# Reclamation Success in Montana (EY 2014)

According to REG-8, the Office of Surface Mining Reclamation and Enforcement (OSMRE) will evaluate and report on the effectiveness of state programs in ensuring successful reclamation on lands affected by surface coal mining operations. Success will be determined based on the number of acres that meet the bond release standards and have been released by the state. According to the Administrative Rules of Montana (ARM), phased bond release is defined as:

**Phase I** – When the permittee completes the backfilling, regrading, and drainage control of a bonded area.
**Phase II** – When the permittee has completed soil replacement and spoil and soil tillage and vegetation is establishing in accordance with the approved reclamation plan.
**Phase III** – When the revegetation criteria applicable to and consistent with the approved postmining land use is met.
**Phase IV** – The remaining portion of the bond may be released after the permittee has successfully completed all surface coal mining and reclamation activities and all disturbed lands within any designated drainage basin have been reclaimed in accordance with the Phase I, II, and III requirements.

In addition to the nationwide information reported, offices and states may conduct specific evaluations and report on individual performance standards. The information collected to measure Reclamation Success is listed below for the following areas. (Note: Montana has a four Phase bond release and in order to report Montana's bond release actions, Montana's Phase III and Phase IV bond release will be utilized in the evaluation of reclamation success).

## Land form/approximate original contour (AOC)

1.) AOC achievement is measured by the acres of Phase I bond released. Acreage disturbed by mining activities that has been released under Phase I bond liability will be documented as having achieved AOC. To date 39,953 acres have been disturbed and of that 19,497 acres (48.7%) have received Phase I bond release in Montana.

## Land Capability

There are several measurements that may be conducted to demonstrate the reestablishment of land capability on mined areas.

1.) Proper replacement of soil resources is measured by acres of Phase II bond release. Where soil replacement is a Phase II reclamation activity this measurement will be Phase II bond release. To date 39,953 acres have been disturbed and of that 13,377 acres (33.4%) have received Phase II bond release in Montana.
2.) Vegetation stability is measured by acres of Phase II bond release. Acreage released from Phase II bond liability can be documented as having achieved erosion stability.

To date 39,953 acres have been disturbed and of that 13,377 acres (33.4%) have received Phase II bond release in Montana.

3.) Achievement of postmining land uses is measured by acres of Montana Phase III bond release. Land capability is demonstrated by the acres for which the approved post mining land uses have been achieved. The acreage released from Montana Phase III bond liability can be documented as having achieved the approved post mining land uses. To date 39,953 acres have been disturbed and of that 3870 acres (9.6%) have received Montana Phase III bond release.

4.) Successful revegetation is measured by the acres of Montana Phase III bond release. Land capability is demonstrated by the acres for which revegetation success has been successfully demonstrated for the land use at the time of Montana Phase III bond release. To date 39,953 acres have been disturbed and of that 3870 acres (9.6%) have received Montana Phase III bond release.

**Hydrologic Reclamation**

There are several measurements that may be conducted to demonstrate the reestablishment of the hydrologic balance and successful hydrologic reclamation on mined areas. Phase IV bond release in Montana ensures hydrologic reclamation has occurred. It should be noted that for Phase IV bond release to occur in Montana, an entire drainage must be reclaimed to the Phase IV criteria before any final bond release can take place. For this reason, few acres of Phase IV bond release have occurred.

1.) Achievement of surface water quality and quantity restoration can be measured by acres of Montana Phase IV bond release. Surface water quality and quantity restoration may be measured in terms of acres released from bond liability. Montana Phase IV bond release will document that water quality meets surface water quality standards and water quantity is adequate for its intended use. To date 39,953 acres have been disturbed and of that 67 acres (0.16%) have received Montana Phase IV bond release.

2.) Achievement of groundwater recharge capacity and ground water quantity and quality restoration can be measured by acres of Montana Phase IV bond release. Groundwater recharge, quality and quantity will be measured in terms of acreage released from Montana Phase IV bond liability. To date 39,953 acres have been disturbed and of that 67 acres (0.16%) have received Montana Phase IV bond release.

3.) Achievement of surface water quality and quantity restoration can be measured by acres of Montana Phase IV bond release. Bond release will document that the water quality and quantity leaving the mine site meets the applicable standards. Montana Phase IV bond liability can be considered as having achieved restoration of this aspect of surface water quality and quantity. To date 39,953 acres have been disturbed and of that 67 acres (0.16%) have received Montana Phase IV bond release.

It should be noted that both State and Federal regulations do not require that a permittee file for bond release at any prescribed time. Therefore, using bond

release statistics only to evaluate reclamation success can be misleading. Typically, permittees do not file for Phase III or Phase IV bond release until completion of the entire mining operation. As a result, the number of acres released from Phase III and Phase IV bond in Montana is relatively small compared to the number of acres actually regraded, soiled, and seeded.

The OSMRE – Denver Field Division (DFD) also reviewed general trends in Montana Phase III bond release. When looking at Phase III bond release trends over the last sixteen evaluation years, the DFD totaled the acres of Phase III bond release from EY 1999 - EY 2006 (18 acres), and then totaled the acres of Phase III bond release from EY 2007 - EY 2014 (2354 acres). During the last eight evaluation years, cumulative Phase III bond release has increased from an average of 2.25 acres per year (EY 1999 - EY 2006), to an average of 294.25 acres per year (EY 2007 - EY 2014).

**Contemporaneous Reclamation**

Contemporaneous reclamation specifically refers to the timeliness in which reclamation is occurring. In Montana to date, a total of 77,426 acres have been permitted with approximately 39,953 acres (51.6%), disturbed by mining. Of those disturbed acres, approximately 20,521 acres have been backfilled, graded, soiled, and seeded; or 51.3% of the lands disturbed have been reclaimed to the point of establishing vegetation. The percentage of reclaimed vs. disturbed has steadily risen from 38% in 1999 to 51% in 2014, which reflects favorably on the Montana program. The DFD analysis shows that the State program is effective in achieving its goal of having disturbed lands reclaimed to the approved post-mining land use as contemporaneously as possible.

The standard for determining if mines are meeting their contemporaneous reclamation obligations is determined by compliance with permit commitments. This evaluation is conducted annually, and all coal mines evaluated were found to be in compliance this evaluation year.

