S-D-6
Whitman - Reconnaissance,
Burnt River Project.

March 16, 1916.

C O S T R E P O R T

on the

R E C O N N A I S S A N C E E X A M I N A T I O N

of the

B U R N T R I V E R P R O J E C T.

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Fred A. Matz,

Chief of Party.

For the Information of the Forester.

4/21 P 4 S V

C O N T E N T S.

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Report on Burnt River Reconnaissance.

Part II, Costs.

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I. Acreage and Mileage.

1. Area Mapped.

The total area mapped differs somewhat from the sum total of all of the blocks as indicated in the township summaries, and is accounted for in the following reasons: Two sections in unsurveyed T. 13 S., R. 35½ E., W. M., were covered by a ten per cent. cruise, which acreage has not been included in any of the summaries, since the final maps do not include this area. Owing to the difficulties encountered in connecting up with the topography already mapped for the adjoining areas, it was necessary to run the strip surveys well over the divide marking the boundary of the tract, and usually to a 10-acre or a 40-acre subdivision line. A true comparison of this difference is best shown by the following summary:

Total area reported in fortnightly reports	34,749 acres.
Total for all blocks mapped	32,251.15
Difference	2,497.85

The above areas include the alienated lands within the several townships. Since the greater portion of the expense has already been incurred for the cruise of the two sections in unsurveyed T. 13 S., R. 35½ E., it would appear proper to include this area when working up the 'per acre' costs for the project. Therefore, adding to the above-mentioned block totals the equivalent of two sections we obtain the sum of 33,531.15 acres for the total area mapped, which will be considered hereafter in determining the average costs per acre.

2. Area Cruised.

The entire project was covered by five and ten per cent. cruise. The total area cruised differs from the total area mapped, in that it was the usual practice to so arrange the work each day as to avoid running the cruise strips across the patented lands, since it was intended primarily to secure the topographic data only for these areas. In many cases it was necessary for the strip crews to cross over some of the patented forties in order to complete their strips, with the result that the cruise data have been secured on the following described patented properties:

N.W. 1/4, Section 1, T. 12 S., R. 36 E.	158.35 A.
S.W. 1/4, " 3, " "	160.00 "
N.W. 1/4, " 10, " "	160.00 "
S.E. 1/4 S.W. 1/4, Section 15, T. 12 S., R. 36 E.	40.00 "
Total	518.35 "

Excepting the 40 acres in Section 15 all the above area was covered by a ten per cent. cruise. There still remains an additional 520 acres of patented lands, which would represent the difference between the area cruised and area mapped. Subtracting this 520 acres from 33,531.15 acres, mentioned under area mapped, we obtain 33,011.15 acres for the total area cruised. The total area cruised is divided into the different degrees of intensiveness as follows:

10 per cent. method	27,125.15 A.
5 " " "	5,886.00 "
Total area cruised . .	33,011.15 "

3. Control Lines.

In order to secure the proper degree of accuracy in any system for both vertical and horizontal control it appears the most practical to divide this phase of the work into at least two distinct classes--transit and compass.

(a) Transit.

The object of transit control is to obtain the relative elevations of the stakes set for starting points for the strip surveys, and points intervening, by means of either direct or indirect leveling. All the transit control run out on this project was done by the indirect leveling system, which requires the field services of but two men, transitman and rodman. It has been the writer's observations that from an efficiency standpoint it is advantageous to have the lines over which the transit control is to be established marked out and staked by a compass party in advance of the work. This is not absolutely necessary, but when we stop to consider that if the transit party is required to set the control stakes, which requires the services of at least one more man, besides considerable computation for distances, the time saved in the end more than offsets the duplication. Usually each computation requires but a short time, but when any great number are made throughout the day it is obvious that there is considerable lost motion, since the remainder of the crew is in waiting during the time the transitman is computing. Owing to this apparent duplication, the total mileage of control lines is probably greater than

that recorded for other equal areas, but it is believed that the total cost of control should compare quite favorably with former cost data. It was the general plan to establish the transit elevations along each alternate section line, which gives an absolute check on one side of each section.

