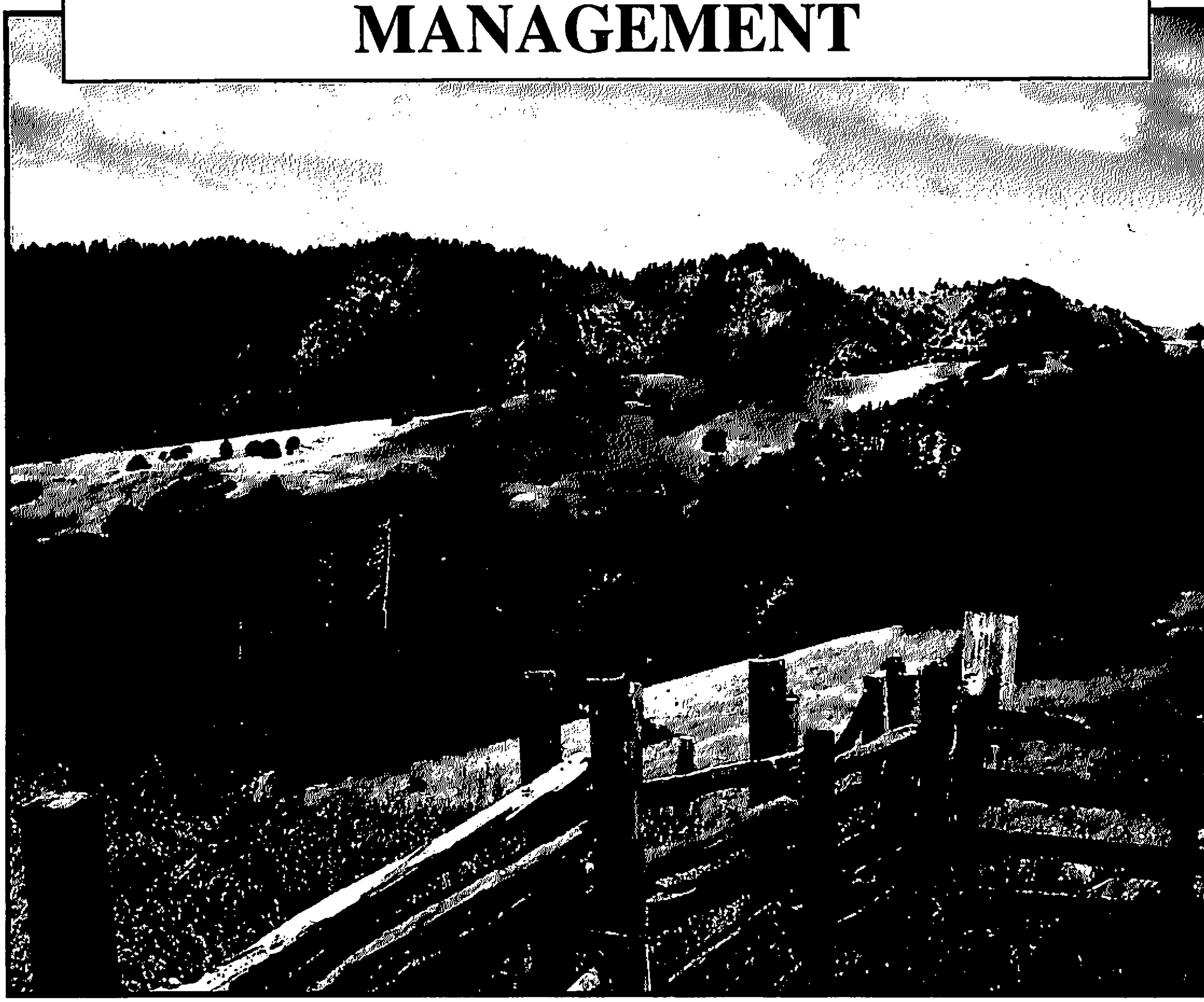
# EVALUATING INVESTMENTS IN NATURAL RESOURCE MANAGEMENT



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# Introduction

Investing capital in forests or rangeland is a long-term consideration. Money invested today in site preparation and tree planting on forestland, or in brush removal and legume seeding on rangeland will bring returns in increased timber value or grazing potential years later — sometimes 60 to 100 years later! This publication presents to natural resource managers a method for evaluating capital investments in forests and rangeland. This method allows managers to compare and rank natural resource investments with stocks, bonds, or other alternatives to ensure efficient use of invested capital.

# The Time Value of Money

Suppose you are offered a choice: Accept \$1 today, or accept it a year from now. You will probably choose to take the \$1 today for one of three different reasons:

(1) You could put it in the bank and earn 6 percent interest, which would make your \$1 today worth \$1.06 in 1 year from now versus just \$1 if you waited a year. The effect is known as the *opportunity cost* of capital, and takes into account the opportunity you have to take \$1 and earn interest in an alternative investment.

(2) Inflation decreases purchasing power, so you will need more than \$1 a year from now to have today's purchasing power. An inflation rate of 3 percent will require needing \$1.03 in a year to have today's purchasing power with \$1. This effect, known as the *inflation cost* of capital, considers the effect of inflation on future decreased purchasing power.

(3) Based on my past promises to give you money, you know that I only follow through 95 percent of the time. This means chances are 1 in 20 that I will renege on my offer to give you \$1 later, making the sure receipt of \$1 today worth more than the uncertain receipt of \$1 a year from now. This effect is known as *risk* and considers the probability that an investment may not pay off in the future.

Each of these three "time costs" of money show why \$1 received today does not have the same value as \$1 received in the future. A methodology that takes into account these time costs allows you to compare costs and returns that occur at different periods of time.

# Compounding and Discounting

To consider the opportunity cost of capital, inflation, and risk, costs and returns must be compared at a constant point in time. For our example above, the opportunity cost is 6 percent, the inflation cost is 3 percent, and the risk cost is 5 percent. The net effect of these three-time costs of capital is approximately equal to the sum of these three interest rates, or 14 percent. This means that to receive the same purchasing power of \$1 today, we will need to receive \$1.14 in one year.

## Compounding

In *compounding*, the future value of an investment at a given interest rate is calculated. The compounded value of \$1 at a 14 percent interest rate in 1 year is \$1.14. After the first year, interest earns interest, so the interest earnings for the second year is 14 percent of \$1.14, or \$.1596. Therefore, the value of \$1 at 14 percent interest after 2 years is:

$$\$1.14 + .1596 = \$1.2996$$

The formula for compounding interest is shown in equation (1). This can be calculated on any calculator that permits exponentiation.

$$FV = PV \times (1 + i)^n \qquad (1)$$

where:
FV = *future value* of investment
PV = *present value* of investment
i = interest rate
n = number of years in investment

For example, suppose you want to know what a $75 investment in weed control will be worth in 10 years at 6 percent interest rate (see "Selecting an Interest Rate"). Applying equation (1), we get:

$$FV = \$75 \times (1 + 0.06)^{10} = 75 \times (1.79) = \$134.25$$

Therefore, if you spend $75 on weed control today, you will require at least $134.25 in benefits 10 years from now, if the opportunity cost of capital is 6 percent. Otherwise, you will be better off investing in an alternative investment for the 10-year period.

Table 1 shows the multiplying factor needed to compound values to give the future value. You can look up the multiplying factor for 6 percent interest and a 10-year period, and see that the multiplying factor is 1.79, the same as that calculated with equation (1).

## Discounting

In evaluating natural resource investments, you often know what the future value of a cost or return will be, and you need to find out what that value will be worth today, considering the time costs of money. In *discounting*, the present value of an investment at a given interest rate is calculated. The formula for discounting is derived by rearranging equation (1) to give:

$$PV = \frac{FV}{(1 + i)^n} \qquad (2)$$

For example, suppose you know that thinning a forest stand today will yield an increased value of the final timber harvest in 20 years of $200 per acre. With an opportunity cost of capital of 5 percent, use equation (2) to calculate how much you can invest today to obtain $200 in 20 years:

$$PV = \frac{\$200}{(1 + .05)^{20}} = \frac{\$200}{2.65} = \$75.47$$

This means that the $200-per-acre benefit which we would receive in 20 years is worth only $75.47 per acre today at a 5 percent interest rate. This is the maximum amount of money you should invest in your thinning operation to still earn at least 5 percent.

Table 2 shows the discount factor for different interest rates and number of years' operation. The multiplying factor for a 5 percent interest rate for 20 years is 0.38, which is identical to the fraction 1/2.65 used in the equation above.

Sometimes, costs and returns occur annually. Suppose we know that a particular range improvement will yield $8 per acre per year over the 10-year life of the improvement. The present value of this series of returns can be calculated by using equation (2) or the multiplying factor in table 2 for each of the 10 years, and summing this for all 10 years. This approach is shown below for a 5 percent interest rate.

$$PV = \frac{\$8}{(1+.05)^1} + \frac{\$8}{(1+.05)^2} + \frac{\$8}{(1+.05)^3} + ... + \frac{\$8}{(1+.05)^{10}}$$

= 1st year returns + 2nd year returns + 3rd year returns + ... + 10th year returns

= $7.60 + $7.28 + $6.88 + ... + $4.88 = $61.68

This means that a return from range improvement that yields $8 per acre per year would be equivalent to receiving almost $62 per acre in a lump sum payment today for an interest rate of 5 percent.

This method is somewhat tedious, however, because you need to discount the annual capital value for each year in the production period. Table 3 shows the one multiplying factor that can be used to give the present value of an equal annual series of costs or returns. This table is calculated from the equation:

$$PV = \text{Annual cost (or return)} \times \frac{(1+i)^n - 1}{i \times (1+i)^n} \quad (3)$$

Look up 5 percent and 10 years in table 3, and you will see that the multiplying factor is 7.72. Multiplying this times the annual return of $8 will get the same result as was obtained above (with slight differences explained by rounding errors):

PV = 7.72 x $8.00 = $61.76

This concept of compounding and discounting is important because it allows you to put all costs and returns at one point in time and to remove all the time effects on capital.

## Selecting an interest rate

In discounting or compounding a cost or return for a resource management investment, selecting the right interest rate is necessary. For example, you wish to know the present value (PV) of a future benefit of $1,000 you will receive in 10 years. Compare the present value of this benefit at a 5 percent and 10 percent interest. The multiplying factor to calculate the present value for 10 years and 5 percent interest rate is 0.61, and the factor for 10 percent is 0.39 (table 2).

PV of $1,000 in 10 years:

@ 5% $1,000 x 0.61 = $610

@ 10% $1,000 x 0.39 = $390

This means that you can afford to invest up to $610 if your time cost of money is 5 percent, but only $390 if it is 10 percent. In general, the higher the interest rate, the less you can afford to spend today to justify a known return in the future.