A general measurement for contemporaneous reclamation is a comparison of the rate at which lands are being permanently reclaimed (re-graded, soiled, and seeded) to the rate of disturbance. In evaluating the rate at which disturbed lands are permanently reclaimed (re-graded, soiled, and seeded) to the rate of disturbance, the OSMRE developed the Reclamation Status Table, shown below. This table shows the database for reclamation through time for all coal mines in Montana. This file is stored on the DFD shared drive and is updated annually, as new data is supplied by the Montana Department of Environmental Quality (MT DEQ).

## Cumulative Montana Reclamation Status Table EY-1999 to Present

| RECLAMATION STATUS OF ALL AREAS DISTURBED UNDER THE PERMANENT REGULATORY PROGRAM | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| EVALUATION YEAR | Disturbed area | | Long-term mining or reclamation facilities | Active mining areas | Areas backfilled and graded | | Areas released phase I bond | | Areas soiled and seeded / planted | | Areas released phase II bond | | Areas final seeded / planted for 10 years | | Areas released Montana phase III bond | | Areas released phase IV bond | |
| | EY | Total (all years) | | | EY | Total (all years) | EY | Total (all years) | EY | Total (all years) | EY | Total (all years) | EY | Total (all years) | EY | Total (all years) | EY | Total (all years) |
| 1999 | 940 | 26899 | 6123 | 9668 | 1186 | 11110 | 1561 | 4630 | 710 | 10122 | 549 | 3996 | 158 | 4053 | 0 | 1498 | 0 | 0 |
| 2000 | 1163 | 28062 | 6086 | 9586 | 1281 | 12391 | 1068 | 5698 | 1240 | 11362 | 1879 | 5875 | 359 | 4412 | 0 | 1498 | 0 | 0 |
| 2001 | 889 | 28951 | 5890 | 10010 | 661 | 13052 | 1064 | 5939 | 848 | 12210 | 976 | 6027 | 829 | 5241 | 0 | 1498 | 0 | 0 |
| 2002 | 1142 | 30093 | 6391 | 9976 | 675 | 13727 | 1077 | 6193 | 647 | 12857 | 950 | 6154 | 483 | 5724 | 0 | 1498 | 0 | 0 |
| 2003 | 1041 | 31134 | 6483 | 10471 | 453 | 14180 | 1446 | 6816 | 424 | 13281 | 838 | 6169 | 491 | 6215 | 0 | 1498 | 0 | 0 |
| 2004 | 495 | 31629 | 6370 | 10629 | 448 | 14628 | 1048 | 7041 | 211 | 13493 | 823 | 6170 | 212 | 6428 | 0 | 1498 | 0 | 0 |
| 2005 | 964 | 32592 | 6522 | 10833 | 610 | 15239 | 1801 | 8840 | 510 | 14002 | 1215 | 7385 | 628 | 7056 | 18 | 1516 | 50 | 50 |
| 2006 | 1087 | 33679 | 6510 | 11461 | 470 | 15708 | 277 | 9116 | 430 | 14433 | 0 | 7385 | 614 | 7669 | 0 | 1516 | 0 | 50 |
| 2007 | 700 | 34379 | 6627 | 11930 | 115 | 15822 | 850 | 9966 | 596 | 15028 | 595 | 7980 | 197 | 7866 | 0 | 1516 | 0 | 50 |
| 2008 | 1024 | 35403 | 6063 | 12587 | 930 | 16752 | 3452 | 13417 | 885 | 15914 | 1789 | 9767 | 1112 | 8978 | 101 | 1617 | 0 | 50 |
| 2009 | 1093 | 36495 | 6175 | 13036 | 531 | 17284 | 1081 | 14497 | 1140 | 17054 | 866 | 10633 | 350 | 9329 | 0 | 1617 | 0 | 50 |
| 2010 | 999 | 37494 | 6410 | 13236 | 565 | 17849 | 608 | 15105 | 777 | 17831 | 429 | 11062 | 554 | 9881 | 1564 | 3181 | 17 | 67 |
| 2011 | 1079 | 38573 | 6560 | 12919 | 1244 | 19093 | 1530 | 16635 | 664 | 18494 | 1360 | 12422 | 519 | 10400 | 130 | 3311 | 0 | 67 |
| 2012 | 239 | 38812 | 6351 | 12021 | 1348 | 20441 | 913 | 17547 | 842 | 19335 | 53 | 12475 | 358 | 10759 | 574 | 3885 | 0 | 67 |
| 2013 | 1035 | 39847 | 6352 | 11430 | 1624 | 22065 | 532 | 18080 | 614 | 19949 | 85 | 12560 | 666 | 11425 | -94 | 3791 | 0 | 67 |
| 2014 | 107 | 39953 | 6401 | 11181 | 307 | 22371 | 1418 | 19497 | 572 | 20521 | 818 | 13377 | 1541 | 12966 | 79 | 3870 | 0 | 67 |

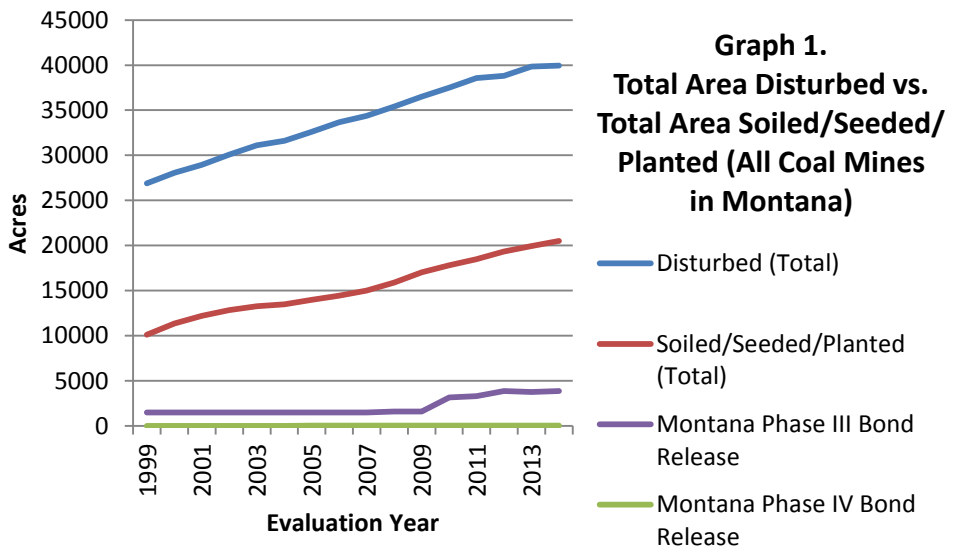
Source: Government Performance Reporting Act (GPRA) data collected from the MT DEQ. The MT DEQ reports acreage to the hundredth acre. OSMRE utilizes Microsoft Excel for data calculations. Any acreage discrepancies (+/- 1 acre) are due to acreage rounding to the nearest whole acre.