(b) Compass.

Excepting the two miles run out in unsurveyed T. 13 S., R. 35½ E., all the compass control was simply a retracement of the surveyed section lines. Although a small part of the project was covered by a five per cent. cruise, the entire area was staked out for a ten per cent. method, by setting stakes at each ten-chain interval. These control lines were established along the section lines extending in an east-and-west direction. In order to systematically designate the stakes set, in reference to some known position, the north line of T. 12 S., R. 36 E. was designated the "A-line." Each section line extending in an east-and-west direction, south of this line, was designated in alphabetical order, as follows: the line one mile south "B-line," two miles south "C-line," etc., resulting in the south line of T. 13 S., R. 36 E., which is the south boundary of the project, being designated as the "M-line." The range line passing through the northeast corner of T. 12 S., R. 36 E. was designated the "zero-line," and each stake set to the west thereof along

the section lines was marked according to its distance in chains from this line.

The working of this system can best be explained by the following examples:

Suppose that stake "A-165" is found; this indicates that it is set on the north line of T. 12 S., R. 36 E. and 165 chains west of the range line, or five chains west of the northeast corner of Section 3 of the same township. "D-235" is on the third line south of the "A-line" and 235 chains west of the range line, or five chains east of the southwest corner of Section 15. For reference this system is platted on the half-inch-to-mile map forming a part of the silvicultural report on this project.

The size of crew for the greatest efficiency should be four men, as follows: one compassman (in charge of party), one axman and two chainmen. The compassman carries an axe and assists in blazing the line, and keeps the notes on topography. The head-chainman carries a belt-axe and sets and marks the stakes. After the lines have been marked and staked in this way the elevations of the stakes are determined by means of barometers. A highly satisfactory plan for determining barometer elevations of points along the control lines is to detail one man to this work, whose duty

it is to record the time of day and the readings of two barometers, which he carries, at each stake and corner and any abrupt changes in topography. In the meantime, while these readings are being taken in the field, a barometer is read each hour in camp to determine the changes in atmospheric pressure. From these readings a curve is drawn to indicate the changes throughout the day and in accordance therewith it is only necessary to add or subtract, as the case may be, to obtain the absolute elevation of any point recorded by the man in the field. These corrected elevations are then recorded in the notebook and are copied onto the field map sheets before the strip crews go into the field, thus insuring a common datum for adjoining sections. When control lines are run at each mile interval it is not necessary that the strip crews record the time of day, the compassman being able to make the necessary corrections for barometer variation from the absolute elevation, at the end of each strip.

The following summary shows the mileage of control lines established on the project:

Number of miles of transit control line	36½
" " compass " "	59
Total number of miles of control line . . .	95½

4. Miles of Strip Cruising Lines.

The strip cruising is done by a party of two, designated as compassman and estimator. The strip crews on this project when working on a ten per cent. cruise covered each day a distance of four miles, representing an area of 320 acres. When working on five per cent. cruise, should the topography be broken or the area wooded, it might require the compassman to make numerous side trips, which would delay him considerably. Three miles per day, or an area of 480 acres, might then be considered a fair average day's work.

The following summary shows the mileage run out for each method of cruising:

Number miles run on ten per cent. cruise . . .	361
" " " " five " " " . . .	36
Total number miles of strip cruise	397

II. Expenses.

1. Cost of Subsistence Supplies.

Excepting a total of about $60.00, which amount represents supplies purchased from the Unity store and from farmers living near the project, all the subsistence supplies were purchased at Sumpter. The hauling of these supplies was done by the Government team at the time the team was sent out to move camp, thereby somewhat reducing the cost, owing to

the difference in cost of transportation. The charge for hauling by Government team is included under "Hauling." The total cost of all subsistence supplies used is $448.61.