When comparing resource management scenarios, it is easy to ignore the effects of inflation in selecting an interest rate, since inflation affects all management scenarios similarly. An interest rate that excludes the effects of inflation is called the ***real interest rate***. This contrasts with the ***nominal interest rate***, which includes inflation's effects.

When selecting an interest rate to use for an analysis, the *alternative rate of return* is often chosen as the best representative of the opportunity cost of capital. For example, suppose that your alternative rate of return for capital not invested in your forest or rangeland is in bonds paying 8 percent interest. Because this includes the effects of inflation, 8 percent is a nominal interest rate. If you use this alternative rate of return of 8 percent in your analysis, you will need to calculate the effects of inflation on your costs and returns from your resource management strategy. However, if you know that inflation is currently running at 3 percent, then you can calculate the approximate real interest rate by subtracting inflation from the nominal interest rate (8% - 3% = 5%). If you use the real interest rate of 5 percent in your calculations, then it is not necessary to include the effects of inflation on your costs and returns.

Risk in forest and rangeland investments can involve fire, weather fluctuations, insects and disease, market uncertainty, changes in the regulatory environment, etc. In general, riskier investments should require higher interest rates for compounding and discounting. Reliable information on the relative risk likely from resource investment alternatives is difficult to obtain. Often, it is assumed that such risk factors are beyond your control and affect management options similarly, so risk is excluded from analysis. However, if you know that differences in risk do exist among investment alternatives, then you should adjust the interest rate accordingly.

## Information Needs in Resource Management

Investment analysis usually compares management options. For example, should a range manager invest money in brush clearing to improve forage yield for livestock on a 10- or 12-year cycle? For this analysis, you need to know the cost of the initial brush clearing, the yearly forage yield after clearing, the speed with which brush resprouts and closes in, the effect of brush regrowth on forage yield, and the subsequent retreatment costs.

Another example: Should a forest manager invest money in a precommercial thinning of an unmerchantable stand of trees to achieve a desired tree spacing at an early age? Or should the manager wait 15 years until a commercial thinning can be conducted, foregoing the cost of thinning today but accepting slow growth and high mortality of the unthinned stand? For this analysis, you need to know the cost of precommercial thinning, the growth rate of your stand — thinned and unthinned — and the relative value of the commercial stand at the two density levels.

To analyze a resource management investment:

(1) Construct a cash flow table, listing all costs and returns that will occur during the investment period under consideration, the dollar amount of costs and returns, and the year or years in which the costs and returns will occur. Note annual costs and returns.

(2) List the interest rate you will use in the analysis and the rationale for selecting that rate. Is this a nominal or real rate? What rate of inflation is assumed? How risky is the alternative rate of return?

(3) List any assumptions you have made, including future price trends, timber and forage growth assumptions, etc.

(4) Are you unsure about any assumptions? Then list the range you can reasonably expect to occur, and see how the assessment of your investment is affected by the uncertain range in dollar value or growth rates. Testing alternative assumptions is known as *sensitivity analysis.*

## The Present Net Worth Framework

The concepts described, including the time cost of money, interest rates, compounding, and discounting, are all important for assessing natural resource investments. The framework for analysis used here to take all of these into consideration is called the *present net worth* (PNW) or the *net present value* (NPV). The PNW is the difference between all costs discounted to the present and all returns discounted to the present for one production period. The PNW shows the net value of production today at a given interest rate. The PNW of several natural resource investments is calculated. The investment with the highest PNW is chosen as the best investment strategy. A negative PNW indicates the net return on the investment is less than the alternative rate of return.

There are many cases where you would like to compare strategies with unequal production periods. For example, suppose we compare an irrigated Christmas tree farm with an unirrigated farm. Experience indicates that the average production period (rotation length) for the unirrigated Christmas tree farm is 6 years versus 5 years for the irrigated one. Does the shorter rotation justify the cost of the irrigation? Comparing the PNWs for the two productions would underestimate the benefit of the shorter rotation length (fig. 1). After 5 years, a second crop can be planted in the irrigated farm, while you are still waiting for the first rotation from the unirrigated farm. In 30 years, the unirrigated plantation is harvested 5 times, whereas there will be six rotations from the irrigated farm.

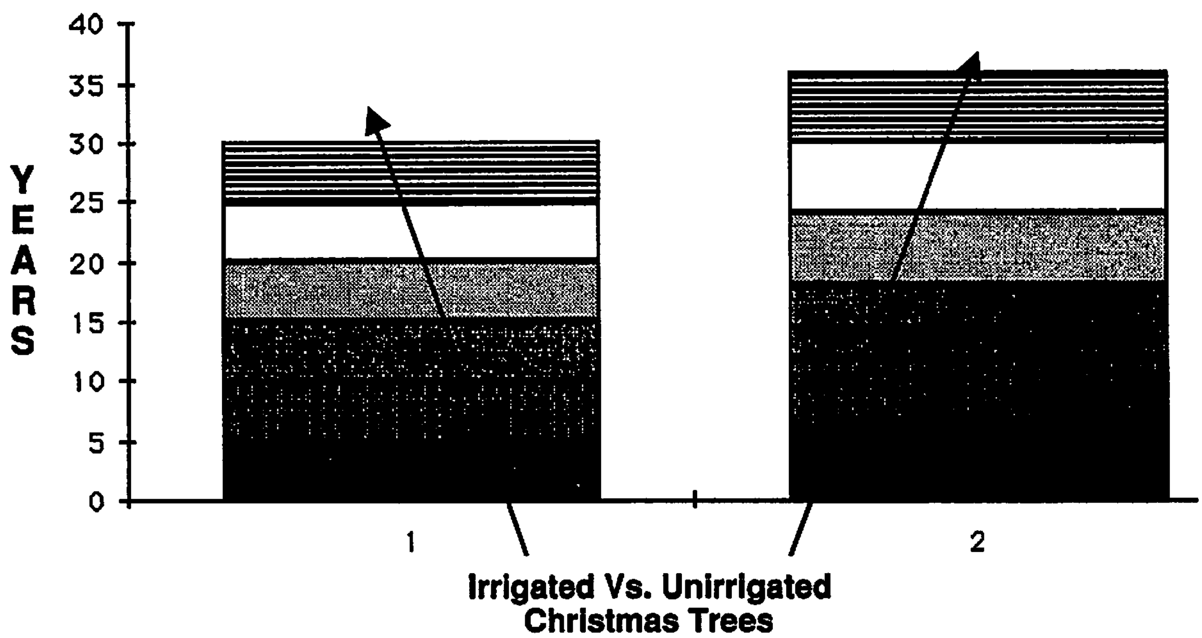


**Figure 1. Comparison of 5- versus 6-year Christmas tree farm.**

To correct for the bias that results from natural resource production periods of different lengths, you must remove the effect of time altogether by converting the PNW for a single production cycle to the PNW for an infinite series of production periods. This is referred to as the *land expectation value* (LEV), and is defined as the net discounted present value of an infinite series of production periods. Table 4 can be used to give the multiplying factor to convert from a single production period to this timeless LEV.

The LEV compares management strategies of different lengths to each other directly; it also gives the theoretical value of bare land using a certain management strategy.

## Worksheet evaluating natural resource investments

What follows is a worksheet used to calculate the PNW for resource management investments. Instructions for completing the worksheet follow:

(1) List all anticipated costs and returns that will occur over the entire production period, filling in the year in which the cost or return occurs in column {1}, a descriptive label for the cost or return item in column {2}, and the dollar value of the cost (in column {3}) or return (in column {4}). Note: A cost or return that occurs annually may be omitted in this step.

(2) Look up the discount factor for the interest rate and the year in which a cost or return occurs from table 2, and put the value in column {5}.

(3) Multiply the cost or return (column {3} or {4}) by the discount factor (column {5}) to give the present value of the cost (column {6}) or the present value of the return (column {7}).

(4) In column {8}, enter any costs that occur annually (include a description of the annual cost item in column {2}). Do the same procedure for any annual returns, and enter the amount of the annual return in column {11}.

(5) Look up the multiplying factor to calculate the present value of an annual cost or return for the number of years in the production period and the interest rate in table 3, and enter the value in column {9}.

(6) Multiply the annual cost from column {8} times the discount factor in column {9} and enter this present value in column {10}.

(7) Multiply the annual return from column {11} times the discount factor in column {9} and enter this present value in column {12}.

(8) Sum up all the present values of the costs in columns {6} and {10} and enter the value in cell {13}.

(9) Sum up all the present value of the returns in columns {7} and {12} and enter the value in cell {14}.

(10) Subtract the present value of total costs for the production period in cell {13} from the present value of total returns in cell {14} and enter the value in cell {15}. This is the present net worth (PNW) for one production period.

(11) Look up the multiplying factor to convert to the land expectation value in table 4 based on the interest rate and the number of years in the production period and enter this number in cell {16}.

(12) Multiply the PNW in cell {15} times the multiplying factor in cell {16} and enter the value in cell {17}. This is the land expectation value (LEV) for this enterprise.

(13) Multiply the LEV value in cell {17} times the interest rate for this enterprise to give the *annual equivalent income* for this investment, and enter this value in cell {18}.

## Conclusions

Following the blank worksheet are five examples of natural resource investments evaluated in this PNW format. As you can see, the strength of this analysis depends upon the strength of the assumptions for each scenario. If you are unsure about any of the inputs in the analysis, bracket the range you expect and run the analysis for the range of costs, returns, or biological responses to management that you are not sure of to determine how your assumptions influence your ranking of investments.

This analysis lends itself to a comparison with other nonresource management investments. This can be accomplished by using the returns from these other investments as the interest rate in the PNW analysis. An analysis with a positive PNW means the natural resource management investment is earning more than your alternative rate of return. A negative PNW indicates that you would earn a greater return on your invested capital by putting your money into the alternative investment.

This kind of analysis is greatly speeded up by using microcomputers. The University of California Cooperative Extension has developed two software packages for natural resource managers with access to a microcomputer. A spreadsheet template has been developed compatible with most commercially available spreadsheet programs used on CP/M, MS-DOS, and Apple Macintosh microcomputer systems. Also, a compiled BASIC program is available that allows users to quickly input cost, return, and economic parameters into a file, and the PNW and LEV to be calculated. Anyone interested in obtaining these programs should write to:

Cooperative Extension
Natural Resources
163 Mulford Hall
University of California
Berkeley, CA 94720

## Spreadsheet for Evaluating Natural Resource Investments

| # Years in Period = | | | | {5} 0.00% Discount Factor | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | | {6} Cost | {7} Return |
| | | | | | | |
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| | | {8} | | {9} | {10} | |
|---|---|---|---|---|---|---|
| Annual Cost - 1 | | | | | | |
| Annual Cost - 2 | | | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | | | | |
| Annual Return - 2 | | | | |

{13} Total Costs

{14} Total Returns

Present Net Worth for One Production Period {15}

Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) {16}

Land Expectation Value {17}

Annual Equivalent Income (Cell {17} x Interest Rate) {18}

**Example 1:** Irrigated versus unirrigated Christmas tree farms

An irrigated and unirrigated Monterey pine Christmas tree farm are compared below. The assumptions used in this analysis are listed.

