Appendix 4-G

Management-Related Discharge Sites for Individual Ownerships

This appendix describes data and analyses related to management discharge sites on individual ownerships in Upper Elk River, including Humboldt Redwood Company (HRC), Green Diamond Resource Company (GDRC) and Bureau of Land Management (BLM).

Humboldt Redwood Company

Figure 1 presents sediment loading associated with non-landslide management-related discharge sites.

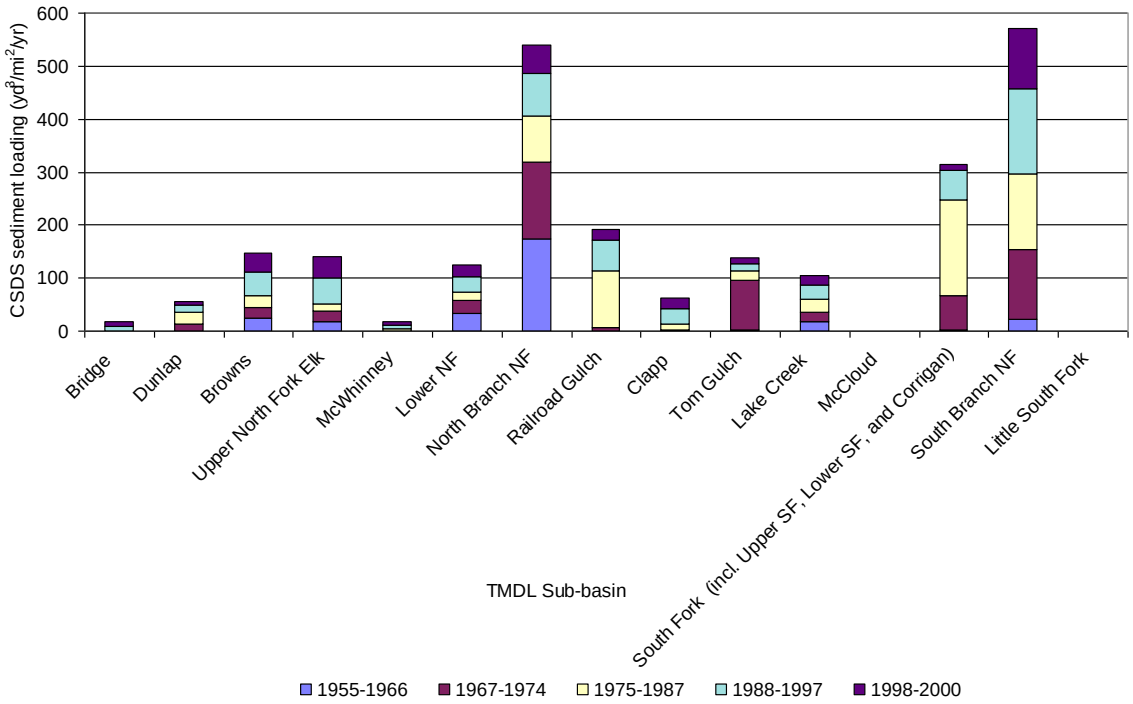


Figure 1 Past sediment delivery by subbasins from non-landslide discharge sites for analysis photo periods[1].

Future sediment delivery from discharge sites was estimated based upon data in the Cleanup and Abatement Order (CAO) Database. Figures 2 and 3 depict the number of discharge sites and the associated sediment volumes identified in each of the named subbasins owned by HRC, as well as their treatment status. Lower North Fork had the largest total volumes of delivery associated with discharge sites and Lake Creek has the largest volume of potential sediment

[1] WA Road Database and non-landslide sources in South Fork and Mainstem Elk River, PWA (2001).

