri River Reservoir Takings from Five Reservations

Reservation	Families Residing in Taking Area 1/	Families to be Relocated			
		Agricultural Families	Employed Workers' Families	Dependent Families 2/	Total 3/
	No.	No.	No.	No.	No.
Fort Berthold 4/	289	150	110	40	300
Standing Rock 5/	170	50	75	65	190
Cheyenne River 6/	181	100	50	50	200
Crow Creek 7/	84	3	50	37	90
Lower Brule 7/	19	8	5	8	21
Five Reservations	743	311	290	200	801
Percent of Total		39	36	25	100

1/ Data from table 11.

2/ Dependent on welfare, or pensions.

3/ Difference between this total and families residing in taking area is the number of families in vicinity of taking area who will have to move because of flooding of reservoir area.

4/ MRBI Report No. 94, Social and Economic Report of Fort Berthold Reservation, Supplement No. 1, August 31, 1949.

Data based on survey of 375 (89.3 percent) resident families. At that time, 147 families, most of whom operated in the taking area, owned beef cattle. In several families both the father and son owned cattle and were making plans to re-establish their enterprises independently.

One-third of the Fort Berthold population received their principal income from regular employment, and a number of other families whose itinerant employment has been supplemented by lease income will be forced to increase their wage earnings as a result of land losses.

Approximately 13 percent of the reservation families are dependent on various types of welfare assistance. These are largely fatherless homes or those where the male head is physically disabled or unemployable because of age.

(continued on next page)

(Footnotes to Table 12 - continued)

5/ MRBI Report No. 124, Report of Socio-Economic Survey - 1951, Standing Rock Indian Reservation, North Dakota and South Dakota, November 9, 1951.

Data based on interviews with 164 of the families within the taking area. A total of 44 families owned beef cattle, but in some of these families, the father and son wish to re-establish independently. Wage work was reported by 74 of these families--in a few families, more than one individual being employed. The remainder of the families are dependent upon pensions or welfare assistance because of unemployability.

6/ MRBI Report No. 117 Revised, Socio-Economic Report and Costs of Removal from Oahe Taking Area, Cheyenne River Reservation, South Dakota, June 15, 1951.

The survey showed 79 families within the taking area owning beef cattle, and in some of these families more than one member owning them. A total of 58 of these families receive income from wage work. An analysis of families in which there was no employable male over 16 years of age showed that 22 percent of the families could not be rehabilitated. Since 70 years was used to indicate a male unemployable because of age, this estimate is conservative.

7/ MRBI (Unpublished report), Problems of Indian Removal and Rehabilitation Growing Out of the Fort Randall Reservoir Taking on the Crow Creek and Lower Brule Reservations, South Dakota.

The data from which the summary tables were prepared show 37 Crow Creek families totally dependent on welfare assistance or pensions because of physical disability, old age, or a fatherless home.

On the Lower Brule Reservation, there are 16 families within the taking area who are permanent welfare clients or pensioners.

There are 15 single males and 23 females on the Crow Creek Reservation who are largely dependent on others at the present time who should be re-established in some kind of employment. On the Lower Brule, there are 6 such males and 2 females. None of these employables have been included in the estimates of wage workers to be relocated.

COST OF MOVING AND RE-ESTABLISHING DISPLACED INDIANS

Re-establishment means placing displaced families in as favorable a situation as they would have occupied if the projects which forced them to move had not been constructed. Their present situation cannot be restored in every particular because the environment basic to present conditions--the fertile alluvial soil, the sheltered valleys, the timber, the wildlife, the wild products, the water supply--cannot be duplicated in kind, quality, or quantity. Only substitutes can be provided. It is assumed that so far as it is practicable to do so, the objectives of re-establishment are dwellings and facilities which will provide the same degree of comfort and convenience in the new environment that families now enjoy and opportunities for earning incomes from labor and investment equal to those afforded by the present situation.

Dwellings, facilities, jobs, and incomes under the new conditions cannot be identical with the old. Better insulated houses than are now in the sheltered valleys will be necessary on the open plains. Artificial livestock shelters in the new locations will replace the present natural shelter of the timber and brush lands in the valleys. Under the new circumstances, cash will be needed to purchase food to be substituted for game, fruits, and fuel, now procured directly. Efforts were made to take such differences between the old and the new conditions into account in estimating costs of re-establishing the homes, the ranches, and the income producing capacities of persons and investments.

Costs of Moving Buildings and Personal Property

Moving of improvements, personal properties, and families is well under way at Fort Berthold. Two methods are being employed. One is to execute contracts with professional movers; the other to issue purchase orders to individuals for moving their own property. In general, the larger buildings, especially those having basements or foundations to replace, are moved by contract. The smaller structures, including most of the log buildings, are moved under purchase order agreement. Purchase orders are also issued to cover moving of fences, farm machinery, corrals, household furnishings, and livestock. Costs of moving livestock are calculated at $10 per man-day required. Toilets go at $25 each, and fences at $100 a mile. The allowance for moving log buildings is figured on a cubic-foot basis, with 8 cents to 10 cents the usual amount. For the larger and better built homes, up to 15 cents may be allowed and for small sheds, as little as 5 cents.

As of March 9, 1953, 69 contracts had been let for moving and re-establishing improvements at Fort Berthold. Average costs by type of job for these 69 contracts are as follows:

Type of Job	Number of Cases	Average Cost Per Unit
Move Frame House	10	$ 693
" " " and Construct Foundation	15	1,960
" " " " " Basement	16	3,727
Move Log House and Basement	3	2,819
Move Frame House and Barn, With or Without Basement and Foundation	12	2,865
Move Complete Set Improvements	4	6,128
Move Frame Barn and Foundation	4	931
Basement Only	2	2,083
Foundation Only	3	267
Total	69	

Costs for moving certain items under the purchase order plan of reimbursement were determined at Fort Berthold as of March 9, 1953. The average cost for 13 common items for which covering purchase order had been issued on that date are:

Item	Number of Cases	Average Cost
Log House	68	$226
Log Barn	23	143
Log Garage	5	110
Log Granary	8	98
Log Chicken House	11	59
Log Shed	16	100
Pole Corral	30	102
Farm Machinery	16	103
Livestock	30	39
Household Furnishings	23	47
Machinery and Household Furnishings	22	71
Fence	24	179
Toilet	16	25

The items for which removal costs are shown in the preceding lists are for 122 sets of improvements. The costs, paid or obligated, amount to $207,420, an average of $1,700 per set. If this average holds for all 289 Indian homesteads to be evacuated from the Garrison Reservoir site at Fort Berthold, the total cost will be $491,300.

Cost of Moving and Relocating Persons and Personal Property

The cost of moving personal property will vary with the kind and quantity of things to be moved, with the distance between the old and new location, with the means of transportation, and other factors. There are great differences in these respects among families. Some have few goods; others have many. Some will move but short distances on the reservation; others will move from the reservation to distant places. Some have livestock and farm machinery; others have none. Some have their own means of transportation; others will require commercial transportation. The experience at Fort Berthold shows an average of $103 for moving of farm machinery, $39 for moving livestock, and $47 for moving household furnishings. For the 22 cases where machinery and household furnishings were combined, the average cost was $71.

The authors of MRBI Report No. 117, after examining information obtained from a number of sources, estimated the average cost of moving persons and personal property at $100 per family. This estimate for Cheyenne River Reservation families was based on the expressed intention of most Indians to relocate on the reservation as near to the present location as possible. If they are unable to do this, costs may be greater.

It will require time to find a suitable place to relocate and to accomplish the job of relocating. Finding and acquiring suitable places to re-establish ranch headquarters or finding new jobs, often in distant places, is likely to involve considerable time and expense.

In connection with its planning for the proposed Bixby Unit in western South Dakota, the Bureau of Reclamation in 1951 made some over-all estimates of costs which families would sustain in moving and re-establishing themselves. In this generalized estimate the Bureau allowed $450 per family for loss of income while moving, and before obtaining a job or becoming established in business in the new location. 1/ MRBI Report No. 117 estimates interim subsistence and incidental costs for families to be relocated at Cheyenne River at $500 per family.

1/ MRBI Report No. 117, Revised, Appendix E.

Average costs of moving persons and personal property from the taking areas of five reservations is placed at $100 per family. An additional cost of $600 for each agricultural family and $700 for each employed worker's family is allowed to cover the losses of earnings during the period required to find a new location and to become established. No additional cost is allowed for welfare families because the income of these families presumably will not be decreased during the moving period. Estimated cost for all families who will need to move because of the takings is shown in table 13.

