Estimate of Revenues and Cost For a Proposed LCCD Conservation Forest

7/29/15

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Lake County Conservation District

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I. BACKGROUND

The Lake County Conservation District (LCCD) is investigating the feasibility of establishing a temporary Conservation Forest on about 60,000 acres of the Flathead National Forest in Lake County, Montana.[1] Under this proposal, the LCCD would ask Montana Department of Natural Resources and Conservation (DNRC) to manage in trust the Conservation Forest for commercial timber harvest on a sustainable basis for 100 years. LCCD would receive the harvest revenues less DNRC's management costs, fire protection costs and other reasonable management costs. DNRC would use the same level of environmental review on the transferred lands as it does on the state forest trust lands.

LCCD has asked Mason, Bruce and Girard, Inc. (MB&G), a natural resource consulting firm, to estimate harvest levels, management costs and net revenues that could reasonably be expected from the proposed Conservation Forest. BDL Forestry, a forest consulting firm in Missoula, Montana, assisted with the study.

[1] See http://swanforestinitiative.org/

II. STUDY OBJECTIVES

This study provides LCCD with information to evaluate whether the proposed Conservation Forest could be an economically viable proposition. To that end, this study:

- Estimates sustainable harvest volumes from the Conservation Forest under several scenarios about availability (60,000 acres, 50,000 acres, 40,000 acres, etc.)
- Estimates likely stumpage receipts associated for each harvest scenario
- Estimates likely management costs associated with each harvest scenario

III. METHODS & ASSUMPTIONS

Mark Rasmussen of MB&G, and Brian Long of BDL Forestry, met with Jim Simpson of LCCD in May 2015 to tour the proposed LCCD Conservation Forest, gather data, and meet with DNRC and USFS staff.

Our objective was to compare the proposed Conservation Forest and the state forest trust lands managed by the DNRC.

Interviews with the USFS District Ranger and the DNRC Unit Manager provided insights about management opportunities and challenges, as well as some idea about management costs and revenues. We also had discussions with DNRC's economist and two of DNRC's fire staff. We subsequently gathered publically available data from the USFS and DNRC and made use of it in this report.

We did not ask DNRC what it would charge to manage a LCCD Conservation Forest, nor did we

determine whether DNRC would be interested in such a project. We did not investigate the legal or political feasibility of the LCCD proposal. Finally, with the exception of assuming limitations on managing lands focused on habitat for grizzly bear, we did not suggest specific management strategies.

Below, we first describe the subject timberlands, providing summary statistics as well as our own observations. Then we describe our estimates of a sustainable harvest volume and the associated revenues and management costs.

The purpose of this paper is to estimate future revenues and costs of a LCCD Conservation Forest. The feasibility test is not a land management plan. We make broad assumptions about management activities, described below. We take a conservative stance on most assumptions:

- DNRC would manage the LCCD Conservation Forest timber sale program under the same laws and regulations that guide DNRC management of state forest trust lands. Environmental documentation would be based on DNRC's current standards established by MEPA (Montana Environmental Protection Act) rather than NEPA (National Environmental Protection Act) used by the USFS.

- The LCCD Conservation Forest would pay fire protection costs like private forest landowners in Montana, and receive the same benefits and protections that they receive.

- Under the LCCD proposal, the LCCC would receive the net revenues (stumpage less DNRC management costs) associated with managing timber in the LCCD Conservation Forest. The USFS would retain the responsibilities and costs for managing recreation and other uses.

IV. THE SUBJECT PROPERTY

We visited the subject property as well as the DNRC Swan Unit property. We made observations about timber stocking, forest cover type, past and current management, growth, management feasibility, access, etc.

We did not collect field measurements for this project. Instead we rely on data provided by the USDA Forest Service Forest Inventory Analysis (FIA) system. As part of the FIA program, the USFS has established a grid of permanent plots and visits them on a ten year basis to describe timber stand conditions, and measure growth, mortality and harvest. Statistics derived from these plots are summarized by county and by owner, and can be obtained from the FIA website.[2] We rely on the FIA data summaries to describe the subject property and to estimate sustainable harvest levels.

The LCCD has not formally identified boundaries of the land that forms the basis of its proposal. The FIA reports 173,520 acres of USFS timberland in the Swan Valley of Lake County, Montana.[3] About 13,400 acres are part of the Mission Mountains Wilderness Area, and another 27,700 acres are in the Swan Front

[2] http://www.fia.fs.fed.us/

[3] USFS acres west of Flathead Lake were not considered for the LCCD conservation forest.

Special Area – these acres are not part of the proposed LCCD Conservation Forest. Acres not suitable for timber management (about 6,800 acres), and lands designated as grizzly bear core (about 43,700 acres) have also been removed from consideration. As discussed below, some acres in the grizzly bear core buffer can be managed, and for this analysis we assume 50% of the suitable acres in the grizzly bear core are unavailable for management (about 11,900 acres) as are the acres not suitable for timber management in the grizzly bear core buffer (about 7,700 acres).

Table 1 shows that after making all of these reductions, the LCCD Conservation Forest could potentially be as large as 62,137 acres.

Table 1: Acres available for a LCCD Conservation Forest

	Acres
USFS Acres in the Swan Valley	173,520
Designated Wilderness - removed	(13,415)
Swan Front Special Area - removed	(27,740)
USFS Not Suitable for Timber Management - removed	(6,854)
GZB Core - removed	(43,715)
GZB Core Buffer Not Suitable for Timber Management - removed	(7,717)
GZB Core Buffer Suitable for Timber Management - 50% removed	(11,941)
Potentical LCCD conservation forest - suitable acres	**62,137**

Figure 1 shows a generalized map of the proposed area. Note that the LCCD has not yet mapped the proposed Conservation Forest. This map and the accounting of acres shown in **Table 1** are only for the purpose of this feasibility study. Ultimately, we show scenarios based on 60,000 acres, 50,000 acres and 40,000 acres.