## Economic Assumptions

Alternative rate of return: 12%
Inflation rate: 5%
Period for investment: 5 years (irrigated)
6 years (unirrigated)

## Cost Summary

| | Irrigated farm | | Unirrigated farm | |
|---|---|---|---|---|
| **Management item** | **Year** | **Cost** | **Year** | **Cost** |
| Site preparation and plant | 1 | $465 | 1 | $465 |
| Weed and pest control | 2 | 65 | 2 | 65 |
| Shearing | 2 | 70 | – | — |
| Weed and pest control | 3 | 40 | 3 | 40 |
| Shearing | 3 | 100 | 3 | 70 |
| Weed and pest control | 4 | 55 | 4 | 40 |
| Shearing | 4 | 120 | 4 | 120 |
| Harvest | 4 | 100 | – | — |
| Weed, pest, shear | 5 | 40 | 5 | 170 |
| Harvest | 5 | 130 | 5 | 100 |
| Weed, pest, shear | – | — | 6 | 60 |
| Harvest | – | — | 6 | 130 |
| Irrigation | Annual | 95 | – | — |
| Management | Annual | 5 | Annual | 5 |

**Return Summary**

| | Irrigated farm | | | Unirrigated farm | | |
|---|---|---|---|---|---|---|
| **Return item** | **Year** | **No. trees cut** | **Price** | **Year** | **No. trees cut** | **Price** |
| 1st harvest | 4 | 369 | $15/tree | 5 | 300 | $15/tree |
| 2nd harvest | 5 | 600 | $15/tree | 6 | 600 | $15/tree |

The two following calculated worksheets show these two assumed investment scenarios. Since the two scenarios differ in time (5 versus 6 years), the land expectation values should be compared. This shows that the 5-year, irrigated farm has a higher LEV ($32,164) than the unirrigated farm ($25,758). Under these cost-and-return assumptions, the extra cost of irrigation can be justified by the shortened rotation period.

Suppose you are uncertain about the cost of irrigation. Would your ranking of these two scenarios be the same if irrigation costs increased to $200 per acre per year? If you try filling in $200 in the annual cost column, you will see that PNW for one period decreases to $8,801 per acre, and the LEV decreases to $30,665, which is still greater than the unirrigated example.

## Spreadsheet for Irrigated Christmas Tree Farm

| # Years in Period = | 5 | | | {5} | Present | Value |
|---|---|---|---|---|---|---|
| | | | | 7.00% | | |
| {1} Year | {2} Item | {3} Cost | {4} Return | Discount Factor | {6} Cost | {7} Return |
| 1 | Site Prep & Plant | $465.00 | | 0.93 | $434.58 | |
| 2 | Weed & Pest Control | 65.00 | | 0.87 | 56.77 | |
| 2 | Shearing | 70.00 | | 0.87 | 61.14 | |
| 3 | Weed & Pest Control | 40.00 | | 0.82 | 32.65 | |
| 3 | Shearing | 100.00 | | 0.82 | 81.63 | |
| 4 | Weed & Pest Control | 55.00 | | 0.76 | 41.96 | |
| 4 | Shearing | 120.00 | | 0.76 | 91.55 | |
| 4 | Harvest Cost | 100.00 | | 0.76 | 76.29 | |
| 5 | Weed, Pest, Shear | 40.00 | | 0.71 | 28.52 | |
| 5 | Harvest Cost | 130.00 | | 0.71 | 92.69 | |
| 4 | First Harvest | | $5,535 | 0.76 | | $4,222.62 |
| 5 | Second Harvest | | 9,000 | 0.71 | | 6,416.88 |

| | | {8} | | {9} | {10} | |
|---|---|---|---|---|---|---|
| Annual Cost - 1 | Management Costs | 5.00 | | 4.10 | 20.50 | |
| Annual Cost - 2 | Irrigation | 95.00 | | 4.10 | 389.52 | |

| | | | {11} | | | {12} |
|---|---|---|---|---|---|---|
| Annual Return - 1 | | | | | | |
| Annual Return - 2 | | | | | | |

| | {13} | {14} |
|---|---|---|
| **Total Costs** | 1,407.80 | |
| **Total Returns** | | 10,639.50 |

Present Net Worth for One Production Period {15} 9,231.70

Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) {16} 3.48

Land Expectation Value {17} 32,164.66

Annual Equivalent Income (Cell {17} x Interest Rate) {18} 2,251.53

## Spreadsheet for Unirrigated Christmas Tree Farm

| # Years in Period = | 6 | | | {5} 7.00% | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | Discount Factor | {6} Cost | {7} Return |
| 1 | Site Prep & Plant | $465.00 | | 0.93 | $434.58 | |
| 2 | Weed & Pest Control | 65.00 | | 0.87 | 56.77 | |
| 3 | Weed & Pest Control | 40.00 | | 0.82 | 32.65 | |
| 3 | Shearing | 70.00 | | 0.82 | 57.14 | |
| 4 | Weed & Pest Control | 40.00 | | 0.76 | 30.52 | |
| 4 | Shearing | 100.00 | | 0.76 | 76.29 | |
| 5 | Weed, Pest, Shear | 170.00 | | 0.71 | 121.21 | |
| 5 | Harvest Cost | 100.00 | | 0.71 | 71.30 | |
| 6 | Weed, Pest, Shear | 60.00 | | 0.67 | 39.98 | |
| 6 | Harvest Cost | 130.00 | | 0.67 | 86.62 | |
| 5 | First Harvest | | $4,500 | 0.71 | | $3,208.44 |
| 5 | Second Harvest | | 9,000 | 0.71 | | 6,416.88 |

| | | {8} | {9} | {10} |
|---|---|---|---|---|
| Annual Cost - 1 | Management Costs | 5.00 | 4.77 | 23.83 |
| Annual Cost - 2 | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | | | | |
| Annual Return - 2 | | | | |

| | {13} | {14} |
|---|---|---|
| Total Costs | 1,030.90 | |
| Total Returns | | 9,625.31 |

| | {16} | |
|---|---|---|
| Present Net Worth for One Production Period | | {15} 8,594.42 |
| Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) | 3.00 | |
| Land Expectation Value | | {17} 25,758.18 |
| Annual Equivalent Income (Cell {17} x Interest Rate) | | {18} 1,803.07 |

**Example 2.** Fertilized versus unfertilized Douglas-fir stands

Research into growth and yield of Douglas-fir has given us a series of yield tables for natural and planted stands, with different thinning regimes, with and without nitrogen fertilizer (see R. O. Curtis et al. 1982. Yield tables for managed stands of coast Douglas-fir. USDA Forest Service General Technical Report No. PNW-135. Pacific Northwest Forest and Range Experiment Station, Portland, OR. 182 pp.). Presented below is an example of using this information to investigate the economic implications of applying nitrogen fertilizer on coastal Douglas-fir stands.

## General Assumptions

At the start of the investment period, the stand is a 13-year-old, overstocked, natural stand of Douglas-fir. A clearcut harvest is assumed when the stand reaches 65 years old, which means the total investment period for this scenario is 52 years. All growth data is drawn from General Technical Report No. PNW-135. The Douglas-fir site index is assumed to be 105 feet, and volumes reported are in cunits, a unit of volume measure equal to 100 cubic feet.

## Economic Assumptions

Alternative rate of return: 10%
Inflation rate: 5%
Period for investment: 52 years

## Cost Summary

| | Fertilized stand | | Unfertilized stand | |
|---|---|---|---|---|
| **Management item** | **Year** | **Cost** | **Year** | **Cost** |
| Precommercial thin to 300 trees per acre | 1 | $175 | 1 | $175 |
| Fertilize with 200 lb N | 10 | 55 | - | — |
| Fertilize with 200 lb N | 25 | 55 | - | — |
| Fertilize with 200 lb N | 40 | 55 | - | — |
| Management costs | Annual | 5 | Annual | 5 |

## Return Summary

The price per cunit is based upon the average volume per tree at each harvest, and is drawn from an article (R. F. Tarrant et al. 1983. Managing red alder in the Douglas-fir region: some possibilities. Journal of Forestry 81(12):787-792).

| | | Fertilized stand | | | Unfertilized stand | |
|---|---|---|---|---|---|---|
| **Return item** | **Year** | **No. cunits cut** | **$/cu.** | **Year** | **No. cunits cut** | **$/cu.** |
| Comm. Thin | 21 | 10.4 | $31 | 24 | 10.8 | $31 |
| Comm. Thin | 30 | 13.8 | 73 | 36 | 14.7 | 73 |
| Comm. Thin | 42 | 16.1 | 105 | -- | ---- | ---- |
| Clearcut | 52 | 90.0 | 190 | 52 | 83.9 | 175 |

The spreadsheets for the fertilized and unfertilized scenarios are shown on pages 14 and 15. Since both production processes are for the same number of years (52), the PNW can be compared directly. In fact, the

LEV cannot be calculated directly for an infinite period of 52-year production periods, since we are really starting with a 13-year-old stand in this example, and all future production periods would be 65 years in length.

Since the scenario for fertilized Douglas-fir has a higher PNW ($1,603) than the scenario for unfertilized ($1,282), fertilization appears to be justified given these cost-and-return assumptions.