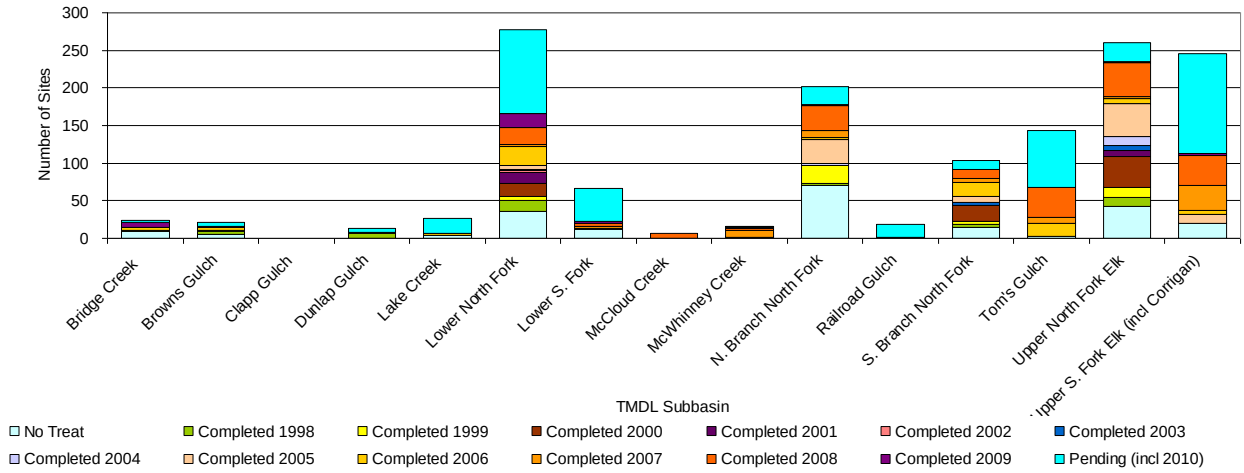


Figure 2. Number of discharge sites identified in the CAO Database[2] and their treatment status by subbasin.

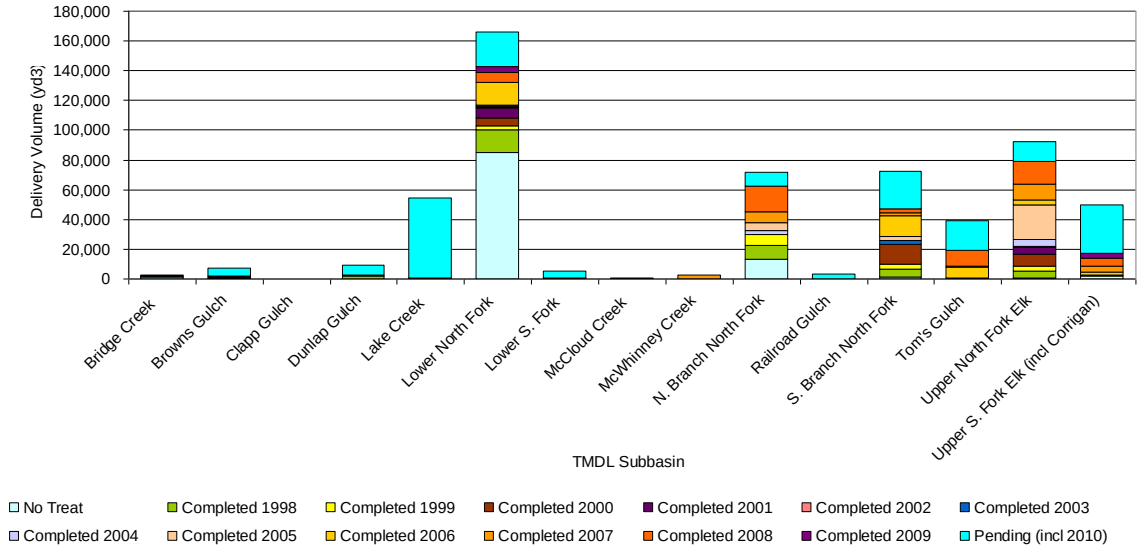


Figure 3. Volume associated with discharge sites identified in the CAO Database[40] and their treatment status by subbasin.

The estimated future delivery from the untreated discharge sites on HRC lands is depicted in Figure 4. Figure 5 shows the potential annual sediment loading from remaining untreated sites in the subject subbasins on HRC lands. These annual delivery rates were determined by amortizing the future yield across the number of years indicated by the treatment immediacy attribute. High = 5 years,

[2] HRC 2010 CAO update summary table.

High/Medium = 10 years, Medium/Not Stated = 20 years, Medium/Low = 30 years, and Low = 50 years. These data can provide useful information to inform treatment scheduling strategies.

Regional Water Board staff note a discrepancy in the data presented in the 2010 CAO Summary Table and the inventory data representing sites pending treatment. The 2010 Summary Table includes 158,060 yd^3 more volume associated with sites pending treatment than shown in the inventory data. As inventories continue to be maintained and site treatments continue, these discrepancies are likely to be resolved.