The following Chart (1) and Graph (1) were developed from the Reclamation Status Table above, and are used to show the rate at which lands are being permanently reclaimed (re-graded, soiled, and seeded) compared to the rate of disturbance. Low ratios of reclamation to disturbance indicate that reclamation is not progressing at the same rate as mining, resulting in an increasing acreage of disturbed lands. Conversely, high ratios of reclamation to disturbance indicate that reclamation is occurring faster than disturbance.

Chart 1 and Graph 1 illustrate the overall mining and reclamation activities for Montana coal mines since 1999. Note that the lines in Graph 1 are parallel to one another, indicating that the rate of permanently reclaimed (re-graded, soiled, and seeded) is progressing at the same rate as disturbance.

| Chart 1. Montana Reclamation Summary | | | | | | |
|---|---|---|---|---|---|---|
| Evaluation Year | Acres Disturbed | Cumulative Acres Disturbed | Acres Reclaimed | Cumulative Acres Reclaimed | Annual Ratio of Reclaimed vs. Disturbed | Cumulative Ratio of Reclaimed vs. Disturbed |
| 1999 | 940 | 26899 | 710 | 10122 | 0.76 | 0.38 |
| 2000 | 1163 | 28062 | 1240 | 11362 | 1.07 | 0.40 |
| 2001 | 889 | 28951 | 848 | 12210 | 0.95 | 0.42 |
| 2002 | 1142 | 30093 | 647 | 12857 | 0.57 | 0.43 |
| 2003 | 1041 | 31134 | 424 | 13281 | 0.41 | 0.43 |
| 2004 | 495 | 31629 | 211 | 13493 | 0.43 | 0.43 |
| 2005 | 964 | 32592 | 510 | 14002 | 0.53 | 0.43 |
| 2006 | 1087 | 33679 | 430 | 14433 | 0.40 | 0.43 |
| 2007 | 700 | 34379 | 596 | 15028 | 0.85 | 0.44 |
| 2008 | 1024 | 35403 | 885 | 15914 | 0.86 | 0.45 |
| 2009 | 1093 | 36495 | 1140 | 17054 | 1.04 | 0.47 |
| 2010 | 999 | 37494 | 777 | 17831 | 0.78 | 0.48 |
| 2011 | 1079 | 38573 | 664 | 18494 | 0.62 | 0.48 |
| 2012 | 239 | 38812 | 842 | 19335 | 3.52 | 0.50 |
| 2013 | 1035 | 39847 | 614 | 19949 | 0.59 | 0.50 |
| 2014 | 107 | 39953 | 572 | 20521 | 5.36 | 0.51 |

Source: Government Performance Reporting Act (GPRA) data collected from the MT DEQ. The MT DEQ reports acreage to the hundredth acre. The OSMRE utilizes Microsoft Excel for data calculations. Any acreage discrepancies (+/- 1 acre) are due to acreage rounding to the nearest whole acre.

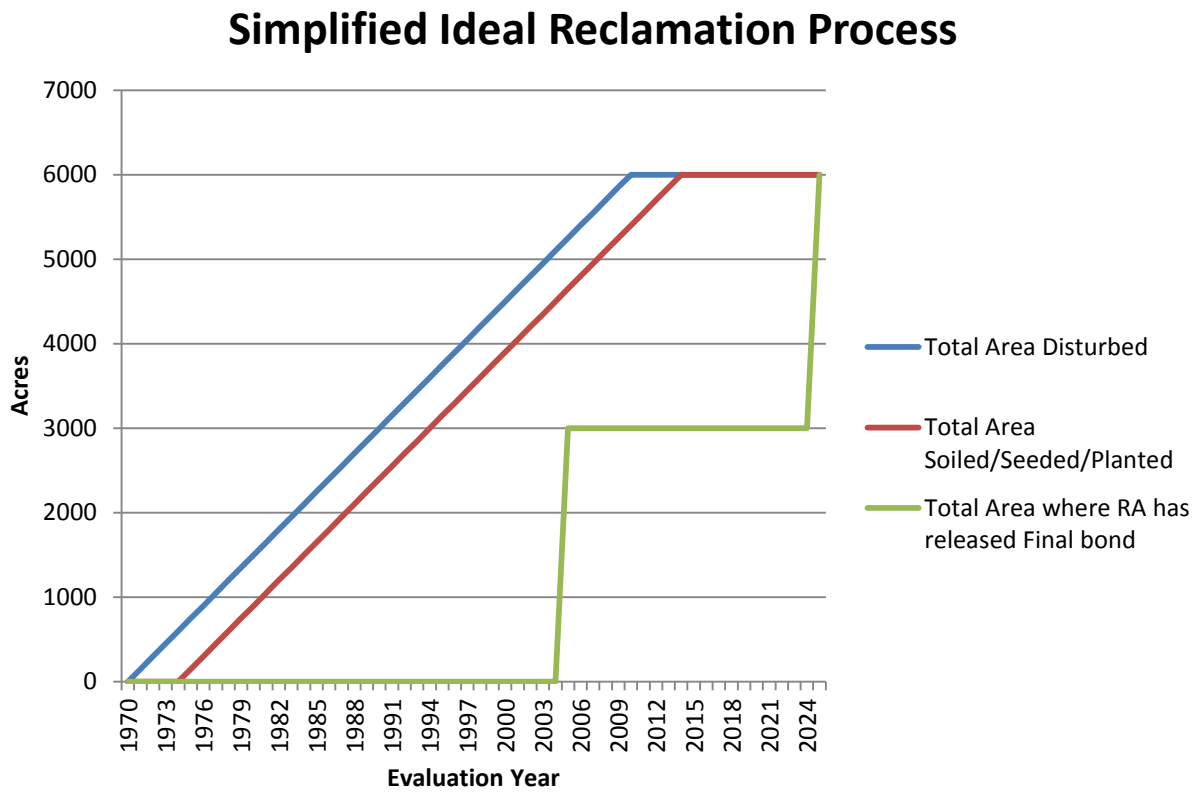



Source: Government Performance Reporting Act (GPRA) data collected from the MT DEQ. The MT DEQ reports acreage to the hundredth acre. The OSMRE utilizes Microsoft Excel for data calculations. Any acreage discrepancies (+/- 1 acre) are due to acreage rounding to the nearest whole acre.

