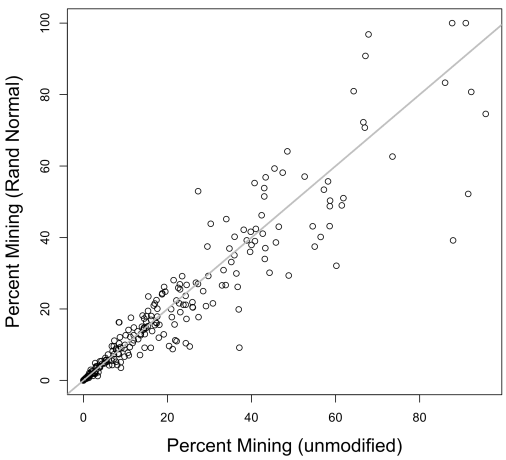
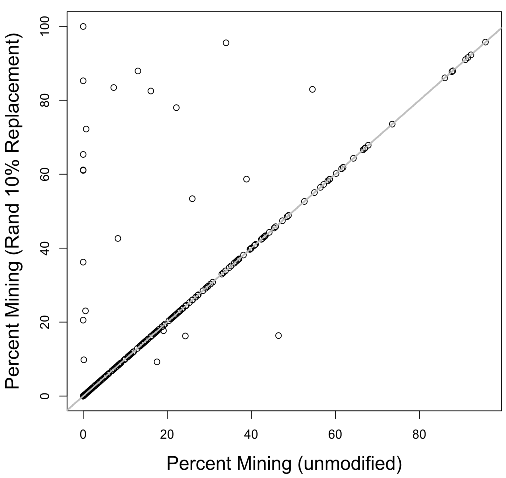
An issue has been raised regarding the accuracy of the SkyTruth aerial mine delineations and potential impacts on the data analysis. We have not experienced anything in using the SkyTruth data which suggests there are large errors in the data, but there has been limited quality control in the dataset and, because of this, we are concerned with how reliable results from the TITAN analyses are given they indicate a strong invertebrate response to very low percentages to surface mining in watersheds (i.e., we are uncertain how sensitive the results are to error in the dataset). Therefore, we have tried to test the robustness of the results by introducing known error through a couple of different approaches and re-running the analyses.



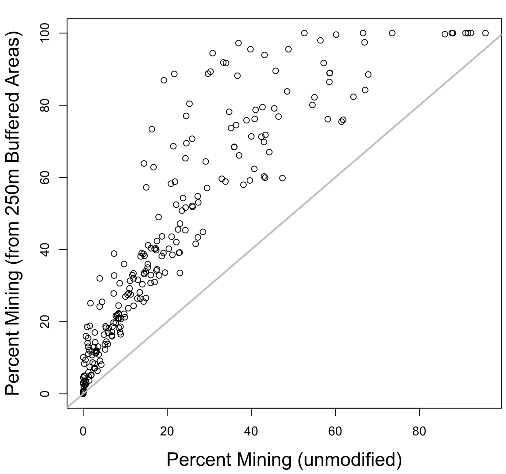
Method I: Random inflation/deflation of %mining

- Created vector of values from random normal distribution ($\mu = 10$, sd = 3) equal in length to %mining gradient. Divided vector by 10 (to give values from -1 to 1, centered around 0). Multiplied vector value by %mining and summed with %mining.
- This simply introduced random scatter into the %mining estimates, with the scatter increasing proportional to the absolute %mining value.