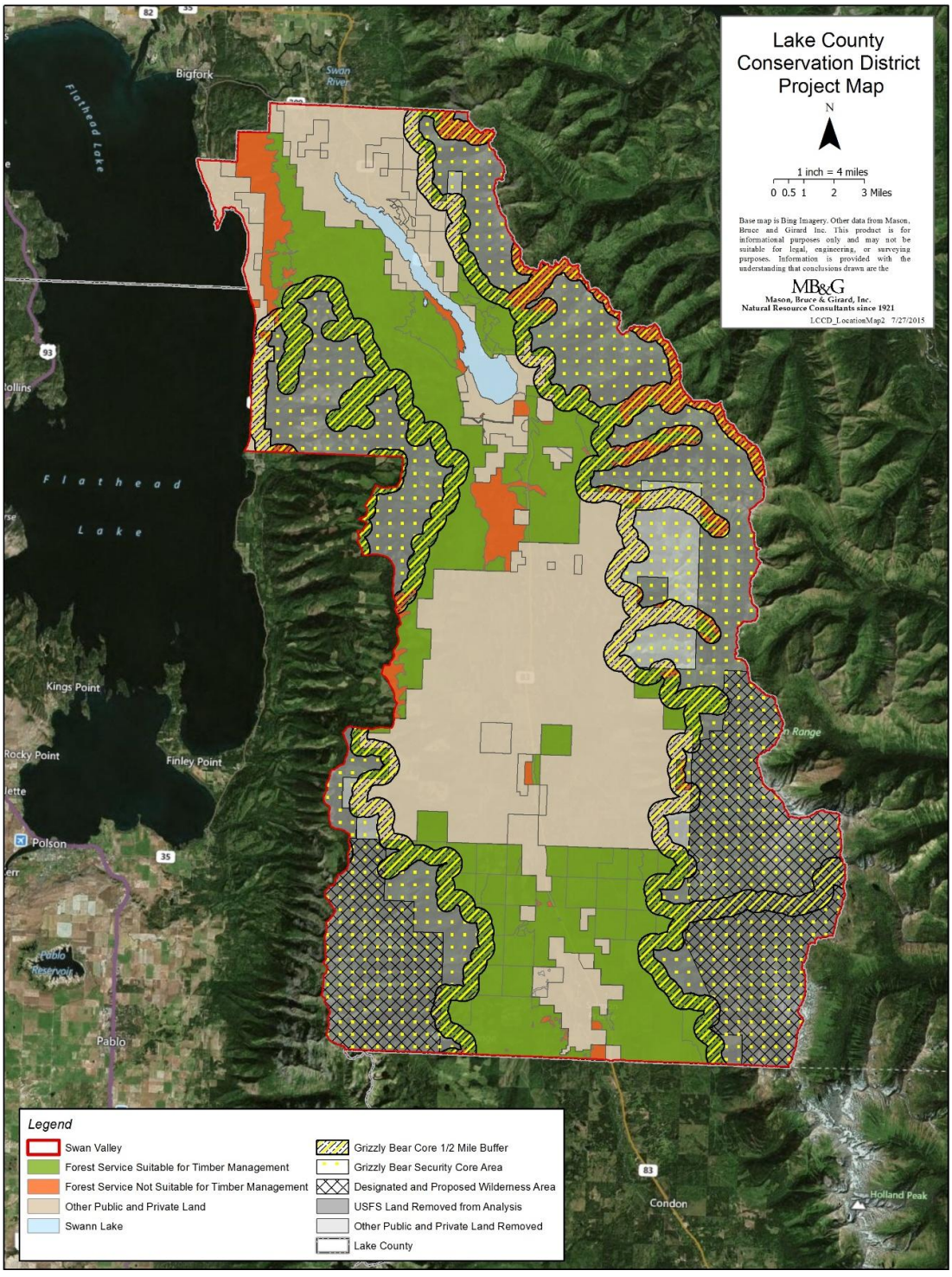

Figure 1: USFS lands in the study area

For this analysis we relied primarily on data about the subject property that is publically available from the USFS Forest Inventory Analysis website. The finest resolution available from the FIA is by ownership group and by county. The tables and graphs that follow, therefore summarize the entire acreage of USFS land in Lake County. While a finer resolution is not possible, we believe that the proposed LCCD Conservation Forest is generally more productive than the average timberland acre in Lake County – it is the lower elevation areas of the productive Swan Valley.

In this section, we show the FIA statistics for state (DNRC) and private land in Lake County. We believe that this will help reviewers better understand the subject property. Note that the 2013 FIA data show forestland acreages prior to the recent USFS purchase of land from The Nature Conservancy. Based on the 2013 FIA data the ownership figures are: USFS - 165,144 acres; State - 47,334 acres; Private - 335,273 acres.[4] While the 2013 FIA data do not quite line up with current ownership, we believe it is still instructive in terms of understanding productivity and forest conditions.

Figure 2 summarizes timberland acreage in Lake County by productivity class by owner.[5] The figure shows that the majority of both the USFS and the DNRC lands are in the 50-84 cubic feet per acre per year class. Note that this is the potential productivity based on fully stocked stands at culmination of mean annual increment. It may not necessarily reflect current growth.

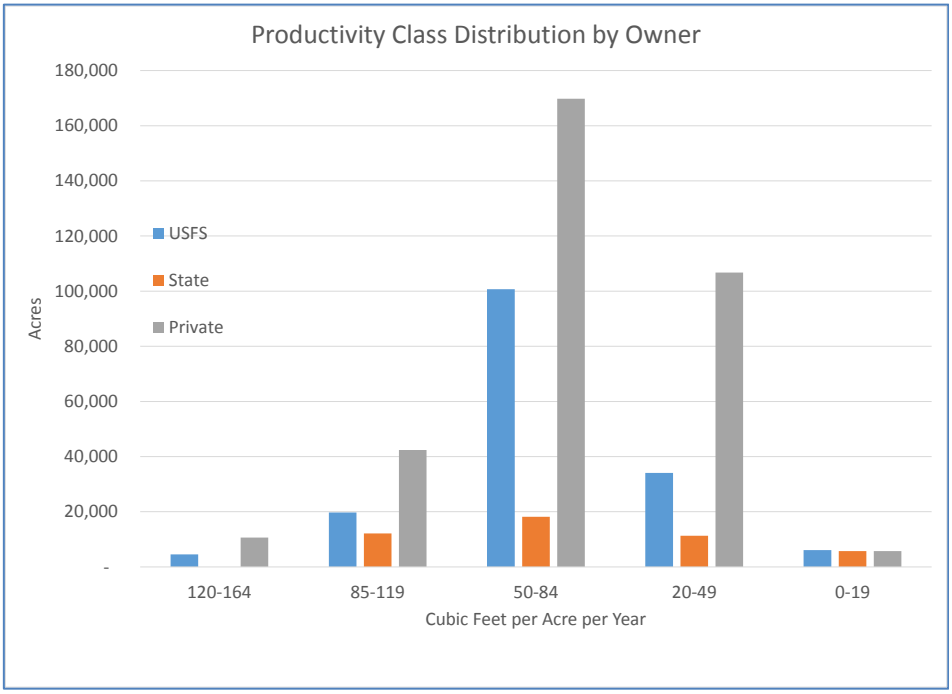

Figure 2: Productivity Class by owner, Lake County, MT.

[4] MT FWP manages about 1700 acres, the rest is DNRC. The FIA statistics do not break out the two properties, and in this paper we refer to the entirety as DNRC or State.

[5] Tribal timberland is included in the "private" ownership category. We estimate that Tribal timberland accounts for about 85% of the private category. In the 2013 FIA statistics, furthermore, Private includes The Nature Conservancy land that has now been purchased by the USFS.