Table 13. Cost of Moving Persons and Personal Property, Five Reservations, Missouri River Reservoir Takings

Reservation	Families to be Moved	Total Cost of Moving
	No.	Dollars
Fort Berthold	300	197,000
Standing Rock	190	101,500
Cheyenne River	200	115,000
Crow Creek	90	45,800
Lower Brule	21	10,400
Five Reservations	801	469,700

Costs of Moving and Re-establishing Dwellings and Other Improvements

The actual costs of moving and relocating dwellings and farm improvements at Fort Berthold were used as a basis for estimating costs for other reservations. The number of each kind of structure to be moved and the estimated cost of moving for Standing Rock, Cheyenne River, Crow Creek, and Lower Brule Reservations are presented in table 14. Differences in average per unit costs among the reservations are explained in footnotes to the table. The number, size, and kind of improvements to be moved was obtained from the detailed appraisals of improvements made for each of the taking areas. The average cost per family in the taking area varies appreciably being influenced mainly by the number, size, and kind of facilities to be moved and to a minor extent by the expected distance of the moves. Moving costs assume that the relocated facility will be re-established in its former condition.

TABLE 14. COSTS OF MOVING AND RE-ESTABLISHING MOVABLE IMPROVEMENTS IN TAKING AREAS, FIVE RESERVATIONS, MISSOURI RIVER RESERVOIR TAKINGS

STRUCTURE OR ITEM	UNIT COST	STANDING ROCK		CHEYENNE RIVER		CROW CREEK		LOWER BRULE	
		ITEMS	TOTAL COST	ITEMS	TOTAL COST	ITEMS	TOTAL COST	ITEMS	TOTAL COST
	DOLLARS	NO.	DOLLARS	NO.	DOLLARS	NO.	DOLLARS	NO.	DOLLARS
MOVABLE WITHOUT TEARING DOWN:									
FRAME HOUSE WITH BASEMENT	2,800 1/	2	5,600	3	8,400	6	21,000	4	12,000
FRAME HOUSE WITH FOUNDATION	2,000	36	72,000	41	82,000	9	18,000	9	18,000
FRAME HOUSE WITHOUT FOUNDATION	700	18	12,600	40	28,000	57	39,900	11	7,700
LOG HOUSE	700	31	21,700	32	22,400				
FRAME BARN	700 2/	8	5,600	9	6,300	5	4,000	9	7,200
LOG BARN				3	2,100				
OUTBUILDING, MISC., LOG	350 3/	5	1,750	10	3,500	2	220	22	7,700
OUTBUILDING, MISC., FRAME	350	25	8,750	20	7,000	20	7,000		
MOVABLE BY TEARING DOWN AND REBUILDING:									
LOG HOUSE	700 4/	109	76,300	67	46,900	14	8,400	4	2,400
FRAME BARN	500	3	1,500	6	3,000				
LOG BARN	500	34	17,000	15	7,500	4	2,000		
MISC. FRAME OUTBUILDING	350	4	1,400			11	3,850		
MISC. LOG OUTBUILDING	350	73	25,550	46	16,100	2	700		
CORRAL	150	51	7,650	49	7,350	6	900		
ROOT CELLAR	200	19	3,800			3	600		
FENCE, MILES	125	130	16,250	137	17,125	22	2,750	6	750
TOTAL			277,450		257,675		109,320		55,750
AVERAGE PER FAMILY IN THE TAKING AREA			1,632		1,424		1,301		2,934

SOURCE: NUMBER OF STRUCTURES AND OTHER ITEMS ARE FROM MRBI APPRAISAL SHEETS. UNIT COSTS ARE MRBI ESTIMATES BASED ON FORT BERTHOLD EXPERIENCE.

1/ $3,500 FOR CROW CREEK AND $3,000 FOR LOWER BRULE BECAUSE OF SEVERAL LARGE DWELLINGS. CROW CREEK ALSO INCLUDES THE TRIBAL COMMUNITY HALL.

2/ $800 FOR CROW CREEK AND LOWER BRULE BECAUSE OF LARGER AVERAGE SIZE BARNS ON THESE RESERVATIONS.

3/ $110 FOR TWO SMALL BUILDINGS AT CROW CREEK.

4/ $600 AT CROW CREEK AND LOWER BRULE BECAUSE OF SHORT HAUL TO NEW LOCATIONS.

Extra Cost of Weatherproofing and Equipping Dwellings in New Locations

To afford the same degree of comfort as is now provided in sheltered valleys, houses placed on the open plains will require additional insulation, storm windows, or other means of protection against cold, heat, and wind. In some instances, larger dwellings may be required to furnish the same comfort and utilities. The additional cost necessary to put a house in shape to provide the comfort and convenience it previously afforded in the sheltered location will vary greatly with circumstances. It will be substantial in many cases. It is estimated that on the average, this will require $500 for each frame house except for Crow Creek and $100 for each log house. At Crow Creek where many of the frame houses are small--frequently one-roomed houses--the average for frame houses is estimated at $300.

Loss of wood for fuel will make it necessary for many families to purchase new stoves or heating equipment because their present wood-burning equipment is not suitable for burning lignite, coal, oil, or gas. It is estimated that such equipment will cost about $50 per family. Loss of timber will affect many families throughout the reservations but estimates in tables 14 and 15 cover only families located in the taking areas. No information was obtained regarding improvements on ranches and homesites adjacent to the taking areas which will be moved because of the reservoirs. All dwellings in the taking areas are included regardless of whether or not they are occupied at present. Some dwellings are occupied by more than one family. On the other hand, a few families occupy two or more small cabins in the taking area.

Table 15. Extra Cost of Weatherproofing and Equipping Dwellings in Taking Areas When Moved to Unprotected Locations, Four Reservations

Item		Standing Rock	Cheyenne River	Crow Creek	Lower Brule
	Unit	Number	Number	Number	Number
Frame Houses	No.	56	84	72	24
Average Cost Per House	Dollars	500	500	300	500
Log Houses	No.	140	99	14	4
Average Cost Per House	Dollars	100	100	100	100
Household Equipment, Families	No.	170	181	84	21
Cost Per Family	Dollars	50	50	50	50
Total Cost	Dollars	50,500	60,950	27,200	13,450

Domestic and Stock Water Supplies

As a consequence of the great dams now under construction on the main stem of the Missouri River, some 801 Indian families on the five reservations will be displaced from their homes. The areas available for their resettlement are, in general, the least desirable of the lands remaining in Indian ownership and they are largely undeveloped. A combination of many things has contributed to this situation, an important one of which is the lack of adequate and easily obtainable supplies of water for domestic and stock use. The conversion now of these areas of low use to higher utilization for resettlement purposes requires consideration of the means and costs of developing water supplies.

These areas lie within a reach of the Great Plains extending from Fort Berthold Reservation some 375 airline miles southeastward to the Crow Creek and Lower Brule Reservations. Only local modifications differentiate its broad geologic uniformity. Relatively low and erratic precipitation is likewise characteristic. Only five streams of any consequence traverse or touch upon these reservations. Stream flow ranges from nothing during the late summer to flood stages during the spring period of rain and snow melt that often inundate the valley. Only two of the five are provided with facilities for partial regulation. Their reaches within the reservations are already in the ownership of non-Indians and individual Indians, and it is only by a rare coincidence that the displaced Indian owns land along their banks. These streams, therefore, cannot be counted upon to any great extent as a source of water supplies for use of these displaced people. While certain disadvantages and hazards are connected with their use, the reservoirs created by these dams will also be a source of water for various purposes but here again only in a few cases will the dispossessed Indians have useable land interests adjacent to their shores. Other sources of water for vacant upland areas must, accordingly, also be considered.

Ground water, stored surface runoff and rainfall-catch, and a combination of these are the additional sources which must be considered. The occurrence of shallow (20-200 ft.) ground water both as to location and extent is limited and its yield and suitability are uncertain. Nevertheless, shallow wells, even though many may fail during drought cycles, will be an important factor in the water development program. An artesian basin, from which adequate supplies may be obtained, underlies the southern edge of North Dakota and extends southward under the region occupied by the reservations of South Dakota. The depth of this basin, however, ranges from 1,200 to 3,500 feet. Its waters are all highly mineralized, are often accompanied by gas, and a majority of the yields cannot be expected to be potable. So far as is known, they may be used for stock water.

These circumstances and the cost of tapping the artesian formations make it doubtful whether any consideration at all should be given to it as a source of water in the resettlement program.

Much reliance will be placed upon the development of small reservoirs on upstream watersheds. This is particularly true with respect to stock water. While such ponds are not regarded as suitable for domestic use, they are now being used and may have to be continued where better sources cannot be found. The use of cisterns to catch rain water and hauling of water for domestic use may be the only alternatives in some places.