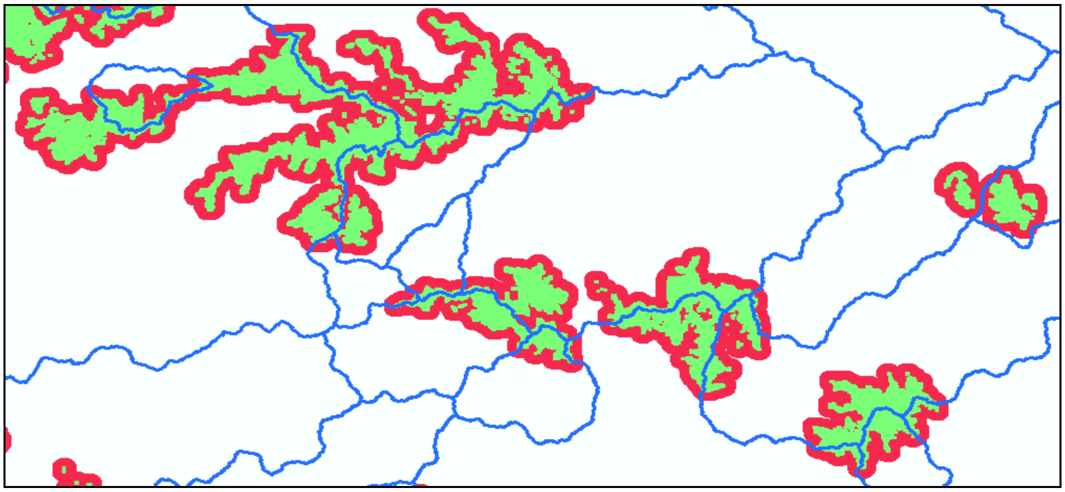
Method II: Replacement of 10% of data w/ random values

- Pulled 10% of the observations and randomly assigned them a %mining value between 0-100%



Method III: 250m Buffer around all mined areas

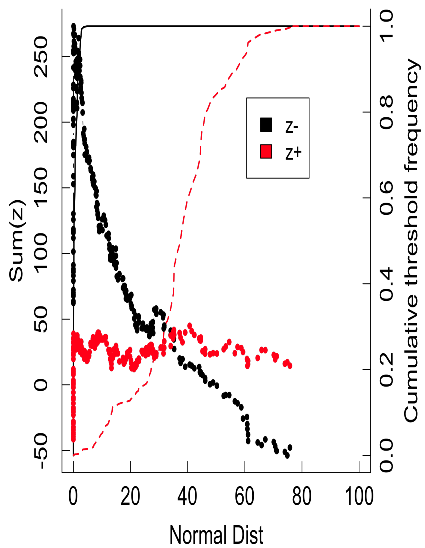
- It is assumed that the greatest amount of uncertainty in the SkyTruth data are around the perimeter of mined areas. Based on the geometry and total area of each watershed, as well as the geometery of the mined area within or near the watershed, uncertainty at the edge of mined areas can impact each watershed differently. We added 250m (~8pixels) to the edge of every mined area, recalculated %mining within each watershed, and re-ran TITAN with these values.

