

# **RESPONSES TO INDEPENDENT SCIENTIFIC PEER REVIEW OF THE RECOMMENDED MINIMUM FLOW FOR JACKSON BLUE SPRING**

**Prepared by:**

**Northwest Florida Water Management District**



**February 2026**

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## INTRODUCTION

The Northwest Florida Water Management District (District) has been tasked with establishing minimum flows for surface watercourses (springs, rivers, etc.) and minimum water levels (MFLs) for surface waters (lakes) and groundwater aquifers located within its boundaries (Section 373.042, Florida Statutes). This program requires that MFLs be set in order to prevent “significant harm” to waters located within the District. Section 373.042 (1), Florida Statutes, provides that “The minimum flow for a given water body is defined as the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area.”

Section 373.042 (1), Florida Statutes, provides requirements for establishing MFLs. MFLs are to be established using the “best available information.” In accordance with Rule 62-40.473, Florida Administrative Code and Section 373.0421, Florida Statutes, the District considered natural seasonal fluctuations in water flows or levels, non-consumptive uses, structural alterations, and multiple environmental values (WRVs), when developing the minimum flows.

If flows are below established minimum flows or are projected to fall below minimum flows within 20 years, water management districts are required to develop and implement either a recovery or prevention strategy, respectively, at the time of rule adoption. A recovery strategy is required when a system is currently not meeting MFL criteria, while a prevention strategy is required if the MFL is expected to not be met during the following 20 years based on projected withdrawals. Prevention/recovery strategies may include water conservation measures and additional water supply or water resource development projects.

The District performed a technical assessment to determine recommended a minimum flow for Jackson Blue Spring located in Jackson County, Florida. The District voluntarily submitted the draft technical assessment report for independent scientific peer review under Florida Statute 373.042 (5). Stantec Consulting Services, Inc. (Stantec) was contracted by the District to assemble subject matter experts (Peer Reviewers) to conduct an independent technical peer review of the draft MFL technical assessment report for Jackson Blue Spring. The Peer Review was completed in January 2026. This document provides the District’s responses to the Peer Review comments.

## SCOPE OF PEER REVIEW

The contractor (Stantec), with the assistance of three subject matter experts, evaluated the data, analyses, models and methodologies used by the District to determine the proposed minimum flow(s) for Jackson Blue Spring. In so doing, Stantec completed the following tasks, and included responses or comments on each task in a written Peer Review Form provided to the District. Responses and comments by the Peer Reviewers were presented collectively in a written report developed by the Peer Review Panel Chairperson.

## Tasks for Peer Reviewers:

1. Supporting Data and Information: Review the data and information that supports the conclusions made in the report to determine:
  - a. The data and information used were properly collected;
  - b. Reasonable quality assurance assessments were performed on the data and information;
  - c. Exclusion of available data from the analyses was justified; and
  - d. The data used was the best information available.

Note: The PEER REVIEWERS are not to provide independent review of standard operating procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the U.S. Geological Survey (USGS) and the DISTRICT's hydrologic monitoring network.

2. Technical Assumptions: Review the technical assumptions inherent to the analysis used in the MFL report to determine whether:
  - a. The assumptions are clearly stated, reasonable and consistent with the best information available; and
  - b. Other analyses that would require fewer assumptions but provide comparable or better results are available.
3. Procedures and Analyses: Review the procedures and analyses used in the MFL report to determine whether:
  - a. The procedures and analyses were appropriate and reasonable, based on the best information available;
  - b. The procedures and analyses incorporate all necessary factors;
  - c. The procedures and analyses were correctly applied;
  - d. The limitations and imprecision in the information were reasonably handled;
  - e. The procedures and analyses are repeatable;
  - f. Conclusions based on the procedures and analyses are supported by the data; and
  - g. Determine if the methods used in establishing the MFL are scientifically reasonable. If a proposed method used in the MFL report is not scientifically reasonable, the PEER REVIEWERS shall:
    1. List and describe scientific deficiencies and, if possible, describe potential implications of the error associated with the deficiencies;
    2. Determine if any identified deficiencies can be remedied:
      - a. If the identified deficiencies can be remedied, then describe the necessary remedies and, if possible, provide an estimate of time and effort required to develop and implement each remedy.
      - b. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative methods that are practical, cost-effective, and scientifically reasonable. If an alternative method is identified, provide a qualitative assessment

of the relative strengths and weaknesses of the alternative method(s) and the effort required to collect data necessary for implementation of the alternative methods.

Stantec and the Peer Reviewers acknowledged the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes and Chapter 62-40.473 Florida Administrative Code) affecting the District’s development of MFLs. Stantec and the Peer Reviewers also acknowledged that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board was not included in the Scope of Work. These items included:

- 1- The selection of waterbodies or aquifers for which minimum levels are proposed to be set;
- 2- The definition of what constitutes “significant harm” to the water resources or ecology of the area;
- 3- The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constraints that such changes or alterations have had or placed on the hydrology of a given watershed, surface water, or aquifer; and
- 4- The method(s) used by other Districts or agencies for establishing MFLs for other waterbodies and aquifers.

## TIMETABLE

The Peer Review Panel received a draft MFL report document titled, “Recommended Minimum Flows for Jackson Blue Spring” on November 14, 2025. The report included the main report and four appendices. The District and Peer Review Panel participated in an MFL Peer Review Kickoff meeting on November 14, 2025. This meeting consisted of a presentation by the District on the MFL background, methodology, and results; in addition to a question-and-answer session where Peer Reviewers could ask the District questions about the presentation and MFL report.

The Peer Review Panel was given 52 days to review the draft MFL document and provide the District with a draft Peer Review Report which included a concise review of the data, methodologies, and models used in the MFL Technical Assessment for Jackson Blue Spring. In addition, the collective scientific opinions of the Peer Review Panel were summarized and completed Peer Review Forms for each Peer Reviewer were provided. The District met with the Peer Review panel on January 12, 2026 to discuss the comments and allow the District an opportunity to ask questions for clarification regarding the peer review comments. The draft Peer Review Report was provided to the District on January 20, 2026. The District reviewed the report and provided Stantec with clarifications regarding some items and requests for clarification of specific peer review comments. A final version of the Peer Review Report was provided to the District on February 6, 2026.

## PEER REVIEW FORMS AND DISTRICT RESPONSES

Completed Peer Review forms from each Peer Reviewer are included below along with District responses to each comment. Column A: “PEER REVIEWERS Specific Comments” and Column B: “PEER REVIEWERS specific remedy and estimate of time and effort needed to implement remedy” were provided by Peer Review committee. Column C has been added which provides the District response to each Peer Review

comment. Completed Peer Review forms and District responses are listed for each Peer Reviewer separately. A District response of “No District Response Required” denotes a Peer Review comment which did not recommend a remedy to be addressed in the technical assessment. Where appropriate, the Jackson Blue Spring MFL Technical Assessment Report and supporting appendices were modified to address Peer Review comments.

## Peer Review Form for Dr. Adam Munson and District Responses

<b>Name and Affiliation of Reviewer:</b> Adam Munson, PhD, PE. University of Florida	<b>Discipline specialty covered by this review:</b> MFL History, Statistical Methods.
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This document is for the use of PEER REVIEWERS retained by the Northwest Florida Water Management District (DISTRICT) for the purpose of providing a technical peer review of a DISTRICT report, including appendices prepared by DISTRICT staff and consultants.

### REVIEW REQUIRED

**1. Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

- a. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:
  - a. The data and information used were properly collected; and
  - b. Reasonable quality assurance assessments were performed on the data and information.

Note: The PEER REVIEWERS are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and DISTRICT hydrologic monitoring networks.

- b. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:
  - a. If the assumptions are clearly stated, reasonable, and consistent with the best available information; and
  - b. Assumptions were eliminated to the extent possible, based on available information.

- c. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:
    - a. The procedures and analyses were appropriate and reasonable, based on the best available information;
    - b. The procedures and analyses incorporate appropriate factors;
    - c. The procedures and analyses were correctly applied;
    - d. Limitations and imprecision in the information were reasonably handled;
    - e. The procedures and analyses are repeatable; and
    - f. Conclusions based on the procedures and analyses are supported by the data.
- 2. If a proposed method used in the MFL report is not scientifically reasonable, the PEER REVIEWERS shall:**
- a. Deficiencies: List and describe scientific deficiencies;
  - b. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
  - c. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of the time and effort required to develop and implement; and
  - d. If the identified deficiencies cannot be remedied, the, if possible, identify one or more alternative methods that are practical, cost-effective, and scientifically reasonable, based on published literature to the extent feasible.

## REVIEW CONSTRAINTS

CONTRACTOR and PEER REVIEWERS shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes and Chapter 62-40.473, Florida Administrative Code) affecting the DISTRICT's development of MFLs. CONTRACTOR and PEER REVIEWERS shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board are not included in the scope of work. These include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels are to be set;
2. The definition of what constitutes "significant harm" to the water resources or ecology of the area;
3. The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constraints that such changes or alterations had or placed on the hydrology of a given watershed, surface water, or aquifer; and
4. The method(s) used by other District or agencies for establishing MFLs for other waterbodies and aquifers.

Instructions:

1. The results of this review are for the use of the DISTRICT and they are not to be revealed to others without the express permission of the DISTRICT.
2. By signing this form, the PEER REVIEWER certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042 (5), in the discipline noted above.
3. The Peer Reviewer also certifies that the review was conducted according to the scope and conditions specified above.

Signature of Peer Reviewer: 	Date of Peer Review: 1/5/2026
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Responders Certification: the comments and criticisms proved by the PEER REVIEWER have been addressed as noted in column C in a separate response document, which is attached, and in the report.

Name and Affiliation of Responder to Peer Review Comments:	
Signature of Responder:	Date of Response:

Comment No.	Figure, Table, or Paragraph No.	Does Comment Directly and Materially Affect Conclusions of Report? (Yes or No)	To be completed by PEER REVIEWER(S)		DISTRRICT responses to Specific Comments
			PEER REVIEWERS Specific Comments	PEER REVIEWERS specific recommended Corrective Action	
1		Overall Impression	<p>The MFL recommendation for Jackson Blue Spring is well reasoned given recent climatic and disturbance impacts on the system. The overall approach is reasonable, uses best-available (if at times limited) data, and is largely consistent with previous MFLs. Importantly, it is consistent with the Econfina Creek system which shares many of the same data limitations. When system specific conditions require judgments, the decisions are reasonable and generally well documented.</p> <p>Overall, the recommended reduction appears to be within the range commonly applied to other spring-dominated systems, including both Econfina and Rainbow systems which bear similarities. Though groundwater withdrawals in the watershed are expected to increase modestly over the planning horizon, the change in flows at Jackson Blue Spring is expected to be small (1.3 cfs), relative to its flow and below the reduction permitted under the proposed MFL.</p>	None	No District response required.
2	Page 17	No	Fourth paragraph, 3 <sup>rd</sup> Line...Suggest changing “will ensure” to something like “are intended to ensure” or other such wording.	Consider wording	Wording edited in report.

3	Page 18 Table E-1	No	<p>Two issues.</p> <ol style="list-style-type: none"> <li>1) The table itself is hard to read. Consider adding gridlines or label each WRV in the left-hand column so the rows align more clearly.</li> <li>2) This table is really about the development of metric, not relevance. This is confusing to the reader (I suspect), especially if they are just reading just the Executive Summary. For instance, WRV 6 is very important in this MFL. The high degree of recreational use is noted in the report, and the report acknowledges the importance of WRV6. But it also goes on to explain why a WRV6 metric was not developed independently and that the WRV 1 and 2 metrics likely suffice as protection for WRV6. WRV6 may be highly relevant even if is addressed indirectly. I suggest that the table either be changed to state which metrics were covered (including indirectly) or that discussion in the summary be more complete regarding WRV relevance.</li> </ol>	Consider reformatting table and perhaps relabeling table or adding a little text in the supporting paragraph.	Modified Table to remove middle column for clarity. Also added gridlines.
4	Page 19	No	Object missing from 3 <sup>rd</sup> complete paragraph.		Error corrected.
5	Page 58	Unlikely	1 <sup>st</sup> complete paragraph: The report notes that the Florida Bass habitat will be evaluated using the largemouth bass habitat suitability curve. This seems reasonable given the lack of a Florida Bass curve, though Dr. Hamel's opinion (if any) should be given greater weight here.	No action requested.	No District response required.

6	Sec. 3, Pg. 73-77	No	<p>The report quickly discusses and largely dismisses water chemistry as a meaningful metric by which to establish MFLs in this system. This is due to the lack of correlation with JBS flows and the BMAP and associated projects. This is reasonable given the trend analysis of the data provided. However, going back to an earlier discussion of WRV 6, in spring-fed systems there is often a discussion of water clarity (Secchi Disk-vertical or horizontal, turbidity, transparency or chlorophyll-a etc.) as an important component and a calculation of flushing time, residence time, retention or other measure. Water clarity is certainly important given the broad array of recreational uses. The report does note that the system has clear, cool water and states that this is unlikely to change. It also characterizes the MMP system as lentic and low velocity. This pivots us to a depth and inundation-based analysis with hydroperiod and moves away from any flushing time or turnover based analysis.</p>	<p>The system has clear water (determined antidotally) and that is unlikely to change under the proposed MFL flow reductions. However, if water clarity data exist it should be presented and discussed in the context of flow. If not, its inclusion should be Consider inclusion of data related to water clarity in future reports. Since large changes in clarity can be realized with only small changes in water column turbidity (organic or inorganic) this component seems too easily dismissed in a system highly valued for recreational use.</p>	<p>A discussion on water clarity and residence time has been added to the water quality section of the report.</p>
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7	Table 4-1, pg. 86 and Fig. 4-7, pg. 87	No	Table 4-1 list nine sites. The names are inconsistent from table to map (e.g. is Chipola river at Marianna FL the same as Chipola River Near Marianna, FL?). There are no station numbers on the table, so the naming discrepancies are important. There are three groundwater stations in the table that are not on the map. At least I think that is the case. There are only 6 locations on the map, and they are all surface water, I believe. In the text you often label them NWFID but in the table they are labeled as NFWMD. It can all be resolved by an attentive reader, but this could be improved.	Consider consistent labels and adding the groundwater stations to Figure 4-7	Table and figure updated for clarity.
8	Fig. 4-14 and Page 95	No	1 <sup>st</sup> paragraph: The description of the 1-year and 2-year moving averages would probably be better labeled 12-month, and 24-month moving averages since they are applied on a monthly, not an annual time step.	Just consider relabeling these in the text, and associated figures for clarity.	Relabeled to 12-month and 24-month in text and figures.
9	Page 99	No	1 <sup>st</sup> paragraph: You found an “optimal” lag of 4 months by minimizing error. I am assuming that since you report R-squared, the error measure used was SSE from an OLS regression? You go on to discuss factors leading to the error as being both in the flow and in the rainfall. So orthogonal regression might have been the technically more correct choice. However, I don’t think this is meaningful since you are not interpreting the slope and are only trying to say baseflow follows antecedent rainfall with a lag and to pick a reasonable lag.	1) Add one sentence identifying what “minimize error” means specifically as the objective function your optimization. 2) Consider a statement that the regression is illustrative and not inferential (though I don’t recall you ever using the slope regardless).	Upon further review, a lag of 7 months resulted in a slightly improved regression. Chart and text was updated accordingly, changing from a lag of 4 months to a lag of 7 months. As this regression was for illustrative purposes, this change does not affect the final MFL assessment. Added additional text to describe how optimal lag was determined: "The optimal lag was determined by finding the lag which minimized the sum of squared errors (SSE) in the ordinary least squares (OLS) regression between cumulative rainfall and Chipola River baseflow." Added statement "It should be noted that this regression analysis is presented here for illustrative purposes only and was not used to make further inferences."

10	Sec 6.2, pg. 133-142 & Appendix B	No	<p>The HEC-RAS model is a challenging aspect of this MFL recommendation. The short concurrent-data period of record, the inexact operations records, the need for data filling, and lack of an independent validation holdout are examples of challenges. The District has done a commendable job working with the data that is available. They have also acknowledged the difficulties in Appendix B regarding the unsteady state model (instability, limited POR, operations records, etc.). While a longer POR was used in the steady state model, much of the model itself was inherited from the unsteady model. The District has committed to adaptive management and listed some of the ongoing efforts that would make a model update worthwhile in the future.</p>	No response requested.	No District response required.
11	Sec 6 or 7	No	<p>Since the pond stage (and thus several WRV metrics) is directly related to the structure's control elevation, a material change to the control elevation or structure hydraulics should trigger re-running of the steady state profiles and recomputing of the WRV metrics. That, of course, would be difficult for everyone to keep up with on an ad hoc basis. Therefore, it might prove helpful, and insightful, to include a sensitivity bracket for a few of different elevations should the operations schedule change.</p>	Consider including a sensitivity bracket to demonstrate robustness of the Merritts Mill Pond WRVs to the choice of a fixed structure in the model.	<p>Jackson County generally keeps the hydraulic gate in the closed position, typically opening the gate occasionally for a planned drawdown event or in preparation for a major storm or hurricane. The steady state model profiles used to evaluate WRV metrics were based on the hydraulic gate being in the fully closed position, which is typically the case. The District's understanding is that Jackson County has no plans in the foreseeable future to significantly change the structure's operating procedure. Therefore, considering sensitivity of varying gate positions on model results was not necessary at this time. As part of the District's commitment toward adaptive management, the District may perform additional model scenarios if changes to structure operation are proposed.</p>

12	Table 6-5, Pg. 142	No	Table 6-5 needs to be reformatted	Resize the columns for readability.	Correction made.
13	Sec 7.5, Pg. 180-187	Unlikely	The use of the hydroperiod tool is interesting.		No District response required.
14	Sec 7.5, Pg. 180	No	<p>For your use of the hydroperiod tool you cited.</p> <p>Fox, S., R. Deschler, N. Mouzon, A. Sutherland and F. Gordu. 2022. ESRI's Arc Hydro Hydroperiod Tool and MFLs determination for lakes in the St. Johns River Water Management District [Poster presentation]. Florida Lake Management Society 33rd Annual Technical Symposium, Bonita Springs, Florida.</p>	<p>I was unable to find any copy of the poster or meaningful material such as an abstract that would allow me to compare your description of what was done to the citation. I did find a pdf of a presentation from Fox online. I think the first use, which I did find was in SJ2022-03 which seems to say this technique was developed for this Lake Buttler evaluation.</p> <p>Jennewein, S., Di, J., Gordu, F., Leta, O., Deschler, R., &amp; Sutherland, A. (2020). <i>Minimum Levels Determination for Lake Butler, Volusia</i></p>	Hydroperiod tool reference changed from Fox et al. 2022 to Leeper et al. 2001 and a recent use of the tool by SJRWMD for the Minimum Levels Reevaluation for Lake Prevatt (SJRWMD 2025) was cited.

				<p><i>County, Florida</i> (Technical Publication SJ2022-03). St. Johns River Water Management District, Palatka, FL.</p> <p>While the GIS tool specifically seems new the use of usable habitat changes for wading birds and fish in lentic systems is not new and has been used on lakes across the state since the early 2000s when SWFWMD first proposed using bird species richness in a lake predicted by usable area (incidentally also fist proposing the 15% change threshold based on a change in richness of 1 bird species).</p>	
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				<p>Leeper, D., Kelly, M., Munson, A., and Gant, R. (2001). <i>A multiple-parameter approach for establishing minimum levels for Category 3 Lakes of the Southwest Florida Water Management District</i>. June 14, 2001 draft. Southwest Florida Water Management District, Brooksville, Florida.</p>	
15	Sec 7.5	No	<p>I think the use of the Hydroperiod Tool is reasonable and well adapted to lake applications. I am uncertain if MMP is correctly characterized as simply a lentic system. I think the use of the tool is reasonable given the low velocity. I am not certain that the use of one necessarily excluded the other. Having both might have supported the use of one preferentially or might have been redundant. It is unclear to me how low a velocity is too low for SEFA. More broadly, it is unclear whether there is a practical minimum-velocity threshold below which SEFA is not appropriate, or whether the decision is primarily based on the ponded/impounded nature of the system.</p>	<p>No action requested.</p>	<p>Language was added to Section 7.5 noting that MMP displays aspects of both a lentic and a lotic system and therefore analyses for addressing instream habitat for both types of systems were included (hydroperiod tool for lentic and SEFA for lotic). Language was also added to note that both SEFA and the hydroperiod tool were utilized in this evaluation to assess instream habitat along MMP to be as protective as possible.</p>

16	No page	Multiple locations – Some previous comments in relation to each other.	Several of my comments come back to this internal tension you have in the narrative - whether Merritts Mill Pond is better treated as a lotic or lentic system. The report largely screens out water-quality consideration based on the lack of correlation with JBS discharge (and a BMAP), while characterizing MMP as a low-velocity/lentic system to justify use of the Hydroperiod Tool and to exclude velocity-based habitat tools such as SEFA. At the same time, the report’s discussion of recreation and “clear water” implies flow-related processes help sustain clarity. These positions are not necessarily inconsistent, but the report would benefit from explicitly reconciling them. For example, explaining what is too low a velocity for SEFA and explaining why turnover/residence-time processes are not expected to become relevant for water clarity. You do this with the 0.8 ft/s for algal response but not for others.	No action necessary for this comment, but it ties together why some of the above were troublesome. No one of these things is a problem individually but taking together they are more difficult to resolve without a sense of inconsistency. Because of that I feel greater discussion would benefit the report, but it is not strictly necessary.	Language was added to Section 7.5 noting that MMP displays aspects of both a lentic and a lotic system and therefore analyses for addressing instream habitat for both types of systems were included (hydroperiod tool for lentic and SEFA for lotic). Language was also added to note that both SEFA and the hydroperiod tool were utilized in this evaluation to assess instream habitat along MMP to be as protective as possible.  A discussion on water clarity and residence time has been added to the water quality section of the report.



## Peer Review Form for Dr. Martin Hamel and District Responses

<b>Name and Affiliation of Reviewer:</b> Marty Hamel – University of Georgia	<b>Discipline specialty covered by this review:</b> Aquatic ecology and ecohydrology
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### REVIEW REQUIRED

#### **3. Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

- d. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:
  - a. The data and information used were properly collected; and
  - b. Reasonable quality assurance assessments were performed on the data and information.

Note: The PEER REVIEWERS are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and DISTRICT hydrologic monitoring networks.

- e. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:
  - a. If the assumptions are clearly stated, reasonable, and consistent with the best available information; and
  - b. Assumptions were eliminated to the extent possible, based on available information.

- f. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:
  - a. The procedures and analyses were appropriate and reasonable, based on the best available information;
  - b. The procedures and analyses incorporate appropriate factors;
  - c. The procedures and analyses were correctly applied;
  - d. Limitations and imprecision in the information were reasonably handled;
  - e. The procedures and analyses are repeatable; and
  - f. Conclusions based on the procedures and analyses are supported by the data.

**4. If a proposed method used in the MFL report is not scientifically reasonable, the PEER REVIEWERS shall:**

- e. Deficiencies: List and describe scientific deficiencies;
- f. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
- g. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of the time and effort required to develop and implement; and
- h. If the identified deficiencies cannot be remedied, the, if possible, identify one or more alternative methods that are practical, cost-effective, and scientifically reasonable, based on published literature to the extent feasible.

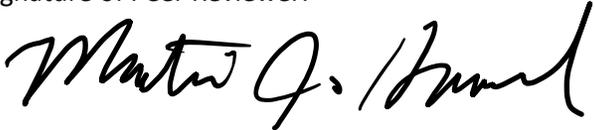
#### REVIEW CONSTRAINTS

CONTRACTOR and PEER REVIEWERS shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes and Chapter 62-40.473, Florida Administrative Code) affecting the DISTRICT's development of MFLs. CONTRACTOR and PEER REVIEWERS shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board are not included in the scope of work. These include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels are to be set;
2. The definition of what constitutes "significant harm" to the water resources or ecology of the area;
3. The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constraints that such changes or alterations had or placed on the hydrology of a given watershed, surface water, or aquifer; and
4. The method(s) used by other District or agencies for establishing MFLs for other waterbodies and aquifers.

Instructions:

4. The results of this review are for the use of the DISTRICT and they are not to be revealed to others without the express permission of the DISTRICT.
5. By signing this form, the PEER REVIEWER certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042 (5), in the discipline noted above.
6. The Peer Reviewer also certifies that the review was conducted according to the scope and conditions specified above.

Signature of Peer Reviewer: 	Date of Peer Review: 12/27/2025
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Responders Certification: the comments and criticisms proved by the PEER REVIEWER have been addressed as noted in column C in a separate response document, which is attached, and in the report.

