When Push Comes to Shove Removal is Warranted

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The City of New Braunfels pushes aquatic mats downstream as part of Section 5.2.10 of the EAHCP which addresses litter collection and floating vegetation management in the Comal. This section of the EAHCP specifically recognizes indirect impacts to fountain darters due to the direct impacts of these floating mats on other native submerged aquatic vegetation:

- “Debris removal also includes the removal of litter from floating vegetation mats before dislodging the vegetation mat and allowing it to continue downstream. Vegetation mats shade out native vegetation and create die off of vegetation if the mats are allowed to collect and grow in size. By dislodging the floating vegetation mats, fountain darter habitat is maintained and protected.”

It is also noted that under low flows, Section 5.2.4 of the EAHCP that aquatic vegetation mat removal is anticipated:

- “If appropriate, the program may include removal of decaying vegetation. Removal techniques for decaying vegetation, if necessary, may include using rakes/pitch forks and a jon boat to transfer material to the banks for subsequent disposal.”
Floating Mat Production

- A natural process throughout the year
  - Increased production with increasing daylight in the spring and summer
  - It is assumed that the increased surface area of Landa Lake compared to the natural river channel results in higher rates of production

- These processes and increased production due to increased surface area are similar between Landa Lake and Spring Lake in the San Marcos River
Spring Lake – San Marcos
The TSU team documented that pushing aquatic vegetation mats downstream was resulting in excessive mat accumulation in downstream areas before these lower mats could be moved.

These mats were observed to be negatively impacting TWR and other native aquatic vegetation by:

- Physically breaking TWR (and other vegetation) leaves.
- In some areas where mat accumulation was not pushed downstream, the underlying aquatic vegetation stands were negatively impacted (i.e., necrosis or loss of native plant stands).

These impacts to aquatic vegetation result in an indirect negative impact to fountain darters.
San Marcos Solution

- The TSU team developed effective methods for dealing with floating vegetation mats that included, as noted, in Section 5.4.3.2 of the EAHCP where mats were lifted vertically and displaced laterally to the Texas wild rice stands until free to move downstream where they were collected in nets, moved to shore, sorted for any entrained animals, and subsequently hauled to a composting facility.

- The number and species of all entrained animals are reported in the COSM/TSU EAHCP monthly and annual reports. The reporting has conclusively documented over several years that no entrainment of fountain darters or other endangered taxa was (or is) occurring from free floating vegetation mats.

- These efforts have also demonstrated that removal of the aquatic vegetation mats has significantly reduced the downstream accumulation of aquatic vegetation mats as would be expected.

- Based on these findings, the COSM/TSU requested a ‘Routine Adaptive Management’ amendment to the EAHCP to allow aquatic mat removal in lieu of pushing mats downstream which was granted by the USFWS.
The Issue

- Floating vegetation mat accumulation in Lake Dunlap is seasonally problematic
  - Health Hazard from entrained rubbish on floating mats
  - Can impact water borne recreational safety
  - Contributes to excessive nutrient loadings compared to natural expected rates
Source of Floating Vegetation Mats in the Comal

- The Guadalupe River upstream of the confluence with the Comal River was kayaked on March 23, 2016 to assess submerged aquatic vegetation and vegetation mats (~ 3.5 miles).
- No *Vallisneria*, *Cabomba*, *Ludwigia* or *Hygrophila* were observed within the river channel.
- Vegetation mats were not observed in the Guadalupe River reach from Gruene Rd crossing to approximately 500 feet upstream of the confluence with the Comal River. The vegetation mat was composed mostly of *Vallisneria* but also contained fragments of *Hygrophila*, *Ludwigia*, and *Cabomba*. None of these species were observed rooted the 3.5 mile upstream stretch of the Guadalupe River.
- Upon reaching the confluence with the Comal River, floating fragments were observed coming down the Comal River as well as another large vegetation mat.
In addition to the vegetation mapping noted above, historical Google Earth imagery was reviewed, and it clearly documents aquatic mat production within the Comal as evidenced by mats entrained on the ‘noodle floats’ upstream of the tube chute area during all years of available historical imagery.

This is in addition to the examples within Landa Lake shown previously.

It is evident that a non-trivial portion of the floating weed mats accumulating in Lake Dunlap originate from the Comal system.

It is evident that removal of the floating vegetation mats from the Comal would reduce their contribution to the floating mat issues within Lake Dunlap.
Ecological Considerations

- The TSU team experience within the San Marcos River specific to floating vegetation mat removal strongly demonstrates an improved overall health of the native aquatic vegetation in areas where mats normally accumulated.
- That in turn, represents improved conditions for the endangered fountain darter that relies on healthy native aquatic vegetation.
- Importantly, data from the San Marcos River strongly suggests that there are no known negative impacts of vegetation mat removal on any of the endangered taxa.
- Sorting the vegetation prior to removal to composting facilities has been demonstrated to be effective for removal on entrained fish and crawfish. To date, no salamanders or turtles have been documented as part of vegetation mat removal.
Based on our experience in the San Marcos, we do not believe that a quantifiable impact exists from entrainment of aquatic macroinvertebrates.

The EAHCP in Section 5.3.4 notes that:

“If appropriate, the program may include removal of decaying vegetation. Removal techniques for decaying vegetation, if necessary, may include using rakes/pitch forks and a jon boat to transfer material to the banks for subsequent disposal.”

Removal of floating mats from the Comal is not anticipated to result in a negative impact to nutrient cycling in Lake Dunlap. It is likely that the reduction may be associated with a positive impact due to reduced decay of organic material.
Based on the accumulated experience within the San Marcos River, we believe that there are expected to be no known negative impacts to the endangered taxa within the Comal System.

Removal of floating mats from the Comal would continue to provide positive benefits to native aquatic species within Landa Lake.

Removal of floating mats from the Comal would be anticipated to reduce the negative impacts of floating vegetation mats in Lake Dunlap in terms of:

- Reduction in health hazards from entrained rubbish on floating mats
- Improved aesthetics in Lake Dunlap due to reduction in floating mats
- Improved safety for water borne recreation
- Reduced nutrient loadings compared to natural expected rates