## Spreadsheet for Fertilized and Thinned Douglas-fir Stands

| # Years in Period = | 52 | | | {5} 5.00% | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | Discount Factor | {6} Cost | {7} Return |
| 1 | Precommercial Thin | $175.00 | | 0.95 | $166.67 | |
| 10 | Fertilize -- 200 lb N | 55.00 | | 0.61 | 33.77 | |
| 25 | Fertilize -- 200 lb N | 55.00 | | 0.30 | 16.24 | |
| 40 | Fertilize -- 200 lb N | 55.00 | | 0.14 | 7.81 | |
| 21 | Commercial Thin | | $322.40 | 0.36 | | $115.72 |
| 30 | Commercial Thin | | 1,007.40 | 0.23 | | 233.09 |
| 42 | Commercial Thin | | 1,690.50 | 0.13 | | 217.80 |
| 52 | Clearcut | | 17,100.00 | 0.08 | | 1,352.55 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | {8} | {9} | {10} |
|---|---|---|---|---|
| Annual Cost - 1 | Management Costs | 5.00 | 18.42 | 92.09 |
| Annual Cost - 2 | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | | | | |
| Annual Return - 2 | | | | |

| | |
|---|---|
| Total Costs {13} | 316.58 |
| Total Returns {14} | 1,919.16 |

| | |
|---|---|
| Present Net Worth for One Production Period {15} | 1,602.59 |
| Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) {16} | |
| Land Expectation Value {17} | |
| Annual Equivalent Income (Cell {17} x Interest Rate) {18} | |

## Spreadsheet for Unfertilized and Thinned Douglas-fir Stands

| # Years in Period = | 52 | | | {5} 5.00% Discount Factor | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | | {6} Cost | {7} Return |
| 17 | Precommercial Thin | $175.00 | | 0.44 | $76.35 | |
| 24 | Commercial Thin | | $334.80 | 0.31 | | $103.81 |
| 36 | Commercial Thin | | 1,073.10 | 0.17 | | 185.28 |
| 52 | Clearcut | | 14,682.50 | 0.08 | | 1,161.33 |
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| | | {8} | {9} | {10} |
|---|---|---|---|---|
| Annual Cost - 1 | Management Costs | 5.00 | 18.42 | 92.09 |
| Annual Cost - 2 | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | | | | |
| Annual Return - 2 | | | | |

| | |
|---|---|
| {13} Total Costs | 168.44 |
| {14} Total Returns | 1,450.42 |
| {15} Present Net Worth for One Production Period | 1,281.98 |
| {16} Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) | |
| {17} Land Expectation Value | |
| {18} Annual Equivalent Income (Cell {17} x Interest Rate) | |

**Example 3:** Planting brushfields—short-term, break-even analysis

The tenure of ownership for many nonindustrial forest landowners is much shorter than the average time it takes most California conifer species to reach a merchantable size. Therefore, investment in regenerating unstocked property is often based on the belief that the cost of regeneration can be justified because it will increase the property's overall value. This example will investigate the required increase in property value an owner would need to achieve a given rate of return on capital invested for 15 years, when the owner would try to sell the regenerated property.

## Economic Assumptions

Alternative rate of return: 14%
Inflation rate: 6%
Period for investment: 15 years

## Cost Summary

| Management item | Year | Cost |
|---|---|---|
| Site preparation | 1 | $180/acre |
| Plant 400 trees/ac | 2 | 100/acre |
| Aerial spray-release | 5 | 40/acre |
| Management costs | Annual | 7/acre |

## Return Summary

The only return assumed in this scenario is a 60 percent cost share payment from the California Forest Improvement Program (CFIP) for site preparation and planting costs (.60 x $280 = $168). No other returns are figured. The objective is to determine the amount of return that would be needed in 15 years to "break even:" that is, to achieve an 8 percent real rate of return on capital invested.

Note that the PNW for the 15-year investment is -$195.51. This is the present value of the "sunk costs" you would have in your tree planting. This means that you would need +$195.51 in present value in benefits in 15 years to make your 8 percent real rate of return on this investment. (A PNW = 0 implies that you are earning exactly the discount interest rate on your capital.) The value of this break-even return can be calculated using the compound interest formula in table 1. Look up 8 percent and 15 years and you will see that the multiplying factor is 3.17. Therefore, the future value of the break-even return you would need is:

$$FV = 3.17 \times \$195.51 = \$619.77.$$

This break-even analysis shows that the value of the 15-year-old project would need to increase the value of the land and trees by $619.77 in real dollars. To evaluate whether the tree planting would yield this extra revenue in terms of increased land and timber value at age 15, it would be necessary to make a market analysis of the value of 15-year-old tree farms, and poorly stocked brushfields, and determine whether stocked timberlands are worth at least $620 more per acre.

If you reevaluate this analysis without the effect of the CFIP cost-share payment, you will see that the break-even price increases to a present value of $339.54 in present value, or $1,076 per acre in increased land and timber value. Not only does the cost-share payment reduce out-of-pocket expenses for the reforestation enterprise, but it greatly decreases the break-even price needed in 15 years.

## Break-even Analysis for Planting Brushfield

| # Years in Period = | 15 | | | {5} 8.00% | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | Discount Factor | {6} Cost | {7} Return |
| 1 | Site Preparation | $180.00 | | 0.93 | $166.67 | |
| 2 | Plant 400 Trees/Acre | 100.00 | | 0.86 | 85.73 | |
| 5 | Aerial Spray-Release | 40.00 | | 0.68 | 27.22 | |
| 2 | CFIP Cost Share | | $168.00 | 0.86 | | $144.03 |
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| | | {8} | {9} | {10} |
|---|---|---|---|---|
| Annual Cost - 1 | Management Costs | 7.00 | 8.56 | 59.92 |
| Annual Cost - 2 | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | | | | |
| Annual Return - 2 | | | | |

Total Costs {13}: 339.54

Total Returns {14}: 144.03

Present Net Worth for One Production Period {15}: -195.51

Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) {16}:

Land Expectation Value {17}:

Annual Equivalent Income (Cell {17} x Interest Rate) {18}:

**Example 4**: Evaluating legume seeding for range improvement

Compare an investment in a range improvement seeding with rose clover, including fertilization at seeding with phosphorus and sulphur, with the existing unimproved range condition. These two scenarios will be compared over a 7-year period. Shown below are the costs and returns for these two scenarios. All other factors of production are assumed to remain the same, and are omitted from the analysis. This method of only excluding those factors of production that are not affected by the different investment scenarios is known as partial budgeting.

## Economic Assumptions

Alternative rate of return: 10%
Inflation rate: 5%
Period for investment: 7 years

## Cost Summary

| | Legume seeding | | Unimproved range | |
|---|---|---|---|---|
| **Management item** | **Year** | **Cost** | **Year** | **Cost** |
| Seed with 8 lb/acre of rose clover | 1 | $30 | - | — |
| Fertilize with 150 lb/acre 0-36-0-19 | 1 | 33 | - | — |

## Return Summary

Forage quantity and quality is improved by the legume seeding. Studies evaluating the improvement in range conditions due to legume seeding and fertilization vary considerably based on local soil and climatic conditions. These range improvements might be expected to increase the range production and quality to anywhere between 1 and 3 animal unit months (AUMs) per acre from an unimproved condition of .8 AUMs per acre. To show how this unknown increase in range condition can be handled, a ranging analysis was carried out to determine the break-even level of improvement in AUMs per acre to justify the forage seeding.

| | Fertilized range | | | Unfertilized range | | |
|---|---|---|---|---|---|---|
| **Return item** | **Year** | **AUMs/Ac** | **$/AUM** | **Year** | **AUMs/Ac** | **$/AUM** |
| Grazing fee | Annual | 1.0 - 3.0 | $8.00 | Annual | 0.80 | $8.00 |

The PNW was calculated for a range of productivity increases due to seeding and fertilization from 1.0 to 3.0 AUMs per acre. The two following worksheets show the seeded and unimproved range management scenarios that approximately equate PNW. As you can see, for a value of 2.1 AUMs per acre for the improved rangeland the PNW was approximately equal to the PNW for the unimproved rangeland. Figure 2 shows the PNW for this ranging analysis. This indicates that for this set of assumptions, if a manager anticipates receiving less than 2.1 AUMs of forage from legume seeding and fertilization, that the improvement would not be justified since it would give a lower PNW. If a range manager anticipated more than 2.1 AUMs per acre after the improvement, then it would be justified.

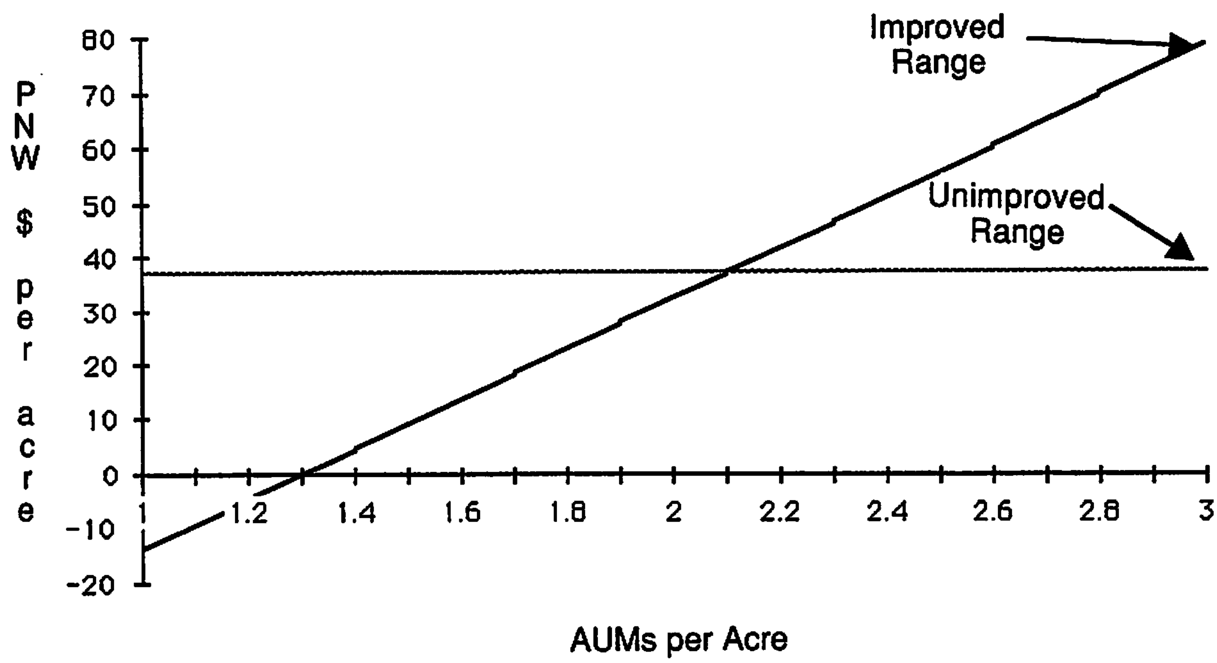


Figure 2. Present net worth of range seeded with legumes and fertilized for improvements ranging from 1.0 to 3.0 AUMs per acre, compared with an unimproved range with 0.8 AUMs per acre.