Name and Affiliation of Responder to Peer Review Comments:	
Signature of Responder:	Date of Response:

Comment No.	Figure, Table, or Page and Paragraph No.	Does Comment Directly and Materially Affect Conclusions of Report? (Yes or No)	To be completed by PEER REVIEWER(S)		DISTRICT responses to Specific Comments
			PEER REVIEWERS Specific Comments	PEER REVIEWERS specific recommended Corrective Action	
1	Table 2-2, Pg. 50	No	It is not clear how the percent groundwater contribution area was calculated (or where these data came from). This was not discussed in the text where the table was referenced.	Please specify if these data were calculated or were used from a different source.	This column refers to the percent of acreage each land use comprises within the Florida portion of the Jackson Blue GWCA. It is computed as total acreage of a given land use/ total acreage within the Florida portion of the Jackson Blue GWCA. The source of the land use data was the FDEP Division of Environmental Assessment and Restoration Landcover Dataset (2022). This reference has been included in the report.
2	Pg. 51, p. 7	No	Hydrilla was not mentioned in the list of invasive species, but in the next sentence, it was stated that herbicide treatments are regularly used to control this plant.	Include hydrilla in the list of invasive species	Hydrilla has been added to the list.
3	Fig. 2-20, Pg. 55	No	Would it be possible to include a before and after image of the floodplain?	Include an “after Hurricane Michael” photo as a side-by-side comparison.	Taking a photo in the floodplain post hurricane Michael was not feasible due to safety concerns. However, Figures 2-21 through 2-23 show the riparian corridor of Spring Creek post Hurricane Michael.
4	Pg. 57, p. 3	No	I think it would be helpful to include the scientific names of the 15 fish species in Merritts Mill Pond.	Include scientific names	Scientific names have been added to the text. A complete list of species and scientific names is provided in Table 2-4.
5	Pg. 58, p. 3	No	It is stated that shoal bass have not been documented in the Jackson Blue Spring MFL study area. I am assuming this	Specify whether “the species not being documented in Jackson Blue Spring MFL” is	Additional text has been added to the report describing the fish occurrence data and the consideration of this species for MFL metrics establishment.

			information is coming from FWC? I reached out to someone familiar with this area and they have reported catching shoal bass in Spring Creek, albeit many years ago. It seems likely that shoal bass would use Spring Creek since there is a direct connection to the Chipola River and that there is a at least one large shoal complex in this system. Given the conservation status of this species, I wanted to ensure this species was not ignored because of a lack of information.	because of a lack of understanding or from sampling data showing no captures.	
6	Pg. 89, p. 1	No	The Mann-Kendall test produced a test statistic, "S"; however, the result reported the Kendal tau test statistic, which is a different test.	Determine if a Mann-Kendall or Kendall Tau test was used.	A Mann-Kendall test was used. Changed the test statistic to "S"
7	Fig. 4-12, Pg. 93 & Table 4-5, Pg. 94	No	It is best practice to include a measure of variance when displaying mean values.	Include standard deviation or standard error with mean values	Added standard deviation to table and chart.
8	Pg. 103, p. 1 & Fig. 4-23, Pg. 104	No	It is not clear to me how this was calculated given the description in the text on Pg. 102/103. Also, the text in the report says "Figure 4-23 shows significant variability in pickup, with a larger fraction of this variability arising from	Provide additional information to clarify.	Added text to clarify "Flow pickup along the pond was calculated as the difference in mean daily discharge between these stations, for all days where concurrent discharge was available at both stations." Changed text to read "Figure 4-23 shows significant variability in pickup, ranging between 0 and 411 cfs, with a median value of 99 cfs."

			flow variations at the Merritts Mill Pond @ US 90 gage." It is not clear how I find/interpret this information while simply looking at Fig. 4-23.		
9	Fig. 4-24, Pg. 104	No	This figure is missing a y-axis label. Also, there appears to be three colors for the graph bars, but there are only 2 labeled in the key.	Add missing information.	Added y-axis to chart in report. There are only two series displayed on the chart.
10	Pg.106	No	It is stated that 4 of 13 pickup estimates were negative, but this should have said "positive".	Revise mistake.	Correction made.
11	Pg.106	No	It is not clear why only 13 comparisons were made and why those specific dates were chosen. Were these the only ones where flow data overlapped?	Please clarify	Added text to clarify: "A total of 13 measurement dates had concurrent flow measurements at all three locations."
12	Pg.141, p. 1	No	Please clarify what is meant by "reflects the additional flow resistance through the fish barrier." What is the additional flow resistance?	Please clarify	As discussed in the report, the control structure has a fish barrier before the hydraulic control gate. The fish barrier could not be directly accounted for in the gate coefficients within HEC-RAS, although it does add additional resistance since vegetative debris can accumulate in front of the barrier. Therefore, the selected gate coefficient on the lower end of the range of typical values for a sluice gate is reasonable, as this would account indirectly for additional friction caused by the fish barrier.
13	Table 7-1, Pg. 156	No	Please define what CR is abbreviated for.	Please clarify.	CR stands for Chipola River, correction made in report.

14	Pg. 167, p. 2	No	A changepoint analysis was used, but supporting information was lacking. For example, multiple methods of changepoint analysis are available and can influence the number or criteria for selecting “changepoints” in the dataset. I could not find this information in the main document or any of the appendices.	Please provide additional information so that it is known what criteria was used for conducting the changepoint analysis	The methods for determining changepoints for the wetted perimeter analysis is provided in Appendix C, Sections 4.2.2.1 and 4.2.2.2
15	Pg. 168, p. 2	No	In the next paragraph, it was stated that a cross-section with multiple changepoints was shown in Appendix C. It would be nice to reference the specific figure in the Appendix that the authors were referring to.	Please provide additional information.	This information is found in Figures 29 and 30, p. 71-72 of Appendix C. This reference was added to the main technical assessment document.
16	Fig. 7-8, Pg. 169	No	It would help to clarify these methods in the text of the document; i.e., the discrete first derivative of the relationship.	Please clarify in the text	Methods for determining changepoints are described on page 42, Section 4.2.2.1, Appendix C. "Since only one distinct changepoint was observed in the relationship between weighted wetted perimeter and flow rate, corresponding to the JBS flow rate at which the water surface reaches the floodplain, the binary segmentation method implemented in the ruptures Python library (Truong et al., 2020) was used for determining changepoints in the WWP analysis." Due to the detailed nature of these methods, this was left out of the primary technical assessment report. However, reference to Appendix C is within the appropriate section of the main technical assessment.

17	Pg. 171, p. 3	No	The reference for Table 7-23 must be a mistake as the tables only go up to 7-17.	Please revise.	Changed reference to Table 7-12.
18	Fig. 7-9, Pg. 172	No	If the red dots represent critical flows, what do the blue dots represent?	Please include the blue dots in the figure key.	The blue points represent noncritical flows. Each point (red and blue) represents inundated floodplain area for a given Jackson Blue flow.
19	Pg. 180	No	There was a reference for Fox and others (2022). The Fox reference was a poster at a conference, which is not a peer-reviewed publication, or even a completed technical report. If there are "others", it would be good to cite what those sources are.	Please include additional sources.	Hydroperiod tool reference changed from Fox et al. (2022) to Leeper et al. (2001) and a recent use of the tool by SJRWMD for the Minimum Levels Reevaluation for Lake Prevatt (SJRWMD 2025) was also referenced.
20	Pg.180	Perhaps	I like the idea of trying to incorporate this new "hydroperiod" tool to account for the lentic habitat in Merritts Mill pond. However, I am wondering if a big component that is missing is the impact of reduced depth that might increase nuisance (or maybe even native) aquatic vegetation. Submerged aquatic vegetation (SAV) is primarily light dependent, which is strongly related to depth of water and suspended solids. Given the amount of SAV seen in photos within the report, it seems plausible that	Model the relationship with current SAV with depth and flow to see if it is plausible to predict the expansion of SAV with reduced flow and subsequent depth.	Detailed information on the location and abundance of SAV in the JBS study area is unavailable, however SAV has been observed throughout the MMP, including many of the deepest parts of the system. Due to the exceptional clarity of the water in MMP and field observations of SAV during multiple field visits to MMP (including the deepest areas of the pond), it is not anticipated that changes in water depth will result in an increase in SAV or nuisance/exotic vegetation coverage. For future MFL evaluations, the District may consider the effect of reduced flows on SAV if additional data becomes available.

			a drawdown in water levels could result in the expansion of dense SAV like Hydrilla. If this occurs, this could negatively impact various fish species, despite having depth and velocities in the preferred range. Is there a way to account for the potential addition of SAV if water levels were to drop?		
21	Table 7-16, Pg. 184	Yes	The importance of individual habitat components for spawning can vary significantly depending on the spawning strategy of the species. For largemouth bass, males build nests and will continue to guard the hatched fry in these excavated nests until they are large enough to disperse. Therefore, depth is not the critical habitat variable that drives successful recruitment. Substrate is a major factor in nest site selection, coupled with appropriate water quality, stable water levels, and proximity to physical structure. Therefore, having the critical depth range of 1-4 ft as the defining characteristics for successful	Consider other metrics for evaluating impacts of reduced flow in Merritts Mill pond, especially for fish spawning. Factors such as water level fluctuation, aquatic vegetation (see comment above).	The depth range for game spawning came from a literature review completed for the Lakes Brooklyn and Geneva MFL reevaluation by the SJRWMD (Sutherland, 2021). They found that the average depth for largemouth bass nests ranged from 1 – 4 feet based on the review of three papers. Similar literature reviews were used for both small and large wading birds. The same range was used in the Draft Lake Prevatt MFL (Shadik, 2025). These references have been added to the hydroperiod sections of the WRV report (Appendix C) as well as the main technical assessment.  Detailed information of species life history requirements for hydrology have not been developed for the Hydroperiod Tool utilized in this analysis. Such information does exist in the form of HSCs used in the instream habitat or SEFA analysis which was also used for Merritts Mill Pond. As the Hydroperiod Tool evolves and additional information becomes available, this metric may be reevaluated in future MFL evaluations/re-evaluations.

			spawning under various flow regimes is not really relevant.		
22	Pg. 144, p. 1 & Appendix A	Perhaps	Substrate was not used for the habitat suitability curves in this MFL. In Appendix A, it was stated that substrate was not used because of a lack of spatial variability (primarily sand and limestone). While sand and limestone might be the dominate substrate in this system, it is hard for me to believe that other substrate types do not persist, especially between Merritts Mill pond and Spring Creek. Was substrate quantified in these systems? Can you reference that in the appendix? I am afraid that continuing to ignore substrate in these MFLs could have repercussions with some species that rely on specific substrate for completing some aspect of their life cycle. For example, the threatened and endangered mussels require specific substrate/flow combinations. Only looking at flow and depth could ignore important attributes that may be limited in the system.	Provide information on whether substrate has been quantified. Possibly incorporate substrate into HSCs.	Detailed substrate information was not available in the study area and as a result was unable to be incorporated into instream habitat analysis. Clarification text has been added to the report. Additionally, field observations suggest that the substrate for the system is relatively consistent sand/shell matrix with occasional limestone outcrops located near the Chipola River downstream of the area of influence of Jackson Blue Spring.

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## Peer Review Forms for Nathan Holt District Responses

<b>Name and Affiliation of Reviewer:</b> Nathan Holt, PE Drummond Carpenter, PLLC	<b>Discipline specialty covered by this review:</b> Hydrology, Hydrogeology, Numerical Modeling
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This document is for the use of PEER REVIEWERS retained by the Northwest Florida Water Management District (DISTRICT) for the purpose of providing a technical peer review of a DISTRICT report, including appendices prepared by DISTRICT staff and consultants.

### REVIEW REQUIRED

**5. Determine whether the methods used for establishing the minimum flows are scientifically reasonable.**

- g. Supporting Data and Information: Review the data and information that supports the method and the proposed minimum flows, as appropriate. The reviewer shall assume the following:
  - a. The data and information used were properly collected; and
  - b. Reasonable quality assurance assessments were performed on the data and information.

Note: The PEER REVIEWERS are not expected to provide independent review of standard procedures used as part of institutional programs that have been established for the purpose of collecting data, such as the USGS and DISTRICT hydrologic monitoring networks.

- h. Technical Assumptions: Review the technical assumptions inherent in the methodology and determine:
  - a. If the assumptions are clearly stated, reasonable, and consistent with the best available information; and
  - b. Assumptions were eliminated to the extent possible, based on available information.

- i. Procedures and Analyses: Review the procedures and analyses used in developing quantitative measures and determine qualitatively whether:
  - a. The procedures and analyses were appropriate and reasonable, based on the best available information;
  - b. The procedures and analyses incorporate appropriate factors;
  - c. The procedures and analyses were correctly applied;
  - d. Limitations and imprecision in the information were reasonably handled;
  - e. The procedures and analyses are repeatable; and
  - f. Conclusions based on the procedures and analyses are supported by the data.

**6. If a proposed method used in the MFL report is not scientifically reasonable, the PEER REVIEWERS shall:**

- i. Deficiencies: List and describe scientific deficiencies;
- j. Remedies: Determine if the identified deficiencies can be remedied and provide suggested remedies;
- k. If the identified deficiencies can be remedied, then describe the necessary corrections and, if possible provide an estimate of the time and effort required to develop and implement; and
- l. If the identified deficiencies cannot be remedied, the, if possible, identify one or more alternative methods that are practical, cost-effective, and scientifically reasonable, based on published literature to the extent feasible.

#### REVIEW CONSTRAINTS

CONTRACTOR and PEER REVIEWERS shall acknowledge the statutory constraints and conditions (Sections 373.042 and 373.0421, Florida Statutes and Chapter 62-40.473, Florida Administrative Code) affecting the DISTRICT's development of MFLs. CONTRACTOR and PEER REVIEWERS shall also acknowledge that review of certain assumptions, conditions, and established legal and policy interpretations of the Governing Board are not included in the scope of work. These include:

1. The selection of waterbodies or aquifers for which minimum flow and/or levels are to be set;
2. The definition of what constitutes "significant harm" to the water resources or ecology of the area;
3. The consideration given to changes and structural alterations to watersheds, surface waters, and aquifers, and the effects and constraints that such changes or alterations had or placed on the hydrology of a given watershed, surface water, or aquifer; and
4. The method(s) used by other District or agencies for establishing MFLs for other waterbodies and aquifers.

Instructions:

7. The results of this review are for the use of the DISTRICT and they are not to be revealed to others without the express permission of the DISTRICT.
8. By signing this form, the PEER REVIEWER certifies that the peer review was conducted according to the guidelines listed above and that the opinions and recommendations included in the review constitute an independent review per Chapter 373.042 (5), in the discipline noted above.
9. The Peer Reviewer also certifies that the review was conducted according to the scope and conditions specified above.

Signature of Peer Reviewer: 	Date of Peer Review: 12/30/2025
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Responders Certification: the comments and criticisms proved by the PEER REVIEWER have been addressed as noted in column C in a separate response document, which is attached, and in the report.

Name and Affiliation of Responder to Peer Review Comments:	
Signature of Responder:	Date of Response:

Comment No.	Figure, Table, or Page and Paragraph No.	Does Comment Directly and Materially Affect Conclusions of Report? (Yes or No)	To be completed by PEER REVIEWER(S)		DISTRCT responses to Specific Comments
			PEER REVIEWERS Specific Comments	PEER REVIEWERS specific recommended Corrective Action	
<p><b>These comments are related to <i>Recommended Minimum Flow for Jackson Blue Spring</i>, DRAFT REPORT, November 2025, Publication Number: PDS 25-02, Northwest Florida Water Management District. (DRAFT_JB_TechAssessment_Document_November2025.pdf)</b></p>					
1	Page 14 Acronyms	No	Space between “OSTDS” and “P or PF” in acronym list.	Remove space.	Space removed.
2	Page 17 Executive Summary	No	Executive summary is within report.	Suggest moving Executive Summary to after cover pages and before Table of Contents and provide unique numbering.	Executive Summary has been moved as suggested.
3	Table E-1, Page 18 and E-3, Page 21 Executive Summary	No	Table E-1: Capitalization issues in label  Table E-3: “Minimum Median Flow at Reference Gage” phrasing could be improved for clarity.	Table E-1: Suggest updating capitalization in table label. <i>Make table and figure label capitalization consistent throughout report.</i>  Table E-3: Consider rephrasing to “Minimum Allowable Median Flow at Reference Gage.”	Capitalization and phrasing have been updated as suggested.
4	Page 19 Paragraph 4	No	Formatting issue in sentence that starts “Floodplain inundation area...”	Correct formatting issue.	Issue corrected.
5	Page 19 Paragraph 4	No	End of paragraph appears to be missing or a period is missing.	Add end of paragraph or period.	Period added.
6	Page 20 Paragraph 2	No	“Proposed hydrologic regime” – phrasing could be improved for accuracy/clarity.	Consider rephrasing to “Allowable minimum	Changed to "proposed allowable hydrologic regime..."

				hydrologic regime” or similar.	
7	Page 22/23 Paragraph 2	No	End of sentence goes to following page with Figure 1-1.	Put part of sentence on page with Figure 1-1 to previous page.	Issue corrected.
8	Figure 1-1	No	Figure 1-1 title not on same page as figure.	Put Figure 1-1 title on same page as figure.	Edit made.
9	Page 26 Paragraph 1	No	“Groundwater withdrawals” – phrasing is inconsistent with Section 1.2, which uses the phrase “further groundwater withdrawals.”	Consider rephrasing to “Further groundwater withdrawals.”	The statement as written refers to Florida Statute 373.042 (1) when referring to further withdrawals which includes all consumptive uses (surface and groundwater). The remainder of the paragraph has been rephrased for clarification.
10	Page 27 Paragraph 2	No	“JBS” defined at start of Section 2.1.	Suggest defining “JBS” acronym at first use in Section 1.	JBS is defined in paragraph 1, Chapter 1. Removed (JBS) from paragraph 1, Section 2.1 as the acronym was previously defined.
11	Figure 2-10, Page 38	No	Comment 1: The groundwater contributing area for JBS, developed using measured data representing 2007 conditions, is shown on Figure 2-10. It is not clear how similar this contributing area is to the groundwater contributing area for JBS in the North-Florida Central District Groundwater Model. As (1) the JBS-MMP-Spring Creek system is groundwater dominated in terms of flow contribution and (2) JBS and MMP have a TMDL for nitrate, it may be beneficial to compare groundwater contributing areas developed measured data and model simulations. It is understood one would not expect the areas to be exactly the same based on potential	Comment 1: Consider developing a groundwater contributing area(s) for JBS from the groundwater model using reverse particle tracking. Could develop for calibration period (average 2017-2019 conditions) and/or 2005 pumping conditions (nearest groundwater model simulation to 2007 when the capture area using measured data was developed). Add to Figure 2-10.  Comment 2: Add layer title or clarification of what	Comment 1: The comparison you suggest is a logical one to make but isn't necessary for establishing and implementing the MFL. However, developing a simulated groundwater contributing area is something that we will consider doing as part of any future effort to refine the estimated groundwater contributing area. Such an effort could also incorporate additional historical data collected since the original map was delineated.  Comment 2: Composite 2nd and Composite 3rd represent flows from a group of springs that collectively would represent a second or third magnitude spring. Text has been added to the report to make this clear.

			changing conditions, interpretations of measured data, and assumptions of the regional groundwater model.  Comment 2: Not clear what Composite 2 <sup>nd</sup> and Composite 3 <sup>rd</sup> represent in figure.	Composite 2 <sup>nd</sup> and Composite 3 <sup>rd</sup> mean.	
12	Figures 2-11 (pg. 40), 2-12 (pg. 42), 2-13 (pg. 44), and Figure 2-14 (pg. 46)	No	Comment 1: JBS not shown on figures.  Comment 2: If UCU thickness should be shaded blue based on legend that has blue as 0-17 feet. Legend does not include a note about the UCU being absent.	Comment 1: Suggest showing JBS on figures.  Comment 2: Suggest adjusting UCU thickness layer symbology ranges in legend and/or add note that UCU is absent where blank coverage.	Added Jackson Blue Spring to figures.  Lower limit of symbology range changed to 0.01 ft
13	Page 48 Paragraph 2	No	The weir geometry is not described.	Suggest documenting the weir and notch elevations and weir width/length.	Weir and notch dimensions have been added to the report.
14	Page 50 Heading	No	“Natural Resource” heading formatting issue.	Apply correct style to “Natural Resources” heading.	Correction made.
15	Page 51 Paragraph 5	No	Punctuation issue “along the shoreline. but are also”	Change to “along the shoreline, but are also”	Correction made.
16	Table 2-4, Page 59	No	Formatting issue with borders.	Fix formatting.	Formatting fixed.
17	Page 68 Paragraph 1	No	Report says “(Figure 225)”	Change to (Figure 2-25).	Correction made.
18	Page 73 Paragraph 3	No	Typo in nitrogen reduction level - “6664,086 lb-N/yr”	Update to “664,086 lbs-N/yr”	Correction made.
19	Page 74 Heading	No	Spacing issue before Section 3.2	Fix spacing issue	Correction made.
20	Table 3-2, Page 75	No	Nitrate concentrations are compared to JBS discharge in Figure 3-2 but	It is recommended that JBS discharge trend statistics	Added JBS trend statistics in Table 3-2.

			<p>discharge trends are not included in Table 3-2. As JBS and MMP are impaired for nitrate and nitrate concentrations are increasing in JBS (Table 3-2), it would be beneficial to compare nitrate concentration trends against discharge trends in JBS to help confirm that nitrate concentrations in JBS are primarily driven by land use practices (which will be governed by the Basin Management Action Plan) rather than consumptive use impacts on reduced spring flows (governed by this MFL).</p>	<p>(which are included in Section 4.2 of the report) be added to Table 3-2.</p>	
21	<p>Figure 3-1, Page 75/76 and Figure 3-2, Page 77</p>	No	<p>Figure 3-1 label has incorrect timeframes for data presented and “Oxygen” is capitalized.</p> <p>Trendlines not included.</p>	<p>Update Figure 3-1 label to “between 1989 and 2024” for (A), “between 2013 and 2024” for (B), and “between 2013 and 2024” for (C).</p> <p>Update Figure 3-1 label remove capitalization from “oxygen”</p> <p>Recommend adding linear trend lines to graphs.</p>	<p>Corrections made to Figure caption. Trend lines added to charts.</p>
22	<p>Figure 4-6, Page 84/85</p>	No	<p>JBS location is not shown on figure.</p> <p>Label not on same page as figure.</p>	<p>Suggest adding Jackson Blue Spring location to Figure 4-6.</p>	<p>Jackson Blue Spring was added to map. Figure label was put on same page as figure.</p>

				Put figure label on same page as figure.	
23	Page 85 Paragraph 4	No	An index velocity rating curve approach was used to estimate discharge at MMP/US 90, and the report identifies measurement uncertainty as a limitation of the hydraulic model calibration/validation, but measurement uncertainty is not documented.	If available, it is suggested that some documentation of differences between the estimated discharges and the quarterly field visit discharge measurements be discussed.	The root-mean square error of the differences between estimated discharges and quarterly field visit discharges was computed and documented in the report.
24	Figure 4-15, Page 96	No	Missing axis labels.	Label figure axes.	Axes labeled.
25	Figure 4-18, Page 99	No	Figure label not on same page as figure.	Put label and figure on same page.	Correction made.
26	Figure 4-21, Page 102	Perhaps	Figure 4-21 indicates that Hurricane Michael impacted river stages due to debris in the floodplain and river systems rather than an introduction of a large volume of water. Once debris was cleared, Chipola River stages appear to return to near pre-Michael stages but remain slightly elevated relative to flow. The report suggests this may be due to remaining debris in the floodplain that has not been removed.	As the HEC-RAS model developed for this MFL was calibrated to post-Hurricane Michael stage-flow relationship, the model may have been calibrated to a slightly elevated stage-flow relationship in MMP and Spring Creek; however, this new relationship may be representative of the watershed over the planning period, given the significant landscape alterations caused by Hurricane Michael. Considering this uncertainty and that	The steady-state model was validated by comparing water surface elevations estimated from steady-state profiles to the elevations measured concurrently with flow measurements performed in early-2025. Text was added to the report describing this validation effort. As discussed in the adaptive management section, the District will continue to monitor and evaluate changes in river flows and hydraulics, including continued effects from Hurricane Michael.

				<p>observation that the calibrated HEC-RAS model used in this MFL analysis does not appear to have been successfully validated, stage-flow relationships in the JBS-MMP-Spring Creek system should continue to be monitored for potential changes over the planning period as part of the adaptive management approach. If a new “natural condition” is identified, it is suggested that consideration be given to re-calibrate/validate the HEC-RAS model.</p>	
27	<p>Figures 4-22 (pg. 103) and 4-25 (pg. 105)</p>	Perhaps	<p>A LOWESS regression was utilized to estimate flow pickup in MMP based on JBS discharge. The regression captures the central tendency, but not variability, which the authors explain is due to measurement uncertainty and other factors. Figure 2-25 indicates that there is variability between flow pickup in MMP and JBS discharge, likely due to operations of the MMP water control structure (dam) and vegetation and turbulence issues with the control structure at the US 90 gage.</p>	<p>(1) Consider clarifying that the technique used to develop flow pickup for MMP was reasonable as the technique was able to capture a general positive relationship between JBS discharge and MMP flow pickup.</p> <p>(2) Consider comparing MMP continuous estimated discharges (orange line on Figure 4-22) to the MMP regression-based discharges by adding</p>	<p>Response to suggestion (1): language was added to the report noting that the method was reasonable because it captures the central tendency of the relation.</p> <p>Response to suggestion (2): estimated MMP discharges have been computed as suggested and are now shown in Figure 4-22.</p> <p>Response to suggestion (3): We considered computing MMP discharge using the water balance method you suggest but felt that estimating variations in some of the components (such as net groundwater inflow and direct runoff) at a daily time step was not practical. However, we will continue to consider ways that we can improve the estimation of</p>

			<p>It is difficult to assess the long-term performance of the regression and specifically whether the regression adequately predicts the MMP continuous discharge estimates for use in the baseline period time series (described in Section 7 of MFL report) and the HEC-RAS models. The variability could impact the (1) the ability to calibrate/validate the HEC-RAS models, which use a uniform lateral inflow for MMP pickup, and (2) the baseline period time series MMP flow pickup and cumulative probability flows (pumping-adjusted) used to define flow conditions in the steady-state HEC-RAS model as part of the WRV evaluation.</p>	<p>the regression-based time series (JBS discharge plus LOWESS regression-based pickup) to Figure 4-22.</p> <p>(3) Consider estimating MMP discharge based on a water balance in the pond and including results in the report to indicate whether this method may be beneficial for future consideration.</p> <p>(4) Consider discussions limitations of this approach on the HEC-RAS models and WRV assessment. Variability in MMP flow pickup in relation to JBS discharge (Figure 4-25) would not be picked up, which could facilitate difficulty in model calibration/validation. Also, potential impacts on the cumulative probability plots used to develop flow conditions for WRV evaluation in the steady-state HEC-RAS model.</p>	<p>the flow from MMP and the inflow to MMP moving forward.</p> <p>Response to suggestion (4): Discussion of the effects of uncertainty in the MMP pickup estimates on the HEC-RAS models and WRV assessments has been added to the report.</p>
28	Page 105	No	<p>The MFL report uses the terminology locally estimated smoothing regression method "LOESS" and the</p>	<p>Please verify the LOESS method described in the MFL report is the same as</p>	<p>The "LOWESS" analysis shown in Figure 7 of the WRV report was similar to the "LOESS" analysis mentioned in the MFL report, but they were not identical. The</p>

			HEC-RAS modeling report uses the terminology locally weighted scatter plot smoothing (LOWESS).	the LOWESS method described in the HEC-RAS modeling report. I believe it is.	LOESS model was ultimately used to estimate MMP pickup. Additional clarification has been added to the WRV report Appendix C).
29	Page 106 Paragraph 1	No	Text says “four of the 13 pickup estimates had negative values, with the remaining being negative.”	Change to “with the remaining being positive.”	Changed to "with the remaining being positive."
30	Page 107 Paragraph 1	No	Text says “Jackson Spring Near Marianna”	“Near” should not be capitalized.	Changed "Near" to lower case "near."
31	Page 120 Paragraph 1	No	<p>The report discusses consideration of WRV 9. Water Quality. The report acknowledges an increasing trend in nitrate concentrations and dissolved oxygen in JBS and that JBS and MMP are under a TMDL being addressed through a Basin Management Action Plan.</p> <p>The report indicates water quality was not considered a WRV. The report states “all parameters displayed no correlation with Jackson Blue Spring discharge, indicating that potential reductions in flow caused from groundwater withdrawals are unlikely to significantly affect water quality for Jackson Blue Spring and Merritts Mill Pond.” This observation may be true (Figure 3-2) but there might not be enough analysis to definitively state this. For example, there is lag time, which can be several years, between nitrate application on the land surface and</p>	<p>(1) Consider updating text to say “parameters displayed no apparent correlation...”</p> <p>(2) Consider providing additional discussion. While there is no apparent relationship between JBS discharge and spring nitrate concentration, a reduction in flow due to pumping could theoretically cause nitrate concentrations to increase. However, possible increases in nitrate concentrations due to reducing JBS discharge by 10% could occur. However, considering existing nitrate concentration in JBS is approximately 3.5 mg/L, impacts of reduced flow due to consumptive use are</p>	<p>1) Text edited in the report from “no trend” to “no statistically significant correlation.”</p> <p>2) Added additional discussion to the report: “Additionally, since nitrate concentrations are currently well above the TMDL of 0.35 mg/L, the extensive BMAP efforts to reduce nitrogen source loading would be anticipated to have a significantly greater impact on nitrate concentrations at Jackson Blue Spring than flow reductions associated with the proposed MFL.”</p>

			<p>concentrations seen at the spring. It is also difficult to tease out if land application of nitrogen is muting a potential relationship between spring nitrate concentrations and JBS discharge. It may be helpful to add additional context.</p> <p>The proposed MFL would allow for a reduction of 10.7% of flow from the median baseline JBS discharge of 103.3 cfs (Table E-1). The median nitrate + nitrite concentration (1960-2024) for JBS is 3.51 mg/L. Under conservation of mass assumptions, a 10% reduction of flow could cause an increase in nitrate + nitrite concentrations of approximately 0.35 mg/L. This concentration is not significant relative to the current concentration observed in JBS but approximately equals the numeric nutrient standard of 0.35 mg/L for Florida Springs, which also is the TMDL concentration set for JBS and MMP in the Basin Management Action Plan.</p>	<p>insignificant in terms of meeting the TMDL of 0.35 mg/L set forth for JBS and MMP. Land use nitrogen reduction practices specified in the Basin Management Action Plan are anticipated to have a significantly greater impact on meeting the TMDL compared to any impacts from flow reductions associated with the MFL.</p>	
32	Figures 6-1 (pg. 124), 6-2 (pg. 126), 6-4 (pg. 129), 6-6 (pg. 131)	No	JBS not shown on figures. Would be helpful when evaluating calibration statistics.	Add JBS to figures.	Added JBS to figures.