The pattern of resettlement has not yet been defined, and it can be only tentatively projected at this time. This situation coupled with the problematic possibilities of developing water supplies makes it particularly difficult to estimate costs. The number of displaced families shown in table 12 was used as a basis for approximating the quantity of water supplies needed. It was assumed the agricultural families will engage in ranching operations and will run 70 to 100 head of stock on a unit of 2,000 to 3,000 acres of grazing land. "Other Families" includes families of wage workers, families on relief, and other families who will not use any appreciable amount of land. For estimating purposes, it is anticipated that one-half of the "Other Families" will eventually settle in communities or other inhabited places where water supplies for domestic use are already available.

The cost of a stock water pond will vary considerably according to its specific location, but an average cost of approximately $500 each is estimated for each of the five reservations. Cisterns are estimated at $600 each. The cost of wells will vary widely with location and use. Wells used for stock watering as well as domestic supply will necessitate additional expenditure for pumping machinery. Hand pumps are satisfactory for domestic wells. Where such lifts exceed 100 feet, special attention will be needed in the design of cylinder and drop-pipe installation to permit use of hand pumps. The cost range used in this estimate is $400 to $1,300 per well.

Taking these many uncertain factors into consideration, a rough estimate of the costs of water development is shown in table 16.

Table 16. Cost of Providing Domestic and Livestock Water for Families to be Re-established, Five Reservations

Reservation	To be Relocated		Average Cost Per		
	Agri-cultural Families	Other Families	Agri-cultural Family	Other Family	Total Cost
	No.	No.	Dollars	Dollars	Dollars
Fort Berthold	150	150	2,100	500	390,000
Standing Rock	50	140	1,500	400	131,000
Cheyenne River	100	100	1,900	400	230,000
Crow Creek	3	87	1,400	200	21,600
Lower Brule	8	13	1,400	200	13,800
Five Reservations	311	490	1,915	390	786,400

References:

Progress Report on the Geology and Ground Water Resources of the Fort Berthold Indian Reservation, North Dakota, U. S. Geological Survey, December 1950.

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Rural Water Supplies in South Dakota, Extension Service, South Dakota State College, Brookings, South Dakota, January 1940.

Report of Investigations No. 26, Artesian Conditions in West Central South Dakota, South Dakota State Geological Survey, E. P. Rothrock, State Geologist, December 1938.

Occurrence of Ground Water in the Cheyenne River and Standing Rock Indian Reservation Areas, North and South Dakota, U. S. Geological Survey, February 1952.

Preliminary Report on the Geology of the Pierre Quadrangle, South Dakota, U. S. Geological Survey, 1951.

Artificial Shelter for Livestock

The timber which shelters livestock from the sun and the wind and from the extremes of heat and cold cannot be moved or replaced. Substitute shelters will need to be erected to re-establish the capacity for production and the net income of stockmen affected by the taking. Shelter afforded by timbered valleys and river breaks is a valuable asset because it reduces operating costs and cattle losses.

Hardy cattle will survive winters on the open plains but sheds, windbreaks, or other shelters are desirable as indicated by the following statements.

> "In the northern portions of the range areas, where extremely low temperatures, blizzards, and heavy snows occur, windbreaks or sheds are of practical value . . . herds may be more economically cared for by the building of windbreaks in the absence of sufficient natural protection. A solid wall 7 feet high built of 1-by 12-inch rough boards has proved satisfactory. Posts used in such a windbreak should be large, set at least 2½ feet in the ground, and 7 or 8 feet apart, depending on whether 14-foot or 16-foot 2 by 4 scantlings are to be used for the crosspieces. Such windbreaks may be built along the north and west sides of corrals where the ground has sufficient slope to insure proper drainage; otherwise, shallow ditches should be constructed.
>
> "Sheds with an open side facing in the opposite direction from which storms and blizzards usually come are generally sufficient for protection where corrals are used during part of the winter. Such sheds protect against the wind and save feed. Calves, in particular, should receive protection from the extreme cold." 1/

The kind and amount of artificial shelter which it is advantageous to provide will differ with circumstances. It cannot be definitely determined until the locality and circumstances surrounding winter headquarters of the ranch are known. Shelter fences 8 feet high built of 2-inch plank lagged to 8-inch diameter posts 12 feet long, set four feet in the ground, with cracks in the lagging battened with 1 by 4 boards cost about $25 per cow unit on small ranches. The cost of sheds constructed of sawed lumber and commercial roofing would be greater. Sheds or windbreaks of poles and packed hay or straw are just as effective and much cheaper to construct but require considerable upkeep.

1/ United States Department of Agriculture Farmers Bulletin 1395.

The cost of needed artificial shelter will vary among ranches because of the particular situation on each ranch, but conditions on the various reservations are sufficiently comparable so that needs for livestock shelter are approximately the same on each. The average cost of livestock shelter is estimated roughly at $1,000 per ranch on all reservations. The total cost is shown in table 17.

Table 17. Costs of Providing Artificial Shelter for Livestock, Five Reservations

Reservation	Ranches to be Relocated	Cost of Shelter Per Ranch	Total Cost
	No.	Dollars	Dollars
Fort Berthold	150	1,000	150,000
Standing Rock	50	1,000	50,000
Cheyenne River	100	1,000	100,000
Crow Creek	3	1,000	3,000
Lower Brule	8	1,000	8,000
Five Reservations	311	1,000	311,000

Additional Fences

Loss of the sheltered pasture, stock water supplies and hay meadows in the taking area will necessitate marked adjustments in livestock ranching operations in some localities. In parts of the Cheyenne River Reservation, for example, seasonal use of range land may be reversed. On this reservation stock now winter in the areas near the rivers and use the back range at other seasons of the year. It appears likely that it will be found expedient to keep stock away from the river during fall and winter when the level of the reservoir is receding. At the present time, there is relatively little fencing. Stock graze the meadows and pasture. The better meadows are cut for hay but usually are not fenced to exclude cattle.

Changes in operations will differ among and within reservations. On all reservations some fencing will be required to keep stock away from the reservoir during seasons of greatest danger. More fencing of hay lands will be necessary in order to obtain, from the remaining less productive meadows, the larger quantities of hay needed under the new conditions. Better control of cattle also will be desirable because of increased hazards from the reservoir as well as the greater winter hazards of the open plains.

It is estimated that on the average, each ranch will need 2½ miles of 3-wire division fence in addition to fencing that can be salvaged. In addition an average of ½ mile per ranch of drift fence to hold cattle from the reservoir area during the more hazardous seasons is likely to be needed.

Cost of the 3-wire fence, using native treated posts 1 rod apart, is estimated at $400 a mile (posts 60 cents, wire $9.40 a spool). Cost of the 4-wire drift fence, using the heavier native treated posts, is estimated at $600 a mile, table 18.

Table 18. Cost of Additional Fences Required Under New Ranching Conditions

Reservation	Number of Ranches	Cost Per Ranch 1/	Total Cost
	No.	Dollars	Dollars
Fort Berthold	150	1,300	195,000
Standing Rock	50	1,300	65,000
Cheyenne River	100	1,300	130,000
Crow Creek	3	1,300	3,900
Lower Brule	8	1,300	10,400
Five Reservations	311	1,300	404,300

1/ Based on 2½ miles of 3-wire fence at $400 and ½ mile of 4-wire fence with heavier posts at $600 a mile.

Decreased Returns from Ranching During Adjustment Period

That large reservoir takings will cause marked changes in livestock operations is supported by experience at Fort Peck. With regard to Fort Peck, one investigator states "There should have been no hope that operations of the pre-reservoir period could be duplicated on the uplands. Many thought it could be done, but know now that an entirely new approach in both thinking and action to fit the new situation must be developed. A great deal more and better management is required to run stock along the shores of the reservoir than is needed to utilize the original river bottoms." 1/

The shelters, water supplies, and fences discussed in the preceding sections will not fully offset the effects of the less favorable conditions prevailing in places where displaced livestock operators are likely to find it feasible to relocate. In the new locations, operating costs will be higher and net returns from livestock enterprises are likely to be lower than at present locations at least for a few years. The shelter afforded by the timbered valleys and breaks is a valuable asset to the stockman because of its effects on operating expenses and cattle losses. A South Dakota Agricultural Experiment Station publication 2/ states that feeding requirements and length of feeding season are affected by the natural shelter on winter pastures. "The length of the feeding period varies from year to year and between ranches. The average for the ranches in the open unprotected areas is about 120 days, while in the rough broken areas, the average is about 75 days." Winter feeding is expensive in the range country, particularly in dry years or during severe winters requiring long feeding periods. "The amount of hay fed annually varies from as little as one-fourth ton or less to more than one ton of hay per mature animal unit."

The North Dakota Experiment Station 3/ notes that the "cost of winter feed and feeding is the biggest item of expense in range cattle production in the plains" and that the "cheapest way to bring livestock through the winter is the most profitable, provided they are not weakened to a point where they will not make normal gains as soon as new grass starts in the spring." It further states

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1/ Memorandum of W. H. Farmer to W. U. Fuhriman, dated October 1, 1952: "Effect of Fort Peck Reservoir on Ranching Operations."

