SECTION 10: Effects of Mine Subsidence on Wetlands

10.A – Overview

PADEP tasked the University with assessing the impact of subsidence on wetlands. Specifically, the University reports on the acreage of wetlands undermined, the change in wetland acreage following mining, the change in wetland types, and wetland mitigation projects active during the 5th assessment.

10.B –Undermined Wetland Acreage

10.B.1 – Methods

The University's scope of work included a determination of wetlands acreage undermined during the 5th assessment (Appendix L). The determination could not be fully accomplished due to incomplete data availability to the University. The most complete source of wetland information in the PADEP records was found in the permit files. Pre-mining wetland surveys are completed as part of the original permit application over the area the operator intends to mine. Alternatively, pre-mining wetland surveys can also be done as part of an expansion permit for a pre-existing mine. Permit renewal applications are then submitted every five years. These renewals include post-mining wetland survey data for the area undermined during that five-year period. The submission date of renewal applications depends on the date of the original mining permit, so each mine is on its own five-year renewal schedule. The renewal schedules are not coordinated with the five-year assessment periods. Thus, not all of the wetlands undermined during the 5th assessment are associated with a renewal application. Harvey Mine and Tunnel Ridge Mine did not reach the fifth year of their permits during the 5th assessment period and therefore have not yet submitted a permit renewal. As a result, the University gathered all pre-mining wetland data for these two mines from their original permit applications.

The data found in the permit files pertain to mining that overlaps the 4th and 5th assessment periods, and thus include wetland surveys for a combination of wetlands undermined during portions of the 4th assessment and 5th assessment period. To determine the acreage of wetlands undermined solely during the whole 5th assessment period, the University relied instead on environmental resource maps and assured the quality of these data by cross-checking with wetland information found in digital map files provided directly by some of the mine operators to improve quality assurance.

10.B.2 – Undermined Wetland Acreage During the 5th Assessment Period

During the 5th assessment period, an estimated 90.7 acres of wetland habitat were undermined by longwall mines (this includes wetlands located within the 200-ft buffer). About half of this acreage (48.6 acres) was over longwall mining, a quarter (20.5 acres) was over room-and-pillar mining, and the remaining quarter (21.6 acres) was within the 200-ft buffer surrounding the 5th assessment mining extent (Table 10-1).

Table 10-1. Acreage of wetlands undermined by longwalls during the 5th assessment period, categorized by mining method.

Mine	Undermined Wetland Acreage				
	Longwall	Room-and-Pillar	200-ft Buffer	Total without Buffer	Total
Bailey	4.04	2.53	2.35	6.57	8.92
Cumberland	9.15	1.70	2.91	10.85	13.76
Emerald	0.07	0.18	0.09	0.25	0.34
Enlow Fork	17.50	9.41	7.37	26.91	34.28
Harvey	11.10	4.29	4.35	15.39	19.74
Monongalia Co.	6.73	2.20	3.60	8.93	12.53
Tunnel Ridge	0.00	0.20	0.88	0.20	1.08
Total	**48.59**	**20.51**	**21.55**	**69.10**	**90.65**

10.C – Change in Wetland Acreage and Type Following Mining

Pre- and post-mining wetland acreages for all longwall mines are summarized in Table 10-2. As in the 4th assessment report (Tonsor et al. 2014), data are from the most recent permit renewal for each mine and therefore represent *a* five-year period rather than the 5th assessment five-year period *per se*. Two mines have yet to submit a permit renewal, so no post-mining wetland survey information has been submitted to PADEP, and their pre-mining wetland information was gathered from original permit applications. Only one mine experienced wetland losses. In this case the 27.2 acres of wetlands lost represented 25 % of the pre-mining wetland acreage. For maps and detailed tables listing individual wetland acreages and types, see Appendix J.

Table 10-2. Pre- and post-mining wetland acreage summary for all longwall mines. Data are from the most recent permit renewal or the original permit application for each mine.