33	Table 6-1 (pg. 127), 6-2 (pg. 130), Figure 6-3 (pg. 128), 6-5 (pg. 130)	No	Groundwater model calibration results indicate the model was able to successfully replicate average 2017-2019 conditions.	Correct formatting on Tables 6-1 and 6-2	Formatting of these tables has been updated.
34	Section 6	No	(1) The groundwater flow model was calibrated to average conditions from January 2017-December 2019, across the period Hurricane Michael made landfall. It does not appear that Michael significantly impacted storage dynamics in the groundwater system and the period was appropriate for steady-state model development. (2) Model domain and regional application of the model appear appropriate. (3) Model limitations, including impacts of using a regional model, were discussed. As importantly noted in the MFL report, the model is not intended to simulate actual flows in JBS or MMP in a given year, only pumping impacts.	None	No response needed.
35	Page 139 Paragraph 3	No	The railroad bridge was excluded from the HEC-RAS model, in part because the model was unstable when it was included. Such instabilities can be corrected by adjustments to the model inputs or solver. The authors explain that the	Recommend discussing which flow condition generated water levels that reach the low chord and would be impacted by exclusion of the bridge. Identify which percentile	Bridge survey data (including low-chord elevation data) were unavailable. However, it is very unlikely that any of the stages simulated by the HEC-RAS model were higher the low chord elevation. The highest simulated stage at the bridge was 65.36 feet, and this was for the 99th percentile Jackson Blue Spring flow (upstream boundary condition) and 90th

			bridge would likely affect flow only during the most extremely high flow conditions, so it was not necessary to include the bridge. This may be a reasonable simplification, but adequate support for this statement and decision is not documented.	flow from the baseline period this corresponds to, or whether it is greater than the 99 <sup>th</sup> percentile.	percentile downstream stage (at the mouth of Spring Creek) boundary condition. LiDAR topographic data indicate that the elevation of the roadway approach to the bridge is about 83 feet. Assuming the elevation of the bridge deck is no lower than the roadway approach, then the low chord elevation would have to be about 18 feet below the bridge deck for it to be at this highest simulated stage, which seems very unlikely. Language has been added to the report indicating that it is very unlikely that the highest simulations could have reached the low chord elevation of the bridge and therefore have been impacted by excluding the bridge from the HEC-RAS model.
36	Page 142 and Table 6-5	Perhaps	<p>MFL document and unsteady state HEC-RAS modeling report indicates the model did a satisfactory job predicting stages in MMP considering the short simulation period and uncertainty in gate operations (<math>R^2=0.48</math>, RMSE = 0.30 (feet?), RSR = 0.785). It is difficult to determine if these metrics represent satisfactory calibration.</p> <p>Validation statistics were not included in the HEC-RAS report as it does not appear the model was able to be validated. Model validation was not discussed in the MFL document.</p> <p>The table formatting could be improved. RMSE should have units.</p>	<p>Consider adding documentation of how these model metrics represent a “satisfactory” job for hydrologic model calibration of MMP stages during the calibration period.</p> <p>Please improve the table formatting and add units to RMSE.</p> <p>As noted in a comment above, continue to monitor stages in the system post-Hurricane Michael and consider revising the HEC-RAS models and updating</p>	<p>Additional discussion of sources of error has been added to the WRV report (Appendix C) as well as the main MFL technical assessment report. “While approximately half of the variability in the MMP stage was accurately represented by the model (indicated by a <math>R^2</math> of 0.48), the model was unbiased (indicated by a difference of 0.06 ft between the simulated mean and the observed mean), represented the overall variability in water level with reasonable accuracy (indicated by an RMSE of 0.30 ft or 13% of the observed range), and represented the extreme stages with reasonable accuracy (indicated by differences of 0.17 ft and 0.18 ft between the simulated and observed maximum and minimum stages, respectively). The model performance was reasonable considering the high level of variation in the stage-discharge relationship observed at the MMP US 90 gage (Appendix C, Figure 6), which was likely caused by gate adjustments of unknown timing and magnitude, periodic vegetation removal directly</p>

				the calibration/validation in the future.	upstream of the structure, and periodic cleaning of the fish barrier. Further, for the WRV assessments, the HEC-RAS model was used to generate steady-state profiles based on JBS discharge statistics while assuming a constant gate condition, and the calibration of the unsteady model indicated that it was accurately simulating MMP stage statistics (e.g., the mean, maximum, and minimum stages)."  Formatting corrected for Table 6-5 in the MFL technical assessment report, and units for RMSE added.
37	Page 148 Paragraph 4	Perhaps	Baseline time series (2005-2024) for MMP flow pickup added pumping impacts simulated in the groundwater model to MMP flow pickups estimated from measured JBS discharge using the LOWESS technique. Cumulative probability plots were then used to develop flow percentiles for use in the steady-state HEC-RAS models as part of the WRV evaluation. As noted above, there is variability in JBS discharge and MMP flow pickup (Figure 4-25), likely due to gate operation unknowns. This variability is not fully captured in the cumulative probability plots (both high MMP flow pickups and low MMP flow pickups).	As a wide range of flows were evaluated and considering the role the MMP water control structure (dam) has on MMP and Spring Creek stages/flows, the technique appears reasonable. Consider adding a discussion on the potential limitations.  As noted in a comment above, continue to monitor stages in the system post-Hurricane Michael and consider revising the HEC-RAS models and updating the calibration/validation in the future.	A discussion on the potential limitations associated with variability in the relation between JBS discharge and MMP pickup was added to the report.  Stages in the system will continue to be monitored on the system and HEC-RAS models revised and recalibrated in the future when indicated by the data.

38	Page 155 Section 7.2.2	No	“for safe power boat” starts paragraph	Capitalize “For”	Correction made.
<p><b>Below is a general comment related to the unsteady-state HEC-RAS modeling report <i>Hydrologic Engineering Centers River Analysis System (HEC-RAS) Model, Jackson Blue Spring, FINAL REPORT, February 2025. Prepared for the Northwest Florida Water Management District, Prepared by Geosyntec Consultants, Inc.</i> Additional comments related to modeling and calibration/validation efforts described in this report are included as part of the MFL document peer review described above.</b></p>					
39	Unsteady State HEC- RAS Report Feb. 2025	Perhaps	<p>Model development, calibration (4/1/2019-10/2020), and validation periods (12/17/2020-3/30/2021, 10/25/2021-2/23/2022) were after Hurricane Michael and debris clean up.</p> <p>Model was calibrated during a period without complete gate records for operation of the MMP water control structure (dam). Model was primarily calibrated to weir and sluice gate coefficients for the MMP water control structure and Mannings n in Spring Creek. Calibration results discussed in a comment above.</p> <p>Model does not appear to have been successfully validated, and validation statistics were not provided. The report indicates that the model is not predicting water levels in Merritts Mill Pond but reasonably predicts stages in Spring Creek. This lack of validation may be due to uncertainty</p>	<p>In this report or in the MFL document, can a discussion be added on how the calibrated Manning n values in Spring Creek (0.055 to 0.045 in the creek, 0.22 in the floodplain) compare to coefficients used in other similar river systems.</p> <p>As part of an adaptive management approach, future effort could consider updating the HEC-RAS model(s) in the future and re-calibrating/validating. Consider separating the SC model from the MMP model and utilize the US 90 continuous discharge data as an upstream boundary condition to the Spring Creek model. This could potentially reduce the calibrated Manning’s n</p>	<p>Comparison of Manning’s n values with similar systems were added to the WRV report (Appendix B).</p> <p>Although continuous stage and discharge data was somewhat limited for the system being modeled, 336 days of data were available for calibration and 226 days of data were used for validation, which was deemed adequate for the purposes of the MFL analysis. The continuous discharge data available for the MMP US 90 gage was used as direct input to the model such that the simulated flow at that location was essentially identical to the observed data. Further, the discharge data at the MMP US 90 gage was more limited than JBS discharge. Also, Manning’s n values used in the model were defined at each cross-section individually. Therefore, there would be no benefit to separating the model into two, split at the MMP control structure. If a significant amount of additional data is available in the future, primarily data associated with the MMP US 90 gage and the operation and maintenance of the control structure, additional model calibration, validation, and analysis could be performed to reassess the minimum flow recommendations for the system, but the current model and recommendations are likely a good</p>

			with operation of the water control structure (dam) at MMP.	values and therefore reduce the steady state model's water level results. This could have a significant effect on the WRV assessments. The reviewer's opinion is that the degree of effect on the WRV assessment should be explored, and if determined to be significant then the WRV assessment should be revisited.	representation of the data that is available for the system.
<p><b>Below are comments related to the steady-state HEC-RAS modeling and WRV assessment report <i>Water Resource Value Assessment for Jackson Blue Spring</i>, TECHNICAL REPORT, September 2025. Prepared for the Northwest Florida Water Management District, Prepared by Environmental Science Associates, Inc.</b> Additional comments related to modeling efforts described in this report are included as part of the MFL document review described above.</p>					
40	Figure 10, Page 15	No	Performance of the steady state model is evaluated for repeat flow measurements under moderately high flow conditions (i.e., up to 168 cfs) but is not evaluated for higher flow conditions. However, the model is utilized to address higher flow conditions that control the WRV limiting flow reduction (flood inundation).	Consider evaluating whether the steady state model results are consistent with the unsteady state model results for high flow conditions. For example, the two models could be qualitatively compared for the period of high flow in September 2020 when simulated flows are approximately 380 cfs and are relatively steady.	The effects of the Manning's n adjustments were evaluated over the full range of flow and full extent of Spring Creek. The results were found to be minimal, and this information was added to the WRV report (Appendix C).

41	Table 13, Page 45 and Figure 30, Page 56	Perhaps	<p>The weighted wetted perimeter WRV metric is a measure of inundated substrate and aquatic habitat. The methodology utilizes a changepoint in the cross-section where wetted perimeter increases suddenly (e.g., at top of bank) and characterizes the critical flow as the flow when water levels reach the change point. A similar methodology was utilized in the Upper Peace River MFL.</p> <p>The metric's use of a changepoint may not be an appropriate method to represent inundated substrate and aquatic habitat because it is not a time-integrated measure of wetted perimeter. In other words, the metric does not account for temporal wetted perimeter variability, which could be important when considering this WRV. It is noted that different flow percentiles were considered, but ultimately the minimum flow reduction is driven by a single flow condition rather than variable flood conditions.</p> <p>Additionally, the changepoint is identified using a graphical / mathematical technique that generates results that might not be consistent with the topography of the creek. For example, the changepoint</p>	<p>It is noted that weighted wetted perimeter was not considered one of the more stringent metrics considered and may not impact final MFL develop in comparison to more restrictive metrics (e.g., floodplain inundation, motorboat passage in MMP). However, evaluating weighted wetted perimeter using a different method may be beneficial. If keeping the existing method, additional discussion on similar applications of this methodology may be beneficial.</p> <p>An option is to calculate the metric as total acre-days of inundation (this metric could be combined with the flood inundation metric as they are similar metrics).</p> <p>If the current methodology continues to be used, a proposed resolution is to set the changepoint to the top of bank elevation,</p>	<p>Weighted wetted perimeter is a commonly used metric for assessing riparian bank habitat. Additional references to previous MFL reports which included WWP analysis has been added to the WRV report (Appendix C). Since changepoints in wetted perimeter at any location along the bank could be of ecological and/or hydrological importance, changepoints need not be defined solely at the top of bank. For example, a changepoint at the toe of bank could be protective of snag habitat while a changepoint near or at the top of bank could be protective of riparian wetland habitat. As part of the adaptive management process, the District may consider alternative metrics for assessing riparian bank habitat in future MFL evaluations.</p>
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			on Figure 30 (at 124.5 cfs) represents a flow condition when the water level is appreciably below top of bank, so it does not reflect a physically-based changepoint condition.	which could be visually identified for each cross section.	
42	Figure 31, Page 58	Perhaps	In Figure 31, it appears that inundated floodplain area is greater than zero at low JBS discharges when the floodplain is presumably not inundated. It seems the values represent total wetted area rather than floodplain inundation. Was flow within the banks of Spring Creek considered part of the floodplain?	Consider adjusting the floodplain inundation calculation to remove areas within Spring Creek or provide additional description/justification of the calculation methodology.	Terminology has been changed from "floodplain inundation" to "riparian wetland inundation" to more accurately depict the habitat area analyzed since the GIS coverages used (wetlands and hydric soils) extend beyond the floodplain.
43	Table 16, Page 59/60 and Figure 31, Page 58	Perhaps	The floodplain inundation WRV metric is a measure of flood mitigation, water quality improvements, transfer of detrital material, and the maintenance of habitat for wetland species. The methodology utilizes changepoints in the cross-section where the relationship between Spring Creek flow and inundation area changes (e.g., at top of bank). A similar methodology was utilized in the Upper Peace River MFL.  The metric's use of a changepoint may not be an appropriate method to evaluate flood mitigation, water quality improvements, transfer of detrital material, and maintenance of habitat for wetland species related to	An option would be to calculate the metric as total acre-days of inundation.	Using changepoint analysis of the relationship between flow and inundated floodplain area as a metric for evaluating potential effects from reduced flows on floodplain habitat is widely accepted and has been used in several previous MFL studies. The acre-days methodology suggested would require calculating the sum of inundated area over the period of record and determining an allowable flow reduction based on a 15% change in the total inundated area. Since the sum of the inundated area time series is directly related to the mean, and the mean is almost equal to the median, the method used for the MFL is almost identical to what was suggested.

			<p>floodplain inundation because it is not a time-integrated measure of flood inundation. In other words, the metric does not account for temporal duration of floodplain inundation, which could be important when considering this WRV. It is noted that different flow percentiles were considered, but ultimately the minimum flow reduction is driven by a single flow condition rather than variable flood conditions.</p>		
<p><b>Below are comments related to the steady-state groundwater modeling report <i>Development and Application of the North-Central District Groundwater Model, DRAFT REPORT, August 2025, Technical File Report 25-XX, Northwest Florida Water Management District.</i> Additional comments related to modeling efforts described in this report are included as part of the MFL document review described above.</b></p>					
44	<p><b>Overall Impression of Groundwater Modeling Report</b></p>	<p>The groundwater modeling approach is reasonable and meets or exceeds conventional standards of groundwater modeling practice.</p> <p>The highly parameterized calibration methodology was implemented adequately, with appropriate parameterization, regularization, and weighting schemes, resulting in an acceptable match to calibration targets using reasonable parameter values.</p>	<p>As part of the adaptive management strategy for the JBS MFL, consider performing an uncertainty analysis, such as Null-Space Monte Carlo, for the groundwater model predictions of pumping impacts on flows in JBS and MMP.</p>	<p>A prediction uncertainty analysis, such as using a Null-Space Monte Carlo or other method, will be considered going forward to complement implementation of the MFL.</p>	

		<p>A predictive uncertainty analysis to estimate the margin of error of the simulated pumping impacts was not performed for this modeling effort. Uncertainty analyses are commonly omitted from groundwater modeling evaluations, but there is growing recognition of the benefits of these analyses for quantifying predictive errors and managing risk. Although an uncertainty analysis is not required for the modeling approach to be scientifically reasonable, adding an uncertainty analysis could enhance the predictive capabilities of the model, in terms of evaluated MFL-related pumping conditions. The highly parameterized calibration methodology implemented for the NCDM using pilot points and PEST_HP with a high-performance computing cluster lends itself to completing a calibration-constrained uncertainty analysis, particularly with the Null-Space Monte Carlo (NSMC) method. Given the current model setup, completing a NSMC for the groundwater model predictions would not be too significant of an effort. Considering the sensitivity of simulated spring flows to the hydraulic conductivity of the Upper Floridan aquifer (Figure 5-36), the wide range of plausible values for this</p>		
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			parameter group (Table 3-1), the likely heterogeneity in this karst aquifer system, and the inherent non-uniqueness of calibrated groundwater models, predictions could potentially vary widely using alternative parameter input values that equally calibrate the model. NSMC helps quantify this predictive variability, which is not currently considered or addressed in the report.		
45	Section 7	No	A steady-state condition was assumed for model construction. A calibration period with minimal observed changes in groundwater storage was selected (Page 33); however, no additional justification of this assumption or discussion of its limitations is provided. It is noted that this calibration period included Hurricane Michael, which had significant impacts on surface water hydrology of the system but does not appear to have had significant impacts on groundwater storage dynamics.	Consider (1) adding a brief explain as to why a steady-state model can meet the modeling objectives of this study, and (2) briefly discuss limitations imposed by the steady-state assumption in the model limitations section of the report.	Text has been added to the report that briefly explains why a steady-state model can meet the modeling objectives of the study and briefly describing limitations associated with the steady-state assumption.
46	Figures	No	General figure comment. Many figures do not include JBS. It would be helpful when evaluating the figures to include the location of JBS.	Consider showing the location of JBS on all applicable figures where it is not already shown.	The location of JBS was added to all applicable figures where it was not already shown.
46	Page 42 Paragraph 1	No	No-flow boundaries were defined "along groundwater flow paths along historically persistent features in the	If available, please provide one or more additional references to other	Additional references to other historical potentiometric surface maps showing these persistent features were added to the report.

			potentiometric surface of the Upper Floridan aquifer." A reference to a single potentiometric surface map (Kinnaman and Dixon 2011, Figure 3-1) is provided to identify these flow paths. Are there additional references to define these "historically persistent" flow paths?	historical potentiometric surface maps showing these persistent features to facilitate verification of the flow paths used to define these boundary conditions are in fact persistent and, therefore, appropriately located in the model.	
47	Figures 2-3 through 2-7, Pages 22-26	No	Figures 2-3 through 2-7 are not referenced in the text. It would be beneficial if these figures were referenced in the text along with citations for the data sources used to generate the figures.	In Section 2-1, consider adding in-text references to Figures 2-3 through 2-7 along with citations to the data used to generate these figures.	References to these figures were added to the text and corresponding citations included in the list of references.
48	Pages 49, 50, 72, and 139	No	$ET_p$ is defined as potential evapotranspiration in the text on pages 49 and 50. In the second paragraph of page 50, $PET$ and $ET_0$ are used interchangeably with $ET_p$ without explicitly being defined. Similarly, $ET_{sat}$ is defined on page 49 as evapotranspiration from near-surface groundwater, but a different term ( $ET_{gw}$ ) is used for shallow groundwater evapotranspiration elsewhere in the report (pages 72 and 139).	Ensure consistency of ET symbols on pages 49, 50, 72, 139, and elsewhere throughout the report.	$ET_0$ has been replaced with $ET_p$ in the instance were it occurred. The terms $ET_{sat}$ and $ET_{sat, max}$ were also changed to $ET_{gw}$ and $ET_{gw, max}$ for consistency.
49	Page 80, Sec. 5-1-1-1 Paragraph 1	No	Text states, "All but 14 of these parameter groups were adjustable parameters that were varied during calibration." The sentence probably is meant to state that all but 14 parameters were adjustable instead	Confirm whether "parameter groups" should be "parameters" in the second sentence of the first paragraph of Section 5-1-1-1 on page 80.	The sentence has been corrected to read "All but 14 of these parameters were adjustable parameters ...".

			of all but 14 parameter groups. The report later describes that there were 14 spring conductance parameters that were tied (not adjustable).		
50	Table 5-1, pg. 81 and Table 5-3, pg. 83	No	Table 5-1 indicates that 7 adjustable drnc parameters were used in calibration, but Table 5-3 defines 9 drnc parameters.	Revise Table 5-1 or Table 5-3 for consistency to indicate the correct number of parameters used in the drnc parameter group.	Table 5-3 has been corrected to reflect the fact that there are 7 adjustable drnc parameters.
51	Page 84 Paragraph 2	No	The second full paragraph on page 84 indicates that the area of river features was “calculated as the product of the feature’s length and area.” This statement likely includes a typo since the area is calculated as the product of the feature’s length and width.	Correct the text to indicate that the feature’s area is calculated as the product of the feature’s length and width.	The text has been corrected to indicate that the feature’s area is calculated as the product of the feature’s length and width.
52	Page 85 Paragraph 2	No	The report indicates that the number of available head measurements by model layer can be found in Figure 5-1, but this information is found in Table 5-5 and not Figure 5-1.	Change the reference in the first paragraph of Section 5-1-2-1 to refer to Table 5-5 instead of Figure 5-1.	The reference in the first paragraph of Section 5-1-2-1 has been changed to refer to Table 5-5 instead of Figure 5-1.
53	Page 91 Paragraph 3	No	Please provide the basis for the assumed specific conductance value of 180 $\mu\text{S}/\text{cm}$ for groundwater. Is it an average value of measurements taken during a specific time period?	Consider additional brief detail to the last paragraph on page 91 to describe the basis for the assumed specific conductance value of 180 $\mu\text{S}/\text{cm}$ for groundwater.	Brief detail was added.
54	Page 92 Paragraph 1	No	In the first full paragraph of page 92, the range for the difference between the flow measured at the mouth of Spring Creek and the daily mean flow	Confirm that the range and interquartile range provided in the first	The minimum value in the report was incorrectly listed as -41 cfs and has been changed to -46 cfs.

			from MMP is given as -41 to 36 cfs and the interquartile range is given as -41 to 20 cfs. Please confirm that these ranges are reported correctly. Is it correct that the first quartile is equal to the minimum value of the dataset?	paragraph of page 92 are reported correctly.	
55	Page 99 Paragraph 3	No	Section 5-1-3-1 states, "The target associated with observation well 012769 Jackson Blue #2–Floridan was set to 100." Should this sentence indicate that the target weight was set to 100 and not that the target was set to 100?	If needed, revise the clarify that the "target weight" was set to 100 (not the target itself).	The sentence was corrected to indicate that the target weight (not the target) was set to 100.
56	Page 142	No	The symbol for sensitivity values uses $h_j$ for calibration targets in the equation on page 142, but the equation parameter definitions use $y_j$ instead.	Update equation or parameter definitions on page 142 to use consistent symbols for calibration target values.	The definition referencing $y_j$ was changed to $h_j$ .

## APPENDIX A – CURRICULUM VITAE OF PEER REVIEW PANEL

## Curriculum Vitae for Dr. Adam Munson

### Adam B. Munson, PhD, PE

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Phone: (352) 222-0587 e-mail: abmunson@mail.ufl.edu

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#### *SUMMARY OF QUALIFICATIONS*

Results-oriented scientist and educator with over 30 years' leadership in combining technology and management expertise to exceed goals for educators, business/utilities, and engineering communities. A diverse education has resulted in technical competence and established the ability to interface with individuals of varied expertise, particularly in the fields of engineering, sustainable supply chain strategy, and business analytics. Holds his Professional Engineering License in the discipline of industrial engineering (#74026). Current interests focus on business intelligence in a big data environment and sustainable operation and supply chain.

#### **EDUCATION**      **University of Florida** Gainesville, FL

*Postdoctoral Bridge Program: July '13*

- *Course work in business disciplines and research focused on consumer decisions in water consumption*

*Master of Business Administration: May '09*

- Course work in Data Analytics, Operations Management, Supply Chain Management, International Logistics, Business Law and Finance, Accounting, Economics, Organizational Behavior, Statistics, and Data Systems.
- Beta Gamma Sigma Business Honorary

*Ph.D. Environmental Engineering (Hydrologic Sciences Academic Cluster): December '06*

- Dissertation title: *Protection of Floodplain Wetlands Associated with Minimum Flow and Level Development in Southwest Florida*
- Focused on Constraint Evaluations, Resource Yield Maximization, Water Supply Optimization, Natural Systems Hydrology, Surface Water Hydrology, Groundwater Hydrology, Advanced Water Quality Analysis, Pollution Control and Prevention, et al.

*Graduate Certificate in Environmental Policy and Management: May '05*

- Course work in Management, Policy, Law, Advanced Planning, and Natural Resources and Environmental Policy, including water-supply optimization modeling of multiple conjunctive uses

*Master of Science, Limnology (Department of Fisheries and Aquatic Sciences): May '99*

- Thesis title: *Water Clarity in Kings Bay/Crystal River, Florida*

- Course work in Limnology, Stream Ecology, Biology and Physiology of Fish, Ecology and Physiology of Aquatic Plants, Extensive Statistics, et al.

