Author	Page	Comment	Response
Conrad	ii	Executive Summary, first paragraph, second sentence - What type of impairment? Ecosystem?	
Conrad	ii	Executive Summary, first paragraph, last sentence - Only three (major) questions follow (not four).	
Conrad	ii	Executive Summary, Finding#2: Lack of a routine monitoring program hampers our ability to discern recent spatial and temporal trends. - This seems like a recommendation rather than a finding. The finding is that Egeria and water hyacinth dominate the macrophyte community in the Delta and may be expanding. The lack of adequate monitoring is addressed in your recommendations below so I suggest removing this sentence here.	
Conrad	iii	Executive Summary, Finding#5: first sentence - Sea level rise should also be mentioned here, perhaps?	
Conrad	1	Under Chapter 1, Section 1.1, fourth sentence: The Delta is widely recognized as in "crisis"…" - Incomplete sentence.	
Conrad	3	Under Chapter 1, Section 1.2, Second paragraph - Re-start numbering (of key questions) at #1.	
Conrad	4	Under section 2.1 , the first two sentences were highlighted by the commenter but no comment provided.	
Conrad	11	Figure 2.5 caption - The caption says that the Google Earth imagery was “digitized and ground trothed.” How was the ground-truthing conducted? It seems hard to believe that a species-level determination of submersed vegetation can be done from visual review of Google Earth imagery, especially given that analysis of hyperspectral imagery was not always reliable for species determination of SAV. The reference for this is Boyer et al. 2015, which is not provided in the Google Drive of references. Is it possible to see this information.	
Conrad	12	4th paragraph, reference to Breitler 2014 - This citation is not provided in the Literature Cited.	
Conrad	13	Second paragraph on *Stuckenia sp* ., first sentence - See comment above on Fig. 2.5. Was Stuckenia coverage in 1993 and 2002 also ground-truthed?	

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Conrad	15	Section 3.1, first paragraph, highlighted sentences from "In contrast, dense canopies... to "...leading to predation on smaller adult and juvenile native fish" - Some of the following paragraph (e.g., highlighted passage) reads as if these conceptual ideas have been well established. Not the case for all of these assertions. Suggest revising the language to be less absolute.	
Conrad	16	Under section 3.1.1, first paragraph, fourth sentence "*E. densa* sheds some biomass in winter but does not fully senesce (Fig. 2.2) - Santos et al. 2011 may be another reference to use for this assertion.	
Conrad	17	Section 3.1.3 - Consider re-naming this “Effects on hydrodynamic and sediment processes” or some version of this. “Habitat” can mean a lot of things- from substrate to food web to water quality. I expected this section to address vegetation effects on water quality given that it addressed suspended sediment. Also, it seems more intuitive to discuss effects of vegetation on the physical habitat (like water velocity) and water quality before discussing food web effects. Right now the organization discusses food web (“trophic support”) in the middle of these physical aspects.	
Conrad	17	Under section 3.1.3, third sentence, "Submerged plants may also …" - I think Shruti Khanna’s 2012 paper present a conceptual model that expresses this idea	
Conrad	18	Under section 3.1.3, last paragraph on floating vegetation - This is a very short section on habitat alteration by floating vegetation. Check Shruti Khanna’s paper for more detail that could be fleshed out here…	
Conrad	18	Under section 3.1.4, first paragraph, first sentence - A useful reference that could be included in this synthesis is: Schultz, R., and E. Dibble. 2012. Effects of invasive macrophytes on freshwater fish and macroinvertebrate communities: the role of invasive plant traits. Hydrobiologia 684:1-14.	
Conrad	19	Under section 3.1.4, Second paragraph under *Eichhornia crassipes* , 2nd sentence - Awkward sentence, should be revised. Shift invertebrate foods available relative to what?	

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Conrad	19	Under section 3.1.4 third paragraph under Eichhornia crassipes - This section seems fairly brief, given the amount of published work on the subject. To help readers process the host of effects that aquatic veg can have on water quality, it may be useful to deal with each water quality parameter one by one, and highlight the important results (e.g. subsections for DO, pH, nutrients. And what about temperature? It seems that should bediscussed as well if there is literature suggesting the AV may have effects. Examples help too…	
Conrad	19	Under section 3.1.5. Changes in Water Quality, 1st paragraph, first sentence - These effects should be described in more detail here, with citations. I expected the rest of this paragraph to delve into effects on DO, but instead the next sentence shifts gears into nutrients.	
Conrad	19	Under section 3.1.5. Changes in Water Quality, 1st paragraph, 2nd sentence - Interesting…is there a citation for this?	
Conrad	20	Under section 3.1.5 2nd paragraph, 1st sentence - Does SAV contribute DO or limit it? There are diurnal swings in DO in dense Egeria beds.	
Conrad	20	Under section 3.1.5, 2nd paragraph, 1st sentence (Meerhoff et al. 2003) - This reference is not listed in the Literature Cited section.	
Conrad	24	Under section 4.1.1 Light, 2nd paragraph, last two sentences - Seems like it's worth noting here that rigorous study of species-specific effects on local water quality conditions (such as turbidity) have not been done- perhaps this is an area worthy of more study?	
Conrad	24	Under section 4.1.1. Light, third paragraph, second sentence - The difference between treatments in the study described is unclear in this sentence. 2x greater…depth…light?	
Conrad	24	Under section 4.1.1 Light, third paragraph, last sentence - Again, the conditions tested in this experiment are not completely clear in this sentence. Why not state what the light exposure treatments were?	

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Conrad	24	Under section 4.1.2 Temperature, reference for Knowles and Cayan 2002 - This reference is missing in the literature cited section. Also, a more recent reference that projects Delta water (rather than air) temperatures is: 1. Wagner RW, Stacey M, Brown LR, Dettinger M (2011) Statistical models of temperature in the Sacramento-San Joaquin Delta under climate-change scenarios and ecological implications. Estuaries and Coasts 34: 544-556.	
Conrad	25	Under section 4.1.3 Salinity, first paragraph, first sentence - This first paragraph provides helpful background on how this aspect of water quality responds to current management practices and how it has been changing over time. It also puts the Delta plant life in context. I think this would be nice to do for light (i.e., turbidity) and for temperature as well. There are several papers that discuss a trend of water clearing in the Delta. You already do this to some extent with temperature, but it could be expanded a little (see above comment for an updated reference).	
Conrad	25	Under section 4.1.3 Salinity, first paragraph, sentence related to summer and fall salinity in last 25 years due to management of fresh water - Reduction?	
Conrad	26	Under section 4.1.3 Salinity, second paragraph, reference to Figure 4.4 - I find the axes below of % change a bit confusing. What is the reference condition? What does 1000% change at 0ppt mean?	
Conrad	27	Under section 4.1.3 Salinity, first paragraph, second sentence - Similar to (Engle's) above comment: I understand this text, but I don’t see this message reflected in Fig. 4.4. It looks like a declining trend in Stuckenia biomass with increasing salinity.	
Conrad	27	Under section 4.1.3 Salinity, second paragraph - Given that there is little detail above on the distribution of these species, I’m not sure what this surmising is based on.	
Conrad	27	Under section 4.1.4, first paragraph, second sentence - And what are primary factors determining pH in the Delta?	