2/ Station Bulletin 385, Ranching in Northwestern South Dakota by C. R. Hoglund and M. B. Johnson, April 1947, pages 14 and 15.

3/ Bulletin 347, Range Cattle Production in Western North Dakota by M. B. Johnson, July 1947.

that "the location of pasture in relation to natural shelter" affects feed requirements and that "ranches located in open unprotected areas require an average of 50 percent more winter feed than those located in well protected territory."

After adjustments have been made the increased production, resulting from the better use of range which fencing brings about and to which better feeding during the winter contributes, should offset the increased costs which continue beyond the adjustment period. In view of this, damages represented by decreased returns to ranchers probably should be claimed only for an adjustment period--say 5 years.

Increased Feeding and Herding Costs

The increased amount of feed required in the more exposed areas will vary widely with conditions and with management but is estimated to average about one-eighth of a ton of hay per head. The extra cost for harvesting and storing this hay is estimated at $10 a ton. Costs of feeding operations on upland range probably will be little more than under existing conditions because winter crews on ranches will not need to be increased materially.

Herding costs on upland range will be increased over present costs where the range borders the shores of the proposed reservoir. The average mile of existing river front will be expanded to about two miles of lake shore on the Cheyenne River Reservation, the greater length being the result of indentations of the shoreline into the draws and coulees. This indentation also restricts sight distances along the shoreline; and, whereas a rider might observe a quarter mile of the original river front at one point, he frequently will be able to see only a few hundred feet along the lake shoreline. Furthermore, patrol of the original river front can be neglected without serious loss of cattle, whereas patrol of some parts of the lake shoreline could not be neglected without risking serious loss particularly during the first few years.

Greater Death Loss Because of Increased Hazards

Hazards to cattle along the shore of the reservoirs are likely to be greater than along the present river shore, particularly during the first few years before cattle and stockmen have become accustomed to the changed environment.

Experience of stockmen around Fort Peck Reservoir indicates that the degree of hazards to livestock differs appreciably from place to place. 1/ The first three or four years of operation of the newly created reservoir are the most hazardous. During this period, the exposed points will be undercut by wave action until beaching has been established at various water stages. Silt deposition, not only from the outwash from upland erosion but from erosion of unstabilized banks, will be heavy and soupy. Sloughing of banks from the effects of bank drainage during draw-down will be considerable. As time goes on, this situation will improve. The silts will begin to consolidate somewhat. Banks will tend to become stabilized both against wave action and bank drainage. Cattle can be trained to make trails down the ridges to water, rather than to use the old trails down the coulees. thus lessening the danger of bogging. The ranchers will learn where the danger spots lie and work of patrolling will be easier.

Most ranchers interviewed said the main hazards are boggy areas, particularly bad in the fall when the pool level is receding. The receding waters expose the water-logged silt deposited at the mouths of draws and coulees. Here cattle become "bogged" in their attempts to cross the silt banks to reach open drinking water. Thick silt depositions on which only a top layer too thin to support the weight of a cow dries out are especially hazardous. A thin frozen layer presents similar dangers. In warm weather bogged stock will survive three to six days; in cold weather, one to three days. Difficulty is experienced in getting a rope on bogged stock. Some are badly injured in the process of pulling them out of the bog and later die or must be killed.

Several ranchers mentioned ice hazards and recommended that stockmen do not attempt to water stock at holes in the ice. A number of cattlemen keep cattle away from the reservoir during the early fall when the ice is thin. At the upper end of the Fort Peck Reservoir and at the backwater point in the larger streams, such as the Musselshell River, the spring ice breakup, combined with incoming flood waters, often causes ice floes to be deposited high on the shores of the stream. This is another situation which must be anticipated and watched.

1/ This and immediately following statements are based on interviews by MRBI personnel with stockmen operating in the vicinity of Fort Peck Reservoir. These interviews were made during September of 1952 and the results reported in two memoranda to the Director of the MRBI Project--one from Mr. W. H. Farmer dated October 1, 1952 and the other from Mr. J. D. Lamont dated October 17, 1952.

Stockmen's estimates of increased death loss caused by the Fort Peck Reservoir differ. Some of the stockmen interviewed thought there had been no increase; some thought death loss had increased, but could not say how much; others gave estimates of losses. Such losses are difficult to determine because cattle often disappear without leaving a trace. One large operator estimated that despite constant vigilance, his annual loss of cattle by bogging was approximately 1 percent of his herd. Another operator reported that during 1943, the first year of the reservoir in the Musselshell area, he lost 5 or 6 head in the bog. In 1944 he pulled out 20 head and lost 14 head. In 1945 he pulled out 15 to 20 head and lost 5 head. In 1946 he pulled out several but did not know of any losses. In 1947 he pulled out 18 and lost 2 head. In 1948 he pulled out 10 head and in 1949 he had to pull out 150 head and lost 20 head because the water receded fast after July 4, 1949. In 1950 he lost 1 head and in 1951 he pulled out 12 head. In 1952 he pulled out 3 and lost 2 head. Most of his losses occurred on the Musselshell bog but some happened at coulees.

Another operator estimated that it required the time of two men for a period of two weeks to herd 500 cattle out of the rough area along the reservoir in the fall. He lost 25 head of cattle the first year and 15 to 20 head the second year.

A cattleman running about 500 head reported he had lost 7 head of cattle on the river and only one on the reservoir. He was of the opinion that it actually does not make much difference except that boggy areas are particularly dangerous when the water in the reservoir is low. He stated that a neighbor had lost 18 head of cattle in the Soda Creek boggy area when the reservoir was first formed.

Fencing cattle away from shoreline grazing during the most dangerous periods and places is practiced, although some operators rely on herding to keep the stock away from the shoreline. With the upland pastures well watered, few stock will wander into the reservoir, but patrols must be maintained to keep stragglers out of danger. Operators along Fort Peck Reservoir consider fencing of the most hazardous and dangerous places essential, but they find that it is necessary then to allow controlled grazing on the reservoir side of the fence so that cattle will not be tempted to go through it to get to the ungrazed lands. Drift fences for this purpose should be built at a considerable distance from the shoreline on the level land above the heads of the tributary draws. The shore areas should be grazed only during periods of least danger.

Estimated Magnitude of Decreased Returns

The extra fences, water facilities, and shelters required on the uplands will entail annual depreciation, repair, and interest costs. The additional feed, labor, and death loss also are annual costs. Only the roughest sort of estimate can be made of these with available information. This extra cost probably will be offset by increased production after adjustments have been fully made to the new conditions. For present purposes, the total decrease in net income to stockmen resulting from displacement from the taking areas is estimated to average $2,000 per ranch over the adjustment period, table 19.

Table 19. Decreased Returns from Ranching During the Adjustment Period, Five Reservations

Reservation	Ranches to be Relocated	Decreased Return Per Ranch	Total Cost During the Adjustment Period
	No.	Dollars	Dollars
Fort Berthold	150	2,000	300,000
Standing Rock	50	2,000	100,000
Cheyenne River	100	2,000	200,000
Crow Creek	3	2,000	6,000
Lower Brule	8	2,000	16,000
Five Reservations	311	2,000	622,000

Cost of Rehabilitating Tribal Properties

Tribal lands are particularly extensive on the Cheyenne River Reservation where 739,729 acres remain after the taking, but are also of considerable importance on the Standing Rock and Lower Brule Reservations. Most of the tribal land on Fort Berthold Reservation was in the taking area while Crow Creek had only a small acreage before the taking, table 20. Most tribal land is rented, except on the Lower Brule Reservation where the tribal livestock enterprise makes use of 45,572 acres. Most tribal land on most reservations is rented to non-Indians.

The loss of sheltered pasture, meadowland, and sources of livestock water will affect some tribal lands in a manner similar to individual ranches. The disturbing effects of the reservoir takings on the use of land will diminish in intensity with distance from the reservoir. Drastic changes in organization and operation will be necessary on many ranches bordering the pool. The amount of land back from the reservoir that will require major adjustments in management will vary with circumstance. On most reservations these adjustments probably will be needed for only a few miles back of the reservoirs, but in the southeast portion of Cheyenne River Reservation, they are expected to extend throughout most of what was formerly Armstrong County.

Estimates of the acreage of tribal land which will be noticeably affected by the reservoirs take into consideration present range units, land use, land ownership pattern, and ranching operations as well as adjustments which will need to be made after the reservoir is filled.

Ranchers displaced by the reservoir are expected to use some of the affected tribal land in their ranching operation. The estimated acreage of affected tribal land to be used by displaced families and the remaining acreage to be rehabilitated by the tribe are shown in the lower part of table 20.

