Modifications Since last time

(1) Dropped the section with CAST loadings I added before and added the correct RIM loadings estimates and text from Qing.

(2) Added Effects of Physical Setting based on Rebecca's text.

(3) Edited text based on Elgin and Roberto's comments

(4) Added first cut of a glossary - feel free to add your favorite term(s). A concise definition of GAMs would be nice.

(5) Updated SAV figures to reflect correct goals.

I. Issues for Discussion

A. General

(1) Inconsistencies in terminology

There is some inconsistency in the text with regards to terminology and naming conventions as it relates to models and model output. Specifically, there is some overlap with terms like non-flow adjusted, non-adjusted, observed, flow independent and flow adjusted, predicted, etc. I'd like to suggest we assign a name to each model (preferably one word) that specifies what its purpose is relative to the effects it models. For water quality these could be:

> **nonlinear trend effects** or **nonlinear effects** model: our baseline non-linear trend effects model with seasonality included.
>
> **flow effects model**: non-linear trend effects + flow effects.

There would be some additional reworking of the methods, text and figure legends to accommodate this, but it shouldn't take long to modify the text. It would allow us to use more generalized terms such as observed, adjusted, residuals, and predicted without confusing the reader.

It doesn't have to be what I've suggested but there does have to be consistency throughout the document.

(2) Figure legends for water quality figures

Let's hash this one out today i.e. come up with a consensus on the figure legends and set them in stone and then I'll update them permanently.

(3) Further issues that need to be resolved are listed below. If comments you made to the text are not listed, assume that I have updated the text to reflect your concerns as best I can but feel free to contest what I have done and complain in an email or via phone.

III. Issues for Discussion

Below are a set of issues identified by reviewers (in parentheses) that I believe we should discuss briefly in the meeting. Some issues require updating of figures I do not have access to. Others are content related, should be hashed out by the group and may or may not need more supporting text and/or literature citations, etc.

<test direct or paraphrased from report, or Table/Figure reference>

(Reviewer)

Followed below by reviewers comments from their review of the report either direct or paraphrased

2.1 Watershed Physiography

(Roberto)

<Figure 2>

Since Valley and Ridge and Appalachian Plateau are not part of the figure remove them from the legend

<The impacts of land development differ depending on the use from which the land is converted>.

Some comment on which type of conversion has the greatest impact (presumably on water quality; could be on wildlife or something else, so it needs to be stated) would be a nice addition to the text.

2.2 Land Use

(Elgin)

(1) Difference in total acerages presented in the Figure 2 versus text in previous section 2.1. We should have consistent numbers between sections. What is the difference between the two sections? Does the land use include just land and the watershed include water surface area and does this account for the difference of 228,429 acres or just over 924 square kilometers. This would seem to be a reasonable value but I have no clue.

2.3 Tidal Waters and Stations

(Roberto)

Figure 4 The legend shows a color that does not appear in the map. I would show the five segment colors in the legend and place the segment labels in the legend, or would take out the "River Segments" portion of the legend and enlarge the segment labels in the map so that they are more visible.

3. Water Quality Trends and Management Goals

(Rebecca)
Needs more appropriate title.

4.1 Surface Total Nitrogen

(Roberto)

<the plots of predicted values that appear to be similar within a given salinity regime (Figure 8).>

It is unclear what the salinity regime is in Figure 8 because segment names do not coincide with station names. For example, RPPOH has one station, TF3.3. So what's the salinity regime here, oligohaline or tidal freshwater? Also, RET stations are shown separately from LE stations, but the segment name is the same. What's the salinity regime for these stations? So perhaps say that "appear to be similar within a segment".

The salinity regime for TF3.3 is typically oligohaline. But should we use a more appropriate naming convention for regions in the river than salinity regimes. Note: salinity regimes are now defined in the glossary of terms.

4.3.1 Surface Chlorophyll a: Spring (March-May)

(Elgin)

Suggested we combine the two chlorophyll a sections into a single Chlorophyll section with seasons as subsections.

Done! Any issues with that?

<Possible improvements in the tidal fresh spring chlorophyll a persisted in the short-term>

(Roberto)

Actually, there is a declining trend in the short term at TF3.2 when flow is adjusted, and it appears that at the mouth stations degrading trends are developing when data are flow adjusted. This is all very hard to interpret, and you are choosing some results over others to highlight. Only strong trends (those more likely to be real) should be evaluated and decide whether flow-adjustment is a good thing, and stick with it. It does not help to have levels of "possible" trends; they do not add to clarifying what's going on.