Mine	Wetland Acreage		
	Pre-mining	Post-mining	Change
Bailey	6.167	6.46	**+0.293**
Cumberland	6.939	14.738	**+7.799**
Emerald	4.254	11.325	**+7.071**
Enlow Fork	108.996	81.771	**-27.225**
Harvey	24.6724	no data	no data
Monongalia Co.	9.394	16.98	**+7.586**
Tunnel Ridge	5.62	no data	no data

10.D – Wetland Mitigation during the 5th Assessment

Mitigation action is required by the mine operator when net loss of wetland habitat due to subsidence exceeds 0.05 acres (PADEP pers. comm. 21 March 2019). Any wetland losses between 0.05 acres and 0.5 acres give the operator the option to contribute to the Pennsylvania Wetlands Replacement project fund or create a wetland of equivalent size (PADEP 1996). Otherwise the lost wetland acreage must be replaced by the operator. Cumberland Mine was the only mine with active subsidence-related wetland mitigation during the 5th assessment period. This was due to 4.84 acres of wetland losses experienced prior to the 5th assessment. Cumberland's wetland mitigation efforts are located at two sites, Dutch Run and Whiteley Creek.

10.D.1 – Methods

Information regarding the progress of wetland mitigation projects during the 5th assessment comes from monitoring reports submitted by the operator every six months for the first two years, and yearly for years three through five following completion of the mitigation project. Only a three-year monitoring report and addendum for the Whiteley Creek mitigation project and a five-year report for the Dutch Run mitigation project were provided to the University.

10.D.2 – Dutch Run

The Dutch Run project was in its early stages when the 4th report was written, with the first wetland plantings taking place in April 2013 on the 2.22-acre site. The project was split into three wetland cells. In March 2019, after the end of the 5th assessment period, a five-year monitoring report was submitted to PADEP which covered monitoring activities from 2014, 2015, 2016, and 2018. Monitoring did not take place in 2017 "as options to address the identified deficiencies and conceptual plans were evaluated" (Wallace & Pancher 2019).

Results from the year one monitoring survey conducted in November 2014 revealed that the three cells possessed all three wetland criteria (wetland hydrology, hydric soil, and hydrophytic vegetation). A mixture of upland and wetland herbaceous vegetation provided dense ground cover over much of the mitigation site, with mature hydrophytic trees showing no signs of being negatively impacted by the construction.

Year two monitoring conducted in October 2015 revealed a vegetative community that was transitioning from a mixture of upland and wetland species to facultative and obligate wetland plant species. The three cells continued to maintain all wetland criteria. Year three monitoring conducted in August 2016 yielded similar results as year two, with the continued progression of the vegetative community to wetland species. No monitoring was conducted in year four (2017), but year five monitoring conducted in October 2018 showed progression of the wetland cells with all three gaining at least one hydrologic indicator. Comparison photos of Wetland Cell 1 from year one to year five can be found in Figure 10-1.

The report concludes that the Dutch Run mitigation project was successful in creating 0.96 acres of PEM and PSS wetland habitat. However, the original project plan proposed to create 2.22 acres of wetland habitat. The remaining 1.26 acres were to be created by expanding an existing wetland at the project site, DR-27. Grading at this site was not done according to plan, however, and plantings did not take place. A field investigation conducted in 2016 determined that the DR-27 expansion site did not exhibit any wetland characteristics and any wetland construction would ultimately fail, so this project will not be implemented. Combined with the wetland acreage created at the Whiteley Creek site, 0.56 acres of additional wetland habitat still need to be created to offset wetland losses over Cumberland Mine. This five-year report also includes an action plan for creating this additional wetland acreage, which involves expanding a different pre-existing wetland. Plans are currently being developed, and construction may begin as early as late 2019 pending approval by PADEP.

Figure 10-1. Wetland Cell 1 of the Dutch Run mitigation area photographed during year one monitoring in 2014 (left) and during year five monitoring in 2018 (right). Photos from Wallace and Pancher.

10.D.3 – Whiteley Creek

For the Whiteley Creek wetland mitigation project, a 4.28-acre site in the floodplain of Whiteley Creek was chosen. The permit had been approved by the PADEP, but work had not begun by the end of the 4th assessment period. Construction was completed early in the 5th assessment period during the fall of 2013. Tree and shrub plantings followed in late 2013. Annual monitoring was performed at Year 1 (2014), Year 2 (2015), and Year 3 (2016). A three-year monitoring report was then submitted to PADEP in September 2017 (Wallace & Pancher 2017). This report summarized the findings from each of the five wetland cells for Year 1-3. The report also provided corrective action recommendations for each of the five cells as there were deficiencies in one or more of three wetland criteria: wetland hydrology, hydric soil, and hydrophytic vegetation.