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Conrad	28	Under section 4.1.5, third paragraph, second sentence - Add a ")" after the words "0 to 4 kg/g sediment"	
Conrad	29	Under section 4.1.6 Flow, first paragraph, second sentence - Erin Hestir's dissertation includes an analysis of maximum water velocity thresholds for SAV establishment in the Delta (I have a copy if you would like to review): 1. Hestir EL (2010) Trends in estuarine water quality and submerged aquatic vegetation invasion [Dissertation]. Davis: University of California, Davis. 146 p.	
Conrad	31	Under section 4.1.8, second paragraph regarding reference to Santos et al. 2011 - An important result from this paper that I don't see highlighted here is that Egeria sustains its biomass in the fall/winter, giving it a head-start in growth in the following spring compared to other species.	
Conrad	35	Under section 5. Recommendations, R2 - More detail of the vision here? See major comment in the accompanying Word File (my general comment #4)	
Cornwell	N/A	General Comments: Overall, this is a good analysis of control of invasive/native macrophytes in the Bay/Delta. As a biogeochemist, my comments are focused on nutrient-related regulation of plant success and the effects of invasive plants on Bay/Delta nutrient cycling and balances. My lab's recent publication in sediment biogeochemistry may be of some help, I didn't emphasize macrophyte effects because we also saw large effects of benthic microalgae in areas with submersed vegetation.	

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Cornwell	N/A	Specific Comment 1. The biogeochemical feedback of increased plant biomass on water quality, especially low dissolved oxygen and higher nutrient remineralization/release is of concern. Often, as in the Hydrilla invasion of the Potomac River, the results can be beneficial for nutrient balances. I think the concern of poor sediment quality, i.e. high rates of respiration/nutrient release/poor habitat for benthos, is perhaps less of a worry. Our sediment flux work (Cornwell et al. 2014) in several locations with (albeit sparse) submersed aquatic vegetation (Sherman Lake, Big Break, Franks Tract) did not suggest extremely high rates of sediment respiration or nitrogen release, although rates tended to be higher than in non-vegetated Suisun Bay environments. The macrotidal nature of much of this estuary might lead to export of decaying macrophyte biomass "downstream", with only a very modest effect on nutrient balances in the plant bed. However, these concerns are easily tested.	
Cornwell	N/A	Specific Comment 2. Evaluating the role of nutrients in the spread of invasive macrophytes is a massive challenge. In the Chesapeake, the loss of water clarity from phytoplankton and the proliferation of epiphytes lead to a collapse of grasses; understanding the enhancement of macrophytes by nutrients is more difficult. The hypothesis that enhanced P release from increasing metabolic rates for E. densa is interesting, and in fact we observed high P releases in March 2012 in areas with macrophytes. If plant beds develop conditions conducive to P release over time, with the buildup of organic matter, there may be a strong supply of P, especially from pore water uptake. Thus, there could be a positive feedback.	

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Cornwell	N/A	Specific Comment 3. The absence for routine monitoring of plant biomass, spatial extent, species composition, and relatively standard water quality measures (oxygen, salinity, pH, chlorophyll a, nutrients) in plant beds is the greatest source of uncertainty in the report and an absolute necessity to move forward with modeling and control strategies. This is perhaps the key investment that needs to be made; without this, the extent of the problems will be poorly understood. Any potential investments in more research, modeling, or management suggestions need this basic information.	
Cornwell	N/A	Specific Comment 4. The suggestion of developing a biogeochemical model of the Delta has been made in this report and from our work, it appears to be a key needed advance. There exist many different models for estuarine ecosystems, and I would suggest that off the shelf models might work well for large scale nutrient cycling and balances. Modeling macrophyte communities remains a huge challenge in estuarine science. The biogeochemical effects of given plant species and biomass are becoming better understood, but models also need to the temporal and spatial patterns of macrophyte abundance.	
Cornwell	N/A	Overlall Comment and Reference: Overall, this is a useful assessment of the state of knowledge regarding Delta macrophytes, with a number of modest caveats from committee members that were expressed at our meeting. The report includes all plausible environmental controls on biomass, as well as biogeochemical feedbacks. Cornwell, J. C., P. M. Glibert, and M. S. Owens. 2014. Nutrient Fluxes from Sediments in the San Francisco Bay Delta. Estuaries and Coasts 37:1120-1133.	
Durand	iii	Under Recommendation #4, first bullet on conditions in Delta favoring growth: low turbidity?	
Durand	iii	Under R1: We need routine nutrient monitoring on a finer scale than we have, too.	
Durand	iv	Under R3: Item 2 in last sentence: Suggestions for control strategies: chemical, mechanical, gated restoration planning, etc.	

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Durand	1	Under 1.1: first paragraph, last sentence - Typo on declined [change "declined" to "decline"], wording for "threatened and endangered" to native? desirable?	
Durand	1	Under 1.1, second paragraph - need an end quote on sentence "…the State Water Resources…".	
Durand	1	Under Potential nutrient related problems, item 1. Decreases in algal abundance - Do you mean phytoplankton?	
Durand	1	Under Potential nutrient related problems, item 3. Increases in the magnitude and frequency of cyanobacterial blooms - Do you mean Microcystis?	
Durand	5	Last paragraph, last sentence - I am certain that it has greatly expanded during the drought.	
Durand	10	Under section 2.3 third sentence on egeria densa related to growth response under red light - … or conditions with sufficient turbidity to shade out blue light.	
Durand	12	3rd paragraph on page starting with "egeria densa is thought to have been introduced to the Delta in 1946". - But worth noting that DWR reports from 1993 (Department of Water Resources. 1970-2000. Water Quality Conditions in the Sacramento-San Joaquin Delta. Sacramento, CA.) mention Egeria without alarm; however by 1996 Grimaldo and Hymanson (1999) noted thick stands with lots of alien centrarchids. My point being that some shift in the late century began accelerating the spread of this plant.	
Durand	13	2nd paragraph on Stuckenia sp., first sentence - Louise' (Conrad) comments notwithstanding, this is an interesting way to compare...can you do something like this with Egeria...and how reliable are your estimates?	
Durand	15	Under Chapter 3, first paragraph, second sentence on negative effects - ...usually facilitated by very high densities of alien SAV	

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Durand	15	Section 3.1, first paragraph, sentence "In contrast, the open water beneath sparse canopies of native *Stuckenia* sp. may provide …" - I am not sure how well these statements are supported by the literature as well. For example, I am not sure if we have any idea that native fish are particularly associated with Stuckenia. Adverse effects of alien SAV on fishes are more consistent with the literature...but even some of that may have been overstated. For example, while high densities of predators may lurk in SAV patches, there is no evidence to suggest that this is responsible for populations effects of vulnerable native fishes like smelt or salmon.	
Durand	16	Under section 3.1.1, first paragraph, fourth sentence "*E. densa* sheds some biomass in winter but does not fully senesce (Fig. 2.2) - Freezing can make a huge impact. Years (like the last) without a freeze had limited die back. I think Shruti has some documentation or a ref for this.	
Durand	18	Under section 3.1.4, first paragraph, second sentence on cascading effects - not sure what you mean by this: trophic cascades are typically top down	
Durand	18	Under section 3.1.4, first paragraph, fourth sentence on thickly growing stems - But it's reasonable to think about this as a management question, because, as we have said, at intermediate densities it probably provides more food access with limited risk. Also, at reasonable densities, it can provide prey refuge, I suspect. the question I have is: how often does it occur at "reasonable densities" and if so, can we find that as an intermediate ideal?	
Durand	18	Under section 3.1.4, first paragraph, last sentence with effects on the food web - predation effects	
Durand	19	Under section 3.1.4 under *Eichhornia crassipes* first paragraph, 3rd sentence - I wonder how much this matters to predators? Matt Young at UCD has a lot of insight into this. [Matt's email] mjyoung@ucdavis.edu	
Durand	20	Under section 3.1.5, 2nd paragraph, 1st sentence - [In reference to Conrad's comments on DO] …especially at night.	