2. Cost of Cook's Wages.

Mr. H. C. Hawley, of Baker, was employed as cook at the rate of $70.00 per month. Previous to this employment Mr. Hawley had been employed by Mr. Hewitt, of the U. S. Geological Survey, by whom he was well recommended. His services on this project were entirely satisfactory in every respect. He was later employed by Mr. Andrews on the Summit Creek and Burnt River appraisals. The cook's wages prorated for each month are:

Month of July	$70.00
" August . . .	65.33
Total cost of cook's wages . .	$135.33

3. Cost of Hauling.

Under this caption is included the cost of hauling supplies and moving camp with the Government team, freight and express charges and hauling by stage or other hired means of transportation.

Government team and driver, 11 days @ $6.00	$ 66.00
Express charges	3.56
Stage and other hauling	38.46
Total	$108.02

4. Travel Expenses.

This includes expenditures for railroad fares and other means of conveyance, and meals and lodgings en route. Segregated as follows:

Railroad transportation . . .	$ 5.70
Meals and lodgings	8.05
Total for travel expenses .	$13.75

5. Equipment and Miscellaneous Expenses.

Nearly all the equipment used was already in stock at the Sumpter office, it being necessary only to purchase some additional cooking utensils and other equipment for the kitchen and also the material and construction of a drafting board for office use.

The total cost of these expenditures is $17.84.

6. Total All Expenses.

For convenience all the above expense items can be summarized as follows:

1. Subsistence Supplies	$ 448.61
2. Cook's Wages	135.33
3. Hauling	108.02
4. Travel	13.75
5. Equipment and Miscellaneous . .	17.84
Total	$ 723.55

7. Average Daily Expense per Man.

This average represents the average daily expenses of each member of the party (not including the cook) and is obtained by dividing the total expenses by the number of man-days spent on the project (including Sundays and holidays). The total number of man-days spent in the field was 485. These expenses can well be separated into two classes: a, subsistence expense; b, all other expenses.

a. Average daily subsistence cost,	$448.61 ÷ 485 =	$ .925
b. " " other expenses,	274.94 ÷ 485 =	.567
Average daily expense per man,	$723.55 ÷ 485 =	$1.492

In addition to the above direct expenses, mention might be made of other expenditures which are indirectly chargeable, and which have been charged against the reconnaissance appropriation. These are recorded as follows:

Fred A. Matz, travel expense, Prineville to Sumpter	$18.95
A. A. Segersten, " " " "	18.95
G. A. Bright, " " Albany "	36.00
E. A. Chase, " " Weitknecht's party to Sumpter	3.70
Preliminary examination of area	23.25
Total	$100.85

In addition to this there is also an indirect charge covering Albert Wiesendanger's travel expenses from Sumpter to Portland, entered on General Expense fund, amounting to $22.30.

These expenditures would increase the above average

expense per man by $.254.

III. Field Work.

1. Average Size of Crew.

Dividing the total number of man-days by the number of days spent in the field by the party gives us an average of 8.23 men. This fractional number is accounted for by the reason of the fact that one of the members of the party served only a period of 14 days at the beginning of the project. The average size crew for the remainder of the work was eight men.

2. Average Individual Monthly Salary.

This does not include the cook's wages and is the total amount paid in salaries, divided by the number of months in the field. The time spent in the field was 1-28/30 months. The total amount paid out in salaries is as follows:

Fred A. Matz, chief	$ 226.28
G. A. Bright, draftsman	202.69
A. A. Segersten, mapper	145.00
T. R. Littlefield, "	145.00
H. C. Deutsch, "	145.00
A. T. Cowley, estimator	96.67
C. M. Hawkinson, "	96.67
E. A. Chase, "	96.67
Albert Wiesendanger, estimator .	32.67
Total	$1186.65

Dividing this $1186.65 by (1-28/30 x 8.23) we obtain $74.58 for the average monthly salary paid.

3. Transit Control.

Number of man-days worked, 37.

Salaries	$ 98.74
Expenses prorated	55.20
Total cost	$153.94

4. Compass Control.

Number of man-days worked, 70.