*Bachelor of Science in Mechanical Engineering: August '94*

- Florida Academic Scholar
- Course work in Fluid Dynamics, Thermodynamics, Mechanical Design, Physics, Chemistry, Heat Transfer, Extensive Mathematics, et al.

## CAREER PROGRESSION

**Warrington College of Business Administration**, University of Florida, Gainesville, FL January 2009 – Present

### Instructional Professor

- Substantial Executive and professional instruction experience in MBA
- Instruct courses in data science. Topics include, artificial intelligence, machine learning, cluster analysis, principal component analysis, association rules, dimensional reduction, and other supervised and unsupervised data mining techniques.
- Recent lead experiential learning program to connect student teams with business to fulfill business needs and provide students a more realistic consulting experience. Most projects were focused on hospital supply chain, and pharma supply chain needs.

- Instructor MAN 4504 Operations and Supply Chain Management, the capstone course in the Warrington College of Business Administrations undergraduate program and part of UF online. This is an electronic platform course of up to approximately 800 students taught through an online learning platform and utilizing an array of technologies to engage students in an asynchronous environment.
- Instruction in Optimization Modeling, Empirical Modeling, Operations and Supply Chain Management, Project Management, Database Structure, and Business Intelligence.
- Developing the framework for a quality simulation model for Pearson Publishing including Learning Objectives, real world scenario development, algorithmic framework and numerical assessment of performance.
- Member of the Warrington College of Business Teaching Committee.
- Faculty advisor for Florida chapter of AIS (Association of Information Systems), Gator FinTech Club, Gator Karate, and Gator Bladers.

**AMFL Inc, Gainesville, FL**

August 2011 - Present

### Principal

- Provide peer review, quality oversight and expertise witness for rule codification in the State of Florida focused on the regulation of water abstraction.
- Consulting services in the area of strategic water supply planning, minimum flows and levels, and sustainable yield.
- Provided hydraulic modeling oversight.
- Provide expert peer review of appropriateness, application, and parameterization of quantitative techniques associated with predictive fore and hind casting.
- Literature review for constraint consistency and statistical comparison of Florida water supply yields with other regulatory entities within North America.
- Projects include 11 peer review panels and associated reports over 15 years and approximately 20 different hydrologic regions.

### Water Supply Planning Activities

- Evaluate water-supply constraints under uncertain demand in northeast Florida.
- Identification of water supply strategies that pair the appropriate level of quality and need so that future demand can be met with the lowest cost for consumers.
- Evaluate the constraints associated with supply and identify demand-side management strategies that are effective and measurable.
- Perform uncertainty analysis on the temporal components of ecologic constraints.
- Evaluate model parameterization for a GIS based model predicting ecologic harm from consumptive water use.
- Develop empirical models of aquifer levels and rainfall/net precipitation to evaluate the proportion of drawdown associated with anthropogenic effects and climate.

### Technical Review Activities

- Provide critical review of technical development supporting proposed rules for the F.A.C. for multiple agencies including FDEP, SRWMD, SWFWMD, and NFWMD.
- Provide critical review for the Suwannee River Water Management District associated with draft documents proposing regulation of ground water limitations in North Central Florida.
- Compare existing flood model results for Sarasota County with observations made during storm events of the past 50 years to determine if model results are reasonable for characterizing current flooding potential along the main-stem of the Myakka River.

**Jones Edmunds & Associates, Gainesville, FL**

August 2009 – August 2011

**Project Scientist/Manager**

## Water Supply Planning Activities

- Evaluate water-supply constraints under uncertain demand in northeast Florida.
- Identification of water supply strategies that pair the appropriate level of quality and need so that future demand can be met with the lowest cost for consumers.
- Evaluate the constraints associated with supply and identify demand-side management strategies that are effective and measurable.
- Perform uncertainty analysis on the temporal components of ecologic constraints.
- Evaluate model parameterization for a GIS based model predicting ecologic harm from consumptive water use.
- Develop empirical models of aquifer levels and rainfall/net precipitation to evaluate the proportion of drawdown associated with anthropogenic effects and climate.

## Technical Review Activities

- Provide critical review for the Suwannee River Water Management District associated with draft documents proposing regulation of ground water limitations in North Central Florida.
- Compare existing flood model results for Sarasota County with observations made during storm events of the past 50 years to determine if model results are reasonable for characterizing current flooding potential along the main-stem of the Myakka River.

## Regulatory Activity

- Water-supply constraint expert evaluating the largest proposed ground-water withdrawal in northeast Florida.
- Involved in the evaluation of demineralization concentration from a reverse osmosis plant into a natural river.

**Southwest Florida Water Management District, Brooksville, FL**

April 2000 – August 2009

### Senior Scientist

## Evaluation of Supply Side Constraints for Water Resources in Southwest Florida

- Developed methodologies, which applied research results to water resource constraints, particularly with respect to surface water availability and the consequences of ground water abstraction related to surface water features.
- Assessed available supply from multiple sources for both near-term and strategic water supply planning.
- Adapted standard, highly complex computer statistical programs to District needs.
- Conducted complex statistical analyses of extensive databases, including water quality, rainfall and flow analysis. Prepares and presents related reports and materials.
- Utilized GIS to develop digital terrain models from manually and remotely gathered survey data and utilized digital terrain models in hydraulic model development and floodplain inundation analysis.
- Applied surface water models (e.g. HEC-RAS) to water bodies of interest and analyzed model output particularly with respect to multiple measures of loss and their inner-relationship.
- Evaluated use of alternate models such as HEC-EMF, River 2D and RHABSIM.
- Interpretation of physical habitat simulation analysis to characterize hydrologic regimes appropriate for specified fauna.
- Studied selected water bodies and environmental impact assessments of entire watersheds in support of regulatory goals and the natural systems objectives of the District.
- Developed, wrote, and presented related recommendations, reports and documents as appropriate.
- Assisted with the assessment of riverine fieldwork related to setting of minimum flows in streams and rivers, often in difficult or adverse conditions.
- Coordinated project activities and technical work of lower-level Environmental Scientists and Student Interns, including oversight of field data collection and preparation of related reports and materials.
- Assisted in developing surface water management recommendations focused on establishing minimum lake levels.
- Designed and conducted scientific investigations related to ecology of lakes and environmental impacts associated with water withdrawals.

## Project Management

- Managed site-specific projects (i.e. installation of water control structures) involving technical interaction with consultant, coordination of agencies and private businesses, and public outreach.
- Managed agreements for regional projects such as the Coastal Springs Water Resource Atlas and the Hillsborough County Lake Monitoring and Assessment Program with total funding near \$1.5 million.
- Prepared requests for proposals, and managed consultant contracts and cooperative funding agreements.

**Florida Department of Environmental Protection, Gainesville, FL**

July 1999 – April 2000

## Scientist

- Ecosystem Manager for Ochlocknee and St. Marks River basins.
- District representative for working groups on Wakulla Springs, Lake Lammonia, Lake Jackson, et al.
- Served as district representative for State Land Use Reviews within the Ochlocknee and St. Marks River basins.
- Evaluated the regulated communities compliance with the submerged lands environmental resource program.
- Performed biological assessments on marine, estuarine and fresh water systems.

**Department of Fisheries and Aquatic Sciences, University of Florida, FL**

March 1996 – July 1999

## Research Assistant

- Researched probable cause of decreased water clarity in Kings Bay/Crystal River.
- Established and maintained water chemistry monitoring program.

- Maintained monthly survey of submersed aquatic macrophytes begun in 1995.
- Recruited and trained citizen volunteers to provide supplemental water samples.
- Examined changes in aquatic macrophyte abundance and composition in relation to tidal storms in Kings Bay.
- Produced bathymetric maps of Florida lakes from field data.
- Performed aquatic macrophyte and water quality surveys of Florida lakes.

### *PEER REVIEWED PUBLICATIONS*

- Gordu, F. B. Goodman, T. Cunningham, and A. Munson, 2014. Have we been here before? Hindcasting Lake Levels for MFL Evaluations Using a Decay Model. Florida Water Resources Journal, February 2014: 50-55 p
- Munson, Adam B and J. Delfino 2007. Minimum Wet-Season Flows and Levels in Southwest Florida Rivers. JAWRA. April 2007. 43(2): 522-532 p
- Munson, Adam B., J. Delfino, D. Leeper. 2005. Establishing MFLs; The Florida Experience. JAWRA. February 2005. 41(1): 1-10 p
- Munson, Adam B. 1999. Water Clarity in Kings Bay/Crystal River, Florida. Thesis, University of Florida, Gainesville, Florida 32604
- Mataraza, L. K., J. B. Terrell, A. B. Munson, and D. E. Canfield, Jr. 1999. Changes in submersed macrophytes in relation to tidal storm surges. J. Aquatic Plant Management. 37: 3-12 p

### *PEER REVIEWED TECHNICAL REPORTS*

- Munson, A, M. Kelly, J. Morales, J. Hood and D. Leeper. 2009. Proposed Minimum Flows and Levels for the Rainbow River. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604
- Heyl, M. G., A. Munson, J. Hood, J. Morales, and M. Kelly. 2009. Anclote River System Recommended Minimum Florida and Levels, SWFWMD, Brooksville, Florida 34604
- Munson, A, M. Kelly, J. Morales, and D. Leeper. 2007. Proposed Minimum Flows and Levels for the Upper Segment of the Hillsborough River, From Crystal Springs to Morris Bridge, and Crystal Springs. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604
- Kelly, M., A. Munson, J. Morales, and D. Leeper. 2007. Proposed Minimum Flows and Levels for the Upper Segment of the Braden River, from Linger Lodge to Lorraine Road. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604
- Kelly, M., A. Munson, J. Morales, and D. Leeper. 2005. Proposed Minimum Flows and Levels for the Upper Segment of the Myakka River, from Myakka City to SR 72. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604
- Kelly, M., A. Munson, J. Morales, and D. Leeper. 2005. Alafia River Minimum Flows and Levels; Freshwater Segment Including Lithia and Buckhorn Springs. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604
- Kelly, M., A. Munson, J. Morales, and D. Leeper. 2005. Proposed Minimum Flows and Levels for the Middle Segment of the Peace River, from Zolfo Springs to Arcadia. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604

### *MAJOR GOVERNMENTAL REPORTS*

- **CamachoRincon, R., Munson, A, Hamel, M., Wyss J. 2025, Independent** Technical Peer Review for the Draft Recommended Minimum Flow for the Middle Econfina Creek, Including Gainer Spring, Williford Spring and Sylvan Spring Groups. Havana Florida, NFWFMD.
- Flows for Upper and Middle Suwannee river, SRWMD, Florida. Live Oak, Florida
- Downing, H, Munson, A. Keifer, J, 2024, Peer Review of the Proposed Minimum Flow Recommendation for Charlie Creek, SWFWMD, Brooksville, Florida 34604
- Downing, H, Munson, A. Keifer, J, 2024, Peer Review of the Proposed Minimum Flow Recommendation for

Horse Creek, SWFWMD, Brooksville, Florida 34604

- Jones, G., Munson, A., Hamel, M. 2023, Independent Technical Peer Review of the Recommended Minimum Flows for Upper and Middle Suwannee river, SRWMD, Florida. Live Oak, Florida
- Jones, G., Leonard, P., Munson, A. 2021, Independent Technical Peer Review of the Recommended Minimum Flows for Wakulla and Sally Ward Springs, Wakulla County, Florida. Tallahassee, Florida
- Dunn, B. Motz, L., Munson, A., 2020, Peer Review of the Reevaluation of the Lower Itchtucknee River & Priority Springs MFL, SRWMD, Live Oak, Florida, 32060
- Peene, S., Yobi, D., Munson, A., 2019 May, Final Peer Review of Re-evaluation of Minimum Flows and Levels for the Chassahowitzka River System, SWFWMD, Brooksville, Florida 34604

- Peene, S., Yobi, D., Munson, A., 2019 May, Final Peer Review of Re-evaluation of Minimum Flows and Levels for the Homosassa River System, SWFWMD, Brooksville, Florida 34604
- Jones, Gregg, Munson, A, Leonard, Paul, and Denton, Sherily, 2018 Scientific Peer Review of the Proposed Minimum Flows for the St. Marks River, SWFWMD, Brooksville, Florida 34604
- Peene, S., Watson, K. and Munson, A, 2016. Scientific Peer Review of the Proposed Minimum Flows for the Crystal River/Kings Bay System, SWFWMD, Brooksville, Florida 34604
- Munson A., F. Gordu and B. Goodman. 2010. Technical Memorandum: Evaluating Uncertainty and Climate Effects on Water Resource Constraints, Gainesville, Florida
- Leeper, D, A. Munson, and R. Gant. 2002. Proposed Minimum and Guidance Levels for Lakes Clinch, Egale, McLeod and Wales in Polk County, Florida and Lakes Jackson, Little Jackson, Letta and Lotela in Highlands County, Florida. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604
- Leeper, D., M. Kelly, A. Munson, and R. Gant. 2002. A Multi-Parameter Approach for Establishing Minimum Levels for Category 3 Lakes of the Southwest Florida Water Management District. Ecologic Evaluations Section, SWFWMD, Brooksville, Florida 34604

## ABSTRACTS and PRESENTATIONS

- CAPSIM Users Group 2018 (August 9) Presented: Development and use of an operations simulation model for experiential learning in the classroom
- INTERFACE 2016 (April 21) Presented *Engaging Online Discussions for Large Enrollment Classes*
- FWRC, Orlando, May '13 Have we been here before? Hindcasting Lake Levels of MFL Evaluations Using a Decay Model
- AWRA; Albuquerque, Nov '11 Similar Minimum Flows or Levels do not Necessarily Mean Similar Protection: Compliance Measures Among Different Water Management Districts in Florida
- AWRA; Albuquerque, Nov '11 Special session chair for - *Evaluating and Complying with Traditional Source Limitations Established by the Development of Surface Water Constraints*
- International Society of River Science; St. Petersburg, July '09  
*Development of freshwater minimum flow requirements for rivers in southwest Florida*
- AWRA; New Orleans, Nov '08  
*Development of Minimum Flows for the Rainbow River, Managing Surface Water Systems for Groundwater Withdrawals*
- AWRA; Albuquerque, Nov '07  
*Development of Seasonal Freshwater Minimum Flows Requirements*
- AWRA; Baltimore, Nov '06  
*Development of Minimum Flows and Levels for Freshwater Rivers in Southwest Florida*
- IFC (Instream Flow Council); Vancouver B.C., April '06  
Invited Speaker; *Application of the Percent of Flow Approach in Determining Instream Flow Requirements in Southwest Florida*
- NALMS (North American Lake Management Society); Madison Wisconsin, Nov '01  
*A Multi-parameter approach to Establishing Minimum Lake Levels in the Southwest Florida Water Management District*  
  
*Course; Storm water practices to protect lakes*
- NALMS; Miami, Florida, Nov '00  
*Current strategies for setting minimum levels in the Southwest Florida Water Management District*
- Florida Aquatic Plant Management Society; Gainesville, Florida, March '97  
*Changes in Submersed Macrophytes in Relation to Tidal Storms*

## **INSTITUTIONAL SERVICE, LEADERSHIP and AWARDS**

- 2025 Florida MBA Program Core Teacher of the Year
- 2023 Florida MBA Program Elective Teacher of the Year
- 2022 Florida MBA Program Elective Teacher of the Year
- 2021 Florida MBA Program Core Teacher of the Year
- 2021 Nominated Undergraduate Teacher of the Year, Warrington College of Business
- 2018 Florida MBA Program Core Teach of the Year
- 2018 WCBA Teaching Committee
- 2017 Florida Warrington College of Business Teacher of the Year
- 2017 Florida MBA Program Core Teach of the Year
- 2017 WCBA Teaching Committee
- 2016 Florida MBA Program Core Teach of the Year

- 2016 Faculty Advisor for UF Association for Information Systems
- 2016 WCBA Teaching Committee
- 2015 WCBA Teaching Committee
- 2015: Faculty Advisor for Gator Karate Club and Gator Bladers
- 2014 WCBA Teaching Committee
- 2014 Nominated for Judy Fisher Award
- 2014: Member of Pearson's Digital Advisory Board
- 2014: Faculty Advisor for Gator Karate Club
- 2013: Member of Pearson's Digital Advisory Board
- 2014: Faculty Advisor for Gator Karate Club
- 2012: University Minority Mentor
- 2011: University Minority Mentor
- 2011: University Commencement Marshal
- President of the Southwest Chapter of FLMS (Florida Lake Management Society), March '02

### **SERVICE for INDIVIDUAL STUDENTS**

- Advisor for James Bautista Honors Thesis in Spring 2025
- Advisor for Charles Mathew Swets Honors Thesis in Spring 2023
- Have run independent student classes all of 2019 and Spring of 2020 with 4-5 students working with outside business sponsors on experiential learning projects
- Independent study for Alyssa Generalli in Spring 2017
- Independent study for Akhilesh Raperthy Spring 2017
- Advisor for Charles Thompsons Honors Thesis in Fall 2014
- Independent study for Jesselle English in Fall 2014
- 2012 Created Independent Study course for three students interested in preparing for the Fundamentals of Engineering Exam

### *CONTINUING EDUCATION SERVICE*

- 2025: DMAIC: Defining and Measuring
- 2023: Course: Ethics I for Professional Engineers, Florida Board of Professional Engineers, Tallahassee, FL, United States. (February)
- 2023: Course: "Green Development," Florida Board of Professional Engineers, Tallahassee, FL, United States. (February 2023)
- Continuing Education Program, "Project Management techniques I," Florida Board of Professional Engineers, Tallahassee, FL, United States. (February 2019)
- 2019: Workshop, "Using Multi-Objective Evolutionary Algorithms to Support Water Resources Planning," AWRA, Salt Lake City, UT, United States. (November)
- 2018: Course: Ethics I for Professional Engineers, Florida Board of Professional Engineers, Tallahassee, FL, United States. (February)
- Continuing Education Program, "Administering Construction Projects," Florida Board of Professional Engineers, Tallahassee, FL, United States. (February 2019)
- 2018: Course: "Ethics I for Professional Engineers," Florida Board of Professional Engineers, Tallahassee, FL, United States. (February 2019)
- 2018: Course: "Florida Law and Rules 2017-2019," Florida Board of Professional Engineers, Tallahassee, FL, United States. (February 2019)
- 2018: Course: "Green Development," Florida Board of Professional Engineers, Tallahassee, FL, United States. (February 2019)
- Continuing Education Program, "Project Management techniques I," Florida Board of Professional Engineers, Tallahassee, FL, United States. (February 2019)
- 2016: Course: Project Management
- 2016: Course: Project Risk Management

- 2016: Course: Administering Construction Projects
- 2016: Course: Green Development
- 2016: Course: Project Management
- 2016: Course: Project Risk Management
- 2015: Course, Quality Project Management
- 2014: MIT December 16<sup>th</sup>, Course: Tackling the Challenges of Big Data

- 2013-2014: Institute for Industrial Engineers Seminar - Work Standards for Optimal Inventory Control, Gainesville, Florida.
- Cost Benefit Analysis in Infrastructure Engineering, Gainesville, Feb '10
- Florida's TMDL, BMAP, and Watershed Management, Gainesville, Oct '09
- Multivariate Statistics, Tampa, July '09
- Supervisory Development Program, Brooksville, Nov '08
- Utah State University; Brooksville, Oct '08

The use of River 2D in Evaluating Changes in Habitat associates with changes in River Flow

- DHI; Brooksville, Oct '07

Course; Mike She – Introduction to Integrated Surface Water and Groundwater Modeling

- ASCE HEC-RAS; Atlanta, Georgia, Jan '03

Course; A three-day intensive engineering course in Hydraulic Modeling

- Project Management; Brooksville, Florida, Nov '02

Course; A two day course in project management by KEPNER TREGOE

- FLMS; Naples, June '02
- NALMS; Madison Wisconsin, Nov '01  
Course; *Storm water practices to protect lakes*
- Received CLM (Certified Lake Manager) Certification from NALMS, October '01  
FLMS; Tallahassee, Florida, May '01
- *Applied Environmental Statistics*; Tampa, Florida, October '00

Course; Intense one-week course focusing on both parametric and non-parametric statistical analysis of environmental data

- *Taxonomy of Wetland Grasses, Sedges and Rushes*; Gainesville, Florida, September '00  
Course; Two-day course focusing on Plant Identification

## CONSULTING

- Member (of three) of Scientific Peer Review Panel for the Proposed Minimum Flows for Econfina Creek and Gainer, Williford and Sylvan Spring Groups; 2024
- Member (of three) of Scientific Peer Review Panel for the Proposed Minimum Flows for the Horse and Charlie Creek; 2024
- Member (of three) of Scientific Peer Review Panel for the Proposed Minimum Flows for the Middle Suwannee River system; 2023
- Member (of three) of Scientific Peer Review Panel for the Proposed Minimum Flows for the Upper Suwannee River system; 2023
- Member (of three) of Scientific Peer Review Panel for the Proposed Minimum Flows for the Lower Santa Fe and Suwannee River System; 2020
- Member of Scientific Peer Review Panel for the Proposed Minimum Flows for the Homosassa and Chassowitzka System; 2018
- Member of Scientific Peer Review Panel for the Proposed Minimum Flows for the Crystal River/Kings Bay System; 2016

Client: NFWFMD Project Manager for Client: Gregg Jones

- Expert Witness for the SWFWMD regarding Proposed Minimum Flows for Crystal River/Kings Bay; 2017-201
- Member of Scientific Peer Review Panel for the Proposed Minimum Flows for the Crystal River/Kings

Bay System; 2016

Project Manager for Client: Doug Leeper

- Development of Quality Control Simulation model for Pearson Education; July 2014-2016 Project Manager for Client: Megan Rees
- Development of HEC-RAS model for SWFWMD 2013-2014 Project Manager for Client: Alan Foley

## Curriculum Vitae for Dr. Martin Hamel

### DR. MARTIN J. HAMEL

Associate Professor  
University of Georgia

Warnell School of Forestry and Natural Resources  
Mailing address: 125 Manorhaven Ct., Athens, GA 30606  
Email: hamel@uga.edu

### EDUCATION

**PhD 2013** University of Nebraska, Lincoln; Natural Resource Sciences – Applied Ecology Specialization;  
Dissertation: Determining *Scaphirhynchus* Sturgeon Population Demographics and Dynamics:  
Implications for Range-Wide Management, Recovery, and Conservation; Advisor: M.A. Pegg

**MS 2006** South Dakota State University; Wildlife and Fisheries Sciences – Fisheries Specialization;  
Thesis: Behavioral Responses of Rainbow Smelt to Sensory Deterrent Systems; Advisor: M.L.  
Brown

**BS 2003** Upper Iowa University; Conservation Management and Biology; Senior Thesis Project:  
*Crepidostomum* in Rock Bass (*Ambloplites rupestris*); Advisor: R. Klann

**AAS 2001** Kirkwood Community College; Parks and Natural Resources

**Graduate Certificate 2019** University of Nebraska, Lincoln – Family Financial Planning

### PROFESSIONAL APPOINTMENTS

- 2022-present** Associate Professor, Warnell School of Forestry and Natural Resources, University of Georgia
- 2023-present** Associate Graduate Faculty Member, Iowa State University
- 2019-present** Adjunct Professor, School of Natural Resources, University of Nebraska
- 2019-2022** Assistant Professor, Warnell School of Forestry and Natural Resources, University of Georgia

- 2014-2019** Research Assistant Professor, School of Natural Resources, University of Nebraska-Lincoln
- 2008-2014** Research Technologist II – River Ecology Specialist, School of Natural Resources, University of Nebraska-Lincoln
- 2006-2008** Fisheries Biologist I, Nebraska Game and Parks Commission
- 2004-2006** Graduate Research Assistant, South Dakota State University

## GRANTS/FUNDING

Hamel, M.J. Population dynamics of crappie in Georgia reservoirs. Georgia Department of Natural Resources, 2024-2026. Total award: \$126,049.

Hamel, M.J., and A. Fox. Using microchemical analysis to monitor Atlantic and Shortnose Sturgeon habitat use in coastal Georgia Rivers. National Marine Fisheries Council, 2023-2024. Total award: \$25,000 (split 50%).

Hamel, M.J., and J. Shelton. Spatial changes in trace element water chemistry across Piedmont rivers of Georgia with applications for native fish species conservation. Georgia Water Resources Institute, 2023-2024. Total award: \$20,409.

Hamel, M.J., M.A Pegg, D. Buckmeier, and J. Koch. Creating a digital repository of calcified structures from known-age fishes. Multistate Conservation Grant Program – Wildlife and Sportfish Restoration, 2023-2026. Total award: \$428,854

Hamel, M.J., and A. Fox. Assessing reproduction and recruitment dynamics of Atlantic and Shortnose Sturgeon in Georgia coastal rivers. National Marine Fisheries Council, 2022-2024. Total award: \$786,586 (split 50%).

Hamel, M.J., B. Irwin, and J. Kirsch. Determining critical knowledge in life history of Lake Sturgeon in the Coosa River basin, Georgia. FY22 Science Support Partnership; U.S. Fish and Wildlife Service – 2021-2024. Total award: \$85,770 (split 50%).

Hamel, M.J., and B. Irwin. Evaluation of Lake Sturgeon in the Coosa River. Georgia Department of Natural Resources. 2021-2023. Total award: \$145,324 (split 70%-30%).

Hamel, M.J. Spatial changes in trace element water chemistry across river basins of Georgia with applications for fish movement. Office of Research, University of Georgia, 2021-2023. Total award: \$23,562

Hamel, M.J. Determining movement dynamics, life history attributes, and angler exploitation of Suwannee Bass in Georgia. Georgia Department of Natural Resources, 2020-2021. Total award: \$96,668

Hamel, M.J. Evaluating impacts on sportfish dynamics following the establishment of hydrilla in Lake Sinclair, Georgia. Georgia Power Company, 2020-2021 Total award: \$137,500

Hamel, M.J., and M.A. Pegg. Blue Catfish Management in the Kansas River. Kansas Wildlife, Parks and Tourism, 2018-2020. Total award: \$206,000 (split 50%)

Hamel, M.J., and M.A. Pegg. Status of Invasive Carps in the Kansas River. Kansas Wildlife, Parks and Tourism, 2018-2020. Total award: \$200,000 (split 50%)

Hamel, M.J., and M.A. Pegg. Continuation: Biological Monitoring of Restored Chutes and Effectiveness in Offsetting Adverse Effects from Levee Construction at the Camp Ashland Training Site for the Nebraska Army National Guard (NEARNG) Environmental Branch. Nebraska Army National Guard, 2017 – 2020. Total award: \$175,777 (split 50%)

Pegg, M.A., and M.J. Hamel. Pallid Sturgeon Movement in the Lower Platte River. Nebraska Game and Parks Commission, 2017-2018. Total award: \$24,802 (split 50%)

Hamel, M.J., and M.A. Pegg. Biological Monitoring of Restored Chutes and Effectiveness in Offsetting Adverse Effects from Levee Construction at the Camp Ashland Training Site for the Nebraska Army National Guard (NEARNG) Environmental Branch. Nebraska Army National Guard, 2014 – 2017. Total award: \$196,946 (split 50%)

Pegg, M.A., and M.J. Hamel. Riverine Sportfish Ecology and Management. Nebraska Game and Parks Commission, 2014 – 2019. Total award: \$401,210 (split 50%).