Chart 1 provides the actual acres disturbed and reclaimed annually for all mines. In looking at the EY 2014 data, of note is the fact that more than five times the acreage was reclaimed (soiled and seeded) than was disturbed. Additionally, the cumulative ratio of reclaimed (soiled and seeded) vs. disturbed acres increased to 0.51. This ratio indicates that 51% of the cumulative acres disturbed in Montana have been reclaimed to the point of being backfilled, graded and seeded. Approximately 16% of the cumulative disturbed lands on Montana coal mines

consist of facilities, such as buildings, ponds, haul roads, soil and overburden stockpiles and other long-term disturbances. These disturbances are necessary in the operation of the mine until mining operations are completed. The total current size of all Montana coal facilities is reported as 6401 acres. When subtracting the acreage of the facilities from the cumulative disturbance, the ratio of reclamation to net disturbance is 0.61. Thus, 61% of the cumulative acres disturbed (minus coal facilities) in Montana have been reclaimed to the point of being backfilled, graded, soiled, and seeded.

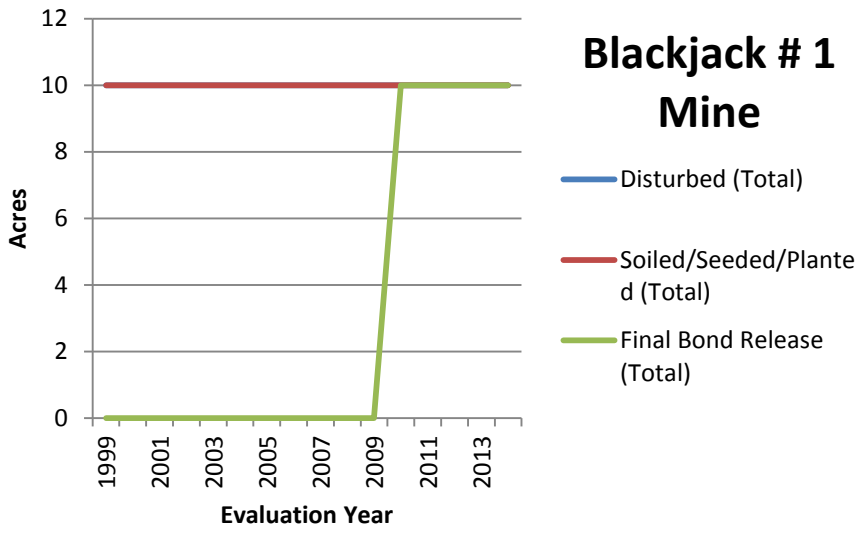
In looking at the general measurement for contemporaneous reclamation by comparing the rate at which lands are being permanently reclaimed (re-graded, soiled, and seeded) to the rate of disturbance, the DFD also developed the "simplified ideal reclamation process" graph, shown below. Ideally, the rate of reclamation should match the rate of disturbance.



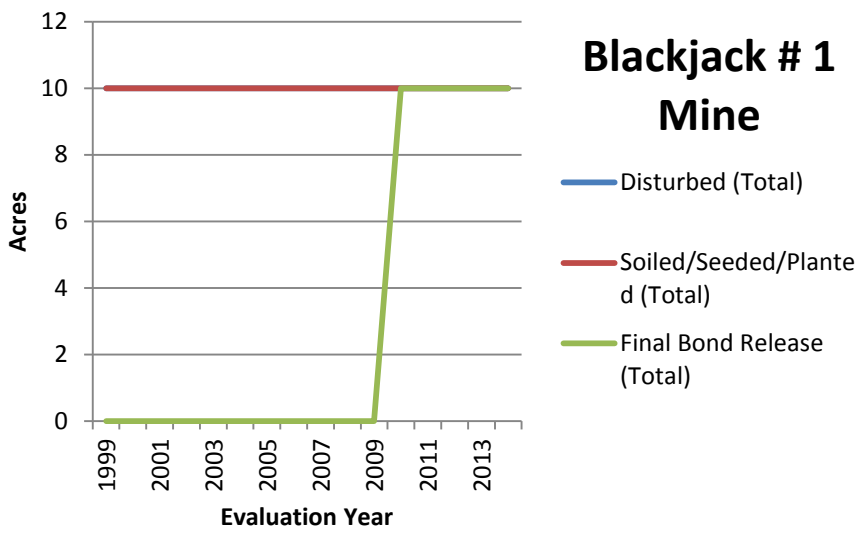

The above graph is a simple representation of the reclamation process. Disturbance, represented by the blue line, occurs when the mine begins operation. For the first couple of years, a boxcut is formed, with adjacent spoil piles. Reclamation, represented by the red line, begins several years after the start of operations, when enough spoil has accumulated to warrant backfilling, soiling, and seeding. Ideally, the red line should run parallel to the blue line. The slope (the rate of reclamation) of the red line should be equal to the slope (the rate of

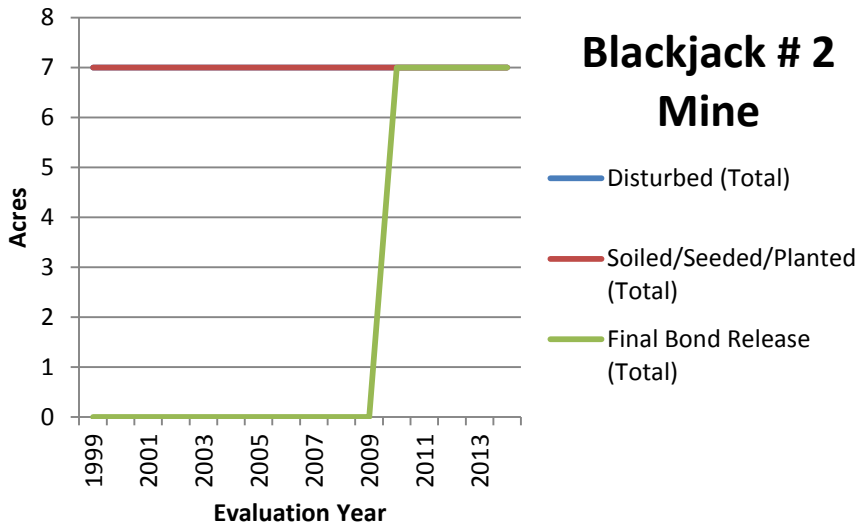
disturbance) of the blue line. The green line represents acres that achieve final bond release. A bond release package requires an investment of time and money from the permittee. A comparable amount of effort and expense is required to develop a bond release package for a small plot of land as for a large one. It is also not a requirement for permittees to achieve Phase I or II bond release incrementally, prior to achieving final bond release. So, it is often more cost effective for permittees to wait until large areas of land are eligible for release until developing and submitting a bond release application. And those applications often bypass earlier incremental bond releases and attempt to qualify for Final bond release in one application package. As a result, bond release can be an inaccurate measure of actual reclamation activities.