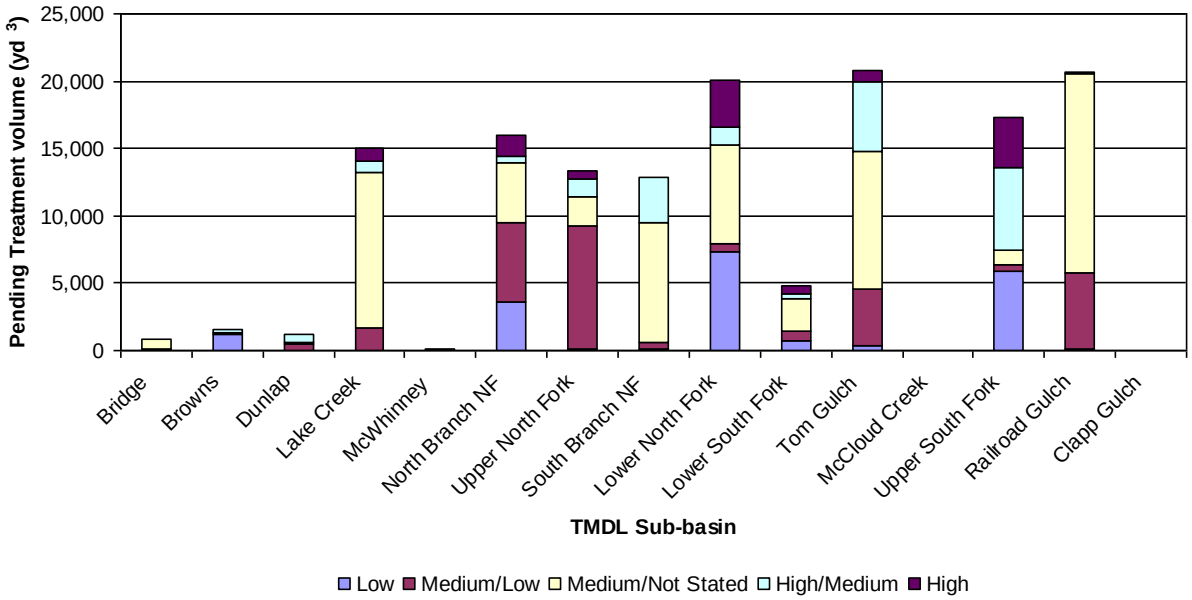
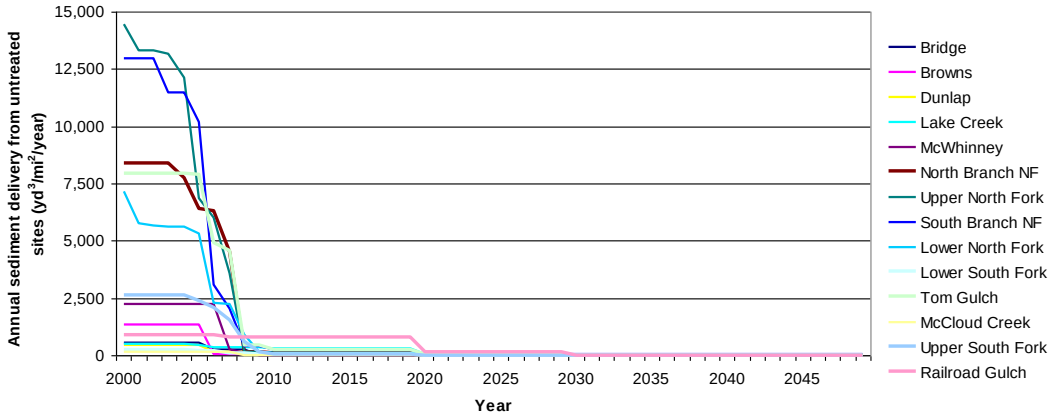


Figure 4. Future sediment delivery from untreated discharge sites, by treatment priority, for HRC lands[3].



[3] Based on 2010 CAO update inventory database. Includes sites identified as infeasible to treat in the CAO database.

Figure 5. Future annual sediment loading from remaining untreated discharge sites on HRC lands, assuming a uniform rate of annual discharge.

Due to a significant difference in the magnitude of delivery of past delivery estimates from the WA Road Database and the future delivery estimates within the CAO Database based upon treatment immediacy, Regional Water Board judge that the treatment immediacy is not reliable for loading estimates. For the purpose of the sediment source analysis, Regional Water Board staff assume that the sediment loading from sediment discharge sites from 2001-2003 were the same as from 1998-2000.

Uncertainties associated with this analysis on HRC lands include:

- Not all areas of the Upper Elk River have been fully inventoried, thus the available data are unlikely complete. Data updates will continue to occur as additional inventories are conducted and updates should be included in the CAO Database. Until a complete inventory is available, the past delivery estimates will be underestimated.
- Of the available data sources, there are inconsistencies in the included areas, number of sites, time periods, and past and future delivery attributes. HRC has attempted to rectify these differences under the ROWD Database and CAO Databases. Despite these efforts, some uncertainty remains with the past and future delivery estimates from these sites.