In order to restore the earning capacity of the affected tribal lands, water will need to be developed, livestock shelters constructed, and fences built. The estimated average extra cost of these items for the 311 families who will need to relocate is $1,915 for developing water, $1,000 for livestock shelter, and $1,300 for additional fences--a total of $3,960 per ranch or $1.58 per acre assuming 2,500 acres per ranch.

Table 20. Acreage of Tribal Land, Acreage Affected by the Takings, and Acreage to be Rehabilitated by Individuals and by the Tribe, Five Reservations

Reservation	Before Taking 1/	Taking Area 2/		Tribal Land After Taking		
				Total	Not Affected By Taking	Affected by Taking 3/
	Acres	Acres	Percent	Acres	Acres	Acres
Fort Berthold	28,549	22,225	77.8	6,324	200	6,124
Standing Rock	166,955	10,473	6.2	156,482	138,845	17,637
Cheyenne River	798,173	58,444	7.3	739,729	292,959	446,770
Crow Creek	5,280	810	15.3	4,470	2,343	2,127
Lower Brule	47,360	4,959	10.5	42,401	30,002	12,399
Total	1,046,317	96,911	9.3	949,406	464,349	485,057

	Acreage Affected by Taking			Cost of Rehabilitation by the Tribe	
	Total	Rehabilitation by Individual	Tribe	Per Acre	Total
	Acres	Acres	Acres	Dollars	Dollars
Fort Berthold	6,124	5,804	320	1.25	400
Standing Rock	17,637	15,637	2,000	1.25	2,500
Cheyenne River	446,770	50,000	396,770	1.25	495,962
Crow Creek	2,127	200	1,927	1.25	2,409
Lower Brule	12,399	6,000	6,399	1.25	7,999
Total	485,057	77,641	407,416		509,270

1/ Data from table 3.

2/ Data from MRBI appraisal reports listed in footnote 1 of table 8.

3/ The reservation area where ranch operations would be measurably affected by the takings was determined by judgment after examining maps showing the taking areas and present range units on the reservations. Acreage of tribal land within the affected area was measured from maps.

The affected tribal land probably can be rehabilitated at a slightly lower cost per acre than land in small ranch units because much of it, particularly on Cheyenne River Reservation, is likely to remain in large operating units. At $1.25 per acre, the total cost of rehabilitating affected tribal land not included in ranching units of individual Indians amounts to $509,270, most of it on Cheyenne River Reservation.

Funds for the rehabilitation of affected tribal land are, in a sense, in lieu of severance damages. The appraisals of tribal land on Cheyenne River and Standing Rock Reservations do not include any severance damage. On Lower Brule Reservation, severance damage on 4,959 acres of tribal land amounts to $6,600 or $1.33 per acre.

Increased Cost of Replacement Land

Most of the Indian ranchers in the reservoir areas desire to relocate near their present headquarters. As already noted the taking areas and adjacent lands are some of the principal population centers. Competition among ranchers from the taking area for suitable nearby land will tend to increase the price of this land during the resettlement period when many operators will be seeking new locations. Only in rare instances is it likely that displaced families will be able to secure replacement lands of equal productivity and earning capacity for the money they receive from land in the takings.

At a conference in 1951, Mr. Gerald T. Hart "mentioned a study which had been made to determine the effects of the condemnation of lands for Camp Hood in Texas. In that study, landowners who bought immediately found land values unchanged. After six months, however, land values had jumped 30 to 60%."

"Mr. Hart illustrated the possibilities of an abrupt increase in real estate values where they might be least expected by describing the lack of any activity in real estate in the town of Trinidad, Colorado until a condemnation made it necessary for a number of families to purchase homes. In this case, real estate prices jumped 25% overnight." 1/

It is estimated that it will require approximately 15 percent more than the appraised value of the land taken to obtain replacement land if land values continue at approximately their November 1951 levels.

1/ Quotations are from minutes of February 8, 1951 conference between Gerald T. Hart and representatives of the Bureau of Indian Affairs.

LOSSES TO INDIANS FROM REDUCTION IN TIMBER, WILDLIFE, AND NATURAL PRODUCTS

Most of the timber and shrubs which furnish shelter from the extremes of weather, provide building materials, fuel, and natural foods for man, and furnish habitat for wildlife will be destroyed through flooding of the reservoir areas. Tolerable substitutes can be built to replace natural shelter for persons and domestic animals, but not for wildlife. Game will be destroyed along with the timber and fruit and seed-bearing shrubs.

Most of the natural products will have to be replaced with store goods--lignite or gas for wood fuel, sawed lumber for house logs, steel posts and wire for native posts and fence poles, and canned and cured foods for game and natural products.

Loss of these resources will have marked repercussions on the Indian economy. Most Indians now obtain these natural products directly by their own labor. Much of the work is done during the winter or other slack periods when there is little other opportunity for productive labor. The cash outlay is small and the work does not conflict greatly with farm work or with opportunities for hired employment. Substitutes for native products destroyed by the reservoirs will be commercial products acquired through money payments. This change will greatly increase the importance of money in the Indian's economy and force substantial change in his way of life.

The importance of forest products is indicated by a recent study which states that "Almost every family on the Cheyenne River Reservation shares in the economic benefits of the reservation's natural resources. More than 400 families reported native timber, obtained without cash expenditure, as the principal source of fuel, corral poles, and house logs. This number does not include families who purchased firewood, posts, or logs, or hired others to haul these for them." 1/

Value of Timber to Indians

The traditional dependence of Indians on Nature is exemplified by their use of timber. Materials for houses, for corrals, for cattle sheds, for other farm structures, and for fence posts are obtained from the woods, as is also fuel for domestic purposes and for heating. Except at Fort Berthold, the volume of timber harvested during recent years exceeded annual growth.

1/ MRBI Report No. 117, Revised, page 19.

Present Timber Stands and Sustained Annual Yield

The timber which grows on the Indian reservations along the Missouri River in North Dakota and South Dakota is composed principally of such species as cottonwood, elm, ash, boxelder, and oak. Much of it was originally seeded in on accreted land. It occurs as a series of separate tracts among which the timber varies in age and density. Each tract may embrace anywhere from a few acres to several hundred. The timber stand on each reservation is comprised of numerous such tracts and while the timber on any one tract is likely to be of an even age, a combination of several of them results in an over-all forest in which many age classes are represented. This condition lends itself favorably to a rotation plan of cutting and thus provides the opportunity for a continued harvest of forest products by the Indian owners.

In any forest, competition for survival among the young trees increases rapidly and as they become older many die. Those in the diameter class 4 inches to 8 inches that fail to survive have, for years, provided a substantial source of dry fuel wood for Indian families. Also this pole-size timber is often cut green for fuel, as well as for corral poles and posts. House logs and some sawtimber also are cut from timber which is in excess of 8 inches in diameter. Obviously then, a relatively large amount of timber which has not reached maturity is being harvested.

Quantities of standing timber in the taking areas were obtained by a 20 percent cruise in which timber was classified as sawtimber, posts, and cordwood. The total was computed to be 123,204,000 board feet, table 21. The reader is referred to footnote 1, table 21, for further detail regarding the timber cruise.

As a basis for the determination of a sustained yield harvest, rotation periods of 25 years for post timber and 50 years for other timber were assumed. Using these rotation periods and the estimated commercial volume of the present stand as a standard or guide as to the amount of mean annual increment that can be anticipated from average stands, an annual sustained yield of mature timber was predicted. Since intermediate cuttings for dry wood, poles, posts, and house logs represent timber that does not reach maturity, the mature timber yield was increased 35 percent in order to arrive at the total sustained annual yields.

The estimated harvest of timber from reservation lands is given each year in the agency's annual report. The average annual harvest for recent periods is presented in the upper portion of table 22.

A distribution of the projected annual sustained yield volume in terms of forest products having local use or sale value is shown in the lower portion of table 22. This distribution is based largely on relative quantities of timber harvested during recent years for each reservation.

TABLE 21. QUANTITY OF STANDING TIMBER AND ESTIMATED SUSTAINED ANNUAL YIELDS IN MISSOURI RIVER RESERVOIR TAKING AREAS OF FIVE RESERVATIONS 1/

	Quantities of Standing Timber			Total Com'l. Timber	Sustained Annual Yield 3/		
	Sawtimber	Posts	Cordwood		Mature Timber	Other Cuttings	Total
Reservation	Mbf.	No.	Cords	Mbf. 2/	Mbf.	Mbf.	Mbf.
Fort Berthold	17,317	608,920	56,191	39,082	842	308	1,150
Standing Rock	11,716	254,215	98,193	45,718	940	340	1,280
Cheyenne River	3,040	122,993	46,579	19,180	395	145	540
Crow Creek	2,353	114,583	25,411	11,395	238	92	330
Lower Brule	2,017	90,829	16,075	7,829	165	60	225
Five Reservations	36,443	1,191,490	242,449	123,204	2,580	945	3,525

1/ Data are from 20 percent timber cruises by 40-acre tracts made by foresters of the Missouri River Basin Investigations Project of the Bureau of Indian Affairs. Cottonwood sawtimber and mixed hardwood types were delineated on aerial photographs and acreages measured.

