South Branch of Blacklick Creek Stream Survey
Cambria and Blacklick Townships
Cambria County

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Introduction

The South Branch of Blacklick Creek watershed lies in Cambria and Blacklick Townships in Cambria County. The headwaters originate in Cambria Township north of the town of Ebensburg and east of the town of Colver. The confluence of the South Branch and the North Branch occurs in the town of Vintondale in Blacklick Township. These two streams then form Blacklick Creek which is a major tributary of the Conemaugh River.

Major tributaries of the South Branch include Williams Run, Stewart Run, Pergrin Run, Coal Pit Run, Bracken Run, and Shuman Run. Of these only Williams Run and Stewart Run show no signs of acid mine drainage (AMD) problems.

The entire watershed was investigated, including affected tributaries, in order to locate and characterize AMD discharges. Discharges were sampled using one 500 ml bottle and two 125 ml bottles, one fixed with hydrochloric acid and the other fixed with nitric acid. The hydrochloric acid is used to test for ferrous iron and the nitric acid is used to test for all other metals. The samples were then sent to the Department of Environmental Protection Lab in Harrisburg. The 711 sample analysis code was used which tests for pH, pH4, total alkalinity CACO3, resident total nonferrous, total hard CACO3, SO4 total, iron, ferrous iron, manganese, aluminum, and total hot acidity.

There are three main problem areas in the South Branch watershed. The area around Revloc is the first place that the South Branch is affected with AMD. Most of the AMD in this area seems to originate from the spoil piles on both sides of the creek. The next problem area is the town of Nanty Glo. The problems here are from two places, the mine dumps surrounding the town and the Webster Discharge. The last major problem area is the town of Vintondale. The main problem is Vintondale's mine dump, but it also has some other impacted areas, especially on the tributaries surrounding the town. All of these areas will be described later. There are also some isolated areas of concern throughout the watershed that will be described later as well. I broke the watershed down into six regions that are discussed in detail below.

Revloc Area to Beula Bridge

The first discharges of the watershed originate out of the mine dumps in Revloc. Discharge 485 and 486 originate out of the mine dumps on the right hand side of the creek. Both are low flow. Discharge 485 was dripping, but you could tell that it flows more by the iron staining on the ground. Discharge 486 was flowing at about 0.50 GPM, but it also seemed to flow a little higher at times. Samples were taken during drought conditions in the region during the summer and fall of 1997, which resulted in very low flow conditions during most of the sample period. Discharge 485 shows moderate levels of manganese and aluminum and high levels of acidity. Discharge 486 shows high levels of manganese, iron, and aluminum. It also contains very high levels of acidity, 298.0 mg/L.

Discharge 487 is one of the worst discharges found in the watershed. The only good thing about it is that it was relatively low flow, 3.83 GPM when sampled. You have to remember though, that this was during drought conditions in the region. The discharge originates out of the mine dumps on the left side of the stream and there is a weir in place. This discharge has extraordinarily high acidity, 4888.0 mg/L, aluminum, 664.0 mg/L, and SO4, 3600 mg/L. It also has high levels of iron, 46.20 mg/L, and moderate levels of manganese at 8.31 mg/L. This discharge is one of the worst in the watershed.

Discharge 489 originates out of the mine dumps on the right side of the stream right after the South Branch exits a railroad tunnel. Discharge 489 is also one of the worst in the watershed. It has very high levels of aluminum, 143.0 mg/L, acidity, 932.0 mg/L, and SO4, 984.0 mg/L. The bad thing about this one is the flow which was estimated at 50-100 GPM, this might be a little high since I did not have much practice at estimating flows.

Discharge 490 demonstrates water chemistry similar to the 489 and 487. This one, like 490, has a trace of iron, but aluminum, acidity, and SO4 are found in very high levels. And like 490, its flow is somewhat high at 50-100 GPM, again this might be a little high. This discharge comes out of a pipe on the right side of the creek and seems to be originating from the mine dumps.

Discharge 491 bubbles up on the left side of the stream. The flow could not be estimated. This is the first discharge, it seems, that the mine dumps do not influence. Acidity levels are very high, 286.0 mg/L. Iron and aluminum levels are quite high and manganese levels are moderately high also.

Discharge 493 also originates out of the left side of the stream. It comes out of a square cement culvert. It seems to be an old deep mine entrance. Acidity levels are high at 104.0 mg/L, and aluminum levels are moderately high at 16.10 mg/L. All other metals are very low. The flow is somewhat high at 50-100 GPM.

The next three discharges are relatively similar in nature. They have moderately high levels of iron and low levels of manganese, aluminum, and acidity. Discharge 537 has the highest iron levels of the three at 25.10 mg/L. It contains no acidity and low levels of all other metals. The flow is very low also, around 1.0 GPM. It can be found on the left side of the stream and is easily recognizable from the bright iron precipitate. There is also a seep area upstream of this discharge that was not sampled because of it's low flow. Discharge 536 has a lower iron concentration, around 2.27 mg/L. It also has no acidity and low levels of all other metals. The flow is higher at 20.0 GPM. It can be found on the left side of the stream just before a sharp right turn. Discharge 536 is the only one of these three that has acidity, 36.0 mg/L, but it also contains some alkalinity. The iron is moderately high at 11.70 mg/L. All other metals are in elevated levels, but are not very high.

All tributaries in this region are unaffected by AMD. This includes Williams Run, which is a major tributary of the South Branch. Other samples taken that did not show any AMD

include sample 488, which had low metals and no acidity, but does contain high levels of SO4, sample 492, which is almost exactly the same as sample 488, and sample 534, which is the unnamed tributary on the left upstream from the Beula bridge. Field parameters showed a high conductance (420 uS), but the water was actually of very good quality.

To examine the impact this region has on the South Branch, I took a water sample upstream from the first discharge and a sample at the Beula bridge. Sample 566 was taken under Route 422 outside of Revloc. This sample had a pH of 6.5 and also contained no acidity. The stream alkalinity was 38.0 mg/L.The iron amounted to 1.58 mg/L and the aluminum and manganese were in trace levels. Sample 533 was taken at the Beula Bridge, downstream of the Revloc discharges. The ph dropped to 4.4 and the acidity rose to 66.0 mg/L, while the alkalinity dropped to 0.0 mg/L. Iron and manganese levels were predominantly the same, but the aluminum levels rose to 11.40 mg/L. So as you can see, these discharges have a great affect on the water quality of the South Branch.