Figure 3 shows the distribution of volume by DBH class.[6] The DBH class reported here is the quadratic mean diameter of the stand. Note that the USFS timberland has a bimodal distribution whereas the DNRC lands are heavier to larger timber.

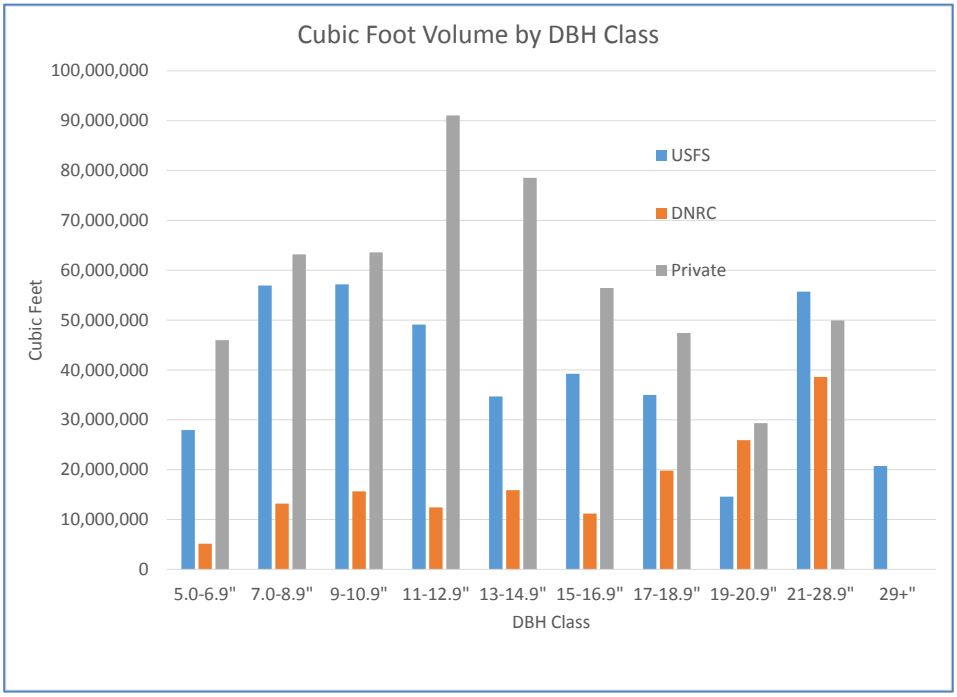

Figure 3: Diameter distribution of timber volume, by owner, Lake County, MT.

Table 2[7] shows total inventory by owner and suggest that the USFS lands carry less stocking than the State lands. We suspect, however, the average is influenced by low stocking on the reserved acres (Wilderness and special use areas).

Table 2: Inventory by owner

	MMcf	MMbf	Mbf/acre
USFS	395	1,580	9.6
State	154	617	13.0
Private	546	2,187	6.5
Total	1,096	4,384	8.0

[6] DBH – Diameter at breast height

[7] MMcf – million cubic feet; MMbf – million board feet; Mbf/acre – thousand board feet per acre

A. Estimate of sustainable harvest levels

This feasibility study requires an estimate of a sustainable harvest level from the LCCD Conservation Forest to project revenues and costs. Calculation of a sustainable harvest level most typically entails projecting future growth and yield from inventory data, identifying management objectives and specifying physical, policy, financial, and operational constraints that limit management opportunities.[8]

This is an initial feasibility analysis, however, not a full-fledged forest planning exercise. We did not obtain specific inventory data from the USFS nor attempt to evaluate a variety of forest management approaches. If the LCCD proposal proceeds, LCCD and/or DNRC will presumably undertake such a forest planning effort to put more detail behind a sustainable harvest level.

For this analysis, we first estimate sustainable harvest level based on available information about productivity and current growth reflected in the FIA data. We then review sustainable harvest levels calculated by DNRC to estimate sustainable harvest level for the proposed LCCD Conservation Forest.[9]

1. Review of FIA data

The 2013 FIA data reports net growth after mortality as shown in **Table 3**. The FIA reports volumes in cubic feet. We use a conservative 4 bf/cf to convert to the more common Scribner board foot measurement.[10]

Table 4: Net growth after mortality, Lake County Montana, 2004-2013 annual average

	Total per year		Per acre per year	
	MMCf	MMbf	Cubic feet	Board feet
USFS	6.0	24.0	36.4	145.6
State	2.0	8.0	42.4	169.5
Private	9.1	36.3	27.1	108.4

Table 3 shows net growth – this is total growth less mortality. To estimate sustainable harvest levels, it is useful to understand how much mortality is occurring. One of the objectives of active management is to minimize timber losses to mortality. **Table 4** summarizes annual mortality 2004-2013, and it shows considerable mortality. These are losses due to fire, insect, disease, competition and other causes. It is impossible to avoid some level of mortality on large properties. But to the extent that active management can minimize losses to mortality, and/or active management can capture mortality, harvest levels above current growth could be sustained.

Figure 2 shows acres by productivity class, which can also be used to estimate sustainable harvest levels. Productivity reported here is for fully stocked stands managed on rotations at

Table 3: Mortality, Lake County Montana, 2004-2013 annual average

	Total per year		Per acre per year	
	MMCf	MMbf	cf	bf
USFS	4.5	18.1	27.5	109.8
State	1.4	5.6	29.4	117.5
Private	8.4	33.7	25.2	100.7

[8] Over the past 20 years, MB&G has mortality performed this kind of analysis on over 150 properties totaling nearly 55 million acres of timberland.

[9] MB&G performed the Sustainable Yield Calculation for DNRC in 2004 and 2015, as well as projected harvest levels under the HCP. At the time of this analysis, the DNRC's 2015 Sustainable Yield Calculation is in a draft form, available for comment. For this study, however, we relied on general relationships between acres and sustainable yield – we did not use DNRC's base inventory or growth and yield projections.

[10] Board foot/cubic foot ratios vary based on species, log size and merchandizing specifications. A 4.0 bf/cf ratio is conservative and assumes smaller trees.

culmination of mean annual increment.[11] In practice, the productivity shown here is more aspirational than operational, and for a variety of reasons, it might be difficult to achieve these levels. Even so, it is instructive to note that the productivity shown in **Table 5** is close to the sum of net growth (**Table 3)** plus mortality (**Table 4)**.

Table 5: Productivity, Lake County Montana

	Total per year		Per acre per year	
	MMCf	MMbf	Cf	bf
USFS	9.4	37.7	64.1	256.5
State	2.6	2.9	68.5	274.0
Private	20.7	20.7	62.9	251.6

2. DNRC harvest levels

The FIA statistics – growth, mortality, productivity – are all biological measures. By its very nature, a sustainable harvest level must be grounded in biologic growth. But a sustainable harvest projection must also account for the political, economic, and legal environment as well. Planned harvest levels will be less than the biologic potential when land is managed for uses that limit or preclude timber management. Furthermore, actual harvest may be less than planned harvest if timber sales encounter opposition, or there is not sufficient budget to offer the planned level of harvest.