Results from the Year 1 monitoring survey conducted in 2014 indicated that 4 of 5 cells were covered with a mix of wetland and upland vegetation. Cell 2 (Figure 10-2) was only sparsely

vegetated with upland plant species. It was determined that Cells 1 and 3 did not meet the criterion for hydrology, and Cells 1 and 4 did not meet the criterion for hydric soils. Following this survey, Cells 2 and 3 were re-excavated and replanted in order to improve hydrology, soil, and vegetation.

Results from the Year 2 monitoring survey conducted in 2015 were very similar to that of Year 1, and the report suggested that improvements to the newly excavated Cells 2 and 3 would be evident in future surveys.

Results from the Year 3 monitoring survey conducted in 2016 were more detailed, and outlined the deficiencies found in each of the five cells. The Whiteley Creek wetland mitigation project was reported as 60 % successful, and therefore the remaining 40 % of the project area would need corrective action. The final section of the report provided specific recommendations for such corrective action within each of the five wetland cells. For all five cells, it was recommended that 1) any upland vegetation be removed, 2) portions of the cells either be excavated to a lower elevation in order to better intercept groundwater from adjacent areas or backfilled to prevent over-inundation, 3) compacted soil be loosened to a depth of 12 inches, 4) hydrophytic trees and shrubs growing within the cells should be relocated and placed back in the cells after grading, 5) soil additives be used to promote establishment of new vegetation, and 6) the cells be revegetated appropriately. Specific recommendations were also included for particular cells, such as the removal of dense cattail colonies from Cells 4 and 5, and additional measures to direct the flow of groundwater in Cells 3 and 4.

PADEP quickly granted approval for this corrective action plan to be implemented at the Whiteley Creek mitigation site and the work was completed in October and November of 2017. A follow-up report was submitted to the PADEP as an addendum to the Year 1-3 report in August 2018 (Wallace & Pancher 2018). This report contained results of an as-built survey of the repairs conducted in December 2017, which reflected the recommendations outlined above. These repairs restored an additional 1.96 acres of wetland habitat. When combined with the successful portion completed earlier, the Whiteley Creek project mitigated a total of 4.12 acres of wetland habitat. The area will continue to be monitored for success and reports will be submitted accordingly.

Figure 10-2. Wetland Cell 2 of the Whiteley Creek mitigation area photographed during year one monitoring in 2014 (left) and during year three monitoring in 2016 (right). Photographs from Wallace and Pancher reports.

10.D.4 – Enlow Fork Wetland Losses

Enlow Fork experienced wetland losses during the 5th assessment, but work has not yet begun on replacement mitigation. According to the latest pending permit renewal submitted by CONSOL to PADEP in November 2015, 11.22 acres of wetlands were lost across the E7-E23 panels and the F6-F21 panels, mined from 2002-2013. Because renewals are submitted on a five-year cycle, this renewal includes wetland surveys that were covered in previous permit renewals. The University sorted the wetland data in this latest permit renewal to include only new data since those included in the 4th assessment report, so as not to count any wetland twice. Based on this approach, Enlow Fork experienced a loss of 27.2 wetland acres in the five-year period since the previous permit renewal was submitted.

10.E – Summary

PADEP tasked the University with assessing the impact of subsidence on wetlands. Specifically, the University reports on the acreage of wetlands undermined, the change in wetland acreage following mining, the change in wetland types, and wetland mitigation projects active during the 5th assessment. Due to the permit renewal submission schedule, which is different for each mine, the University reports on impacted wetland acreage for *a* five-year period covered in each mine's most recent permit renewal, rather than the actual five-year 5th assessment reporting period.

A total of 90.7 acres of wetland were estimated to have been undermined during the 5th assessment period. Of this, 48.6 acres was over longwall panels, 20.5 acres was over room-and-pillar portions, and 21.6 acres overlaid the 200-ft buffer zones surrounding longwall mining

extents. The only longwall mine to experience wetland loss was Enlow Fork, which lost about 25 % of the total wetland acreage overlaying mined areas.

Cumberland Mine was the only mine with active wetland mitigation work related to subsidence during the 5th assessment period. Two sites totaling 4.86 acres were chosen, a site on Whiteley Creek and a site on Dutch Run. Construction began in 2013 and monitoring is ongoing.

As a result of the incomplete and inconsistent data obtained for wetlands, the University could only report limited conclusions. The University has provided recommendations in Section 12 of this report that will improve protection of wetlands impacted by subsidence due to underground coal mining.

References

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