## Spreadsheet for Legume Seeding for Range Improvement

| # Years in Period = | 7 | | | {5} 5.00% | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | Discount Factor | {6} Cost | {7} Return |
| 1 | Seed Legume | $30.00 | | 0.95 | $28.57 | |
| 1 | Fertilize w/ P & S | 33.25 | | 0.95 | 31.67 | |
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| | | {8} | {9} | {10} |
|---|---|---|---|---|
| Annual Cost - 1 | | | | |
| Annual Cost - 2 | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | 2.1 AUMs @ $8/AUM | 16.80 | 5.79 | 97.21 |
| Annual Return - 2 | | | | |

| | |
|---|---|
| Total Costs {13} | 60.24 |
| Total Returns {14} | 97.21 |

| | |
|---|---|
| Present Net Worth for One Production Period {15} | 36.97 |
| Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) {16} | 3.46 |
| Land Expectation Value {17} | 127.79 |
| Annual Equivalent Income (Cell {17} x Interest Rate) {18} | 6.39 |

## Spreadsheet for Unimproved Rangeland

| # Years in Period = | 7 | | | {5} 5.00% | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | Discount Factor | {6} Cost | {7} Return |
| | | | | | | |
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| | | {8} | {9} | {10} |
|---|---|---|---|---|
| Annual Cost - 1 | | | | |
| Annual Cost - 2 | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | 0.8 AUMs @ $8/AUM | 6.40 | 5.79 | 37.03 |
| Annual Return - 2 | | | | |

| | {13} | {14} |
|---|---|---|
| Total Costs | 0.00 | |
| Total Returns | | 37.03 |

| | | |
|---|---|---|
| Present Net Worth for One Production Period | {15} | 37.03 |
| Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) | {16} | 3.46 |
| Land Expectation Value | {17} | 128.00 |
| Annual Equivalent Income (Cell {17} x Interest Rate) | {18} | 6.40 |

**Example 5:** Optimal timing between range clearings

A common decision facing natural resource managers is the timing between management inputs. Forest managers often must decide when to time thinnings, or the number of years in a timber rotation. Range managers face a similar decision. This example will evaluate the number of years between brush clearing operations. Following initial brush removal, forage yield is increased. After several years as brush regrows, forage begins to decline. The cost of the range clearing must be balanced out against the forage gain.

## Economic Assumptions

Alternative rate of return: 11%
Inflation rate: 5%
Period for investment: 10 years and 14 years

## Cost Summary

| | Number of years between brush clearings | | | |
|---|---|---|---|---|
| | 10 years | | 14 years | |
| **Management item** | **Year** | **Cost** | **Year** | **Cost** |
| Brush clearing | 0 | $50 | 0 | $50 |
| Followup brush clearing | 10 | 40 | 14 | 45 |

## Return Summary

Forage quantity and quality are improved by brush clearing. After 8 years, brush regrowth begins to cause a decline in forage yield. The following table shows the anticipated yield in AUMs per acre.

| | Number of years between brush clearings | | | | |
|---|---|---|---|---|---|
| | 10 years | | | 14 years | |
| **Return item** | **Year** | **AUMs/Ac** | **$/AUM** | **AUMs/Ac** | **$/AUM** |
| Grazing return | 1 | 1.0 | $8.00 | 1.0 | $8.00 |
| | 2 | 1.0 | 8.00 | 1.0 | 8.00 |
| | 3 | 1.0 | 8.00 | 1.0 | 8.00 |
| | 4 | 1.0 | 8.00 | 1.0 | 8.00 |
| | 5 | 1.0 | 8.00 | 1.0 | 8.00 |
| | 6 | 1.0 | 8.00 | 1.0 | 8.00 |
| | 7 | 1.0 | 8.00 | 1.0 | 8.00 |
| | 8 | 0.9 | 8.00 | 0.9 | 8.00 |
| | 9 | 0.8 | 8.00 | 0.8 | 8.00 |
| | 10 | 0.7 | 8.00 | 0.7 | 8.00 |
| | 11 | - | — | 0.6 | 8.00 |
| | 12 | - | — | 0.5 | 8.00 |
| | 13 | - | — | 0.4 | 8.00 |
| | 14 | - | — | 0.3 | 8.00 |

The two following worksheets show the LEV for the 10- and 14-year period between brush clearings. The initial brush clearing cost of $50 per acre is not shown on the worksheets since this occurs for both management options for only one time and not over the infinite series of management scenarios assumed in the LEV analysis. The LEV for the 10-year interval between brush clearings is $76.44 versus a LEV of $97.98 for a 14-year interval between brush clearings. For this set of assumptions, therefore, the 10-year interval gives a higher economic return.

## Spreadsheet for 10-Year Interval between Brush Clearings

| # Years in Period = | 10 | | | {5} 6.00% Discount Factor | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | | {6} Cost | {7} Return |
| 1 | Grazing Return | | $8.00 | 0.94 | | $7.55 |
| 2 | Grazing Return | | 8.00 | 0.89 | | 7.12 |
| 3 | Grazing Return | | 8.00 | 0.84 | | 6.72 |
| 4 | Grazing Return | | 8.00 | 0.79 | | 6.34 |
| 5 | Grazing Return | | 8.00 | 0.75 | | 5.98 |
| 6 | Grazing Return | | 8.00 | 0.70 | | 5.64 |
| 7 | Grazing Return | | 8.00 | 0.67 | | 5.32 |
| 8 | Grazing Return | | 7.20 | 0.63 | | 4.52 |
| 9 | Grazing Return | | 6.40 | 0.59 | | 3.79 |
| 10 | Grazing Return | | 5.60 | 0.56 | | 3.13 |
| 10 | Brush Clearing | $40.00 | | 0.56 | $22.34 | |
| | | | | | | |

| | | {8} | | {9} | {10} |
|---|---|---|---|---|---|
| Annual Cost - 1 | | | | | |
| Annual Cost - 2 | | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | | | | |
| Annual Return - 2 | | | | |

Total Costs {13}: 22.34

Total Returns {14}: 56.09

Present Net Worth for One Production Period {15}: 33.76

Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) {16}: 2.26

Land Expectation Value {17}: 76.44

Annual Equivalent Income (Cell {17} x Interest Rate) {18}: 4.59

**Spreadsheet for 14-Year Interval between Brush Clearings**

| # Years in Period = | 10 | | | {5} 6.00% | Present | Value |
|---|---|---|---|---|---|---|
| {1} Year | {2} Item | {3} Cost | {4} Return | Discount Factor | {6} Cost | {7} Return |
| 1 | Grazing Return | | $8.00 | 0.94 | | $7.55 |
| 2 | | | 8.00 | 0.89 | | 7.12 |
| 3 | Grazing Return | | 8.00 | 0.84 | | 6.72 |
| 4 | | | 8.00 | 0.79 | | 6.34 |
| 5 | Grazing Return | | 8.00 | 0.75 | | 5.98 |
| 6 | | | 8.00 | 0.70 | | 5.64 |
| 7 | Grazing Return | | 8.00 | 0.67 | | 5.32 |
| 8 | | | 7.20 | 0.63 | | 4.52 |
| 9 | Grazing Return | | 6.40 | 0.59 | | 3.79 |
| 10 | | | 5.60 | 0.56 | | 3.13 |
| 11 | Grazing Return | | 4.80 | 0.53 | | 2.53 |
| 12 | | | 4.00 | 0.50 | | 1.99 |
| 13 | Grazing Return | | 3.20 | 0.47 | | 1.50 |
| 14 | Grazing Return | | 2.40 | 0.44 | | 1.06 |
| 14 | Brush Clearing | $45.00 | | 0.44 | $19.90 | |
| | | | | | | |
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| | | | | | | |

| | | {8} | | {9} | {10} |
|---|---|---|---|---|---|
| Annual Cost - 1 | | | | | |
| Annual Cost - 2 | | | | | |

| | | {11} | | {12} |
|---|---|---|---|---|
| Annual Return - 1 | | | | |
| Annual Return - 2 | | | | |

| | |
|---|---|
| **Total Costs** {13} | 19.90 |
| **Total Returns** {14} | 63.17 |
| Present Net Worth for One Production Period {15} | 43.27 |
| Multiplying Factor to Convert to Land Expectation Value (Infinite Length Production Period) {16} | 2.26 |
| Land Expectation Value {17} | 97.98 |
| Annual Equivalent Income (Cell {17} x Interest Rate) {18} | 5.88 |

Table 1. Future value of $1.00 (compounding factor)