Cottonwood is the most important species of timber on all reservations. Other useful species include ash, elm, boxelder, juniper, oak, and diamond willow. Juniper constitutes a larger portion of the timber on Lower Brule and Crow Creek Reservations than on reservations farther up the Missouri River.

Timber was recorded as sawtimber, cordwood, and posts in order to simplify the tally sheets. Saw log timber was measured by two-inch diameter classes D.B.H. (diameter breast high) with a Biltmore stick and tallied on the basis of merchantable length for trees 11 inches and up D.B.H. which included one or more 8-foot lengths with top diameters of 8 inches or more. Logs had to be at least 50 percent sound to be considered merchantable.

Cordwood was tallied by two-inch diameter and 20-foot height classes and computed in accordance with the cordwood volume table for hardwoods contained in Technical Notes No. 185 of the Lake State Experiment Station. Two-thirds of a cord for the tree tops was added as cordwood for each thousand feet of sawtimber tallied. All trees 4 to 8 inches D.B.H. with one or more posts seven feet long with a minimum top diameter of three inches were recorded by species.

2/ Assuming 5 board feet per post and 333 1/3 board feet per cord.

3/ Assuming a 25-year cutting cycle for posts and a 50-year cutting cycle for other timber and adding approximately 35 percent for deadwood and green cuttings harvested within the period.

Table 22. Reported Annual Harvest of Timber by Indians and Estimated Potential Annual Harvest from Reservoir Taking Areas, Five Reservations

Reservation	Logs	Poles	Posts	Cord-wood	Total	Per Resident Family 1/
	No. 3/	No.	No.	Cords	Mbf. 4/	Mbf.
Annual Harvest from Reservation in Recent Years 2/						
Fort Berthold	5,935	7,717	28,556	452	550	1.49
Standing Rock	5,365	5,812	59,928	5,944	2,500	3.68
Cheyenne River	1,200	2,800	6,950	3,384	1,226	2.04
Crow Creek	1,830	6,300	4,400	1,200	540	2.18
Lower Brule	335	2,800	4,200	672	285	2.42
Five Reservations	14,665	25,429	104,034	11,652	5,101	2.53
Potential Annual Harvest from Taking Area 5/						
Fort Berthold	5,200	7,000	24,800	2,400	1,150	3.11
Standing Rock	2,750	2,975	30,680	3,040	1,280	1.88
Cheyenne River	900	3,000	6,000	1,359	540	.90
Crow Creek	1,115	3,850	2,690	735	330	1.33
Lower Brule	265	2,210	3,310	530	225	1.91
Five Reservations	10,230	19,035	67,480	8,064	3,525	1.75

1/ Total Mbf. divided by the number of resident families shown in table 11.

2/ Data are from the annual reports of the Forest and Range Branch of the agencies concerned. For Standing Rock, Cheyenne River, Crow Creek, and Lower Brule Reservations, these figures represent the approximate average during the 10-year period 1942 to 1951, except that for Cheyenne River Reservation the quantity of cordwood is based on recently revised estimates made by the agency. For the Fort Berthold Reservation, the years 1942 to 1947 were used because harvesting of timber has been greatly accelerated since 1947 in anticipation of the impending flooding of the lands.

3/ In the annual reports, logs are reported in terms of board feet. Thirty board feet per log are used to convert Mbf. to house logs--the most common use of such timber.

4/ Logs, poles, posts, and cordwood were converted to Mbf. on the basis of 30 board feet per log, 10 board feet per pole, 5 board feet per post, and 333 1/3 board feet per cord of wood.

5/ Approximately 90 percent of the commercial timber in each of the reservations is within the taking area. Total potential annual harvest from the taking area is based on estimated sustained annual yield, table 21. Distribution of potential annual harvest among logs, poles, posts, and cordwood is approximately proportional to reported harvest during recent years except for Fort Berthold and some modification for Cheyenne River. For Fort Berthold, where most cordwood is left unharvested, potential cordwood was estimated from harvestings on other reservations, and the remaining potential annual harvest distributed among logs, poles, and posts in proportion to harvestings during recent years.

Total Mbf. reported harvested during recent years from the reservations is appreciably greater than estimated potential annual harvest from the taking area except at Fort Berthold. The potential sustained yield from the taking area equals 44 percent of the reported annual harvest on Standing Rock, 51 on Cheyenne River, 61 on Crow Creek, and 79 on Lower Brule Reservation. Since approximately 90 percent of the commercial timber is in the taking areas, the annual harvest during recent years apparently exceeds the estimated annual rate of timber growth on these four reservations. This situation demonstrates that timber resources are valuable and are being used by the Indians.

Value of Sustained Annual Yield of Timber

The estimated gross value to Indians of timber products is shown in table 23. These values were obtained by applying unit values given in footnote 1 to quantities shown in the lower portion of table 22. They represent the value of the harvested product to the people on the reservation. They are gross values because no expenses have been deducted from the value of the product to cover costs of felling the timber, cutting it into house logs, poles, posts, and cordwood, and transporting these products to the homesite.

Harvesting of timber is largely hand labor and transportation ordinarily involves only small cash outlay. Much of the work is done by labor for which there is little or no other employment at the time. Where harvesting is done with labor and equipment which would not otherwise be utilized, the opportunity cost of harvesting is small, and in the taking of his timber, the Indian sustains losses substantially equal to the value of the harvested product.

To the extent that harvesting involves cash outlays or real opportunity costs for labor, gross value overstates damages from loss of timber. These costs probably are considerable for some Indians, but information from which the magnitude of such costs might be estimated is not at hand. A settlement for loss of timber based on the gross annual value of products shown in table 23 can be considered a liberal one.

Value of Wildlife to Indians

Game constitutes an important source of food for peoples of the five reservations. Like timber products, it is obtained largely by surplus or spare labor with little cash outlay. Game is taken so widely that it is difficult to determine the amount taken by the Indians. The annual reports of the agencies contain estimates based on information available to agency personnel. The MRBI socio-economic family survey report of the Fort Berthold Reservation estimated 1,215 deer taken by the resident families in 1948. 1/

1/ MRBI Report No. 94, Social and Economic Report of Fort Berthold Reservation, Supplement No. 1, August 31, 1949.

Table 23. Yearly Value to Indians of the Annual Potential Harvest of Timber from the Taking Areas, Five Reservations 1/

Reservation	Logs	Poles	Posts	Cord-wood	Total	Per Resident Family 2/
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Fort Berthold	10,400	7,000	9,920	36,000	63,320	171 3/
Standing Rock	5,500	2,975	12,272	45,600	66,347	98
Cheyenne River	1,800	3,000	2,400	20,385	27,585	46
Crow Creek	2,230	3,850	1,345	11,025	18,450	74
Lower Brule	530	2,210	1,655	7,950	12,345	105
Five Reservations	20,460	19,035	27,592	120,960	188,047	93

1/ Values computed by multiplying quantities under "potential annual harvest from the taking area" in table 22 by the following per unit values,--logs $2, poles $1, cordwood $15, posts on Fort Berthold, Standing Rock, and Cheyenne River Reservations 40 cents, and posts on Crow Creek and Lower Brule Reservations 50 cents. Equivalent Mbf. values are: logs $67, poles $100, posts $80 to $100, and cordwood $45. They are values of the harvested product to the Indian or at his place of residence.

2/ Total value divided by the number of resident families shown in table 11.

3/ Use of a uniform per-unit value for cordwood on all reservations probably overstates the value to Fort Berthold Indians relative to that to Indians on other reservations. Accessibility of lignite has caused persons on Fort Berthold Reservation to depend less on wood for fuel than do Indians on the other four reservations; nevertheless, a considerable quantity of wood is used for fuel even though its use is comparatively less than on the other four reservations.

The most extensive studies of wildlife population have been made by the U. S. Fish and Wildlife Service. This Service made an intensive field survey during 1946-48 to determine the effects of the Oahe Reservoir on wildlife. Separate estimates were made for the taking areas on Cheyenne River and Standing Rock Reservations. Similar estimates were made for Fort Randall Reservoir; however, no separate estimates were computed for Crow Creek and Lower Brule Reservations. In the absence of such separate estimates, it was assumed that losses on these reservations would be proportionate to the land area involved. Indian land at Crow Creek constitutes 8.15 percent of the Fort Randall Reservoir area, and at Lower Brule Reservation 7.10 percent.