As the LCCD proposes to have the subject property managed by DNRC under laws and regulations applicable to state forest trust lands, it is instructive to look at DNRC harvest levels as an indicator for what might be expected from the subject property.

[11] Culmination of mean annual increment is the age at which growth rates begin to slow. Sustainable harvest levels are maximized when a forest is regulated with rotations at culmination of mean annual increment.

For this discussion, we introduce the concept of harvest per gross acre. Gross acres are all of the acres in a planning unit including all of the acres that will be managed for timber production, plus the acres unsuitable for timber production (rocky areas, wetlands, etc.), plus all of the acres unavailable for timber production (roads, etc.), plus all of the acres where timber harvest might be precluded due to policy constraints (riparian areas, eagle nest sites, etc.), plus all of the acres where timber harvest might be limited due to policy constraints (old growth areas, lynx management areas, etc.). Dividing the total planned harvest by gross acres yields an estimate of harvest levels that can be achieved after accounting for all of the reductions experienced by the DNRC.

By law, DNRC is required every ten years to calculate a sustainable harvest level reflecting available data, forest management objectives and the forest management rules under which DNRC operates. From the 2004 DNRC calculation, long term harvest from the 288,101 gross acres in the Northwest Land Office was projected to average 33.0 MMbf/year over the planning horizon, or about 115 bf/gross acre/year. On the Swan unit, harvest was projected to average 6.5 MMbf/year from 38,282 gross acres or about 170 bf/gross acre/year. These figures reflect both the inherent productivity of the land, as well as all of the limitations and restrictions incorporated into the DNRC management plan.

The draft of the 2015 Sustainable Yield Calculation is now out for public review. It is based on more recent and comprehensive inventory data, and uses a different growth model than the 2004 calculation. The draft shows long term harvest from the Northwest Land office averages 140 bf/gross acre/year

from 294,068 gross acres. On the Swan unit, harvest averages about 164 bf/gross acre/year from about 52,085 acres. These figures reflect both acreage deductions for streams, roads, deferred acres and non-forest inclusions as well as management restrictions including green tree retention, grizzly bear management and lynx management.

Table 5 shows that biological productivity of the USFS land in Lake County is similar to the DNRC land. Given that the LCCD Conservation Forest would be managed by DNRC under state forest management regulations, we assume that the sustainable harvest per gross acre from the DNRC lands would be a good estimate of the sustainable harvest per gross acres from the LCCD Conservation Forest.

We therefore assume that the LCCD Conservation Forest could sustain a harvest level of 150 bf/gross acre/year. In **Table 6**, we apply this factor to the land base to estimate sustainable harvest levels from different sized land bases.

B. Timber values

1. Stumpage

DNRC usually sells timber with a two or three year timber sale contract. Purchasers pay for the right to cut standing timber, and are required to perform project work (road construction, road maintenance, etc.) as part of the timber sale contract. As a result, stumpage prices reflect that value of the logs delivered to the mill less the logging, haul and project costs borne by the purchaser.

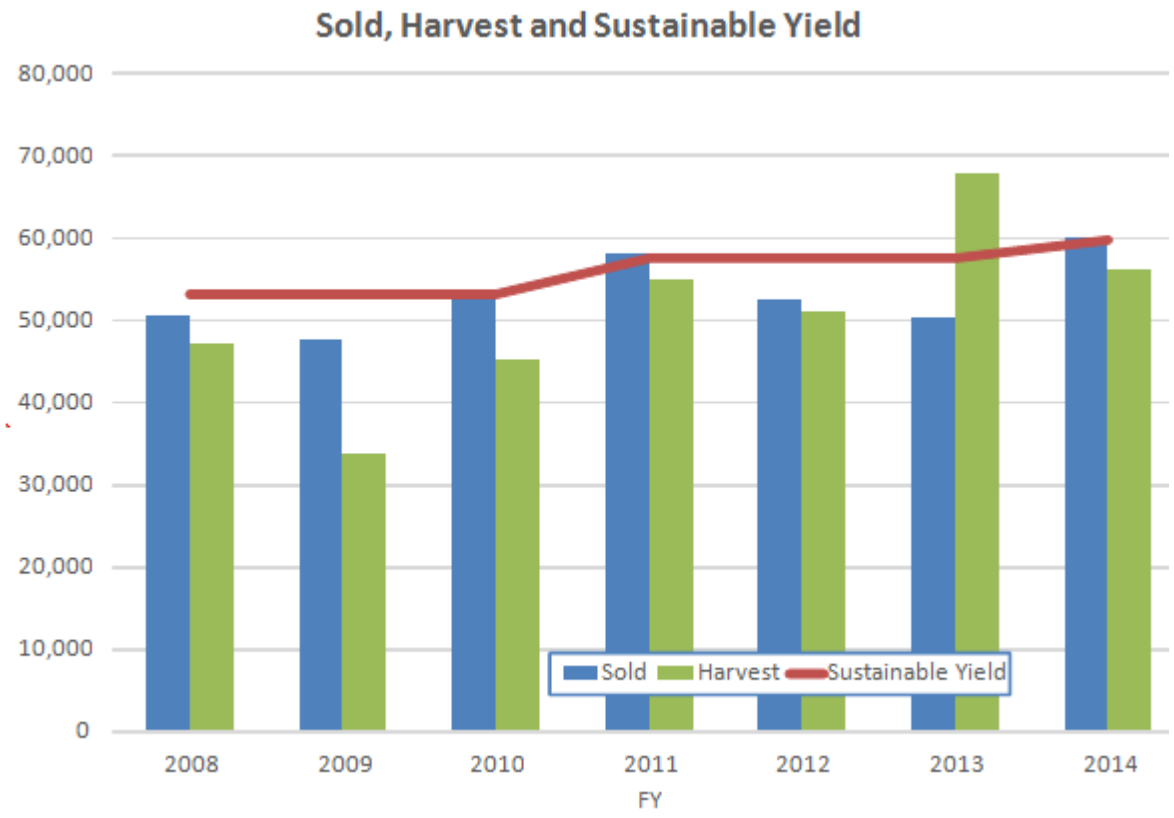

Figure 4: Volume of timber sold and harvested from state forest trust lands managed by the DNRC, and the calculated sustained yield level from those same lands.

