

Comments on The State of Utah 2012 – 2014 Integrative Report, Chapter 4, Wetlands  
Heidi M. Hoven, PhD  
The Institute for Watershed Sciences

Submitted to James Harris  
July 14<sup>th</sup>, 2014

Page 3, paragraph 1, line 5 – “These wetlands...”: It would probably be a good idea to make a stronger statement of the importance of habitat function here particularly in light of your charge to assess support of beneficial use as currently defined.

Page 3, paragraph 2: Since the initial focus of the State’s MMI is on IW’s it would make sense to develop more background on the ecological contribution of IW’s, which in turn would support the primary emphasis on them. As written, they amount to wetlands that are constructed for hunting waterfowl and no mention is made of any ecosystem services they provide. Although managed, they too provide the many wetland ecosystem services while carrying the burden of treating incoming waters and assimilating ecologically detrimental pollutants as waters drain toward the Lake.

Page 7, paragraph 3: This short list of metrics runs the risk of highly over-simplifying the complexity of biological response even in these managed systems. Our work shows the need for more detailed metrics and tighter sampling windows to capture IW’s at risk of degradation (Hoven et al. 2014).

Page 7, Table 1, Cultural Eutrophication metrics: Please define acceptable or unacceptable thresholds used, otherwise they are just potential stressors.

Page 7, Table 1, Physical Habitat Degradation: Water depth is specifically related to management objectives. It may be a stressor, however, it is important to note that it is generally not due to natural fluctuations but rather management prescriptions. How (and why) the wetland is managed could covary with other stressors and should be considered.

Also, why is size of a wetland considered a metric? Size can be used as a categorical descriptor, but is not a metric. What time of day was temperature recorded? Was the temperature data normalized with depth? What was the acceptable percentage or coverage of emergent marsh?

Page 8, Table 1, Toxic Constituent metrics: Please define acceptable or unacceptable thresholds used, otherwise they are just potential stressors.

Page 8, paragraph 3: State makes assumption that 25 - 100 cm is optimal based on what data and what part of the growing season? May be excluding high functioning, quality habitat that exists at depths more shallow than 25cm.

Sampling windows span too much time. Our reports show major changes between months (e.g., June vs. July; August vs. Sept.) (Hoven et al. 2011, 2014).

Page 8, paragraph 4: What extent of surface mat qualifies as indicative of a degraded system? Our research shows that the development of extensive surface mats, which we define as greater than 75% cover, is rare and short term. What if the survey window misses the timing of surface mat development? Do you have statistical evidence that indicates strong correlation between surface mats and a metric that reflects biological response (presumable percent cover SAV)? Our research suggests otherwise (Hoven et al. 2011, 2014).

What macroinvertebrate community composition (although I believe you mean assemblage) connotes ecological health in a highly managed system?

Page 9, paragraph 1: How do you make the connection between the listed metrics (biological indicators) and land use when the IW water source is affected by practices far upstream? How is site-specific impact from adjacent land use determined and included in the MMI without being too generalized, i.e., subwatershed level?

Page 9, paragraph 2: Willard Spur is not an IW and not managed. Setting water quality standards based on a natural system that receives high flushing flows during spring runoff is probably not comparable or relevant.

Page 12, paragraph 2: SAV cover and condition could be biased from waterfowl grazing - they arrive mid-August and reach a maximum density by mid-September. If different ponds were sampled one month apart, the grazing pressure could be unequal.

Page 14, paragraph 1: What data support greater than 25% surface mats as indicative of poor condition? What evidence do you have that supports the notion that an impounded wetland must essentially not have any algae (less than 1%) to qualify as good condition? Algae are a natural component of aquatic systems and important contributors to a balanced ecosystem. Extensive, healthy beds of SAV can and do coexist with well over 50% cover of surface mat. It is quite possible there are other stressors that have detrimental impacts on the ecological condition of the ponds.

If there are negative impacts on the condition of waterfowl habitat and hunting related to algal mats, the data should support it. Our data show that surface mat cover and SAV cover are not correlated (Hoven et al. 2011, 2014). There is no indication of negative impacts from surface mat cover in your summary other than a broadly applied assumption with no statistical evidence.

Page 14, Figure 4: Not many ponds show extensive surface mats (above 60%, our conservative definition, Hoven et al. 2014). Surface mat cover is probably not a good predictor of ecological condition.

Page 15, paragraph 1: Your PMI metric shows that phytophillic macroinvertebrates are associating with sites that have SAV as they should. What is the ecological significance relative to wetland condition that differs from that implied by SAV percent cover? Isn't this a covariable?

Page 16, paragraph 2: Lack of SAV index sensitivity is possibly due to the broad sampling windows. IW's that host a high number of waterfowl during the first half of September receive high grazing pressure from the waterfowl and could bias your results and interpretation. Best to consider an alternate sampling window as recommended by Hoven et al. 2014. Also, the State should consider incorporating additional metrics that have been shown to reflect good biological response to stressors (Hoven et al. 2011; Hoven et al. 2014).

Were the "good" sites measured for DO and pH at the same time of day as the "poor" sites? Both measures vary highly throughout a 24hr cycle in healthy and degraded wetlands.

Page 17, paragraph 1: This observation illustrates our findings of no significant correlation between degradation of a site as reflected by SAV cover and surface mat cover (Hoven et al. 2010; Hoven et al. 2014). Again, why is this considered an important biological response and included in the State's MMI?

Page 17, paragraph 2: DO and pH data are practically irrelevant when measured at different times of day and used for comparison among sites.

Page 17, paragraph 3: What is the value in re-scaling and combining the metrics into one final score? How does it provide guidance toward the development of specific water quality goals when the only useful metric is either SAV cover or PMI? I suppose it warrants further investigation, however, our comparison of State selected metrics versus use of additional vegetative metrics show a likelihood of overlooking some potentially degraded sites if only State selected vegetative metrics are used (Hoven et al. 2014).

Page 18, paragraph 2: There is no indication that surface mat cover is a key measure of biological integrity. What data does the State use to back the inclusion of this metric?

Page 18, paragraph 3: What frame of reference does the State use for DO and pH that are collected at different times of day as indicators of good ecological health?

Page 19, Figure 8: Not very good separation of 95% confidence intervals. The metrics used are oversimplified and probably inadequate as indicators of biological response. Our comparison of State-applied metrics versus additional vegetative metrics shows a lack of sensitivity for using percent cover SAV, percent cover surface mat and SAV condition index as the sole assessment of SAV condition from a vegetative perspective (Hoven et al. 2014). We show that in addition to using a more appropriate sampling window and need for seasonal reference for natural changes in development and establishment of a SAV community, other metrics related to physiological queues from the SAV are important to include. Those are branch density and productivity of drupelets and tubers. Other biological responses related to the environmental condition of a site such as percent cover of algae on SAV and other coating on the leaves formed by biofilm, diatoms and / or sediment, make a more direct link between stressors (elevated metals and nutrients) and negative impacts on biological response (Hoven et al. 2011; Hoven et al. 2014).

Page 19, paragraph 1: Stream assessment protocols are not applicable in wetland settings. Impounded wetlands do not operate similarly to flowing streams on a biogeochemical, biological, or ecological stand point. What basis does the State provide that they can use stream assessment protocols in IW's?

Appendix 2: Please provide units in your graphs.