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Durand	24	Under section 4.1.1 Light - For what it's worth, my model using Santos' data showed an ambiguous relationship with turbidity, a low probability of establishment at depths below 5 m and a rapidly decreasing probability of establishment with increasing flows.	
Durand	25	Under section 4.1.3 Salinity, first paragraph, second sentence - [In reference to Shruti Khanna's comment] Not sure what you mean Shruti, but the Delta was not necessarily fresher before the 1970's. It had more intra and inter-annual variability than we see now. One of the famous early pieces of evidence for this is the Martinez C&H Sugar plant records which document how far up the Delta they needed to go for freshwater. After project implementation, the Vernalis agreement established a salinity standard, legally prohibiting the intrusion of salinity past a certain point. Clearly, Egeria responds well to the more stable salinity regime. We have recommended salinity variability as a way of controlling a number of alien species. Generally, this has been shot down because of legal implications, in Delta consumptive use and the cost of water.	
Durand	27	Under section 4.1.5, second paragraph, first sentence - But limited at times, in the north Delta, that is, off of the Sac plume.	
Durand	29	Under section 4.1.6 Flow, first paragraph, second sentence - [In reference to Conrad's comments on Hestir's disseration reference] Hestir found a dramatic decrease at .49 ms-1, I found a decrease at around .3 ms-1.	
Durand	31	Under section 4.1.8, first paragraph, first sentence - [his comments on the words "is interactions"] case	

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Durand	34	Under section 5. Recommendations - Are there really no concrete recommendations that we can bring, at least in the form of hypotheses, about management of the two main invasives? The "more research is needed" is understandable, but not really adequate, given the time and money currently invested in research and management of this beast. I believe we can say a number of things about SAV/FAV distributions, even if we have to qualify the recommendations with a certain amount of uncertainty, or state explicitly that some recommendations remain disputed or controversial. For example, restorations with limited flow and shallow water 1 and 5 meters are going to get a lot of Egeria. Small embayments or eddies on the lee side of channels are going to be heavily impacted by E. crassipes. Regions that can utilize flow pulses of water will be able to "reset". Managed wetlands are able to "reset" by draining. Chemical management is not very effective except for short periods, and is quite spotty in terms of its impact. Mechanical harvesting is slow and the effect is only good for short periods (how long?), but the effect is targeted where it is most needed. The waste can be re-used as fertilizer to subsidize the harvest. Etc, etc. I am sure that at this point, we can describe these and other hypo-recommendations either as targeted research questions or for interim management recommendations....	
Durand	34	Under section 5. Recommendations, first listed item #3 - This may not be your charge, but a fourth question worth considering is how aq. veg will affect restoration and how restoration sites can be managed or designed in anticipation of this.	

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Durand	34	Under section 5. Recommendations, second paragraph, second listed item #1 - I said this before, but routine monitoring should include continuous water quality monitoring, flow conditions, and nutrient compositions across the estuary. The SFE is really behind in these basic observational elements.	
Durand	35	Under section 5. Recommendations, R2 - Also a widely available hydrodynamic model, which will be necessary to understand stand development and dispersal	
Engle	iii	Under R1: Second senternce on monitoring: We have to be able to quantify the net primary production (changes in biomass over small time periods using tagged whole rosettes or internodes) , expected growth increments based on (standing biomass at "Time A")x(measured NPP), and then compare the expected growth increment to standing biomass at next time point (Time B). This provides NPP and turnover rate. Without those you cant know what the carbon or nutrient flux into and out of the plant biomass is. In other words, standing biomass can be absolutely static even while huge quantities of carbon and nutrients are being fixed in tissue and rapidly turning over.	
Engle	3	Under section 1.2, originally item 6) of the following key questions: What is the relative importance of nutrients and organic matter accumulation … - Not sure that "organic matter accumulation" is meant to be described here as "a factor promoting trends" in the vegetation. At our meeting, it was being discussed as a potential result of vegetation but not the cause of it.	
Engle	5	Last paragraph, first sentence in references (see Literature Cited…) - Rephrase to "Literature Cited, Local and regional press reports"	

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Engle	15	Section 3.1, first paragraph - Floating macrophyte beds also provide a substrate near the water surface for a diverse and large biomass of attached microalgae that can exceed the biomass of phytoplankton in adjacent open water (on a per m2 basis). We may not fully understand how the epiphytic community contributes to production at higher trophic levels. Certainly in my own experience there can be thousands of microcrustaceans and other invertebrates (especially insect larvae) per dry gram of root tissue in floating macrophyte beds. If you would like some references from analogous systems in the Amazon, let me know.	
Engle	15	Section 3.1, first paragraph, last sentence discussing excessive organic matter accumulation - As we discussed during the meeting, I am not sure if there is accumulation of organic matter in the Delta channels where this stuff grows. I'm sure there is a "rain" of detritus, however - what is the evidence that there is organic sediment build up? It is just as likely that the turnover of biomass yields primarily DOC that is exported downstream. This is the predominant fate of macrophyte-fixed carbon in the Amazon system.	
Engle	16	Under section 3.1.1, first sentence on sediments over time - See my comments above. Are we really getting organic matter build up in Delta sediments? If we are going to emphasize a sediment feedback hypothesis as leading to impairment I would like to see some citations from the Delta confirming that there is organic matter accumulation in the sediments, or this should be couched as hypothesis and a data gap. Also, in a lotic system, nutrients released from sediment into the water column aren't preferentially used by macrophytes...they are available to any primary producer in the downstream environs. In general I find myself wishing for more discussion of fate and transport processes related to elemental stocks in macrophytes since the Delta is a "fluid" system (no pun intended).	

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Engle	16	Under section 3.1.1, first paragraph, last sentence on page "As aquatic vegetation expands in coverage, this large contribution of organic matter from both natural senescence and management of these abundant plants represents eutrophication. - I really am uncomfortable with this assertion unless we can demonstrate that the macrophyte bed carbon metabolized in adjacent water is causing the Delta waterways to be net heterotrophic.	
Engle	17	Under section 3.1.2., 1st paragraph, 1st sentence - See my earlier comment regarding macrophyte beds providing a platform for attached microalgae that are maintained near the surface and get plenty of light. In fact, there may be more primary production in attached microalgae being held near the surface than there is in the turbid, mixed water column in adjacent waters.	
Engle	19	Section 3.1.5 Changes in Water Quality - Since this paper will be used in a nutrient standard setting purpose, it is important that this section be robust and supported by citations.	
Engle	19	Under section 3.1.5 Changes in Water Quality, 1st paragraph, 3rd sentence - The Greenfield citation is about effects of mechanical shredding. Natural senescence is not likely to have the same water quality effects. There ought to be sufficient literature to support a hypothesis about large beds naturally "sinking" -if not, we should leave this out. In my experience, aquatic macrophytes usually lose most of their labile elemental mass while still in the water column as they senesce - which means lots of transport downstream through dissolved organic compounds. You dont usually find hearty masses of decaying stems and other tissues sitting around on the bottom unless there has been a physical disturbance. If massive sinking occur in the Delta in undisturbed beds - it should be backed up with a citation.	