On the basis of the Fish and Wildlife Service values, wildlife losses on four reservations will amount to $175,470 annually, table 24. This amount is based upon sportsmen's expenditures at the general level of prices which prevailed during 1939-44. Sportsmen's expenditures reflect the amount sportsmen are willing to spend to bag the various species of game. Examples of these prices on 1939-44 base are: deer $100; antelope $75; waterfowl, pheasants, and grouse $5; and rabbits $1. Under the price projection now being used by Federal agencies in project planning reports (farm prices at 215 percent of the 1910-14 average) these prices are increased 36 percent--$136 for a deer, $102 for an antelope, etc.

The value of game to the Indian people undoubtedly is less than the amount sportsmen spend for hunting game. Reservation Indians probably are more skilled hunters than the average sportsman, use less costly equipment, and no hotel bills or long distance travel are incident to their hunting activities. Sportsmen's expenditures therefor are not considered a sound basis for arriving at the value of game to Indians. The loss to Indians from destruction of wildlife is taken to be the value to them of the annual wildlife harvest which they obtain. This value may be measured by the additional amounts which Indians will have to pay for food to replace that previously supplied by the destroyed wildlife resources. Estimated values for each reservation are shown in the bottom portion of table 24. They reflect the increase in store bills which will result from the loss of game for food. Fur values are based on the market prices of these furs at 1939-44 price level. These are the prices used in the Fish and Wildlife Service reports.

Table 24. Annual Loss in Wildlife Values Expected to Result from Flooding of Indian Lands on Five Reservations

Reservation	Big Game	Upland Game	Fur Animals	Waterfowl	Total	Per Resident Family
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Loss as Computed by Fish and Wildlife Service 1/						
Standing Rock	17,200	35,000	8,100	0	60,300	
Cheyenne River	30,600	32,000	11,700	0	74,300	
Crow Creek	408	16,055	1,141	4,238	21,842	
Lower Brule	355	13,987	994	3,692	19,028	
Four Reservations	48,563	97,042	21,935	7,930	175,470	
Estimated Loss to Indians 2/						
Standing Rock	8,600	10,500	8,100	0	27,200	40
Cheyenne River	15,300	9,600	11,700	0	36,600	61
Crow Creek	204	4,816	1,141	1,271	7,432	30
Lower Brule	178	4,196	994	1,108	6,476	55
Four Reservations	24,282	29,112	21,935	2,379	77,708	47
Fort Berthold 3/	25,600	8,100	7,000	0	40,700	110
Five Reservations	49,882	37,212	28,935	2,379	118,408	59

1/ Data for Standing Rock and Cheyenne River Reservations are from "A Report on Fish and Wildlife Resources in Relation to the Water Development Plan for the Oahe Reservoir," Fish and Wildlife Service, January 1951. This report contains separate estimates for Cheyenne River and Standing Rock Reservations.

Data for Crow Creek and Lower Brule Reservations are from "A Preliminary Evaluation of the Effect of the Fort Randall Reservoir on Fish and Wildlife Resources," Fish and Wildlife Service, February 1948. Data for Crow Creek and Lower Brule are 8.15 and 7.10 percent respectively of the total for the Fort Randall Reservoir, which represent the percentage of Indian land in the reservoir area.

2/ Values for big game are approximately 25 cents a pound live weight or 50 cents a pound locker-dressed weight. Values of upland game and waterfowl average around $1.50 per bird--50 cents to 75 cents a pound, and for rabbits 30 cents a head. These values are approximately 50 percent of the 1939-44 sportsman's value of big game and 30 percent of the value of upland game and waterfowl. Fur values are the same as those used in the Fish and Wildlife Service reports, namely, the 1939-44 average market value of the furs.

3/ Data for Fort Berthold are based on 1949-53 average take as reported in annual reports of the Branch of Forest and Range Management, Bureau of Indian Affairs. The value of fur-bearing animals is an unpublished estimate of the Fish and Wildlife Service.

Recent prices are much higher than those of 1939-44. For example, the 1947-52 average farm price of meat animals in the United States was more than twice that of the 1939-44 average price. The difference between 1939-44 prices and 1952 prices for furs probably is as great as the cost to the Indians of trapping and preparing the furs. The value for furs in table 24 therefore may be considered to be the net value. The estimated annual loss which will be incurred by reservation people because of the decrease in wildlife on the five reservations totals $118,408--an average of $59 per resident Indian family. For the four reservations for which settlement has not been reached, the total annual loss amounts to $77,708--44 percent of the Fish and Wildlife Service estimates.

Value of Natural Products to Indians

People on the reservations make use of such wild products as fruits, berries, beans, herbs, barks, and roots. Their use is not so extensive as formerly but still is widespread. Such products make important contributions to the living of many families on all reservations.

Three MRBI surveys obtained estimates of the quantity of wild products used. On Fort Berthold Reservation, the 1949 Survey reported 23,668 quarts or pounds of wild fruit stored by the families interviewed. A conservative estimate of the food value at 25 cents per quart or pound gave a total annual value of $5,917. Converted to bushels of fresh fruit[1/] the quantity of fruit stored annually is approximately 1,553 bushels with a commercial value of $5,345. At least 90 percent of the families participate in the harvest of the wild fruits. On the Crow Creek-Lower Brule Reservations, 106 families were interviewed in March 1953. A total of 72 of these families reported harvesting of 607 bushels of wild fruit in 1952. The commercial value of this fruit ($3.50 per bushel) totals $2,124.50, an average of $29.51 per family reporting its use. The number of families reporting use of wild fruit constitutes 67.9 percent of the families interviewed.

The Cheyenne River Reservation survey, made in 1949-50, was reservation-wide and included 529 resident families. The 189 families who reported harvesting wild fruit in 1949 represent only 35.7 percent of the families interviewed but many families indicated that they had not obtained fruit because of the exceptionally poor harvest that summer. The families who shared in this harvest estimated that they had canned or dried approximately 10,900 quarts or pounds with a total value of $2,725, or $14.42 per family reporting.

1/ Using conversion tables, USDA: Agricultural Statistics, 1945 (1 lb. of dried fruit equals 5 lbs. fresh fruit; average 50 lbs. = 1 bu.)

The survey samples on these reservations are not entirely comparable. The Crow Creek-Lower Brule group included only those families living along the timbered bottoms where the fruit is most readily accessible, whereas the Cheyenne River and Fort Berthold surveys included more than 90 percent of the total resident families. The Crow Creek-Lower Brule survey was made following a year of abundance of fruit, whereas the Cheyenne River study was made in a year when the fruit crop was poor. None of the surveys included questions about consumption of many miscellaneous products such as mice beans, herbs, barks, and roots. The estimates obtained need to be corrected to reflect accessibility of fruit to total resident populations, an average season somewhere between that of the poor year in which the Cheyenne River study was made and the good year in which the Crow Creek-Lower Brule survey was made, and the value of products not covered in the surveys.

In making such adjustments, information from the formal surveys was supplemented by observations of a number of people well acquainted with the areas and by information from members of the tribal negotiating committees. The estimated average annual value of natural products per resident family in table 25 is based on the survey data, all available supplemental information and the judgment of MRBI personnel well acquainted with conditions on each of the reservations. Values range from $32 per resident family at Fort Berthold to $9 at Cheyenne River. Most Fort Berthold families in 1949 lived close to wooded areas where wild fruits were normally more abundant than on any of the other reservations. Many of the Cheyenne River families, on the other hand, live in areas of the reservation far removed from the bottoms where the fruits grow abundantly. Most of the natural products are produced in the wooded areas. Estimates of the timberland included in the reservoir areas range from 63 percent on the Cheyenne River Reservation to 94 percent on Crow Creek Reservation. 1/ These are the major differences which explain the range of $9 to $32 per resident family in the value of natural products obtained from the taking area.

1/ Table 7, page 35.

TABLE 25. ANNUAL VALUE OF WILD FRUITS, BERRIES, AND MISCELLANEOUS PRODUCTS GATHERED BY INDIANS FROM THE ENTIRE RESERVATION AND FROM THE TAKING AREA, FIVE RESERVATIONS 1/

RESERVATION	RESIDENT INDIAN FAMILIES 2/	PERCENT OF FAMILIES GATHERING WILD PRODUCTS	ANNUAL VALUE OF PRODUCTS PER RESIDENT FAMILY 3/	VALUE OF PRODUCTS FROM		
				ENTIRE RESERVATION	TAKING AREA	
					TOTAL 4/	PER RESIDENT FAMILY
	No.	PERCENT	DOLLARS	DOLLARS	DOLLARS	DOLLARS
STANDING ROCK	680	60	18	12,240	9,180	14
CHEYENNE RIVER	600	50	15	9,000	5,670	9
CROW CREEK	248	60	18	4,464	4,196	17
LOWER BRULE	118	60	18	2,124	1,784	15
FOUR RESERVATIONS	1,646			27,828	20,830	13
FORT BERTHOLD	370	90	36	13,320	11,855	32
FIVE RESERVATIONS	2,016			41,148	32,685	16

1/ ESTIMATES IN THIS TABLE ARE BASED ON SURVEY DATA, DISCUSSIONS WITH INDIANS AND AGENCY PERSONNEL, AND FIELD OBSERVATIONS BY MEMBERS OF MRBI STAFF.

