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The impact of gold mining on the aquatic ecosystem of the Witi Creek area in the Brownsberg Nature Park Suriname

The eastern part of the Brownsberg Nature Park has been affected by small scale gold mining activities. The mining activities include the disconnection of the creeks by building dams in it, thus creating both connected and disconnected pits alongside the creek and the irresponsible use of mercury, which is discharged in the aquatic ecosystems of the area. Mining activities started downstream of the Moeder Creek, the main stream of the Witi Creek and are nowadays moved upstream of the Moeder Creek. Two surveys were conducted to assess the impact of these gold mining activities on the aquatic ecosystems of both creeks. During this research the effected Moeder Creek and the less effected Witi Creek were compared to each other, to asses the impact on the Moeder Creek.

Witi Creek

The Witi Creek is a clear water stream, flowing mainly under forest cover. The substrate in the stream consists mainly of stone and gravel with flat to steep shores. Though gold is only being extracted from the Moeder Creek, the Witi Creek is also being impacted by the gold mining activities. The downstream part of the creek is being used as a transportation road for All Terrain Vehicles. Therefore, the substrate of the creek, which consists mainly of stones and gravel, has been piled up along side the creek. Compared to the upstream part of the creek, the downstream part also is more turbid (10 Nephelometric Turbidity Units or 10 NTU). Due to this disturbance, high levels of metals, for example iron, were measured in this part of the Witi creek.

Moeder Creek

The impact of the gold mining activities on the Moeder Creek is of a larger and 'direct' nature. The creek, which originally was under the forest canopy, is now in a more open landscape. The creek is also loaded with sediments. Extreme high levels of turbidity were found (average 4963 NTU). High levels of metals were also found in the creek. Mercury levels have been measured in water, sediments and fish. All levels, measured in the Moeder Creek, were above international norms for mercury (WHO norm for mercury in freshwater aquatic life).

Fish and Macro invertebrates

Impacts were also found on fish and aquatic macro invertebrate diversity of the Moeder creek. A total of 285 individuals of nine families of macro invertebrates were caught in this creek. This is very low, compared to the Witi Creek, where 1806 individuals of 23 families have been caught.

During the first survey in August 2005, 124 fishes from 16 species have been caught in the Witi Creek, while in the Moeder Creek 47 fishes were caught from 7 species. This indicates that the high level of turbidity in the Moeder Creek has impacted the fish diversity of the creek. Fishes, which use their sight to seek prey, move away because they can not tolerate the high turbidity in the creek. Individuals of catfish (Ancistrus) species were caught the most. These fishes are benthic species that feed by sense of touch. They feed on benthic algae which have increased in the creek due to increased nutrient levels in the creek. Compared to data from a study done in 2001 fewer species have been caught in 2005. The created pits alongside the creek, which have filled up with water, were also diverse with fish. A total of 65 individuals of 12 species have been caught.

It should be noticed that during the second survey in November 2005, no fish was caught in the Moeder Creek. Therefore, an additional survey was made in 2006 to determine if the fishes in the creek will re-colonize during the long rainy season. The water quality in the creek was slightly improved due to higher water levels in the creek (turbidity: 147.5 NTU) and 12 new fish species have been caught in the Moeder Creek. Most individuals caught wree Krobia's (*Geophagus surinamensis*), Meervallen (*Hypostomus gymnorhynchus*, *Ancistrus spp.*) and Noja's (*Tracgelyopterus galeatus*)

Two species that have been caught during the surveys in 2005, Sriba's (*Moenkhausia coletti* and *Moenhkausia surinamensis*) did not return to the Moeder Creek. It can be concluded that though the fish diversity is still low in the creek, some improvement can be seen after the rainy season.

Proposed rehabilitation strategy

Based on the collected data, a stream rehabilitation strategy has been developed for the Moeder Creek and other similar creeks that have been impacted by small scale gold mining activities. The steps to be taken chronologically for stream habilitation are:

- Slightly leveling of steep walls of pits, without filling up the pits
- Erosion preventing measures like planting of selected pioneer tree spieces
- Removal of sludge from the stream
- Making connections between isolated pits and the stream, so the creek can also re-colonize with species from the pits
- Rehabilitation of the forest, which will occur in most localities in combination with step 2

Rehabilitation of the creek can only start after the mining activities upstream of the Moeder Creek have come to a complete stop.

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For more information:
Tropenbos International Suriname, PO Box 4194-Paramaribo Zuid, Suriname
Leysweg-CELOS gebouw
Phone: +597-532001

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