Green Diamond Resource Company

The past and future sediment loadings estimates are based upon the subbasin area rather than GDRC ownership within the subbasin, thus the loadings from their ownership is higher, especially in Toms Gulch and Lower South Fork where GDRC owns little of the subbasin.

Past annual sediment loading from discharge sites on GDRC lands is presented in Figure 6.

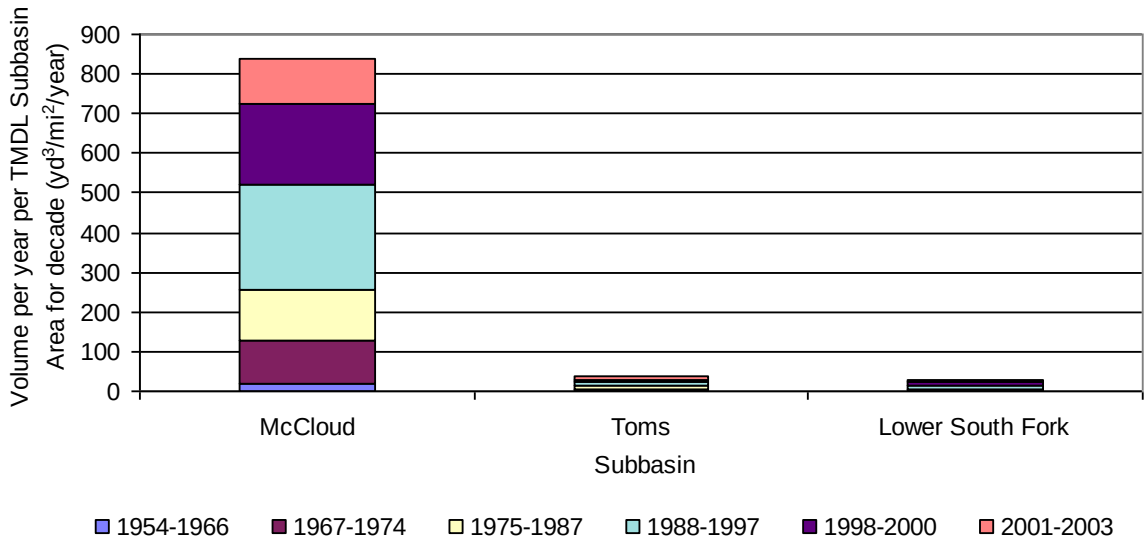


Figure 6. Annual past sediment loading from discharge sites on GDRC lands by subbasins and analysis time periods.

The estimated future sediment delivery was evaluated for sites based upon information in the GDRC Roads Inventory Database or, where no data was provided, estimates were developed as part of the sediment source analysis. Figures 7 and 8 depict the number of discharge sites and the associated sediment volumes ~~associated with sites identified in the subbasins~~, respectively, from the named subbasins in which CGRC owns property. Figure 8 also depicts the~~as well as their~~ treatment status of sediment discharge sites. Estimated~~The~~ future sediment delivery from ~~the~~ known discharge sites currently un~~that remain to be~~ treated is depicted in Figure 9. Figure 10 shows the potential annual sediment loading from remaining untreated sites in the subject subbasins on GDRC lands. As with estimates on HRC-owned land, t~~T~~hese annual delivery rates were determined by amortizing the future yield across the number of years indicated by the treatment immediacy attribute. High = 5 years, High/Medium = 10 years, Medium/Not Stated = 20 years, Medium/Low = 30 years, and Low = 50 years. These data can provide information to inform treatment scheduling strategies.

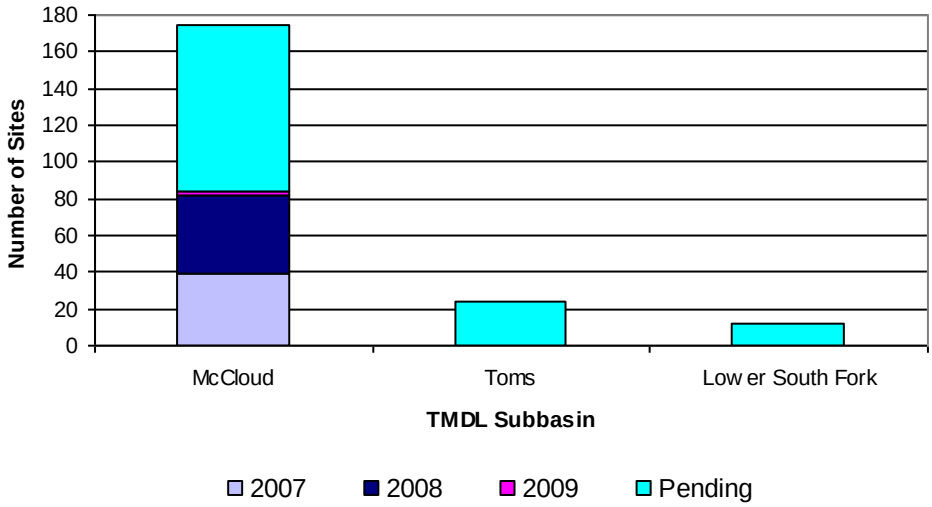


Figure 7. Number of inventoried discharge sites and treatment date for GDRC lands.