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Engle	21	Under section 4.1, first paragraph, last sentence - Back in the days when BDCP was generating its conservation measures, they relied heavily on a threshold velocity for Egeria establishment of 0.49 meter per second (m/s) to model the effects of their future operations scenarios on Egeria distribution. This threshold was cited to come from: Hestir, E. L., D. H. Schoellhamer, J. A. Greenberg, T. Morgan-King, and S. L. Ustin. 2010. Interactions between Submerged Vegetation, Turbidity, and Water Movement in a Tidal River Delta. Water Resources Research,(in review) I dont find that this paper ultimately appeared in the literature, but the threshold received lots of publicity in the arena of BDCP-management scenarios and I would like to know if the macrophyte-mavens in the Delta support acknowledgement of this threshold in the white paper. I see further down that this threshold is brought up by other reviewers and came from Hestir's thesis.	
Engle	24	Under section 4.1.2 Temperature - If you take Louise's suggestion about adding water management aspects to the other "factors", you might want to look at the BDCP modeling outcomes for temperature under operations scenarios. They modeled the operations effects on Microcystis (not saying I agree or disagree with their conclusions) by calculating how many days temperature would exceed certain thresholds in the Delta in the future. Cant remember if they published temperature scenarios that include climate change.	
Engle	27	Under section 4.1.3 Salinity, first paragraph, second sentence - Should you let people know you are using PSU, if you are?	
Engle	27	Under section 4.1.4, second paragraph - Are there any direct diel measurements of pH inside macrophyte beds in the Delta? If not, this should be acknowledged. I'm skeptical of dissolved-gas mediated changes in water chemistry in lotic settings, although in flooded islands and back sloughs less skeptical.	

Author	Page	Comment	Response
Engle	29	Under section 4.1.5, first paragraph on section related to organic loading of sediments - My usual saw...this is highly speculative unless there is evidence that there is continual organic loading of sediments going on in this system (as opposed to rapid export), with subsequent higher release rates of DIN and DIP from sediments where macrophytes are growing.	
Engle	29	Under section 4.1.5, second paragraph on *Eichhornia crassipes* - I dont have time by today to look into Eichhornia dosing experiments, but its seems that there should be more than 1 citation out there regarding Eichhornia dosing experiments. I suspect Shruti may have provided some resources. Given the "charge" to guide the Central Valley Board regarding whether nutrients are driving macrophytes - this nutrient section should be beefed up with a more thorough literature review - and the experimental conditions placed in context of DIN and DIP concentrations from monitoring stations in the Delta to see if any of them are environmentally relevant.	
Engle	30	Under section 4.1.7 third paragraph, first sentence - Is there a review paper or two to cite, or even the proceedings of some symposia or another?	
Engle	31	Under section 4.1.8, third paragraph, first sentence - It seemed from our meeting that there is concern that the "niche" occupied by Eichhornia would be occupied by SAV if Eichhornia was effectively managed. This "zero sum game" aspect of the Delta macrophyte issue should be discussed more fully in this white paper, in my view.	

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Engle	33	Under section 4.2 - There seem to be only a few examples where a hyacinth or SAV-dominated system experienced a state-change to plankton-dominated. In the cases I am aware of, climatic perturbations seem to be a driver, not nutrient management. One case is the state change to low hyacinth in Lake Victoria in the late 1990s. The explanations for this state change have been debated in the literature (bio-control, meteorologic event like an El Nino?). In addition, there was a regime shift from Egeria dominance to turbid open water in the Rio Cruces wetland in Chile that may have been prompted by a climatic event (Marin et al. - citation was among those posted for the group). I think the white paper should have at least a brief section acknowledging cases where some kind of perturbation actually DID result in disappearance of FAV or SAV - it could be instructive for management debate here.	
Engle	33	Under section 4.2, third sentence on accumulation of biomass as well as clonal propagation - But at environmentally relevant concentrations for the Delta?	
Engle	34	Under section 5. Recommendations, R1 - Please see my comment about NNP and turnover measurements in the executive summary	
Engle	39	Reference for Marina, V.H. et al. 2009 - spelling is Marin; This paper is not referenced in the paper, but should be regarding regime shifts having to do with climatic perturbations. I wonder if there are other references here that are not cited in the text?	

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Foe	24	You note that light availability is important for successful colonization of Egeria densa, and maximizing its tissue growth and biomass. The Delta has become clearer. The delivery of suspended sediment from the Sacramento River to the Delta has decreased by about half during the period between 1957 and 2001 (Wright and Schoellhamer (2004)[1] and this has resulted in a statistically significant 2 to 6 percent decrease per year in SPM between 1975 and 2005 (Jassby, 2008)[2]. Of course, it is uncertain whether the trend will continue. Might this increase in clarity also increase the biomass and distribution of submerged macrophytes like E. densa? Could this increase in clarity make other factors like nutrients more important? 1 San Francisco Estuary and Watershed Science, 2004 volume 2, issue 2 2 San Francisco Estuary and Watershed Science, 2006 volume 6, issue 1	
Foe	24-25	I have observed large rafts of Eichornia crassipes being tidally moved seaward out of the Delta to San Francisco bay in late fall with the first cold snaps. I assumed that colonies lost their cohesive stability under freezing night time conditions. This seems like a potentially significant biomass loss mechanism. Is this true? Is there any mention of this in the literature?	
Foe	28	Second paragraph - You say, “High nutrient availability is often cited…..” Can you give a reference to support this assertion?	

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Foe	29	Redfield ratios are often used in phytoplankton studies to determine which nutrient will become limiting as the nutrient pool is exhausted. Typical phytoplankton N:P Redfield ratios are 7.5:1 (wt:wt) although the number may change somewhat based upon algal growth stage and species. DIN to DIP ratios for Suisun Bay are around 6:1 (Glibert et al 2010). Ratios for the delta are more variable but range between 5 and 10 (Foe et al., 2010). You can get more data from Alex Parker and Dick Dugdale at the Romberg Tiburon Center. N:P ratios are 2 to 3 for Stuckenia sp and E densa in figure 4.4 If so, it seems that macrophytes may have a higher P requirement than phytoplankton and may be more likely to become P limited in the Delta if consuming mostly waterborne nutrients. Can you comment?	
Foe	29	It would be nice to include a summary table of the key factors controlling macrophytes in the Delta. Left column would be a list of primary macrophyte species and across the top the primary drivers. These might be light, temperature, salinity, DIC, and nutrients. In the cells give the ranges that restrict plant establishment and growth.	
Foe	34	I think the recommendations are fine but are too general. I suspect that both the monitoring and modelling should be accompanied by special studies to help interpret and inform the results. Maybe under monitoring you could list specific high priority questions in bullet form. For example: Do N and P concentrations limit E. crassipes growth and biomass anywhere in the Delta now? To determine this conduct amendment experiments in the laboratory and/or in field mesocosms to determine growth as a function of nutrient concentrations and compare these with levels found in and around macrophyte beds in the Delta now. What is the limiting nutrient? Are these conclusions robust under different light and temperature regimes typical of the delta?	

Author	Page	Comment	Response
Foe	N/A	I think the nutrient discussion would be improved by including a paragraph or two on ambient nutrient concentrations and trends over time in the Delta. Annual average DIP and DIN concentrations at key locations in the Delta range between 0.02-0.09 mg/l and 0.13-1.10 mg/l (Foe et al., 2010)[1]. Typical DIN and DIP concentrations are 0.5 and 0.05 mg/l, respectively, but talk with dick dugdale from the Romberg Tiburon Center for more information. All the amendment experiments cited in the review paper are at higher concentrations than occur in the delta and this may affect the interpretation of the results. The results obtained by You et al. for E. crassipes are particularly interesting and suggest the possibility of nutrient limitation in the delta now. You et al. increased N and P concentrations above 0.6 and 0.05 mg/l and observed a 30% increase in growth and clonal propagation. If these findings are confirmed by additional experiments, then nutrient management might be an option for reduce the severity of the water hyacinth problem. Please comment. [1] http://www.waterboards.ca.gov/centralvalley/water_issues/delta_water_quality/ambient_ammonia_concentrations/foe_nutrient_conc_bio_effects.pdf	
Foe	N/A	About trends, nutrient concentrations, N speciation, and dissolved N:P ratios have changed in the delta over the last 40 years. More DIN, more NH4, less SRP and an increase in the N:P ratio (Jassby 2008; Glibert, 20102 ; Van Nieuwenhuyse, 20073). Could these changes in concentrations be partially responsible for the emerging macrophyte problem? [2] Reviews in fishery Science, 18:211-232 [3] Canadian journal of fisheries and aquatic science 64:1529-1542	
Foe	N/A	The modelers are going to need specific data to be collected to help inform model development. This paper should note and recommend that there be collaboration between the monitoring and modeling team to collect high priority information to inform the models.	