The DNRC sells a relatively constant amount of timber volume from year to year. Given a multi-year stumpage sale contract, however, purchasers have some flexibility to decide when to harvest, and harvest volumes may vary from year to year. **Figure 4** compares sold volumes, harvest volumes and sustainable yield volumes from FY 2008 to 2014. The sustained yield volume increased over time as DNRC acquired acres from The Nature Conservancy. Sold volumes are relatively constant and differ from sustained yield levels – the DNRC's target – primarily from sales that were offered, but did not sell. Annual changes in harvest volumes reflect purchasers' decisions about when to cut the DNRC volume in their portfolios – harvest was low in 2009 during the worst part of the recession, and peaked during this period in 2013 when product markets were stronger.

Since harvest levels vary from year to year, and because stumpage values vary from sale to sale and year to year, annual harvest receipts may vary considerably from year to year, as shown in **Figure 5.** As a result, predicting annual cash flows is difficult at best. For this analysis, therefore, we project generalized cash flows and report them as estimates of annual averages. Without major modifications to the DNRC timber sale program, however, the LCCD should expect annual revenues to vary from year to year.

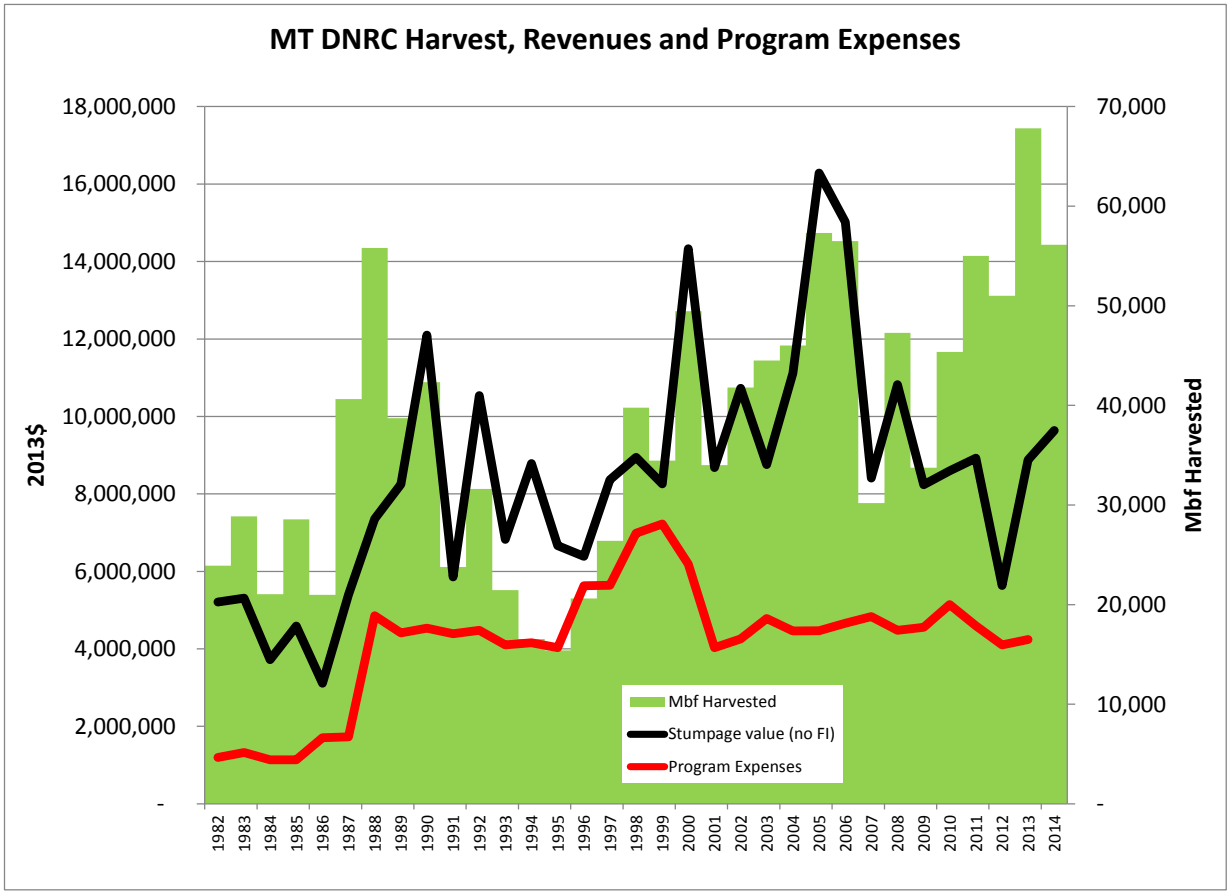

Figure 5: Harvest, revenues and costs for state forest trust lands managed by the DNRC.

Figure 6 shows revenues on a per Mbf basis (all costs and revenues have been converted to 2013$). These are statewide averages for timber harvested. Stumpage prices peaked in 1994. This was in response to the listing of the Northern Spotted Owl under the Endangered Species Act. The 1990 listing resulted in severe reductions in USFS timber sales on the West Coast, and when the economy recovered from a small recession, West Coast lumber producers for the first time were unable to respond with increased supply. As a result, lumber prices rose sharply, and log and stumpage prices followed suit. Prices softened as markets adjusted to the reductions in West Coast production. Since then, DNRC average harvest prices have bounced around between $200/Mbf and $300/Mbf in 2013$. **Figure 6** shows that like most other timber producing regions, Montana harvest prices began to slide in 2008 as the economy slipped into the Great Recession. Average harvest prices approached $100/Mbf in 2012, but have been gaining strength since then as the economy improves.

To estimate future cash flows we need to project future stumpage prices. **Figure 5** indicates that any projection must be viewed as some kind of long term average and that actual harvest prices (and volumes) will vary considerably from year to year.