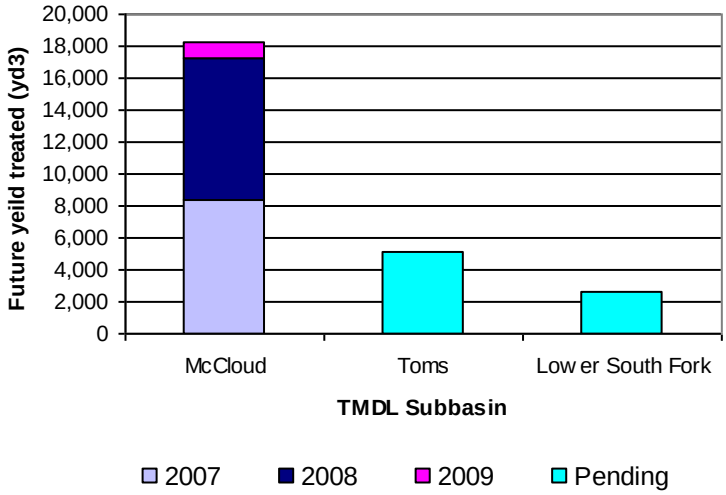


Figure 8. Volume of known discharge sites and treatment date for GDRC lands.

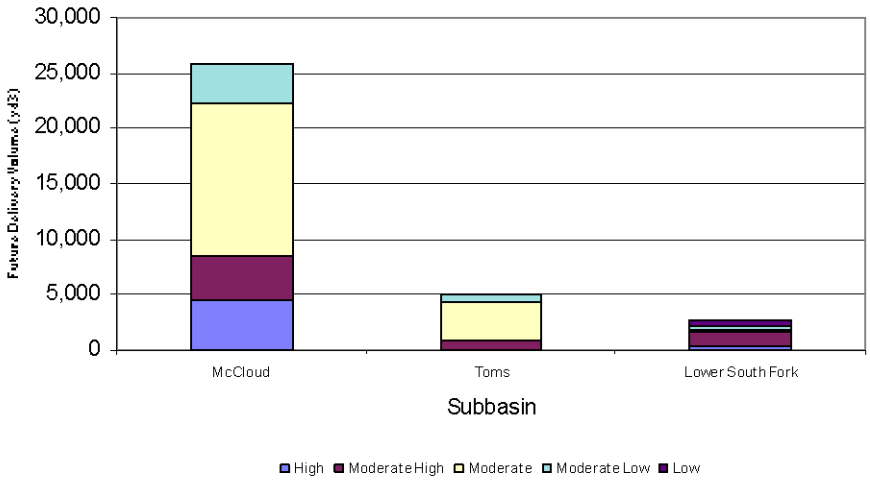


Figure 9. Future delivery from untreated discharge sites by treatment priority on GDRC lands.