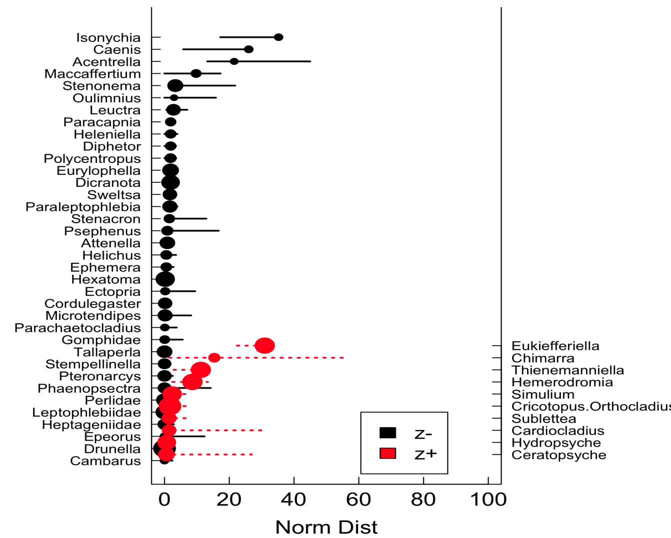


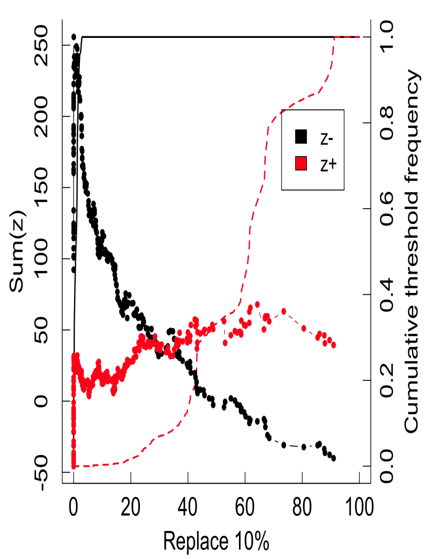
Example of buffered mine delineations. Green = SkyTruth Mining extent; Red = Buffered extension of mining delineation; Blue lines = watershed boundaries.

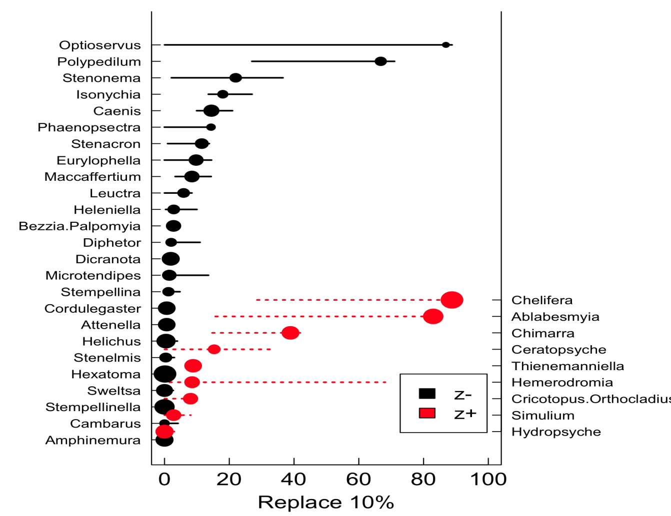
Table 1. Change point values (+/- 95% boostrap CI) for each TITAN run.

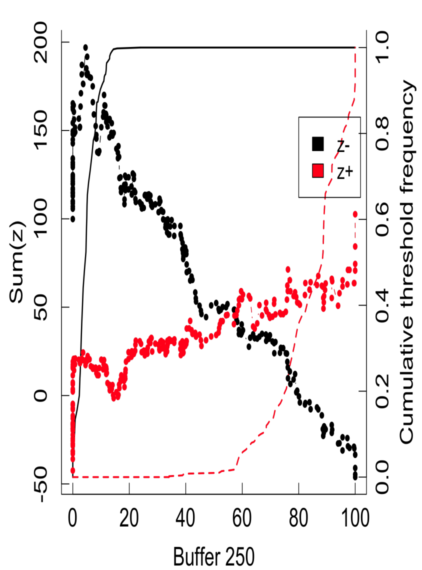
		Change Point	Lower 95% CI	Upper 95% CI
No Modifications				
	sumz-	1.28	0.00	2.43
	sumz+	63.08	15.36	67.47
Random Change 10% Sites				
	sumz-	0.04	0.00	2.06
	sumz+	65.45	27.01	91.27
Normal Distribution Modifier				
	sumz-	0.06	0.00	2.36
	sumz+	41.04	10.09	61.02
Buffered Areas by 250m				
	sumz-	4.66	0.34	11.85
	sumz+	100.00	59.69	100.00