Burgin, A., M. Pegg, M. Hamel, J. Spurgeon, and J. Hammen. Conservation of large-river fishes: a complementary approach to determine population structure and river-of-origin. UNL Research Council Grant-in-Aid, 2013. Total award \$6,500

*Not-awarded*

Hamel, M.J., and A. Fox. A multi-pronged approach for addressing critical knowledge gaps for Atlantic and Shortnose Sturgeon recovery. National Marine Fisheries Council, 2024. Total award: \$750,000 (split 50%) – *Not funded*

Irwin, B., M. Freeman, S. Wenger, M. Hamel, P. Hazelton, and A. Fox. Advancing understanding of flow effects on fishes and mussels to guide water management under a changing climate. Climate Adaptation Science Center. Total award: \$183,798 – *Not funded*

Hamel, M.J. CAREER: A holistic approach to studying biotic responses to dam removal in a highly fragmented river system. National Science Foundation. 2021-2026. Total award: \$885,237 – *Not funded*

Wenger, S., M. Hamel, and D. Leigh. Adaptively managing for Robust Redhorse: A range-wide collaboration to address data gaps, assess potential environmental threats, and implement conservation actions. 2022-2024. Total award: \$261,288 – *Not funded*

Hamel, M.J. Determining population dynamics, movement, and natal river origin of the invasive Blue Catfish in major river systems of Georgia. Gulf States Marine Fisheries Commission. Total award: \$48,302.10 – *Not funded*

Hamel, M.J., and A. Fox. Population dynamics and life history of Atlantic and Shortnose Sturgeon in the Altamaha and Savannah Rivers, Georgia, National Marine Fisheries Council, 2021-2023. Award requested: \$551,248 (split 50%) – *Not funded*

Hamel, M.J., and J. Glomb. Examining the efficacy of novel techniques for assessing hydrilla and its ecological impact in large reservoirs. North American Plant Management Society, 2020. Award requested: \$40,000 – *Not funded*

Hamel, M.J. Tributary Use of Pallid Sturgeon. Mohamed bin Zayed Species Conservation Fund. 2017. Award requested: \$23,600 – *Not funded*

Pope, K., and M.J. Hamel. Effects of Invasive Carp on Algal and Invertebrate Biomass in the Missouri National Recreational River. National Park Service, 2016-2019. Award requested: \$226,435 – *Not funded*

Hamel, M.J. Lower Platte River Biological Monitoring. Nebraska Environmental Trust, 2017-2020. Award requested: \$76,237 – *Not funded*

Pope, K., and M.J. Hamel. Longitudinal Assessment of Aquatic Macroinvertebrate Communities in Backwater and Side-Channel Habitats in the 59-mile District of Missouri National Recreational River, 2015-2018. Award requested: \$217,862 – *Not funded*

## PEER-REVIEWED PUBLICATIONS

Authorship key: **Self** – bold; last position in author line corresponds to direct supervisor  
Graduate Student Supervised – underline

*Undergraduate Student Supervised* - italics

49. Faherty, T., M. Martin, M. Baker, A. Bond, K. Fincher, Z. Schumber, A. Lyons, J. Dahlen, J. Shelton, W. Gerrin, S. McNair, **M.J. Hamel**, and P. Hazelton. 2025. Estimating reproductive parameters of a newly discovered weather loach population. *Aquaculture, Fish, and Fisheries*.

48. Nolan, J.D., W.C. Post, E. Waldrop, J.J. Facendola, M.S. Loeffler, W. Collier, E.C. Ingram, **M.J. Hamel**, and A.G. Fox. 2025. Longest documented coastal migrations of shortnose sturgeon. *Journal of Fish Biology* DOI: 10.1111/jfb.70205.
47. Bonvechio, T.F., K.J. Dockendorf, K.I. Bonvechio, and **M.J. Hamel**. 2025. Standard weight equation and standard-length categories for Flier. *North American Journal of Fisheries Management* 00:1-8, <https://doi.org/10.1093/najfnt/vqaf063>.
46. **Hamel, M.J.**, M.A. Phillips, S.R. Perry, B.J. Irwin, and J.D. Damer. 2025. First evidence of natural reproduction and recruitment of reintroduced Lake Sturgeon in the Coosa River, Georgia. *North American Journal of Fisheries Management* 45(3): 516–522.
45. Rider, H.J., M.K. Morgan, A.T. Bond, J.D. Nolan, A.G. Fox, and **M.J. Hamel**. 2025. Validating age estimates from pectoral fin spines and length frequency analysis of known-age Shortnose Sturgeon. *Journal of the Southeastern Association of Fisheries and Wildlife Agencies*.
44. Amman, B.R., W.L. Gerrin, S.F. McNair, P.D. Hazelton, J.L. Shelton, B.M. Shamblyn, and **M.J. Hamel**. 2025. Otolith increments and elements: assessing a recently discovered population of Weather Loach. *Aquaculture Fish and Fisheries* 5(1); DOI: 10.1002/aff2.70037.
43. Davis, V.D., P.C. Sakaris, T.F. Bonvechio, P. Hazelton, and **M.J. Hamel**. 2025. Comparative diets of invasive Blue Catfish: Differences across rivers and ontogenetic stages. *Ecology of Freshwater Fish* 34(2). DOI: 10.1111/eff.70001
42. Bond, A.T., W.L. Gerrin, S. McNair, and **M.J. Hamel**. 2025. Spatial changes in trace elemental water chemistry I the Piedmont ecoregion with applications for understanding fish movement. *Hydrobiology* 4(2):9; DOI: 10.3390/hydrobiology4020009
41. **Hamel, M.J.**, and W.L. Gerrin. 2025. A regional analysis of trace element water chemistry with applications for reconstructing environmental life history of fishes. *River Research and Applications* <https://doi.org/10.1002/rra.4417>
40. Davis, V.D., P.C. Sakaris, T.F. Bonvechio, and **M.J. Hamel**. 2024. Assessing Blue Catfish population dynamics across varying introduction timelines in Georgia. *North American Journal of Fisheries Management* 44(5)1134-1146.
39. **Hamel, M.J.**, V.D. Davis, M.A. Pegg, D.L. Buckmeier, and J.D. Koch. 2024. Enhancing the Science of Age Estimation: The Creation of FishAge.org. *Fisheries* DOI: 10.1002/fsh.11187
38. Glomb, J.C., R.C. Lowe III, J.L. Shelton, and **M.J. Hamel**. 2024. A Multi-Prong Approach for Monitoring Hydrilla [*Hydrilla verticillate* (L. fil.) Royle] in Lakes and Reservoirs. *Aquaculture, Fish, and Fisheries* 4(6): e70018.
37. Yeager, J.L., T. Bonvechio, and **M.J. Hamel**. 2024. Population demographics and angler exploitation of Suwannee Bass. *North American Journal of Fisheries Management* 44:415-427.
36. Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2024. Movement dynamics and habitat selection of Suwannee bass *Micropterus notius*. *Hydrobiologia* 851(5):1153-1167.

35. Werner, J.P., Q.D. Dean, M.A. Pegg, and M.J. Hamel. 2023. Patterns in spatial use and movement of Silver Carp among tributaries and main-stem rivers: Insight from otolith microchemistry analysis. *Biological Invasions* 25(2):471-484. DOI: <https://doi.org/10.1007/s10530-022-02927-y>

34. Werner, J.P., Q.D. Dean, M.A. Pegg, and **M.J. Hamel**. 2022. Spatial variability of Silver Carp population demographics in a large tributary river. *North American Journal of Fisheries Management* 25(2):471-484.
33. Dean, Q.D., J.P. Werner, M.A. Pegg, and **M.J. Hamel**. 2022. Blue catfish population characteristics and dispersal along a great plains river gradient. *River Research and Applications* 38(6):1179-1191. DOI: 10.1002/rra.3985
32. Pegg, M.A., **M.J. Hamel**, J. Koch, and D. Buckmeier. 2022. Creating a digital repository of calcified structures from known-age fishes, a century in the making. *Fisheries* 47(8):357-360 DOI: 10.1002/fsh.10773
31. Dean, Q., M.A. Pegg, and **M.J. Hamel**. 2021. Temporal patterns of capture, retention rates and efficacy of bank poles in the Kansas River: A novel sampling tool for catfish managers. *North American Journal of Fisheries Management* 41:S379-S387 DOI: <https://doi.org/10.1002/nafm.10627>
30. **Hamel, M.J.**, J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2020. Uncovering unique plasticity in life history of an endangered centenarian fish. *Nature Scientific Reports* <https://doi.org/10.1038/s41598-020-69911-1>
29. **Hamel, M.J.**, J.J. Spurgeon, and M.A. Pegg. 2020. Catfish population characteristics among river segments with altered fluvial-geomorphic conditions in the Missouri River, NE, USA. *North American Journal of Fisheries Management* <http://dx.doi.org/10.1002/nafm.10478>
28. Goto, D., **M.J. Hamel**, J.J. Hammen, M.L. Rugg, M.A. Pegg, and V.A. Forbes. 2020. Divergent density feedback control of migratory predator recovery following sex-biased perturbations. *Ecology and Evolution* <https://doi.org/10.1101/828244>
27. Uerling, C.C., **M.J. Hamel**, and M.A. Pegg. 2019. Fish community response to habitat variables in two restored side channels of the lower Platte River, Nebraska. *River Research and Applications* 35:178-187; DOI: <https://doi.org/10.1002/rra.3390>.
26. Steffensen, K.D., **M.J. Hamel**, and J.J. Spurgeon. 2019. Post-stocking pallid sturgeon *Scaphirhynchus albus* growth, dispersal, and survival in the lower Missouri River. *Journal of Applied Ichthyology* 35:117-127.
25. **Hamel, M.J.**, M. Porath, and L.L. Pierce. 2018. Young Professional Survey Results: Member and non-member perspective on decisions to join AFS. A survey of attitudes and perceptions regarding membership to the American Fisheries Society. *Fisheries*; DOI: <https://doi.org/10.1002/fsh.10066>
24. Goto, D., **M.J. Hamel**, J.J. Hammen, M.L. Rugg, M.A. Pegg, and V.L. Forbes. 2018. Spatially dynamic maternal control of migratory fish recruitment pulses triggered by shifting seasonal cues. *Marine and Freshwater Research* 69:942-961.
23. Spurgeon J.J., **M.J. Hamel**, K.D. Steffensen, and M.A. Pegg. 2018. Spatial structure of large-river fish population across main-stem and tributary habitats. *River Research and Applications* 34:807-815.

22. Steffensen, K.D., and **M.J. Hamel**. 2018. Fin ray removal may be deleterious on *Scaphirhynchus* species. North American Journal of Fisheries Management 38:439-445.

21. Hammen, J.J., **M.J. Hamel**, M.L. Rugg, and M.A. Pegg. 2018. Population characteristics of Shovelnose Sturgeon during low- and high-water conditions in the lower Platte River, Nebraska. North American Journal of Fisheries Management 38:308-315.

20. **Hamel, M.J.**, A.J. Blank, J.J. Spurgeon, and M.A. Pegg. 2017. Assessment of a channel catfish population in a large open river system. *Fisheries Management and Ecology* 24:460-468.
19. Hammen, J.J., **M.J. Hamel**, M.L. Rugg, and M.A. Pegg. 2017. Habitat associations of shovelnose sturgeon *Scaphirhynchus platyrhynchus* (Rafinesque, 1820) in the lower Platte River, Nebraska. *Journal of Applied Ichthyology* DOI: 10.1111/jai.13513.
18. Phelps, Q.E., S.J. Tripp, **M.J. Hamel**, J. Koch, E.J. Heist, J.E. Garvey, K.M. Kappenman, and M.A.H. Webb. 2016. Status of knowledge of the Shovelnose Sturgeon (*Scaphirhynchus platyrhynchus*, Rafinesque, 1820). *Journal of Applied Ichthyology* 32:249-260.
17. **Hamel, M.J.**, J.J. Spurgeon, C.J. Chizinski, K.D. Steffensen, M.A. Pegg. 2016. Variability in age estimation results in ambiguity and false understanding of population persistence. *North American Journal of Fisheries Management* 36:514-522.
16. **Hamel, M.J.**, J.J. Spurgeon, M.L. Pegg, J.J. Hammen, and M.L. Rugg. 2016. Hydrologic variability influences distribution and occurrence of pallid sturgeon in a Missouri River tributary. *River Research and Application* 32:320-329.
15. Spurgeon, J.J., **M.J. Hamel**, M.A. Pegg. 2016. Multi-scale approach to hydrological classification provides insight to flow structure in an altered river system. *River Research and Applications*. DOI: 10.1002/rra.3041
14. **Hamel, M.J.**, M.L. Rugg, J.J. Hammen, and M.A. Pegg. 2015. Reproductive traits of shovelnose sturgeon *Scaphirhynchus platyrhynchus* (Rafinesque, 1820) in the Lower Platte River, Nebraska. *Journal of Applied Ichthyology*.
13. Spurgeon, J.J., **M.J. Hamel**, M.A. Pegg, and K.L. Pope. 2015. The global status of freshwater fish age validation studies and a prioritization framework for further research. *Reviews in Fisheries Science and Aquaculture* 23:329-345.
12. Hogberg, N.P., **M.J. Hamel**, and M.A. Pegg. 2015. Age-0 channel catfish *Ictalurus punctatus* growth related to environmental conditions in the channelized Missouri River, Nebraska. *River Research and Applications*. DOI: 10.1002/rra.2890.
11. **Hamel, M.J.**, M.A. Pegg, R.R. Goforth, Q.E. Phelps, K.D. Steffensen, J.J. Hammen, and M.L. Rugg. 2014. Range-wide age and growth characteristics of shovelnose sturgeon from mark-recapture data: implications for conservation and management. *Canadian Journal of Fisheries and Aquatic Sciences* 72:71-82.
10. Goto, D., **M.J. Hamel**, J.J. Hammen, M.L. Rugg, M.A. Pegg, and V.E. Forbes. 2014. Spatiotemporal variation in flow-dependent recruitment of long-lived riverine fish: Model development and evaluation. *Ecological Modelling* 296:79-92.
9. Rugg, M.L., **M.J. Hamel**, M.A. Pegg, and J.J. Hammen. 2014. Validation of annuli formation in pectoral fin rays from shovelnose sturgeon in the lower Platte River, Nebraska. *North American Journal of Fisheries Management* 34:1028-1032.
8. **Hamel, M.J.**, M.A. Pegg, J.J. Hammen, and M.L. Rugg. 2014. Population characteristics of pallid sturgeon in the lower Platte River, Nebraska. *Journal of Applied Ichthyology* 30:1362-1370.

7. **Hamel, M.J.**, J.D. Koch, K.D. Steffensen, M.A. Pegg, J.J. Hammen, and M.L. Rugg. 2014. Using mark-recapture information to validate and assess age and growth of long-lived fish species. *Canadian Journal of Fisheries and Aquatic Sciences* 71:559-566.
6. **Hamel, M.J.**, K.D. Steffensen, J.J. Hammen, and M.A. Pegg. 2013. Evaluation of PIT Tag Retention from Two Tagging Locations in Juvenile Pallid Sturgeon. *Journal of Applied Ichthyology* 29:41-43.
5. **Hamel, M.J.**, J.J. Hammen, and M.A. Pegg. 2012. Tag Retention of T-Bar Anchor Tags and Passive Integrated Transponder Tags in Shovelnose Sturgeon. *North American Journal of Fisheries Management* 32:533-538.
4. **Hamel, M.J.**, N.L. Richards, M.L. Brown, and S.R. Chipps. 2010. Avoidance of Strobe Lights by Zooplankton. *Lake and Reservoir Management* 26:212-216.
3. **Hamel, M.J.**, K.D. Steffensen, P.T. Horner, and S.M. Stukel. 2009. A comparison of catch rate with two different benthic trawls in the Missouri River. *Journal of Freshwater Ecology* 24:625-634.
2. **Hamel, M.J.**, M.L. Brown, and S.R. Chipps. 2008. Behavioral Responses of Rainbow Smelt to *in situ* Strobe Lights. *North American Journal of Fisheries Management* 28:394-401.
1. Neely, B.C., **M.J. Hamel**, and K.D. Steffensen. 2008. A Proposed Standard Weight Equation for Blue Suckers. *North American Journal of Fisheries Management* 28:1450-1452.

## *PUBLICATIONS IN REVIEW*

1. Nolan, J.D., E. Waldrop, W.C. Post, M. Breece, M.J. Hamel, and A.G. Fox. In review. Differential behavior of juvenile Atlantic Sturgeon during the initial ontogenetic shift into marine migration. *Movement Ecology*

## *TEXTBOOK CHAPTERS*

**Hamel, M.J.**, J.D. Koch, Z. Jackson, and S. Ludsin. (In Preparation). Overview of Management Philosophies in M. Quist, D. Isermann, and M. Wuellner, editors. *Inland Fisheries Management in North America*, 4<sup>th</sup> edition. American Fisheries Society, Bethesda, Maryland.

Pracheil, B.M., P.J. Braaten, E.B. Macias, C.S. Guy, D.P. Herzog, **M.J. Hamel**, J.C. Justice, A.R. Loeppky, J.M. Mollish, J.W. Simmons, and S. Tripp. 2024. Warmwater fish in rivers in S. Bonar, N.M. Silva, and K. Pope, editors. *Standard methods for sampling North American freshwater fishes*, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.

Phelps, Q.E., **M.J. Hamel**, S.A. Tripp, Z. Jackson, and R. Koenigs. 2017. Choice of structure – selecting the appropriate aging structure *in* M.C. Quist and D.A. Isermann, editors. *Age and growth of fishes: principles and techniques*. American Fisheries Society, Bethesda, Maryland.

## THESIS AND DISSERTATION

**Hamel, M.J.** 2013. Determining *Scaphirhynchus* Sturgeon Population Demographics and Dynamics: Implications for Range-Wide Management, Recovery, and Conservation. Ph.D. Dissertation. University of Nebraska-Lincoln, Lincoln, Nebraska.

**Hamel, M.J.** 2006. Behavioral Responses of Rainbow Smelt to Sensory Deterrent Systems. M.S. Thesis. South Dakota State University, Brookings, South Dakota.

## POPULAR ARTICLES AND INTERVIEWS

Hamel, M.J. 2024. AFS Sections Roundup: Education Section. Interview on the AFS Beneath the Surface podcast.

Hamel, M.J. 2021. Interview with the Labor Street Park podcast:  
<https://www.youtube.com/watch?v=fLVAXNmTUuw>

Hamel, M.J. 2020. What role does connectivity play in altered aquatic systems? River Stressors podcast.

Hamel, M.J. 2018. Airboats: A vital tool for research when chasing dinosaurs. Airboating 12(70):8-12

## ORAL PRESENTATIONS

Authorship key: **Self** – bold

Graduate Student Supervised – underline

*Undergraduate Student Supervised* - italics

Wilson, R., A. Kaeser, S. Parker, **M.J. Hamel**, and A.G. Fox. 2025. Estimating over-winter survival of juvenile Gulf Sturgeon in the Apalachicola River, Florida. Southern Division of the American Fisheries Society, Asheville, NC.

Nolan, J.D., B. Post, E. Waldrop, M. Breece, A.G. Fox, and **M.J. Hamel**. 2025. Spatiotemporal characteristics of juvenile Atlantic Sturgeon migration during the initial ontogenetic shift into the marine migratory life stage. Southern Division of the American Fisheries Society, Asheville, NC.

Rider, H.J., A.T. Bond, and **M.J. Hamel**. 2025. Characterizing growth and maximum ages of native suckerfishes (Catostomidae) in Georgia, USA: Implications for bowfishing management needs. Southern Division of the American Fisheries Society, Asheville, NC.

Bonvechio, T.F., K.J. Dockendorf, K.I. Bonvechio, and **M.J. Hamel**. 2025. Proposed standard weight equation and standard length categories for Flier. Southern Division of the American Fisheries Society, Asheville, NC.

Bond, A.T., M.K. Morgan, J.D. Nolan, H.J. Rider, A.G. Fox, **M.J. Hamel**. 2025. A robust design model to assess survival of Atlantic Sturgeon in the Altamaha River. Southern Division of the American Fisheries Society, Asheville, NC.

Bond, A.T., M.K. Morgan, J.D. Nolan, H.J. Rider, A.G. Fox, **M.J. Hamel**. 2025. Survival of juvenile Atlantic Sturgeon using a Robust Design Model. Warnell Graduate Student Symposium, Augusta, GA.

Bond, A.T., M.K. Morgan, J.D. Nolan, H.J. Rider, A.G. Fox, **M.J. Hamel**. 2025. Survival of juvenile Atlantic Sturgeon using a Robust Design Model. Georgia Chapter of the American Fisheries Society, Augusta, GA.

Nolan, J.D., B. Post, E. Waldrop, M. Breece, A.G. Fox, and **M.J. Hamel**. 2025. Spatiotemporal characteristics of juvenile Atlantic Sturgeon migration during the initial ontogenetic shift into the marine migratory life stage. Georgia Chapter of the American Fisheries Society, Augusta, GA.

Rider, H.J., A.T. Bond, and M.J. Hamel. 2025. Characterizing growth and maximum ages of native suckerfishes (Catostomidae) in Georgia, USA: Implications for bowfishing management needs. Georgia Chapter of the American Fisheries Society, Augusta, GA.

Wilson, R., A. Kaeser, S. Parker, M.J. Hamel, and A.G. Fox. 2025. Estimating over-winter survival of juvenile Gulf Sturgeon in the Apalachicola River, Florida. Georgia Chapter of the American Fisheries Society, Augusta, GA.

Bonvechio, T.F., K.J. Dockendorf, K.I. Bonvechio, and M.J. Hamel. 2025. Proposed standard weight equation and standard length categories for Flier. Georgia Chapter of the American Fisheries Society, Augusta, GA.

**Hamel, M.J.,** V.D. Davis, M.A. Pegg, D. D.L. Buckmeier, and J.D. Koch. 2025. Enhancing the Science of Age Estimation: The Create of Fishage.org. Georgia Chapter of the American Fisheries Society, Augusta, GA.

Nolan, J.D., B. Post, E. Waldrop, M. Breece, A.G. Fox, and **M.J. Hamel.** 2025. Spatiotemporal characteristics of juvenile Atlantic Sturgeon migration during the initial ontogenetic shift into the marine migratory life stage. FACT Network annual meeting, Jensen Beach, FL.

Kaloczi, J., M. Moore, M.J. Hamel, G. Jones, R.N. Hupfeld, R.M. Krogman, and G.C. Brooks. 2025. A multi-method assessment of age and growth rates in Cedar River Shovelnose Sturgeon. Iowa Chapter of the American Fisheries Society

**Hamel, M.J.,** V.D. Davis, M.A. Pegg, D. D.L. Buckmeier, and J.D. Koch. 2024. Enhancing the Science of Age Estimation: The Create of Fishage.org. Southeastern Association of Fish and Wildlife Agencies annual conference. Augusta, GA.

Roop, H, J. Page, M. Rigglesford, W. Sims, P. Sakaris, **M.J. Hamel,** N. Whelan, and A. Williams. 2024. It takes a team: A five-year overview of the collaborative approach to management of northern snakehead in Georgia. Southeastern Association of Fish and Wildlife Agencies annual conference. Augusta, GA.

Rider, H., A. Bond, J. Nolan, A.G. Fox, and **M.J. Hamel.** 2024. Assessing Accuracy and Precision of Shortnose Sturgeon Aging Procedures with Fin Spines from Known-Age Fish. Southeastern Association of Fish and Wildlife Agencies annual conference. Augusta, GA.

Phillips, M., S. Perry, B. Irwin, and **M.J. Hamel.** 2024. Abundance and evidence of natural recruitment of reintroduced Lake Sturgeon in the Coosa River, Georgia-Alabama. Southeastern Association of Fish and Wildlife Agencies annual conference. Augusta, GA.

Nolan, J.D., B. Post, F. Scharf, E. Waldrop, A.G. Fox, and **M.J. Hamel.** 2024. Shortnose Sturgeon straying from home: partial migration revealed through a telemetry network. North American Sturgeon and Paddlefish Society annual meeting, Mobile, AL.

**Hamel, M.J.,** B. Pracheil, P. Braaten, E. Barba Macias, C. Guy, D. Herzog, J. Justice, A. Loepky, J. Michael Mollish, J. Simmons, and S. Tripp. 2024. Warmwater Fish in Rivers. American Fisheries Society annual meeting, Honolulu, HI.

Davis, V., **M.J. Hamel,** M.A. Pegg, D.L. Buckmeier, and J.D. Koch. 2024. Enhancing the Science of Age Estimation: The Create of Fishage.org. American Fisheries Society annual meeting, Honolulu, HI.

Bond, A.T., K. Morgan, H. Rider, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. Using fin spine microchemistry to infer life history characteristics in Southern Atlantic Sturgeon. American Fisheries Society annual meeting, Honolulu, HI.

Rider, H.J., K. Morgan, A.T. Bond, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. Mark-recapture reveals age and growth characteristics of Shortnose Sturgeon in Georgia, USA. American Fisheries Society annual meeting, Honolulu, HI.

Rider, H.J., K. Morgan, A.T. Bond, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. Assessing accuracy and precision of Shortnose Sturgeon aging procedures with fin spines. American Fisheries Society annual meeting, Honolulu, HI.

Nolan, J.D., B. Post, F. Scharf, E. Waldrop, A.G. Fox, and M.J. Hamel. 2024. Shortnose Sturgeon straying from home: partial migration revealed through a telemetry network. American Fisheries Society annual meeting, Honolulu, HI.

Yeager, J., T. Bonvechio, and **M.J. Hamel.** 2024. Movement dynamics and habitat selection of Suwannee Bass (*Micropterus notius*) in Georgia. Mississippi Chapter of the American Fisheries Society, Tupelo, MS.