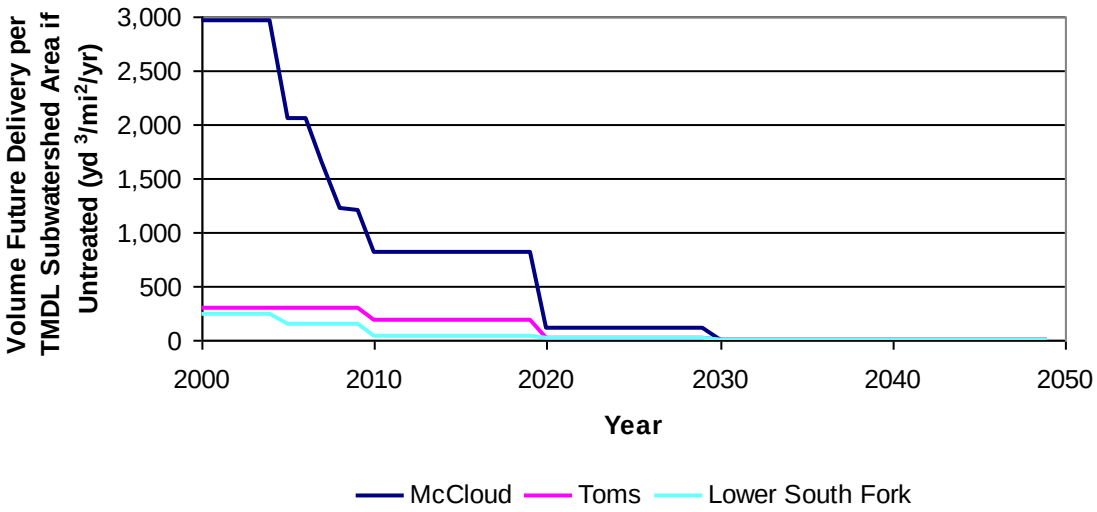


Figure 10. Future annual loading from remaining untreated sites on GDRC, assuming uniform rates of annual discharge associated with treatment priorities.

Evaluation of the results indicates a significant difference in the estimated discharge based upon the past delivery estimates (Figure 9) and future delivery estimates (Figure 10) for the same time period (2001-2003). This discrepancy highlights the uncertainty associated with the inventory delivery estimates and that treatment priority appears to be an unreasonable estimator of sediment loading.

The GDRC Road Inventory, and GDRC Master Treatment Schedule (and Annual Reports) only include sites with the potential for future delivery. Thus sites that have already discharged their entire volume and no longer have erosion potential are not quantified; this results in an underestimate of past sediment loading associated with discharge sites.

Uncertainties associated with the estimates produced for this source category include:

- The loadings are based upon the subject subbasin areas rather than GDRC ownership within the subbasin, thus the estimated loadings from their ownership is higher than actual loadings, especially in Toms Gulch and Lower South Fork.
- Assumptions about past and future delivery volumes may affect the estimates.
- There is uncertainty about the accuracy of the past and future delivery estimates.

Bureau of Land Management

The resulting past and future sediment loadings are based upon the subbasin area rather than BLM ownership within the subbasin, thus the loadings per their ownership is greater than is presented herein. Figure 11 presents the sediment loading associated with past erosion from discharge sites on BLM lands within the subject subbasins, based on the discharge site inventory data.

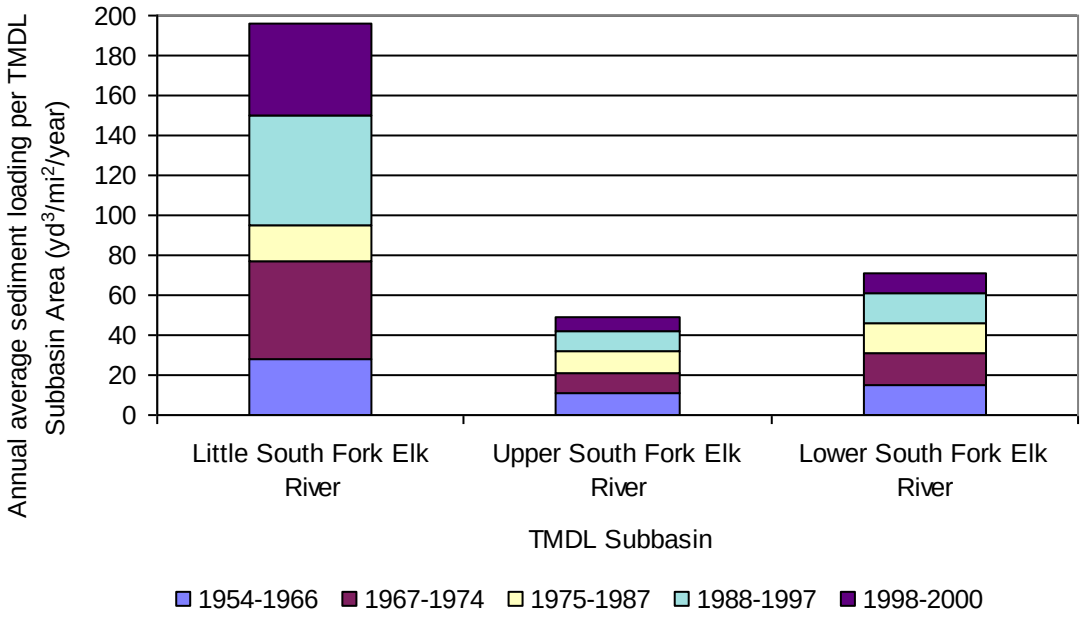


Figure 11. Sediment loading from discharge sites on BLM lands by photo periods.