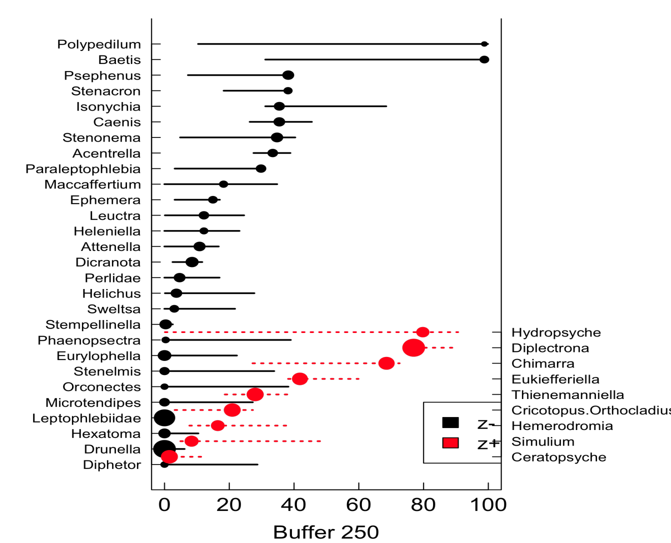

Sum(z)
Cumulative threshold frequency
z-
z+
Normal Dist


Isonychia
Caenis
Acentrella
Maccaffertium
Stenonema
Oulimnius
Leuctra
Paracapnia
Heleniella
Diphetor
Polycentropus
Eurylophella
Dicranota
Sweltsa
Paraleptophlebia
Stenacron
Psephenus
Attenella
Helichus
Ephemera
Hexatoma
Ectopria
Cordulegaster
Microtendipes
Parachaetocladius
Gomphidae
Tallaperla
Stempellinella
Pteronarcys
Phaenopsectra
Perlidae
Leptophlebiidae
Heptageniidae
Epeorus
Drunella
Cambarus
Eukiefferiella
Chimarra
Thienemanniella
Hemerodromia
Simulium
Cricotopus.Orthocladius
Sublettea
Cardiocladius
Hydropsyche
Ceratopsyche
z-
z+
Norm Dist


Sum(z)
Cumulative threshold frequency
z-
z+
Replace 10%


Optioservus
Polypedilum
Stenonema
Isonychia
Caenis
Phaenopsectra
Stenacron
Eurylophella
Maccaffertium
Leuctra
Heleniella
Bezzia.Palpomyia
Diphetor
Dicranota
Microtendipes
Stempellina
Cordulegaster
Attenella
Helichus
Stenelmis
Hexatoma
Sweltsa
Stempellinella
Cambarus
Amphinemura
Chelifera
Ablabesmyia
Chimarra
Ceratopsyche
Thienemanniella
Hemerodromia
Cricotopus.Orthocladius
Simulium
Hydropsyche
z-
z+
Replace 10%


Sum(z)
Cumulative threshold frequency
z-
z+
Buffer 250


Polypedilum
Baetis
Psephenus
Stenacron
Isonychia
Caenis
Stenonema
Acentrella
Paraleptophlebia
Maccaffertium
Ephemera
Leuctra
Heleniella
Attenella
Dicranota
Perlidae
Helichus
Sweltsa
Stempellinella
Phaenopsectra
Eurylophella
Stenelmis
Orconectes
Microtendipes
Leptophlebiidae
Hexatoma
Drunella
Diphetor
Hydropsyche
Diplectrona
Chimarra
Eukiefferiella
Thienemanniella
Cricotopus.Orthocladius
Hemerodromia
Simulium
Ceratopsyche
z-
z+
Buffer 250

- The results are robust when we introduce a moderate amount of random variation (though proportional to the absolute value) in the %mining values.
    - Change point value and CI are very similar to non-modified result.

- When 10% of the observations are removed and replaced with a random % mining value, the overall community response value remains unchanged but the number of taxa responding negatively decreases.
    - This is likely because a modifying a few samples for taxa that are highly uncommon can introduce enough uncertainty that a change point for that taxa cannot be determined

- Buffering sites by 250m increased the change point estimate and confidence interval values
    - We expected the values would increase (because we added mining area)
    - The change point is broader, but there is still a clearly defined negative response