Author	Page	Comment	Response
Joab	1	Under 1.1 - In sentence "…critical habitat or fish.." Change "or" to "for".	
Joab	1	Under section 1.1, last paragraph - The Water Board only commissioned two not three literature reviews.	
Joab	3	Under section 1.2, listing for Section 3: Insert "to" between "Contributing" and "the" and capitalize the words "submersed", "floating", "aquatic", and "vegetation" to be consistent in formating.	
Joab	4	Under section 2.2, first sentence - Only 17 species are identified in Table 2.1, not eighteen. Please correct text or Table 2.1.	
Joab	17	Under section 3.1.1., last sentence - "identified" spelled incorrectly.	
Joab	All	Global Comment: I found numerous references cited in document that were not included in the Chapter 6 Literature Cited. Please compare all references in text and Chapter 6.	
Khanna	iv	Under R3: Item 2 in last sentence: adding information to Durand's comments on control strategies: also biological	
Khanna	1	Under 1.1 - In sentence, "...45,000 square mile" change "mile" to "miles."	
Khanna	1	Under 1.1, second paragraph - the sentence "Studies needed for development of Delta…" seems incomplete - difficult to understand.	
Khanna	2	Figure 1.1 - Maybe pick a different figure? I can't read any of the text in this figure.	
Khanna	4	Heading of section 2.1 - "Classification" is misspelled.	
Khanna	4	Under section 2.2, second paragraph reference to Hestir et al. 2010 - As I remember, this figure actually comes from some other paper that Erin might have cited in her paper. I know she did not herself harvest biomass and determine the % coming from Egeria. Moreover, this original paper is even older. I think the timeline is important. I think when you mention cover, biomass ratios, any information pertaining specifically to the Delta, it is better to mention which year this study comes from. Because the Delta is so dynamic and what was true 10 years ago, might no longer be true. Same goes for the Santos et al. 2009 study.	

Author	Page	Comment	Response
Khanna	4	Under section 2.2, last paragraph, first sentence on Coontail being the most frequently encountered native species - In 2014, (coontail) found in 45% of all sampled SAV points. Average cover where sampled - 30%.	
Khanna	4	Under section 2.2, last paragraph, last sentence - What is the citation for these numbers (284 hectares)?	
Khanna	5	Table 2.1 - There are two more species we have documented which I don't see mentioned here - one is water purslane (which is similar to water primrose and floating - genus Ludwigia), the other is parrotfeather (genus myriophyllum), which is actually a floating species.	
Khanna	5	General comment on figures - for new figures, see total area of floating in the excel sheet I forwarded and divide by half to get appx. water hyacinth area. Other half is water primrose.	
Khanna	10	Under section 2.3, last sentence on egeria densa on range of depths in turbid and clear water - but maybe to a shallower depth in turbid water.	
Khanna	11	Under section on Stuckenia sp. - 2014 survey: Sago or fineleaf found in 26% of sampled points. Avergae cover where samples: 50%. Especially in the open bay. It is found as 100% cover so it looks like it's niche is at least partially unique from all other submerged species.	
Khanna	11	Figure 2.5 caption - I agree with Louise's comment. We have not been able to differentiate between SAV species even with hyperspectral data. I'd like to see this reference.	
Khanna	12	Thirrd paragraph,fourth sentence "*Egeria* coverage expanded during the years between 2003 and 2007" - I haven't read Maria's paper recently but according to the numbers I have (see the xls file), Egeria was abundant until 2006 then decreased quite a bit in 2007 and even more in 2008.	
Khanna	12	Fourth paragraph, second sentence on Eichhornia crassipes, reference to Santos et al 2009 study - Maria's study was hazy about the efficacy of water hyacinth control. My study found that control had no impact on year-to-year cover of water hyacinth. The decline of cover in 2007 was mainly due to a 3 week period of continuous frost nights in Jan 2007. There are several studies that back up the claim that water hyacinth is vulnerable to frost.	

Author	Page	Comment	Response
Khanna	12	Fourth paragraph, second sentence on Eichhornia crassipes with mention on estimates of acreage - Take estimates from the SOTER report or the xls file. I have a comment on this earlier.	
Khanna	15	Section 3.1, first paragraph, highlighted sentences from "In contrast, dense canopies..." to "...leading to predation on smaller adult and juvenile native fish" - [Following Louise Conrad's statement] Moreover, doesn't each of these statements require a citation?	
Khanna	16	Under section 3.1.1, first paragraph, 4th sentence "*E. densa* sheds some biomass in winter but does not fully senesce (Fig. 2.2) - [In reference to John Durand's comment that Shruti may have references.] Yes, check the annotated bibliographies. There are examples from Florida and Louisiana.	
Khanna	17	Under section 3.1.3, fourth sentence "Dense submersed vegetation is ..." - There are a couple of new Hestir et al. papers on the relationship between SAV and turbidity e.g.Hestir, E. L., D. H. Schoellhamer, T. Morgan-King, and S. L. Ustin. 2013. A step decrease in sediment concentration in a highly modified tidal river delta following the 1983 El Niño floods. Marine Geology 345:304-313.	
Khanna	19	Under section 3.1.5 Changes in Water Quality, first paragraph, second sentence - [In reference to Conrad's comments on citations for this section] Yes, many. Kathy, check out the bibliography. If not there, then the Gopal book should have a ton. I think he has a chapter on the use of water hyacinth as a secondary water pollutants purifier.	
Khanna	20	Under section 3.1.5, second paragraph, first sentence - [In reference to Conrad's comments on DO] I also seem to remember that Egeria mats can depress oxygen levels.	
Khanna	20	Under section 3.1.5, second paragraph, third sentence on decomposition of E. crassipes following senescence - Even in a healthy mat, the growth rate of hyacinth is so obscene that there is material constantly dripping from the root system and a thick mat can cause part of its own mat to senesce due to intra-species competition.	

Author	Page	Comment	Response
Khanna	24	Under section 4.1.1 Light, second paragraph, last two sentences - [In reference to Conrad's comments on these statements] I agree. I think the Stuckenia comment can still stand but maybe instead of Egeria, you can say SAV mats? Especially since Elodea, a native that has increased in the Delta over the past six years, also forms dense canopies identical to Egeria. Also Hestir et al. paper cited in a previous comment.	
Khanna	24	Under section 4.1.2 Temperature - For water hyacinth, lower air temperatures can be pretty limiting and this is insufficiently discussed here. I have some references on the subject in the bibliography.	
Khanna	25	Under section 4.1.3 Salinity, first paragraph, second sentence - This is a matter of debate. The historic delta used to be a lot more of freshwater and the X2 line was much farther away. Only in times of drought would part of the Delta become brackish. And the reason was that the water had a much longer route to take through meandering narrow channels and did not meet with the bay waters as readily. By dredging the Sacramento river and getting most of the water out quickly into the bay, we have reduced the residence time of the water in the Delta thereby ironically increasing the salt intrusion. The thing different in the part was the strong seasonal variability in the salinity - especially more salinity during low-flow. Now the delta is fresh all year long. This is the crucial change. References?? I have a bibliography on the Delta too, I think. I'll send it to you directly.	
Khanna	27	Under section 4.1.3 Salinity, second paragraph - there are many salinity studies for eichhornia and they are all mentioned in my annotated bibliography. Please take a look.	
Khanna	27	Under 4.1.3 Salinity, second paragraph - [In reference to Conrad's comment on this section] probably field data?	