2/ FROM TABLE 11.

3/ BASED ON ESTIMATED PERCENT OF FAMILIES GATHERING WILD PRODUCTS MULTIPLIED BY THE AVERAGE VALUE OF $40 PER FAMILY FOR FORT BERTHOLD AND $30 PER FAMILY FOR OTHER RESERVATIONS.

4/ SINCE MOST WILD PRODUCTS ARE FROM WOODED AREAS, THE PROPORTION OF THE ENTIRE RESERVATION WHICH IS FROM THE TAKING WAS BASED ON THE PERCENTAGE OF TIMBERLAND IN THE TAKING AREA AS FOLLOWS: FORT BERTHOLD 89, STANDING ROCK 75, CHEYENNE RIVER 63, CROW CREEK 94, AND LOWER BRULE RESERVATION 84 PERCENT.

POTENTIAL AND INTANGIBLE DAMAGES

Potential Values

Several kinds of potential values of Indian lands in the taking areas were talked about at various times during conferences called for the purpose of negotiating settlements between the Indians and the United States. Among these were irrigation potentials, potential increases in the commercial value of timber, and enhancement of land values in underdeveloped localities as the general area develops.

Irrigation Potential

Irrigation potential refers to the speculative value sometimes attached to land because it is thought to have possibilities for irrigation development. In order to determine acreages having such possibilities, soil scientists classified lands in the taking areas of Fort Berthold, Standing Rock, and Cheyenne River Reservations. In this classification they indicated lands physically and topographically suitable for irrigation. Engineering parties surveyed these lands for suitability as to topography, size of tract, pump sites, pumping heads, and other items entering into the cost per acre for constructing and operating irrigation systems. Areas unsuitable for irrigation were then deleted from the total acreage of irrigable lands as determined by the soil scientists. The net acres of irrigable land in the taking area as determined by these procedures are shown in table 26. On the Lower Brule and Crow Creek Reservations, irrigable acreages on four irrigation units authorized by Congress under the provisions of the Flood Control Act of 1944 are included within the taking areas. These are the acreages shown for Crow Creek and Lower Brule. The taking area also includes about 320 acres of land which once had been under small irrigation developments but which are now abandoned. These acreages are not included.

The irrigation-potential component of land value differs from place to place because of the character of the soil, the location of the land, the probable costs of constructing and operating an irrigation system, the immediacy of construction, and other factors. Available information on costs and likelihood of development, however, do not justify any differentiation in per acre value of the irrigation potential among reservations, so a flat rate of $10 per acre for the irrigable factor was used. This rough estimate was made after reviewing gross annual earnings reported for Bureau of Reclamation projects in various localities in Wyoming, Montana, North Dakota, and South Dakota; estimated operating and maintenance costs of the facilities required to irrigate land in the taking area; the appraised value of the land; and other factors.

TABLE 26. ACRES OF INDIAN OWNED IRRIGABLE LAND ON THE RESERVATION AND IN THE RESERVOIR TAKING AREA, FIVE RESERVATIONS

RESERVATION	IRRIGABLE LAND ON RESERVATION 1/	IRRIGABLE LAND IN TAKING AREA			
		PERCENT OF TOTAL	NET IRRIGABLE ACREAGE 2/	VALUE OF IRRIGABLE FACTOR PER ACRE 3/	VALUE OF IRRIGABLE FACTOR TOTAL
	ACRES	PERCENT	ACRES	DOLLARS	DOLLARS
FORT BERTHOLD	26,781	100	26,781	10	267,810
STANDING ROCK	29,867	26	7,844	10	78,440
CHEYENNE RIVER	25,211	8	1,937	10	19,370
CROW CREEK	19,509	4	692	10	6,920
LOWER BRULE	16,580	9	1,446	10	14,460
FIVE RESERVATIONS	117,948	33	38,700	10	387,000

1/ BASED ON REPORTS PREPARED BY THE BUREAU OF INDIAN AFFAIRS AND THE BUREAU OF RECLAMATION. IRRIGABLE REFERS TO LAND CONSIDERED TO BE PHYSICALLY SUITED TO IRRIGATION AND ENGINEERINGLY FEASIBLE OF IRRIGATION.

2/ BASED ON SOIL SURVEYS AND ENGINEERING ESTIMATES MADE BY MRBI AND THE BUREAU OF RECLAMATION.

3/ THE IRRIGABLE FACTOR OF $10 PER ACRE IS A ROUGH FIGURE ARRIVED AT AFTER AN EXAMINATION OF GROSS ANNUAL RETURNS REPORTED FOR BUREAU OF RECLAMATION PROJECTS IN VARIOUS LOCALITIES IN WYOMING, MONTANA, NORTH DAKOTA, AND SOUTH DAKOTA AND TAKING INTO CONSIDERATION PROBABLE COSTS OF OPERATING AND MAINTAINING IRRIGATION FACILITIES.

Most of the irrigable land in reservoir sites is on the Fort Berthold Reservation where settlement for the taking has already been made. There are only 11,919 acres of irrigable land in the taking areas of the other four reservations.

Prospects for Increased Commercial Value of Timber

In MRBI Report No. 132 and in Mr. Hart's Basic Data Report 1/ it was noted that no well-established commercial market for timber stumpage exists in the Oahe taking area, partly because of the undeveloped character of the reservations. As development in such localities catches up with developments in neighboring areas, it is reasonable to expect commercial stumpage values of timber to rise to a figure comparable with that of similar timber resources in more developed areas.

There is an additional reason for anticipating increases in commercial stumpage rates. Virgin timber supplies are being steadily reduced and the demand for timber in the United States seems likely to continue to expand with increased population and new industrial uses of timber. 2/

In view of these prospects for increased timber values and present non-taxable status of Indian trust lands, the investment value of timber to the Indians is substantially above the commercial stumpage values used in MRBI appraisals. However, the prices used for computing the value to Indians of timber products are considered ample to cover all timber values, including potential increases in commercial values.

Potential Increases in the Market Value of All Lands

As already noted, retarded development has caused market values of land in the taking area to be lower than the value of land with the same productive potentials in more fully developed neighboring areas. With such lands in trust and tax-free status, Indians are presently in a favorable position to hold these lands and thus to reap the benefits of increased values arising out of a maturing economy in the area. Indians who use money obtained from sale of their land to purchase other land in trust will not lose the possible advantages inherent in land ownership provided they can replace their holding with trust land at equal prices. Difficulties likely to be encountered in doing this are discussed earlier in this report and estimates made of probable higher prices.

1/ See MRBI Report No. 132, pages 15 to 18 and Mr. Hart's Basic Data Report, pages 68 to 70.

2/ See MRBI Report No. 131, pages 5 to 7 for documentation of this point.

Intangible Damages

Intangible damages and costs usually represent secondary repercussions arising from the disruptions and disturbances caused by the taking. These affect the economic, social, religious, community, and home life of the people and the peace of mind of individuals not only on the taking area but also on the residual part of the reservations. Some effects extend even to tribal members residing away from the reservations.

The consequences of such disruptions and disturbances are particularly severe on Indians because they place great store on traditional tribal and family ties and because most reservation Indians have not become fully amalgamated with the social and economic structure of the country. Indians generally find it more difficult than do most other Americans to fit into the social and economic life of communities outside the reservation area. This is one reason why local community ties are so strong among the Indian people.

The fact that lands outside the reservation cannot be acquired in trust status, the presence of racial discrimination or lack of social acceptance in some non-Indian communities, and the fear of loss of security if present social and tribal ties are broken, are other factors which make disturbance of their present condition particularly disquieting to many Indians.

Certain desirable conditions in the taking areas which cannot be fully duplicated in the new areas involve intangible losses. The pleasant living environment afforded by the wooded protected valleys, the good quality water from some springs and wells, the abundance of game and wild products, the recreational values of the streams and wooded areas, the association with old friends and neighbors, and the attachment which people have to their home locality, are things that cannot be fully replaced.

Intangible damages are difficult to assess or even to identify. They are of a highly elusive and speculative nature. They are immaterial, subjective, and affect each person differently; hence, marked variation in monetary evaluation of such imponderabilia as intangible damages is to be expected.

This study does not attempt to place a monetary value on each kind of intangible damage, but does point up similarities and differences in the impact which the reservoir takings are likely to have on over-all economy and social structure of particular reservations. Consideration of these differences and similarities should be useful in arriving at acceptable evaluations of damages on which settlements between the Indians and the United States can be based.