Dockendorf, K., T. Bonvechio, and **M.J. Hamel.** 2024. Data wanted for Flier – elusive acrobats with lightning quick bites. North Carolina Chapter of the American Fisheries Society, Sylva, NC.

**Hamel, M.J.** 2024. Fish microchemistry applications. Georgia Department of Natural Resources annual fisheries management meeting.

Bond, A.T., H. Rider, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. A statistical model to assess juvenile Atlantic Sturgeon age based on length and Julian day. Warnell Graduate Student Symposium. Athens, GA.

Nolan, J.D., A.T. Bond, H. Rider, A.G. Fox, and M.J. Hamel. 2024. Coastal migratory behavior of juvenile Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) from the South Atlantic Distinct Population Segment. Warnell Graduate Student Symposium. Athens, GA.

Rider, H., A. Bond, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. Validating Shortnose Sturgeon age estimates from known age fish. Warnell Graduate Student Symposium. Athens, GA.

Phillips, M., S. Perry, B. Irwin, and M.J. Hamel. 2024. Age and growth characteristics of reintroduced Lake Sturgeon in the Coosa River, Georgia-Alabama. Warnell Graduate Student Symposium. Athens, GA.

Phillips, M., S. Perry, B. Irwin, and M.J. Hamel. 2024. Abundance and evidence of natural recruitment of reintroduced Lake Sturgeon in the Coosa River, Georgia-Alabama. Warnell Graduate Student Symposium. Athens, GA.

Simon, T., and **M.J. Hamel.** 2024. Can otolith microchemistry inform sportfish stocking program? Georgia Chapter of the American Fisheries Society, LeGrange, GA.

Nolan, J.D., A.T. Bond, H. Rider, A.G. Fox, and M.J. Hamel. 2024. Coastal migratory behavior of juvenile Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) from the South Atlantic Distinct Population Segment. Georgia Chapter of the American Fisheries Society, LeGrange, GA.

Bond, A.T., H. Rider, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. A statistical model to assess juvenile Atlantic Sturgeon age based on length and Julian day. Georgia Chapter of the American Fisheries Society, LeGrange, GA.

Rider, H., A. Bond, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. Validating Shortnose Sturgeon age estimates from known age fish. Georgia Chapter of the American Fisheries Society, LeGrange, GA.

Schumber, Z., M. Baker, B. Irwin, **M.J. Hamel**, and P. Hazelton. 2024. Habitat and landscape characteristics affecting *Corbicula* presence in the upper Savannah River drainage. Georgia Chapter of the American Fisheries Society, LeGrange, GA.

*Browning, E., W. Gerrin, J. Shelton, B. Shamblin, M.J. Hamel, P. Hazelton, S. McNair, A. Musolf, B. Ammen, and R. Bryne.* Aquatic nuisance species in Georgia: current status of weather loach research by UGA Warnell School of Forestry and Natural Resources. Georgia Chapter of the American Fisheries Society, LeGrange, GA.

Perry, S., M. Phillips, B. Irwin, and M.J. Hamel. 2024. Movement and habitat use of Lake Sturgeon in the Coosa River System in Georgia. Georgia Chapter of the American Fisheries Society, LeGrange, GA.

Phillips, M., S. Perry, B. Irwin, and M.J. Hamel. 2024. Abundance and evidence of natural recruitment of reintroduced Lake Sturgeon in the Coosa River, Georgia-Alabama. Georgia Chapter of the American Fisheries Society, LeGrange, GA.

Phillips, M., S. Perry, B. Irwin, and M.J. Hamel. 2024. Growth and abundance of reintroduced Lake Sturgeon in the Coosa River, Georgia – Alabama. Southern Division of the American Fisheries Society, Chattanooga, TN.

Nolan, J.D., A.T. Bond, H. Rider, A.G. Fox, and M.J. Hamel. 2024. Coastal migratory behavior of juvenile Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) from the South Atlantic Distinct Population Segment. Southern Division of the American Fisheries Society, Chattanooga, TN.

Rider, H., A. Bond, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. Validating Shortnose Sturgeon age estimates from known age fish. Southern Division of the American Fisheries Society, Chattanooga, TN.

Faherty, T., J. Shelton, P. Hazelton, **M.J. Hamel**, W. Gerrin, S. McNair, K. Evans, and B. Shamblin. 2024. Mitochondrial and nuclear genetic markers suggest at least three introductions of Weather Loach (*Misgurnus anguillicaudatus*) introductions in Georgia. Southern Division of the American Fisheries Society, Chattanooga, TN.

Bond, A.T., H. Rider, J. Nolan, A.G. Fox, and M.J. Hamel. 2024. A statistical model to assess juvenile Atlantic Sturgeon age based on length and Julian day. Southern Division of the American Fisheries Society, Chattanooga, TN.

**Hamel, M.J.,** J.D. Koch; M.A. Pegg, and D. Buckmeier. 2023. A proposed publicly available known-age fish structure repository. 7th International Otolith Symposium, Vina Del Mar, Chile – South America.

Phillips, M., S. Perry, B. Irwin, and M.J. Hamel. 2023. Growth and longevity of Lake Sturgeon in the Coosa River in Georgia. American Fisheries Society annual meeting, Grand Rapids, MI.

Perry, S., M. Phillips, B. Irwin, and M.J. Hamel. 2023. Movement and habitat use of Lake Sturgeon in the Coosa River system in Georgia. American Fisheries Society annual meeting, Grand Rapids, MI.

Davis, V., R. Bringolf, P. Sakaris, T. Bonvechio, and M.J. Hamel. 2023. Diet composition of introduced blue catfish populations in four major rivers in Georgia. American Fisheries Society annual meeting, Grand Rapids, MI.

Gerrin, W., *B. Amman*, P. Hazelton, J. Shelton, B. Shamblin, and **M. Hamel**. 2023. CSI Warnell: Investigating the source, dispersal, and recruitment of the Weather Loach using otolith microchemistry. Georgia Water Resources Conference, Athens, GA.

Gerrin, W., J. Shelton, **M. Hamel**, P. Hazelton, B. Shamblin, and S. McNair. 2023. Georgia Weather Loach Update: Tools for Rapid Response to ANS Issues. Gulf and South Atlantic Regional Panel on Aquatic Nuisance Species. Jekyll Island, GA.

McNair, S., W. Gerrin, J. Shelton, B. Shamblin, **M.J. Hamel**, and P. Hazelton. 2023. Approach of the loach: Using genetics to better understand a newly invasive species, the Weather Loach (*Misgurnus anguillicaudatus*), in Georgia. Georgia Water Resources Conference, Athens, GA.

Byrne, R., W. Gerrin, J. Shelton, B. Shamblin, **M.J. Hamel**, P. Hazelton, S. McNair. 2023. Aquatic nuisance species in Georgia: current status of the Weather Loach. Georgia Water Resources Conference, Athens, Ga.

**Hamel, M.J.** and W. Gerrin. 2023. Trace element concentrations in Georgia waters: applications for future fish microchemistry studies. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

Davis, V., T. Bonvechio, R. Bringolf, P. Sakaris, and M. Hamel. 2023. Diet composition of introduced blue catfish populations in four major rivers of Georgia. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

Phillips, M., B. Irwin, and **M. Hamel**. 2023. Growth and longevity of Lake Sturgeon in the Coosa River system in Georgia. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

*Amman, B.*, W. Gerrin, P. Hazelton, J. Shelton, B. Shamblin, and M. Hamel. 2023. CSI Warnell: Investigating the source, dispersal, and recruitment of the Weather Loach using otolith microchemistry. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

Perry, S., B. Irwin, and **M. Hamel**. 2023. Movement and habitat use of Lake Sturgeon in the Coosa River system in Georgia. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

McNair, S., W. Gerrin, J. Shelton, B. Shamblin, M. Hamel, and P. Hazelton. 2023. Approach of the loach: Using genetics to better understand a newly invasive species, the Weather Loach (*Misgurnus anguillicaudatus*), in Georgia. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

D'Ercole M., **M. Hamel**, P. Hazelton, A. Kaeser, and A. Fox. 2023. Flow regime and recruitment in Gulf Sturgeon in the Apalachicola River. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

Carroll-Everett, L., N. Nibbelink, C. Cox, **M. Hamel**, R. Guy, and J. Flowers. 2023. Interpreting partial information provided by fishery-independent surveys towards a holistic understanding of estuarine fishes. Georgia Chapter of the American Fisheries Society, St. Simons, GA.

Phillips, M., and **M. Hamel**. 2022. Coosa River Lake Sturgeon Reintroduction. Invited speaker for the Oconee River Chapter of Trout Unlimited, Athens, GA.

Phillips, M., S. Perry, and **M. Hamel**. 2022. Population dynamics of reintroduced Lake Sturgeon (*Acipenser fulvescens*) in the Coosa River, GA-AL. Lake Sturgeon Working Group annual meeting – virtual.

Perry, S., M. Phillips, and **M. Hamel**. 2022. Lake Sturgeon movement and habitat use in the Coosa River system. Lake Sturgeon Working Group annual meeting – virtual.

Gerrin, W., J. Shelton, B. Shamblin, **M. Hamel**, and P. Hazelton. 2022. Dirty loaches: an update on the Georgia Oriental Weatherfish (*Misgurnus anguillicaudatus*) invasion. Georgia Chapter of the American Fisheries Society, Jekyll Island, GA.

D'Ercole, M., A. Fox, **M. Hamel**, and A. Kaeser. 2022. Flow regime and recruitment in Gulf Sturgeon in the Apalachicola River, FL. Georgia Chapter of the American Fisheries Society, Jekyll Island, GA.

**Hamel, M.J.**, H.J. Roop, P.C. Sakaris, A.S. Williams, and J. Page. 2022. Where have all the snakehead gone? Two years of monitoring of a wild population of Northern Snakehead *Channa argus* in Gwinnett County, Georgia. Georgia Chapter of the American Fisheries Society, Jekyll Island, GA.

Werner, J.P., Q.D. Dean, **M.J. Hamel**, and M.A. Pegg. 2022. Patterns in special use and movement of Silver Carp among tributaries and main-stem rivers: Insight from otolith microchemistry analysis. Nebraska Chapter of the American Fisheries Society, Grand Island, NE.

Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2022. Suwannee bass movement, life-history, and angler exploitation in Georgia. Georgia Chapter of the American Fisheries Society, Jekyll Island, GA.

Glomb, J.C., R.C., Lowe, J.L. Shelton, and **M.J. Hamel**. 2022. Novel methods for assessing hydrilla spread in Lake Sinclair, Georgia. Georgia Chapter of the American Fisheries Society, Jekyll Island, GA.

**Hamel, M.J.**, J. Koch, D. Buckmeier, and M.A. Pegg. 2022. A proposed publicly available known-age fish structure repository. Georgia Chapter of the American Fisheries Society annual meeting, Jekyll Island, GA.

Buckmeier, D., **M.J. Hamel**, J. Koch, and M.A. Pegg. 2022. A proposed publicly available known-age fish structure repository. Southern Division of the American Fisheries Society annual meeting, Charlestown, SC.

Koch, J., **M.J. Hamel**, D. Buckmeier, and M.A. Pegg. 2021. A proposed publicly available known-age fish structure repository. American Fisheries Society annual meeting, Baltimore, MD.

Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2021. Movement dynamics and habitat use of Suwannee Bass in Georgia. Georgia DNR Research Meeting - virtual.

Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2021. Movement dynamics and habitat use of Suwannee Bass in Georgia. American Fisheries Society annual meeting, Baltimore, MD.

Glomb, J.C., R.C., Lowe, and **M.J. Hamel**. 2021. Assessing hydrilla and its impacts on sportfish communities. American Fisheries Society annual meeting, Baltimore, MD.

Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2021. Suwannee Bass movement and life-history in the Withlacoochee River, Georgia. Southern Division of the American Fisheries Society – Virtual Conference

\*Invited symposium speaker.

Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2021. Suwannee Bass movement and life-history in the Withlacoochee River, Georgia. Florida Chapter of the American Fisheries Society – Virtual Conference.

Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2021. Movement dynamics of Suwannee Bass in the Withlacoochee River, Georgia. Georgia Chapter of the American Fisheries Society – Virtual Conference.

Glomb, J., R. Lowe III, J. Shelton, and **M.J. Hamel**. 2021. Assessing hydrilla spread and subsequent impacts on sportfish communities in Lake Sinclair, Georgia. Florida Chapter of the American Fisheries Society – Virtual Conference.

Glomb, J., R. Lowe III, J. Shelton, and **M.J. Hamel**. 2021. Assessing hydrilla spread and subsequent impacts on sportfish communities in Lake Sinclair, Georgia. Southern Division of the American Fisheries Society – Virtual Conference.

Glomb, J., R. Lowe III, J. Shelton, and **M.J. Hamel**. 2021. Into the weeds: Assessing hydrilla occurrence using novel methods in Lake Sinclair, Georgia. Georgia Chapter of the American Fisheries Society – Virtual Conference.

Dean, Q.D., J.P. Werner, M.A. Pegg, and **M.J. Hamel**. 2021. Efficacy and temporal capture patterns of bank poles in the Kansas River: a novel sampling tool for catfish managers. Texas Chapter of the American Fisheries Society 2021 Virtual Annual Meeting.

**Hamel, M.J.**, Q.D. Dean, and J.P. Werner. 2020. Connectivity across altered riverscapes: understanding how scale influences fish populations. American Fisheries Society national meeting – virtual.

**Hamel, M.J.** 2020. Connectivity: Bridging the gap between research, management, and people. Invited speaker for the Oconee River Chapter of Trout Unlimited, Athens, GA.

Werner, J.P., Q.D. Dean, **M.J. Hamel**, and M.A. Pegg. 2020. Variability in silver carp population demographics in the Kansas River, Kansas. Wyoming/Colorado Chapter of the American Fisheries Society, Laramie, WY.

Werner, J.P., Q.D. Dean, **M.J. Hamel**, and M.A. Pegg. 2020. Variability in silver carp population demographics in the Kansas River, Kansas. Kansas Natural Resources Conference, American Fisheries Society, Manhattan, KS.

Werner, J.P., Q.D. Dean, **M.J. Hamel**, and M.A. Pegg. 2020. Variability in silver carp population demographics in the Kansas River, Kansas. Nebraska Chapter of the American Fisheries Society, Lincoln, NE.

Dean, Q.D., J.P. Werner, **M.J. Hamel**, and M.A. Pegg. 2020. Population Characteristics and Movement Patterns of Blue Catfish in the Kansas River, Kansas. Nebraska Chapter of the American Fisheries Society, Lincoln, NE.

**Hamel, M.J.**, J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2020. Plasticity in life-history traits: adaptations of pallid sturgeon to human perturbations. Southern Division of the American Fisheries Society, Little Rock, AK.

**Hamel, M.J.**, and M.A. Pegg. 2020. Large-river catfish fisheries: insight into catfish community dynamics across varying spatial and temporal patterns. Catfish 2020: The Third International Catfish Symposium, Little Rock, AK.

Dean, Q.D., J.P. Werner, **M.J. Hamel**, and M.A. Pegg. 2020. Population Characteristics and Movement Patterns of Blue Catfish in the Kansas River, Kansas. Catfish 2020: The Third International Catfish Symposium, Little Rock, AK.

Dean, Q.D., **M.J. Hamel**, and M.A. Pegg. 2020. Temporal patterns of capture, retention rates and efficacy of bank poles in the Kansas River. Catfish 2020: The Third International Catfish Symposium, Little Rock, AK.

**Hamel, M.J.**, J.P. Werner, Q.D. Dean, and M. A. Pegg. 2020. The influence of connectivity on native and invasive fish populations in the Kansas River. Georgia Chapter of the American Fisheries Society, Augusta, GA.

Werner, J.P., Q.D. Dean, **M.J. Hamel**, and M.A. Pegg. 2019. Variability in silver carp population demographics in the Kansas River. American Fisheries Society national meeting, Reno, NV.

Dean, Q.D., J.P. Werner, **M.J. Hamel**, and M.A. Pegg. 2019. Population Characteristics and Movement Patterns of Blue Catfish in the Kansas River, Kansas. American Fisheries Society national meeting, Reno, NV.

Werner, J.P., Q.D. Dean, **M.J. Hamel**, and M.A. Pegg. 2019. Status of invasive carps in the Kansas River. Nebraska Rivers and Streams Technical Committee meeting. Wood River, NE.

Dean, Q.D., J.P. Werner, **M.J. Hamel**, and M.A. Pegg. 2019. Blue catfish management in the Kansas River. Nebraska Rivers and Streams Technical Committee meeting. Wood River, NE.

**Hamel, M.J.**, J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2018. Linking differential life-history traits of pallid sturgeon throughout the Missouri River basin. International Conference on the Biology of Fishes, Calgary, Alberta.

**Hamel, M.J.**, J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2018. Linking differential life-history traits of pallid sturgeon throughout the Missouri River basin. American Fisheries Society national meeting, Atlantic City, NJ.

**Hamel, M.J.**, J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2018. Diverging life history characteristics of pallid sturgeon throughout the Missouri River basin. Midwest Fish and Wildlife Conference, Lincoln, NE.

Uerling, C.C., **M.J. Hamel**, M.A. Pegg. 2017. Fish community response to restored side channels on the Lower Platte River, Nebraska. Midwest Fish and Wildlife Conference, Lincoln, NE.

Spurgeon, J.J., **M.J. Hamel**, and M.A. Pegg. 2017. Origin and movement patterns of channel catfish using otolith microchemistry. Midwest Fish and Wildlife Conference, Lincoln, NE.

**Hamel, M.J.**, J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2017. Examination of life history characteristics of pallid sturgeon throughout the Missouri River basin. Midwest Fish and Wildlife Conference, Lincoln, NE.

**Hamel, M.J.** 2016. University of Nebraska-Lincoln Research. 2017. What we have learned and where we are going. Nebraska Rivers and Streams Technical Committee meeting. Gretna, NE.

**Hamel, M.J.**, J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2016. Examination of life history characteristics of pallid sturgeon throughout the Missouri River basin. American Fisheries Society annual meeting – Invited symposium speaker. Kansas City, MO.

Uerling, C.C., **M.J. Hamel**, and M.A. Pegg. 2016. Monitoring a Restored Side Channel on the Lower Platte River, NE. American Fisheries Society annual meeting, Kansas City, MO.

**Hamel, M.J.**, and J.D. Koch. 2016. Age and Growth Workshop for the NE/KS AFS joint chapter meeting. Manhattan, KS.

Uerling, C.C., **M.J. Hamel**, and M.A. Pegg. 2016. Monitoring a Reconnected side channel on the Lower Platte River Nebraska. Nebraska and Kansas Joint Chapter Meeting of the American Fisheries Society, Manhattan, KS.

Turner, D., M. Pegg, and **M.J. Hamel**. 2016. Diet analysis of flathead catfish in the Red River of the North. Nebraska and Kansas Joint Chapter Meeting of the American Fisheries Society, Manhattan, KS.

Uerling, C.C., **M.J. Hamel**, and M.A. Pegg. 2016. Monitoring fish and macroinvertebrate response to a restored side channel on the Platte River. Midwest Fish and Wildlife Conference, Grand Rapids, MI.

**Hamel, M.J.**, J.J. Spurgeon, C. Chizinski, and M.A. Pegg. 2015. Ignorance is bliss: poor aging precision from an un-validated fish aging structure has deleterious effects on understanding population dynamics. Nebraska Chapter Meeting of the American Fisheries Society, Nebraska City, NE.

**Hamel, M.J.**, J.J. Spurgeon, C.J. Chizinski, K.D. Steffensen, and M.A. Pegg. 2015. Ignorance is bliss: Poor aging precision from an un-validated fish aging structure has deleterious effects on understanding population dynamics. Missouri River Natural Resources Conference, Nebraska City, NE.

Uerling, C.C., K. Turek, M.A. Pegg, and **M.J. Hamel**. 2015. A Biological assessment of the Shell Creek watershed. Nebraska Chapter Meeting of the American Fisheries Society, Nebraska City, NE

Spurgeon, J.J., **M.J. Hamel**, and M.A. Pegg. 2015. Inter-annual variability in climate and anthropogenic stressors drive hydrological character of the Platte River, NE. Nebraska Chapter Meeting of the American Fisheries Society, Nebraska City, NE.

**Hamel, M.J.**, M.A. Pegg, R.R. Goforth, Q.E. Phelps, K.D. Steffensen, J.J. Hammen, and M.L. Rugg. 2014. Range-Wide Age and Growth Characteristics of Shovelnose Sturgeon from Mark-Recapture Data: Implications for Conservation and Management. Midwest Fish and Wildlife Conference, Kansas City, MO.

**Hamel, M.J.**, M.A. Pegg, R.R. Goforth, Q.E. Phelps, K.D. Steffensen, J.J. Hammen, and M.L. Rugg. 2014. Using Mark-Recapture to Determine Population Dynamics of *Scaphirhynchus* Sturgeon: Implications for Pallid Sturgeon Recovery. Missouri River Natural Resources Conference, Nebraska City, NE.

Hogberg, N.P., **M.J. Hamel**, and M.A. Pegg. 2014. Channel catfish first-year growth in relation to environmental conditions in the Missouri River, Nebraska. Joint Meeting of the Nebraska and Iowa Chapters of the American Fisheries Society. Council Bluffs, IA.

Hogberg, N.P., **M.J. Hamel**, and M.A. Pegg. 2014. Long Term Trends in Age-0 Channel Catfish Growth in the Channelized Missouri River, Nebraska. 74<sup>th</sup> Annual Midwest Fish and Wildlife Conference. Kansas City, MO.

**Hamel, M.J.**, J.J. Hammen, M.L. Rugg, and M.A. Pegg. 2013. Hydrologic Variability Influences Distribution and Occurrence of Pallid Sturgeon in the Lower Platte River. The Missouri River Natural Resources Conference, Jefferson City, MO.

Rugg, M., **M.J. Hamel**, J.J. Hammen, and M.A. Pegg. 2013. Reproductive potential of shovelnose sturgeon in the Lower Platte River, Nebraska. The Missouri River Natural Resources Conference, Jefferson City, MO.

Rugg, M., **M.J. Hamel**, J.J. Hammen, and M.A. Pegg. 2013. Reproductive potential of shovelnose sturgeon in the Lower Platte River, Nebraska. NE Chapter of the American Fisheries Society, Gretna, NE.

**Hamel, M.J.**, J.J. Hammen, M.L. Rugg, and M.A. Pegg. 2013. Hydrologic Variability Influences Distribution and Occurrence of Pallid Sturgeon in the Lower Platte River. NE Chapter of the American Fisheries Society, Gretna, NE.

**Hamel, M.J.**, J.J. Hammen, and M.A. Pegg. 2012. Sturgeon growth characteristics: The good, the bad, and the ugly. NE Chapter of the American Fisheries Society, Gretna, NE.

Hammen, J.J., **M.J. Hamel**, and M.A. Pegg. 2012. Geomorphology and instream habitat associations of shovelnose sturgeon in the lower Platte River, NE. NE Chapter of the American Fisheries Society, Gretna, NE.

**Hamel, M.J.**, J.J. Hammen, and M.A. Pegg. 2012. Sensitivity of using fin rays for shovelnose sturgeon age, growth, and dynamic rate functions. American Fisheries Society national meeting, St. Paul, MN.

**Hamel, M.J.**, K.D. Steffensen, J.J. Hammen, and M.A. Pegg. 2012. Evaluation of two tagging locations for injection of PIT tags in pallid sturgeon. Missouri River Natural Resources Conference, Pierre, SD.

Goto, D., **M.J. Hamel**, J.L. Hammen, M.L. Rugg, M.A. Pegg, and V. Forbes. Spatially Explicit Hydrological Influences on Individual Variation in Shovelnose Sturgeon Reproduction and Recruitment in a Regulated River. American Fisheries Society national meeting, St. Paul, MN.

**Hamel, M.J.**, M.A. Pegg, and J.J. Hammen. 2011. Tag retention of T-bar anchor tags and PIT tags in shovelnose sturgeon. American Fisheries Society national meeting, Seattle, WA.

Hammen, J.L., **M.J. Hamel**, and M.A. Pegg. 2011. Seasonal distributions, characteristics, and population dynamics of shovelnose sturgeon in the Lower Platte River, NE. American Fisheries Society national meeting, Seattle, WA.

**Hamel, M.J.**, M.A. Pegg, and J.J. Hammen. 2011. Tag retention of T-bar anchor tags and PIT tags in shovelnose sturgeon. Missouri River Natural Resources Committee meeting, Nebraska City, NE.

**Hamel, M.J.**, M.A. Pegg, and J.J. Hammen. 2011. Tag retention of T-bar anchor tags and PIT tags in shovelnose sturgeon. NE chapter of the American Fisheries Society, Gretna, NE.

Hammen, J.J., **M.J. Hamel**, and M.A. Pegg. 2011. Shovelnose sturgeon movements within the lower Platte River, NE. NE chapter of the American Fisheries Society, Gretna, NE.

**Hamel, M.J.**, M.A. Pegg, J.J. Hammen, and T.L. Anderson. 2010. Population characteristics of pallid sturgeon in the lower Platte River, Nebraska. NE chapter of the American Fisheries Society, Ponca, NE.

Hammen, J.L., **M.J. Hamel**, T.L. Anderson, and M.A. Pegg. 2010. Population dynamics of shovelnose sturgeon in the Lower Platte River, Nebraska. NE chapter of the American Fisheries Society, Ponca, NE.

Anderson, T.L., **M.J. Hamel**, and M.A. Pegg. 2010. Age and growth of shovelnose sturgeon in the lower Platte River, Nebraska. NE chapter of the American Fisheries Society, Ponca, NE.

**Hamel, M.J.**, M.A. Pegg, J.J. Hammen, and T.L. Anderson. 2010. Population characteristics of pallid sturgeon in the lower Platte River, Nebraska. Missouri River Natural Resources Committee meeting, Nebraska City, NE.

Hammen, J.J., **M.J. Hamel**, and M.A. Pegg. Shovelnose sturgeon movements within the lower Platte River, NE. Midwest Fish and Wildlife Conference, Minneapolis, Minnesota.

Anderson, T.L., **M.J. Hamel**, J.J. Hammen, and M.A. Pegg. 2010. Shovelnose sturgeon, *Scaphirhynchus platyrhynchus* in the Lower Platte River. Thesis Defense.

Hammen, J.J., **M.J. Hamel**, T.L. Anderson, and M.A. Pegg. 2010. Shovelnose sturgeon population dynamics and seasonal population characteristics in the Lower Platte River. Missouri River Natural Resources Conference, Nebraska City, Nebraska.