Author	Page	Comment	Response
Khanna	28	Under section 4.1.5, second paragraph - There are many studies of Eichhornia with nutrients but in a slightly different set of literature - paper on water purification plants. I'm not sure if I have much in my bibliography but if you research use of water hyacinth in water purification, you'll get some good references.	
Llaban	ii	Under Major Finding #1, first sentence - Native floating aquatic vegetation (i.e. pennywort) can also be a beneficial component (invertebrate habitat and trophic support). Toft et al 2003 found higher insect densities in pennywort vs. hyacinth and that invertebrates associated with pennywort occured more often in diets of adjacent fish.	
Llaban	iv	Under R3 - Mechanical removal/harvesting of water hyacinth is already being implemented by DBW in the Delta as a part of an integrated pest management program (Water Hyacinth Control Program).	
Llaban	1	Under 1.1, first paragraph, last sentence on Delta Plan - Please include a full reference under literature cited.	
Llaban	3	Under section 1.2 regarding key questions 4-7 - Should these questions be numbered starting from 1?	
Llaban	11	Under Eichhornia crassipes paragraph, first sentence on windy periods- High tides can also cause water hyacinth to dislodge from shores or tule islands and move with the tidal flux. Disturbance from boating activity can also cause water hyacinth to detach and float around. (DBW staff observations)	
Llaban	11	Under Eichhornia crassipes, paragraph, second sentence regarding abundance - Also has been historically abundant near USBR's Tracy Fish Collection Facility and River's End Marina (Old River) due to hydrodynamics and waterway characteristics. Related news articles at http://www.recordnet.com/article/20121222/A_NEWS/212220315 http://www.contracostatimes.com/contra-costa-times/ci_24673609/state-begins-using-mechanical-harvesters-control-water-hyacinth	

Author	Page	Comment	Response
Llaban	11	Under Eichhornia crassipes paragraph, third sentence regarding channel edges - Also can be found around tule islands in the	
Llaban	12	Under Egeria densa paragraph concerning active management spraying - Suggest avoiding the word "spraying" and rephrase to "herbicide application" or "herbicide treatment". Egeria densa treatments are done with application of granular (pellet) formulations of herbicide, rather than spraying of liquid herbicide. In the rest of the paragraph change "spraying/sprayed" to "treatment".	
Llaban	12	Under Eichhornia crassipes paragraph, second to last sentence regarding "spraying over several years" - Please change the word "several" to "two". 2011 and 2012 were years where there were delays in permitting between DBW and federal agencies.	
Llaban	15	Under section 3.1, first paragraph, third sentence regarding shading of phytoplankton - Can also decrease dissolved oxygen in water (as depicted in Figure 3.1).	
Llaban	18	Under section 3.1.3, first paragraph, last sentence on west Delta - Also observed by DBW staff in east Delta.	
Llaban	20	Under section 3.16, third sentence referencing "boating" - In return, boating activity can facilitate spread of egeria densa by production of plant fragments from propeller disturbance.	
Llaban	24	Under section 4.1.1, third paragraph, last sentence on E. densa expanding more rapidly - Under what conditions? Low light?	
Llaban	27	Under second paragraph, first sentence regarding local studies - Found a report from a UC Berkeley student on salinity effects on water hyacinth. http://nature.berkeley.edu/classes/es196/projects/2004final/Cheng.pdf This is not a peer-reviewed article and appears to be a class project, so I'm unsure if it can be used as a reference.	

Author	Page	Comment	Response
Llaban	30	Under section 4.1.7, first paragraph, last sentence - This section should include a description of benthic barriers as an alternative control measure (cultural control) to control small infestations of Egeria densa in or around high-use areas such as docks, boat launches and swimming areas. I'm not aware of use of benthic barriers in the Delta, but it has been used in Emerald Bay to control Eurasian watermilfoil.	
Llaban	30	Under section 4.1.7, second paragraph, first sentence on mechanical removal - In general, there are concern about impacts to non-target plant species and by catch of non target organisms, that should be addressed in this section. A useful reference: Biology and Control of Aquatic Plants. A Best Management Practices Handbook.	
Llaban	30	Under section 4.1.7, second paragraph, last sentence on concerns - Another concern is potential survival and regrowth of cut water hyacinth. Reference: Spencer et al 2006. Evaluation of Waterhyacinth Survival and Growth in the Sacramento Delta, California, Following Cutting. Journal of Aquatic Plant Management 44:50-60.	
Llaban	30	Under section 4.1.7, third paragraph, fifth sentence regarding no biological control methods - USACE released Neochetina bruchi in the Delta in the early 1980s. USDA-ARS also has done some releases of Neochetina.	
Llaban	32	Figure 4.6 - Left figure is cutoff. Please resize to present the complete 2007-2008 data.	

Author	Page	Comment	Response
Llaban	33	Under section 4.1.9, first paragraph, last sentence - Vegetative growth is not limited by depth and bank slope. However, water hyacinth seed germination and seedling establishment can be limited by depth and requires shallow water. Although vegetative reproduction is likely the primary means of reproduction, factors affecting sexual reproduction should be considered. Barret 1980 conducted a study of seed production germination in the Delta near Stockton, Ca. S.C.H. Barrett. 1980. Sexual Reproduction in Eichhornia Crassipes. II. Seed Production in Natural Populations. Journal of Applied Ecology. 17:113-124.	
Llaban	34	Under section 5 Recommendations - Section title is inconsistent with title on pg. 3 - "Section 5: Key Data Gaps and Research Recommendations". Please revise either title for consistency.	
Llaban	36	Under section 6 Literature Cited - Many references within the body of the paper are missing from the literature cited section. Please revise the literature cited to ensure consistency with referenced literature.	
Madsen	5	Recommendation 1. Aerial remote sensing, whether by satellite or aircraft, provide useful data on water hyacinth distributions, but perform extremely poorly on egeria or any other submersed plant communities. Species discrimination with remote sensing is still insufficient to categorize species composition without significant ground truthing. The recommendation does not indicate how biomass estimates would be derived from transects, nor does what technique is planned for transect.	
Madsen	5	Recommendation 2. The authors are assuming that nutrients are limiting plant growth without knowing if this, in fact, is the case. It is doubtful that an ecosystem model will indicate if nutrients are limiting either water hyacinth or egeria. It is far more common to see luxury consumption of nutrients by submersed and floating aquatic plants than nutrient limitation.	

Author	Page	Comment	Response
Madsen	6	Recommendation 3. Why do the authors want to reinvent the wheel on management of invasive species? Why select a management technique that is already known to kill fish – namely, harvesting? USDA ARS has already been doing this research for decades, as has the US Army Engineer Research and Development Center. This recommendation is made, yet no citations of existing best management practices manuals are included in this report. The Journal of Aquatic Plant Management has 2,000 articles on the biology and management of aquatic macrophytes, and has ONE citation in the report. The San Francisco Estuary Institute had a multi-year project to investigate harvesting to replace herbicides for management in the early part of the last decade, and concluded that harvesting was not a replacement for herbicides.	
Madsen	17	Rake methods. Rake methods to “estimate biomass” are poor substitutes for actually measuring biomass.	
Madsen	19	Coontail does not “attach to other plants.” It might wrap around other plants. It lies on the surface of the sediment.	
Madsen	22-23	Egeria densa. I realize that, in trying to be understood by non-scientists, many people use the term “male” and “female” plant or flower, but the plant or flower itself is not male or female. The plant or flower is correctly referred to as either “staminate” or “pistillate,” not male or female.	
Madsen	23	Water hyacinth. While water hyacinth does produce a large number of seeds, outside of their native range they have very low germination rates, and the seedlings take exceedingly long to grow. A seedling may not be capable of producing a flower until the end of the year. For overwintering, the importance of the stembase cannot be overstated. The stembase can lie underwater during the cold season, and initiate growth rapidly in the new growing season.	
Madsen	23	Coontail does not attach to other plants. It is neither epiphytic nor saprophytic.	
Madsen	26	Line 5. M. spicatum is misspelled as spicatam. Repeatedly.	