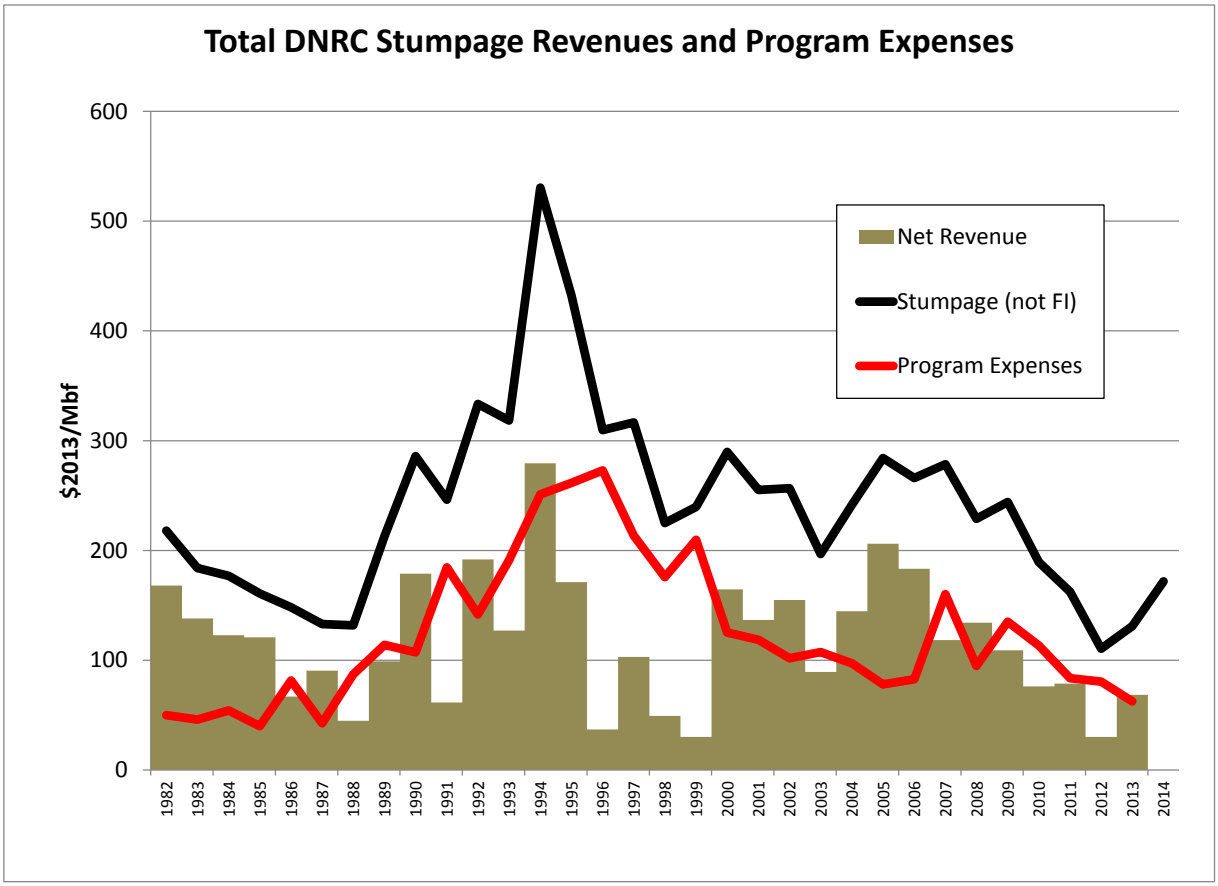

Figure 6: Annual average stumpage prices, program expenses and net revenue for state forest trust lands managed by the DNRC.

In **Figure 7** we deconstruct the DNRC averages to understand differences across geographic areas. Lake County lies in DNRC's Northwest Land Office (NWLO). According to the Swan Unit Manager, there are five or six mills within a reasonable haul distance from the Swan Valley and Swan Unit sales typically get five or six bids. **Figure 7** shows that the NWLO bid prices are typically higher than the rest of the state. But since the NWLO accounts for about two thirds of the volume, the NWLO average is only about $10/Mbf over the state average. For this analysis, we estimate that the LCCD Conservation Forest timber will sell, on average, for $250/Mbf. Bids for NWLO timber have averaged just over $200/Mbf during the last two years. Our rationale is consistent with recent timberland appraisals and briefly summarized as follows:

- We expect stumpage prices will increase as housing markets improve – US housing starts were at 0.928 million and 1.001 million in 2013 and 2014 respectively, and over the long term, housing is expected to average about 1.5 million starts.
- Canadian lumber producers, furthermore, have timber supply problems due to a long running bark beetle infestation – timber reductions are expected to be on the same magnitude as the reductions due to the listing of the Spotted Owl.
- Finally, Chinese demand for lumber and logs has put pressure on US timberlands and is expected to do so into the future.

Given the difficulties in projecting future stumpage values, we bracket our estimate with

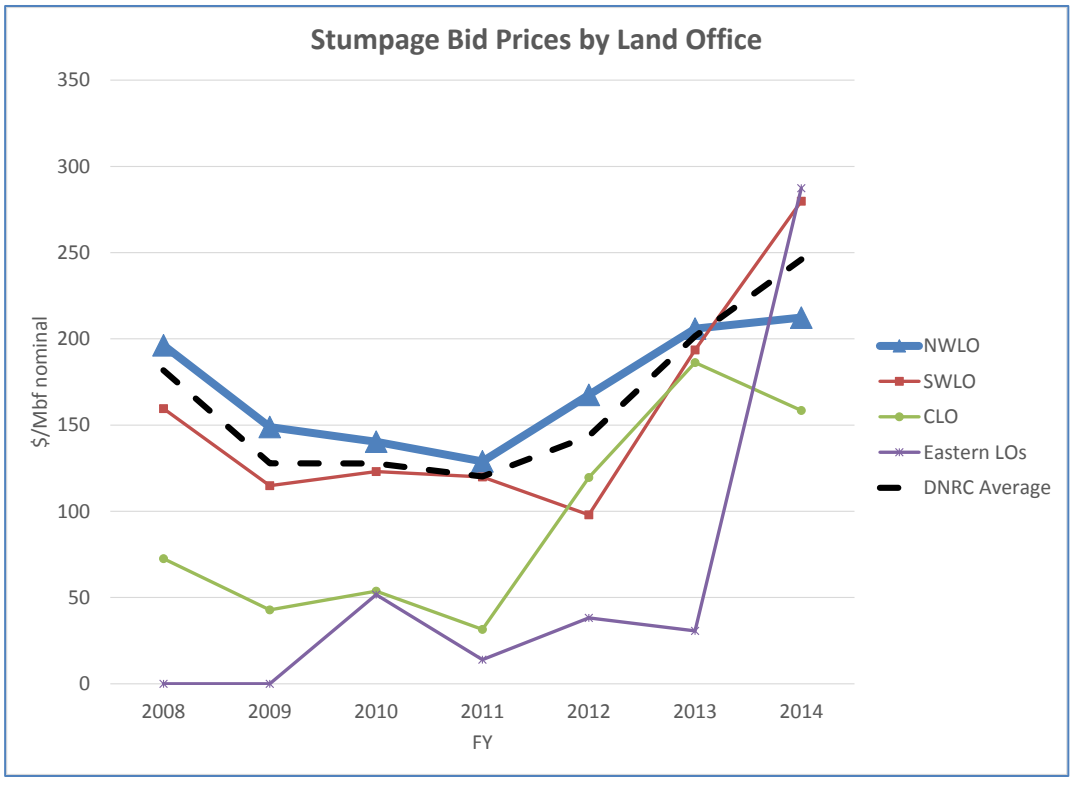

Figure 7: Stumpage bid prices for state forest trust timber sold by DNRC.

two additional estimates to test the sensitivity of our conclusions to changes in market prices. Our high price scenario is for $300/Mbf and our low price scenario is for $200/Mbf. This range generally correlates with the period after the 1994 price spike and before the Great Recession.