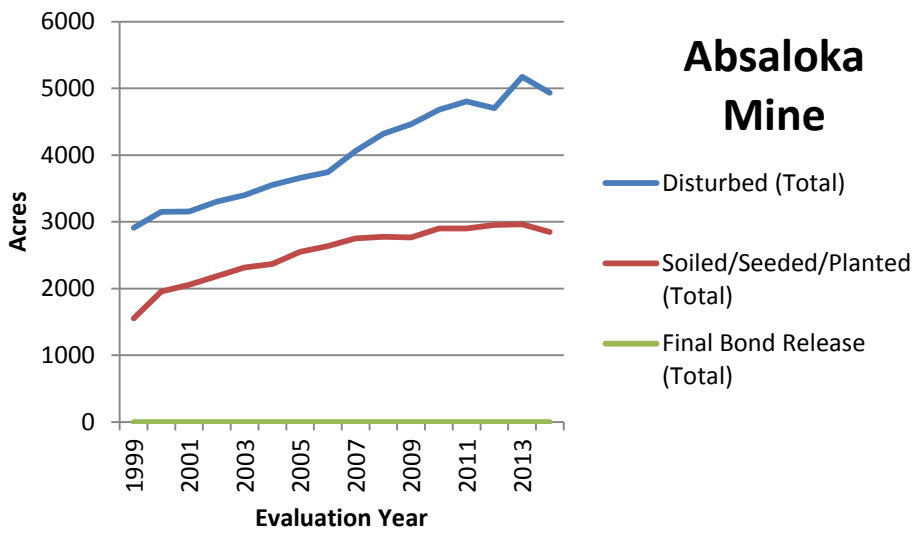
This tendency for final bond release to occur in large blocks of acreage is demonstrated by the graph below. The graph below shows the reclamation plot for the Blackjack I Mine. The Blackjack I Mine has neither disturbed nor reclaimed any acreage since 1999 (when the DFD began consistent collection of this data); however, it achieved final bond release during EY 2010. Note how final bond release was not achieved until 2010, and that goal was reached in one large block of acreage.



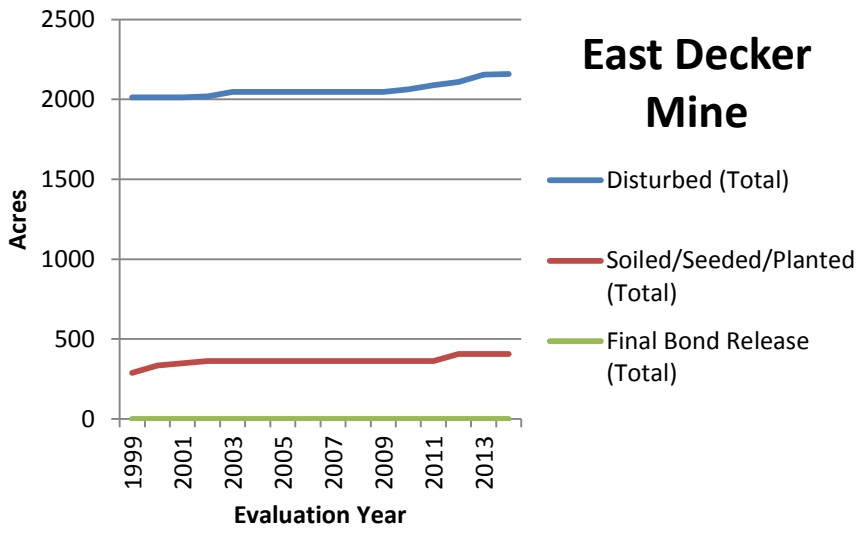

Currently in Montana, there are eight active surface mine permits, one active underground mining permit, four inactive surface mine permits, and two surface mine permits in the final stages of reclamation. The following graphs demonstrate the degree to which each individual mine is contemporaneously conducting reclamation activities.

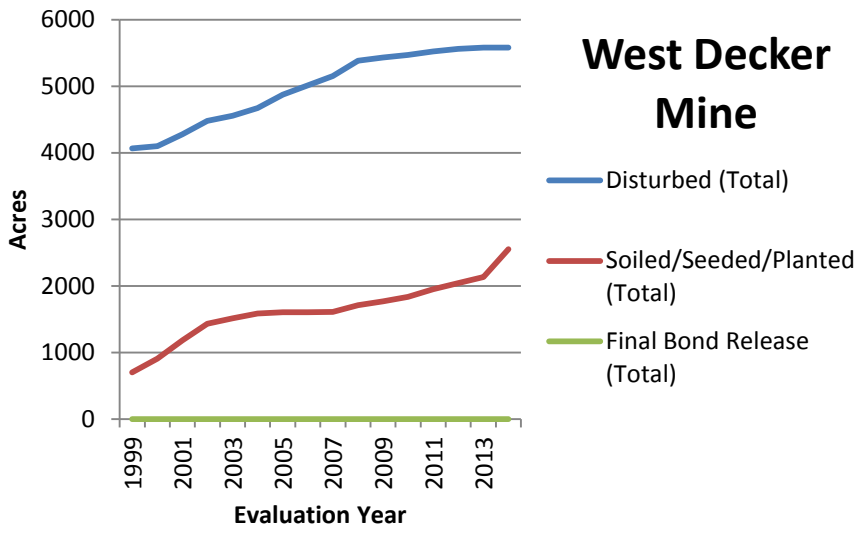

Blackjack # 1 Mine
Acres
12
10
8
6
4
2
0
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)