<and is likely reflective of the dynamics of local phytoplankton populations>

I don't know why you say that ("reflective of local dynamics"). THE GAMs for TF3.2A, TF3.3. and RET3.1 indeed show increases over time that are in agreement with the results shown in Figure 11, and LE3.3. shows a decline. If those changes are not ecologically significant, it should be stated and explained why not. A more rigorous interpretation of the data analysis results is needed

See phytoplankton section. The question does remain, what is the cause of the increases in phytoplankton observed.

4.3.2 Surface Chlorophyll a: Summer (July-September)

<This indicates that freshwater nutrient inputs may have mediated increasing summer chlorophyll>

(Roberto)

Why nutrient inputs make chlorophyll to increase in the lower portion of the river but not farther up? Could it be inputs from land in the mid estuary?, or inputs from the mainstem Chesapeake Bay?

4.5 Secchi Disk Depth

(Roberto)

<paralleled those of summer chlorophyll a regardless of time period assess and flow adjustment suggesting>

Not really, not in the short term. So perhaps chlorophyll has changed recently in the mid river (long term is significant, short term is not) and secchi is telling you something not about chlorophyll but about sediment. Also, in the short term there is only one station that has a significant trend for secchi, not 5, so this should be highlighted as important in the restoration process of the lower Rappahannock.

4.6 Summer Bottom Dissolved Oxygen

<Degrading or potentially degrading long-term trends in summer dissolved oxygen concentrations were observed at most stations in the Rappahannock River and do not appear to be related to flow effects >.

(Elgin)

Elgin suggests caution at making this statement.

<In the short-term, only degrading and potentially degrading trends occur at the lower mesohaline stations, many of which appear due to flow effects (Figure 17).>

(Roberto)

All but one trend appears to be flow related.

5.1.1. Effects of Physical Setting

(Elgin)

<u>Delivery to tidal waters from the non-tidal watershed</u>

<“There are no natural chemical processes that remove phosphorus from streams” >

Do we know anything about Phosphorus concentrations in below fall line streams? Should we add something about TP profiles in the estuary? TP concentrations a greatest in the turbidity max zone. What about Biological processes? Phytoplankton. SAV. Marshes, etc. Do we need supporting statement (citations?).

(Elgin)

Figure 19 Presents conflicting statements (paraphrased below)

<"Nutrients in the Coastal Plain can reach tidal waters quickly with little opportunity for storage or loss">

<"TN Groundwater is high and can decades to reach streams - in stream processing can reduce nitrogen loads but no such process for TP" >

This statement contradicts statement above about lack of storage. Except maybe for nitrogen???

<Figure 19>

(Roberto)

Five in Figure 19. Could the 4 stations be identified in Figure 19?

5.1.2. Estimated Nutrient and Sediment Loads

<Table 2>

(Roberto/Elgin)

<Please indicate what is the number (long-term mean?) and what are the units of the numbers shown in this table. Also, as the trends are assessed against some statistical threshold (because one number is reported as "no trend"), please indicate threshold (e.g., p <0.05). This is important because several p were considered earlier in the report. Finally, please indicate what kind of trends these are (linear?).>

The values are percentages.

(MFL)

<Table 2. A "-" indicates no available data.>

Is this correct?

<Figure 20>.

(Roberto)

This kind of plots are tricky. I think you are showing total load (RIM + below-RIM) as the top line of the yellow band, and while the RIM load can be read directly off the y axis, the below-RIM load cannot be read easily without subtracting the blue area from the blue + yellow areas. Look at the yellow area in the sediment plot - visually it looks the yellow area has gone up, but it hasn't. In fact, the percentage change between 1985 and 2014 was 0. A line plot would remove the ambiguity and allow both loads to be read from the y axis. Also, it would be better to express the load in tons (t), because counting the number of zeros without thousands separators is difficult.

(MFL)

I can modify these figures if I can get the data or the location: USGS RIM website? I think Roberto makes a reasonable case for a double Y-axis plot. Also, the figures also need to be referenced in the text.

5.1.5. Best Management Practices (BMPs) Implementation

(Roberto)

<Figure 22>

Why expected if this was for 1985, 2009, and 2019? Estimated, or predicted?

5.2 Tidal Effects 5.2.1 Volume and Area Impacts

(MFL)

<Figure The numbers in the figure for volumes in km^3 seem very small. Are they real?>

To Do List

Appendixes

(1) I have water quality Appendices but need to add.
(2) Phytoplankton summary tables MFL
(3) Benthic summary tables MFL

Finalizing overall formatting:

Note: No fonts wars! Decisions to be made by formatting editor or team alone i.e. someone else more familiar with MS Word and with access to all figures (i.e. not me).

(1) Sizing of figures and positioning of text relative to figures.
(2) Headings size, spacing, tabs/indentation
(3) Table of contents
(4) Anything I haven't thought of?