| YEAR | INTEREST RATE (PERCENT) 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.01 | 1.02 | 1.03 | 1.04 | 1.05 | 1.06 | 1.07 | 1.08 | 1.09 | 1.10 | 1.11 | 1.12 | 1.13 | 1.14 | 1.15 |
| 2 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.12 | 1.14 | 1.17 | 1.19 | 1.21 | 1.23 | 1.25 | 1.28 | 1.30 | 1.32 |
| 3 | 1.03 | 1.06 | 1.09 | 1.12 | 1.16 | 1.19 | 1.23 | 1.26 | 1.30 | 1.33 | 1.37 | 1.40 | 1.44 | 1.48 | 1.52 |
| 4 | 1.04 | 1.08 | 1.13 | 1.17 | 1.22 | 1.26 | 1.31 | 1.36 | 1.41 | 1.46 | 1.52 | 1.57 | 1.63 | 1.69 | 1.75 |
| 5 | 1.05 | 1.10 | 1.16 | 1.22 | 1.28 | 1.34 | 1.40 | 1.47 | 1.54 | 1.61 | 1.69 | 1.76 | 1.84 | 1.93 | 2.01 |
| 6 | 1.06 | 1.13 | 1.19 | 1.27 | 1.34 | 1.42 | 1.50 | 1.59 | 1.68 | 1.77 | 1.87 | 1.97 | 2.08 | 2.19 | 2.31 |
| 7 | 1.07 | 1.15 | 1.23 | 1.32 | 1.41 | 1.50 | 1.61 | 1.71 | 1.83 | 1.95 | 2.08 | 2.21 | 2.35 | 2.50 | 2.66 |
| 8 | 1.08 | 1.17 | 1.27 | 1.37 | 1.48 | 1.59 | 1.72 | 1.85 | 1.99 | 2.14 | 2.30 | 2.48 | 2.66 | 2.85 | 3.06 |
| 9 | 1.09 | 1.20 | 1.30 | 1.42 | 1.55 | 1.69 | 1.84 | 2.00 | 2.17 | 2.36 | 2.56 | 2.77 | 3.00 | 3.25 | 3.52 |
| 10 | 1.10 | 1.22 | 1.34 | 1.48 | 1.63 | 1.79 | 1.97 | 2.16 | 2.37 | 2.59 | 2.84 | 3.11 | 3.39 | 3.71 | 4.05 |
| 11 | 1.12 | 1.24 | 1.38 | 1.54 | 1.71 | 1.90 | 2.10 | 2.33 | 2.58 | 2.85 | 3.15 | 3.48 | 3.84 | 4.23 | 4.65 |
| 12 | 1.13 | 1.27 | 1.43 | 1.60 | 1.80 | 2.01 | 2.25 | 2.52 | 2.81 | 3.14 | 3.50 | 3.90 | 4.33 | 4.82 | 5.35 |
| 13 | 1.14 | 1.29 | 1.47 | 1.67 | 1.89 | 2.13 | 2.41 | 2.72 | 3.07 | 3.45 | 3.88 | 4.36 | 4.90 | 5.49 | 6.15 |
| 14 | 1.15 | 1.32 | 1.51 | 1.73 | 1.98 | 2.26 | 2.58 | 2.94 | 3.34 | 3.80 | 4.31 | 4.89 | 5.53 | 6.26 | 7.08 |
| 15 | 1.16 | 1.35 | 1.56 | 1.80 | 2.08 | 2.40 | 2.76 | 3.17 | 3.64 | 4.18 | 4.78 | 5.47 | 6.25 | 7.14 | 8.14 |
| 16 | 1.17 | 1.37 | 1.60 | 1.87 | 2.18 | 2.54 | 2.95 | 3.43 | 3.97 | 4.59 | 5.31 | 6.13 | 7.07 | 8.14 | 9.36 |
| 17 | 1.18 | 1.40 | 1.65 | 1.95 | 2.29 | 2.69 | 3.16 | 3.70 | 4.33 | 5.05 | 5.90 | 6.87 | 7.99 | 9.28 | 10.76 |
| 18 | 1.20 | 1.43 | 1.70 | 2.03 | 2.41 | 2.85 | 3.38 | 4.00 | 4.72 | 5.56 | 6.54 | 7.69 | 9.02 | 10.58 | 12.38 |
| 19 | 1.21 | 1.46 | 1.75 | 2.11 | 2.53 | 3.03 | 3.62 | 4.32 | 5.14 | 6.12 | 7.26 | 8.61 | 10.20 | 12.06 | 14.23 |
| 20 | 1.22 | 1.49 | 1.81 | 2.19 | 2.65 | 3.21 | 3.87 | 4.66 | 5.60 | 6.73 | 8.06 | 9.65 | 11.52 | 13.74 | 16.37 |
| 21 | 1.23 | 1.52 | 1.86 | 2.28 | 2.79 | 3.40 | 4.14 | 5.03 | 6.11 | 7.40 | 8.95 | 10.80 | 13.02 | 15.67 | 18.82 |
| 22 | 1.24 | 1.55 | 1.92 | 2.37 | 2.93 | 3.60 | 4.43 | 5.44 | 6.66 | 8.14 | 9.93 | 12.10 | 14.71 | 17.86 | 21.64 |
| 23 | 1.26 | 1.58 | 1.97 | 2.46 | 3.07 | 3.82 | 4.74 | 5.87 | 7.26 | 8.95 | 11.03 | 13.55 | 16.63 | 20.36 | 24.89 |
| 24 | 1.27 | 1.61 | 2.03 | 2.56 | 3.23 | 4.05 | 5.07 | 6.34 | 7.91 | 9.85 | 12.24 | 15.18 | 18.79 | 23.21 | 28.63 |
| 25 | 1.28 | 1.64 | 2.09 | 2.67 | 3.39 | 4.29 | 5.43 | 6.85 | 8.62 | 10.83 | 13.59 | 17.00 | 21.23 | 26.46 | 32.92 |
| 30 | 1.35 | 1.81 | 2.43 | 3.24 | 4.32 | 5.74 | 7.61 | 10.06 | 13.27 | 17.45 | 22.89 | 29.96 | 39.12 | 50.95 | 66.21 |
| 35 | 1.42 | 2.00 | 2.81 | 3.95 | 5.52 | 7.69 | 10.68 | 14.79 | 20.41 | 28.10 | 38.57 | 52.80 | 72.07 | 98.10 | 133.18 |
| 40 | 1.49 | 2.21 | 3.26 | 4.80 | 7.04 | 10.29 | 14.97 | 21.72 | 31.41 | 45.26 | 65.00 | 93.05 | 132.78 | 188.88 | 267.86 |
| 45 | 1.56 | 2.44 | 3.78 | 5.84 | 8.99 | 13.76 | 21.00 | 31.92 | 48.33 | 72.89 | 109.53 | 163.99 | 244.64 | 363.68 | 538.77 |
| 50 | 1.64 | 2.69 | 4.38 | 7.11 | 11.47 | 18.42 | 29.46 | 46.90 | 74.36 | 117.39 | 184.56 | 289.00 | 450.74 | 700.23 | 1083.66 |
| 55 | 1.73 | 2.97 | 5.08 | 8.65 | 14.64 | 24.65 | 41.32 | 68.91 | 114.41 | 189.06 | 311.00 | 509.32 | 830.45 | 1348.24 | 2179.62 |
| 60 | 1.82 | 3.28 | 5.89 | 10.52 | 18.68 | 32.99 | 57.95 | 101.26 | 176.03 | 304.48 | 524.06 | 897.60 | 1530.05 | 2595.92 | 4384.00 |
| 65 | 1.91 | 3.62 | 6.83 | 12.80 | 23.84 | 44.14 | 81.27 | 148.78 | 270.85 | 490.37 | 883.07 | 1581.87 | 2819.02 | 4998.22 | 8817.79 |
| 70 | 2.01 | 4.00 | 7.92 | 15.57 | 30.43 | 59.08 | 113.99 | 218.61 | 416.73 | 789.75 | 1488.02 | 2787.80 | 5193.87 | 9623.64 | 17735.72 |
| 75 | 2.11 | 4.42 | 9.18 | 18.95 | 38.83 | 79.06 | 159.88 | 321.20 | 641.19 | 1271.90 | 2507.40 | 4913.06 | 9569.37 | 18529.51 | 35672.87 |
| 80 | 2.22 | 4.88 | 10.64 | 23.05 | 49.56 | 105.80 | 224.23 | 471.95 | 986.55 | 2048.40 | 4225.11 | 8658.48 | 17630.94 | 35676.98 | 71750.88 |
| 85 | 2.33 | 5.38 | 12.34 | 28.04 | 63.25 | 141.58 | 314.50 | 693.46 | 1517.93 | 3298.97 | 7119.56 | 15259.21 | 32483.86 | 68692.98 | 144316.65 |
| 90 | 2.45 | 5.94 | 14.30 | 34.12 | 80.73 | 189.46 | 441.10 | 1018.92 | 2335.53 | 5313.02 | 11996.87 | 26891.93 | 59849.42 | 132262.47 | 290272.33 |
| 95 | 2.57 | 6.56 | 16.58 | 41.51 | 103.03 | 253.55 | 618.67 | 1497.12 | 3593.50 | 8556.68 | 20215.43 | 47392.78 | 110268.67 | 254660.08 | 583841.33 |
| 100 | 2.70 | 7.24 | 19.22 | 50.50 | 131.50 | 339.30 | 867.72 | 2199.76 | 5529.04 | 13780.61 | 34064.18 | 83522.27 | 203162.87 | 490326.24 | 1174313.45 |

Table 2. Present value of $1.00 (discounting factor)

| | INTEREST RATE (PERCENT) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 |
| 1 | 0.99 | 0.98 | 0.97 | 0.96 | 0.95 | 0.94 | 0.93 | 0.93 | 0.92 | 0.91 | 0.90 | 0.89 | 0.88 | 0.88 | 0.87 |
| 2 | 0.98 | 0.96 | 0.94 | 0.92 | 0.91 | 0.89 | 0.87 | 0.86 | 0.84 | 0.83 | 0.81 | 0.80 | 0.78 | 0.77 | 0.76 |
| 3 | 0.97 | 0.94 | 0.92 | 0.89 | 0.86 | 0.84 | 0.82 | 0.79 | 0.77 | 0.75 | 0.73 | 0.71 | 0.69 | 0.67 | 0.66 |
| 4 | 0.96 | 0.92 | 0.89 | 0.85 | 0.82 | 0.79 | 0.76 | 0.74 | 0.71 | 0.68 | 0.66 | 0.64 | 0.61 | 0.59 | 0.57 |
| 5 | 0.95 | 0.91 | 0.86 | 0.82 | 0.78 | 0.75 | 0.71 | 0.68 | 0.65 | 0.62 | 0.59 | 0.57 | 0.54 | 0.52 | 0.50 |
| 6 | 0.94 | 0.89 | 0.84 | 0.79 | 0.75 | 0.70 | 0.67 | 0.63 | 0.60 | 0.56 | 0.53 | 0.51 | 0.48 | 0.46 | 0.43 |
| 7 | 0.93 | 0.87 | 0.81 | 0.76 | 0.71 | 0.67 | 0.62 | 0.58 | 0.55 | 0.51 | 0.48 | 0.45 | 0.43 | 0.40 | 0.38 |
| 8 | 0.92 | 0.85 | 0.79 | 0.73 | 0.68 | 0.63 | 0.58 | 0.54 | 0.50 | 0.47 | 0.43 | 0.40 | 0.38 | 0.35 | 0.33 |
| 9 | 0.91 | 0.84 | 0.77 | 0.70 | 0.64 | 0.59 | 0.54 | 0.50 | 0.46 | 0.42 | 0.39 | 0.36 | 0.33 | 0.31 | 0.28 |
| 10 | 0.91 | 0.82 | 0.74 | 0.68 | 0.61 | 0.56 | 0.51 | 0.46 | 0.42 | 0.39 | 0.35 | 0.32 | 0.29 | 0.27 | 0.25 |
| 11 | 0.90 | 0.80 | 0.72 | 0.65 | 0.58 | 0.53 | 0.48 | 0.43 | 0.39 | 0.35 | 0.32 | 0.29 | 0.26 | 0.24 | 0.21 |
| 12 | 0.89 | 0.79 | 0.70 | 0.62 | 0.56 | 0.50 | 0.44 | 0.40 | 0.36 | 0.32 | 0.29 | 0.26 | 0.23 | 0.21 | 0.19 |
| 13 | 0.88 | 0.77 | 0.68 | 0.60 | 0.53 | 0.47 | 0.41 | 0.37 | 0.33 | 0.29 | 0.26 | 0.23 | 0.20 | 0.18 | 0.16 |
| 14 | 0.87 | 0.76 | 0.66 | 0.58 | 0.51 | 0.44 | 0.39 | 0.34 | 0.30 | 0.26 | 0.23 | 0.20 | 0.18 | 0.16 | 0.14 |
| 15 | 0.86 | 0.74 | 0.64 | 0.56 | 0.48 | 0.42 | 0.36 | 0.32 | 0.27 | 0.24 | 0.21 | 0.18 | 0.16 | 0.14 | 0.12 |
| 16 | 0.85 | 0.73 | 0.62 | 0.53 | 0.46 | 0.39 | 0.34 | 0.29 | 0.25 | 0.22 | 0.19 | 0.16 | 0.14 | 0.12 | 0.11 |
| 17 | 0.84 | 0.71 | 0.61 | 0.51 | 0.44 | 0.37 | 0.32 | 0.27 | 0.23 | 0.20 | 0.17 | 0.15 | 0.13 | 0.11 | 0.09 |
| 18 | 0.84 | 0.70 | 0.59 | 0.49 | 0.42 | 0.35 | 0.30 | 0.25 | 0.21 | 0.18 | 0.15 | 0.13 | 0.11 | 0.09 | 0.08 |
| 19 | 0.83 | 0.69 | 0.57 | 0.47 | 0.40 | 0.33 | 0.28 | 0.23 | 0.19 | 0.16 | 0.14 | 0.12 | 0.10 | 0.08 | 0.07 |
| 20 | 0.82 | 0.67 | 0.55 | 0.46 | 0.38 | 0.31 | 0.26 | 0.21 | 0.18 | 0.15 | 0.12 | 0.10 | 0.09 | 0.07 | 0.06 |
| 21 | 0.81 | 0.66 | 0.54 | 0.44 | 0.36 | 0.29 | 0.24 | 0.20 | 0.16 | 0.14 | 0.11 | 0.09 | 0.08 | 0.06 | 0.05 |
| 22 | 0.80 | 0.65 | 0.52 | 0.42 | 0.34 | 0.28 | 0.23 | 0.18 | 0.15 | 0.12 | 0.10 | 0.08 | 0.07 | 0.06 | 0.05 |
| 23 | 0.80 | 0.63 | 0.51 | 0.41 | 0.33 | 0.26 | 0.21 | 0.17 | 0.14 | 0.11 | 0.09 | 0.07 | 0.06 | 0.05 | 0.04 |
| 24 | 0.79 | 0.62 | 0.49 | 0.39 | 0.31 | 0.25 | 0.20 | 0.16 | 0.13 | 0.10 | 0.08 | 0.07 | 0.05 | 0.04 | 0.03 |
| 25 | 0.78 | 0.61 | 0.48 | 0.38 | 0.30 | 0.23 | 0.18 | 0.15 | 0.12 | 0.09 | 0.07 | 0.06 | 0.05 | 0.04 | 0.03 |
| 30 | 0.74 | 0.55 | 0.41 | 0.31 | 0.23 | 0.17 | 0.13 | 0.10 | 0.08 | 0.06 | 0.04 | 0.03 | 0.03 | 0.02 | 0.02 |
| 35 | 0.71 | 0.50 | 0.36 | 0.25 | 0.18 | 0.13 | 0.09 | 0.07 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 |
| 40 | 0.67 | 0.45 | 0.31 | 0.21 | 0.14 | 0.10 | 0.07 | 0.05 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 |
| 45 | 0.64 | 0.41 | 0.26 | 0.17 | 0.11 | 0.07 | 0.05 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 |
| 50 | 0.61 | 0.37 | 0.23 | 0.14 | 0.09 | 0.05 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| 55 | 0.58 | 0.34 | 0.20 | 0.12 | 0.07 | 0.04 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 60 | 0.55 | 0.30 | 0.17 | 0.10 | 0.05 | 0.03 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 65 | 0.52 | 0.28 | 0.15 | 0.08 | 0.04 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 70 | 0.50 | 0.25 | 0.13 | 0.06 | 0.03 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 75 | 0.47 | 0.23 | 0.11 | 0.05 | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 80 | 0.45 | 0.21 | 0.09 | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 85 | 0.43 | 0.19 | 0.08 | 0.04 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 90 | 0.41 | 0.17 | 0.07 | 0.03 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 95 | 0.39 | 0.15 | 0.06 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 100 | 0.37 | 0.14 | 0.05 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 3. Present value of a terminating annual series