**Hamel, M.J.**, M.A. Pegg, J.J. Hammen, and T.L. Anderson. 2010. Sturgeon management in the lower Platte River, Nebraska. Platte River Symposium – University of Nebraska-Lincoln, Lincoln, NE.

**Hamel, M.J.**, M.A. Pegg, J.J. Hammen, and T.L. Anderson. 2009. Population characteristics of pallid sturgeon in the lower Platte River. Platte River Symposium – University of Nebraska-Lincoln, Lincoln, NE.

**Hamel, M.J.**, M.A. Pegg, J.J. Hammen, and T.L. Anderson. 2009. Population characteristics of pallid sturgeon in the lower Platte River, Nebraska. Midwest Fish and Wildlife Conference, Springfield, IL.

Hammen, J.L. **M.J. Hamel**, T.L. Anderson, and M.A. Pegg. 2009. Shovelnose sturgeon population dynamics and seasonal population characteristics in the Lower Platte River, Nebraska. Midwest Fish and Wildlife Conference, Springfield, IL.

**Hamel, M.J.**, and K.D. Steffensen. 2008. Age and growth of shovelnose sturgeon in the Missouri River. American Fisheries Society national meeting, Ottawa, Ontario.

**Hamel, M.J.**, and K.D. Steffensen. 2008. Influence of mesh size and trawling techniques on catch of benthic fish species of the Missouri River. NE chapter of the American Fisheries Society, Gretna, NE.

**Hamel, M.J.**, K.D. Steffensen, P. Horner, and S. Stukel. 2008. Influence of mesh size and trawling techniques on catch of benthic fish species of the Missouri River. Missouri River Natural Resources Conference (MRNRC) & BiOp Forum, Nebraska City, NE.

**Hamel, M.J.**, and K.D. Steffensen. 2007. Influence of mesh size and trawling techniques on catch of benthic fish species of the Missouri River. Midwest Fish and Wildlife Conference, Madison, WI.

**Hamel, M.J.**, M.L. Brown, and S.R. Chipps. 2007. Use of hydroacoustics to assess free-ranging rainbow smelt responses to sensory deterrents. Midwest Fish and Wildlife Conference, Madison, WI – Invited symposium speaker.

**Hamel, M.J.**, D.W. Everitt, and J.D. Haas. 2007. Intensive and extensive tracking of pallid and shovelnose sturgeon movements in the middle Missouri River. MRNRC & BiOp Forum, Nebraska City, NE.

**Hamel, M.J.**, D.W. Everitt, and J.D. Haas. 2007. Intensive and extensive tracking of pallid and shovelnose sturgeon movements in the middle Missouri River. AFS Tri-State (Nebraska, Kansas, and Iowa) Chapter Annual Meeting, Council Bluffs, IA.

**Hamel, M.J.**, M.L. Brown, and S.R. Chipps. 2006. Behavioral Responses of Rainbow Smelt to Sensory Deterrence Systems. Midwest Fish and Wildlife Conference, Omaha, NE.

**Hamel, M.J.**, N.S. Richards, M.L. Brown, and S.R. Chipps. 2006. Rainbow Smelt Responses to Sensory Deterrence Systems. AFS Dakota Chapter Annual Meeting, Chamberlain, SD.

**Hamel, M.J.**, and N.S. Richards. 2005. Influence of Underwater Sound and Strobe Lights on Deterrence Behavior of Rainbow Smelt in Lake Oahe, South Dakota. SDGFP Annual Winter Fisheries Meeting. Yankton, SD.

## INVITED PRESENTATIONS/SEMINARS

**Hamel, M.J.** 2024. Fish microchemistry applications. Georgia Department of Natural Resources annual fisheries management meeting.

**Hamel, M.J.**, B. Pracheil, P. Braaten, E. Barba Macias, C. Guy, D. Herzog, J. Justice, A. Loeppky, J. Michael Mollish, J. Simmons, and S. Tripp. 2024. Warmwater Fish in Rivers. American Fisheries Society annual meeting, Honolulu, HI.

Yeager, J.W., T.F. Bonvechio, and **M.J. Hamel**. 2021. Suwannee Bass movement and life-history in the Withlacoochee River, Georgia. Southern Division of the American Fisheries Society – Virtual Conference

\*Invited symposium speaker.

**Hamel, M.J.**, Q.D. Dean, and J.P. Werner. 2020. Connectivity across altered riverscapes: understanding how scale influences fish populations. Invited speaker to the American Fisheries Society annual virtual

conference to be presented in the symposium entitled, “Confronting present and emerging stressors in rivers for global fisheries conservation.”

**Hamel, M.J.** 2020. Connectivity: Bridging the gap between research, management, and people. Invited speaker for the Oconee River Chapter of Trout Unlimited, Athens, GA

**Hamel, M.J.** 2019. Plasticity in life history traits in a long-lived sturgeon. Invited presentation to the American Fisheries Society student sub-unit of the University of Georgia. Athens, GA, October 2019.

**Hamel, M.J.** 2018. Connectivity – Bridging the gap between research, management, and people. Invited seminar presented to the University of Wisconsin-LaCrosse. LaCrosse, WI, November 2018

**Hamel, M.J.** 2018. How do we assess fishes in rivers and streams? Invited seminar presented to the University of Nebraska-Kearney, November 2018.

**Hamel, M.J.** 2018. Connectivity – Bridging the gap between research, management, and people. Invited seminar presented to the University of Illinois Champaign-Urbana, Champaign, IL, October 2018

**Hamel, M.J.,** J.J. Spurgeon, M.A. Pegg, and K.D. Steffensen. 2018. Linking differential life-history traits of pallid sturgeon throughout the Missouri River basin. Invited presentation to the International Conference on the Biology of Fishes, Calgary, Alberta 2018

**Hamel, M.J.,** M.A. Pegg, J.J. Hammen, and T.L. Anderson. 2010. Population characteristics of pallid sturgeon in the lower Platte River, Nebraska. Invited presentation to the Nebraska Game and Parks Commission, Lincoln, NE, January 2010

**Hamel, M.J.,** M.A. Pegg, J.J. Hammen, and T.L. Anderson. 2009. Population characteristics of pallid sturgeon in the lower Platte River, Nebraska. Invited presentation to the Nebraska Game and Parks Commission, Lincoln, NE, January 2009

**Hamel, M.J.,** M.L. Brown, and S.R. Chipps. 2006. Behavioral Responses of Rainbow Smelt to Sensory Deterrence Systems. Invited presentation to the Midwest Fish and Wildlife Conference, Omaha, NE.

## *WORKSHOPS/CONFERENCE SYMPOSIA*

2024 Co-organizer of “Views on Undergraduate Curricula in Fisheries” symposium for the American Fisheries Society annual meeting in Honolulu, HI.

2024 Fish Aging. Workshop prepared for the American Fisheries Society’s Hutton Program at Charlie Elliot Wildlife Management Area.

2024 Co-organizer of “Atlantic Sturgeon Recovery” workshop for the Southern Division of the American Fisheries Society annual meeting in Chattanooga, TN.

2024 Co-organizer of “Atlantic and Gulf Sturgeon Aging” workshop for the Southern Division of the American Fisheries Society annual meeting in Chattanooga, TN.

2024 Co-organizer of “Atlantic and Gulf Sturgeon Status, Conservation, and Management” symposium for the Southern Division of the American Fisheries Society annual meeting in Chattanooga, TN.

2022 Co-organizer of “Experiences with and Views of Online Learning in the Aftermath Campus Shutdowns” symposium for the American Fisheries Society annual meeting in Spokane, WA.

2021 Getting into graduate school. Workshop prepared for the UGA American Fisheries Society student sub-unit and presented to the Warnell School of Forestry and Natural Resources fisheries and wildlife majors (February 18, 2021).

2020 Co-organizer of “Black Bass Biodiversity, Conservation, and Management” symposium for the Southern Division meeting of the American Fisheries Society – virtual.

2019 Organizer of “Sturgeon population dynamics: a compilation of techniques, tools, and research” symposium for the Southern Division meeting of the American Fisheries Society in Little Rock, AR.

2016 Fish age and growth considerations and procedures. Presented as part of the continuing education program for the 2016 joint conference between the Nebraska and Kansas chapters of the American Fisheries Society, Manhattan, KS.

## ACADEMIC EXPERIENCE

### *Courses taught:*

Estimating Reproductive Parameters in Fish; Co-instructor with Dr. Pete Hazelton (FISH 8950) – Spring 2024 (4 hr)

Age and Growth of Fishes (FISH 8300) – Spring 2023 (2 hr)

Fisheries Management/Lab (FISH 5360/7360 & FISH 5360L/7360L) – Fall 2019-2025 (3 hr)

Natural Resources Conservation (FANR 1100e) – Summer 2023-2025 (3 hr)

Teaching Practicum (FANR 8900) – Fall 2022 & 2023 (3 hr)

Conservation Conversations (FYOS 1001) – Spring 2021 and Fall 2022-2025 (1 hr)

Information and Strategies for Pursuing a Successful Career in Fisheries (FYOS 1001) – Spring & Fall 2020, and Fall 2021 (1 hr)

Fisheries Problems: How to Develop a Scientific Review Paper (FISH 7980) – Spring 2020, 2022, and 2025 (3 hr)

Senior Project in Forestry and Natural Resources Management – Spring 2020, 2025 (1 hr)

Ichthyology (NRES 489/889) – Spring 2019 (3 hr)

Stream Ecology (NRES 481/881) – Fall 2015 (3 hr)

Exploring Fisheries Opportunities and Research; Co-Instructor with Dr. Mark Pegg (NRES 163) – Annually 2013-2019 (1 hr)

### *Guest lectures:*

Fish Physiology (FISH 4500/6500): University of Georgia – Fall 2024

Society and Natural Resources (FANR 3400): University of Georgia – Fall 2023

Georgia Fishes Field Study (Maymester course): University of Georgia – Spring 2021

Environmental Biology of Fishes: University of Georgia – Spring 2020

Freshwater Management Techniques: University of Nebraska-Kearney (Invited, 11/2018)  
Fisheries Science (NRES 463/863): Annual guest lectures (2013-2018)  
Ichthyology (NRES 489/889): Annual guest lectures (2013-2018)  
Topics in Applied Ecology (NRES 801): Fall 2017

*Graduate students supervised:*

Kaylin Regan, University of Georgia – M.S. (anticipated 2027)  
Garrison Forrester, University of Georgia – M.S. (anticipated 2026)  
Alan Bond, University of Georgia – Ph.D. (anticipated 2027)  
Hunter Rider, University of Georgia – M.S. (2025)  
  
Joseph Nolan, University of Georgia – M.S. (2025)  
  
Russell Wilson (co-advised with Dr. Fox), University of Georgia – M.S. (2024)  
Savannah Perry, University of Georgia – M.S. (2024)  
  
Matthew Phillips, University of Georgia – M.S. (2024)

Victoria Davis, University of Georgia – M.S. (2023)

(Presently employed by the University of Georgia)

Mark D’Ercole (co-advised with Dr. Fox), University of Georgia – M.S. (2023)

Joel Yeager, University of Georgia – M.S. (2022)

(Current PhD student at the University of Southern Mississippi)

Jackson Glomb, University of Georgia – M.S. (2022)

(Presently employed by the University of Illinois)

Jacob Werner, University of Nebraska-Lincoln – M.S. (2020)

(Presently employed by the Nebraska Game and Parks Commission)

Quintin Dean, University of Nebraska-Lincoln – M.S. (2020)

(Presently employed by the Texas Parks and Wildlife Department)

Caleb Uerling, University of Nebraska-Lincoln - M.S (2018)

(Presently employed by Montana Fish, Wildlife, and Parks)

*Employees supervised:*

David Higginbotham, University of Georgia – Research Professional III (2019-present)

Victoria Davis, University of Georgia – Research Professional I (2023-present)

Joel Yeager, University of Georgia – Research Professional I (2022-2023)

Troy Simon, University of Georgia – Research Professional III (2021-2022)

*Graduate student committee member:*

Katie Morgan, University of Georgia – M.S. (spring 2026)

Michaela Collins, University of Georgia – MNR (spring 2026)

Zoe Scribner, University of Georgia – M.S. (anticipated spring 2026)

Sarah Weaver, University of Georgia – M.S. (anticipated fall 2025)

Juliana Kaloczi, Iowa State University – M.S. (anticipated fall 2025)

Zachary Schumber, University of Georgia – M.S. (2024)

Lauren Carroll, University of Georgia – M.S. (2023)

Kieran Merritt, University of Georgia – M.S. (2022)

Zach Horstman, University of Nebraska-Lincoln – M.S. (2020)

Henry Hansen, University of Nebraska-Lincoln – M.S. (2019)

Dylan Turner, University of Nebraska-Lincoln – M.S. (2018)

Stephen Siddons, University of Nebraska-Lincoln – M.S. (2016)

*Undergraduate Senior/Honors Thesis Advisor:*

Adam Fischer, University of Georgia (Anticipated 2026)

Ana Cawthon, University of Georgia (Anticipated 2026)

Brendan Amman, University of Georgia (2023)

Brandon Filaski, University of Georgia (2021)

Kaitlyn Elder, University of Nebraska-Lincoln (2019)

## ACADEMIC SERVICE

2024-present UGA Warnell representative for the National Association of University Fish and Wildlife Programs (NAUFWP)

2020-2022 &

2023-present Administrative Leadership Committee for the Warnell School of Forestry and Natural Resources - UGA

2023 Dean Greene 5-year Administrative Review Committee, UGA

2023 Warnell Outstanding Teaching Assistantship Ad Hoc Awards Committee - UGA

2023	Search Committee for Wildlife Lecturer position – Warnell School of Forestry and Natural Resources - UGA
2023-present	University Libraries Committee - UGA
2020-2025	Graduate Affairs Committee for the Warnell School of Forestry and Natural Resources - UGA
2020-2021	Curriculum Committee for the Warnell School of Forestry and Natural Resources - UGA
2021	Search Committee for Landscape Conservation Genetics position - Warnell School of Forestry and Natural Resources - UGA
2015-2019	Community Engagement Committee for the UNL School of Natural Resources
2015-2019	Safety and Facilities Committee for the UNL School of Natural Resources
2012-2013	Staff Advisory Professional Development Committee for the UNL School of Natural Resources
2012-2013	Staff and Professional/Managerial Committee for the UNL School of Natural Resources

## *CONTINUING EDUCATION, JOB-RELATED TRAINING COURSES, AND AWARDS*

2025 Jack DeQuine Award for Best Technical Paper in SEAFWA Journal (2025)

Integrating writing to activate learning in any class - Center for Teaching and Learning, UGA (2025)

Creative uses of generative AI for teaching - Center for Teaching and Learning, UGA (2025)

Responsible Use of AI for Teaching & Learning – Center for Teaching and Learning, UGA (2025)

Meaningful Student Interaction with Perusall, UGA – Center for Teaching and Learning (2024)

Warnell Fall Graduation Commencement Speaker, University of Georgia (2022)

Teaching & Learning Conference, University Systems of Georgia, Athens, GA (2023)

Active Learning Workshop, Center for Teaching & Learning, University of Georgia (2023)

Perusall Exchange – An event for innovators in social learning, virtual (2022)

Biennial Conference on University Education in Natural Resources, UNL – virtual (2022)

Teaching Academy Fellows Program, University of Georgia (2020)

Creating a Sustainable Writing Practice, University of Georgia (Fall 2020)

Faculty Search Committee Training, University of Georgia (11/16/2020)

Promotion and Tenure Dossier Preparation Workshop, University of Georgia (5/19/2020)

Promotion and Tenure Procedure Workshop, University of Georgia (12/17/210)

Active Learning workshop, University of Georgia, Athens, GA (11/2019)

Leadership workshop, Midwest Fish and Wildlife Conference, Lincoln, NE (02/2017)

Leadership workshop, *Becoming an EPIIC Leader*, by Marquita Qualls - Entropia Consulting (10/2016)

Mentoring workshop, *Enhancing Productivity and Professional Relationships*, UNL, (09/2016)

Leadership workshop, Midwest Fish and Wildlife Conference, Grand Rapids, MI (02/2016)

Personal Income Taxation, CYAF 840, University of Nebraska-Lincoln, Spring semester 2017

Principles of Risk Management, CYAF 824, University of Nebraska-Lincoln, Spring semester 2016

Foundations in Financial Planning CYAF 821, University of Nebraska-Lincoln, Spring semester 2016

Investing for the Family's Future, CYAF 883, University of Nebraska-Lincoln, Summer semester 2016

Estate Planning, CYAF 823, University of Nebraska-Lincoln, Fall semester 2016

*Awards:*

2025 – Jack DeQuine Award for Outstanding Technical Paper of the Year, SEAFWA Journal.

2024 –Professional of the Year in Fisheries Science and Research, Georgia Chapter of the American Fisheries Society (Runner-up).

2024 – Professional Team of the Year, Georgia Chapter of the American Fisheries Society.

2023 – Early Career Fisheries Education Award, American Fisheries Society.

2022 – Creative Teaching Award nomination from the Warnell School, University of Georgia (not awarded).

2021 – Creative Teaching Award nomination from the Warnell School, University of Georgia (not awarded).

2021 – Alumni Award for Early Career Teaching, University of Georgia.

2018 – Institute of Agriculture and Natural Resources Travel Award, University of Nebraska.

2018 – Early Career Professional Award, Education Section of the American Fisheries Society.

2016 – Institute of Agriculture and Natural Resources Travel Award, University of Nebraska.

- 2016 – Award of Merit – Fish Management Section of the American Fisheries Society. Awarded for significant achievement and contribution to fisheries science.
- 2015 – Service Award – Nebraska Chapter of the American Fisheries Society. Awarded for recognition of personal contributions to the achievement and enhancement of fisheries science.
- 2011 – Best Oral Presentation – Nebraska Chapter of the American Fisheries Society. Awarded for the presentation entitled, “Tag retention of t-bar anchor tags and PIT tags in shovelnose sturgeon.”
- 2007 – Best Professional Poster Presentation Award. Missouri River Natural Resource Conference

*Student awards:*

- 2024 – Best Student Presentation (2<sup>nd</sup> place) – Georgia Chapter of the American Fisheries Society – Matt Phillips, M.S.
- 2024 – Best Student Presentation (3<sup>rd</sup> place) – Georgia Chapter of the American Fisheries Society – Hunter Rider, M.S.
- 2024 – Ronnie J. Gilbert Scholarship award winner – Hunter Rider
- 2024 – Georgia AFS travel grant recipient – Hunter Rider
- 2023 – Selected recipient for the annual travel award presented by the Invasive and Introduced Species Section of the American Fisheries Society – Victoria Davis
- 2021 – First Runner Up for Best Student Presentation – Southern Division of the American Fisheries Society virtual conference. M.S. Student – Jackson Glomb
- 2021 – Overall winner for Best Student Presentation – American Fisheries Society annual conference in Baltimore, MD. M.S. Student – Jackson Glomb
- 2021 – Runner Up for the Skinner Award from the American Fisheries Society. M.S. Student – Joel Yeager

## PROFESSIONAL SERVICE

- 2024: Symposium Moderator, American Fisheries Society annual meeting
- 2024 Distinguished Service Award Committee, American Fisheries Society
- 2023-present President, American Fisheries Society, Education Section
- 2023-present Governing Board member, American Fisheries Society
- 2022: Standing declaration for the litigation of Center of Biological Diversity vs. US Department of Transportation Maritime Administration’s America’s Marine Highway Program
- 2022: Standing declaration for the litigation of Center of Biological Diversity vs. US Army Corps of Engineers Nationwide Permit 12 regarding the Keystone XL Pipeline
- 2021: Symposium Moderator, Southern Division of the American Fisheries Society
- 2021-present Appointed member of the AFS Financial Planning and Procedures Committee
- 2020-present Advisory Board for Field Sciences, Upper Iowa University
- 2020-present: Independent Science Advisory Panel member – Advisor to the Missouri River Recovery Implementation Committee
- 2020-2021: Associate Editor, Special Issue: Catfish 2020 – the 3<sup>rd</sup> International Catfish Symposium in

*North American Journal of Fisheries Management*

- 2020: Session Moderator, Southern Division of the American Fisheries Society
- 2020: Standing declaration for the litigation of Center of Biological Diversity vs. US Army Corps of Engineers
- 2020: Standing declaration for the litigation of Center of Biological Diversity vs. US Environmental Protection Agency
- 2019-present: Faculty advisor for the UGA student subunit of the American Fisheries Society
- 2016-2023: Secretary/Treasurer, American Fisheries Society, Education Section
- 2004-present: Member, American Fisheries Society
- 2020-present: Member, North American Sturgeon and Paddlefish Society
- 2014-2019: Early Career professional committee of the North Central Division of the American Fisheries Society

- 2014-2019: Faculty advisor for the UNL archery club
- 2007-2019: Member, Nebraska Chapter of the American Fisheries Society
- 2015-2018: Member, Communications Strategic Planning Committee, American Fisheries Society
- 2014-2018: Member, Awards Committee for the North Central Division of the American Fisheries Society
- 2017: Session Moderator, Midwest Fish and Wildlife Conference, Lincoln, NE
- 2015-2016: President, Nebraska Chapter of the American Fisheries Society
- 2011-2014: Member, Iowa Chapter of the American Fisheries Society

## CONSULTING

- 2025 Econfinia Creek System; Northwest Florida Water Management District, Havana, Florida
- 2023 Suwannee River Water Management District. Peer reviewer for “The minimum flow and minimum water levels” reports for the upper and middle Suwannee River.
- 2017 U.S. Army Corps of Engineers. Peer Reviewer of “Middle Mississippi River Sturgeon Chub Model”

## MANUSCRIPT REVIEWS:

- 2024 *North American Journal of Fisheries Management (3), Journal of Applied Ichthyology (1), Transactions of the American Fisheries Society (1)*

Previous

*Journal of Fish Biology, Journal of Oceanology and Limnology, Ecohydrology, Ecology of Freshwater Fishes, North American Journal of Fisheries Management, Transactions of the American Fisheries Society, Canadian Journal of Fisheries and Aquatic Sciences, Environmental Biology of Fishes, Journal of Applied Ichthyology, Fisheries Management and Ecology, River Research and Applications, Lakes and Reservoirs*

## TECHNICAL REPORTS

**Hamel, M.J.,** S. Perry, and B. Irwin. 2023. Movement and Distribution of Lake Sturgeon in the Coosa River. Annual Performance Review, US Fish and Wildlife Service Science Support Program.

**Hamel, M.J.,** S. Perry, and M. Phillips. 2023. Population demographics and dynamics of introduced Lake Sturgeon in the Coosa River basin, Georgia. Annual Performance Review, Georgia Department of Natural Resources.

**Hamel, M.J.,** S. Perry, and B. Irwin. 2022. Movement and Distribution of Lake Sturgeon in the Coosa River. Annual Performance Review, US Fish and Wildlife Service Science Support Program.

**Hamel, M.J.,** S. Perry, and M. Phillips. 2022. Population demographics and dynamics of introduced Lake Sturgeon in the Coosa River basin, Georgia. Annual Performance Review, Georgia Department of Natural Resources.

**Hamel, M.J.,** and J. Yeager. 2022. Determining movement dynamics, life history attributes, and angler exploitation of Suwannee Bass in Georgia. Completion Report, Georgia Department of Natural Resources, Atlanta, GA

**Hamel, M.J.**, and J. Yeager. 2021. Determining movement dynamics, life history attributes, and angler exploitation of Suwannee Bass in Georgia. Annual Performance Review, Georgia Department of Natural Resources, Atlanta, GA

**Hamel, M.J.**, and M.A. Pegg. 2019. Riverine Sportfish Ecology and Management. Project completion report (No. F-75-R) to Nebraska Game and Parks Commission, Lincoln, NE

**Hamel, M.J.**, and M.A. Pegg. 2018. Sturgeon Management in the Platte River, Nebraska: Implications to a Declining Sportfish Population. Project completion report to Nebraska Game and Parks Commission, Lincoln, NE

**Hamel, M.J.**, and M.A. Pegg. 2018. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.**, and M.A. Pegg. 2017. Sturgeon Management in the Platte River, Nebraska: Implications to a Declining Sportfish Population. Annual Performance Report to Nebraska Game and Parks Commission, Lincoln, NE

**Hamel, M.J.**, and M.A. Pegg. 2017. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.**, and M.A. Pegg. 2016. Sturgeon Management in the Platte River, Nebraska: Implications to a Declining Sportfish Population. Annual Performance Report to Nebraska Game and Parks Commission, Lincoln, NE

**Hamel, M.J.**, and M.A. Pegg. 2016. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.**, and M.A. Pegg. 2015. Sturgeon Management in the Platte River, Nebraska: Implications to a Declining Sportfish Population. Annual Performance Report Nebraska Game and Parks Commission, Lincoln, NE

**Hamel, M.J.**, and M.A. Pegg. 2015. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.**, and M.A. Pegg. 2014. Sturgeon Management in the Platte River, Nebraska: Implications to a Declining Sportfish Population. Annual Performance Report to Nebraska Game and Parks Commission, Lincoln, NE

**Hamel, M.J.**, and M.A. Pegg. 2014. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.**, and M.A. Pegg. 2013. Sturgeon Management in the Platte River, Nebraska: Implications to a Declining Sportfish Population. Annual Performance Report to Nebraska Game and Parks Commission, Lincoln, NE

**Hamel, M.J.**, and M.A. Pegg. 2013. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.** and M.A. Pegg. 2012. Sturgeon Management in the Platte River, Nebraska. Annual Performance Report. Nebraska Game and Parks Commission, Lincoln, NE.

**Hamel, M.J.**, and M.A. Pegg. 2012. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.** and M.A. Pegg. 2011. Sturgeon Management in the Platte River, Nebraska. Annual Performance Report. Nebraska Game and Parks Commission, Lincoln, NE.

**Hamel, M.J.**, and M.A. Pegg. 2011. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.** and M.A. Pegg. 2010. Sturgeon Management in the Platte River, Nebraska. Annual Performance Report. Nebraska Game and Parks Commission, Lincoln, NE.

**Hamel, M.J.**, and M.A. Pegg. 2010. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

**Hamel, M.J.** and M.A. Pegg. 2009. Sturgeon Management in the Platte River, Nebraska. Annual Performance Report. Nebraska Game and Parks Commission, Lincoln, NE.

**Hamel, M.J.**, and M.A. Pegg. 2009. Sturgeon Management in the Platte River, Nebraska. Annual Performance Review, U.S. Fish and Wildlife Service, Endangered Species Permitting – Denver, CO.