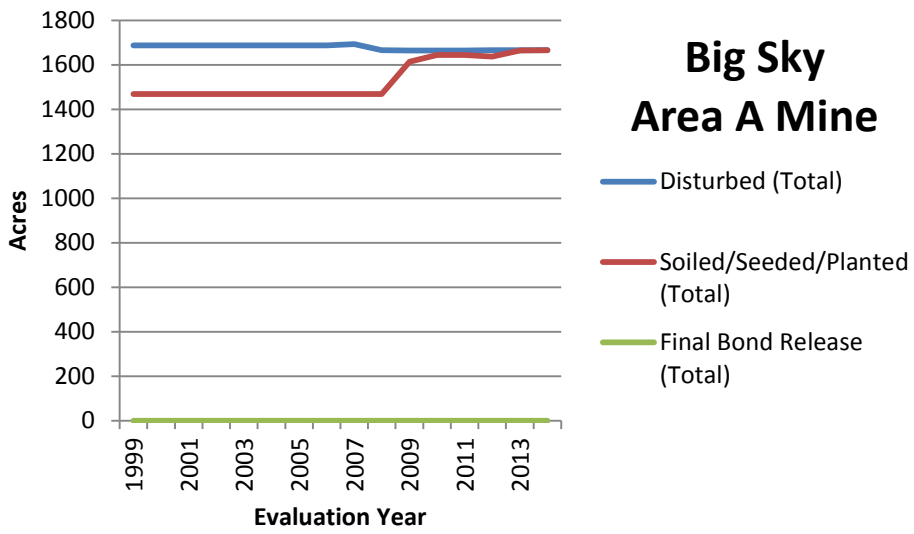

Blackjack # 2 Mine
Acres
8
7
6
5
4
3
2
1
0
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)

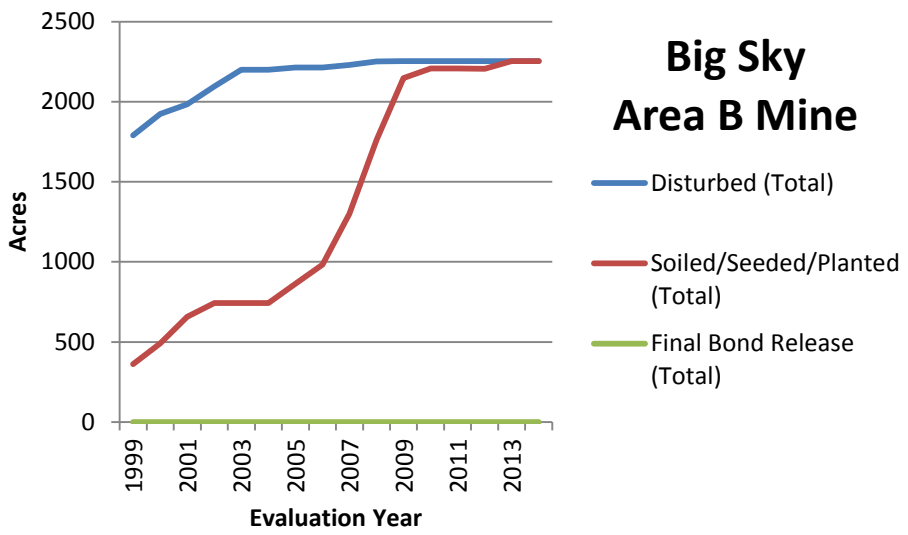


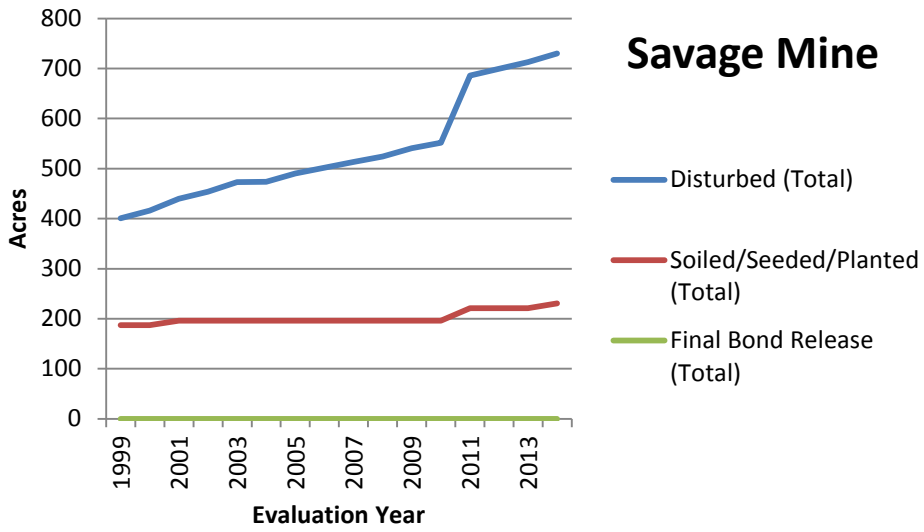

The Absaloka Mine reported a negative disturbance from EY 2011 to EY 2012 due to the re-calculation of a powerline disturbance corridor, which reduced the disturbed acreage in EY 2012 by roughly 100 acres. The Absaloka Mine also reported a negative disturbance from EY 2013 to EY 2014 due to a permittee reporting error.