Author	Page	Comment	Response
Madsen	26	Line 23. Submersed herbicide application is inaccurately described as “spraying,” when in fact liquid herbicides for submersed plants are injected beneath the water’s surface using trailing weighted hoses. Since most of the fluridone in the past decade has been applied as a granular formulation, “spraying” is even more inaccurate.	
Madsen	27	Stuckenia distribution. Unless remote sensing is ground truthed, it is not a reliable method for estimating the distribution of submersed plants. More than half of the population will be out of detection, and the amount remaining undetected will vary based on water clarity and other issues.	
Madsen	N/A	Global Comment. By the way, most of the figures did not download from Google Documents.	
Madsen	N/A	Global Comment. About half of the Literature Cited citations are incomplete, making it impossible for me to look up these citations.	
Moran	i	Acknowledgments: Does the author mean this Macrophyte Science Working Group? Or is there a separate Submersed and Floating Macrophyte Technical Advisory Group?	
Moran	ii	Executive Summary: Text indicates four major questions, but only three are listed.	
Moran	ii	Executive Summary: Major Finding #2, aquatic weed coverage values are too low -CDBW-CA Parks estimates *Egeria densa* coverage at 10,000-15,000 acres or 4,050-6,075 ha. -Water hyancinth coverage in the Delta is much more than 200 ha. In 2014, for example, the Division of Boating and Waterways-CA Parks treated 2,617 acres or 1,060 ha. In 2015, they plan to treat close to 3,400 acres or 1,377 ha. DBW estimates at least 5,000 acres or 2,025 ha in the Delta. See comments from Ustin lab for more precise estimates of coverage. Provide information on increase in coverage from mid-2000s to now. [See reference below.]	

Author	Page	Comment	Response
Moran	ii	Ustin lan, UC Davis, estimates 2000 ha, 1/2 Water hyacinth, 1/2 Ludwigia -This study should consider other important aquatic invasive macrophytes for which there is currently no control program, especially Ludwigia spp., which is likely as widespread or more widespread than water hyacinth and equally damaging (and the two weeds co-occur and appear to benefit from each other's presence)	
Moran	iii	Recommendation R1: (Comment for discussion) Remote sensing data for water hyacinth are being collected by NASA as part of the USDA-ARS Areawide Project for improved control of aquatic weeds in the Delta. R1: Check spelling of "areal" (correct is "arial")	
Moran	iii-iv	Recommendation R2: This should be communicated to the Modeling Work Group. The Macrophyte work Group could identify data requirements.	
Moran	iv	Recommendation R3: The USDA-ARS Areawide Delta Aquatic Weed Management Project is conducting pilot studies on integrated control.	
Moran	3	Under Introduction Section 1.2 Goal and Organization of Macrophyte Literature Review - Key Questions: Why are they numbered 4,5,6, and 7?	
Moran	5	Information on coverage of water hyacinth, see above and information from Ustin lab on correct coverage estimates.	
Moran	10	Under Chapter 2 General Ecology and Trends, Section 2.3 Habitat Types in which they are typically found - *Egeria densa* some of the information here is redundant with page 8.	
Moran	12	Under Chapter 2 General Ecology and Trends, Section 2.4 Spatial and Temporal Trends in Distribution and Abundance - DBW-CA Parks is treating up to 4-5% of Delta area for Egeria densa.	
Moran	13-14	Under Chapter 2 General Ecology and Trends, Section 2.4 Spatial and Temporal Trends in Distribution and Abundance - Are there specific causes of the Stuckenia expansion over the past 20+ years? Describe here or in Section 4.	

Author	Page	Comment	Response
Moran	16	Under Chapter 3 Role of Submersed and Floating Aquatic Vegetation in Supporting Delta Ecosystem Services 3.1.1 Organic matter subsidy/accumulation - For more information on seasonal growth and senescence of water	
Moran	17	Under Chapter 3 Role of Submersed and Floating Aquatic Vegetation in Supporting Delta Ecosystem Services 3.1.3 Habitat alteration - Can Egeria densa alter habitat in ways that helps it outcompete Stuckenia and other submersed natives? Refer reader to Section 4.1.8	
Moran	17	Under Chapter 3 Role of Submersed and Floating Aquatic Vegetation in Supporting Delta Ecosystem Services 3.1.3 Habitat alteration - Water hyacinth and Ludwigia often grow together, although one dominates. Could mention here and refer to Section 4.1.8.	
Moran	18	Under Chapter 3 Role of Submersed and Floating Aquatic Vegetation in Supporting Delta Ecosystem Services 3.1.4 Trophic support - Redundant information in the paragraph about Egeria densa providing hiding habitat for predatory non-native fish.	

Author	Page	Comment	Response
Moran	19	Under Chapter 3 Role of Submersed and Floating Aquatic Vegetation in Supporting Delta Ecosystem Services 3.1.5 Changes in water quality - Consider more references here and in the more detailed nutrient section later on to support statement of use of water hyacinth to remove nutrients from sewage or other nutrient-rich water. Reddy, K. R., M. Agami and J. C. Tucker. 1989. Influence of nitrogen supply rates on growth and nutrient storage by waterhyacinth (Eichhornia crassipes) plants. Aquat. Bot. 36:33-43. Reddy, K. R., M. Agami and J. C. Tucker. 1990. Influence of phosphorous on growth and nutrient storage by water hyacinth (Eichhornia crassipes Mart. Solms.) plants. Aquat. Bot. 37:355-265. Moran, P. J. 2006. Water nutrients, plant nutrients, and indicators of biological control on waterhyacinth at Texas field sites. J. Aquat. Plant Mgmt. 44:109-115. 2006. (This paper, based on Texas field sites, supports earlier work by other authors in tanks showing a positive association between dissolved inorganic N in water and % N content in water hyacinth leaves, although in this study no associations were found between soluble water P and plant % P, in contrast to a number of other studies. This study did not examine plant growth; however no associations were found between water N or P and plant size)	
Moran	20	Under Chapter 3 Role of Submersed and Floating Aquatic Vegetation in Supporting Delta Ecosystem Services 3.1.5 Changes in water quality - The DBW-CA Parks aquatic weed control programs include DO monitoring requirements and follows thresholds established by the CVRWQCB or other agencies for minimum DO levels under which treatments may be conducted (5-7 ppm)	
Moran	25	Under Chapter 4 Factors Contributing to the Prevalence of Submersed and Floating Aquatic Vegetation in the Delta 4.1.2 Temperature - Not local, but studies have been done to show that above about 33-34 C, water hyacinth loses nutrients from the roots and experiences negative growth.	