| | INTEREST RATE (PERCENT) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 |
| 1 | 0.99 | 0.98 | 0.97 | 0.96 | 0.95 | 0.94 | 0.93 | 0.93 | 0.92 | 0.91 | 0.90 | 0.89 | 0.88 | 0.88 | 0.87 |
| 2 | 1.97 | 1.94 | 1.91 | 1.89 | 1.86 | 1.83 | 1.81 | 1.78 | 1.76 | 1.74 | 1.71 | 1.69 | 1.67 | 1.65 | 1.63 |
| 3 | 2.94 | 2.88 | 2.83 | 2.78 | 2.72 | 2.67 | 2.62 | 2.58 | 2.53 | 2.49 | 2.44 | 2.40 | 2.36 | 2.32 | 2.28 |
| 4 | 3.90 | 3.81 | 3.72 | 3.63 | 3.55 | 3.47 | 3.39 | 3.31 | 3.24 | 3.17 | 3.10 | 3.04 | 2.97 | 2.91 | 2.85 |
| 5 | 4.85 | 4.71 | 4.58 | 4.45 | 4.33 | 4.21 | 4.10 | 3.99 | 3.89 | 3.79 | 3.70 | 3.60 | 3.52 | 3.43 | 3.35 |
| 6 | 5.80 | 5.60 | 5.42 | 5.24 | 5.08 | 4.92 | 4.77 | 4.62 | 4.49 | 4.36 | 4.23 | 4.11 | 4.00 | 3.89 | 3.78 |
| 7 | 6.73 | 6.47 | 6.23 | 6.00 | 5.79 | 5.58 | 5.39 | 5.21 | 5.03 | 4.87 | 4.71 | 4.56 | 4.42 | 4.29 | 4.16 |
| 8 | 7.65 | 7.33 | 7.02 | 6.73 | 6.46 | 6.21 | 5.97 | 5.75 | 5.53 | 5.33 | 5.15 | 4.97 | 4.80 | 4.64 | 4.49 |
| 9 | 8.57 | 8.16 | 7.79 | 7.44 | 7.11 | 6.80 | 6.52 | 6.25 | 6.00 | 5.76 | 5.54 | 5.33 | 5.13 | 4.95 | 4.77 |
| 10 | 9.47 | 8.98 | 8.53 | 8.11 | 7.72 | 7.36 | 7.02 | 6.71 | 6.42 | 6.14 | 5.89 | 5.65 | 5.43 | 5.22 | 5.02 |
| 11 | 10.37 | 9.79 | 9.25 | 8.76 | 8.31 | 7.89 | 7.50 | 7.14 | 6.81 | 6.50 | 6.21 | 5.94 | 5.69 | 5.45 | 5.23 |
| 12 | 11.26 | 10.58 | 9.95 | 9.39 | 8.86 | 8.38 | 7.94 | 7.54 | 7.16 | 6.81 | 6.49 | 6.19 | 5.92 | 5.66 | 5.42 |
| 13 | 12.13 | 11.35 | 10.63 | 9.99 | 9.39 | 8.85 | 8.36 | 7.90 | 7.49 | 7.10 | 6.75 | 6.42 | 6.12 | 5.84 | 5.58 |
| 14 | 13.00 | 12.11 | 11.30 | 10.56 | 9.90 | 9.29 | 8.75 | 8.24 | 7.79 | 7.37 | 6.98 | 6.63 | 6.30 | 6.00 | 5.72 |
| 15 | 13.87 | 12.85 | 11.94 | 11.12 | 10.38 | 9.71 | 9.11 | 8.56 | 8.06 | 7.61 | 7.19 | 6.81 | 6.46 | 6.14 | 5.85 |
| 16 | 14.72 | 13.58 | 12.56 | 11.65 | 10.84 | 10.11 | 9.45 | 8.85 | 8.31 | 7.82 | 7.38 | 6.97 | 6.60 | 6.27 | 5.95 |
| 17 | 15.56 | 14.29 | 13.17 | 12.17 | 11.27 | 10.48 | 9.76 | 9.12 | 8.54 | 8.02 | 7.55 | 7.12 | 6.73 | 6.37 | 6.05 |
| 18 | 16.40 | 14.99 | 13.75 | 12.66 | 11.69 | 10.83 | 10.06 | 9.37 | 8.76 | 8.20 | 7.70 | 7.25 | 6.84 | 6.47 | 6.13 |
| 19 | 17.23 | 15.68 | 14.32 | 13.13 | 12.09 | 11.16 | 10.34 | 9.60 | 8.95 | 8.36 | 7.84 | 7.37 | 6.94 | 6.55 | 6.20 |
| 20 | 18.05 | 16.35 | 14.88 | 13.59 | 12.46 | 11.47 | 10.59 | 9.82 | 9.13 | 8.51 | 7.96 | 7.47 | 7.02 | 6.62 | 6.26 |
| 21 | 18.86 | 17.01 | 15.42 | 14.03 | 12.82 | 11.76 | 10.84 | 10.02 | 9.29 | 8.65 | 8.08 | 7.56 | 7.10 | 6.69 | 6.31 |
| 22 | 19.66 | 17.66 | 15.94 | 14.45 | 13.16 | 12.04 | 11.06 | 10.20 | 9.44 | 8.77 | 8.18 | 7.64 | 7.17 | 6.74 | 6.36 |
| 23 | 20.46 | 18.29 | 16.44 | 14.86 | 13.49 | 12.30 | 11.27 | 10.37 | 9.58 | 8.88 | 8.27 | 7.72 | 7.23 | 6.79 | 6.40 |
| 24 | 21.24 | 18.91 | 16.94 | 15.25 | 13.80 | 12.55 | 11.47 | 10.53 | 9.71 | 8.98 | 8.35 | 7.78 | 7.28 | 6.84 | 6.43 |
| 25 | 22.02 | 19.52 | 17.41 | 15.62 | 14.09 | 12.78 | 11.65 | 10.67 | 9.82 | 9.08 | 8.42 | 7.84 | 7.33 | 6.87 | 6.46 |
| 30 | 25.81 | 22.40 | 19.60 | 17.29 | 15.37 | 13.76 | 12.41 | 11.26 | 10.27 | 9.43 | 8.69 | 8.06 | 7.50 | 7.00 | 6.57 |
| 35 | 29.41 | 25.00 | 21.49 | 18.66 | 16.37 | 14.50 | 12.95 | 11.65 | 10.57 | 9.64 | 8.86 | 8.18 | 7.59 | 7.07 | 6.62 |
| 40 | 32.83 | 27.36 | 23.11 | 19.79 | 17.16 | 15.05 | 13.33 | 11.92 | 10.76 | 9.78 | 8.95 | 8.24 | 7.63 | 7.11 | 6.64 |
| 45 | 36.09 | 29.49 | 24.52 | 20.72 | 17.77 | 15.46 | 13.61 | 12.11 | 10.88 | 9.86 | 9.01 | 8.28 | 7.66 | 7.12 | 6.65 |
| 50 | 39.20 | 31.42 | 25.73 | 21.48 | 18.26 | 15.76 | 13.80 | 12.23 | 10.96 | 9.91 | 9.04 | 8.30 | 7.68 | 7.13 | 6.66 |
| 55 | 42.15 | 33.17 | 26.77 | 22.11 | 18.63 | 15.99 | 13.94 | 12.32 | 11.01 | 9.95 | 9.06 | 8.32 | 7.68 | 7.14 | 6.66 |
| 60 | 44.96 | 34.76 | 27.68 | 22.62 | 18.93 | 16.16 | 14.04 | 12.38 | 11.05 | 9.97 | 9.07 | 8.32 | 7.69 | 7.14 | 6.67 |
| 65 | 47.63 | 36.20 | 28.45 | 23.05 | 19.16 | 16.29 | 14.11 | 12.42 | 11.07 | 9.98 | 9.08 | 8.33 | 7.69 | 7.14 | 6.67 |
| 70 | 50.17 | 37.50 | 29.12 | 23.39 | 19.34 | 16.38 | 14.16 | 12.44 | 11.08 | 9.99 | 9.08 | 8.33 | 7.69 | 7.14 | 6.67 |
| 75 | 52.59 | 38.68 | 29.70 | 23.68 | 19.48 | 16.46 | 14.20 | 12.46 | 11.09 | 9.99 | 9.09 | 8.33 | 7.69 | 7.14 | 6.67 |
| 80 | 54.89 | 39.74 | 30.20 | 23.92 | 19.60 | 16.51 | 14.22 | 12.47 | 11.10 | 10.00 | 9.09 | 8.33 | 7.69 | 7.14 | 6.67 |
| 85 | 57.08 | 40.71 | 30.63 | 24.11 | 19.68 | 16.55 | 14.24 | 12.48 | 11.10 | 10.00 | 9.09 | 8.33 | 7.69 | 7.14 | 6.67 |
| 90 | 59.16 | 41.59 | 31.00 | 24.27 | 19.75 | 16.58 | 14.25 | 12.49 | 11.11 | 10.00 | 9.09 | 8.33 | 7.69 | 7.14 | 6.67 |
| 95 | 61.14 | 42.38 | 31.32 | 24.40 | 19.81 | 16.60 | 14.26 | 12.49 | 11.11 | 10.00 | 9.09 | 8.33 | 7.69 | 7.14 | 6.67 |
| 100 | 63.03 | 43.10 | 31.60 | 24.50 | 19.85 | 16.62 | 14.27 | 12.49 | 11.11 | 10.00 | 9.09 | 8.33 | 7.69 | 7.14 | 6.67 |