The main problem with this part of the watershed is the mine dumps. By removing these dumps, you will greatly increase the water quality of the South Branch since five of the discharges originate from the mine dumps. The other discharges might also be influenced by the mine dumps and with their removal, might help conditions here also.

Beula Bridge to Nanty Glo

This region is one of the most scenic stretches of the stream. The South Branch's water quality also improves through this region. There were only eight samples taken with only two that seem to impact the South Branch negatively. The improvement of the South Branch will be shown below after a description of the samples taken.

The first area sampled is the AMD treatment plant on the right, downstream of the Beula bridge. The discharge out of the plant greatly improves the water quality of the South Branch by pumping in water with a pH around 9.6 and alkalinity around 72.0 mg/L. It also pumps out a tremendous flow that could not be estimated. This sample is sample 500 on the spreadsheet. Raising the pH of the water allows the metals to drop out of the South Branch. You can see this immediately upon contact of the stream water and the treated water.

The only discharge of great concern is discharge 502. It is located on the right side of the stream coming out between two rocks on the bank. Its location is marked on the map. The flow was estimated at 10.0 GPM. It contains no acidity and a huge amount of alkalinity at 3910.0 mg/L. The pH is also very high at 9.7, which is very close to the pH of the AMD treatment plant which makes me believe that this is what it is from. This discharge contains one of the highest amounts of iron found in the watershed at 196.0 mg/L. It also has moderately high amounts of aluminum at 7.16 mg/L, and manganese at 7.11 mg/L. These metals though seem to drop out very quickly leaving a short, bright iron streak in the South Branch.

Discharge 503 originates on the first unnamed tributary on the left after the Beula bridge. You can see it enter the tributary right before the tributary enters the South Branch. It is also an alkaline discharge. It contains 182.0 mg/L of alkalinity and has a pH of 8.4. The metals are low in this discharge with only iron being a little above normal at almost 2.0 mg/l. This discharge does not impact the tributary it enters and this tributary does not impact the South Branch.

The next area of concern is a diverse seep area that is located upstream of where Stewart Run enters on the right. It could not be sampled because the seeps occurred underwater. The seeps do not seem to impact the South Branch that much although iron staining does occur in the sediment. There is also a small discharge located where the seeps are that contains heavy iron. The flow is very low (1.0 GPM). A sample was not taken because it was impossible to get a clean sample. Because of the low flow, it does not seem to impact the South Branch that much.

Discharge 584 originates out of a AMD treatment facility off Route 22 by the town of Mundys Corner. It treats water out of an old Beth Energy mine. The water is alkaline out of the treatment plant. It has alkalinities around 22.0 mg/L and a pH of 8.6. It also has a very high flow of around 1500 GPM. It was sampled after a heavy rain event though. It contains about 2.0 mg/L of iron and 1000 mg/L of SO4. All other metals are in low quantities. This water then has to flow approximately 1.0 mile before it impacts an unnamed tributary. Before it impacts the tributary, there are numerous seep areas that impact this discharge. Metal concentrations increase because of this. You can see this in sample 585 of the tributary downstream of the entry of the discharge. The Ph drops to 6.0 and the alkalinity decreases to 11.40 mg/L. Iron concentrations are relatively the same as the discharge, but the aluminum concentration increases from 0.50 mg/L in the discharge to 2.12 mg/L in the tributary. So you can see how these seeps impact this tributary worse than the actual discharge does.

All other tributaries are unaffected by AMD. This includes the largest tributary of the South Branch, Stewart Run. Samples 500, 501, 504, 519, and 652 also posed no threats to the South Branch. The improvement of the water quality of the South Branch through this area is great. Sample 567 was taken on the South Branch by the unnamed tributary upstream of Stewart Run on the right. There was no acidity in the sample and 64.0 mg/L of alkalinity. The pH was 7.5 and only one metal, aluminum, was higher than normal at almost 1.0 mg/L. If you compare the quality of this water to the water of the South Branch at the Beula bridge you can see how it improves and this improvement happens mostly because of the high ph, high alkalinity water being pumped in from the AMD treatment plant downstream of the Beula bridge.

The South Branch was then sampled (Sample 586) before it is impacted by the Nanty Glo mine dumps. The pH dropped to 5.9 while acidity increased to 1.20 mg/L, iron increased to 1.07 mg/L, and aluminum increased to 1.22 mg/L. This shows the influence of the seeps and the unnamed tributary that receives discharge 584 and the numerous seeps along it's length.

There are not many problems with this part of the watershed other than discharge 502, 584, and the seepage areas before Stewart Run and along the unnamed tributary that receives discharge 584. Once again, in my opinion, if you clean up the Revloc mine dumps, the South Branch should be relatively clean down to the town of Nanty Glo.

Nanty Glo Area

This is the worst section of the stream. By the time the South Branch makes it through this area, all metals increase substantially, acidity increases, alkalinity decreases, and pH also drops. There are three main problems in this area: the mine dumps before the South Branch enters Nanty Glo, the mine dumps along Pergrin Run, a minor tributary of the South Branch, and the Webster discharge which also impacts Pergrin Run. Pergrin Run, by far, is the worst AMD impacted tributary in the watershed.

The first problem I ran into walking downstream into Nanty Glo were the mine dumps on the left side of the stream. To see the influence the mine dumps had on the South Branch, I took a water sample (Sample 587) downstream of the mine dumps before Pergrin Run impacts the stream. Compared to sample 586, which was taken before the mine dumps, pH dropped from 5.9 to 5.7. The acidity concentration increased from 1.20 mg/L to 3.0 mg/L. The alkalinity dropped from 6.60 mg/L to 4.0 mg/L. Iron increased from 1.07 mg/L to 2.22 mg/L. And aluminum increased from 1.22 mg/L to 2.24 mg/L. As you can see the mine dumps have a major impact on the South Branch.

Discharge 542 originates out of a pipe at the end of the Nanty Glo mine dumps. It is not major since it's flow is low at 1.0 GPM. The pH is 6.3 and does contain 30.0 mg/L of alkalinity, but acidities run around 14.40 mg/L. Iron concentrations are at 2.13 mg/L and aluminum concentrations are at 3.12 mg/L.