Author	Page	Comment	Response
Moran	27	Under Chapter 4 Factors Contributing to the Prevalence of Submersed and Floating Aquatic Vegetation in the Delta 4.1.2 Temperature - One past review indicates that water hyacinth cannot tolerate salinity above 2 ppt. This may not be accurate in the Delta. Wilson, J. R., Rees, M., Holst, N., Thomas, M. B., Hill, G. 2001. Waterhyacinth population dynamics. pp. 99-103 in Julien MH, Hill M. P., Center T. D., Jianqing, D. (eds.), Biological and Integrated Control of Water Hyacinth, Eichhornia crassipes. Proceedings of the Second Meeting of the Global Working Group for the Biological and Integrated Control of Water Hyacinth, Beijing, China, 9-12 October, 2000. ACIAR, Canberra, Australia.	
Moran	28	Under Chapter 4 Factors Contributing to the Prevalence of Submersed and Floating Aquatic Vegetation in the Delta 4.1.5 Nutrients - Can you provide information on average and range of N and P values in the Delta, and compare to averages for other key estuaries such as Chesapeake? What do you mean by “high” nutrient levels?	
Moran	29	Under Chapter 4 Factors Contributing to the Prevalence of Submersed and Floating Aquatic Vegetation in the Delta 4.1.5 Nutrients - The conclusion that E. densa management cannot likely be improved much using nutrient management is important and should be restated at the end.	

Author	Page	Comment	Response
Moran	30	Under Chapter 4 Factors Contributing to the Prevalence of Submersed and Floating Aquatic Vegetation in the Delta 4.1.7 Chemical, mechanical, and biological control - Major errors in fact regarding biological control -The U.S. Army Corps of Engineers and CDFA released three agents for water hyacinth in the early 1980s in the Delta: Stewart, R. M., A.F. Cofrancesco, and L.G. Bezark. 1988. Biological control of waterhyacinth in the California Delta. U.S. Army Corps of Engineers Waterways Experiment Station, Technical Report A-88-7. U.S Army Corps of Engineers, Washington, D.C.-CDFA conducted surveys in the early 2000s and found that only one agent, the weevil Neochetina bruchi, is established in the Delta. It is widespread but is not having sufficient impact. A key reason appears to be the inability of immature stages to survive winter conditions in the Delta. Akers, R. P., and M. J. Pitcairn. 2006. Biological control of water hyacinth in the Sacramento-San Joaquin Delta year 3 - final report. California Department of Food and Agriculture, Sacramento, California, USA.	

Author	Page	Comment	Response
Moran	30	Section 4.1.7 Chemical, mechanical and biological control - Major errors in fact regarding biological control **Continued comment from above:** -Plant nutrient levels in water hyacinth in the Delta are likely sufficient for Neochetina weevil development: Spencer, D. F., and G. S. Ksander. 2004. Do tissue carbon and nitrogen limit population growth of weevils introduced to control waterhyacinth at a site in Sacramento-San Joaquin Delta, California? Journal of Aquatic Plant Management 42:45-48. CDFA and the USDA-ARS are beginning to release a planthopper, Megamelus scutellaris, for biocontrol of water hyacinth. This insect was discovered and characterized as being sufficiently host-specific to water hyacinth by the USDA-ARS in Florida, where it is now widely established, with impact evaluations ongoing. Tipping, P. W., A. Sosa, E. N. Pokorny, J. Foley, D. C. Schmitz, J. S. Lane, L. Rodgers, L. McCloud, P. Livingston, M. S. Cole, and G. Nichols. 2014b. Release and establishment of Megamelus scutellaris (Hemiptera: Delphacidae) on waterhyacinth in Florida. Florida Entomologist 97:804-806.	
Moran	30	Section 4.1.7 Chemical, mechanical and biological control - Major errors in fact regarding biological control **Continued comment from above:** (and Patrick Moran, USDA-ARS Exotic and Invasive Weeds Research Unit, Albany, CA, pers. comm.) -No biocontrol agents have been released for any of the other non-native weeds listed. -Biocontrol using non-native natural enemies is not be an option for control of native aquatic plants that may sometimes be invasive/cause problems, such as coontail and pennywort. Biocontrol using native natural enemies that are reared and released in large numbers (such as a native fungus or a plant-feeding insect) may be an option.	

Author	Page	Comment	Response
Moran	30	Gopal 1987 book cited here is not listed in Literature Cited.	
Moran	30	The conclusion that biocontrol poses a unique risk to DO is flawed. Biocontrol of water hyacinth reduces the size of plants over several generations of growth: Tipping, P. W., M. R. Martin, E. N. Pokorny, K. R. Nimmo, D. L. Fitzgerald, F. A. Dray, Jr., and T. D. Center. 2014a. Current levels of suppression of waterhyacinth in Florida, USA. Biological Control 71:65-69. Biocontrol does not cause rapid sinkage that would be associated with DO declines. Also, biomass accumulation in sediments in areas of water hyacinth invasion will occur in either the presence or absence of biocontrol, in areas of low flow; biocontrol will reduce the problems caused by living plants. In any event, biocontrol would not pose any greater DO hazard than herbicidal control, and in fact would pose less of a hazard.	
Moran	32	Under Chapter 4 Factors Contributing to the Prevalence of Submersed and Floating Aquatic Vegetation in the Delta 4.1.8 Interactions with submersed or other floating species - Fig 4.6 (Left, Bar charts). I assume that Ludwigia is the pink bars after yellow, but this is missing in legend. The figure is partially cut off on the right.	
Moran	34-35	Under R1, include monitoring of water and plant nutrient content and analysis of their relationships. Also water flow. Possibly also rates of growth.	
Moran	34-35	R3 is already underway through the USDA-ARS Areawide Project focused on water hyacinth and Egeria densa.	
Moran		General Comment on the evaluation factor - All of the major water quality problems caused by the proliferation of water hyacinth and Brazilian waterweed in the Delta have been identified. "**Yes"**	

Author	Page	Comment	Response
Moran		General Comment on the evaluation factor - All physical and biological factors that influence the abundance and distribution of these invasive aquatic weeds have been identified. **"YES, but little quantitative information is provided on the environmental tolerances of the aquatic weeds in terms of salinity, water flow, turbidity, may be other factors such as temperatures. Information could be provided on what is known for the Delta (lots of gaps), and what is known from other areas.**	
Moran		General Comment on the evaluation factor - Evidence is presented that ambient nutrient concentrations influence or do not influence the growth, distribution and abundance of aquatic weeds. **More quantitative information is needed on typical nutrient levels in the Delta, and nutrient requirements/concentration ranges in the aquatic weeds, and effects on plant growth (not well-studied in the Delta, so would be mostly from other regions).**	
Moran		General Comment on the evaluation factor - The White Paper findings are fully supported by the literature and there is no additional unreferenced information that either supports or refutes the findings. **Additional references have been suggested.**	
Moran		General Comment on the evaluation factor - The prioritized list of nutrient recommendations include all questions that need to be resolved before it can be concluded that nutrient management will reduce the severity of the invasive aquatic weed problem in the Delta. **NO, the monitoring plan under R1 needs to include water nutrient, plant nutrient, and plant growth information. Also, studies are needed on nutrient changes resulting from control-killed plants being left in place vs removed.**	
Moran		Additional Questions from the STAG: Is nutrient management necessary for management of macrophytes **UNCERTAIN** a. Yes or No? b. If so, what level?	
Moran		Additional Questions from the STAG: Is nutrient management alone sufficient to control macrophytes? **UNLIKELY**	

Author	Page	Comment	Response
Moran		Additional Questions from the STAG: What combinations of management actions (nutrient and non-nutrient) are likely to achieve equal levels of benefit with regard to macrophyte management? What are the likelihoods, costs, and potential unintended consequences of these different strategies?	
Moran		Additional Questions from the STAG: How do stands of macrophytes affect nutrient dynamics in surrounding waters? **Include under R2**	
Moran		Additional Questions from the STAG: How do stands of macrophytes affect higher-level organisms, including POD species? **Some studies underway as part of USDA-ARS Areawide Project. Invertebrates in water hyacinth roots before/after chemical herbicide control.**	