

STAG comments and Science Work Group members responses  
on the Macrophyte Knowledge Gaps document

**Table 1. Comments from Andria Ventura**

#	Andria Ventura's Comments	SWG Members Response
1	<p>Table 2, Issue #2 - There is a slight disconnect between Issue #2 in Table 2 and the research recommendation on page 9. The question is about the biomass and distribution but also addresses differences in habitat, which was an issue discussed in the 2<sup>nd</sup> paragraph on page 4. I recommend revising the research recommendation in Table 2 Issue #2 to read as <b>“A comprehensive multi-year monitoring program needs to be implemented <u>in a variety of site and Delta habitats</u> to determine changes in seasonal and annual biomass of all dominant macrophyte species.”</b></p>	<p>Members agreed with revision. Sentence was rephrased to be consistent with formatting of other recommendations.</p>
2	<p>We would add a management question #7B that asks if other more prominent factors that impact macrophyte growth are controlled (e.g., temperature, flow, etc.), will nutrient management make a substantial difference?</p>	<p>Science Work Group members recommended this question be added to Table 3 (STAG proposed management questions). A few members did not think this question needed to be assessed separately as it could be included in the studies recommended in #7b to assess efficacy of nutrient management with and without other control measures.</p>
3	<p><b>We would recommend that the impacts of increased use of herbicides as a management strategy be studied before such strategies are extensively employed.</b> Specifically, we should determine the potential impacts on water quality, other aquatic species (plant, animal, cellular organisms, etc.) and normal macrophyte growth that is needed for beneficial ecological services in the Delta. This is critical since it is unlikely all plants will be eradicated in the Delta (page 4) and we need to balance macrophyte negative impacts on aquatic species with their benefits described. (Table 3, Issue #1)</p>	<p>Members agreed that studies should be undertaken to examine the effects of new herbicides and adjuvants on key water quality parameters and aquatic organisms. Text was inserted into the knowledge gap and research recommendation.</p>

**Table 2. Comments from Paul Bedore on behalf of the Port of Stockton**

#	Paul Bedore's Comments	SWG Members Response
1	<p><b>Page 2, Paragraph 3</b> – While the paragraph indicates the density of aquatic plants can be problematic, hyacinth does not need to be dense to impede navigation. Mats that break loose from dense nursery areas and move into the channel impede commercial ships. We suggest adding the following sentence to this paragraph.</p> <p><i>E. densa</i>, <i>E. crassipes</i> and <i>Ludwigia</i> sp are a problem because they are non-native species with no natural biological control. Colonies of all three species have invaded large areas of the Delta and have rapidly increased in biomass. These invasive species tend to occur at high density. <b>The density of <i>E. crassipes</i> is highest in nursery areas, which typically consists of Delta sloughs and channels with high residence times. Wind and boat turbulence, among other factors, can cause mats of <i>E. crassipes</i> colonies to break from large nursery colonies and migrate into main river channels where they may adjoin other migrating colonies and impede commercial navigation.</b> In dense beds the colonies <b>of all three species</b> can cause multiple problems.</p>	<p>Members agreed with some slight revisions to the text and suggested moving the text further down in the paragraph.</p>
2	<p><b>Page 3, Paragraph 1</b> – While additional study would address other factors, POS recognizes that current mechanical and herbicide control programs could be more effective were they implemented earlier in the year. We suggest the following changes to highlight the importance of addressing the efficacy of current control strategies.</p> <p>A number of factors have been identified that may influence the establishment, growth and dispersal of macrophytes in the Delta (Table 1). The factors include light, temperature, salinity, flow, substrate stability, chemical/mechanical control, interspecies competition, and nutrients. Most of these factors have been determined from research conducted elsewhere. Studies are needed to establish their relative importance in determining the seasonal and inter-annual abundance of both native and introduced species in the Delta. <b>In the experience of the Port of Stockton, inter-annual production of <i>E. crassipes</i> is modulated when there is a sufficient period of sub-freezing air temperatures to bring about senescence of <i>E. crassipes</i> colonies in the Delta. They also identified the need to implement mechanical</b></p>	<p>Members agreed with some slight revisions to the text.</p>

	<p>and herbicide control programs earlier in the year and more extensively as a means to target <i>E. crassipes</i> nursery areas following warm winters.</p>	
3	<p><b>Page 3, Paragraph 2</b> – It is unknown whether nutrient management in the Delta could reduce nutrient levels low enough to influence plant production, and the difference in response of FAVs and SAVs to water column nutrient management is also unknown. We recommend modifying this paragraph as follows: The range of nutrient concentrations that limit macrophyte growth in the Delta are not known. FAV species, like <i>E. crassipes</i>, acquire their nutrients from the water column while SAV species, like <i>E. densa</i> and <i>Ludwigia spp</i>, can obtain nutrients from both the sediment and water column. Therefore, FAV species are hypothetically a more plausible target for a water column nutrient management plan. The Science Work Group cautioned, however, that it was unlikely that nutrient reductions alone would be sufficient to control the abundance and distribution of any macrophyte species. To their knowledge, nutrient reductions have not been effective at eliminating invasive aquatic plants anywhere. The group did hypothesize, though, that were nutrient management able to reduce nutrients to levels that reduce the growth rate and viability of some invasive species, nutrient management and might be an option for improve improving the efficacy of present physical and chemical control actions.</p>	Members agreed with the revisions.
4	<p><b>Table 1, Issue #4</b> – We suggest modifying this section to clarify that only two surveys have been conducted recently. <i>E. densa</i>, <i>E. crassipes</i>, and <i>Ludwigia spp</i>. have increased in abundance since the middle of the last century in the Delta. The two most recent aquatic vegetation surveys in the Delta showed that between 2008 and 2014 there has been a two-fold increase in submersed aquatic vegetation (SAV) and a five-fold increase in floating aquatic vegetation (FAV).</p>	Members agreed with the revisions.
5	<p><b>Table 1, Issue #7</b> – For same reason identified above for Page 3, Paragraph 2, we recommend modifying the entry to read as “The Science Work Group is unsure whether nutrient management can control macrophytes. There is no precedence from other ecosystems that nutrient management alone will be an effective control option. Hypothetically, was nutrient management able to reduce nutrients to levels that may reduce the</p>	Members agreed with the revisions.

	<p>growth rate and plant viability of some invasive species, nutrient management might be an option for improving and increase the efficacy <del>effectiveness</del> of present chemical and mechanical control <del>efforts</del> actions.</p>	
6	<p><b>Table 2, Issue #7</b> – To determine if nutrient management could be an option for improving current control efforts, the efficacy of current control efforts should be evaluated. We suggest dividing Issue 7 into Issue 7A and Issue 7B. 7A focused on factors that influence the efficacy of current control practices and 7B focused on nutrient management and whether its addition to current control practices can improve the efficacy of these practices.</p>	<p>SWG members were ok with separation of these two issues, and provided some edits to the knowledge gap and research recommendation language.</p>
7	<p><b>Table 2, Issue #8</b> – While we do not have any specific edits to suggest at this time, we recommend that this issue be revised to clarify how and why this research question is important to aquatic weed management.</p>	<p>SWG members did not respond to the request to revise and clarify the language.</p>