Pergrin Run

The only other area of AMD problems is Pergrin Run, but it by far impacts the South Branch the greatest. This tributary was sampled on two days to get samples at low flow conditions and high flow conditions. Two upstream samples were taken. On 9/26/97, sample 588, the flow was estimated at 100 GPM and on 01/15/98, sample 649, the flow was measured using a digital flow meter at 433.30 GPM. The water quality data from 9/26/97 has no metals in elevated concentrations, but has a fair amount of acidity at 8.00 mg/L. The alkalinity concentration is at 9.80 mg/L. The water quality data from 01/15/98 has no metals in elevated concentrations and has less acidity at 1.8 mg/L and the same amount of alkalinity.

The first problems the stream runs into are the mine dumps on the right side of the stream. The water that filters through these piles and into Pergrin Run is the worst water I have ever seen. It seeps in along Pergrin Run's length and a sample, sample 650, was taken on 01/15/98 where this water was actually running into Pergrin Run at about 10.0 GPM. The

acidity level is at 6536.0 mg/L. The iron concentration was measured at 1280.0 mg/L, the aluminum is at 690.0 mg/L, and the manganese level is at 6.77 mg/L. The SO4 total is also outrageous at 2000.0 mg/L.

To see the influence of the mine dumps all you have to do is compare sample 651, which was taken below the mine dumps, to sample 649, which was taken above them and was discussed before. The acidity increases from 1.80 mg/L to 646.0 mg/L. The alkalinity drops from 9.80 mg/L to zero. The iron concentration increases from 0.21 mg/L to 111.0 mg/L. The aluminum increases from 0.20 mg/L to 65.0 mg/L. The manganese also increases slightly. The flow of Pergrin Run also increases from 433.30 GPM to 719.04 GPM. This increase has to be from the mine piles seeing that no tributaries enter Pergrin Run between these two points.

The next discharge occurs right beside the road that parallels Pergrin Run. Discharge 648 occurs right across the street from the BP gas station in Nanty Glo. It then flows under route 271 and enters Pergrin Run on the other side. The flow was measured and was quite low at 10.20 GPM. The water quality of this discharge though makes up for the low flow. The acidity concentration is at 3308.0 mg/L. The iron concentration is at 484.0 mg/L. The aluminum level was measured at 346.0 mg/L . The manganese level was also elevated at 4.53 mg/L.

The next discharge, the Webster discharge is the worst discharge on the South Branch watershed. It does not have the worst water quality, but it does have the highest flow of any discharge on the watershed. This discharge was sampled twice, once on 09/26/97 (sample 538) and 01/15/98 (sample 647). The acidity ranged from 320.0 mg/L on 01/15/98 to 444.0 mg/L on 09/26/97. The iron concentration ranged from 24.60 mg/L on 01/15/98 to 47.50 mg/L on 09/26/87. The aluminum concentration ranged from 30.20 mg/L on 01/15/98 to 397.0 mg/L on 09/26/97. The manganese averaged around 4.00 mg/L. The problem with this discharge is it's flow. On 09/26/97 the flow was measured at 123.0 GPM. This was during low flow conditions. On 01/15/98 the flow was measured at 880.0 GPM at high flow conditions. So you can see the impact this discharge has on the already degraded Pergrin Run.

Pergrin Run's mouth was sampled twice, sample 539 and 646, on the dates mentioned above. The acidity ranged from 490.0 mg/L to 1318.0 mg/L. The iron concentration ranged from 65.10 mg/L to 159.0 mg/L. The aluminum concentration ranged from 49.0 mg/L to 128.0 mg/L. The manganese averaged around 3.0 mg/L. The flow of Pergrin Run at it's entry into the South Branch ranged from 269.28 GPM to 2103.75 GPM.

The only sample that was taken in the Nanty Glo area that did not possess any AMD problems was sample 543. This tributary enters the South Branch just downstream of Pergrin Run. It was sampled because of it's high conductance. No acidity was detected and it did contain 48.0 mg/L of alkalinity. All metal concentration were low.

You can easily see the influence that the Nanty Glo mine dumps and Pergrin Run have on the South Branch. Comparing sample 586 (upstream of Nanty Glo) to sample 544 (downstream of mine dumps and Pergrin Run), the acidity increases from 1.20 mg/L to 13.60 mg/L, the iron increases from 1.07 mg/L to 5.83 mg/L, the aluminum increases from 1.22 mg/L to 5.01 mg/L, and the manganese concentration increases slightly.

This is definitely the prime area of concern for the South Branch because it has the problems of the expansive mine dumps as well as one of the largest discharges in the area. The treatment system for the Webster discharge is currently being designed by the Army Corp of Engineers and there are plans to begin removal of the mine dumps. If this is done, along with the removal of the mine dumps in Revloc, the South Branch should be a fairly clean stream until Coal Pit Run impacts it in Twin Rocks.

Nanty Glo to Bridge on Road that Leads to Vintondale

This section of the South Branch is again very scenic. The main reason for this is the absence of AMD problems. This section of the stream is also very wooded and has a part of the Ghost Town Trail running beside it. Only one unnamed tributary was sampled (Sample 566) because it seemed suspicious, but the water quality results did not show any AMD problems. The water quality of the South Branch also improves through this area. A sample of the South Branch (Sample 555) was taken at the bridge on the road that leads to Vintondale. Compared to sample 544 which was taken at the Nanty Glo bridge the water quality of thesample is noticeably better. The pH increases from 6.1 to 6.5. Acidities dropped from 13.60 mg/L to 0.0 mg/L. Iron concentrations dropped from 5.83 mg/L to 3.14 mg/L and aluminum concentrations dropped from 5.01 mg/L to 3.18 mg/L.

Twin Rocks to Vintondale

This part of the watershed is also very scenic. After the town of Twin Rocks, the South Branch flows through a very steep gorge. The water is fast moving with lots of twists and turns and large boulders. The South Branch improves its water quality through this region also. This is mainly because of the relatively low abundance of AMD problems. It does though contain a moderately polluted major tributary called Coal Pit Run which will be discussed below along with all other discharges.