## Curriculum Vitae for Nathan Holt



## Nate Holt, PE

### Senior Engineer

#### Professional Profile

Mr. Holt's experience includes environmental studies involving pollutant characterization and assessment; modeling and analysis (surface water, vadose zone, and groundwater); water supply-related surface-groundwater interactions; and geospatial mapping and analysis. He evaluates pollutant leaching and transport through soils, in groundwater, and within surface water systems through measurement and modeling. Mr. Holt develops surface water, porewater, and groundwater monitoring systems to collect environmental data. He develops, calibrates, and uses flow and pollutant transport numerical models, including hydrodynamic surface water models, vadose zone soil-water models, and groundwater models. Mr. Holt also develops and leverages GIS geospatial tools for field mapping and data management. He has been published in peer-reviewed journals, including the *American Society of Civil Engineer's Irrigation and Drainage*, *Advances in Water Resources*, the *Journal of Hydrology*, and *Communications Earth & Environment* from the Nature Portfolio.

#### Representative Experience

**Lake Weston BMP Feasibility Analysis, Orlando, FL.** Project engineer and modeler for the evaluation of BMPs designed to reduce nutrient loads to Lake Weston. Conducted hydrodynamic and water quality modeling of the canal with RMA2/RMA4 software to evaluate nutrient reduction and potential recirculation issues associated with installing a nutrient reduction filter off a canal that feeds Lake Weston.

**Conway Area Drainage Infrastructure GIS Assessment Project, Orange County, FL.** Project engineer. Identified, mapped, and evaluated approximately 7,000 drainage infrastructure deficiencies through a geospatial field assessment of roadway and drainage infrastructure for 120 lane miles. Tasks included developing GIS feature classes for use in the field assessment; developing field maps in ArcGIS Online for use in mobile mapping applications; geospatial field mapping of infrastructure deficiencies; geodatabase development and management; evaluating mapped infrastructure deficiencies, and map creation. GIS software included ArcGIS Pro, ArcMap, ESRI's mobile mapping applications (Field Maps/Collector), and QGIS. Deliverables included clean GIS geodatabases of mapped infrastructure deficiencies, including photographs, and maps showing locations and descriptions of mapped infrastructure deficiencies.

**Groundwater Vulnerability Assessment, Orange County, FL.** Evaluated the impact of pollution from septic systems on the quality of vulnerable water resources. Conducted groundwater vulnerability mapping using geospatial modeling (Arc-SDM) in GIS and water quality modeling and analysis using vadose zone and groundwater transport modeling (STUMOD, HYDRUS, and MODFLOW). Identified vulnerable regions to develop priority focus areas, guide ordinance updates, and help determine areas to target for future septic-to-sewer conversions and upgrades.

#### Years Experience

13 years; 6 years with firm

#### Expertise

Hydrodynamic, Vadose Zone, & Groundwater Modeling

Surface Water/Groundwater Interactions

Hydrogeology

Environmental Assessment

Geospatial Mapping & GIS Analysis

#### Education

MS, Agricultural & Biological Engineering, University of Florida, 2014

BS, Agricultural & Biological Engineering, University of Florida, 2012

#### Licenses/Certifications

Professional Engineer, FL #87082

Professional Engineer, IA #25045

**Professional Affiliations**  
**DRUMMOND**  
American Society of Agricultural and  
Biological Engineers  
**CARPENTER**

**Peer Review Services, Orange County, FL.** Project manager providing technical peer review services to Orange County's Environmental Protection Division. Activities involve technical peer review and analysis of water quality projects and deliverables conducted by other consultants to help Orange County identify any shortcomings and potential recommendations.

**Pine Hills Road Trail Phase 2C, Orange County, FL.** Project manager providing services on a roadway construction project designed to increase pedestrian safety. Conducting environmental screening and developing a Site Evaluation Report (SER). The SER will identify contaminated sites adjacent to the construction project area and evaluate how potential nearby contamination could impact project activities.

**Lake Okeechobee Basin Management Action Plan (BMAP) Assessment, Orange County, FL.** Project manager helping Orange County identify their role and responsibility in the Lake Okeechobee BMAP. Project activities include determining the fairness of relevant BMAP source allocations; evaluating nutrient source loading modeling efforts; identifying potential discrepancies between Orange County's reported and received BMP nutrient reduction credits; conducting pollutant load modeling; and developing recommendations for future BMPs that will help the County meet its nutrient reduction requirements related to the BMAP.

**Lake Condel Lead Assessment, Orange County, FL.** Project manager and technical lead who evaluated the impacts of heavy metal, lead (Pb), on an impaired freshwater lake in central Florida (Lake Condel). The project included a field investigation that involved sampling of lake sediment and lake water quality. Measurements of lake soft sediment thickness and water depth were also collected. Using past water quality data and results from data collected during the field investigation, a path forward was developed for Orange County to facilitate achieving mitigation of Pb impacts on the lake and potential removal of the lake's Pb impairment status. Options reviewed included both active (dredging, capping, planting) and passive (monitored natural recovery) mitigation strategies.

**Lake Hart Lead Assessment, Orange County, FL.** Project manager and technical lead evaluating the impacts of a heavy metal, lead (Pb), on an impaired freshwater lake in central Florida (Lake Hart). The project includes a field investigation that involved sampling of lake sediment and lake water quality. Measurements of lake soft sediment thickness and water depth were also collected. Using past water quality data and results from data collected during the field investigation, a path forward was developed for Orange County to facilitate achieving mitigation of Pb impacts on the lake and potential removal of the lake's Pb impairment status. Options reviewed included both active (dredging, capping) and passive (monitored natural recovery) mitigation strategies.

**Lake Buchanan Feasibility Study, Orange County, FL.** Project manager evaluating conceptual BMPs designed to reduce nutrients in a freshwater lake in central Florida (Lake Buchanan). The project involves surface water modeling of different design alternatives using ICPR; modeling of potential recirculation issues in the lake using the hydrodynamic software RMA2/RMA4; developing a conceptual design of a BMP; and conducting a feasibility assessment of the selected BMP. Specifically, the conceptual BMP design includes a chamber with filter media that will receive pumped lake water, treat it to reduce nitrogen and phosphorus levels, and discharge the water back to the lake.

**Lake Mary Jane Lead Assessment, Orange County, FL.** Project manager and technical lead who evaluated the impacts of a heavy metal, lead (Pb), on an impaired freshwater lake in central Florida (Lake Mary Jane). The project included a field investigation that involved sampling of lake sediment and lake water quality. Measurements of lake soft sediment thickness and water depth were also collected. Using past water quality data and results from data collected during the field investigation, a path forward was developed for Orange County to facilitate achieving mitigation of Pb impacts on the lake and potential removal of the lake's Pb impairment status. Options reviewed included both active (dredging, capping) and passive (monitored natural recovery) mitigation strategies.

**Lake Gandy Phase II BMP Performance Monitoring, Orange County, FL.** Project manager and technical lead who evaluated the nutrient reduction performance of two structural BMPs, gravel treatment wetland and a modular wetland system, design to capture and treat stormwater before reaching a freshwater lake in Central Florida (Lake Gandy). Project activities included installation of surface water monitoring equipment, including autosamplers, bubblers, rain gauges, and area-velocity sensors. Telemetry systems were also installed to allow for remote data collection and storage. Surface water sampling using ICPR was conducted to develop triggering protocols to collect samples during storm events to evaluate the effectiveness of the BMPs in reducing nutrient loads.

**Fertilizer Ordinance Support, Orange County, FL.** Project manager and numerical modeler who evaluated Orange County's fertilizer ordinance. Reviewed existing fertilizer ordinance literature; conducted a survey of local governments in Florida with fertilizer ordinances; isotopic nitrate source tracing analysis; and simulation of the fate and transport of surface-applied nitrogen fertilizer using numerical modeling software (HYDRUS, MODFLOW, RT3D). Recommendations were developed to support Orange County's existing fertilizer ordinance and potential future updates.

**Big Sand Lake Lead Assessment Phases I and II, Orange County, FL.** Project engineer and technical lead who evaluated the impacts of a heavy metal, lead (Pb), on an impaired freshwater lake in central Florida (Big Sand Lake). The project included a field investigation that involved sampling of onshore soil, lake sediment, and lake water quality. Measurements of lake soft sediment thickness and water depth were also collected. Using past water quality data and results from data collected during the field investigation, a path forward was developed for Orange County towards achieving mitigation of Pb impacts on the lake and potential removal of the lake's Pb impairment status. Options reviewed included both active (dredging, capping) and passive (monitored natural recovery) mitigation strategies.

**Mallory Swamp Groundwater Modeling, Suwannee River Water Management District, Dixie and Lafayette Counties, FL.** Groundwater modeler who evaluated potential flooding impacts from Mallory Swamp on downstream areas. Refined the North Florida-Southeast Georgia (NFSEG) regional groundwater model to represent local head conditions in the area around Mallory Swamp. Refined the model using Groundwater Vistas and conducted exploratory simulations to analyze potential flooding impacts from Mallory Swamp and the impact of water table position on infiltration and stormwater runoff dynamics.

**Lakes Water Quality Prioritization Master Plan, Orlando, FL.** Project engineer on the development of a water quality master plan for the City of Orlando. Evaluated the connectivity of lakes throughout the city, factors driving lake water quality parameters within City lakes using lake water quality statistical and spatial analyses in GIS, and developed project maps.

**Lake Lawne Weir Gate Design, Orange County, FL.** Project engineer who provided design support services for installation of a sluice gate into a weir that serves as the control structure for Lake Lawne Regional Stormwater Facility. Modified an existing stormwater model (ICPR) to perform a sluice gate sizing analysis.

**Pine Hills Road Pedestrian Safety Project, Orange County, FL.** Project engineer who provided water resources, GIS field mapping, and environmental services on a roadway construction project designed to increase pedestrian safety. Performed drainage design, developed stormwater pollution plans, and conducted environmental screening. Developed a GIS feature class stored in ArcGIS Pro and a field map in ESRI's Field Maps mobile mapping application to conduct field mapping of stormwater inlets in the project area.

**Regulatory Permitting Support Services, Orange County, FL.** Senior engineer who supported Orange County's regulatory permitting of boat docks and lakeshores. Developed GIS feature classes in a geodatabase, including the ability to attach photographs, to complete approximately 400 lakeshore and boat dock permit inspections. Developed GIS field forms for the feature classes using Smart Forms in ArcGIS Online for use in ESRI's Field Maps mobile mapping application. Information collected by field crew is automatically loaded into the GIS feature classes. Inspection maps detailing results of each site inspection are autogenerated using ArcGIS Pro linked to the inspection GIS feature classes. Project effort also included reviewing permit case files, contacting permittees, performing field data collection efforts, conducting vegetation surveys, conducting post-construction inspections, and report generation of project findings.

**Pine Hills East Landfill, Orange County, FL.** Engineer and technical lead providing services for the long-term monitoring of the landfill. Developed the annual environmental monitoring report and closure cost estimate for the landfill for several years. Evaluated historical landfill data, water level and quality data, water quality trends, and plume migration.

**Fate and Transport Modeling of Nitrogen for TMDL/BMAP Support, Orange County, FL.** Project engineer and environmental modeler on the evaluation of the fate and transport of a pollutant (fertilizer) applied at the land surface through the vadose zone and groundwater to downstream waterbodies (e.g., springs). Simulated uptake, decay, and drainage dynamics of fertilizer applied to lawns and subsequent transport to downstream waterbodies using numerical modeling (HYDRUS, MODFLOW, RT3D). The goal was to identify nutrient reduction strategies for fertilizer and support Orange County's Environmental Protection Divisions fertilizer ordinance update recommendations.

**State of the Wetlands Groundwater Modeling, Orange County, FL.** Engineer and numerical modeler who evaluated wetland health across Orange County. Used a refined county-scale groundwater model, which was developed from the

regional ECFTX model, to conduct conducted groundwater modeling simulations to evaluate how major pumping centers and predicted long-term water withdrawals would impact water levels in wetlands. Results were used to identify areas where wetlands may become stressed in the future due to potential groundwater withdrawals.

**Professional Services for Gate Replacements, ALCOSAN Project S-494, Pittsburgh, PA.** Technical lead providing professional and technical GIS support services to GAI. As a subconsultant to a prime that is conducting inspections of infrastructure assets (backwater flap gates, sluice gates, bypass valves, and stop logs) associated with ALCOSAN's Interceptor System, Mr. Holt developed GIS feature classes and ArcGIS Online applications used in the inspections. The GIS mapping applications store inspection data, geospatial infrastructure information, and photographs to document asset condition. The GIS features and maps being developed are designed to be compatible with ALCOSAN's GIS data inventory and the GIS software utilized by ALCOSAN GIS staff.

**Geophysical Investigation of L-BAR Disposal Cell, Cibola County, NM.** Field engineer on a geophysical investigation to identify potential locations of significant subsurface voids and to develop a material cross-section of the disposal cell. Conducted field collection of electromagnetic, ground penetrating radar, and electrical resistivity geophysical data. Developed GIS mobile maps to facilitate project execution in the field.

**Groundwater Modeling for Future Plume Capture, White Sands Test Facility, Las Cruces, NM.** Numerical modeler who modified a numerical groundwater flow model to evaluate capture of N-nitrosodimethylamine (NDMA) and trichloroethylene (TCE) plumes by a pump-and-treat system under different operation strategies. Models included MODFLOW-SURFACT and MODPATH. Model results were used to inform decisions regarding operation of the pump-and-treat system.

## EXPERIENCE PRIOR TO DC

### **USGS National Groundwater Monitoring Network Support, IA.**

Field engineer on a project conducting slug tests and analyzing test results for a project that incorporated wells from the Iowa Geological Survey's water level network into the USGS National Groundwater Monitoring Network. Analyzed slug tests using the software package AquiferTest.

**Water Supply Sustainability Modeling, Linn, Johnson, Cerro Gordo, and Webster Counties, IA.** Engineer and numerical modeler on multiple groundwater modeling water supply planning projects using MODFLOW to evaluate long-term, local, and regional sustainability of groundwater withdrawals from the Cambrian-Ordovician aquifer. Duties included collecting and analyzing aquifer tests, model development and calibration, predictive groundwater modeling. Predictive simulations were conducted for 20-year periods in accordance with the length of water use permits issued in the state.

**Plainfield Wellfield Protection, Plainfield, IA.** Plainfield is a small town in Iowa that was using two wells for its water supply. Nitrate concentrations in the wells were increasing. In 2014, the Iowa Department of Natural Resources conducted Phase I and II source water protection assessments for Plainfield's wellfield. In 2017, the Iowa Geology Survey (IGS) conducted additional assessment to refine the wellfield's capture zone and identify areas where the wellfield is most vulnerable to surface contamination and most in need of wellhead protection. Mr. Holt, working with IGS colleagues, conducted a conventional aquifer test using Plainfield's wells and analyzed the test using the AquiferTest software from Waterloo Hydrogeologic. The locally developed hydrogeologic parameters from the aquifer test were used to update the capture zone for the wellfield. The updated capture zone in conjunction with an evaluation of local geology was used to identify the most vulnerable areas within the wellfield's recharge area. These identified areas were significantly smaller than the previously developed protection areas and were recommended for conversion from row crop to natural grasses through the USDA's Conservation Resource Program.

**Groundwater Flow Modeling, Iowa Department of Natural Resources/State of Iowa, Cerro Gordo and Webster Counties, IA.** Numerical modeler on a regional groundwater modeling project (MODFLOW) to evaluate long-term, regional sustainability of the Cambrian-Ordovician (CO) aquifer in the Fort Dodge and Mason City areas of Iowa. Duties included participating in collecting and analyzing aquifer tests, model calibration, and simulating regional drawdown under various growth scenarios. All area CO aquifer users in the Fort Dodge and Mason City areas were incorporated into the model in order to account for the impact of collective well interference on future drawdowns. Predictive simulations were conducted for 20 year periods. Regular meetings were held with the regulatory authority, the Iowa Department of Natural Resources (IDNR), during model development. Upon project completion, a report on model development and results was presented to the IDNR for use in future water use permit allocations.

**Groundwater Flow Modeling, Fort Dodge, IA.** Numerical modeler on a groundwater flow modeling project for the City of Fort Dodge. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report on modeling results for the client.

**Groundwater Flow Modeling, Mason City, IA.** Numerical modeler on a groundwater flow modeling project for the City of Mason City. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report on modeling results for the client.

**Groundwater Flow Modeling, Koch Fertilizer, LLC, Duncombe, IA.** Numerical modeler on a groundwater flow modeling project for Koch Fertilizer, LLC. Numerical modeler on a groundwater flow modeling project for the City of Fort Dodge. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report on modeling results for the client.

**Groundwater Exploration and Flow Modeling, Harlan Municipal Utilities, Harlan, IA.** Field engineer on a groundwater exploration project conducted for Harlan Municipal Utilities to evaluate current wellfield infrastructure, identify areas for expansion, and predict future water production under drought conditions. Participated in collecting geophysical data (electrical resistivity). Participated in conducting a conventional pump test, including installing observation wells, installing pressure transducers in observation wells, installing a temporary pump in a production well, collecting water use and water levels during the test, and analyzing results to determine local hydrogeologic parameters. Participated in groundwater flow model development and execution.

**Groundwater Exploration and Flow Modeling, Fairfax, IA.** Field engineer on a groundwater exploration project was conducted for the City of Fairfax to identify potential water production for a bedrock aquifer in an area that the city had identified for expansion. Participated in collecting geophysical data (electrical resistivity) to identify potential fractures and voids. Designed pump tests, analyzed pump test data, and developed a local groundwater flow model to evaluate water production, well interference on neighboring wells, and potential capture zones.

**Groundwater Exploration and Flow Modeling, Iowa Falls, IA.** Field engineer on a groundwater exploration project conducted for the City of Iowa Falls to help the city identify ideal locations for a new well in a bedrock aquifer. Participated in collecting geophysical data (electrical resistivity) to identify potential fractures and voids. Designed pump tests, installed pressure transducers, analyzed pump test data, and developed a local groundwater flow to evaluate water production and potential well interference on neighboring wells.

**Groundwater Exploration with Geophysics, Northwest Iowa Rural Water System, Rock Valley, IA.** Field engineer on a groundwater exploration project conducted for Northwest Iowa Rural Water System to identify potentially productive areas of an alluvial aquifer. Participated in collecting geophysical data (electrical resistivity) and interpreting the geophysical results in terms of how electrical resistivity relates to potential water production in the aquifer.

**Groundwater Sustainability Modeling, Iowa.** Groundwater modeler evaluating the local and regional long-term water supply sustainability of the Cambrian-Ordovician (Jordan) aquifer. Refined a regional aquifer model to local wellfields across multi-county areas. Duties included collecting and analyzing aquifer tests, model development with local mesh refinement, model calibration, predictive modeling, and meeting with clients including the Iowa Department of Natural Resources.

**Groundwater Exploration with Geophysics, Rural Water System #1, Hospers, IA.** Field engineer on groundwater exploration project conducted for Rural Water System #1 to identify potentially productive areas of an alluvial aquifer for wellfield expansion. Participated in collecting geophysical data (electrical) and interpreting the geophysical results in terms of how electrical resistivity relates to potential water production in the aquifer.

**Groundwater Flow Modeling, Iowa Department of Natural Resources/State of Iowa, Linn and Johnson Counties, IA.** Numerical modeler on a regional groundwater modeling project to evaluate long-term, regional sustainability of the Cambrian-Ordovician (CO) aquifer in the Linn and Johnson Counties Groundwater Protected Area. Duties included participating in collecting and analyzing aquifer tests, model calibration, and simulating regional drawdown under various growth scenarios. All area CO aquifer users in Linn County and Johnson County were incorporated into the model in order

to account for the impact of collective well interference on future drawdowns. Predictive simulations were conducted for 20 year periods. Regular meetings were held with the regulatory authority, the Iowa Department of Natural Resources (IDNR), during model development. Upon project completion, a report on model development and results was presented to the IDNR for use in future water use permit allocations.

**Groundwater Flow Modeling, North Liberty, IA.** Numerical modeler on a groundwater flow modeling project for the City of North Liberty. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Flow Modeling, Marion, IA.** Numerical modeler on a groundwater flow modeling project for the City of Marion. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Flow Modeling, Iowa City, IA.** Numerical modeler on a groundwater flow modeling project for the City of Iowa City. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Flow Modeling, Tiffin, IA.** Numerical modeler on a groundwater flow modeling project for the City of Tiffin. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Flow Modeling, Coralville, IA.** Numerical modeler on a groundwater flow modeling project for the City of Coralville. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Flow Modeling, Iowa City, IA.** Numerical modeler on a groundwater flow modeling project for the University of Iowa. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Flow Modeling, Archer Daniels Midland Company, Cedar Rapids, IA.** Numerical modeler on a groundwater flow modeling project for the Archer Daniels Midland Company. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Flow Modeling, Ingredion, Cedar Rapids, IA.** Numerical modeler on a groundwater flow modeling project for Ingredion. A regional groundwater flow model (MODFLOW) of the Cambrian-Ordovician (CO) aquifer was modified down to the local wellfield scale. Duties included participating in client meetings, analyzing aquifer tests, incorporating local hydrogeologic and water use information into the model, model calibration, conducting predictive simulations to evaluate long-term drawdowns under various growth scenarios, and developing a report for the client on modeling results.

**Groundwater Evaluation, Northwest Iowa Rural Water System, Rock Valley, IA.** A groundwater evaluation project was conducted for Northwest Iowa Rural Water to evaluate an area's potential for development of a new wellfield. Installed pressure transducers, collected water levels and pump rates during a conventional pump test conducted in the area, analyzed pump test results, and participated in summarizing results of the pump tests and evaluating the area's potential for an alluvial wellfield.

**Drought Resiliency Evaluation, Rural Water System #1, Rock Valley Rural Water, Osceola County Rural Water, Iowa Department of Natural Resources, Hospers, Rock Valley, and May City, Iowa.** A drought resiliency evaluation project was conducted for three rural systems in northwest Iowa. Three different potential drought resiliency solutions (recharge basin, floodplain pond, rock riffle) were evaluated at three alluvial wellfield sites. Participated in installing observations wells, analyzing aquifer pump tests, and collecting water levels and water quality data. Developed a local groundwater flow model and report for the Rural Water System #1 site to evaluate the impact of a floodplain pond on drought resiliency and potential impacts on water quality. Participated in data evaluation and report development for the Rock Valley Rural Water and Osceola County Rural Water sites. Participated in developing project reports, which were presented to each rural water system and to the Iowa Department of Natural Resources.

**Bed Geometries for Agricultural Production, Florida Department of Agriculture and Consumer Services, Immokalee and Clewiston, FL.** Engineer on a research project evaluating the impact of different bed geometries on agricultural production in Florida was conducted for the Florida Department of Agriculture and Consumer Services. The project was managed by Dr. Sanjay Shukla of the University of Florida's IFAS-Southwest Florida Research and Education Center. Was responsible for the project's day-to-day execution to meet project requirements and deliverables. Duties included communicating with growers, designing layouts for field trials, implementing field trials, developing sampling protocols, installing monitoring equipment (e.g., soil moisture probes, pressure transducers, flowmeters), setting up telemetry for remote data access and storage, analyzing project results, and developing reports to satisfy project deliverables.

**Nutrient Removal from Agricultural Stormwater Runoff, Florida Department of Environmental Protection, Clewiston, FL.** Engineer on research project evaluating potential impacts of retrofits to a farm's stormwater retention/detention basin on water storage and water quality was conducted for the Florida Department of Environmental Protection. The research project was managed by Dr. Sanjay Shukla of the University of Florida's IFAS-Southwest Florida Research and Education Center. Was responsible for the project's day-to-day execution to meet project requirements and deliverables. Duties included maintaining monitoring equipment (e.g. transducers, ISCOs, flowmeters), managing telemetry and data storage, managing sampling and QA/QC protocols, and participating in developing reports to meet project deliverables.

**Bed Geometries for Agricultural Production, Southwest Florida Water Management District, Immokalee, FL.** Graduate research assistant on research project evaluating the impact of different bed geometries on agricultural production in Florida was conducted for the Southwest Florida Water Management District. The project was managed by Dr. Sanjay Shukla of the University of Florida's IFAS-Southwest Florida Research and Education Center. Was responsible for collecting and analyzing data (e.g. yield, soil-water quality, flow), evaluating the impact of different bed geometries on agricultural production, and participating in developing reports to meet project deliverables. Developed multi-dimensional (2D) vadose

(semi-saturated) numerical flow models using the HYDRUS software. Models were used to evaluate the impact of different bed geometries on the field-scale hydrology of agricultural fields under shallow water table conditions.

## Peer-Reviewed Publications

V. Santikari, K. Hansen, S. Shukla, and **N. Holt**. 2025. Sustainably Intensified Fresh-Market Vegetable Production with Compact Bed Plasticulture. *Nature Portfolio: Communications Earth & Environment*. Accepted, Under Review.

J. A. Vogelgesang, **N. Holt**, K.E. Schilling, J. M. Gannon, and S. Tassier-Surine. 2019. Using High-Resolution Electrical Resistivity to Estimate Hydraulic Conductivity and Improve Characterization of Alluvial Aquifers. *Journal of Hydrology* 580: 123992.

**N. Holt**, R. Sishodia, S. Shukla, and K. Hansen. 2019. Improved water and economic sustainability with low-input compact bed plasticulture and precision irrigation. *American Society of Civil Engineers: Journal of Irrigation and Drainage Engineering*

145(7). [https://doi.org/10.1061/\(ASCE\)IR.1943-4774.0001397](https://doi.org/10.1061/(ASCE)IR.1943-4774.0001397)

**N. Holt**, S. Shukla, G. Hochmuth, R. Muñoz-Carpena, and M. Ozores-Hampton. 2017. Transforming the Food-Water-Land-Economic Nexus of Plasticulture Production System through Compact Bed Geometries. *Advances in Water Resources* 110: 515-527. <https://doi.org/10.1016/j.advwatres.2017.04.023>.

**N. Holt** and S. Shukla. 2016. Transforming the Plasticulture Production System through Novel Bed Geometry Design.

*Transactions of the ASABE* 59(3): 1-13. <http://dx.doi.org/10.13031/trans.59.11408>.

S. Shukla, **N. Holt** and G.S. Hendricks. 2014. Using Multi-Sensor Soil Moisture Probes to Decide When and How Long to Run Drip Irrigation. University of Florida's Institute of Food and Agricultural Sciences (UF-IFAS), Gainesville. Extension Document: AE505.

S. Shukla, **N. Holt** and G.S. Hendricks. 2014. Interpreting Dye Test Results for Improved Drip Irrigation Management for the Mulched Vegetable-Production Systems in South Florida. University of Florida's Institute of Food and Agricultural Sciences (UF-IFAS), Gainesville. Extension Document: AE506.