Figures 12 and 13, respectively, present the number and potential delivery volume of identified discharge sites and their treatment status on BLM land by TMDL subbasin. Figure 14 presents the treatment priority associated with ~~associated with~~ identified discharge sites pending treatment. Figure 15 shows the potential annual sediment loading from remaining untreated sites in the subject subbasins on BLM lands. As with the other two ownerships, t~~T~~hese annual delivery rates were determined by amortizing the future yield across the number of years indicated by

the treatment immediacy attribute. High = 5 years, High/Medium = 10 years, Medium/Not Stated = 20 years, Medium/Low = 30 years, and Low = 50 years. These data can provide information to inform treatment scheduling strategies.

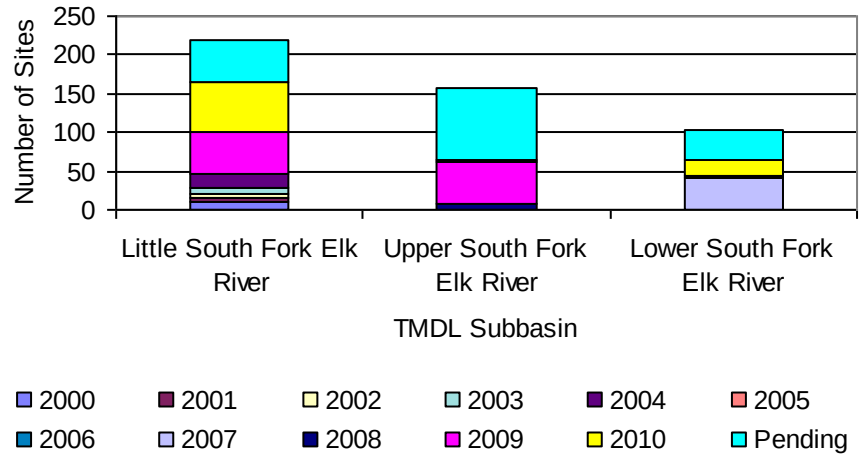


Figure 12. Number of discharge sites by treatment year for BLM lands.

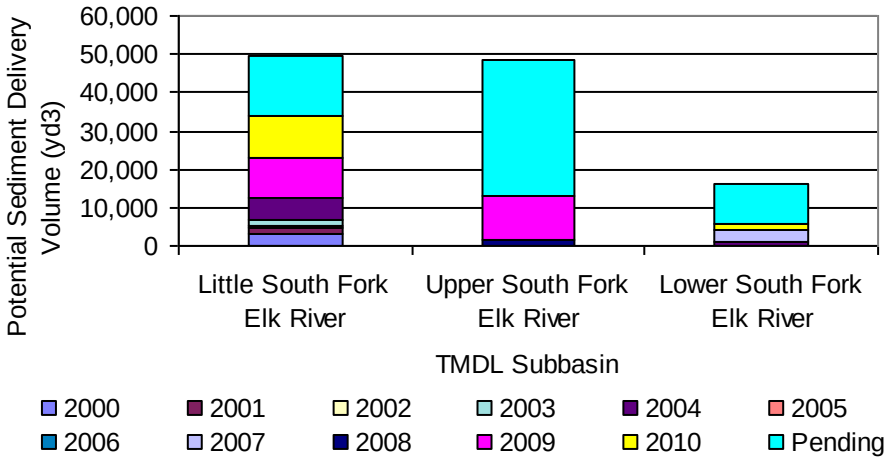


Figure 13. Future sediment volume from discharge sites by treatment year for BLM lands.