The water entering the South Branch from Coal Pit Run was sampled on 10/17/97 (Sample 563). Coal Pit Run enters the South Branch on the right by the town of Twin Rocks. Aluminum precipitate was easily observed in Coal Pit Run and there is a small streak of aluminum precipitate in the South Branch. Coal Pit Run contains about 30.0 mg/L of acidity and a pH of 4.6. The big problem with this tributary though, as mentioned above, is the aluminum. Coal Pit Run contains about 3.39 mg/L. And with a flow of around 50.0 GPM, Coal Pit Run's load of aluminum in the South Branch is quite high. This sample was also taken during very low flow conditions. Coal Pit Run's flow is usually much higher.

The next area of concern is the backfilled mine dump on the left side of the stream. It occurs on the sharp bend of the South Branch downstream of Coal Pit Run's entry into the South Branch. A diffuse seep area occurs out of the an old mine dump or strip mine. A flow cannot be estimated because it is very small, but the water quality is very severe. This is sample 564 on the spreadsheet. The acidity runs at about 772.0 mg/L and the pH is around 3.0. These seeps contain heavy amounts of iron, 90.60 mg/L, and aluminum, 75.60mg/L, and a fair amount of manganese at 8.97 mg/L. These seeps do not seem to adversely affect the South Branch that much, but there is slight iron staining on the bottom of the South Branch.

A sample(Sample 565) of the South Branch was taken below the seeps to see the influence the seeps and Coal Pit Run has on the South Branch. By comparing it to the sample taken upstream of these points, sample 555, you can see that these areas do have an influence on the stream. The pH and alkalinity are relatively the same and the acidities are both zero, but iron concentrations increased slightly from 3.14 mg/L to 3.28 mg/L. Aluminum stayed relatively the same.

The next area is a seep area that was not sampled because a clean sample could not be obtained. The seep area is located at an unnamed tributary on the right side of the South Branch right before a hard left turn. There is heavy iron staining in the unnamed tributary but flow was quite low.

The next two samples were taken on suspicious unnamed tributaries. Sample 575 and 577 were taken from the next two unnamed tributaries on the left. Sample 575 flows under the old railroad grade before a hard right hand turn in the stream. Sample 577 is the tributary that enters the South Branch below an old concrete mine bridge. Both samples show a low pH of 4.7 and acidities around 12.0 mg/L. Iron and manganese are in normal concentrations, but aluminum is a little above normal at around 1.0 mg/L. The small amount of SO4 in each sample (16.0 mg/L and 10.0 mg/L) though leads me to believe that these are not AMD impacted. These were not investigated since other tributaries that originate on this same ridge have very similar water qualities as these two tributaries do. This will be explained more later when these other tributaries are explained.

Downstream, on the right of this old concrete mine bridge is an unnamed tributary that runs through a backfilled strip mine. The sample number of this tributary is 582. This water contains 34.0 mg/L of acidity and no alkalinity. It also contains 2.77 mg/L of aluminum and slightly elevated levels of iron and manganese. No discharges were found, but seeing that the SO4 concentration at 349.0 mg/L leads me to believe that water is filtering through the backfill, picking up aluminum and acidity and then entering the stream.

The South Branch improves through this area also. Sample 576 was taken at the concrete mine bridge. Comparing it to sample 565 you can see this. The acidity stayed at zero. Alkalinity dropped slightly. The iron concentration dropped from 3.28 mg/L to 2.36 mg/L. The manganese concentration dropped slightly. And the aluminum concentration dropped

from 3.15 mg/L to 2.39 mg/L. Another sample, sample 581, was taken before the South Branch enters Vintondale. The acidity is still zero. The alkalinity dropped slightly, but the iron concentration also dropped to1.63 mg/L and the aluminum dropped to 1.81 mg/L. So even though this area has some minor problems, the overall quality of the stream improves greatly.

Coal Pit Run

The headwaters of this tributary begin close to the small town Cardiff north of the town of Nanty Glo. The water quality in the headwaters is quite good. If you look at sample 627 in the spreadsheet it shows that the metals in this water are all in trace amounts. The acidity level is only 1.4 mg/L while the alkalinity is 7.6 mg/L. This water quality goes downhill fast though.

The first four discharges all originate on the left side of the stream out of an old deep mine. The water quality of the first discharge, sample 629, is not as bad as the other three, but it does has the highest flow out of the four at around 75.0 GPM. It contains 94.0 mg/L of acidity and 8.62 mg/L of aluminum. All other metals are not in elevated levels. Discharge 630 occurs 100 yards downstream of discharge 629. The water quality is worse here, but the flow is only at 3.0 GPM. The acidity level is at 210.0 mg/L and aluminum is at 23.10 mg/L. Iron and manganese are also found in slightly elevated levels. Discharge 631 occurs only 25 yards downstream of discharge 630. The water quality is very similar to discharge 629. The acidity level is 92.0 mg/L and aluminum is at 9.18 mg/L. Manganese is also found is slightly elevated levels. Discharge 632 occurs right next to discharge 631. They have similar water qualities leading me to believe that it is the same water coming out at two different places. You will see that all of the discharges on this stream fit the same bill, high acidity and aluminum and moderate levels of iron and manganese.

The next discharge, sample 607, occurs on the right side of the stream about 100 yards downstream of discharge 632 and about 200 yards upstream of the Cardiff bridge. It's flow was estimated at 10.0 GPM. It contains about 5.65 mg/L of aluminum along with 3.77 mg/L of manganese and 1.48 mg/L of iron. The acidity is also quite high at 54.0 mg/L.

The next discharge, sample 606, occurs out of a wetland area just upstream of the Cardiff bridge on the left. It has very similar water quality to discharge 607 with around 5.0 mg/L of aluminum, 2.91 mg/L of manganese, 1.14 mg/L of iron, and 48.0 mg/L of acidity. As I said before most discharges in this area have the same water quality.

To show the influence of these discharges on Coal Pit Run all we have to do is to compare the upstream sample, sample 627, with the sample taken at the Cardiff bridge, sample 613, downstream from the above discharges. The acidity jumps from 1.40 mg/L to 34.0 mg/L. The iron concentration increases from 0.20 mg/L to 0.80 mg/L. Manganese increases from 0.03 mg/L to 1.13 mg/L. And the aluminum concentration increases from 0.20 mg/L to

3.86 mg/L. You can see the influence these discharges have on Coal Pit Run, and they all occur within a quarter mile from each other.