Salaries	$164.04
Expenses prorated	104.44
Total cost	$268.48

5. Strip Cruising.

Number of man-days worked, 207.5

Salaries	$445.80
Expenses prorated	309.53
Total cost	$755.33

6. Camp Computing & Map Compilation.

Number of man-days worked, 22.5

Salaries	$ 72.77
Expenses prorated	33.57
Total cost	$106.34

7. Supervision by Chief.

This includes work spent by the chief on reports and other general office work, and all miscellaneous duties not properly chargeable against any specific line.

Number of man-days worked, 25.5

Salaries	$ 94.60
Expenses prorated	38.05
Total cost	$132.65

8. Travel, Moving to & Establishing Camp, & Camp Chores.

Number of man-days worked, 53.

Salaries	$147.56
Expenses prorated	79.07
Total cost	$226.63

9. Sundays, Holidays, Rain & Leave.

Number of man-days, 69.5

Salaries	$163.14
Expenses prorated	103.69
Total cost	$266.83

10. Tabulated Summary of Costs of Field Work.

Class of Work.	Number man-days.	Salaries.	Expenses prorated.	Totals.
Transit control	37	$ 98.74	$ 55.20	$ 153.94
Compass control	70	164.04	104.44	268.48
Strip cruising	207½	445.80	309.53	755.33
Camp computation & map compilation	22½	72.77	33.57	106.34
Supervision by chief	25½	94.60	38.05	132.65
Travel, moving to & establishing camp, and camp chores	53	147.56	79.07	226.63
Sundays, holidays, rain and leave	69½	163.14	103.69	266.83
Total cost of field work	485	$ 1186.65	$723.55	$1910.20

Dividing the total cost of the field work by the number of days spent in the field we obtain an average daily expense of $32.38 for maintaining the party in the field.

IV. Headquarters Office Work.

The completed maps and summaries for the several townships in which the work was conducted, show the areas which have been covered by other intensive methods. About 13 days, including Sundays, were spent in the compilation and mapping of this additional data and has not been included in the following cost summaries.

1. Computation.

This includes time spent in actual compilation of data for summary sheets and making the estimate tracings.

Number of man-days (including 6 Sundays) 41.5

Salaries $161.39

2. Mapping.

Includes time spent in completing the topographic base maps, making the tracings of same, the copying and coloring of the type maps and the marking out and lettering of the blocks and compartments.

Number of man-days (including 5 Sundays) 27.5

Salaries $106.95

3. Reports.

Includes time spent on writing up the Personnel, Cost and Silvicultural Reports.

Number of man-days (including 1 Sunday) 8.

Salaries $31.11

4. Expenses.

Making of White Prints in Portland:

Topographic	$16.72
Estimate	8.50
Total	$25.22

5. Summary of Cost of Headquarters Work.

	Man-days	Salaries.	Expense.	Totals.
Computation	41.5	$161.39		$161.39
Mapping . .	27.5	106.95		106.95
Reports . .	8.	31.11		31.11
Expense . .			$25.22	25.22
Total Cost	77	$299.45	$25.22	$324.67

V. Totals.

1. Summarized Cost of Project.

Class of Work.	Number man-days.	Salaries.	Expenses.	Totals.
Field work	485	$1186.65	$723.55	$1910.20
Headquarters work .	77	299.45	25.22	324.67
Total Cost . . .	562	$1486.10	$748.77	$2234.87

2. Cost per Acre for Gross Area Mapped.

This is easily determined from the above figures, by dividing the same by the total area mapped, 33,531 acres.

Average per-acre cost of field work is $1910.20 ÷ 33,531 =	$ .057
Average per-acre cost of headquarters work is $324.67 ÷ 33,531 =	.009
Total average per-acre cost	$ .066

3. Cost per Acre for Net Area Cruised.

This cost represents the total cost of the project, $2,234.87, divided by the area cruised, 33,011 acres. This division gives an average per-acre cost of $.067.

4. Cost per M. feet cruised.

From the statistical summary, under IV of the Silvicultural report on this project, we obtain the total of 344,195 M. feet cruised. Dividing the total cost of the project by 344,195 gives us an average per M. feet cost of $.0065.

Fred G. Matt.
National Forest Examiner.

Approved: C. P. M. Evans
Acting Forest Supervisor.