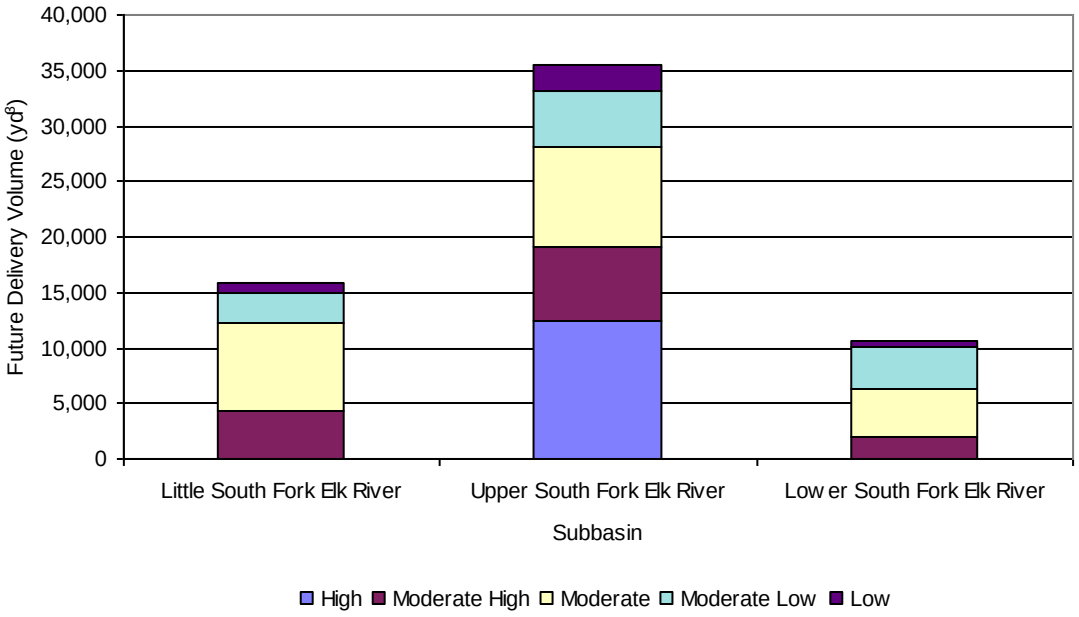


Figure 14. Future delivery from untreated discharge sites, by treatment priority for BLM Lands

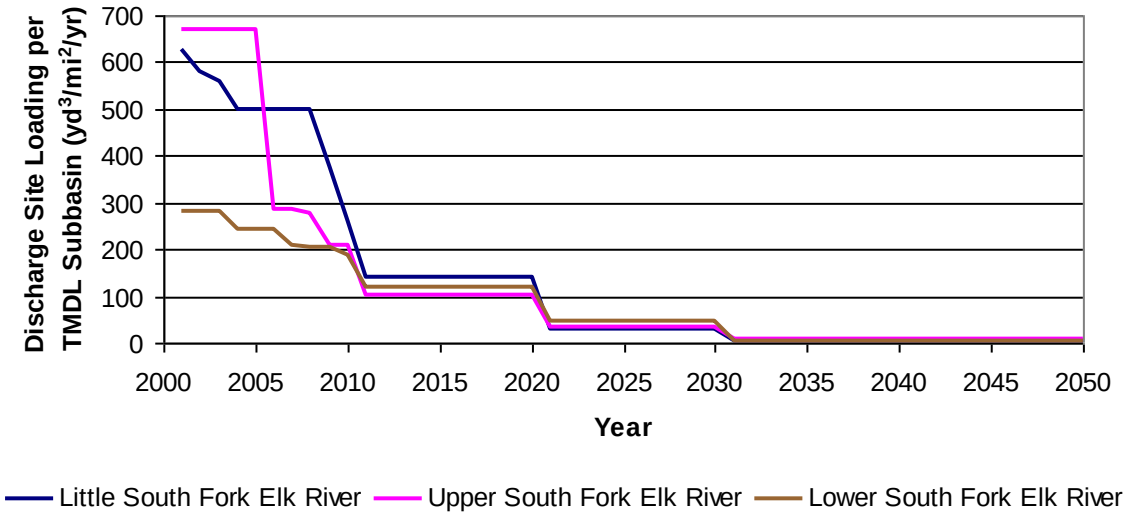


Figure 15. Estimated annual sediment loading from treated and remaining discharge sites on BLM lands, assuming a uniform rate of annual discharge associated with treatment priorities.

The site treatment priority, representing the potential time period for erosion, results in much greater loading rates (Figure 14) than the past erosion estimates based on the inventories (Figure 15). This discrepancy highlights uncertainty associated with timing of sediment delivery both based on the inventory and the site treatment priority. Additionally, this discrepancy precludes the use of the treatment priority ~~of~~ for estimating loading rates associated with the 2001-2003 time period. Rather, Regional Water Board staff has assumed, for the purpose of the sediment source analysis, the same loading rate as during the 1998-2000 analysis period.

This rate does not however reflect the treatments accomplished within that period. Additionally, the treatment priority parameter appears to be an unreasonable estimator of sediment loading.

Uncertainties associated with the discharge sites analysis on BLM lands include:

- An ownership landslide inventory has not been developed. Landslides identified on BLM lands included in the WA inventory[4] are assumed to be representative.
- The discharge site data for BLM lands lack site-specific field estimates of past delivery. The average ratio of past to future erosion volume is assumed to be representative,
- The discharge site data for BLM lands lack time period estimates of past sediment delivery. The time period for past erosion was assumed based upon staff's estimates of disturbance throughout the BLM lands.
- Lack of acreage totals owned by BLM in individual subbasins result in sediment loadings per subject subbasin lower than those specific to the BLM ownership.

[4] Palco (2004b).