The next discharges occur farther downstream before Coal Pit Run enters the town of Twin Rocks. The first mine influence you run into is the Twin Rocks mine. A sample was taken upstream, sample 608, and downstream, sample 610, to show the influence of the mine dumps that border both sides of the creek. Discharge 609 originates out of the rear of the mine dumps on the left. It enters the stream between sample 608 and 610 and also influences the stream at this point. The acidity level in this discharge is 80.0 mg/L, has an iron level at 1.22 mg/L, manganese at 1.69 mg/L, and aluminum levels at 6.90 mg/L. The flow was estimated at 10.0 GPM. A weir was in place but was not functioning properly.

By comparing the two in-stream samples you can see the influence that discharge 609 and the mine dumps have on Coal Pit Run. The acidity concentration increases from 30.0 mg/L to 32.0 mg/L. The manganese concentration increases from 0.84 mg/L to 0.98 mg/L. And the aluminum concentration increases from 3.42 mg/L to 4.16 mg/L.

Discharge 611 originates on the left and creates a swampy area before it enters Coal Pit Run. This discharge has a acidity level of 78.0 mg/L, a manganese level of 2.18 mg/L, and a aluminum level of 10.80 mg/L. The bad thing about this discharge is its flow which was estimated at 20.0 mg/L. It creates a noticeable aluminum streak in the stream.

The last impact on Coal Pit Run is a small tributary which flows over a small mine dump on the right. It enters the stream behind an old baseball diamond. This tributary has an acid level at 40.0 mg/L , a iron concentration at 2.42 mg/L, and a aluminum level at 2.45 mg/L. The flow was estimated at 50.0 GPM.

There are two prime areas of concern on Coal Pit Run. The first is the discharges out of the deep mine by the town of Cardiff and the second is the Twin Rock mine dump and the discharges associated with it. The removal of the mine dump and the treatment of the deep mine discharges in Cardiff should eliminate most of the problems on Coal Pit Run.

Vintondale Area

This area of the watershed is very similar to the Nanty Glo area. It contains a mine dump which greatly impacts the stream, has two moderate discharges, and two slightly impacted tributaries. The tributaries are quite interesting in their water chemistry and will be discussed later. The South Branch greatly improves from Twin Rocks to Vintondale, but this part of the watershed degrades it again before it's confluence with the North Branch of Blacklick creek outside of Vintondale. The problems of this area will be discussed in detail below.

Discharge 605 impacts the South Branch first. It enters the stream right before the South Branch makes contact with the Vintondale mine dump. Discharge 605 originates on the left side of the road that brings you into Vintondale. It can easily be seen from the road.

This discharge was sampled twice, samples 580 and 605, from different locations, right as it comes out of the side of the hill and right as it enters the South Branch. This was done because it flows over the mine dump and may pick up additional metals before it enters the South Branch. This though did not happen. Sample 605 is the sample just as it surfaces and will be the one that is discussed. The acidity is very high at 412.0 mg/L. The iron and aluminum concentrations are also very high both at around 33.0 mg/L. The manganese is also moderately high at 3.81 mg/L. The major problem with this discharge is its flow which was estimated to be around 100 GPM. This discharge, along with the mine dumps to follow, really hit the South Branch hard.

Seepage from the mine dumps was easily noticeable, but a clean sample could not be taken. We can see the damage done though by comparing sample 579, which was taken below the mine dumps, to sample 581, which was taken upstream of the mine dumps and discharge 605. The acidity increases from 0.0 mg/L to 14.80 mg/L. The alkalinity concentration decreases from 14.20 mg/L to 3.20 mg/L. The iron concentration increases from 1.63 mg/L to 2.53 mg/L and the aluminum concentration also increases from 1.81 mg/L to 3.56 mg/L. So you can easily see the influence that the mine dumps, along with help from discharge 605, have on the South Branch.

Bracken Run enters the South Branch on the left downstream of the mine dumps. It was sampled twice, samples 578 and 624, once during low flow conditions and once during high flow conditions. The water chemistry of this tributary is quite odd, especially in the headwaters and will be discussed later. Acidity levels ranged from 18.80 mg/L to 24.0 mg/L. Alkalinity ranged from 1.0 mg/L to 2.0 mg/L. Aluminum ranged from 2.05 mg/L to 2.37 mg/L. Manganese ranged from 1.58 mg/L to 2.15 mg/L. The tributary is not impacted by iron, which is in low concentrations. The flow is quite variable and was estimated on the two occasions at 50.0 GPM and 1000.0 GPM. More of this tributary will be discussed later.

Discharge 600 originates 100 yards downstream of Brackens Run on the left. It flows out of a pipe almost right at stream level. It has a water chemistry very similar to other discharges around it. Acidity was measured at 36.0 mg/L. There was 2.0 mg/L of alkalinity. And as with other discharges, the aluminum (4.17 mg/L) and manganese (6.30 mg/L) are in elevated levels while the iron concentration is normal. The flow was also quite high at around 25.0 GPM.

Shuman Run enters the South Branch downstream of discharge 600. It is the last occurrence of AMD entering the South Branch. Shuman Run's water chemistry is also quite odd in the headwaters and will be discussed later along with Bracken Run. This tributary contains 22.0 mg/L of acidity along with 1.64 mg/L of both manganese and aluminum and also 0.95 mg/L of iron. The flow was estimated at 1000 mg/L.

These AMD discharges in the Vintondale area damage the improving South Branch right before its confluence with the North Branch of Blacklick Creek. Sample 602 was taken at the Vintondale bridge, downstream of all the AMD influences going into the South

Branch. By comparing this with 581 that was taken upstream of Vintondale, you can see the impairment caused by the Vintondale area. The acidity increases from 0.0 mg/L to 28.0 mg/L. The alkalinity concentration decreases from 14.20 mg/L to 1.60 mg/L. The iron concentration increases from 1.63 mg/L to 3.69 mg/L. The aluminum increases from 1.81 mg/L to 3.32 mg/L and the manganese concentration also increases slightly. The Vintondale area perhaps is not as AMD impacted as the Revloc and Nanty Glo areas are, but it does noticeable damage the South Branch.