2. Forest improvement funds

In addition to the stumpage bid price, DNRC timber purchasers pay a forest improvement fund. These funds are used to cover the cost of reforestation and timber stand improvement. Over the last five years FIP collections in the NWLO have averaged about $30/Mbf. Over time, FIP collections and FIP expenditures should be equal, and we include both a $30/Mbf cost and revenue.

C. Management costs

Figure 5 shows that in real dollars, DNRC management costs have been remarkably constant from 2001-2013, averaging about $4.5 million annually.

For this feasibility analysis, we need an estimate of what DNRC would charge the LCCD for managing the subject property. We have not asked DNRC how it might consider such an arrangement, and we are unaware if LCCD has done so.

A land management contract could take one of many forms. MB&G manages about 150,000 acres in about 15 different properties, and our management agreements vary considerably from one client to the next. On some properties, we have a per acre charge to cover certain fixed costs and then a per Mbf cost to cover the cost of preparing, selling and administering timber sales. On other properties we have a time and materials arrangement to cover both fixed and variable costs. We are aware that some land managers simply charge a percentage of the gross revenue. Still other land managers partner with the landowner, sharing some of the profits and taking some risk of a loss. There are many models.

DNRC management cost data available to us are limited. We do not have budgets by Land Office or by Unit, nor do we have budgets by land management function. Our interview with the Swan Unit Forester, however, did provide some useful insight – about 50% of the Unit's costs are for MEPA analysis supporting timber sales.

For this analysis, therefore, we represent a DNRC management fee as a per Mbf fee, rather than a per acre fee. This approach has the advantage of showing differences across scenarios as harvest volumes change.

From 2001-2013 DNRC harvests averaged 47.6 MMbf and DNRC management costs averaged $4.51 million, giving an average of about $95/Mbf. For the purpose of this analysis, we believe it is prudent to add $10/Mbf to account for rising costs, differences in an LCCD/DNRC management agreement, additional costs that DNRC might incur for managing federal land, etc. That leaves a total cost of $105/Mbf. We view this as a conservative estimate.

1. Fire protection costs

Based on instructions from LCCD, we assume here that the subject property would face the same fire protection costs as any landowner. Under current Montana state law (MCA 76-13-201), private owners of land classified as forest land within a wildland fire protection district annually pay a $50 fee plus 30 cents for each additional acre in excess of 20 acres.

2. Roads

Based on our observations, it appears that major road systems are in place, and that future roads would be in line with DNRC NWLO historic practices. Road construction and maintenance to support timber harvest are paid for by the timber purchaser, and historic stumpage prices therefore reflect these historic costs. No adjustments are needed.

3. Reforestation

DNRC practices reforestation with natural regeneration, supplemented by planting as needed. We assume here that reforestation costs would be adequately covered by the FIP cost collections.

4. Threatened & Endangered Species (T&E species)

The subject property encompasses habitat for some species listed under the federal Endangered Species Act (ESA). The ESA requires federal agencies to participate in efforts to recover threatened and endangered species, while state and private landowners are required only to avoid take of individuals. The ESA makes provision for state or private landowners to enter into a Habitat Conservation Plan (HCP) that improves habitat conditions, and in exchange the government authorizes an incidental take permit which protects the landowner from prosecution of a take that occurs while operating under the plan. Below we discuss how we incorporated T&E species management into the calculations.

The USFWS is the lead agency in T&E species management and would have to approve using the DNRC HCP approach to managing grizzly bear and lynx in the LCCD Conservation Forest. The analysis for the DNRC's HCP did not include the proposed LCCD Conservation Forest, and it is doubtful that the USFWS would approve tiering to the DNRC HCP and extend the habitat management methods and standards agreed to for the DNRC to the LCCD Conservation Forests. Without such an agreement, we assume that the T&E species covered by the DNRC's HCP (grizzly bear, lynx, bull trout, and westslope cutthroat trout) would have to be managed using the same methodologies and standards as are currently being used by the USFS. Other T&E species habitat occurring within the Conservation Forest would also be managed using USFS methodologies and standards. We assume those methodologies and standards would not differ greatly than those applied by DNRC's Swan Unit.

Assumptions by species:

Canada Lynx and Grizzly Bear:

- A significant portion of the Conservation Forest has been classified as critical lynx habitat by the USFWS. It is likely the

growth and amount of timber harvested within critical lynx habitat will be less on a per acre per year basis than the amounts that can be achieved by DNRC on the Swan River Unit due to greater limitations on precommercial thinning (PCT) in lynx habitat and the requirement to have 70% of lynx habitat in a suitable condition.

- Forest management investments would be somewhat lower due to a reduction in the number of acres receiving PCT compared to the amount of PCT that would be conducted by DNRC.
- The requirement to maintain at least 68% of each grizzly bear subunit in grizzly bear core habitat could have substantial impacts on potential harvest levels. About 23,000 acres of USFS land in Lake County is identified as grizzly bear core and it is unlikely that much of the suitable timberland acres in core can be harvested – to do so would require replacement core acres be found elsewhere within the grizzly bear subunit that meet the road density requirements. Within the core area, roads must be closed and there can be no administrative activities (including PCT and planting). We have removed 43, 715 acres of grizzly bear core from consideration as part of the LCCD Conservation Forest.
- There is a half-mile wide buffer around the grizzly bear core area where harvest is allowed, but roads must remain closed. Stands within the buffer below an existing road could potentially be logged using cable systems. Stands within the buffer above an existing road inside or outside of the buffer could be logged using tractor skidding. For this analysis, we assume that 50% suitable acres within the buffer could be logged. We therefore removed 7,717 of unsuitable land within the buffers and 11,941 of suitable land within the buffers from our calculation of the LCCD Conservation Forest.
- Outside of grizzly bear core and buffer areas, no more than 19% of a grizzly bear subunit can have more than 1 mile/square mile of open road and no more than 19% of a grizzly bear subunit can have more than 2 mile/square mile of total road density. These limits are more restrictive than those facing DNRC and could pose logistical problems in accessing timber. We have, however, made no further reductions in our baseline sustainable yield calculations to meet these requirements. The scenarios with fewer acres found in **Table 6** can be used to estimate the impact of additional acreage withdrawals.

  Keeping the road density within the specified limits could increase costs – roads can be "reclaimed" to meet the limits by bringing the first 100 yards of a road back to contour. Road density requirements, furthermore, could result in longer skidding distances. The additional costs will result in lower bid prices. The magnitude of the reduction will vary from sale to sale and a comprehensive analysis is beyond the scope of this report. We adjust the stumpage price downward by $10/Mbf to account for this impact and believe that to be a generous allowance.

Bull Trout and Westslope Cutthroat Trout:

- To protect T&E fish species, the USFS follows INFISH standards. Limited timber management is allowed within 300' on either side of fish bearing streams, and 150' of non-fish bearing streams. These standards would impact a higher proportion of the suitable timberland in

the Conservation Forest than the proportion of manageable forest land being impacted by riparian zones in the Swan Unit. We make no additional reduction in our acreage calculations, but direct the reader to examine scenarios in **Table 6** with fewer acres to estimate the cost of wider buffers.