Table 4. Conversion factor to convert PNW to LEV

| | INTEREST RATE (PERCENT) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 |
| 1 | 101.00 | 51.00 | 34.33 | 26.00 | 21.00 | 17.67 | 15.29 | 13.50 | 12.11 | 11.00 | 10.09 | 9.33 | 8.69 | 8.14 | 7.67 |
| 2 | 50.75 | 25.75 | 17.42 | 13.25 | 10.76 | 9.09 | 7.90 | 7.01 | 6.32 | 5.76 | 5.31 | 4.93 | 4.61 | 4.34 | 4.10 |
| 3 | 34.00 | 17.34 | 11.78 | 9.01 | 7.34 | 6.24 | 5.44 | 4.85 | 4.39 | 4.02 | 3.72 | 3.47 | 3.26 | 3.08 | 2.92 |
| 4 | 25.63 | 13.13 | 8.97 | 6.89 | 5.64 | 4.81 | 4.22 | 3.77 | 3.43 | 3.15 | 2.93 | 2.74 | 2.59 | 2.45 | 2.34 |
| 5 | 20.60 | 10.61 | 7.28 | 5.62 | 4.62 | 3.96 | 3.48 | 3.13 | 2.86 | 2.64 | 2.46 | 2.31 | 2.19 | 2.08 | 1.99 |
| 6 | 17.25 | 8.93 | 6.15 | 4.77 | 3.94 | 3.39 | 3.00 | 2.70 | 2.48 | 2.30 | 2.15 | 2.03 | 1.92 | 1.84 | 1.76 |
| 7 | 14.86 | 7.73 | 5.35 | 4.17 | 3.46 | 2.99 | 2.65 | 2.40 | 2.21 | 2.05 | 1.93 | 1.83 | 1.74 | 1.67 | 1.60 |
| 8 | 13.07 | 6.83 | 4.75 | 3.71 | 3.09 | 2.68 | 2.39 | 2.18 | 2.01 | 1.87 | 1.77 | 1.68 | 1.60 | 1.54 | 1.49 |
| 9 | 11.67 | 6.13 | 4.28 | 3.36 | 2.81 | 2.45 | 2.19 | 2.00 | 1.85 | 1.74 | 1.64 | 1.56 | 1.50 | 1.44 | 1.40 |
| 10 | 10.56 | 5.57 | 3.91 | 3.08 | 2.59 | 2.26 | 2.03 | 1.86 | 1.73 | 1.63 | 1.54 | 1.47 | 1.42 | 1.37 | 1.33 |
| 11 | 9.65 | 5.11 | 3.60 | 2.85 | 2.41 | 2.11 | 1.91 | 1.75 | 1.63 | 1.54 | 1.46 | 1.40 | 1.35 | 1.31 | 1.27 |
| 12 | 8.88 | 4.73 | 3.35 | 2.66 | 2.26 | 1.99 | 1.80 | 1.66 | 1.55 | 1.47 | 1.40 | 1.35 | 1.30 | 1.26 | 1.23 |
| 13 | 8.24 | 4.41 | 3.13 | 2.50 | 2.13 | 1.88 | 1.71 | 1.58 | 1.48 | 1.41 | 1.35 | 1.30 | 1.26 | 1.22 | 1.19 |
| 14 | 7.69 | 4.13 | 2.95 | 2.37 | 2.02 | 1.79 | 1.63 | 1.52 | 1.43 | 1.36 | 1.30 | 1.26 | 1.22 | 1.19 | 1.16 |
| 15 | 7.21 | 3.89 | 2.79 | 2.25 | 1.93 | 1.72 | 1.57 | 1.46 | 1.38 | 1.31 | 1.26 | 1.22 | 1.19 | 1.16 | 1.14 |
| 16 | 6.79 | 3.68 | 2.65 | 2.15 | 1.85 | 1.65 | 1.51 | 1.41 | 1.34 | 1.28 | 1.23 | 1.19 | 1.16 | 1.14 | 1.12 |
| 17 | 6.43 | 3.50 | 2.53 | 2.05 | 1.77 | 1.59 | 1.46 | 1.37 | 1.30 | 1.25 | 1.20 | 1.17 | 1.14 | 1.12 | 1.10 |
| 18 | 6.10 | 3.34 | 2.42 | 1.97 | 1.71 | 1.54 | 1.42 | 1.33 | 1.27 | 1.22 | 1.18 | 1.15 | 1.12 | 1.10 | 1.09 |
| 19 | 5.81 | 3.19 | 2.33 | 1.90 | 1.65 | 1.49 | 1.38 | 1.30 | 1.24 | 1.20 | 1.16 | 1.13 | 1.11 | 1.09 | 1.08 |
| 20 | 5.54 | 3.06 | 2.24 | 1.84 | 1.60 | 1.45 | 1.35 | 1.27 | 1.22 | 1.17 | 1.14 | 1.12 | 1.10 | 1.08 | 1.07 |
| 21 | 5.30 | 2.94 | 2.16 | 1.78 | 1.56 | 1.42 | 1.32 | 1.25 | 1.20 | 1.16 | 1.13 | 1.10 | 1.08 | 1.07 | 1.06 |
| 22 | 5.09 | 2.83 | 2.09 | 1.73 | 1.52 | 1.38 | 1.29 | 1.23 | 1.18 | 1.14 | 1.11 | 1.09 | 1.07 | 1.06 | 1.05 |
| 23 | 4.89 | 2.73 | 2.03 | 1.68 | 1.48 | 1.35 | 1.27 | 1.21 | 1.16 | 1.13 | 1.10 | 1.08 | 1.06 | 1.05 | 1.04 |
| 24 | 4.71 | 2.64 | 1.97 | 1.64 | 1.45 | 1.33 | 1.25 | 1.19 | 1.14 | 1.11 | 1.09 | 1.07 | 1.06 | 1.05 | 1.04 |
| 25 | 4.54 | 2.56 | 1.91 | 1.60 | 1.42 | 1.30 | 1.23 | 1.17 | 1.13 | 1.10 | 1.08 | 1.06 | 1.05 | 1.04 | 1.03 |
| 30 | 3.87 | 2.23 | 1.70 | 1.45 | 1.30 | 1.21 | 1.15 | 1.11 | 1.08 | 1.06 | 1.05 | 1.03 | 1.03 | 1.02 | 1.02 |
| 35 | 3.40 | 2.00 | 1.55 | 1.34 | 1.22 | 1.15 | 1.10 | 1.07 | 1.05 | 1.04 | 1.03 | 1.02 | 1.01 | 1.01 | 1.01 |
| 40 | 3.05 | 1.83 | 1.44 | 1.26 | 1.17 | 1.11 | 1.07 | 1.05 | 1.03 | 1.02 | 1.02 | 1.01 | 1.01 | 1.01 | 1.00 |
| 45 | 2.77 | 1.70 | 1.36 | 1.21 | 1.13 | 1.08 | 1.05 | 1.03 | 1.02 | 1.01 | 1.01 | 1.01 | 1.00 | 1.00 | 1.00 |
| 50 | 2.55 | 1.59 | 1.30 | 1.16 | 1.10 | 1.06 | 1.04 | 1.02 | 1.01 | 1.01 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 |
| 55 | 2.37 | 1.51 | 1.24 | 1.13 | 1.07 | 1.04 | 1.02 | 1.01 | 1.01 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 60 | 2.22 | 1.44 | 1.20 | 1.11 | 1.06 | 1.03 | 1.02 | 1.01 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 65 | 2.10 | 1.38 | 1.17 | 1.08 | 1.04 | 1.02 | 1.01 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 70 | 1.99 | 1.33 | 1.14 | 1.07 | 1.03 | 1.02 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 75 | 1.90 | 1.29 | 1.12 | 1.06 | 1.03 | 1.01 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 80 | 1.82 | 1.26 | 1.10 | 1.05 | 1.02 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 85 | 1.75 | 1.23 | 1.09 | 1.04 | 1.02 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 90 | 1.69 | 1.20 | 1.08 | 1.03 | 1.01 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 95 | 1.64 | 1.18 | 1.06 | 1.02 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 100 | 1.59 | 1.16 | 1.05 | 1.02 | 1.01 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

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