Bracken Run

There are two main branches of this tributary and both have similar, somewhat odd water chemistries. Sample 621 was taken on the right branch just upstream of a small dam on the creek. What is odd about this water is that no discharges are upstream of this sample, but the sample does show signs of AMD. The pH is around 4.4, the acidity is around 18.40 mg/L, and the aluminum concentration is 1.88 mg/L. What is stranger is that the SO4 concentration is only 21.0 mg/L. Looking at the SO4 concentration would lead you to believe that this is not AMD related. I asked Rich Beam, a hydrogeologist from the Pennsylvania Department of Environmental Protection, for his opinion on the matter. He said that it is either (1) seepage from old strip mines in the watershed, but this should give you higher levels of SO4 or (2) the soils of the region contain little buffering capabilities and high levels of aluminum. The acid rain that falls on the region does not get buffered and this acidic rains picks up the aluminum in the soil and carries it to the stream. This is probably what is happening. If it was infiltrate from the strip mines, you would believe the SO4 concentration would be higher than 21.0 mg/L. Sample 622 of the left branch also shows these characteristics. The acidity concentration is at 18.2 mg/L, aluminum at 1.63 mg/L, and SO4 concentration at only 16.0 mg/L.

Discharge 623 enters on the left downstream of the dam. It originates very far away from its point of entry into Bracken Run. It contains acidity levels at 42.0 mg/L, aluminum at 4.57 mg/L and manganese at 5.02 mg/L. The flow entering Bracken Run is about 100 GPM. Seeing that it has to flow a long distance before it enters Bracken Run, allows it to increase its flow along the way.

Discharge 620 originates out of a borehole at the entrance to a cemetery on the left side of the creek. It enters a small tributary and does not seem to impact Bracken run greatly. It does though contain 120.0 mg/L of acidity, 58.80 mg/L of iron, and 4.39 mg/L of manganese. The flow was estimated at 5.0 GPM. The reason it does not affect Bracken Run greatly is the pH of the discharge. A pH of 6.0 allows the iron to drop out fast into the tributary and not in Bracken Run. You can see that it does not impact Bracken Run by looking at the iron concentrations at the mouth which are only around 0.20 mg/L.

Discharge 619 can be found on the right downstream of discharge 620. It originates above a rock slide. It contains 104.0 mg/L of acidity, 5.57 mg/L of aluminum, and 3.91 mg/L of iron. The flow of this discharge is not high and was estimated at 10.0 GPM. This is the last discharge found on Bracken Run.

Shuman Run

The upstream sample, sample 603 shows the same characteristics as the upstream samples on Bracken Run. This is because this tributary occurs on the same ridge as Bracken Run and would thus have the same soil characteristics as the Bracken Run watershed. It contains 13.80 mg/L of acidity, 1.26 mg/L of aluminum , and less than 10.0 mg/L of SO4.

The only discharge on Shuman Run, discharge 604, is a large one. It occurs at the intersection in Vintondale behind an automobile mechanics garage. It originates on the right out of an old deep mine. It contains 144.0 mg/L of acidity, 10.30 mg/L of aluminum, 10.80 mg/L of manganese, and 6.21 mg/L of iron. The worst thing about this discharge is it's flow which was estimated at 75.0 GPM.

Conclusion

By removing the mine dumps in Revloc, Nanty Glo, and Vintondale, and treating the Webster discharge you would eliminate a majority of the problems in the South Branch watershed in my opinion. The removal of the mine dumps in Revloc would eliminate most of the discharges in that region and would give you fairly clean water all the way down to Nanty Glo. The removal of the mine dumps in Nanty Glo would significantly improve the water quality of the South Branch directly and most importantly indirectly because of the improvement in Pergrin Run, the area of the stream most affected by AMD. The only other problem is this area is the Webster discharge, but a passive treatment system is currently being designed for this discharge. With the treatment of this major discharge and the removal of the mine dumps in Nanty Glo, the South Branch should have excellent water quality down into Vintondale.

Yes, there are other area of concern like Coal Pit Run, Bracken Run, Shuman Run, and smaller discharges here and there, but the main bulk of acid and metals entering the South Branch come from the four areas listed above. The South Branch is far from dead. With a good deal of money and work this very scenic stream can change from being known as "that orange stream in Nanty Glo" to a productive fishery and aquatic resource.

I just would like to thank some people who helped me out with this survey.

Pam Milavec from DEP for trusting me with the responsibility of collecting this important data.

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South Branch of Blacklick Creek Stream Survey
Cambria and Blacklick Townships
Cambria County
07/29/97-01/15/98