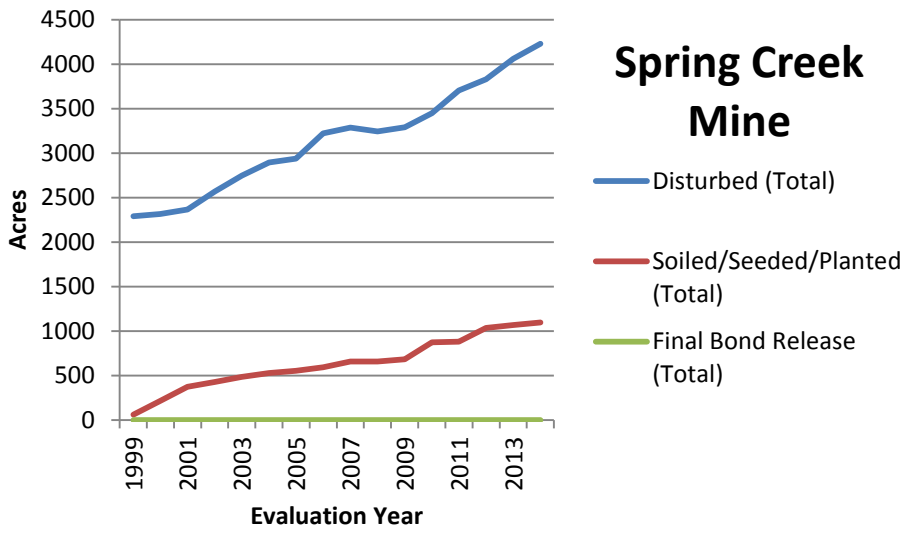


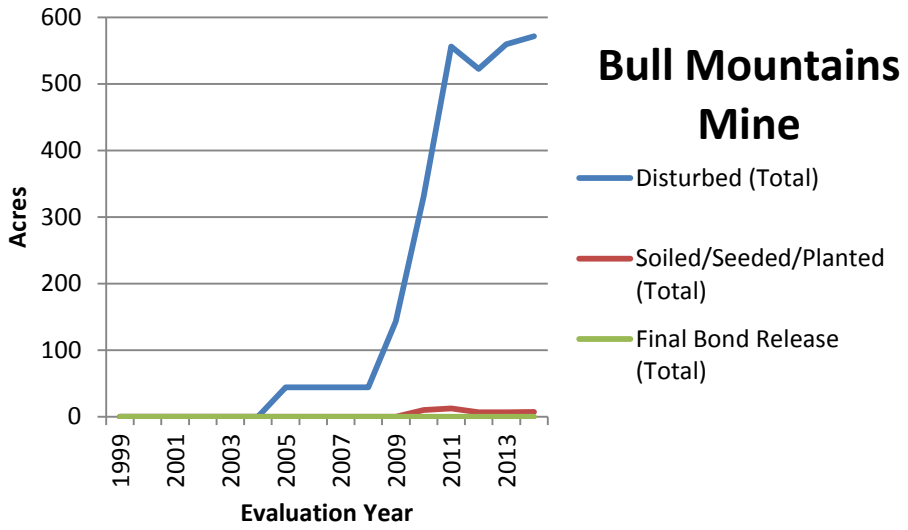

West Decker Mine
Acres
6000
5000
4000
3000
2000
1000
0
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)


Big Sky Area A Mine
Acres
1800
1600
1400
1200
1000
800
600
400
200
0
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)

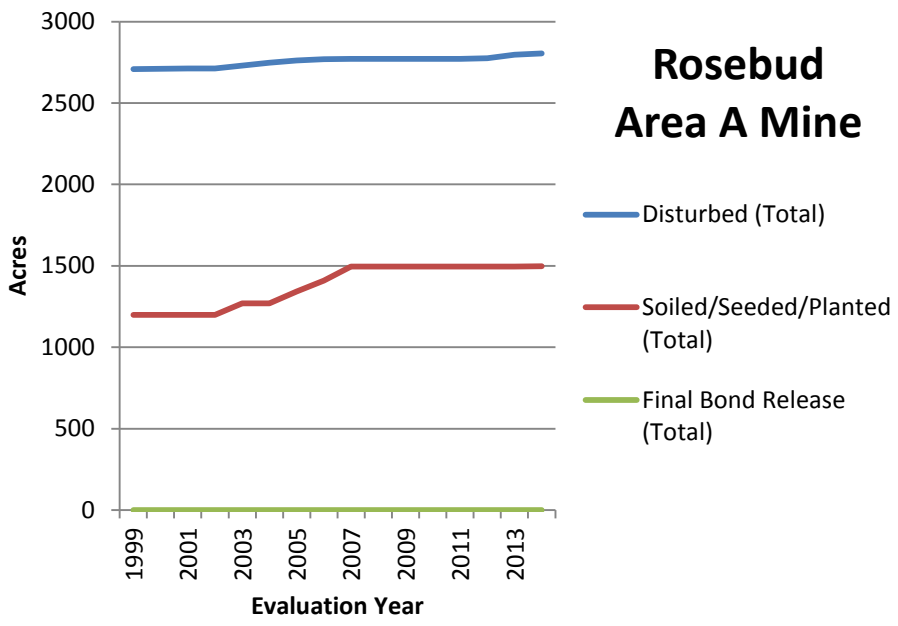

Big Sky
Area B Mine
Acres
2500
2000
1500
1000
500
0
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)

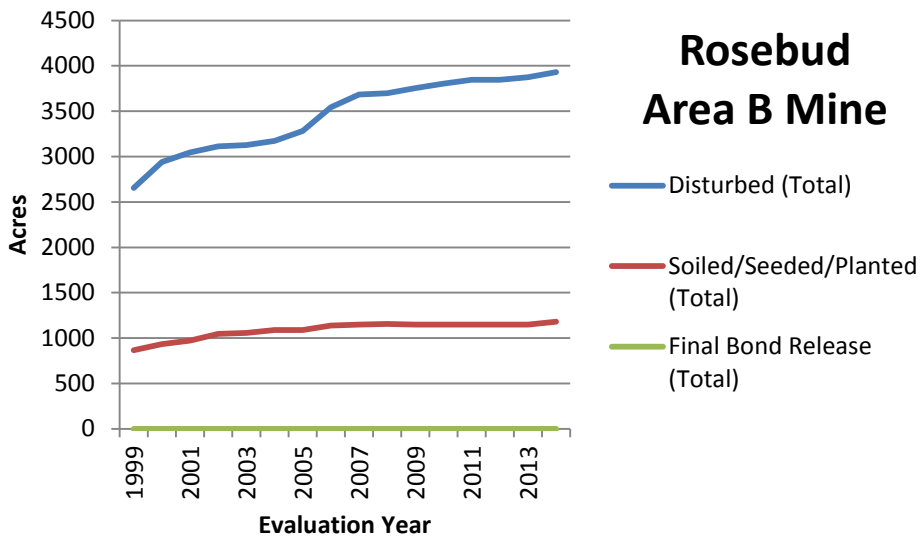

Savage Mine
Acres
800
700
600
500
400
300
200
100
0
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)