- INFISH has restrictive sediment standards and requires bridges and roads be built to standards to accommodate a 100 year flood. This will increase bridge building and road building costs compared to the Swan Unit by an unknown amount.

V. RESULTS

Table 6 shows the estimated annual cash flows under nine different scenarios which differ in terms of:

- **The land base available for harvest**. After removing the wilderness areas, special areas, and grizzly bear core and buffer areas, we estimate that there remains about 60,000 acres of USFS land in the eastern portion of Lake County. These should be considered "gross acres" as we have not made reductions for roads, riparian areas, non-timber inclusions, etc. To provide some idea about how sensitive the projections are to the size of the LCCD Conservation Forest, we also show calculations for 50,000 and 40,000 acres.
- **The stumpage price for timber harvested**. **Figure 6** shows that between 1999-2010, stumpage prices fluctuated between $200/Mbf and $300/Mbf in real terms. We use the midpoint of $250/Mbf as the base case and make calculations with $200/Mbf and $300/Mbf to show the relative impact of changes in stumpage prices.

Looking across the scenarios in **Table 6** shows:

1. There are positive net revenues in all scenarios. Annual net revenue range from about $0.5 million to $1.6 million.
2. DNRC management costs are less than stumpage revenues in all cases. Management costs are about 40-60% of stumpage values, which is within the expected range.
3. Price has a larger impact than acreage. Any increase or decrease on stumpage prices falls directly to the bottom line. The LCCD should anticipate some volatility in stumpage prices and anticipate fluctuations in annual income.

LCCD Analysis of Potential Cash Flow
Draft 7/25/15

Data Element	Source	Stumpage prices at $250/Mbf			Stumpage prices at $200/Mbf			Stumpage prices at $300/Mbf		
arvest Levels		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9
Gross Acres		60,000	50,000	40,000	60,000	50,000	40,000	60,000	50,000	40,000
Sustainable harvest (bf/gross ac/yr)	DNRC 2004 and 2015 SYC	150	150	150	150	150	150	150	150	150
Estimate of sustainable harvest (Mbf/yr)	Calc	9,000	7,500	6,000	9,000	7,500	6,000	9,000	7,500	6,000
ıd Revenues										
Stumpage value ($/Mbf)	Projections	$ 250.00	$ 250.00	$ 250.00	$ 200.00	$ 200.00	$ 200.00	$ 300.00	$ 300.00	$ 300.00
Road reclamation cost	Estimate	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00	$ 10.00
FI Fees collected ($/Mbf)	2008-2014 average	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00
Mangement Cost ($/Mbf)	2008-2013 average + $10/Mbf	$ 105.00	$ 105.00	$ 105.00	$ 105.00	$ 105.00	$ 105.00	$ 105.00	$ 105.00	$ 105.00
Forest investment ($/acre harvested)	Assumption	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00	$ 30.00
Fire protectioncosts ($Acre)	2015 Rate	$ 0.30	$ 0.30	$ 0.30	$ 0.30	$ 0.30	$ 0.30	$ 0.30	$ 0.30	$ 0.30
annual cash flows										
Stumpage revenue ($)		$2,160,000	$1,800,000	$1,440,000	$1,710,000	$1,425,000	$1,140,000	$2,610,000	$2,175,000	$1,740,000
FI Fees Collected ($)		$ 270,000	$ 225,000	$ 180,000	$ 270,000	$ 225,000	$ 180,000	$ 270,000	$ 225,000	$ 180,000
Land management costs		$ (945,000)	$ (787,500)	$ (630,000)	$ (945,000)	$ (787,500)	$ (630,000)	$ (945,000)	$ (787,500)	$ (630,000)
Forest investment		$ (270,000)	$ (225,000)	$ (180,000)	$ (270,000)	$ (225,000)	$ (180,000)	$ (270,000)	$ (225,000)	$ (180,000)
Fire protection costs		$ (18,050)	$ (15,050)	$ (12,050)	$ (18,050)	$ (15,050)	$ (12,050)	$ (18,050)	$ (15,050)	$ (12,050)
Net Revenue		$1,196,950	$ 997,450	$ 797,950	$ 746,950	$ 622,450	$ 497,950	$1,646,950	$1,372,450	$1,097,950
Average Gross Revenue per gross acre		$ 36.00	$ 36.00	$ 36.00	$ 28.50	$ 28.50	$ 28.50	$ 43.50	$ 43.50	$ 43.50
DNRC Mgmt costs per gross acre		$ (15.75)	$ (15.75)	$ (15.75)	$ (15.75)	$ (15.75)	$ (15.75)	$ (15.75)	$ (15.75)	$ (15.75)
Average Net Revenue pergross acre		$ 19.95	$ 19.95	$ 19.95	$ 12.45	$ 12.45	$ 12.45	$ 27.45	$ 27.45	$ 27.45
Mgmt costs as % of stumpage		51%	51%	51%	62%	62%	62%	43%	43%	43%
Net revenue as % of gross revenue		55%	55%	55%	44%	44%	44%	63%	63%	63%

Table 6: Projected conservation forest cash flows under nine scenarios

VI. SUMMARY

In this study we estimate that a LCCD Conservation Forest could be formed from about 60,000 to 65,000 of relatively unencumbered land managed by the US Forest Service within the portion of the Swan Valley that lies within Lake County, Montana. If the LCCD Conservation Forest were managed by the Montana Department of Natural Resources and Conservation under rules, procedures and regulations that govern that agency's management of state forest trust lands, the LCCD Conservation Forest could generate about $1 million annually for the LCCD.

We also evaluated expected costs and revenues for scenarios based on different assumptions about the acres that could be available for a LCCD Conservation Forest, and different timber price scenarios. All scenarios showed a positive net revenue.

Terms and Abbreviations

Bf – board foot volume. A measure of log volume.

Cf – cubic foot volume. A measure of log volume

DBH – Diameter at Breast Height

DNRC – Montana Department of Natural Resources and Conservation

ESA – the federal Endangered Species Act

FIA – The US Department of Agriculture Forest Inventory and Analysis program

FIP – Forest Improvement Program funds collected by DNRC

Gross acres – all acres in an area, regardless of their suitability and availability for timber management

HCP – Habitat Conservation Plan

LCCD – Lake County Conservation District

MEPA – Montana Environmental Policy Act

Mbf – Thousand board feet.

MMbf – Million board feet

Mcf – Thousand cubic feet

MMcf – Million cubic feet

NEPA – National Environmental Policy Act

NWLO – DNRC's Northwest Land Office

PCT – Precommercial thinning

T&E – Species that are listed as Threatened or Endangered under the Endangered Species Act

USDA – United States Department of Agriculture

USFS – United States Forest Service