South Branch Sample Points Sample Number and Location	Flow GPM	Lab pH	Acidity mg/L	Alkalinity mg/L	Iron mg/L	Ferrous Iron mg/L	Mang. mg/L	Alum. mg/L	SO4 mg/L	Acid Load lb/day	Iron Load lb/day	Mang. Load lb/day	Alum. Load lb/day
566 US Sample Point	NA	6.5	0.00	38.00	1.58	0.25	0.50	0.21	18.00	NA	NA	NA	NA
533 At Buela Bridge	NA	4.4	66.00	0.00	0.63	0.09	1.18	11.40	109.00	NA	NA	NA	NA
567 At Trib. US of Stewarts Run	NA	7.5	0.00	64.00	0.37	0.03	0.18	0.98	418.00	NA	NA	NA	NA
586 US of Nanty Glo Mine Dumps	NA	5.9	1.20	6.60	1.07	0.15	0.24	1.22	10.00	NA	NA	NA	NA
587 DS of Nanty Glo Mine Dumps	NA	5.7	3.00	4.00	2.22	0.14	0.29	2.24	70.00	NA	NA	NA	NA
544 DS of Pergrin Run	NA	6.1	13.60	22.00	5.83	0.15	0.40	5.01	613.00	NA	NA	NA	NA
555 US of Coal Pit Run	NA	6.5	0.00	16.60	3.14	0.18	0.41	3.18	483.00	NA	NA	NA	NA
565 DS of Coal Pit and Backfill	NA	6.5	0.00	19.40	3.28	0.17	0.44	3.15	597.00	NA	NA	NA	NA
576 At Concrete Mine Bridge	NA	6.5	0.00	17.20	2.36	0.17	0.38	2.39	646.00	NA	NA	NA	NA
583 DS of Small Mine Dump	NA	6.6	0.00	16.20	1.94	0.07	0.41	2.04	539.00	NA	NA	NA	NA
581 US of Vintondale Mine Dump	NA	6.5	0.00	14.20	1.63	0.07	0.42	1.81	554.00	NA	NA	NA	NA
579 DS of Vintondale Mine Dump	NA	5.1	14.80	3.20	2.53	0.37	0.46	3.56	683.00	NA	NA	NA	NA
602 At Vintondale Bridge	NA	4.6	28.00	1.60	3.69	0.68	0.51	3.32	98.00	NA	NA	NA	NA
Revloc Area													
485 1st Seep Out of Mine Dump	0.00	4.1	68.00	0.00	0.62	0.13	3.88	5.63	133.00	0.00	0.00	0.00	0.00
486 2nd Seep Out of Mine Dump	0.50	3.6	298.00	0.00	24.30	12.18	17.60	25.80	618.00	1.79	0.15	0.11	0.16
487 Wier On Left Side	3.83	2.8	4888.00	0.00	46.20	8.91	8.31	664.00	3600.00	225.03	2.13	0.38	30.57
488 Metal Pipe Before Tunnel	5.00	6.8	0.00	64.00	0.61	0.04	0.23	1.10	190.00	0.00	0.04	0.01	0.07
489 Plastic Pipe After Tunnel	75.00	4.1	932.00	0.00	0.79	0.26	7.62	143.00	984.00	840.20	0.71	6.87	128.91
490 Vertical Pipe On Right	100.00	3.3	1718.00	0.00	1.30	0.48	9.53	281.00	1300.00	2065.04	1.56	11.46	337.76
491 Vertical Flow On Left	NA	3.8	260.00	0.00	19.80	18.27	5.63	28.40	274.00	NA	NA	NA	NA
492 Cement Pipe Right Side	75.00	6.5	0.00	40.00	0.88	0.07	0.72	0.20	79.00	0.00	0.79	0.65	0.18
493 Cement Culvert On Left	75.00	4.5	104.00	0.00	0.65	0.23	1.58	16.10	192.00	93.76	0.59	1.42	14.51
537 Bright FE Discharge on Left	1.00	6.4	0.00	54.00	25.10	0.39	0.72	0.20	10.00	0.00	0.30	0.01	0.00
536 Discharge On Left, Sharp Bend	20.00	6.4	0.00	40.00	2.27	0.11	0.66	0.20	10.00	0.00	0.55	0.16	0.05
535 Discharge Entering In Two Places	5.00	5.1	36.00	3.00	11.70	4.08	2.06	1.23	50.00	2.16	0.70	0.12	0.07

Sample Number and Location	Flow GPM	Lab pH	Acidity mg/L	Alkalinity mg/L	Iron mg/L	Ferrous Iron mg/L	Mang. mg/L	Alum. mg/L	SO4 mg/L	Acid Load lb/day	Iron Load lb/day	Mang Load lb/day	Alum. Load lb/day
534 Trib. US of Beula Bridge	200.00	7.1	0.00	76.00	0.08	0.02	0.01	0.20	57.00	0.00	0.19	0.02	0.48
Beula Bridge To Nanty Glo													
500 Water Out of AMD Plant	NA	9.6	0.00	72.00	0.27	0.02	0.02	0.20	494.00	NA	NA	NA	NA
501 Seep on Right DS of Plant	5.00	6.4	0.00	72.00	0.50	0.14	0.56	0.20	195.00	0.00	0.03	0.03	0.01
502 Iron Flow Between Rocks Right	10.00	9.7	0.00	3910.00	196.00	1.98	7.11	7.16	309.00	0.00	23.56	0.85	0.86
503 Discharge Into Trib. 504	50.00	8.4	0.00	182.00	1.83	0.56	1.12	0.45	440.00	0.00	1.10	0.67	0.27
504 Trib. That Receives 504	100.00	7.2	0.00	100.00	0.28	0.22	0.18	0.20	179.00	0.00	0.34	0.22	0.24
519 Trib. US of Stewart Run	750.00	5.0	8.80	2.40	0.29	0.08	0.22	0.38	10.00	79.33	2.61	1.98	3.43
584 Treated Water Out of Mine	1500.00	8.6	0.00	22.00	1.97	0.09	0.11	0.48	1000.00	0.00	35.52	1.98	8.65
585 Trib. That Receives 584	2000.00	6.0	0.00	11.40	1.90	0.08	0.68	2.12	655.00	0.00	45.68	16.35	50.96
Nanty Glo Area													
542 Pipe At End of Mine Dumps	1.00	6.3	14.40	36.00	2.13	0.17	1.97	3.12	453.00	0.17	0.03	0.02	0.04
539 Pergrin Run	269.28	2.8	1318.00	0.00	159.00	1.86	5.02	128.00	656.00	4266.03	514.64	16.25	414.30
646 Pergrin Run	2103.75	3.0	490.00	0.00	65.10	8.91	2.08	49.00	234.00	12390.67	1646.19	52.60	1239.07
543 Trib. DS of Pergrin Run	100.00	6.9	0.00	48.00	0.05	0.02	0.01	0.20	217.00	0.00	0.06	0.01	0.24
Nanty Glo To Road To Vintondale													
556 Trib. US of Bridge to Vintondale	10.00	4.9	6.00	2.00	0.13	0.02	0.05	0.26	51.00	0.72	0.02	0.01	0.03
Twin Rocks To Vintondale													
563 Coal Pit Run	50.00	4.6	30.00	1.60	0.13	0.08	1.61	3.39	144.00	18.03	0.08	0.97	2.04
564 Seeps Out of Backfill	NA	2.9	772.00	0.00	90.60	83.83	8.97	75.60	588.00	NA	NA	NA	NA
575 Pipe Under Trail DS of Small Trib.	3.00	4.7	11.20	1.80	0.05	0.02	0.31	0.86	16.00	0.40	0.00	0.01	0.03
577 Trib. DS of Concrete Mine Bridge	10.00	4.7	13.00	2.80	0.02	0.02	0.65	1.10	10.00	1.56	0.00	0.08	0.13
582 Small Trib US of Trail Bridge	25.00	4.1	34.00	0.00	0.59	0.05	0.72	2.77	349.00	10.22	0.18	0.22	0.83
Vintondale Area													
605 DMD by Road at Source	20.00	2.8	412.00	0.00	32.70	0.50	3.81	34.70	878.00	99.04	7.86	0.92	8.34
580 DMD 605 at Entry to S. Branch	20.00	2.9	320.00	0.00	21.00	0.87	3.07	28.00	381.00	76.93	5.05	0.74	6.73
578 Bracken Run	50.00	4.8	18.80	2.00	0.14	0.04	2.15	2.05	86.00	11.30	0.08	1.29	1.23
624 Bracken Run	1000.00	4.6	24.00	1.00	0.20	0.13	1.58	2.37	65.00	288.48	2.40	18.99	28.49
600 DMD DS of Bracken Run	25.00	4.7	36.00	2.00	0.15	0.06	6.30	4.17	36.00	10.82	0.05	1.89	1.25
626 Shuman Run	1000.00	4.1	22.00	0.00	0.95	0.17	1.64	1.64	96.00	264.44	11.42	19.71	19.71