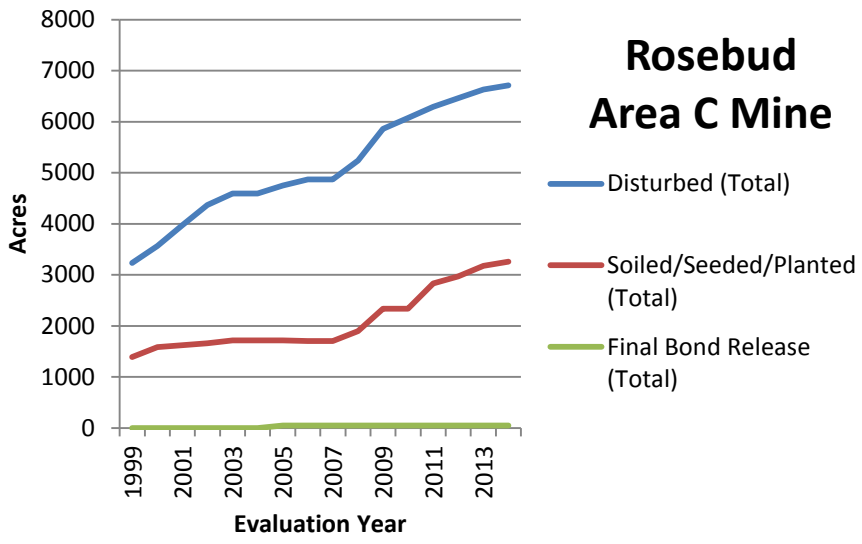


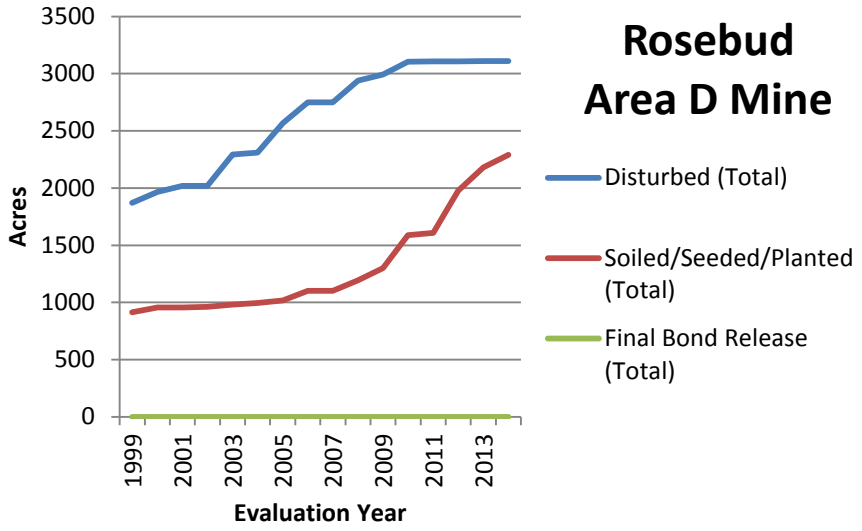



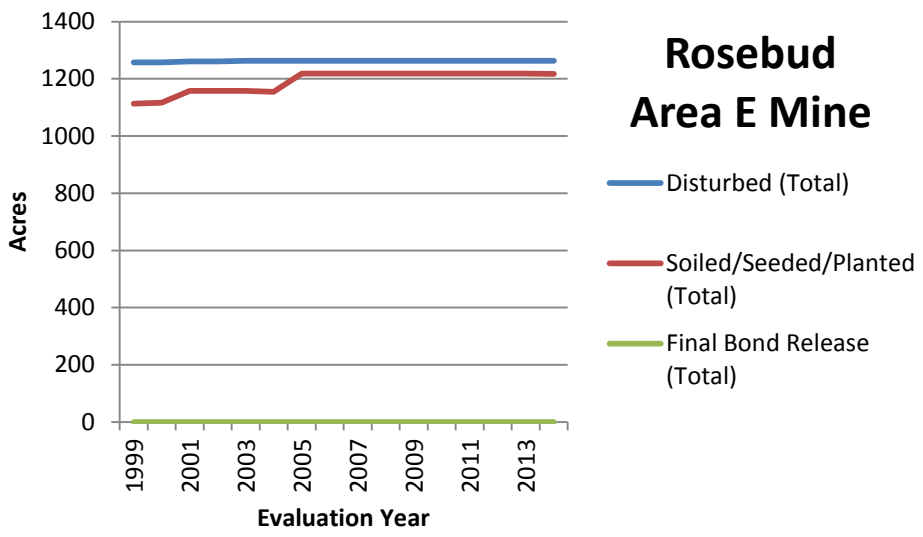

The Bull Mountain Mine is an underground mine. The Bull Mountains Mine reported a negative disturbance from EY 2011 to EY 2012 due to a permittee reporting error.


Rosebud
Area A Mine
3000
2500
2000
1500
1000
500
0
Acres
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)


Rosebud
Area B Mine
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Acres
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)


Rosebud
Area C Mine
8000
7000
6000
5000
4000
3000
2000
1000
0
Acres
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)


Rosebud
Area D Mine
3500
3000
2500
2000
1500
1000
500
0
Acres
1999
2001
2003
2005
2007
2009
2011
2013
Evaluation Year
Disturbed (Total)
Soiled/Seeded/Planted (Total)
Final Bond Release (Total)




Historically, some years have an increase in the development of new mine areas, and a resulting delay in final reclamation. This can be seen as a predictable aspect of the mining process. When mining ceases in a pit area, a large spoil area behind the final pit cannot be reclaimed as quickly as desired. This is because the spoil material must be transported and used to backfill the final pit to meet AOC requirements. This can cause a short term delay in final reclamation. However, as the spoil piles are re-graded and the final pit is properly backfilled to AOC requirements, large acreages will likely be reclaimed in future years. Likewise, as new areas are developed, several pits must be mined before a large enough area is available to move and re-grade boxcut spoils to ensure the AOC requirements are met. Once enough boxcut spoils have been placed in their final location to meet AOC requirements, large areas become available for soil re-spreading and seeding.

Of note is the fact that the MT-DEQ uses a *four* phase bond release system. Since the inception of Montana's coal regulatory program, only a small percentage of reclamation has qualified for final (Phase IV) bond release. This fact has been misconstrued as being the result of poor reclamation or lack of contemporaneous reclamation. However, the quality of reclamation and/or the ability to support the post-mine land use has never been the limiting factor for final bond release. Rather, it is Montana's Phase IV regulations, requiring that "all disturbed lands within any designated drainage basin [be] reclaimed in accordance with the Phase I, II, and III requirements," that have limited final bond release. The ramifications of this requirement are compounded by the fact that facilities – such as haul roads – required to support mining and/or reclamation activities in adjacent areas through the life of mining operations, often cut across drainages. Until such facilities are fully reclaimed, and have met the requirements of Phase I, II, and III, the entire drainage cannot achieve final (Phase IV) bond release. The

DFD will continue to report reclamation success and inventory the status of disturbed lands for future reports.