Sample Number and Location	Flow GPM	Lab pH	Acidity mg/L	Alkalinity mg/L	Iron mg/L	Ferrous Iron mg/L	Mang. mg/L	Alum. mg/L	SO4 mg/L	Acid Load lb/day	Iron Load lb/day	Mang. Load lb/day	Alum. Load lb/day
Pergrin Run													
588 US Sample Point	100.00	6.1	8.00	9.80	0.09	0.02	0.01	0.20	35.00	9.62	0.11	0.01	0.24
649 US Sample Point	433.30	6.4	1.80	9.80	0.21	0.04	0.05	0.20	20.00	9.37	1.09	0.26	1.04
650 Water Off of Mine Dumps	10.00	2.4	6536.00	0.00	1280.00	336.00	6.77	690.00	2000.00	785.63	153.86	0.81	82.94
651 DS of Mine Dumps	719.04	3.0	646.00	0.00	111.00	23.46	0.86	65.00	375.00	5583.29	959.36	7.43	561.79
648 Discharge Under Route 271	10.20	2.5	3308.00	0.00	484.00	6.71	4.53	346.00	963.00	405.57	59.34	0.56	42.42
541 US of Webster Discharge	50.04	2.5	3624.00	0.00	504.00	3.36	6.36	382.00	2200.00	2179.77	303.15	3.83	229.77
538 Webster Discharge	123.00	3.0	444.00	0.00	47.50	3.60	4.43	42.30	397.00	656.44	70.23	6.55	62.54
647 Webster Discharge	880.00	3.0	320.00	0.00	24.60	1.98	3.27	30.20	296.00	3384.83	260.21	34.59	319.44
540 Pipe DS of Webster	3.00	2.8	1078.00	0.00	151.00	5.94	4.95	120.00	572.00	38.87	5.45	0.18	4.33
Coal Pit Run													
627 US Sample Point	100.00	6.0	1.40	7.60	0.20	0.09	0.03	0.20	15.00	1.68	0.24	0.04	0.24
628 Small Trib. on Right	10.00	6.7	0.00	68.00	0.07	0.02	0.01	0.20	141.00	0.00	0.01	0.00	0.02
629 Large DMD on Left	75.00	3.5	94.00	0.00	0.82	0.09	0.63	8.62	94.00	84.74	0.74	0.57	7.77
630 DMD Right DS of 629	3.00	3.3	210.00	0.00	1.38	0.20	1.44	23.10	352.00	7.57	0.05	0.05	0.83
631 DMD Right DS of 630	10.00	3.5	92.00	0.00	0.67	0.12	2.66	9.18	231.00	11.06	0.08	0.32	1.10
632 DMD Right DS of 631	10.00	3.5	90.00	0.00	0.66	0.11	2.44	8.35	228.00	10.82	0.08	0.29	1.00
607 Discharge on Right US of Bridge	10.00	3.9	54.00	0.00	1.48	0.10	3.77	5.65	254.00	6.49	0.18	0.45	0.68
606 Discharghe Out of Wetland, Left	25.00	4.0	48.00	0.00	1.14	0.09	2.91	5.38	208.00	14.42	0.34	0.87	1.62
613 Coal Pit at Cardiff Bridge	NA	4.3	34.00	0.00	0.80	0.06	1.13	3.86	111.00	NA	NA	NA	NA
608 Coal Pit US of Mine Dumps	NA	4.4	30.00	0.00	0.33	0.04	0.84	3.42	90.00	NA	NA	NA	NA
609 DMD at Rear of Mine Dump	10.00	3.5	80.00	0.00	1.22	0.13	1.69	6.90	177.00	9.62	0.15	0.20	0.83
610 Coal Pit DS of Mine Dump	NA	4.4	32.00	0.00	0.32	0.07	0.98	4.16	102.00	NA	NA	NA	NA
611 Discharge Out of Swampy Area	20.00	3.7	78.00	0.00	0.73	0.09	2.18	10.80	184.00	18.75	0.18	0.52	2.60
612 Trib That Flows Over Mine Dump	50.00	3.7	40.00	0.00	2.42	0.09	0.56	2.45	106.00	24.04	1.45	0.34	1.47
Bracken Run													
621 Right Branch of Bracken Run	NA	4.4	18.40	0.00	0.08	0.02	0.75	1.88	21.00	NA	NA	NA	NA
622 Left Branch of Bracken Run	NA	4.5	18.20	0.00	0.07	0.02	0.61	1.63	16.00	NA	NA	NA	NA
623 Discharge DS of Dam	300.00	4.3	42.00	0.00	0.12	0.04	5.02	4.57	206.00	151.45	0.43	18.10	16.48
620 Borehole by Cemetary Entrance	5.00	6.0	120.00	28.00	58.80	62.62	4.39	0.20	206.00	7.21	3.53	0.26	0.01
625 Trib That Receives 620	5.00	5.3	7.60	3.60	0.08	0.02	0.16	0.36	50.00	0.46	0.00	0.01	0.02
619 Discharge Out of Rockslide	10.00	3.2	104.00	0.00	3.91	0.19	0.73	5.57	124.00	12.50	0.47	0.09	0.67

Sample Number and Location	Flow	Lab	Acidity	Alkalinity	Iron	Ferrous Iron	Mang	Alum.	SO4	Acid Load	Iron Load	Mang. Load	Alum. Load
	GPM	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	lb/day	lb/day	lb/day	lb/day
Shuman Run													
603 US Sample Point	25.00	4.5	13.80	0.00	0.02	0.02	0.40	1.26	10.00	4.15	0.01	0.12	0.38
604 DMD at Vintondale Intersection	75.00	3.2	144.00	0.00	6.21	0.26	10.80	10.30	619.00	129.82	5.60	9.74	9.29